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July 29, 2008 70073.00003

Dale Rundquist
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California Energy Commission
1516 Ninth Street, MS-15
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Re: Amendment Petition Application (02-AFC-2)
Salton Sea Unit 6
Imperial County, California

Dear Mr. Rundquist

On behalf of CE Obsidian Energy LLC ("CE Obsidian") we respectfully submit the attached document entitled Air Quality Modeling Protocol for the Salton Sea Unit 6 AFC Amendment Petition prepared by Atmospheric Dynamics, Inc.

This document has also been submitted to the Docket Unit of the California Energy Commission for filing in Siting Proceeding (02-AFC-2). Thank you

Sincerely,

Michael K. Sharpless
Senior Environmental Paralegal

LEGAL_US_W # 59600069.1

Air Quality Modeling Protocol

For the:

Salton Sea Unit 6 AFC Amendment Petition

Prepared for:

Obsidian Energy, LLC
7030 Gentry Road
Calipatria, California 92233

Prepared by:

Atmospheric Dynamics, Inc.
2925 Puesta del Sol
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July 2008

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1.0 INTRODUCTION

Obsidian Energy, LLC (OE) is proposing to amend the Salton Sea Unit 6 Application for Certification (AFC), which was licensed by the California Energy Commission (CEC) to build and operate a 185-megawatt (MW) geothermal electric power plant in Imperial County, California. The proposed amendment to the Salton Sea Unit 6 AFC will consist of three individual power plants when combined will produce 159 MW (net) of power generation (The Project). Each of the three units which will be located at one combined plant site and will share certain common auxiliary facilities. Each power plant will be comprised of a single flash unit with the capacity to generate 58 MW (gross). The location of the three single flash units will be at the same location previously selected for the Salton Sea Unit 6 project. The overall plant site will incorporate the three turbine/generator areas, resource production facilities, power generation facilities, electrical control building, cooling towers, electrical switchyard, brine ponds, facility rain water run off basin, common condensate, fire protection, raw water and purge water storage, H_2S/benzene abatement equipment, well test units, rock muffler/pressure relief vent system, parking area and construction lay-down area. In addition, nine production wells on three well pads and two each plant injection wells and aerated brine injection wells will be located on the plant site. The nine injection wells will be located south of the main blind fault approximately 8,000 – 10,000 feet from the plant site.

The CEC and the Imperial County Air Pollution Control District (APCD) will evaluate the project's potential and cumulative air quality impacts, appropriateness of the proposed mitigation measures, and the project conformance with applicable local, state and federal air quality rules and regulations. The purpose of this protocol is to establish the procedures to be used in assessing the Project's potential air quality impacts. Both agencies have in place regulations establishing the required review process. The CEC conducts their review through the California Code of Regulations, Title 20, Division 2, Chapters 1, 2, and 5, *Regulations Pertaining to the Rules of Practice and Procedure and Power Plant Site Certification Including Additional Provisions of Considering Expedited Applications Under Public Resources Code Section 25550.*

The APCD conducts their review under Rule 207(F), *Air Quality Impact Analysis*, and Rule

207(D.9), *Power Plants*, for procedures regarding CEC projects.

Except for those federal regulations already delegated to the APCD, no other federal regulations are expected to be applicable, mainly because the project will be below the Prevention of Significant Deterioration (PSD) thresholds.

The purpose of these regulations is to certify as expeditiously as possible, environmentally acceptable sites that demonstrate superiority with respect to environmental protection or efficiency in performance. Geothermal production of electricity has been shown to be an environmentally preferred process and OE intends to demonstrate these aspects.

2.0 PROPOSED PROJECT

2.1 PROJECT LOCATION

The Salton Sea Unit 6 project site is located approximately five miles west of Calipatria, California (Refer to Figure 1). The general UTM coordinates of the site are 628000 meters Easting and 3670500 meters Northing (Zone 11). The site elevation is approximately 228 feet below mean sea level. The site is within the Salton Sea Known Geothermal Resource Area (KGRA). The site is located in the middle of the existing OE facilities. Land use of the proposed site and surrounding area include existing geothermal power production, agriculture, wildlife management, and the Sonny Bono National Wildlife Refuge.

2.2 DESCRIPTION OF THE PROPOSED PROJECT

The Salton Sea Unit 6 project consists of three major components:

- Well fields, including production and injection wells and associated pipelines.
- Power plants.
- Transmission lines.

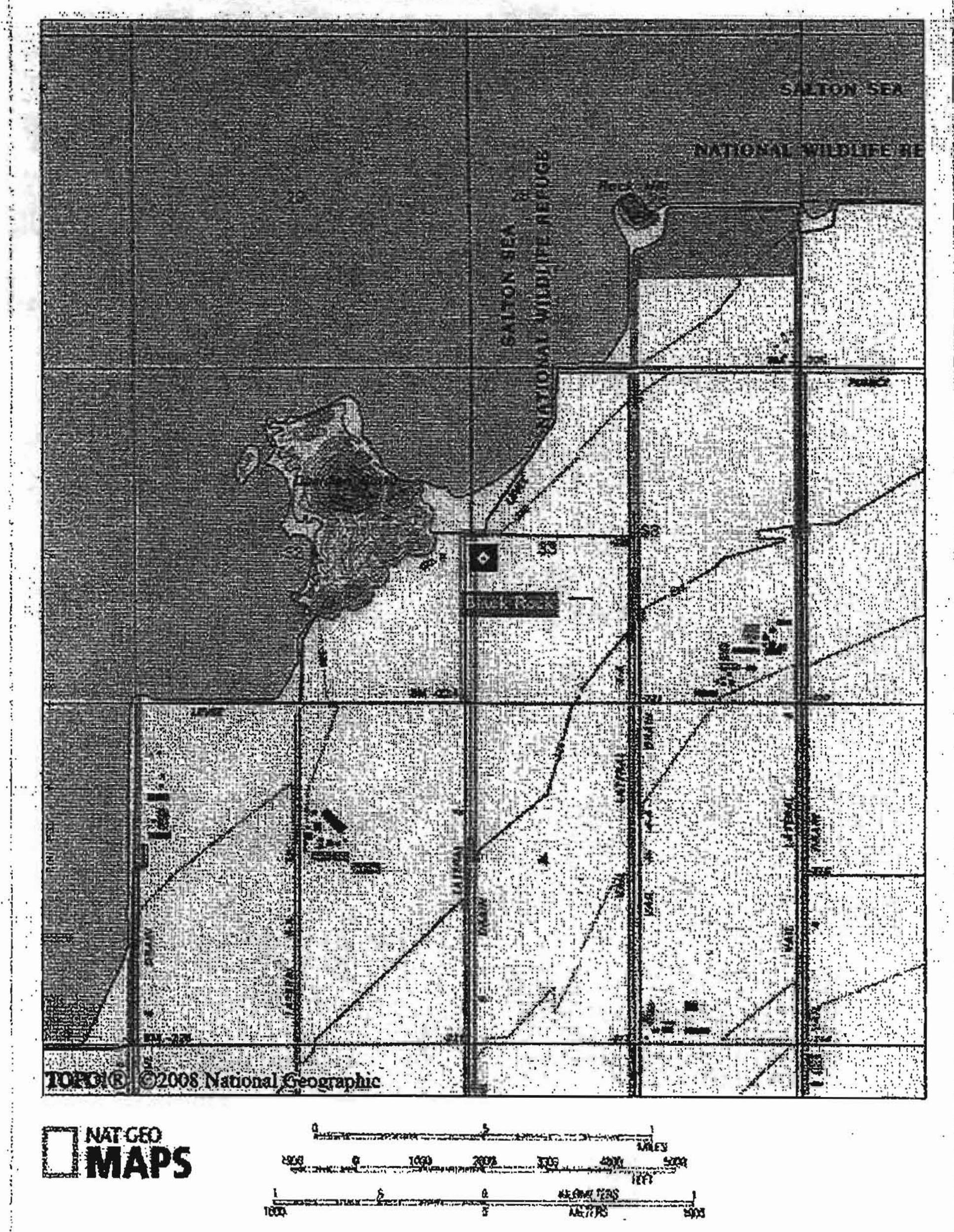

Figure 1: Topographic Map of Salton Sea Project Site

2.2.1 Well Field and Pipelines

OE is proposing the development of nine production wells on three well pads to be located on the main plant site. In addition to the nine (9) production wells, two (2) condensate injection wells and two (2) aerated brine injection wells will also be located on the main plant site. Nine (9) injection wells on three well pads are to be located near the plant site. The nine (9) injection wells will be located south of the main blind fault approximately 8,000 – 10,000 feet from the plant site. Drilling contractors, with equipment permitted under the County or the State Portable Source Program, are anticipated to be used to drill and develop the wells.

2.2.2 Power Plant

The power plant will consist of three, 58 MW (gross) individual units on one plant site with certain common auxiliary facilities. The location of the three single flash generation units will be at the same location previously selected for the Salton Sea Unit 6 project. Each generation unit will consist of:

15 Hp Diesel "pony" pump	4,160v – One, 1.5-MW Diesel generator
200 Hp diesel fire Pump	460v – One 1.0 MW Diesel Generator
NCG removal system	RTO H_2S/benzene emission control system
Five (5) cell cooling tower	Rock muffler/pressure relief vent system
Brine Injection System	Production Test Unit Brine pond
Re-injection Acid Injection System	

Together with their respective production and re-injection wells each unit is referred to as a "resource production facility" or RFP.

The three (3) generation units will share the following:

Electrical control building	Storm water runoff control basin
Fire protection water tank	Condensate storage tank
Purge water storage tank	Water pond
Construction lay-down area	Paved parking area
Aerated brine injection wells (2)	Plant condensate injection wells (2)

Each turbine generator system will consist of a condensing turbine generator set with high pressure (HP) steam entry pressures. The 3,600-revolutions-per-minute (RPM) turbine generator is a single-casing, single-pressure, dual flow, bottom exhaust condensing turbine. It will be nominally rated at 53 MW net. Nominal turbine inlet pressure is 245 pounds per square inch absolute (psia). Steam becomes a condensate through this process and is pumped to a wet cooling tower for cooling. The cooled condensate is pumped back to the condenser to complete the power generation cycle. Non-condensable gases (NCG), which are entrained in the mass flow, average approximately 0.2 percent of the total steam flow. These NCGs are mostly carbon dioxide gas.

The hydrogen sulfide (H_2S) and benzene emission control system for each unit will be based on recuperative thermal oxidation (RTO) incineration technology. RTO is a direct combustion process that allows for simultaneous destruction of benzene and H_2S in a compact unit that is easy to operate and maintain. During start-up the RTO unit burns a propane-air mixture to bring the temperature of the internal compartments up to 1,500 °F. When the appropriate temperature is reached suction created by a downstream blower causes the process stream and outside air to enter the combustion chamber. Flammable gases in the process stream (methane, benzene, H_2S, and hydrogen) are oxidized. During this process benzene and methane are converted into carbon dioxide and water while hydrogen sulfide becomes sulfur dioxide gas. Hydrogen is oxidized to water vapor. Following combustion, the gas stream enters a bypass that routes the 1,500 °F oxidized gases to a heat exchanger connected to the process stream inlet plenum. Process heat is removed from the hot gases lowering their temperature to approximately 700 °F. Heat removed from the hot gases is used to increase the inlet process stream to a temperature of 800 °F prior to entry into the combustion chamber. Heating of the inlet stream precludes creation of sulfuric acid mists that can damage equipment through aggressive corrosion. After releasing heat to the inlet process stream the cooled gases are routed to a quencher to further reduce their temperature prior to entry into a packed-bed scrubber for treatment of the acid gases created by the oxidation process.

Gases from the RTO enter a SO_2 scrubber where a sodium hydroxide solution (NaOH) is introduced. A reaction occurs in the presence of the NaOH converting the sulfur dioxide gas to a solution containing sodium sulfite and sodium sulfate. These latter two (2) compounds are highly water soluble. The sodium sulfite/sulfate solution created by operation of the SO_2 scrubber is of a sufficiently small volume that it can be safely introduced into the cooling tower basin for disposal. While leaving the scrubber, the water content of the gas stream is lowered by passing it through a mesh to reduce the possibility of PM_{10} formation from subsequent evaporation. Remaining gases are then vented into the atmosphere through a stack.

Each turbine generator will have a dedicated cooling tower containing five (5) cells. Three 50 percent capacity, vertical, wet-pit circulating water pumps will circulate water between the cooling tower and turbine condensers. A slip stream from the circulating water will be used for the plant auxiliary cooling loads. Plant auxiliary cooling water loads will include the NCG removal system, turbine oil cooling system, generator cooling system, and H_2S/benzene abatement system.

Liquid containing hydrogen sulfide from the turbine condenser will be directed to a treatment system that will be located in separate cell of the cooling tower array. The treatment system will convert dissolved hydrogen sulfide in the condensate to soluble sulfate. These types of treatment systems have been installed at other existing Salton Sea geothermal facility cooling towers significantly reducing hydrogen sulfide levels in the turbine condensate. Similar performance is expected in treating the condensate from the Salton Sea Unit 6 project. However, as the geochemistry of the brine varies slightly from well to well, it is likely that treatment performance will also vary. Therefore, for the purposes of developing the air dispersion model, a conservative treatment efficiency of 90% (Based on CalEnergy operating experience) has been assumed.

After treatment, condensate will flow into the cooling tower basin to offset water lost in evaporation. Condensate may also be routed to a condensate storage tank and used for other plant water demands such as the steam scrubbing water, and pump seal flush water. Any excess condensate not required for plant use will be sent to a dedicated condensate injection wells located on the plant site.

A rock muffler/pressure relief vent system is used during upset conditions when it is necessary to vent steam into atmosphere. This occurs during start-ups and upset conditions associated with plant trips or other controlled venting events. The proposed rock muffler vent system is a reinforced-concrete rectangular structure with dual chambers, designed to allow internal inspection of the diffuser at the bottom chamber through a man way into the vent chamber. The upper chamber is filled with volcanic rocks using expanded alloy metal inserts. This design minimizes the size of the muffler and substantially reduces the venting noise level. The muffler will allow steam loading of 4,600 lb/hr without fluidizing the bed. This design concept has been successfully deployed at Salton Sea Unit 5 and in other geothermal locations.

In case of a total loss of auxiliary power, or in a situation when the utility system is out of service, emergency power for critical loads (i.e., brine injection pumps air compressor; DC lube oil pump, turbine turning gear; emergency lighting; heating, ventilation, and air condition (HVAC) and other vital loads will be supplied by the standby emergency generators. One, 2-MW, 4,160-volt generators will be installed for each generating unit. These generators are sized to maintain reduced capacity operation of the RPF and critical loads associated with the plant's common facilities.

2.2.3 Transmission Lines

An electrical transmission line will connect the power plant to the Imperial Irrigation District (IID) electrical grid. The electrical transmission line will be operated and owned by IID.

3.0 REGULATORY SETTING

3.1 CEC REQUIREMENTS

The CEC requires that applicants prepare an AFC addressing all of the air quality items listed in *Appendix B: Information Requirements for an Application.*

3.2 APCD REQUIREMENTS

The APCD requires that applicants undergo a CEC permitting process following Rule 207(D.9), *Power Plant.* In general, the Air Pollution Control Officer, upon receipt of an AFC, will notify appropriate parties and submit a report that specifies Best Available Control Technology (BACT) for the proposed facility and states whether the facility can likely satisfy APCD regulations and under what conditions. Once the application is received, the Officer will conduct a compliance review to assure the application meets the requirements of the regulations. Certain deadlines are imposed once the application is accepted as complete. The Officer, if appropriate, will issue and submit a determination of compliance to the CEC and then a permit to operate with concurrence from the CEC.

The focus of this protocol is the proposed procedures required by Rule 207(F), *Air Quality Impact Analysis,* and also to meet the requirements of the CEC. The intent of the regulation is to determine the air quality impacts associated with constructing and operating a facility.

3.3 EPA REQUIREMENTS

As noted earlier, the PSD requirements are not expected to be applicable to the Salton Sea Unit 6 project. For this source to be defined a major source under the US EPA's PSD program, the potential to emit emissions of any criteria pollutant would need to equal or exceed 250 tons per year. The emissions anticipated are expected to be significantly below this threshold. Under Title I, Section 112 of the Clean Air Act, US EPA also regulates hazardous air pollutants (HAP). Geothermal power plants are not subject under this Title at this point because their expected HAP emissions are below threshold levels.

4.0 EXISTING ENVIRONMENT

4.1 AREA CLIMATE

The climate of Imperial County is a desert climate, characterized by low precipitation, hot summers, mild winters, low humidity and strong inversions. Local temperature and precipitation data from the nearest representative local cooperative station, Brawley 2 SW, over a 30-year record, 1961-1990, is used to define climatic normal, means and extremes. The hottest month, July, has an average maximum temperature of 106.5 °F, an average minimum temperature of 74.4 °F, and an average mean temperature of 90.5 °F. The coldest month, January, has an average maximum temperature of 69.3 °F, average minimum temperature of 38.7 °F, and average mean temperature of 54.0 °F. Annual average rainfall is 3.05 inches. The wettest month is December, averaging 0.41 inches; the driest month, June, averages 0.01 inches. Rainfall is highly variable with precipitation from a single heavy storm potentially exceeding the entire annual total rainfall during or following a drought year. Humidity levels have not been recorded at Brawley 2 SW. High winds are occasionally experienced in the Imperial Valley region. Monthly average wind speeds in the region range from 6.6 mph in October to 9.5 mph in July. On an annual basis, winds average 7.8 mph. Winds in the valley are primarily from west to east throughout the year, but have a secondary southeast component in the fall. These patterns are discussed more completely for the site in the following subsection. Solar isolation, again based on regional data, suggests that 90 percent of possible sunshine occurs in the region. The cloudiest periods occur in winter while the sunniest periods are in the summer.

The area's climatic conditions are strongly influenced by the large-scale sinking and warming of air in the semi-permanent subtropical high-pressure center over this area. The high-pressure ridge blocks out most mid-latitude storms except in winter when the high is weakest and the farthest south. The coastal mountains on the western edge of the Imperial Valley also have a major influence on climatic conditions by blocking the cool, damp marine air found in the California coastal environs. The flat terrain of the valley floor in the Salton Sea area and the strong temperature differentials created by intense solar heating produce moderate winds and deep thermal convection currents. The combination of subsiding air, protective mountains, and distance from the ocean all combine to severely limit precipitation. The valley area experiences surface inversions almost every day of the year. Solar heating usually breaks these inversions. Strong, persistent subsidence inversions, caused by the presence of a Pacific high-pressure system, can persist for one or more days, causing air stagnation conditions.

4.2 METEOROLOGICAL DATA AND SITE REPRESENTATION

Meteorological data will be used in the application in two ways. First a long-term record of meteorological data defines the overall climate of a region. These data were discussed previously in Section 4.1. Second, hourly meteorological observations of certain parameters are used to define the area's dispersion characteristics. These data are used in approved air dispersion models for defining a project's impact on air quality. These data must meet criteria established by the US EPA and the following discussion details the proposed data and its applicability to this project.

There are several National Weather Bureau Army Navy sites (WBAN) in the general area of the proposed facility. The closest most representative station relative to the proposed site is the Imperial County Airport site. This WBAN site provides meteorological data that can be readily converted to a site dispersion database that is directly used by atmospheric dispersion models. Other WBAN sites with current data in this area include Palm Springs Thermal, Blythe Airport, Yuma, AZ Airport and the San Diego Airport. As illustrated on Figure 2, the Imperial County site is the closest to the proposed site in the central valley area between the Santa Rosa, Laguna and Chocolate Mountains and to the southeast of the Salton Sea.

As discussed below, OE proposes to use the most recent five (5) years of meteorological data collected at the Imperial County Airport, which is located approximately 22 miles south from the project site, and believes use of this data would satisfy the definition of on-site data (See Figure 2). The Imperial County meteorological data was collected in ASOS format for the years 2001 through the present. The most recent five years of data (2003-2007) will be used in the air quality analysis.

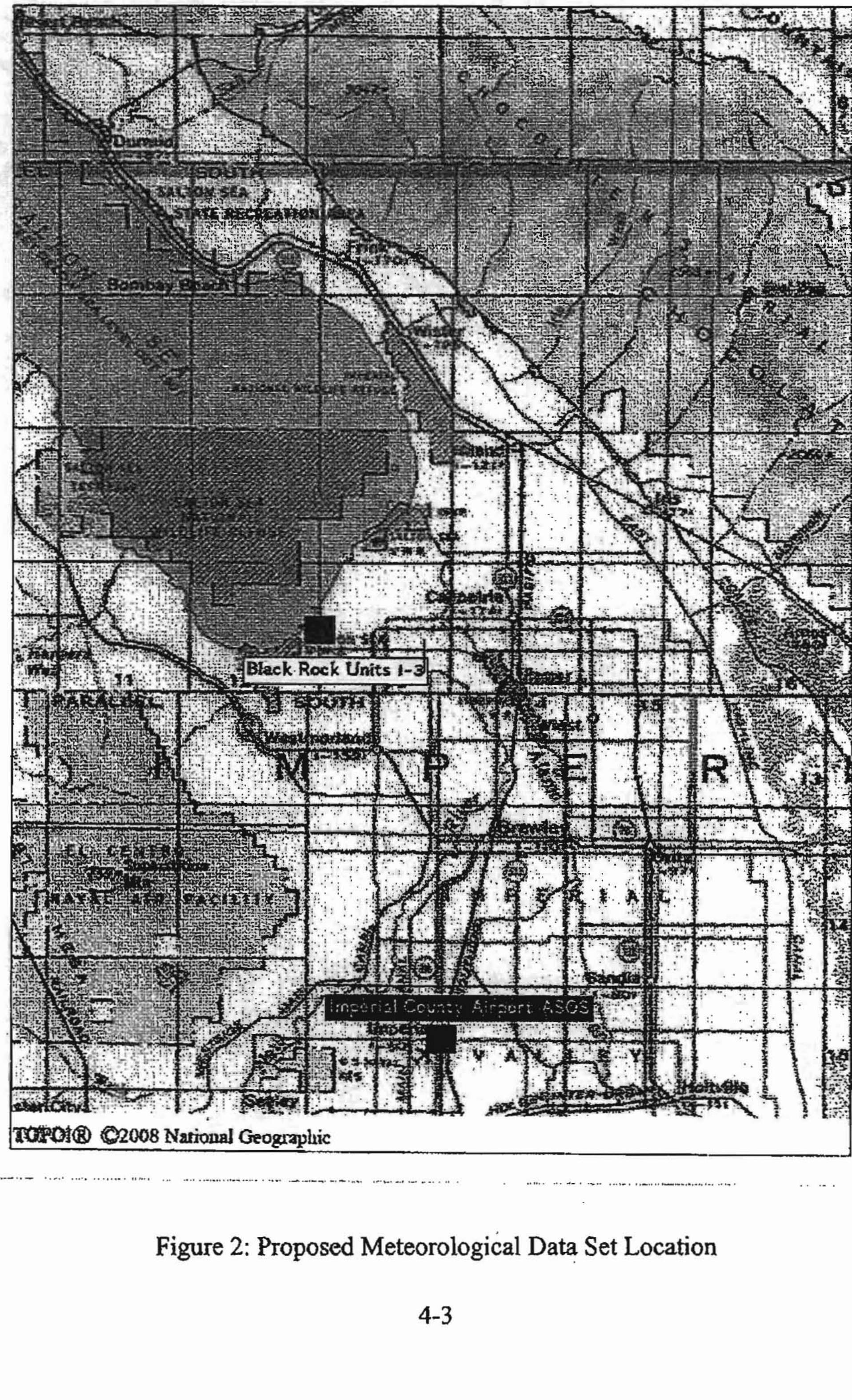

Figure 2: Proposed Meteorological Data Set Location

One of the main reasons that the use of Imperial County Airport data is considered representative of the proposed Salton Sea Unit 6 project is that there are no nearby (localized) terrain features between or surrounding the project site and the Imperial County Airport that would limit the use of the airport data set for the proposed project. The same large-scale geographic and topographic features that influence the Imperial County Airport site also influence the proposed project site. Five years of data are proposed to be used.

The Imperial County Airport site is shown in Figure 2. A graphical wind rose for an earlier five-year period is presented in Figure 3. A five-year quarterly wind rose analysis for the modeling data set will be provided in the application.

US EPA defines the term "on-site data" to mean data that would be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. Specifically, the meteorological data requirement originates from the Clean Air Act in Section 165(e)(1), which requires an analysis "of the ambient air quality at the proposed site and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under [the Act] which will be emitted from such facility."

This requirement and US EPA's guidance on the use of on-site monitoring data are also outlined in the *On-Site Meteorological Program Guidance for Regulatory Modeling Applications* (US EPA, 1987). The representativeness of meteorological data is dependent upon: (a) the proximity of the meteorological monitoring site to the area under consideration; (b) the complexity of the topography of the area; (c) the exposure of the meteorological sensors; and (d) the period of time during which the data are collected.

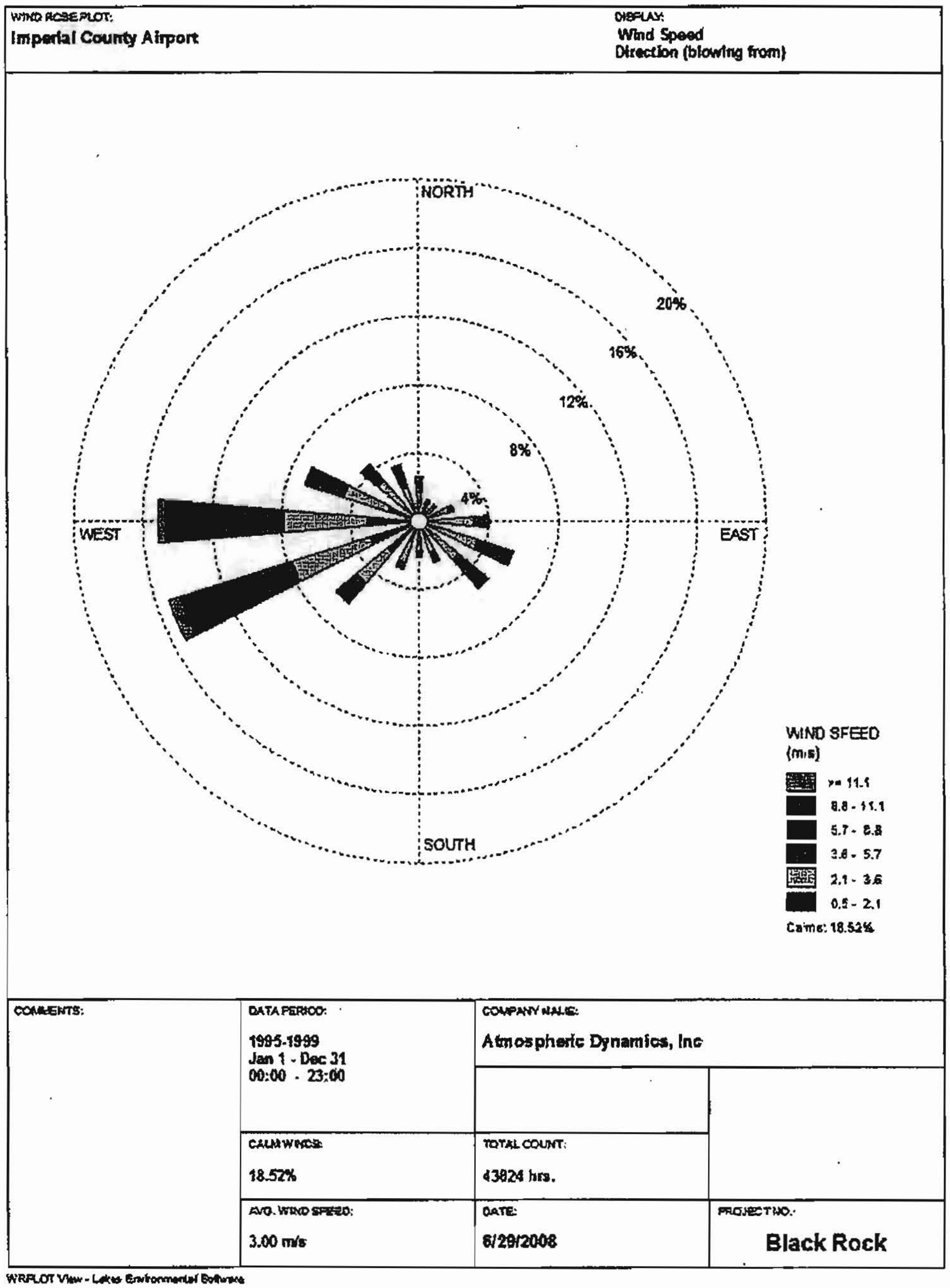

Figure 3: Annual Imperial County Airport Wind Rose for 1995-1999 Combined

Representativeness has been defined in the document "Workshop on the Representativeness of Meteorological Observations" (Nappo et. al., 1982) as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application." Judgments of representativeness should be made only when sites are climatologically similar, as is the case with the Imperial County Airport and the project site location.

In determining the representativeness of the meteorological data set for use in the dispersion models at the project site, the following considerations were addressed:

- *Aspect ratio of terrain, which is the ratio of the height of terrain to the width of the terrain at its base* - The ratio of terrain heights to base widths is constant for the terrain surrounding the project site and the Imperial County Airport meteorological site.
- *Slope of terrain* - The slope of the terrain in the area of the project site is similar to the slope of terrain in the vicinity of the meteorological site. The surface roughness of the terrain in the area is also similar.
- *Ratio of terrain height to stack/plume height* - Since the terrain at the Imperial County Airport site and the project site are essentially flat and at elevations below mean sea level, terrain effects on plume dispersion would be similar at locations throughout the regional area, and the plume would disperse in an identical manner to the dispersion conditions monitored at the Imperial County Airport site.
- *Correlation of terrain features to prevailing meteorological conditions* - The orientation of terrain in the region, with respect to both the meteorological data and project sites is similar and correlates well with the prevailing wind field in the Imperial Valley Region. Thus, wind flow at the Imperial County Airport site would be similar to that at the project site. No local topographic features exist that would appreciably distort the local wind field. One feature, the Salton Sea, which is located next to the project site, will be accounted for with the use of shoreline fumigation dispersion modeling.

In summary, OE believes that the meteorological data collected at Imperial County Airport would accurately represent meteorological conditions at the project site. No terrain or other steering mechanisms exist that would have a significant affect on the meteorology at the project site. The surface roughness, height and length of the large-scale terrain features is consistent throughout the area, and plays a large role in the affect on the horizontal and vertical wind patterns. There is no slope aspect in the vicinity of the site that would reasonably affect the wind direction or speed. The mesoscale features at both the project site and the Imperial County Airport site are similar.

4.3 PREPARATION OF THE METEOROLOGICAL DATA SET

OE proposes to use ASOS formatted meteorological data collected at Imperial County Airport from 2003 through 2007 in the atmospheric dispersion modeling analyses. The data will be pre-processed for direct use by the AERMET (version 06341) preprocessor model. Surface data were acquired from the nearest available representative surface weather station at Imperial, California (WBAN 03144). As recommended by the US EPA in the *Guideline on Air Quality Models* (GAQM, EPA, 2000), 5 years of ASOS meteorological data are used. National Climatic Data Center (NCDC) provided the ASOS data. Upper air data for the same time period will be taken from the closest representative NWS radiosonde station that, when combined with the proposed surface dataset, meet the US EPA required data recovery rates of 90%. This radiosonde station is Tucson, Arizona.

Any missing data will substituted as per US EPA recommended procedures, as discussed in the US EPA memorandum (Lee, R. & Atkinson, D., 1992). Periods with more than one consecutive missing hour of wind speed or wind direction will be set to calm/missing to ensure that worst case predicted impacts were resulting from actual rather than interpolated meteorological conditions.

As part of the input requirements into AERMET and AERMOD, a land use classification must be made. The area surrounding the Imperial County Airport (source of meteorological data for

AERMOD modeling) and the proposed project site was determined to be primarily rural following the methods outlined by the Auer land use classification method for the area within a 3 km radius around the proposed project site. Therefore, normal AERMOD dispersion characteristics will be used for all modeled emissions sources at Salton Sea Unit 6. As part of the AERMET input requirements, Albedo, Bowen Ratio, and Surface Roughness must be classified. The AERSURFACE program was used to generate the surface characteristics for use in AERMET as specified in EPA's January 2008 AERMOD Guidance Document and AERSURFACE User's Guide using default settings where appropriate. AERSURFACE was executed for two sectors (Sector#1 = 110-355° and Sector#2 = 355-110°) to define surface roughness as shown in Figure 4. Other AERSURFACE inputs/outputs are listed in Table 4-1.

TABLE 4-1 AERSURFACE INPUTS/OUTPUTS FOR USE IN AERMET

Month	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
Surface Roughness (meters) and Albedo based on the following Seasonal Assumptions:												
Season	Fall	Fall	Fall	Fall	Summer	Summer	Summer	Summer	Summer	Summer	Fall	Fall
Arid	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Airport	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Surface Roughness (meters) for Sectors 1/2:												
	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142	0.144/ 0.142
Albedo for Sectors 1/2:												
	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20	0.20/0.20
Bowen Ratio for each Month/Year based on the above inputs and the following surface moisture contents:[1]												
2003	Dry	Wet	Avg	Avg	Avg	Avg	Avg	Wet	Avg	Avg	Avg	Avg
2004	Avg	Wet	Avg	Wet	Avg	Avg	Avg	Avg	Avg	Wet	Wet	Wet
2005	Wet	Wet	Avg	Avg	Avg	Avg	Avg	Wet	Avg	Wet	Avg	Avg
2006	Dry	Dry	Avg	Avg	Wet	Avg	Avg	Dry	Avg	Avg	Avg	Avg
2007	Dry	Dry	Avg	Wet	Avg	Avg	Avg	Avg	Wet	Avg	Wet	Avg
Bowen Ratio												
2003	2.29	0.48	0.86	0.86	0.63	0.63	0.63	0.37	0.63	0.63	0.86	0.86
2004	0.86	0.48	0.86	0.48	0.63	0.63	0.63	0.63	0.63	0.37	0.48	0.48
2005	0.48	0.48	0.86	0.86	0.63	0.63	0.63	0.37	0.63	0.37	0.86	0.86
2006	2.29	2.29	0.86	0.86	0.37	0.63	0.63	1.73	0.63	0.63	0.86	0.86
2007	2.29	2.29	0.86	0.48	0.63	0.63	0.63	0.63	0.37	0.63	0.48	0.86

[1]Dry/Average/Wet designate total monthly rainfall amounts that fall into the lower 30th percentiles / middle 40th percentiles / upper 30th percentiles for a standardized 30-year climatological period (in this case, 1971-2000).

As stated above, upper air data recorded in Tucson, Arizona were incorporated into the data set. The Tucson site is considered the most representative for upper air data for the proposed plant site which meets USEPA required data recovery rates. The upper air data from the San Diego, California and Flagstaff, Arizona monitoring sites are considered less representative because of the Pacific Ocean shoreline location at San Diego and the more mountain like character of the Flagstaff site. Data recovery rates for Yuma Proving Grounds and Phoenix (both in Arizona) were less than 90% when combined with the proposed surface dataset.

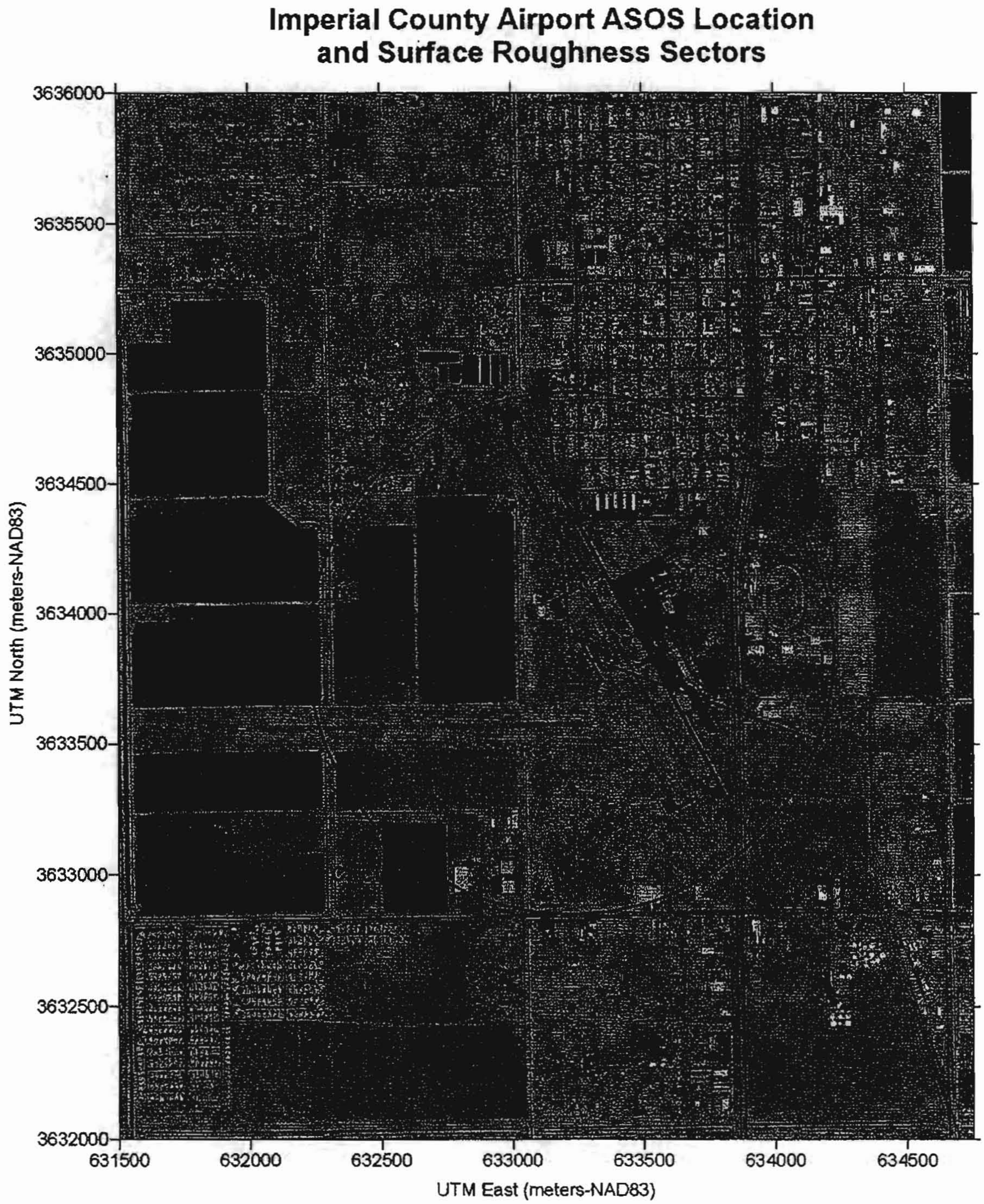

Figure 4: Imperial County Airport ASOS Location

4.4 EXISTING AIR QUALITY DATA

Existing air quality data are available from several monitoring sites in the regional area and have been used to derive background levels for several pollutants. The maximum air quality values over the past 5 years of data available in Imperial County or the Salton Sea Basin are presented below in Table 4-2.

Table 4-2 Air Quality Summary for Most Recent 3 Years

Pollutant	Site	Avg. Time	2005	2006	2007
Ozone, ppm	Brawley	8 Hr	-	.043	.067
	Calexico-East		.077	.078	.083
	El Centro		.086	.091	.083
	Niland		.072	.072	.078
	Westmorland		.090	.086	.085
PM10, ug/m³	Brawley	24 Hr	71.0	127.0	291.0
	El Centro		81.0	146.0	200.0
	Niland		77.0	116.0	162.0
	Westmorland		54.0	182.0	226.0
PM10, ug/m³	Brawley	Annual AM	35.4	45.1	56.4
	El Centro		33.8	44.0	50.1
	Niland		31.1	34.9	38.9
	Westmorland		31.4	50.4	49.1
PM2.5, ug/m³	Brawley	24 Hr	37.8	30.4	19.5
	El Centro		57.9	33.8	30.5
PM2.5, ug/m³	Brawley	Annual AM	-	-	-
	El Centro		9.4	8.8	8.5
CO, ppm	Calexico-East	8 Hr	7.76	5.80	4.50
	El Centro		2.23	2.59	1.67
CO, ppm	Calexico-East	1 Hr	-	-	-
	El Centro		-	-	-
NO_2, ppm	Calexico-East	1 Hr	.114	.095	.112
	El Centro		.065	.066	.071
NO_2, ppm	Calexico-East	Annual	.012	.012	.010
	El Centro		.011	.011	.011
SO_2, ppm	Calexico-Ethel	24 Hr	.002	.041	.004
SO_2, ppm	Calexico-Ethel	Annual	.000	.001	.001
Sulfate, ug/m³	-	24 Hr	nd	nd	nd
H_2S	-	1 Hr	nd	nd	nd

Background hydrogen sulfide data are not available from the published information. Because OE proposes to offset hydrogen sulfide emissions from the operations, for a "no net increase in emissions", the actual background concentration is not a necessary component in an air quality review. All except two of the Salton Sea facilities currently have hydrogen sulfide controls that normally control hydrogen sulfide emissions to non-detectable levels through the use of bioreactors. The APCD had previously recommended on the Salton Sea Unit 6 AFC a background concentration of 24.6 $\mu g/m^3$ based on their assessment of the area. This same background is also proposed for the Salton Sea Unit 6 Project.

The current air quality status of the County is listed below.

Pollutant	*CAAQS*	*NAAQS*
Carbon Monoxide	Unclassified/Attainment	Unclassified/Attainment
Nitrogen Dioxide	Attainment	Unclassified/Attainment
Hydrogen Sulfide	Unclassified/Attainment	---
Ozone (8-hour)	Non attainment	Non attainment
Sulfur Dioxide	Attainment	Attainment
Sulfates	Attainment	---
PM10	Non attainment	Non attainment
PM2.5	Attainment	Attainment
Lead	Attainment	---

5.0 PROPOSED MODELS AND ANALYTICAL APPROACH

USEPA dispersion models proposed for use to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations include the AERMOD modeling system (version 07026 with the associated meteorological and receptor processing programs AERMET and AERMAP versions 06341) for modeling most facility operational and construction impacts in both simple and complex terrain, the Building Profile Input Program for PRIME (BPIP-PRIME version 04274) for determining building dimensions for downwash calculations in the models, the SCREEN3 model (version 96043) for determining inversion breakup/shoreline fumigation impacts, and the use of the California Health Risk Assessment models/protocols for determining toxic impacts, which includes the HARP On-Ramp program. These models, along with options for their use and how they are used, are discussed below. These models will be used for the following:

- Comparison of operational and construction impacts to significant impact levels (SILs), ambient monitoring significance thresholds, California Ambient Air Quality Standards (CAAQS), and National Ambient Air Quality Standards (NAAQS) using AERMOD;
- Cumulative impacts analyses with AERMOD in accordance with local/state/USEPA/CEC requirements; and
- Toxics analyses using ARB algorithms as incorporated into state/CEC requirements.
- Assessment of impacts to soil and vegetation

5.1 LOAD SCREENING MODELING

The facility is anticipated to be operated at base load, and therefore, an initial load screening analysis will not be conducted to identify which operating conditions cause worst-case ambient air impacts. As a result, the approach will be to provide refined modeling for plant operations.

5.2 REFINED MODELING

The purpose of the refined modeling analysis is to demonstrate that air emissions from the Salton Sea Unit 6 project will not cause or contribute to a NAAQS/CAAQS violation; will not cause a significant health risk impact. For modeling the project's operational impacts under normal and startup, shutdown, or malfunction conditions due to emissions from the proposed sources (as well as temporary project construction impacts) on nearby simple, complex, and intermediate terrain, the AERMOD model will be used with five (5) years of hourly meteorological data from the Imperial County Airport. The federal rule adopting AERMOD as a preferred EPA model became effective December 9, 2005. Therefore, the most recent version of AERMOD will be used for the Project modeling analyses (AERMOD version 07026 and AERMAP version 06341). AERMOD is a steady-state plume dispersion model that simulates transport and dispersion from multiple point, area, or volume sources based on updated characterizations of the atmospheric boundary layer. AERMOD uses Gaussian distributions in the vertical and horizontal for stable conditions, and in the horizontal for convective conditions; the vertical distribution for convective conditions is based on a bi-Gaussian probability density function of the vertical velocity. For elevated terrain AERMOD incorporates the concept of the critical dividing streamline height, in which flow below this height remains horizontal, and flow above this height tends to rise up and over terrain. AERMOD also uses the advanced PRIME algorithm to account for building wake effects.

For regulatory applications of AERMOD, the regulatory default option will be set (i.e., the parameter DFAULT will be employed in the MODELOPT record in the COntrol Pathway). The DFAULT option requires the use of terrain elevation data, stack-tip downwash, sequential date checking, and does not permit the use of the model in the SCREEN mode. In the regulatory default mode, pollutant half life or decay options will not be employed. AERMOD incorporates the PRIME algorithms for the simulation of aerodynamic downwash induced by buildings. These effects are important because many of the emission points may be below Good Engineering Practice (GEP) stack height. As noted earlier, the area around both the meteorological monitoring location and project site are rural so urban options (either in COntrol or SOurce Pathways) will NOT be employed. The use of flagpole receptors are not expected. AERMAP will be used to calculate receptor elevations and hill height scales for all receptors from DEM data in accordance with US EPA guidance.

For the cooling tower assessment, two ambient operating conditions are proposed to be used to determine short-term worst-case air impacts. Short-term impact analysis would be based on worst-case short-term emissions and ambient conditions. Annual average conditions would be used to calculate the worst-case annual ambient air impact for the cooling tower. Concentrations for each pollutant would be expressed in terms of micrograms per cubic meter ($\mu g/m^3$). The emission rates calculated for each pollutant will be expressed in terms of grams per second (g/s).

Annual NO_2 concentrations will be calculated using the Ambient Ratio Method (ARM), adopted in Supplement C to the Guideline on Air Quality Models (USEPA, 1994). The Guideline allows a nationwide default conversion rate of 75% for annual NO_2/NO_x ratios.

If 1-hour NO_2 standards are exceeded, then the Ozone Limiting Method (OLM) will be used with hourly ozone data collected near the project site. The hourly ozone data will be input into the AERMOD dispersion model to calculate the 1-hour NO_2 impacts.

The SCREEN3 model will be used to evaluate fumigation impacts following the methodology in US EPA 454/R-92-019, *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised.* Fumigation impact analysis will include evaluating the impacts of the proposed facility during shoreline fumigation and inversion breakup events.

5.2.1 Receptor Grids

Receptor and source base elevations will be determined from USGS Digital Elevation Model (DEM) data using the most recent 7½-minute format (i.e., at this time, only DEM files with 30-meter spacing between grid nodes are available). All coordinates will be referenced to UTM North American Datum 1927 (NAD27), zone 11. The receptors from the DEM files will be placed exactly on the DEM nodes. Every effort will be made to maintain receptor spacing across DEM file boundaries.

Cartesian coordinate receptor grids will be used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. The maximum extent of the significant impact isopleth for any pollutant will be used to represent the impact radius.

For the full impact analyses, a nested grid will be developed to fully represent the significance area(s) and maximum impact area(s). The downwash receptor grid will have a receptor spacing of 30-meters along the facility fence line and out to 2 kilometers from the proposed facility; and the coarse receptor grid will have a 210-meter receptor spacing and will extend outwards at least 10 km (or more as necessary to calculate the significant impact area). When maximum impacts occur in areas outside the 30-meter spaced receptor grids, additional refined receptor grids with 30-meter resolution will be placed around the maximum impacts and extended as necessary to determine maximum impacts. Ambient concentrations within the facility fence line will not be calculated. DEM receptor data will be input into AERMAP (version 06341) to calculate hill height scales as per EPA guidance.

5.2.2 Model Options

The AERMOD model allows the selection of a number of options that affect model output. The regulatory default options will be used and include:

- Elevated terrain effects
- Stack tip downwash
- Calms processing

An analysis was performed to determine whether to if the urban option should be used. This analysis used the procedures of Auer (1978) and included drawing a 3 km radius around the project site. Within this region, land use is classified as either rural or urban. The rural land use classifications include the following:

- A1 – Metropolitan natural (golf courses, campuses, cemeteries, etc.)
- A2 – Agricultural rural
- A3 – Undeveloped, uncultivated wasteland
- A4 – Undeveloped rural
- A5 – Water surfaces (rivers, lakes, etc.)
- R1 – Common residential (single family)
- R4 – Estate residential (large homes)

Over 95 percent of the land use within 3 km of the project site is identified as rural. Therefore, no urban option will be used in the modeling analysis.

5.2.3 Building Wake Effects

Stack locations and heights and building locations and dimensions will be input to BPIP-PRIME. The first part of BPIP-PRIME determines and reports on whether a stack is being subjected to wake effects from a structure or structures. The second part calculates direction-dependent "equivalent building dimensions" if a stack is being influenced by structure wake effects. The BPIP-PRIME output is formatted for use in AERMOD input files.

5.3 MODELING EMISSIONS INVENTORY

5.3.1 Project Sources – Operations

The proposed geothermal facility is designed as a base load plant. Geothermal plants operate at a design capacity or are offline. Operational emissions are anticipated from the following sources:

Cooling Towers:	PM_{10}, Lead, H_2S, VOC and HAP
RTO H2S/Benzine Emissions Control:	PM_{10}, Lead, H_2S, VOC and HAP
Operating and Maintenance Equipment:	PM_{10}, SO_2, CO, NO_X, and VOC
Fire Pump Engine:	PM_{10}, SO_2, CO, NO_X, and VOC
Emergency Power Generator:	PM_{10}, SO_2, CO, NO_X, and VOC

Hazardous Air Pollutants (HAP) includes: Antimony, Arsenic, Arsine, Benzene, Beryllium, Cadmium, Chromium, Cobalt, Ethylbenzene, Manganese, Mercury, Nickel, Radium 226, Radium 228, Radon, Selenium, Toluene, and Xylenes. POC means pollutants of concern and includes: Ammonia, Boron, Copper, and Zinc. These pollutants are included because of their potential environmental effects. Most often these sources will be modeled based on anticipated stack parameters and emissions as point sources and the remainder will be modeled as volume or area sources.

5.3.2 Project Sources –Startups

At times, an individual well will be taken off-line and another well will be added. Before the new well is combined with the others, it is flowed to operating temperatures. The air emissions are vented at the well test unit and include PM_{10}, Lead, H2S, HAP and POC. Emissions from this activity will be based on anticipated hours of operations for this activity.

Less frequently, the entire facility is taken off-line for maintenance or other reasons and later restarted. These startup emissions are vented at the Emergency Relief Tanks (ERT). These emissions will also be based on the anticipated hours of operation for this activity and engineering design specifications.

5.3.3 Construction Sources

Prior to full facility operation, several construction activities are anticipated with corresponding air pollutant emissions. Construction of the proposed project will be divided into five main phases:

1. Site preparation and construction activities,
2. Well drilling,
3. Well testing,
4. Well reworking and
5. Commissioning.

5.3.3.1 Site Preparation and Construction Activities

Fugitive dust emissions from construction of the project can result from dust entrained during grading of the site; travel on paved and unpaved roads and across the site; soil loading and unloading operations; raw material transfers to and from material stockpiles; and wind erosion of areas being disturbed. Fugitive dust emissions will be calculated using the most appropriate South Coast Air Quality Management (SCAQMD) or US EPA AP-42 emission factors. Emissions for these activities will be modeled as a combination of volume and area sources. Combustion emissions will be generated from the heavy equipment used for excavation, grading and construction of on-site structures, the water truck used for controlling dust emissions, miscellaneous diesel-fired equipment, and gasoline-fueled trucks to transport workers and materials. These emissions will be based on current off-road and mobile emission rates and modeled as a series of equidistantly placed point sources.

5.3.3.2 Well Drilling

The diesel-fired well drilling equipment used by the drilling contractor will generate combustion emissions. This equipment will have state portable equipment air permits or APCD permits prior to use at a well pad. Four to six portable internal combustion engines rated between 400 to 600 brake horsepower are typically used for drilling wells in the Salton Sea area. These engines are equipped with turbochargers and aftercoolers. Emissions will be based on emissions information or data supplied by the manufacturers. These emissions will be modeled as point sources.

5.3.3.3 Well Testing

The test unit is used to flow test a well. A flow test usually runs for a short period. Air emissions during testing will be estimated at maximum throughput and load for the unit. These emissions will be modeled as a point source because of the short-term nature of this activity. It is expected that only one well will be tested at a time, however, a well may be tested more than once.

5.3.3.4 Well Reworking

During well reworking combustion emissions will be generated by the diesel-fired well drilling equipment used by the drilling contractor. This equipment will have state portable air permits or APCD permits prior to use at the well pad. Emissions from these units and the modeling approach are described above in Section 5.3.3.2.

5.3.3.5 Commissioning

The initial startup of the facility will be assessed and generally follow the emissions and conditions of an entire facility startup (refer to Section 5.3.2). These emissions will be based on engineering design specifications and the anticipated hours of operation for this activity. This period will be modeled based on anticipated stack parameters and emissions and the sources will be treated as point sources.

5.4 MODELING SCENARIOS

5.4.1 Compliance Review

The following activities will be reviewed separately for compliance with state and federal air quality standards:

Construction Activities	
Site preparation and construction activities:	Short term and annual
Well drilling:	Short term and annual
Well testing:	Short term (only)
Commissioning:	Short term (only)
Operations Activities	
Base load operations:	Short term and annual
Temporary Activities	
Plant startup operations:	Short term (only)
Well testing	Short term (only)
Well reworking	Short term (only)

The information developed in the above analyses for the noncriteria pollutants will be used as data input to assess the health risk impacts as discussed in Section 6.

5.4.2 Other Assessments

For impacts to soils, vegetation and other biological resources, a review of the annual emissions of the base loaded operations will be conducted. For any potential cumulative assessment both short term and annual impacts will be addressed, under base loaded operations.

6.0 MODELING RESULTS

6.1 AREA OF IMPACT ANALYSIS

Ground level concentrations caused by the project will be compared to ambient air quality impact significance levels defined by US EPA (Table 6-1). If maximum off-property pollutant concentrations for each pollutant are below these levels, then the project will not cause significant air quality impacts, thus it is proposed that no further modeling be conducted.

The maximum results from the AOI analysis will be presented in summary tables.

6.2 NAAQS AND CAAQS ANALYSIS

National Ambient Air Quality Standards/California Ambient Air Quality Standards analyses will be presented in a summary table. For CO, NO_X, SO_2, and PM_{10}, the highest short term and highest annual concentrations will be reported. For H_2S, the maximum 1-hour concentration over the five years will be presented. Background concentrations will be added to yield the total concentration, which will then be compared to the NAAQS and CAAQS.

An ambient impact significance level has not been developed for hydrogen sulfide by regulatory agencies. To provide a modeling review procedure similar to other pollutants, OE proposes the use of 6 $\mu g/m^3$ as the 1-hour significance level. This level is based upon the World Health Organization odor threshold value of 7 $\mu g/m^3$ or 5 ppb for 30 minutes (WHO, 1981). A power law relationship referenced by Turner (1970) was used to calculate a 1-hour odor threshold value based upon the WHO level. The California Office of Environmental Health Hazard Assessment in 1999 formally adopted 30 ppb (42 $\mu g/m^3$) as the acute reference exposure level and adopted in 2000 a level of 8 ppb (10 $\mu g/m^3$) as the chronic reference exposure level. The proposed significance level is consistent with US EPA's approach with the other criteria pollutants.

Table 6-1 Ambient air quality standards.			
Pollutant	**Averaging Time**	**California Standards Concentration**	**National Standards Concentration**
Ozone	1 hour	0.09 ppm (180 μg/m³)	-
	8 hour	0.07 ppm (137 μg/m³)	0.08 ppm (157 μg/m³) (3-year average of annual 4th-highest daily maximum)
Carbon Monoxide	8 hour	9.0 ppm (10000 ug/m³)	9 ppm (10000 ug/m³)
	1 hour	20 ppm (23000 ug/m³)	35 ppm (40000 ug/m³)
Nitrogen dioxide	Annual Average	0.03 ppm (57 μg/m³)	0.053 ppm (100 μg/m³)
	1 hour	0.18 ppm (339 μg/m³)	-
Sulfur dioxide	Annual Average	-	0.03 ppm (80 μg/m³)
	24 hour	0.04 ppm (105 μg/m³)	0.14 ppm (365 μg/m³)
	3 hour	-	0.5 ppm (1300 μg/m³)
	1 hour	0.25 ppm (655 μg/m³)	-
Respirable particulate matter (10 micron)	24 hour	50 μg/m³	150 μg/m³
	Annual Arithmetic Mean	20 μg/m³	-
Fine particulate matter (2.5 micron)	Annual Arithmetic Mean	12 μg/m³	15 μg/m³ (3-year average)
	24 hour	-	35 μg/m³ (3-year average of 98th percentiles)
Sulfates	24 hour	25 μg/m³	-
Hydrogen Sulfide	1 hour	0.03 ppm (42 μg/m³)	-
Lead	30 day	1.5 μg/m³	-
	Calendar Quarter	-	1.5 μg/m³
ppm = parts per million μg/m³ = micrograms per cubic meter CARB: 6/26/08			

6.3 HEALTH RISK IMPACT ANALYSIS

The screening health risk assessment will be conducted in accordance with the procedures developed by the California Air Resources Board and the Office of Environmental Health Hazard Analysis. The latest version of the Health Risk Assessment Program (HARP version 1.4) and the HARP On-Ramp program will be used to characterize risks from the proposed facility.

The HARP program is a tool that assists with the programmatic requirements of the Air Toxics Hot Spots Program, and it can be used for preparing health risk assessments for other related programs such as air toxic control measure development or facility permitting applications. HARP is a computer based risk assessment program, which combines the tools of emission inventory database, facility prioritization, air dispersion modeling, and risk assessment analysis. Use of HARP promotes statewide consistency in the area of risk assessment, increases the efficiency of evaluating potential health impacts, and provides a cost effective tool for developing facility health risk assessments. HARP may be used on single sources, facilities with multiple sources, or multiple facilities in close proximity to each other.

The screening health risk assessment will be carried out in three steps. First, emissions of toxic air pollutants from the project will be calculated. Next, AERMOD will be used to generate normalized emissions impacts on a source by source basis as input into the HARP On-Ramp program. Output from the On-Ramp program will be input into the HARP model will be used to predict the maximum concentration at each receptor due to the operation of the proposed project. A separate analysis will be conducted for construction generated PM_{10}, as per CEC requirements. The high-resolution receptor grids as derived from the facility AERMOD modeling will then be used in HARP. Finally, the ARB/OEHHA Health Risk Assessment Program (HARP) will be used to evaluate acute, chronic and cancer risks through inhalation and non-inhalation pathways based upon the maximum predicted concentration at each receptor. Some of the assumptions used in running the HARP program will be set as follows:

- Emission rates for non-criteria pollutants will be based upon the expected fuel use of the turbines as well as any compounds that could be re-circulated in the cooling tower water.
- Number of residents affected will be based upon the updated 2000 population data for those census tracts or portions of census tracts that lie within the maximum impact receptor radius of the proposed facility.
- Number of workers affected will be based upon the county average percentage of non-farm workers as compared to the total county population in 2000. This average was applied to all affected census tracts.
- Deposition velocity is taken to be 0.02 m/s, as recommended by ARB for controlled sources.
- Fraction of residents with gardens is taken to be 0.25, which is probably conservatively high for the urban area.
- Fraction of produce grown at home is taken to be 0.05, which is also believed to be conservatively high.

The receptor grids used for the HARP risk analyses are similar to those used for the refined modeling, with the addition of discrete receptor annotations representing the 1st, 2nd, and 3rd

highest impact points, i.e., MIR-1, MIR-2, and MIR-3. A complete list of the discrete sensitive receptors within 1 mile of the facility will be included in the application as well as census tract population data, census tract maps and affected tracts within 6 miles of the facility.

The HARP program results for acute and chronic inhalation and chronic non-inhalation exposures, cancer burden and individual cancer risk (workplace and residential) for the cooling tower and the combustion sources will be summarized. Separate calculations will be shown for each type of exposure and risk.

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ADDENDUM 1

Offset Identification and Cumulative Modeling Protocol

1. Offset Identification

CE is proposing to use the hydrogen sulfide emissions from the J. M. Leathers Power Plant, owned and operated by CalEnergy, as a source of hydrogen sulfide offsets. The Leathers Power Plant has a permitted emission rate of 100 tons per year. Actual noncondensible hydrogen sulfide emissions for the last three years have averaged approximately 71.1 tons per year.

2. Cumulative Modeling Analysis

Pursuant to the requirements of the CEC licensing process, a cumulative impacts analysis will be required and must consider the additional impacts of the following sources located within 6 miles of the project site.

Sources with impacts on existing air quality that are not reflected in the ambient air quality data used to establish background. These sources are generally those which have received permits authorizing construction but are not yet in operation and sources which have commenced operations subsequent to the data used to establish background air quality levels. Data derived from the ICAPCD, CARB, and the EPA AIRS data system indicates that air quality data for the project region is available up to the end of year 2007. As such, the cumulative analysis will concentrate on the above types of sources permitted or becoming operational after January 1, 2008.

Docket Optical System - Request for Documents to be docketed regarding 02-AFC-2

From: "Sharpless, Michael K." <michaelsharpless@paulhastings.com>
To: <DOCKET@energy.state.ca.us>
Date: 7/31/2008 11:31 AM
Subject: Request for Documents to be docketed regarding 02-AFC-2
Attachments: 20080731111859382.pdf; 20080731111939966.pdf

Please accept the attached letter to Compliance Project Manager Rundquist and the Air Quality Monitoring Protocol for the proposed amended petition regarding Obsidian Energy, LLC's Salton Sea Unit Six ((02-AFC-2). If you have any difficulty accessing these documents please let me know. Thank you. Mike Sharpless

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