6.3 GEOLOGIC HAZARDS AND RESOURCES

This section describes the geologic hazards and resources in the vicinity of the Project at the Morro Bay Power Plant (MBPP). This Project will be completed within the confines of an existing industrial power plant property, which has been in operation since the 1950s. There will be no impacts from geologic hazards or to geologic resources of recreational, commercial or scientific value.

The MBPP is located 12 miles northwest of San Luis Obispo, California, in San Luis Obispo County in the City of Morro Bay. The plant is situated west of Highway 1, near Morro Bay Harbor and east of Estero Bay. The area includes light industry, commercial fishing operations, and marine, residential and recreational uses.

Geologic resources were assessed through a comprehensive review of literature pertaining to regional, local and site geology. This included an independent crosscheck for completeness against the California Division of Mines and Geology (CDMG) "Guidelines for Geologic/Seismic Considerations in Environmental Impact Reports, 1982." This literature review and analysis was complemented by site reconnaissance and interview of Duke Energy staff at MBPP.

Morro Rock, located approximately 1/2 mile west of MBPP, is an important geologic resource in terms of general tourism interest and sightseeing activities. As stated above, however, since the Project will be completed within the confines of the existing industrial site, the geologic resource value of Morro Rock will not be denigrated or affected by the Project.

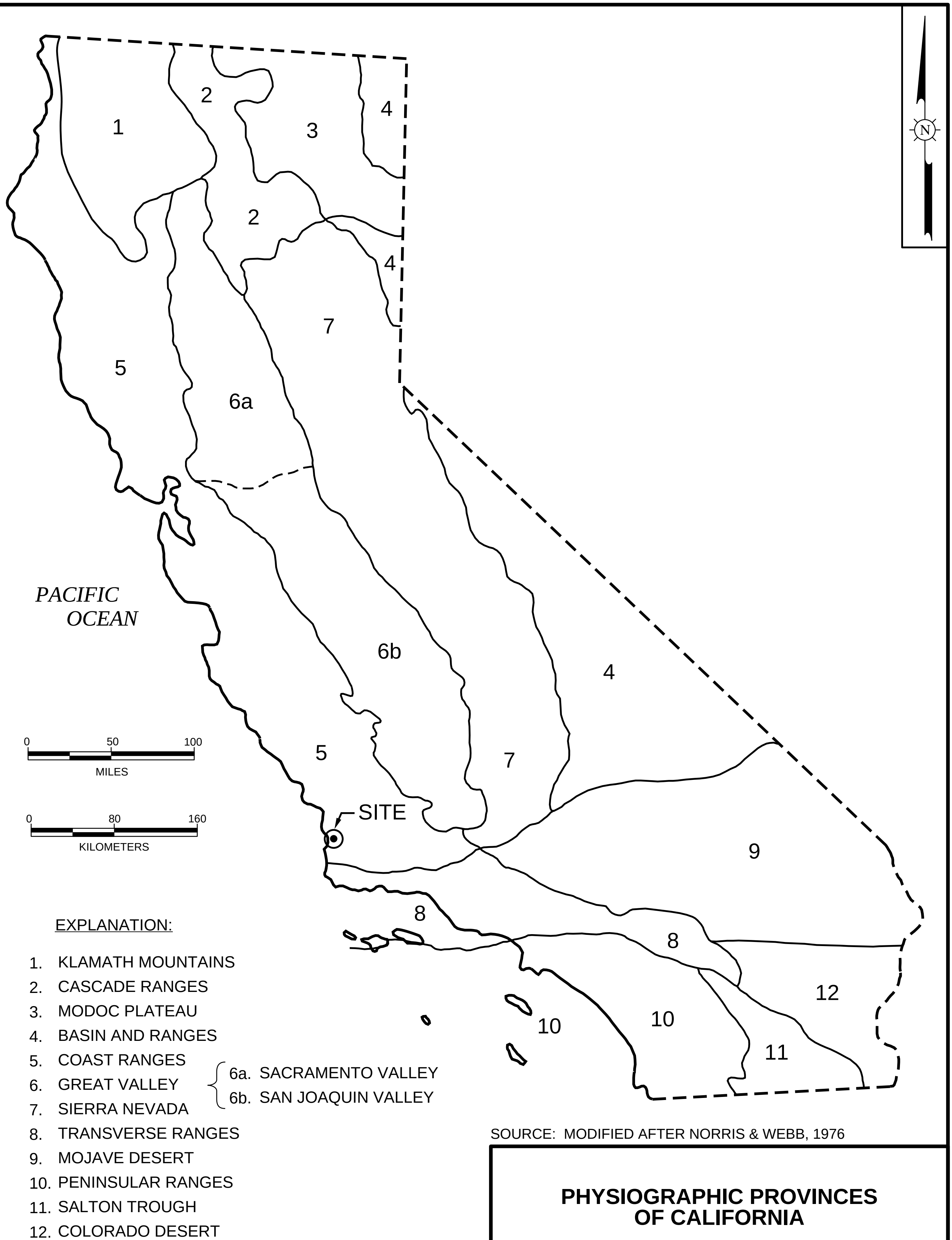
Beneficial aspects of the Project related to geologic resources are as follows:

- Ground disturbance is confined to an existing industrial site.
- Plant construction will be completed in conformance with civil and structural engineering design criteria, as noted in Section 8.1.
- Potential impacts in terms of geologic hazard will be controlled through appropriate building foundation and seismic structural design.

6.3.1 EXISTING CONDITIONS

6.3.1.1 Regional Geology

The MBPP is located within the southernmost portion of the Coast Range Geomorphic Province (see Figure 6.3-1). The Coast Range consists of a sequence of northwest-trending mountains and valleys, aligned with and adjacent to the California coastline. The Coast Range is on average 60 miles wide, extending from the Pacific coast inland to the San Joaquin Valley. This range



SOURCE: MODIFIED AFTER NORRIS & WEBB, 1976

PHYSIOGRAPHIC PROVINCES OF CALIFORNIA

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FIGURE 6.3-1

continues north to Oregon and is bounded on the south by the Transverse Range Geomorphic Province. The dominant structural feature in the Coast Range Geomorphic Province is the northwest-trending San Andreas Fault.

The regional geology of the Morro Bay area is shown in Figure 6.3-2. Morro Bay is located along the east-central shoreline of Estero Bay. The predominant geologic formation in the area is the Franciscan Formation, a heterogeneous assemblage of oceanic and terrigenous rock units that form the core complex of much of the Coast Range (Page, 1966). The Franciscan complex consists mainly of marine sandstone that is interbedded with chert. The rocks range in age from the late Jurassic (140-million years old) to the late Cretaceous (75-million years old). The volcanic rocks consist primarily of tuff and basalt. Ultramafic rocks, consisting largely of serpentinite and other altered rocks, comprise the remainder of the Franciscan Formation.

Marine sediments of the middle and lower Miocene age (10- to 25-million years old) unconformably overlie the Franciscan basement rock in the San Luis Range, located south and southeast of Morro Bay. These marine sediments consist mainly of siliceous shale and chert interbedded with thin sandstone units.

6.3.1.2 Local Geology

Morro Bay is at the northern end of a structural depression which trends southeast through the Los Osos Valley and extends through the San Luis Valley. Morro Bay is surrounded by Quaternary age alluvial and sand dune deposits (see Figure 6.3-3). The prominent local geologic feature is Morro Rock, a volcanic unit composed of dacite. A number of Tertiary intrusive rocks, mainly dacite and andesite, form a line of isolated outcrops extending about 20 miles southeastward from Morro Rock. These features are interpreted to be eroded volcanic necks (Norris and Webb, 1990).

Local alluvial sediments are derived from Morro Creek, which drains southwest toward MBPP. Morro Creek traverses the western portion of the industrial portion of the plant property, approximately 400 feet west of the MBPP onsite fuel oil tank farm. Willow Camp Creek flows northwestward into Morro Creek near the north end of the tank farm. Landslide deposits are common in the adjacent uplifted hills located east and northeast of MBPP. Given its generally flat topography, however, MBPP has no landslides or other evidence of slope instability.

6.3.1.3 Site Geology

The MBPP is located on the northwestern edge of the City of Morro Bay, several hundred feet from Morro Bay. In the immediate vicinity of the power plant, alluvium has been deposited in tidal flats at the mouth of Morro Creek where it enters Morro Bay. To the immediate west are recent dune deposits, and older dune deposits are located to the southeast and along the perimeter of Morro Bay.

A number of site-specific geologic investigations have been performed at MBPP over the years. These have consisted of geotechnical investigations, hydrogeologic investigations, and ongoing geotechnical studies as part of previous MBPP construction activities and power plant modifications. These investigations are largely summarized in the Impoundment Integrity Report (Pacific Gas and Electric Company [PG&E], 1995). The locations of exploratory borings from these ongoing investigations are shown in Figure 6.3-4. (The location of the new combined-cycle power plant units is also shown, for reference.) Results from Phase I and Phase II environmental site assessments are summarized in Section 6.14 - Waste Management.

A total of 47 borings (1 to 45, 1-FW and 2-CS) were drilled between 1953 and 1974. These borings ranged in depth from 10 to 65 feet below mean lower low water (mllw) level. Most borings were advanced prior to site grading and, therefore, ground surface elevations may differ somewhat from current topography. Eleven monitoring wells (84-1 to 84-8 and 85-9 to 85-11) and two piezometers (85P-1 and 85P-2) were installed in 1984 and 1985 to maximum depths of 50 feet below mean sea level (msl). Six geotechnical borings (GT-1 to GT-6) were drilled by Woodward & Clyde Consultants as part of a surface impoundment investigation. All available logs for borings, wells and piezometers are provided in Appendix 6.3-1.

A geotechnical investigation was performed at the tank farm area to assess the seismic stability of the berms and subsurface soils (Roger Foott Associates, 1993). That investigation included five cone penetrometer test (CPT) borings. The CPT logs and testing results are provided as Appendix 6.3-2.

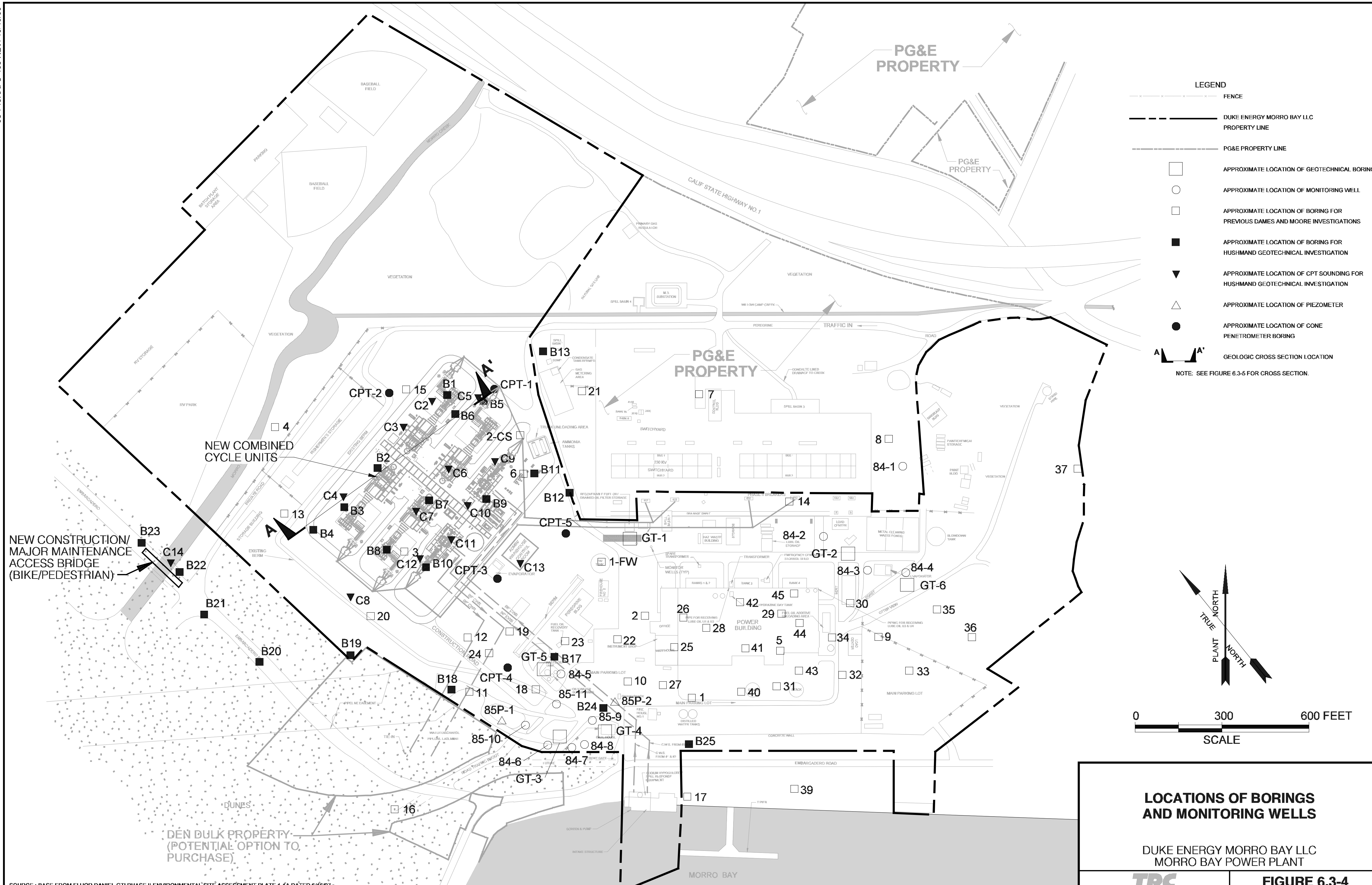
Most recently, geotechnical investigation (Hushmand, 2000) was performed in July, 2000 at the proposed location for the new combined cycle power plant (the tank farm area) and the adjacent offsite maintenance access and bike/pedestrian bridge location. The investigation was performed by Hushmand Associates and consisted of drilling 24 exploratory borings and performing 14 cone penetration test (CPT) soundings at the locations shown in Figure 6.3-4. The boring logs and CPT

Fig. 6.3-2 (2 pages) (11x17)

Fig. 6.3-2 (2 pages) (11x17)

Fig 6.3-3 (11x17) (2 pages)

Fig 6.3-3 (11x17) (2 pages)



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LOCATIONS OF BORINGS AND MONITORING WELLS

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FIGURE 6.3-4

logs are provided as Appendix 6.6-3. In addition, CPT-based seismic (compression and shear) wave velocities were measured at locations C4 and C9, and field electrical resistivity tests were conducted at CPT locations C12 and C14.

Subsurface geologic data in cross section form is shown in Figure 6.3-5. In the tank farm area, the shallow subsurface soils consist of dune sand or hydraulic fill. Most of the tank farm area was originally a sand dune that was graded as part of site development. The hydraulic fill unit consisting of silty sand, was dredged locally and placed on the tidal flats by the United States Navy in 1941 and 1942. This artificial fill raised the elevation of the tidal flats and the power plant site to about 15 to 20 feet above sea level. This fill unit averages 8 feet in thickness but varies due to the existence of the old stream channels in the former tidal flats.

Underlying the dredged fill materials are Quaternary age alluvium, fine-grained estuarine deposits, and medium- to coarse-grained marine terrace deposits. Franciscan Formation sandstone and shale underlie these deposits at depths ranging from 55 feet to 69 feet below mllw.

6.3.1.4 <u>Tectonic Framework and Seismicity</u>

6.3.1.4.1 Tectonic Framework

Faults in the vicinity of MBPP are shown in Figure 6.3-6. In general, MBPP is situated within a region of complexly-faulted and folded basement rocks. The dominant tectonic grain is aligned northwest, consistent with the trace of the San Andreas Fault. While there are faults in the region, no active faults are known to pass beneath the power plant or exist in the immediate vicinity. An active fault is one that shows clear evidence of movement within the Holocene Period (i.e., over the last 11,000 years) (Hart, 1997).

For purpose of this discussion, only nearby active faults are described. Additional faults in the area, shown in Figure 6.3-6, are not documented as active by CDMG. The nearest major fault of regional extent known to have experienced Holocene activity is the Hosgri Fault, located offshore about 11 miles west of MBPP (see Figure 6.3-6). This fault is part of a network of north-northwest-trending, predominantly right-lateral strike-slip faults that extends for about 250 miles from near Point Arguello on the south to north of San Francisco.

The Los Osos Fault, a local feature located about 5 miles south of MBPP, also shows evidence of Holocene activity. This fault is a west- to northwest-trending, southwest-dipping reverse fault, 35 to 38 miles long, that separates the San Luis Range on the south from the Morro Bay structural basin

(Lettis and Hall, 1994). The Los Osos Fault extends offshore an additional 9 miles and intersects the Hosgri Fault. The other major active fault in the region is the San Andreas Fault, located 37 miles east-northeast of the site. The San Andreas Fault forms the major tectonic boundary between the North American and Pacific tectonic plates. Right-lateral motion along the San Andreas Fault occurs at an average rate of 2.5 centimeters (cm) per year.

6.3.1.4.2 Seismicity

Estimated locations of historical earthquakes of magnitude (M) 5.0 or greater within south central California for the period 1812 through 1988 are shown in Figure 6.3-7. Table 6.3-1 summarizes the pertinent data for each earthquake. The two active faults nearest MBPP that are considered potentially significant seismic sources are the Los Osos and Hosgri Faults. Other major faults in the region are the San Andreas and Rinconada Faults. The Rinconada Fault, however, is not classified active by the CDMG.

The EQFAULT fault model program (Blake, 1989) was used to assess seismic sources near MBPP. There are a number of sources available for assessing earthquake potential and attendant ground shaking (expected ground acceleration in the event of an earthquake). EQFAULT utilizes the CDMG digital fault map database. The CDMG is the state agency responsible for mapping and documenting the location of active faults in California.

Table 6.3-2 summarizes the key faults and fault parameters derived from the EQFAULT program for maximum credible earthquake (MCE) events. A search radius of 100 kilometers (km) (62 miles) was used for this analysis. Based on the analysis, the MCE peak horizontal site ground acceleration is 0.33g from an M 6.8 earthquake on the Los Osos Fault.

As shown in Table 6.3-2, although the San Andreas Fault is capable of generating a much larger earthquake, its distance from MBPP results in significant attenuation of earthquake energy and, consequently, lesser potential ground shaking at the site.

6.3.1.5 <u>Geologic Hazards</u>

The following sections address geologic hazards in accordance with California Code of Regulations (CCR) Title 20, Appendix B requirements. Flood hazards, other than tsunamis, are discussed in Section 6.5 - Water Resources.

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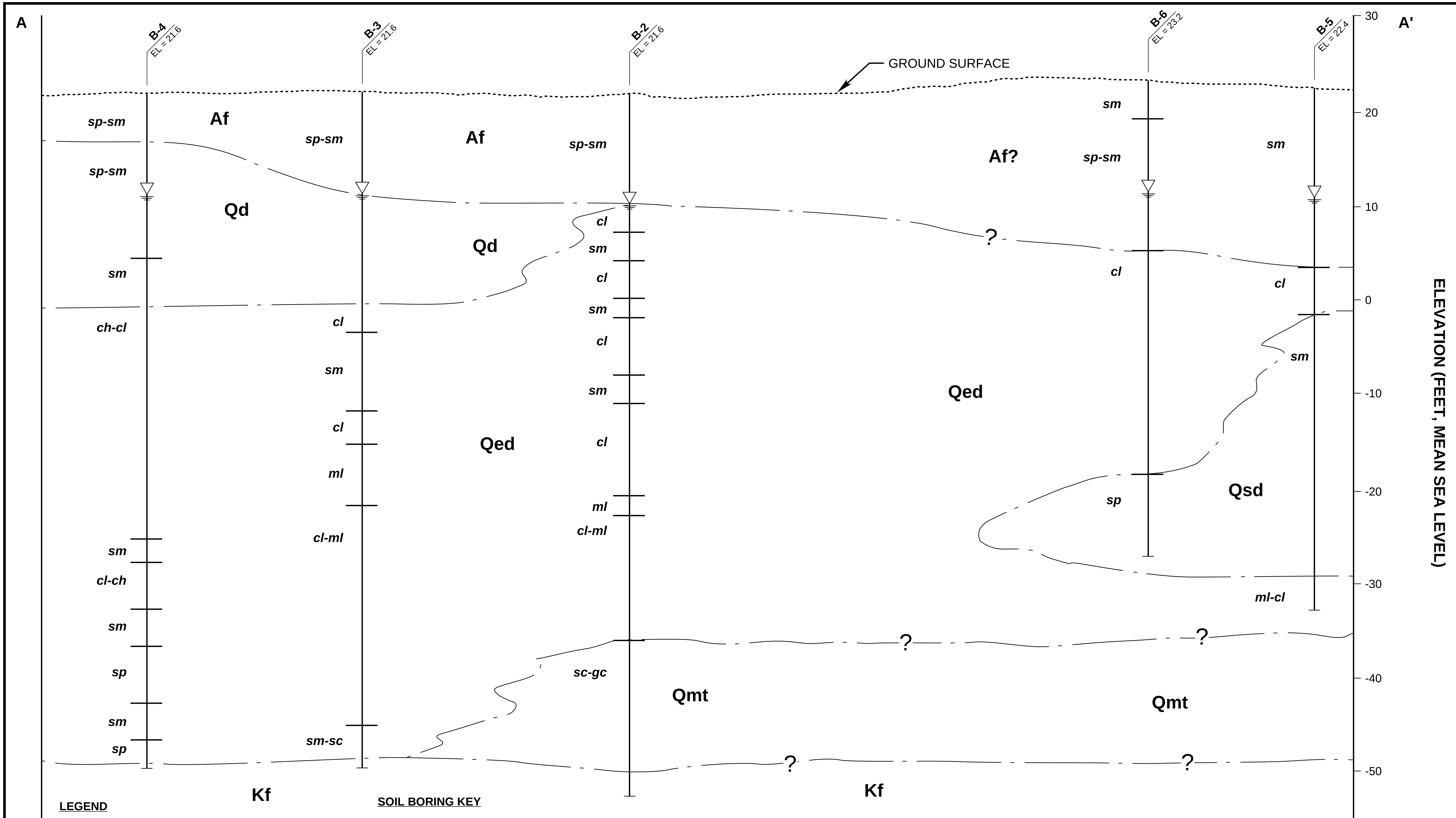

LEGEND

Af	ARTIFICIAL FILL
Qd	QUATERNARY DUNE DEPOSITS
Qed	QUATERNARY ESTUARINE DEPOSITS
Qsd	QUATERNARY STREAM DEPOSITS
Qmt	QUATERNARY MARINE TERRACE DEPOSITS
Kf	BEDROCK - INTERBEDDED SANDSTONE AND SHALE

SOIL BORING KEY

sp	POORLY GRADED SAND
sm	SILTY SAND
ch	FAT CLAY
cl	LEAN CLAY
sc	CLAYEY SAND
gc	CLAYEY GRAVEL
ml	SILT

▽ WATER LEVEL AT TIME OF DRILLING

NOTES:
1. GROUND SURFACE SHOWN IS APPROXIMATE AND INTERIOR TANK FARM BERM IS NOT REFLECTED.
2. GEOLOGIC CONTACTS SHOWN ARE INTERPRETIVE AND APPROXIMATE IN NATURE.

0 60 120 FEET
HORIZONTAL SCALE

0 10 20 FEET
VERTICAL SCALE

VE = 6:1

SECTION A-A'

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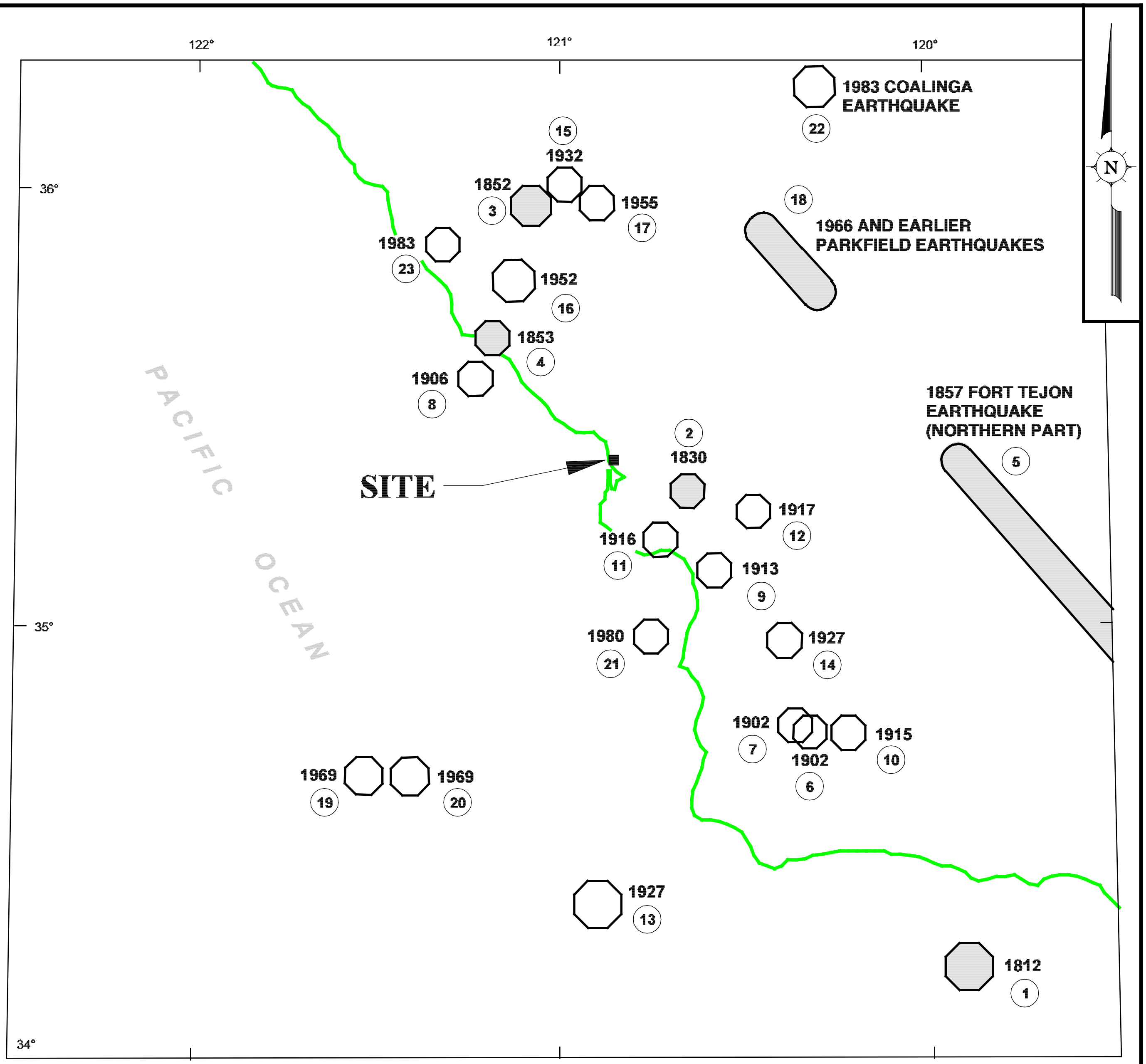
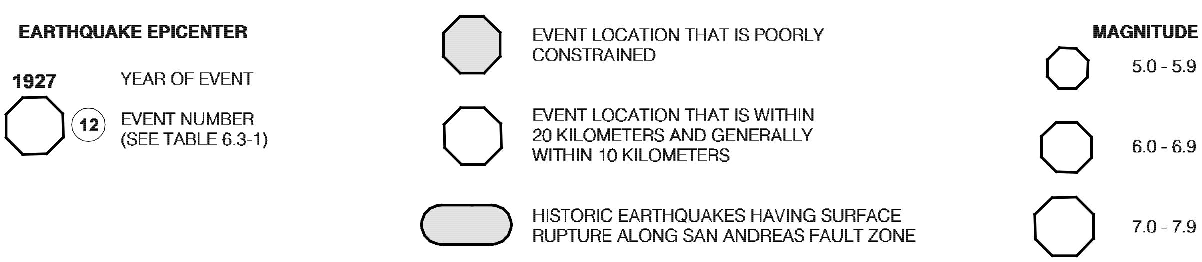
FIGURE 6.3-5



EXPLANATION



REFERENCE: DESIGN-LEVEL GEOLOGICAL/GEOTECHNICAL ENGINEERING REPORT, CITY OF SAN LUIS OBISPO DESALINATION PROJECT, BY GEOMATRIX CONSULTANTS, FIGURE 5, APRIL 1991.

0 40 80 KILOMETERS

SCALE

HISTORICAL EARTHQUAKES OF MAGNITUDE 5 AND GREATER, 1812 - 1988, IN SOUTH-CENTRAL COASTAL CALIFORNIA

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FIGURE 6.3-7

TABLE 6.3-1

HISTORICAL EARTHQUAKES OF MAGNITUDES 5.0 AND GREATER, 1812-1988, SOUTH-CENTRAL COASTAL CALIFORNIA

EVENT NO.	DATE	MAGNITUDE	LOCATION	LOCATION ACCURACY	ASSOCIATE FAULT OR STRUCTURE
1	21 Dec., 1812	~7.1	Offshore, southwest of Santa Barbara (34.2˚N, 119.9˚W)	<50 km	South side of Transverse Ranges in Santa Barbara Channel. Probably dip-slip on an east-trending fault.
2	1830	~5	In vicinity of San Luis Obispo (35.3˚N, 120.65˚W)	poor	Unknown; effects observed between the Los Osos and Rinconada Faults.
3	27 to 30 Nov., 1852	~6?[1]	Uncertain report of event near Lockwood in Lockwood Valley, Monterey County (35.65˚N, 121.1˚W)	very poor	Unknown; nearest fault is the Rinconada.
4	17 Dec., 1852 1 Feb., 1853	~5	San Simeon?[1] (35.65˚N, 121.20˚W)	poor	Unknown; nearest major fault may be San Simeon Fault zone.
5	9 Jan., 1857	8 (M)	35.3˚N, 119.8˚W	<25 km	San Andreas Fault zone
6	27 to 31 Jul., 1902	~5 1/2	6 kilometers west of Los Alamos (34.75˚N, 120.33˚W)	<10 km	Los Alamos/Baseline Fault.
7	12 Dec., 1902	~5	Los Alamos (34.76˚N, 120.37˚W)	<10 km	Los Alamos/Baseline Fault.
8	6 Dec., 1906	~5	Offshore, south of Point Piedras Blancas (35.55˚N, 121.25˚W)	<20 km	South flank of Piedras Blancas anticlinorium.
9	20 Oct., 1913	~5+	Arroyo Grande (35.12˚N, 120.58˚W)	<10 km	Faults along southwestern margin of San Luis/Pismo block.
10	11 Jan., 1915	5.2	3 to 5 kilometers east of Los Alamos (34.75˚N, 120.23˚W)	<10 km	Los Alamos/Baseline Fault.
11	1 Dec., 1916	~5	Avila (35.18˚N, 120.73˚W)	<10 km	Los Osos Fault or faults along southwest margin of San Luis/Pismo block.

Source: Geomatrix, 1991

km = Kilometers

(1) Prior to 1932, earthquake information is based on historical records, which provide approximate estimates of earthquake magnitude and location.

TABLE 6.3-1

HISTORICAL EARTHQUAKES OF MAGNITUDES 5.0 AND GREATER, 1812-1988, SOUTH-CENTRAL COASTAL CALIFORNIA

(Continued)

EVENT NO.	DATE	MAGNITUDE	LOCATION	LOCATION ACCURACY	ASSOCIATE FAULT OR STRUCTURE
12	9 Jul., 1917	~5	Lopez Canyon (32.25˚N, 120.475˚W)	<20 km	Between the Rinconada and West Huasna Faults.
13	4 Nov., 1927	7.0 (M)	Offshore, west of Point Arguello (34.35˚N, 120.90˚W)	<20 km	Compressional structure west of Point Arguello, near south end of Santa Lucia Bank Fault.
14	18 Nov., 1927	~5	Near Santa Maria (34.95˚N, 120.40˚W)	<~10 km	Faults along southwest margin of San Luis/Pismo block.
15	26 Feb., 1932	5.0 (M)	San Ardo (36.0˚N, 121.0˚W)	<20 km	Near the Rinconada Fault.
16	22 Nov.,1952	6.2 (M)	Bryson (35˚ 46.1'N, 121˚ 08.7'W)	<5 km	Near the Nacimiento Fault zone.
17	2 Nov., 1955	5.1 (M)	San Ardo (35˚ 57.6'N, 120˚ 54.9'W)	<5 km	East of Rinconada Fault.
18	12 Sep., 1966	6+(M)	39.42'N, 120.15'W	<25 km	San Andreas Fault zone
19	22 Oct., 1969	5.4 (M)	Offshore, west of Santa Lucia Bank (34˚ 37.41'N, 121˚ 32.06'W)	<10 km	Zone of northwest-trending faults and folds near the Santa Lucia escarpment.
20	5 Nov., 1969	5.6 (M)	Offshore, west of the Santa Lucia Bank (34˚ 37.91'N, 121˚ 26.04'W)	<10 km	Zone of northwest-trending faults and folds near the Santa Lucia escarpment.
21	29 May 1980	4.9 (M) 5.1 (M)	Offshore, west of Point Sal (34˚ 57.5'N, 120˚ 45.5'W)	<5 km	Associated with the offshore section of the Casmalia fault zone (close to Hosgri Fault zone).
22	2 May, 1983	6.4 (M)	36.2'N, 120.3'W	<25 km	Unknown
23	29 Aug., 1983	5.2 (M)	Near San Simeon (35˚ 50.17'N, 121˚ 20.70'W)	<5 km	Near the San Simeon Fault zone.

98-710/Rpts/AFC(text)/Tbls&Figs (8/16/99/mc)

Source: Geomatrix, 1991
km = Kilometers

(1) Prior to 1932, earthquake information is based on historical records, which provide approximate estimates of earthquake magnitude and location.

TABLE 6.3-2

ESTIMATED SEISMIC SOURCE PARAMETERS

FAULT	DISTANCE FROM MBPP (miles)	MAXIMUM CREDIBLE EARTHQUAKE (M)	ESTIMATED PEAK HORIZONTAL GROUND ACCELERATION AT MBPP (g)
San Juan	33	7.0	0.06
Los Osos	5	6.8	0.33
Hosgri	11	7.3	0.25
Rinconada	12	7.3	0.22
San Andreas[1]	38	7.8	0.08

98-710/Rpts/AFC(text)/Tbls&Figs (8/16/99/mc)

(1) Section of the San Andreas Fault that ruptured in the 1857 earthquake, per California Division of Mines and Geology.

6.3.1.5.1 Ground Rupture

As previously discussed, there are no active faults in the immediate vicinity of MBPP, nor do any active faults pass beneath the site. Consequently, the likelihood for fault rupture at the site is remote.

6.3.1.5.2 Ground Shaking

The MBPP, like much of California, is located within a seismically active area. Therefore, the potential for future earthquakes in the vicinity of the power plant within the lifetime of the plant is high. As discussed above in Section 6.3.1.4.2, the degree of ground shaking anticipated at MBPP was assessed using EQFAULT, and the MCE peak horizontal site ground acceleration was determined to be 0.33g from an M 6.8 earthquake on the Los Osos Fault.

The MBPP is located within Seismic Zone 4 as designated in the California Building Code (CBC). Location of the power plant within this zone requires a minimum 0.4g horizontal acceleration coefficient for earthquake-resistant structural design.

6.3.1.5.3 Tsunami

Seismic waves, or tsunamis, can be triggered by earthquakes or undersea landslides. The CDMG classifies Morro Bay as potentially dangerous if tide and tsunami are in phase. Historic tsunamis occurred in the Morro Bay area in 1878, 1953, 1960 and 1964. These tsunamis resulted in localized damage to piers, wharves and buoys in Morro Bay Harbor. Based on historical records and discussions with Duke Energy plant personnel (Cochran, 1999), there has been no resultant flooding or damage to MBPP as a result of earthquake-induced tsunamis.

The potential for damage to MBPP from tsunamis, including once-through cooling intake structures, is minimized by the existing sand spit, Morro Rock and the narrow harbor entrance. The major protection in terms of injury and death from tsunamis is a system of warning, response and evacuation, which is managed by the United States Weather Service and other local emergency response agencies.

6.3.1.5.4 Mass Wasting and Slope Stability

The MBPP is located adjacent to the coast, overlying dredged fill and bay deposits. Topography at the site is essentially flat. Given this subdued site topography, there is negligible potential for development of landslides or other forms of slope instability.

Additionally, the seismic stability of the berms in the tank farm area was previously investigated (Roger Foott Associates, 1993). Results from that investigation supported the finding that the berms will not suffer significant permanent deformation during seismic events evaluated; localized small sloughing may occur on berm slope faces and this can be addressed through standard remedial grading practices.

6.3.1.5.5 Liquefaction

Liquefaction is the loss of soil shear strength due to increased pore water pressure from ground shaking generated during earthquakes. The liquefaction potential at a given site is usually evaluated through geotechnical investigations that assess earthquake sources, soil type, soil density and depth to ground water.

The two primary conditions required for liquefaction potential are:

- Presence of low density silt and sand.
- Shallow ground water within 30 to 50 feet of the ground surface.

Liquefaction potential of subsurface soils in the vicinity of the tank farm was previously investigated (Roger Foott Associates, 1993). This investigation concluded that the potential for liquefaction of submerged soils in the tank farm area (beneath the water table) exists based on fault sources evaluated. The zone subject to potential liquefaction is present discontinuously from the water table to an elevation of -20 feet. Since the tank farm area has a base elevation of 23 feet and containment berm elevations of 33 feet, the zone potentially subject to liquefaction is covered by about 20 to 30 feet of overlying soil. This overlying soil cover helps mitigate the potential for surface disturbance, since some of the potential deformation from a liquefaction event would be taken up by underlying soils.

Liquefaction potential was further evaluated in the latest geotechnical investigation (Hushmand, 2000). Conclusions from the analysis were that localized liquefaction may occur in unconsolidated sand layers, on the order of a few feet in thickness, which could result in several inches of settlement. Liquefaction potential will, however, be minimized in loaded areas where structures are founded on deep foundations, due to the densification of sandy soils caused by the penetration of prestressed precast concrete piles. Precase concrete piles, driven to refusal, was recommended as the foundation type for relatively heavy structures.

6.3.1.5.6 Subsidence

The subsurface soils are relatively well consolidated and contain sufficient fines to bind framework grains, thus preventing substantial settlement and subsidence.

A review of boring logs from prior investigations indicates there are some organic materials contained within the clayey estuarine soils beneath the site. Organic soils, especially peat, are subject to settlement over time due to decay of the organic material and subsequent collapse of soil structure.

6.3.1.5.7 Expansive Soils

Based on prior site investigations, there are organic, clayey estuarine soil deposits located at typical depths of 15 to 70 feet below ground surface, in the tank farm area. A number of these soils are classified as high plasticity clays (Hushmand, 2000).

6.3.2 IMPACTS

Significance criteria were determined based on California Environmental Quality Act (CEQA) Guidelines, Appendix G, Environmental Checklist Form (approved January 1, 1999) and on performance standards or thresholds adopted by responsible agencies. An impact may be considered significant if the Project results in:

- Severe damage or destruction to one or more project components as a direct consequence of a geologic event.
- Release of toxic or other damaging material into the environment as a result of a geologic event.
- Exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving:
  - Rupture of a known earthquake fault.
  - Strong seismic ground shaking.
  - Seismic-related ground failure, including liquefaction.
  - Inundation by seiche, tsunami or mudflow.
  - Landslides.
  - Flooding.
  - Loss of a unique geologic feature.

- Loss of availability of a known mineral resource classified MRZ-2 by the state geologist and of value to the region and residents of the state.
- Loss of availability of a locally important mineral resource recovery site.

6.3.2.1 Construction Impacts

Given the potential for earthquakes in the vicinity, there are potential secondary earthquake effects, including liquefaction, lateral spread and tsunamis. The potential for flood damage from tsunamis is considered low, given the fact that the site is elevated relative to the water table. The potential for lateral spreading in the footprint area of the new units also is considered low. There is a potential for liquefaction of subsurface soils in the tank farm area based on previous investigations.

The presence of laterally continuous expansive and organic soils could potentially impact foundation design, in terms of structural design and support. The impacts of expansive soils and settlement of compressible organic soils can typically be addressed by conventional design measures and project design features.

6.3.2.2 Operations and Maintenance-Related Impacts

The MBPP is located in a seismically active area, and the likelihood of ground shaking within the lifetime of the facility is high. Fault modeling suggests conservative peak site horizontal ground accelerations as high as 0.33g, which is less than CBC 0.4g seismic design coefficient for Seismic Zone 4.

There will be no operations impacts to geologic resources. While Morro Rock is an important geologic resource in terms of general tourism interest and sightseeing activities, the Project will be completed within the confines of the existing industrial site. As a result, the geologic resource value of Morro Rock will not be affected by the Project. Any potential operations impacts are controlled through appropriate foundation and seismic structural design.

6.3.2.3 Cumulative Impacts

As shown in Table 6.1-1, there are also several offsite land development projects in the vicinity of MBPP. Since these projects are offsite, they have no bearing on geologic resource impacts.

6.3.2.4 Project Design Features

The following design and/or operational features of the Project avoid potentially significant environmental impacts and have been incorporated into the Project:

- A geotechnical investigation report shall be performed as part of Project siting design. This report will summarize geotechnical site conditions relevant to plant foundation, structural design and seismic design.
- An engineering geology report will be developed as part of project siting design. The report will be developed in conformance with the 1998 California Building Code (CBC), Appendix Chapter 33, Section 3309.3, Grading Designation. The report will be developed, signed and stamped by a licensed California Certified Engineering Geologist.
- A detailed evaluation of subsurface soils shall be conducted to determine any necessary structural improvements to comply with the CBC requirements including Seismic Zone 4 requirements. This will include an evaluation of potentially expansive clayey soils and potentially compressible organic site soils to evaluate their performance relative to foundation design.
- Since MBPP is located in a seismically active area, a detailed, site-specific seismic evaluation shall be performed as part of the detailed engineering. This evaluation will determine the governing design ground acceleration, liquefaction potential, and will be coordinated with power plant structural design, as needed, to control any potential impacts associated with high ground shaking. Potentially liquefiable subsurface soils will be mitigated through appropriate foundation design measures, which may include a pile-supported power plant or utilization of a raft foundation to minimize the potential for differential settlement.

6.3.3 MITIGATION MEASURES

Based on the above analysis of impacts and the design and operational features that have been incorporated into the Project, no mitigation measures are required.

6.3.4 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

There are no significant unavoidable adverse impacts from geologic hazards or to geologic resources from the construction or operations of the Project.

6.3.5 LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS) COMPLIANCE

LORS related to geologic hazards and resources are described in Section 7.3-1 and listed in Table 6.3-3 along with names of the administering agencies and the project's approach to compliance. The Project will comply with applicable LORS during project construction and operation.

TABLE 6.3-3

GEOLOGIC HAZARDS AND RESOURCES LORS AND COMPLIANCE

APPROACH TO COMPLIANCE	AFC SECTION	JURIS-DICTION	LORS/AUTHORITY	ADMINISTERING AGENCY	REQUIREMENTS/ COMPLIANCE
MBPP will be designed to meet Seismic Zone 4 requirements. Perform detailed, site-specific seismic evaluations.	None applicable.	Federal	None applicable.	None applicable.	None applicable.
(cont.)	Sections 6.3.1.5, 6.3.2.1, 6.3.2.4, 6.3.5 Pages 6.3-5 through 6.3-10	State	PRC 25523(a); 20 CCR §1752(b),(c)	Delegated to Morro Bay Planning and Building Department by California Energy Commission (Commission delegation to Morro Bay).	Restricts building relative to seismicity.
Performance of Foundation investigation and detailed evaluation of subsurface soils.	Sections 6.3.2.4, 6.3.5 Pages 6.3-9, 6.3-10	(cont.)	Uniform Building Code (UBC) Chapter 33.	Commission delegation to Morro Bay.	Control excavation, grading, construction to safeguard life and property.
(cont.)	None applicable.	Local	None applicable.	None applicable.	None applicable.

98-710/Rpts/AFC(text)/Tbls&Figs (9/7/00/ks)

The site is not located within an Alquist-Priolo Special Studies Zone. Therefore, no site-specific fault studies are required. The Project will comply with applicable building codes to address power plant foundation and seismic structural design. Engineering design criteria, which include building code compliance features, are provided in Engineering Appendices 8-3, 8-4 and 8-5.

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