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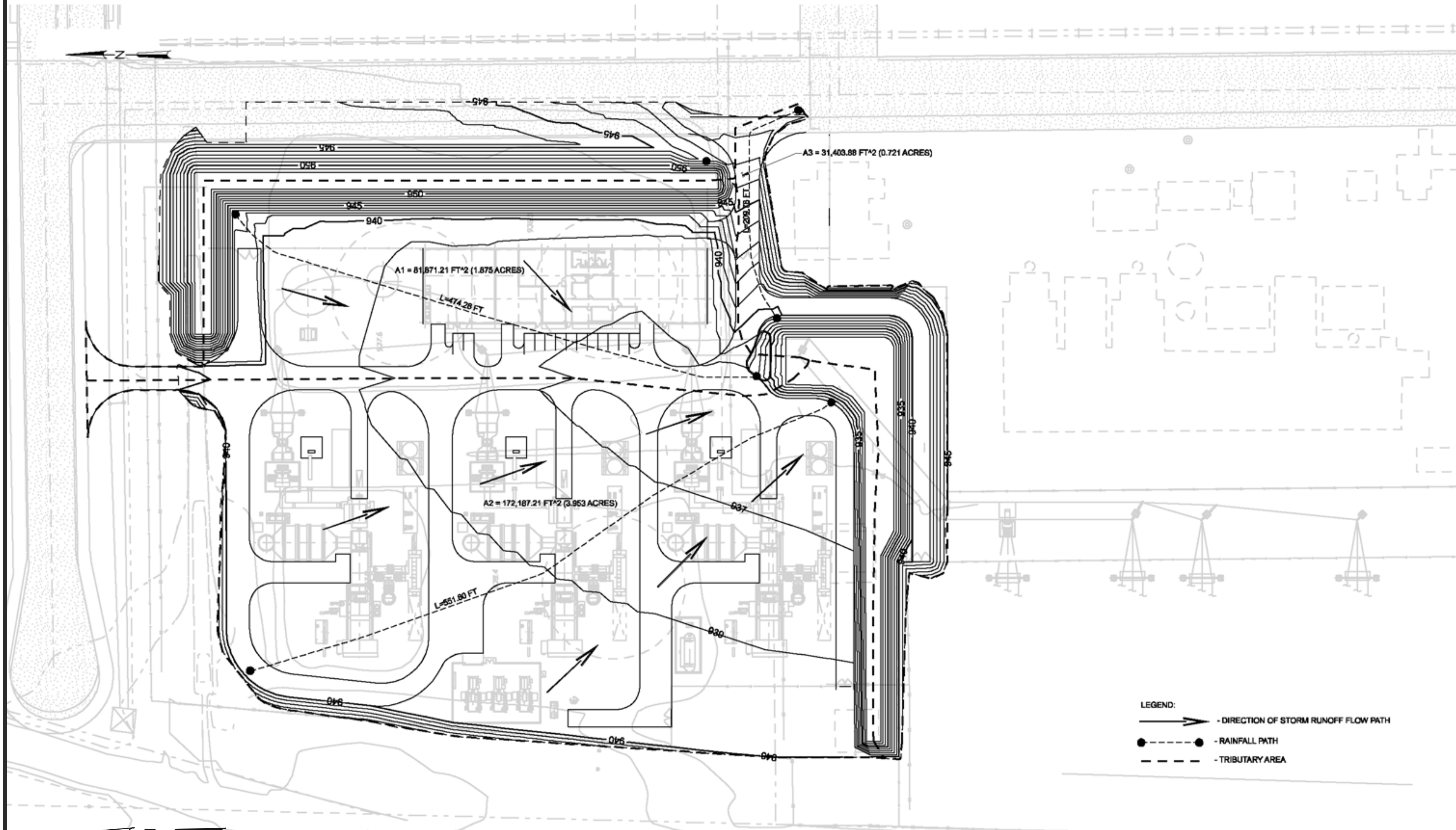

FIGURE 8.14-4
PROPOSED DRAINAGE FACILITIES
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

IS032006003RDD_17 (5/8/06)

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8.15 Geologic Hazards and Resources

8.15.1 Introduction

This subsection evaluates the effect of geologic hazards and resources that might be encountered on the AES Highgrove project site. The objective of this evaluation is to identify site conditions and the potential impacts from the construction or operation of the project. This subsection presents a summary of the relevant laws, ordinances, regulations, and standards (LORS); the existing site conditions; and the expected direct, indirect, and cumulative impacts because of construction, operation, and maintenance of the project. Proposed mitigation measures and the effectiveness and monitoring plans are also described. Permits that are required and permitting agencies are identified.

8.15.2 Laws, Ordinances, Regulations, and Standards

The LORS that apply to geologic hazards and resources are summarized in Table 8.15-1.

TABLE 8.15-1
Laws, Ordinances, Regulations, and Standards Applicable to Geologic Hazards and Resources

Jurisdiction	Authority	Administering Agency	Compliance
State/Local	California Building Code (CBC), 2001.	California Building Standards Commission, State of California, and City of Grand Terrace Building Department	Acceptable design criteria for structures with respect to seismic design and load-bearing capacity.
State/Local	Alquist Priolo Earthquake Fault Zoning Act	Title 14, Division 2, Chapter 8, Subchapter 1, Article 3, California Code of Regulations.	Identifies areas subject to surface rupture from active faults
State /Local	The Seismic Hazards Mapping Act	Title 14, Division 2, Chapter 8, Subchapter 1, Article 10, California Code of Regulations.	Identifies non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides
Local	City of Grand General Plan City of Riverside County of Riverside	City of Chula Vista City of Riverside County of Riverside	Compliance with the Safety Element of the General Plan

8.15.3 Affected Environment

The proposed AES Highgrove project site is a 9.8-acre parcel in the City of Grand Terrace, San Bernardino County, California, located along the western side of Taylor Street, north of Main Street. The elevation of the site is approximately 940 feet above mean sea level. The project also includes a natural gas pipeline that extends approximately 7 miles (11.5 km) south of the plant site to connection with a regional gas pipeline and will involve the demolition of the existing generating equipment located on the Generating Station Property.

The project area lies in the Inland Empire area of southern California between the San Bernardino and San Jacinto Mountains of the Transverse Ranges to the east, and the Chino Hills and Santa Ana Mountains to the west. Physiographically, it lies on the northwestern portion of the Perris Block, an eroded surface of Mesozoic crystalline rock between the Santa Ana and the San Jacinto Mountains. The Box Springs Mountains lie immediately to the east of the pipeline route. The La Loma Hills lie immediately to the west and northwest of the plant site. Farther to the east, the San Jacinto Fault Zone lies at the eastern base of the Box Springs Mountains and marks the eastern edge of the Perris Block. To the west, the Elsinore and Chino Fault Zones lie along the eastern margin of the Santa Ana Mountains and mark the western limit of the Perris Block.

The project area is considered to be seismically active and is designated as a California UBC Seismic Zone 4.

8.15.3.1 Regional Geology

The geology of the vicinity is complex, largely a result of the interaction of numerous faults that are present in the southern California area. The project area lies in the Inland Empire area of southern California between the San Bernardino and San Jacinto Mountains of the Transverse Ranges to the east, and the Chino Hills and Santa Ana Mountains to the west. Physiographically, it lies on the northwestern portion of the Perris Block, an eroded surface of Mesozoic crystalline rock between the Santa Ana and the San Jacinto Mountains (Woodford et al., 1971). The Box Springs Mountains lie immediately to the east of the pipeline route. The La Loma Hills lie immediately to the west and northwest of the plant site. Father to the east, the San Jacinto Fault Zone lies at the eastern base of the Box Springs Mountains and marks the eastern edge of the Perris Block. To the west, the Elsinore and Chino Fault Zones lie along the eastern margin of the Santa Ana Mountains and mark the western limit of the Perris Block.

8.15.3.2 Local Geology and Stratigraphy

Very limited exposures of metamorphic rocks of probable Paleozoic age are present in the project area. These rocks, originally sedimentary in nature, were subject to high-temperature metamorphism during the emplacement of the Mesozoic igneous batholith in this area. They include biotite schist, impure quartzite, marble, and other calc-silicate rocks (Morton and Cox, 2001).

Igneous rocks emplaced in the crust primarily during the Late Mesozoic dominate the basement geology. In the project area these rocks are of the Peninsular Range Batholith (Morton and Miller, 2003), in most areas overlain by varying depths of Quaternary alluvium and, in some cases, by artificial fill (Morton and Cox, 2001). Rocks of the Peninsular Range Batholith were emplaced during the Cretaceous Epoch, which ended about 64 million years ago. These granitic rocks vary in mineralogical composition and, in the project area, are principally tonalite and granodiorite (Morton and Cox, 2001).

Quaternary (Pleistocene and Holocene) sediments exposed in the project area are primarily alluvial fan deposits issuing from the Box Springs Mountains to the east along the northern 5 miles (8.2 km) of the pipeline route and the plant site. Older alluvium of less certain provenance lies along the southern 2 miles (3.3 km) of the pipeline route on the northwest edge of the Perris Plain, as well as beneath the northern approximately 1 mile (1.6 km) of the pipeline route and beneath the generating site. Artificial fill and Holocene eolian and sheet wash sediments typically mantle these units. Figure 8.15-1 (figures are located at the end of the subsection) shows the stratigraphic units, strata, and geographic features within a 2-mile radius of the Highgrove project site. Figure 8.15-2 shows the geology within a ¼-mile buffer along the gas pipeline linear.

8.15.3.3 Seismicity

The Highgrove project site lies within a seismically active region. Large earthquakes have occurred in the past and will occur in the future. The region is influenced by the San Andreas Fault system that separates the North American and Pacific plate boundaries. This boundary has been the site of numerous large-scale earthquakes. Numerous active faults are in the vicinity of Grand Terrace although none are known to exist within the city (Bortogno and Spittler, 1986). These include the Rialto-Colton fault (4 miles north of site), San Jacinto fault zone (3 miles east of site),), the San Andreas fault zone (10 miles north of site), Cucamonga fault (13 miles northwest of site), Whittier-Elsinore fault (20 miles southwest of site). The site is not located within a special study zone, as delineated by the Alquist-Priolo Special Studies Zone Act of 1972; and no known fault, active or inactive, reaches the surface within the project area (Jennings, 1994). However, the San Jacinto Fault Zone that is less than 3 miles from the site is state-designated fault with a ground rupture hazard area. The significant faults in the study area are described below and are shown on Figure 8.15-3.

8.15.3.3.1 San Andreas Fault

The nearest major fault is the San Andreas fault, which is approximately 10 miles north of the site. This fault is the largest active fault in California and extends from the Gulf of California to Cape Mendocino in northern California (Jennings, 1994). The fault is divided into numerous segments. The segment nearest the site is the San Bernardino segment and has been assigned individual maximum moment magnitude (Mmax) of 7.5, by the Working Group on California Earthquake Potential (WGCEP, 2002).

8.15.3.3.2 San Jacinto Fault Zone

Northeast of the site is the San Jacinto Fault Zone. This fault is approximately 3 miles from the Highgrove project site and is considered to be an active Holocene fault and is an Alquist-Priolo Special Studies fault zone. It is approximately 160 miles long and runs from southern end of the Imperial Valley south of the Salton Sea to the eastern San Gabriel Mountains at the San Andreas fault (Jennings, 1994). The Mmax from this fault is 6.7 (WGCEP, 2002).

8.15.3.3.3 Whittier-Elsinore Fault Zone

The Whittier-Elsinore Fault Zone lies approximately 20 miles southwest of the site. The fault system essentially parallels the San Jacinto fault zone and extends from Whittier in Los Angeles County to the southern end of Imperial Valley south of the Salton Sea (Jennings, 1994). According to the WGCEP (2002), the Whittier-Elsinore Fault Zone has been assigned a Mmax of 6.8.

8.15.3.4 Geologic Hazards

A site-specific geotechnical investigation is being planned for the Highgrove project site. Results will be provided upon its completion.

The following subsections discuss the potential geologic hazards that might occur in the project area.

8.15.3.4.1 Ground Rupture

Ground rupture is caused when an earthquake event along a fault creates rupture at the surface. Since no known faults exist at the Highgrove project site, the likelihood of ground rupture to occur at the project site is low.

8.15.3.4.2 Seismic Shaking

The Inland Empire of southern California has experienced strong ground motion in the past and will do so in the future. Mualchin (1996) estimated that the ground-shaking of a moment magnitude 7.50 earthquake along the San Jacinto Fault Zone system could produce peak bedrock acceleration of up to 0.55g (where g is gravity) in the vicinity of the Highgrove Project. A preliminary review of the probabilistic peak ground acceleration (PGA) with a return period of 475 years, indicates that the PGA will be on the order of 0.7g at the site (California Geological Survey, 2003).

8.15.3.4.3 Liquefaction

During strong ground-shaking, loose, saturated, cohesionless soils can experience a temporary loss of shear strength. This phenomenon is known as liquefaction. Liquefaction is dependent on grain size distribution, relative density of the soils, degree of saturation, and intensity and duration of the earthquake. The potential hazard associated with liquefaction is seismically induced settlement. The depth to groundwater at the Highgrove project site is relatively shallow, less than 50 feet, and the soil types generally consist of alluvial sediments. According to the City of Grand Terrace General Plan, the southwestern part of the city is susceptible to liquefaction due to high water table. Therefore, the likelihood that liquefaction will occur is considered high.

8.15.3.4.4 Mass Wasting

Mass wasting depends on steepness of the slope, underlying geology, surface soil strength, and moisture in the soil. Significant excavating, grading, or fill work during construction might introduce mass wasting hazards at the Highgrove project site. Because the Highgrove project site is relatively flat and no significant excavation is planned during site construction, the potential for direct impact from mass wasting at the site is considered low to negligible.

8.15.3.4.5 Subsidence

Subsidence can be a natural or man-made phenomenon resulting from tectonic movement, consolidation, hydrocompaction, or rapid sedimentation. Given that the site is underlain by dense alluvial fan deposits, the potential for subsidence, as a hazard that could affect the project site, is low.

8.15.3.4.6 Expansive Soils

Expansive soils shrink and swell with wetting and drying. The shrink-swell capacity of expansive soils can result in differential movement beneath foundations. Expansive soils have not been identified as a potential hazard in the Grand Terrace area. Based on this, the likelihood of expansive soils to be present at the site is low.

8.15.3.4.7 Geologic Resources of Recreational, Commercial, or Scientific Value

Geologic resources of recreational, commercial, or scientific value in the project vicinity that could be affected include aggregate and gas reserves. Geologic resources of value are discussed in the next paragraph.

8.15.3.4.8 Aggregate Resources

In 1995, the California Division of Mines and Geology performed a mineral land classification of part of the San Bernardino Valley area. According to the published report, the entire Highgrove project site was classified as Mineral Resource Zone (MRZ)-3 that is defined as "areas of undetermined mineral resource significance (State of California, 1995). An area to the west of the site, all along the Santa Ana River flood plain was classified as MRZ-2, "Areas of identified Mineral Resource Significance." This classification is primarily due to the presence of portland cement-grade aggregate and limestone.

8.15.3.4.9 Natural Gas

No oil or gas fields are present in the project vicinity, according to online maps from the California Division of Oil, Gas and Geothermal Resources (CDOGGR, 2004).

There are no known geologic resources that provide a significant scientific or recreational value in the vicinity of the site.

8.15.4 Environmental Impacts

8.15.4.1 Generating Facility and Pipelines

8.15.4.1.1 Geologic Hazards

Ground-shaking and liquefaction present the most significant geologic hazard to the proposed Highgrove project site and project linear. Table 8.15-2 summarizes the geologic hazards associated with the project.

TABLE 8.15-2
Summary of Potential Geologic Hazards

Project Component	Area of Potential Concern	Geologic Hazards of Potential Concern
Proposed generating facility site (up to 9.8 acres)	Entire site	Seismic ground-shaking. Liquefaction
Water pipeline	Entire length of pipeline	Seismic ground-shaking, Liquefaction
Gas pipeline	Entire length of pipeline	Seismic ground-shaking, Liquefaction

8.15.4.1.2 Geologic Conditions and Topography

Construction will require minor grading and excavation, thereby altering the terrain of the Highgrove site. Impacts on the geologic conditions involve changes in drainage, cuts, and fills. Since the site is generally level, site grading is not expected to adversely impact the geologic environment.

8.15.4.2 Geologic Resources of Recreational, Commercial, and Scientific Value

No known natural resources occur in the Highgrove project site area. The MRZ-2 area identified along the Santa Ana River is not being actively developed. No significant impact to geologic resources would occur with the project.

8.15.5 Mitigation Measures

The following subsections describe mitigation measures that could be used to reduce impacts from geologic hazards.

8.15.5.1 Ground Rupture

No active faults cross the Highgrove site or project linear (Jennings, 1994). Therefore, no mitigation measures are required to reduce the hazard from surface faulting rupture.

8.15.5.2 Ground-Shaking

The Highgrove site and pipelines will need to be designed and constructed to withstand strong earthquake-shaking as specified in the 2001 CBC for Seismic Zone 4. A site-specific geotechnical investigation (forthcoming) will aid in the development of the seismic design criteria.

8.15.5.3 Liquefaction

The soil types present at the Highgrove site and along the pipeline routehave been mapped as being conducive to liquefaction. A site-specific geotechnical investigation currently being planned will aid in the full assessment of liquefaction potential and lateral spreading.

8.15.5.4 Subsidence

Based on site-specific data, subsidence is not considered to be a hazard at the site and mitigation would not be required.

8.15.5.5 Expansive Soils

Expansive soils can be mitigated by removing the soil and backfilling with non-expansive soil, instituting chemical stabilization of the soil, or constructing a foundation treatment that resists uplift of the expansive soil. Expansive soils have not been identified as potential hazard at the site. Mitigation measures would likely not be required at the site, however, borings that will be drilled at the site during the geotechnical study will identify any potential soils that would be prone to expansion.

8.15.6 Involved Agencies and Agency Contacts

No permits are required for compliance with geological LORS. However, the City of Grand Terrace, and the County of San Bernardino are responsible for enforcing compliance with building standards.

8.15.7 Permits Required and Permit Schedule

Compliance of building construction with CBC standards is covered under engineering and construction permits for the project. There are no other permit requirements that specifically address geologic resources and hazards. However, excavation/grading and inspection permits will be required prior to construction and will be included in the overall project construction permit. Borings planned for the geotechnical investigation will require a permit from the County of San Bernardino since they will likely penetrate groundwater (borings that do not encounter groundwater and are immediately grouted up do not require a permit). According to the City of Grand Terrace, no separate drilling permit is required for private property (Glander, 2005). The County of San Bernardino Geologist, may be required to review geotechnical reports and/or design documents as part of land use permitting. Required permits and agency contact information is summarized in Table 8.15-3.

TABLE 8.15-3
Permits and Agency Contact Information

Agency	Contact	Telephone
County of San Bernardino, Dept of Environmental Health	Steve Sassler	(909) 387-4666
County of San Bernardino, Land Use Dept, County Geologist	Wes Reader	(909) 387 4240

8.15.8 References

Bortogno, E.J. and T.E. Spittler. 1986. Geologic Map of the San Bernardino Quadrangle. Regional Geologic Map Series, 1:250000 scale. State of California, Department of Conservation, Division of Mines and Geology.

California, State of. 1995. Mineral Land Classification of a Part of Southwest San Bernardino Valley Area, California, State of California, Department of Conservation, Division of Mines and Geology. Open-File Report 94-08.

California Geological Survey. 2003. Probabilistic Seismic Hazards Mapping Ground Motion Page Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). http://www.consrv.ca.gov/CGS/rghm/pshamap/pshamain.html.

California Division of Oil, Gas, and Geothermal Resources (CDOGGR). 2004. Oil and Gas Field Maps. http://www.consrv.ca.gov/dog.

Glander, Jerry. 2005. Personal communication between CH2M HILL staff and Mr. Jerry Glander, Director of Building and Safety, Public Works and Housing Department, City of Grand Terrace, CA. (909) 430 2250. February 18.

Jennings, C.W. 1994. Fault Activity Map of California and Adjacent Areas. Division of Mines and Geology.

Morton, D.M., and B. Cox. 2001. Geologic Map of the Riverside East 7.5′ Quadrangle, Riverside County, California. U.S. Geological Survey Open-File Report 01-452. Denver Federal Center, Boulder, CO.

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Mualchin, L. 1996. A Technical Report to Accompany the Caltrans California Seismic Hazard Map. Prepared for Caltrans by the Office of Earthquake Engineering. July.

Norris, R.M. and R.W. Webb. 1990. *Geology of California.* Second Edition. John Wiley and Sons. New York.

U.S. Geological Survey (USGS). 2002. National Seismic Hazard Mapping Project. http://geohazards.cr.usgs.gov/eq/

Working Group On California Earthquake Potential (WGCEP). 2002. Appendix A. California Fault Parameters. Division of Mines and Geology. Update to Open-File Report 96-08.

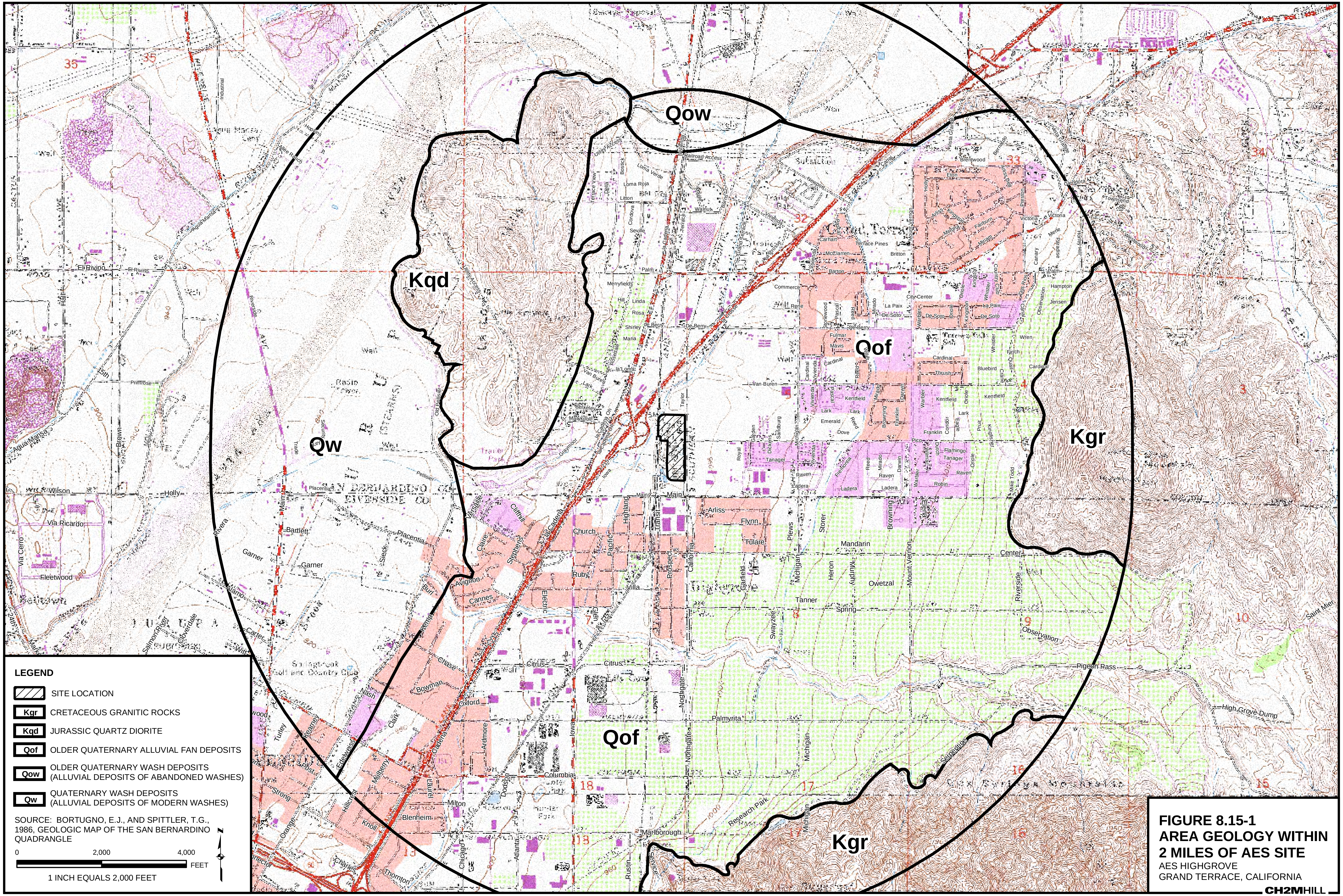

FIGURE 8.15-1
AREA GEOLOGY WITHIN 2 MILES OF AES SITE
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

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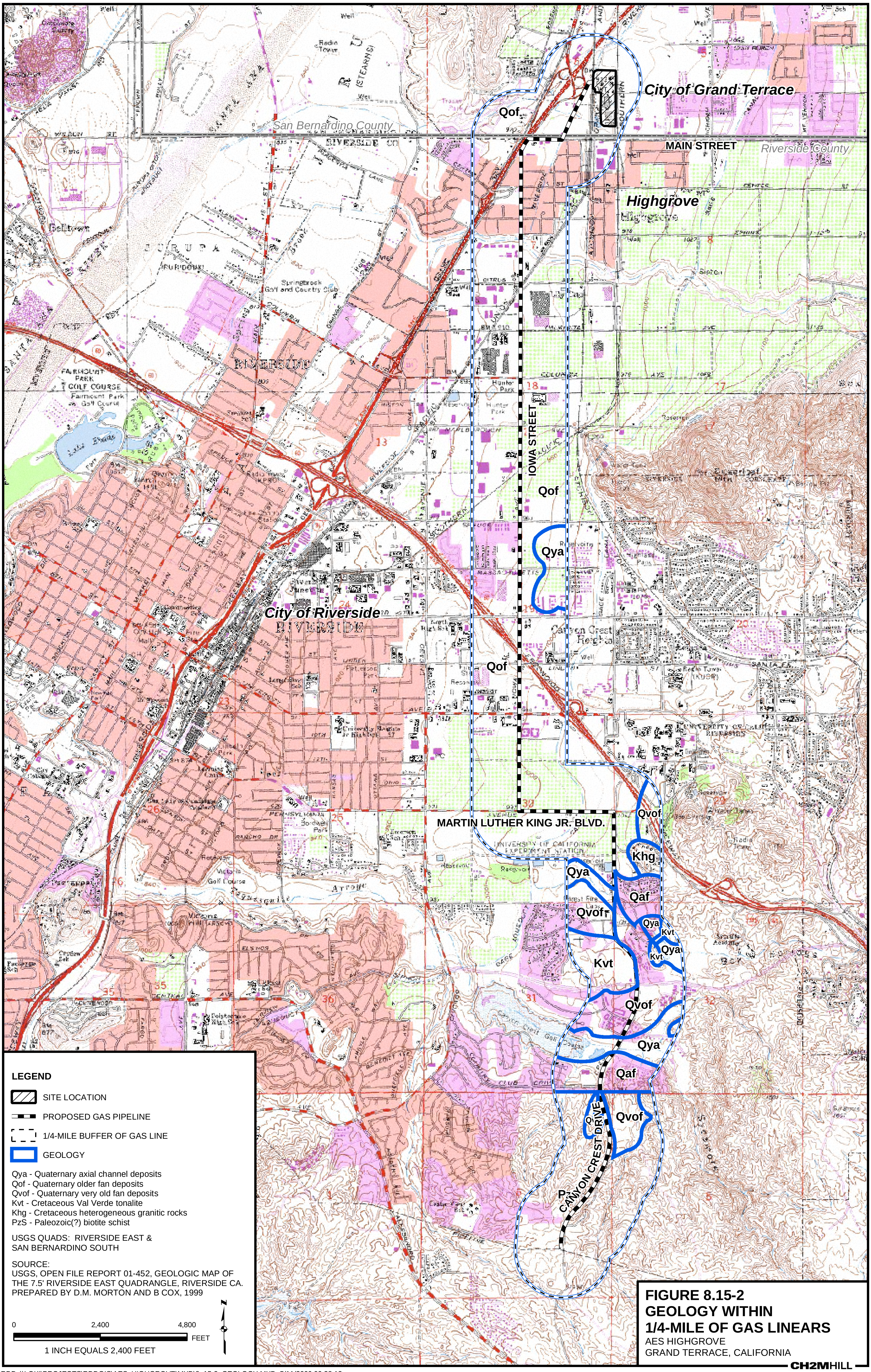

FIGURE 8.15-2
GEOLOGY WITHIN 1/4-MILE OF GAS LINEARS
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

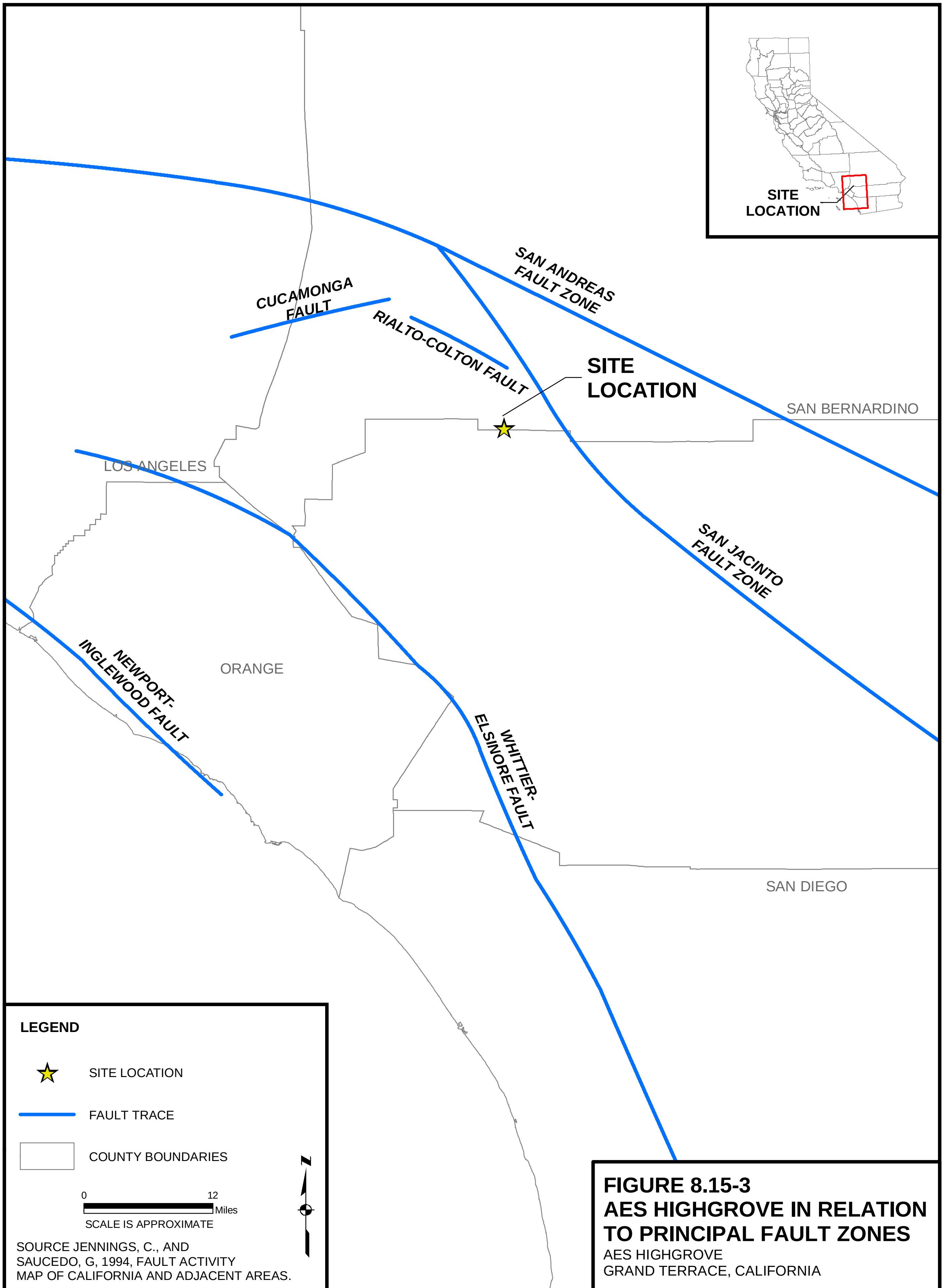

FIGURE 8.15-3
AES HIGHGROVE IN RELATION TO PRINCIPAL FAULT ZONES
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

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8.16 Paleontological Resources

8.16.1 Introduction

Paleontological resources are fossils, the remains of prehistoric plants and animals, and are important scientific and educational resources because of their use in: (1) documenting the presence and evolutionary history of particular groups of both extinct and extant organisms, (2) reconstructing the environments in which these organisms lived, and (3) in determining the relative ages of the strata in which they occur and the geologic events that resulted in the deposition of the sediments that formed these strata. This subsection summarizes the paleontological resources and the potential impacts on paleontological resources that may result from construction of the AES Highgrove project.

8.16.1.1 Project Description

The AES Highgrove project is the proposed construction of a nominal 300-megawatt (MW) peaking facility consisting of three natural-gas-fired turbines, and associated equipment. The proposed generating facility site is located on the property of the former Southern California Edison (SCE) Highgrove Generating Station in the City of Grand Terrace, in San Bernardino County. The proposed generating facility site is located in an industrially-zoned area of the City. It will connect to SCE's electrical transmission system via the adjacent 115-kV Highgrove Substation. Natural gas for the facility will be delivered to the generating station via a natural gas pipeline that will connect to an existing Southern California Gas (SoCalGas) transmission line (Line 2001) located approximately 7 miles (11.5 km) south of the project site in Riverside County. A proposed gas line and two alternate gas pipeline routes are reviewed (see Figure 8.16-1) and are included in this paleontologic resources assessment.

The natural gas line and short potable water line will be the only offsite laterals for this project. Industrial water will be supplied by an existing onsite well. Potable water for drinking and sanitary uses will be provided by the Riverside Highland Water Company from a water main about 1,300 feet south of the plant site on Main Street. Similarly, sanitary wastewater disposal will be via a hookup to the city's sanitary sewer, which is located on Taylor Street, bordering the plant. The power plant parcel will consist of approximately 9.8 acres of land under the Applicant's control.

8.16.2 Laws, Ordinances, Regulations, and Standards

Paleontological resources are non-renewable scientific and educational resources and are protected by several federal and state statutes (California Office of Historic Preservation, 1983; see also Marshall, 1976; West, 1991; Gastaldo, 1999), most notably by the 1906 Federal Antiquities Act and by the State of California's environmental regulations (California Environmental Quality Act [CEQA], Section 15064.5). Professional guidelines for the assessment and mitigation of impacts to paleontological resources have been disseminated by the Society of Vertebrate Paleontology (SVP; 1995, 1996). Construction of the proposed AES Highgrove project will be conducted in accordance with all laws, ordinances, regulations, and standards (LORS) applicable to paleontological resources. Federal, State, and County LORS applicable to paleontological resources are summarized in Table 8.16-1 and discussed briefly below, along with SVP guidelines. The cities of Grand Terrace and Riverside do not have LORS applicable to paleontological resources.

TABLE 8.16-1
LORS Applicable to Paleontological Resources

LORS	Applicability	Reference	Project Conformity
Antiquities Act of 1906	Protects paleontological resources on federal lands	Section 8.16.2.1, Page 8.16-2	Yes
Public Resources Code, Sections 5097.5/5097.9	Designates unauthorized removal or disturbance of fossil remains or fossil site on publicly owned lands in the State of California as a misdemeanor	Section 8.16.2.2, Page 8.16-3	Yes
CEQA, Appendix G(j)	Requires that impacts to paleontological resources be assessed and mitigated on all discretionary projects, public and private	Section 8.16.2.2 Pages 8.16-2, 8.16-3	Yes
San Bernardino and Riverside County General Plans	Emphasize the conservation of resources having the potential to provide information important in history and prehistory	Section 8.16.2.3 Pages 8.16-3, 8.16-4	Yes

8.16.2.1 Federal LORS

Federal protection for significant paleontological resources would only apply to the AES Highgrove project if any construction or other related project impacts occur on federally owned or federally managed lands. Federal legislative protection for paleontological resources stems primarily from the Antiquities Act of 1906 (PL 59-209; 16 United States Code 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. Since no portion of the AES Highgrove project site is on federally owned or managed land, federal LORS do not apply to this project.

8.16.2.2 State LORS

The California Energy Commission (CEC) environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of CEQA (Public Resources Code Sections 21000 et seq.). CEQA requires that public agencies and private interests identify the potential environmental analysis of their proposed projects on any object or site of significance to the scientific annals of California (Division I, California Public Resources Code Section 5020.1 [b]). Guidelines for the Implementation of CEQA (Public Resources Code Sections 15000 et seq.) define procedures, types of activities, persons, and public agencies required to comply with CEQA. Appendix G in Section 15023 provides an Environmental Checklist of questions that a lead agency should address if relevant to a project’s environmental impacts. One of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section V, part c) is the following: “Would the project directly or indirectly destroy a unique paleontological resource or site…?”

Although CEQA does not define what is “a unique paleontological resource or site,” Section 21083.2 defines “unique archaeological resources” as “…any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. [It] contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. It has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. [It] is directly associated with a scientifically recognized important prehistoric or historic event."

Making accommodation for the type of antiquity involved, this definition of "unique archaeological resources" is equally applicable to recognizing "a unique paleontological resource or site." Additional guidance is provided in CEQA Section 15064.5 (a)(3)(D), which indicates "generally, a resource shall be considered historically significant if it has yielded, or may be likely to yield, information important in prehistory or history."

Section XVII, part a, of the CEQA Environmental Checklist asks a second question equally applicable to paleontological resources: "Does the project have the potential to eliminate important examples of the major periods of California history or pre-history?" Fossils are important examples of the major periods of California prehistory. To be in compliance with CEQA, environmental impact assessments, statements, and reports must answer both these questions in the Environmental Checklist. If the answer to either question is *yes* or *possibly*, a mitigation and monitoring plan must be designed and implemented to protect significant paleontological resources.

The CEQA lead agency having jurisdiction over a project is responsible to ensure that paleontological resources are protected in compliance with CEQA and other applicable statutes. The lead agency with the responsibility to ensure that fossils are protected during construction of the proposed AES Highgrove project is the CEC. California Public Resources Code Section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the CEQA lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process.

Other state requirements for paleontological resource management are in California Public Resources Code Chapter 1.7, Section 5097.5 (Stats. 1965, c. 1136, p. 2792), entitled Archaeological, Paleontological, and Historical Sites. This statute defines any unauthorized disturbance or removal of a fossil site or fossil remains on public land as a misdemeanor and specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources. This statute would not apply to the proposed AES Highgrove project since construction or other related project impacts would not occur on publicly owned or managed lands.

8.16.2.3 County and City LORS

California Planning and Zoning Law requires each county and city jurisdiction to adopt a comprehensive, long-term General Plan for its development. The General Plan is a policy document designed to give long-range guidance to those making decisions affecting the future character of the planning area. It represents the official statement of the community's physical development as well as its environmental goals. The General Plan also acts to clarify and articulate the relationship and intentions of local government to the rights and expectations of the general public, property owners, and prospective investors. Through its general plan, the local jurisdiction can inform these groups of its goals, policies, and development standards; thereby communicating what must be done to meet the objectives of the general plan.

Both the San Bernardino County and Riverside County General Plans have Conservation Elements that emphasize the conservation of resources that are important to the history of the area, including cultural resources. Paleontological resources are commonly subsumed under this category at the local level because they too have the potential to provide "information important in history and prehistory." Per CEQA, the cultural resources section of the "San Bernardino County Initial Study Environmental Checklist Form" specifically asks if a given project would directly or indirectly destroy a unique paleontological resource.

8.16.2.4 Professional Standards

To assist in the compliance with applicable laws, the SVP, an international scientific organization of professional vertebrate paleontologists, has disseminated guidelines (SVP, 1995; 1996) that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys; monitoring and mitigation; data and fossil recovery; sampling procedures; and specimen preparation, identification, analysis, and museum curation. The SVP's guidelines are a commonly used standard against which paleontological monitoring and mitigation programs are evaluated. Briefly, SVP guidelines recommend that each project have literature and museum archival reviews, a field survey, and, if there is a high potential for disturbing significant fossils during project construction, a mitigation plan that includes monitoring by a qualified paleontological monitor, salvage of fossils if encountered, preparation and identification of salvaged fossils, and placement of curated fossil specimens into a permanent, retrievable public museum collection (such as the San Bernardino County Museum).

8.16.3 Setting

The study area includes the AES Highgrove plant site as well as three alternate natural gas pipeline routes that extend approximately 7 miles (11.5 km) south of the plant site to a point of interconnection with a regional gas transmission pipeline, Line 2001 (see Figure 8.16-2).

8.16.3.1 Geographic Setting

The project area lies in the Inland Empire area of southern California between the San Bernardino and San Jacinto mountains of the Transverse Ranges to the northeast and east, respectively, and the Chino Hills and Santa Ana mountains to the west and southwest, respectively. Physiographically, it lies on the northwestern portion of the Perris Block, an eroded surface of Mesozoic crystalline rock between the Santa Ana and the San Jacinto mountains (Woodford et al., 1971). The Box Springs Mountains lie immediately to the east of the pipeline alternate routes. The La Loma Hills lie immediately to the west and northwest of the plant site. Father to the east, the San Jacinto Fault Zone lies at the eastern base of the Box Springs Mountains and marks the eastern edge of the Perris Block. To the west, the Elsinore and Chino Fault Zones lie along the eastern margin of the Santa Ana Mountains and mark the western limit of the Perris Block.

Within the context of the Perris Block, the project area encompasses two distinct physiographic units. To the north of Tequesquite Arroyo, the plant site and approximately

5 miles (8.2 km) of the proposed gas pipeline and alternate routes lie within the Santa Ana River Valley in the vicinity of Riverside and Colton (Figure 8.16-1). The remaining southern portion of the gas pipeline routes to the south ascend onto the northwestern margin of the Perris Plain, represented by the northwestern edge of the Perris Surface (Woodburn et al., 1971). The northeast-southwest trending northern margin of the Perris Plain may be structurally controlled, but no fault is currently mapped in that area (Morton and Cox, 2001; Woodford et al., 1971). Elevations in the Santa Ana River Valley are generally below about 1,000 feet (305 m), while elevations on the Perris Plain are about 1,700 feet (520 m) on the Perris Surface near the southern termini of the gas pipeline route alternatives. The northwestern edge of the Paloma Surface of the Perris Plain lies about 1.5 miles (2.5 km) east of the southern termini of the gas pipeline routes, and elevations on that surface there are around 1,500 feet (460 m). Morton and Cox (2001) note that, in this area, the lower-elevation Paloma Surface is mantled with alluvium while the higher Perris Surface is generally characterized by exposed or very thinly mantled bedrock.

8.16.3.2 Geologic Setting

Limited exposures of metamorphic rocks of probable Paleozoic age are present in the project area. These rocks, originally sedimentary in nature, were subject to high-temperature metamorphism during the emplacement of the Mesozoic igneous batholith in this area. They include biotite schist, impure quartzite, marble, and other calc-silicate rocks (Morton and Cox, 2001).

Igneous rocks emplaced in the crust primarily during the Late Mesozoic dominate the basement geology. In the project area, these rocks are of the Peninsular Range Batholith (Morton and Miller, 2003). In most areas they were originally overlain by varying depths of Quaternary alluvium and, in some cases, by artificial fill (ibid.; Morton and Cox, 2001). Rocks of the Peninsular Range Batholith were emplaced during the Cretaceous Epoch, which ended about 64 million years ago. These granitic rocks vary in mineralogical composition and, in the project area, are principally tonalite and granodiorite (Morton and Cox, 2001), represented chiefly by the Val Verde tonalite.

Quaternary (Pleistocene and Holocene) sediments exposed in the project area are primarily alluvial fan deposits issuing from the Box Springs Mountains to the east along the northern portion of the pipeline alternative routes north of Tequesquite Arroyo and the plant site. Older alluvium of less certain provenance lies along the southern portion of the pipeline routes south of the Tesquesquite Arroyo, on the northwest edge of the Perris Plain. Artificial fill and Holocene eolian and sheet wash sediments typically mantle these units. In areas south of Tequesquite Arroyo extensive excavations associated with roadway and housing tract development have removed this alluvium in many places and exposed the underlying Val Verde tonalite.

The project area has been subject to considerable development and, as a consequence, much of the geology is obscured by buildings, pavement, landscaping, and artificial fill. South of the Tequesquite Arroyo deep road cuts reveal primarily extensive exposures of Cretaceous Val Verde tonalite.

8.16.4 Resource Inventory

8.16.4.1 Resource Inventory Methods

A records search and literature review was conducted for this project by the San Bernardino County Museum, the regional repository for paleontological records in this area. It is included as Confidential Appendix 8.16A (Scott, 2005). Subsequent to the receipt of the results of the records search, an initial paleontological field survey of the project area was conducted by Mr. Russel Hasting on February 5, 2005. Mr. Hasting is a trained field paleontologist with more than 4 years of paleontological field experience in California, including other projects licensed by the CEC, such as the Walnut Energy Center. This was followed by a field review of the project area on April 11, 2005, by the project Paleontologic Resource Specialist, Dr. Geoffrey Spaulding. Areas where undisturbed or possibly undisturbed sediments were accessible were walked, while areas where the ground surface was obscured were subject to a windshield survey. Prior to field work and during the preparation of this assessment, the geological literature covering the project area also was consulted.

The potential paleontological productivity of each rock unit in the study area was assessed based on the abundance of fossil remains it has yielded and previously recorded fossil sites it contains in the broader study area of the Inland Empire (Riverside, San Bernardino, and the Perris Plain).

8.16.4.2 Results: Geology and Stratigraphy

8.16.4.2.1 Rocks Lacking or Unlikely To Yield Fossils

The results of the paleontological records review, available geological literature and geologic mapping, and the field surveys were used to determine the nature of the geology and the paleontological sensitivity of the rocks in the vicinity of the project. The study area is largely developed and little of the ground surface is visible. Therefore, greater reliance was placed on the literature and records review than on the negative results of the field surveys.

Paleozoic Rocks

South of Tequesquite Arroyo and west of Chicago Street there are mapped a number of limited outcrops of calc-silicate metamorphic rock of probable Paleozoic age (Morton and Cox, 2001). Other Paleozoic calc-silicate rocks and schists intermixed with Cretaceous granitic rocks also outcrop within one mile (1.6 km) of the southern portion of the pipeline routes.

These rocks were extensively altered by metamorphism during the emplacement of the adjacent Mesozoic granitic batholiths. Due to their highly metamorphosed nature, the probability of recovering fossils from these rocks is extremely remote. Therefore, they possess low paleontological potential.

Mesozoic Rocks

Crystalline igneous rocks of the Val Verde pluton and the Box Springs plutonic complex comprise the Mesozoic igneous suite in the project area. From their southern termini the gas pipeline extends north over the Cretaceous Val Verde tonalite until about the position of the Tequesquite Arroyo. Heterogeneous porphyritic granodiorites of the Box Springs plutonic complex comprise the ridge extending west from Sugar Loaf Mountain, immediately to the east of the project area. Porphyritic granodiorite also comprises the proximal portion of the La Loma Hills to the west and northwest of the plant site.

Although igneous volcanic rocks (chiefly volcanic ash and volcanic debris flow deposits) may occasionally yield fossil materials, these plutonic rocks represent molten material that cooled at depth beneath the earth's crust. Plutonic igneous rocks, therefore, do not contain fossils and therefore possess no paleontological potential.

Artificial Fill

Artificial fill is mapped by Morton and Cox (2001) between Chicago Avenue and Canyon Crest Drive, south of Tequesquite Arroyo. This fill is associated with residential development of the generally steep terrain descending from the Perris Plain and Box Springs Mountains to the Santa Ana River Valley. Field review revealed that artificial fill is widespread elsewhere in the study area south of Tequesquite Arroyo. In areas north of the arroyo, agricultural activities and urban development in the Riverside area have resulted in the deposition of variable thicknesses of disturbed sediments and artificial fill.

Artificial fill could have fragmentary fossil material transported from other sites. Even if such were the case, this material would be out of stratigraphic context and, therefore, have no scientific value and minimal, if any, educational value due to its lack of context and fragmentary nature. Therefore, artificial fill has low paleontological potential.

8.16.4.2.2 Potentially Fossiliferous Sediments

The results of the field survey indicate that the surficial geology of much of the plant site and the gas pipeline route alternatives is obscured by industrial, urban and residential development, and by agricultural activities. Therefore, geological maps were the primary source used to determine the extent of potentially fossiliferous sedimentary units in the project area.

Although alluvial fan deposits are generally thought to be subaerial, coarse-grained sediments deposited in a high-energy regime with consequently low paleontological sensitivity, experience in the study area has shown that certain facies of these alluvial units yield important vertebrate fossils (see below). Other sedimentary rocks, such as the highly fossiliferous San Timoteo Formation found farther east in the San Jacinto Valley, are not known to be present in the project area (Morton and Cox, 2001; Morton and Miller, 2003; Scott, 2005).

Early to Middle Pleistocene Alluvium

Older alluvium of probable Early to Middle Pleistocene age occurs intermittently through the study area (Morton and Cox, 2001; and Morton and Miller, 2003). Outcrops are mapped primarily south of Tequesquite Arroyo, and along the western piedmont of the Box Springs Mountains. It also underlies the general vicinity of the plant site. It is well-oxidized and indurated, and commonly contains local duripans and silcretes indicative of soil formation processes in a more humid climatic regime than the semi-arid climate typical of the area today. Morton and Miller (2003) note that alluvial clasts in the La Loma Hills were transported from the San Gabriel Mountains, suggesting that some of these older alluvial units may have originated from more distant sources than the Box Springs Mountains.

Middle to Late Pleistocene Alluvium

Younger alluvial fan deposits extending west and northwest from the Box Springs Mountains to the Santa Ana River Valley are mapped by Morton and Cox (2001) and Morton and Miller (2003) as Middle to Late Pleistocene in age. These deposits occur north of the Tequesquite Arroyo. They are usually indurated and oxidized, but neither the degree of induration nor the reddening of these sediments is as strongly developed as the older Pleistocene alluvium.

Late Pleistocene to Holocene Alluvium

The youngest alluvial deposits in the study area are usually restricted to well-defined drainages and arroyos extending west from the topographic high represented by the Box Spring Mountains. In contrast to the oxidized soils of the older alluvial units, there is little to no evidence of reddening in these sediments and their color is buff to gray. They are often somewhat consolidated, but are rarely indurated to the degree exhibited by the older alluvium. Late Pleistocene alluvium, as well as the older alluvial units, is commonly blanketed by middle to late Holocene eolian and sheet wash sediments. In areas of low relief, this Holocene overburden can reach a depth of up to 15 feet (4.6 m) and, normally, attains a depth of at least 5 feet (1.5 m) (e.g., Onken, 2001).

8.16.4.3 Results: Paleontological Resources

The paleontological resources records review conducted for this project encompassed an area extending 9 miles (14.7 km) in all directions from the proposed pipeline routes and the plant site (Confidential Appendix 8.16A). No previously recorded fossil sites have been documented within the footprint of the plant site or of the alternate gas pipeline routes. No previously recorded fossil site occurs within 4 miles of the project area. The majority of vertebrate and paleobotanical sites recorded in this search area are from the highly fossiliferous San Timoteo beds of Frick (1921), which are assigned a Plio-Pleistocene age. The closest outcrops of the San Timoteo beds lie approximately 3.6 miles (5.9 km) east of the plant site along the San Jacinto Fault Zone, where local tectonic uplift has exposed these sediments (Morton and Miller, 2003).

No paleontological resources were identified in the course of the field survey. The underlying geology of most of the project area, including the proposed pipeline and alternative routes, is obscured by development, vegetation, and Holocene or artificial overburden.

8.16.4.3.1 Paleontological Sensitivity of Paleozoic and Mesozoic Rocks

The Paleozoic and Mesozoic rocks in the study area are either highly metamorphosed, or are igneous in origin. No fossils have been recorded for these rocks, and none are expected in the project area. Therefore, these rocks are assigned a Low Sensitivity rating for paleontological resources.

8.16.4.3.2. Paleontological Sensitivity of Pleistocene (Irvingtonian and Rancholabrean) Sediments

At least three different-age alluvial units are recognized in the project area, and they range in age from Early Pleistocene to Late Pleistocene and Holocene. There is no record of these specific geologic units having yielded fossils in the immediate vicinity of the project, but similar alluvial sediments elsewhere in the area have yielded rich records of primarily Rancholabrean fauna and flora. These finds have varied in depth from about 13 feet (4 m) below original ground surface, to greater than 437 feet (133 m) below ground surface, and have come to light mainly as a result of construction-related excavations (Reynolds and Reynolds, 1991; Springer et al., 1998, 1999). They include records of saber-tooth cat (*Smilodon fatalis*), mammoth (*Mammuthus columbi*), mastodon (*Mammut americanum*), horse (*Equus* spp.), camel (*Camelops hesternus*), and other members of the extinct Pleistocene megafauna that used to inhabit these valleys. Paleobotanical remains that have been recovered from these sediments include logs of juniper or cedar (Cupressaceae), the seeds and cone scales of ponderosa pine (*Pinus ponderosa*), and the seeds and fruit of manzanita species (*Arctostaphylos* spp.). These plant species now occur only at higher elevations in the surrounding mountains

Because of the abundant and significant fossil material that has been recovered from Pleistocene alluvium in the region, these sediments are assigned a High Sensitivity rating for paleontological resources.

8.16.4.3.3. Paleontological Sensitivity of Holocene Sediments and Artificial Fill

Throughout the area, Holocene sediments occur as a mantle over older alluvium, and normally consist of carbonate-rich eolian silts and fine sands, and sheet wash debris. A distinct unconformity and soil usually separates these sediments from underlying Pleistocene sediments. Significant paleontological resources have not been recovered from Holocene-age sedimentary units in the region. Holocene sediments are, therefore, assigned a Low Sensitivity rating for paleontological resources. However, some of the Late Pleistocene age fossil finds in the region have been dated by radiocarbon and are as young as 13,000 to 14,000 years, placing them only 3,000 to 4,000 years older than the Pleistocene/Holocene boundary. Therefore, monitoring of excavations of these sediments should take place if a reasonable probability exists that construction would disturb underlying Pleistocene deposits.

While artificial fill may contain fragmentary fossil material, that material would be out of stratigraphic context and, therefore, of no scientific value. Similarly, the educational value of any fragmentary material recovered from artificial fill would be minimal. Consequently, this soil is assigned a Low Sensitivity rating for paleontological resources. However, like Holocene units, monitoring of excavations of artificial fill should take place if there is a reasonable probability that construction would disturb underlying Pleistocene deposits.

8.16.5 Impacts

Impacts to paleontological resources from construction and operation of the AES Highgrove facility are evaluated in the following subsections.

8.16.5.1 Discussion of Impacts

8.16.5.1.1 Paleontological Resource Significance Criteria

In its standard guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) established three categories of sensitivity for paleontological resources: high, low, and undetermined. The paleontological importance or sensitivity of a stratigraphic unit reflects: (1) its potential paleontological productivity (and thus sensitivity), and (2) the scientific significance of the fossils it has produced. The potential paleontological productivity of a stratigraphic unit exposed in a project area is based on the abundance of fossil specimens and/or previously recorded fossil sites in exposures of that unit in or near that project site. The underlying assumption of this assessment method is that exposures of a stratigraphic unit are most likely to yield fossil remains in quantity (and quality) similar to those previously recorded from that unit.

An individual fossil specimen is considered scientifically important and significant if it is: (1) identifiable, (2) complete, (3) well preserved, (4) age diagnostic, (5) useful in paleoenvironmental reconstruction, (6) a type or topotypic specimen, (7) a member of a rare species, (8) a species that is part of a diverse assemblage, and/or (9) a skeletal element different from, or a specimen more complete than, those now available for that species (SVP, 1995). For example, identifiable land mammal fossils are considered scientifically important because of their potential use in providing age determinations and paleoenvironmental reconstructions for the sediments in which they occur. Moreover, vertebrate remains are comparatively rare in the fossil record. Although fossil plants are less frequently considered to be significant fossils, as sessile (attached in place) organisms they are actually more sensitive indicators of their environment and, thus, more valuable than mobile mammals for paleoenvironmental reconstructions.

Under SVP (1995) standard guidelines, stratigraphic units in which fossils have been previously found are deemed to have a high sensitivity and a high potential to produce additional fossils. In areas of high sensitivity, full-time monitoring by a professionally trained paleontologist is recommended during any project ground disturbance. Stratigraphic units that are not sedimentary in origin or that have not been known to produce fossils in the past are deemed to have low or undetermined sensitivity and monitoring is usually not recommended nor needed during project construction in these units. Stratigraphic units that have not had any previous paleontological resource surveys or fossil finds are deemed undetermined until surveys and mapping are done to determine their sensitivity. After reconnaissance surveys, observation of exposed strata, and possibly subsurface testing, a qualified paleontologist can usually determine whether the stratigraphic unit should be categorized as having high, low, or undetermined sensitivity; that is, whether there is a high, low, or undetermined potential to encounter fossil resources during construction. In keeping with the significance criteria of the SVP (1995), all vertebrate fossils are categorized as being of significant scientific value and all stratigraphic units in which vertebrate fossils have previously been found have high sensitivity. According to SVP (1995) standard guidelines, sensitivity comprises both: (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or botanical; and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, or stratigraphic data.

Using the criteria of the SVP (1995), the significance of the potential adverse impacts of earthmoving on the paleontological resources of each stratigraphic unit exposed in and near the project site was assessed, including the proposed gas pipeline route and alternatives. The paleontological sensitivity of the stratigraphic unit in turn reflects the potential for fossil remains and fossil sites being encountered during earthmoving. However, it should be noted that any impact on a fossil site or a fossil-bearing rock unit during construction would be considered significant, regardless of the previously determined paleontological importance of the rock unit in which the site or fossiliferous layer occurs. For example, grading in an area underlain by a rock unit with low sensitivity would have only a low potential to disturb fossil remains (i.e., the rock unit would have low sensitivity to adverse impacts). However, the loss of any fossil remains from that rock unit would be a significant impact.

8.16.5.2 Paleontological Resource Impact Assessment

No impacts to non-renewable paleontological resources would occur from operation of the proposed AES Highgrove facility or associated gas pipeline. Impacts to paleontological resources would only occur from construction-related excavations that would be sufficiently deep to affect sediments possessing high paleontological sensitivity. Based on prior detailed geomorphologic investigations on the Perris Plain (Onken, 2001), the depth below which paleontologically sensitive sediments (if present) have the potential to be disturbed is considered to be the minimal depth of the Holocene overburden, or about 5 feet (1.5 m) below original ground surface.

Significant impacts to paleontological resources would occur from construction-related excavations at depth greater than 5 feet at the plant site to the extent that those excavations would disturb underlying Pleistocene alluvium, which is mapped as occurring in the area. Similarly, significant impacts would occur from trenching along the gas pipeline route in those areas that are underlain by Pleistocene alluvium, primarily north of Tequesquite Arroyo.

No significant impacts to paleontologic resources would occur from trenching along the pipeline route in those areas underlain by Paleozoic metamorphic rocks, by Mesozoic granitic rocks, or by artificial fill. These areas occur primarily south of Tequesquite Arroyo.

Site grading at depths of less than 5 feet below original ground surface is not expected to result in significant adverse impacts to paleontological resources, as the ground surface in the area is already relatively flat, is covered by Holocene overburden, and has already been disturbed by previous construction activities. Support activities such as the emplacement of temporary construction offices, proposed laydown area(s), and parking areas, are also expected to have no significant adverse impact on paleontological resources, as they also would be located on ground previously disturbed and will not involve ground disturbance at depths greater than 5 feet (1.5 m). However, deeper excavations for foundations, pipelines and conduits, and drainage basins, as well as trenching for the gas pipeline, would impact paleontologically sensitive sediments, and therefore, result in adverse impacts to paleontological resources.

8.16.6 Mitigation

8.16.6.1 Proposed Mitigation Measures

This section describes Applicant-proposed mitigation measures that would be implemented to reduce potential adverse impacts to significant paleontological resources resulting from construction of the power generation facility and gas pipeline. These proposed paleontological resource mitigation measures would reduce to an insignificant level the direct, indirect, and cumulative adverse impacts to paleontological resources that would result from project construction. The mitigation measures proposed below are in compliance with CEC environmental guidelines (CEC, 2000) and with SVP standard guidelines for mitigating adverse construction-related impacts on paleontological resources (SVP, 1995; 1996).

8.16.6.1.1 Paleontological Monitoring

During construction, earthmoving construction activities will be monitored where these activities occur at a sufficient depth and in a paleontologically sensitive geological unit and, therefore, would potentially disturb previously undisturbed sediment. Monitoring of surface grading and other activities at depths less than 5 feet (1.5 m) below the original ground surface is not proposed. These shallow activities have minimal probability to disturb paleontologically sensitive sediments. Monitoring will not be conducted in areas of artificial fill, in areas immediately underlain by metamorphic and igneous rocks, and in areas where exposed sediment will be buried but not otherwise disturbed.

8.16.6.1.2 Paleontological Resource Monitoring and Mitigation Plan

Prior to construction, a qualified paleontologist will be retained to design and implement a paleontological resources monitoring and mitigation program (PRMMP). The PRMMP will include a description of where and when construction monitoring will be required; emergency discovery procedures including avoidance of discovered resources; sampling and data recovery protocol; preparation, identification, and museum curation of any fossil specimens and data recovered; preconstruction coordination; worker education; and reporting.

This PRMMP will be consistent with SVP standard guidelines for the mitigation of construction-related adverse impacts on paleontological resources (SVP, 1995), as well as the requirements of the designated museum repository for any fossils collected. The Division of Geological Sciences of the San Bernardino County Museum in Redlands is the regional repository for recovered paleontological specimens.

Scientific recovery, preparation, identification, determination of significance, and curation into a public museum is considered by most land management agencies and by the SVP (1995) to adequately mitigate impacts to paleontological resources in most circumstances. Therefore, the implementation of these mitigation measures would reduce potentially significant adverse environmental impact of project-related ground disturbance on paleontological resources to an insignificant level by allowing for the recovery of fossil remains and associated specimen data, and corresponding geologic and geographic site data, that otherwise would be lost. With a well-designed and implemented PRMMP, project construction could actually result in beneficial impacts through the possible discovery of fossil remains that would otherwise not have been exposed without project construction and, therefore, would not have been known to science. The identification and analysis of fossil remains discovered on other projects in this area have helped answer important questions regarding the paleobiogeography, paleoecology, stratigraphy, and age of fossiliferous sediments in the Riverside region (e.g., Springer et al., 1998, 1999).

8.16.6.1.3 Construction Personnel Education

Prior to start of construction, construction personnel involved with earthmoving activities will be given a worker education briefing providing them with information that: fossils may be encountered, the appearance of fossils, and proper avoidance and notification procedures. This worker training will be prepared and presented by a qualified paleontologist.

8.16.6.2 Significant Unavoidable Adverse Impacts

Because potential impacts on paleontological resources resulting from construction of the AES Highgrove facility can be mitigated to an insignificant level, the proposed project would not cause significant unavoidable adverse impacts as defined by CEQA.

8.16.6.3 Cumulative Impacts

Disturbance or destruction of paleontological resources during project excavation has the potential to contribute to cumulative impacts. Impacts from this and other projects that may take place in the reasonably foreseeable future could cumulatively result in significant, adverse impacts to paleontological resources. These impacts would include the destruction of nonrenewable paleontological resources as a consequence of disturbance by earthmoving, and the consequent loss of their scientific data and educational potential.

However, the potential cumulative impacts to paleontological resources during project-related ground disturbance would be low as long as the mitigation measures proposed above are fully-implemented to: recover the resources, ensure they are identified, have their significance determined, have a written report is prepared, and ensure they are curated into a public museum. When properly implemented, the mitigation measures proposed above would effectively recover the value to science of any significant fossils discovered during project construction. Thus, with mitigation the proposed project would not cause or contribute to significant cumulative impacts to paleontological resources.

8.16.6.4 Project Conformity

Development and implementation of these monitoring and mitigation measures will maintain conformity with the LORS identified in Section 8.16.2.

8.16.7 Involved Agencies and Agency Contacts

There are no state or local agencies having specific jurisdiction over paleontological resources. However, in San Bernardino County, the Division of Geological Sciences of the San Bernardino County Museum maintains an active paleontological resources mitigation program, and acts on behalf of the County on issues dealing with paleontological resources mitigation and management. The CEQA lead agency having specific responsibility to ensure that paleontological resources are protected in compliance with CEQA and other applicable statutes during construction of the AES Highgrove facility is the CEC. California Public Resources Code Section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the CEQA lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process.

8.16.8 Permits Required and Permit Schedule

No state or local agency requires a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earthmoving on private or public lands, except for federal lands. Removal of paleontological resources from federal lands requires a Cultural Resource Use Permit from the Bureau of Land Management. However, since no federal lands are involved in this project, no permits will be required.

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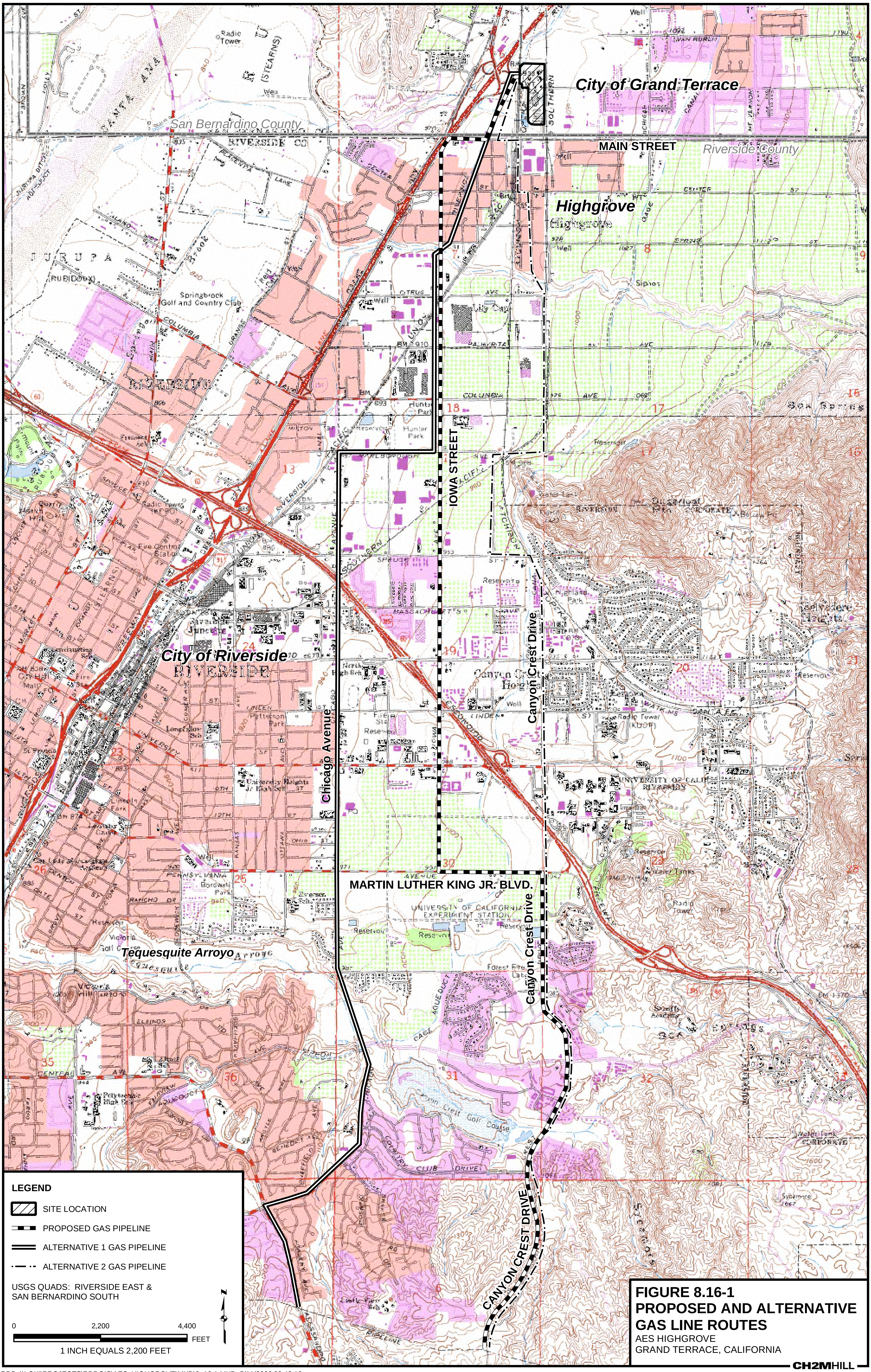

FIGURE 8.16-1
PROPOSED AND ALTERNATIVE GAS LINE ROUTES
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

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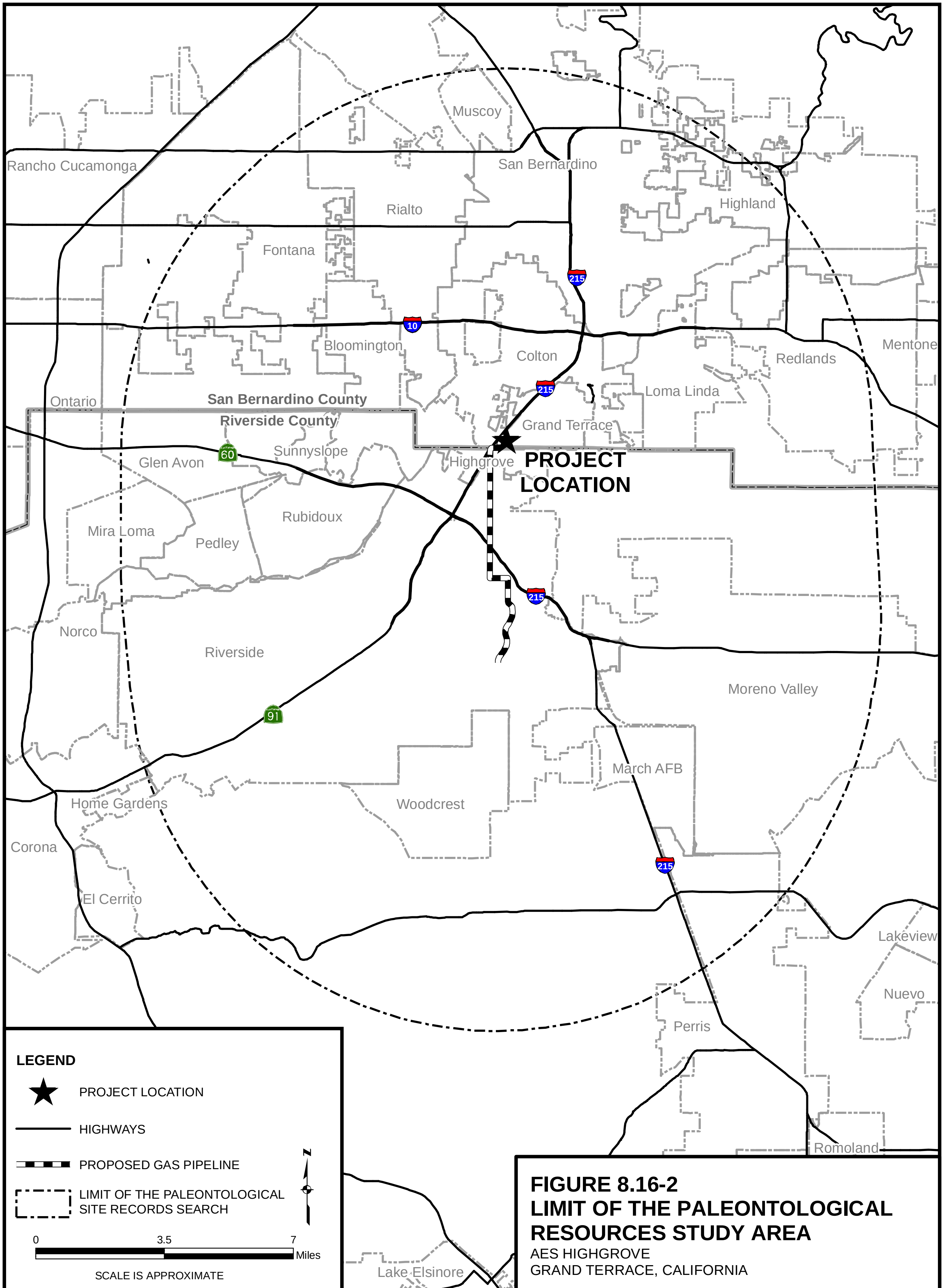

FIGURE 8.16-2
LIMIT OF THE PALEONTOLOGICAL RESOURCES STUDY AREA
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

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SECTION 9.0

Alternatives

9.1 Introduction

The California Environmental Quality Act (CEQA) requires consideration of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives" [14 CCR. 15126.6(a)]. Thus, the focus of an alternatives analysis should be on alternatives that "could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects" [14 CCR 15126.6(c)]. The CEQA Guidelines further provide that "[a]mong the factors that may be used to eliminate alternatives from detailed consideration in an EIR are: (i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts" (*Id*.).

A range of reasonable alternatives that could feasibly attain most of the basic objectives of the proposed AES Highgrove Project are identified and evaluated in this section. These include:

- The "No Project" alternative (that is, not developing a new power generation facility and not demolishing the existing Generating Station equipment);
- Alternative site locations for constructing and operating the Highgrove Project within the historic property boundaries of the SCE Highgrove Generating Station;
- Alternatives routes for the natural gas line;
- Alternative water supply sources; and
- Alternative generation technologies.

9.2 Project Objectives

AES has identified several basic objectives for the development of a power project. These objectives include:

- To construct and operate a nominal 300-MW, natural-gas-fired, simple-cycle generating facility specifically designed to serve peak electricity demand in the Southern California region.
- To remove an existing 1950s-vintage steam generator power plant and replace the existing plant with a state of the art peaking facility at a location already adapted to power plant operations.
- To provide competitively-priced peak load electricity for sale to electric service providers, which may result in savings that can be passed along to ratepayers.

- To construct a facility at an AES-owned or controlled property to capitalize on existing AES resources and establish community goodwill by removing the aging power plant.
- To help meet expected electrical demand growth in Southern California, including rapidly growing portions of San Bernardino and Riverside counties.
- To generate power at a location near the electric load, increasing reliability of the regional electricity grid and reducing regional dependence on imported power.
- To safely produce electricity and to do so without creating significant environmental impacts.

9.3 No Project Alternative

9.3.1 Description

If the No Project alternative is selected, AES would not receive authorization to construct and operate a new power generation facility and the existing plant would not be removed. Electricity required for local reliability and peaking requirements that would have been produced by the Highgrove Project would need to be generated by another source and/or imported to southern California. If the project is not constructed, alternative peak load sources include older power generation facilities that may operate less efficiently and may result in greater environmental impacts than the proposed facility.

The State of California has projected a shortfall in peak load power supply for the Southern California region. The No Project Alternative would not assist the State in meeting this projected peak load demand. The No Project Alternative does not meet the objectives to produce efficient cost-competitive electricity that will increase grid reliability and reduce dependence on imported power.

9.3.2 Potential Environmental Impacts

Potential environmental impacts from the No Project alternative would include continued degradation of local visual resources by not removing the existing, aging power plant. The No Project alternative would also result in the loss of a substantial new local property tax revenue source and other local economic benefits that would be created by the construction and operation of the Highgrove Project. In addition, the No Project alternative could result in greater fuel consumption and air pollution if older, less-efficient plants with higher air emissions are used to meet future peak demand that could be provided by the proposed Highgrove Project. Other insignificant environmental impacts that may be attributed to the Highgrove Project if constructed would not occur with the No Project Alternative.

9.4 Proposed and Alternative Sites

9.4.1 Alternative Site Selection Criteria

The Highgrove Project is a repowering of the existing old and inefficient power plant. The Project Site is the location of the former SCE Highgrove Generating Station and consists of a portion of the former Tank Farm Property and a portion of the existing Generating Station

Property. Demolition and removal of the existing generating equipment on the Generating Station Property and removal and relocation of the Highgrove Substation Controls to SCE's adjacent Highgrove Substation are activities integral to construction of the proposed project. Construction of the new project on the preferred site will capitalize on the close proximity to the Highgrove Substation, allowing the transmission interconnection to be constructed "onsite."

As consistent with Public Resources Section 25540.0 (b), evaluation of alternative sites is not required when a natural gas-fired thermal power plant is proposed for development at an existing industrial site and the project has a strong relationship to the existing industrial site. The former SCE Highgrove Generating Station site, which included both the Generating Station Property and the Tank Farm Property has an industrial zoning designation and since the 1950's has been used only for industrial activity. Because of the proximity to the existing Highgrove Substation and the property's former use for power plant operations, alternative sites that did not include former SCE Highgrove Property were not considered. Therefore, alternative sites considered for the proposed facility were those within the boundaries of the existing industrial use instead of alternative sites outside the former SCE Generating Station property boundaries.

According to Public Resource Code 25540.6 (b), evaluation of alternative sites is not required when a natural gas-fired thermal power plant is proposed for development at an existing industrial site and "the project has a strong relationship to the existing industrial site. The former SCE Highgrove Generating Station site, which included both the Generating Station Property and the Tank Farm Property has an industrial zoning designation and since the 1950s has been used only for industrial activity. Because of the proximity to the existing Highgrove Substation and the properties' former use for power plant operations, alternative sites that did not include former SCE Highgrove operations were not evaluated as alternatives.

In accordance with Public Resources Section 25540.0 (b) and in compliance with the key project objective to remove the existing 1950s-vintage steam generator power plant and construct a state-of-the-art peaking power generating facility at a location already adapted to power plant operations, only two properties warranted further consideration: the Generating Station Property and the Proposed Project Site.

9.4.2 Properties Considered

9.4.2.1 Generating Station Property

The Generation Station Property is an approximately 10-acre parcel that contains the power plant buildings and structures of the former SCE Highgrove Generating Station constructed in the 1950s. The site is located on Taylor Street about 300 feet north of Main Street. The Generating Station Property contains four large cooling tower structures on the southern end of the site, generating equipment in the center of the site, and an administration building/control room at its northern end (see Figure 9.4-1). The existing Generating Station is currently idle. The former oil "Tank Farm," which previously contained several large oil storage tanks, is located north of the Generating Station Property. Cage Park Property, a private park formerly used by SCE employees, borders the Generating Station property on the south.

9.4.2.2 Proposed Project Site

The proposed site for the Highgrove Project is a 9.8-acre parcel that is comprised of the Tank Farm Property and a small portion of the Generating Station Property.

The Tank Farm Property portion of the proposed site encompasses the northernmost 7.6 acres of the Project Site. At one time, three large storage tanks were located on the Tank Farm Property to store fuel oil for the existing power plant. The oil storage tanks were originally constructed approximately 10 feet below grade inside bermed areas. The fuel oil tanks were later removed from the Tank Farm Property by SCE. The Tank Farm Property is currently vacant; the berms that surrounded the oil storage tanks remain.

A parcel split and lot line adjustment will be completed prior to construction of the new facility; the 9.8-acre Project Site parcel is shown in Figure 9.4-1.

9.4.3 Environmental Considerations

In this section, the potential environmental impacts of the two sites considered are discussed in comparison to each other. The No Project alternative is also analyzed. Potential environmental impacts from use of the proposed site are presented in more detail in the 16 environmental subsections of Section 8 of this Application for Certification (AFC). Table 9.4-1 summarizes the impacts of the alternative site in comparison to the proposed site. Unless otherwise stated, it is assumed that the No Project alternative would not provide the beneficial outcomes of the project, would not meet the basic project objectives of the Applicant, and would not result in the impacts associated with the project.

TABLE 9.4-1
Summary Comparison of Environmental Effects Between the Alternative Sites that were Considered

Resource	Proposed Project Site	Generating Station Property
Air Quality	Given the design of the project, air impacts would be expected to be less than significant.	No difference.
Biological Resources	This industrial site is developed with no habitat value. No biological impacts are expected.	No difference.
Cultural Resources	There is insignificant cultural resources sensitivity at the proposed site.	No difference.
Land Use	The site is zoned Industrial (M2). The parcel configuration allows construction of the Proposed Project with greater setback from and less frontage on Taylor Street.	Greater Land Use Impact. The site is also zoned Industrial (M2). The parcel configuration would result in less setback from Taylor Street. In addition, this parcel has greater frontage on Taylor Street.
Noise	The Proposed Project Site is located further from sensitive residential areas. The plant's noise level at the nearest residence is projected to be about 52 dBA. This site is located further from other noise sensitive uses.	Greater Noise Impact. The site would be closer to sensitive residential areas. The plant's noise level at the nearest residence is projected to be about 56 dBA. This site is located closer to other noise sensitive uses.
Public Health	Given the design of the project, public health impacts are expected to be insignificant.	No difference.
Agriculture and Soils	Agricultural and soil erosion impacts would be insignificant.	No difference.

TABLE 9.4-1
Summary Comparison of Environmental Effects Between the Alternative Sites that were Considered

Resource	Proposed Project Site	Generating Station Property
Traffic and Transportation	No significant impacts on traffic and transportation are expected.	No difference.
Visual Resources	Impacts to Visual Resources would be insignificant. Demolition of the existing power plant represents an aesthetic improvement for the community. The project will be constructed approximately 10 feet below street grade and with greater setback from Taylor Street, reducing visual impacts from Taylor Street.	Impacts to Visual Resources would be insignificant. Demolition of the existing power plant represents an aesthetic improvement. Because the project would be closer to Taylor Street and constructed at grade, however, it would have a greater visual profile along Taylor Street.
Hazardous Material Handling	Hazardous materials impacts would be insignificant.	No difference.
Waste Management	There are no significant waste management impacts.	No difference.
Water Resources	Water supply and disposal impacts would be insignificant.	No difference.
Geologic Hazards	No known natural resources occur at the site and the project will be designed and constructed to withstand ground-shaking. Thus, geologic impacts are expected to be less than significant.	No difference.
Paleontological Resources	With mitigation, the impact on paleontological resources is expected to be less than significant.	No difference.

9.4.3.1 Air Quality

The plant's configuration and operation would be essentially the same from an air quality perspective at both locations. The type and quantity of air emissions from the sites would be identical. However, the impacts on the human population and the environment may differ very slightly because of the location of residences and other human uses in the project vicinity. Since the sites are adjacent to each other, they are in the same air basin and offsets acquired by the Applicant would be equally appropriate for both sites. Impacts of the project to air quality are insignificant and are discussed in Subsection 8.1, Air Quality.

9.4.3.2 Biological Resources

As the two sites are urban—developed sites with little biological habitat value—the potential biological impacts associated with the development of a power plant on each of these sites would be similar. Special-status species that are recorded, or that potentially occur in the region, are the same for both sites. Both sites are within the potential habitat range of the Swainson's hawk (a California threatened species), Western burrowing owl (a federal and California species of concern); California horned lark and tricolored blackbird (both California species of concern); Coastal California gnatcatcher (a federally threatened species and California species of concern); and Least Bell's vireo (a California and federally endangered species). As with the Tank Farm Property site, the Generating Station Property is located within an industrial zone (with little to no habitat for special status species), is developed (having the ground covered by either gravel or asphalt), and has no natural biological habitat. Construction of the project on either site will not directly affect threatened or endangered species. Impacts of the project on biological resources are insignificant and are discussed in Subsection 8.2, Biological Resources.

9.4.3.3 Cultural Resources

Both sites have the same cultural sensitivity. They are in an area that has been highly disturbed by past industrial operations. A record search of the area in San Bernardino County was performed by staff of the Archaeological Information Center, which reported four archaeological sites and four isolated finds located within one mile of the plant site. No sites were reported within the plant site area of potential effects. Eleven individual investigation reports have been filed in the CHRIS archives for the portion of the project area lying within San Bernardino County. Impacts of the project on cultural resources are insignificant and are discussed in Subsection 8.3, Cultural Resources.

9.4.3.4 Land Use

Both sites are located in the City of Grand Terrace and zoned industrial (M2). Therefore, development of the project on either parcel would conform to the zoning and general plan requirements. Impacts of the project on land use are insignificant and are discussed in Subsection 8.4, Land Use.

9.4.3.5 Noise

Both sites are located within an urban area with a noise environment influenced by freeway and rail traffic. Noise levels attributable to the project at the Proposed Site are not expected to result in significant impacts to sensitive receptors. Construction of the project on the Generating Station Property would place noise-emitting sources closer to sensitive receptors resulting in predicted noise levels approximately 4 dBA higher at the closest sensitive receptor. Impacts of the project’s noise levels are insignificant and are discussed in Subsection 8.5, Noise.

9.4.3.6 Public Health

Both sites are located in an industrial area of Grand Terrace, with nearby industrial, commercial, and residential uses. The sites are considered approximately the same with respect to this environmental resource. Impacts of the project on public health are insignificant and are discussed in Subsection 8.6, Public Health.

9.4.3.7 Agriculture and Soils

The Tank Farm Property and the Generating Station Property are located in urban, developed areas with no agricultural resources. The sites are on land that was previously developed for industrial uses. Furthermore, the soil conditions are expected to be comparable. No agricultural land will be removed from production and best management practices will be employed at either site to reduce soil erosion during construction. Impacts of the project on agriculture and soils are insignificant and are discussed in Subsection 8.9, Agriculture and Soils.

9.4.3.8 Traffic and Transportation

Both sites are located between two railroad lines. They are bounded by two local streets (Main and Taylor), with Interstate 215 (I-215) located to the north and west of the site. Since the sites all use the same system of roads and highways, the impacts due to construction and operation of a power plant at these sites are considered the same. Impacts of the project on traffic and transportation are insignificant and are discussed in Subsection 8.10, Traffic and Transportation.

9.4.3.9 Visual Resources

Since the parcels are adjacent, the potential for visual resource impacts associated with each of the sites would be similar. Construction of the project at the Project Site (below grade and with a greater setback from Taylor Street) would reduce its visual profile. The major features of the facility would be more prominent and more visible from Taylor Street if the project is constructed on the Generating Station Property.

Development of the project at either location would result in the removal of the existing generating station, which is considered an eyesore. The existing generating station would be replaced with a new modern facility and new landscaping. Impacts of the project on visual resources are considered insignificant and are discussed in Subsection 8.11, Visual Resources.

9.4.3.10 Hazardous Materials Handling

The same quantity of hazardous materials would be stored and used at both sites. Since the Project Site and the Generating Station Property are adjacent, the impacts from hazardous materials handling would be insignificant at both sites. An evaluation of the handling and storage of hazardous materials at the Project Site is discussed in Subsection 8.12, Hazardous Materials.

9.4.3.11 Waste Management

The same quantity of waste will be generated at either site. Also, the environmental impact of waste disposal would not differ between locations. The impacts of the project on waste management are considered insignificant and are discussed in Subsection 8.13, Waste Management.

9.4.3.12 Water Resources

Both sites are adjacent to each other and share similar features from a water resources perspective. Water resource impacts would be insignificant at both locations. A discussion of the potential effects of the project on water resources is contained in Subsection 8.14, Water Resources.

9.4.3.13 Geologic Hazards and Resources

Since the sites are adjacent to each other, design of the plant at either location would incorporate features to withstand potential seismic events. The impacts of the project on geologic hazards are considered insignificant and are discussed in Subsection 8.15, Geologic Hazards and Resources.

9.4.3.14 Paleontological Resources

Both sites are located on previously disturbed industrial property. Based on prior detailed geomorphologic investigations on the Perris Plain, the depth below which paleontologically sensitive sediments (if present) have the potential to be disturbed is considered to be the minimal depth of the Holocene overburden, or about 5 feet (1.5 meters) below original ground surface. With mitigation, the impacts to paleontological resources are considered to be insignificant and are discussed in Subsection 8.16, Paleontological Resources.

9.5 Selection of the Proposed Site

As described above, both sites have very similar environmental effects. The Proposed Site is preferred over the Generating Station Property because the plant can be constructed on the Proposed Site below grade and with greater setback from Taylor Street, reducing the project's visual profile and reducing noise levels predicted at sensitive receptors.

9.6 Process Water Supply

The CEC studied use of water for power plant cooling in its 2003 Integrated Energy Report Proceeding. The proceeding produced the following policy:

> Consistent with the Board Policy[1] and the Warren-Alquist Act, the Energy Commission will approve the use of fresh water for cooling purposes by power plants which it licenses only where alternative water supply sources and alternative technologies are shown to be "environmentally undesirable" or "economically unsound". (2003 IEPR, page 41)

The most relevant and primary underpinning of this section of the 2003 IEPR is State Water Resources Control Board Policy 75-58 (Policy 75-58). In order to comply with the 2003 IEPR Policy, an extensive evaluation of all potential water supply sources that are available now or may be available in the future was conducted (see Figure 9.6-1 for locations of water supply sources considered). The following describes the results of the search for available recycled and other potential non-fresh water sources. The use of potable water from Riverside Highlands Water Company was not considered to be a feasible source of supply for the project.

From a cooling water perspective, two features distinguish the proposed project from a typical power plant facility. First, as a peaking facility, operation will occur only during periods of peak demand and will be intermittent; thus, there may be long periods of time during which the facility will not operate. Second, because the peaking facility is only expected to operate 15 to 30 percent on an annual basis, and the cooling water is used for gas turbine intercooling, the water consumption resulting from the cooling process is significantly less than that required by a combined-cycle plant. Thus, the review of water supply alternatives was conducted with the objective of evaluating sources suitable for supplying a peaking facility with a flexible operating profile, which may include long

[1] This reference is to SWRCB Policy 75-58.

periods of time when the plant does not operate. Consideration of the following key factors was used to assess the alternatives:

- Type/source of water (including recycled or "impaired" water)
- Quantity available (peak and average)
- Water quality (i.e., variability, impact on plant metallurgical requirements, impact on discharge limitations, pre-treatment requirements)
- Water provider's commitments to serve others
- Jurisdictional constraints/ability to serve
- Environmental impacts associated with construction of new infrastructure
- Economic considerations

Our evaluation concluded that there is no existing recycled water program to serve recycled water to industrial users by Riverside Highland Water Company (RHWC), the water purveyor that serves Grand Terrace. Further, while there are a number of initiatives underway to expand recycled water service in the larger Santa Ana region, there are no current plans to serve recycled water to the City of Grand Terrace. Therefore, in order for the project to obtain recycled water, it would have to contract separately with an agency that operates a wastewater treatment plant. An evaluation of all wastewater treatment facilities within the area has concluded that there are no plants with existing facilities to serve the site or plans to construct such facilities.

In addition, alternate sources of impaired water were considered. While a potential source of impaired water has been located, the analysis was unable to confirm the viability of this source at this time. A detailed discussion of alternative water sources evaluated is provided below.

9.6.1 Recycled Water

The Highgrove Project is currently in the service territory of the RHWC. RHWC provides potable and non-potable irrigation water for the City of Grand Terrace and unincorporated areas of the County of Riverside through the operation of 13 operating wells. RHWC does not currently provide recycled water service: wastewater treatment and disposal services for the City of Grand Terrace are currently managed through a joint agreement with the City of Colton. A discussion of RHWC's non-potable water system is provided below in Section 9.6.2.1.

9.6.1.1 RIX Facility—City of San Bernardino and City of Colton

The Rapid Infiltration and Extraction (RIX) plant is an experimental process designed to treat effluent from the Colton and San Bernardino Wastewater Treatment Plants and achieve discharge water quality equivalent to conventional tertiary treated facilities. The treated effluent from the RIX facility is currently discharged into the Santa Ana River. A connection to the Santa Ana Regional Interceptor "brine line" is used during periods of high rainfall when the soil is saturated or if effluent quality requirements are not met.

The RIX treatment process uses in-situ native soil filtration by applying the secondary treated wastewater to a series of shallow earthen basins. As the secondary effluent percolates through the unsaturated soil media to the groundwater table, physical, biological and chemical processes take place within the soil structure. Once the wastewater is filtered through the soil, it is pumped and extracted along with some native groundwater underlying the percolation basins. The extracted water is then channeled to ultraviolet disinfection banks prior to being discharged to the Santa Ana River.

The City of San Bernardino Municipal Water Department (SBMWD) has prepared a Programmatic Environmental Impact Report (PEIR) to assess the impacts of developing a recycled water sales program in which up to 18,000 acre-feet per year of RIX effluent would be sold to potential future water suppliers within the Southern California region. The PEIR did not evaluate the specific equipment required to treat the water to standards necessary for industrial use or pipeline and pumping infrastructure required to deliver treated effluent to any user including the City of Grand Terrace.

AES met with the City of San Bernardino Municipal Water District to discuss their interest in selling a portion of the effluent directly to an industrial user. RIX representatives explained they will sell only to wholesale water suppliers, not directly to industrial users. Therefore, involvement by the local water purveyor in the City of Grand Terrace would be required to serve water from the RIX facility to the Highgrove Project. Further, there are currently no pumping facilities, pipelines, or any pre-treatment facilities in place or planned in the near future to support water sales from the RIX plant. According to the City of San Bernardino, discharged water from the RIX facility is considered Title 22 compliant at the RIX facility but is not chlorinated to allow transport via pipeline to a potential user. The City expressed some concern that the chlorination process might lead to the formation of disinfection byproducts which may necessitate further treatment prior to re-use.

Infrastructure required for the AES Highgrove Project to use water from the RIX facility for process needs would likely include the following: easements/ROW from RIX for a storage tank, pump station, remote control interface, and chlorination facilities all to be located at the RIX facility. A pipeline crossing the Santa Ana River as well as Interstate-215 would have to be constructed to serve the plant. The requirements for these types of crossings present significant technical and economic challenges, as well as potential environmental impacts, and are prohibitively expensive for a peaking facility with such low water demand and intermittent use. In addition, there is a concern with the potential for water quality deterioration in the line to occur as a result of the plant’s intermittent operating profile and stagnant water that would remain in the line during times when the plant is not operating.

In conclusion, water from the RIX facility is considered infeasible as a source of water for the Highgrove Project facility at this time because: 1) presently RIX has not instituted a program to sell recycled water to industrial clients; 2) there are concerns with the potential for deterioration of water quality in any future service line due to the intermittent operating profile of a peaking plant; and 3) there is no infrastructure available or planned to deliver water to the Highgrove Project site 4-5 miles across the Santa Ana River and construction of a line to meet the limited cooling water needs of a peaking project is prohibitively expensive.

9.6.1.2 City of San Bernardino Water Reclamation Plant

The San Bernardino Water Reclamation Plant (WRP), located approximately 5 miles northeast of the Highgrove Project site, treats wastewater to secondary quality and then pipes the discharge to the RIX Facility for tertiary treatment. Recycled water is not marketed from this plant nor are there future plans to do so because: (a) additional treatment processes would have to be installed to comply with the Department of Health Services' requirements, (b) the City of San Bernardino constructed the RIX facility to treat this wastewater rather than invest in additional facilities required to treat this discharge, and (c) the discharge is considered a source of supply water to the RIX facility. Thus the use of effluent from the City of San Bernardino Water Reclamation Plant is not a feasible source of supply for the Highgrove Project.

9.6.1.3 Colton Wastewater Treatment Plant

The City of Colton Wastewater Treatment Plant (WWTP) is located approximately 2.25 miles north of the Highgrove Project site. Similar to the San Bernardino WRP, the Colton WWTP produces disinfected secondary water that is piped to the RIX plant for tertiary treatment. Based upon discussions with the City, there are no current or future plans to either establish a recycled water system from the Colton WWTP or invest in additional treatment facilities to produce recycled water. Therefore, the Colton Wastewater Treatment Plant is not a feasible source of supply for the Highgrove Project.

9.6.1.4 Rialto Wastewater Treatment Plant

The City of Rialto operates a wastewater treatment plant that treats wastewater from Rialto, the nearby City of Bloomington, and a portion of the City of Fontana. The Rialto WWTP is designed to treat approximately 10 mgd of wastewater, and is scheduled to be expanded to treat up to 15 mgd by 2010. The Rialto WWTP currently provides tertiary treatment and discharges most treated wastewater to the Santa Ana River. The plant produces some recycled water that meets Title 22 requirements, and this water is currently used by Caltrans for irrigation and maintenance purposes. Because the Highgrove Project site is outside of the Rialto city limits, this source could have jurisdictional issues in terms of inter-agency requirements. The Rialto WWTP is located approximately 4.5 miles northwest of the Highgrove Project site along local roads. As with the RIX facility, it is considered cost-prohibitive to construct a line of this length with the sole purpose of serving the relatively low water demands of the proposed peaking facility.

9.6.1.5 Riverside Regional Water Quality Control Plant

The Riverside Regional Water Quality Control Plant (WQCP) produces approximately 2 million gallons per day (mgd) of recycled water. This plant is located approximately 7.75 miles southwest of the Highgrove Project site. According to City representatives, the City is planning to serve recycled water to local wetlands, streams, local irrigation users, and a peaking power plant. Because the City is also required to discharge some of its water to the Santa Ana River, these additional demands are likely to fully allocate the WQCP's capacity of available recycled water. In addition, the City has indicated that it would likely elect to use any other potential future recycled water supply for its own use in order to offset imported water costs. Therefore, the Riverside WQCP is not considered a feasible source of supply for the project.

9.6.1.6 Inland Empire Utilities Agency

The IEUA currently provides regional wastewater and recycled water services to seven contracting agencies including the Cities of Chino Hills, Chino, Fontana, Montclair, Ontario, Upland, and the Cucamonga County Water District. The member agencies of the IEUA produce water in excess of the safe yield of the Chino Basin such that the IEUA has an extensive water replenishment plan.

The IEUA has the potential to produce up to 70,000 acre-feet of recycled water from four existing and future regional plants and has an ongoing program of developing recycled water service within its service area. Currently, IEUA is not serving recycled water outside the Chino Basin but the personnel at IEUA have indicated that they would be willing to serve recycled water outside their service area if such supply were sought by the public agencies with responsibility for water service in that outside jurisdiction. While IEUA has indicated that it would sell recycled water sale to agencies within San Bernardino Valley in the future from its Regional Plant Number Four, a pipeline in excess of 10 miles would be needed to deliver the water directly to the Highgrove Project. Such a pipeline is considered environmentally undesirable considering the environmental impacts associated with construction of such a long line through highly-developed areas and uneconomical considering the small volume of cooling water needed for a peaking facility.

9.6.1.7 Eastern Municipal Water District

Eastern Municipal Water District (EMWD) serves southwestern Riverside County. While it has an extensive system to provide recycled water to its customers, demand for recycled water within its service territory is twice the volume it can currently produce (EMWD website). In addition to concerns with providing service to users outside the county, the lack of infrastructure to serve users in the vicinity of the Highgrove Project, and the lack of excess water available to serve the project, recycled water from EMWD is not considered to be a feasible source of cooling water for the Highgrove Project.

9.6.1.8 Western Municipal Water District

Western Municipal Water District (WMWD) serves western Riverside County. Representatives of WMWD were contacted to determine their ability to provide recycled water from its existing system to the Highgrove Project. WMWD indicated that the closest possible source of water was over 20 miles from the Project Site. Further, WMWD can not serve a customer located in San Bernardino County. Therefore, WMWD is not a feasible source of recycled water supply for the Highgrove Project.

9.6.2 Impaired Water Sources

9.6.2.1 Riverside Highland Water Company

The RHWC serves drinking water to the City of Grand Terrace and portions of the unincorporated areas of Riverside County. RHWC presently supplies all of its customer demands from wells it owns and operates.

In addition to providing potable water for drinking from its wells, RHWC also provides irrigation water to agricultural users. RHWC recently expanded its non-potable system to provide irrigation and construction water to a new housing development from its Spring

Street Wells (RN#21 and RN #22). These wells produce water that is considered "impaired" due to high nitrate levels which are in excess of drinking water standards. Nitrate contamination can exist in areas which have experienced heavy agricultural use and/or a prevalence of septic systems.

The Spring Street wells are located approximately 0.5 miles southeast of the site. RHWC has indicated that serving water from these wells to the plant would be considered beneficial to RHWC's long-term water supply and management plan. Extraction of nitrate-laden water from the aquifer is considered an economical means of improving the quality of the aquifer such that it can in the future be acceptable as a source of potable water.

AES is supportive of using impaired water if the use results in an overall regional benefit through cleanup of a contaminated aquifer and assisting in the creation of a regional system that could supply non-potable water to surrounding areas. However, AES has been unable to fully assess the impacts of using this water to date as a source of supply. Potential concerns associated with this source include the impact of high nitrates on plant equipment, constraints on meeting discharge specifications due to poorer water quality and high salts, and reliability of supply. AES will continue to evaluate this option as more data is obtained.

9.6.2.2 United States Environmental Protection Agency's Stringfellow Superfund Site

The Stringfellow Superfund cleanup operations, located near the Redlands area, produce a maximum of 180 gpm of impaired water. Only 90 gpm produced during dry years (Allen Wolfenden of DTSC, pers. com.). Because the Highgrove Project will require larger quantities of water, this is not considered a feasible source of water for the project.

9.6.2.3 Muscoy and Newmark Plumes

Two cleanup sites in the San Bernardino (Bunker Hill) groundwater basin exist that are engaged in cleanup of the Muscoy and Newmark plumes; both are USEPA Superfund sites. Both contaminant plumes are being remediated using a pump-and-treat system that strips volatile organic compounds from the groundwater. This produces water that meets drinking water quality standards. Information obtained from the Santa Ana Watershed Project Authority (SAWPA) indicates that the water from these sites is used as drinking water by local potable water suppliers or is recharged back into the groundwater. Therefore, these sites are unlikely sources of water for the Highgrove Project.

9.6.3 Dry Cooling Technology

Dry cooling technology was evaluated as an alternative to the use of well water for cooling purposes. It is important to note that the use of dry cooling technology will not eliminate the use of water at the site, but will only reduce the amount of water used at the site by approximately 60 percent.

Dry cooling technology would replace use of the cooling tower for cooling the gas turbine intercooler, which is a unique feature of the GE LMS100 gas turbine technology. The intercooling system reduces the temperature of the compressed air in the gas turbine compression cycle, increasing cycle efficiency. The cycle efficiency benefit is reduced when the cooling medium to the intercooler exceeds 90°F, with proportionally greater performance impacts at higher temperatures. Because the cooling medium is the ambient air in dry cooling technologies, the cooling medium temperature is limited by the ambient dry bulb temperature. Therefore, dry cooling technologies will necessarily result in performance impacts at ambient temperatures above 90°F compared to wet cooling technologies for which the cooling medium can be designed to never exceed 90°F.

At 97 F, use of dry cooling would result in a performance loss of approximately 4 MW per turbine with a heat rate impact of approximately 0.5%. Since the primary purpose of a peaking plant is to provide electricity during periods of peak electricity demand which typically occur during times of high ambient temperature, these performance impacts are considered significant. Further, use of dry coolers result in a significantly larger cooling structure with a highly visible profile and would likely generate more noise than a conventional cooling tower.

9.7 Alternative Linear Corridors

Linear facilities required for the Highgrove Project include an electric transmission line, natural gas supply line, potable water line, and sanitary sewer line. The proposed linear facilities are presented in Section 2.0, Project Description. This section compares the alternative routes. The comparison is made among the following categories:

- **Institutional Factors.** Institutional factors are an assessment of the ease of obtaining rights-of-way, public agency support, required permits, etc.
- **Engineering/Construction Feasibility.** Engineering/construction feasibility is an assessment of how the pipeline can be physically placed along a given route.
- **Length of Linear Feature.** Length of the gas line is important because cost and potential environmental impacts are usually functions of length.
- **Environmental Factors.** Environmental factors are an initial assessment of which routes would have the least impact on the environment. Environmental impacts must be either not significant or mitigatable to a less-than-significant level.

9.7.1 Potable Water Supply

Potable water will be provided from the Riverside Highland Water Company's potable water system using an existing water main in Main Street, about 1,300 feet from the project site. Because of its proximity to the site, extension in an existing public right of way, and use of a direct route to the site, no alternative routes were analyzed.

9.7.2 Sanitary Sewer Line

All sanitary wastewater will be discharged to the City of Grand Terrace's sewer system. Grand Terrace's sewer system is served by the City of Colton under a joint powers agreement. Because the sewer line is located adjacent to the project in Taylor Street, no alternative alignments were analyzed.

9.7.3 Electric Transmission Lines

The plant's 115-kV transmission lines will connect to SCE's Highgrove Substation adjacent to the site. Because the substation is adjacent to the site, and the lines will not cross any property owned by third-parties, no alternative routes were considered.

9.7.4 Natural Gas Supply Line

A new 7-mile-long, 12-inch-diameter natural gas line will be needed from the Highgrove Project power plant to SoCalGas' Line 2001. Because of the distance and potential environmental impacts, three routes were considered (see Figure 9.7-1). Construction will primarily be by open trench.

9.7.4.1 Route Descriptions

Proposed Route: The proposed route would exit the west side of the power plant and follow the Riverside Canal southwest to Main Street. It would turn west on Main Street to Iowa Street and head south on Iowa Street, cross over I-215/Highway 60 inside the Iowa Street overcrossing, then continue on to Martin Luther King Boulevard. It would turn east on Martin Luther King Boulevard to Canyon Crest Drive. On Canyon Crest Drive, the line would head south and end at Via Vista Drive where it would connect into Line 2001.

West Route: The west route would exit the west side of the power plant and follow the Riverside Canal southwest to when it intersects with Iowa Street. It would then travel south on Iowa Street to Marlborough Avenue. On Marlborough Avenue the line would head west to Chicago Avenue, head south on Chicago Avenue, cross under I-215/Highway 60, then continue on Chicago Avenue until it turns south on Alessandro Boulevard. At the intersection of Chicago Avenue and Alessandro Boulevard, the line would turn south until it intersects with Line 2001.

East Route: The east route would exit the west side of the power plant and follow the Riverside Canal southwest to Main Street. At Main Street, it would travel east for a block and turn south on Transit Avenue. It would follow Transit Avenue south, take a quick jog east on Center Street, then continue south again on Prospect Avenue, which turns into Northgate Street. At Marlborough Avenue, the line would head west to Rustin Avenue, where it would head south to Spruce Street. At Spruce Street, the line would go east to Watkins Drive, turn southeast on Watkins Drive then south on Canyon Crest Drive. It would follow Canyon Crest Drive, crossing under I-215/Highway 60, until the point where Canyon Crest Drive intersects with Line 2001.

9.7.4.2 Summary Comparison of Proposed and Alternative Gas Line Routes

Table 9.7-1 provides a brief comparison between the Proposed Gas Line route and the alternative routes considered. A discussion of the impacts for each environmental discipline follows.

TABLE 9.7-1
Comparison Summary of the Proposed Gas Line Route and Alternate Routes

Resource	Proposed Route	West Route	East Route
Route Length	7.0 miles	6.8 miles	7.0 miles
Air Quality	Air quality from construction is primarily a function of distance and surface material. Since the distance of the proposed route and the east route are the same and the routes are primarily asphalt, air emissions would be insignificant.	Since distance is less and the route follows the Riverside Canal longer (dirt surface) air emissions would be slightly less. However, the difference would be insignificant.	Same length as the proposed route. Will require the use of HDD to cross I-215/Hwy 60.Therefore, slightly more impacts than the other two alternatives, yet still insignificant.
Biological Resources	Insignificant impact.	No difference.	No difference.
Cultural Resources	Insignificant impact.	No difference.	No difference.
Land Use	No land use entitlements. Insignificant impacts.	No difference.	No difference.
Noise	Construction noise sensitivity would be a function of the surface material, the duration of any trenchless crossings, and proximity to residential areas. This route would not require HDD crossing of I-215	This route would not require HDD crossing of I-215	This route would require HDD crossing of I-215.
Public Health	This is a function of air quality emissions associated with construction equipment and fugitive dust.. Since these emissions are low and intermittent, potential public health impacts are insignificant.	Insignificant difference.	Same as proposed route.
Agriculture and Soils	No direct agricultural land impacts or significant soil erosion impacts.	.No difference	No difference

TABLE 9.7-1
Comparison Summary of the Proposed Gas Line Route and Alternate Routes

Resource	Proposed Route	West Route	East Route
Traffic and Transportation	Function of the number and type of intersections crossed, street traffic, and width of right-of-way. Would travel down major collector street (Iowa Avenue). With mitigation measures the impacts to traffic would be temporary and insignificant.	Would travel down major collector streets (Iowa Avenue and Chicago Avenue) and therefore any potential impacts would similar to those of the proposed route. However with the mitigation measures the impacts to traffic would be temporary and insignificant.	Would travel down smaller roads and require more turns (which slow down construction and therefore may prolong work in the roadway). However, even with the potential delays with the mitigation measures the impacts to traffic would be temporary and insignificant.
Visual Resources	All features would be below ground with the ground surface restored to pre-construction conditions. No difference.	No difference	No difference
Hazardous Material Handling	Potential hazardous material impacts would be from disposal of water used to pressure test line. Longer lines would have more potential for hazardous material impacts. However, since in all cases the test water would be contained, tested and disposed of in accordance with any permit that may be required, there will be no significant impacts to the environment from the use or disposal of hazardous materials during construction of the proposed route.	Since line is shorter, the amount of test water would be slightly less. However, difference is not significant.	The amount of test water would be greater than Proposed Route. However the difference is not significant.
Waste Management	Waste impacts would be from disposal of pressure test water. Same as discussion above for Hazardous Material Handling.	Same as discussion above for Hazardous Material Handling.	Same as discussion above for Hazardous Material Handling.

TABLE 9.7-1
Comparison Summary of the Proposed Gas Line Route and Alternate Routes

Resource	Proposed Route	West Route	East Route
Water Resources	The amount of water used for construction (wetting for soil compaction, dust suppression, and hydrostatic testing) is directly related to the length of the proposed pipeline. The total amount of water used will not result in a significant impact on water supply. In addition implementation of BMPs during construction will ensure no impacts to surface water resources	Slightly less amount of water used. However, no difference in impact evaluation as proposed route.	No difference.
Geologic Hazards	No difference. Lines would be designed for proper seismic code and therefore no significant impacts relating to geologic hazards.	No difference.	No difference.
Paleontological Resources	No impacts to paleontological resources	No difference	No difference

9.7.4.2.1 Air Quality

Both the East and West routes will require the use of horizontal directional drilling (HDD) under I-215/ Highway 60. The use of HDD may offset the small benefit of the West Route being shorter. Because the proposed route will not require HDD to cross the freeway (it will cross in a 24-inch casing that exists in the bridge), it would be preferred over the East Route.

Emissions from construction equipment and fugitive dust will occur during construction at any of the pipeline routes. Generally, air emissions will be slightly less for shorter routes although the differences between these routes are insignificant. Therefore, with mitigation (for example, water to suppress fugitive dust and low emissions construction equipment), the air emissions impacts would be insignificant for construction of all routes.

9.7.4.2.2 Biological Resources

All routes generally follow roads and rights-of-way that are partly disturbed. Significant site-specific natural habitats or resources have not been identified. Each route will cross several streams/waterways. These crossings may be done in the dry season with standard trenching or with trenchless technology (HDD, or jack and bore) during the wet season. The proposed route would require 6 water crossings, the West Route 6 water crossings, and the East Route 5 water crossings. With implementation of mitigation measures, however, none of the routes would create significant impacts to Biological Resources.

9.7.4.2.3 Cultural Resources

A total of 23 historic sites are located within the project Area of Potential Effect (APE), that is, within 50 feet of the plant site and gas pipeline alignments. Of these, four linear historic sites, CA-RIV-4768H/CA-SBR-7168H, CA-RIV-4787H/CA-SBR-7169H, CA-SBR-6847H, and CA-RIV-9774, will be crossed by construction of the gas pipeline along the preferred and alternate routes. Three of these sites, CA-RIV-4768H/CA-SBR-7168H, CA-RIV-4787H/CA-SBR-7169H, and CA-SBR-6847H have been previously determined to be eligible for nomination to the National Register of Historic Places (NRHP) and/or California Register of Historical Resources (CRHR). Impacts to all four of these sites will be completely avoided by directional drilling or jack-and-bore construction for both the preferred and alternative routes.

The rest of the sites are late 19th and early 20th century homes. None of these sites are considered significant, and none will be directly or indirectly impacted by construction of any of the gas pipeline routes, as the pipeline will be located in a buried trench and construction activities will take place entirely within existing disturbed roadway rights-of-way or previously disturbed property. Therefore, all alignments were considered equal for cultural resources.

9.7.4.2.4 Land Use

All routes would follow existing roads, established rights-of-way or be within previously disturbed property. None of the routes would require additional land use entitlements or have significant impacts on land use.

9.7.4.2.5 Noise

Construction noise will be short-term and will be limited to daytime hours with the exception of HDD, which needs to be continuous until the feature is crossed. The only major feature that would require a substantial HDD crossing is the I-216/Highway 60 freeway. With the West Route, an HDD crossing is not required because the freeway crosses over Chicago Avenue. In the proposed route, the gas line would cross the freeway inside a 24-inch casing in the Iowa Bridge. With the East Route, HDD would be needed to cross the freeway. Therefore, there would be a slight preference for the West and Proposed routes over the East Route.

9.7.4.2.6 Public Health

Public health is a function of air quality emissions from construction equipment and fugitive dust. For all routes, the potential public health impacts associated with construction of the pipelines would be insiginificant.

9.7.4.2.7 Agriculture and Soils

None of the routes have direct agricultural impacts. The West Route has a lower proportion of soil units with shallow to medium depths to bedrock or hardpan than other two routes. The East Route has the highest proportion of soil units with shallow to medium depths to bedrock or hardpan; with the Proposed Route falling in-between. Although the routes may encounter different soil units, since the construction and backfill of pipeline segments is fairly continuous, the potential for soil erosion during construction is insignificant for all routes.

9.7.4.2.8 Traffic and Transportation

Since all routes travel primarily down existing roadways, mitigation measures will be required to minimize impacts below the level of significance on all three routes. The West Route and the Proposed Route would travel down major collector streets (Iowa Avenue and Chicago Avenue); whereas, the East Route would be located in smaller roads and require more turns (which may slow down construction). However, in all cases, with the mitigation measures proposed the impacts to traffic will be temporary and insignificant.

9.7.4.2.9 Visual Resources

All features would be below ground with the ground surface restored to pre-construction conditions. Therefore, there would be no visual impacts from any of the routes.

9.7.4.2.10 Hazardous Material Handling

Potential hazardous material impacts would be from disposal of water used to pressure test the gas line. Longer lines would have more potential for hazardous material impacts; therefore, the West Route would have less test water to dispose of. The East and Proposed routes would have about the same amount of test water, but the East Route also would have HDD spoils to dispose of. However, since in all cases the test water would be contained, tested and disposed of in accordance with any permit that may be required, there will be no significant impacts to the environment from the use or disposal of hazardous materials during construction of any of the pipeline routes.

9.7.4.2.11 Waste Management

Waste impacts would be from disposal of pressure test water. See description in Section 9.7.5.2.10 Hazardous Materials Handling

9.7.4.2.12 Water Resources

Water would be required for wetting the soil for recompaction, dust suppression and for pressure testing the gas lines. Therefore, the difference in the amount of water used during construction of the pipeline is directly related to the length of the pipeline route. Since the Proposed Route and East Route are roughly the same length, the amount of water used for construction would be approximately the same for each. The West Route is slightly shorter in length and would likely require a slightly smaller of water for construction. However, in all cases, the amount of water is insignificant. In addition, a Construction Storm Water Pollution Prevention Plan (SWPPP) would be required for construction of any of the routes. Implementation of the Best Management Practices (BMPs) contained in the SWPPP would ensure not impacts from construction of the pipeline on surrounding surface water resources.

9.7.4.2.13 Geologic Hazards

The gas line would be designed to meet stringent seismic safety codes. Therefore, there would be no difference between the routes.

9.7.4.2.14 Paleontological Resources

No previously recorded fossil sites have been documented within the footprint of the gas pipeline routes. No previously recorded fossil sites occur within 4 miles of the project area. The gas lines will be located in streets and established rights-of-way where the soils have been disturbed. In addition, the pipeline will generally be between less than 7 feet deep. Therefore, there is no substantial difference between alternative routes and impacts are insignificant.

9.7.4.3 Conclusion

The differences between the alternatives are generally minor. With any route, the potential impacts from the gas line would be less than significant. If all potential impacts were weighted equally, there would be a slight preference for the West Route because of its shorter length. However, when all potential impacts are considered, the proposed route is preferable because it would cross the freeway though an existing 24-inch casing that is available within the Iowa Street overcrossing, thus eliminating the need for an HDD crossing or additional trenching.

9.8 Alternative Air Pollution Emission Control Analysis

The proposed project is required to comply with the requirements of the South Coast Air Quality Management District's (SCAQMD's) permit regulations requiring the application of the Best Available Control Technology (BACT) to control air emissions. To comply with the SCAQMD's BACT requirements for oxides of nitrogen (NO_x), the project's design includes water injection and selective catalytic reduction (SCR) to control NO_x emissions. The SCR technology proposed for the Highgrove Project uses a 19 percent solution of ammonia to reduce NO_x emissions to elemental nitrogen, water, and a small quantity of unreacted ammonia. However, the use and storage of ammonia—even the less toxic 19 percent aqueous ammonia proposed for the Highgrove Project —represents a potential risk to the public in the event of a catastrophic breach of the storage tank. The offsite consequence analysis (presented in Subsection 8.12, Hazardous Materials Handling) shows that if the Highgrove Project's ammonia storage tank were breached, the resulting ammonia concentrations at publicly accessible areas along the project's eastern and northern fence lines would be below the CEC significance criteria (less than 75 parts per million). Therefore, the potential impacts associated with the project's use and storage of ammonia does not result in a significant public health impact.

Potential NO_x control technologies for combustion gas turbines include the following:

- **Combustion controls**
  - Water/Steam injection
  - Dry combustion controls
  - Dry low-NO_x combustor design
  - Catalytic combustors (e.g., XONON)
- **Post-combustion controls**
  - Selective non-catalytic reduction (SNCR)
  - Non-selective catalytic reduction (NSCR)
  - SCONO$_x$™

The technical feasibility of available NO_x control technologies are presented below.

9.8.1 Combustion Modifications

9.8.1.1 Wet Combustion Controls

Steam or water injection directly into the turbine combustor is one of the most common NO_x control techniques. These wet injection techniques lower the peak flame temperature in the combustor, reducing the formation of thermal NO_x. The injected water or steam exits the turbine as part of the exhaust. Although the lower peak flame temperature has a beneficial effect on NO_x emissions, it can also reduce combustion efficiency and prevent complete combustion. As a result, carbon monoxide (CO) and volatile organic compounds (VOCs) emissions increase as water/steam injection rates increase.

Water and steam injection have been in use on both oil- and gas-fired combustion turbines in all size ranges for many years, so these NO_x control technologies are generally considered technologically feasible and widely available. Since a steam injection combustion system is not yet available for the new LMS100 technology, water injection will be employed instead of steam to reduce NOx emissions. 9.8.1.2 Dry Combustion Controls

Combustion modifications that lower NO_x emissions without wet injection include lean combustion, reduced combustor residence time, lean premixed combustion, and two-stage rich/lean combustion. Lean combustion uses excess air (greater than stoichiometric air-to-fuel ratio) in the combustor primary combustion zone to cool the flame; thereby, reducing the rate of thermal NO_x formation. Reduced combustor residence times are achieved by introducing dilution air between the combustor and the turbine sooner than with standard combustors. The combustion gases are at high temperatures for a shorter time, which also has the effect of reducing the rate of thermal NO_x formation.

The most advanced combination of combustion controls for NO_x is referred to as dry low-NO_x (DLN) combustors. DLN technology uses lean, premixed combustion air to keep peak combustion temperatures low, thus reducing the formation of thermal NO_x. This technology is effective in achieving NO_x emission levels comparable to levels achieved using wet injection without the need for large volumes of purified water and without the increases in CO and VOC emissions that result from wet injection. However, this control technology does not result in lower NO_x emissions than can be achieved using water injection on the LMS-100 combustion turbine.

Catalytic combustors use a catalytic reactor bed mounted within the combustor to burn a very lean fuel-air mixture. This technology has been commercially demonstrated under the trade name XONON in a 1.5-MW natural gas-fired combustion turbine in Santa Clara, California. The technology has not been announced commercially for the engines used at the Highgrove Project. No turbine vendor, other than Kawasaki, has indicated the commercial availability of catalytic combustion systems at the present time; therefore, catalytic combustion controls are not available for this specific project and are not discussed further.

9.8.1.2 Post-combustion Controls

Selective catalytic reduction is a post-combustion technique that controls both thermal and fuel-bound NO_x emissions by reducing NO_x with a reagent (generally ammonia or urea) in the presence of a catalyst to form water and nitrogen. NO_x conversion is sensitive to exhaust gas temperature, and performance can be limited by contaminants in the exhaust gas that may mask the catalyst (sulfur compounds, particulates, heavy metals, and silica). SCR is used in numerous gas turbine installations throughout the United States, almost exclusively in conjunction with other wet or dry NO_x combustion controls. SCR requires the consumption of a reagent (ammonia or urea) and requires periodic catalyst replacement. Estimated levels of NO_x control are in excess of 90 percent.

SNCR involves injection of ammonia or urea with proprietary conditioners into the exhaust gas stream without a catalyst. SNCR technology requires gas temperatures in the range of 1,200 to 2,000°F and is most commonly used in boilers. The exhaust temperatures for the Highgrove Project gas turbines are in the 900°F range, which is well below the minimum SNCR operating temperature. Some method of exhaust gas reheat, such as additional fuel combustion, would be required to achieve exhaust temperatures compatible with SNCR operations, and this requirement makes SNCR technologically infeasible for the Highgrove Project.

NSCR uses a catalyst without injected reagents to reduce NO_x emissions in an exhaust gas stream. NSCR is typically used in automobile exhaust and rich-burn stationary internal combustion engines, and employs a platinum/rhodium catalyst. NSCR is effective only in a stoichiometric or fuel-rich environment where the combustion gas is nearly depleted of oxygen, and this condition does not occur in turbine exhaust where the oxygen concentrations are typically between 14 and 16 percent. For this reason, NSCR is not technologically feasible for the Highgrove Project.

$SCONO_x$™ is a proprietary catalytic oxidation and adsorption technology that uses a single catalyst for the control of NO_x, CO, and VOC emissions. The catalyst is a monolithic design, made from a ceramic substrate with both a proprietary platinum-based oxidation catalyst and a potassium carbonate adsorption coating. The catalyst simultaneously oxidizes NO to NO_2, CO to CO_2, and VOCs to CO_2 and water, while NO_2 is adsorbed onto the catalyst surface where it is chemically converted to and stored as potassium nitrates and nitrites. The $SCONO_x$ potassium carbonate layer has a limited adsorption capability and requires regeneration approximately every 12 to 15 minutes in normal service. Each regeneration cycle requires approximately 3 to 5 minutes. At any point in time, approximately 20 percent of the compartments in a $SCONO_x$ system would be in regeneration mode, and the remaining 80 percent of the compartments would be in oxidation/absorption mode.

There are serious questions about the probability of a successful application of the $SCONO_x$ technology for application to the Highgrove Project, as well as the levels of emission control that can be consistently achieved. Therefore, this technology is not considered feasible for the Highgrove Project.

9.8.2 Alternatives to Ammonia-based Emission Control Systems

Over the last few years, several vendors have designed urea-based systems to generate ammonia onsite; thereby eliminating the need to transport and store ammonia. These units are referred to as Ammonia on Demand (Environmental Elements Corporation) and Urea to Ammonia (EC&C Technologies Incorporated). However, on September 9, 2003, a permanent injunction was issued against Environmental Elements Corporation, barring the company from selling or manufacturing the Ammonia on Demand system due to patent infringement on EC&C Technologies Inc. Therefore, only EC&C's Urea to Ammonia (U2A) system is commercially available.

The U2A system generates ammonia from solid dry urea. The process starts by dissolving urea in deionized water to produce an aqueous urea solution. Steam is used in the U2A reactor to convert the urea solution into a gaseous mixture of ammonia, carbon dioxide, and water for use in the SCR system.

The U2A technology was first commercially installed on AES's Alamitos Generating Station (AGS) Unit 6, in Long Beach California, as a demonstration project. Unit 6 is a utility boiler that had an existing SCR system that used and stored ammonia. The U2A technology replaced the ammonia storage tank. Based on a successful demonstration of the U2A at AGS, AES contracted for the permanent installation of two U2A systems at its Huntington Beach Generating Station (HBGS) in Huntington Beach, California.

Based on the success of these projects, the U2A technology has been selected for a number of utility retrofit projects. However, as stated above, the U2A technology requires steam for the process to work and the Highgrove Project will not be generating steam. Therefore, this technology is not feasible for the Highgrove Project. Furthermore, there is some concern regarding the applicability of the U2A technology for use on a peaking combustion turbine that is not expected to operate continuously.

9.9 Alternative Technologies

Other generation technologies considered for the project are grouped according to the fuel used:

- Oil
- Coal
- Nuclear
- Hydroelectric
- Biomass
- Solar
- Wind

Alternative technologies were evaluated with respect to commercial availability, implementability and cost-effectiveness.

9.9.1 Oil; Coal; Conventional and Supercritical Boiler/Steam Turbine

These technologies are commercially available and could be implemented. However, because of relatively low efficiency, some of these fuels or technologies may emit a greater quantity of air pollutants per kilowatt-hour generated than technologies that are more efficient. Space requirements, water usage, and the cost of generation for these alternative technologies is relatively high compared to simple-cycle/natural gas-fired technologies.

9.9.2 Nuclear

California law prohibits new nuclear plants until the scientific and engineering feasibility of disposal of high-level radioactive waste has been demonstrated. To date, the California Energy Commission (CEC) is unable to make the findings of disposal feasibility required by law for this technology to be viable in California. This technology, therefore, is not implementable.

9.9.3 Water

These technologies use water as "fuel," and include hydroelectric, geothermal, and ocean energy conversion.

9.9.3.1 Hydroelectric

Most of the sites for hydroelectric facilities have already been developed in California, and remaining potential sites face lengthy environmental licensing periods. It is doubtful that this technology could be implemented within 3 to 5 years, and the cost would probably be higher than the cost of a conventional simple-cycle. There are no hydroelectric sites within the project area.

9.9.3.2 Geothermal

Geothermal development is not viable at the project location because suitable thermal resources and strata are not present. Therefore, it was eliminated from consideration.

9.9.4 Biomass

Major biomass fuels include forestry and mill wastes, agricultural field crop and food processing waste, and construction and urban wood wastes. Their cost tends to be high relative to conventional simple-cycle units burning natural gas.

9.9.5 Solar

Most of these technologies collect solar radiation, heat water to create steam, and use the steam to power a steam turbine/generator. Power is only available while the sun shines so the units do not supply power that can be cycled up or down to follow demand. The cost of solar power is relatively high when compared to simple-cycle units burning natural gas.

9.9.6 Wind Generation

In California, the average wind generation capacity factor has been 25 to 30 percent and, like solar, cannot be cycled up and down to track demand. The cost of generation is generally above the cost of simple-cycle units burning natural gas. There are no wind generation sites within the project area. In addition, the Highgrove Project is configured specifically to operate during periods of high electricity demand whereas wind generation facilities rely on the presence of wind to produce electricity at any given time. In addition, wind turbines are significantly smaller in size than thermal power producing technologies; therefore, an extensive amount of real estate would be required to generate an equivalent amount of energy to that produced by the proposed Highgrove Project.

9.10 References

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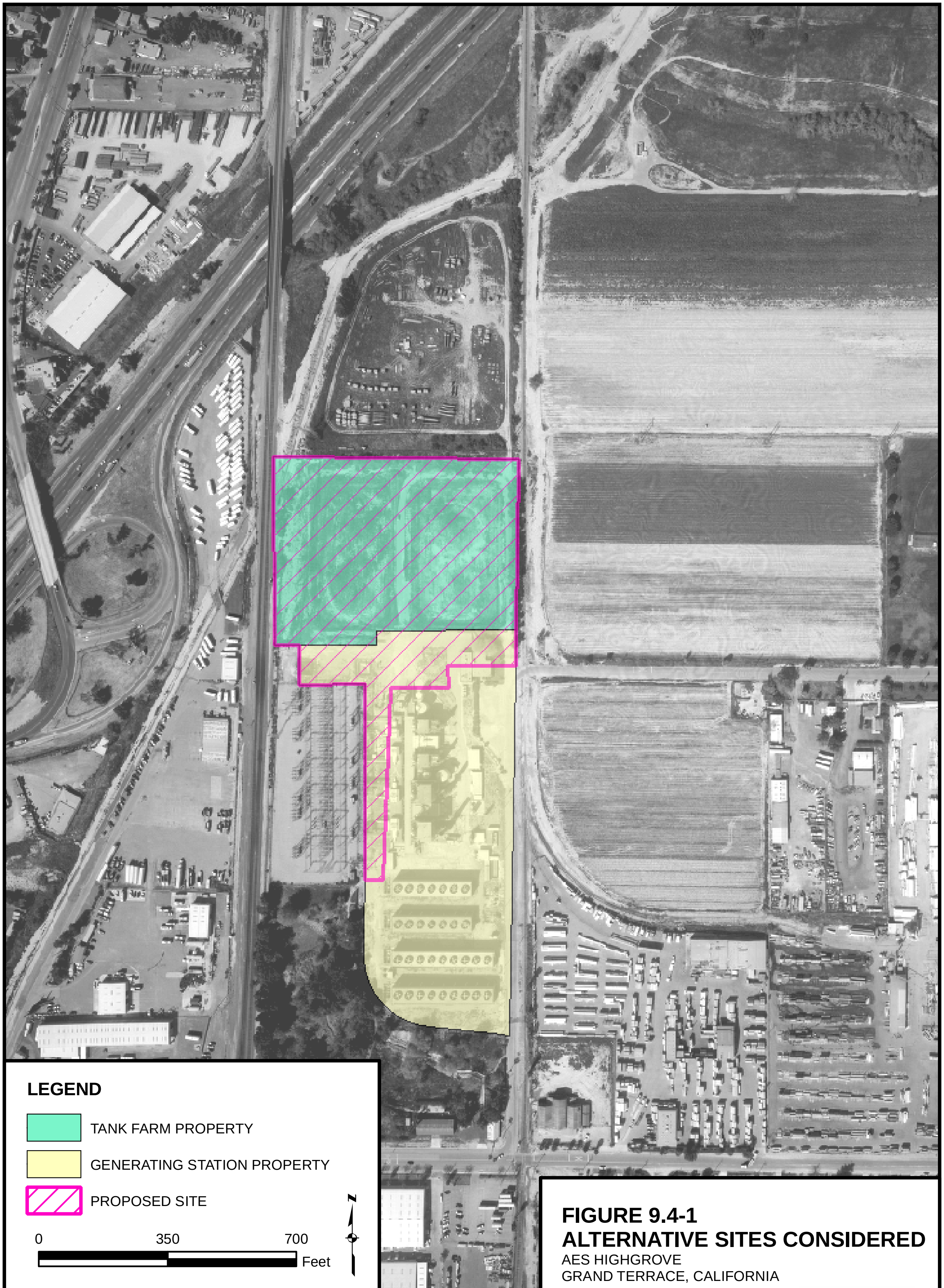

FIGURE 9.4-1
ALTERNATIVE SITES CONSIDERED
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

CH2MHILL

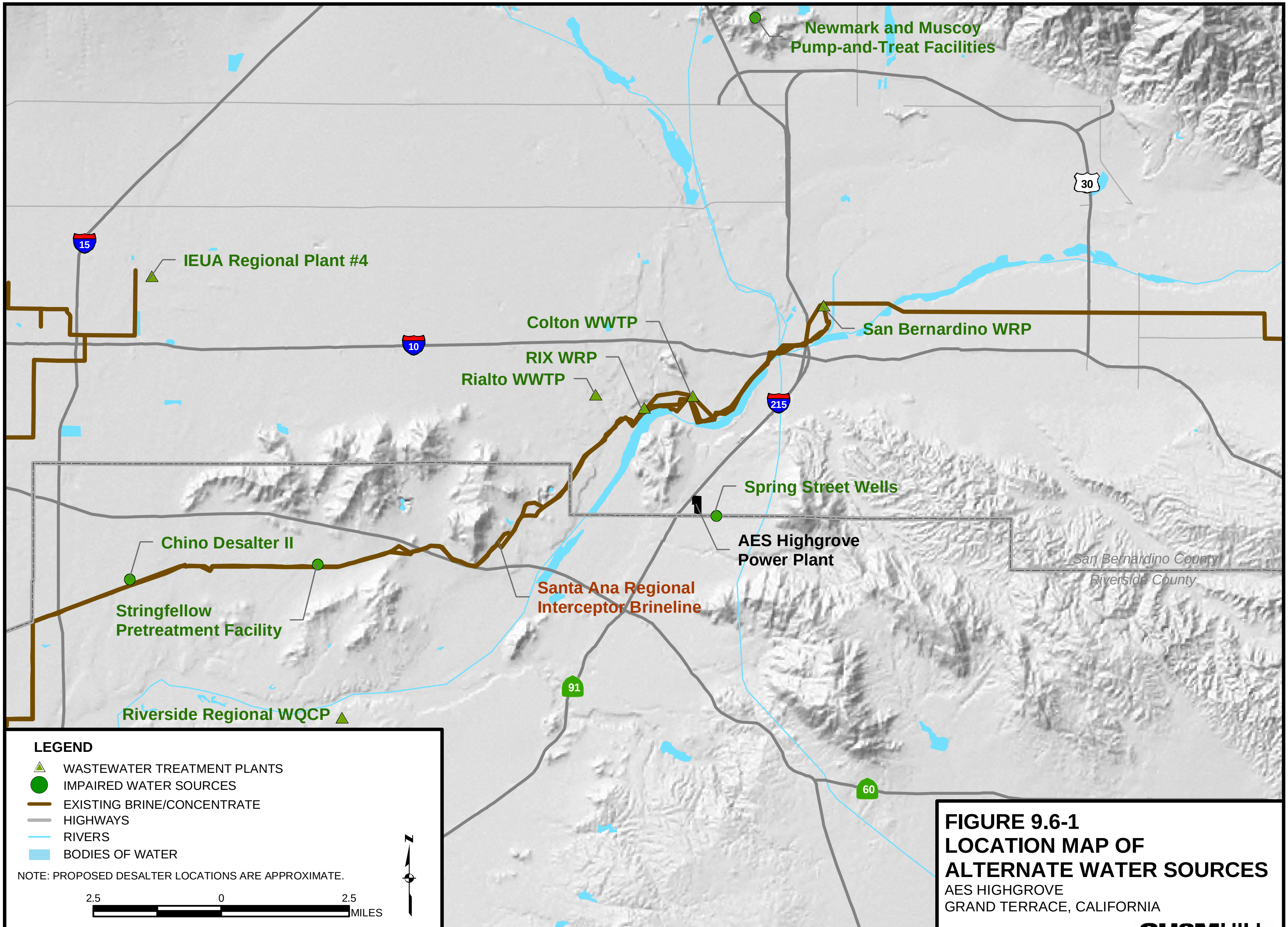

FIGURE 9.6-1
LOCATION MAP OF ALTERNATE WATER SOURCES
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

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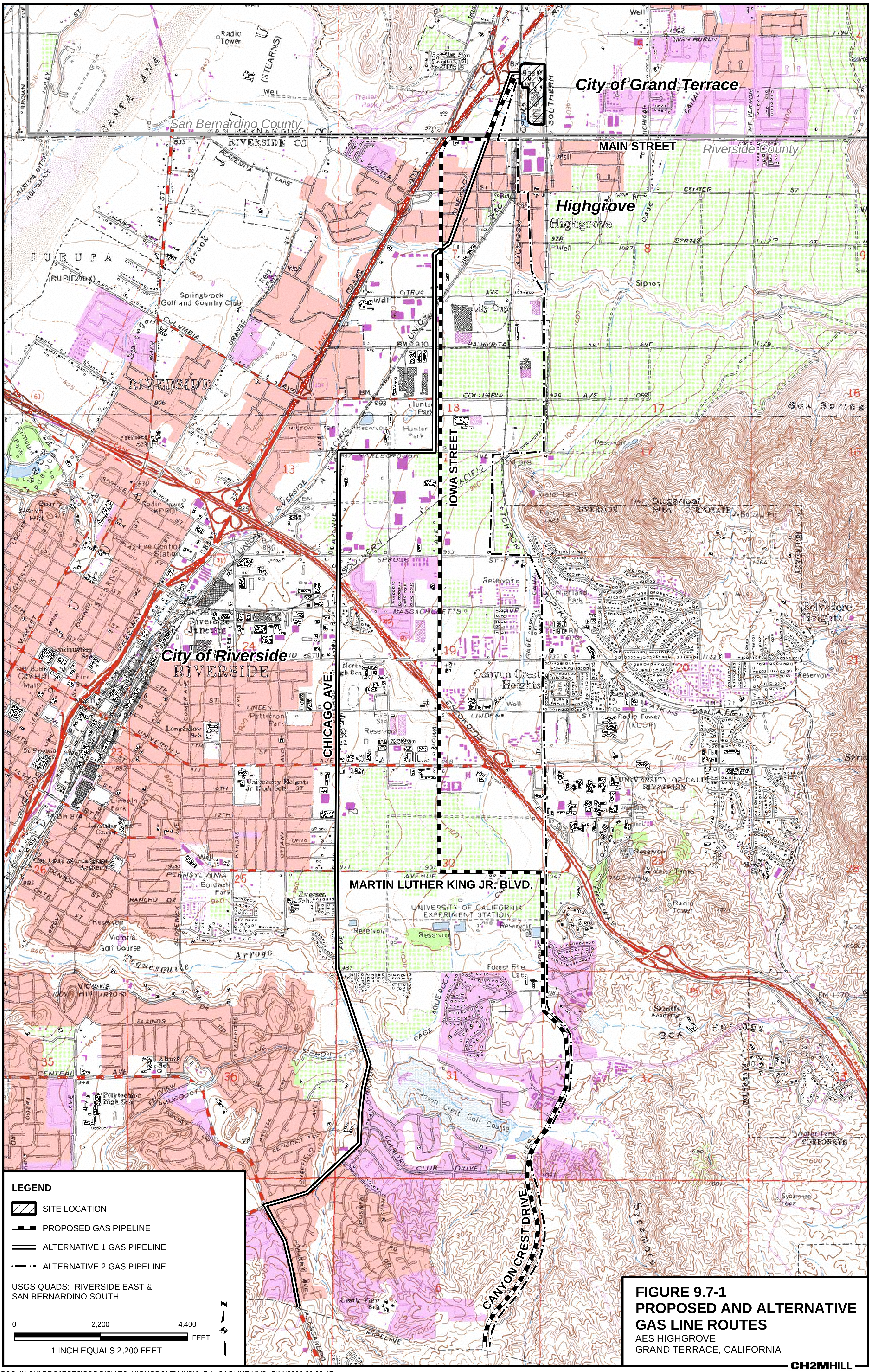

FIGURE 9.7-1
PROPOSED AND ALTERNATIVE GAS LINE ROUTES
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

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SECTION 10.0

Engineering

10.1 Introduction

In accordance with California Energy Commission (CEC) regulations, this section, together with the engineering appendixes and Sections 6.0 and 7.0 (Gas Supply and Water Supply, respectively), presents information concerning the design and engineering of the AES Highgrove Project. Subsection 10.2 describes the design of the facility with reference to Section 2.0, Project Description. Subsection 10.3 discusses the reliability of the facility. Subsection 10.4 presents the estimated thermal efficiency of the facility. Subsection 10.5 describes the laws, ordinances, regulations, and standards (LORS) applicable to the engineering of the Highgrove Project. Subsection 10.6 identifies agencies that have jurisdiction and the contact persons within those agencies. Subsection 10.7 lists the permits that will be required.

10.2 Facility Design

A detailed description of the Highgrove Project is provided in Subsection 2.2, Generating Facility Description, Design, and Operation. Design for safety is provided in Subsection 2.3, Facility Safety Design.

Summary descriptions of the design criteria are included in the following appendices:

- Appendix 10A, Civil Engineering Design Criteria
- Appendix 10B, Structural Engineering Design Criteria
- Appendix 10C, Mechanical Engineering Design Criteria
- Appendix 10D, Electrical Engineering Design Criteria
- Appendix 10E, Control Engineering Design Criteria
- Appendix 10F, Chemical Engineering Design Criteria
- Appendix 10G, Geologic and Foundation Design Criteria

Design and engineering information and data for the following systems are found in the following sections of this AFC:

- **Power Generation**—See Subsection 2.2.4, Combustion Turbine Generators (CTGs). Also see Appendix 10C and Subsections 2.2.5 through 2.2.9, which describe plant auxiliaries.
- **Heat Dissipation**—See Subsection 2.2.8, Plant Cooling Systems, and Appendix 10C.
- **Air Emission Control System**—See Subsection 2.2.11, Emission Control and Monitoring, and Subsection 8.1, Air Quality.
- **Waste Disposal System**—See Subsection 2.2.9 and Subsection 8.13, Waste Management.
- **Noise Abatement System**—See Subsection 8.5, Noise.

- **Switchyards/Transformer Systems**—See Subsection 2.2.5, Major Electrical Equipment and Systems; Subsection 2.2.13.2, Grounding; Subsection 2.2.5.1, AC Power-Transmission; Subsection 2.2.14, Interconnect to Electrical Grid; Section 5.0, Electric Transmission; and Appendix 10D.

10.3 Facility Reliability

This subsection discusses the availability of fuel, the expected service life of the plant, and the degree of reliability to be achieved by the Highgrove Project.

10.3.1 Fuel Availability

The Highgrove Project will be connected to Southern California Gas Company's (SoCalGas's) existing high-pressure pipeline (Line 2001) located approximately 7 miles south of the Project Site. There is sufficient capacity in SoCalGas' existing line to deliver the required quantity of gas to the project. It is conceivable that SoCalGas' pipeline could become temporarily inoperable if there is a breach in the pipeline upstream or from other causes such as a compressor failure, resulting in fuel being unavailable at the plant. Because the project has no backup supply of natural gas or other fuel, it would have to be shut down until the situation was corrected.

10.3.2 Plant Availability

Due to the Highgrove Project's predicted high efficiency relative to other units traditionally used for peaking service, it is anticipated that the facility will be called upon to operate at annual capacity factors between 20 and 40 percent. The facility will be designed to operate between approximately 50 to 100 percent of baseload to support dispatch service and automatic generation control in response to customer demands for electricity.

The Highgrove Project will be designed for an operating life of 30 years. Reliability and availability projections are based on this operating life. Operations and maintenance procedures will be consistent with industry standard practices to maintain the useful life of plant components.

The percent of time that the power plant is projected to be operated is defined as the "service factor." The service factor considers the amount of time that a unit is operating and generating power, whether at full or partial load. The projected service factor for the simple-cycle power block, which is based on the percentage of time a unit or plant is operated, differs from the "equivalent availability factor" (EAF), which is based on the projected percentage of energy production capacity achievable at any point in time. The EAF may be defined as a weighted average of the percent of full energy production capacity achievable. The projected EAF for the Highgrove Project is estimated to be in the range of 92 to 98 percent. The EAF differs from the "availability of a unit," which is the percentage of time that a unit is available for operation, whether at full load, partial load, or standby.

There are no known geologic hazards other than the possibility of a major earthquake (see Subsection 8.15, Geologic Hazards and Resources).

The Highgrove Project will be designed to ensure high plant reliability, including the redundancy of critical components (see Subsection 2.4.2, Redundancy of Critical Components).

Deterioration of output capacity and efficiency of the project over time, called performance degradation, is expected to be on the order of 2 to 3 percent over a 3-year period, depending on the amount of time the unit is operated. Cleaning, maintenance, or overhaul will recapture most of the loss. Over the expected 30-year life of the facility, the estimated total, non-recoverable loss in output and efficiency is anticipated to be on the order of 1 to 2 percent.

10.4 Efficiency

The maximum thermal efficiency that can be expected from each individual CTG is approximately 44 to 47 percent on a higher heating value (HHV) basis. This level of efficiency will be achieved when the CTGs are operating at 100 percent of baseload. The Highgrove Project will be designed as a peaking facility to serve load during periods of high demand and is therefore expected to typically operate at no more than a 30 percent annual capacity factor. Because the capacity will be sold through contract and the prices that will be offered for spot market purchases are unknown at this time, the exact mode of operation cannot be prescribed. The maximum annual generation possible from the facility, based on the expected permitted operating limits, is estimated to be between 365 and 750 gigawatt hours (GWh).

10.5 Laws, Ordinances, Regulations, and Standards (LORS)

10.5.1 General LORS

The following LORS are generally applicable to the project.

TABLE 10.5-1
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Location in AFC for Facility Design Compliance	Conformance
Federal		
Occupational Safety and Health Act—29CFR1910 and 29CFR126	Section 10	Meet Requirements
Environmental Protection Agency— 40CFR60, 40CFR75, 40CFR112, 40CFR302, 40CFR423, 40CFR50, 40CFR100, 40CFR260, 40CFR300, and 40CFR400	Section 8 & 10	Meet Requirements
Federal Aviation Administration—Obstruction Marking and Lighting AC No. 70/74601H	Section 6 & 10	Meet Requirements
California		
California Code of Regulations— Title 8, Sections 450 and 750 and Title 24, 1995, Titles 14, 17, 19, 20, 22, 23, and 26.	Section 10	Meet Requirements
California Department of Transportation—Standard Specifications	Section 10	Meet Requirements

TABLE 10.5-1
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Location in AFC for Facility Design Compliance	Conformance
California Occupational Safety and Health Administration—Regulations and Standards	Section 10	Meet Requirement
California Business and Professions Code—Sections 6704, 5730, and 6736	Section 10	Meet Requirements
California Vehicle Code—Section 35780	Section 10	Meet Requirements
California Labor Code—Section 6500	Section 10	Meet Requirements
Local		
City of Grand Terrace—Regulations and Ordinances	Section 10	Meet Requirements
Industrial		
Civil Engineering Design Criteria	Appendix 10A	Meet Design Criteria
Structural Engineering Design Criteria	Appendix 10B	Meet Design Criteria
Mechanical Engineering Design Criteria	Appendix 10C	Meet Design Criteria
Control Engineering Design Criteria	Appendix 10E	Meet Design Criteria
Chemical Engineering Design Criteria	Appendix 10F	Meet Design Criteria
Geologic and Foundation Design Criteria	Appendix 10G	Meet Design Criteria

Codes and standards pertinent to the generating facility are presented in Engineering Appendices 10A through 10F. The applicable local LORS and local agency contacts involved in administration and enforcement are described below.

10.5.2 Local LORS

Zoning for the Highgrove Project site is consistent with the development of a generating facility (see Section 8.4, Land Use).

The Highgrove Project site is located within the city limits of the City of Grand Terrace, in an area zoned for industrial use, and will therefore be subject to applicable regulations of the City of Grand Terrace. The project will conform to all of these LORS, as shown in Table 10.5-1.

10.6 Local Agency Contacts

Table 10.6-1 lists local agency contacts.

TABLE 10.6-1
Local Agency Contacts

Agency	Contact	Title	Telephone
San Bernardino County Fire Department	Carmen Conti	Fire Marshall	(909) 368-8465
City of Grand Terrace	Gary Koontz	Community Development Director	(909) 824-6621
San Bernardino County Fire Department	Doug Snyder	Supervisor, Hazardous Materials Division CUPA Program	(909) 386-8401

10.7 Local Permits Required and Permit Schedule

After the receipt of the approval of project design, several permits will be required. These include a Building Permit, a Grading Permit, and a Certificate of Occupancy. These three permits are described in the City of Grand Terrace's Municipal Ordinance.