SECTION 9.0

Alternatives

The following sections discuss alternatives to the Walnut Creek Energy Park (WCEP) as proposed in this Application for Certification (AFC). These include the "no project" alternative, power plant site alternatives, linear facility route alternatives, technology alternatives, water supply alternatives, and wastewater disposal alternatives. These alternatives are discussed in relation to the environmental, public policy, and business considerations involved in developing the project. The main objective of the WCEP is to produce economical, reliable, and environmentally sound electrical energy and ancillary services.

The Energy Facilities Siting Regulations (Title 20, California Code of Regulations [CCR], Appendix B) guidelines titled *Information Requirements for an Application* require:

> *A discussion of the range of reasonable alternatives to the project, including the no project alternative… 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 an evaluation of the comparative merits of the alternatives.*

The regulations also require:

> *A discussion of the applicant's site selection criteria, any alternative sites considered for the project, and the reasons why the applicant chose the proposed site.*

9.1 Project Objectives

The key objective of the WCEP is to provide the most efficient peaking capacity available to the growing southern California market cost-effectively. As part of this effort the Applicant has identified the newly available GE Energy LMS100 as the most efficient technology available in the current market. The LMS100 has a nominal heat rate of 9,000 btu/kWh high heat value (HHV). To achieve such significant improvement in efficiency over other peaking technologies, the LMS100 includes an intercooler that requires cooling water. In addition, to the high efficiency, the LMS100 has a 10-minute start, sustained hot-day power, no maintenance penalty for cycling, and high part-power efficiency and load following capability to make it excellent technology to provide peaking capacity. Using the most efficient peaking technology minimizes the use of natural gas for each kilowatt-hour of electrical energy produced.

In addition to technology alternatives, an objective of the site selection was to minimize or eliminate the length of any project linears including gas and water supply lines, discharge lines, and transmission interconnections. This objective both minimizes potential offsite environmental impacts and cost of construction.

To respond to the need for peaking capacity in Southern California, the Applicant initiated a region-wide search for peaking power sites based on the following criteria:

- Adjacent to or near an existing substation where additional peaking capacity would serve growing markets near load centers and provide system stability as well as peaking energy
- Adjacent to or near high-pressure natural gas transmission lines
- Adjacent to or near recycled water supply for cooling purposes to maximize efficiency
- Adjacent to or near non-reclaimable wastewater discharge
- Industrial land use designation with consistent zoning
- Large enough to accommodate the site including construction laydown
- Potential environmental impacts can be mitigated and minimized

The WCEP will provide peaking power to the grid to help meet the demand for electricity and to help replace less efficient fossil fuel generation resources retired because of age or cost of producing power. The WCEP will enhance the reliability of the State's electrical system by providing peaking power generation near the centers of electrical demand. According to data included in the System Impact Study, WCEP's capacity is less than the peak amount of customer electrical load distributed from the Walnut substation. In addition, as demonstrated by the analyses contained in this AFC, the project would not result in any significant environmental impacts. Therefore, as will be demonstrated below, there are no alternatives that would be preferred over the project as proposed.

9.2 The "No Project" Alternative

If the Applicant were to not build the WCEP (the "no project" alternative), it would not be possible to meet the project objectives. The "no project" alternative would forego all of the benefits associated with the WCEP project. In addition, the "no project" alternative would result in more energy production from existing power plants than would otherwise occur, and these currently include older, less efficient, and less environmentally sound generating units. This would have negative economic consequences for the region's commercial and residential rate-payers and for the regional economy. WCEP's location within the Southern California Import Transmission area (also known at "SCIT") provides important grid stability benefits, because CAISO operation rules for grid stability require at least 40 percent of electricity requirements within SCIT to be generated there.

In summary, the "no project" alternative would not serve the growing needs of the Los Angeles County and California's businesses and residents for economical, reliable, and environmentally sound generation resources.

9.3 Power Plant Site Alternatives

For comparison purposes, and to meet the requirements of the California Environmental Quality Act (CEQA) and Title 20, alternative sites were chosen that could feasibly attain most of the project's basic objectives. The alternative sites are shown in Figure 9.3-1.

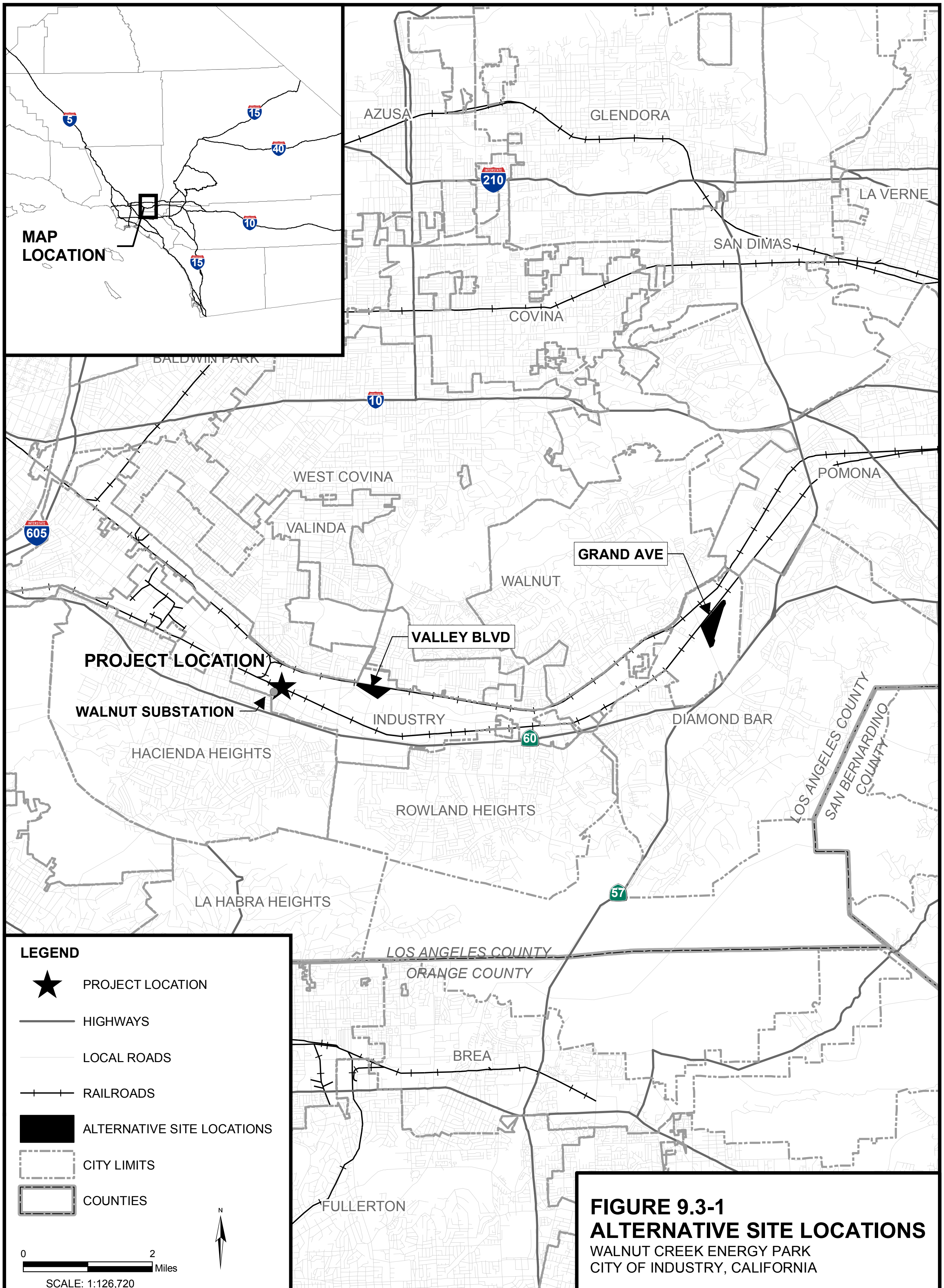

FIGURE 9.3-1
ALTERNATIVE SITE LOCATIONS
WALNUT CREEK ENERGY PARK
CITY OF INDUSTRY, CALIFORNIA

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The key siting criteria in considering these alternatives and the proposed WCEP site included the following factors:

- Location more than 1,000 feet from the nearest residential areas
- Location near the centers of demand for maximum efficiency and system benefit
- Land zoned for industrial use
- Access to tertiary treated wastewater for cooling water
- Location near electrical transmission facilities
- Location near reliable natural gas supply
- A parcel or adjoining parcels of sufficient size for a power plant and construction laydown areas
- Site control (lease or ownership) feasibility
- Minimize construction impacts to existing residences and businesses
- Feasible mitigation of potential environmental impacts

9.3.1 Proposed Walnut Creek Energy Park Site

The proposed site for the WCEP on Bixby Drive, City of Industry, meets all of the project's objectives and, in addition, would have no significant, unmitigated, environmental impacts. The proposed site is approximately 11.48 acres including construction laydown area. The site is currently owned by the Industry Urban Development Agency, subject to a lease option agreement with Edison Mission Energy that will be assigned to its wholly-owned subsidiary, Walnut Creek Energy, LLC. The Walnut Creek site is:

- Adjacent to SCE's Walnut Substation. The project capacity would serve the need for reliable peaking power in the vicinity of the Walnut substation. Interconnection will require a short (approximately 600-foot-long) connection.
- Adjacent to a high-pressure natural gas transmission lines located in a utility easement on the WCEP site.
- Adjacent to existing Rowland Water District recycled water supply lines located in a utility easement adjacent to the WCEP site in Bixby Drive.
- Adjacent to a sanitary sewer trunk line that is located in a utility easement on the project site and that is capable of receiving the project's effluent.
- Designated industrial land use with zoning that permits utility land uses.
- Large enough to accommodate the proposed project including construction laydown.
- Located such that any potential environmental impacts can be mitigated.

9.3.2 Alternative A: Grand Avenue

This alternative is located in a 600-acre industrial park known as the Industry Business Center in the City of Industry, Los Angeles County, between the communities of Diamond Bar and Walnut. The Grand Avenue alternative location is the 32.3-acre Parcel E-5 of this industrial park. This site is located in the southwest corner of the business park, near the intersection of Grand Avenue and Baker Street and approximately 6.5 miles east of the

WCEP site. This site is located in a new and undeveloped industrial park and is zoned Industrial. The site is not located near a sufficient source of reclaimed water or near an electrical substation, and so would require that offsite connections be built.

9.3.3 Alternative B: Valley Boulevard Railyards

This alternative is located approximately 1 mile east of the WCEP site on property owned and operated by the Union Pacific Railroad east of Azusa Boulevard and between Valley Boulevard and Arenth Avenue in the City of Industry. This property is currently used for intermodal transfer of newly manufactured automobiles (offloading from rail, storage, and loading to trucks for distribution). It is a large parcel, exceeding 35 acres. This property is zoned industrial and is located relatively near the high-pressure natural gas line that runs along the Union Pacific Railroad tracks (0.6 mile). The Rowland Water District's storage tank for reclaimed water is 0.35 mile to the west. This site would require a 1.5-mile-long electrical transmission line be built to the Walnut Substation. In addition, site control could be difficult to achieve at this site because of the demand for rail-truck intermodal container storage.

9.3.4 Other Alternatives in the Vicinity

Sites west of the proposed project site were also considered. These included property in a nearby oil field that met several of the project development criteria. The property owner, however, planned a development for this site that would be incompatible with power plant operations.

9.4 Comparative Evaluation of Alternative Sites

In the discussion that follows, the sites are compared in terms of each of the 16 topic areas required in the AFC, as well as in terms of project development constraints. The most useful topics for comparison are as follows:

- **Project Development Constraints—**Are there site characteristics that would prohibit or seriously constrain development, such as significant contamination problems, or lack of fuel, transmission capacity, or water?
- **Land Use Compatibility—**Is the parcel zoned appropriately for industrial use and compatible with local land use policies? What is the distance to the nearest residential area? What is the distance to sensitive receptors?
- **Routing and Length of Linear Facilities—**Can linear facilities be routed to the site along existing transmission lines, pipelines, and roads? Will linear facilities be significantly shorter for a given site?
- **Water Supply—**Is a supply of recycled water readily available such that it is not necessary to use potable water for all or part of the cooling water?
- **Visual Resources—**Are there significant differences between the sites in their potential for impact on valuable or protected viewsheds?

- **Biological Resources—**Would there be significant impacts to wetlands or threatened or endangered species such that mitigation of these effects would be unduly expensive or constrain the supply of available mitigation resources?
- **Contamination—**Is there significant contamination onsite, such that cleanup expense would be high or such that cleanup would cause significant schedule delay?
- **Noise—**Is the site sufficiently near to a sensitive receptor area such that it would be difficult to mitigate potential noise impacts below the level of significance?
- **Use of Previously Disturbed Areas—**Has the site been previously disturbed? Does the site minimize the need for clearing vegetation and otherwise present low potential for impact on biological and cultural resources?
- **Other Environmental Categories—**Are there significant differences between the sites in their potential for impact in other environmental categories?

There is no precise mathematical weighting system established for considering potential impacts in alternatives analyses. Some of the criteria used to compare the alternatives are more or less important to consider than others. For example, an impact that could affect public health and safety or could result in significant environmental impacts is obviously of greater concern than a purely aesthetic issue associated with an advisory design guideline. It is important in comparing alternatives to focus on the key siting advantages and the potential adverse environmental effects of a particular site. Comparing each of the environmental disciplines and giving each discipline equal weight would provide a misleading analysis because effects in one area are not necessarily equivalent in importance to effects in another area.

For example, though the sites may differ in terms of available local road and street capacities and the current levels of traffic congestion, the number of workers during the operational phase of the project is low and would be unlikely to have a significant effect on local traffic. The sites may differ widely in the amount of traffic congestion they would cause during construction, but this is a temporary impact and should not be a strong consideration in site selection, as long as measures to mitigate this impact are feasible. The sites would not differ significantly in terms of geological hazards, though close proximity to a major fault would call for more rigorous and expensive seismic engineering. Hazardous materials handling and worker health and safety issues would be the same or nearly the same for most sites. Though the risk of a release of hazardous materials during transport might be seen as more or less likely depending on location (roadway hazards, in particular), the record of safe transport and handling of such materials is clear. Further, the sites considered here are all in or near urban areas that are served by good transportation networks and are close to the sources of supply.

Similarly, project effects on paleontological and cultural resources are not often consequential in comparing alternatives. Once an initial screening for effects on highly significant sites is completed, the probabilities of encountering hidden paleontological or cultural resources during construction are difficult to calculate or compare.

9.4.1 Project Development Constraints

As indicated in the introductory descriptions of each of the alternative sites, the basic needs of power plant siting for land, access to electrical transmission, gas supply, and cooling water, are met at the Walnut Creek and Valley Boulevard sites. The Grand Avenue site is not located near a substation or source of reclaimed water. The WCEP site is ideally located in this regard, as fuel gas and wastewater discharge are onsite, potable and recycled water are immediately adjacent to the site, and electrical transmission is only 600 feet away. The Valley Boulevard site would require relatively short connections of 0.6 mile for high-pressure natural gas and 1.5 mile or less for electrical transmission and recycled water.

9.4.2 Air Quality

The quantity of emissions from project operation would be the same at any of the sites. Each of the sites has similar contributions to airsheds and would, therefore, be subject to similar review, emission reduction crediting, and permitting requirements. Each site is located in relatively flat terrain that will help to promote dispersion of emissions. The Grand Avenue site is somewhat closer to complex terrain, but the effects of this could not be determined without detailed modeling. The differences between the sites in terms of their distances from the nearest residences should not make a significant difference in air quality impacts at these residences. Mitigation would bring any potential impacts to a level below significance for any of the alternatives.

9.4.3 Biological Resources

The WCEP site has virtually no biological resources or habitat value. The entire site is either covered by a building or paved. The Grand Avenue site is currently open space, ruderal grassland that is in the process of being converted for industrial and commercial uses. It provides habitat for wildlife, but does not appear to contain wetlands or provide habitat for listed species. The Valley Boulevard site is entirely developed and does not appear to have any habitat value.

9.4.4 Cultural Resources

There are no known cultural resources at the WCEP site. Resources of the Grand Avenue and Valley Boulevard sites are unknown. Each of the sites has approximately the same cultural resources sensitivity.

9.4.5 Geological Resources and Hazards

There would be no significant differences between the sites in terms of geological resources and hazards. There are no geological resources located on or near any of the sites.

9.4.6 Hazardous Materials Handling

There would be no significant difference between the site locations in terms of hazardous materials handling. The uses of hazardous materials would be the same for any of the sites. Though there might be differences in the distances that trucks carrying hazardous materials would travel to deliver the materials, these differences would be minor and would not necessarily be consequential, given the effective mitigation measures available and the excellent safety record for transport of these materials.

9.4.7 Land Use

All of the sites are zoned industrial and are located in highly developed urban areas. None of the sites presents a significant land use conflict.

9.4.8 Noise

Developments at each site would be able to meet the City and County noise standards. The sites are very similar in their distance from residential receptors, though most of the nearest residences at the Grand Avenue site are located on the other side of a hill from the project and this location would attenuate noise for all but a few residences that are located near or on the hilltop.

9.4.9 Paleontology

There would be no significant differences between the sites in terms of potential effects on paleontological resources. The probability of encountering significant fossils is approximately the same at each site.

9.4.10 Public Health

The project would not be likely to cause significant adverse long-term health impacts (either cancer or non-cancer) from exposure to toxic emissions, regardless of the site chosen.

9.4.11 Socioeconomics

All three sites are located in Los Angeles County. The number of workers, construction costs, payroll, and property tax revenues would be nearly the same for the project at each of the sites. The majority of the workers would come from the greater San Gabriel Valley area depending on the site. Most workers would commute daily or weekly to the plant site. Some may move temporarily to the local area during construction, causing site-specific impacts to schools, utilities, and emergency services. These impacts would be temporary. Disproportionate impacts to minority and low income populations would be unlikely since minority populations are not concentrated in an area or areas that are also high potential impact areas. The project is not likely to cause significant adverse public health impacts to areas that are disproportionately minority or low income.

9.4.12 Soils and Agriculture

All three sites are urban and are located in areas without agriculture. The Grand Avenue site was formerly in pasture. The WCEP and Valley Boulevard sites have been developed, urban land for some time.

9.4.13 Traffic and Transportation

The number of employees working at a given time during project operation (approximately 3) will not significantly impact local traffic conditions at any of the sites. The peak number of employees during construction (228) will have much more impact, but the impact will be temporary, and can be mitigated by transportation management planning The effect on construction-phase traffic, therefore, should not figure as a major consideration in evaluating or comparing the sites.

9.4.14 Visual Resources

None of the sites is located in an area with protected viewshed or in a designated viewshed corridor. The visual effects are roughly the same. The WCEP and Valley Boulevard sites will be visible at a distance from residences on hills to the south and north. The Grand Avenue site will be visible from residences in Walnut to the north. Views from the south would be blocked by hills except for a few houses located on the hilltops overlooking the project site.

9.4.15 Water Resources

Each of the sites would be able to use tertiary treated recycled water for power plant cooling, although the Grand Avenue site would require a long pipeline to do so. This is consistent with the State Water Resources Control Board's Policy 75-58 indicating that water for power plant cooling should avoid using fresh inland waters if other waters (such as treated wastewater) are available. Reclaimed water in sufficient quantities is available near the WCEP and Valley Boulevard sites. It would be necessary to construct a pipeline for approximately 5 miles to bring reclaimed water in sufficient quantities to the Grand Avenue site.

9.4.16 Waste Management

The management of wastes would differ between the project site and the two alternatives, though these differences would not necessarily lead to a site preference. The WCEP and Grand Avenue sites will be vacant at the time WCE assumes site control, and no demolition would be necessary. At the Valley Boulevard site, demolition and removal of existing asphalt and other facilities may be necessary.

9.4.17 Summary and Comparison

Returning to the original site selection criteria as described in Section 9.3, it is clear that power plant siting is feasible at all three sites. Following is a summary of site selection factors:

- **Location more than 1,000 feet from the nearest residential areas—**Each of the sites meets this standard.
- **Location near the centers of electrical demand—**Each of the sites is located in the urban, developed area of Los Angeles County, where electrical demand is very high.
- **Land zoned for industrial use—**Each of the sites is zoned industrial or manufacturing.
- **Location near a sufficient source of cooling water, preferably treated wastewater—** Reclaimed water is available at the WCEP and Valley Boulevard sites. It would be necessary to construct a pipeline 5 or more miles long to serve the Grand Avenue site.
- **Location near electrical transmission facilities—**The WCEP site is located very near the SCE Walnut Substation. A transmission line 7 or more miles long would have to be constructed to connect the Grand Avenue site with the Walnut Substation, which is the nearest 230-kilovolt (kV) substation. For the Valley Boulevard site, a 230 kV transmission line would have to be constructed to the Valley Substation, 1.5 miles away.
- **Location near ample natural gas supply—**Each of the sites is located near a sufficient source of fuel gas. There is a high-pressure gas line on the WCEP site. Availability of gas

at the Grand Avenue site is unknown. The Valley Boulevard site is approximately 0.60 mile from the high-pressure natural gas pipeline.

- **Parcel or adjoining parcels of sufficient size for a power plant**—There is sufficient land available at each parcel to develop a power plant.
- **Site control feasible**—Site control is feasible at the WCEP and Grand Avenue sites. Use of land at the Valley Boulevard site would require negotiations with the Union Pacific Railroad. Feasibility is, therefore, undetermined.
- **Mitigation of potential impacts feasible—**Mitigation of potentially significant environmental impacts appears feasible at each of the sites.

In conclusion, the WCEP site offers some significant project design advantages over the Grand Avenue site. Mostly importantly, it is adjacent to a high-pressure natural gas pipeline, electrical substation, and source of recycled water. At the Grand Avenue site, long linears would be required for electrical transmission and reclaimed water. This would be costly and would raise the possibility of additional environmental impacts. The WCEP site would also have no biological resources impacts, whereas the Grand Avenue site would involve conversion of open space and plant and wildlife habitat of moderate quality. Although the Valley Boulevard site would not require construction of long linear appurtenances, the feasibility of an agreement with Union Pacific to use the site is unknown. Because the availability of land near the railway for intermodal transfer and cargo container storage uses is low and demand is high, site control in this location may be difficult or infeasible.

9.5 Alternative Project Design Features

The following section addresses alternatives to some of the WCEP design features, such as the locations of the natural gas supply pipeline, electrical transmission line, and water supply pipeline.

9.5.1 Alternative Natural Gas Supply Pipeline Routes

Because high-pressure natural gas is available onsite no other alternatives are deemed feasible for consideration.

9.5.2 Electrical Transmission System Alternatives

The preferred transmission alternative is to connect with the SCE Walnut Substation through a approximately 600-foot-long, double-circuit, 230-kV transmission line that will run north from the WCEP to the southern portion of the Valley Substation, using a two monopole towers. There is no other feasible alternative.

9.5.3 Water Supply Alternatives

The Rowland Water District will supply reclaimed water for the proposed project as described in Section 7.0 through a pipeline that runs immediately adjacent to the WCEP site. Other sources of water might include potable water from the Rowland Water District. Well water would be another possible source of cooling water. Reclaimed water is clearly the better alternative, however, because it provides a beneficial use for treated wastewater which might otherwise be wasted. Using potable water from either the local system or onsite wells would involve consuming large quantities of scarce fresh water for power plant cooling that could be more beneficially used for other purposes.

9.6 Technology Alternatives

The configuration of the WCEP was selected from a wide array of technology alternatives. These include generation technology alternatives, fuel technology alternatives, combustion turbine alternatives, nitrogen oxide (NO_x) control alternatives, inlet air cooling alternatives, and heat rejection alternatives.

9.6.1 Generation Technology Alternatives

Selection of the power generation technology focused on those technologies that can utilize the natural gas readily available from the existing transmission system. Following is a discussion of the suitability of such technologies for application to the WCEP.

9.6.1.1 Conventional Boiler and Steam Turbine

This technology burns fuel in the furnace of a conventional boiler to create steam. The steam is used to drive a steam turbine-generator, and the steam is then condensed and returned to the boiler. This is an outdated technology that is able to achieve thermal efficiencies up to approximately 36 percent when utilizing natural gas, although efficiencies are somewhat higher when utilizing oil or coal. Because of this low efficiency and large space requirement, the conventional boiler and steam turbine technology was eliminated from consideration.

9.6.1.2 Conventional Simple-Cycle Combustion Turbine

Conventional aeroderivative turbine-generator units are able to achieve thermal efficiencies up to approximately 38 percent. In comparison, the LMS100 turbine-generator can achieve efficiencies of up to 44 percent. The LMS100 also has a quick startup capability and lower capital cost than that of a combined-cycle, and is very appropriate for peaking applications. Because of its relatively low efficiency, conventional simple-cycle technology tends to emit more air pollutants per kilowatt-hour generated than the LMS100 will. Because of this relatively low efficiency, the conventional simple-cycle combustion turbine technology was eliminated from consideration.

9.6.1.3 Conventional Combined-Cycle

This technology integrates combustion turbines and steam turbines to achieve higher efficiencies. The combustion turbine’s hot exhaust is passed through a heat recovery system generator (HRSG) to create steam used to drive a steam turbine-generator. This technology is able to achieve high thermal efficiencies. The combined-cycle alternative, however, requires very large capital cost more appropriate for a baseload facility, a large site, and very large quantities of water for cooling. In addition, conventional combined-cycle technology cannot match the GE Energy LMS100 technology for rapid startup, sustained hot-day power, efficient cycling, and high part-power efficiency and load following capability. These are essential characteristics for a peaking facility.

9.6.1.4 Kalina Combined-Cycle

This technology is similar to the conventional combined-cycle, except a mixture of ammonia and water is used in place of pure water in the steam cycle. The Kalina cycle could potentially increase combined cycle thermal efficiencies by several percentage points. However, because this technology is still in the development phase and has not been commercially demonstrated, it was eliminated from consideration.

9.6.1.5 Advanced Combustion Turbine Engines

There are a number of efforts to enhance the thermal efficiency of combustion turbines by injecting steam or staged firing. These include the steam-injected gas turbine (STIG), the intercooled steam-recuperated gas turbine (ISRGT), the chemically recuperated gas turbine (CRGT), and the humid air turbine (HAT) cycle. The STIG is less efficient than other technologies, uses large amounts of de-ionized water and is only able to achieve thermal efficiencies up to approximately 40 percent. None of the remaining technologies, ISRGT, CRGT, or HAT, is commercially available. Consequently, all of these technologies were eliminated from consideration.

9.6.2 Fuel Technology Alternatives

Technologies based on fuels other than natural gas were eliminated from consideration because they do not meet the project objective of utilizing natural gas available from the existing transmission system. Additional factors rendering alternative fuel technologies unsuitable for the proposed project are as follows:

- No geothermal or hydroelectric resources exist in Los Angeles County.
- Biomass fuels such as wood waste are not locally available in sufficient quantities to make them a practical alternative fuel and WCEP site space is limited.
- Solar and wind technologies are generally not dispatchable and are therefore not capable of producing ancillary services other than reactive power, and WCEP site space is limited.
- Coal and oil technologies emit more air pollutants than technologies utilizing natural gas.
- The availability of the natural gas resource provided by Southern California Gas Company (SoCalGas), as well as the environmental and operational advantages of natural gas technologies, make natural gas the logical choice for the proposed project.

9.6.3 NO_x Control Alternatives

To minimize NO_x emissions from the WCEP, the combustion turbine generators (CTGs) will be equipped with water injection combustors and the HRSGs will be equipped with post-combustion selective catalytic reduction (SCR) using aqueous ammonia as the reducing agent. The following combustion turbine NO_x control alternatives were considered:

- Steam injection (capable of 25 to 42 parts per million [ppm] NO_x)
- Water injection (capable of 25 to 42 ppm NO_x)
- Dry low NO_x combustors (capable of 15 to 25 ppm NO_x)

Water injection was selected because it allows for lower acceptable NO_x emissions while being able to achieve an output turndown rate of 30 percent. This turndown is necessary to meet variable load demand.

Two post-combustion NO_x control alternatives were considered:

- SCR
- $SCONO_x$™

SCR is a proven technology and is used frequently in combined cycle applications. Ammonia is injected into the exhaust gas upstream of a catalyst. The ammonia reacts with NO_x in the presence of the catalyst to form nitrogen and water.

$SCONO_x$™ is a new technology and there has been only implementation; a 25-megawatt (MW) combined-cycle plant. $SCONO_x$™ consists of an oxidation catalyst, which oxidizes carbon monoxide (CO) to carbon dioxide (CO_2) and nitric oxide (NO) to nitrogen dioxide (NO_2). The NO_2 is adsorbed onto the catalyst, and the catalyst is periodically regenerated. Although a potentially promising technology, $SCONO_x$™ has not been commercially demonstrated on a large power plant. There are several technological and commercial issues remaining to be resolved prior to application of this new technology to the class of combustion turbines selected for the proposed project.

The following reducing agent alternatives were considered for use with the SCR system:

- Anhydrous ammonia
- Aqueous ammonia
- Urea

Anhydrous ammonia is used in many combined cycle facilities for NO_x control, but is more hazardous than diluted forms of ammonia. Aqueous ammonia (a 19-percent ammonia, 81-percent water solution) is proposed for the WCEP because of its safety characteristics. Urea has not been commercially demonstrated for long-term use with SCR and was, therefore, eliminated from consideration.

9.6.4 Heat Rejection Alternatives

The WCEP will employ a surface (plate and frame or shell and tube type) heat exchanger cooled by circulating water, with heat rejection provided by a mechanical draft, wet cooling tower. An air-cooled heat exchanger was considered as an alternative. The wet cooling tower was found to be the most cost-effective heat rejection system and produces the highest plant efficiency.

The advantages of an air-cooled heat exchanger include reductions in makeup water requirements, water vapor plumes, and cooling tower drift. Among the disadvantages of the air-cooled heat exchanger are the land area requirements and high cost. Heat exchanger performance is inversely related to the temperature of the cooling medium. The local climate in the project area is characterized by high dry-bulb temperatures and low wet-bulb temperatures (i.e., low relative humidity). Consequently, the performance of an air-cooled heat exchanger (which is inversely related to dry-bulb temperature) is poor compared to the performance of a surface condenser cooled by circulating water (which is inversely related to wet-bulb temperature). The air-cooled heat exchanger’s relatively poor performance results in relatively high gas turbine intercooling air temperature, which negatively impacts gas turbine output and efficiency. This negative impact causes a decrease in overall plant output and efficiency. The air-cooled heat exchanger also uses more auxiliary power due to the greater number and horsepower of its fans as compared to the wet cooling tower. As a result, net plant output and efficiency are further reduced. In addition, the capital cost and land requirements of an air-cooled heat exchanger greatly exceed the cost of a surface heat exchanger, circulating water system, and wet cooling.

The air-cooled heat exchanger's disadvantages of reduced plant output, reduced plant efficiency, and higher capital costs were found to outweigh the advantage of reduced water consumption.