

## 4.2 Geology, Soils, and Seismicity

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This section evaluates the potential for construction and operation of the Monterey Peninsula Water Supply Project (MPWSP or proposed project) to result in adverse impacts associated with geologic hazards, soils hazards, and/or seismic hazards. The analysis is based on review of available geologic and geotechnical maps and reports of the project area and vicinity, including reports and information published by the U.S. Geological Survey (USGS) and the California Geological Survey (CGS), the *Monterey County General Plan*, and project-specific investigations conducted for various project components.

### 4.2.1 Setting

#### 4.2.1.1 Geologic Conditions

##### *Topography*

**Figures 3-2** through **3-10** in Chapter 3, Project Description, show the locations of the proposed MPWSP components. The project area extends approximately 14 miles, from the MPWSP Desalination Plant site located in unincorporated Monterey County in the north to the western terminus of the Monterey Pipeline in the city of Pacific Grove, and east approximately 8 miles to the unincorporated community of Hidden Hills along Highway 68. In addition to unincorporated areas and the city of Pacific Grove, project components are also proposed in the cities of Monterey, Marina, Seaside, and Sand City. Although the topography of the project area is variable, the majority of the project components would be constructed in coastal dune areas or in low-lying inland areas within 2 miles of the coast.

The northern and coastal dune areas are characterized by gently to moderately rolling dunes with elevations ranging from sea level at the coast to 100 feet above mean sea level (msl) at the

proposed MPWSP Desalination Plant. Along the shoreline, the coastal dune slopes can be steep and have a high potential for erosion (Ninyo & Moore, 2005). East of the coastline, the dune deposits have gentle slopes (0 to 10 percent) with increased stability and vegetation cover. Fill embankments up to approximately 30 feet high are located throughout the area with road cuts up to approximately 20 feet high within the dune sands.

The topography of the more urbanized southern coastal portion of the project area ranges from rolling coastal dunes to older, more stable dunes and terrace deposits. The topography in this portion of the project area varies, and elevations range from 0 feet msl at the coast to about 235 feet above msl at the proposed aquifer storage and recovery (ASR) Pump Station and about 340 feet above msl at the proposed ASR injection/extraction wells (ASR-5 and ASR-6 Wells).

The proposed Ryan Ranch–Bishop Interconnection Improvements and Main System–Hidden Hills Interconnection Improvements would be located 3 and 6 miles southeast of the coastline in a relatively rugged mountainous area with elevations of about 200 and 1,000 feet above msl, respectively. The two proposed locations for the Valley Greens Pump Station are on the south side of Carmel Valley Road about 4.25 miles inland at an elevation of 107 feet above msl (Site Option 1) and about 1.5 miles inland at an elevation of about 90 feet above msl (Site Option 2).

### ***Regional Geology***

The project area lies within the geologically complex region of California referred to as the Coast Ranges Geomorphic Province.<sup>1</sup> The Coast Ranges province lies between the Pacific Ocean and the Great Valley Geomorphic Province (Sacramento and San Joaquin Valleys) and stretches from the Oregon border to the Santa Ynez Mountains near Santa Barbara. This province is marked by northwest-trending elongated ranges and narrow valleys that roughly parallel the coast and the San Andreas Fault Zone. Much of the Coast Ranges province is composed of marine sedimentary deposits, metamorphic rocks, and volcanic rocks. The project area is also underlain by the “Salinian Block”, a continental fragment of the granitic Sierra Nevada that was pushed northward by tectonic forces along the western side of the San Andreas Fault Zone (Tavarnelli, 1998). The tectonics of the San Andreas Fault and other major faults in the western part of California have played a major role in the geologic history of the area. The drainages south of San Francisco Bay are strongly influenced by tectonic-related faults and folds that typically trend parallel to the coast, although some drainages run perpendicular to the coast. The Salinas River, whose course largely lies within a synclinal trough,<sup>2</sup> exemplifies this pattern.

The Santa Lucia Range, the Salinas Valley, and the Santa Cruz Mountains are the prominent geologic features of the region. The rugged Santa Lucia Range generally runs from the Monterey Peninsula southeast to San Luis Obispo; the proposed Ryan Ranch–Bishop and Main System–Hidden Hills Interconnection Improvements and the Valley Greens Pump Station (both site options) would be located in this area. The Salinas Valley is east of the Santa Lucia Range and

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<sup>1</sup> A geomorphic province is an area that possesses similar bedrock, structure, history, and age. California has 11 geomorphic provinces (CGS, 2002a).

<sup>2</sup> A syncline or synclinal trough is a geologic feature where stratified bedrock has been folded into a concave upward form.

roughly parallels these northwest-southeast-trending mountains. The geologic development of the Salinas Valley, which runs from Monterey Bay southeast into San Luis Obispo County, is largely the result of folding, although the valley also shows characteristics of stream erosion and faulting. Most of the proposed project components (the subsurface slant wells, MPWSP Desalination Plant, improvements to the ASR system, and associated pipelines) would be constructed within the Salinas Valley. The Santa Cruz Mountains extend from the San Francisco Peninsula south to the Pajaro River, near Watsonville, where they merge with the Gabilan Range. These mountains help define the northern end of Monterey Bay.

### **Geologic Units**

The discussion of geologic units is based on the geologic mapping compilation prepared by the CGS (2002b; which is based largely on Clark et al. [1997] and Dupre and Tinsley [1980]); geotechnical field reconnaissance conducted in June and November 2004 during which various geologic units within the project area were observed and described (Ninyo & Moore, 2005); and subsurface investigations consisting of soil borings and analytical testing at the proposed and alternate slant well locations (Geoscience, 2014). **Figure 4.2-1** presents the regional surface geology from the CGS's compilation for the project area. **Figure 4.2-2** presents a north to south regional geologic cross-section along the coast (HydroMetrics, 2009).

The Salinas Valley extends about 80 miles inland and is filled with recent to Tertiary (65 million years ago [mya] to 1.6 mya) river and estuary deposits of the current and ancestral Salinas River and regional eolian<sup>3</sup> and marine sediments over the Mesozoic Salinian Block granitic basement (Kennedy Jenks, 2004). Based on a review of geologic literature combined with the field observations, it is expected that fill, active and older coastal dune sands, terrace deposits, and granodiorite<sup>4</sup> would be encountered during construction of the project components. Deeper subsurface geologic units that were not encountered at the surface but are known to be present in the project area include the Aromas Sand, Paso Robles Formation, Purisima Formation, Santa Margarita Formation, and Monterey Formation, as well as an underlying, unnamed sandstone and the granodiorite of the Salinian Block.

**Table 4.2-1** summarizes the geologic units and the project components, which are discussed below.

### **Fill Materials**

Fill materials are located throughout the project area (Ninyo and Moore, 2005). The fill is associated with previous grading for roads, bridges, railroad corridors, agricultural uses, and commercial, residential, and military land developments. The thicknesses of the fill deposits vary and range from relatively shallow fills (a few feet thick) along roadways and railroad alignments in relatively flat, low-lying areas to deeper fills along bridge-approach embankments and in developed hillside areas. Most of the fill materials in the project area were likely derived from local native soils and would be similar in composition to the native soils described in the following sections.

<sup>3</sup> Eolian deposits are borne, deposited, produced, or eroded by wind.

<sup>4</sup> Granodiorite is a granular, igneous rock intermediate between granite and quartz-diorite. Igneous rock is produced by fire, great heat, or the action of a volcano, and has been solidified from a molten state.

**TABLE 4.2-1  
 SUMMARY OF GEOLOGIC UNITS AND PROJECT COMPONENT LOCATIONS**

<b>Geologic Unit</b>	<b>Project Component</b>
Fill	Some pipeline segments
Dune Sands	Subsurface slant wells; westernmost portion of Source Water Pipeline
Older Dune Sands	Subsurface slant wells; most pipeline segments; MPWSP Desalination Plant; ASR system
Terrace Deposits	Subsurface slant wells; portions of the Monterey Pipeline; Ryan Ranch–Bishop Interconnection Improvements
Carmel Valley Floodplain	Valley Greens Pump Station (both site options)
Aromas Sand	ASR-5 and ASR-6 Wells <sup>a</sup>
Paso Robles Formation	ASR-5 and ASR-6 Wells <sup>a</sup>
Purisima Formation	ASR-5 and ASR-6 Wells <sup>a</sup>
Santa Margarita Formation	ASR-5 and ASR-6 Wells <sup>a</sup>
Monterey Formation	Main System–Hidden Hills Interconnection Improvements
Granodiorite	Portions of the Monterey Pipeline

NOTES:

<sup>a</sup> The ASR-5 and ASR-6 Wells would be drilled through the Aromas Sand, Paso Robles, and Purisima Formations, and screened in the Santa Margarita Formation.

SOURCE: Geoscience, 2014

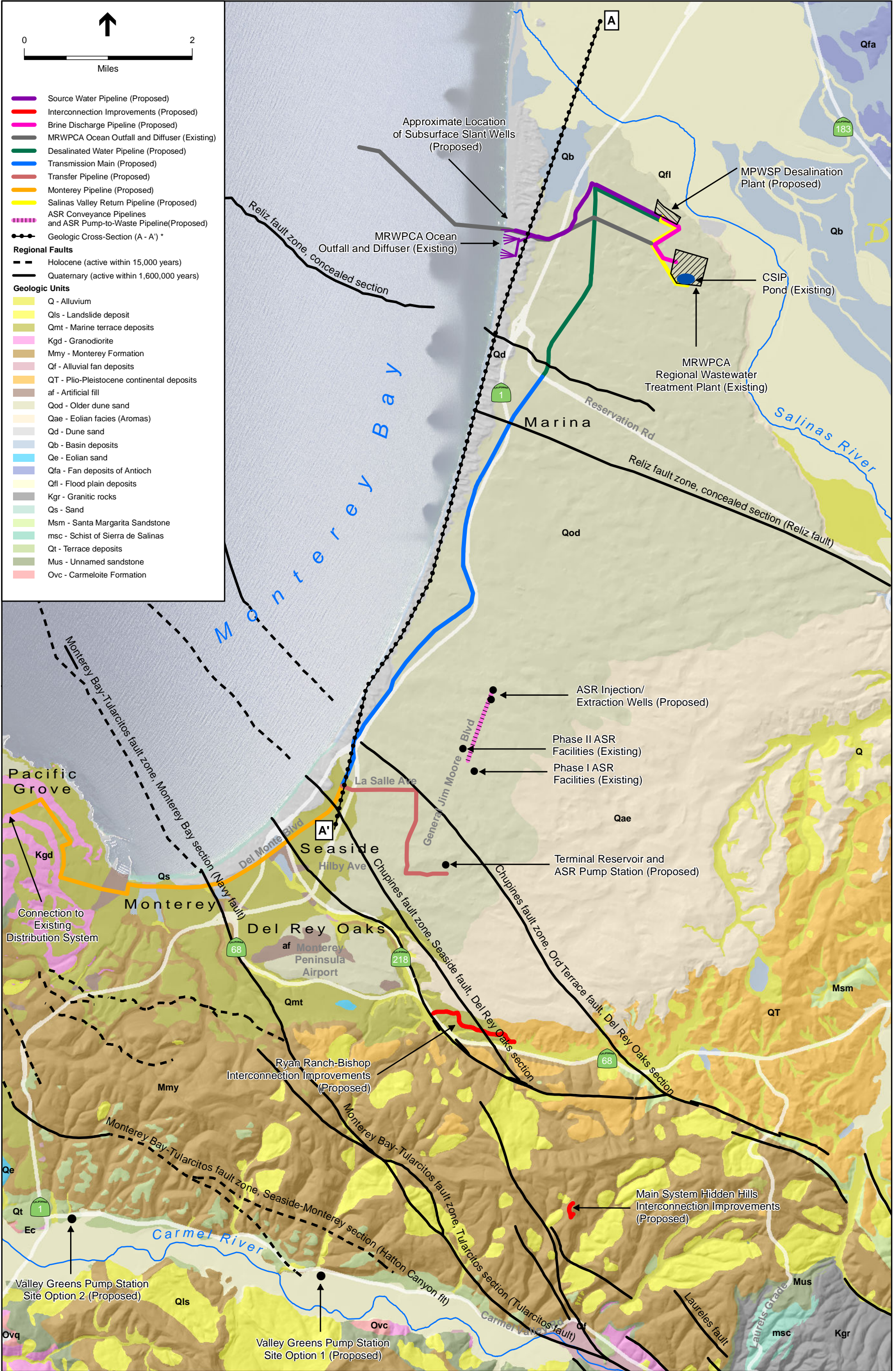
**Dune Sand Deposits**

Dune sand deposits are present along the coastal areas from the Seawater Intake System in the north to the eastern area of the city of Monterey in the south where the proposed pipeline additions would connect to the existing system (CGS, 2002b). Active, wind-blown dunes generally extend less than 0.5 mile inland, and older, more stabilized dunes extend up to 4 miles inland. Most of the project components would be located on or within dune deposits, except for the deeper portions of the proposed ASR injection/extraction wells, the southernmost extent of the proposed Monterey Pipeline west of the Naval Postgraduate School in Monterey, the Ryan Ranch–Bishop and Main System–Hidden Hills Interconnection Improvements, and the Valley Greens Pump Station.

The dune areas typically consist of elevated rolling hills composed of loose to moderately consolidated, fine sand (Ninyo & Moore, 2005). Younger, sparsely vegetated, active<sup>5</sup> dunes are present along the coastline. Older dune deposits<sup>6</sup> with more established vegetation are present in the inland areas and underlie the locations of most of the proposed project components. During the geologic reconnaissance (Ninyo & Moore, 2005), dune deposits were observed in existing cut slopes and excavations and ranged from loose to weakly cemented sands. Shallow groundwater is not expected within the elevated dune deposits, except in localized low-lying areas along the coastline.

<sup>5</sup> Active dunes are composed of loose sand shifting in real time.

<sup>6</sup> Older dunes are inactive in that much of the sands have become weakly cemented, limiting active movement.



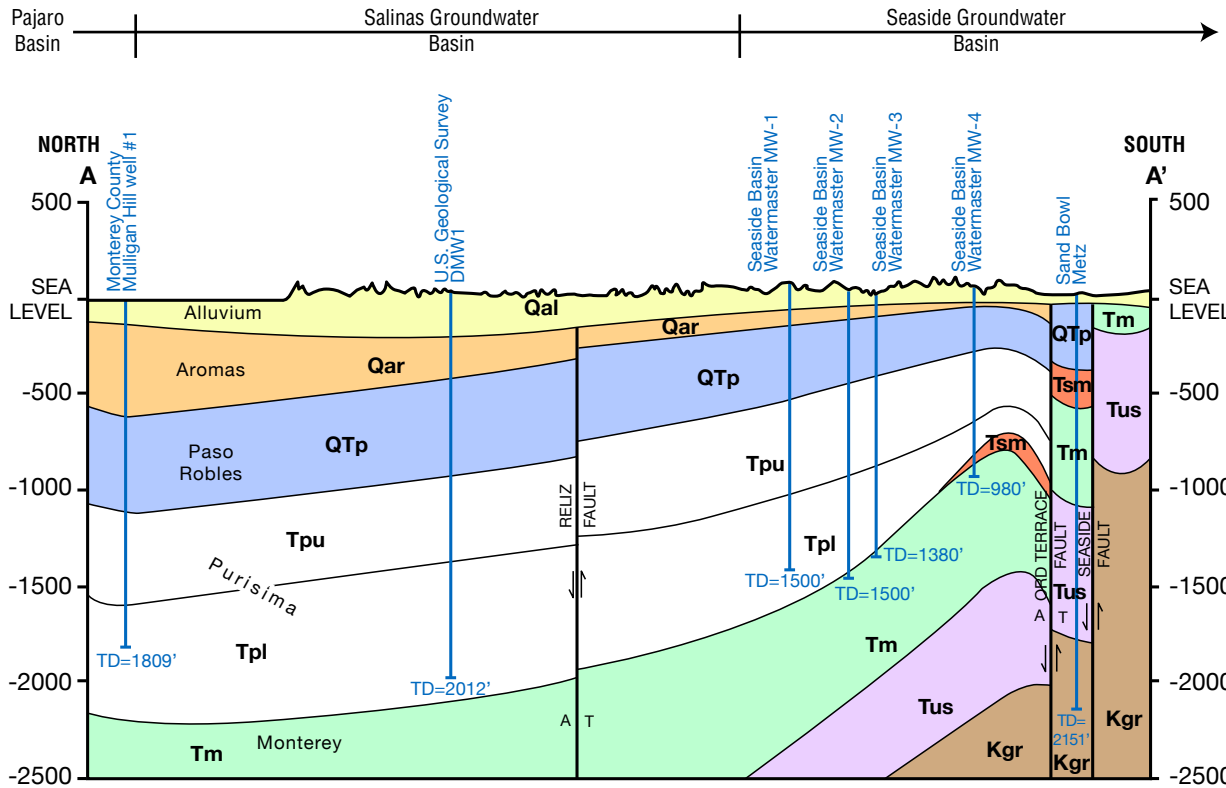
NOTE:  
 \*Refer to figure 4.2-2 for geologic cross-section information.

SOURCE: CGS, 2002

205335.01 Monterey Peninsula Water Supply Project

**Figure 4.2-1**  
 Geologic Map of Project Area

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- Qal** Alluvium (Holocene)
  - Qar** Aromas Sand (Pleistocene)
  - QTp** Paso Robles Formation (Pleistocene-Pliocene?)
  - Tp** Purisima Formation (Pliocene), subdivided into upper unit (Tpu) and lower unit (Tpl)
  - Tsm** Santa Margarita Sandstone (late Miocene)
  - Tm** Monterey Formation (middle Miocene)
  - Tus** Unnamed sandstone (middle Miocene)
  - Kgr** Granitic rocks (late Cretaceous)
- Fault, half arrows show direction of vertical separation; A indicates horizontal movement away from viewer, T indicates movement toward viewer

**SCALE**

10,000 feet

Vertical exaggeration = 10X

1,000 feet

SOURCE: HydroMetrics, 2009

NOTES: TD = Total depth in feet

205335.01 Monterey Peninsula Water Supply Project

**Figure 4.2-2**  
Generalized Geologic Cross-Section

### **Terrace Deposits**

Pleistocene-age (1.6 mya to 11,000 years ago [ya]) Terrace Deposits are present beneath the CEMEX mining facility where the proposed slant wells would be constructed (Geoscience, 2014). These Terrace Deposits are former alluvial fan and river floodplain deposits—which may also include marine terrace deposits—that generally consist of sand with some gravels. Uplifted Pleistocene marine terrace deposits are also present within the southern portion of the project area from Sand City to the city of Monterey (CGS, 2002b; Clark et al., 1997; Ninyo & Moore, 2005). These deposits are fine-grained sands and silts with locally thin, discontinuous gravel layers. The terrace deposits are typically dissected by streams and lie on the Aromas Sand. The deposits are variable in thickness, typically from up to 50 feet to a maximum of 200 feet (Muir, 1977). Terrace deposits at the CEMEX mining facility range from 150 to 163 feet in thickness (Geoscience, 2014).

### **Carmel Valley Floodplain Deposits**

At both proposed Valley Greens Pump Station site options, the Quaternary (1.6 mya to present) floodplain deposits along the Carmel River consist of a mixture of unconsolidated sand and silt deposits, commonly including relatively thin layers of clay (Clark et al., 1997). The older floodplain deposits are nearly flat to gently sloping and fill an irregularly shaped valley beneath the Carmel River. The Monterey Formation underlies these floodplain deposits.

### **Undifferentiated Quaternary Alluvium**

The proposed site for the Main System–Hidden Hills Interconnection Improvements is underlain by undifferentiated Quaternary alluvium in a small, steep-sided valley in the Santa Lucia Range (CGS, 2002b). Given the mountainous location, the alluvial materials are likely to be a mix of mostly coarse-grained sand and gravel.

### **Aromas Sand**

The Pleistocene-age (1.6 mya to 11,000 ya) Aromas Sand consist of both older river deposits and younger eolian (windblown) deposits of unconsolidated, brown to red sands with interbeds of clay and poorly sorted gravels (Muir, 1977; Hanson, 2003). The eolian portion of the Aromas Sand crops out just east of the central and southern portion of the project area and extends beneath the project area to offshore on the continental shelf and in the Monterey submarine canyon (CGS, 2002b). In addition, the surface outcrops of the Aromas Sand have been mapped about one mile east of the CSIP Pond beneath the older dune sands to the west, as shown on **Figure 4.2-1**. The Aromas Sand overlies the Paso Robles Formation north of the east-to-west Ord Terrace Fault in Seaside, but is not present south of the fault (HydroMetrics, 2009). The proposed ASR injection/extraction wells would be drilled to about 1,000 feet below the surface through the Aromas Sand into the deeper Santa Margarita Sandstone.

### **Paso Robles Formation**

The Plio-Pleistocene-age (about 5.3 mya to 11,000 ya) Paso Robles Formation is a series of fine-grained, oxidized sand and silt beds that contain gravel beds (Clark et al., 1997) interbedded with



some less-prevalent calcareous<sup>7</sup> beds (DWR, 2004). The Paso Robles Formation is interfingered<sup>8</sup> with the lower portion of the Aromas Sand and the upper portion of the Purisima Formation (HydroMetrics, 2009). The Paso Robles Formation is present beneath the northern portion of the project area at depths ranging from less than 100 feet to 600 feet in the northern portion of the project area (HydroMetrics, 2009). The proposed ASR injection/extraction wells would be drilled to about 1,000 feet below the ground through the Paso Robles Formation into the deeper Santa Margarita Sandstone.

### **Purisima Formation**

The mostly marine Miocene-age (24 mya to 5.3 mya) to Pliocene-age (5.3 mya to 1.8 mya) Purisima Formation underlies the project area at depths ranging from about 400 feet below the surface in Seaside to as much as 1,100 feet in the northern part of the project area (Powell et al., 2007; HydroMetrics, 2009) and extends westward under Monterey Bay (Muir, 1977). The Purisima Formation consists of layered sand, silt, clay, shale, and some gravel deposited in near-shore and far-shore marine environments. The basal, or lowermost, unit of the Purisima Formation consists of relatively impermeable clay and shale (Muir, 1977; HydroMetrics, 2009). The proposed ASR injection/extraction wells would be drilled to about 1,000 feet below the surface into the deeper Santa Margarita Sandstone.

### **Santa Margarita Formation**

The late Miocene-age (24 mya to 5.3 mya) to Pliocene-age (5.3 mya to 1.8 mya) Santa Margarita Sandstone is a marine, coarse-grained sandstone that overlies the Monterey Formation (Clark et al., 1997; MCWRA, 2006). Relatively small pieces of this unit are present beneath the project area in the Seaside vicinity at depths of about 800 feet deep just north of the Ord Terrace Fault and about 500 feet below ground surface (bgs) in between the Ord Terrace and Seaside Faults (HydroMetrics, 2009), as shown on **Figure 4.2-1**. The unit has surface outcrops east of the project area (CGS, 2002b) and is up to 400 feet thick in places (Durbin, 2007). The proposed ASR injection/extraction wells would be drilled to about 1,000 feet below the surface and screened within the Santa Margarita Sandstone.

### **Monterey Formation**

The Tertiary-age (65 mya to 1.6 mya) Monterey Formation is a marine sedimentary unit generally consisting of siliceous and diatomaceous<sup>9</sup> interbedded layers of mudstone, siltstone, sandstone, and claystone (Clark et al., 1997). Seams of the expandable clay bentonite are also present (Ninyo & Moore, 2005). This 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 and at the proposed Main System–Hidden Hills Interconnection Improvements. The Monterey Formation is at the surface on both sides of the Carmel Valley and underlies the Carmel Valley floodplain deposits beneath the proposed Valley Greens Pump Station. The unit extends beneath the remainder of the project area to the north, as well as west into Monterey Bay.

<sup>7</sup> Mostly or partly composed of calcium carbonate i.e. containing lime or being chalky.

<sup>8</sup> Pertains to the lateral change from one rock or sediment type to another in a zone where the two types form interpenetrating wedges.

<sup>9</sup> Diatomaceous deposits consist of fossilized amorphous silica remains of diatoms, a type of hard-shelled algae.

## **Porphyritic Granodiorite**

The entire project area is underlain by the Salinian Block basement, which is composed of Cretaceous-age (144 mya to 65 mya) granodiorite<sup>10</sup> (Tavarnelli, 1998). The porphyritic granodiorite is medium grained and light gray to moderate pink, and has orthoclase phenocrysts<sup>11</sup> ranging from 3 to 10 centimeters long. The granodiorite is present at the surface on the Monterey Peninsula due to tectonic forces and faulting (Clark et al., 1997; CGS, 2002b). This bedrock unit could be encountered during installation of the southwestern portion of the proposed Monterey Pipeline alignment and at the Ryan Ranch–Bishop Interconnection Improvements.

### **4.2.1.2 Seismicity and Faults**

This section characterizes the region’s existing faults, describes historical earthquakes, estimates the likelihood of future earthquakes, and describes probable groundshaking effects.

#### ***Earthquake Terminology and Concepts***

##### **Earthquake Mechanisms and Fault Activity**

Faults are planar features within the earth’s crust that have formed to release strain caused by the dynamic movements of the earth’s major tectonic plates. An earthquake on a fault is produced when these strains overcome the inherent strength of the earth’s crust, and the rock ruptures. The rupture causes seismic waves that propagate through the earth’s crust, producing the groundshaking effect known as an earthquake. The rupture also causes variable amounts of slip along the fault, which may or may not be visible at the earth’s surface.

Geologists commonly use the age of offset rocks as evidence of fault activity—the younger the displaced rocks, the more recently earthquakes have occurred. To evaluate the likelihood that a fault would produce an earthquake, geologists examine the magnitude and frequency of recorded earthquakes and evidence of past displacement along a fault. The State of California defines an active fault as one that has had surface displacement within Holocene time (the last 11,000 years). A Quaternary fault is defined as a fault that has shown evidence of surface displacement during the Quaternary period (the last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not mean that a fault lacking evidence of surface displacement is necessarily inactive. The term “sufficiently active” is also used to describe a fault if there is some evidence that Holocene displacement has occurred on one or more of its segments or branches (Hart, 1997).

For the purpose of delineating fault rupture zones, the CGS historically sought to zone faults defined as potentially active, which are faults that have shown evidence of surface displacement during the Quaternary period (the last 1.6 million years). Older maps still use the “potentially active” term. However, under the Alquist-Priolo Earthquake Fault Zoning Act, usage of this term was discontinued when it became apparent that the sheer number of Quaternary-age faults in the state made it meaningless to zone all of them (Bryant and Hart, 2007). In late 1975, the state

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<sup>10</sup> Granodiorite is an intrusive igneous rock that is similar to granite.

<sup>11</sup> A phenocryst is a relatively large and usually conspicuous crystal that is distinctly larger than the grains of the surrounding igneous rock.

geologist made a policy decision to zone only those faults that had a relatively high potential for ground rupture, determining that a fault should be considered for zoning only if it was sufficiently active and “well defined.”<sup>12</sup> Blind faults do not show surface evidence of past earthquakes, even if they occurred in the recent past; and faults that are confined to pre-Quaternary rocks (more than 1.6 million years old) are considered inactive and incapable of generating an earthquake.

### **Earthquake Magnitude**

When an earthquake occurs along a fault, its size can be determined by measuring the energy released during the event. A network of seismographs records the amplitude and frequency of the seismic waves that an earthquake generates. The Richter magnitude (ML) of an earthquake represents the highest amplitude measured by the seismograph at a distance of 100 kilometers from the epicenter. Richter magnitudes vary logarithmically with each whole-number step, representing a tenfold increase in the amplitude of the recorded seismic waves and 32 times the amount of energy released. While Richter magnitude was historically the primary measure of earthquake magnitude, seismologists now use Moment Magnitude as the preferred way to express the size of an earthquake. The Moment Magnitude (Mw) scale is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the style of movement or displacement across the fault. Although the formulae of the scales are different, they both contain a similar continuum of magnitude values, except that Mw can reliably measure larger earthquakes and do so from greater distances.

### **Peak Ground Acceleration**

A common measure of ground motion at any particular site during an earthquake is the peak ground acceleration (PGA). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. In terms of automobile acceleration, one “g” of acceleration is equivalent to the motion of a car traveling 328 feet from rest in 4.5 seconds. For comparison purposes, the maximum PGA value recorded during the Loma Prieta earthquake in the vicinity of the epicenter, near Santa Cruz, was 0.64 g. Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA varies from place to place and is dependent on the distance from the epicenter and the character of the underlying geology (e.g., hard bedrock, soft sediments, or artificial fills).

### **Modified Mercalli Intensity Scale**

The Modified Mercalli Intensity Scale assigns an intensity value based on the observed effects of groundshaking produced by an earthquake. Unlike measures of earthquake magnitude and PGA, the Modified Mercalli Intensity Scale is qualitative in nature in that it is based on actual observed effects rather than measured values. Similar to PGA, Modified Mercalli values for an earthquake at any one place can vary depending on the earthquake’s magnitude, the distance from its

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<sup>12</sup> A fault is considered well defined if its trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The fault may be identified by direct observation or by indirect methods (e.g., geomorphic and geophysical evidence). The critical consideration is that the fault, or some part of it, can be located in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

epicenter, the focus of its energy, and the type of geologic material. The Modified Mercalli values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X can cause moderate to significant structural damage. Because the Modified Mercalli scale is a measure of groundshaking effects, intensity values can be correlated to a range of average PGA values, as shown in **Table 4.2-2**.

**TABLE 4.2-2  
 MODIFIED MERCALLI INTENSITY SCALE**

<b>Intensity Value</b>	<b>Intensity Description</b>	<b>Average Peak Ground Acceleration<sup>a</sup></b>
I	Not felt except by a very few people under especially favorable circumstances.	< 0.0017 g
II	Felt only by a few people at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	0.0017 – 0.014 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing automobiles may rock slightly, vibration similar to a passing truck. Duration estimated.	0.0017 – 0.014 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing automobiles rocked noticeably.	0.014 – 0.039 g
V (Light)	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.035 – 0.092 g
VI (Moderate)	Felt by all, many frightened and run outdoors. Some heavy furniture moved; fallen plaster or damaged chimneys. Damage slight.	0.092 – 0.18 g
VII (Strong)	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by people driving automobiles.	0.18 – 0.34 g
VIII (Very Strong)	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. People driving automobiles disturbed.	0.34 – 0.65 g
IX (Violent)	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65 – 1.24 g
X (Very Violent)	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 1.24 g
XI (Very Violent)	Few, if any, masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24 g
XII (Very Violent)	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24 g

NOTES:

<sup>a</sup> Value is expressed as a fraction of the acceleration due to gravity (g). Gravity (g) is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCES: ABAG, 2003; CGS, 2003.

### ***Faults and Historical Earthquake Activity***

The project area is located in a seismically active region of California. The Coast Ranges geomorphic province is composed of a series of parallel, northwest-trending mountain ranges and valleys that are generally controlled by faults. These faults juxtapose blocks of geologic units of different origins called belts. The Monterey Bay region 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. Major earthquakes have affected the region in the past and are expected to occur in the near future on one of the principal active faults in the San Andreas Fault System.

The Monterey Bay region contains both active (Holocene-age, or within the last 11,000 years) and potentially active (Quaternary-age, or within the last 1.6 million years) faults and is considered a region of high seismic activity. Throughout the project area, there is the potential for damage resulting from movement along any one of a number of the active faults. In 2007, the USGS, the CGS, and the Southern California Earthquake Center formed the Working Group on California Earthquake Probabilities (WGCEP) to evaluate the probability of one or more earthquakes of Mw 6.7 or higher occurring in the state of California over the next 30 years. Accounting for the wide range of possible earthquake sources, it is estimated that the San Francisco and Monterey Bay areas as a whole have a 63 percent chance of experiencing an earthquake of Mw 6.7 or higher before 2036; among the various active faults in the region, the San Andreas Fault System is the most likely to cause such an event (USGS, 2003; WGCEP, 2008a, 2008b).

Several active and potentially active faults have been mapped within or close to the project area. **Figure 4.2-3** shows the approximate locations of the major faults in the region and their geographic relationship to the project area. **Table 4.2-3** lists the principal active and potentially active faults in the region that could affect the project components; the type of the faults; and the estimated Maximum Moment magnitude of earthquakes that could occur on each fault. The approximate distance to each fault is based on estimated distances from the nearest proposed project component.

### ***Regional Faults***

#### **San Andreas Fault Zone**

The San Andreas Fault Zone is a major structural feature in the region and forms a boundary between the North American and Pacific tectonic plates (Bryant and Lundberg, 2002). The San Andreas Fault is a major northwest-trending, right-lateral,<sup>13</sup> strike-slip<sup>14</sup> fault. The fault extends for about 600 miles from the Gulf of California in the south to Cape Mendocino in the north. The San Andreas is not a single fault trace but rather a system of active faults that diverges from the

<sup>13</sup> To an observer straddling a right-lateral fault, the right-hand block or plate would move towards the observer.

<sup>14</sup> A strike-slip fault creates vertical (or nearly vertical) fractures (i.e., the blocks primarily move horizontally). If the block opposite an observer looking across the fault moved to the right, the slip style is termed "right lateral"; if the block moved to the left, the motion is termed "left lateral."

**TABLE 4.2-3  
 ACTIVE AND POTENTIALLY ACTIVE FAULTS**

<b>Fault or Fault Zone</b>	<b>Location Relative to Project Component</b>	<b>Recency of Faulting</b>	<b>Slip Rate (millimeters/year)</b>	<b>Maximum Moment Magnitude (Mw)</b>	<b>Historical Seismicity<sup>a</sup></b>
Monterey Bay – Tularcitos Fault Zone <sup>b</sup>	Under Transmission Main and Monterey Pipeline	Late Quaternary with evidence of Holocene activity (Potentially Active)	0.1 to 0.9	7.3	
Reliz–Rinconada Fault Zone	Under Transmission Main	Late Quaternary (Potentially Active)	0 to 2	7.5	
Hatton Canyon Fault	May be near Valley Greens Pump Station (both site options)	Quaternary with evidence of Holocene Activity (Potentially Active)			
Laureles Fault	2 miles southwest of Main System–Hidden Hills Interconnection	Late Quaternary (Potentially Active)	Unknown	5.5	
San Gregorio Fault (Sur Region)	5 miles southwest of Valley Greens Pump Station (both site options)	Historical (<200 years ago) (Active)	1 to 5	7.0	6+, 1926
Zayante–Vergeles Fault Zone	11 miles northeast of MPWSP Desalination Plant	Holocene (Active)	0 to 0.2	7.0	
San Andreas Fault	15 miles northeast of MPWSP Desalination Plant	Historical (Active)	17 to 34	6.2 to 7.0	6.9, 1989 7.8, 1906 6.7, 1898 6.5, 1885
Sargent Fault Zone	17 miles northeast of MPWSP Desalination Plant	Late Quaternary (Potentially Active)	1.5 to 4.5	6.8	
Calaveras Fault (southern)	22 miles northeast of MPWSP Desalination Plant	Historical (Active)	12 to 18	5.8	6.3, 1897 6.5, 1911

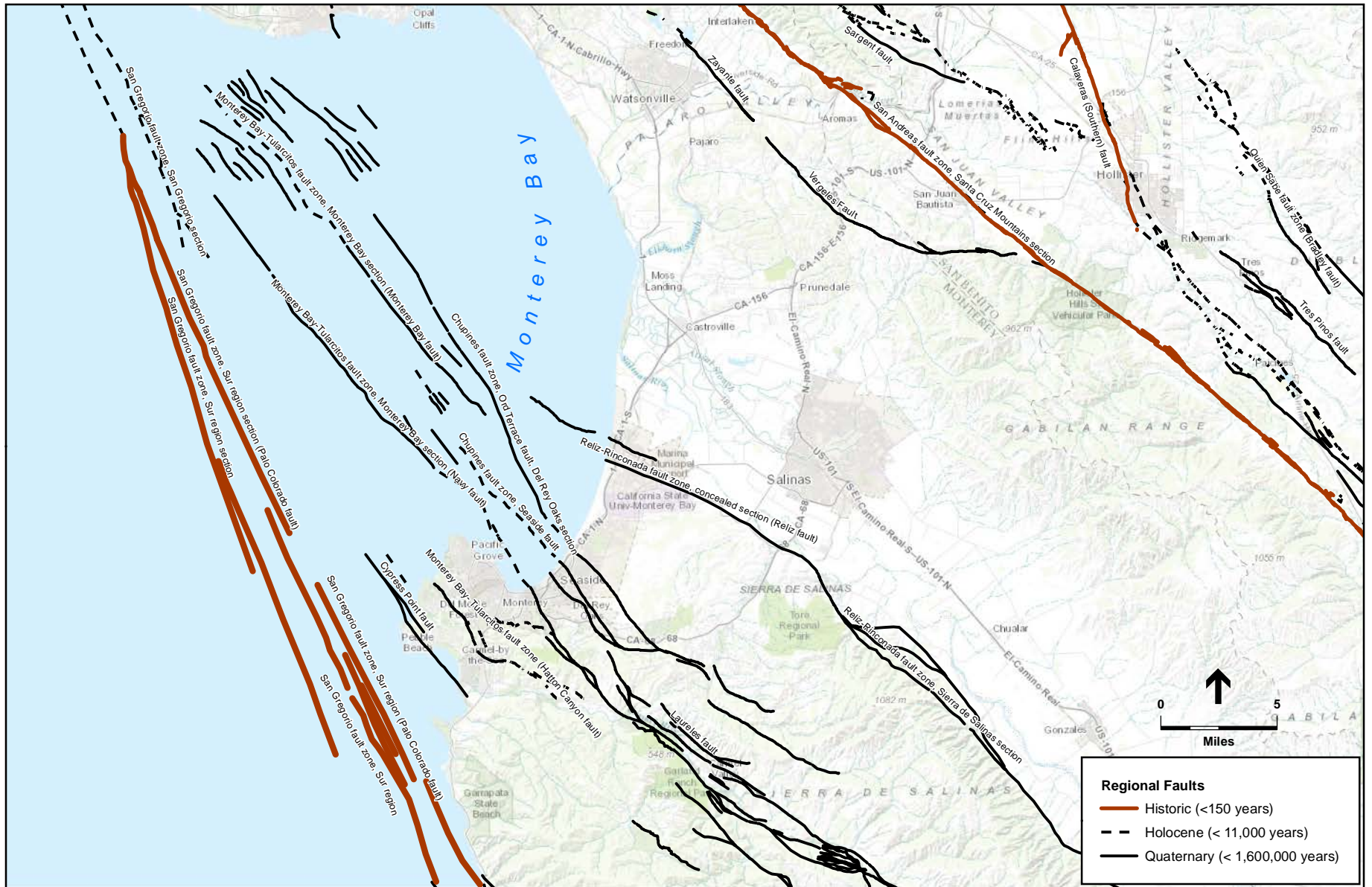
NOTES:

- <sup>a</sup> Richter Magnitude (ML) or Moment Magnitude (Mw) and year of recent or large events. References that cite earthquake magnitudes do not always specify whether the measurement used the Richter or moment magnitude scale; however, the ML and Mw values are similar.  
<sup>b</sup> Includes the Chupines, Seaside, Ord Terrace, and Navy Faults.

SOURCES: CGS, 2003, 2008; USGS, 2010; Johnson, 2004; Clark et al., 1997.

main fault south of San Jose. Regional faults that are subparallel to the San Andreas Fault, such as the Hayward, Calaveras, and San Gregorio Faults, are within the broader San Andreas Fault System (see **Figure 4.2-3**).

The San Andreas Fault has produced numerous large earthquakes, including the 1906 San Francisco earthquake. That event had an estimated ML 8.3, or Mw 7.8 (WGCEP, 2008a, 2008b) and was associated with up to 21 feet of displacement and widespread ground failure (Lawson, 1908). In the Watsonville area and to the east, reports of strong groundshaking, toppled chimneys, ground cracks, broken pipes, and twisted and sunken railroad tracks (Lawson, 1908) indicate that groundshaking intensities reached IX on the Modified Mercalli scale.



SOURCE: USGS/CGS, 2010

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**Figure 4.2-3**  
 Active and Potentially Active Regional Faults

Numerous moderate-sized earthquakes (approximately magnitude 5.2) in Watsonville (in 1954 and again in 1964 and 1969) resulted in broken irrigation lines, ruptured water mains, and cracked plaster and stucco (PVWMA, 2001). The magnitude 7.1 Loma Prieta earthquake of October 1989, centered in the Santa Cruz Mountains, caused strong groundshaking and ground failure throughout the San Francisco and Monterey Bay areas. Major damage was experienced in downtown and residential Watsonville, Castroville, Gilroy, and Hollister (McNutt and Topozada, 1990). In the project area, the Loma Prieta earthquake produced a PGA of 0.39 g and groundshaking with a Modified Mercalli intensity of VIII.

The San Andreas Fault, which has experienced multiple large earthquake events resulting in large surface fault rupture is a designated earthquake fault zone under the Alquist-Priolo Earthquake Fault Zoning Act. The 1906 San Francisco earthquake was estimated at Mw 7.8 and caused approximately 290 miles of surface fault rupture. Horizontal displacement along the fault approached 17 feet near the epicenter. The more recent 1989 Loma Prieta earthquake, with a magnitude of Mw 6.9, resulted in widespread damage throughout the Bay Area. According to the WGCEP, the Northern California portion of the San Andreas Fault has a 21 percent of producing one or more Mw 6.7 earthquakes during the next 30 years (WGCEP, 2008a, 2008b). The closest segment of the San Andreas Fault to a proposed project component is about 13 miles northeast of the MPWSP Desalination Facility site.

### **San Gregorio Fault Zone**

The San Gregorio Fault Zone is a complex of faults that skirt the coastline north of Big Sur and run northwestward across Monterey Bay, briefly touching the shoreline of the San Mateo County coastline at Point Año Nuevo and at Seal Cove, just north of Half Moon Bay (Bryant and Cluett, 1999b). This fault is active and was recently recognized as capable of producing large earthquakes. Studies have shown Holocene displacement on the San Gregorio Fault as recently as 1270 AD to 1400 AD (Bryant and Cluett, 1999b). Additionally, a 1926 earthquake with a Richter magnitude above 6.0—previously thought to have occurred on the Monterey Fault—may have actually ruptured an offshore segment of the San Gregorio Fault Zone (Johnson, 2004). According to the WGCEP, the San Gregorio Fault has a 6 percent chance of producing one or more MW 6.7 earthquakes in the next 30 years (WGCEP, 2008a, 2008b). The closest portion of the fault to a proposed project component is approximately 7 miles southwest of the Monterey Pipeline.

### **Calaveras Fault Zone**

The Calaveras Fault Zone, a major right-lateral, strike-slip fault, extends for about 100 miles from Dublin to Hollister, where it merges with the San Andreas Fault (Bryant and Cluett, 1999a). The Calaveras Fault is designated as an earthquake fault zone under the Alquist-Priolo Act. The Calaveras Fault is most active on its southern segment; the magnitude 6.2 Morgan Hill earthquake (April 1984) originated on this fault. Tectonic creep<sup>15</sup> has been documented along the Calaveras Fault in the vicinity of Hollister. According to the WGCEP, the Calaveras Fault has a 7 percent chance of producing one or more MW 6.7 earthquakes in the next 30 years (WGCEP,

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<sup>15</sup> Tectonic creep is the slow, apparently continuous movement on a fault (Bates and Jackson, 1980).



2008a, 2008b). The closest portion of the fault to a proposed project component is about 21 miles northeast of the MPWSP Desalination Plant site.

### **Sargent Fault Zone**

The Sargent Fault Zone branches from the San Andreas Fault and extends for about 34 miles, from the Lexington Reservoir in the north to just north of Hollister in the south (Bryant, 2000a). The Sargent Fault is a reverse-oblique, right-lateral, strike-slip fault zone that dips steeply to the west and is seismically active. The fault is considered to be capable of surface rupture and is designated as an Alquist-Priolo earthquake fault zone. The closest part of the Sargent Fault is about 16 miles northeast of the MPWSP Desalination Plant site.

### **Zayante-Vergeles Fault Zone**

The Zayante-Vergeles Fault Zone is approximately parallel with and about 5 miles west of the San Andreas Fault (Bryant, 2000b). The Zayante Fault is considered to be a late Pleistocene-age (1.6 mya to 11,000 ya), and possibly Holocene, potentially active Quaternary fault. Some portions of the Zayante Fault may be active, and some scientists believe its southern section may be indirectly connected to the San Andreas Fault Zone. Following recent investigations of the Vergeles Fault, the CGS designated portions of the fault as a fault rupture hazard zone USGS Watsonville East and Watsonville West 7.5-minute topographic map). However, other portions of the Vergeles are classified as potentially active and are not designated under the Alquist-Priolo Act. The closest part of the Zayante-Vergeles Fault is about 9 miles northeast of the MPWSP Desalination Plant site.

### **Local Faults**

Several Quaternary faults intersect the project area. Additionally, several potentially active faults are located in close proximity to project.

### **Reliz-Rinconada Fault Zone**

The Reliz-Rinconada Fault Zone runs parallel to Highway 101 along the Salinas River Valley at the base of the Santa Lucia Mountains. This Quaternary-age (present to 1.6 mya) high-angle, reverse fault offsets Salinian Block basement rocks and locally juxtaposes the Pliocene-Pleistocene-age (5.3 mya to 11,000 ya) Paso Robles Formation against basement rocks (Rosenberg and Bryant, 2003). The Reliz Fault has been projected crossing through the central portion of the project area in the vicinity of Marina as well as the Transmission Main portion of the pipeline (Ninyo & Moore, 2005). The fault trace in this area is concealed by fluvial deposits of the Salinas River Valley and coastal dunes, causing uncertainty as to the precise location of the fault. Geologic evidence indicates that this fault system has displaced materials that are between 50,000 to 100,000 years old and is considered potentially active (Rosenberg and Bryant, 2003).

### **Monterey Bay–Tularcitos Fault Zone**

The Monterey Bay–Tularcitos Fault Zone extends for about 52 miles, from Santa Cruz to the crest of the Sierra de Salinas. The onshore portion of the fault zone includes the Chupines, Seaside, Tularcitos, Navy, Ord Terrace, and Hatton Canyon Faults (Bryant, 2001). These faults

create an approximately 6- to 9-mile-wide zone of short in-echelon, northwest-striking faults that are related. The activity and locations of these faults are not well defined. Data presented by Jennings (2010) show that no active portions of the Monterey Bay–Tularcitos Fault Zone extend onshore into the southern portion of the project area. Jennings classifies the Ord Terrace, Seaside, Chupines, and Tularcitos Faults as Quaternary. However, Bryant (2001), citing Rosenberg and Clark et al. (1997), provides evidence of Holocene displacement along the Hatton Canyon, and Tularcitos Faults, which are located close to the proposed Valley Greens Pump Station Option 1. The Monterey section of the Monterey Bay-Tularcitos Fault Zone also crosses the route of the Monterey and Transmission Main Pipelines. Additionally, there is evidence of a probable offshore extension of the Chupines Fault displacing Holocene-age (less than 11,000 years old) deposits and seafloor sediments (Ninyo & Moore, 2014). There is evidence for recent (less than 11,000 ya) 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.

### **Laureles Fault Zone**

The northwest-striking, nearly vertical, reverse<sup>16</sup> Laureles Fault Zone extends approximately 4 miles along the north side of Carmel Valley and is up to 0.2 mile wide (Clark et al., 1997). The northeast side is upthrown and displaces Pleistocene-age (5.3 mya to 11,000 ya) terrace gravels, suggesting the latest movement to be middle to late Pleistocene.

### **4.2.1.3 Geologic Hazards**

Based on the geologic data reviewed during preparation of this EIR, the potential geologic hazards at the proposed project sites include erosion, localized slope instability, and hazards associated with problematic soils. These geologic hazards are discussed below.

#### ***Accelerated Erosion***

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind, and underground water. Excessive soil erosion can eventually damage infrastructure such as pipelines, wellheads, building foundations, and roadways. In general, granular soils with relatively low cohesion and soils located on steep topography have a higher potential for erosion. The *Monterey County General Plan* (Monterey County, 2010) includes a soil erosion hazard map showing relative erosion hazards within the county. Soils are classified based on the soil surveys consolidated for the soil survey geographic database for Monterey County prepared by the National Resources Conservation Service (NRCS, 2014). In the project area, the steep coastal dune slopes have a high potential for erosion. The dune deposits east of the coastline, where the topography is not as steep, are considered to have a moderate potential for erosion. The soil erosion potential is typically reduced or eliminated once the soil is graded and covered with concrete, structures, asphalt, or vegetation, or other slope protection measures are implemented.

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<sup>16</sup> A geologic fault in which the hanging wall (the upper block) has moved upward relative to the footwall (the lower block). Reverse faults occur where two blocks of rock are forced together by compression.

### **Sea Level Rise and Coastal Erosion**

Monterey Bay is a large, lowland coastal embayment, with rocky headlands at the north and south and a sweeping arc of sandy, dominantly dune- and cliff-backed shoreline in between. 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 is wider at the southern end than at the northern end. The morphology of beaches in this region varies from season to season, with beaches generally being wider and gently sloping in summer and narrower and steeper in winter. The dunes at the back edge of the beach have an average height of 34 feet but can be as high as 151 feet. Most of the dune surfaces that are not directly exposed to wave energy are vegetated, indicating that the dunes are stabilized in some areas.

The topographic surface, including the dunes, beach, and undersea nearshore areas, can be affected by coastal retreat in four ways.

1. **Long-term erosion** – Over time, the dunes and surrounding area have been and will continue to erode as a result of rain and wind.
2. **Sea level rise** – As sea level rises, the shoreline area affected by wave action will migrate inland and will erode the sand dunes. As a result, the dunes and the shoreline will also retreat inland.
3. **Storm events** – Storm events also erode sand from the coastal dunes and shoreline areas. Typically, a storm event moves sand out to sea during the event. The strongest of these events are referred to as the 100-year storm event. Similar to the 100-year flood event, the 100-year storm event is the storm that has a 1 percent chance of occurring in a given year. After the storm passes and over the following year, some and possibly most of the sand reaccumulates along the shore and dune areas. However, at the time of that storm event, any structures present within that scoured area would be exposed.
4. **Rip embayments** – Rip embayments are caused by the erosive action of cross-shore rip currents and affect an area from just offshore to the toe of the sand dunes closest to the shoreline. As this sand is removed, sand from the shore area and ultimately the dunes can erode seaward to fill in the void. Rip embayments tend to be stronger in the winter and weaker in the summer. After the rip embayment passes by a particular shoreline location, some of the sand reaccumulates.

The Marina area, including the proposed subsurface slant wells in the CEMEX active mining area and the proposed pipeline alignments located along Del Monte Boulevard, the Monterey Peninsula Recreational Trail, and the TAMC right-of-way are characterized by extensive sand dunes. These dunes vary in height and are composed entirely of unconsolidated, highly erodible sand. The erosion of dunes by waves occurs more often in winter months, when the active beach area is narrow and storms are stronger and more frequent. Erosion in this region is highly episodic, occurring in steps when high tides coincide with large, storm-generated waves. The steep to near-vertical bluffs in the vicinity of the CEMEX active mining area indicate that rapid erosion has taken place in this area.

The existence of wide sandy beaches throughout the area, as well as the flanking sand dunes, indicate that past sand supply was in excess of sand loss. However, the shoreline of southern

Monterey Bay has been retreating for a number of years. Dam impoundments have decreased the historical sediment yield of the Salinas River, thus reducing a major source of sediment for the beaches in the Marina area. The Nacimiento Dam (completed in 1961) and the San Antonio Dam (completed in 1965) have impounded about 15 percent of the Salinas River Watershed, thereby trapping sand that would have been delivered to the beach, as well as reducing peak flow rates that transport the bulk of the river sediments. Additionally, sand mining in the region has increased sediment and sand loss and has contributed to disequilibrium, thus increasing the rate of coastal retreat in the southern Monterey Bay south of the Salinas River (Thornton et al., 2006).

As discussed in the *Analysis of Historic and Future Coastal Erosion with Sea Level Rise* (ESA, 2014), various studies conducted over the period between 1930 to 2006 indicate sea level is rising at a rate of approximately 5.3 to 7.6 inches per century. With sea level rise, the coastline is expected to retreat inland and has the potential to intersect project components if they are constructed within the extent of that retreat.

### **Soil Hazards**

**Table 4.2-4** identifies the soil types and soil properties at proposed facility locations. The subsurface slant wells would be constructed in dune sands and not soils; therefore, information regarding soil properties at the subsurface slant well site is not included below. Potential impacts related to problematic soil conditions include corrosivity and expansion (linear extensibility or shrink-swell potential). Drainage pertains to soils that are unable to adequately percolate or shed surface water away from a development site, leading to flooding and water-related damage. Poorly drained soils can increase the risks of corrosion, linear extensibility, differential settlement, and other water-related issues.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical actions that corrode or weaken concrete or uncoated steel. The rate of concrete corrosion is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. The rate of uncoated-steel corrosion is related to such factors as the moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Steel installations that intersect soil boundaries or soil layers are more susceptible to corrosion than the steel installations that are entirely within one kind of soil or within one soil layer. The risk of corrosion is expressed as low, moderate, or high.

Linear extensibility or shrink-swell potential refers to the change in volume of soil as moisture content is increased or decreased between a moist and dry state. The volume change is reported as a percent change for the whole soil. The amount and type of clay minerals in the soil influence changes in soil volume.

#### **4.2.1.4 Seismic Hazards**

Seismic hazards are generally classified into two categories: primary seismic hazards (surface fault rupture and groundshaking) and secondary seismic hazards (liquefaction and other types of seismically induced ground failure, along with seismically induced landslides).

**TABLE 4.2-4  
 SUMMARY OF SOIL PROPERTIES**

Proposed Project Component	Soil	Drainage	Concrete Corrosion Potential	Unprotected Steel Corrosion Potential	Linear Extensibility <sup>a</sup>
MPWSP Desalination Plant and Most Pipelines <sup>b</sup>	Oceano Loamy <sup>c</sup> Sand (OaD) or similar	Excessively	Moderate	Moderate	Low (1.5%)
Terminal Reservoir and ASR Pump Station	Baywood Sand (BbC)	Somewhat excessively	Moderate	High	Low (1.5%)
ASR Injection/Extraction Wells and Pipelines <sup>b,d</sup>	Oceano Loamy Sand (OaD)	Excessively	Moderate	Moderate	Low (1.5%)
Valley Greens Pump Station	Dissected xerorthents <sup>e</sup>	Excessively	Low	Low	Low to moderate (1.5 to 4.5%)
Main System–Hidden Hills Inter-connection Improvements	Santa Ynez Fine Sandy Loam (ShE)	Moderately well	Low	Low	Moderate (4.5%)
Ryan Ranch–Bishop Inter-connection Improvements	Santa Ynez Fine Sandy Loam (ShE); Narlon Loamy Fine Sand (NcC); and badland weathered bedrock (Ba)	Moderately well to somewhat poorly	Low (ShE and Ba); High (NcC)	High (NcC); no data for other units	Moderate to high (4.5 to 7%)

NOTES:

- <sup>a</sup> Also known as shrink-swell potential or expansion potential.
- <sup>b</sup> All pipelines except the ASR Conveyance Pipelines, the ASR Pump-to-Waste Pipeline, and the Transfer Pipeline.
- <sup>c</sup> Loamy soils are composed of sand, silt, and clay in relatively even concentrations (about 40-40-20 percent concentration, respectively). Loam soils generally contain more nutrients and humus than sandy soils, have better drainage and infiltration of water and air than silty soils, and are easier to till than clay soils.
- <sup>d</sup> These are the ASR Conveyance Pipelines and the ASR Pump-to-Waste Pipeline.
- <sup>e</sup> Dissected xerorthents are deposits located on alluvial fans and terraces with steeper slopes such that the alluvial deposits do not have sufficient time to develop into soils.

SOURCE: NCRS, 2014.

**Surface Fault Rupture**

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake’s seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. Although future earthquakes could occur anywhere along the length of an active fault, only regional strike-slip earthquakes of magnitude 6.0 or greater are likely to be associated with significant surface fault rupture and offset (CDMG and USGS, 1996). It is also important to note that unmapped subsurface fault traces could experience unexpected and unpredictable earthquake activity and fault rupture.

Ground rupture is considered more likely along active faults, which are referenced above in **Figure 4.2-3** and **Table 4.2-3**. The highest potential for surface faulting is along existing fault traces that have had Holocene displacement. The closest known active faults with historical earthquake events are the San Gregorio and San Andreas at 5 and 15 miles, respectively, from components of the proposed project. The onshore portions of potentially active faults in the

Monterey-Tularcitos and the Reliz-Rinconada Fault Zones pass beneath the proposed Transmission Main and Monterey Pipelines. These active faults or segments of faults are not zoned under the Alquist-Priolo Earthquake Fault Zone (see Section 4.2.2, Regulatory Framework, below).

**Seismic Groundshaking**

As discussed above, the WGCEP estimated that a major earthquake has a 21 percent chance of affecting the project vicinity in the next 30 years and would produce strong groundshaking throughout the region. Earthquakes on active or potentially active faults, depending on magnitude and distance from the project area, could produce a range of groundshaking intensities at the project area. Historically, earthquakes have caused strong groundshaking and damage in the San Francisco Bay Area. For example, the Mw 6.9 Loma Prieta earthquake in October 1989 on the San Andreas Fault, which had an epicenter near Santa Cruz, produced very damaging groundshaking in Santa Cruz but also in the San Francisco Bay Area more than 50 miles away. However, disregarding local variations in ground conditions, the intensity of shaking at different locations within the area can generally be expected to decrease with distance from an earthquake source.

The primary tool that seismologists use to describe groundshaking hazard is a probabilistic seismic hazard assessment (PSHA). The PSHA for the State of California takes into consideration the range of possible earthquake sources (including such worst-case scenarios as described above) and estimates their characteristic magnitudes to generate a probability map for groundshaking. The PSHA maps depict PGA value of that have a 10 percent probability of being exceeded in 50 years (i.e., a 1 in 475 chance of occurring each year). Use of this probability level allows engineers to design structures to withstand ground motions that have a 90 percent chance of *not* occurring in the next 50 year interval, thus making buildings safer than if they were designed only for the ground motions that are expected within the next 50 years.

In 2002, the USGS and the CGS updated the model by introducing new parameters and updated fault locations (CGS, 2003). **Table 4.2-5** summarizes the estimated PGAs (10 percent probability of being exceeded in 50 years) at the proposed project components for alluvial, soft rock, and firm rock conditions.

**TABLE 4.2-5  
 SUMMARY OF ESTIMATED PEAK GROUND ACCELERATIONS  
 AT PROPOSED NON-LINEAR FACILITY LOCATIONS**

<b>Proposed Project Component</b>	<b>Alluvium</b>	<b>Soft Rock</b>	<b>Firm Rock</b>
Subsurface Slant Wells and MPWSP Desalination Plant	0.377 g	0.345 g	0.330 g
ASR-5 and ASR-6 Wells	0.354 g	0.322 g	0.304 g
Terminal Reservoir/ASR Pump Station	0.354 g	0.322 g	0.304 g
Valley Greens Pump Station, Ryan Ranch-Bishop and Main System-Hidden Hills Interconnection Improvements	0.360 g	0.330 g	0.313 g

SOURCE: CGS, 2003.

The majority of the project components would be constructed on alluvium, where estimated PGAs range from 0.377 g to 0.354 g. As listed in **Table 4.2-2**, this range of PGAs equates to a Modified Mercalli groundshaking intensity of VII (strong) to VIII (very strong).

### ***Liquefaction and Lateral Spreading***

Liquefaction is the rapid loss of shear strength experienced in saturated, predominantly granular soils below the groundwater level during strong earthquake groundshaking and occurs due to an increase in pore water pressure. Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore-pressure buildup or liquefaction in a shallow underlying deposit during an earthquake (VT, 2013). The occurrence of this phenomenon is dependent on many complex factors, including the intensity and duration of groundshaking, particle-size distribution, and density of the soil.

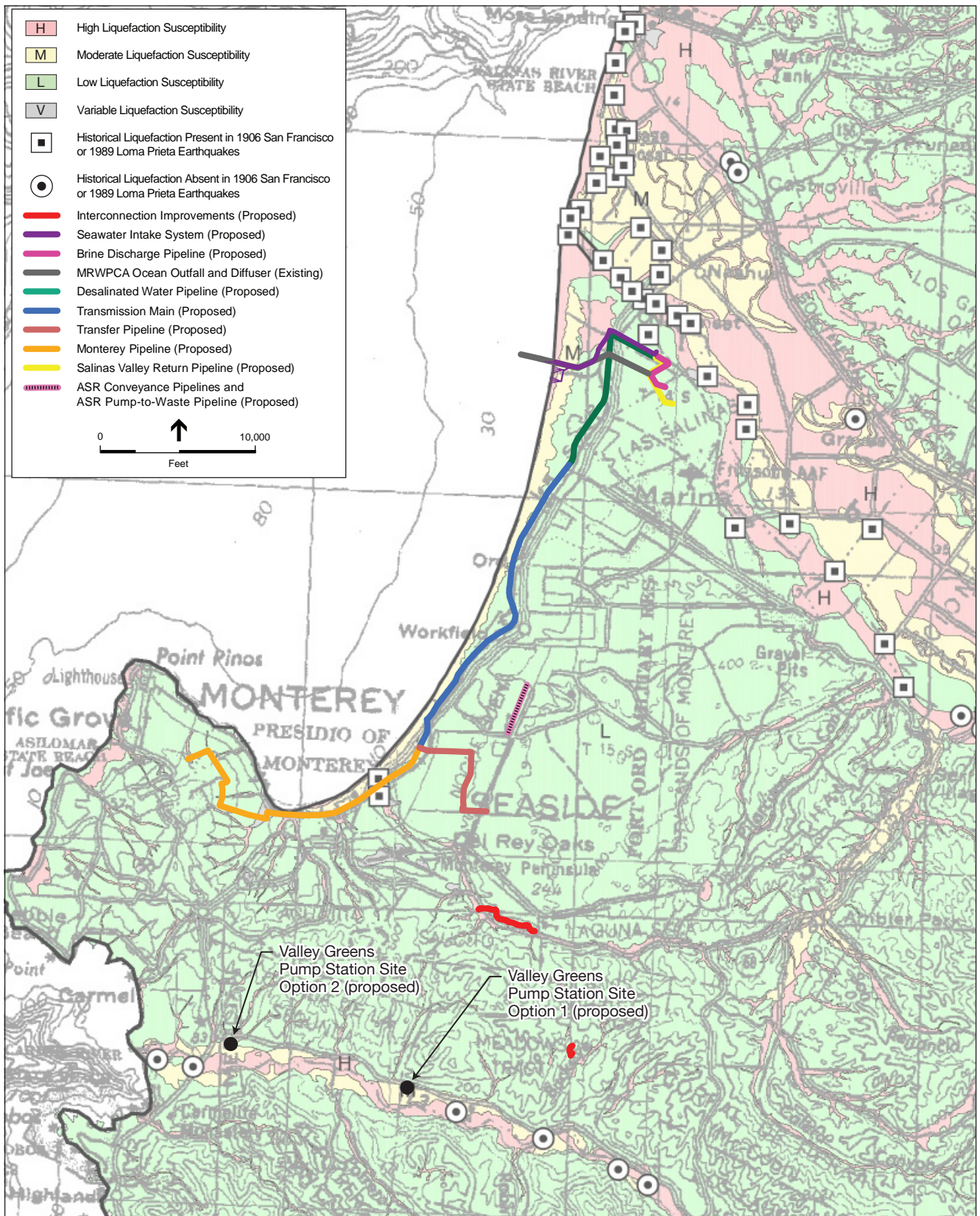
The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of structure slabs due to sand boiling, and buckling of deep foundations due to ground settlement. Dynamic settlement (i.e., pronounced consolidation and settlement from seismic shaking) may also occur in loose, dry sands above the water table, resulting in settlement of and possible damage to overlying structures. 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). Lateral spreading can move blocks of soil, placing strain on buried pipelines that can lead to leaks or pipe failure (VT, 2013).

**Figure 4.2-4** presents the relative liquefaction hazard potential in Monterey County in the vicinity of the proposed project, with liquefaction susceptibility designations (high, moderate, low, and variable) adapted by Ninyo & Moore (2005) from the *Monterey County General Plan*. Sites with a designation of “low” are considered to have the lowest potential for liquefaction hazards, and sites with a designation of “high” are considered to have the highest potential for liquefaction because of the soil type (sand) and probable groundwater depths.

Some locations in the project area, including the floodplain of the Salinas River and other low-lying coastal areas, have a moderate to high liquefaction potential. During the 1989 Loma Prieta earthquake, liquefaction caused settlement and ground cracking in the Moss Landing area about 5 miles north of the proposed MPWSP Desalination Plant site, damaging roads and the approach to the bridge linking Moss Landing to the mainland. Over 30 separate locations of historical liquefaction incidents have been documented in the project vicinity, the majority of which were in the northern portion of the project area near the Salinas River. Both site options for the proposed Valley Greens Pump Station are mapped as having a moderate liquefaction potential.

### ***Earthquake-Induced Settlement***

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, noncompacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible



SOURCE: Ninyo & Moore, 2005

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**Figure 4.2-4**  
Liquefaction Potential



sediments, such as poorly engineered artificial fill. Earthquake-induced settlement could occur in the event of an earthquake and is a potential seismic hazard discussed further in the Impact and Mitigations Measures section of this section.

### ***Landslides and Ground Cracking***

Earthquake motions can induce substantial stresses on slopes and can cause earthquake-induced landslides or ground cracking if the slope fails. Earthquake-induced landslides can occur in areas with steep slopes that are susceptible to strong ground motion during an earthquake. The 1989 Loma Prieta earthquake on the San Andreas Fault triggered thousands of landslides over an area of 5,400 square miles. **Figure 4.2-5** presents the seismically-induced landslide hazard potential in the project vicinity based on a map from the *Monterey County General Plan*, as adapted by Ninyo & Moore (2005). The figure characterizes landslide susceptibility as high, moderate, and low. Because the steepness of topography is a major factor in the potential for landslides, **Figure 4.2-5** provides insight into areas prone to non-seismically induced landslides. Non-seismically induced landslide can be caused by the force of gravity on steep unstable slopes, by construction activities that disturb soil conditions and create unstable slopes, and by water leaks or breaks in pipelines or pumps.

Potential landslide hazards are present in the hillside terrain on and east of the Monterey Peninsula. All but one of the project components would be located in relatively flat to gently sloping topography and would therefore have a low susceptibility to landslides; the proposed Main System-Hidden Hills Interconnection Improvements are located in an area mapped as having a moderate to high susceptibility to landslides.

## **4.2.2 Regulatory Framework**

### **4.2.2.1 Federal Regulations**

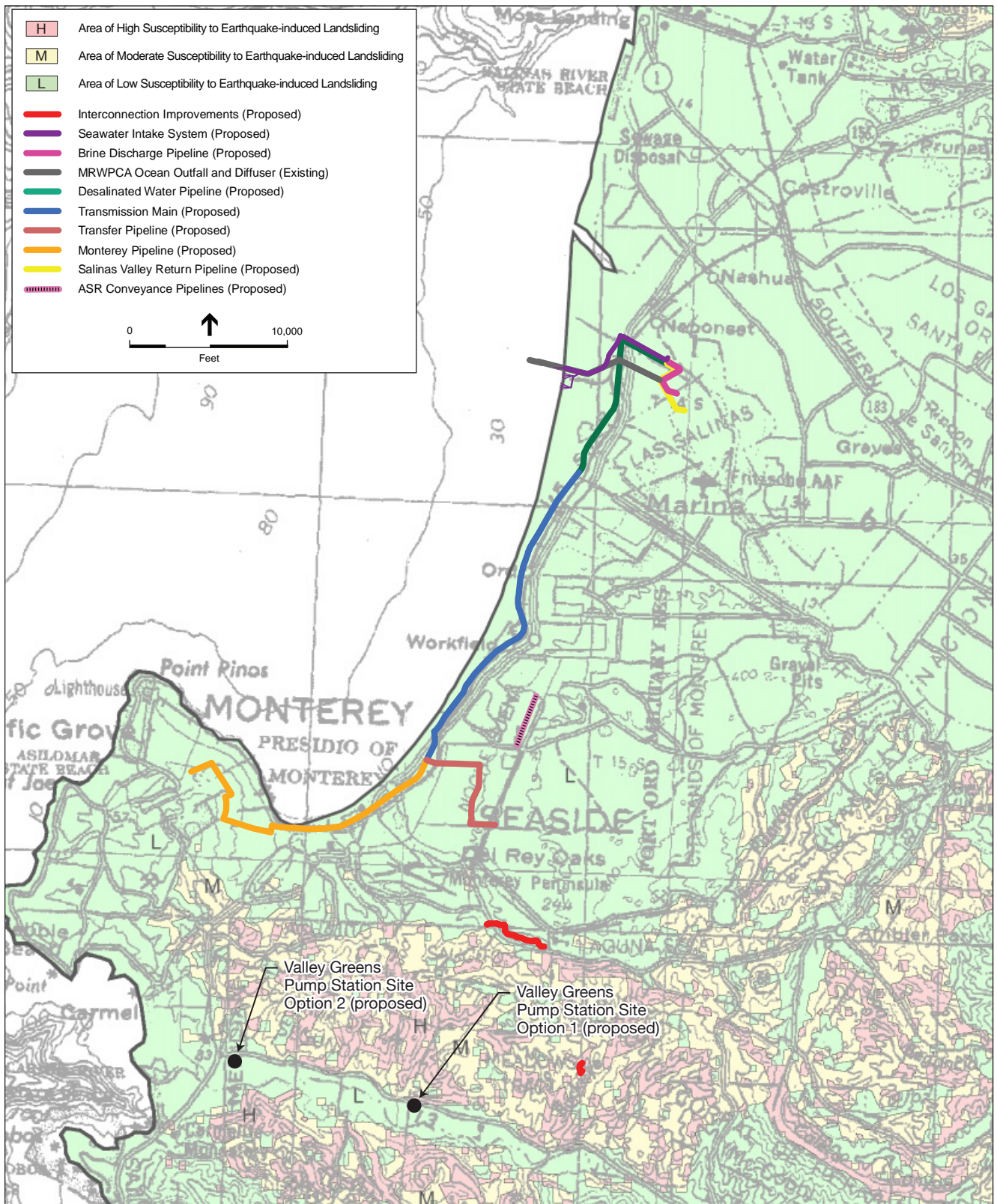
#### ***Federal Occupational Safety and Health Administration Regulations***

The Occupational Safety and Health Administration's (OSHA) Excavation and Trenching standard, Title 29 of the Code of Federal Regulations (CFR), Part 1926.650, covers requirements for excavation and trenching operations. OSHA requires that all excavations in which employees could potentially be exposed to cave-ins be protected by sloping or benching the sides of the excavation, supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area. These regulations apply to the project because of the proposed construction and trenching activities.

### **4.2.2.2 State Regulations**

#### ***Alquist-Priolo Earthquake Fault Zoning Act***

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to protect structures for human occupancy from the hazard of surface faulting. In accordance with the Act, the State Geologist has established regulatory zones—called earthquake fault zones—around the surface traces of active faults, and has published maps showing these zones. Buildings for human



SOURCE: Ninyo & Moore, 2005

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**Figure 4.2-5**  
Landslide Hazard Map

occupancy cannot be constructed across surface traces of faults that are determined to be active. Because many active faults are complex and consist of more than one branch that may experience ground surface rupture, earthquake fault zones extend approximately 200 to 500 feet on either side of the mapped fault trace. The Alquist-Priolo Earthquake Fault Zoning Act does not apply to the proposed project because the State of California has not zoned under the Alquist-Priolo Act, the active and potentially active faults that intersect the project components.

### ***Seismic Hazards Mapping Act***

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones, and cities, counties, and other local permitting agencies to regulate certain development projects within these zones. For projects that would locate structures for human occupancy within designated Zones of Required Investigation, the Seismic Hazards Mapping Act requires project applicants to perform a site-specific geotechnical investigation to identify the potential site-specific seismic hazards and corrective measures, as appropriate, prior to receiving building permits. The *CGS Guidelines for Evaluating and Mitigating Seismic Hazards* (Special Publication 117A) provides guidance for evaluating and mitigating seismic hazards (CGS, 2008). The CGS is in the process of producing official maps based on USGS topographic quadrangles. To date, the CGS has not completed delineations for any of the USGS quadrangles in which project components are proposed. Therefore, as of the publication of this EIR, the proposed project is not subject to the Act.

### ***California Building Code***

The California Building Code (CBC), which is codified in Title 24 of the California Code of Regulations, 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. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. 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 2013 edition of the CBC is based on the 2012 International Building Code (IBC) published by the International Code Council. The 2013 edition of the CBC was published by the California Building Standards Commission in July, 2013, and took effect starting January 1, 2014. The 2013 CBC contains California amendments based on the American Society of Civil Engineers (ASCE) Minimum Design Standard 7. ASCE 7, *Minimum Design Loads for Buildings and Other Structures*, provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (such as wind loads) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, use and occupancy, location, maintenance, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California. Seismic design provisions of the building code

generally prescribe minimum lateral forces applied statically to the structure, combined with the gravity forces of dead and live loads. The prescribed lateral forces are generally considered to be substantially smaller than the actual peak forces that would be associated with a major earthquake. Consequently structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse, but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake. However, it is reasonable to expect that a structure designed in accordance with the seismic requirements of the CBC should not collapse in a major earthquake.

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; SDC ranges from A (very small seismic vulnerability) to E/F (very high seismic vulnerability and near a major fault). Seismic design specifications are determined according to the SDC in accordance with Chapter 16 of the CBC. Chapter 16, Section 1613 provides earthquake loading specifications for every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, which shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE Minimum Design Standards 7-05. Chapter 18 of the CBC covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load-bearing of soils (1805), as well as foundations (Section 1808), shallow foundations (Section 1809), and deep foundations (Section 1810). Chapter 18 also describes analysis of expansive soils and the determination of the depth to groundwater table. For Seismic Design Categories D, E, and F, Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The potential for liquefaction and soil strength loss must be evaluated for site-specific peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions.

**1803.5.3 Expansive Soil.** In areas likely to have expansive soil, the building official shall require soil tests to determine where such soils do exist. Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted:

1. Plasticity index (PI) of 15 or greater, determined in accordance with ASTM D 4318
2. More than 10 percent of the soil particles pass a No. 200 sieve (75 micrometers), determined in accordance with ASTM D 422
3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422

4. Expansion index greater than 20, determined in accordance with ASTM D 4829

### **California Excavation Notification Requirements**

California Code of Regulations Section 4216 requires that construction contractors report a project that involves excavation 48-hours prior to breaking ground. This program allows owners of buried installations to identify and mark the location of its facilities before any nearby excavation projects commence. Adherence to this law by contractors of projects reduces the potential of inadvertent pipeline and utility damage and leaks.

### **California Occupational Safety and Health Administration Regulations**

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the work place. In California, the California Division of Occupational Safety and Health (Cal/OSHA) and the federal OSHA are the agencies responsible for ensuring worker safety in the workplace.

The OSHA Excavation and Trenching standard (29 CFR 1926.650), described above in Section 4.2.2.1, Federal Regulations, covers requirements for excavation and trenching operations, which are among the most hazardous construction activities. OSHA requires that all excavations in which employees could potentially be exposed to cave-ins be protected by sloping or benching the sides of the excavation, supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area. Cal/OSHA is the implementing agency for both state and federal OSHA standards.

### **NPDES Construction General Permit**

Construction associated with the proposed project would disturb more than one acre of land surface affecting the quality of stormwater discharges into waters of the U.S. The proposed project would therefore be subject to the *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002, Construction General Permit). The Construction General Permit regulates discharges of pollutants in stormwater associated with construction activity to waters of the U.S. from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects (LUP), including installation of water pipelines and other utility lines.

Portions of the proposed project would fall under the Type 1 LUP category if the following conditions are met:

- a) Construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them;
- b) The areas disturbed during a single construction day are returned to their preconstruction condition, or to an equivalent condition (i.e., disturbed soils such as those from trench

- excavation are hauled away, backfilled into the trench, and/or placed in spoils piles and covered with plastic), at the end of that same day;
- c) Vegetated areas disturbed by construction activities are stabilized and revegetated at the end of the construction period; and
  - d) When required, adequate temporary soil stabilization best management practices (BMPs) are installed and maintained until vegetation has reestablished to meet the permit's minimum cover requirements for final stabilization.

The Construction General Permit requires that construction sites be assigned a Risk Level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the receiving waters risk during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could potentially be discharged to receiving water bodies and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving waters risk level reflects the risk to the receiving waters from the sediment discharge. The Construction General Permit contains requirements for Risk Levels 1, 2 and 3, and the LUP Type 1, 2, and 3 categories. If a project does not meet any one or more of the aforementioned conditions under the Type 1 LUP category, depending on its location within a sensitive watershed area or floodplain, the level of receiving water risk could be considered low, medium, or high. Depending on the Risk Level, the construction projects could be subject to the following requirements:

- Effluent standards
- Good site management "housekeeping"
- Non-stormwater management
- Erosion and sediment controls
- Run-on and runoff controls
- Inspection, maintenance, and repair
- Monitoring and reporting requirements

The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific BMPs designed to prevent pollutants from contacting stormwater and keep all products of erosion from moving offsite into receiving waters. The SWPPP BMPs are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The SWPPP must be prepared before the construction begins. The SWPPP must contain a site map(s) that delineates the construction work area, existing and proposed buildings, parcel boundaries, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the project area. The SWPPP must list BMPs and the placement of those BMPs that the applicant would use to protect stormwater runoff. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Examples of typical construction BMPs include scheduling or limiting certain

activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, vehicle and equipment washing and fueling. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site following construction).

In the project area, the Construction General Permit is implemented and enforced by the Central Coast RWQCB, which administers the stormwater permitting program. Dischargers are required to electronically submit a notice of intent (NOI) and permit registration documents (PRDs) in order to obtain coverage under this Construction General Permit. Dischargers are responsible for notifying the RWQCB of violations or incidents of non-compliance, as well as for submitting annual reports identifying deficiencies of the BMPs and how the deficiencies were corrected.

The permit contains several additional compliance items, including: (1) additional mandatory BMPs to reduce erosion and sedimentation, which may include vegetated swales, setbacks and buffers, rooftop and impervious surface disconnection, bioretention cells, rain gardens, rain cisterns, implementation of pollution/sediment/spill control plans, training, and other structural and nonstructural actions; (2) sampling and monitoring for non-visible pollutants; (3) effluent monitoring and annual compliance reports; (4) development and adherence to a Rain Event Action Plan; (5) requirements for post-construction; (6) numeric action levels and effluent limits for pH and turbidity; (7) monitoring of soil characteristics onsite; and (8) mandatory training under a specific curriculum.

The proposed project would be required to comply with the permit requirements to control stormwater discharges from the construction sites. To obtain coverage under the Construction General Permit, CalAm would be required to electronically file the NOI along with the PRDs, the SWPPP, risk assessment, site map, signed certification statement, and other compliance-related documents required by the Construction General Permit using the Stormwater Multiple Applications and Report Tracking Systems, along with the appropriate permit fee to State Water Resources Control Board (SWRCB). The risk assessment and SWPPP must be prepared by a state-qualified SWPPP Developer and implementation of the SWPPP must be overseen by a state-qualified SWPPP Practitioner. A Legally Responsible Person, who is legally authorized to sign and certify PRDs, is responsible for obtaining coverage under the permit.

### 4.2.2.3 Local Regulations

**Table 4.2-6** describes the regional and local land use plans, policies, and regulations pertaining to geology, soils, and seismicity that are relevant to the MPWSP and that were adopted for the purpose of avoiding or mitigating an environmental effect. Also included in **Table 4.2-6** is an analysis of project consistency with such plans, policies, and regulations. Where the analysis concludes the proposed project would not conflict with the applicable plan, policy, or regulation, the finding is noted and no further discussion is provided. Where the analysis concludes the proposed project may conflict with the applicable plan, policy, or regulation, the reader is referred to Section 4.2.3, Impacts and Mitigation Measures, for additional discussion.

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**TABLE 4.2-6  
APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

Project Planning Region	Applicable Planning Document	Plan Element/Section	Project Component(s)	Specific Plan, Policy, or Ordinance	Relationship to Avoiding or Mitigating a Significant Environmental Impact	Project Consistency with Plan, Policy, or Ordinance
Cities of Marina & Monterey (coastal zone)	California Coastal Act	Development	Subsurface Slant Wells, Source Water Pipeline, Desalinated Water Pipeline, Transmission Main, and Monterey Pipeline	<b>Section 30235: Construction altering natural shoreline.</b> Retirements, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.	This section is intended to preserve the coastal shoreline and limit the loss of existing structures or public beaches from erosion.	<b>Potentially Inconsistent:</b> The subsurface slant wells, Source Water Pipeline, and the segment of the Monterey Pipeline between El Estero Lake and the Monterey Bay shoreline would be constructed below the ground surface. Portions of these project components are anticipated to be exposed in the future due to coastal retreat caused by sea level rise, thus altering natural shoreline processes. This is addressed in Impact 4.2-6, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
Cities of Marina & Monterey (coastal zone)	California Coastal Act	Development	Subsurface Slant Wells, Transmission Main, Source Water Pipeline, Desalinated Water Pipeline, and Monterey Pipeline	<b>Section 30253: Minimization of Adverse Impacts.</b> New development shall do all of the following: a. Minimize risks to life and property in areas of high geologic, flood, and fire hazard. b. Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.	This section is intended to minimize the potential for loss of life, and property damage resulting from geologic, flood, and fire hazards. Additionally, this section is intended to ensure that development would not contribute to erosion, geologic instability, or other natural landforms along bluffs and cliffs.	<b>Potentially Inconsistent:</b> The subsurface slant wells, Source Water Pipeline, and the segment of the Monterey Pipeline between El Estero Lake and the Monterey Bay shoreline would be constructed below the ground surface. Portions of these project components are anticipated to be exposed in the future due to coastal retreat caused by sea level rise, thus altering natural shoreline processes. This is addressed in Impact 4.2-6, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
City of Marina (coastal zone & inland area)	City of Marina General Plan	Community Design and Development	Subsurface Slant Wells, Transmission Main, Source Water Pipeline, and Desalinated Water Pipeline	<b>Policy 4.99:</b> 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.	This policy is intended to reduce risks to people and property associated with seismic hazards.	<b>Consistent:</b> The subsurface slant wells and proposed pipelines 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 registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. In addition, the proposed pipelines would be constructed in accordance with the industry-accepted American Water Works Association (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 Marina (coastal zone & inland area)	City of Marina General Plan	Community Design and Development	Subsurface Slant Wells, Transmission Main, Source Water Pipeline, and Desalinated Water Pipeline	<b>Policy 4.102.1:</b> Ensure that critical or sensitive facilities, e.g., hospitals, fire and police stations, schools, major transportation links, high-occupancy structures, emergency communication facilities, utility lines, and sites containing or storing hazardous materials, are located, designed and operated to maximize their ability to remain functional after the expected or maximum credible event on any of the local active fault systems. Critical facilities shall not be located in areas of high to very high seismic shaking hazard.	This policy is intended to ensure that emergency or vital public facilities are able to withstand a major seismic event.	<b>Consistent:</b> The subsurface slant wells and proposed pipelines 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 registered geotechnical engineer, to reduce the risk of substantial damage and collapse in the event of an earthquake. 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 Marina (coastal zone & inland area)	City of Marina General Plan	Community Design and Development	Subsurface Slant Wells, Transmission Main, Source Water Pipeline, and Desalinated Water Pipeline	<b>Policy 4.102.2:</b> 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.	This policy is intended to minimize topographic alteration that could increase risks of geologic or seismic hazards.	<b>Consistent:</b> The proposed project design would not require massive grading. The subsurface slant wells and all pipelines 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 (coastal zone & inland area)	City of Marina General Plan	Community Design and Development	Subsurface Slant Wells, Transmission Main, Source Water Pipeline, and Desalinated Water Pipeline	<b>Policy 4.102.4:</b> 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.	This policy is intended to ensure that development would neither contribute to dune erosion nor encroach on migrating dunes.	<b>Potentially Inconsistent:</b> The subsurface slant wells and the westernmost portions of the Source Water Pipeline and Desalinated Water Pipeline would be constructed within an active dune area. While most facilities would be constructed below ground, these locations are anticipated to 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 4.2-6, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
City of Marina (coastal zone & inland area)	City of Marina General Plan	Community Design and Development	Subsurface Slant Wells, Transmission Main, Source Water Pipeline, and Desalinated Water Pipeline	<b>Policy 4.124.1:</b> 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	This policy is intended to minimize new development soil erosion and associated water quality impacts.	<b>Consistent:</b> The proposed project would be subject to the state Construction General Permit and the Marina Excavations and Encroachment Ordinance, which require the implementation of specific construction-related BMPs to prevent concentrated stormwater run-on/runoff, soil erosion, and release of construction site contaminants.

**TABLE 4.2-6 (Continued)**  
**APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

Project Planning Region	Applicable Planning Document	Plan Element/Section	Project Component(s)	Specific Plan, Policy, or Ordinance	Relationship to Avoiding or Mitigating a Significant Environmental Impact	Project Consistency with Plan, Policy, or Ordinance
				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.		
City of Marina (coastal zone)	City of Marina Local Coastal Land Use Plan	Planning Guidelines, Geotechnical	Subsurface Slant Wells, Transmission Main, Source Water Pipeline, and Desalinated Water Pipeline	<b>Geotechnical:</b> Structural development shall not be allowed on the ocean-side of the dunes, in the area subject to wave erosion in the next 50 years, or in the tsunami run-up zone. The only exception to this would be essential support facilities to a coastally dependent industry, and in these areas the City will not undertake any liability for property damage due to hazards.	This policy is intended to protect life and property from wave erosion and tsunami run-up hazards.	<b>Potentially Inconsistent:</b> The subsurface slant wells and Source Water Pipeline would be constructed beneath the ocean side of the active coastal dunes at the 2060 coastal erosion line. At this location, of these facilities could potentially become exposed by the year 2060 due to coastal erosion. If exposed, the proposed facilities could be subject to damage from wave erosion or tsunami run-up. This issue is addressed in Impact 4.2-6, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
City of Monterey (coastal zone)	Monterey Harbor Land Use Plan	Diking, Dredging, Filling and Shoreline Structures	Monterey Pipeline	<b>Policy 3.b:</b> Existing roads and utility pipelines shall be related landward of erosion and storm water encroachments, wherever feasible.	This policy is intended to preserve the natural coastal shoreline and protect people and property from hazards associated with coastal erosion.	<b>Potentially Inconsistent:</b> 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 4.2-6, 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	<b>Policy 3.a:</b> 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.	This policy is intended to minimize risk to people and property from geologic and seismic hazards.	<b>Consistent:</b> 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 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	<b>Policy 3.b:</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.	This policy is intended to protect life and property from geologic, flood, and fire hazards, and to minimize natural landform alteration.	<b>Potentially Inconsistent:</b> 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 4.2-6, 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	<b>Policy 3.c:</b> 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.	This policy is intended to minimize risks to life and property as a result of wave and tsunami run-up hazards.	<b>Potentially Inconsistent:</b> 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 4.2-6, 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	<b>Policy 3.d:</b> 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.	This policy is intended to reduce risks to life and property as a result of wave and tsunami run-up hazards.	<b>Potentially Inconsistent:</b> 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 4.2-6, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.

**TABLE 4.2-6 (Continued)**  
**APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

Project Planning Region	Applicable Planning Document	Plan Element/ Section	Project Component(s)	Specific Plan, Policy, or Ordinance	Relationship to Avoiding or Mitigating a Significant Environmental Impact	Project Consistency with Plan, Policy, or Ordinance
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Natural Hazards	Monterey Pipeline	<b>Policy 3.1:</b> 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.	This policy is intended to protect life and property from geologic, flood, and fire hazards.	<u>Potentially Inconsistent:</u> 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 4.2-6, 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	Natural Hazards	Monterey Pipeline	<b>Policy 3.2:</b> 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.	This policy is intended to minimize geologic and seismic hazards risks.	<u>Consistent:</u> 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	Natural Hazards	Monterey Pipeline	<b>Policy 3.3:</b> 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 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.	This policy is intended to reduce risks to life and property as a result of coastal erosion, wave inundation, and tsunami run-up hazards.	<u>Potentially Inconsistent:</u> 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 4.2-6, 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	Natural Hazards	Monterey Pipeline	<b>Policy 3.4:</b> 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.	This policy is intended to reduce the risk to life and property associated with wave inundation and tsunami run-up hazards.	<u>Potentially Inconsistent:</u> 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 4.2-6, 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	Natural Hazards	Monterey Pipeline	<b>Policy 3.5:</b> 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.	This policy is intended to minimize disturbance to the coastal dunes and dune habitats.	<u>Consistent:</u> 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	Natural Hazards	Monterey Pipeline	<b>Policy 3.7:</b> 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.	This policy is intended to preserve the natural coastal shoreline and protect people and property from hazards associated with anticipated sea level rise.	<u>Potentially Inconsistent:</u> 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 4.2-6, 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	Natural Hazards	Monterey Pipeline	<b>Policy 3.11:</b> 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.	This policy is intended to protect coastal dunes from shoreline development and coastal development from coastal hazards.	<u>Potentially Inconsistent:</u> 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 4.2-6, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.

**TABLE 4.2-6 (Continued)**  
**APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

<b>Project Planning Region</b>	<b>Applicable Planning Document</b>	<b>Plan Element/ Section</b>	<b>Project Component(s)</b>	<b>Specific Plan, Policy, or Ordinance</b>	<b>Relationship to Avoiding or Mitigating a Significant Environmental Impact</b>	<b>Project Consistency with Plan, Policy, or Ordinance</b>
Del Monte Beach, City of Monterey (coastal zone)	Del Monte Beach Land Use Plan	Diking, Dredging, Filling and Shoreline Structures	Monterey Pipeline	<b>Policy 2:</b> Existing roads and utility pipelines shall be related landward of erosion and storm water encroachments, wherever feasible.	This policy is intended to preserve the natural coastal shoreline and protect people and property from hazards associated with coastal erosion.	<u>Potentially Inconsistent:</u> 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 4.2-6, 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	<b>Section 18.040.050: Engineering reports.</b> a. <b>Preparation of Reports.</b> Building owners shall employ a civil or structural engineer to prepare the investigation and engineering report outlined below. b. <b>Purpose.</b> 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. <b>General.</b> 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. <b>Level of Investigation.</b> 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.	This section is intended to minimize risk to people and property from seismic hazards.	<u>Consistent:</u> 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	Transmission Main, Transfer Pipeline, and Monterey Pipeline	<b>Section 15.09.010:</b> 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.	This section is intended to minimize risk to people and property from geologic and seismic hazards.	<u>Consistent:</u> The Transmission Main, 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	Transmission Main, Transfer Pipeline, and Monterey Pipeline	<b>Section 4.3.9: Require preparation of geologic and soils reports for all new developments located in the coastal zone.</b> 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.	This section is intended to protect people and property from geologic and seismic hazards.	<u>Consistent:</u> The Transmission Main, 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	Transmission Main, Transfer Pipeline, and Monterey Pipeline	<b>Section 4.3.14:</b> Require all new developments to be designed to withstand expected ground shaking during a major earthquake.	This section is intended to protect people and property from geologic and seismic hazards.	<u>Consistent:</u> The Transmission Main, 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.

**TABLE 4.2-6 (Continued)**  
**APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

Project Planning Region	Applicable Planning Document	Plan Element/ Section	Project Component(s)	Specific Plan, Policy, or Ordinance	Relationship to Avoiding or Mitigating a Significant Environmental Impact	Project Consistency with Plan, Policy, or Ordinance
						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	Transmission Main, Transfer Pipeline, and Monterey Pipeline	<b>Policy NCR-CZ 5.2: Protection from Natural Hazards:</b> 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.	This policy is intended to protect people and property from geologic hazards and natural disasters,	<u>Consistent:</u> The Transmission Main, 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.
City of Seaside (coastal zone & inland area)	Seaside General Plan	Safety	Transmission Main, Monterey Pipeline, Transfer Pipeline, ASR Pump-to-Waste Pipeline, ASR Settling Basin, ASR Pump Station, Terminal Reservoir	<b>Policy S-1-1:</b> Reduce the risk of impacts from seismic and geologic hazards. <i>Implementation Plan S-1.1.1: CEQA:</i> Assess development proposals for potential seismic and 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. <i>Implementation Plan S-1.1.2: Building Codes.</i> As new versions of building and construction codes are released, adopt and enforce the most recent codes. Specifically, to minimize damage from earthquakes and other geologic activity, implement the most recent State and seismic requirements for structural design of new development and redevelopment.	This policy is intended to protect people and property from seismic and geologic hazards.	<u>Consistent:</u> 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.
County of Monterey (coastal zone & inland area)	Monterey County Code	Chapter 16.08 - Grading	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Chapter 16.08:</b> The Monterey County Grading Ordinance generally regulates grading activities that involve more than 100 cubic yards of excavation and fill. Minor fills and excavations ("cuts") of less than 100 cubic yards that are not intended to provide foundations for structures, or that are very shallow and nearly flat, are typically exempt from the ordinance, as are shallow footings for small structures. Submittal requirements for a County grading permit include site plans, existing contours and proposed contour changes, an estimate of the volume of earth to be moved, and geotechnical (soils) reports. Grading activities that involve over 5,000 cubic yards of soil must include detailed plans signed by a state-licensed civil engineer.  Grading is not allowed to obstruct storm drainage or cause siltation of a waterway. All grading requires implementation of temporary and permanent erosion-control measures. Grading within 50 feet of a watercourse, or within 200 feet of a river, is regulated in the Monterey County Zoning Ordinance floodplain 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. The soil engineering and engineering geology report must include the following: a. Data regarding the properties, distribution and strength of existing soils b. Recommendations for grading and corrective measures for project design, as appropriate c. An adequate description of the geology of the site and potential hazards.  The recommendations from the soil engineering and engineering geology report must be incorporated in the grading plans and construction specifications.	This ordinance is intended to minimize soil erosion, and loss of topsoil, and associated environmental effects.	<u>Consistent:</u> The proposed project would be subject to the state Construction General Permit, the Monterey County Grading Ordinance, and the Monterey County Erosion Control Ordinance, which require the implementation of specific construction-related BMPs to minimize soil erosion and soil loss from construction sites.

**TABLE 4.2-6 (Continued)**  
**APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

Project Planning Region	Applicable Planning Document	Plan Element/Section	Project Component(s)	Specific Plan, Policy, or Ordinance	Relationship to Avoiding or Mitigating a Significant Environmental Impact	Project Consistency with Plan, Policy, or Ordinance
County of Monterey (coastal zone & inland area)	Monterey County Code	Chapter 16.12 – Erosion Control	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Section 16.12:</b> The Monterey County Erosion Control Ordinance requires project applicants to implement runoff control measures and avoid creek disturbance; regulates land clearing; and prohibits grading activities during winter. The ordinance generally prohibits development on slopes greater than 30 percent. The Monterey County Director of Building Inspection enforces the ordinance, under which applicants must complete an erosion control plan.	This section is intended to minimize erosion and soil loss, and associated water quality impacts, among other environmental effects.	<u>Consistent:</u> The proposed project would be subject to the state Construction General Permit, the Monterey County Grading Ordinance, and the Monterey County Erosion Control Ordinance, which require implementation of specific construction-related BMPs to minimize erosion and prevent stormwater pollutants from leaving the construction sites. No construction is proposed on slopes of greater than 30 percent. Discussion related to surface water quality is also in Section 4.3, Surface Water Hydrology and Water Quality.
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Conservation and Open Space	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy OS-3.1:</b> Best Management Practices (BMPs) to prevent and repair erosion damage shall be established and enforced.	This policy is intended to minimize erosion and soil loss, and associated water quality impacts, among other environmental effects.	<u>Consistent:</u> The proposed project would be subject to the state Construction General Permit, the Monterey County Grading Ordinance, and the Monterey County Erosion Control Ordinance, which require implementation of specific construction-related BMPs to prevent erosion.
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Conservation and Open Space	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy OS-3.3:</b> Criteria for studies to evaluate and address, through appropriate designs and BMPs, geologic and hydrologic constraints and hazards conditions, such as slope and soil instability, moderate and high erosion hazards, and drainage, water quality, and stream stability problems created by increased stormwater runoff, shall be established for new development and changes in land use designations.	This policy is intended to minimize development-related impacts on people, property, and water quality associated with hydrologic and geologic hazards.	<u>Consistent:</u> The proposed project would be subject to the state Construction General Permit, the Monterey County Grading Ordinance, and the Monterey County Erosion Control Ordinance, which require implementation of specific construction-related BMPs to prevent erosion.
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Safety	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy S-1.1:</b> 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.	This policy is intended to protect people and property from seismic and geologic hazards.	<u>Consistent:</u> 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.
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Safety	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy S-1.3:</b> 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.	This policy is intended to protect people and property from seismic and geologic hazards.	<u>Consistent:</u> 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 and structural 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.
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Safety	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy S-1.4:</b> The Alquist-Priolo Earthquake Fault Zoning Act shall be enforced.	This policy is intended to protect people and property from seismic hazards, such as those resulting from fault rupture.	<u>Consistent:</u> No project elements are proposed within an Alquist-Priolo Earthquake Fault Zone.

**TABLE 4.2-6 (Continued)**  
**APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

Project Planning Region	Applicable Planning Document	Plan Element/ Section	Project Component(s)	Specific Plan, Policy, or Ordinance	Relationship to Avoiding or Mitigating a Significant Environmental Impact	Project Consistency with Plan, Policy, or Ordinance
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Safety	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy S-1.5:</b> 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.	This policy is intended to protect people and property from hazards associated with fault rupture, landslides, or coastal erosion.	<u>Potentially Inconsistent:</u> 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 4.2-6, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Safety	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy S-1.6:</b> 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.	This policy is intended to protect people and property from geologic and seismic hazards.	<u>Potentially Inconsistent:</u> 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 4.2-6, which identifies mitigation measures whose implementation would minimize or avoid this potential inconsistency.
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Safety	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy S-1.7:</b> 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.	This policy is intended protect people and property from geologic hazards, such as fault rupture, secondary fracturing, landslides, or liquefaction.	<u>Consistent:</u> 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 and structural 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.
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Safety	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy S-1.8:</b> 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 neither create nor significantly contribute to geologic instability or geologic hazards.	This policy is intended to protect people and property from geologic hazards (e.g., liquefaction, landslides).	<u>Consistent:</u> 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 and structural 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.

**TABLE 4.2-6 (Continued)  
 APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

Project Planning Region	Applicable Planning Document	Plan Element/Section	Project Component(s)	Specific Plan, Policy, or Ordinance	Relationship to Avoiding or Mitigating a Significant Environmental Impact	Project Consistency with Plan, Policy, or Ordinance
County of Monterey (coastal zone & inland area)	Monterey County General Plan	Safety	Source Water Pipeline, MPWSP Desalination Plant, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Ryan Ranch-Bishop Interconnection Improvements	<b>Policy S-1.9:</b> 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.	This policy is intended to minimize erosion hazards.	<u>Consistent:</u> The proposed project would be subject to the state Construction General Permit, the Monterey County Grading Ordinance, and the Monterey County Erosion Control Ordinance, which require implementation of specific construction-related BMPs to minimize erosion and prevent stormwater pollutants from leaving the construction sites. Discussion related to surface water quality is also discussed in Section 4.3 Surface Water Hydrology and Water Quality.
County of Monterey (coastal zone)	North County Land Use Plan	Geologic Hazards	Source Water Pipeline, Desalinated Water Pipeline	<b>Policy 2.8.3.A1:</b> All development shall be sited and designed to conform to site topography and to minimize grading and other site preparation activities.	This policy is intended to minimize landform alteration and associated environmental effects.	<u>Consistent:</u> The Source Water Pipeline and Desalinated Water Pipeline installation would generally occur within existing road rights-of-way, not requiring extensive grading. Upon completion of construction the topography of all work areas would be restored to their approximate pre-construction condition. The subsurface slant wells would be constructed below the ground surface and the original topography would be restored.
County of Monterey (coastal zone)	North County Land Use Plan	Geologic Hazards	Source Water Pipeline, Desalinated Water Pipeline	<b>Policy 2.8.3.A2:</b> 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.	This policy is intended to minimize impacts on utility infrastructure from seismic hazards.	<u>Consistent:</u> No active or potentially active faults have been identified in the vicinity of the Source Water Pipeline or Desalinated Water Pipeline.
County of Monterey (coastal zone)	North County Land Use Plan	Geologic Hazards	Source Water Pipeline, Desalinated Water Pipeline	<b>Policy 2.8.3.A4:</b> Soils and geologic reports shall be required for all new land divisions and for construction of structures and roads on slopes exceeding 30 percent or in areas of known or suspected geologic hazards. Evaluations of potential onsite and offsite impacts shall be included in the report.	This policy is intended to protect people and property from geologic hazards.	<u>Consistent:</u> The proposed project does not propose any new land divisions or construction of any structures or roads. No project elements would be placed on slopes greater than 30 percent.
County of Monterey (coastal zone)	North County Land Use Plan	Geologic Hazards	Desalinated Water Pipeline	<b>Policy 2.8.3.A5:</b> 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 ground water 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.	This policy is intended to protect people and property from geologic hazards.	<u>Consistent:</u> 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 and structural 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 Seaside	Municipal Code	Title 15 Buildings and Construction	ASR Conveyance Pipeline, ASR Pump-to-Waste Pipeline, ASR Settling Basin, ASR Pump Station, Terminal Reservoir	<b>Chapter 15.32 Standards to Control Excavation, Grading, Clearing and Erosion:</b> When required by the city engineer, each application for a permit shall be accompanied by two sets of supporting data consisting of a soil and/or civil engineering report and/or engineering geology report, and/or any other reports necessary. B. The civil engineering report shall include hydrological calculations of runoff for ten-year and one-hundred year storm frequencies; conclusions and recommendations for adequate erosion control and grading procedures, comparison of runoff without and with project; design criteria for corrective measures, including the existing and/or required safe storm drainage capacity outlet of channels both on-site and off-site; and opinions and recommendations covering adequacy of the site to be developed by the proposed grading. The City shall require developers to prepare and implement erosion control plans prepared by a registered civil engineer or an approved erosion controls specialist" means a person who has a certificate of qualifications and is recognized by the city engineer as capable of preparing erosion control and grading plans and shall be subject to the approval of the City Engineer. The erosion component of the plan must at least meet the requirements of Storm Water Pollution Prevention Plans (SWPPPs) required by the California State Water Resources Control Board.	These standards are intended to minimize erosion resulting from excavation, grading, and clearing.	<u>Consistent:</u> The proposed project would be subject to state Construction General Permit, the City of Seaside Standards to Control Excavation, Grading, Clearing and Erosion, which require implementation of specific construction-related BMPs to minimize erosion and prevent stormwater pollutants from leaving the construction sites. The Construction General Permit requires the preparation and implementation of a SWPPP.



**TABLE 4.2-6 (Continued)**  
**APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

Project Planning Region	Applicable Planning Document	Plan Element/Section	Project Component(s)	Specific Plan, Policy, or Ordinance	Relationship to Avoiding or Mitigating a Significant Environmental Impact	Project Consistency with Plan, Policy, or Ordinance
Fort Ord Reuse Authority (Seaside)	Fort Ord Reuse Plan	Conservation	ASR Conveyance Pipeline, ASR Pump-to-Waste Pipeline, ASR Settling Basin, ASR Pump Station, Terminal Reservoir	<b>Soils and Geology Policy A-4:</b> The City shall continue to enforce the Uniform Building Code to minimize erosion and slope instability problems.	This policy is intended to minimize erosion and slope instability.	<u>Consistent:</u> The proposed project would be constructed in compliance with the California Building Code (CCR Title 24), which is based on the International Building Code, the predecessor of the Uniform Building Code. The CBC 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.
Fort Ord Reuse Authority (Seaside)	Fort Ord Reuse Plan	Conservation	Conveyance Pipeline, ASR Pump-to-Waste Pipeline, ASR Settling Basin, ASR Pump Station, Terminal Reservoir	<b>Soils and Geology Policy A-5:</b> Before issuing a grading permit, the City shall require that geotechnical reports be prepared for developments proposed on soils that have limitations as substrates for construction or engineering purposes, including limitations concerning slope and soils that have piping, low-strength, and shrink-swell potential. The City shall require that engineering and design techniques be recommended and implemented to address these limitations.	The policy is intended to protect people and property from geologic hazards, including soil instability.	<u>Consistent:</u> 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 and structural 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.
Fort Ord Reuse Authority (Seaside)	Fort Ord Reuse Plan	Conservation	ASR Conveyance Pipeline, ASR Pump-to-Waste Pipeline, ASR Settling Basin, ASR Pump Station, Terminal Reservoir	<b>Soils and Geology Policy A-6:</b> The City shall require that development of lands having a prevailing slope above 30% include implementation of adequate erosion control measures.	This policy is intended to minimize the erosion impacts of new development.	<u>Consistent:</u> No project elements would be placed on slopes greater than 30 percent.
Fort Ord Reuse Authority (Seaside)	Fort Ord Reuse Plan	Safety	ASR Conveyance Pipeline, ASR Pump-to-Waste Pipeline, ASR Settling Basin, ASR Pump Station, Terminal Reservoir	<b>Seismic and Geologic Hazards Policy A-2:</b> The City shall use the development review process to ensure that potential seismic or geologic hazards are evaluated and mitigated prior to construction of new projects. <b>Program A-2.1:</b> The City shall require geotechnical reports and seismic safety plans when development projects or other area plans are proposed within zones that involve high or very high seismic risk. Each plan shall be prepared by a certified geotechnical engineer and shall be subject to the approval of the Planning Director for the City of Seaside. <b>Program A-2.2:</b> Through site monitoring, the City shall ensure that all measures included in the project's geotechnical and seismic safety plans are properly implemented and a report shall be filed and on public record prepared by the Planning Director and/or Building Inspector confirming such. <b>Program A-2.3:</b> The City shall continue to update and enforce the Uniform Building Code to minimize seismic hazards impacts from resulting from earthquake induced effects such as ground shaking, ground rupture, liquefaction, and or soils problems.	This policy is intended to protect people and property from seismic and geologic hazards.	<u>Consistent:</u> As designed, 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 and structural 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.
Fort Ord Reuse Authority (Monterey County)	Base Reuse Plan	Conservation	Ryan Ranch–Bishop Interconnection Improvements	<b>Soils and Geology Policy A-2:</b> The County shall require developers to prepare and implement erosion control and landscape plans for projects that involve high erosion risk. Each plan shall be prepared by a registered civil engineer or certified professional in the field of erosion and sediment control and shall be subject to the approval of the public works director for the City of Marina. The erosion component of the plan must at least meet the requirements of Storm Water Pollution Prevention Plans (SWPPPs) required by the California State Water Resources Control Board.	This policy is intended to minimize erosion resulting from new development.	<u>Consistent:</u> The proposed project would be subject to the state Construction General Permit, the Monterey County Grading Ordinance, and the Monterey County Erosion Control Ordinance, which require the implementation of specific construction-related BMPs to prevent concentrated stormwater run-on/runoff, soil erosion, and release of construction site contaminants.
Fort Ord Reuse Authority (Monterey County)	Base Reuse Plan	Conservation	Ryan Ranch–Bishop Interconnection Improvements	<b>Soils and Geology Policy A-3:</b> Through site monitoring, the County shall ensure that all measures included in the developer's erosion control and landscape plans are properly implemented.	The policy is intended to minimize erosion resulting from new development.	<u>Consistent:</u> As stated above for Policy A-2, the proposed project would be subject to the state Construction General Permit, the Monterey County Grading Ordinance, and the Monterey County Erosion Control Ordinance. The construction contractor will adhere to the site monitoring and reporting requirements of the Construction General Permit and Monterey County ordinances.
Fort Ord Reuse Authority (Monterey County)	Base Reuse Plan	Conservation	Ryan Ranch–Bishop Interconnection Improvements	<b>Soils and Geology Policy A-4:</b> The County shall continue to enforce the Uniform Building Code to minimize erosion and slope instability problems.	This policy is intended to minimize erosion and slope instability.	<u>Consistent:</u> 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 that address erosion, slope stability, and various other geologic, soil, and seismic hazards.

**TABLE 4.2-6 (Continued)  
 APPLICABLE STATE, REGIONAL, AND LOCAL PLANS AND POLICIES RELEVANT TO GEOLOGY, SOILS, AND SEISMICITY**

<b>Project Planning Region</b>	<b>Applicable Planning Document</b>	<b>Plan Element/ Section</b>	<b>Project Component(s)</b>	<b>Specific Plan, Policy, or Ordinance</b>	<b>Relationship to Avoiding or Mitigating a Significant Environmental Impact</b>	<b>Project Consistency with Plan, Policy, or Ordinance</b>
Fort Ord Reuse Authority (Monterey County)	Base Reuse Plan	Conservation	Ryan Ranch–Bishop Interconnection Improvements	<b>Soils and Geology Policy A-5:</b> Before issuing a grading permit, the County shall require that geotechnical reports be prepared for developments proposed on soils that have limitations as substrates for construction or engineering purposes, including limitations concerning slope and soils that have piping, low-strength, and shrink-swell potential. The County shall require that engineering and design techniques be recommended and implemented to address these limitations.	The policy is intended to protect people and property from geologic hazards, including soil instability.	<u>Consistent:</u> Preliminary and final geotechnical investigations would be completed and the recommendations of the geotechnical engineer incorporated into final project design.
Fort Ord Reuse Authority (Monterey County)	Base Reuse Plan	Conservation	Ryan Ranch–Bishop Interconnection Improvements	<b>Soils and Geology Policy A-6:</b> The County shall require that development of lands having a prevailing slope above 30% include implementation of adequate erosion control measures.	This policy is intended to minimize the erosion impacts of new development.	<u>Consistent:</u> No construction is proposed on slopes of greater than 30 percent.
Fort Ord Reuse Authority (Monterey County)	Base Reuse Plan	Safety	Ryan Ranch–Bishop Interconnection Improvements	<b>Seismic and Geologic Hazards Policy A-2:</b> The County shall use the development review process to ensure that potential seismic or geologic hazards are evaluated and mitigated prior to construction of new projects.  <b>Program A-2.1:</b> The County shall require geotechnical reports and seismic safety plans when development projects or other area plans are proposed within zones that involve high or very high seismic risk. Each plan shall be prepared by a certified geotechnical engineer and shall be subject to the approval of the Planning Director for the County of Monterey.  <b>Program A-2.2:</b> Through site monitoring, the County shall ensure that all measures included in the project's geotechnical and seismic safety plans are properly implemented and a report shall be filed and on public record prepared by the Planning Director and/or Building Inspector confirming such.  <b>Program A-2.3:</b> The County shall continue to update and enforce the Uniform Building Code to minimize seismic hazards impacts from resulting from earthquake induced effects such as ground shaking, ground rupture, liquefaction, and or soils problems.	This policy is intended to protect people and property from seismic and geologic hazards.	<u>Consistent:</u> The proposed project would be constructed in compliance with the California Building Code (CCR Title 24), which requires that new structures be designed to address the various geologic, soil, and seismic hazards. Preliminary and final geotechnical investigations would be completed and the recommendations of the geotechnical engineer incorporated into final project design.

SOURCES: City of Marina, 1982; City of Marina, 2000; City of Monterey, 2003a; City of Monterey, 2003b; City of Sand City, 1982; City of Seaside, 2004; City of Seaside, 2012; FORA, 1997; Monterey County, 1982; Monterey County, 2010.

## 4.2.3 Impacts and Mitigation Measures

### 4.2.3.1 Significance Criteria

Appendix G of the CEQA Guidelines recommends significance criteria for the evaluation of impacts related to geology, soils, and seismicity. Those same criteria, with some minor modifications, are provided below. This EIR assumes implementation of the proposed project would have a significant impact related to geology, soils, and seismicity if it would:

- Expose people or structures to potential substantial adverse effects, including 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 and lateral spreading;
  - Seismically-induced landslides;
- Result in substantial soil erosion capable of causing significant property damage or the loss of useable topsoil.
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslides, subsidence, soil failure or soil compaction;
- Be located on problematic soils such as those characterized as expansive, as defined in 24 CCR 1803.5.3 of the California Building Code (2013), or corrosive;<sup>17</sup> or
- Be located on soils that are incapable of adequately supporting alternative methods of wastewater disposal where sewers are not available for the disposal of wastewater.

In addition to the above-listed CEQA significance criteria, the following significance criterion is also considered in the evaluation of impacts in Section 4.2.3.5, below, to capture the full range of project effects.

- Accelerate and/or exacerbate natural rates of coastal erosion, scour, or dune retreat, resulting in damage to adjoining properties or a substantial change in the natural coastal environment.

Based on the location and characteristics of the proposed project, the following criteria are not considered in the impact analyses in Sections 4.2.3.4 and 4.2.3.5 for the reasons described below.

***Alternative Wastewater Disposal.*** This CEQA Guidelines Appendix G criterion addresses the adequacy of the soils to support septic systems or alternative wastewater disposal systems, none of which are proposed as part of the project. Furthermore, the soils in the

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<sup>17</sup> The updated CBC no longer cites the 1997 UBC Table 18-1-B for identifying expansive soils. The checklist in Appendix G of the CEQA Guidelines still refers to this out of date table. This EIR uses the updated CBC section as defined in 24 CCR 1803.5.3 of the California Building Code (2013).

project area are generally sands, which are adequate. The issue of infiltration of all waters through the sands, and changes to infiltration as a result of the creation of impervious surfaces, is addressed in Section 4.3, Surface Water Hydrology and Water Quality (see Impact 4.3-2) and Section 4.4, Groundwater Resources (see Impact 4.4-1).

#### **4.2.3.2 Approach to Analysis**

Geologic and seismic information for the project area was derived from various sources and compiled in this chapter to develop a comprehensive understanding of the potential constraints and hazards associated with project construction and operations. Information sources include regional geologic maps prepared by the CGS and USGS, the PSHA of California, and earthquake rupture forecasts developed by the WGCEP, all of which reflect the most up-to-date understanding of the regional geology and seismicity. In addition, geologic and seismic analysis relied on two project-specific geotechnical studies and a project-specific coastal erosion study that was designed to evaluate the risk of coastal erosion that would result from future sea level rise and 100-year storm events.

As described in more detail below, the analysis of geologic and seismic impacts in this section takes into account that CalAm would incorporate into their facility designs the engineering recommendations provided by the various geotechnical studies conducted for the proposed project. The analysis also considers the various existing state and local regulations that apply to geotechnical design and construction, which include the CBC and the Monterey County ordinances for building and grading. Through compliance with the existing ordinances, CalAm would be required to demonstrate that the proposed site uses are compatible with the subsurface geology and local seismic conditions; this must occur before building permits are issued. Additionally, CalAm would require its pipeline engineers and construction contractors to adhere to the American Water Works Association (AWWA) standards for pipeline design and construction; this analysis considers that in evaluating potential geologic and seismic impacts.

#### ***Existing Geotechnical Investigations for Project Facilities***

Where appropriate, this analysis benefited from geotechnical information and data derived from a project-specific geotechnical studies prepared for project facilities, including a geotechnical baseline report prepared for the proposed MPWSP Desalination Plant at Charles Benson Road (URS, 2014), and a geotechnical investigation (Ninyo & Moore, 2005) conducted to support CalAm's previously proposed Coastal Water Project. Certain project components, including the Seawater Intake System (subsurface slant wells and Source Water Pipeline), the proposed improvements to the Seaside Groundwater Basin ASR system (two additional ASR injection/extraction wells, Terminal Reservoir, ASR Pump Station, ASR Conveyance Pipelines, ASR Settling Basin, and ASR Pump-to-Waste Pipeline), and the water conveyance pipelines (ASR Conveyance Pipelines and Transmission Main) are located in the same locations as the components of the Coastal Water Project, or in locations with similar geology and soil conditions. In addition, this analysis also utilized the preliminary geotechnical study completed by Ninyo & Moore (2014) for the Groundwater Replenishment Project EIR. As appropriate, the findings of the URS 2013

geotechnical baseline report and the 2005 and 2014 Ninyo & Moore geotechnical investigations were applied to the geological and seismic impact analysis for the proposed project.

CalAm 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 the foundation 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 CBC for most structures intended for human occupancy and by the Monterey County Grading Ordinance. 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 earthquake 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.

### ***American Water Works Association Standards for Proposed Pipelines***

Pipelines are constructed to various industry standards. The 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 pipelines.

### ***Geotechnical Design for Proposed Pipelines***

CalAm's engineering consultant for the proposed pipelines, URS Corporation, 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 (URS, 2014). 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 aboveground 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, 2014).

CalAm's final geotechnical evaluation would be completed following project approval and prior to obtaining final county and 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. CalAm would incorporate the recommendations developed by the final geotechnical study into the pipeline design. The recommendations developed from the final geotechnical design represent standard engineering practices that are typically employed for large pipeline projects 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 4.2.3.1, 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 be required to 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 ordinances pertaining to excavation, grading, and site development in geologic hazard zones. The *CGS Guidelines for Evaluating and Mitigating Seismic Hazards* (Special Publication 117A) (CGS, 2008) provides guidance for evaluating and mitigating seismic hazards as required by the 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. For projects whose grading activities would move over 5,000 cubic yards of soil, the Monterey County Grading Ordinance requires that a site-specific geotechnical investigation (i.e., soil engineering and engineering geology report) be completed prior to final design in order to obtain a building or grading permit.<sup>18</sup>

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.

### ***Site-Specific Soil Borings and Groundwater Sampling***

CalAm consultants drilled several exploratory borings at the CEMEX mining facility to depths of 306 to 350 feet below ground surface, logged the subsurface materials encountered, and collected soil and groundwater samples for laboratory testing. The exploratory boring logs, field screening tests results, and laboratory analytical results are presented in *Technical Memorandum (TM 1) - Summary of Results - Exploratory Boreholes* (Geoscience, 2014). The exploratory work, as described in detail in Section 4.4, Groundwater Resources, helped further define the subsurface geology in the CEMEX active mining area (the proposed site for the subsurface slant wells). While this work was intended to refine groundwater modeling parameters, it also benefits the impact analysis for geology, soils and seismicity in this chapter. The pertinent data gathered from the exploratory work is incorporated, where appropriate, into Sections 4.2.3.4 and 4.2.3.5, below.

### ***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*

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<sup>18</sup> Unless the investigation is deemed unnecessary by the Building Official due to existing information.

*Erosion with Sea Level Rise* — was conducted by a team of licensed coastal engineers and coastal geomorphologists (ESA, 2014). The findings and recommendations of the study inform the analysis of Impact 4.2-8, below. The coastal retreat study is included as **Appendix C1** of this EIR.

The coastal retreat study focuses on six locations within the project area and examines 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 4.4, 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.

### 4.2.3.3 Summary of Impacts

**Table 4.2-7** summarizes the proposed project’s impacts and significance determinations related to geology, soils, and seismicity.

**TABLE 4.2-7  
 SUMMARY OF IMPACTS – GEOLOGY, SOILS, AND SEISMICITY**

Impacts	Significance Determinations
<b>Impact 4.2-1:</b> Increased soil erosion or loss of topsoil during construction.	LSM
<b>Impact 4.2-2:</b> Exposure of people or structures to substantial adverse effects related to fault rupture.	LS
<b>Impact 4.2-3:</b> Exposure of people or structures to substantial adverse effects related to seismically-induced groundshaking.	LS
<b>Impact 4.2-4:</b> Exposure of people or structures to substantial adverse effects related to liquefaction and lateral spreading.	LS
<b>Impact 4.2-5:</b> Exposure of people or structures to substantial adverse effects related to landslides.	LS
<b>Impact 4.2-6:</b> Exposure of people or structures to substantial adverse effects related to coastal erosion and bluff retreat caused by sea level rise.	LSM
<b>Impact 4.2-7:</b> Exposure of people or structures to substantial adverse effects related to land subsidence.	LS
<b>Impact 4.2-8:</b> Exposure of people or structures to substantial adverse effects related to expansive soils.	LS
<b>Impact 4.2-9:</b> Exposure of structures to substantial adverse effects related to corrosive soils.	LS

LS = Less than Significant impact, no mitigation required  
 LSM = Less than Significant impact with Mitigation

#### 4.2.3.4 Construction Impacts and Mitigation Measures

##### **Impact 4.2-1: Increased soil erosion or loss of topsoil during construction. (*Less than Significant with Mitigation*)**

###### **Soil Erosion**

**All Proposed Project Components.** Project construction would involve localized ground disturbance activities (e.g., grading, excavation, drilling, construction of structures and pipelines, and drilling) associated with drilling of the subsurface slant wells, monitoring wells, and ASR injection/extraction wells, installation of pipelines, and construction of buildings and structures. These activities could result in increased soil erosion or loss of topsoil.

The construction activities would involve short-term ground disturbance. As described above in Section 4.2.1, Setting, many of the project facilities and pipelines would be located underground or in relatively flat areas with little topographic relief. This would minimize the potential for soil erosion during construction.

Because the overall footprint of construction activities would exceed 1 acre, the proposed project would be required to comply with the *NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002) (Construction General Permit), the Monterey County Grading Ordinance, and Monterey County Erosion Control Ordinance, all of which are described in Section 4.2.2, Regulatory Framework. These state and local requirements were developed to ensure that stormwater is managed and erosion is controlled on construction sites. The Construction General Permit requires preparation and implementation of a SWPPP, also described in Section 4.2.2, which requires applications of BMPs to control run-on and runoff from construction work sites. The BMPs would include, but would not be limited to, physical barriers to prevent erosion and sedimentation, construction of sedimentation basins, limitations on work periods during storm events, use of bioinfiltration swales, protection of stockpiled materials, and a variety of other measures that would substantially reduce or prevent erosion from occurring during construction. The Monterey County Grading Ordinance, as well as similar city grading and erosion ordinances, requires implementation of temporary construction and permanent post-construction erosion control measures. The applicable erosion control ordinances restrict grading activities during winter months and require preparation of an erosion control plan prior to issuance of building permits.

Project construction activities would be subject to the requirements of the NPDES Construction General Permit, the Monterey County Grading Ordinance, the Monterey County Erosion Control Ordinance, and similar grading and erosion control ordinances of the affected incorporated areas. As a result, impacts associated with substantial increases in soil erosion during construction would be less than significant for all project components.

## Loss of Topsoil

**Subsurface Slant Wells, Source Water Pipeline, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Transmission Main, Transfer Pipeline, Monterey Pipeline, ASR-5 and ASR-6 Wells, ASR Conveyance Pipelines, ASR Pump-to-Waste Pipeline, ASR Settling Basin, and Terminal Reservoir/ASR Pump Station.** Several of the project-related construction activities would disturb vegetated areas, including sensitive natural vegetation communities and designated farmland. Grading, excavation, and backfill activities in these areas could result in the loss of topsoil (a fertile soil horizon that typically contains a seed base) if there is a well-developed topsoil horizon and it is mixed with other soil horizons or otherwise lost during excavation and backfilling. Impacts related to the loss of topsoil during construction of these components would be significant. However, the impact associated with loss of topsoil in sensitive natural communities would be reduced to a less-than-significant level with implementation of **Mitigation Measure 4.6-2b (Avoid, Minimize, and Compensate for Direct Construction Impacts to Sensitive Communities)**. The impact associated with loss of topsoil on agricultural lands would be reduced to a less-than-significant level with implementation of **Mitigation Measure 4.16-3 (Measures to Minimize Indirect Effects on Agricultural Land)**. These measures require that topsoil be salvaged, stockpiled separately from subsoils, and returned to its appropriate location in the soil profile during backfilling activities.

**MPWSP Desalination Plant and Valley Greens Pump Station.** Surface soils at the 25-acre MPWSP Desalination Plant site are sandy and do not have a well-developed soil horizon. The site is covered in ruderal and disturbed habitat and does not support sensitive natural communities or crop production. Valley Greens Pump Station site Option 1 is located within a dirt parking. Site Option 2 is located in a paved parking lot. Construction of the Valley Greens Pump Station at either site option would have no effect on topsoil. Therefore, construction of the MPWSP Desalination Plant and Valley Greens Pump Station would have no impact related to loss of topsoil and no mitigation is necessary.

## Impact Conclusion

Impacts associated with soil erosion during construction would be less than significant for all project facilities. Impacts associated with loss of topsoil during construction would be significant for the Subsurface Slant Wells, Source Water Pipeline, Desalinated Water Pipeline, Brine Discharge Pipeline, Salinas Valley Return Pipeline, Transmission Main, Transfer Pipeline, Monterey Pipeline, ASR-5 and ASR-6 Wells, ASR Conveyance Pipelines, ASR Pump-to-Waste Pipeline, ASR Settling Basin, and Terminal Reservoir/ASR Pump Station. Implementation of **Mitigation Measures 4.6-2b (Avoid, Minimize, and Compensate for Direct Construction Impacts to Sensitive Communities)** and **4.16-3 (Measures to Minimize Indirect Effects on Agricultural Land)** would reduce this impact to a less-than-significant level. No impact related to the loss of topsoil would result from construction of the MPWSP Desalination Plant and Valley Greens Pump Station.

### **Mitigation Measures**

*Mitigation Measure 4.6-2b applies to the Subsurface Slant Wells, Source Water Pipeline, Desalinated Water Pipeline, Transmission Main, Transfer Pipeline, Monterey Pipeline, ASR-5 and ASR-6 Wells, ASR Conveyance Pipelines, ASR Pump-to-Waste Pipeline, ASR Settling Basin, and Terminal Reservoir/ASR Pump Station.*

**Mitigation Measure 4.6-2b: Avoid, Minimize, and Compensate for Direct Construction Impacts to Sensitive Communities.**

(See Impact 4.6-2 in Section 4.6, Terrestrial Biological Resources, for the description.)

*Mitigation Measure 4.16-3 applies to the Source Water Pipeline, Desalinated Water Pipeline, Brine Discharge Pipeline, and Salinas Valley Return Pipeline.*

**Mitigation Measure 4.16-3: Measures to Minimize Indirect Effects on Agricultural Land.**

(See Impact 4.16-3 in Section 4.16, Agriculture and Forestry Resources, for the description.)

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### **4.2.3.5 Operational and Facility Siting Impacts and Mitigation Measures**

**Impact 4.2-2: Exposure of people or structures to substantial adverse effects related to fault rupture. (*Less than Significant*)**

The proposed project would not alter the seismic environment or increase the risk of fault rupture. None of the proposed facilities are located within an Alquist-Priolo Earthquake Fault Zone (i.e., on a State-recognized active fault trace). Although there is evidence of Holocene movement along some of the faults that cross the project area, these faults are unlikely to generate an earthquake or result in surface fault rupture because the segments with Holocene movement are concealed and do not exhibit any surface expression of fault movement, and/or are comparatively short (i.e. in comparison to an active fault such as the San Andreas Fault).

As shown on **Figures 4.2-1** and **4.2-3** and discussed in the Section 4.2.1.2, above, the Monterey Bay–Tularcitos Fault Zone passes through the project area in Monterey, Del Rey Oaks, and Seaside. This fault zone creates a 6- to 9-mile wide zone of short in-echelon, northwest striking faults. These faults are not zoned under the Alquist Priolo Earthquake Fault Zoning Act (see Regulatory Framework, Section 4.2.2) because they do not exhibit surface displacement that is younger than 11,000 years and are not considered sufficiently active or well defined. This distinction is discussed in more detail above in Section 4.2.1.2. From east to west, the individual faults in the Monterey Bay–Tularcitos Fault Zone are referred to as the:

- Chupines Fault Zone, Ord Terrace Fault, Del Rey Oaks section
- Chupines Fault Zone, Seaside Fault, Del Rey Oaks section
- Monterey Bay-Tularcitos Fault Zone, Monterey Bay section (Navy Fault)
- Monterey Bay-Tularcitos Fault Zone, Monterey Bay section (Hatton Canyon Fault)

Although these faults are not zoned by the State of California as active and the Fault Activity Map of California (Jennings, 2010) identifies these faults as older Quaternary-age faults (i.e. displacement between 1.6 mya to 11,000 ya or older), there has been evidence (Bryant, 2001) of Holocene displacement along the Hatton Canyon and Tularcitos Faults. Additionally, there is evidence of a probable offshore extension of the Chupines Fault displacing Holocene-age (less than 11,000 years old) deposits and seafloor sediments (Ninyo & Moore, 2014). Therefore, because there is evidence of Holocene-age displacement on certain segments of these otherwise Quaternary-aged and older faults, the potential for earthquake activity and possible ground surface displacement (ground rupture) cannot be dismissed. However, because the majority of these faults have not exhibited Holocene displacement and are not considered sufficiently active or well-defined, the potential is very low that the individual traces of these faults could generate an earthquake and result in surface fault rupture.

The Reliz-Rinconada and the Laureles Fault Zones are also present in the project area. These fault zones are discussed above in Section 4.2.2 and are listed in **Table 4.2-3**. The Reliz-Rinconada Fault Zone intersects the Transmission Main in the city of Marina and the Laureles Fault Zone occurs north of Carmel Valley. Both these fault zones are older, concealed Quaternary features with no evidence of historic or Holocene-age displacement. The potential for these faults to generate an earthquake or surface fault rupture is low. Therefore, these fault zones are not discussed further.

#### **Monterey Pipeline and Transmission Main**

The proposed Monterey Pipeline would cross over two strands of the Chupines Fault Zone in the city of Seaside and the trace of the Navy Fault in the city of Monterey. The Chupines and Navy Faults are concealed along Del Monte Avenue and there is no reported evidence of Holocene-age fault displacement in this area. The Transmission Main is intersected by the Chupines Fault Zone (Ord Terrace Fault, Del Ray Oaks section) in central Seaside. The Chupines Fault in Seaside is also concealed and covered with dune sand deposits.

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 (i.e. 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. In the unlikely event that the Navy or Chupines Faults generated earthquake activity or surface fault displacement along the Monterey Pipeline or the Transmission Main, the pipeline would likely accommodate the lateral movement and not be damaged. If damage did occur, it would amount to a pipe break and possibly leakage that would be readily repaired. This impact is considered less than significant.

#### **Valley Greens Pump Station (Site Option 1) and the Ryan Ranch-Bishop Interconnection Improvements**

The Hatton Canyon Fault has displayed evidence of Holocene-age movement and is located near the Valley Greens Pump Station (site Option 1). The Hatton Canyon Fault in this area of Carmel

Valley is concealed under river sediments and in some places the fault trace is inferred. However, upon review of the fault maps and considering the location of the proposed Valley Greens Pump Station Option 1 site, the Hatton Canyon Fault is far enough away from the proposed pump station to preclude damage from surface displacement if it were to occur. Further, while there is a possibility that the Hatton Canyon Fault could generate an earthquake, the potential for damaging groundshaking and surface displacement is low due to the age and concealed nature of the fault. The Ryan Ranch-Bishop Interconnection Improvements cross the southern portion of the Chupines Fault Zone, Seaside Fault, Del Rey Oaks section. The Chupines Fault in this area is mapped as a Quaternary fault with no evidence of recent or Holocene displacement. Considering its age and lack of recent activity, the potential for this fault to generate a damaging earthquake or rupture at the surface is considered low. In the unlikely event that the Hatton Canyon Fault generated earthquake activity or surface fault displacement, the pump station and pipeline would likely accommodate the lateral movement and not be damaged. If damage did occur, it would amount to a pipe break and possibly leakage that would be readily repaired. This impact is considered less than significant.

#### **All Other Proposed Components**

None of the other project components are close enough to the project area faults to be vulnerable to surface fault rupture. Therefore, there would be no impact.

#### **Impact Conclusion**

The faults mapped within the project area intersect the proposed Monterey Pipeline, Transmission Main, Ryan Ranch-Bishop Interconnection Improvements, and Valley Greens Pump Station (site Option 1). 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 identified that certain segments of certain faults do exhibit Holocene-age displacement leading to the conclusion that certain segments could be considered active. While it is possible that these 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 a 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 for the Monterey Pipeline, Transmission Main, Ryan Ranch-Bishop Interconnection Improvements, and Valley Greens Pump Station (site Option 1). For all other project components, no impact would result.

#### **Mitigation Measures**

None required.

**Impact 4.2-3: Exposure of people or structures to substantial adverse effects related to seismically induced groundshaking. (*Less than Significant*)**

**All Proposed Project Components**

As discussed in Section 4.2.1, Setting, Monterey County will likely experience a large regional earthquake within the operational life of the proposed project. There is a potential for high-intensity groundshaking associated with a characteristic earthquake in this region. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the moment magnitude, the duration of shaking, and the nature of the geologic materials on which the project components would be constructed. Intense groundshaking and high ground accelerations would affect the entire area around the proposed facilities and associated pipelines. The primary and secondary effects of groundshaking could damage structural foundations, distort or break pipelines and other water conveyance structures, and cause structural failure.

The MPWSP Desalination Plant would be staffed full-time, and the ASR Pump Station and Valley Greens Pump Station would be staffed on an as-needed maintenance schedule. During operations, intense groundshaking could cause damage to these three facilities, facility outages, and temporary water service disruptions in the CalAm Monterey District service area. Pumps could be rendered inoperable. Broken pipelines could result in soil washout and sinkholes that could damage nearby non-project facilities or the environment. Locating and repairing damaged pipelines and the pumps could require a temporary cessation of operation of the facilities for a significant period of time. The 1989 Loma Prieta earthquake reportedly caused more than 60 water pipeline breaks in Santa Cruz, the nearest urbanized area to the epicenter (McNutt and Topozada, 1990).

The structural elements of the MPWSP would undergo appropriate design-level geotechnical evaluations prior to final design and construction. Implementing the regulatory requirements in the CBC and County ordinances and ensuring that all buildings and structures constructed in compliance with the law is the responsibility of the project engineers and building officials. The geotechnical engineer, as a registered professional with the State of California, is required to comply with the CBC and local codes while applying standard engineering practice and the appropriate standard of care for the particular region in California, which, in the case of the proposed project, is the Monterey Bay area.<sup>19</sup> The California Professional Engineers Act (Building and Professions Code Sections 6700-6799), and the Codes of Professional Conduct, as administered by the California Board of Professional Engineers and Land Surveyors, provides the basis for regulating and enforcing engineering practice in California. The local Building Officials are typically with the local jurisdiction (i.e. Monterey County) and are responsible for inspections and ensuring CBC compliance prior to approval of the building permit.

<sup>19</sup> A geotechnical engineer (GE) specializes in structural behavior of soil and rocks. GEs conduct soil investigations, determine soil and rock characteristics, provide input to structural engineers, and provide recommendations to address problematic soils.

### **Impact Conclusion**

It is likely that the structural elements of the MPWSP would be subjected to a moderate to strong earthquake at least once during their operational life. Damage from an earthquake could result in temporary water service disruptions. However, there is a low potential for the groundshaking associated with an earthquake to cause injury, loss of life, or substantial property damage. Completion of a comprehensive design-level geotechnical investigation, adherence to the current California Building Code and local ordinances regulating construction, and the application of proven seismic design criteria that are standard engineering practice would ensure that structures are designed to withstand seismic events without sustaining substantial damage or collapsing. Therefore, this impact is considered less than significant.

### **Mitigation Measures**

None required.

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### **Impact 4.2-4: Exposure of people or structures to substantial adverse effects related to liquefaction and lateral spreading. (*Less than Significant*)**

#### **All Project Components**

The potential for liquefaction is higher in areas composed of granular soils with a shallow depth to groundwater. 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. The placement of structures on such soils could place the public at risk of injury or structures at risk of damage. Lateral spreading is the movement of blocks of soil on liquefiable soils.

**Figure 4.2-4** shows the liquefaction hazard potential in Monterey County. As shown on the figure, most of the project components would be located in areas with a low susceptibility. While areas in the Salinas River floodplain have experienced historic liquefaction during the 1906 San Francisco and 1989 Loma Prieta earthquakes, the components of the proposed project are located south of documented liquefaction areas. The proposed slant wells and MPWSP Desalination Plant are near but not on soils with a moderate to high liquefaction potential. The Source Water Pipeline is partially located on soils with a moderate to high potential for liquefaction. The Valley Greens Pump Station is also located on soils with a moderate liquefaction potential. However, no liquefaction was observed during the 1906 San Francisco and 1989 Loma Prieta earthquakes near these project components. Those project components located on or in soils with a moderate to high potential for liquefaction that could experience damage or failure as a result of liquefaction are discussed below.

The water conveyance pipelines would consist of 36- to 42-inch diameter pipelines buried from about 4 to 8 feet below ground surface. Most of the conveyance pipelines would be underlain by deposits and fill materials consisting of dune sand. Most of these deposits are anticipated to



consist of dry sand and silt mixtures (Ninyo and Moore, 2005). Fill materials likely consist of compacted mixtures of sand and silt generated locally from the natural dune deposits. The slant wells and portions of the pipelines close to and under the coastal areas could have shallow depths to groundwater; in this case seawater intruded from the ocean, and thus could be susceptible to liquefaction damage. Although not located in the coastal zone, the Valley Greens Pump Station would be located on similarly sandy deposits.

As discussed above in the Section 4.2.3.2, Approach to Analysis, the proposed project components would undergo a final geotechnical investigation and be designed to resist damage from seismic shaking. CalAm would implement all geotechnical recommendations provided by the project geotechnical engineer if liquefiable soils are identified. Solutions to rectify liquefaction are modern engineering approaches used throughout California and are considered standard industry practice. Methods to correct liquefiable soils include removal and replacement of problematic soils, the use of pile foundations, and drainage columns to reduce saturated conditions. The geotechnical investigation and corrective actions for potential liquefiable soils, where needed, would be based on the CGS Special Publication 117A (See Section 4.2.2).

In comparison to aboveground 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. In addition, the slant wells would be constructed within a well box that would protect the well from liquefiable sands. The monitoring wells are vertical structures that would be less susceptible to damage from liquefiable sand.

### **Impact Conclusion**

With implementation of standard engineering practices, compliance with Monterey County requirements for geotechnical study, implementation of the design recommendations from the geotechnical engineer, and standard construction methods, this impact would be less than significant for all proposed project facilities.

### **Mitigation Measures**

None required.

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### **Impact 4.2-5: Exposure of people or structures to substantial adverse effects related to landslides. (*Less than Significant*)**

**Figure 4.2-5** shows the locations of the proposed project components and the potential slope stability hazards associated with seismically-induced landslides. The designation of a given area as having high landslide susceptibility does not necessarily mean that an active landslide is

present at that location, only that the steepness of the topography and soil type renders that location more susceptible to landslides. Because steep topography increases landslide risk, the map also shows areas prone to non-seismically induced landslides. Non-seismic slope movement can be caused by the force of gravity on steeper unstable slopes, construction activities that change the existing surface water drainage and create unstable slopes, or the addition of water into the slope material through leaks or breaks in pipelines in steeper landslide prone areas.

### **Main System-Hidden Hills Interconnection Improvements**

The steep hillside terrain on and east of the Monterey Peninsula has an elevated susceptibility to landslides. All but one of the project components would be located in relatively flat to gently-sloping topography and would therefore have a low susceptibility to landslides. Only the Main System-Hidden Hills Interconnection Improvements would be located in an area characterized as having a moderate to high susceptibility to earthquake-induced landslides.

The Main System-Hidden Hills Interconnection Improvements consists of a 100-foot long, 6-inch-diameter pipeline to connect the Hidden Hills section of the system with the main distribution system. The entire pipeline section would be buried from about 4 to 8 feet below the surface in the Tierra Grande Drive road right-of-way, as shown in Chapter 3, Project Description, **Figure 3-10**. Upon the completion of construction activities, the surface would be restored to the original existing paved condition. This existing road would continue to be maintained with curbs and gutters to collect and control surface water runoff. Although the Main System-Hidden Hills Interconnection Improvements would be placed in an area with a moderate to high landslide susceptibility, there are no existing active landslides in the area and the project does not include activities that would exacerbate an otherwise unstable slope condition. Furthermore, this area would be evaluated during the project geotechnical evaluation and if potentially unstable slope conditions exist, the geotechnical recommendations that would be developed through that study would be implemented by CalAm to diminish the potential for slope failure. Therefore, the potential impact related to landslide susceptibility is considered less than significant.

### **All Other Project Components**

All other project components would be located in relatively flat to gently-sloping topography and would therefore have a low to no susceptibility to landslides. Therefore, there would be no impact for all other project components.

### **Impact Conclusion**

Impacts associated with landslides would be less than significant for the Main System–Hidden Hills Interconnection Improvement. For all other project components, no impact would occur.

### **Mitigation Measures**

None required.

**Impact 4.2-6: Exposure of people or structures to substantial adverse effects related to coastal erosion and bluff retreat caused by sea level rise. (*Less than Significant with Mitigation*)**

The sea level in Monterey Bay has been rising for years and is expected to continue rising over the next several decades (ESA, 2013). The Monterey Bay coastline is expected to retreat inland due to the rising sea level and the resulting erosion (ESA, 2014). Erosion and bluff retreat would result in a beach and surf zone that is inland of where it is today. The primary concern associated with the proposed project is that coastal erosion could slowly degrade the sand dune bluffs and expose previously buried project elements such as the subsurface slant wells casings, concrete well head vaults, and certain sections of conveyance pipelines. The exposure of the project components could alter the existing natural beach dynamics and the coastal environment, resulting in an increase in beach erosion that would be considered an impact of the proposed project. In addition, beach erosion and bluff retreat caused by the rise in sea level would be a predicted environmental condition that could adversely affect certain components of the project sometime in the future.

The project components that could be exposed by sea level rise and coastal erosion are the subsurface slant wells in the CEMEX active mining area and portions of the Monterey Pipeline along Del Monte Boulevard in the city of Monterey. These two project components fall within the coastal erosion hazard zones that were delineated in the coastal retreat study prepared to evaluate potential coastal erosion hazards associated with the proposed project. The assumptions and methodologies used in the coastal retreat study are discussed above in Section 4.2.3.2, Approach to Analysis.

**Subsurface Slant Wells**

The coastal retreat study (ESA, 2014) anticipated that the subsurface slant wells in the CEMEX active mining area could be susceptible to coastal erosion. It is important to note the predicting the future rate of coastal retreat is an approximation based on anticipated future climate conditions that may vary significantly from actual climate conditions. The coastal retreat study assumes a worst case scenario for planning purposes; the actual amount or rate of coastal retreat could be less.

As described in Chapter 3, Project Description, Sections 3.4 and 3.4.1.1, the Seawater Intake System would include 10 subsurface slant wells: the converted test slant well and the 9 additional slant wells that would be constructed under the proposed project. The subsurface slant wells would begin at a buried well head vault behind the beach and radiate out a distance of between 760 and 1,000 feet at anticipated angles of 19 degrees for the test slant well and 14 degrees for all other slant wells off the horizontal toward the Monterey Bay. The results of the aquifer pumping test of the test slant well will further inform the final angle of the slant wells. As shown in **Figure 3-3**, slant well cluster #1, located adjacent to and immediately north of the MRWPCA outfall pipeline, would be comprised of two slant wells: the existing test slant well, which would be converted into a permanent well, and an additional slant well. The two southerly well clusters (slant well clusters #2 and #3) would contain four wells per cluster. The wellheads in each cluster would be encased in a single wellhead vault, for a total of 3 wellhead vaults.

**Figures 4.2-6 and 4.2-7** are coastal profiles developed from the coastal retreat study that show the predicted cross-sectional profile of the coastal bluffs at the CEMEX mining facility through 2060. The methodology and assumptions applied to developing these erosion profiles are discussed above in Section 4.2.3.2, Approach to Analysis, and in the attached coastal retreat study (see **Appendix C1**). The cross-sectional profiles in **Figures 4.2-6 and 4.2-7** show a projected future profile (solid line) and an extremely eroded profile or “lower profile envelope” (dashed line) for the time horizons of 2010, 2040, and 2060. These modeled erosion profile envelopes account for long-term erosion and sea level rise, additional seasonal scour from rip embayments that would predominantly occur in winter, and the additional erosion that would occur from a 100-year storm event.

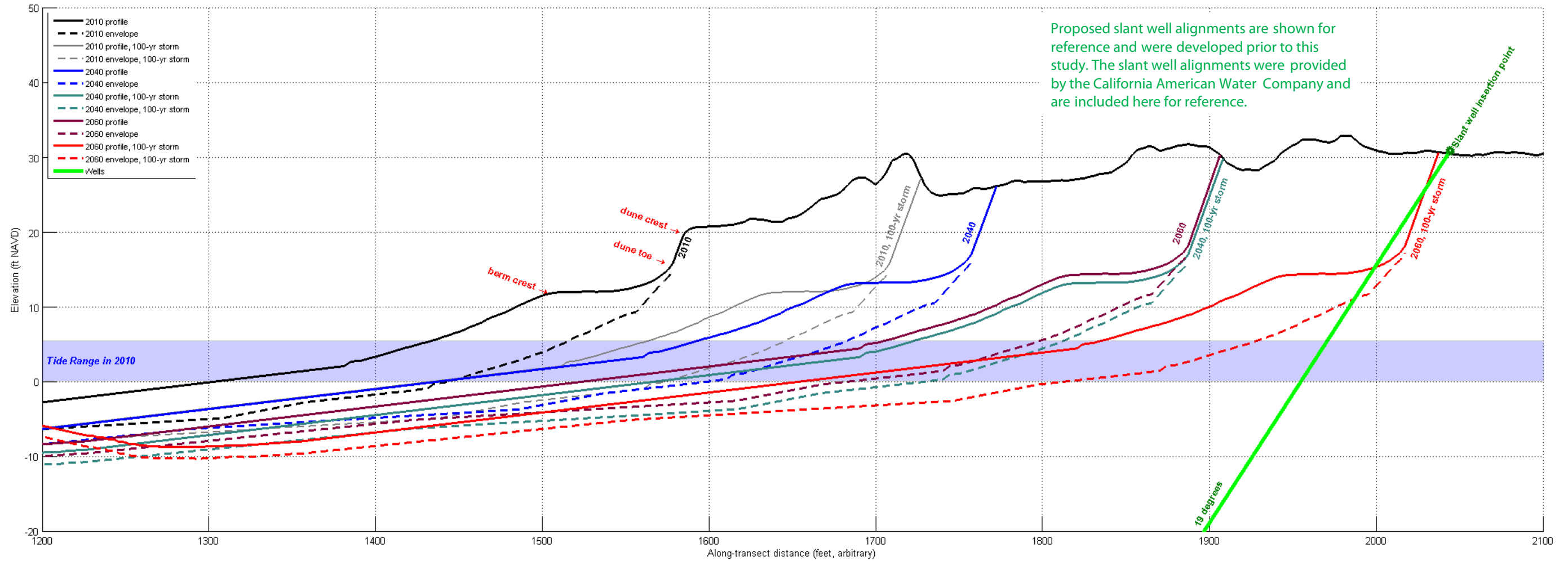
As originally proposed by CalAm, slant well clusters #2 and #3 were in locations that the coastal retreat study predicted were too close to the shoreline and could either be undermined and exposed, or undergo damage during a large storm event. Consequently, the insertion points for these wells were relocated approximately 400 feet inland to the proposed locations shown on **Figures 4.2-6, 4.2-7, and 3-3**.

Based on the profile, the two southerly slant well clusters would now be located behind the predicted 2060, 100-year lower profile envelope. This finding shows that under a conservative predicted erosion rate and considering the additional scour caused by a 100-year storm event in that time horizon, the two southern slant well clusters would remain buried in the dunes and would not become exposed on the beach until sometime after 2060. The rate of bluff retreat used in the coastal retreat study is conservative in that it may not account for natural accretion of sand on the beach and bluffs that could occur during years of below normal storm activity. As a result, it is possible that the 2060 bluff retreat envelope shown on the profile may not be realized until several years after 2060. According to the significance criteria for coastal erosion (see Section 4.2.3.1, Significance Criteria, above), the proposed project would cause a significant impact if it accelerated and/or exacerbated natural rates of coastal erosion, scour, or dune retreat resulting in damage to adjoining properties or a substantial change in the coastal environment. The two slant well clusters would not be exposed during the operational life of the slant production wells and would not contribute to further coastal erosion or changes in the beach environment. Therefore, the proposed location of these two southerly clusters would not represent a potential erosion hazard and would not contribute to a significant impact of the proposed project.

Based on the profile, insertion points for slant well cluster #1 were relocated further inland towards the dunes. The relocated position of this well vault is approximately 360 feet closer to the ocean than the other eight subsurface slant wells. The new location of slant well cluster #1 is now at the 2060 future coastal erosion profile and within the 2060 100-year lower profile envelope. The test well also lies on the 2040 100-year storm event line. As noted above, the modeled coastal retreat rate is conservative and the actual rate of coastal retreat may be less.

The coastal erosion modeling anticipates that the test slant well and the other well in slant well cluster #1 could become exposed by the year 2040. Assuming the pilot program being conducted for the test slant well confirms the CEMEX active mining area to be a viable location for the Seawater Intake System, the test slant

Profile 4a - Northern Cluster at CEMEX



Proposed slant well alignments are shown for reference and were developed prior to this study. The slant well alignments were provided by the California American Water Company and are included here for reference.

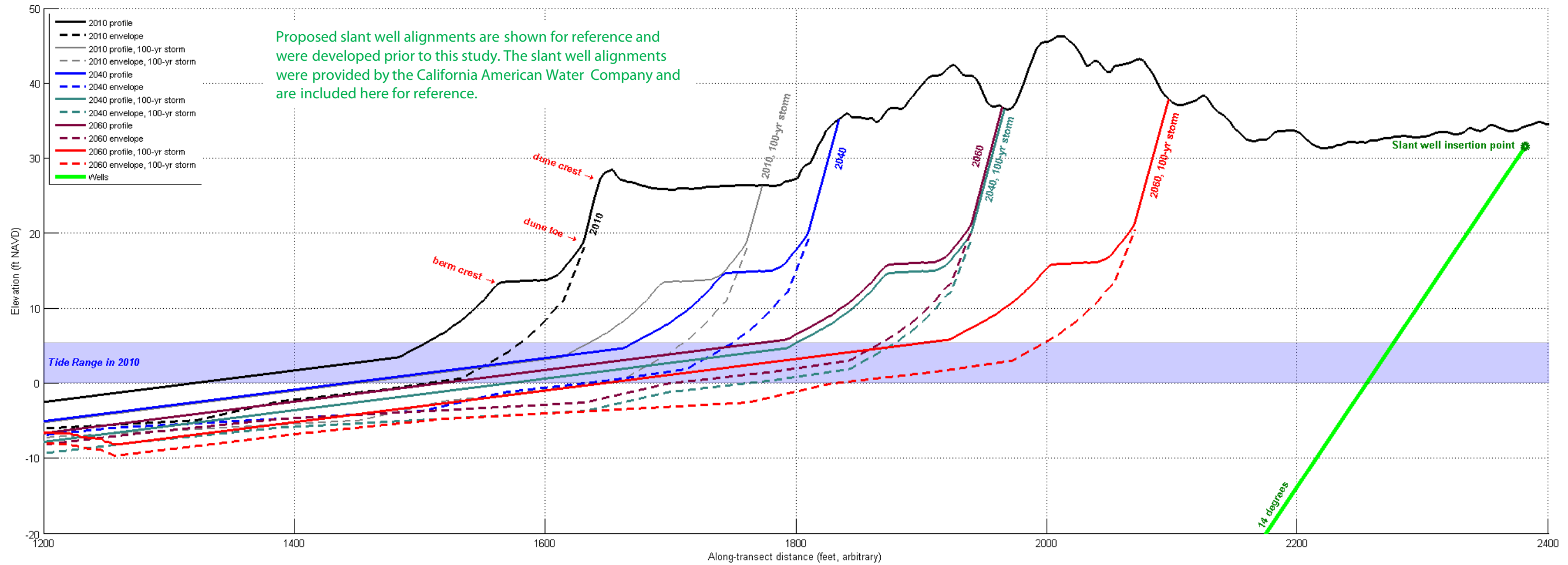
Notes:

1. These envelopes of erosion consider seasonal changes in beach width, localized erosion (rip currents), long-term erosion, and accelerated erosion caused by sea level rise.
2. The profile shape is linearly interpolated between the bathymetry data and the topography data (between x = 919 ft and x = 1385).
3. This profile is located immediately south of the CEMEX Pacifica Lapis sand mining plant. No data is available to quantify the uncertainty in adjacent beach and dune erosion related to sand mining activities. The potential for fluctuations in beach width associated with sand mining were not considered in this analysis.
4. Slant well location and angle are based on the "Test Slant Well Alignment" and "Test Slant Well Cross-Section" drawings provided by Geoscience on July 30, 2013.
5. The well input parameters in the table to the right were developed prior to this study and were provided by the California American Water Company.

Northern Cluster Parameters

	Production	Notes
type of well	Production	
<b>inputs</b>		
angle (degrees from horizontal)	19	
length (feet)	1000	
insertion pt elevation (feet NAVD)	31	Estimated from LiDAR digital elevation model
insertion point loc (feet, arbitrary)	2044	Based on location in GIS
<b>calculations</b>		
intake elevation (feet NAVD)	-295	
intake loc (feet, arbitrary)	1098	
Bed elevation at intake (ft NAVD)	-5	interpolated from topo data
Depth of sediment above intake (ft)	289	difference between bed and intake elevation

Profile 4b - Southern Cluster at CEMEX



Proposed slant well alignments are shown for reference and were developed prior to this study. The slant well alignments were provided by the California American Water Company and are included here for reference.

Notes:

1. These envelopes of erosion consider seasonal changes in beach width, localized erosion (rip currents), long-term erosion, and accelerated erosion caused by sea level rise.
2. The profile shape is linearly interpolated between the bathymetry data and the topography data (between x = 820 ft and x = 1480).
3. This profile is located immediately south of the CEMEX Pacifica Lapis sand mining plant. No data is available to quantify the uncertainty in adjacent beach and dune erosion related to sand mining activities. The potential for fluctuations in beach width associated with sand mining were not considered in this analysis.
4. Slant well location and angle are based on the "Well 3 Alignment" and "Well 3 Cross-Section" drawings provided by Geoscience on July 30, 2013.
5. The well input parameters in the table to the right were developed prior to this study and were provided by the California American Water.

Southern Cluster Parameters		Notes
type of well	Production	
<b>inputs</b>		
angle (degrees from horizontal)	19	
length (feet)	800	
insertion pt elevation (feet NAVD)	32	Estimated from LiDAR digital elevation model
insertion point loc (feet, arbitrary)	2381	Based on location in GIS
<b>calculations</b>		
intake elevation (feet NAVD)	-229	
intake loc (feet, arbitrary)	1625	
Bed elevation at intake (ft NAVD)	18	<i>interpolated from topo data</i>
Depth of sediment above intake (ft)	246	<i>difference between bed and intake elevation</i>

well would be converted into a permanent well and another subsurface slant well would be drilled at the same insertion point. These two wells are herein referred to as the northern well cluster. The wellheads at the northern well cluster would be enclosed in a single well vault. Given the vault's forward location on the beach at the estimated 2040 100-year erosion line and within the 2060 100-year lower profile erosion envelope, it is possible that the well casings and concrete wellhead vault might become exposed on the beach sometime during the operational life of the project. If exposed, the subsurface slant wells could contribute to accelerated and/or exacerbated natural rates of coastal erosion, scour, and dune retreat that could alter the natural coastal environment. In addition, exposure of these structures could adversely affect scenic resources and recreational uses on the beach.

### **Monterey Pipeline at Del Monte Avenue**

The coastal erosion hazard zone assessment (ESA, 2014) completed as part of coastal retreat study found that the portion of the Monterey Pipeline along Del Monte Avenue, adjacent to the El Estero Lake, could be close enough to the ocean to succumb to coastal erosion during the operational life of the project. 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 4.2-8** shows that the Monterey Pipeline is within the 2060 100-year lower profile envelope meaning that there is 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 (see Section 4.2.3.1), 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.

### **All Other Proposed Facilities**

None of the other project components are close enough to the coast to be vulnerable to coastal retreat. Therefore, there would be no impact.

### **Land Use Plan & Policy Consistency**

In addition to the physical impacts described above, as noted in **Table 4.2-6**, the MPWSP could conflict with applicable land use plans, policies, or ordinances related to coastal erosion that were adopted for the purpose of avoiding or mitigating an environmental effect. Specifically, coastal-erosion-induced exposure of the subsurface slant wells, or portions of the Source Water Pipeline and the Monterey Pipeline would conflict with California Coastal Act Sections 30235 and 30253; Marina General Plan Policy 4.102.4; Marina Local Coastal Land Use Plan Geotechnical Guidelines; Monterey Harbor Land Use Plan Policies 3.b, 3.c, and 3.d; Del Monte Beach Land Use Plan Policies 3.1, 3.3, 3.4, 3.7, and 3.11; and Monterey County General Plan Policy S-1.6. As discussed in the subsequent paragraphs, **Mitigation Measures 4.2-6a (Slant Well Abandonment Plan)** and **4.2-6b (Monterey Pipeline Deepening)** would require abandonment of the subsurface slant wells before they became exposed and the Monterey Pipeline along El Estero be sited farther below ground surface. With these measures implemented, the MPWSP would be brought into conformance with the above-noted policies.

### **Impact Conclusion**

Slant well cluster #1 could result in a significant impact if it were to become undermined and exposed on the beach by coastal erosion. **Mitigation Measure 4.2-6a (Slant Well Abandonment Plan)** would reduce the impact to a less-than-significant level by requiring CalAm to monitor coastal retreat rates and initiate well decommissioning before the subsurface slant wells become exposed on the active beach.

The Monterey Pipeline along Del Monte Avenue could become exposed due to 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. **Mitigation Measure 4.2-6b (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 Measures**

*Mitigation Measure 4.2-6a only applies to the northernmost slant well cluster.*

#### **Mitigation Measure 4.2-6a: Slant Well Abandonment Plan.**

CalAm shall monitor the rate of coastal retreat and implement the following corrective measure:

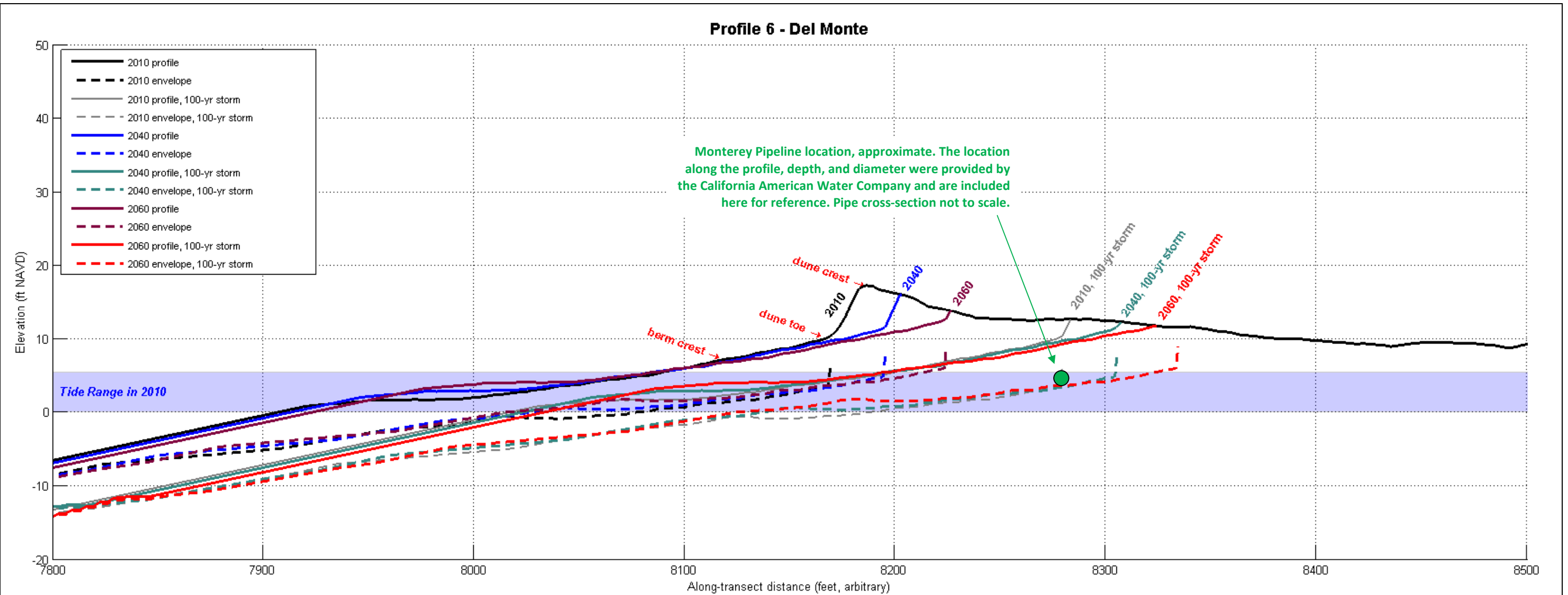
1. CalAm shall conduct annual monitoring of the rate of coastal retreat relative to the northern slant well cluster (the test slant well and one additional slant well) at the CEMEX site. The data shall be used to estimate the year at which the test well and associated pipelines have 5 years before exposure.
2. Beginning 5 years prior to the anticipated exposure of the slant wells in the northern cluster, CalAm shall implement the planning and permitting necessary to abandon the northernmost slant well cluster in accordance with state well destruction standards.
3. Once an estimated exposure window is established through annual monitoring and a removal date is identified, CalAm shall remove the northernmost slant well cluster from service prior to its removal.
4. The test well casings shall be pressure grouted such that the screened section is sealed. The section of well casing and pipelines at risk of exposure shall be cut and removed a depth of five feet below the 2060, 100-year lower profile envelope as determined by the 2014 Coastal Erosion Study (ESA, 2014).

*Mitigation Measure 4.2-6b only applies to the Monterey Pipeline.*

#### **Mitigation Measure 4.2-6b: Monterey Pipeline Deepening.**

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, 2014).





**Notes:**

1. These envelopes of erosion consider seasonal changes in beach width, localized erosion (rip currents), long-term erosion, and accelerated erosion caused by sea level rise.
2. The profile shape is linearly interpolated between the bathymetry data and the topography data (between x = 7960 ft and x = 7920 ft).
3. Approximate horizontal and vertical location of the Monterey Pipeline provided by California American Water Company.

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**Impact 4.2-7: Exposure of people or structures to substantial adverse effects related to land subsidence. (*Less than Significant*)**

When groundwater is extracted from a confined aquifer, subsidence of the overlying land surface can occur. This type of subsidence is usually associated with severe, long-term withdrawal in excess of recharge that eventually leads to overdraft of the aquifer. As groundwater is pumped out, water is removed from the soil pore spaces leading to a reduction in soil strength. The subsurface conditions more conducive to subsidence include clay or organic-rich soils. Sand- and gravel-rich soils are less prone to subsidence because the larger grains comprise a skeleton less dependent on water pressure for support. The subsidence can result in damage to infrastructure such as buildings or pipelines, or can result in a decrease in the volume of available aquifer storage.

**Subsurface Slant Wells**

While overdrafting of the Salinas Valley Groundwater Basin has taken place over an extended time, saltwater has replaced the freshwater in those affected areas, thereby preventing subsidence (Monterey County, 2010). According to the *Monterey County General Plan*, subsidence is not a critical hazard in the county. As described in Section 3.4.1 of Chapter 3, Project Description, the subsurface slant wells would be 700 to 800 feet long and extend offshore. The slant wells would be screened at depths corresponding to both the Dune Sand Aquifer and the underlying 180-Foot-Equivalent Aquifer of the Salinas Valley Groundwater Basin. These aquifer units are composed predominantly of sand and gravel. Geologic units composed of sands and gravels are less prone to subsidence because the granular structure is better able to support the overlying weight of soil. In addition, because the subsurface slant wells would draw water from coastal aquifers, seawater would replace the water pumped from the slant wells. The continuous replacement of water would keep the pore spaces between the grains filled with water, further supporting the granular structure. Consequently, the soil structure above the slant wells would be unable to subside as a result of pumping and there would be no impact from subsidence impacts associated with the subsurface slant wells.

**ASR-5 and ASR-6 Wells**

The screened sections of the proposed ASR-5 and ASR-6 Wells would be located about 1,000 feet bgs in the sandstone portions of the Santa Margarita Formation in the Seaside Groundwater Basin. The sandstone structure of the geologic unit would be expected to support the granular structure during groundwater pumping, especially considering the depth. In addition, the proposed project would typically extract water injected and stored in the ASR system in the same water year. Therefore, the water pumped into the system during the winter and spring would be extracted during the following summer or fall. Furthermore, for the first 25 years of the proposed project, 700 acre-feet annually would be left in the Seaside Groundwater Basin to restore water extracted in years prior to this project. This means that the overall groundwater levels in the Seaside Groundwater Basin would increase as a result of the proposed project. This would result in a decreased potential for surface ground subsidence. Subsidence impacts associated with the ASR-5 and ASR-6 Wells would be less than significant.

### **All Other Project Components**

None of the other project components would extract groundwater. Therefore, there would be no impact for all other project components.

### **Impact Conclusion**

Given the existing lack of clay in the aquifer units to be pumped and the management of groundwater levels to reduce overdraft, the potential impacts related to subsidence caused by the ASR injection/extraction wells would be less than significant. For all other project components, there would be no impacts.

### **Mitigation Measures**

None required.

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### **Impact 4.2-8: Exposure of people or structures to substantial adverse effects related to expansive soils. (*Less than Significant*)**

Unless properly removed or reconditioned during construction, expansive soils could exert additional pressures on foundations and below-grade facilities, producing shrinkage cracks that allow water infiltration and compromise the integrity of backfill material. Depending on the depth of buried pipelines, soil in expansion or contraction could lead to lateral pipeline stress and stress of structural joints. Lateral stresses could, over time, lead to pipeline rupture or leaks in the coupling joints. Shrinkage cracks could form in native soils adjacent to the pipeline trench or in backfill material if expansive soils are used. If shrinkage cracks extend to sufficient depths, groundwater can infiltrate into the trench, causing piping (progressive erosion of soil particles along flow paths) or settlement failure of the backfill materials. Settlement failure can also occur if expansive soils are used in backfill and undergo continued expansion and contraction. Over time these soils could settle, resulting in misalignment or damage to buried facilities.

The effects of expansive soils could damage foundations of aboveground structures, paved service roads, and concrete slabs. Surface structures with foundations constructed in expansive soils would experience expansion and contraction depending on the season and the amount of surface water infiltration. The expansion and contraction, also referred to as linear extensibility, could exert enough pressure on the structures to result in cracking, settlement, and uplift.

### **Valley Greens Pump Station (both site options), Main System–Hidden Hills and Ryan Ranch–Bishop Interconnection Improvements**

**Table 4.2-4** lists the soil properties of all of the soil units on or within which project components would be constructed. Proposed components that would be placed on or in soils with moderate to high expansion or linear extensibility potential include the Valley Greens Pump Station (both site options), the Main System–Hidden Hills Interconnection Improvements, and the Ryan Ranch–Bishop Interconnection Improvements.

As discussed in Section 4.2.3.2, Approach to Analysis, the project geotechnical engineer for CalAm has completed a preliminary geotechnical assessment of the pipeline route and project facility sites and would complete a final geotechnical design investigation prior to project construction. The geotechnical evaluation of the project sites includes field sampling and testing of surface soils to determine the presence of expansive soils. The investigation of and treatment for expansive soils is considered standard engineering practice for most development projects. Completion of a geotechnical evaluation and implementation of its recommendations reduces the likelihood that expansive soils could impact project components. In addition, all project elements and pipeline facilities would be designed consistent with AWWA standards for pipelines (discussed in the Approach to Analysis, Section 4.2.3.2), which account for problematic soils and require remedies for adverse soils in order to adhere to specific standards for pipeline trench excavation, pipe bed material, and backfill. Considering that the CalAm's geotechnical engineer would evaluate soil conditions and provide recommendations that would be implemented into final design and/or construction and given that the project would adhere to AWWA guidelines and applicable requirements of the CBC, the potential for expansive soils to adversely impact project components is low and therefore this impact is less than significant.

#### **All Other Project Components**

All other project components would be located in soils with a low linear extensibility potential. Therefore, there would be no impact.

#### **Impact Conclusion**

With compliance with applicable construction requirements and the design criteria from the geotechnical engineer, this impact would be less than significant for the Valley Greens Pump Station (both site options), Main System–Hidden Hills and Ryan Ranch–Bishop Interconnection Improvements. There would be no impact for the other project components.

#### **Mitigation Measures**

None required.

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#### **Impact 4.2-9: Exposure of structures to substantial adverse effects related to corrosive soils. (Less than Significant)**

Soils with a high conductivity can corrode unprotected 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 at the location of the failure. Failed subsurface electrical conduits could result in electrical short-circuiting. Soils with an acidic pH can corrode unprotected concrete. Over time, concrete corrosion could lead to the degradation of concrete resulting in the cracking and failure of concrete foundations and other support structures. Failed foundations and support structures could result in the breakage of equipment or pipelines and possibly result in temporary shutdown of operations interrupting the public water supply.

**MPWSP Desalination Plant, Terminal Reservoir, ASR Pump Station, ASR-5 and ASR-6 Wells, ASR Settling Basin, ASR Conveyance Pipelines, ASR Pump-to-Waste Pipeline, and Ryan Ranch–Bishop Interconnection Improvements**

**Table 4.2-4** lists the soil properties of all of the soil units within which project components would be constructed. Clayey soils are potentially corrosive. Project components that would be located on or in soils with moderate to high concrete and unprotected steel corrosion potential include the MPWSP Desalination Plant, Terminal Reservoir, ASR Pump Station, ASR-5 and ASR-6 Wells, ASR Conveyance Pipelines, ASR Pump-to-Waste Pipeline, and Ryan Ranch–Bishop Interconnection Improvements.

As discussed in Section 4.2.3.2, Approach to Analysis, the project geotechnical engineer for CalAm has completed a preliminary geotechnical assessment of the pipeline route and would complete a final geotechnical design investigation prior to project construction. The geotechnical evaluation of the project area boundaries includes an evaluation for the presence of corrosive soils. Managing corrosive soils is standard engineering practice especially for pipeline projects. If corrosive soils are identified during the final geotechnical design study, the project geotechnical engineer would recommend remedies to eliminate damage from corrosive soils, and those recommendations would be implemented by CalAm. Methods to reduce corrosion of metal and concrete caused by soils include avoidance and removal or the use of cathodic protection. In addition, all project elements and pipeline facilities would be designed consistent with AWWA standards for pipelines (discussed in the Approach to Analysis, Section 4.2.3.2), which account for problematic soils and require remedies for adverse soils in order to adhere to specific standards for pipeline trench excavation, pipe bed material, and backfill.

**All Other Project Components**

All other project components would be located in sandy soils with a low corrosivity potential. Therefore, there would be no impact.

**Impact Conclusion**

The presence of corrosive soils would be evaluated and addressed through the final geotechnical investigation prior to project construction. If the investigation finds corrosive soils, the geotechnical engineer would recommend avoidance, removal or cathodic protection, and those recommendations would be implemented by CalAm. Therefore, the impact of corrosive soils is considered less than significant for the MPWSP Desalination Plant, Terminal Reservoir and Pump Station, ASR injection/extraction wells and ASR Conveyance Pipelines, ASR Pump-to-Waste Pipeline, ASR Settling Basin, and Ryan Ranch–Bishop Interconnection Improvements. There would be no impact for the other project components.

**Mitigation Measures**

None required.

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