8.1 AIR QUALITY

8.1.1 Air Quality Setting

8.1.1.1 Geography and Topography

The Russell City Energy Center (RCEC) is located approximately 2.14 miles west-southwest of the intersection of State Route 92 and I-880 in Hayward, California. The site is located 1.24 miles east of Johnson Landing on the southeastern shore of San Francisco Bay (Alameda County). Approximately 1.65 miles northeast of the site lies the Hayward Municipal Airport complex. The nearest residential area is approximately 0.82 miles northeast of the proposed project site.

The project site is relatively flat, at an elevation of 10 feet above sea level on the floor of the San LeandroValley. To the immediate north and north-northwest of the site lies the upper portion of the San Leandro Valley and the City of Oakland. To the west, northwest, and southwest of the site is the San Francisco Bay. To the immediate northeast, east, and southeast lie the cities of San Leandro, Hayward, and the Union City-Fremont areas respectively. To the south and southeast of the site lie extensive bay marsh and salt evaporator areas. Figure 8.1-1 (in pocket at end of section) shows the terrain within 6 miles of the project.

8.1.1.2 Climate and Meteorology

The overall climate in the project area is dominated by the semi-permanent eastern Pacific high pressure system, centered over the northeastern Pacific Ocean. This high is typically centered between the 140 W and 150 W meridians. Its position and size typically governs California's weather. In the summer, the high is strongest and moves to its northernmost position, which results in strong northwesterly air flow and negligible precipitation. A thermal low pressure area from the Sonoran-Mojave Desert also causes air to flow onshore over the San Francisco Bay area much of the summer.

The steady northwesterly flow around the eastern edge of the Pacific high pressure cell exerts a stress on the ocean surface along the west coast. This causes cold water to form at the surface, which cools the air even further. This cooling produces a high incidence of fog and clouds along the northern California coast in summer.

In the winter, the high weakens and moves southwestward toward Hawaii, which allows storms originating in the Gulf of Alaska to reach northern California, bringing wind and rain. About 80 percent of the region's annual rainfall of approximately 19.5 inches occurs between November and March. During the winter rainy periods, inversions are weak or nonexistent, winds are often moderate, and the air pollution potential is very low. During summer and fall, when the Pacific high becomes dominant, inversions become strong and often are surface based; winds are light and the pollution potential is high. These periods are often characterized by winds that flow out of the Central Valley into the Bay Area and often include tule fog.

Historical climatic data for the project area was derived from the following sites located to the north and south of the project site.

- San Leandro, elevation 394 ft. amsl

  Latitude 37 deg, 46 min N, Longitude 122 deg, 10 min W

- Newark, elevation 10 ft. amsl

  Latitude 37 deg, 31 min N, Longitude 122 deg, 2 min W

A summary of data from these sites indicates the following:

- Maximum average daily temperature is 67.7 deg F
- Minimum average daily temperature is 48.8 deg F
- Average days per year with maximum daily temperature > 90 deg F = 8
- Average days per year with maximum daily temperature <= 32 deg F = 0
- Average days per year with minimum daily temperature <= 32 deg F = 4
- Average days per year with minimum daily temperture <= 0 deg F = 0
- Average annual precipitation = 19.5 in. year
- Average annual days with precipitation >= 0.1 in. = 37

Air quality is determined primarily by the type and amount of pollutants emitted into the atmosphere, the topography of the air basin, and the meteorological conditions. In the project area, stable atmospheric conditions and light winds can provide conditions for pollutants to accumulate in the air basin. The predominant winds in California are shown in Figures 8.1-2 through 8.1-5 (all of the figures in this section are located at the end of the section). As the figures indicate, winds in California generally are light and easterly in the winter, but strong and westerly in the spring, summer, and fall.

Wind patterns in the area of the project site are presented in Figures 8.1-6a through 8.1-6e, which are the annual and quarterly wind roses for the Union City (1990-1994) meteorological station. The wind roses indicate that winds are persistent and predominantly from the west through the north-west. Calm conditions occur approximately 0.42% percent of the time. A total of about 56% percent of the winds come from west through north-northwest. In general, the northwesterly winds are associated with a convective flow of cool marine air (i.e., off San Francisco Bay) inland to the warm interior during the warm part of the day and the warm part of the year. However, there is also a significant incidence of southeast through south-southeast wind flow (approximately 16.8 percent). These southeasterly winds occur under conditions of relatively cold temperatures inland, i.e., during the cool parts of the year and the cool parts of the day, when temperatures over the Bay are warmer than those inland and cause an offshore convective flow. Figure 8.1-6f shows the stability/wind rose for the Union City data.

Seasonal wind flow patterns for the Bay Area are shown on Figure 8.1-7. Statistical data for these patterns is summarized in Table 8.1-1.

The mixing heights of the area are affected by the eastern Pacific high pressure system and marine influences. Often the base of an inversion is found at the top of a layer of marine air because of the cooler nature of the marine environment. Smith, et al. (1984), reported that at Oakland, the nearest upper-level meteorological station (located approximately 7 miles north-northwest of the project site), 50th percentile morning mixing heights for the period 1979-80 were approximately 1770 feet (530-550 meters) in summer and fall, and 3600-3900 feet (1100-1200 meters) in winter and spring. The 50th percentile afternoon mixing heights ranged between 2150 and 3030 feet (660-925 meters) in summer and fall, and over 3900 feet (>1200 meters) in winter and spring. Such mixing heights provide generally favorable conditions for the dispersion of pollutants. Inland areas, where the marine influence is weaker, often experience strong ground-based inversions during cold weather periods. These inversions inhibit dispersion of low-lying sources of air pollution such as cars, trucks, and buses, which can result in high pollutant concentrations.

Table 8.1-1. San Francisco Bay Area air basin surface airflow types: seasonal and diurnal percentage of occurrence (1977-1981 Data).

Time - PST	Ib North-westerly (Weak)	Ia North-Westerly (Moderate to Strong)	II South-erly	III South-easterly	IV North-easterly	V Bay Inflow	VI Bay Out-Flow	VII Calm
Winter								
4 a.m.	3	4	19	14	8	21	5	24
10 a.m.	4	5	19	20	10	11	19	9
4 p.m.	16	16	16	12	13	3	22	1
10 p.m.	6	9	14	14	10	20	3	21
All Times	7	9	17	15	10	14	12	14
Spring								
4 a.m.	27	25	11	2	4	15	5	12
10 a.m.	29	25	14	6	5	3	17	1
4 p.m.	22	60	7	4	4	2	2	*
10 p.m.	40	34	8	2	4	5	3	5
All Times	29	36	10	3	4	6	7	5
Summer								
4 a.m.	40	37	4	*	0	6	2	10
10 a.m.	37	44	4	*	1	1	13	0
4 p.m.	20	77	2	0	1	0	*	0
10 p.m.	39	55	2	0	*	1	1	1
All Times	34	53	3	0	1	2	4	3
Fall								
4 a.m.	25	13	7	6	3	22	3	19
10 a.m.	28	15	6	11	6	7	23	4
4 p.m.	31	46	5	2	6	2	2	*
10 p.m.	37	24	6	4	3	13	13	12
All Times	30	24	6	6	4	11	11	9
Yearly								
4 a.m.	24	20	10	6	4	16	4	16
10 a.m.	25	22	11	9	6	6	18	4
4 p.m.	22	50	8	5	6	2	7	*
10 p.m.	31	30	8	5	4	10	2	10
All Times	26	30	9	6	5	8	8	8

Note: * <0.5%

8.1.2 Existing Air Quality and Overview of Standards and Health Effects

The U.S. Environmental Protection Agency (USEPA) has established national ambient air quality standards (NAAQS) for ozone, nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), 10-micron particulate matter (PM_{10}), 2.5-micron particulate matter ($PM_{2.5}$), and airborne lead for the protection of public health and welfare. In general, if these NAAQS are exceeded in an area more than once a year, the area is considered a "nonattainment area" subject to planning and pollution control requirements that are more stringent than normal requirements.

In addition, the California Air Resources Board (CARB) has established standards for ozone, CO, NO_2, SO_2, sulfates, PM_{10}, airborne lead, hydrogen sulfide, and vinyl chloride at levels designed to protect the most sensitive members of the population, particularly children, the elderly, and people who suffer from lung or heart diseases. CARB carries out control program oversight activities, while local air pollution control districts have primary responsibility for air quality planning and enforcement.

Both state and national air quality standards consist of two parts: an allowable concentration of a pollutant and an averaging time over which the concentration is to be measured. Allowable concentrations are based on the results of studies of the effects of the pollutants on human health, crops and vegetation, and, in some cases, damage to paint and other materials. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposures to a high concentration for a short time (one hour, for instance), or to a relatively lower average concentration over a longer period (eight hours, 24 hours, or one year). For some pollutants there is more than one air quality standard, reflecting both its short-term and long-term effects. Table 8.1-2A presents the state and national ambient air quality standards for selected pollutants. Many of the California ambient air quality standards are more stringent than the federal standards and have shorter averaging periods.

Table 8.1-2A. Ambient air quality standards.

Pollutant	Averaging Time	California Standards Concentration	National Standards Concentration
Ozone	1 hour	0.09 ppm	0.12 ppm
	8 hours	-	0.08 ppm (3-year average of annual 4th-highest daily maximum)
Carbon Monoxide	8 hours	9.0 ppm	9 ppm
	1 hour	20 ppm	35 ppm
Nitrogen Dioxide	Annual Average	-	0.053 ppm
	1 hour	0.25 ppm	-
Sulfur Dioxide	Annual Average	-	80 $\mu g/m^3$ (0.03 ppm)
	24 hours	0.04 ppm (105 $\mu g/m^3$)	365 $\mu g/m^3$ (0.14 ppm)
	3 hours	-	1300 $\mu g/m^3$ (0.5 ppm)
	1 hour	0.25 ppm	-
Suspended Particulate Matter (10 Micron)	Annual Geometric Mean	30 $\mu g/m^3$	-
	24 hours	50 $\mu g/m^3$	150 $\mu g/m^3$
	Annual Arithmetic Mean	-	50 $\mu g/m^3$
Suspended Particulate Matter (2.5 Micron)	Annual Arithmetic Mean	-	15 $\mu g/m^3$ (3-year average)
	24 hours	-	65 $\mu g/m^3$ (3-year average of 98th percentiles)
Sulfates	24 hours	25 $\mu g/m^3$	-
Lead	30 days	1.5 $\mu g/m^3$	-
	Calendar Quarter	-	1.5 $\mu g/m^3$

ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter

USEPA's new NAAQS for ozone and fine particulate matter went into effect on September 16, 1997. For ozone, the previous one-hour standard of 0.12 ppm was replaced by an eight-hour average standard at a level of 0.08 ppm. Compliance with this standard is based on the three-year average of the annual fourth-highest daily maximum eight-hour average concentration measured at each monitor within an area.

Table 8.1-2B. Alameda County air quality data summary.

Alameda County										
OZONE (ppm)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Peak Indicator	0.136	0.129	0.130	0.126	0.118	0.135	0.151	0.149	0.151	0.144
National 1-Hour Design Value	0.130	0.130	0.120	0.120	0.120	0.138	0.138	0.138	0.138	0.139
National 8-Hour Design Value	0.087	0.084	0.082	0.081	0.082	0.087	0.093	0.090	0.089	0.086
Maximum 1-Hour Concentration	0.130	0.140	0.130	0.130	0.129	0.155	0.138	0.114	0.146	0.146
Maximum 8-Hour Concentration	0.105	0.092	0.091	0.102	0.092	0.115	0.112	0.084	0.110	0.116
Days Above State Standard	9	19	16	8	7	21	23	6	22	15
Days Above National 1-Hour Standard	2	1	1	2	2	9	8	0	6	2
Days Above National 8-Hour Standard	4	2	3	4	3	12	10	0	10	6
PM10 (ug/m3)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Maximum 24-Hour Concentration	137	155	99	84	97	52	71	65	63	88
Maximum Annual Geometric Mean	27.4	29.9	25.8	22.3	21.7	19.4	20.4	22.0	20.1	22.6
Days Above State 24-Hour Standard	57	84	30	18	24	6	6	12	12	18
Calculated Days Above Nat'l 24-Hour Standard	0	3	0	0	0	0	0	0	0	0
CARBON MONOXIDE (ppm)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Peak Indicator	6.8	7.0	6.4	5.8	4.8	4.8	4.8	4.4	4.5	4.7
Maximum 1-Hour Concentration	8.0	9.0	7.0	7.0	8.7	5.5	6.9	7.9	6.3	6.4
Maximum 8-Hour Concentration	6.1	6.8	4.6	4.9	5.6	3.8	3.9	3.6	4.6	5.2
Days Above State 8-Hour Standard	0	0	0	0	0	0	0	0	0	0
Days Above Nat.'l 8-Hour Standard	0	0	0	0	0	0	0	0	0	0
NITROGEN DIOXIDE (ppm)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Peak Indicator	0.138	0.133	0.120	0.112	0.092	0.091	0.090	0.089	0.087	0.094
Maximum 1-Hour Concentration	0.130	0.150	0.110	0.110	0.097	0.086	0.088	0.086	0.098	0.112
Maximum Annual Average	0.023	0.024	0.021	0.022	0.022	0.021	0.022	0.020	0.020	0.022
SULFUR DIOXIDE (ppm)	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Peak Indicator	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum 24-Hour Concentration	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Sources: California Almanac of Emissions and Air Quality-2001

The NAAQS for particulates were revised in several respects. First, compliance with the current 24-hour PM_{10} standard is now based on the 99th percentile of 24-hour concentrations at each monitor within an area. In addition, two new $PM_{2.5}$ standards were added: a standard of 15 $\mu g/m^3$, based on the three-year average of annual arithmetic means from single or multiple monitors (as available); and a standard of 65 $\mu g/m^3$, based on the three-year average of the 98th percentile of 24-hour average concentrations at each monitor within an area. USEPA is delaying implementation of the new standards for an interim period to allow time to establish $PM_{2.5}$ monitoring networks, designate areas, and develop control strategies. Presently, USEPA has very little data to establish the air quality status of areas with regard to $PM_{2.5}$. Table 8.1-2B delineates a historical summary of air quality data for Alameda county from 1990-1999. Specific monitoring station data used for background is given in Section 8.1.3.

8.1.3 Criteria Pollutants and Air Quality Trends

Existing SLAMS/NAMS ambient air monitoring stations were used to characterize the air quality at the project site. These stations were utilized because of their proximity to the project site and because they record area-wide ambient conditions rather than the localized impacts of any particular facility. All ambient air quality data presented in this section were taken from CARB, BAAQMD, and EPA publications and data sources. Monitoring station location and pollutant data used to establish background air quality for the project area is as follows:

- Fremont Station – Ozone, carbon monoxide, nitrogen dioxide, sulfates, PM_{10}, lead
  Chapel Way Monitoring Site
- Hayward Station – Ozone
  La Mesa Monitoring Site
- San Leandro Station – Ozone and PM_{10}
  County Hospital Monitoring Site
- San Francisco Station – Sulfur dioxide
  Arkansas St. Monitoring Site
- San Jose Station – Sulfates
  4th St. Monitoring Site

8.1.3.1 Ozone

Ozone is generated by a complex series of chemical reactions between precursor organic compounds (POC) and oxides of nitrogen (NO_x) in the presence of ultraviolet radiation. Ambient ozone concentrations follow a seasonal pattern: higher in the summer time and lower in the winter time. At certain times, the general area can provide ideal conditions for the formation of ozone due to the persistent temperature inversions, clear skies, mountain ranges to trap the air mass, and exhaust emissions from motor vehicles and stationary, area, and biogenic sources. Based upon ambient air measurements at stations throughout the area, the San Francisco Bay Area Air Basin is classified as a nonattainment area for ozone for both state and federal air quality standards.

Maximum ozone concentrations at the identified stations usually are recorded during the summer months. Tables 8.1-3a, 8.1-3b, and 8.1-3c show the annual maximum hourly ozone levels recorded at the Fremont, Hayward, and San Leandro monitoring stations, respectively, during the period 1993-2000, as well as the number of days in which the state and federal standards were exceeded. The data show that, on average, the state ozone air quality standard was exceeded several days each year. During the last three (3) monitoring years, only one exceedance of the federal standard was recorded (Fremont station-1999).

Data from these stations over the last 3-4 years indicate that ozone concentrations have been consistently below or at the NAAQS, but above the SAAQS. Only one of the three stations has recorded an exceedance of the NAAQS for ozone in the past three (3) years. Data from the most recent three (3) years of data will be used to establish a background level.

Table 8.1-3a. Ozone levels at the Fremont monitoring station, 1993-2000 (ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	.13	.12	.15	.10	.11	.12	.13	.10
Number of Days Exceeding:								
State Standard (0.09 ppm, 1-hour)	5	4	10	2	2	7	3	2
Federal Standard (0.12 ppm, 1-hour)	1	0	2	0	0	0	1	0

Source: BAAQMD, CARB

Table 8.1-3b. Ozone levels at the Hayward monitoring station, 1993-2000 (ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	.09	.10	.15	.11	.11	.10	.12	.11
Number of Days Exceeding:								
State Standard (0.09 ppm, 1-hour)	0	1	7	2	2	4	4	1
Federal Standard (0.12 ppm, 1-hour)	0	0	2	0	0	0	0	0

Source: BAAQMD, CARB

Table 8.1-3c. Ozone levels at the San Leandro monitoring station, 1993-2000 (ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	.12	.09	.15	.11	.10	.11	.11	.10
Number of Days Exceeding:								
State Standard (0.09 ppm, 1-hour)	3	0	6	2	3	2	3	1
Federal Standard (0.12 ppm, 1-hour)	0	0	3	0	0	0	0	0

Source: BAAQMD, CARB

8.1.3.2 Nitrogen Dioxide

Nitrogen oxides are primarily generated from the combustion of fuels. Nitrogen oxides include nitric oxide (NO) and NO_2. Because NO converts to NO_2 in the atmosphere over time and NO_2 is the more toxic of the two, nitrogen dioxide is the listed criteria pollutant. The control of NO_2 is important because of its role in the formation of ozone.

Based upon regional air quality measurements of NO_2, the San Francisco Bay Area Air Basin is in attainment for NO_2 for both state and federal standards.

Table 8.1-4 shows the maximum one-hour NO_2 levels recorded at the Fremont monitoring station each year from 1993 through 2000, as well as the annual average level for each of those years. During this period there has not been a single violation of either the state one-hour standard or the annual NAAQS of 5.3 pphm.

Table 8.1-4. Nitrogen dioxide levels at the Fremont monitoring station, 1993-2000 (pphm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	10	10	9	9	9	10	11	8
Annual Average (NAAQS = 5.3 pphm)	2.2	2.2	2.1	2.2	2.0	2.0	2.2	1.8
Number of Days Exceeding:								
State Standard (0.25 ppm, 1-hour)	0	0	0	0	0	0	0	0

Source: California Air Resources Board and BAAQMD

8.1.3.3 Carbon Monoxide

CO is a product of inefficient combustion, principally from automobiles and other mobile sources of pollution. In many areas of California, CO emissions from wood-burning stoves and fireplaces can also be measurable contributors. Industrial sources typically contribute less than 10 percent of ambient CO levels. Peak CO levels occur typically during winter months, due to a combination of higher emission rates and calm weather conditions with strong, ground-based inversions. Based upon ambient air quality monitoring, the San Francisco Bay Area Air Basin is classified as being in attainment for CO for state and federal standards.

Table 8.1-5 shows the California and federal air quality standards for CO, and the maximum one-hour and eight-hour average levels recorded at the Fremont monitoring station during the period 1993-2000.

Table 8.1-5. Carbon monoxide levels at the Fremont monitoring station, 1993-2000(ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 8-hour average	3.6	3.9	2.9	3.4	3.0	2.8	3.1	2.4
Highest 1-hour average	7	9	6	6	6	5.1	5.6	3.6
Number of days exceeding:								
State Standard (9.0 ppm, 8-hr)	0	0	0	0	0	0	0	0
State Standard (20 ppm, 1-hr)	0	0	0	0	0	0	0	0
Federal Standard (9 ppm, 8-hr)	0	0	0	0	0	0	0	0
Federal Standard (35 ppm, 1-hr)	0	0	0	0	0	0	0	0

Source: California Air Resources Board and BAAQMD

Trends of maximum eight-hour and one-hour average CO as shown in Table 8.1-5 indicate that maximum ambient CO levels at the Fremont station have been below the state standards for many years, and continue to decline. This same trend is present for the entire BAAQMD as shown in Table 8.1-2B.

8.1.3.4 Sulfur Dioxide

SO_2 is produced when any sulfur-containing fuel is burned. It is also emitted by chemical plants that treat or refine sulfur or sulfur-containing chemicals. Natural gas contains negligible sulfur, while fuel oils contain larger amounts. Peak concentrations of SO_2 occur at different times of the year in different parts of California, depending on local fuel characteristics, weather, and topography. The San Francisco Bay Area Air Basin is considered to be in attainment for SO_2 for purposes of state and federal air quality planning.

Table 8.1-6 presents the state air quality standard for SO_2 and the maximum levels recorded in San Francisco (site of the nearest SO_2 monitor) from 1993 through 2000. The federal annual average standard is 0.03 ppm; during the period shown, the annual average SO_2 levels at San Francisco have been well below the federal standard.

Table 8.1-6. Sulfur dioxide levels in San Francisco, 1993-2000 (ppm).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 1-Hour Average	.04	.02	.04	.04	.03	.04	.03	.02
Annual Average	.001	.000	.001	.001	.001	.001	.002	.002
Number of Days Exceeding:								
State Standard (0.25 ppm, 1-hr)	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

8.1.3.5 Particulate Sulfates

Particulate suspended sulfates are generated from the oxidation of SO_2 in the atmosphere. A natural source of particulate sulfates in coastal areas comes from sea spray, due to the sulfate content in seawater. The San Francisco Bay Area Air Basin is in attainment with the state standard for sulfates. There is no federal standard for sulfates.

Table 8.1-7 shows the California air quality standard for particulate suspended sulfate and the maximum 24-hour average levels recorded in Fremont from 1993 through 1995 and San Jose from 1996 to 2000. Maximum levels are generally well below the state standard.

Table 8.1-7. Particulate suspended sulfate levels, 1993-2000 ($\mu g/m^3$).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 24-Hour Average	8.4	6.7	6.6	6.3	6.9	3.3	5.4	10.2
Number of Days Exceeding:								
State Standard (25 $\mu g/m^3$, 24-hour)	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

8.1.3.6 Particulates (PM_{10})

Particulates in the air are caused by a combination of wind-blown fugitive dust; particles emitted from combustion sources and manufacturing processes; and organic, sulfate, and nitrate aerosols formed in the air from emitted hydrocarbons, sulfur oxides, and nitrogen oxides. In 1984, CARB adopted standards for PM_{10} and phased out the total suspended particulate (TSP) standards that had been in effect previously. PM_{10} standards were substituted for TSP standards because PM_{10} corresponds to the size range of particulates that can be inhaled into the lungs and therefore is a better measure to use in assessing potential health effects. In 1987, USEPA also replaced national TSP standards with PM_{10} standards. PM_{10} levels in the San Francisco Bay Area Air Basin are in attainment with federal standards but exceed the state standards.

As discussed previously, the NAAQS for particulates were further revised by USEPA with new standards that went into effect on September 16, 1997; two new $PM_{2.5}$ standards were added at that time.

Table 8.1-8a shows the federal and state air quality standards for PM_{10}, maximum levels recorded at the Fremont monitoring station for 1993-2000, and geometric and arithmetic annual averages for the same period. Table 8.1-8b presents the same information for the San Leandro monitoring station (1993 to 1998).

Table 8.1-8a PM_{10} levels at the Fremont monitoring station, 1993-2000 ($\mu g/m^3$).

	1993	1994	1995	1996	1997	1998	1999	2000
Highest 24-Hour Average	77	82	52	59	63	63	88	50
Annual Geometric Mean (State Standard = 30 $\mu g/m^3$)	22.3	21.7	19.2	20.5	21.8	20.1	21.9	17.9
Annual Arithmetic Mean (Federal Standard = 50 $\mu g/m^3$)	25.3	24.9	21.9	22.7	23.6	21.8	24.3	18.4
Number of Days Exceeding:								
State Standard (50 $\mu g/m^3$, 24-hour)	3	3	1	1	1	1	2	0
Federal Standard (150 $\mu g/m^3$, 24-hour)	0	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

Table 8.1-8b PM_{10} levels at the San Leandro monitoring station, 1993-1998 ($\mu g/m^3$).

	1993	1994	1995	1996	1997	1998
Highest 24-Hour Average	51	62	47	59	65	32.4
Annual Geometric Mean (State Standard = 30 $\mu g/m^3$)	18.1	18.7	16.9	19.1	15.9	13.2
Annual Arithmetic Mean (Federal Standard = 50 $\mu g/m^3$)	20.8	21.1	19.5	21.3	17.4	14.0
Number of Days Exceeding:						
State Standard (50 $\mu g/m^3$, 24-hour)	1	1	0	1	1	0
Federal Standard (150 $\mu g/m^3$, 24-hour)	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

8.1.3.7 Airborne Lead

Lead in the air results from the combustion of fuels that contain lead. Twenty-five years ago, motor gasolines contained relatively large amounts of lead compounds used as octane-rating improvers, and ambient lead levels were relatively high. Beginning with the 1975 model year, new automobiles began to be equipped with exhaust catalysts, which were poisoned by the exhaust products of leaded gasoline. Thus, unleaded gasoline became the required fuel for an increasing fraction of new vehicles, and the phaseout of leaded gasoline began. As a result, ambient lead levels decreased dramatically. The San Francisco Bay Area Air Basin is considered an attainment area for state and federal airborne lead levels for air quality planning purposes.

Table 8.1-9 lists the state air quality standard for airborne lead and the levels recorded in Fremont from 1993 through 1999. Maximum quarterly levels are well below the federal standard.

Table 8.1-9. Airborne lead levels at the Fremont monitoring station 1993-1999 ($\mu g/m^3$).

	1993	1994	1995	1996	1997	1998	1999
Highest Quarterly Average	.01	.02	.02	.01	.01	.02	.01
Number of Days Exceeding:							
State Standard (1.5 $\mu g/m^3$, monthly)	0	0	0	0	0	0	0

Source: California Air Quality Data, Annual Summary, California Air Resources Board

Figures 8.1-8, 8.1-9, and 8.1-10 show overall air quality trends in the Bay Area AQMD for ozone, carbon monoxide, and PM10 respectively as delineated in the CARB 2001 Almanac of Emissions and Air Quality.

8.1.4 Affected Environment

The USEPA has responsibility for enforcing, on a national basis, the requirements of many of the country's environmental and hazardous waste laws. California is under the jurisdiction of USEPA Region IX, which has its offices in San Francisco. Region IX is responsible for the local administration of USEPA programs for California, Arizona, Nevada, Hawaii, and certain Pacific trust territories. USEPA's activities relative to the California air pollution control program focus principally on reviewing California's submittals for the State Implementation Plan (SIP). The SIP is required by the federal Clean Air Act to demonstrate how all areas of the state will meet the national ambient air quality standards within the federally specified deadlines (42 USC §7409, 7411).

The California Air Resources Board was created in 1968 by the Mulford-Carrell Air Resources Act, through the merger of two other state agencies. CARB's primary responsibilities are to develop, adopt, implement, and enforce the state's motor vehicle pollution control program; to administer and coordinate the state's air pollution research program; to adopt and update as necessary the state's ambient air quality standards; to review the operations of the local air pollution control districts; and to review and coordinate preparation of the SIP for achievement of the federal ambient air quality standards (California Health & Safety Code (H&SC) §39500 et seq.).

When the state's air pollution statutes were reorganized in the mid-1960s, local air pollution control districts (APCDs) were required to be established in each county of the state (H&SC §4000 et seq.). There are three different types of districts: county, regional, and unified. In addition, special air quality management districts (AQMDs), with more comprehensive authority over non-vehicular sources as well as transportation and other regional planning responsibilities, have been established by the Legislature for several regions in California, including the San Francisco Bay Area (H&SC §40200 et seq.).

Air pollution control districts and air quality management districts in California have principal responsibility for developing plans for meeting the state and federal ambient air quality standards; for developing control measures for non-vehicular sources of air pollution necessary to achieve and maintain both state and federal air quality standards; for implementing permit programs established for the construction, modification, and operation of sources of air pollution; for enforcing air pollution statutes and regulations governing non-vehicular sources; and for developing employer-based trip reduction programs.

Each level of government has adopted specific regulations that limit emissions from stationary combustion sources, several of which are applicable to this project. The other agencies having permitting authority for this project are shown in Table 8.1-10. Applicable LORS and compliance with these requirements are discussed in more detail in the following sections. An application for a Determination of Compliance will be filed with the BAAQMD approximately one week after the AFC is filed with the Commission.

Table 8.1-10. Air quality agencies.

Agency	Authority	Contact
USEPA Region IX	oversight of permit issuance, enforcement	Matt Haber, Chief Permits Officer USEPA Region IX 75 Hawthorne Street San Francisco, CA 94105 (415) 744-1254
Bay Area Air Quality Management District	permit issuance, enforcement	William deBoisblanc, Director of Permit Services Bay Area Air Quality Management District 939 Ellis Street San Francisco, CA 94109 (415) 749-4707
California Air Resources Board	regulatory oversight	Mike Tollstrup, Chief Project Assessment Branch, CARB 2020 L St. Sacramento, CA. 95814 (916) 322-6026

8.1.4.1 Laws, Ordinances, Regulations, and Standards

Federal

Prevention of Significant Deterioration Program

Authority: Clean Air Act §160-169A, 42 USC §7470-7491; 40 CFR Parts 51 and 52

Requirements: Requires prevention of significant deterioration (PSD) review and facility permitting for construction of new or modified major stationary sources of air pollution. PSD review applies with respect to attainment pollutants for which ambient concentrations are lower than the corresponding national ambient air quality standards (NAAQS). The following federal requirements apply on a pollutant-by-pollutant basis, depending on facility emission rates.

- Emissions must be controlled using Best Available Control Technology (BACT).
- Air quality impacts in combination with other increment-consuming sources must not exceed maximum allowable incremental increases for SO_2, PM_{10}, and NO_x.
- Air quality impacts of all sources in the area plus ambient pollutant background levels cannot exceed NAAQS.
- Pre- and/or post-construction air quality monitoring may be required.
- The air quality impacts on soils, vegetation, and nearby PSD Class I areas (specific national parks and wilderness areas) must be evaluated. (Note: RCEC is located in a Class II area.)

PSD review jurisdiction has been delegated to the Bay Area Air Quality Management District (BAAQMD) for all pollutants and is discussed further below under local LORS and conformance.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

New Source Review

Authority: Clean Air Act §171-193, 42 USC §7501 et seq.; 40 CFR Parts 51 and 52

Requirement: Requires new source review (NSR) facility permitting for construction or modification of specified stationary sources. New source review applies with respect to nonattainment pollutants for which ambient concentration levels are higher than the corresponding NAAQS. The following federal requirements apply on a pollutant-by-pollutant basis, depending on facility emission rates.

- Emissions must be controlled to the lowest achievable emission rate (LAER).
- Sufficient offsetting emissions reductions must be obtained following the requirements in the regulations to continue reasonable further progress toward attainment of applicable NAAQS.
- The owner or operator of the new facility has demonstrated that major stationary sources owned or operated by the same entity in California are in compliance or on schedule for compliance with applicable emissions limitations in this rule.
- The administrator must find that the implementation plan has been adequately implemented.
- An analysis of alternatives must show that the benefits of the proposed source significantly outweigh any environmental and social costs.

New source review jurisdiction has been delegated to the BAAQMD for all pollutants and is discussed further under local LORS and conformance below.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

Acid Rain Program

Authority: Clean Air Act §401 (Title IV), 42 USC §7651

Requirement: Requires the reduction of the adverse effects of acid deposition through reductions in emissions of sulfur dioxide and nitrogen oxides. BAAQMD has received delegation authority to implement Title IV.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

Title V Operating Permits Program

Authority: Clean Air Act §501 (Title V), 42 USC §7661

Requirements: Establishes comprehensive operating permit program for major stationary sources. BAAQMD has received delegation authority for this program.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

National Standards of Performance for New Stationary Sources

Authority: Clean Air Act §111, 42 USC §7411; 40 CFR Part 60

Requirements: Establishes national standards of performance for new stationary sources. These standards are enforced at the local level with USEPA oversight. Relevant new stationary source performance standards are discussed under local LORS below.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

National Emission Standards for Hazardous Air Pollutants

Authority: Clean Air Act §112, 42 USC §7412

Requirements: Establishes national emission standards for hazardous air pollutants. These standards are enforced at the local level with USEPA oversight and are further discussed under local LORS and conformance below.

Administering Agency: BAAQMD, with USEPA Region IX oversight.

State

Nuisance Regulation

Authority: CA Health & Safety Code §41700

Requirements: Provides that "no person shall discharge from any source whatsoever such quantities of air contaminants or other material which causes injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property."

Administering Agency: CARB and BAAQMD

Toxic "Hot Spots" Act

Authority: H& SC §44300-44384; 17 CCR §93300-93347

Requirements: Requires preparation and periodic updating of inventory of facility emissions of hazardous substances listed by CARB, in accordance with CARB's regulatory guidelines. Risk assessments are to be prepared by selected facilities based upon local priorities and risk scoring criteria.

Administering Agency: BAAQMD and CARB

CEC and CARB Memorandum of Understanding

Authority: CA Pub. Res. Code §25523(a); 20 CCR §1752, 1752.5, 2300-2309 and Div. 2, Chap. 5, Art. 1, Appendix B, Part (k)

Requirements: Provides for the inclusion of requirements in the CEC's decision on an application for certification to assure protection of environmental quality; application is required to include information concerning air quality protection.

Administering Agency: California Energy Commission

Local

Authority: CA Health & Safety Code §40001

Requirements: Prohibit emissions and other discharges (such as smoke and odors) from specific sources of air pollution in excess of specified levels.

Administering Agency: BAAQMD, with CARB oversight.

8.1.4.2 Conformance of Facility

As addressed in this section, RCEC is designed, and will be constructed and operated, in accordance with all relevant federal, state, and local requirements and policies concerning protection of air quality.

Federal and Bay Area Air Quality Management District Prevention of Significant Deterioration Program

USEPA has promulgated PSD regulations for areas that are in compliance with national ambient air quality standards (40 CFR 52.21). The PSD program allows new sources of air pollution to be constructed, or existing sources to be modified, while preserving the existing ambient air quality levels, protecting public health and welfare, and protecting Class I areas (e.g., specific national parks and wilderness areas). USEPA has delegated the authority to implement the PSD program to various California air pollution control districts, including the BAAQMD where the RCEC is located (40 CFR 52.21(u)).

The five principal elements of the federal PSD program are:

- Applicability
- Best available control technology
- Pre-construction monitoring
- Increments analysis
- Air quality impact analysis

The PSD requirements apply on a pollutant-specific basis to any project that is a new major stationary source or a major modification to an existing stationary source. (These terms are defined in federal regulations.) (40 CFR 52.21) The determination of applicability is based on evaluating the emissions changes associated with the proposed project in addition to all other emissions changes at the same location since the applicable PSD baseline dates (40 CFR 52.21).

Under the BAAQMD PSD program (Regulation 2, Rule 2), best available control technology (BACT) must be applied when a new or modified source shows emission increases in excess of 10 pounds per highest day of precursor organic compounds (POC), nonprecursor organic compounds (NPOC), NO_x, SO_2, PM_{10}, or CO. The BAAQMD program also dictates that a permit for a project will be denied if specified emissions thresholds are exceeded unless air dispersion modeling shows that ambient air quality standards will not be violated and the applicable PSD increments, as defined in the PSD rule, will not be exceeded. The BAAQMD PSD emission threshold levels for requiring modeling are shown in Table 8.1-11. The PSD modeling requirements apply to all facilities with cumulative increases in emissions that exceed the levels shown in Table 8.1-11 on a pollutant-specific basis since the applicable PSD baseline date.

Table 8.1-11. BAAQMD PSD significant emission threshold levels.

Pollutant	Threshold Level
PM_{10}	15 tpy
NO_x	40 tpy
SO_2	40 tpy
POC	40 tpy
CO	100 tpy

The BAAQMD PSD program applies, on a pollutant-specific basis, only to a new major stationary source or to a major modification of an existing major stationary source that meets the following criteria:

- A new facility that will emit 100 tons per year (tpy) or more, and is one of the 28 PSD source categories in the federal Clean Air Act or any new facility that will emit 250 tpy or more; or
- A facility that emits 100 tpy or more with net emissions increases since the applicable PSD baseline date that exceed the threshold levels shown in Table 8.1-11.

Federal New Source Performance Standards

The Standards of Performance for New Stationary Sources are source-specific federal regulations, limiting the allowable emissions of criteria pollutants (i.e., those that have a national ambient air quality standard). These regulations apply to certain sources depending on the equipment size, process rate, and/or the date of construction, modification, or preconstruction of the affected facility. Recordkeeping, reporting, and monitoring requirements are usually necessary for the regulated pollutants from each subject source; the reports must be regularly submitted to the reviewing agency (40 CFR 60.4). As with the PSD program, this program has been delegated by USEPA to the BAAQMD. A summary of the BAAQMD New Source Performance Standards applicable to the project is provided in Section 8.1.4.2.9.

National Emissions Standards for Hazardous Air Pollutants

The National Emissions Standards for Hazardous Air Pollutants (NESHAPs) are either source-specific or pollutant-specific regulations, limiting the allowable emissions of hazardous air pollutants from the affected sources (40 CFR 61). Unlike criteria air pollutants, hazardous air pollutants do not have a national ambient air quality standard but have been identified by USEPA as causing or contributing to the adverse health effects of air pollution.

Administration of the hazardous air pollutants program has been delegated to the BAAQMD and is described in Section 8.1.4.2.10 (40 CFR 61.04).

Federal Clean Air Act Amendments of 1990

In November 1990, substantial revisions and updates to the federal Clean Air Act were signed into law. This complex enactment addresses a number of areas that could be relevant to RCEC, such as State Implementation Plan requirements for nonattainment areas that set new compliance deadlines and annual progress increments, more extensive permitting requirements, new USEPA mandates and deadlines for developing rules to control air toxic emissions, and acid deposition control. Following is a summary of the new provisions applicable to this project.

Title IV - Acid Deposition Control

This title requires the reduction of emissions of acidic compounds and their precursors (42 USC §7651 et seq.). The principal source of these compounds is the combustion of fossil fuels. Other requirements include monitoring and recordkeeping for emissions of SO_2 and NO_x and for opacity and volumetric flow.

Title V - Operating Permits

This title establishes a comprehensive operating permit program for major stationary sources (42 USC §7661 et seq.). Under the Title V program, a single permit that includes a listing of all the stationary sources, applicable regulations, requirements, and compliance determination is required.

The BAAQMD's Major Facility Review Program (Regulation 2, Rule 6) has been approved by USEPA and includes the acid rain program. Consequently, the BAAQMD has received delegation to implement the Title IV and V programs. The BAAQMD Title IV and V permit programs applicable to this project are summarized below.

California Clean Air Act

AB 2595, the California Clean Air Act (Act), was enacted by the California Legislature and became law in January 1989. The Act requires the local air pollution control districts to attain and maintain both the federal and state ambient air quality standards at the "earliest practicable date." The Act contains several milestones for local districts and the California Air Resources Board. In 1993, the BAAQMD submitted to the Air Resources Board an air quality plan defining the program for meeting the required emission reduction milestones in the Bay Area. Several updates to the original plan have also been submitted.

Air quality plans must demonstrate attainment of the state ambient air quality standards and must result in a five percent annual reduction in emissions of nonattainment pollutants (ozone, CO, NO_x, SO_2, and their precursors) in a given district (H&SC §40914). A local district may adopt additional stationary source control measures or transportation control measures, revise existing source-specific or new source review rules, or expand its vehicle inspection and maintenance program (H&SC §40918) as part of the plan. District air quality plans specify the development and adoption of more stringent regulations to achieve the requirements of the Act. The applicable regulations that will apply to RCEC are included in the discussion of BAAQMD prohibitory rules in Section 8.1.4.2.8.

BAAQMD New Source Review Requirements

BAAQMD Regulation 2, Rule 2, New Source Review, requires that a pre-construction review be conducted for all proposed new or modified sources of air pollution. New Source Review contains three principal elements:

- Best available control technology (BACT)
- Emissions offsets
- Air quality impact analysis

BACT is required for all new sources or modifications of existing sources if emission increases caused by the project exceed 10 pounds per highest day of any criteria air pollutant. The district rule also contains separate BACT thresholds for numerous "non-criteria" pollutants, such as lead and various sulfur compounds.

The BAAQMD regulation further requires that for new or modified sources emitting in excess of 50 tons per year of POCs or NO_x, the total project emissions must be offset (i.e., an emission reduction comparable to the emission increase attributable to the source must be achieved at the project site or at another location). To ensure that there is no net increase in regional emissions as a result of new or modified sources, offsets at a ratio of 1.15 to 1.0 must be provided. For facilities emitting more than 15 but less than 50 tons per year of POCs or NO_x, offsets are provided by the District from the Small Facility Banking account at a ratio of 1.0 to 1.0.

In addition, a Major Facility (100 tpy facility) is required to offset net emissions increases from a project, on a pollutant-specific basis, in excess of 1 tpy of PM_{10} and SO_2 that have occurred or will occur after April 5, 1991.

For the BAAQMD, the air quality impact analysis is the same as the PSD requirement: the project must not cause a violation or interfere with the maintenance of any ambient air quality standards or applicable increments.

Finally, the district may impose appropriate monitoring requirements to ensure compliance.

District Regulation 2, Rule 3 specifies procedures for review and standards for approval of Authorities to Construct power plants within the District. The applicant must obtain a Determination of Compliance and an Authority to Construct from the District prior to commencing construction. An application for a Determination of Compliance and an Authority to Construct is expected to be filed with the BAAQMD within one week of the filing of the AFC with the CEC. As the USEPA has delegated permitting authority to the BAAQMD, no application to the USEPA is required for this project.

Risk Management Policy

The District has developed a procedure for reviewing permit applications for projects that will emit compounds that may result in health impacts. The procedure requires comparing the potential emissions of toxic air contaminants from the project to specific levels, and requires the preparation of a written risk screening analysis if the levels are exceeded. The screening analysis includes estimates of the maximum hourly and annual concentrations of the toxic air contaminants, calculations of cancer risk, and comparison of maximum modeled concentrations with appropriate non-cancer threshold levels. The use of best available control technology for toxic air contaminant emissions (T-BACT) is required if the incremental cancer risk from the project is projected to be between 1 and 10 in 1 million.

Other BAAQMD Regulatory Requirements

As required by the federal Clean Air Act and the California Clean Air Act, plans that demonstrate attainment must be developed for those areas that have not attained the national and state air quality standards (42 USC §7401; H&SC §40912). As part of its plan, the BAAQMD has developed regulations limiting emissions from specific sources. These regulations are collectively known as "prohibitory rules," because they prohibit the construction or operation of a source of pollution that would violate specific emission limits.

The general prohibitory rules of the BAAQMD applicable to the RCEC are as follows:

Regulation 1-301 - Public Nuisance

Prohibits emissions in quantities that adversely affect public health, other businesses, or property.

Regulation 6 - Particulate Matter and Visible Emissions

Limits the visible emissions from the project to no darker than No. 1 when compared to a Ringelmann Chart for a period or periods aggregating more than 3 minutes in any hour. Opacity is limited to no greater than 20 percent from any source for a period or periods aggregating 3 minutes in any hour. Particulate emission concentrations cannot exceed 0.15 grains per dry standard cubic foot of exhaust gas volume.

Regulation 7 - Odorous Substances

Limits emission concentrations of dimethylsulfide, ammonia, mercaptan, phenols, and trimethylamine. This regulation becomes applicable upon confirmation of 10 or more odor complaints from the public within a 90-day period. Once the rule becomes applicable, it remains in effect for one year and can be re-triggered with the receipt of 5 or more odor complaints within a 90-day period.

Regulation 9, Rule 1 - Sulfur Dioxide

Limits stationary source emissions of sulfur dioxide to less than 300 ppm. In addition, the rule restricts sulfur dioxide emissions that will result in ground-level concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes, 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours.

Regulation 9, Rule 2 - Hydrogen Sulfide

Limits the emission of hydrogen sulfide during any 24-hour period in such quantities that result in ground-level hydrogen sulfide concentrations in excess of 0.06 ppm averaged over 3 consecutive minutes or 0.03 ppm averaged over any 60 consecutive minutes.

Regulation 9, Rule 3 - Nitrogen Oxides From Heat Transfer Operations

Limits emissions of nitrogen oxides from new or modified heat transfer operations to less than 125 ppm.

Regulation 9, Rule 9 - Nitrogen Oxides from Stationary Gas Turbines

Limits emissions of nitrogen oxides from gas turbines during baseload operations to less than 9 ppmv corrected to 15 percent oxygen.

Regulation 11, Rule 10 - Hexavalent Chromium Emissions From Cooling Towers

Limits hexavalent chromium emissions from cooling towers by eliminating the use of chromium-based chemicals.

BAAQMD New Source Performance Standards

Regulation 10 (40 CFR 60 subpart GG) - Standards of Performance for Stationary Gas Turbines. The BAAQMD has adopted by reference the federal New Source Performance Standard (NSPS) for stationary gas turbines. This regulation requires monitoring of sulfur and nitrogen in the fuel; limits emissions of NO_x and SO_2 emissions; requires source testing of emissions; requires emissions monitoring; and requires recordkeeping for the collected data.

BAAQMD Hazardous Air Pollutants

As noted, the BAAQMD is enforcing the federal NESHAP regulations. None of the NESHAPs apply to the proposed project.

BAAQMD Title IV and Title V Programs

BAAQMD Regulation 2, Rule 6 - Major Facility Review

This rule implements the operating permit requirements of Title V of the federal Clean Air Act. The rule applies to major facilities, Phase II acid rain facilities, subject solid waste incinerator facilities, and any facility listed by USEPA as requiring a Title V permit. As a Phase II acid rain facility, RCEC will be required to submit a permit application to undergo a major facility review within 12 months of commencement of facility operation.

The BAAQMD has adopted by reference the federal Title IV (Acid Rain) Regulation and is now responsible for implementing the program through the Title V operating permit program. Under Title IV, a project must comply with maximum operating emissions levels for SO_2 and NO_x and is required to install and operate continuous monitoring systems for SO_2, NO_x, and CO_2 emissions. Extensive recordkeeping and reporting requirements are also part of the acid rain program.

A summary of the demonstration of compliance with applicable LORS is given at the end of this chapter in Table 8.1-37.

8.1.5 Environmental Consequences

8.1.5.1 Overview of the Analytical Approach to Estimating Facility Impacts

The emissions sources at the RCEC include two gas turbines with heat recovery steam generators equipped with supplemental burners (duct burners), and a wet, mechanical-draft cooling tower, plus minor auxiliary equipment (emergency generator and fire pump engine). The actual operation of the turbines will range between 70 percent and 100 percent of their maximum rated output. Supplemental firing will be provided by the duct burners as needed to achieve the required power generation level. Steam injection into the combustion turbines (power augmentation, or PAG) will also be used to increase power output under certain conditions. Emission control systems will be fully operational during all operations except during startups and shutdowns. Maximum annual emissions are based on operation of the RCEC at maximum firing rates and envelope the expected maximum number of startups that may occur in a year. Each turbine startup will result in transient emission rates until steady-state operation for the gas turbine and emission control systems is achieved.

Ambient air quality impact analyses for the site have been conducted to satisfy the CEC requirements for criteria pollutants (NO_2, CO, PM_{10}, and SO_2), noncriteria pollutants, and construction impacts have been addressed on a pollutant-specific basis. It should be noted that the operational scenarios having the highest emissions rates do not necessarily produce the highest ambient impacts. The following sections describe the emission sources that have been evaluated for RCEC, the ambient impact analyses results, and the evaluation of facility compliance with the applicable air quality regulations, including BAAQMD Regulation 2 (Permits), and Rule 2 (New Source Review). Rule 2 includes both the District's NSR and PSD requirements.

Facility Emissions

The proposed project will be a new source. As discussed in Section 2, the new equipment will consist of two Westinghouse 501F combustion turbines (or equivalent), rated at 200 MW (nominal net, at site design conditions); two heat recovery steam generators (HRSGs) equipped with duct burners rated at 200 MMBtu/hr; a 235 MW condensing steam turbine-generator; and a 10-cell cooling tower. Incidental equipment will include a 300 bhp Diesel fire pump and a 600 kW natural gas fired emergency generator. Natural gas will be the only fuel consumed during operation of RCEC. There will be no distillate fuel oil firing at RCEC except for the Diesel fire pump. Typical specifications for the natural gas fuel are shown in Table 8.1-12.

Natural gas combustion results in the formation of NO_x, SO_2, unburned hydrocarbons (POC), PM_{10}, and CO. Because natural gas is a clean burning fuel, there will be minimal formation of combustion PM_{10} and SO_2. The combustion turbines will be equipped with dry low-NO_x combustors that minimize the formation of NO_x and CO. To further reduce NO_x emissions, selective catalytic reduction (SCR) control systems will be utilized. Similarly, the duct burners will also be equipped with a low-NO_x burner design that minimizes NO_x formation.

Table 8.1-12. Typical chemical characteristics and heating value of natural gas.

Constituent	Mole %
Nitrogen	0.815
CO_2	0.516
Methane	95.619
Ethane	2.647
Propane	0.300
I-Butane	0.033
N-Butane	0.043
I-Pentane	0.011
N-Pentane	0.008
C 6+	0.008
HHV	23,171 Btu/lbm 1,022 Btu/lb

Various noncriteria pollutants will also be emitted by the facility, including ammonia (NH_3), which is used as a reactant by the SCR system to control NO_x, and sulfate (or secondary particulate matter) due to the oxidation of the SO_2 emitted by the facility. Emissions of all of the criteria and noncriteria pollutants have been characterized and quantified in this application.

Criteria Pollutant Emissions

The gas turbines, duct burners, and IC engine emission rates have been estimated from vendor data, RCEC design criteria, and established emission calculation procedures. The emission rates for the combustion turbines alone, the combustion turbines with duct burners and power augmentation in operation, and the IC engines are shown in Tables 8.1-13, 8.1-14, 8.1-15 and 8.1-16, respectively.

Table 8.1-13. Maximum short term pollutant emission rates—each gas turbine[a].

Pollutant	ppmvd @ 15% O_2	lb/MMBtu	lb/hr
NO_x	2.5[b]	0.0096	19.1
CO	6.00[b]	0.0143	28.3
POC	1.00[c]	0.0014[c]	2.5[c]
PM_{10}[d]	-	0.0045	9.0
SO_2[e]	0.120	0.0007	1.40

Basis:
[a]Emission rates shown reflect the highest value with no power augmentation, and no duct burners at any operating load except startup and shutdown.
[b]RCEC design criteria.
[c]Pounds per hour provided by vendor; ppm and lb/MMBtu calculated from lb/hr.
[d]100 percent of particulate matter emissions assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half as those terms are used in USEPA Method 5.
[e]Based on maximum fuel sulfur content of 4 ppmv.

Table 8.1-14. Maximum short term pollutant emission rates—each turbine with duct burner and power augmentation.

Pollutant	ppmvd @ 15% O_2	lb/MMBtu	lb/hr
NO_x	2.5[a]	0.0106	21.4
CO	6.0[a]	0.0157	31.7
POC	1.0	0.0015	2.8[b]
PM_{10}[c]	-	0.0059	12.0
SO_2[d]	0.12	0.0007	1.50

Basis:
[a]RCEC design criteria.
[b]Pounds per hour provided by vendor; ppm and lb/MMBtu calculated from lb/hr.
[c]100 percent of particulate matter emissions assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half as those terms are used in USEPA Method 5.
[d]Based on maximum fuel sulfur content of 4 ppmv.

Table 8.1-15. Maximum pollutant emission rates—emergency generator set (600 Kw).

Pollutant	g/bhp-hr	lb/hr	tons/yr
NO_x	1.0	1.773	0.18
CO	1.7	3.015	0.30
POC	0.8	1.419	0.142
PM_{10}	0.000353	0.006	0.0001
SO_2	neg	0.00386	0.00039

Notes:
Emission rates shown reflect the highest value at any operating load per vendor guarantee.
Tons/yr based on max operation hours of 200 hrs/yr.
100 percent of particulate matter emissions were assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half as those terms are used in USEPA Method 5. EPA AP-42, Table 3.2-2.
SO2 emissions based on maximum gas sulfur content of 4 ppm.

Table 8.1-16. Maximum pollutant emission rates—fire pump engine.

Pollutant	g/bhp-hr	lb/hr	tons/yr
NO_x	5.89	3.9	0.06
CO	3.55	2.35	0.0353
POC	0.73	0.48	0.0072
PM_{10}	0.0867	0.1275	0.0019
SO_2	neg	0.106	0.0016

Notes:
Emission rates shown reflect the highest value at any operating load per vendor guarantee.
Tons/yr based on max operation of 30 hrs/yr.
100 percent of particulate matter emissions were assumed to be emitted as PM_{10}; PM_{10} emissions include both front and back half as those terms are used in USEPA Method 5.
SO2 based on maximum fuel sulfur content of 0.05% wt.

The maximum firing rates, daily and annual fuel consumption rates, and operating restrictions define the allowable operations that determine the maximum potential hourly, daily, and annual emissions for each pollutant. These allowable operations are typically referred to as "the operating envelope" for a facility.

The maximum heat input rates (fuel consumption rates) for the gas turbines, and gas turbines with duct burners, and the IC engines are shown in Table 8.1-17.

Table 8.1-17. Maximum device heat input rates (HHV) (MMBtu).

Period	Gas Turbines w/ Duct Burners[a]	Gas Turbines w/o Duct Burners[b]	Emergency Generator Set	Emergency Fire Pump
Per Hour	2138.4	1979.4	~6.44	~2.11
Per Day	Note C	Note C	~6.44	~2.11
Per Year	Note C	Note C	~1288	~422

Notes:
[a] Based on maximum heat input for full load operation at 94 deg. F plus duct burner with power augmentation.
[b] Based on maximum heat input for full load turbine operation at 34 deg. F.
[c] Daily and annual heat input rates are highly variable due to the wide capability of the turbines and duct burners to operate at various loads on a daily and annual basis.

Natural gas @ 1022 btu/scf (HHV), #2 diesel fuel @ 137,000 btu/gal (EPA AP-42), see App 8.1A, Table 8.1A-9 for approximate fuel use calculations.

Maximum emission rates expected to occur during a startup or shutdown are shown in Table 8.1-18. PM_{10} and SO_2 emissions have not been included in this table because emissions of these pollutants will be lower during a startup period than during baseload facility operation.

Table 8.1-18. Maximum facility startup emission rates[a].

	NO_x	CO	POC
Cold Start, lb/hour	80	838	16
Cold Start, lb/start[b]	240	2,514	48
Hot Start, lbs/start[c]	80	902	16

[a]Estimated based on vendor data and source test data. See Appendix 8.1A, Table 8.1A-1.
[b]Maximum of three hours per cold start.
[c]Maximum of one hour per hot start.

The analysis of maximum facility emission levels was based on the pollutant emission factors shown in Tables 8.1-13, 8.1-14, 8.1-15, and 8.1-16; the RCEC operating envelope shown in Table 8.1-17; the RCEC startup emission rates shown in Table 8.1-18; and the ambient conditions that result in the highest emission rates. The maximum annual, daily, and hourly emissions for RCEC are shown in Table 8.1-19. Detailed emission calculations appear in Appendix 8.1A, Table 8.1A-2. Emissions from the cooling tower were calculated from the maximum cooling water TDS level (see Table 8.1A-6).

Noncriteria Pollutant Emissions

Noncriteria pollutants are compounds that have been identified as pollutants that pose a significant health hazard. Nine of these pollutants are regulated under the federal New Source Review program; they are lead, asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds.[1] In addition to these nine compounds, the federal Clean Air Act lists 189 substances as potential hazardous air pollutants (Clean Air Act Sec. 112(b)(1)). The BAAQMD has also published a list of compounds it defines as potential toxic air contaminants (Toxics Policy, May 1991;

[1] These pollutants are regulated under federal and state air quality programs; however, they are evaluated as noncriteria pollutants by the California Energy Commission.

Rule2-1-316). Any pollutant that may be emitted from RCEC and is on the federal New Source Review list, the federal Clean Air Act list, and/or the District toxic air contaminant list has been evaluated as part of the AFC. Emission factors were determined by reviewing the available technical data, determining the products of combustion, and/or using material balance calculations.

Table 8.1-19. Emissions from new equipment[a].

	NO_x	SO_2	CO	POC	PM_{10}
Maximum Hourly Emissions, lb/hr					
Turbines and Duct Burners	101.4	2.9	933.7	18.8	21.0
Cooling Tower	-	-	-	-	0.7
Emergency Generator[c]	0	0	3.0	1.4	0
Fire Pump Engine[c]	3.9	0.1	0	0	0
Total Project, pounds per hour[d]	105.3	3.0	936.7	20.2	21.7
Maximum Daily Emissions, lb/day					
Turbines and Duct Burners[b]	1441.8	67.6	8019.2	232.9	510.0
Cooling Tower	-	-	-	-	16.4
Emergency Generator[c]	0	0	3.0	1.4	0
Fire Pump Engine[c]	3.9	0.1	0	0	0
Total Project, pounds per day[d]	1,445.7	67.7	8022.2	234.3	526.4
Maximum Annual Emissions, tpy					
Turbines and Duct Burners	134.6	12.4	610	28.4	83.4
Cooling Tower	-	-	-	-	3
Emergency Generator	0.18	<0.1	0	0.142	0
Fire Pump Engine	0.06	<0.1	0.2	0.007	0.002
Total Project, tons per year[d]	134.6	12.4	610.2	28.5	86.3

Table 8.1-19. (continued).

Notes:
*Maximum annual NO_x emissions limit is based upon a 2.0 ppm, emission limit, seasonal annual site conditions and seasonal turbine performance profiles.
[a]See Appendix 8.1A, Table 8.1A-2 for calculations.
[b]Includes startup emissions.
[c]Emergency generator and Diesel fire pump engine will not be tested on the same day. Hourly and daily emissions reflect the higher of the two units' emissions.
[d]Numbers may not add directly due to rounding.

Noncriteria pollutant emission factors recommended by the BAAQMD staff were used for the analysis of emissions from the gas turbines. The recommended factors were taken from data compiled by the Ventura County APCD and from the California Air Toxics Emission Factors (CATEF) database. Noncriteria pollutant emissions from the cooling tower were calculated from an analysis of the proposed water quality as delivered from the plant water treatment system (worst case front end RO permeate).

The noncriteria pollutants that may be emitted from RCEC, and their respective emission factors, are shown in Table 8.1-20. Appendix 8.1A, Tables 8.1A-4, 8.1A-7, and 8.1A-8 provides the detailed emission calculations for noncriteria pollutants.

Air Quality Impact Analysis

Air Quality Modeling Methodology

An assessment of impacts from RCEC on ambient air quality has been conducted using USEPA-approved air quality dispersion models. These models are based on various mathematical descriptions of atmospheric diffusion and dispersion processes in which a pollutant source impact can be calculated over a given area.

The impact analysis was used to determine the worst-case ground-level impacts of RCEC. It should be noted that the operational scenarios having the highest emissions rates do not necessarily produce the highest ambient impacts. The results were compared with established state and federal ambient air quality standards and PSD significance levels. If the standards are not exceeded then it is assumed that, in the operation of the facility, no exceedances are expected under any conditions. In accordance with the air quality impact analysis guidelines developed by USEPA (40 CFR Part 51, Appendix W: *Guideline on Air Quality Models) and CARB (Reference Document for California Statewide Modeling Guideline*, April 1989), the ground-level impact analysis includes the following assessments:

- Impacts in simple, intermediate, and complex terrain,
- Aerodynamic effects (downwash) due to nearby building(s) and structures, and
- Impacts from inversion breakup (fumigation).

Table 8.1-20. Noncriteria pollutant emissions for the RCEC.

Pollutant	Emission Factor	Emissions	
	(lb/MMscf)	lb/hr	ton/yr
Gas Turbines (with Duct Burners) (each):			
Acetaldehyde	$6.86x10^{-2}$	0.15	0.59
Acrolein	$6.43x10^{-3}$	0.01	0.06
Ammonia	-[a]	15.8	65.39
Benzene	$1.36x10^{-2}$	0.03	0.12
1,3-Butadiene	$1.27x10^{-4}$	0.000276	0.0011
Ethylbenzene	$1.79x10^{-2}$	0.04	0.15
Formaldehyde	$1.10x10^{-1}$	0.24	0.94
Hexane	$2.59x10^{-1}$	0.56	2.22
Naphthalene	$1.66x10^{-3}$	0.0036	0.0142
Polycyclic Aromatics	$2.23x10^{-3}$	0.00143	0.00565
Propylene	$7.70x10^{-1}$	1.67	6.59
Propylene Oxide	$4.78x10^{-2}$	0.10	0.41
Toluene	$7.10x10^{-2}$	0.15	0.61
Xylene	$2.61x10^{-2}$	0.06	0.22
Cooling Tower:	**mg/l**		
Ammonia	4.0	0.00137	0.006
Arsenic	0	0	0
Cadmium	0	0	0
Chromium III	0	0	0
Copper	0	0	0
Lead	0	0	0
Mercury	0	0	0
Nickel	0	0	0
Silver	0	0	0
Zinc	0	0	0

[a]Ammonia emissions calculated from ammonia slip rate. See Appendix 8.1A, Table 8.1A-4.
Cooling tower data based on worst case front end RO permeate quality.

Simple, intermediate and complex terrain impacts were assessed for all meteorological conditions that would limit the amount of final plume rise. Plume impaction on elevated terrain, such as on the slope of a nearby hill, can cause high ground-level concentrations, especially under stable atmospheric conditions. Another dispersion condition that can cause high ground-level pollutant concentrations is caused by building downwash. Building downwash can occur when wind speeds are high and a building or structure is in close proximity to the emission stack. This can result in building wake effects where the plume is drawn down toward the ground by the lower pressure region that exists in the lee side (downwind) of the building or structure.

Fumigation conditions occur when the plume is emitted into a low lying layer of stable air (inversion) that then becomes unstable, resulting in a rapid mixing of pollutants towards the ground. The low mixing height that results from this condition allows little diffusion of the stack plume before it is carried downwind to the ground. Although fumigation conditions rarely last as long as an hour, relatively high ground-level concentrations may be reached during that period. Fumigation tends to occur under clear skies and light winds. Such conditions are more prevalent in the summer.

The basic model equation used in this analysis assumes that the concentrations of emissions within a plume can be characterized by a Gaussian distribution about the centerline of the plume (see Figure 8.1-11). Concentrations at any location downwind of a point source such as a stack can be determined from the following equation:

$$C(x,y,z,H) = \left(\frac{Q}{2\pi\sigma_y\sigma_z u}\right) * \left(e^{-1/2(y/\sigma_y)^2}\right) * \left[\left\{e^{-1/2(z-H/\sigma_z)^2}\right\} + \left\{e^{-1/2(z+H/\sigma_z)^2}\right\}\right]$$

where:

C	=	the concentration in the air of the substance or pollutant in question
Q	=	the pollutant emission rate
$\sigma_y\sigma_z$	=	the horizontal and vertical dispersion coefficients, respectively, at downwind distance x
u	=	the wind speed at the height of the plume center
x,y,z	=	the variables that define the 3-dimensional Cartesian coordinate system used; the downwind, crosswind, and vertical distances from the base of the stack (see Figure 8.1-10)
H	=	the height of the plume above the stack base (the sum of the height of the stack and the vertical distance that the plume rises due to the momentum and/or buoyancy of the plume)

Gaussian dispersion models are approved by USEPA for regulatory use and are based on conservative assumptions (i.e., the models tend to overpredict actual impacts by assuming steady state conditions, no pollutant loss through conservation of mass, no chemical reactions, etc.). The USEPA models were used to determine if ambient air quality standards would be exceeded, and whether a more accurate and sophisticated modeling procedure would be warranted to make the impact determination. The following sections describe:

- Screening modeling procedures
- Refined air quality impact analysis
- Existing ambient pollutant concentrations and preconstruction monitoring

- Results of the ambient air quality modeling analyses
- PSD increment consumption

The screening and refined air quality impact analyses were performed using the Industrial Source Complex, Short-Term Model ISCST3 (Version 00101). ISCST3 is a Gaussian dispersion model capable of assessing impacts from a variety of source types in areas of simple, intermediate, and complex terrain. The model can account for settling and dry deposition of particulates; area, line, and volume source types; downwash effects, and gradual plume rise as a function of downwind distance. The model is capable of estimating concentrations for a wide range of averaging times (from one hour to one year).

Inputs required by the ISCST3 model include the following:

- Model options
- Meteorological data
- Source data
- Receptor data

Model options refer to user selections that account for conditions specific to the area being modeled or to the emissions source that needs to be examined. Examples of model options include use of site-specific vertical profiles of wind speed and temperature; consideration of stack and building wake effects; and time-dependent exponential decay of pollutants. The model supplies recommended default options for the user. Except where explicitly stated, such as for building downwash, as described in more detail below, default values were used. A number of these default values are required for USEPA and local District approval of model results and are listed below:

- Rural dispersion coefficients
- Gradual plume rise
- Stack tip downwash
- Buoyancy induced dispersion
- Calm processing
- Default rural wind profile exponents = 0.07, 0.07, 0.10, 0.15, 0.35, 0.55
- Default vertical temperature gradients = 0.02, 0.035
- 20 meter anemometer height (Union City)

ISCST3 uses hourly meteorological data to characterize plume dispersion. The representativeness of the data is dependent on the proximity of the meteorological monitoring site to the area under consideration; the complexity of the terrain, the exposure of the meteorological monitoring site, and the period of time during which the data are collected. The meteorological data set used in this analysis was determined by the BAAQMD staff to be representative of meteorological conditions at the RCEC site and to meet the requirements of the USEPA "On-Site Meteorological Program Guidance for Regulatory Model Applications" (EPA-450/4-87-013, August 1995). The data were collected by the BAAQMD during 1990-1994 at its Union City station approximately 4.2 miles southeast of the project site.

The required emission source data inputs to ISCST3 include source locations, source elevations, stack heights, stack diameters, stack exit temperatures and velocities, and emission rates. The source locations are specified for a Cartesian (x,y) coordinate system where x and y are distances east and north in meters, respectively. The Cartesian coordinate system used is the Universal Transverse Mercator Projection (UTM). The stack height that can be used in the model is limited by federal and BAAQMD Good Engineering Practice (GEP) stack height restrictions, discussed in more detail below. In addition, ISCST3 requires nearby building dimension data to calculate the impacts of building downwash.

For the purposes of modeling, a stack height beyond what is required by Good Engineering Practices is not allowed (BAAQMD Regulation 2-2-418). However, this requirement does not place a limit on the actual constructed height of a stack. GEP as used in modeling analyses is the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, or wakes that may be created by the source itself, nearby structures, or nearby terrain obstacles. In addition, the GEP modeling restriction assures that any required regulatory control measure is not compromised by the effect of that portion of the stack that exceeds the GEP. The USEPA guidance ("Guideline for Determination of Good Engineering Practice Stack Height," Revised 6/85) for determining GEP stack height is as follows:

$$H_g = H + 1.5L$$

where

H_g = Good Engineering Practice stack height, measured from the ground-level elevation at the base of the stack

H = height of nearby structure(s) measured from the ground-level elevation at the base of the stack

L = lesser dimension, height or maximum projected width, of nearby structure(s)

In using this equation, the guidance document indicates that both the height and width of the structure are determined from the frontal area of the structure, projected onto a plane perpendicular to the direction of the wind.

For the turbine/HRSG stacks, the nearby (influencing) structures are the HRSGs, which are approximately 100 feet (30.5 m) high and 135 feet (41.15 m) long. Thus H = 100 ft and L = 135 feet, and H_g = 100 ft + (1.5 * 100 ft) = 250 ft, and the proposed stack height of 145 feet does not exceed GEP stack height.

For regulatory applications, a building is considered sufficiently close to a stack to cause wake effects when the downwind distance between the stack and the nearest part of the building is less than or equal to five times the lesser of the height or the projected width of the building.

For the buildings analyzed as downwash structures, the building dimensions were obtained from digital RCEC site plans. The building dimensions were analyzed using the Building Profile Input Program (BPIP) to calculate 36 wind-direction-specific building heights and projected building widths for use in building wake calculations. The building dimensions used in the GEP analysis are shown in Appendix 8.1B, Tables 8.1B-1A, 8.1B-1B, and Figure 8.1B-1. The four-sided architectural enclosure around the HRSGs and HRSG stacks was modeled as a solid structure.

Screening Procedures

To ensure the impacts analyzed were for maximum emission levels and worst-case dispersion conditions, a screening procedure was used to determine the inputs to the impact modeling. The screening procedure analyzed the turbine operating conditions that would result in the maximum impacts on a pollutant-specific basis. The operating conditions examined in this screening analysis, along with their exhaust and emission characteristics, are shown in Appendix 8.1A, Table 8.1A-3a and 8.1A-3b. These operating conditions represent maximum and minimum turbine loads (100 percent and 70 percent) at maximum and minimum ambient operating temperatures (94 deg F, 59 deg F, and 34 deg F).

The operating conditions were screened for worst-case ambient impact using USEPA's ISCST3 model and five (5) years of meteorological data collected at Union City, as described above. The results of the screening procedure are presented in Appendix 8.1B, Table 8.1B-2. The screening analysis showed that short term impacts (excluding 3-hr SO_2) under Case 12 (turbine operating at 70 percent load without power augmentation and duct burning) were the highest for each pollutant and averaging period. The stack parameters for this turbine operating condition were then used in the refined modeling analyses to evaluate the modeled impacts of the entire project for each pollutant and short term averaging period. Case 14 (full load w/duct burners and power augmentation at 59 deg F) per the screening modeling showed the highest impacts for all pollutants for annual averages as well as the high for the 3-hour SO_2 impacts.

The screening analysis included simple, intermediate, and complex terrain. Terrain features were taken from USGS DEM data and 7.5 minute quadrangle maps of the area. For the screening analysis, a coarse Cartesian grid of receptors spaced at 180 meters was used with a finer downwash grid, spaced at 30 meters, around the RCEC fenceline. The coarse grid extended over five kilometers from RCEC in all directions; the downwash grid extended to between 400 and 500 meters from the fenceline.

Refined Air Quality Impact Analysis

The operating conditions and emission rates used to model RCEC are summarized in Table 8.1-21. As discussed above, the turbine stack parameters for Cases 12 and 14 were used in modeling the impacts for each pollutant and averaging period. The complete modeling input for each pollutant and averaging period is shown in Appendix 8.1B, Table 8.1B-3.

The model receptor grids were derived from three-second DEM data. Initially, a 180-meter coarse grid was extended to five kilometers from RCEC in all directions. A 30 meter resolution downwash receptor grid was used within approximately 0.5 km of the site.

Thirty-meter refined receptor grids were used in areas where the coarse grid analyses indicated modeled maxima for each site plan would be located. A map showing the layout of each modeling grid around the site plan is presented in Figure 8.1-12.

Receptors for the refined modeling analysis were from USGS DEM data for four 7.5-minute quadrangles and included San Leandro, Hayward, Redwood Point, and Newark. The coarse grid contained a total of approximately 23339 receptors while each of the refined grids contained approximately 1100 receptors.

Under BAAQMD Regulation 2-1-128.4, the cooling tower is not exempt from District permitting requirements even though it will not be used for the evaporative cooling of process water. Therefore the evaluation of compliance with District requirements includes the cooling tower for both emissions calculation and modeling purposes. For the CEC's review, the cooling tower emissions have also been included.

Table 8.1-21. ISCST3 model input data: source characteristics for refined modeling (emissions in grams per second).

Unit	NO_x	SO_2	CO	PM_{10}
One-Hour Average:				
Turbine/Duct Burner 1	1.591	0.113	2.356	N/A
Turbine/Duct Burner 2	1.591	0.113	2.356	N/A
Emergency Generator	-	-	0.38	N/A
Fire Pump	0.49	0.0134	-	N/A
Cooling Tower (10 cells)	N/A	N/A	N/A	N/A
Three-Hour Average:				
Turbine/Duct Burner 1	N/A	0.189	N/A	N/A
Turbine/Duct Burner 2	N/A	0.189	N/A	N/A
Emergency Generator	N/A	-	N/A	N/A
Fire Pump	N/A	0.0045	N/A	N/A
Cooling Tower (10 cells)	N/A	N/A	N/A	N/A
Eight-Hour Average:				
Turbine/Duct Burner 1	N/A	N/A	41.07	N/A
Turbine/Duct Burner 2	N/A	N/A	41.07	N/A
Emergency Generator	N/A	N/A	0.037	N/A
Fire Pump	N/A	N/A	-	N/A
Cooling Tower (10 cells)	N/A	N/A	N/A	N/A
24-Hour Average:				
Turbine/Duct Burner 1	N/A	0.113	N/A	1.134
Turbine/Duct Burner 2	N/A	0.113	N/A	1.134
Emergency Generator	N/A	-	N/A	-
Fire Pump	N/A	0.000556	N/A	0.00067
Cooling Tower (10 cells)	N/A	N/A	N/A	0.0086
Annual Average:				
Turbine/Duct Burner 1	1.927	0.178	N/A	1.20
Turbine/Duct Burner 2	1.927	0.178	N/A	1.20
Emergency Generator	0.0051	0.000011	N/A	0.0000018
Fire Pump	0.00168	0.0000457	N/A	0.000055
Cooling Tower (10 cells)	N/A	N/A	N/A	0.0086

Specialized Modeling Analyses

Fumigation Modeling

Fumigation occurs when a plume that was originally emitted into a stable layer is mixed rapidly to ground-level when unstable air below the plume reaches plume level. Fumigation can cause very high ground-level concentrations for short time periods, typically less than one hour. Two situations were addressed according to BAAQMD *Permit Modeling Guidance (August 1999)*:

- Type 1: Break-up of the nocturnal radiation inversion by solar warming of the earth surface (inversion breakup), which occurs in the morning after sunrise and
- Type 3: Shoreline fumigation caused by advection of pollutants from a stable marine environment to an unstable inland environment. This is required for stacks within 3 kilometers of the shoreline of a large body of water (the turbines are located 1.8 kilometers from the shore of the San Francisco Bay).

Both types of fumigation were modeled with the USEPA model SCREEN3 (version 96043). As required by BAAQMD *Permit Modeling Guidance*, SCREEN3 was modified for shoreline fumigation to include thermal internal boundary layer (TIBL) factors of 2 to 6, inclusive (SCREEN3 as written only evaluates a TIBL factor of 6). This is important for stacks located some distance from the shoreline as is the situation with the RCEC site (where maximum impacts occurred for a TIBL factor of 3 and greater factors gave no fumigation impacts since the plume was below the TIBL). Only emissions from the HRSG stacks would be affected by fumigation. Maximum 1-hour shoreline and inversion breakup fumigation impacts were calculated to be 4.421 and 1.608 ug/m^3, respectively, for turbine emissions of 1 g/s/turbine for Case 12 conditions. These concentrations are less than the maximum 1-hour ISCST3 concentration of 5.927 ug/m^3 for one turbine at 1 g/s from the screening analysis for the same turbine condition. Therefore, maximum fumigation concentrations are less than maximum concentrations under more typical dispersion conditions and the effects of fumigation can be ignored (page 4-33, *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (October 1992), USEPA*). In the main body of text, shoreline fumigation concentrations are compared to maximum ISCST3 facility impacts for the 1-hour criteria pollutants for completeness.

Turbine Startup

Facility impacts were also modeled during the startup of one turbine to evaluate short-term impacts under startup conditions. Emission rates used for this scenario were based on an engineering analysis of available data, which included source test data from startups of the gas turbine at the Crockett Cogeneration Project. A summary of the data evaluated in developing these emission rates was shown in Appendix 8.1A, Table 8.1A-1A and 8.1A-1B. At the request of the Energy Commission staff, turbine exhaust parameters for the minimum operating load point (70 percent) were used to characterize turbine exhaust during startup. Startup impacts were evaluated for both the one- and three-hour averaging periods using ISCST3. Emission rates and stack parameters used in the startup modeling analysis are shown in Table 8.1-22.

Ozone Limiting

With approval from the BAAQMD staff, one-hour and annual NO_2 impacts were modeled using ISC3_OLM (Industrial Source Complex, Version 3, Ozone Limiting Method) Model (version 96113). While this version of ISCST3 is not based on the latest model ISCST3 update, this modeling analysis does not include any features (such as area sources or pit retention) that were affected by recent model updates. Both versions of ISCST3 were run without the ozone-limiting feature to verify that the modeled results would not be affected by using the OLM version of the model.

Table 8.1-22. Emission rates and stack parameters used in modeling analysis for startup emissions impacts.

Parameter	Value
Turbine stack temperature	349.7 deg. K
Turbine exhaust velocity	14.2 m/s
One-hour average impacts	
NO_x emission rate	10.08 g/s
SO_2 emission rate	0.189 g/s
CO emission rate	113.7 g/s
PM_{10} emission rate	N/A
Three-hour average impacts	
NO_x emission rate	N/A
SO_2 emission rate	0.189 g/s
CO emission rate	N/A
PM_{10} emission rate	N/A

ISC3_OLM uses hourly ozone data to perform ozone-limiting calculations on individual plumes on an hour-by-hour basis. Hourly ozone data from the San Leandro monitoring site for 1990-1994, which is concurrent with the Union City met data for the same years was used in the OLM analysis.

Missing hours in the ozone data set were filled in using linear interpolation if the period of missing data was 2 hours or less. If the data were missing for 3 or more hours, an average of the ozone data during the corresponding time periods during the rest of the same month was used to fill in the missing hours.

Turbine Commissioning

There are two high emissions scenarios possible during commissioning. The first would be the period prior to SCR system installation, when the combustor is being tuned. Under this scenario, NO_x emissions would be higher than normal because the NO_x emissions control system would not be functioning and because the combustor would not be tuned for optimum performance. CO emissions would also be higher than normal because combustor performance would not be optimized. The second high emissions scenario would occur when the combustor had been tuned but the SCR installation was not complete, and other parts of the turbine operating system were being checked out. Since the combustor would be tuned but the NO_X control system installation would not be complete, NO_x levels would again be higher than normal.

Preconstruction Monitoring

To ensure that the impacts from RCEC will not cause or contribute to a violation of an ambient air quality standard or an exceedance of a PSD increment, an analysis of the existing air quality in the area of RCEC is necessary. BAAQMD rules require preconstruction ambient air quality monitoring data for the purposes of establishing background pollutant concentrations in the impact area (Regulation 2-2-414.3). However, a facility may be exempted from this requirement if the predicted air quality impacts of the facility do not exceed the *de minimis* levels listed in Table 8.1-23.

Table 8.1-23. BAAQMD PSD preconstruction monitoring exemption levels .

Pollutant	Averaging Period	*De minimis* Level
CO	8-hr average	575 $\mu g/m^3$
PM_{10}	24-hr average	10 $\mu g/m^3$
NO_2	annual average	14 $\mu g/m^3$
SO_2	24-hr average	13 $\mu g/m^3$

A facility may, with the District's approval, rely on air quality monitoring data collected at District monitoring stations to satisfy the requirement for preconstruction monitoring. In such a case, in accordance with Section 2.4 of the USEPA PSD guideline, the last three years of ambient monitoring data may be used if they are representative of the area's air quality where the maximum impacts occur due to the proposed source.

Results of the Ambient Air Quality Modeling Analyses

The maximum facility impacts calculated from each of the modeling analyses described above are summarized in Table 8.1-24 below. The results of the fumigation modeling analysis are summarized in Appendix 8.1B, Table 8.1B-4.

Table 8.1-24. Summary of results from refined modeling analyses.

Pollutant	Averaging Time	Modeled Concentration (μg/m^3)		
		ISCST3	Fumigation	Startup
NO_x	1-hour	169.0[b]	34.6	68.9
	Annual	0.36	N/A	N/A
SO_2	1-hour	20.15	1.73	2.03
	3-hour	3.67	[c]	1.46
	24-hour	0.35	[c]	N/A
	Annual	0.02	N/A	N/A
CO	1-hour	1230.6	39.87	841.0
	8-hour	230.1	[c]	N/A
PM_{10}[a]	24-hour	3.78	[c]	N/A
	Annual	0.22	N/A	N/A

Notes:
[a] Including cooling tower.
[b]Worst-case one-hour NO_x impacts are dominated by the Diesel fire pump and emergency generator. The Diesel fire pump will be operated for testing for up to 30 minutes for each test and for a maximum of 30 hours per year. The emergency generator will be operated for testing purposes for up to one hour per week, and not on the same day the Diesel fire pump engine is tested. Worst-case hourly average NO_2 impacts during other periods will be only 18.9 μg/m^3.
[c]Since the estimated 1-hour shoreline fumigation concentration is less than the maximum 1-hour concentration modeled using ISCST3, the effects of fumigation may be ignored (EPA-454/R-92-019, Section 4.5.3).

Preconstruction monitoring is not required because the maximum impacts did not exceed *de minimis* levels, as shown in Table 8.1-25.

Impacts During Turbine Commissioning

As discussed above, there are two potential scenarios under which NO_x impacts could be higher than under other operating conditions already evaluated. As discussed below, CO emissions are less than emissions evaluated elsewhere, so these emissons were not considered here.

Scenario 1

Under this scenario, NO_x emissions can be conservatively estimated to be twice the guaranteed turbine-out level of 25 ppmvd @ 15 percent O2, or 50 ppm. If operation under this condition were to continue for one hour, maximum hourly NO_x emissions at full load would be (50 ppm/2.5 ppm) * 19.1 lbs/hr = 382.0 lbs/hr. Similarly, CO can be estimated at twice the highest expected turbine-out level of 10 ppm, or 20 ppm. Maximum hourly CO emissions under this scenario would thus be (20 ppm/6 ppm) * 28.3 lb/hr, or 94.3 lb/hr.

Table 8.1-25. Evaluation of preconstruction monitoring requirements.

Pollutant	Averaging Time	Exemption Concentration (µg/m³)	Maximum Modeled Concentration (µg/m³)	Monitoring Required?
NO_x	annual	14	0.36	no
SO_2	24-hr	13	0.35	no
CO	8-hr	575	230.1	no
PM_{10}[a]	24-hr	10	3.78	no

[a]Including cooling tower.

Impacts During Turbine Commissioning

As discussed above, there are two potential scenarios under which NO_x impacts could be higher than under other operating conditions already evaluated. As discussed below, CO emissions are less than emissions evaluated elsewhere, so these emissons were not considered here.

Scenario 1

Under this scenario, NO_x emissions can be conservatively estimated to be twice the guaranteed turbine-out level of 25 ppmvd @ 15 percent O2, or 50 ppm. If operation under this condition were to continue for one hour, maximum hourly NO_x emissions at full load would be (50 ppm/2.5 ppm) * 19.1 lbs/hr = 382.0 lbs/hr. Similarly, CO can be estimated at twice the highest expected turbine-out level of 10 ppm, or 20 ppm. Maximum hourly CO emissions under this scenario would thus be (20 ppm/6 ppm) * 28.3 lb/hr, or 94.3 lb/hr.

Scenario 2

Under these lower load conditions, NO_x emissions could be as high as 100 ppm @ 15 percent O_2. Based on the transient nature of the loads, the average fuel consumption would be expected to be equivalent to half the full load flow rate, or 233.8 MMBtu/hr. Worst-case hourly NO_x emissions under this scenario would be (100 ppm/2.5 ppm) * 9.55 lbs/hr = 382.0 lbs/hr. CO emissions under these conditions would be expected to be the same as those calculated for Scenario 1.

As the maximum hourly emissions under each scenario are expected to be the same, the maximum modeled NO_2 and CO impact will occur under the turbine operating conditions that are least favorable for dispersion. As shown in the turbine screening analysis, these conditions are expected to occur under hot (94 degrees F) temperature conditions without chilling (Case 12).

An ISC_OLM modeling analysis using a NO_x emission rate of 48.132 g/s (382.0 lb/hr) and the appropriate stack parameters indicates that the maximum modeled one-hour NO_2 impact during commissioning is 121 $\mu g/m^3$. This is lower than the maximum modeled one-hour NO_2 impact from the facility as a whole, as shown in Table 8.1-19. With the maximum background NO_2 one-hour concentration of 207 $\mu g/m^3$, the maximum total impact would be 328 $\mu g/m^3$, which is well below the state one-hour NO_2 standard of 470 $\mu g/m^3$. Modeling of turbine commissioning for CO emissions was not done, as the CO startup emissions of 902 lb/hr under the same load case (Case 12) were evaluated elsewhere and would produce higher impacts since the emissions are also higher.

Ambient Air Quality Impacts

To determine a project's air quality impacts, the modeled concentrations are added to the maximum background ambient air concentrations and then compared to the applicable ambient air quality standards. The modeled concentrations have already been presented in earlier tables. The maximum background ambient concentrations are listed in the following text and tables.

The BAAQMD monitors ambient air quality concentrations at several sites within the regional vicinity of the proposed plant site.

Table 8.1-26 presents the maximum established background concentrations used in the impacts analysis as derived from data collected at the following monitoring sites. Data on the specific monitoring sites is as follows:

Fremont-Chapel Way Station: ID# 6000336

- Ozone 1976-Present
- Carbon Monoxide 1971–Present
- Nitrogen Dioxide 1974–Present
- PM10 1989–Present
- Lead 1993–1999

Hayward-La Mesa Station: ID# 6000337

- Ozone 1977–Present

San Leandro-County Hospital Station: ID# 6000343

- Ozone 1990–Present
- PM10 1990–1998

San Francisco-Arkansas Street Station: ID# 9000306

- Sulfur Dioxide 1986–Present

Maximum ground-level impacts due to operation of RCEC are shown together with the ambient air quality standards in Table 8.1-27. Using the conservative assumptions described earlier, the results indicate that RCEC will not cause or contribute to violations of any state or federal air quality standards, with the exception of the state PM_{10} standard. For this pollutant, existing concentrations already exceed the state standard.

Table 8.1-26. Maximum background concentrations (1998-2000).

Pollutant	Averaging Time	1998	1999	2000
Fremont-Chapel Way:				
NO_2 pphm	1-Hour	10	11	8
	Annual	2.0	2.2	1.8
PM_{10} ug/m3	24-Hour	63	88	50
	Annual (AAM)[a]	21.8	24.3	18.4
	Annual (AGM)[b]	20.1	21.9	17.9
CO ppm	1-Hour	5.1	5.6	3.6
	8-Hour	2.8	3.1	2.4
Fremont-Chapel Way, San Leandro-County Hospital, Hayward-La Mesa:				
Ozone ppm	Max 1-Hour	.12	.13	.11
	3 Station Max			
	1-Hour Avg	.11	.12	.10
San Francisco-Arkansas St.:				
SO_2 ppm	1-Hour	.04	.03	.02
	24-hour	.005	.007	.006
	Annual	.001	.002	.002

Notes:
[a]Annual Arithmetic Mean
[b]Annual Geometric Mean

Table 8.1-27. Modeled maximum project impacts.

Pollutant	Averaging Time	Maximum Facility Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2	1-hour	169.0[d]	206.8	376	470	-
	Annual	0.36	41.5	42	-	100
SO_2	1-hour	20.15	104.8	125	650	-
	3-hour	3.67	52	56	-	1300
	24-hour	0.35	18.4	19	109	365
	Annual	0.02	5.3	5.3	-	80
CO	1-hour	1230.6	6440	7671	23,000	40,000
	8-hour	230.1	3617	3847	10,000	10,000
PM_{10}[a]	24-hour	3.78	88	92	50	150
	Annual[b]	0.22	24.3	24.5	30	-
	Annual[c]	0.22	21.9	22.1	-	50

Notes:
[a]Including cooling tower
[b]Annual Arithmetic Mean
[c]Annual Geometric Mean
[d]Worst-case one-hour NO_x impacts are dominated by the Diesel fire pump and emergency generator, which will be operated for testing purposes for up to one hour per week. Worst-case hourly average NO_2 impacts during other periods will be only 18.9 $\mu g/m^3$

PSD Increment Consumption

The Prevention of Significant Deterioration (PSD) program was established to allow emission increases (increments of consumption) that do not result in significant deterioration of ambient air quality in areas where criteria pollutants have not exceeded the National Ambient Air Quality Standards (NAAQS). For the purposes of determining applicability of the PSD program requirements, the following regulatory procedure is used.

- RCEC emissions are evaluated to determine whether the potential increase in emissions will be significant. Because this facility is a new major facility, the level of emissions that requires an analysis of ambient impacts is determined on a pollutant-specific basis. The emissions increases are those that will result from the proposed new equipment. For new facilities that include large gas turbines with fired HRSGs, USEPA considers a potential increase of 100 tons per year of any of the criteria pollutants to be significant. In this specific case, RCEC is considered a new major source. Potential emissions increases are compared with the levels considered significant for new sources in Table 8.1-28.

Table 8.1-28. Comparison of emissions increase with PSD significance emissions levels.

Pollutant	Emissions (tons per year)	Significant Emission Levels (tons per year)	Significant?
NO_x	134.6	40	yes
SO_2	12.4	40	no
POC	28.5	40	no
CO	610.2	100	yes
PM_{10}[a]	86.3	15	no

[a]Including cooling tower.

- If an ambient impact analysis is required, the analysis is first used to determine if the impact levels are significant. The determination of significance is based on whether the impacts exceed established significance levels (BAAQMD Rule 2.2-233) shown in Table 8.1.29. If the significance levels are not exceeded, no further analysis is required.

Table 8.1-29. BAAQMD PSD levels of significance.

Pollutant	Averaging Time	Significant Impact Levels	Maximum Allowable Increments
NO_2	1-Hour	19 μg/m³	N/A[a]
	Annual	1 μg/m³	25 μg/m³
SO_2	3-hour	25 μg/m³	512 μg/m³
	24-Hour	5 μg/m³	91 μg/m³
	Annual	1 μg/m³	20 μg/m³
CO	1-Hour	2000 μg/m³	N/A
	8-Hour	500 μg/m³	N/A
PM_{10}	24-Hour	5 μg/m³	30 μg/m³
	Annual	1 μg/m³	17 μg/m³

[a]The significance level for 1-hour average NO_2 ia a BAAQMD level only.

- If the significance levels are exceeded, an analysis is required to demonstrate that the allowable increments will not be exceeded, on a pollutant-specific basis. Increments are the maximum increases in concentration that are allowed to occur above the baseline concentration. These PSD increments are also shown in Table 8.1-29.

Table 8.1-28 shows that RCEC will be a major new source of NO_x and CO. Emissions of SO_2, PM_{10} and POC from RCEC will be below the 100 ton per year major new source threshold. However, since RCEC is considered major for at least one criteria pollutant, PSD review is required for the entire facility.

The maximum modeled impacts from RCEC are compared with the significance levels in Table 8.1-30 below. These comparisons show that RCEC exceeds the BAAQMD 1-hour average NO_2 significance level. Since no federal NO_2 standards or PSD increments exist for one-hour NO_2 concentrations, no multi-source modeling analyses were performed.

Table 8.1-30. Comparison of maximum modeled impacts and PSD significance thresholds.

Pollutant	Averaging Time	Maximum Modeled Impacts ($\mu g/m^3$)	Significance Threshold ($\mu g/m^3$)	Significant?
NO_2	1-Hour	169	19	yes
	Annual	0.36	1	no
SO_2	3-Hour	3.67	25	no
	24-Hour	0.35	5	no
	Annual	0.02	1	no
CO	1-Hour	1230.6	2000	no
	8-Hour	230.1	500	no
PM_{10}[a]	24-Hour	3.78	5	no
	Annual	0.22	1	no

[a]Including cooling tower.

8.1.5.2 Screening Health Risk Assessment

The screening health risk assessment (SHRA) was conducted to determine expected impacts on public health of the noncriteria pollutant emissions from the facility. The SHRA was conducted in accordance with the CAPCOA Air Toxics "Hot Spots' Program Revised 1992, Risk Assessment Guidelines" (October 1993) and the Bay Area Air Quality Management District "Risk Management Procedure" Policy (May 1991). The SHRA estimated the offsite cancer risk at the maximum impact receptor (MIR) location. If impacts at the MIR are below the significance thresholds with respect to cancer risk and acute and chronic health effects, then the impacts at all other identified receptors will also be insignificant. The CARB/OEHHA Health Risk Assessment computer program was used to evaluate multipathway exposure to toxic substances. Because of the conservatism (overprediction) built into the established risk analysis methodology, the actual risks will be lower than those calculated.

A health risk assessment requires the following information:

- Unit risk factors (or carcinogenic potency values) for any carcinogenic substances that may be emitted
- Noncancer Reference Exposure levels (RELs) for determining non-carcinogenic health impacts
- Annual average and maximum one-hour emission rates for each substance of concern
- The modeled maximum offsite concentration of each of the pollutants emitted

Pollutant-specific unit risk factors are the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 µg/m3 over a 70-year lifetime. The SHRA uses unit risk factors specified by the California Office of Environmental Health Hazard Assessment (OEHHA). The cancer risk for each pollutant emitted is the product of the unit risk factor and the modeled concentration. All of the pollutant cancer risks are assumed to be additive.

An evaluation of the potential noncancer health effects from long-term (chronic) and short-term (acute) exposures has also been included in the SHRA. Many of the carcinogenic compounds are also associated with noncancer health effects and are therefore included in the determination of both cancer and noncancer effects. RELs are used as indicators of potential adverse health effects. RELs are generally based on the most sensitive adverse health effect reported and are designed to protect the most sensitive individuals. However, exceeding the REL does not automatically indicate a health impact. The OEHHA reference exposure levels were used to determine any adverse health effects from noncarcinogenic compounds. A hazard index for each noncancer pollutant is then determined by the ratio of the pollutant annual average concentration to its respective REL for a chronic evaluation. Each of the individual indices are summed to determine the overall hazard index for the project. Because noncancer compounds do not target the same system or organ, this sum is considered conservative. The same procedure is used for the acute evaluation.

RCEC SHRA results are compared with the established risk management procedures for the determination of acceptability. The established risk management criteria include those listed below.

- If the potential increased cancer risk is less than one in one million, the facility risk is considered not significant.
- If the potential increased cancer risk is greater than one in one million but less than ten in a million and Toxics-Best Available Control Technology (TBACT) has been applied to reduce risks, the facility risk is considered acceptable.
- If the potential increased cancer risk is greater than ten in one million and there are mitigating circumstances that, in the judgment of a regulatory agency, outweigh the risk, the risk is considered acceptable.
- For noncancer effects, total hazard indices of one or less are considered not significant.
- For a hazard index greater than one, OEHHA and the reviewing agency conduct a more refined review of the analysis and determine whether the impact is acceptable.

The SHRA includes the noncriteria pollutants listed above in Table 8.1-20. The receptor grid described earlier for criteria pollutant modeling was used for the SHRA. Receptors were also placed at each sensitive receptor identified in Appendix 8.1D, Table 8.1D-1 (Parts 1 and 2) and shown in Figure 8.9-2.

The SHRA results for RCEC are presented in Table 8.1-31, and the detailed calculations are provided in Appendix 8.1D.

Table 8.1-31. Screening health risk assessment results.

Cancer Risk at Maximum Impact Receptor	0.174 in one million
Total Cancer Burden	0.043
Acute Inhalation Hazard Index	<0.246
Chronic Inhalation Hazard Index	<0.0216
Chronic Noninhalation Exposure	NoValue Calculated

The screening HRA results indicate that the acute and chronic hazard indices are well below 1.0, and are therefore not significant. The maximum chronic noninhalation exposure was not established due to the lack of REL data for the specified substances and is therefore considered insignificant. The cancer burden is also well below 1.0. The cancer risk to a maximally exposed individual at the maximum impact receptor location is 0.174 in one million, well below the 1 in one million level. The screening HRA results indicate that, overall, RCEC will not pose a significant health risk.

8.1.5.3 Visibility Screening Analysis

CALPUFF Modeling System

A screening mode of the CALPUFF modeling system was run for the proposed project in order to calculate potential impacts to Point Reyes National Seashore and Pinnacles National Monument, both managed by the National Park Service. The modeling analysis focused on the potential visibility impacts to protected areas in the vicinity of the project.

The modeling followed screening guidance as provided by the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report. The modeling procedures also incorporate comments provided by the Federal Land Managers' Air Quality Related Values workgroup (FLAG) Phase I report (December 2000).

The screening mode of the CALPUFF modeling system requires hourly, single station meteorological data as input, both surface and upper air. Based on the guidance contained in the IWAQM Phase 2 Summary Report, CALPUFF was used in a screening mode, which required five years of single station meteorology. Five years of surface and upper air data were obtained for San Francisco surface and Oakland upper air (1986-1990). The surface data was in SAMSON format.

The PCRAMMET meteorological preprocessor, as recommended by the IWAQM Phase 2 Report, was used to process the surface, precipitation, and upper air data. PCRAMMET requires complete data sets of the following variables: wind speed, wind direction, temperature, ceiling height, opaque cloud cover or total cloud cover, surface pressure, relative humidity, and precipitation type. The five years of upper air data includes twice-daily mixing heights.

PCRAMMET was run with wet deposition options as required in the Phase 2 Report. As such, the following domain averaged variables are required and were based on values expected in the modeling region:

- Precipitation data
- Minimum Obukhov length = 2 meters
- Surface roughness length = 0.25 meters (at both measurement and application site)
- Noon time albedo = 0.15
- Bowen ratio = 0.1
- Fraction of net radiation absorbed by ground = 0.15
- Anthropogenic heat flux = 57 W/m^2

Five years of data was preprocessed with PCRAMMET, which was then used as input into CALPUFF.

CALPUFF also requires domain averaged background ozone (O_3) and ammonia (NH_3) concentrations for the Mesopuff II chemistry algorithm. For O_3, a domain-averaged value of 4 ppb was used, which was based on background O_3 data collected in the project region by the Bay Area Air Quality Monitoring District. For NH_3, a domain average value of 10.0 ppb was selected and was based on guidance in the IWAQM Phase 2 Report.

CALPUFF Model Options

A CALPUFF control file was generated that included IWAQM recommended defaults for the model options. This included rural dispersion coefficients, default wind speed profile exponents, and default vertical potential temperature gradient. Model options are listed in the CALPUFF model output, which is included on compact disk. A brief summary of the options used in the modeling analysis are listed below:

- Number of X grid cells = 2
- Number of Y grid cells = 2
- Number of vertical layers = 2
- Grid spacing = 210 km
- Cell face heights = 0 and 5000 meters
- Minimum mixing height = 50 meters
- Maximum mixing height = 5000 meters (based on observational data)
- Minimum wind speed allowed for non-calm conditions = 0.5 m/s
- Vertical distribution used in the near field = gaussian
- Terrain adjustment method = partial plume path adjustment
- No puff splitting allowed
- Chemical mechanism = Mesopuff II
- Wet and dry removal modeled
- Dispersion coefficients = PG dispersion coefficients
- PG sigma-y and z not adjusted for roughness
- Partial plume penetration of elevated inversion allowed
- Lateral turbulence not used

The computational grid extended 50 kilometers beyond the furthest receptor point.

Receptors were placed in three polar receptor rings surrounding the proposed modification. The radius was set equal to the distance from the source to the Point Reyes National Seashore, and similarly for Pinnacles National Monument. The receptors were spaced at one-degree intervals (360 receptors per receptor ring). The closest receptor ring was placed at a distance where it extends through the portion of the Class I area located closest to the proposed project. The middle receptor ring was placed at a distance where it extends through the central portion of the Class I area. The farthest receptor ring was placed at a distance where it extends through the most distant portion of the Class I area. A single elevation value was assigned to all receptors on a given ring. The selected elevation value was based on the average elevation of the arc length that extended into the Class I Area.

Following the IWAQM screening method, the maximum concentration for each pollutant, for each distance averaging time modeled was selected for comparison with the appropriate AQRV.

To assess visibility impacts at Point Reyes and Pinnacles, Flag Phase I report guidance was followed to determine the background visual range on a season by season basis. The allowable level of acceptable change (LAC) to extinction is 5 percent.

Emissions

As stated earlier, the combustion sources at the proposed project will utilize advanced NO_x control technology and natural gas fuel to achieve very low emission rates. Emissions from the project include NO_x, SO_2, and PM_{10}, all of which have the potential to interfere with visibility. Emissions used in the ISCST3 modeling analysis of visibility impacts are the same as those used for the criteria pollutant modeling analysis. The parameters modeled for the visibility impacts assume that the particulate nitrate (NO_3-) is in the form of ammonium nitrate (NH_4NO_3) and that particulate sulfate (SO_4) is in the form of ammonium sulfate ($(NH_4)2SO_4$). The visibility calculation is based on the ambient concentrations of NH_4NO_3, $(NH_4)2SO_4$, and PM_{10} along with a monthly relative humidity adjustment factor.

Impacts

The maximum 24-hour visibility impact was generated by taking the maximum 24-hour average modeled concentration at each receptor, regardless of the season in which it occurred, and assigning it to represent the visibility impact at Point Reyes or Pinnacles.

To calculate extinction coefficients, the following general equation was used:

$$b_{ext} = b_{SN} * f(RH) + b_{dry}$$

where:

b_{ext} = particle scattering coefficient
b_{SN} = $3[((NH_4)2SO_4) + (NH_4NO_3)]$
b_{dry} = b_{Coarse}

The quantities in brackets are the masses expressed in $\mu g/m^3$ and can further be broken down into the following equations:

b_{NO3} = $3[1.29(NO_3)f(RH)]$
b_{SO4} = $3[1.375(SO_4)f(RH)]$
b_{fine} = $0.6[PM_{10}]$

Using the above equations to calculate the extinction coefficients and correcting for f(RH) except for b_{fine}, which is not corrected), Table 8.1-32 summarizes the maximum extinction coefficients for each year for each pollutant and the total extinction.

Table 8.1-32. Maximum modeled impacts in protected areas.

Class I Area	b_{NO3} (Mm-1)	b_{SO4} (Mm-1)	b_{fine} (Mm-1)	24-hour Average Visibility Impact (Mm-1)	Percent Change in Extinction
Point Reyes	0.502	0.018	0.10	0.619	3.67%
Pinnacles	0.293	0.014	0.057	0.364	2.20%

Thus, during operation of the proposed project, potential visibility impacts to Point Reyes National Seashore and Pinnacles National Monument will be less than the 5 percent level of acceptable change.

8.1.5.4 Construction Impacts Analysis

Emissions due to the construction phase of the project have been estimated, including an assessment of emissions from vehicle and equipment exhaust and the fugitive dust generated from material handling. A dispersion modeling analysis was conducted based on these emissions. A detailed analysis of the emissions and ambient impacts is included in Appendix 8.1E. With the exception of the maximum modeled one-hour NO_2 and 24-hour PM_{10} concentrations, the results of the analysis indicate that the maximum construction impacts will be below the state and federal standards for all the criteria pollutants emitted. Exclusion of the background values results in construction impacts which will not exceed state and federal air quality standards. The best available emission control techniques will be used. The RCEC construction site impacts are not unusual in comparison to most construction sites; construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause violations of air quality standards.

8.1.6 Consistency with Laws, Ordinances, Regulations and Standards

8.1.6.1 Consistency with Federal Requirements

The Bay Area Air Quality Management District (District) has been delegated authority by the USEPA to implement and enforce most federal requirements that are applicable to the RCEC, including the new source performance standards and PSD review for all pollutants. Compliance with the District regulations ensures compliance and consistency with the corresponding federal requirements as well. RCEC will also be required to comply with the Federal Acid Rain requirements (Title IV). Since the District has received delegation for implementing Title IV through its Title V permit program, the RCEC will secure a District Title V permit that imposes the necessary requirements for compliance with the Title IV Acid Rain provisions.

8.1.6.2 Consistency with State Requirements

State law sets up local air pollution control districts and air quality management districts with the principal responsibility for regulating emissions from stationary sources. As discussed above, the RCEC is under the local jurisdiction of the District, and compliance with District regulations will ensure compliance with state air quality requirements.

8.1.6.3 Consistency with Local Requirements: Bay Area Air Quality Management District (District)

The District has been delegated responsibility for implementing local, state, and federal air quality regulations in the nine counties surrounding the Bay Area. The RCEC is subject to District regulations that apply to new sources of emissions, to the prohibitory regulations that specify emission standards for individual equipment categories, and to the requirements for evaluation of impacts from toxic air pollutants. The following sections include the evaluation of facility compliance with the applicable District requirements.

Under the regulations that govern new sources of emissions, the RCEC is required to secure a preconstruction Determination of Compliance from the District (Regulation 2, Rule 3), as well as demonstrate continued compliance with regulatory limits when RCEC becomes operational. The preconstruction review includes demonstrating that RCEC will use best available control technology (BACT) and will provide any necessary emission offsets.

Applicable BACT levels are shown in Table 8.1-33, along with anticipated potential facility emissions. BAAQMD Rule 2-2-301 requires the RCEC to apply BACT for emissions of NO_x, POC, SO_x, CO and

PM_{10} (criteria pollutants) in excess of 10.0 pounds per highest day. Rule 2.2-301.2 imposes BACT for emissions of lead, asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur, and reduced sulfur compounds when emitted in excess of specified amounts. RCEC will not emit any of these latter pollutants in detectable quantities; therefore, Rule 2-2-301.2 is not applicable to RCEC. As shown in the table, BACT is required for NO_x, POC, SO_2, CO, and PM_{10}. The calculation of facility emissions was discussed in AFC Section 8.1.5.1.

Table 8.1-33. Facility Best Available Control Technology (BACT) requirements.

Pollutant	Applicability Level	Facility Emission Level (lbs/day)	BACT Required
Criteria Pollutants: District Regulation 2-2-301.1			
POC	10 lbs/day	234.3	yes
NPOC	10 lbs/day	-	no
NO_x	10 lbs/day	1445.7	yes
SO_2	10 lbs/day	67.7	yes
PM_{10}	10 lbs/day	526.4[a]	yes
CO	10 lbs/day	8022.2	yes
Noncriteria Pollutants: District Regulation 2-2-301.2			
Lead	3.2 lbs/day	Neg	no
Asbestos	0.04 lbs/day	Neg	no
Beryllium	0.002 lbs/day	Neg	no
Mercury	0.5 lbs/day	Neg	no
Fluorides	16 lbs/day	Neg	no
Sulfuric Acid Mist	38 lbs/day	Neg	no
Hydrogen Sulfide	55 lbs/day	Neg	no
Total Reduced Sulfur	55 lbs/day	Neg	no
Reduced Sulfur Compounds	55 lbs/day	Neg	no

[a]Including cooling tower.

BACT for the applicable pollutants was determined by reviewing the District BACT Guidelines Manual, the South Coast Air Quality Management District BACT Guidelines Manual, the most RCECent Compilation of California BACT Determinations, CAPCOA (2nd Ed., November 1993) and USEPA's BACT/LAER Clearinghouse. A summary of the review is provided in Appendix 8.1F. For the gas turbines and duct burners, the District considers BACT to be the most stringent level of demonstrated emission control that is feasible. RCEC will use the BACT measures discussed below.

As a BACT measure, RCEC will limit the fuels burned at RCEC to natural gas, a clean burning fuel. Liquid fuels will not be fired at RCEC except in the emergency Diesel fire pump. Burning of liquid fuels in the gas turbine combustors, duct burners, and emergency generator would result in greater criteria pollutant emissions than if the units burned only gaseous fuels. This measure acts to minimize the formation of all criteria air pollutants.

BACT for NO_x emissions will be the use of low NO_x emitting equipment and add-on controls. RCEC has selected a gas turbine equipped with dry, low NO_x combustors. The gas turbine dry, low NO_x combustors will generate a maximum of 25 ppmvd NO_x, corrected to 15 percent O_2 at loads and above 70 % of base load. In addition, RCEC will use a selective catalytic reduction (SCR) system to further reduce NO_x emissions to 2.5 ppmvd NO_x, corrected to 15 percent O_2 (3-hour average). The District BACT guidelines indicate that BACT from large gas turbines (>23 MMBtu/hr heat input) is an exhaust concentration not to exceed 5 ppmvd NO_x, corrected to 15 percent O_2; therefore, RCEC will meet the necessary BACT requirements for NO_x. The duct burner will also be exhausted to the SCR system; therefore, BACT for the duct burner is also the stringent 2.5 ppmvd NO_x level, corrected to 15 percent O_2. The District BACT Guideline determination for NO_x from gas turbines is shown in Appendix 8.1F.

BACT for CO emissions will be achieved by use of gas turbines equipped with dry, low NO_x combustors and the use of duct burners with similarly low CO production characteristics. Dry, low NO_x combustors emit low levels of combustion CO while still maintaining low NO_x formation. RCEC has specified a CO limit of 6 ppmvd, corrected to 15 percent O_2, for all load conditions down to approximately 70% of base load, or 1,700 MMBtu/hr heat release in each combustion turbine. The duct burner CO emission rate is 0.10 pounds CO per million Btu heat input. While the District has previously determined that BACT for gas turbines is 6 ppm CO, corrected to 15 percent oxygen, recent source test and CEM data from the Crockett Cogeneration Facility, which utilizes an oxidation catalyst to control CO emissions, show that the 6 ppm level cannot be achieved without excursions above that limit under certain operating conditions. The District BACT guidelines indicate that BACT from large gas turbines (>23 MMBtu/hr heat input) is 10 ppmvd CO, corrected to 15 percent O_2. CO emissions from the RCEC HRSG stacks will meet the District BACT requirements. The CO emission rate from the gas turbines and duct burners, as measured at the HRSG exhaust stacks, will not exceed 6 ppmvd, corrected to 15 percent O_2 during base load, durct firing, and power augmentation operations. CO emissions will be higher during turbine startups. A review of recent BACT determinations for CO from gas turbines is provided in Appendix 8.1F.

BACT for POC emissions will be achieved by use of the gas turbine dry, low NO_x combustors and the use of duct burners with similarly low POC production characteristics. As in the case of CO emission formation, dry, low NO_x combustors use air to fuel ratios that result in low combustion POC while still maintaining low NO_x levels. The duct burner POC emission rate is 0.02 lbs/MMBtu heat input. BACT for POC emissions from combustion devices has historically been the use of best combustion practices. With the use of the dry, low NO_x combustors and advanced duct burner design, POC emissions leaving the HRSG stacks will not exceed 1.0 ppmvd, corrected to 15 percent oxygen. This level of emissions meets the BACT requirements for POC without the use of a CO catalyst.

BACT for PM_{10} is best combustion practices and the use of gaseous fuels. As mentioned, use of clean burning natural gas fuel will result in minimal particulate emissions.

SO_2 emissions will be kept at a minimum by firing natural gas.

Emissions Offsetting

In addition to the BACT requirements, District regulation 2-2-302 requires RCEC to provide full emission offsets (Emissions Reduction Credits, or ERCs) when emissions exceed specified levels on a pollutant-specific basis. As shown in Table 8.1-34, RCEC will be required to provide emission offsets for NO_x and POC emissions.

Table 8.1-34. BAAQMD offset requirements and RCEC emissions.

Pollutant	Applicable Facility Size	Emission Increase	RCEC Emission Rate	Regulation	Offsets Required
POC	50 tpy	Any increase	28.5 tpy	2-2-302	yes
NO_x	50 tpy	Any increase	134.6 tpy	2-2-302	yes
PM_{10}	100 tpy	1 tpy Net increase	86.3 tpy[a]	2-2-303	no
SO_2	100 tpy	1 tpy Net increase	12.4 tpy	2-2-303	no

[a]Including cooling tower.

Section 2-302 requires POC and NO_x emission reduction credits to be provided at an offset ratio of 1.15:1. Because both POC and NO_x contribute to the Bay Area Basin ozone levels, Section 2-302.1 allows emission reduction credits of NO_x to be used to offset increased emissions of POC, at the required offset ratio of 1.15:1; likewise, Section 2-302.2 allows the use of POC emission reduction credits for NO_x emissions, at the 1.15:1 offset ratio.

Section 2-303 requires emissions offsets for emissions increases at facilities that emit more than 100 tpy of SO_2 and PM_{10}. As facility emissions of SO_2 and PM_{10} will be below 100 tpy, SO_2 and PM_{10} offsets are not required.

Sections 2-304 and 2-305 impose emissions offset requirements, or require project denial, if SO_2, NO_2, PM_{10}, or CO air quality modeling results indicate emissions will interfere with the attainment or maintenance of the applicable ambient air quality standards or will exceed PSD increments. For many of the pollutants and averaging periods, District regulations do not require RCEC to conduct these analyses, since the modeled impacts of the proposed facility are not significant under District rules. However, modeling for these pollutants has been conducted to satisfy CEC requirements. The modeling analyses show that facility emissions will not interfere with the attainment or maintenance of the applicable air quality standards.

Emissions offset requirements for NO_x and POC are shown in Table 8.1-35 below. Sufficient offsets have been purchased by Calpine/Bechtel. The information in the Appendix includes:

- Ownership of emission offset sources
- Emission reduction credits granted by the District that have been determined to meet the District's requirements for bankable offsets.

Table 8.1-35. Facility offset requirements.

Pollutant	Emissions (tons/yr)	Required Offset Ratio	Required Offsets (tons/yr)
NO_x	134.6	1.15:1.0	154.8
POC	28.5	1.0:1.0	28.5

A current listing of deposits in the offset bank is included in Appendix 8.1G. Calpine/Bechtel has been in contact with the owners of facilities that have registered emission reduction credits in the offset bank, and will submit to the CEC a confidential list of potential suppliers, as well as dates of contact and persons contacted, under separate cover. Because of the highly competitive nature of the offset market, confidential treatment of this contact list is being sought at this stage of the negotiations with the various owners.

As discussed in AFC Section 5.1.2, Regulatory Setting, the BAAQMD PSD program requirements apply on a pollutant-specific basis to:

- A new major facility that will emit 100 tpy or more, if it is one of the PSD source categories in the federal Clean Air Act, or a new facility that will emit 250 tpy or more; or
- A facility that emits 100 tpy or more, with net emissions increases since the applicable PSD baseline date that exceed the modeling threshold levels shown in Table 8.1-36.

Table 8.1-36. BAAQMD PSD requirements applicable to 100 tpy fossil fuel fired power plants.

Pollutant	PSD Facility Applicability Level	Modeling Threshold Level	Facility Emissions	Modeling Required	Applicable District Regulation
NO_x	100 tpy	100 tpy	134.6 tpy	yes	2-2-304.2
SO_2	100 tpy	100 tpy	12.4 tpy	no	2-2-304.2
PM_{10}[a]	100 tpy	100 tpy	86.3 tpy	no	2-2-304.3
CO	100 tpy	100 tpy	610.2 tpy	yes	2-2-305.1
POC	100 tpy	not required	-	-	-

[a]All particulate matter from RCEC is assumed to be emitted as PM_{10}. Includes cooling tower.

RCEC is a new major source as defined by BAAQMD regulations. Therefore, it is subject to the USEPA and District PSD regulations. The District modeling threshold requirements and their applicability to RCEC are shown in Table 8.1-37. The required modeling analysis was carried out and the results presented in Section 8.1.5.1.2.

As discussed below, the specific District Regulation 2, Rule 2 criteria for conducting modeling analyses have been met.

Rule 2-2-414.1 requires that the modeling be conducted with appropriate meteorological and topographic data necessary to estimate impacts. The RCEC modeling analyses used District-approved U.S. Geological Service topographic data for the surrounding area and District-approved weather data gathered from the Union City meteorological monitoring station approximately 4.2 miles southeast from the project site. As discussed above, the meteorological data meet the requirements of USEPA guidance.

Rule 2-2-304 and 2-2-412.2 require a demonstration that emission increases subject to the PSD program not interfere with the attainment or maintenance of any State or national ambient air quality standards for each applicable pollutant, unless adequate emissions offsets are provided. As shown in Table 8.1-30, RCEC will exceed only the BAAQMD PSD one-hour significance level for NO_2. There are no corresponding federal significance levels. In addition, offsets will be provided for increases in NO_x and POC emissions. Therefore, project impacts on state and federal ambient air quality standards are not considered significant. Additionally, the modeling analysis results do not show an exceedance of State or national ambient air quality standards, with the exception of the state 24-hour average PM_{10} standard, which is already being exceeded. The modeling analysis is discussed in detail in Section 8.1.5.1.2.

For an application that triggers PSD modeling requirements, Rules 2-2-211 and 2-2-413.3 require that ambient monitoring data be gathered for one year preceding the submittal of a complete application, or a District-approved representative time period. However, if the air quality impacts of RCEC do not exceed the specified *de minimis* levels on a pollutant-specific basis, RCEC is exempted from the preconstruction monitoring requirement. The air quality impacts of RCEC's NO_x, CO, SO_2 and PM_{10} emissions were below their respective *de minimis* levels, as shown in Table 8.1-23, and therefore the exemption applies to the proposed project. The District-operated ambient monitoring stations in San Leandro, Hayward, Fremont, and San Francisco are representative of existing air quality in the vicinity of the project, and were used to determine existing ambient concentrations.

Rule 2-2-308 requires applicants to demonstrate that emissions from a project located within 10 km (6.2 miles) of a Class I area will not cause or contribute to the exceedance of any national ambient air quality standard or any applicable Class I PSD increment. Because the nearest Class I areas, Point Reyes

National Seashore and Pinnacles National Park, are over 80 km from RCEC, this section is not applicable to the proposed facility.

Rule 2-2-417 requires an applicant for a permit subject to a PSD air quality analysis to provide additional analysis of the impact of the facility on visibility, soils and vegetation. The visibility analysis is provided in Section 8.1.5.3. The soils and vegetation analyses are provided in Sections 8.9, 8.2 and 8.4 of the AFC.

Rule 2-2-306 is also not applicable to RCEC. This section requires modeling analyses for specific noncriteria pollutants (lead, asbestos, beryllium, mercury, fluorides, sulfuric acid mist, hydrogen sulfide, total reduced sulfur and reduced sulfur compounds) if they are emitted in significant quantities and if the facility emits more than 100 tons per year of any criteria pollutant. As RCEC will not emit significant quantities of the specific noncriteria pollutants, a noncriteria pollutant modeling analysis under this section is not required. However, a screening health risk assessment has been conducted for potential emissions of toxic air contaminants. The analysis methodology and results are discussed in Section 8.1.5.2.

Rule 2-2-418 requires the use of Good Engineering Practices (GEP) stack height. Conformance with the GEP stack height requirement was demonstrated in the modeling analysis conducted for RCEC.

Regulation 2, Rule 6, Major Facility Review (Title V permit program), applies to facilities that emit greater than 100 tons per year on a pollutant-specific basis. Under the Title V permit program, RCEC will be required to file an application for an operating permit within 12 months of facility startup. The Phase II acid rain requirements will also apply to RCEC. As a Phase II Acid Rain facility, RCEC will be required to provide sufficient allowances for every ton of SO_2 emitted during a calendar year. RCEC will obtain any necessary allowances on the current open trade market. RCEC will also be required to install and operate continuous monitoring systems; District enforcement of its rules will ensure installation of these systems.

The general prohibitory rules of the District applicable to RCEC and the determination of compliance follow.

Regulation 1-301 addresses Public Nuisance. RCEC will emit insignificant quantities of odorous or visible substances; therefore, RCEC will comply with this regulation.

Regulation 6 pertains to particulate matter and visible emissions. Any visible emissions from the project will not be darker than No. 1 when compared to a Ringlemann Chart for any period(s) aggregating 3 minutes in any hour. Because RCEC will burn clean fuels, the opacity standard of not greater than 20 percent for a period or periods aggregating 3 minutes in any hour and the particulate emission concentrations limit of 0.15 grains per standard cubic feet of exhaust gas volume will not be exceeded.

Regulation 7, Odorous Substances, is not applicable to RCEC. Gas turbine operations do not result in odor complaints.

Regulation 9, Rule 1, Sulfur Dioxide, specifies an emission standard of less than 300 ppm SO_2. Because of the insignificant quantities of sulfur in natural gas, this limit will be achieved. In addition, the ambient air quality modeling analysis discussed in Section 8.1.5.1.2 shows that ground-level concentrations of SO_2 from RCEC will not result in ground-level concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes or 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours.

Regulation 9, Rule 2, pertains to hydrogen sulfide. RCEC is not expected to emit H_2S.

Regulation 9, Rule 3, Nitrogen Oxides From Heat Transfer Operations, imposes a NO_x limit of 125 ppm. RCEC will easily comply with this rule.

Regulation 9, Rule 9, limits the emissions of nitrogen oxides from gas turbines during baseload operations to less than 9 ppmv corrected to 15 percent O_2. RCEC's NO_x level of 2.5 ppmvd, corrected to 15 percent O_2, will satisfy the requirements of this rule. In addition, the continuous emission monitoring (CEM) system that RCEC will install will also satisfy the monitoring and recordkeeping requirements of this rule.

Regulation 9, Rule 10, limits hexavalent chromium emissions from cooling towers. Chemicals containing hexavalent chromium will not be used in the RCEC cooling tower; therefore, rule requirements will be met.

District Regulation 10 (40 CFR 60 subpart GG) adopts by reference the federal New Source Performance Standard (NSPS) for stationary gas turbines. This regulation requires monitoring of fuel; imposes limits on the emissions of NO_x and SO_2; and requires source testing of stack emissions, process monitoring, and data collection and recordkeeping. All of the BACT limits imposed on RCEC will be more stringent than the requirements of the NSPS emission limits. Monitoring and recordkeeping requirements for BACT will be more stringent than the requirements in this rule. RCEC will comply with the NSPS regulation.

A summary of the demonstration of compliance with applicable LORS is provided in Table 8.1-37.

A complete application for an "Authority to Construct" will be filed with the BAAQMD within 10 working days of the RCEC AFC filing.

8.1.7 Cumulative Air Quality Impacts Analysis

An analysis of potential cumulative air quality impacts that may result from RCEC and other reasonably foreseeable projects is generally required only when project impacts are significant.

To ensure that potential cumulative impacts of RCEC and other nearby projects are adequately considered, a cumulative impacts analysis will be conducted in accordance with the protocol included as Appendix 8.1H. This procedure is similar to that which will be used to evaluate increment consumption for the project.

Table 8.1-37 Laws, ordinances, regulations, standards (LORS), and permits for protection of air quality.

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
Federal					
Clean Air Act (CAA) §160-169A and implementing regulations, Title 42 United States Code (USC) §7470-7491 (42 USC 7470-7491), Title 40 Code of Federal Regulations (CFR) Parts 51 & 52 (40 CFR 51 & 52). (Prevention of Significant Deterioration Program)	Requires prevention of significant deterioration (PSD) review and facility permitting for construction of new or modified major stationary sources of air pollution. PSD review applies to pollutants for which ambient concentrations are lower than NAAQS.	BAAQMD with USEPA oversight	After project review, issues Authority to Construct (ATC) with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.1, Tables 8.1-19,25,28, Appendix 8.1D
CAA §171-193, 42 USC §7501 et seq. (New Source Review)	Requires new source review (NSR) facility permitting for construction or modification of specified stationary sources. NSR applies to pollutants for which ambient concentration levels are higher than NAAQS.	BAAQMD with USEPA oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.6, Tables 8.1-19,25,28, Appendix 8.1F
CAA §401 (Title IV), 42 USC §7651 (Acid Rain Program)	Requires reductions in NO_x and SO_2 emissions.	BAAQMD with USEPA oversight	Issues Acid Rain permit after review of application.	Application to be made within 12 months of start of facility operation.	8.1.4.2.4
CAA §501 (Title V), 42 USC §7661 (Federal Operating Permits Program)	Establishes comprehensive permit program for major stationary sources.	BAAQMD with USEPA oversight	Issues Title V permit after review of application.	Application to be made within 12 months of start of facility operation.	8.1.4.2.4
CAA §111, 42 USC §7411, 40 CFR Part 60 (New Source Performance Standards - NSPS)	Establishes national standards of performance for new stationary sources.	BAAQMD with USEPA oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.2, Tables 8.1-13-16
CAA §112, 42 USC §7412, 40 CFR Part 63 (National Emission Standards for Hazardous Air Pollutants - NESHAPs)	Establishes national emission standards for hazardous air pollutants.	BAAQMD with USEPA oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.3, Table 8.1-18
State					
California Health & Safety Code (H&SC) §41700 (Nuisance Regulation)	Outlaws discharge of such quantities of air contaminants that cause injury, detriment, nuisance, or annoyance.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.2 Table 8.1-27

Table 8.1-37 (continued).

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
H&SC §44300-44384; California Code of Regulations (CCR) §93300-93347 (Toxic "Hot Spots" Act)	Requires preparation and biennial updating of facility emission inventory of hazardous substances; risk assessments.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Screening HRA submitted before start of construction.	8.1.5.2, 8.1.4.1.2, Table 8.1-31, Appendices 8.1A, 8.1C, 8.1D
California Public Resources Code §25523(a); 20 CCR §1752, 2300-2309 (CEC & CARB Memorandum of Understanding)	Requires that CEC's decision on AFC include requirements to assure protection of environmental quality; AFC required to address air quality protection.	CEC	After project review, issues Final Determination of Compliance (FDOC) with conditions limiting emissions.	CEC approval of AFC, i.e., FDOC, to be obtained before start of construction.	8.1.4.1.2, Appendix 8.1E
Local					
BAAQMD Regulation 1 §301(Public Nuisance)	Prohibits emissions in quantities that adversely affect public health, other businesses, or property.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 2 (Permits), Rule 2 (New Source Review)	NSR and PSD: Requires that pRCEConstruction review be conducted for all proposed new or modified sources of air pollution, including BACT, emissions offsets, and air quality impact analysis.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1, 8.1.5.2, 8.1.5.3, 8.1.5.4 8.1.6.3, 8.1.4.2.6, Tables 8.1- 27-37, Appendices 8.1C, 8.1D, 8.1E, 8.1F, 8.1G
BAAQMD Regulation 2, Rule 6 (Major Facility Review)	Implements operating permits requirements of CAA Title V and acid rain regulations of CAA Title IV.	BAAQMD	Issues Title V permit after review of application.	Application to be made within 12 months of start of facility operation.	8.1.6.1, 8.1.4.2.4, 8.1.4.2.11
BAAQMD Regulation 6 (Particulate Matter and Visible Emissions)	Limits visible emissions to no darker than Ringelmann No. 1 for periods greater than 3 minutes in any hour; limits PM emissions to #0.15 gr/dscf.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 7 (Odorous Substances)	Limits emissions of dimethylsulfide, ammonia, mercaptan, phenols, and trimethylamine; becomes applicable upon confirmation of 10 or more odor complaints with 90 days.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.6.3, 8.1.4.2.3, Table 8.1-20
BAAQMD Regulation 9, Rule 1 (Sulfur Dioxide)	Limits SO_2 emissions to <300 ppm; also limits SO_2 emissions resulting in ground level concentrations of specified level and duration.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.6.3, 8.1.4.2.8, Tables 8.1- 13-16

BAAQMD Regulation 9, Rule 2 (Hydrogen Sulfide)	Limits H_2S emissions during any 24-hour period that result in ground level H_2S concentrations exceeding specified levels and durations.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 9, Rule 3 (Heat Transfer Operation NO_x Emissions Limits)	Limits NO_x emissions from new heat transfer operations $250 MMBtu/hr maximum to <125 ppm.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8

Table 8.1-37 (continued).

LORS	Purpose	Regulating Agency	Permit or Approval	Schedule and Status of Permit	Conformance (Section)
BAAQMD Regulation 9, Rule 9 (Nitrogen Oxides from Stationary Gas Turbines)	Limits NO_x emissions during baseload operations to 9 ppmv @ 15 percent exhaust oxygen (15 ppmv if SCR is not used).	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 10 (40 CFR 60 Subpart GG) (Standards of Performance for Stationary Gas Turbines)	Requires monitoring of fuel, other operating parameters; limits NO_x and SO_2 emissions, requires source testing, emissions monitoring, and RCECordkeeping.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.6.3, 8.1.4.2.8
BAAQMD Regulation 11, (Hazardous Pollutants)	Implements federal NESHAP regulations.	BAAQMD with CARB oversight	After project review, issues ATC with conditions limiting emissions.	Agency approval to be obtained before start of construction.	8.1.5.1.1, 8.1.4.2.3, Table 8.1-20

8.1.8 Mitigation

While the BAAQMD regulations require facility emissions offsets to be provided on an annual average basis, the CEC's policy is to require mitigation of short-term impacts as well. The CEC asks that adequate offsets be provided to mitigate annual emissions calculated based on reasonable worst-case daily emissions. Maximum worst-case daily emissions are based on expected operation of RCEC, including the cooling tower, as presented in Table 8.1-19.

Maximum daily emisisons impacts are calculated based on the following assumptions regarding operation of RCEC:

- One turbine has one hot startup (one hour) and 23 hours of full load operation.
- The second turbine has one cold startup (three hours) and 21 hours of full load operation.
- Each duct burner operates for 16 hours.
- Fire pump or emergency generator operates for one hour.
- Cooling tower operates for 24 hours.

Mitigation for annual emissions will be provided through the purchase of offsets. As discussed in Section 8.1.5.3, sufficient offsets to fulfill this requirement have already been purchased by Clapine/Bechtel. The applicant owns the offset credits required and has included a list in Appendix 8.1G (filed separately under a request for confidentiality). The applicant is also offsetting No_x with POCs at a 1:1 ratio.

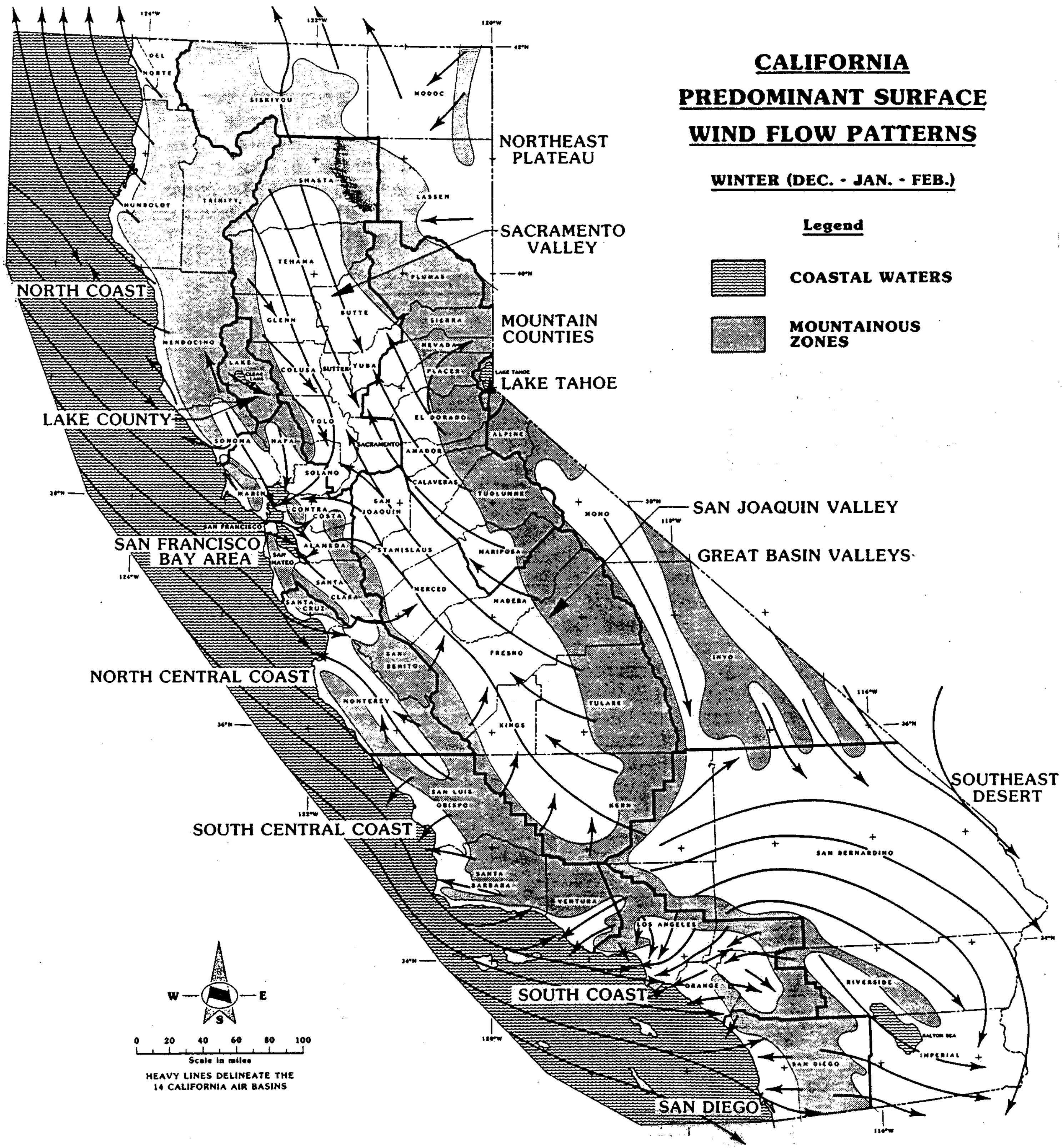

Figure 8.1-2. California predominant surface wind flow patterns, winter.

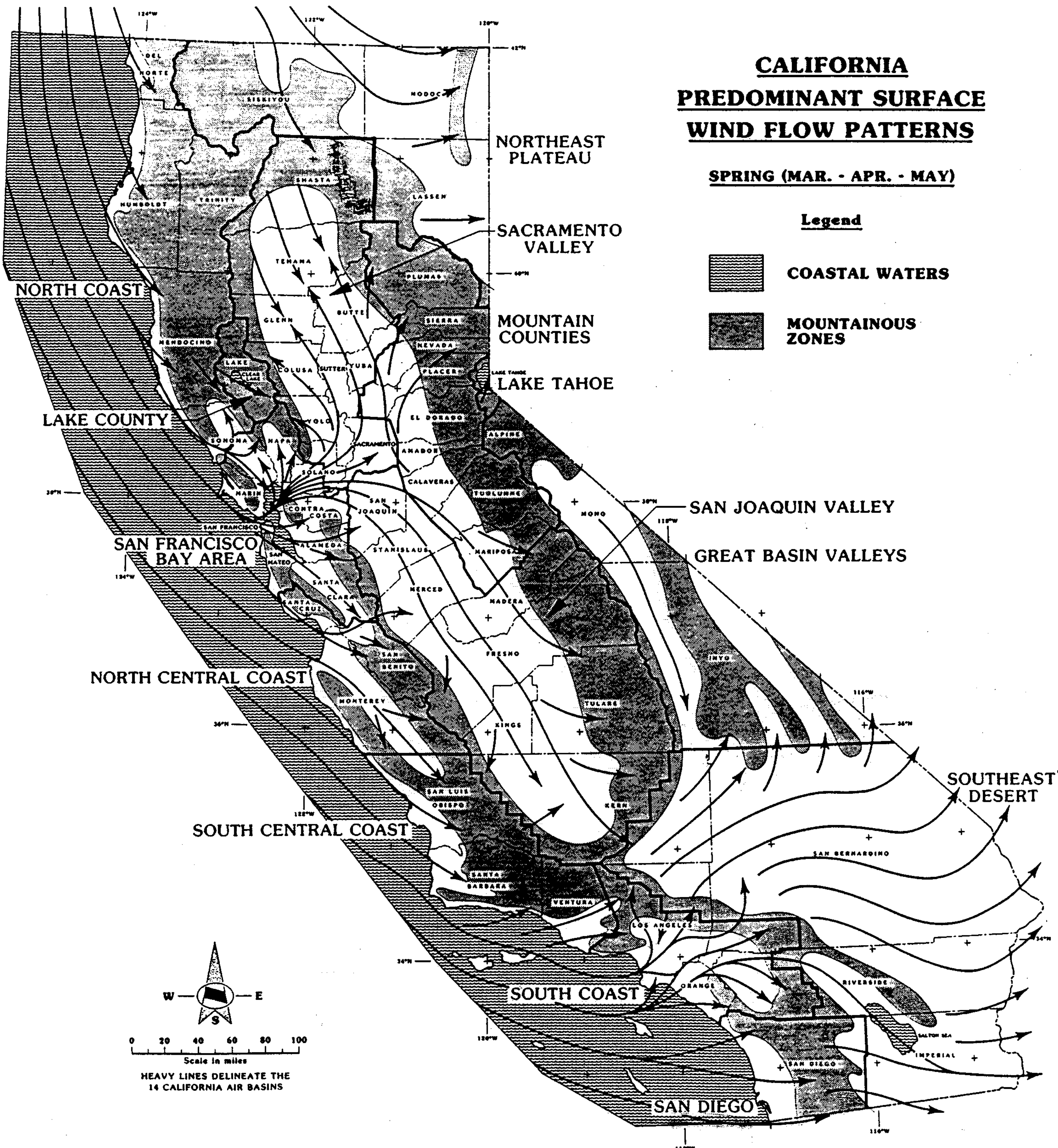

Figure 8.1-3. California predominant surface wind flow patterns, spring.

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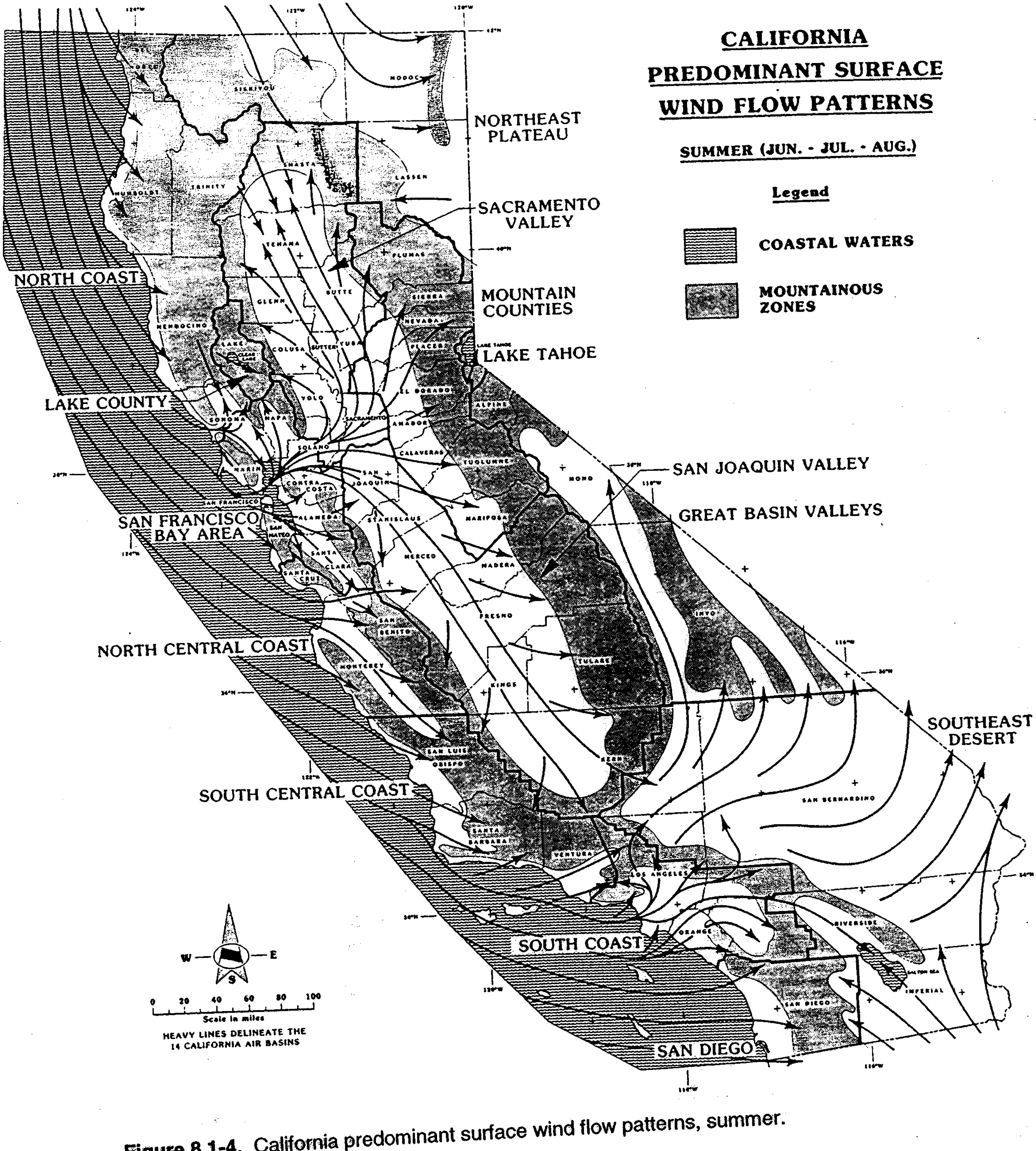

Figure 8.1-4. California predominant surface wind flow patterns, summer.

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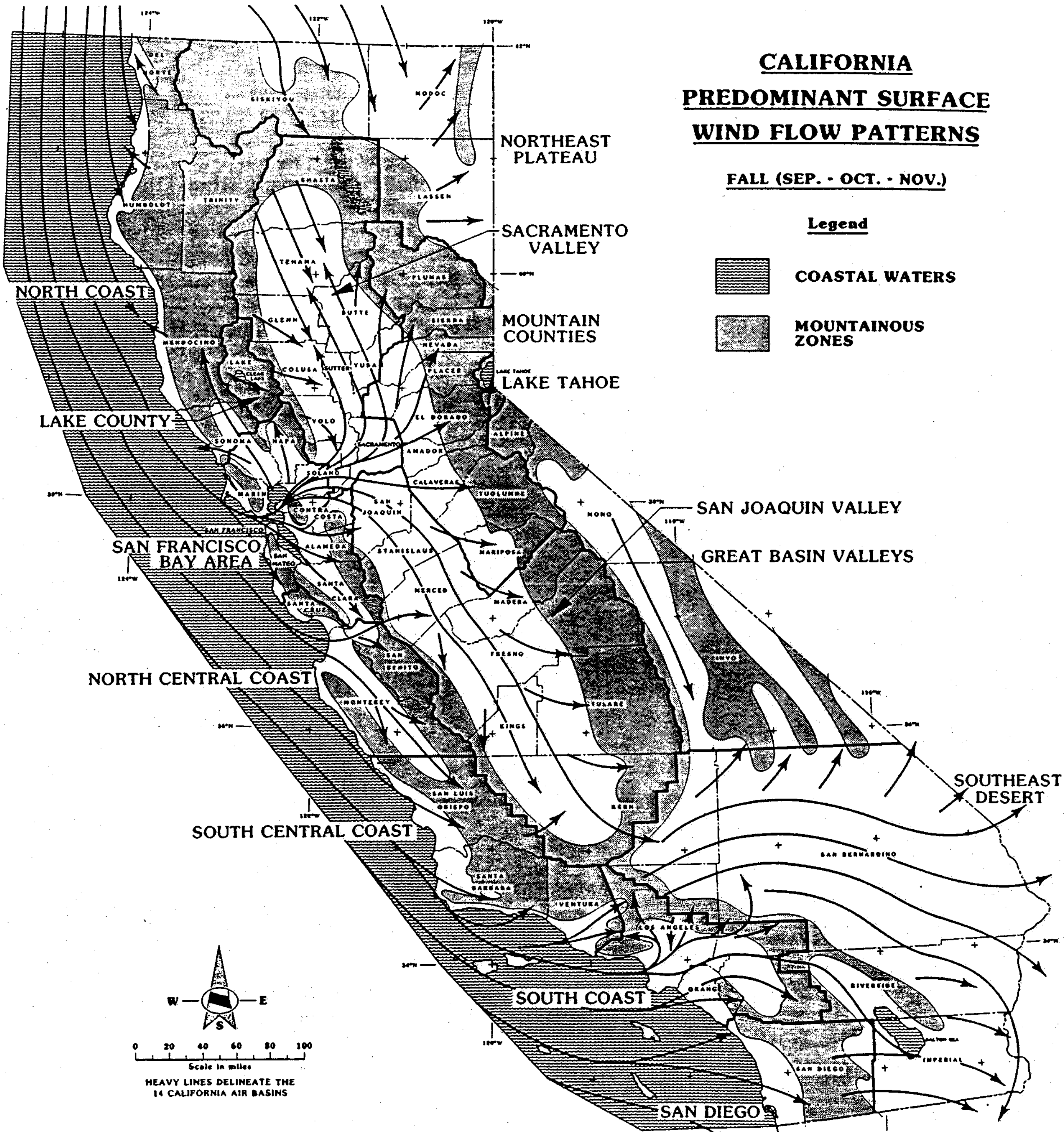

Figure 8.1-5. California predominant surface wind flow patterns, fall.

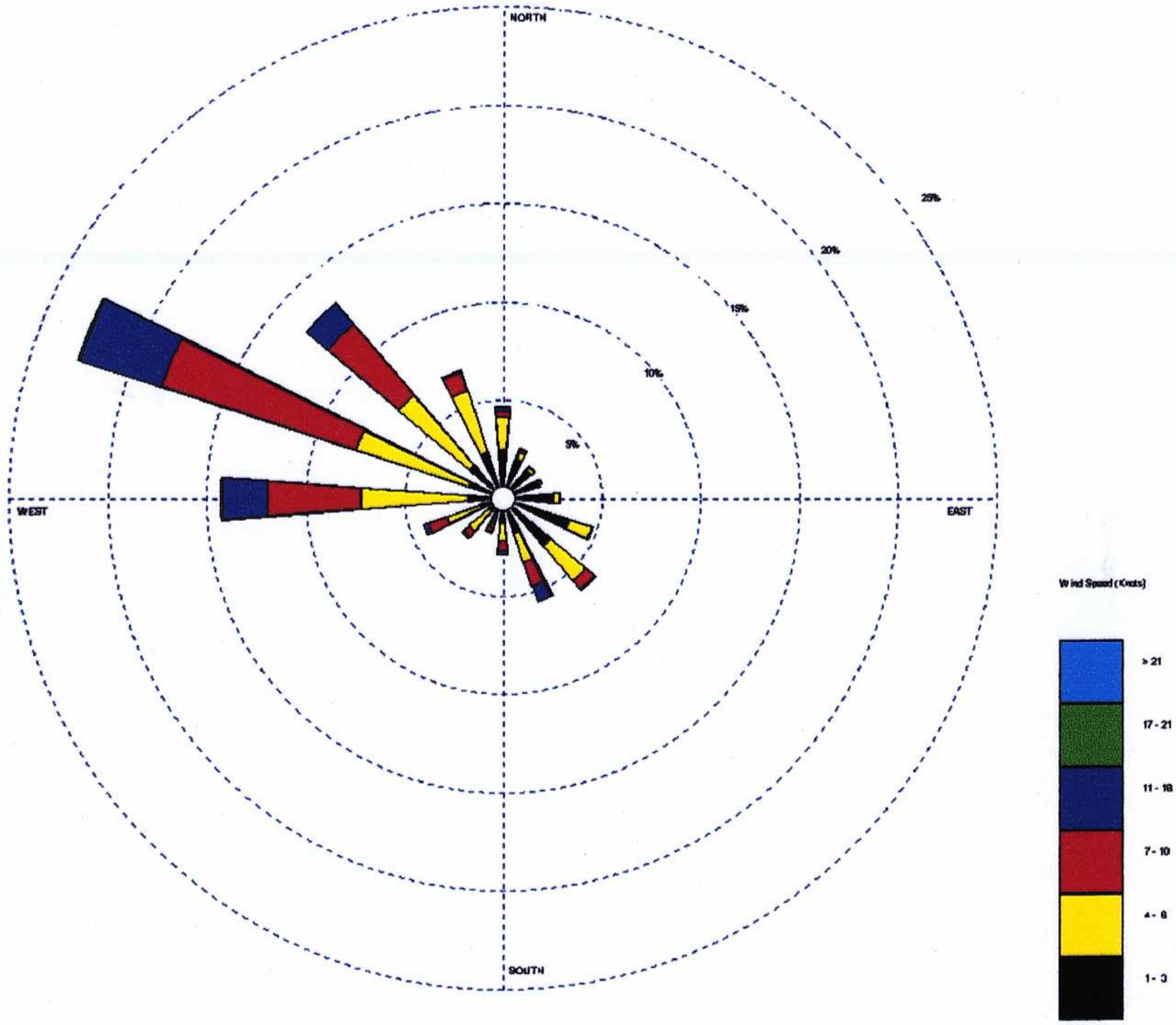

Figure 8.1-6a. Union City wind rose (1990-1994), annual.

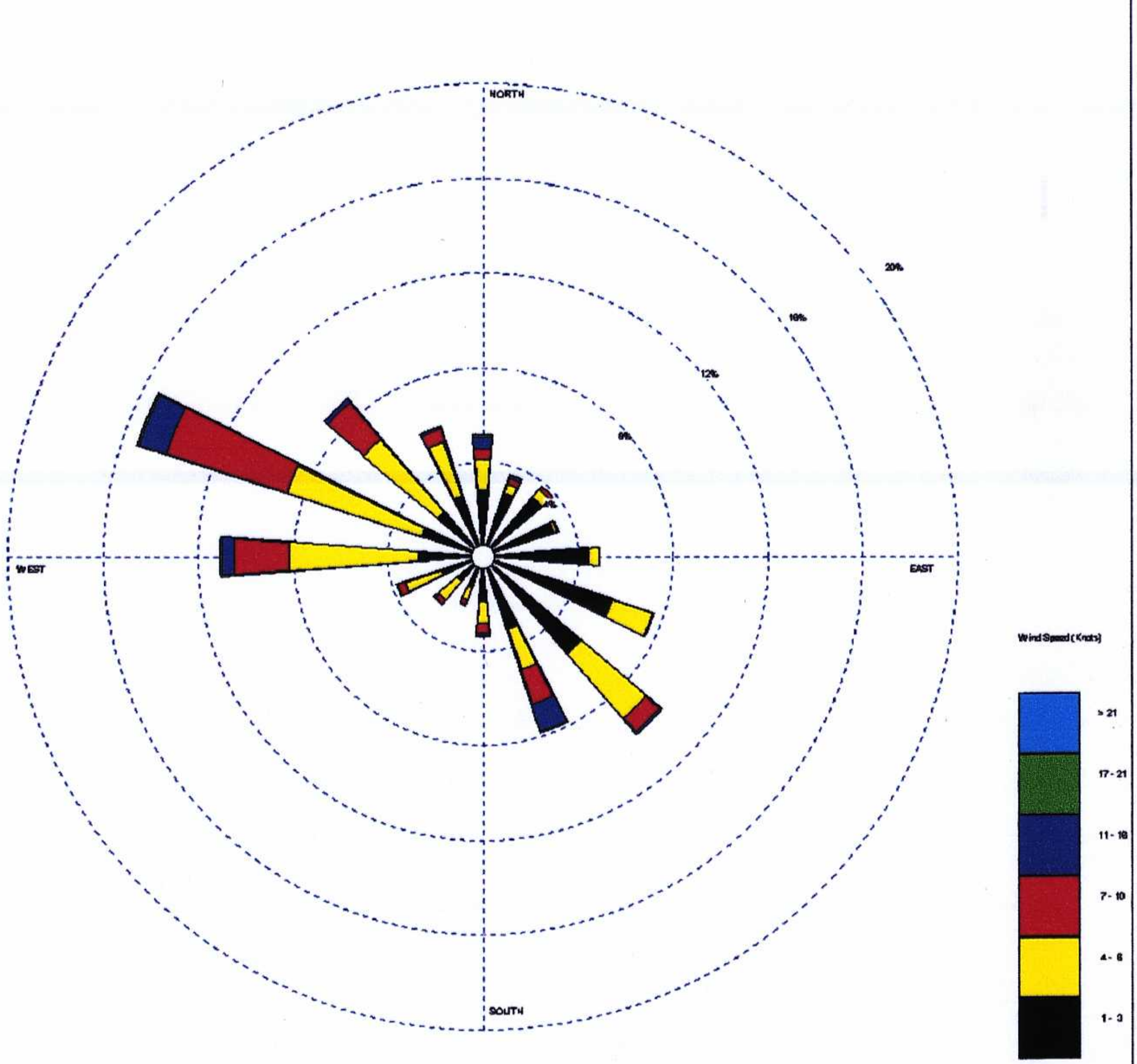

Figure 8.1-6b. Union City wind rose (1990-1994), quarterly fall.

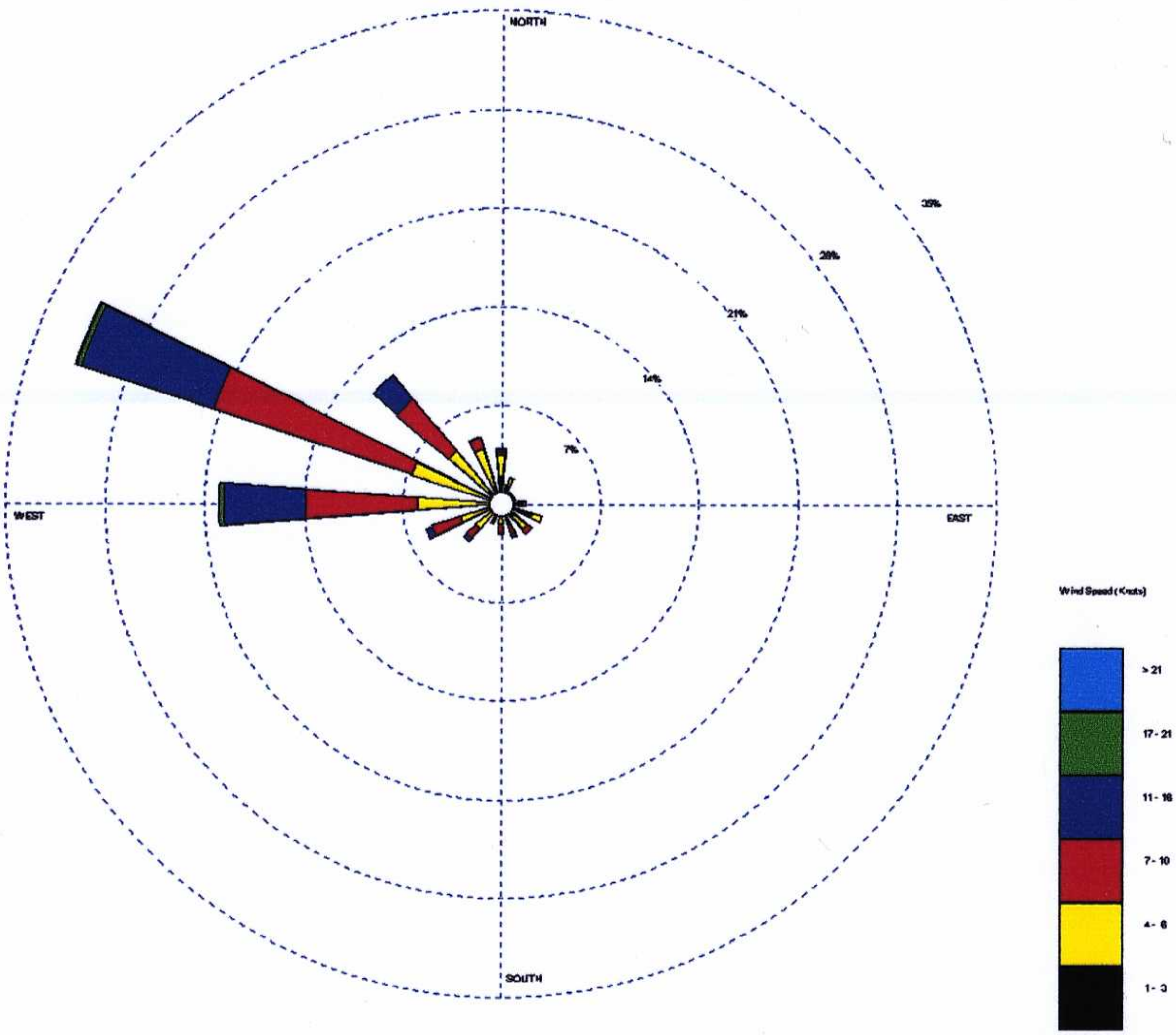

Figure 8.1-6c. Union City wind rose (1990-1994), quarterly spring.

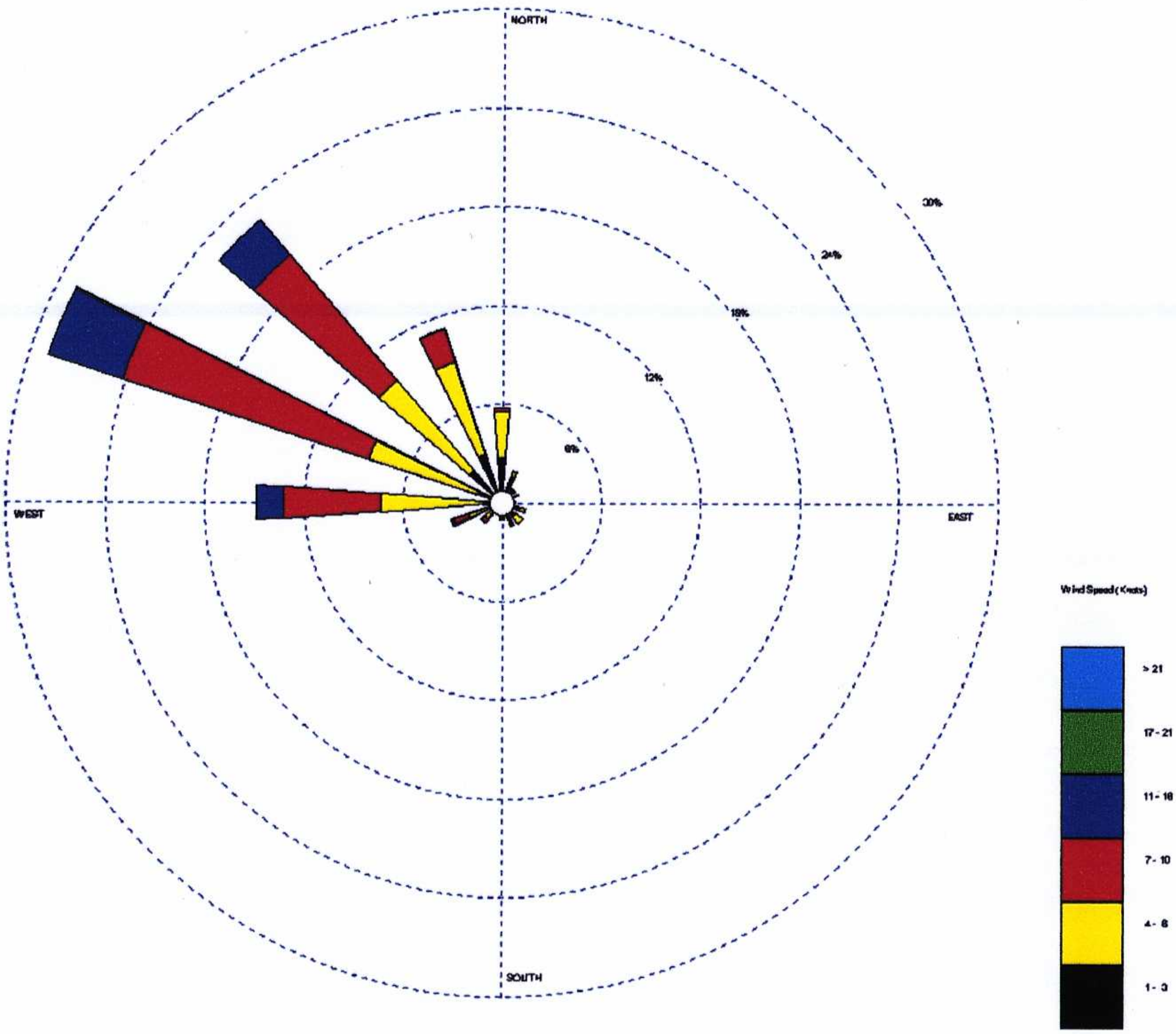

Figure 8.1-6d. Union City wind rose (1990-1994), quarterly summer.

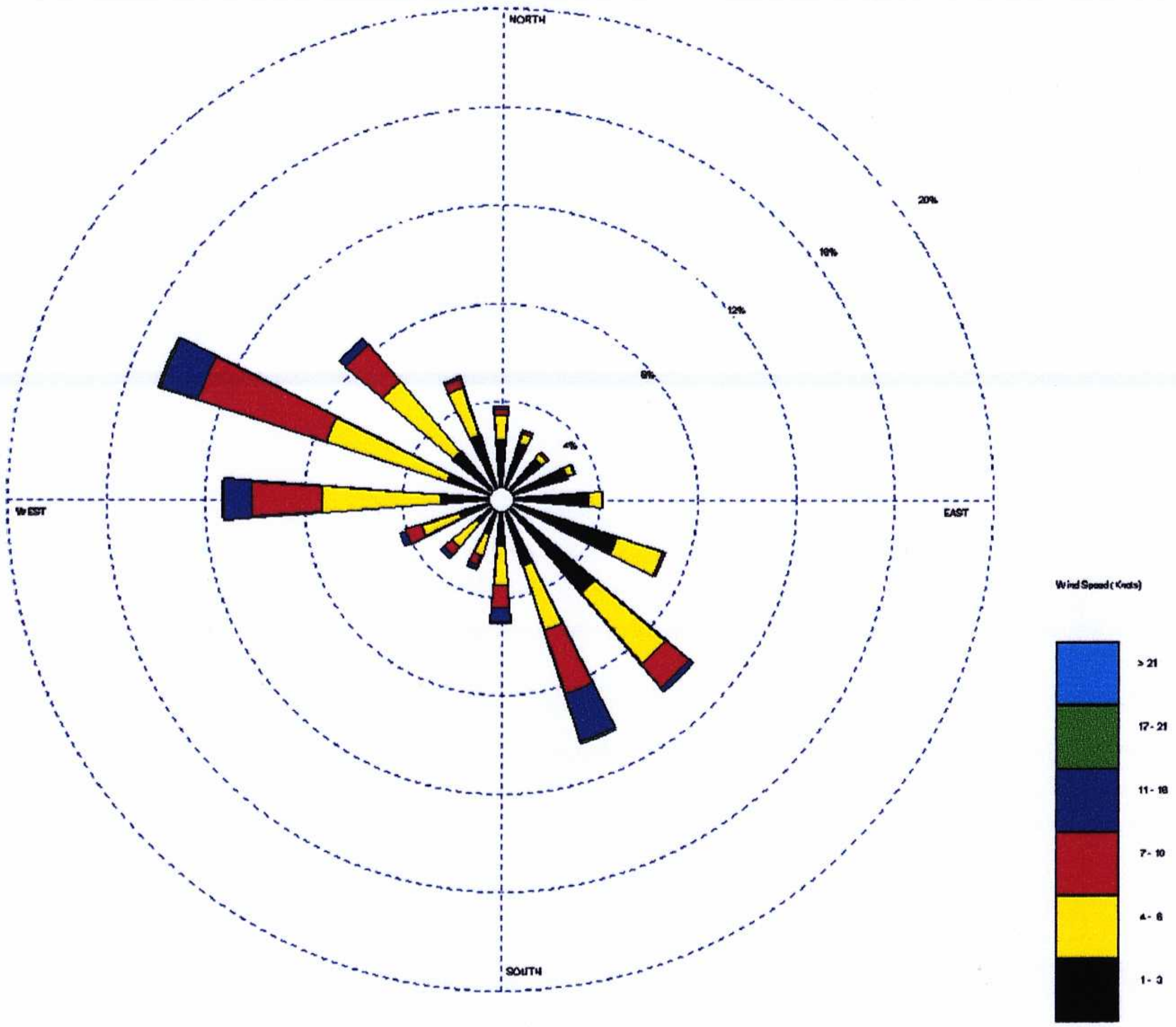

Figure 8.1-6e. Union City wind rose (1990-1994), quarterly winter.

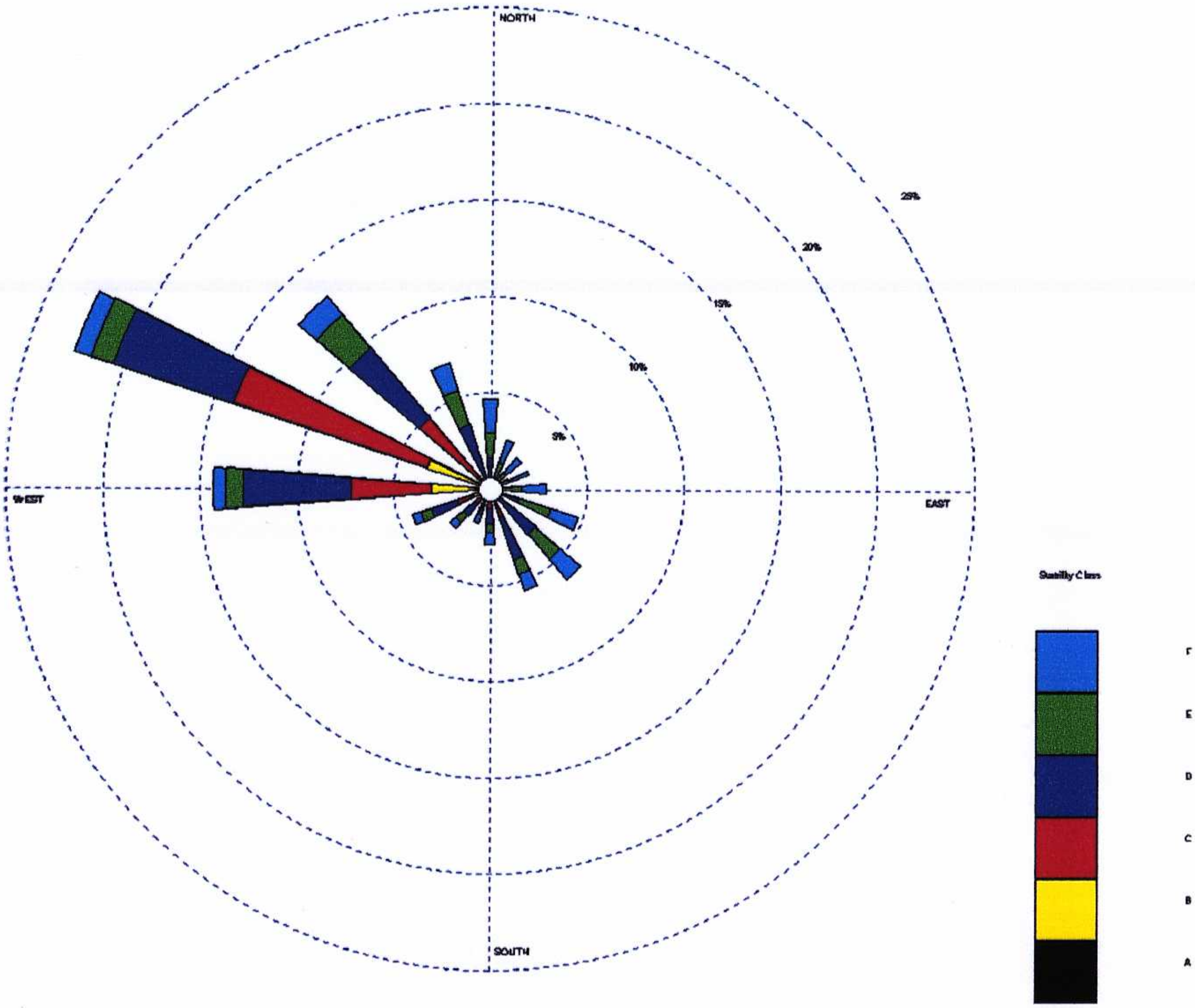

Figure 8.1-6f. Union City stability rose (1990-1994), annual.

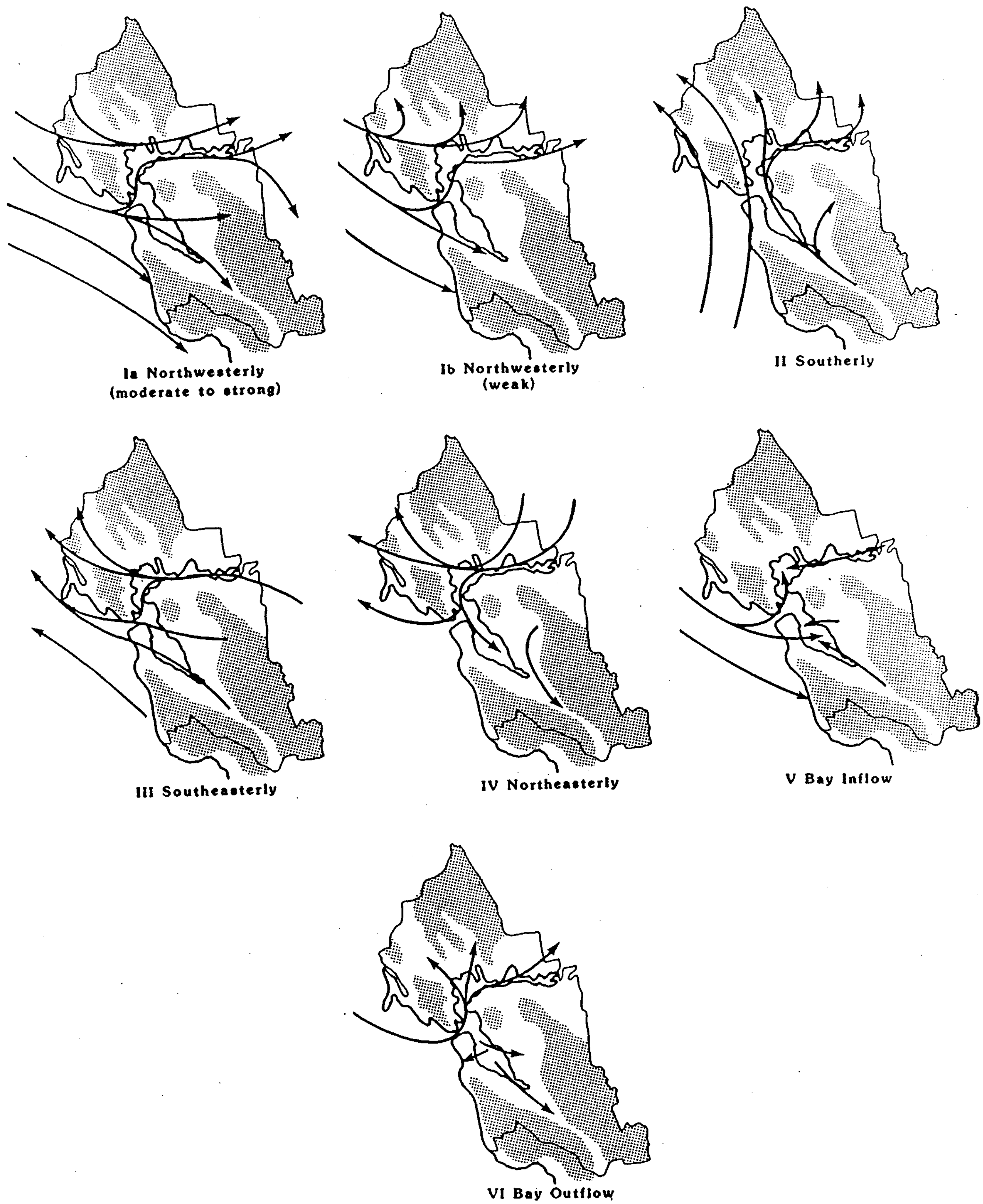

Figure 8.1-7. Bay Area air flow pattern types.

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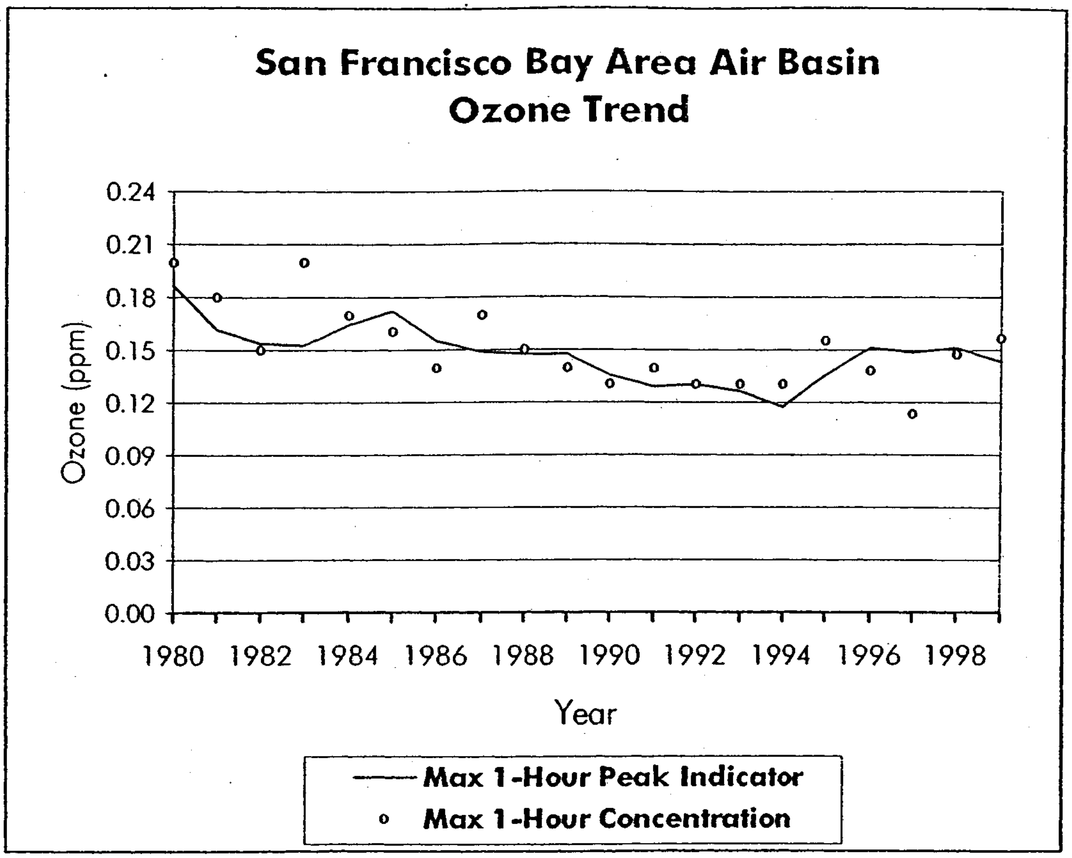


Figure 8.1-8. San Francisco Bay Area air basin ozone trend.

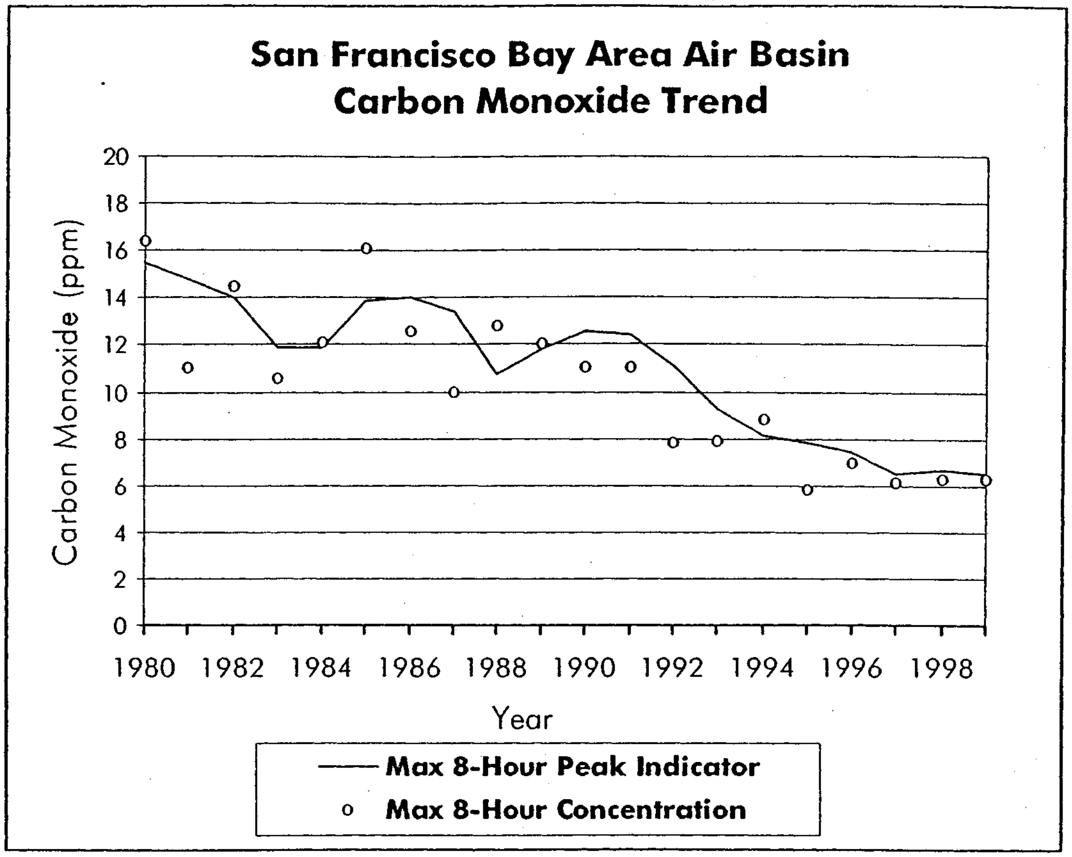


Figure 8.1-9. San Francisco Bay Area air basin carbon monoxide trend.

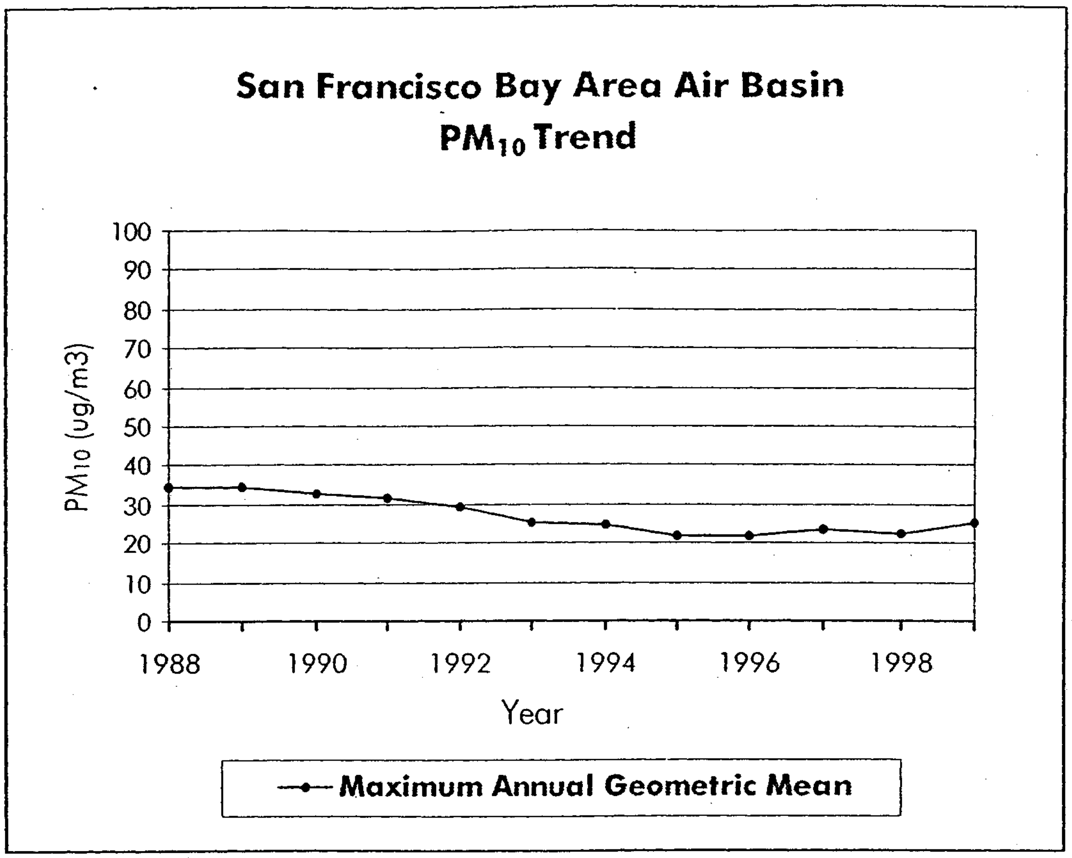
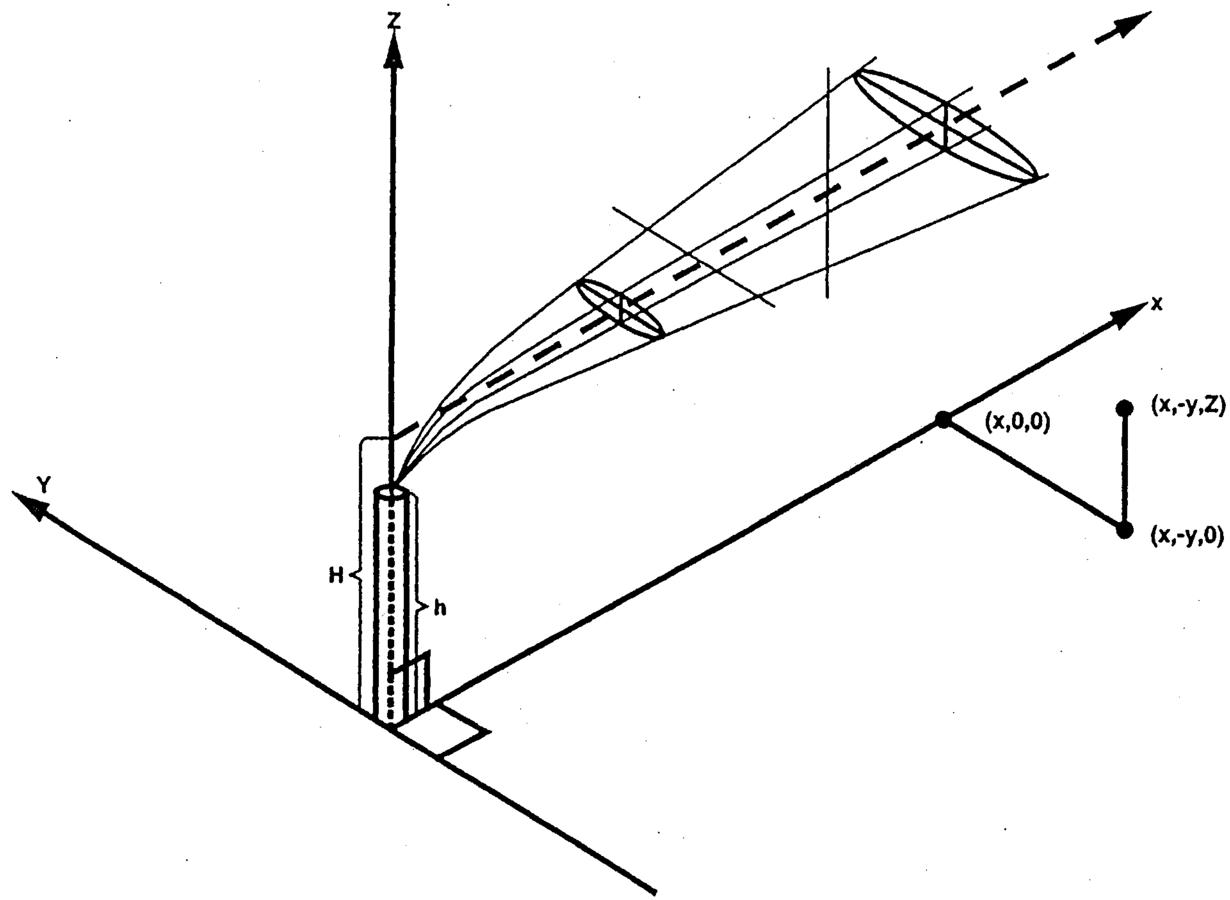


Figure 8.1-10. San Francisco Bay Area air basin PM_{10} trend.



Coordinate system showing Gaussian distributions in the horizontal and vertical.

Figure 8.1-11. Coordinate systems showing Gaussian distributions.

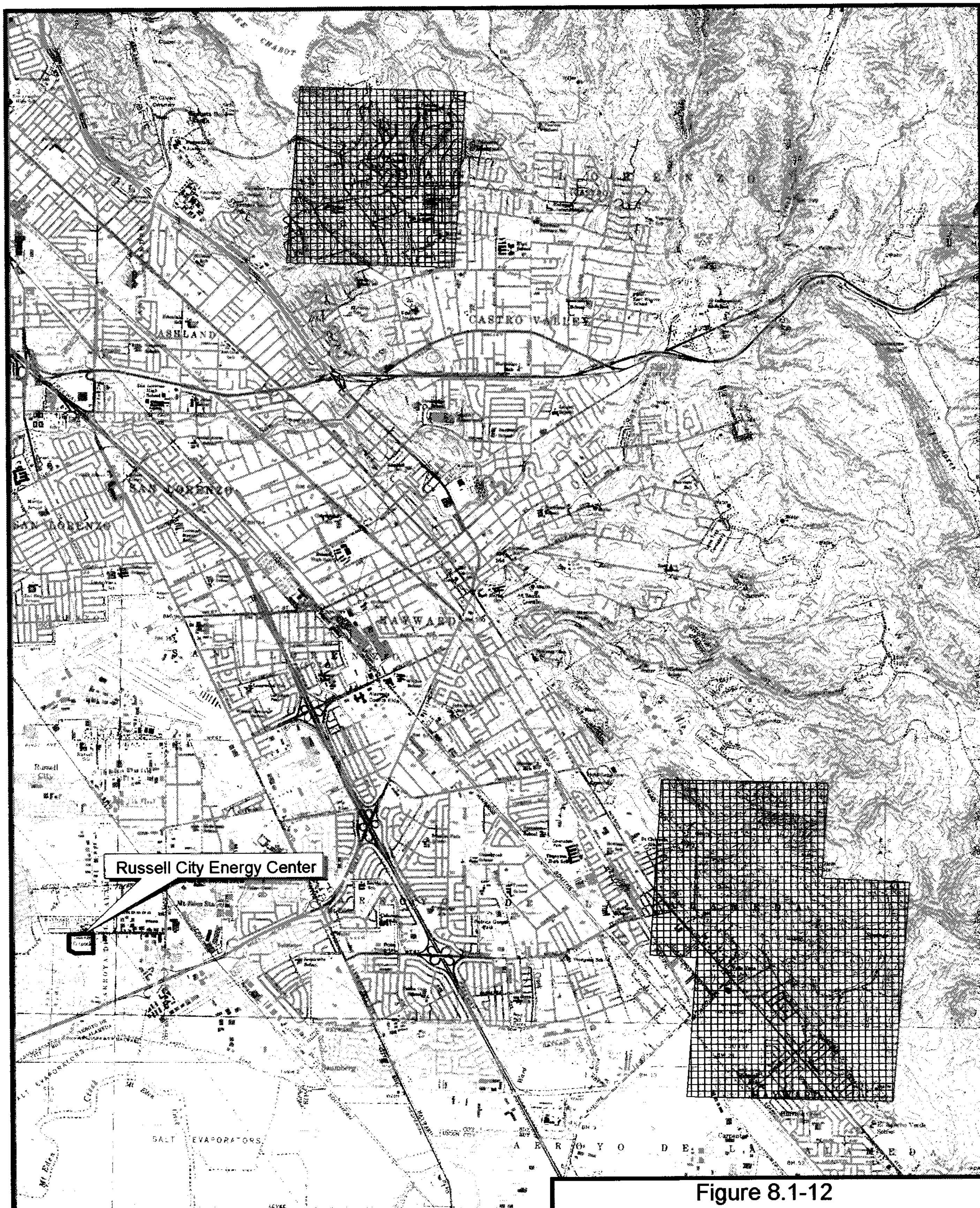


Figure 8.1-12

Fine-Grained Receptor Grids
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

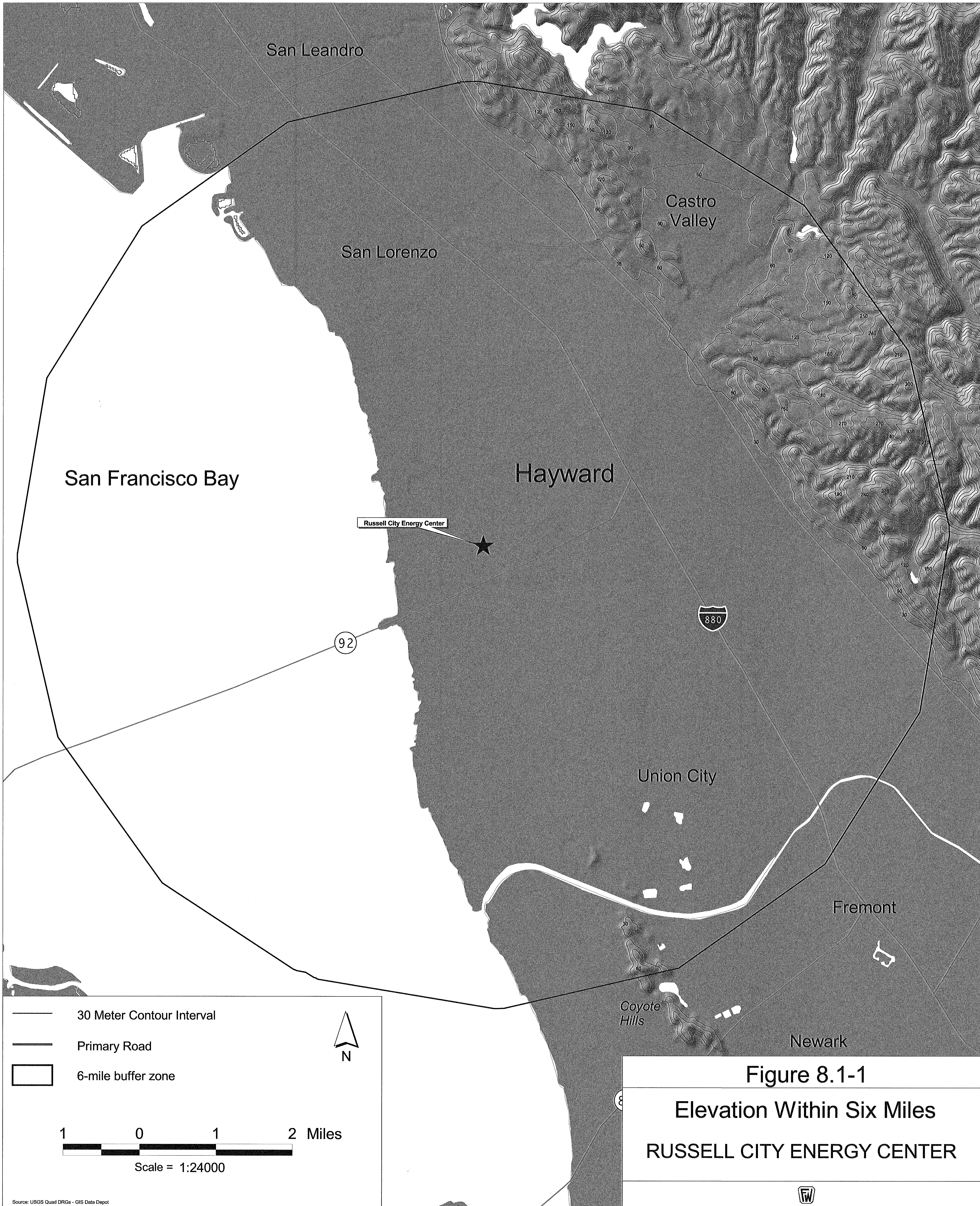


Figure 8.1-1
Elevation Within Six Miles
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Russell City Energy Center AFC

May 2001