DEPARTMENT OF THE INTERIOR

Bureau of Land Management

COUNTY OF RIVERSIDE

COUNTY OF RIVERSIDE
SOUTHERN CALIFORNIA
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Planning Department

APPENDIXES
TO THE
DRAFT
ENVIRONMENTAL IMPACT STATEMENT
ENVIRONMENTAL IMPACT REPORT

FOR THE PROPOSED

EAGLE MOUNTAIN LANDFILL PROJECT
VOLUME II OF II

JULY 1991

Appendixes to the Draft Environmental Impact Statement/ Environmental Impact Report for the Eagle Mountain Landfill Project (Volume II of II)

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Appendixes Volume II

APPENDIX E

Air Quality Impacts of Proposed Eagle Mountain Project

August 22, 1990

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AIR QUALITY IMPACTS OF PROPOSED
EAGLE MOUNTAIN PROJECT

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PART I. ENVIRONMENTAL SETTING

1. GEOGRAPHY/TOPOGRAPHY

A. South Coast Air Basin

The South Coast Air Basin (SCAB) consists of all of Orange County, and the metropolitan areas of Los Angeles, San Bernardino, and Riverside Counties. It is bounded on the northwest by Ventura County and on the south by San Diego County. The northern boundary runs roughly along the Angeles National Forest line north of the crest of the San Gabriel and San Bernardino Mountains. The eastern border runs north-south through the San Bernardino and San Jacinto mountains, although the Banning Pass area is excluded from the Air Basin. The remaining boundary line is the entire shoreline of Los Angeles and Orange Counties.

Within the rim of high mountains that rise to altitudes greater than 11,000 feet, the basin is a coastal plain with connecting broad valleys and low hills. On most days, the net wind flow is from west to east, which produces the effect of having air pollution source areas near the coast impacting receptor areas inland to the east. This source-receptor relationship is compounded by the population distribution in the basin. The highest population, the greatest population density, and the majority of industries, commerce, and streets and freeways are located in the principal source areas in the western portion of the basin.

B. Southeast Desert Air Basin

The Southeast Desert Air Basin (SEDAB) is composed of the eastern part of San Bernardino, Riverside, Kern, Los Angeles and San Diego Counties, and all of Imperial County, covering a total area of 33,636 square miles. It is separated from the coastal regions by mountain ranges, which also provide a climatological boundary. Elevations within the basin range from 235 feet below sea level at the Salton Sea, to 11,485 feet at the summit of Mt. San Gorgonio. The basin is naturally divided into two distinct parts: the High Desert (Mojave) and the Low Desert (Colorado).

High Desert (Mojave)

In the northern part of the Southeast Desert Air Basin lies the Mojave Desert, which gradually merges into the Great Basin without a distinct transition. This region is sheltered from maritime weather influences by mountain barriers extending from north to south. The southern end of the Sierra Nevada and the Tehachapi Mountains form a border on the northwest. To the southwest, the Sawmill, Liebre, and Sierra Pelona Mountains merge with the San Gabriel and San Bernardino Mountains to the south. Entry points into the Mojave where inter-basin transport takes place include Tehachapi Pass, Soledad Canyon, Cajon Pass, Morongo Valley, and Yucca Valley.

Low Desert (Colorado)

The Imperial and Coachella Valleys constitute the major portion of the southern part of the SEDAB. These valleys form a great depression of roughly V-shaped ground plane. This immense structural trough has its apex to the north not far from where the San Jacinto and San Bernardino Mountains meet at San Gorgonio Pass. The trough opens to the southeast, where it is continuous with the larger and much deeper depression occupied by the Gulf of Lower California. Rising more or less abruptly from the southwestern and northwestern sides of the Imperial and Coachella Valleys are bold mountains that restrict inter-basin transport of air pollution and marine air. The Peninsular Ranges border the southwestern margin, while the southeastern portion of the San Bernardino Mountains and various elevated blocks belonging to the Mojave Desert Province, lie along the northeastern side. The Salton Basin lies in the southeasternmost section of the Imperial-Coachella Trough and although now separated, it is continuous with the depression under the Gulf of Lower California. The San Gorgonio Pass has a maximum elevation of about 2,500 feet and represents a passageway between the interior and coastal portions of southern California.

2. METEOROLOGY

A. South Coast Air Basin

The South Coast Air Basin lies within the semi-permanent high pressure zone of the eastern Pacific Ocean. Typical of coastal strips along the western shores of continents at lower latitudes, the region is characterized by warm, dry summers and mild winters of moderate rainfall.

The climate of the area is characterized by warm, dry summers and mild winters. The warmest month is August, with average temperatures in the low 70s. January is the coldest month, with minimum temperatures averaging in the low 40s. Summertime maximum temperatures range from about 75°F at the coast to the 90s in inland locations. Winter lows range from the 30s at inland and mountain locations to the mid-40s near the coast.

Precipitation in the basin is associated with winter storms that migrate inland from the Pacific Ocean. Nearly 90 percent of the annual rainfall in the basin occurs during the period from November to April. Precipitation patterns show a strong orographic influence. The annual average rainfall is 11 to 15 inches in the coastal plain and inland valleys, up to 21 inches in the foothills, and greater than 50 inches in the mountains.

During the dry season, and to a lesser degree during the winter, the daily circulation pattern in the basin is typified by a daytime sea breeze blowing onshore and a nighttime land breeze moving offshore. Generally, the sea breeze is about twice as strong as the land breeze, and summer wind speeds average slightly higher than winter wind speeds. Throughout the year during the night, a drainage flow exists as cool air from the nearby mountain slopes drains down and back toward the ocean.

On occasion during the fall and winter months, a high pressure system develops over Nevada and Utah and pushes air southward over the San Gabriel and San Bernardino mountains. The resulting wind is known as a Santa Ana wind. Santa Ana winds can be very strong, with wind speeds through the mountain passes sometimes exceeding 60 mph (SCAQMD 1980), and are usually warm and dry. They tend to clear the basin of accumulated air pollutants, but can also cause dust storms and high particulate levels.

Air in the South Coast basin is generally moist, due to the presence of a marine air layer. Relative humidity during the summer usually ranges from 70 to 80 percent during the night, and 50 to 60 percent in the daytime. During winter, daytime relative humidity is usually between 50 and 60 percent, while nighttime relative humidity is approximately 50 percent.

The vertical dispersion of air pollutants in the South Coast Air Basin is limited by the presence of a persistent temperature inversion (a temperature increase with altitude) in the lower atmosphere. For that reason, the base of the inversion is called the "mixing height" of the atmosphere. Usually, inversions are lower before sunrise than during the daylight hours. The mixing height normally increases during the day as the base of the inversion erodes because of surface heating.

Along the coast of southern California, relatively cool surface air temperatures, coupled with warm, dry, subsiding air from aloft, produce inversions about 87 percent of the time in the early morning. The average occurrence of ground-based inversions is 11 days per month, and ranges from two days in June to 22 days in December and January. High inversions, with heights less than 2,500 feet above sea level (ASL), occur 22 days each month. Mixing heights of 3,500 feet ASL or less occur about 191 days each year (SCAQMD).

B. <u>Southeast Desert Air Basin</u>

The Southeast Desert Air Basin includes the hottest and driest parts of California, with a climate characterized by hot, dry summers and relatively mild winters. Rainfall is scant in all seasons, so differences between the seasons are marked principally by differences in temperature and not by substantial rainfall during any season. Average annual precipitation in the basin is in the range of 2 to 6 inches per year, except at high-altitude locations.

Seasonal temperature differences in the basin are large, confirming the absence of marine influences and the location of the basin. Average monthly high temperatures in the Southeast Desert Air Basin range from 108°F in July to 57°F in January. Average monthly low temperatures range from about 40°F in January to about 80°F in July. Diurnal temperature ranges are also typical of continental locations, with values of 20° to 30° in January, and 30° to 40° in July.

During much of the winter, the Southeast Desert Air Basin is covered by a moderately intense anticyclonic circulation, except during periods of frontal activity. The Pacific High retreats to the south, so that frontal systems from the North Pacific can move onto the California coast. On average, 20 to 30 frontal systems move into the northern part of the basin each winter. The first front usually arrives around the middle of October, and the average period of frontal activity is five to six months. Most of these systems are relatively weak by the time they reach the basin, however, and they become more diffuse as they move southward.

Most of the precipitation received in the Southeast Desert Air Basin is associated with this winter frontal activity, the amount varying from site to site due to the influence of altitude and mountain ranges.

The basin is protected by distance and intervening mountain ranges from the cold air masses that move southward from Canada over the Great Plains. This protection, together with the relatively low latitude, results in very infrequent occurrence of sub-zero temperatures.

Spring is a transition season between the winter period of frontal activity and the generally dry summer; some precipitation continues during the early part of the season.

During the summer, the Pacific High is well developed to the west of California, and a thermal trough overlies the SEDAB. The intensity and orientation of the trough varies from day to day. Although the rugged mountainous country prevents a normal circulation, the influence of the trough does permit some inter-basin exchange with coastal locations through the passes.

The relative humidity in summer is very low, averaging 30 to 50% in the early morning and 10 to 20% during the late afternoon. During the hottest part of the day, humidities below 10% are common. These conditions promote intense heating during the day in summer and marked cooling at night, and the intense solar radiation is highly conducive to the formation of photochemical smog.

Fall is the transition period from the hot summer back to the season of frontal activity, but it is still very dry and temperatures are still mild.

Desert regions tend to be windy, since little friction is generated between the moving air and the low, sparse vegetation cover. In addition, the rapid daytime heating of the lower air over the desert leads to convective activity. This exchange of lower and upper air tends to accelerate surface winds during the warm part of the day when convection is at a maximum. During winter, however, the rapid cooling in the surface layers at night retards this exchange of momentum, and the result is often a high frequency of calm winds. An extreme example of this is found at Edwards AFB, where calm prevails 28.8% of the time during the winter.[1*]

During all seasons, the prevailing wind direction is predominantly from the south and west. At specific sites, the prevailing winds can be modified somewhat by the effect of orographic flows, i.e., upslope in daytime and downslope at night. Only during the winter at Victorville and summer at El Centro does the wind have a significant easterly component. This southeasterly flow into the Imperial Valley presents a possible entry point of pollutants from more populated areas of nearby Mexico.

The mixing depth, i.e., the height available for dispersion of airborne pollutants emitted near the surface, is limited by the occurrence of temperature inversions. A temperature inversion is a layer of air in which the temperature increases with height. Thus, knowledge of the frequency and height of temperature inversions in the basin provides insight into the dispersion potential of the atmosphere.

The temperature inversion conditions of the SEDAB are quite different from those of the coastal regions of California. When a subsidence inversion exists over the basin, the height of the inversion base lies some 6,000 to 8,000 feet above the surface. There is a low frequency of elevated inversions in all seasons. Nighttime surface inversions in the desert are common, however, occurring with high frequency in all seasons (ARB 1975). Mixing heights are predominantly 1000 feet or less. These inversions are caused by nighttime radiational cooling of the land surface in contact with overlying air that cools more slowly. They tend to be destroyed early in the day in summer, due to intense solar radiation and heating of the land surface, and the great mixing heights result in rapid dilution of pollutants.

In winter, however, they tend to persist throughout much of the day, limiting mixing in the lower atmosphere to heights of 200 to 2,000 feet above the surface.

3. EXISTING AIR QUALITY - OVERVIEW

The federal Clean Air Act provides that national ambient air quality standards (NAAQS) can be exceeded no more than once each year. The U.S. Environmental Protection Agency has set standards for sulfur

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* Superscripts denote references listed at the end of the report.

dioxide, nitrogen dioxide, carbon monoxide, 10-micron particulate matter (PM10), lead, and ozone. An area where a National Ambient Air Quality Standard is exceeded twice or more during a year can be considered a "non-attainment area" subject to more stringent planning and pollution control requirements. Once an area has been declared to be in non-attainment for a pollutant, it must show twelve consecutive calendar quarters with no violation of the National Ambient Air Quality Standard for that pollutant in order to be re-designated as an "attainment" area.

State of California ambient air quality standards are set by the state Air Resources Board (ARB) to protect public health and welfare. Standards have been set for sulfur dioxide, nitrogen dioxide, carbon monoxide, 10-micron particulate matter, lead, sulfates, hydrogen sulfide, vinyl chloride, and ozone, at levels designed to protect the most sensitive portions of the population, particularly children, the elderly, and people who suffer from lung or heart diseases. ARB performs program oversight activities, while primary air quality planning and enforcement activities are carried out by local air pollution control districts.

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. The concentrations are based on the results of studies of the effects of the pollutants on human health, crops and vegetation, and occasionally 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 period of time (one hour, for instance), or to a relatively lower average concentration over a much longer period (one month or one year). For some pollutants there are more than one air quality standard, which reflect both its short-term and long-term effects.

Table 1 presents the state and national ambient air quality standards for selected pollutants.

Table 1

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards Concentration	National Standards Concentration
Ozone	1 hour	0.09 ppm	0.12 ppm
Carbon Monoxide	8 hour	9.0 ppm	9 ppm
	1 hour	20 ppm	35 ppm
Nitrogen Dioxide	Annual Average	-	100 $\mu g/m^3$ (0.053 ppm)
	1 hour	0.25 ppm	-
Sulfur Dioxide	Annual Average	-	80 $\mu g/m^3$ (0.03 ppm)
	24 hour	0.05 ppm (131 $\mu g/m^3$)	365 $\mu g/m^3$ (0.14 ppm)
	3 hour	-	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 hour	50 $\mu g/m^3$	150 $\mu g/m^3$
	Annual Arithmetic Mean	-	50 $\mu g/m^3$
Sulfates	24 hour	25 $\mu g/m^3$	-

* Secondary Standard

4. CRITERIA POLLUTANTS - AIR QUALITY TRENDS

A. Ozone

South Coast Air Basin

Ozone (O_3) is an end product of complex reactions between reactive organic gases - ROG (or non-methane hydrocarbons - NMHC) and NOx in the presence of intense ultraviolet radiation. ROG and NOx emissions from millions of vehicles and stationary sources, in combination with daytime wind flow patterns, mountain barriers, a persistent temperature inversion, and intense sunlight, result in high ozone concentrations. Maximum ozone concentrations in the SCAB usually are recorded during the summer months.

Table 2 shows the California and federal air quality standards for ozone, and maximum levels recorded in the SCAB in the period 1984-1988. The data show that state ozone air quality standard is exceeded over half the days in the year.

Figures 1 and 2 show, respectively, the long-term trend of the maximum 1-hour ozone concentrations and of violations of ozone air quality standards in the SCAB. Peak ozone levels have slowly but steadily declined in the South Coast Air Basin over the last ten years, despite significant population growth in the region. However, the frequency of violations has remained relatively constant over the last several years after a substantial drop in the late 1970's and early 1980's. The Basin is a nonattainment area for ozone for purposes of state and federal air quality planning.

Southeast Desert Air Basin

Ozone (O_3) is a problematic air contaminant in the Southeast Desert Air Basin. The bulk of the ozone (and ozone precursors) in the basin comes from the heavily populated South Coast basin to the west. ROG and NOx emissions from millions of vehicles and stationary sources, in combination with daytime wind flow patterns, mountain barriers, a persistent temperature inversion, and intense sunlight, result in high ozone concentrations. Maximum ozone concentrations in both the South Coast basin and the SEDAB usually are recorded during the summer months. In the SEDAB, maximum ozone concentrations historically have been measured at the Banning (in San Gorgonio Pass) and Hesperia (near Cajon Pass) monitoring stations. Both of these stations are close to the SEDAB boundary with the South Coast basin, where readings would be expected to be higher than in other areas in the SEDAB.

Table 2

Ozone Levels in South Coast Air Basin

1984-1988
(parts per million - ppm)

Air Quality Standards:

California: 0.09 ppm (1-hour average)

Federal: 0.12 ppm (1-hour average)

	1984	1985	1986	1987	1988
Highest 1-hour average	.34	.39	.35	.33	.35
No. of days exceeding					
State standard	209	218	217	196	216
Federal standard	175	174	164	162	178

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

Figure 1

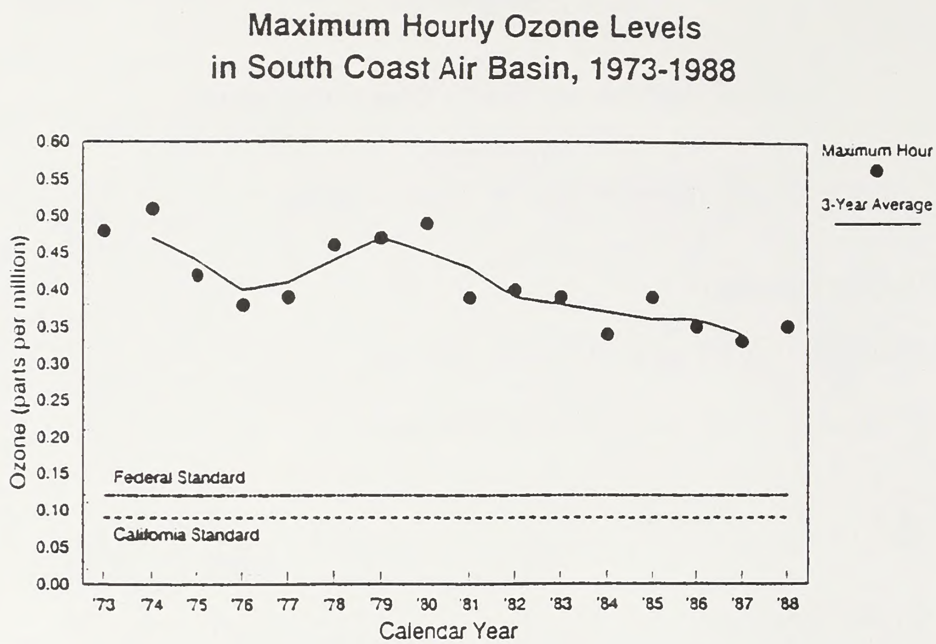


Figure 2

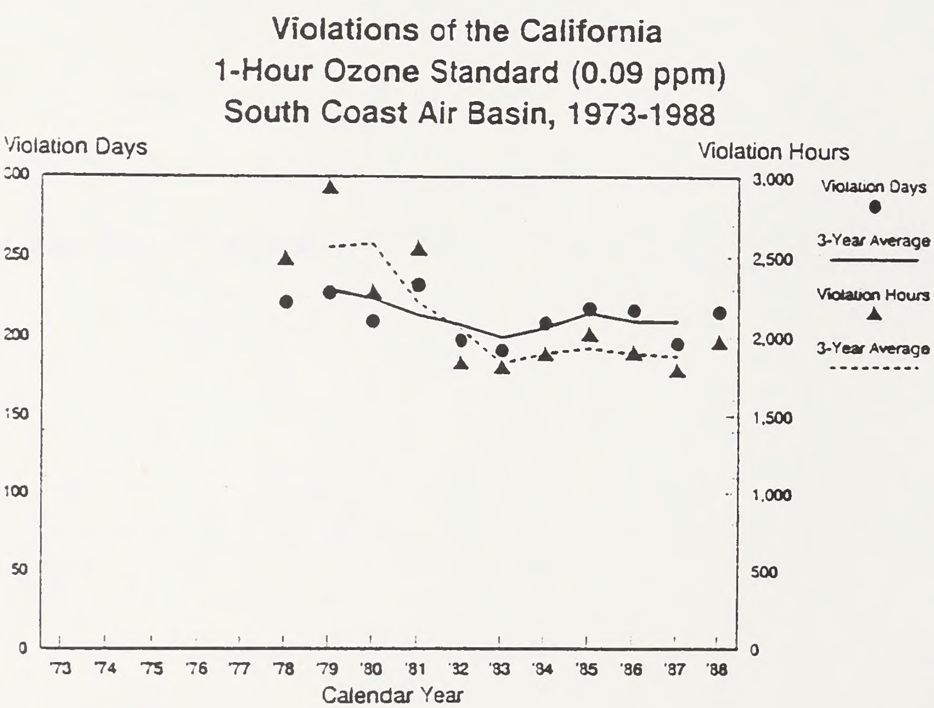


Table 3 shows the California and federal air quality standards for ozone, and maximum levels recorded in the SEDAB in the period 1984-1988. The data show that state and federal ozone air quality standards are exceeded in roughly one third to one half the days in the year.

Figures 3 and 4 show, respectively, the long-term trend of the maximum 1-hour ozone concentrations and of violations of ozone air quality standards in the SEDAB. While the maximum hourly concentrations have stayed relatively constant since 1973, in the range of 0.25 ppm, the number of days and hours each year when the standard is violated is on an upward trend since 1983. The basin is a non-attainment area for ozone under the state standards. Under the federal standards, all areas in the basin, with the exception of the Victorville area in San Bernardino County, are unclassified or attainment for ozone.

B. <u>Nitrogen Dioxide</u>

South Coast Air Basin

Nitrogen dioxide (NO_2) is formed primarily in the atmosphere from a reaction between nitric oxide (NO) and oxygen or ozone. Nitric oxide is formed during high temperature combustion processes when the nitrogen and oxygen in the combustion air combine. Although NO is much less harmful than NO_2, it can be converted to NO_2 in the atmosphere within a matter of hours, or even minutes under certain conditions.

Table 4 shows the state and federal air quality standards for NO_2, plus the maximum levels recorded in the SCAB in the period 1984-1988.

Figure 5 shows the trend of maximum 1-hour NO_2 levels in the Basin, while violation days are plotted in Figure 6. The data show that a long, steady decline in NO_2 levels appears to have ended in the late 1980's. The Basin is a nonattainment area for NO_2 for purposes of state and federal air quality planning.

Table 3

Ozone Levels in Southeast Desert Air Basin
(Worst Case)

1984-1988
(parts per million - ppm)

Air Quality Standards:

California: 0.09 ppm (1-hour average)

Federal: 0.12 ppm (1-hour average)

	1984	1985	1986	1987	1988
Highest 1-hour average	.25	.29	.26	.22	.27
No. of days exceeding					
State standard	159	159	161	166	188
Federal standard	92	111	115	101	124

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

Figure 3

Maximum Hourly Ozone Levels in Southeast Desert Air Basin, 1973-1988

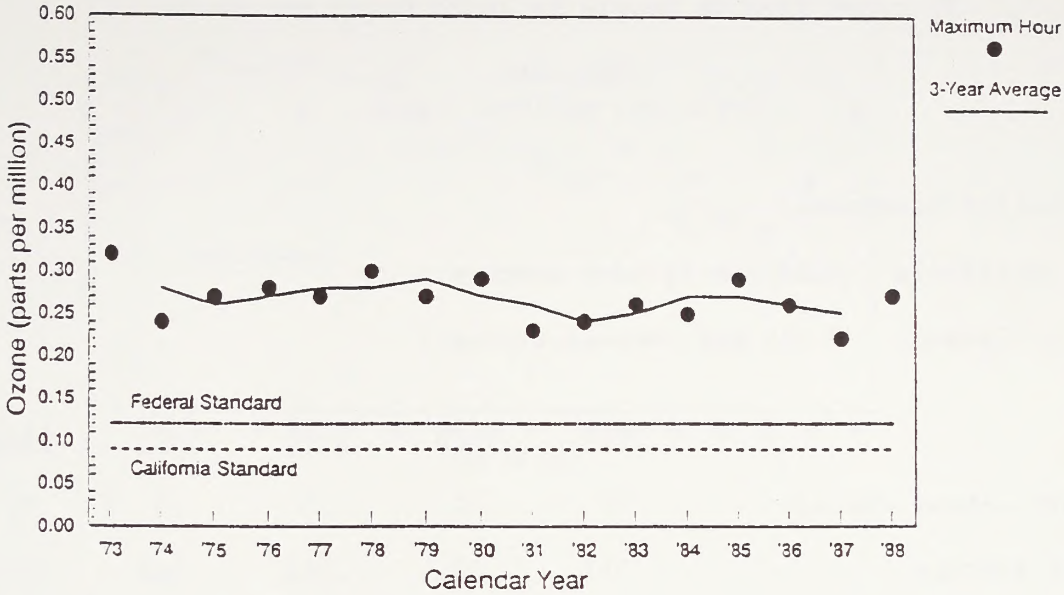


Figure 4

Violations of the California 1-Hour Ozone Standard (0.09 ppm) Southeast Desert Air Basin, 1973-1988

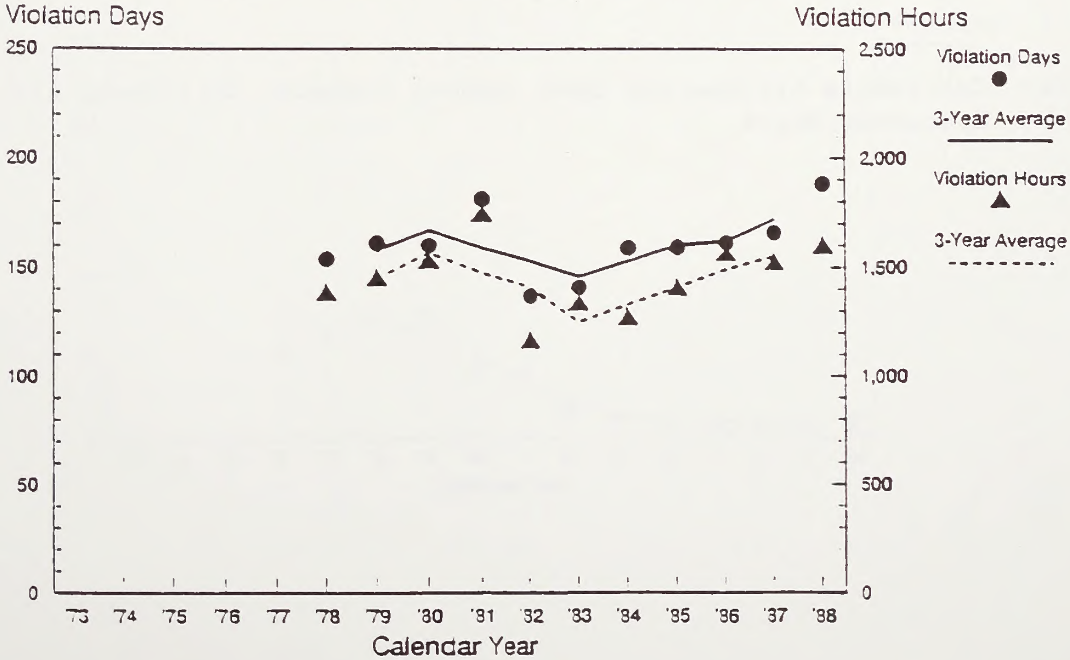


Table 4

Nitrogen Dioxide Levels in South Coast Air Basin

1984-1988
(parts per million - ppm)

Air Quality Standards:

California: 0.25 ppm (1-hour average)

Federal: 0.053 ppm (annual average)

	1984	1985	1986	1987	1988
Highest 1-hour average	.35	.35	.33	.42	.54
Annual average	.057	.061	.061	.055	.061
No. of days exceeding					
State standard	12	9	9	7	11

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

Figure 5

Maximum Hourly NO2 Levels in South Coast Air Basin, 1973-1988

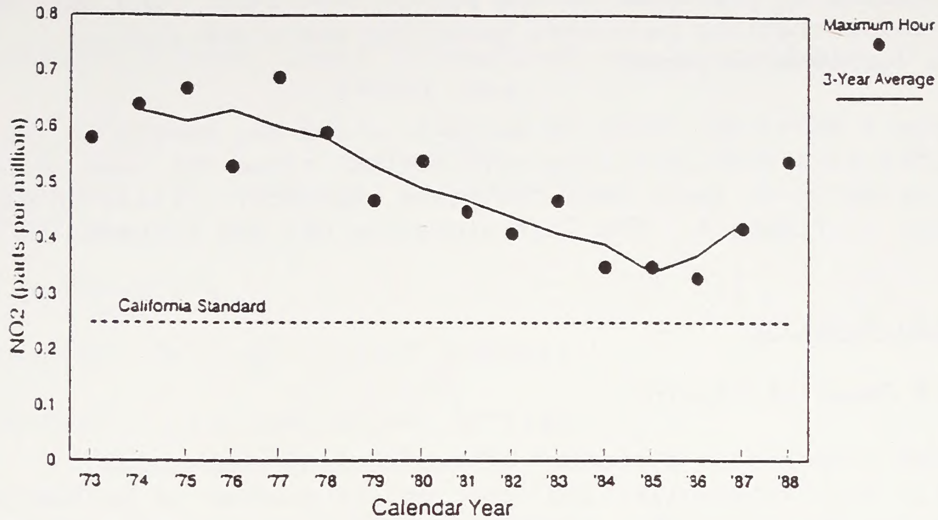
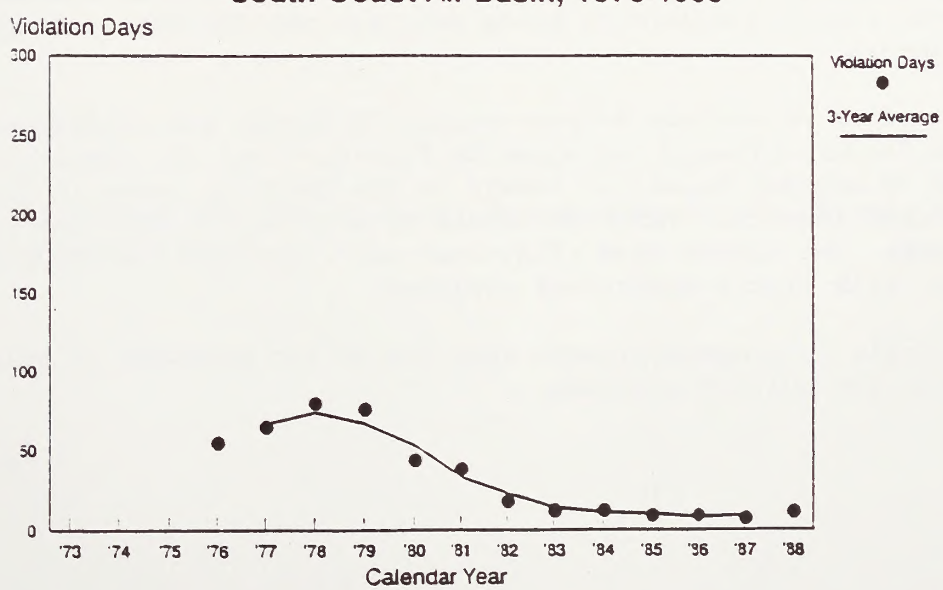


Figure 6

Violations of the California 1-Hour NO2 Standard (0.25 ppm) South Coast Air Basin, 1973-1988



Southeast Desert Air Basin

Table 5 shows the air quality standards for NO_2, plus the maximum levels recorded in the SEDAB in the period 1984-1988. The data show that NO_2 concentrations have been below the state and federal standards for several years.

Figure 7 shows the trend of maximum 1-hour NO_2 levels in the basin. They have been in a long-term decline since the late 1970's, and are currently at about half the state standard. Violation days are plotted in Figure 8. The last violation day was recorded in 1981.

C. Carbon Monoxide

South Coast Air Basin

Carbon monoxide is a product of inefficient combustion, principally from automobiles and other mobile sources of pollution. In many areas in California, CO emissions from wood-burning stoves and fireplaces can also be measurable contributors. Industrial sources of pollution 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 stagnant weather conditions.

Table 6 shows the California and federal air quality standards for CO, and the maximum 1-hour and 8-hour average levels recorded in the SCAB during the period 1984-1988. Maximum 8-hour CO levels in the basin are roughly two to three times the state and federal standards. The federal 1-hour standard is being met, but not the more stringent state standard.

The trends of maximum 8-hour average CO levels and violations of the state 8-hour standard are shown in Figures 9 and 10, respectively. The trend of maximum hourly CO levels in the Basin is shown in Figure 11. The data show that while CO levels have decreased over the last twenty years, the trends have "flattened out" over the last five to ten years, with little additional progress.

The Basin is a nonattainment area for CO for purposes of state and federal air quality planning.

Table 5

Nitrogen Dioxide Levels in Southeast Desert Air Basin
(Worst Case)

1984-1988
(parts per million - ppm)

Air Quality Standards:

California: 0.25 ppm (1-hour average)

Federal: 0.053 ppm (annual average)

	1984	1985	1986	1987	1988
Highest 1-hour average	.16	.14	.15	.13	.11
Annual average	.017	.018	.015	.017	.016
No. of days exceeding					
State standard	0	0	0	0	0

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

Figure 7

Maximum Hourly NO2 Levels in Southeast Desert Air Basin, 1973-1988

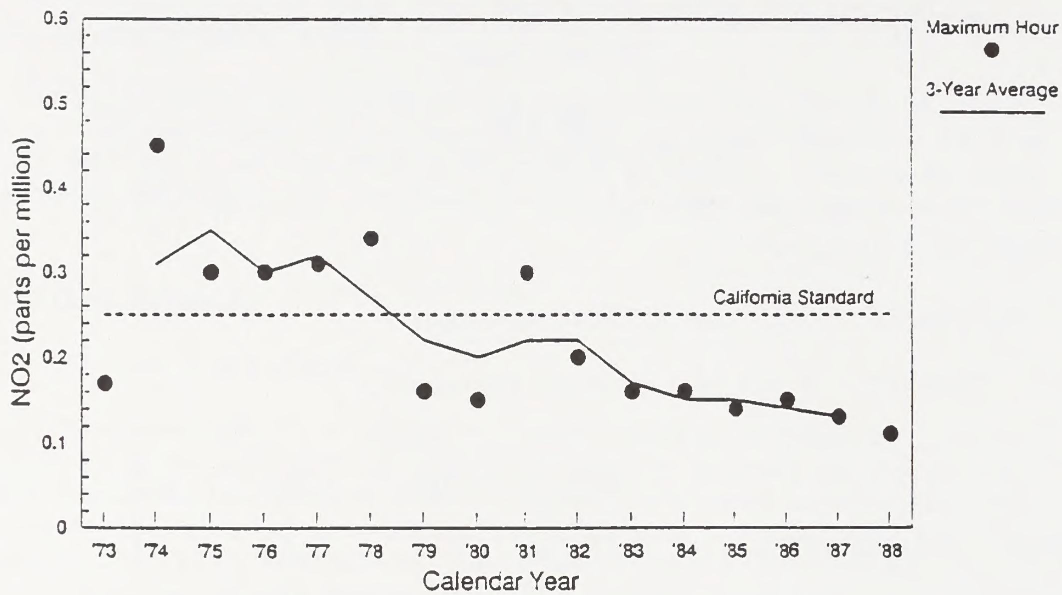


Figure 8

Violations of the California 1-Hour NO2 Standard (0.25 ppm) Southeast Desert Air Basin, 1973-1988

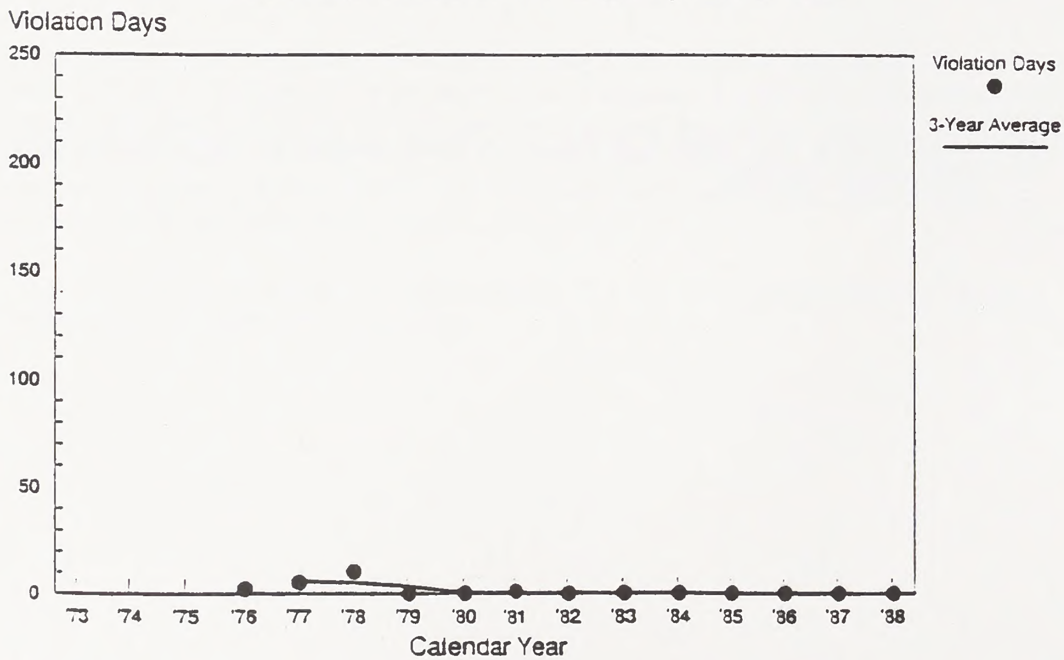


Table 6

Carbon Monoxide Levels in South Coast Air Basin
(Worst Case)

1984-1988
(parts per million - ppm)

Air Quality Standards:

California: 9.0 ppm (8-hour average)

Federal: 9 ppm (8-hour average)

California: 20 ppm (1-hour average)

Federal: 35 ppm (1-hour average)

	1984	1985	1986	1987	1988
Highest 8-hour average	19.7	27.7	19.7	19.6	27.5
Highest 1-hour average	29	33	27	26	32
No. of days exceeding					
State standard (1-hr)	17	18	11	12	21
State standard (8-hr)	77	59	58	48	65
Federal standard (1-hr)	0	0	0	0	0
Federal standard (8-hr)	75	51	49	43	60

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

Figure 9

Maximum 8-Hour Average CO Levels in South Coast Air Basin, 1973-1988

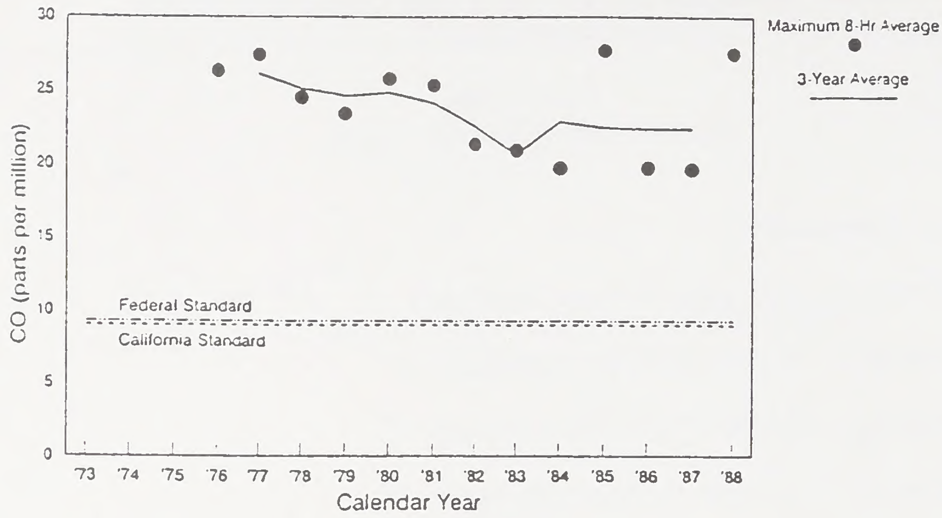


Figure 10

Violations of the California 8-Hour CO Standard (9.0 ppm) South Coast Air Basin, 1973-1988

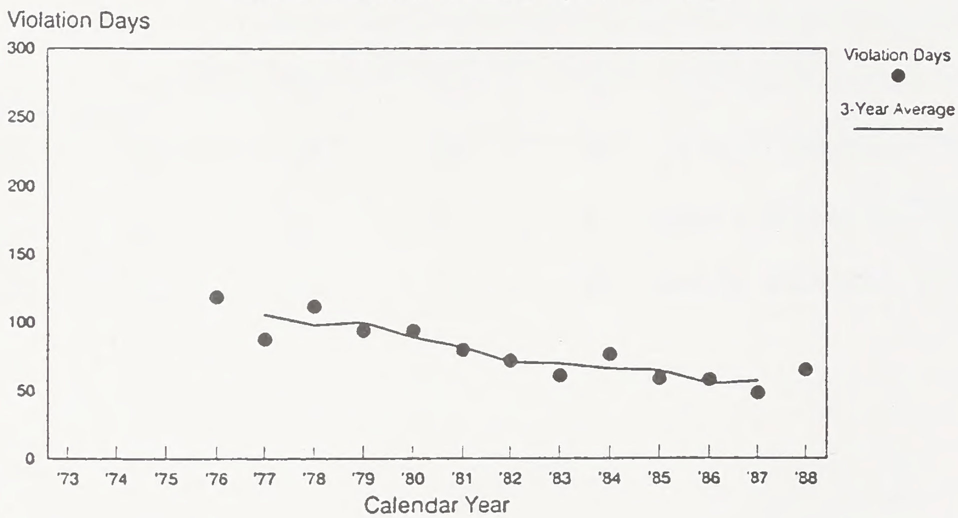
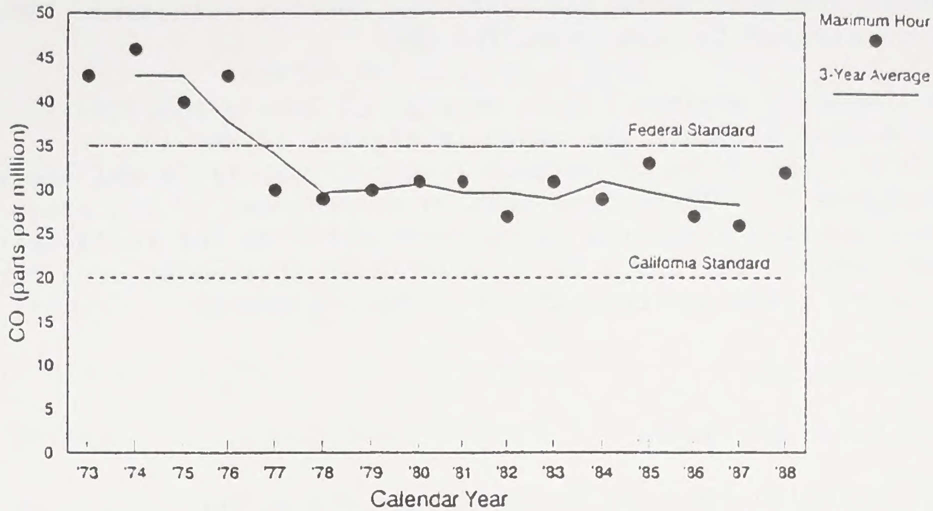


Figure 11

Maximum Hourly CO Levels in South Coast Air Basin, 1973-1988



Southeast Desert Air Basin

Table 7 shows the California and federal air quality standards for CO, and the maximum 1-hour and 8-hour average levels recorded in the SEDAB during the period 1984-1988. The data show that CO levels in the basin are well below the state and federal standards. The basin is considered in attainment for CO.

The trends of maximum 8-hour average CO levels and violations of the state 8-hour standard are shown in Figures 12 and 13, respectively. The trend of maximum 1-hour CO levels in the basin is shown in Figure 14. There have been no exceedances of any state or federal air quality standards for CO since 1979 in the Southeast Desert Air Basin. The Basin is considered an attainment area for CO for purpose of state and federal air quality planning

D. <u>Sulfur Dioxide</u>

South Coast Air Basin

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.

Because of the complexity of the chemical reactions that convert SO_2 to other compounds (such as sulfates), peak concentrations of SO_2 occur at different times of the year in different parts of the state, depending on local fuel characteristics, weather, and topography.

Table 8 shows the California and federal air quality standards for SO_2, and the maximum levels recorded in the basin during the period 1984-1988. The 1984 maximum 24-hour average was slightly above the California standard; no exceedances of state or federal SO_2 standards have been observed since that time.

Figures 15 and 16 show that SO_2 levels in the SCAB generally have been within state air quality standards since 1981. The Basin is considered to be an attainment area for SO_2 purposes of state and federal air quality planning.

Southeast Desert Air Basin

Table 9 shows the California and federal air quality standards for SO_2, and the maximum levels recorded in the basin during the period 1984-1988. The data show that SO_2 levels in the SEDAB have been well within air quality standards since 1978. The most recent violation of the more-stringent state standard was in 1977 (See Figures 17 and 18). The basin is considered to be in attainment of the state and federal SO_2 standards.

Table 7

Carbon Monoxide Levels in Southeast Desert Air Basin
(Worst Case)

1984-1988
(parts per million - ppm)

Air Quality Standards:

California: 9.0 ppm (8-hour average)

Federal: 9 ppm (8-hour average)

California: 20 ppm (1-hour average)

Federal: 35 ppm (1-hour average)

	1984	1985	1986	1987	1988
Highest 8-hour average	4.9	5.7	4.6	4.4	5.9
Highest 1-hour average	10	12	9	12	13
No. of days exceeding					
State standard (1-hr)	0	0	0	0	0
State standard (8-hr)	0	0	0	0	0
Federal standard (1-hr)	0	0	0	0	0
Federal standard (8-hr)	0	0	0	0	0

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

Figure 12

Maximum 8-Hour Average CO Levels in Southeast Desert Air Basin, 1973-1988

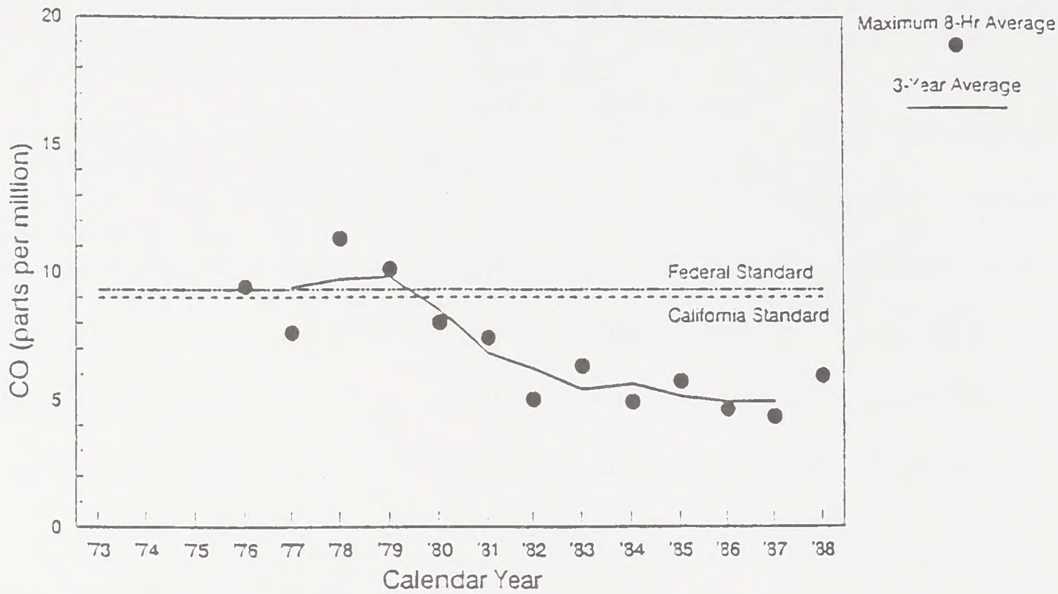


Figure 13

Violations of the California 8-Hour CO Standard (9.0 ppm) Southeast Desert Air Basin, 1973-1988

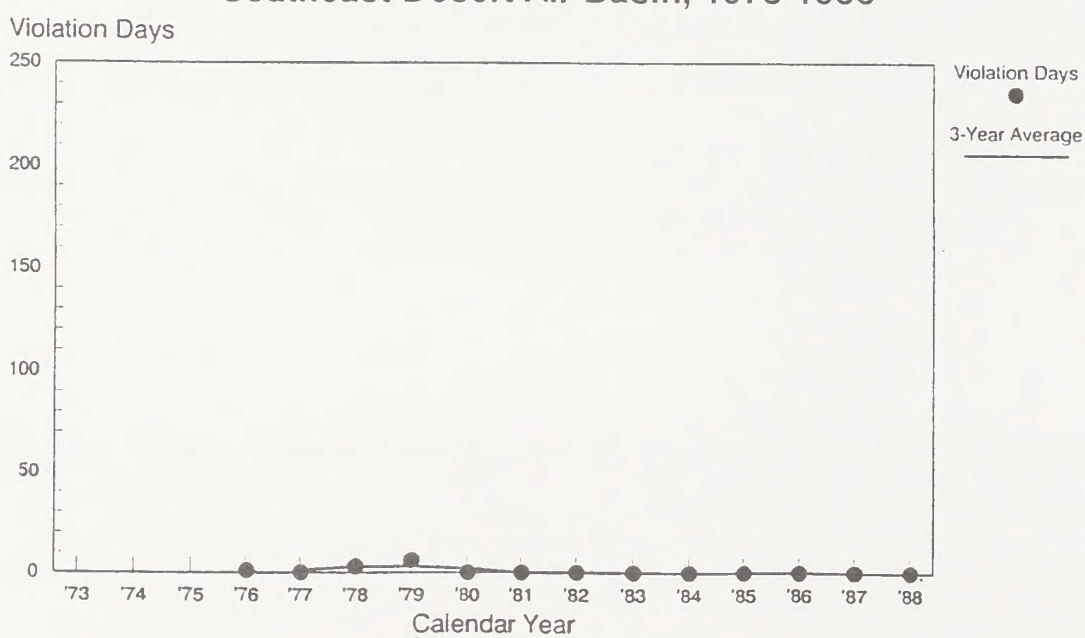


Figure 14

Maximum Hourly CO Levels in Southeast Desert Air Basin, 1973-1988

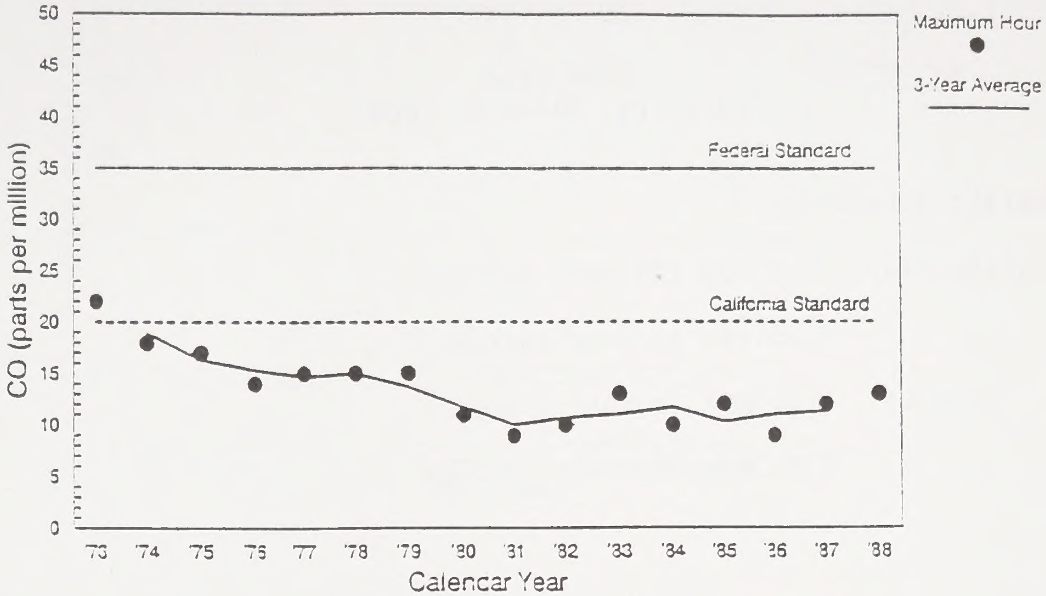


Table 8

Sulfur Dioxide Levels in Southeast Desert Air Basin
(Worst Case)

1984-1988
(parts per million - ppm)

Air Quality Standards:

California: 0.05 ppm (24-hour average)

0.25 ppm (1-hour average)

Federal: 0.03 ppm (annual average)

0.14 ppm (24-hour average)

	1984	1985	1986	1987	1988
Highest 24-hour average	.004	.012	.007	.001	.022
No. of days exceeding					
State standard (24-hr)	0	0	0	0	0
State standard (1-hr)	0	0	0	0	0
Federal standard (24-hr)	0	0	0	0	0

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

Figure 15

Maximum 24-Hour Average SO2 Levels in South Coast Air Basin, 1973-1988

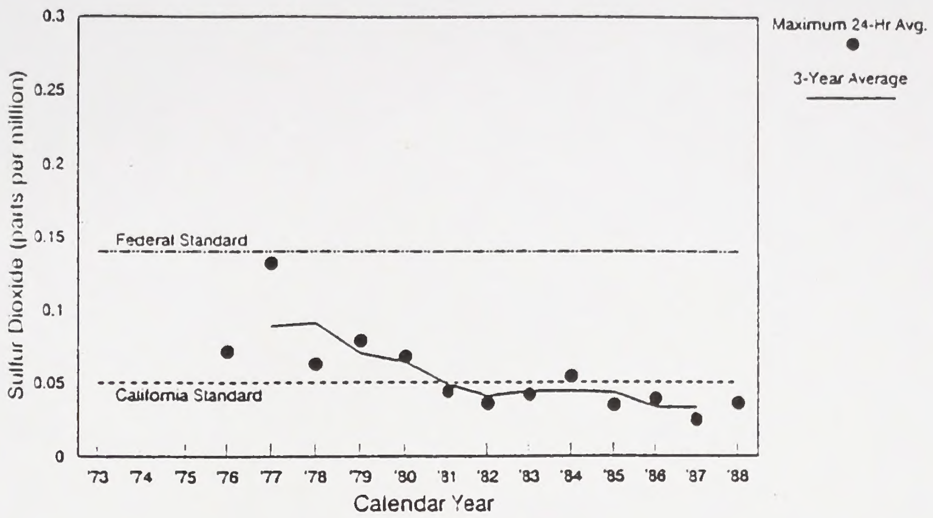


Figure 16

Violations of the California 24-Hour SO2 Standard (0.05 ppm) South Coast Air Basin, 1973-1988

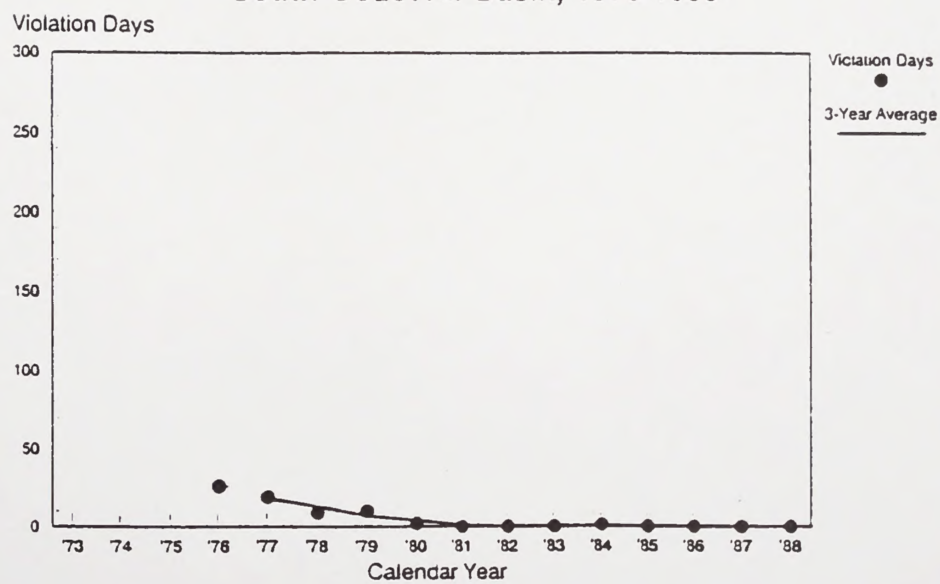


Table 9

Sulfur Dioxide Levels in Southeast Desert Air Basin
(Worst Case)

1984-1988
(parts per million - ppm)

Air Quality Standards:

California: 0.05 ppm (24-hour average)

0.25 ppm (1-hour average)

Federal: 0.03 ppm (annual average)

0.14 ppm (24-hour average)

	1984	1985	1986	1987	1988
Highest 24-hour average	.004	.012	.007	.001	.022
No. of days exceeding					
State standard (24-hr)	0	0	0	0	0
State standard (1-hr)	0	0	0	0	0
Federal standard (24-hr)	0	0	0	0	0

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

Figure 17

Maximum 24-Hour Average SO2 Levels in Southeast Desert Air Basin, 1973-1988

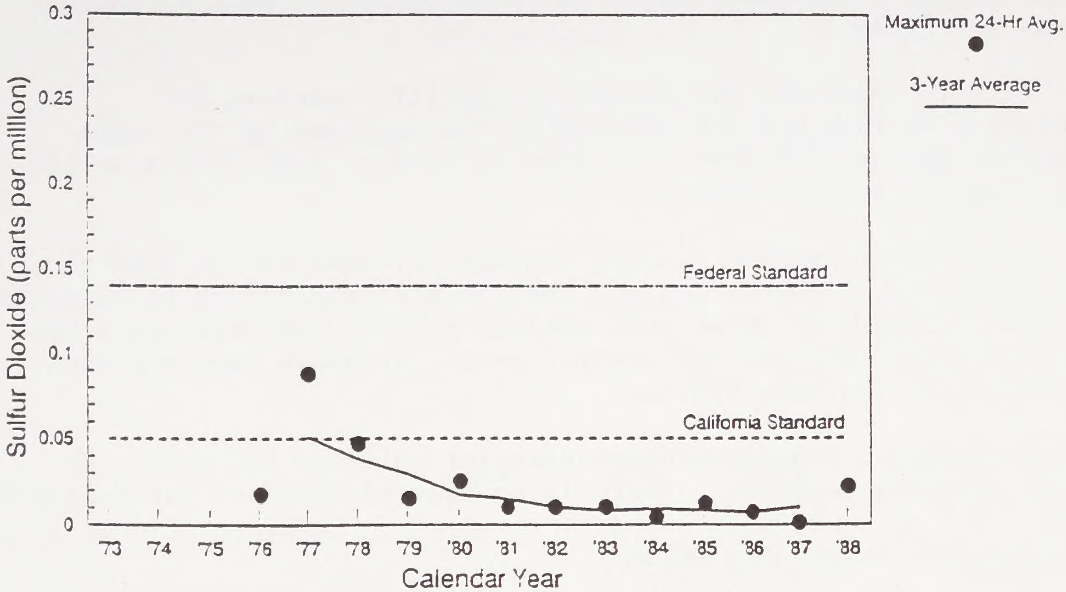
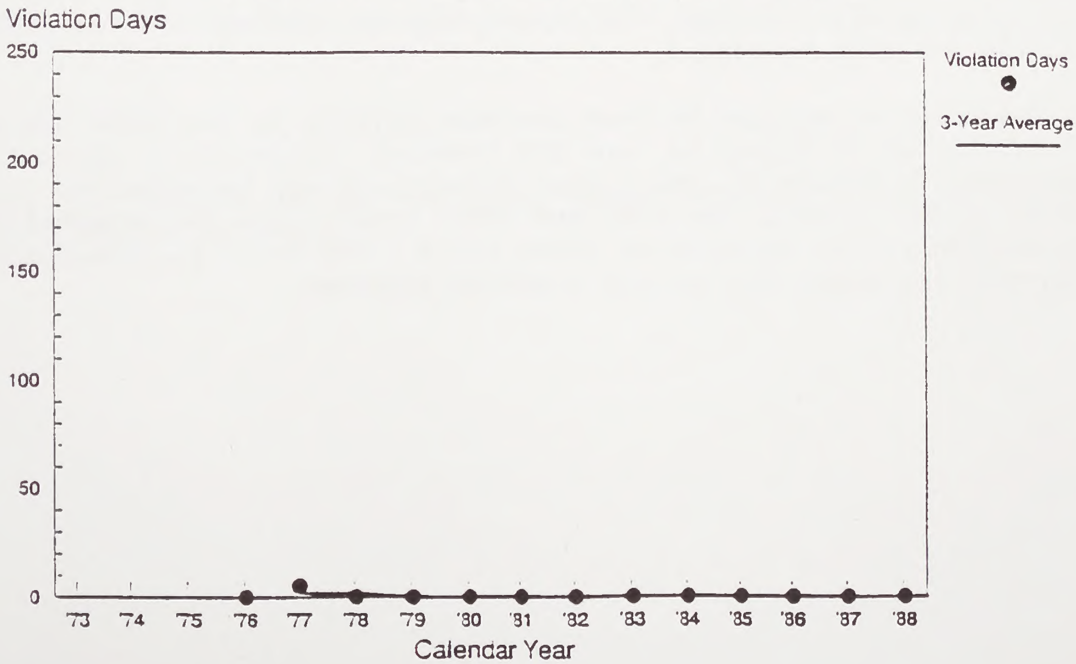


Figure 18

Violations of the California 24-Hour SO2 Standard (0.05 ppm) Southeast Desert Air Basin, 1973-1988



E. Particulate Sulfates

South Coast Air Basin

Particulate sulfates are the product of further oxidation of sulfur dioxide. Elevated levels can also be due to natural causes, such as sea spray.

Table 10 shows the California air quality standard for particulate sulfate and the maximum levels recorded in the basin during the period 1984-1988. Maximum 24-hour sulfate levels do not quite meet the state standard.

The trend of maximum 24-hour average sulfates in the SCAB since 1976 is plotted in Figure 19, and the trend of violations is shown in Figure 20. Figure 19 shows that maximum sulfate concentrations have been in a steady decline for several years, although they may have leveled out in the late 1980's.

The Basin is a nonattainment area for sulfates for state air quality planning purposes. There is no federal standard for sulfates.

Southeast Desert Air Basin

Table 11 shows the California air quality standard for particulate sulfate and the maximum levels recorded in the basin during the period 1984-1988. In 1985 and 1986, the maximum readings were abnormally high. These aberrant levels were recorded at China Lake during a brief period of extremely high winds that entrained the naturally-occurring sulfates from the dry lake there. To give some perspective to the readings, the second-highest readings for the 1984-88 period are also presented.

The trend of maximum 24-hour average sulfates in the SEDAB since 1976 is plotted in Figure 21, and the trend of violations is shown in Figure 22. In Figure 21, the 3-year running average includes the second-highest readings for 1985 and 1986, rather than the abnormally high maximum levels recorded in those years. The basin is considered attainment for state air quality planning purposes.

Table 10

Particulate Sulfates Levels in South Coast Air Basin
(Worst Case)

1984-1988
(micrograms per cubic meter - $\mu g/m^3$)

Air Quality Standards:

California: 25 $\mu g/m^3$ (24-hour average)

	1984	1985	1986	1987	1988
Highest 24-hour average	28.3	31.0	26.3	20.6	28.1
No. of days exceeding					
State standard	2	1	4	0	2

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

Figure 19

Maximum 24-Hour Average Sulfate Levels in South Coast Air Basin, 1973-1988

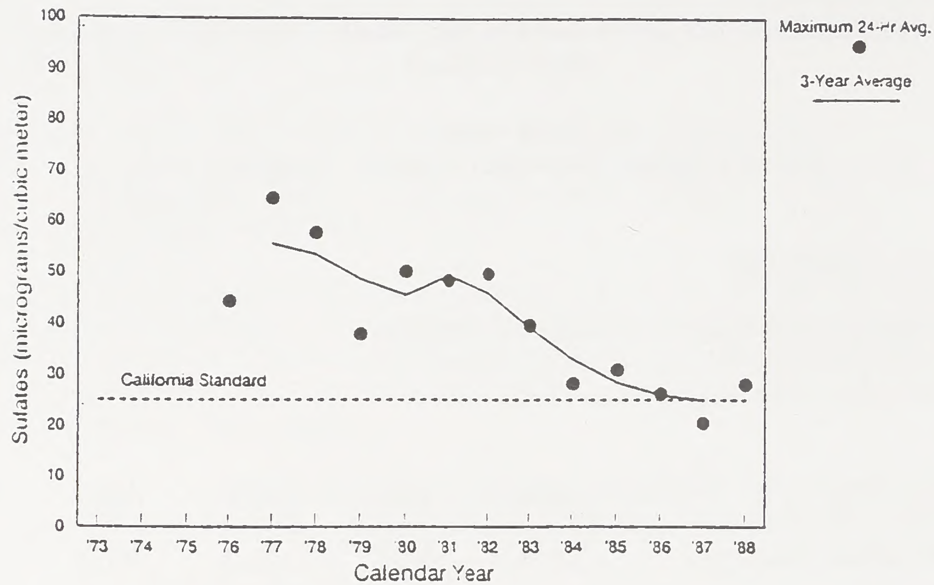
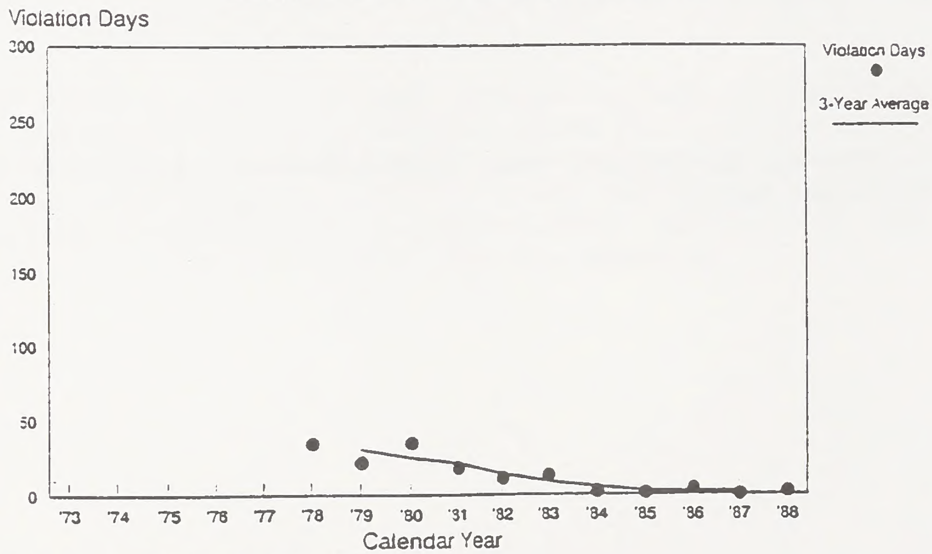


Figure 20

Violations of the California 24-Hour Sulfate Standard South Coast Air Basin, 1973-1988



Note: Standard is 25 micrograms/cubic meter.

Table 11

Particulate Sulfates Levels in Southeast Desert Air Basin
(Worst Case)

1984-1988
(micrograms per cubic meter - $\mu g/m^3$)

Air Quality Standards:

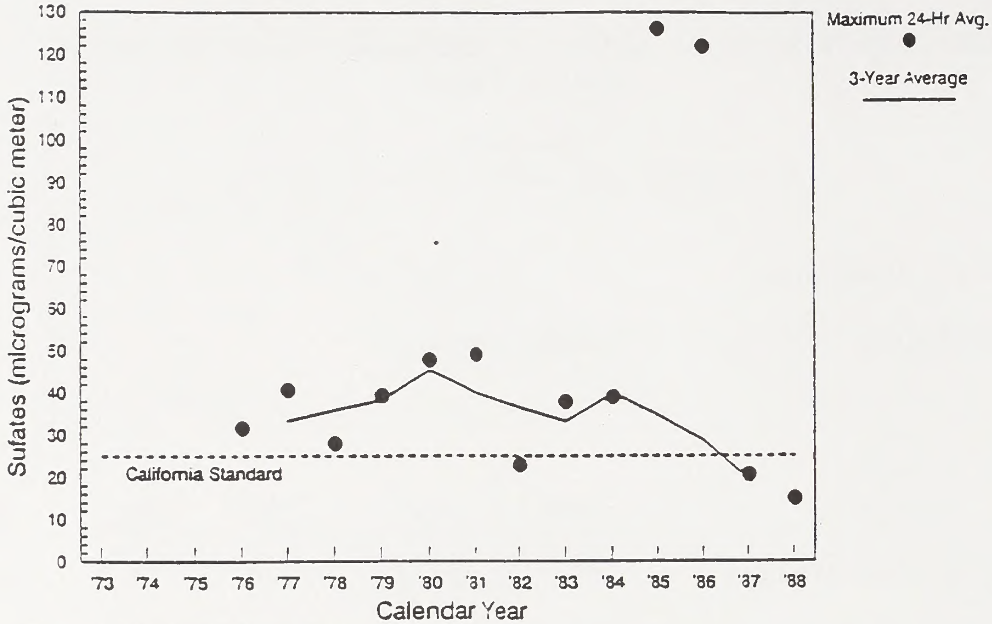
California: 25 $\mu g/m^3$ (24-hour average)

	1984	1985	1986	1987	1988
Highest 24-hour average	39.0	126.1	122.0	20.5	14.8
2nd highest 24-hour average	29.9	42.7	22.5	16.9	14.5
No. of days exceeding					
State standard	2	2	1	0	0

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

Figure 21

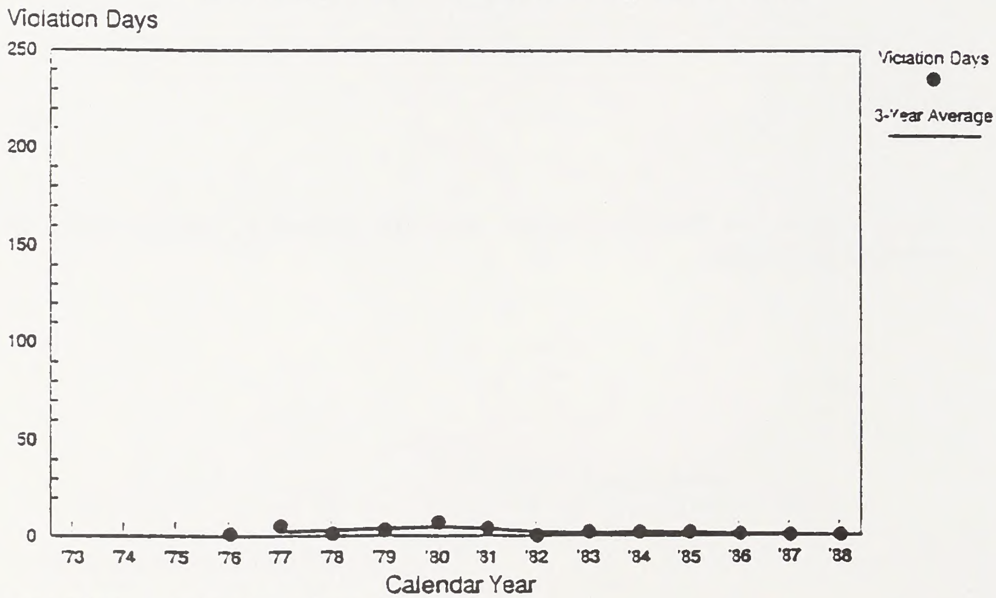
Maximum 24-Hour Average Sulfate Levels in Southeast Desert Air Basin, 1973-1988



Note: 3-Year Average includes 2nd-highest readings from 1985-86.

Figure 22

Violations of the California 24-Hour Sulfate Standard Southeast Desert Air Basin, 1973-1988



Note: Standard is 25 micrograms/cubic meter.

F. Fine Particulates (PM10)

South Coast Air Basin

Particulates in the air are caused by a combination of wind-blown fugitive dust, particles emitted from combustion sources (usually carbon particles), and organic, sulfate, and nitrate aerosols formed in the air from emitted hydrocarbons, sulfur oxides, and oxides of nitrogen.

Beginning in 1984, the ARB adopted standards for fine particulates (PM10 - particulate matter less than 10 microns in size), and phased out the pre-existing total suspended particulate (TSP) standards. PM10 standards were substituted for TSP standards because PM10 corresponds to the size range of inhalable particulates related to human health. In 1987, EPA also replaced national TSP standards with PM10 standards.

Table 12 shows the California and federal air quality standards for fine particulates, as well as maximum and second-highest levels recorded in the SCAB during the period 1984-1988. The 24-hour levels are four to six times the state standard.

Maximum 24-hour levels and violations for the period 1984-1988 are graphically depicted in Figures 23 and 24, respectively. There are not enough years of observation to reveal a trend.

The Basin is a nonattainment area for PM_{10} for purposes of state air quality planning. Upon promulgation of the PM10 regulations by the U.S. Environmental Protection Agency, all areas were designated attainment areas, regardless of the current air quality standing for total suspended particulates (TSP).

Southeast Desert Air Basin

Table 13 shows the California and federal air quality standards for fine particulates, as well as maximum and second-highest levels recorded in the SEDAB during the period 1984-1988. The data show that both state are being exceeded about 50 days per year, while federal standards are exceeded less than 10 days per year.

Maximum 24-hour levels and violations for the period 1984-1988 are graphically depicted in Figures 25 and 26, respectively. There are not enough years of observation to reveal a trend.

The Basin is considered a nonattainment area for PM10 for state air quality planning purposes. Upon promulgation of the PM10 regulations by the U.S. Environmental Protection Agency, all areas were designated attainment areas, regardless of the current air quality standing for total suspended particulates (TSP).

Table 12

Fine Particulate (PM10) Levels in South Coast Air Basin
(Worst Case)

1984-1988
(micrograms per cubic meter - $\mu g/m^3$)

Air Quality Standards:

California: 50 $\mu g/m^3$ (24-hour average)

30 $\mu g/m^3$ (annual geometric mean)

Federal: 150 $\mu g/m^3$ (24-hour average)
50 $\mu g/m^3$ (annual arithmetic mean)

	1984	1985	1986	1987	1988
Highest 24-hour average	135	208	294	219	289
Annual geometric mean*	41.2	80.9	111.2	73.5	91.9
Annual arithmetic mean*	53.4	96.1	111.3	89.6	104.6
No. of days exceeding					
State standard (24-hr)	7	59	60	58	65
Federal standard (24-hr)	0	11	8	9	11

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

*No basinwide summary available. Annual means are highest station in the Basin.

Figure 23

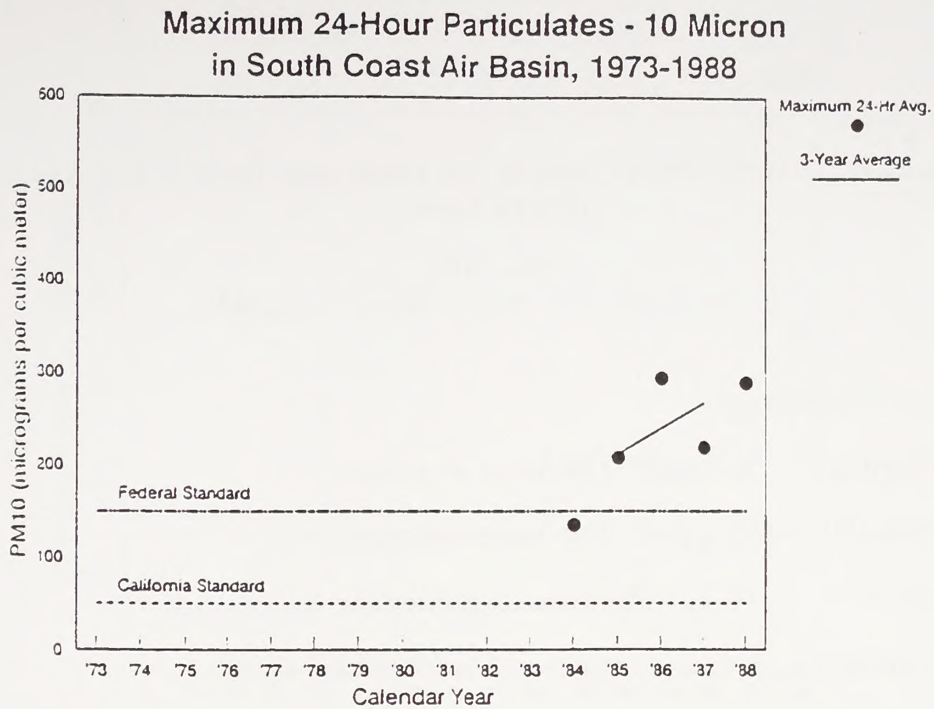
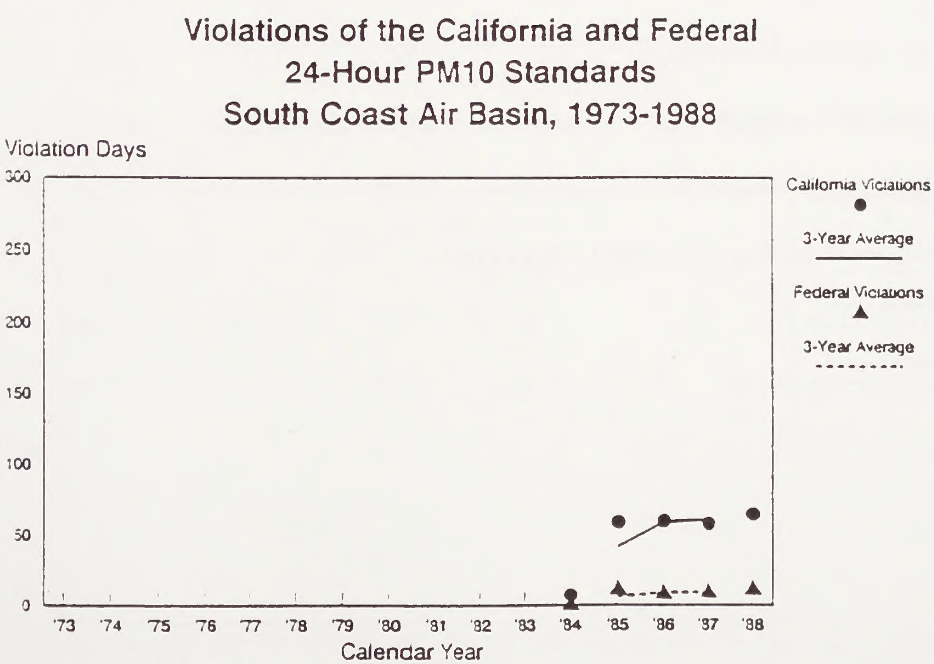


Figure 24



California Standard is 50 micrograms/cubic meter
Federal Standard is 150 micrograms/cubic meter

Table 13

Fine Particulate (PM10) Levels in Southeast Desert Air Basin
(Worst Case)

1984-1988
(micrograms per cubic meter - $\mu g/m^3$)

Air Quality Standards:

California: 50 $\mu g/m^3$ (24-hour average)

Federal: 150 $\mu g/m^3$ (24-hour average)

California: 30 $\mu g/m^3$ (annual geometric mean)

Federal: 50 $\mu g/m^3$ (annual arithmetic mean)

	1984	1985	1986	1987	1988
Highest 24-hour average	65	496	230	171	368
2nd highest 24-hour average	60	358	191	163	192
Annual geometric mean*	37.3	59.9	59.3	65.2	58.6
Annual arithmetic mean*	39.5	70.9	64.1	75.8	66.2
No. of days exceeding (24-hour average)					
State standard	6	57	54	56	56
Federal standard	0	6	2	3	2

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

* No basinwide summary available. Annual means are highest station reading in Basin.

Figure 25

Maximum 24-Hour Particulates - 10 Micron in Southeast Desert Air Basin, 1973-1988

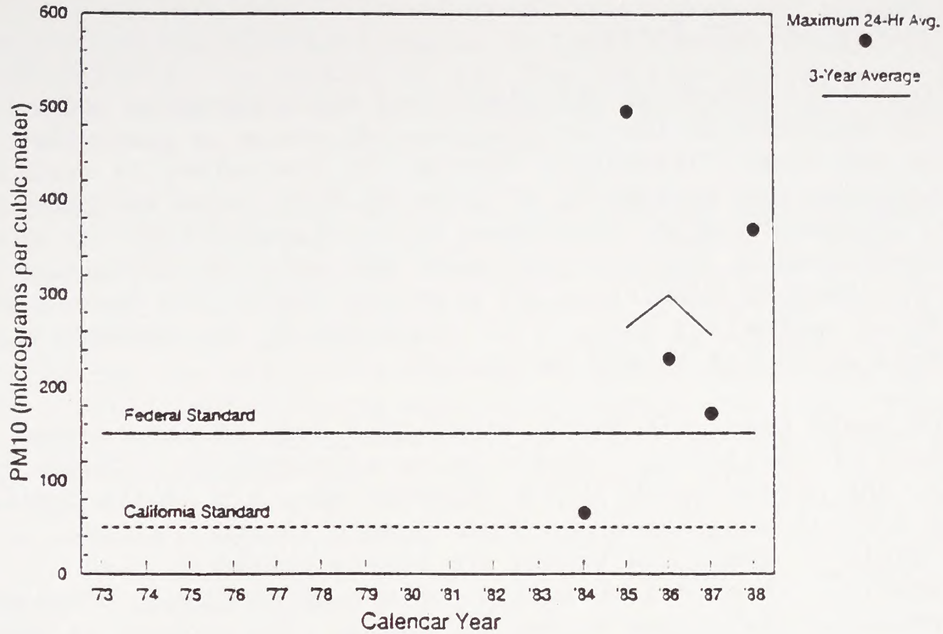
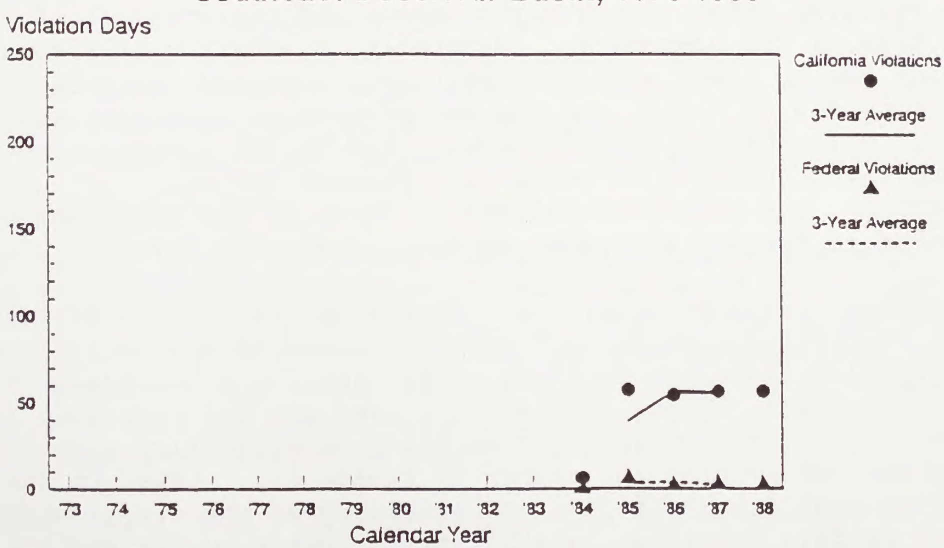


Figure 26

Violations of the California and Federal 24-Hour PM10 Standards Southeast Desert Air Basin, 1973-1988



California Standard is 50 micrograms/cubic meter
Federal Standard is 150 micrograms/cubic meter

5. OTHER AIR QUALITY ISSUES

A. Regional Visibility

South Coast Air Basin

Visibility refers to the clarity of the atmosphere and is typically measured as the distance one can see at a particular location and time. Visibility through the atmosphere is restricted by the absorption and scattering of light by both gases and particles. Natural phenomenon which contribute to decreased visibility include fog, precipitation, blowing sand/snow, and relative humidities greater than 70%. Manmade conditions which reduce visibility include the emission of combustion gases which transform in the atmosphere to form very small particles termed "aerosols".

The South Coast Air Basin experiences some of the poorest visibility in California. Corrected to eliminate the effects of weather, the median visibilities recorded at 1 p.m. daily during 1974 through 1976 at Long Beach and Ontario were 10 and 7 miles, respectively.[2] These low levels are likely caused by high concentrations of oxides of sulfur, oxides of nitrogen, hydrocarbon, and particulate emissions in the air basin. The problem is made worse by low wind speeds, strong inversion layers, and intense sunlight (leading to high production rates of aerosols).

Visibility in the South Coast varies both hourly and seasonally. The major influence is from aerosol levels, while water vapor from the ocean has a strong effect in coastal regions. Aerosol levels vary with the emission rates of combustion gases and the strength of sunlight heating the atmosphere. Generally, visibility is highest in the morning due to lower pollutant emission rates and lower formation rates of aerosols at night. As the day progresses, emission rates increase with increasing traffic levels, and higher sun angles accelerate the production of aerosols. Maximum aerosol concentrations, and lowest visibilities, occur in mid-afternoon before lower angles of the sun slow down aerosol production rates.

In coastal regions, water vapor levels generally have a greater effect on visibility than aerosol concentrations in spring and summer. At night, cooler temperatures cause water vapor from the ocean to form very small droplets. These droplets act like aerosol particles in scattering light, causing severe reductions in visibility especially when droplets become numerous enough to create fog. Later in the day, fog and high humidity conditions are broken up as the air is heated by sunlight. In this situation, visibility is lowest in the morning and best at midday.

Seasonal changes in visibility are almost entirely due to fluctuations in aerosol concentrations. Throughout the air basin, visibility is lower in the spring and summer, and improved in the fall and winter. These trends correlate closely with sulfate and nitrate concentrations, and point to variations in production of these pollutants which are climate related. In the summer, solar radiation is higher, inversions are stronger, and transport winds are lighter, maximizing the production of aerosol and trapping it within the air basin. In the winter, lower aerosol production rates and greater dispersion out of the air basin result in lower concentrations and improved visibility. In coastal areas, fog and high humidity conditions also cause morning visibilities in the spring and summer to be lower than those in the fall and winter.

Historically, visibility trends at downtown Los Angeles have varied in a cyclical fashion. During the early 1940's, a sharp deterioration occurred during the industrial expansion of the war years. As air pollution controls were imposed in the late 1940's, significant improvement was observed. A gradual deterioration in visibility during the mid-1950's was due to growth (especially in automobile traffic) outstripping stationary source controls. This trend was again reversed as automotive controls came into effect and stationary source controls were further tightened, causing visibility to slowly improve through 1986.[3] The net result for the period 1958 to 1986 was moderate improvement in visibility for the coastal portion and moderate or no improvement for the inland portion of the air basin. These trends are shown in Figure 27.

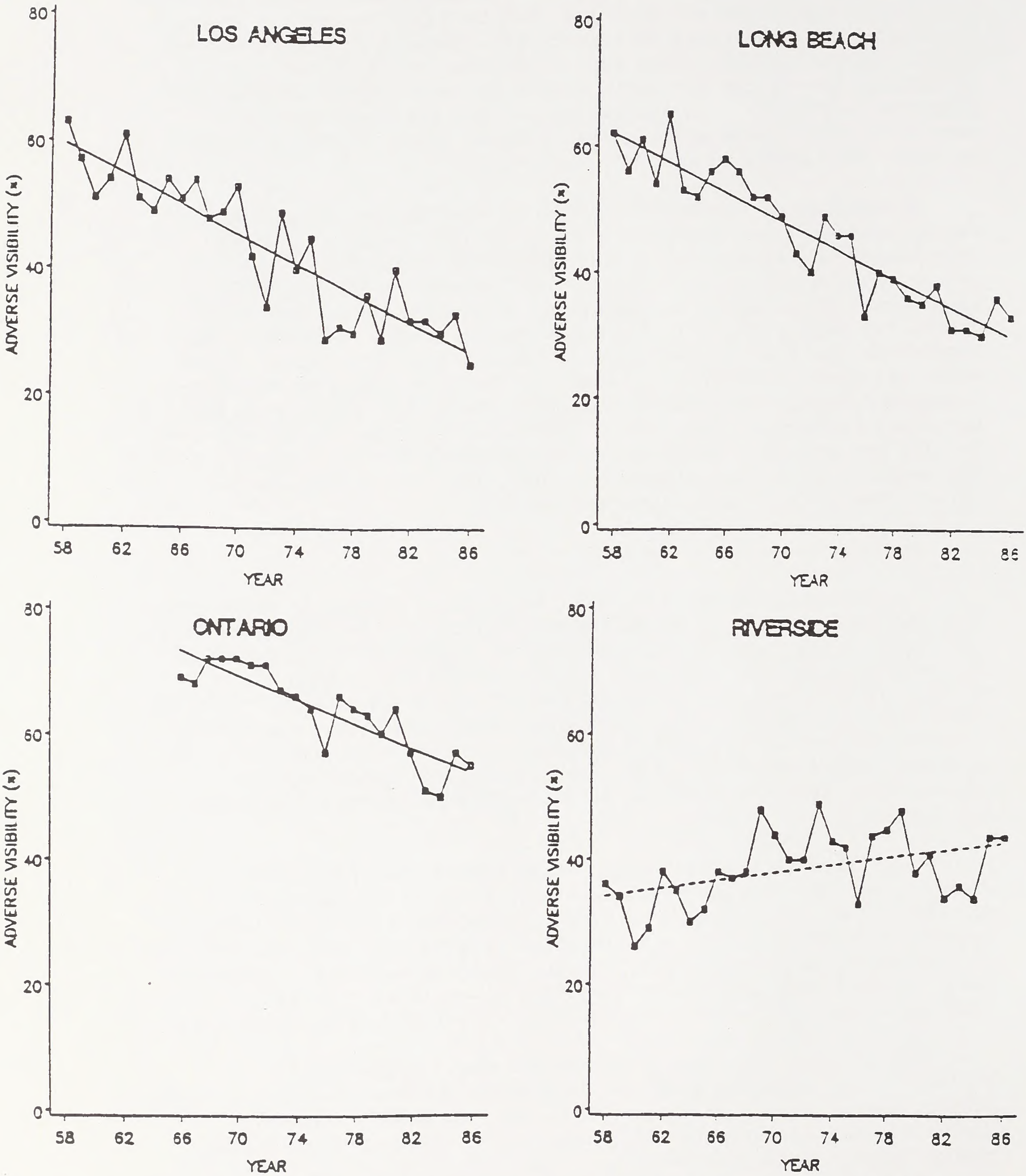
Southeast Desert Air Basin

The Southeast Desert Air Basin experiences improving visibilities when viewed from west to east. Near the urbanized western edge of the air basin, midday visibilities average 15 miles, while in the remote desert regions at the east end, average visibilities approach 70 miles. As relative humidities in the air basin are usually below 70%, water vapor in the air does not significantly influence visibility levels. In the absence of large cities or industrial complexes, the greatest contribution to visibility degradation is made by the transport of aerosols from the South Coast and southern San Joaquin Air Basins.

Visibility in the Southeast Desert varies seasonally with changing aerosol levels. Minimum visibilities occur during the spring and summer due to increased transport of aerosol from upwind urban areas. A contribution to deterioration is also made by local sources of fugitive dust during drier, windier summer conditions. Limited data indicate that the hourly variation in visibility is small, confirming the small effect on visibility contributed by water vapor.

Historically, the locations nearest the air basin where visibility was recorded were the Ontario and Riverside airports in the eastern end of the South Coast Air Basin. At these locations, visibility has either moderately improved or shown no significant change between 1958 and 1986.

Figure 27



*Adverse visibility is defined as being less than 10 miles when the relative humidity is less than 70% (the California ambient air standard for visibility reducing particles). The long term trend line is shown either being flat, increasing or decreasing. A dashed trend line indicates that a model departing from simple linearity would be more representative.

ARB/ADD 5/87

B. Acid Deposition

Acid deposition occurs as acid rain, acid fog, acid cloud water, acid snow, and dry deposition of both gases and particles. Examples of dry deposition include nitric acid vapors, organic acid vapors, and sulfuric acid mist. Acid deposition is a result of the emissions of sulfur and nitrogen oxides. These emissions may come from sources such as industrial power plants, motor vehicles, or chemical manufacturing plants. Damage from acid deposition has been widely investigated in the Eastern States. In that region, problems include the acidification of lakes and streams and the harmful effects on vegetation, especially forests and grassland, from acid rain incidents.

Because of the concern regarding the potential adverse effects which acid deposition might have on the general population, the ecological system, and various man-made materials, the Kapiloff Acid Deposition Act of 1982 (Act) was adopted by California Legislature. This Act required a five-year research and monitoring program to review the problem, an investigation of the causes and effects in California, and the possible development of strategies for reducing acidic deposition. This research program continues today under the direction of the California Air Resources Board.

Unlike conditions found in the Eastern U.S., California's acid deposition problems are different and less severe. Chronically acidified lakes or streams have not been found in California. However, there are California lake watersheds in the high elevations of the Sierra Nevada that have low acid-neutralizing capacity and suffer from episodic acidification rather than chronic acidification. In addition, California experiences less acid rain because of the limited annual precipitation, compared to the East. Acid fog is more common in California and is typically 100 times more acidic than acid rain. Acid fog occurs in urban coastal areas and in the southern San Joaquin Valley. Dry deposition of gases and particles contribute greatly to acid deposition in southern California. Urban coastal sites experience the most acidic deposition, both wet and dry, with nitric acid being the predominant acid of both forms.

Paints and building materials are also affected by acid deposition. Exposure of paints on building exteriors to acidic air pollution has resulted in discoloration. In the Los Angeles area, it has been determined that smog damages various materials. Because elevated concentrations of acidic air pollution occur with the presence of smog, other materials such as concrete and various metals (i.e., steel, nickel, aluminum) are currently being investigated to determine the extent of damage which acid deposition might have directly on them.

C. Toxic Air Pollutants

In California, public concerns about emissions of toxic substances to the atmosphere have lead to three statewide programs regulating such releases:

- The toxic air contaminants program, which is often called the AB 1807 or Tanner process, referring to the enabling bill and its author;

- The toxic "hot spots" program, enacted in AB 2588 (Toxic "Hot Spots" Information and Assessment Act"); and

- Proposition 65, the "Safe Drinking Water and Toxic Enforcement Act".

In addition, local air pollution control districts and other environmental regulatory agencies have adopted specific programs that require inventories or additional control of emissions of toxic substances and other hazardous materials. (See Regulatory Setting for details about these local programs.)

The Tanner bill (AB 1807) established a formal procedure for designating certain substances as toxic air contaminants. This process is also used to establish measures that reduce emissions of these toxic air contaminants. Currently, there are about 60 different substances or chemical categories that have been designated as toxic air contaminants, are being reviewed, or will be reviewed when sufficient information is available. During the identification phase, the staffs of the California Air Resources Board and the Department of Health Services concurrently prepare reports that assess exposure and health effects, respectively. Their report is made available for public comment before it is submitted to a Scientific Review Panel for review. If the Scientific Review Panel is satisfied with the report, it recommends to the Air Resources Board that the substance be designated as a toxic air contaminant. After a public hearing, a final decision is made by the Air Resources Board. The substances that have been designated as toxic air contaminants to date include:

asbestos
benzene
cadmium
carbon tetrachloride
chlorinated dioxins and furans
ethylene dibromide
ethylene dichloride
ethylene oxide
hexavalent chromium
methylene chloride

Of the substances still under review, several are expected to be completed in the next two years:

acetaldehyde
inorganic arsenic
benzo(a)pyrene
1,3-butadiene
chloroform
Diesel exhaust
formaldehyde
nickel
perchloroethylene
trichloroethylene
vinyl chloride

The Air Resources Board develops and adopts an Airborne Toxics Control Measure for each of the designated toxic air contaminants. If there is a safe threshold for a substance (i.e., a level below which there is no toxic effect), the control measure must reduce the emissions so that exposure is below the threshold. If there is no safe threshold, the measure must reduce emissions to the lowest level that can be achieved using the best available control technology. All of the substances that have been designated as toxic air contaminants so far are cancer-causing substances for which there is no safe threshold. After the Air Resources Board adopts the Air Toxics Control Measure, it is adopted by the local air district, which is responsible for enforcing the control measure.

In 1987, the California Legislature enacted AB 2588. AB 2588 established a process for developing an inventory of toxic substances, determining health risks, and notifying the public regarding these risks. This Act requires facilities to develop emission inventories for selected toxic substances and submit the inventories to the local air districts. The emission inventories will assist the Air Resources Board and local districts in setting priorities for controlling toxic air contaminant emissions and will provide information to the public regarding the presence of these substances and associated health risks. The Act requires the Air Resources Board to establish a list of chemicals subject to the Act. Currently, the list includes more than 300 chemicals and chemical categories.

A facility is subject to AB 2588 if it

(1) manufactures, formulates, uses, or releases any of the listed substances (or any substance that reacts to form any of the listed substances) and

(2) emits more than 10 tons of nitrogen oxides, organic gases, sulfur oxides, or particulates per year.

A facility subject to this law must submit an inventory plan (i.e., a description of the methods the facility will use to prepare the inventory) to the local air district. After the district has approved the plan, the facility prepares an inventory report and submits the data to the district.

After collecting the data from these facilities, the district will rank the facilities in low, intermediate, and high priority categories. The ranking is based on the potency, toxicity, quantity, and volume of hazardous materials released from the facility; distance to sensitive receptors; and other factors. Facilities in the highest priority category must assess the health risks caused by their emissions. After the health risk assessment is approved, the facility must notify all exposed persons about the results of the assessment if the district finds a high risk is associated with the emissions from the facility. In addition, the districts are required to publish an annual report on the findings of the emission inventory, the priority list of the facilities, estimated health risks, and related topics.

Proposition 65 does not directly control toxic air emissions, but it does require that warnings be provided to the affected public if they are exposed to significant concentrations of substances listed by the Governor as causing cancer or reproductive toxicity. Nearly 370 substances and classes of chemicals have been listed as cancer-causing or as reproductive toxicants as of January 1, 1990. Starting twelve months after a chemical is listed by the Governor, a "clear and reasonable" warning must be provided to individuals that are exposed to the substance unless the exposure meets the "no significant risk" criterion. For substances that cause cancer, the "no significant risk" level is established as one excess case of cancer in an exposed population of 100,000, assuming a lifetime exposure. For reproductive toxicants, the "no significant risk level" is 1/1000 of the level at which no effects on test animals have been observed. Proposition 65 also prohibits discharges of the listed chemicals that pass into drinking water sources. An air emission may be prohibited if it "more likely than not" will pass into a drinking water source.

D. <u>Interbasin Transport</u>

The transport of air pollutants from one air basin to another occurs when there are winds of sufficient speed, duration, and direction. Both ozone and ozone precursors, including hydrocarbons and nitrogen oxides, may be transported. In addition, PM_{10} precursors, including organic, sulfate and nitrate aerosols, may be transported.

One of the difficulties in understanding air pollution transport in California is that there is significant variability of the geography and meteorology throughout the State. These characteristics vary from the cool, rainy areas of the north coast to the arid regions of the Mojave and Colorado Deserts in the Southwest. Because of this great variability, the State has been subdivided into air basins, each of which comprises areas of similar meteorological and geographic conditions.

In several studies completed by the Air Resources Board (ARB) over the last ten years, it has been shown that transport of air pollutants from an upwind area can contribute to measured violations of air quality standards in downwind areas under certain conditions. The ARB studies used surface air trajectory analyses in order to identify pollutant transport pathways.

South Coast Air Basin Focus

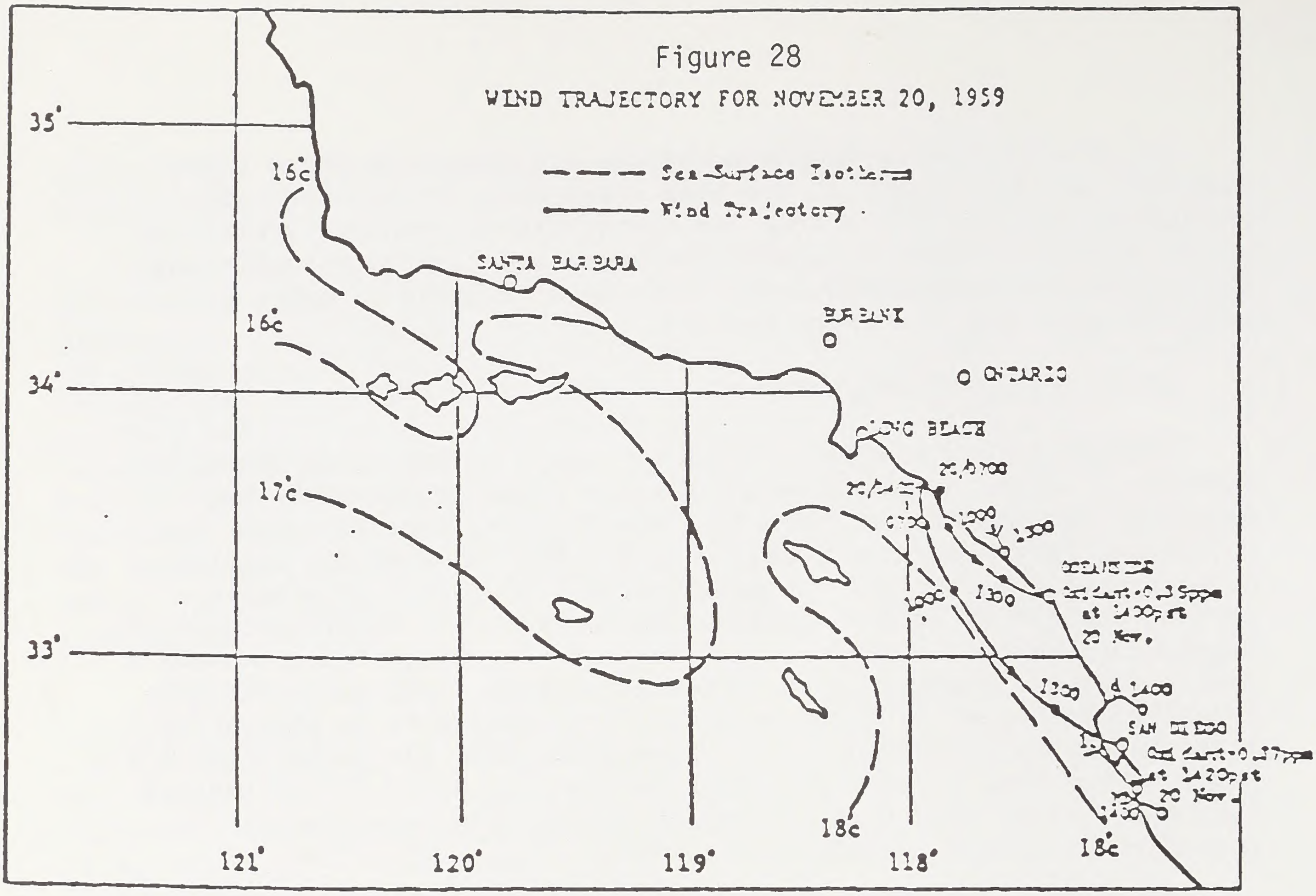
Transport from the South Coast Air Basin to San Diego County can take place if northwesterly winds develop after contaminated air masses in the Los Angles Basin have moved to the coastal zone. The pollutants follow a pathway beginning off the coast of Los Angeles, extending southward along the coast, until it crosses land again between the cities of Oceanside and San Diego. Not every instance of transport from the South Coast Air Basin to San Diego County causes a substantial air quality impact. Low inversions along the coast are necessary to concentrate the ozone and its precursors in the marine layer below the inversion. Two trajectories from the South Coast Air Basin to San Diego County are shown on Figures 28 and 29 (reproduced from ARB's staff report on identification of Districts affected by pollutant transport, dated October 1989).

In addition to transport to San Diego County, there is also pollutant transport from the South Coast Air Basin to the Southeast Desert Air Basin. The three major pollutant transport corridors between the two Air Basins are the Soledad Canyon, Cajon Pass, and San Gorgonio Pass. Figure 30 illustrates these three pathways (reproduced from ARB's October 1989 staff report). The San Gorgonio Pass connects the Los Angeles Basin to the Colorado (Low) Desert. The wind through the pass is a constant current of air sweeping from the west to east. Based on the analyses of aerometric data from surface stations, balloon measurements, and aircraft measurements, several studies have concluded that the Low Desert is subject to the intrusion of pollution from the coastal area of Southern California. The Soledad Canyon and the Cajon Pass connect the High Desert to the Los Angeles Basin. The High Desert is the western portion of the Mojave Desert located north of the San Gabriel and San Bernardino Mountains. Tracer trajectory routes show that the northwest part of the South Coast Air Basin feeds into the Soledad Canyon while the southern part of the South Coast Air Basin feeds into the Cajon Pass.

Finally, ARB studies indicate that pollutant transport also occurs between the South Coast Air Basin and the South Central Coast Air Basin. The South Central Coast Air Basin includes San Luis Obispo, Santa Barbara, and Ventura Counties. Due to the interaction of the topography and meteorology, the wind flows between these two Air Basins are some of the most complex in California. Pollutant transport can take place in either direction, from the southern portion of the South Central Coast Air Basin to the South Coast Air Basin. There are two major pollutant transport routes between these two Air Basins. One is overland between the San Fernando Valley and

Figure 28

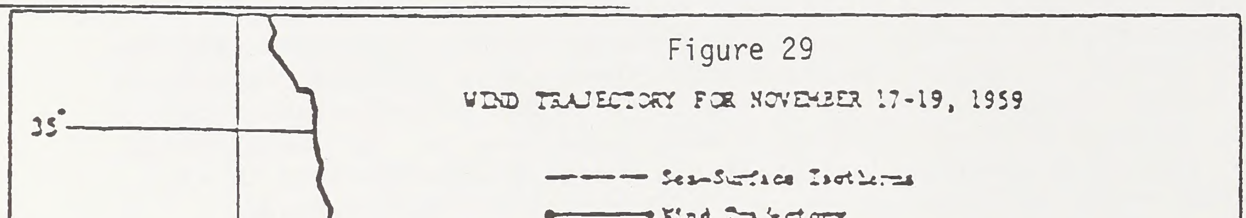
WIND TRAJECTORY FOR NOVEMBER 20, 1959



Sources: U.S. Weather Bureau and Scripps Institution of Oceanography

Figure 29

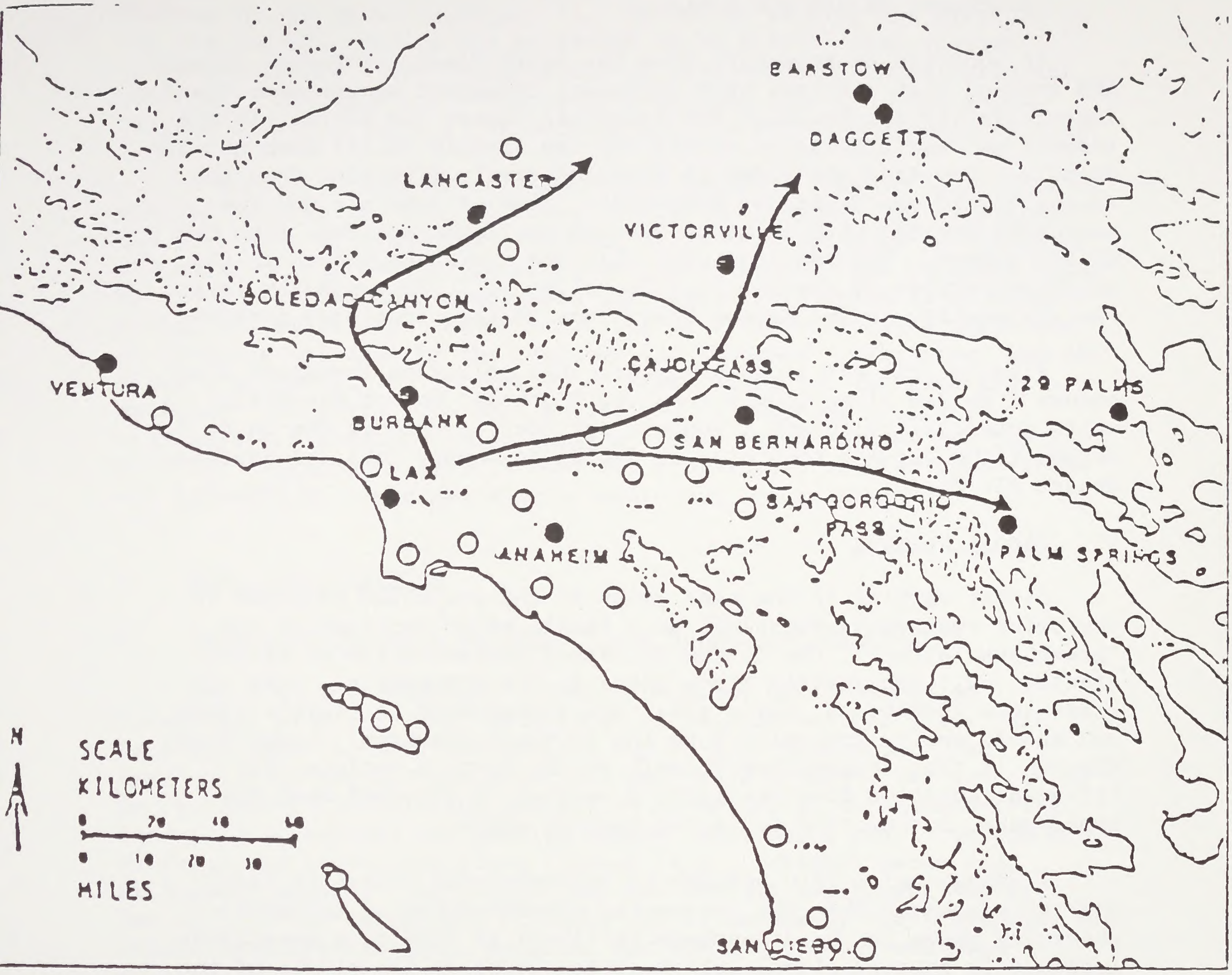
WIND TRAJECTORY FOR NOVEMBER 17-19, 1959



Examples of Trajectories
(from Bell, 1960)

Figure 30

Interbasin Transport Corridors Through the Mountain Passes Between the South Coast Air Basin and the Southeast Desert Air Basin



Interbasin Transport Corridors Through the Mountain Passes Between the South Coast Air Basin and the Southeast Desert Air Basin (Soledad Canyon 3,300 ft; Cajon Pass 4,200 ft; San Gorgonio Pass 2,300 ft) (from Smith et al. 1984) eastern Ventura County. The second transport route is over water across the Santa Monica Bay.

Southeast Desert Air Basin

In addition to transport from the South Coast Air Basin, several ARB studies also indicate that pollutant transport occurs from the San Joaquin Valley Air Basin to the Southeast Desert Air Basin. In the summertime, air frequently enters the San Joaquin Valley from the San Francisco Bay Area and flows in a southeasterly direction down the valley toward the Tehachapi Mountains. Some of this air and the pollution carried with it moves through the Tehachapi Pass into the Mojave Desert. The ARB concludes that the increased growth in the southern portion of the San Joaquin Valley will substantially impact the air quality in the Mojave Desert due to this transport corridor.

Finally, the ARB studies suggest that pollutant transport also occurs from San Diego County into the Southeast Desert Air Basin. A major potential pollutant transport corridor is through the In Ko Pah Gorge of the Jacumba Mountains in San Diego County into the Southeast Desert Air Basin.

E. Global Warming

Global warming is the name given to the projected increase in worldwide average temperatures as a result of an increase in the "greenhouse effect", due to the increased concentration of carbon dioxide (CO_2) and several trace gases in the atmosphere. Like the glass in a greenhouse, these gases are transparent to visible light, but absorb energy transmitted to the infraced spectrum. Light from the sun is thus transmitted through to the earth's surface, but infrared radiation from the earth's surface is absorbed near the atmosphere, rather than radiating back to space.

Although scientific opinion is not unanimous, there is fairly general agreement that the increasing concentration of infrared absorbing gases in the atmosphere is likely to lead to a measurable increase in average global surface temperature by the middle of the next century. The impacts of this increase on California could include a decrease in water supplies, increased electric demand for cooling, a rise in ocean level which would imperil wetlands and shorelines, increased air pollution, and adverse impacts on California's economy.[5]

Significant greenhouse gases in addition to CO_2 include methane, ozone, nitrous oxide, and various chlorofluorocarbon (CFC) species. Carbon monoxide (CO) and non-methane hydrocarbons (NMHC) are also important through their effects on atmospheric chemistry. These species react in the atmosphere to form ozone, and compete for OH radicals, which are responsible for degrading methane. Although nitrous oxide and the CFC species are present in the atmosphere in much smaller concentrations than CO_2, ozone, and methane, their infrared absorption per molecule is thousands of times greater, so that they have a major impact overall. One much-cited study by Ramanathan et al.[6] projects a global temperature increase of 1.54°C, by 2030. The estimated contributions of various gases to this phenomenon are shown in Figure 31. The total warming due directly to the various CFC species was projected to be 0.36°C, with another increase of 0.08°C due to depletion of stratospheric ozone (also due to CFCs). The total CFC contribution is thus 0.44°C -- the second largest effect after CO_2, accounting for 29% of the projected warming.

A complete inventory of greenhouse gas emissions in California is not yet available. The California Energy Commission[1] has estimated the breakdown of carbon emissions in California as shown in Figure 32. CFC emissions in California are also significant -- one estimate cited by the Energy Commission suggests that California emits 5% of total global CFC emissions. Major emissions of CFCs result from their use as cleaning solvents in the computer and aerospace industries, and as blowing agents in the production of foam insulation and packaging material. CFCs are also used extensively as working fluids in refrigeration and air-conditioning systems, but this does not result in their emission, except in the case of leakage, or when the systems are scrapped or recharged without salvaging the refrigerant.

6. REGULATORY SETTING

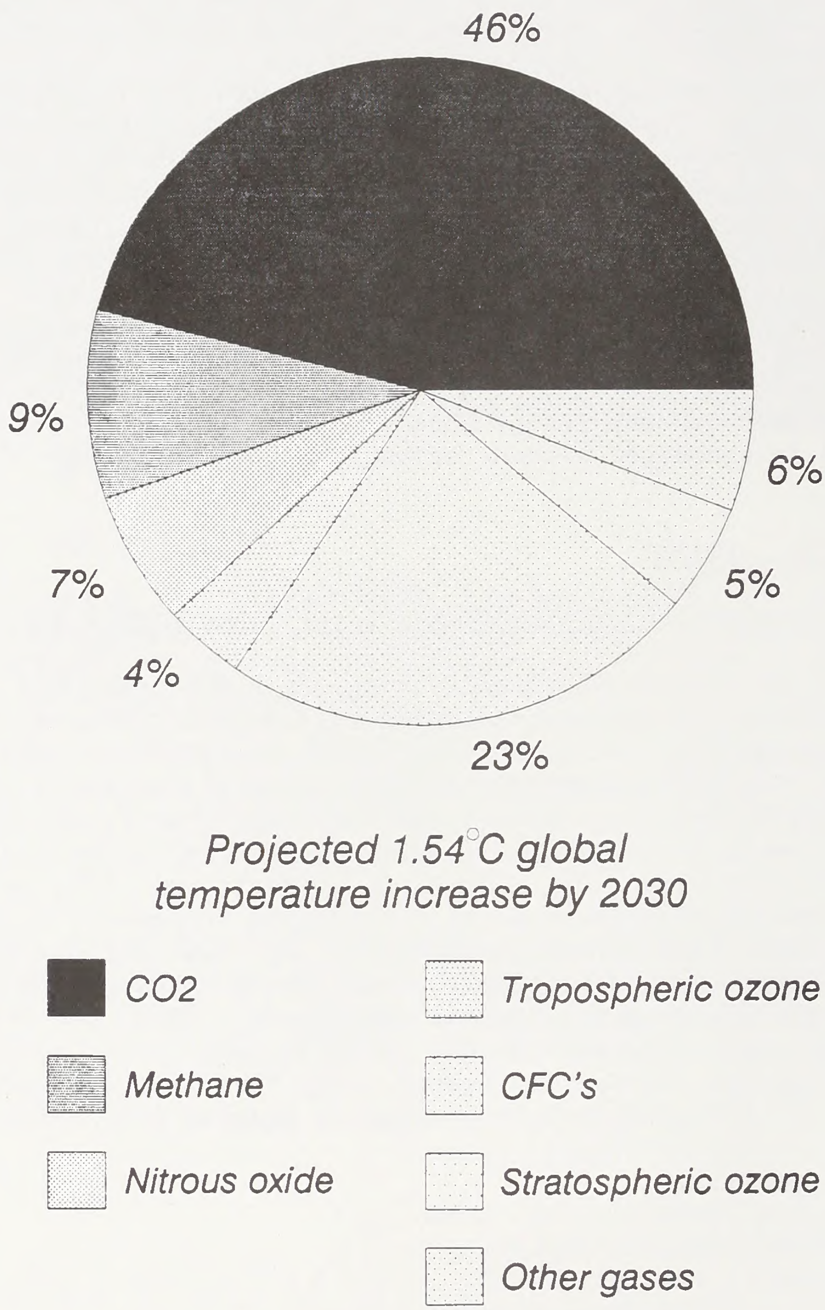
A. Federal Prevention of Significant Deterioration Program

The U.S. Environmental Protection Agency has promulgated Prevention of Significant Deterioration regulations for areas that have achieved the National Ambient Air Quality Standards. The Prevention of Significant Deterioration program allows new sources 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., national parks and wilderness areas). The South Coast Air Quality Management District has applied for delegation of authority to implement the Prevention of Significant Deterioration program, but the request has not been approved by the Environmental Protection Agency. Thus, the Prevention of Significant Deterioration review, if applicable, would be conducted by the Environmental Protection Agency. The five principal areas of the Prevention of Significant Deterioration program are as follows:

- applicability;
- best available control technology;
- pre-construction monitoring;
- increments analysis;
- air quality impact analysis.

Figure 31

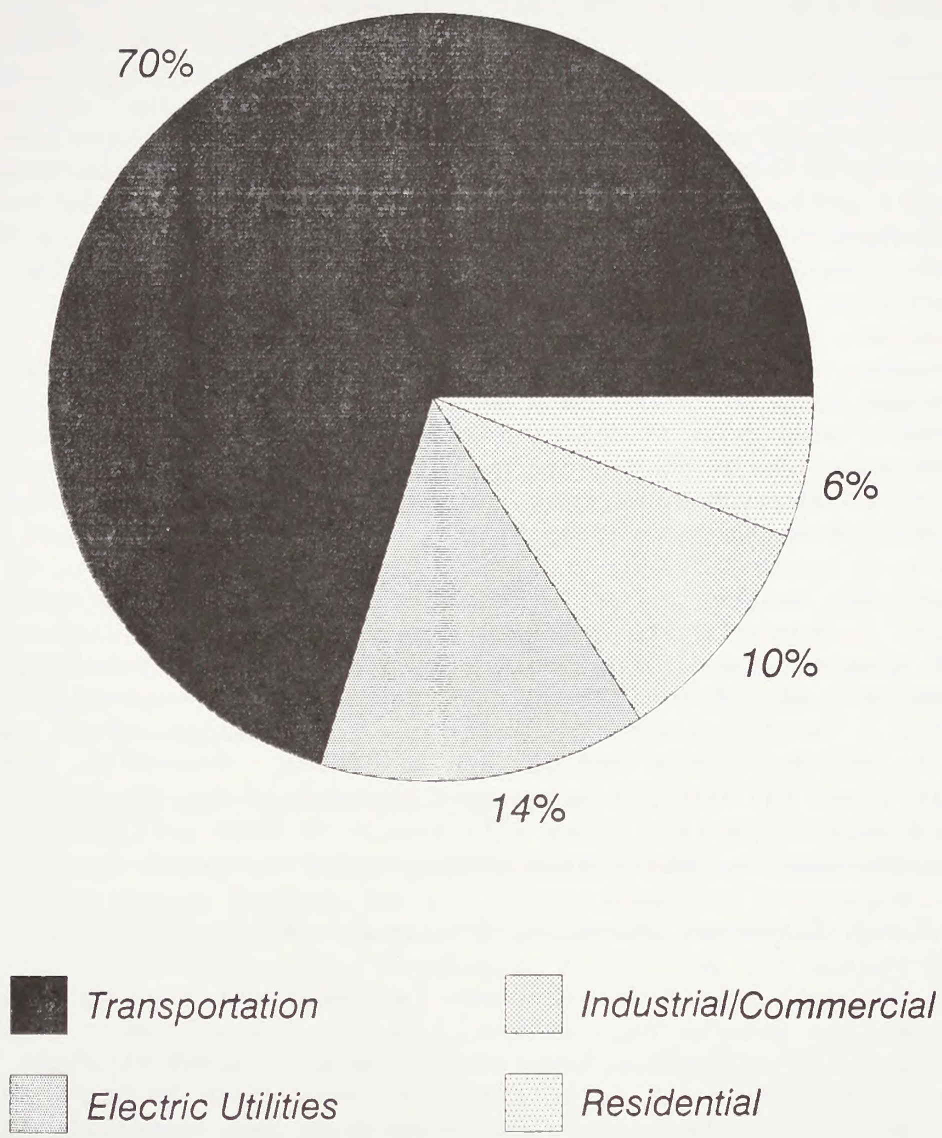
Contribution of Greenhouse Gases to Global Temperature Changes



V. Ramanathan, et al.
Trace Gas Trends and Their Potential Role in Climate Change
J. Geophys. Res., June 20, 1985.

Figure 32

Breakdown of Carbon Emissions in California



California Energy Commission
The Impacts of Global Warming: Interim Report
Sacramento, CA June 1989

The Prevention of Significant Deterioration requirements apply on a pollutant-specific basis to any project which is a new major stationary source or a major modification to an existing stationary source. (These terms are defined in federal regulations.) This determination is based on evaluating the emissions changes associated with the proposed project in addition to all other emissions changes at the same location over the last five years.

B. 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 which have a National Ambient Air Quality Standard and their precursors) from such sources. The New Source Performance Standards apply to certain sources depending on the equipment size, process rate, and/or the date of construction, modification, or reconstruction of the affected facility. Recordkeeping, reporting and monitoring requirements are generally provided for each pollutant from each subject source, and reports must be regularly submitted to the reviewing agency. The New Source Performance Standards that could apply to reconstruction or new installations associated with the project include the standard for Non-metallic Mineral Processing Plants.

The South Coast Air Quality Management District has adopted the New Source Performance Standards by reference in its Regulation IX and enforces them as part of its permitting process. New installations of emissions controls or changes in existing operations or equipment that constitute a "modification" as defined in federal regulations could be subject to the New Source Performance Standards. Generally, however, the South Coast Air Quality Management District's New Source Review rules and source-specific rules will result in more stringent requirements than the New Source Performance Standards.

National Emissions Standards for Hazardous Air Pollutants

The National Emissions Standards for Hazardous Air Pollutants are source-specific federal regulations, limiting the allowable emissions of hazardous air pollutants from such sources. Unlike criteria air pollutants, hazardous air pollutants are those which do not have a National Ambient Air Quality Standard but have been identified by the Environmental Protection Agency to cause or contribute to the adverse health effects of air pollution.

Administration of the hazardous air pollutants program has been delegated to the South Coast Air Quality Management District, which has referenced the federal standards in its Regulation X. Applicability of these standards is generally based on the equipment size, process rate, and/or the date of construction, modification, or reconstruction of the affected facility. Hazardous air pollutant standards that could apply to the project include:

- o Benzene
- o Vinyl Chloride
- o Asbestos

C. California Clean Air Act

AB 2595, the "California Clean Air Act" (Act) was enacted by the California Legislature and became law on January 1, 1989. The Act requires the local air pollution control districts to attain and maintain the federal and state ambient air quality standards at the "earliest practicable date." The Act contains several milestones for the local districts and the California Air Resources Board. The most immediate milestone is the requirement that local districts submit air quality plans to the Air Resources Board.

The plans are required to demonstrate attainment of the state ambient air quality standards, and specifically, the plans must result in a five percent annual reduction in emissions of nonattainment pollutants (ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and their precursors) in a given district. 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 their vehicle inspection and maintenance program. There is no immediate impact on the project, because the Act directly affects only the local districts. However, future district regulations developed and adopted to achieve the requirements of the Act may apply to the proposed project and affect future plans for expansion or modification.

D. Local New Source Review Requirements

The South Coast Air Quality Management District conducts a pre-construction review program for all new or modified sources of air pollution. This program, which is known as New Source Review, is prescribed in the District's Regulation XIII. The New Source Review program contains three principal elements:

- o best available control technology;
- o emissions offsets;
- o air quality impact analysis.

Best Available Control Technology and emissions offsets are for all new emissions sources or modifications of existing sources. The New Source Review regulation also requires that a project neither cause nor contribute measurably to a violation of any state or National Ambient Air Quality Standard.

The South Coast Air Quality Management District has also adopted additional rules that prescribe requirements for review of new or modified sources of toxic air contaminants.

E. Other Local Regulatory Requirements

As required by the federal Clean Air Act, plans that demonstrate attainment must be developed for those areas that have not attained the National Ambient Air Quality Standards. As part of these plans, the local air pollution control and air quality management districts have developed regulations limiting emissions from specific sources. The South Coast Air Quality Management District has adopted a variety of regulations that limit the emissions of various pollutants from many types of sources in the District. These rules are collectively known as "prohibitory rules", because they prohibit the construction or operation of a source of pollution that would violate specific emissions limits. The South Coast Air Quality Management District has adopted general and source-specific rules and regulations that apply to this project, which include the following:

Rule 401 (Visible Emissions) - Applies to emissions of particulate matter from any stationary sources. As applied to the proposed project, this rule would apply to emissions from landfill gas flares and tailings processing equipment to 20% opacity.

Rule 403 (Fugitive Dust) - Applies to emissions of fugitive dust from any transport, handling, construction, or storage activity. As applied to the proposed project, this rule could prohibit the emission of visible plumes of particulate matter beyond the project boundaries from haul road use and the excavation and placement of liner and cover material.

Rule 404 (Particulate Matter - Concentration) - Applies to emissions of particulate matter from landfill gas flares. As applied to the proposed project, this rule would limit the concentration of particulate matter in the flare exhaust gases to that dictated in a published table.

Rule 405 (Solid Particulate Matter - Weight) - Applies to emission of particulate matter from tailing processing equipment. As applied to the proposed project, this rule would limit the mass emission rate of particulate matter from stationary equipment used to crush, size, or blend tailing materials used in the production of pit liner or waste cover products to that dictated in a published table.

Rule 407 (Liquid and Gaseous Air Contaminants) and Rule 409 (Combustion Contaminants) - Apply to emissions of carbon monoxide and sulfur dioxide from landfill gas flares. As applied to the proposed project, these rules would limit emissions of carbon monoxide and sulfur dioxide from the flares to 2000 ppm and 500 ppm, respectively.

Rule 431.1 (Sulfur Content of Gaseous Fuels) - Applies to the sulfur content of commercial gaseous fuel. As applied to the proposed project, this rule would limit the content of sulfur in landfill gas to 250 ppm if such gas were to be processed and sold for offsite use.

Rule 1150.1 - This rule requires the installation of a landfill gas collection system. To comply with this rule, horizontal networks of perforated pipe will be installed at periodic elevations in the landfill as deposited waste rises from the bottom of the pit. These networks will be connected to vertical wells which will be connected to headers and a main trunk line delivering landfill gas to the flare station. Large centrifugal fans at the flare station, or intermediate between the landfill and the station, will generate the slight vacuum needed to induce the flow of landfill gas into the collection system. This vacuum will be carefully regulated. If the vacuum is too high, air will be drawn through the landfill cover into the collection system, diluting the landfill gas concentration and requiring auxiliary fuel to maintain combustion conditions at the flares. With too little pressure, excess landfill gas will escape the landfill and be emitted to the atmosphere without being treated by the flares. At optimum settings, it is estimated that 80% of the landfill gas will be vented to the flare station with the remaining 20% escaping through the landfill cover. These optimum flows will be maintained by regulation of the number of operating fans. A control system sensing the oxygen content in the delivered gas and the methane content in gas probes at the surface and near the edges of the landfill will be used to made flow adjustments.

At the flare station, large cylindrical drums will be used to combust the landfill gas. Gas supplied by the centrifugal fans will be fed to a series of identical flares. Each flare will be operated at a fixed gas flowrate. As the flow of gas from the landfill varies, the number of flares operated will be varied. Each flare will be equipped with a diffusion grid burner consisting of a row of burner nozzles installed in each of a series of parallel headers. The remainder of each flare will consist of a cylindrical shell with an open top rising above the diffusion burner. A sensor and feed system in the main flare supply pipe will measure the concentration of combustible gas and add auxiliary propane fuel if the fuel value of the landfill gas falls below the limit of ignitability.

Rule 1401 - This rule prohibits the construction of a new or modified facility which causes health risks in excess of specific limits contained in the rule. This rule would apply to increased cancer risks imposed by exposure to nearby residents from emissions of carcinogenic hydrocarbons emitted in trace concentrations in landfill gas from the landfill surface and from the landfill gas flares. The cumulative risk from these exposures could not exceed a level which would cause an increase in maximum individual cancer risk of $1.0x10^{-6}$ over a seventy year lifespan. If a source uses control technology selected as "toxic best available control technology" by the District, then the allowable increase in maximum individual cancer risk would be $1.0x10^{-5}$. Each source desiring to be permitted under the second risk standard would additionally be required to demonstrate that within the source's downwind impact area, the cumulative number of increased cancer cases would not statistically average 0.5 or more.

F. South Coast Air Quality Management Plan

In March 1989, the South Coast Air Quality Management District adopted an Air Quality Management Plan in accordance with federal Clean Air Act requirements, which mandate that areas not attaining ambient air quality standards prepare plans demonstrating attainment by December 31, 1987, or the earliest date practicable. Because the District has such a severe air quality problem, the earliest date by which the District has projected attainment with the federal ozone standard is 2010.

The attainment strategy relies on three "tiers" of regulatory proposals, each addressing emissions reductions from stationary sources, measures pertaining to the motor vehicle sector, and impacts from population growth in the region. The proposed measures are categorized into each tier depending upon how soon they can be implemented.

Tier I proposals are based on technology and management practices that are currently available or can be implemented within the next five years. The Tier I measures are aimed at reducing the emissions from industrial surface coating and solvent use, consumer products, and combustion-associated processes; adopting rules that apply to small, currently unregulated sources and processes; and increasing energy conservation. Tier I control measures affecting the transportation sector are focused on reducing vehicle use and imposing stricter emissions standards for off-road vehicles (railroads, boats and ships, and aircraft).

Tier II consists of goals to be achieved through significant advances in current technology and strict regulatory enforcement. Specific regulations have not yet been developed as they have for Tier I, but goals and strategies for achieving those goals have been established. It is expected that the Tier II measures will be implemented in the next ten to fifteen years. For many types of stationary sources, the goal is to minimize existing emissions, along with potential emission growth, to achieve a 50 percent reduction of the emissions remaining after the Tier I controls are implemented. The goals for the transportation sector are more specific and rely heavily on using "alternative" fuels and "low-emitting" vehicles.

The Tier III category is the most optimistic of the three categories being proposed, depending heavily upon breakthroughs in process technology and pollution control to achieve the emission reductions necessary to attain the federal ozone standard. Strategies include non-reactive solvents for surface coatings and solvent use and "extremely low-emitting" vehicles.

PART II. IMPACTS AND MITIGATION MEASURES FOR THE PROPOSED ACTION AND ALTERNATIVES

1. OVERVIEW OF THE ANALYTICAL APPROACH

Air quality impacts associated with the project are due to emissions from the following sources:

- Construction operations
- Transfer stations
- Solid waste transport
- On-site material handling (except fugitive dust)
- Landfill gas generation and combustion
- Fugitive dust

Emissions from each of the categories of sources were estimated on both a maximum daily and annual basis.

Worst case emission rates were used to avoid underestimating impacts from the project. These emission rates were chosen as representative of currently permittable technology and from test data from similar units in operation. For the train haul scenario, for example, current fuel use and emission data for the Southern Pacific locomotive fleet were obtained, and grade-specific factors were generated through information received from Southern Pacific. Manufacturer test data were gathered from General Electric's files for the Kaiser locomotives, and specific fuel factors were computed from analyses of the grade profile from Ferrum Junction to Eagle Mountain. For the landfill gas flares, emission and equipment data from seven landfills tested by the South Coast Air Quality Management District were used to determine average emission rates for similar equipment design. Within the range of dust factors published by the Environmental Protection Agency in AP-42 and various research reports, values at the high end of those considered representative of on-site material and proposed processes were chosen.

In addition to estimating the emissions from the project, an assessment was made of the impact on ambient air quality which would result from these emissions. The maximum ground level impacts were determined for on-site operations. In addition, for the rail haul of waste, an at-grade crossing of street traffic in a residential area was evaluated and maximum ground level concentrations were determined.

To further maximize potential impacts, receptor sites closest to each source, or nearest the maximum groundlevel impact site, were selected for analysis. For the train haul scenario, the nearest receptor was represented as a hypothetical residence lying immediately outside the narrowest right-of-way width found along the line between Los Angeles and Ferrum Junction. For the on-site sources, the target receptor is selected as the one closest to the project's southern boundary.

Because digitized wind data are not available for the project site, worse case impact conditions were simulated by varying wind speeds across the spectrum found in this region and at a series of directions around the compass. Wind speeds and atmospheric stability modeling combinations, as specified by the Environmental Protection Agency, were used to determine the highest impacts irrespective of direction. Then, these conditions were combined with the wind directions blowing from project sources toward identified residences to estimate the highest concentrations to which members of the public might reasonably be exposed as a result of operation of the project.

The screening methodology outlined above estimates worse case concentrations for one-hour periods. However, the analysis of longer term averages is necessary as many of the state and federal ambient air quality standards are designed to be measured over these timeframes. In this type of screening analysis, longer term averages are computed from highest one-hour concentrations through the use of recommended Environmental Protection Agency conversion factors. These conversion factors are:

1-hour:	1.00
3-hour:	0.90
8-hour:	0.70
24-hour:	0.40
annual:	0.10

2. SELECTION OF AIR QUALITY MODELS

Air quality models are computer simulations which translate source-specific emission information into impacts on ambient air quality over local or regional areas. Several different approved models can be used to make this translation. Those which have been considered for the analysis are ISCST, COMPLEX I, PAL, and SHORTZ.

ISCST

The Industrial Source Complex (ISC) model is a steady-state Gaussian plume model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial source complex. This model can account for settling and dry deposition of particulates; downwash; point, area, line, and volume sources; plume rise as a function of downwind distance; separation of point sources; and limited terrain adjustment. The model cannot, however, accept receptor elevations exceeding the stack height, limiting its practical application to flat terrain sites. Since a critical receptor area for this project is the Class I area (Joshua Tree National Monument) rising above and to the north of the project, the ISC model was not used in the impact analysis.

COMPLEX I

The COMPLEX I model is a multiple point source steady-state Gaussian plume model which is recommended for use with complex (varying elevation) terrain. This model can use hourly meteorological data and produce output concentrations averaged over a number of time periods. The model cannot accommodate area and line source input data, and thus cannot account for all on-site sources associated with the project. For this reason, COMPLEX I was not used in the impact analysis.

PAL

The Point, Area, Line (PAL) source model is a short-term steady-state Gaussian plume model. The model is designed to accommodate combinations of point, area, and line sources for such projects as shopping centers and airports. The model has unique capabilities in handling curved line sources, but does not contain an algorithm for computing concentrations in complex terrain. Because of its inability to model impacts in varying topography such as is found at the project site, PAL was not used in the impact analysis.

SHORTZ

The SHORTZ model is a steady-state Gaussian plume model for use in flat or complex terrain. As designed by the Environmental Protection Agency, the model can accommodate point and area sources and produce output concentrations averaged over a variety of timeframes. As modified by Radian Corporation, a version of the model can also accommodate line sources. Line sources include truck and train traffic, and represent a large component of the project's emissions. In its revised form, the model has successfully completed qualifying tests and has been approved for use by the Environmental Protection Agency as an alternative methodology for computing concentrations in complex terrain. Because the revised version of SHORTZ contains those features needed in modeling impacts from all on-site project sources in flat and complex terrain, SHORTZ was selected and used in the impact analysis.

3. DISCUSSION OF SIGNIFICANCE CRITERIA

In attempting to evaluate the significance of air quality impacts of proposed projects, it is difficult to identify a single measure of significance. Some people believe that percentage changes in emissions are most critical, while others believe that changes in ambient concentrations are appropriate measures. Most air quality regulations are based on emissions, rather than ambient concentrations, due to uncertainties in the accuracy of available modeling techniques.

To assist in evaluating the impacts described in the preceding section, we should identify tools used by local, state and federal air quality agencies to determine whether a project's air quality impacts are significant. In addition, we should discuss other measurements of significance which have been suggested in other projects. The impacts of each of the project alternatives discussed above should then be compared with each of these measures.

Measures of significance for air quality impacts can generally be separated into four major categories:

- those used for the evaluation of industrial sources of pollution, prior to issuing permits to construct or operate, which rely on the comparison of potential emissions increases to established emissions thresholds;
- those used for the evaluation of industrial sources of pollution which rely on the comparison of potential increases in ambient pollutant concentrations to established "significance" thresholds;
- the limits of detection or reportability of ambient concentrations; and
- measures used in areas with severe air quality problems.

Each of these categories is discussed in more detail in the following sections.

Emissions Based Measures

Industrial facilities in California are required to undergo an extensive air quality analysis, known as "new source review", prior to being granted approval for construction. The new source review programs in California are carried out by local air pollution control districts.

The regulations which implement these new source review programs contain a number of thresholds which trigger various requirements for project applicants. These thresholds are expressed as emissions limitations (pounds per hour or tons per year). The thresholds vary from district to district, with the South Coast AQMD having the most stringent thresholds. One could construe these thresholds as assessments of the significance of a project's impacts, since a project with emissions below these levels is exempted from all (or a portion) of the review.

Therefore, one potential measure of the significance of emissions increases from the proposed project is the applicable new source review thresholds in the air quality district in which the project is located.

Concentration Based Measures

The federal Environmental Protection Agency administers a program under which proposed new and modified sources in clean air areas are reviewed for their impact on air quality before being granted permits to construct. This program, known as the "prevention of significant deterioration," or PSD, program, uses ambient concentration-based measures as well as emission thresholds to determine whether an emissions increase is significant. The concentration-based assessment of significance is used as a screening technique to determine the applicability of additional preconstruction data gathering and analysis requirements. The ambient concentration levels used by the EPA to measure significance could also be applied to modeled increases in ambient pollutant levels to decide whether the impacts of the project are significant.

Limits of Detection and Measurement Accuracy

A third category of measures of significance has to do with the ability of regulatory agencies to detect changes in concentrations of pollutants in the ambient air. This ability is a function of the limits of detection and the accuracy of the system used to analyze the air. The limit of detection for most pollutants is extremely small. Advances in analytical technology allow lower and lower concentrations of pollutants to be measured. In general, the more serious constraint has to do with the accuracy of the measurements.

The California Air Resources Board conducts periodic audits of the ambient air quality monitoring network throughout the state. The Board has established guidelines for the accuracy of these analyzers. If an analyzer is found to be operating outside of ARB's 10% limit for accuracy, an "advisory warning" is issued and a more thorough check is made of the analyzer's calibration data. If an analyzer is found to be operating outside of ARB's 15% limit for accuracy, the data collected by that analyzer are rejected unless the discrepancy can be explained and corrected.

In ARB's most recent published results of their field audits, they listed the average accuracy estimates for ambient monitors in California. While these accuracy tests were conducted at a variety of different concentrations, their use is most critical at or near the level of the ambient air quality standards. Consequently, one potential measure of "significance" for air quality impacts would be whether the difference in pollutant concentrations attributable to a project is above or below the accuracy of the average analyzer as estimated at the air quality standard for that pollutant.

A second, related measure has to do with the degree of precision to which the Air Resources Board maintains and reports ambient air quality concentrations. ARB selects their reporting precision based on a subjective evaluation of the precision of the analyzers, the accuracy of the analyzers, and the level of precision to which the ambient air quality standard is expressed. Thus, another measure of significance of air quality impacts would be whether the difference in pollutant concentrations attributable to the merger would change a number reported by the ARB.

Other Measures of Significance

One measure which has been suggested for use in areas with particularly difficult air quality problems is known as "the one molecule theory". Under this approach, it is assumed that because the existing air quality problem in a region is so severe, any increase in emissions or pollutant concentrations, even a single molecule, would constitute a significant increase. The purpose of this approach is generally to require mitigation of all projects which would result in any increase in emissions.

However, this approach tends to break down when evaluating the impacts of extremely small projects. For example, the addition of a stop sign at a traffic intersection would result in a small increase in emissions (and localized concentrations) of carbon monoxide. While there may be mitigation measures available which could reduce carbon monoxide emissions at another nearby location, there would always be an increase of at least one molecule of carbon monoxide right where the new stop sign is located. Under this example, if the one molecule theory were rigorously applied, one would have to conclude that the addition of the stop sign resulted in a significant impact and that this significant impact could not be mitigated.

A more practical application of the one molecule theory is to use it to determine <u>whether</u> mitigation should be required for a project in areas with severe air quality problems, but to rely on other measures of significance (or simply judgment) to evaluate the benefits of the mitigation measures.

Applicable regulations of the South Coast Air Quality Management District and the federal Environmental Protection Agency were reviewed, along with reports published by the California Air Resources Board, in order to develop the significance criteria used to evaluate the Eagle Mountain project. The selected criteria are shown in Tables 14 - 18 for ozone, oxides of nitrogen, carbon monoxide, sulfur dioxide, and fine particulate matter, respectively.

These criteria were applied to emissions from the "in basin" alternative, which was treated as a no project alternative, and to the Eagle Mountain and Alternate Desert Site alternatives. In addition, the latter cases were compared with emissions from the no project alternative, and the incremental effects were evaluated.

Table 14

Eagle Mountain Project
Measures of Significance for Hydrocarbons/Ozone

Agency	Level	Abbreviation	Comment
Hydrocarbon and NOx Emissions Based Measures - Industrial Sources			
South Coast AQMD	0 lbs/day	AQMD BACT	level above which BACT is reqd. for new/mod facility
South Coast AQMD	75 lbs/day	AQMD offsets	level above which offsets are required
South Coast AQMD	100 tons/year	AQMD major NSR	definition of major stationary source (NSR)
South Coast AQMD	25 tons/year	AQMD major PSD	definition of major stationary source (PSD)
South Coast AQMD	25 tons/year	AQMD sig incr PSD	definition of significant emission increase (PSD)
EPA	100 tons/year	EPA major source	definition of major stationary source
EPA	40 tons/year	EPA major mod	definition of major modification
Ozone Measurement Accuracy and Reporting Precision			
CARB	0.54 pphm	ARB accuracy	ARB measured accuracy of 6.0% times 9 pphm standard
CARB	1 pphm	ARB reporting	precision to which ARB reports concentrations
Other Measures			
none	0 lbs/day	Zero molecule	the zero molecule theory (see text)

Table 15

Eagle Mountain Project
Measures of Significance for Oxides of Nitrogen

Agency	Level	Abbreviation	Comment
Emissions Based Measures - Industrial Sources			
South Coast AQMD	0 lbs/day	AQMD BACT	level above which BACT is reqd. for new/mod facility
South Coast AQMD	100 lbs/day	AQMD offsets	level above which offsets are required
South Coast AQMD	100 tons/year	AQMD major NSR	definition of major stationary source (NSR)
South Coast AQMD	25 tons/year	AQMD major PSD	definition of major stationary source (PSD)
South Coast AQMD	25 tons/year	AQMD sig incr PSD	definition of significant emission increase (PSD)
EPA	100 tons/year	EPA major source	definition of major stationary source
EPA	40 tons/year	EPA major mod	definition of major modification
Concentration Based Measures - Industrial Sources			
South Coast AQMD	10 ug/m3 ann	AQMD Class I ann	allowable increment for Class I areas (parks)
EPA	10 ug/m3 ann	EPA Class I ann	significant impact on a Class I area
EPA	14 ug/m3 ann	EPA de minimus ann	level below which ambient monitoring is not required
EPA	1 ug/m3 ann	EPA sig ann	significant air quality impact in nonattainment areas
Measurement Accuracy and Reporting Precision			
CARB	0.18 pphm 1-hr	ARB accuracy 1h	ARB measured accuracy of 0.7% times 25 pphm standard
CARB	1 pphm 1-hr	ARB report 1h	precision to which ARB reports concentrations
CARB	0.1 pphm ann	ARB report ann	precision to which ARB reports concentrations
Other Measures			
none	0 lbs/day	Zero molecule	the zero molecule theory (see text)

Table 16

Eagle Mountain Project
Measures of Significance for Carbon Monoxide

Agency	Level	Abbreviation	Comment
Emissions Based Measures - Industrial Sources			
South Coast AQMD	0 lb/day	AQMD BACT	level above which BACT is reqd. for new/mod facility
South Coast AQMD	550 lbs/day	AQMD offset	level above which offsets are required
South Coast AQMD	100 tons/year	AQMD major NSR	definition of major stationary source (NSR)
South Coast AQMD	25 tons/year	AQMD major PSD	definition of major stationary source (PSD)
South Coast AQMD	25 tons/year	AQMD sig incr PSD	definition of significant emission increase (PSD)
EPA	100 tons/year	EPA major source	definition of major stationary source
EPA	100 tons/year	EPA major mod	definition of major modification
Concentration Based Measures - Industrial Sources			
EPA	1 ug/m3 24-hr	EPA Class I 24h	significant impact on a Class I area
EPA	575 ug/m3 8-hr	EPA de minimus 8h	level below which ambient monitoring is not required
EPA	500 ug/m3 8-hr	EPA sig 8h	significant impact in nonattainment areas
EPA	2000 ug/m3 1-hr	EPA sig 1h	significant impact in nonattainment areas
Measurement Accuracy and Reporting Precision			
CARB	0.02 ppm 1-hr	ARB accuracy 1h	ARB measured accuracy of 0.1% times 20 ppm standard
CARB	1 ppm 1-hr	ARB report 1h	precision to which ARB reports concentrations
CARB	0.1 ppm 8-hr	ARB report 8h	precision to which ARB reports concentrations
Other Measures			
none	0 lbs/day	Zero molecule	the zero molecule theory (see text)

Table 17

Eagle Mountain Project
Measures of Significance for Sulfur Dioxide

Agency	Level	Abbreviation	Comment
Emissions Based Measures - Industrial Sources			
South Coast AQMD	0 lbs/day	AQMD BACT	level above which BACt is reqd. for new/mod facility
South Coast AQMD	150 lbs/day	AQMD offsets	level above which offsets are required
South Coast AQMD	100 tons/year	AQMD major NSR	definition of major stationary source (NSR)
South Coast AQMD	25 tons/year	AQMD major PSD	definition of major stationary source (PSD)
South Coast AQMD	25 tons/year	AQMD sig incr PSD	definition of significant emission increase (PSD)
EPA	100 tons/year	EPA major source	definition of major stationary source
EPA	40 tons/year	EPA major mod	definition of major modification
Concentration Based Measures - Industrial Sources			
South Coast AQMD	2 ug/m3 ann	AQMD Class I ann	allowable increment for Class I areas (parks)
South Coast AQMD	5 ug/m3 24-hr	AQMD Class I 24h	allowable increment for Class I areas (parks)
South Coast AQMD	25 ug/m3 3-hr	AQMD Class I 3h	allowable increment for Class I areas (parks)
EPA	2 ug/m3 ann	EPA Class I ann	allowable increment for Class I areas (parks)
EPA	5 ug/m3 24-hr	EPA Class I 24h	allowable increment for Class I areas (parks)
EPA	25 ug/m3 3-hr	EPA Class I 3h	allowable increment for Class I areas (parks)
EPA	13 ug/m3 24-hr	EPA de minimus 24h	level below which ambient monitoring is not required
EPA	1 ug/m3 ann	EPA sig ann	significant air quality impact in nonattainment areas
EPA	5 ug/m3 24-hr	EPA sig 24h	significant air quality impact in nonattainment areas
EPA	25 ug/m3 3-hr	EPA sig 3h	significant air quality impact in nonattainment areas
Measurement Accuracy and Reporting Precision			
CARB	0.33 pphm 1-hr	ARB accuracy 1h	ARB measured accuracy of 1.3% times 25 pphm standard
CARB	1 pphm 1-hr	ARB reporting 1h	precision to which ARB reports concentrations
Other Measures			
none	0 lbs/day	Zero molecule	the zero molecule theory (see text)

Table 18

Eagle Mountain Project
Measures of Significance for Fine Particulates (PM10)

Agency	Level	Abbreviation	Comment
Emissions Based Measures - Industrial Sources			
South Coast AQMD	0 lbs/day	AQMD BACT	level above which BACT is reqd. for new/mod facility
South Coast AQMD	150 lbs/day	AQMD offsets	level above which offsets are required
South Coast AQMD	100 ton/year	AQMD major NSR	definition of major stationary source (NSR)
South Coast AQMD	25 tons/day	AQMD major PSD	definition of major stationary source (PSD)
South Coast AQMD	15 ton/year	AQMD sig incr PSD	definition of significant emission increase (PSD)
EPA	100 tons/year	EPA major source	definition of major stationary source
EPA	15 tons/year	EPA major mod	definition of major modification
Concentration Based Measures - Industrial Sources			
South Coast AQMD	5 ug/m3 ann	AQMD Class I ann	allowable increment for Class I areas (parks)
South Coast AQMD	10 ug/m3 24-hr	AQMD Class I 24h	allowable increment for Class I areas (parks)
EPA	5 ug/m3 ann	EPA Class I ann	allowable increment for Class I areas (parks)
EPA	10 ug/m3 24-hr	EPA Class I 24h	allowable increment for Class I areas (parks)
EPA	10 ug/m3 24-hr	EPA de minimus 24h	level below which ambient monitoring is not required
EPA	1 ug/m3 ann	EPA sig ann	definition of a significant air quality impact
EPA	5 ug/m3 24-hr	EPA sig 24h	definition of a significant air quality impact
Measurement Accuracy and Reporting Precision			
CARB	1.2 ug/m3 24-hr	ARB accuracy 24h	ARB measured accuracy of 2.4% times 50 ug/m3 std.
CARB	1 ug/m3 24-hr	ARB reporting 24h	precision to which ARB reports concentrations
CARB	0.1 ug/m3 ann	ARB reporting ann	precision to which ARB reports concentrations
Other Measures			
none	0 lbs/day	Zero molecule	the zero molecule theory (see text)

4. PROJECT IMPACTS

A. Proposed Action

1) Emissions Impacts

Emissions from the Proposed Action will be associated with a number of activities. These activities will occur both offsite, such as the operation of urban transfer stations, and on-site, including all of the operations at the Eagle Mountain site. They will involve both stationary sources, such as the landfill gas flares, and mobile equipment, such as the trains hauling waste. By emission type, project sources can be grouped into four classes: motor vehicles, fugitive dust sources, fugitive vapor sources, and stationary combustion sources. Motor vehicles include train locomotives, on-highway haul trucks, and off-highway highway equipment. Fugitive dust sources include short-term construction activities, landfill road use, mine tailing reclamation, and solid waste covering. Fugitive vapor sources include the landfill, and stationary combustion sources include the landfill gas flares.

Motor vehicles will generate "tailpipe" emissions and, in the case of on-site vehicles, fugitive dust from unpaved roads and cover material handling. Processing of daily cover material will produce particulate emissions as ore tailing are reclaimed by screening and crushing. As the refuse begins to decompose, gas will be generated by the anaerobic activity in the landfill. The gas will consist primarily of methane and carbon dioxide with trace concentrations of other substances either produced by the bacterial activity or evaporated from materials disposed of in the landfill. The gas will be collected through a series of underground pipes and will be disposed of by flaring. The burning of the landfill gas in flares will result in the production of combustion emissions. Each of these sources is discussed in more detail below.

Construction Operations

Temporary emissions will be produced during the construction of project facilities. At both on-site and offsite locations, fugitive dust and construction equipment exhaust will be generated. As these emissions will be temporary and, for fugitive dust, readily controllable, they are not considered to be significant.

Some new transfer stations processing and shipping solid waste may be constructed in the South Coast Air Basin. These sites may require demolition of existing structures, excavation for new foundations, and disturbance of soil areas during construction. Fugitive dust and exhaust emissions from construction equipment will be generated. Soil that is carried out of construction sites and dropped onto paved roads will generate fugitive dust as it is pulverized by vehicle tires and suspended by the air turbulence created by moving vehicles.

In developing the Eagle Mountain facility for the long term handling of solid waste, a new container handling yard, rail spur, and access road will be constructed. All three facilities will require the placement of significant quantities of structural base aggregate due to the low carrying capacity of desert soils at the site. The transfer and placement of native and imported aggregate will generate fugitive dust and vehicle exhaust emissions for a limited period of time.

Solid waste will be transported from the container handling yard to the active face of the landfill over a packed gravel road surrounding the landfill pit. Initial construction of this road, and spurs accessing it, will generate fugitive dust and vehicle exhaust emissions for a limited period of time. During the life of the East Pit, the main and spur roads will be periodically reconstructed as the road surface rises up the pit walls with the landfill surface and eventually lies on the landfill flanks. Although emissions from initial construction were not quantified, the emissions from road reconstruction will contribute to total on-site impacts during peak operation and are quantified below.

To periodically check the quality of groundwater under the landfill, monitoring wells will be drilled at the commencement of project operations. Prior to drilling, fugitive dust and exhaust emissions will be generated as a crawler tractor levels pads and the drills are moved into place. During initial drilling of each hole, some dust will be generated as the drill cuts into soil within the first three to five feet below the surface.

During the period of waste disposal and afterward, leachate from deposited waste will be collected and treated. Pipelines will carry leachate collected by the landfill liner to a wastewater pretreatment plant. The pretreatment plant will consist of a facility for the removal of floating oil and grease and grit. Effluent from the pretreatment plant will be directed to the existing plant which served the community of Eagle Mountain during Kaiser Steel's operation of the mine. Prior to project startup, the connecting pipeline will be constructed. This work will involve excavation for project components and disturbance of soil areas from the passage of construction equipment. These activities will generate fugitive dust and exhaust emissions.

To minimize the quantity of leachate collected and treated, a network of ditches and pipelines will capture and divert storm water falling in and around the landfill. Construction of this system will generate fugitive dust and exhaust emissions for a limited period of time. During the life of the project, surface ditches will require periodic maintenance to remove sloughed material. Although emissions from initial construction were not quantified, the emissions from maintenance will contribute to total on-site impacts during peak operation and are quantified below.

Prior to project startup, on-site facilities for the inspection of solid waste and storage of recycled components will be constructed. Construction of these facilities will generate fugitive dust and exhaust emissions for a limited period of time.

To comply with South Coast Air Quality Management District Rule 403, standard dust control measures such as prewatering will be used in the mitigation of fugitive dust from each of the activities listed above. Water will be obtained from existing wells located at the project site. Control effectiveness will be monitored visually by District inspectors and project supervisors. The application of water to travelled surfaces and exposed soil will be adjusted to maintain very low levels of visible emissions without creating mud. Mud carried offsite and deposited on paved roads will produce fugitive dust when dry.

Transfer Stations

During project operation, urban transfer stations will be used to segregate recyclables and hazardous materials, and to compact waste components. Streams destined for recycling may be temporarily stored on-site and periodically shipped to processors. When market demand is low for such materials, recyclables may be shipped to Eagle Mountain for storage pending sale. Nonrecyclable waste will be shipped from the transfer stations by rail for ultimate disposal at Eagle Mountain. Each transfer station will be served directly by a rail spur or be located near one. Containerized waste will be transferred by truck to railheads from those stations not directly served by rail.

Emissions are generated at the transfer stations by the operation of on-site vehicles. Diesel-powered construction equipment will be used to load segregated waste into compactors, load filled containers onto trucks or rail cars, and spot rail cars for loading. Where rail sidings are separated from transfer stations, truck and trailer combinations will be used to move containers offsite to railcars. A summary of equipment activity rates, emission factors, and daily emissions from a typical transfer site appears in Table 19. Corresponding data for all seven of the anticipated transfer stations appears in Table 20.

Solid Waste Transport

Solid waste will be transported to Eagle Mountain by two modes: trains and trucks. Approximately 80% of the waste will be transported by train, primarily from the Los Angeles basin, while the remainder will be hauled from central or eastern Riverside County by truck. Waste will arrive at Eagle Mountain in 25 ton containers compacted at urban transfer sites. Both transportation modes will produce exhaust emissions from the combustion of diesel fuel in internal combustion engines.

Table 19

Eagle Mountain Project
Transfer Station Emissions (Single Station)
Proposed Project Without Mitigation

Vehicle Type	Number	Hr/Day	Fuel Gal/Hr	Location
Rubber-tired Loader	3	20	6	All stations
Container Handler	2	20	6	Truck-access stations
Train Car Spotter	1	5	7	Rail-access stations

Vehicle Type	Emission Factors (lb/1000 gal)*				
	NOx	CO	PM10	VOC	SO2
Rubber-tired Loader	325.18	81.00	31.70	23.48	33.54
Container Handler	325.18	81.00	31.70	23.48	33.54
Train Car Spotter	466.05	287.22	49.70	68.87	33.30

Vehicle Type	Emissions (lb/day)				
	NOx	CO	PM10	VOC	SO2
Rubber-tired Loader	117.07	29.16	11.41	8.45	12.07
Container Handler	78.04	19.44	7.61	5.63	8.05
Train Car Spotter	16.31	10.05	1.74	2.41	1.17
Total	211.42	58.65	20.76	16.50	21.29

Reference:

*"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), Table 7-1 converted to lbs/1000 gal. based on 0.4 lbs fuel/BHP and 7.1 lbs/gal. fuel.

Table 20

Eagle Mountain Project
Transfer Station Emissions (Total)
Proposed Project Without Mitigation

Vehicle Type	Number	Hr/Day	Fuel Gal/Hr
Rubber-tired Loader	21	20	7
Container Handler	12	20	6
Train Car Spotter	2	5	7

Vehicle Type	Emission Factors (lb/1000 gal)* NOx	CO	PM10	VOC	SO2
Rubber-tired Loader	325.18	81.00	31.70	23.48	33.54
Container Handler	325.18	81.00	31.70	23.48	33.54
Train Car Spotter	466.05	287.22	49.70	68.87	33.30

Vehicle Type	Number	Mileage Per Day
Transfer Truck/Trailer	24	450

Vehicle Type	Emission Factors (gm/VMT)** NOx	CO	PM10	VOC	SO2
Transfer Truck/Trailer	15.65	7.40	2.28	2.44	3.21

Vehicle Type	Emissions (lb/day) NOx	CO	PM10	VOC	SO2
Rubber-tired Loader	906.28	225.75	88.34	65.44	93.46
Transfer Truck/Trailer	372.72	176.11	54.20	58.17	76.45
Container Handler	468.26	116.64	45.64	33.81	48.29
Train Car Spotter	32.62	20.11	3.48	4.82	2.33
Total	1779.88	538.61	191.66	162.24	220.54

References:

*"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), Table 7-1 converted to lbs/1000 gal. based on 0.4 lbs fuel/BHP and 7.1 lbs/gal. fuel.

**California Air Resources Board's EMFAC7D/BURDEN7B models for 1995 calendar year, Southeast Desert Air Basin

Waste processed at urban transfer stations will be transported in unit trains over Southern Pacific and Eagle Mountain track. The trains will consist of 14 articulated cars, each capable of carrying 10 containers. Southern Pacific will pick up the loaded cars at urban transfer sites and ferry them to a siding near Ferrum Junction, where the Eagle Mountain spur line intersects. Eagle Mountain engines will hook up to the unit trains at Ferrum Junction and transport them to the container handling yard at the landfill facility.

Diesel locomotive emissions vary proportionately with fuel consumption. Fuel consumption is dependent upon the weight of the train being pulled and the vertical grade of the track. Because the transfer station to landfill route carries trains over two passes, fuel consumption and emissions are not constant over each section of the route. Therefore, separate fuel consumption estimates were generated for flat and inclined portions of the route. Also, as locomotives having different emission factors will be used on the Southern Pacific and Eagle Mountain portions of the route, care was taken to apply the appropriate factors to each portion. A summary of fuel use and emissions for portions of the route operated by the two carriers is shown in Table 21. This operation represents an average day with 4.7 trains making the round trip.

An estimated 20% (4000 tons per day) of waste will be transported to the project site by on-highway trucks. It is anticipated that within 75 miles driving distance from the project, the cost of transporting solid waste in containers from transfer stations using tractor-trailers will be less expensive than shipping it by rail. As a result, up to 100 trucks will make two trips per day to the project site with 20-25 ton loads. An analysis of the emissions from this activity, calculated at a maximum daily trip distance of 300 miles per truck, appears in Table 22.

On-Site Material Handling (except Fugitive Dust)

As a category, on-site construction equipment is the largest source of gaseous emissions on the project site. Cumulatively, on-site construction equipment consumes nearly 8,000 gallons of diesel fuel per day. Nearly 30% of this fuel is consumed by the fleet of trucks which will haul containers from the rail line to the landfill face, while the remainder is distributed among five other general categories of operations. The emission rates of equipment grouped within these categories are listed in Table 23.

At the peak of landfill activity, container haul trucks will be in almost constant motion. The disposal of 20,000 tons of solid waste in 20-25 ton containers will require 800-840 trips by the truck fleet each day between the container handling yard and the active face of the landfill. Operating during 10 hours of daylight each day, the 32 trucks will each complete a circuit of loading and dumping every 23-24 minutes.

Table 21

Eagle Mountain Project
Train Emissions - Average Operating Day
Proposed Project Without Mitigation

System	Fuel Use (gal/locomotive)	Number of Locomotives	Fuel Use (gal/trip)
Southern Pacific			
Basin to Ferrum	489	4	1956
Ferrum to Basin	570	2	1140
		Total	3096
Eagle Mountain			
Ferrum to Landfill	403	3	1209
Landfill to Ferrum	83	3	249
		Total	1458

	Pollutant				
	NOX	CO	PM10	VOC	SO2
Southern Pacific					
Emission Factor (lb/1000 gal)*	558	226	13	38.4	71
Emissions (lb/train)	1728	700	40	119	220
Emissions (lb/day)	8120	3289	189	559	1033
Emissions (tons/yr)	1482	600	35	102	189
Eagle Mountain					
Emission Factor (lb/1000 gal)^	403	162	17	63	71
Emissions (lb/train)	588	236	25	92	104
Emissions (lb/day)	2762	1110	116	432	487
Emissions (tons/yr)	504	203	21	79	89
Total System					
Emissions (lb/train)	2315	936	65	211	323
Emissions (lb/day)	10881	4399	306	990	1520
Emissions (tons/yr)	1986	803	56	181	277

References:

*"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), factors for mixed GE and EMD locomotives.

^"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), factors for GE locomotives.

Table 22

Eagle Mountain Project
Delivery Truck Emissions
Proposed Project Without Mitigation

Truck Delivery Rate =	4000	tons/day
Truck Capacity =	20	tons/trip
Trip Length (round trip) =	150	miles
Total Haul Miles =	30000	miles/day

On-Highway Trucks	NOX	CO	PM10	VOC	SO2
Emission Factors, gm/VMT*	15.65	7.40	2.28	2.44	3.21
Total Emissions, lb/day	1035.32	489.18	150.55	161.59	212.36
Total Emissions, ton/yr	188.95	89.28	27.48	29.49	38.76

Reference:

*California Air Resources Board's EMFAC7D/BURDEN7B models for 1995 calendar year, Southeast Desert Air Basin

TABLE 23

Eagle Mountain Project
Onsite Mobile Equipment Exhaust Emissions
Proposed Project Without Mitigation

			Fuel	Emission Factors (lb/1000 gal)*					Emissions (lb/day)				
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
CONTAINER HANDLING YARD	------	------	------	---	--	----	---	---	---	--	----	---	---
Overhead Crane	4	11	7	487.19	195.27	35.22	23.09	36.47	150.05	60.14	10.85	7.11	11.23
Container Handler	2	10	6	325.18	81.00	31.70	23.48	33.54	39.02	9.72	3.80	2.82	4.02
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
WASTE HAULING	------	------	------	---	--	----	---	---	---	--	----	---	---
Container Hauler	32	10	7	318.92	89.22	19.57	14.48	34.83	714.38	199.85	43.83	32.43	78.01
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
LANDFILL FACE	------	------	------	---	--	----	---	---	---	--	----	---	---
Crawler Tractor	10	10	14	258.27	64.57	27.00	14.48	33.30	361.57	90.39	37.80	20.27	46.62
Refuse Compactor	12	10	16	463.32	208.57	30.52	34.44	39.13	889.57	400.46	58.60	66.12	75.13
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
COVER EXCAVATION	------	------	------	---	--	----	---	---	---	--	----	---	---
Rubber-Tired Loader	2	10	11	325.18	81.00	31.70	23.48	33.54	71.54	17.82	6.97	5.17	7.38
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
COVER HAULING	------	------	------	---	--	----	---	---	---	--	----	---	---
Off-Highway Truck	5	10	7	318.92	89.22	19.57	14.48	34.83	111.62	31.23	6.85	5.07	12.19
APPLICATION OF	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
DAILY COVER	------	------	------	---	--	----	---	---	---	--	----	---	---
Crawler Tractor	3	10	14	258.27	64.57	27.00	14.48	33.30	108.47	27.12	11.34	6.08	13.99

TABLE 23 (Continued)

Eagle Mountain Project
Onsite Mobile Equipment Exhaust Emissions
Proposed Project Without Mitigation

			Fuel	Emission Factors (lb/1000 gal)*					Emissions (lb/day)				
DUST CONTROL AND	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
ROAD MAINTENANCE	------	------	------	---	--	----	---	---	---	--	----	---	---
12,000-Gal Tanker	2	11	20	318.92	89.22	19.57	14.48	34.83	140.33	39.26	8.61	6.37	15.32
Motor Grader	2	10	7	279.40	60.26	24.65	14.09	34.20	39.12	8.44	3.45	1.97	4.79
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
LINER CONSTRUCTION	------	------	------	---	--	----	---	---	---	--	----	---	---
Frontend Loader	1	8	5	325.18	81.00	31.70	23.48	33.54	13.01	3.24	1.27	0.94	1.34
Pugmill	1	8	10.5	392.10	178.83	35.22	43.04	36.47	32.94	15.02	2.96	3.62	3.06
Dump Truck	1	8	6	318.92	89.22	19.57	14.48	34.83	15.31	4.28	0.94	0.69	1.67
Crawler Tractor	1	8	6	258.27	64.57	27.00	14.48	33.30	12.40	3.10	1.30	0.69	1.60
Compactor	1	8	6	463.32	208.57	30.52	34.44	39.13	22.24	10.01	1.47	1.65	1.88
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
BENCH CLEARING	------	------	------	---	--	----	---	---	---	--	----	---	---
Crawler Tractor	1	8	6	258.27	64.57	27.00	14.48	33.30	90.39	22.60	9.45	5.07	11.66
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
MISCELLANEOUS	------	------	------	---	--	----	---	---	---	--	----	---	---
Backhoe	1	2	3	466.05	287.22	49.70	68.87	33.30	2.80	1.72	0.30	0.41	0.20
Utility Truck	1	2	5	318.92	89.22	19.57	14.48	34.83	3.19	0.89	0.20	0.14	0.35
Grader	1	2	5	279.40	60.26	24.65	14.09	34.20	2.79	0.60	0.25	0.14	0.34
						GRAND TOTAL, lb/day			2820.7	945.9	210.2	166.8	290.8
								tons/yr	514.8	172.6	38.4	30.4	53.1

Reference:

*"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), Table 7-1 converted to lbs/1000 gal. based on 0.4 lbs fuel/BHP and 7.1 lbs/gal. fuel.

In the container handling yard, overhead cranes and container handlers will also operate continuously during peak periods. Cranes will transfer loaded waste containers from rail cars and tractor-trailers to container haul trucks and empty containers from returning haul trucks back to rail cars and tractor-trailers. All of this transfer equipment will be powered by diesel engines and generate exhaust emissions during operation.

Another area of concentrated mobile source activity will be the landfill face itself. In the area where final waste deposition occurs, twenty-five units of construction equipment will operate simultaneously. Crawler tractors will distribute dumped waste to shape the fill, while compactors will roll over the graded surface to develop the desired volume reduction of deposited material. After final compaction of waste, crawler tractors will spread and compact a layer of cover material.

Prior to the placement of waste in the mine pit, a mineral liner will be installed as a part of the leachate collection system. The bulk of liner material will derive from reclaimed fine tailing created during operation of the former iron mine. This material will be excavated by frontend loader from former settling ponds and fed to a wet mixer for blending with bentonite or other clay binder. Exhaust emissions will be produced by the frontend loader in excavating the tailing, by the pugmill mixer in preparing the liner mixture, by a dump truck in transporting the slurry to the pit, by a crawler tractor in shaping the material into a constant-thickness blanket, and by a compactor in rolling over the blanket to compress it.

The project will also reclaim coarse tailing on site to produce cover material for the waste. In this operation, a frontend loader will excavate material from storage piles and feed it to a stationary crushing plant. The crushed product will be transported by dump truck to the landfill face, where it will be spread and compacted. Exhaust emissions will be produced by each piece of equipment in the process, with the exception of the crushing plant, which will be electrically powered.

A separate fleet of vehicles will be used onsite to maintain the roadways used to transport liner, waste, and cover material. Two water trucks will wet roadway surfaces continuously during landfill operations to mitigate fugitive dust emissions and enhance compaction of surface material. As the main roads providing access to the working face of the landfill will be constructed in part on the landfill surface itself, frequent reconstruction will occur as the surface of the fill rises from the bottom of the pit. Graders will be used to apply new courses to road surfaces. All of these vehicles will generate exhaust emissions in the pit area during the life of the project.

In the excavation of ore by the former mining operation, benches were cut into the pit walls to catch falling rocks and to provide temporary roads for mine vehicles. These benches now harbor significant accumulations of loose rock which limit their ability to provide protection from falling rock to work forces in the lower portions of the pit. To regain a measure of safety, a crawler tractor will be used to push accumulated debris off of each bench prior to commencing waste disposal in that portion of pit below. Exhaust emissions from this vehicle will be generated during operation.

A network of perforated pipes will be installed throughout the deposited waste to collect and dispose of landfill gas generated by waste decomposition. Trenches will be excavated weekly in fresh waste deposits for the installation of horizontal pipe runs. Exhaust emissions will be generated by a backhoe and a grader used in the installation effort.

Landfill Gas Generation and Combustion

Landfill gas will be formed over time as waste decomposes. In the absence of oxygen, hydrocarbon wastes will break down to form predominantly carbon dioxide and methane. Trace quantities of toxic gases will also be formed by these processes. As discussed in the Section on Public Safety, the landfill gas collection system is assumed to capture approximately 80% of the gas generated. Captured gas will be piped to a combustion system for incineration. The remainder of the gas will escape the landfill through cracks in the cover layers.

The gas combustion system will initially use flares to burn the methane and toxic gases. The flares will be designed to mix the landfill gas with air and burn it in an open-topped chamber. Auxiliary fuel will be added when the energy content of the landfill gas is too low to maintain combustion. As the generation rate of landfill gases increases with the increasing age of deposited waste, the economics of recovering energy from the combustion of the gas will become more attractive. At some point during the life of the project, an energy recovery system will be substituted for the flares. The earliest date forecast for conversion is 1999, but this data is uncertain, due to uncertainties in estimating gas generation rates in an arid climate. Consequently, the project will be applying for permits to use only flares for landfill gas disposal. If a conversion to energy recovery equipment is proposed in the future, the impacts of that system will be the subject of a supplemental environmental review.

Most of the data existing on the generation rates of landfill gas come from studies conducted in the South Coast Air Basin. On the basis of this information, it is estimated that the project will generate between 18,000 and 46,000 cubic feet of gas per minute of landfill gas after 35 years of operation. While the factors which influence landfill gas production are not well understood, research data suggests that production rates increase with increased precipitation. Thus, because precipitation rates are lower at the project than in the coastal areas where landfill test data were collected, the gas generation rate for the project is expected to be at the lower end of the range of historical data. In order not to underestimate project impacts, however, the gas flow rate used in this analysis was that at the upper end of this range.

Limited data collected from landfill gas flares in the South Coast Air Basin show criteria pollutant emissions to vary significantly from flare to flare. These variations are most likely due to differences in construction and operation of the flares and to variations in the mixture of gases generated by each landfill. Standards for flare construction adopted by the South Coast Air Quality Management District in recent years and improvements in combustion technology will reduce some of the emission variability in new flares. In selecting emission factors representative of the flares proposed, data from source tests, South Coast Air Quality Management District regulations, and an equipment manufacturer's guarantee were reviewed. These data are summarized in Table 24, with a best estimate of flare emission factors based upon project design. Criteria emission rates from the flares, based upon maximum gas production rates and estimated emission factors, are shown in Table 25.

Trace quantities of toxic gases are contained in landfill gas and will be emitted from both cracks in the landfill surface and from the gas flares. The data collected by South Coast Air Quality Management District at a number of landfills shows concentrations of toxic gases in raw landfill gas to vary widely from site to site (see Table X-3, Public Safety). As all of these gases are organic, a sizable fraction of each of them will be incinerated as landfill gas is burned in the flare system. Data from South Coast Air Quality Management District testing indicates that destruction efficiencies in flares for these gases range from 70% to 99%+ with a majority of tests showing efficiencies above 99.0%. Emission rates of toxic gases from the landfill and from the flares at maximum landfill gas production rates are shown in Table 26. In this table, the maximum concentration of each toxic gas listed in Table X-3 and the average of 99.0% destruction efficiency were assumed for a worse case analysis.

Table 24

Eagle Mountain Mine Project
Gas Flare Emission Factors
(lb/MMBTU)

Units	NOx	CO	ROG	SO2	PM10
SCAQMD BACT (1)	0.060	NA	NA	NA	NA
Vendor Data (2)	0.060	0.290	NA	NA	0.024
Puente Hills (3)	0.083	0.068	0.080	0.011	NA
BKK (4)	0.013	0.482	0.022	0.005	0.073
Milliken (5)	0.141	0.132	0.136	NA	NA
Best Estimate	0.060	0.290	0.060	0.011	0.024

Notes:
(1) South Coast Air Quality Management District Best Available Control Technology Guidelines, January 1990
(2) Manufacturer's Guarantee
(3) California Air Resources Board Source Test, July 1986
(4) California Air Resources Board Source Test, July 1986
(5) South Coast Air Quality Management District Source Test, July 1988
(6) Best estimate factors reflect BACT levels for NOx, data for CO and PM10, average of CARB tests for ROG, and highest SO2 levels.

Table 25

Eagle Mountain Project
Landfill Gas Flare Emissions
Worst Case/Maximum Gas Generation Rate

Landfill Gas Production Rate = 46000 scfm
= 66.24 MMscf/day
Heat Content = 425 BTU/scf
Heat Input = 1173 MMBTU/hr

	NOx	CO	PM10	VOC	SO2
Emission Factors (lb/MMBTU)	0.060	0.290	0.024	0.060	0.011
Mitigation Efficiency:*	30%	90%		50%	
Emissions					
(lb/hr)	49.3	34.0	28.2	35.2	12.9
(lb/day)	1182.4	816.4	675.6	844.6	309.7
(tons/yr)	215.8	149.0	123.3	154.1	56.5

*Reflects urea injection for NOx control, oxidation catalyst for CO control at maximum gas generation rate.

Table 26

Eagle Mountain Project
Toxic Gas Emissions
Proposed Project Without Mitigation

Landfill Gas Production Rate = 46000 scfm
= 66.24 MMscf/day
Gas Collection Efficiency = 80%
Flare Gas Feed Rate = 36800 scfm
Fugitive Gas Release = 9200 scfm
Flare Efficiency = 99.0%
Catalyst Efficiency = 0.0% (worst case assumption)

Toxic Gas	Mole. Weight	Max. Conc. (ppb)	Flare Feed (lb/hr)	Flare Emission (lb/hr)	Fugitive Landfill Emission (lb/hr)	Total Emission (lb/hr)
Vinyl Chloride	62.50	12900	4.69	0.047	1.17	1.22
Benzene	78.11	11000	5.00	0.050	1.25	1.30
Dibromoethane	173.86	6	0.01	0.000	0.00	0.00
Dichloroethane	98.96	552	0.32	0.003	0.08	0.08
Dichloromethane	84.94	43000	21.24	0.212	5.31	5.52
Tetrachloroethene	165.83	53100	51.21	0.512	12.80	13.31
Tetrachloromethane	153.84	16	0.01	0.000	0.00	0.00
Tricloroethane	133.42	580	0.45	0.005	0.11	0.12
Trichloroethylene	131.40	15500	11.84	0.118	2.96	3.08
Tricloromethane	119.39	18	0.01	0.000	0.00	0.00

Fugitive Dust

Almost all project activities which involve the use of mobile equipment will generate fugitive dust. Although the solid waste will not be dry enough or have a sufficient fraction of fine material to contribute measurably to particulate emissions, the movement of vehicles over any surface within the project's boundaries will cause air pollution. Material spilled onto paved roads will be ground and suspended by traffic. The surface of unpaved roadways will abrade and become airborne with the passage of vehicles. Fine particles in the fine and coarse tailing will become airborne with the handling of these materials. The overhead cranes in the container handling yard, moving on suspended guideways, are possibly the only items of mobile equipment which will not produce fugitive dust while operating. Although mitigation techniques can significantly reduce particulate emissions from all sources, such emissions cannot be eliminated fully. A summary of computed fugitive dust emissions from the project appears in Table 27.

The emission rate of fugitive dust from roadway surfaces will be dependent upon a number of roadway and vehicle characteristics. Research indicates that the mass of fine particles within the loose material on a road surface will be the most significant parameter in the emission equation. This mass tends to be small on paved roads as the asphalt or concrete do not significantly abrade with traffic flow. Instead, the major sources of loose material on paved project road will be material dropped from vehicles previously travelling over bare earth areas, spillage of cover or liner material from haul trucks, tire wear, and dust fallout from nearby sources. In the case of unpaved roads, loose surface material will be generated primarily by the tire friction of passing vehicles on easily eroded soil particles. Additionally, the grinding action of tire friction will reduce the particle size of loose surface material, whether on paved or unpaved roads, until a point is reached where particles will be readily entrained in the turbulent wakes of passing vehicles.

The characteristics of the passing vehicles will also dictate the amount of PM10 generated with traffic flow. As the entraining forces on surface particles are dependent upon wind velocities generated by passing vehicles, vehicle speed will have a large influence on emission rates. Some surface particles in a vehicle's track will be thrown into the air by the passage of tires over that portion of the roadway. As a result, the number and size of tires on each vehicle will influence emission rates. The volume of traffic on a road surface will have a direct impact on emission rates over time. Finally, as the grinding action of tires is influenced by the pressure of the tires against a road's surface, the weight of each vehicle will have an influence on its fugitive dust emission rate.

TABLE 27

Eagle Mountain Project
Fugitive Dust Emissions
Proposed Project Without Mitigation

Activity	Annual Process Rate	Process Rate Units	Emission Factor* (lb/unit)	Control Factor* (%)	TSP Emission Rate (lb/hr)	PM10 Factor* (%)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (lb/day)	PM10 Emission Rate (ton/yr)
Waste Hauling	1433379	VMT	9.50	95%	186.45	0.22	41.02	410.20	74.86
Cover Excavation	3650	hr	5.70	90%	0.57	0.13	0.08	0.75	0.14
Cover Processing	2190000	ton	0.27	89%	18.16	0.52	9.52	95.18	17.37
Truck Loading	2190000	ton	0.01	0%	6.36	0.50	3.18	31.80	5.80
Cover Hauling	215780	VMT	16.80	95%	49.65	0.22	10.92	109.24	19.94
Cover Dumping	2190000	ton	0.01	0%	6.36	0.50	3.18	31.80	5.80
Cover Spreading	3650	hr	5.70	0%	5.70	0.13	0.75	7.50	1.37
Road Watering	56210	mi	9.38	90%	13.13	0.22	2.89	31.78	5.80
Road Grading	14600	mi	0.23	50%	0.45	0.54	0.24	2.44	0.45
Liner Excavation	2920	hr	34.23	90%	3.42	0.28	0.96	7.70	1.41
Liner Hauling	43800	VMT	9.38	90%	14.07	0.22	3.10	24.76	4.52
Bench Clearing	2920	hr	13.10	30%	9.17	0.16	1.48	11.87	2.17
Backhoe	730	hr	0.04	30%	0.03	0.76	0.02	0.04	0.01
Utility Truck	730	mi	3.79	90%	0.38	0.22	0.08	0.17	0.03
Grader	730	hr	0.23	50%	0.11	0.54	0.06	0.12	0.02
Windblown Fugitive Dust								0.18	0.03
			TOTALS		314.0		77.5	765.5	139.7

*See following Footnotes.

Table 27 (continued)
Footnotes

1. Waste Hauling, Cover Hauling, Road Watering, Liner Hauling, and Utility Truck Use: The emission factors are computed from AP-42 "Compilation of Air Pollutant Emission Factors", 11.2.6-1 (Industrial Paved Roads), using unpaved entry areas (multiplier = 7), 4 traffic lanes, 6% silt fraction, 5900 lb/mile surface dirt loading, and vehicle weights of 43 (waste hauling, road watering, and liner hauling), 94 (cover hauling), and 8 (utility truck use) gross tons loaded (for 50% of travel) and 18 (waste hauling, road watering, and liner hauling), 44 (cover hauling), and 8 (utility truck use) gross tons empty (for 50% of travel). The control efficiency is computed from EPA-450/3-88-008 "Control of Open Fugitive Dust Sources" with 0.80 mm/hr evaporation rate, 80 vehicle/hr traffic flow, 60 minute application interval, 3.00 gal/yd2 application rate for road watering, or sufficient watering to raise surface moisture content from 1% to 5%, or (from EPA-600/2-87-102 "Evaluation of the Effectiveness of Chemical Dust Suppressants on Unpaved Roads) monthly application of 0.30 gallons/yd2 of a 5:1 solution of water and Soil Cement. The PM10 conversion factor is from AP-42, 11.2.6-3 (Industrial Paved Roads).

2. Cover Excavation, Cover Spreading, Liner Excavation, and Bench Clearing: The emission factors are computed from AP-42, 8.24-5 (Western Surface Coal Mines, bulldozing overburden) with 1.0% (cover excavation and cover spreading), 20% (liner excavation), and 2% (bench clearing) silt contents (estimated from discussions with facility personnel) and 1% (cover excavation, cover spreading, and bench clearing) and 4% (liner excavation) moisture contents (estimated). The control factors are estimated from field data collected during the excavation of tailings at a former asbestos mine near Copperopolis, California. The PM10 conversion factor is computed from AP-42, 8.24-5 (Western Surface Coal Mines, bulldozing overburden).

3. Cover Processing: The emission factor is computed as the sum of emission factors for the stationary equipment included in the cover processing operation: 0.12 pounds/ton - dump hopper (from AP-42, 8.24-3, Metallic Minerals, dry transfer), 0.01 pounds/ton - belt transfer at base of dump hopper (from AP-42, 11.2.3-3, Aggregate Handling and Storage Piles, with 7.5 mph average wind and 1% moisture content), 0.02 pounds/ton - cone crusher (from AP-42, 8.19.2-4, Crushed Stone primary crushing at 1.5% moisture content), and 0.12 pounds/ton - pile stacker (from AP-42, 8.24-3, Metallic Minerals dry transfer). The average wind speed is taken from ARB's "California Surface Wind Climatology" for Desert Center and the moisture contents are estimated. The control efficiency is computed as a composite weighted by emissions from each of the stationary sources: 80% - dump hopper (estimated from vendor literature and inspection of hoppers equipped with hollow cone spray nozzles), 99% - belt transfer and cone crusher (estimated from vendor literature and MD-20 "Control of Particulate Emissions" for pulse-jet baghouses), 95% - pile stacker (estimated from vendor literature and inspection of stackers with drop height controllers,

Table 27 (continued)
Footnotes

midbelt deluge sprays, and head pulley solid cone nozzles). The PM10 conversion factor is an emission-weighted average covering each item of stationary equipment: 50% - dump hopper (from ARB "Information for Applying the State Ambient Air Quality Standards for PM10 to the Permitting of New and Modified Stationary Sources"), 100% - belt transfer and cone crusher (all emissions from baghouse assumed to be PM10), 60% - pile stacker (from AP-42, 8.23-4, Metallic Minerals, transfer of material with 4.0% moisture content).

4. Truck Loading, Cover Dumping: The emission factors are computed from AP-42, 11.2.3-3 (Aggregate Handling and Storage Piles), with 7.5 mph average wind speed (ARB, Desert Center) and 1% moisture content (estimated). The PM10 conversion factor is from the ARB PM10 permitting manual.

5. Road Grading, Backhoe Use, and Miscellaneous Grading: The emission factors are computed from AP-42, 8.24-5 (Western Surface Coal Mines, grading) with vehicle speeds of 2 mph (estimated for road and miscellaneous grading) and 1 mph (estimated for backhoe use). The control factors are estimated from EPA-450/3-88-008 with 0.80 water evaporation rate, 4 vehicle passes per hour, 8 hour water application interval, and 0.15 gallon/yd2 water application rate for road and miscellaneous grading, and are estimated from inspection of pipeline construction projects for backhoe use. The PM10 conversion factor is from AP-42, 8.24-5 (Western Surface Coal Mines, grading).

In producing suitable material for pit lining and waste covering operations, fine and coarse tailing will be processed on-site. In the production of pit liner, material will be excavated from former settling ponds by frontend loader and charged to a wet pugmill. As 90% of the fine tailing are silt-sized particles, this activity will generate significant emissions if performed unabated. To comply with South Coast Air Quality Management District Rule 403 (Fugitive Dust), this material will be prewatered with a sprinkler system prior to disturbance. Once charged to the pugmill, the fine tailing are maintained at a moisture content that will eliminate the emission of fugitive dust during the remainder of handling.

Coarse tailing will similarly constitute most, if not all, of the material needed for waste covering operations. A frontend loader will excavate the tailing from a large storage pile. The material will be dropped into a dump hopper which will feed one or more standard cone crushers. Output from the crushers will be belt conveyed to a temporary storage pile. Material from temporary storage will be loaded into haul trucks by a frontend loader and transported to the working face of the landfill. Dumped cover material will be spread and compacted by crawler tractors.

Although excavated coarse tailing may contain some indigenous moisture, water sprays and other controls will be needed to comply with emission limitations. Dust will be generated at each step of processing. Because of the very low fraction of this material which is smaller than 1/8 inch, and because of its low abrasion tendencies, the overall dusting potential of this material is comparatively low. The federal New Source Performance Standard for nonmetallic mineral processing plants requires low opacity emission levels or wet scrubbers. The South Coast Air Quality Management District Best Available Control Technology guidelines recommends baghouses or wet scrubbers for the control of dust from rock crushing facilities. In complying with these standards, emissions from the cone crushers will be maintained at low levels. Some dust will be emitted in transferring crusher product to the temporary stockpile, to haul trucks, and to a dumping area at the landfill face.

Low levels of dust will be emitted through road maintenance activities. As water trucks travel slowly in a continuous pattern of road sprinkling, fugitive dust emissions from this operation will be much lower than those generated by waste or cover material hauling. Also, as road fill will be watered to enhance compaction as it is applied, and as the process of road buildup will be performed by slow moving equipment, emissions from this activity will remain low in comparison to other project activities.

One project activity producing uncertain fugitive dust emission levels will be the clearing of natural debris from the pit benches. A crawler tractor will push this material off of benches as the landfill face moves along the pit walls. As material free falls off of each bench, fine particles in that material will become suspended in the air and contribute to pit emissions. As the content of fine particles in the bench debris is not known, it is difficult to forecast the average level of emissions. In this analysis, the bench clearing emission factor was derived from factors reported for crawler tractors operating in surface coal mines although material at coal mines is known to be softer than at the Eagle Mountain site. This results in an overestimate of expected emissions from this activity. Bench debris could be prewatered to reduce dust emissions, and this analysis assumed a control efficiency of 30%. Because a sizable fraction of dust generated by the falling debris will fall out within the pit, the emission factor chosen has a built-in margin of safety.

Another source of dust at the working face of the landfill will be the installation of the landfill gas collection system. A backhoe will dig trenches in freshly compacted waste, into which gas collection pipe will be installed. A grader will be used to cover the ditches and recontour the cover material. Dust will be produced during both of these operations, but as equipment movements will be relatively slow, the fugitive dust emission rates will be low. Also, as this equipment will operate only two hours per day, its contribution to particulate emissions from the pit will be small.

Finally, there will be particulate emissions due to windblown fugitive dust from disturbed areas at times when there is no vehicle activity generating fugitive dust. However, these emissions are expected to be negligble, since most disturbed areas will be in regular use (with fugitive dust emissions accounted for elsewhere), or will be regularly treated, or both.

Overall Project Impacts - Emissions

Total project emissions from all sources at maximum projected operating levels are shown in Table 28. These emission levels include controls that the project must incorporate in order to comply with South Coast Air Quality Management District and U.S. Environmental Protection Agency emission standards. The emissions are reported in terms of pounds per day and tons per year.

Table 28

Eagle Mountain Project
Total Project Emissions*
Proposed Project Without Mitigation

Activity	NOx (lb/day)	CO (lb/day)	PM10 (lb/day)	VOC (lb/day)	SO2 (lb/day)	NOx (ton/yr)	CO (ton/yr)	PM10 (ton/yr)	VOC (ton/yr)	SO2 (ton/yr)
Offsite Sources:										
Transfer Stations	1780	539	192	162	221	325	98	35	30	40
Trains	10881	4399	306	990	1520	1986	803	56	181	277
On-Highway Trucks	1035	489	151	162	212	189	89	27	29	39
Subtotal, Offsite	13696	5427	649	1314	1953	2500	990	118	240	356
Onsite Sources:										
Onsite Vehicle Exhaust	2821	946	210	167	291	515	173	38	30	53
Onsite Fugitive Dust			766					140		
Landfill Gas Flares	1182	816	676	845	310	216	149	123	154	57
Subtotal, Onsite	4003	1762	1652	1012	601	731	322	301	184	110
PROJECT GRAND TOTAL	17699	7189	2301	2326	2554	3231	1312	419	424	466

* Reflects measures required to comply with current regulations.

2) Project Impacts - Ambient Concentrations

Project Impacts Near the Landfill Site

Using the methodology described previously in Sections II.1 and II.2, an analysis was performed of the impacts of the project on ambient concentrations of pollutants. This analyis was performed for the area surrounding the landfill site; for the boundary of the nearest Class I area, the Joshua Tree National Monument; and for a typical rail crossing in the South Coast Air Basin.

All of the analyses described below were performed with a high degree of conservatism, with the result that the concentrations shown are much higher than the levels which would likely be experienced. This conservatism results from the following assumptions:

1. Landfill gas generation rates are the maximum forecast, 66.25 million cubic feet per day. This forecast was based on gas generation rates in the South Coast Air Basin. As discussed elsewhere in this report, gas generation rates at the Eagle Mountain site are expected to be much lower. Furthermore, the maximum landfill gas generation rates are not expected to be reached for at least 30 years after the project begins operation, if they are reached at all.

2. The analyses were performed based on the assumption that the landfill face was at an elevation which is not expected to be reached for at least 30 years.

3. Only currently available emission control technologies have been assumed, although recent history has shown that dramatic improvements will likely be made between the start of the project and the date worst case impacts could occur.

4. All of the air quality models were run in a screening mode. This means that the impacts were analyzed for a standard combination of wind speeds, wind directions, and mixing heights which do not necessarily reflect site conditions, and which were selected to maximize the modeled concentrations. Upon the collection of at least one year of actual weather data at the project site, the modeling analyses should be performed again. The use of the screening mode results in overestimates of concentrations, particularly for longer averaging periods (e.g., 24 hours, annual average).

Table 29 presents the results of the air quality modeling analysis. As discussed above, the analysis was performed in a screening mode, with a high degree of conservatism. Consequently, actual project impacts would be expected to be significantly lower than those shown.

Table 29

Maximum Impact of Proposed Eagle Mountain Project
on Ambient Air Quality
(without mitigation)
(all concentrations in micrograms per cubic meter)

Pollutant/ Averaging Time	California Standards	National Standards	Maximum Offsite Concen- tration	Maximum Background (1986-88)	Maximum Cumulative Impact	Maximum Impact at Class I Area	Allowable Class I Area Increment
CO							
1-hour	23,000	40,000	188.3	14,950	15,138	----	----
*8-hour	10,000	10,000	131.8	6,344	6,476	----	----
NO2							
1-hour	470	---	332.0	207	539	----	----
*Annual	---	100	27.3	32	59	8.1	2.5
SO2							
1-hour	655	---	71.3	210	281	----	----
*3-hour	---	1300	64.1	---	---	18.9	25
*24-hour	131	365	26.4	58	84	8.0	5
*Annual	---	80	6.6	5	12	2.0	2
PM10							
*24-hour	50	150	76.5	368	445	17.9	10.0
*Annual	30	50	19.1	65	84	4.5	5.0

*For project impacts:
3-hour = 0.9 x 1 hour
8-hour = 0.7 x 1 hour
24-hour = 0.4 x 1 hour
annual = 0.1 x 1 hour

The data indicate that the project's unmitigated impacts would represent the following fractions of the most stringent ambient air quality standards for each pollutant:

Carbon Monoxide	1%
Nitrogen Dioxide	71%
Sulfur Dioxide	20%
Fine Particulates (PM10)	153%

These levels are predictions of the worst case project impacts at any location outside of the project boundary. These concentrations are projected, in the absence of mitigation measures, at a location towards the northwest corner of the community of Eagle Mountain. The analysis is based on the extreme worst case assumption that the elevation of the landfill has risen to near the rim of the present mine site, while the size of the tailing pile has been substantially reduced. Thus, these conditions would reflect worst case operations after at least 30 years of project operations.

The relative contribution of sources to these levels are as follows:

	Landfill Equipment*	Flares
Carbon Monoxide	47%	53%
Nitrogen Dioxide		
1-hr average	75%	25%
Annual average	36%	69%
Sulfur Dioxide		
1,3 hr average	19%	81%
Annual average	8%	92%
Fine Particulates	100%	0%

*Includes fugitive dust.

Consequently, mitigation measures which reduce emissions from landfill equipment and flares would be effective, to varying degrees, in reducing project impacts.

Impact on Class I Areas

The Federal Prevention of Significant Deterioration program requires an extra level of protection for air quality in the vicinity of national parks and other special protected areas. The closest such area to the Eagle Mountain project is the Joshua Tree National Monument, which has its southern boundary just over two miles north of the project site.

Table 29 also presents the results of the modeling analysis at the Joshua Tree boundary, and compares these values with the allowable Class I area "increments". (It is expected that the Eagle Mountain project would not be subject to a formal PSD review, since project emissions would be below the regulatory thresholds for review. However, these increments of allowable growth can be used as one basis to evaluate the significance of the project's impacts.)

The analysis indicates that, in the absence of mitigation, the project impacts will exceed allowable increments at the Joshua Tree boundary for all three pollutants for which increments have been established: nitrogen dioxide, sulfur dioxide, and fine particulates (PM10). As noted previously, this conclusion will probably change upon a re-analysis using actual weather data from the project site.

Cumulative Impacts at the Project Site

The data indicate that, in the absence of mitigation measures, the project could result in exceedances of the state air quality standards for nitrogen dioxide and fine particulate matter. Emissions of carbon monoxide and sulfur dioxide are not expected to results in violations of air quality standards for those pollutants, even in combination with emissions from other sources.

Impacts at Typical Rail Crossings

During the scoping process, several commenters suggested that there may be adverse air quality impacts at locations in Southern California where rail crossings are at grade and periodically result in traffic backups waiting for a passing train. Using the same data presented elsewhere in the report regarding traffic impacts, a modeling analysis was performed to evaluate the potential air quality impacts during these events. The results are presented in Table 30.

The results of this analysis are presented for one-hour averaging periods only, since these impacts would occur for only short periods of time during the day. The data indicate that there would be only a minor impact for carbon monoxide during train crossings. The nitrogen dioxide impact reflects the short term concentration which could be reached near the intersection, assuming worst case weather conditions. As with previous analyses, these levels are likely to overestimate actual concentrations.

Screening Level Health Risk Assessment

As discussed in Section II.4.A.1), landfill gases can contain trace quantities of materials which are considered to be toxic air contaminants. For this analysis, an estimated 20% of these gases are assumed to escape from the landfill directly into the air, while the remaining 80% are expected to be captured by the landfill gas collection system and burned in the flares. A screening level health

Table 30

Eagle Mountain Project
Air Quality Impacts at Rail Crossings

Pollutant	California Standards ($\mu g/m^3$)	National Standards ($\mu g/m^3$)	Maximum Concentration ($\mu g/m^3$)	% of Strictest Standard
CO 1-hour	23,000	40,000	332	1.4%
NO2 1-hour	470	---	143	30.4%

risk assessment was performed on the flare and fugitive gas emissions using techniques recommended by the California Air Pollution Control Officer's Association. The results are presented in Tables 31 and 32.

The screening analysis indicates that the increased cancer risk from the proposed facility would be 19 in a million, based on the maximum gas production rate and the highest concentrations of trace toxic air contaminants. Based on the maximum gas production rate and average concentrations of trace toxic air contaminants, the increased cancer risk from the landfill operation would be approximately 6 in a million.

This risk would occur in the community of Eagle Mountain. As discussed above, these results are likely overestimates of the actual risk, and a re-analysis should be performed with actual weather data from the project site.

A more detailed analysis of the source of this risk indicates that 98% of the risk is associated with fugitive landfill gas emissions, and not the flares. Consequently, the fact that the project site is located in a dry climate where gas generation rates are expected to be lower is beneficial. In addition, the risks are associated with gas generation rates which would not be reached for 30 years, if ever.

Nonetheless, this is an area which should be addressed in a more refined modeling analysis, and additional mitigation measures may be required.

3) Consistency with Regulatory Programs

Consistency with Federal Requirements

Comparison with Prevention of Significant Deterioration Significance Levels - The determination as to whether the proposed project will be subject to Prevention of Significant Deterioration review is based on its emissions. For the proposed project, the "source" which could be subject to review includes the landfill gas flares and the mineral processing equipment. Table 33 displays the emissions for that equipment and the corresponding PSD emission trigger levels. (Fugitive emissions are not included in the assessment of applicability under federal prevention of significant deterioration regulations.)

The use of flares to incinerate landfill gas, in compliance with all other regulations, could cause the project to exceed prevention of significant deterioration trigger levels at the maximum expected flow rate, in the absence of any mitigation. In order to reduce project emissions, however, mitigation has been proposed for flare emissions. Such mitigation will be provided through the installation and operation of a selective non-catalytic reduction system and an

Table 31

Eagle Mountain Project
Landfill Gas Risk
Maximum Trace Concentrations

Landfill Gas Production Rate	46000 scfm	Maximum Groundlevel Impact	
=	66.24 MMscf/day	from Unit Emission Rate =	15.27 ug/m3
Gas Collection Efficiency =	80%	Unit Emission Rate =	1.00 gm/sec
Flare Gas Feed Rate =	36800 scfm	Ratio of Annual to	
Fugitive Gas Release =	9200 scfm	1-Hour Concentrations =	0.1

Toxic Gas	Mole. Weight	Max. Conc. (ppb)	Fugitive Landfill Emission Rate (lb/hr)	Fugitive Landfill Emission Rate (gm/sec)	Maximum Groundlevel Concentration (ug/m3) (1-Hour)	Maximum Groundlevel Concentration (ug/m3) (Annual)	Unit Risk Value 1/(ug/m3)	70-Year Risk
Vinyl Chloride	62.50	12900	1.17	0.15	2.26	0.23	7.0E-06	1.58E-06
Benzene	78.11	11000	1.25	0.16	2.40	0.24	5.3E-05	1.27E-05
Dibromoethane	173.86	6	0.00	0.00	0.00	0.00	7.2E-05	2.10E-08
Dichloroethane	98.96	552	0.08	0.01	0.15	0.02	2.2E-05	3.36E-07
Dichloromethane	84.94	43000	5.31	0.67	10.22	1.02	1.0E-06	1.02E-06
Tetrachloroethene	165.83	53100	12.80	1.61	24.63	2.46	5.8E-07	1.43E-06
Tetrachloromethane	153.84	16	0.00	0.00	0.01	0.00	4.2E-05	2.89E-08
Tricloroethane	133.42	580	0.11	0.01	0.22	0.02	1.6E-05	3.46E-07
Trichloroethylene	131.40	15500	2.96	0.37	5.70	0.57	1.3E-06	7.41E-07
Tricloromethane	119.39	18	0.00	0.00	0.01	0.00	2.3E-05	1.38E-08

TOTAL RISK = 1.83E-05

Table 32

Eagle Mountain Project
Landfill Gas Risk
Average Trace Concentrations

Landfill Gas Production Rate	46000 scfm	Maximum Groundlevel Impact	
=	66.24 MMscf/day	from Unit Emission Rate =	15.27 ug/m3
Gas Collection Efficiency =	80%	Unit Emission Rate =	1.00 gm/sec
Flare Gas Feed Rate =	36800 scfm	Ratio of Annual to	
Fugitive Gas Release =	9200 scfm	1-Hour Concentrations =	0.1

Toxic Gas	Mole. Weight	Max. Conc. (ppb)	Fugitive Landfill Emission Rate (lb/hr)	(gm/sec)	Maximum Groundlevel Concentration (ug/m3) (1-Hour)	(Annual)	Unit Risk Value 1/(ug/m3)	70-Year Risk
Vinyl Chloride	62.50	6735	0.61	0.08	1.18	0.12	7.0E-06	8.24E-07
Benzene	78.11	3160	0.36	0.05	0.69	0.07	5.3E-05	3.66E-06
Dibromoethane	173.86	4	0.00	0.00	0.00	0.00	7.2E-05	1.28E-08
Dichloroethane	98.96	242	0.03	0.00	0.07	0.01	2.2E-05	1.47E-07
Dichloromethane	84.94	7880	0.97	0.12	1.87	0.19	1.0E-06	1.87E-07
Tetrachloroethene	165.83	11434	2.76	0.35	5.30	0.53	5.8E-07	3.08E-07
Tetrachloromethane	153.84	16	0.00	0.00	0.01	0.00	4.2E-05	2.89E-08
Tricloroethane	133.42	368	0.07	0.01	0.14	0.01	1.6E-05	2.20E-07
Trichloroethylene	131.40	4078	0.78	0.10	1.50	0.15	1.3E-06	1.95E-07
Tricloromethane	119.39	11	0.00	0.00	0.00	0.00	2.3E-05	8.60E-09

TOTAL RISK = 5.59E-06

Table 33

Eagle Mountain Mine Project
Emissions Subject to PSD Review
(ton/yr)

	NOx	CO	PM10	VOC	SO2
Without Mitigation					
Gas Flares	308	1490	123	308	57
Mineral Processing			18		
Total	308	1490	141	308	57
With Mitigation*					
Gas Flares	216	149	123	154	57
Mineral Processing			18		
Total	216	149	141	154	57
PSD Trigger Level (ton/yr)	250	250	250	250	250

Notes: Annual Emissions assumes 66 $MMft^3$ cubic feet of landfill gas at 425 BTU/SCF produced per day, 365 days per year

* Mitigation for flares at maximum gas generation rates is urea injection for NOx control and oxidation catalysts for VOC and CO control.

oxidation catalyst in the event that gas flow rates approach the maximum predicted levels.

The oxidation catalyst, in a temperature regime up to 1400°F, can achieve better than 90% control efficiency for carbon monoxide in normal operation. The same catalyst bed will produce reductions in reactive organic gas emissions exceeding 50%. The selective non-catalytic reduction catalyst would use ammonia or urea to reduce NOx emissions by 30%. The oxidation catalyst system would be installed on the flares if gas generation exceeds approximately 10 million cubic feet per day. The selective catalytic reduction system would be installed if gas generation exceeds approximately 50 million cubic feet per day. A summary of stationary source emissions, as defined in federal regulations, with mitigation is also presented in Table 28.

New Source Performance Standards for Non-Metallic Mineral Processing Plants (40CFR60.670) - Emissions generated by the dropping of material from the frontend loaders into the dump hopper will be controlled by water sprays producing a spray curtain across the open top of the hopper. Emissions generated by the freefall of crushed material from the conveyor belt to the surface of the storage pile will be controlled by deluge sprays and an elevator system for the conveyor belt. The deluge sprays will deliver a sufficient quantity of water to material travelling up the storage pile conveyor belt to result in an average moisture content exceeding 8% in particles smaller than 100 microns in diameter. This action will cause the smaller particles to agglomerate to larger particles.

Particulate emissions from the processing of fine tailing will be eliminated by the use of sufficient quantities of water in the mixing process. Fine tailing, damp from watering prior to excavation, will be fed to a pugmill for conversion to a paste-like consistency. At this stage, where water contents are increased beyond 12%, dusting will be eliminated. This elevated moisture content will be maintained throughout transport and application of the fine tailing.

Consistency with Local Requirements

Prohibitory Rules

The South Coast Air Quality Management District limits the emissions of various pollutants from many sources in the District, including landfill flares and other gas combustion devices. These rules will apply to the proposed project, and the project has been designed to comply with them. The applicable rules and a brief summary of each are discussed below:

Rule 401 (Visible Emissions) - This rule limits the opacity of visible emissions from any source. Under current District policy, this rule will apply to emissions from the landfill gas flares, the coarse tailing crushing circuit, and the fine tailing pugmill.

Rule 403 (Fugitive Dust) - This rule limits the visibility and particulate matter concentration of dust plumes at project boundaries. Fugitive dust emissions from haul roads, excavation areas, and waste disposal areas will be regulated by this rule.

Rule 404 (Particulate Matter - Concentration) - This rule limits the concentration of particulate matter emitted from source stacks. This rule will apply to landfill gas flares.

Rule 405 (Solid Particulate Matter - Weight) - This rule limits the mass emission rate of particulate matter from sources. This rule will apply to the landfill gas flares, the crushing equipment, and the fine tailing pugmill.

Rule 409 (Combustion Contaminants) - This rule limits the concentration of particulate matter from combustion sources. The landfill gas flares will be regulated by this rule.

Rule 431.1 (Sulfur Content of Gaseous Fuels) - This rule limits the sulfur content of landfill gas combusted on-site or offered for sale. This rule will apply to the landfill gas flares and the sale of any landfill gas.

Rule 53 (Specific Air Contaminants) - This rule limits the concentration of sulfur compounds in the exhaust of any source. The rule will apply to the landfill gas flares.

Rule 1150.1 (Control of Gaseous Emissions from Active Landfills) - This rule requires the collection and treatment of landfill gases. It will apply to the landfill gases generated by the project.

Rule 1401 will require that a health risk assessment be performed for the emissions from the facility.

New Source Review Rules

The South Coast Air Quality Management District New Source Review rules (contained in Regulation II and Regulation XIII of the SCAQMD Rules and Regulations) govern the preconstruction review of new and modified stationary sources that emit nonattainment pollutants. The project site is located in the Southeast Desert Air Basin, which is designated as unclassified for all pollutants with respect to the National Ambient Air Quality Standards. With respect to California Ambient Air Quality Standards, the desert portion of Riverside County (including the project site) is designated nonattainment for ozone and fine particulate matter (PM10), and attainment or unclassified for all other pollutants.

As a result of the state nonattainment status for ozone and PM10, the project must undergo new source review for these pollutants and their precursors. Therefore, direct and precursor emissions of PM10, as well as ozone precursors, are subject to new source review. South Coast Air Quality Management District Rule 1302 defines reactive organic gases and nitrogen oxides as precursors to ozone, and reactive organic gases, nitrogen oxides, and sulfur oxides as precursors to particulate matter. New source review would not apply to emissions of carbon monoxide, for which state and federal air quality standards are being met.

For the purpose of new source review, Rule 1302 defines a facility as:

> "Any permit unit or grouping of permit units or other air contaminant-emitting activities which are located on one or more contiguous properties within the District, in actual physical contact or separated solely by a public roadway or other public right-of-way, and are owned or operated by the same person (or by persons under common control)."

In the evaluation of projects by the South Coast Air Quality Management District, related fugitive emissions are often included in the calculation of accountable project emissions. With respect to the proposed project, the District will not be permitting the landfill itself. Only the landfill gas collection and disposal (flare) system and the mineral (cover) processing plant will be permitted. District policy has held that the fugitive emissions from the landfill operation per se will not be included in the new source review analysis.

Furthermore, District policy has been that only those mobile source emissions directly associated with a permit unit must be considered. Since the only permit units at the site will be the flares and the cover processing plant, the District staff has informally concluded that emissions from on-site vehicles, as well as exhaust emissions from project-related cargo carriers (on-highway trucks and locomotives), will not be included in the new source review analysis.

Rule 1303 requires that the applicant apply Best Available Control Technology (BACT) to any new or modified stationary source. In its Best Available Control Technology Guideline, the South Coast Air Quality Management District specifies the minimum control technology requirements for landfill gas flares. The Guideline specifies two general alternative levels of control that would apply to the project emissions: (1) the use of control methods that are technologically feasible, barring a demonstration that the methods are not cost-effective, or (2) the use of control methods that have been achieved in practice or are contained in an Environmental Protection Agency approved State Implementation Plan, regardless of cost.

For the gas flares, the BACT Guideline specifies the following control methods:

Technologically Feasible

Nitrogen oxides:	less than 0.06 pounds of NOx per million BTU
Sulfur oxides:	gas scrubbing and/or carbon adsorption for hydrogen sulfide removal
Particulates:	fuel gas filter

Achieved in Practice

Reactive organics:	Ground level, shrouded flare with ≥ 0.6 second retention time at ≥ 1400°F, automatic combustion air control, automatic shutoff gas valve and automatic restart system
Nitrogen oxides:	0.06 pounds of NOx per million BTU
Carbon monoxide:	same as reactive organics
Particulates:	knockout vessel

The Guidelines require that technologically feasible control measures be imposed unless it can be demonstrated that the capital and operating costs per ton of pollutant removed or destroyed are greater than the District's cost-effectiveness exemption thresholds. Information gathered from one flare vendor indicates that an exemption on the basis of cost could not be demonstrated. Therefore, this analysis assumes that the technologically feasible control measures will be installed on the project's flares.

For the coarse tailing (cover) processing plant, the best available control technology guideline specifies the following control methods:

Technologically Feasible

Particulates:

1. Baghouse
2. Venturi Scrubber
3. Impingement Scrubber
4. Charged Fog Spray or Water Spray with Chemical Additives

Achieved in Practice

Particulates: Water Fog Spray

A screening cost/benefit analysis using a typical design for a baghouse control system indicated that such equipment did not exceed the District's cost exemption threshold. For the processing equipment configuration proposed in the project design, using the economic factors required in the guidelines, the cost effectiveness of a baghouse system is estimated at $208 per ton of particulate matter. As the District exemption threshold for particulate matter is $5,300 per ton, it was assumed that a baghouse would be required for control of emissions from the coarse tailing processing system.

Rule 1303 requires that the applicant offset all net emission increases from any new or modified facility. However, Rule 1309.1 provides that the offset requirement for emissions from landfill gas control equipment can be satisfied through withdrawals from a "Community Bank" of offsets. Since this rule was adopted in June 1990, it is not yet clear how this Bank will operate.

4) Mitigation

This discussion of mitigation measures includes regulatory actions by other agencies which are reasonably foreseeable, or which have future effective dates, as well as measures which can be implemented by the applicant. Regulatory measures which are already in effect are discussed in Section I.6, above. Estimates of project emissions reflect those measures required to comply with currently adopted regulations.

Truck Emissions

Diesel engine exhaust emissions from the truck transport of waste to the landfill will contribute to the cumulative environmental impact of the project. This transport will be carried out by waste disposal operations not under Mine Reclamation Corporation's control. Truck emissions from waste transport will be mitigated primarily by transporting most of the incoming waste by rail, thereby eliminating truck emissions except for the short haul from transfer station to railhead. This short haul is present to some degree in all project configurations and all alternatives to the project, including the no project alternative. Truck emissions will also be mitigated by a number of California Air Resources Board and local district regulations already in place, or which are expected to be adopted in the near future. These regulations include:

1. existing California Air Resources Board emissions standards for heavy-duty Diesel engines, and still more stringent standards to take effect in 1991 and 1994;

2. California Air Resources Board regulations limiting the sulfur and aromatic hydrocarbon content of motor vehicle Diesel fuel;

3. existing South Coast Air Quality Management District smoke enforcement program for excessive visible smoke from Diesel vehicles;

4. the new California Air Resources Board/California Highway Patrol smoke enforcement and anti-tampering program for heavy-duty trucks, to begin in 1990;

5. anticipated new "low emission vehicle" regulations for heavy-duty engines, due to be developed and adopted in 1991; and

6. anticipated South Coast Air Quality Management District Rule 1601, requiring phase-in of low emission vehicles in fleets.

California Air Resources Board 1991 and 1994 emissions standards - A new set of very stringent NOx and particulate emissions standards for new heavy-duty engines used in on-highway vehicles will take effect beginning in the 1991 model year. These standards will require NOx emissions less than 5.0 g/BHP-hr and particulate emissions less than 0.25 g/BHP-hr. These represent a 17% and a 58% reduction, respectively, from the present standards, which have been in effect since 1988. Compared to uncontrolled emission levels, the 1991 standards will require roughly a 50% reduction in NOx and a 75% reduction in particulates. A still more stringent particulate emissions standard of 0.10 g/BHP-hr (representing a 90% reduction from the uncontrolled level) will go into effect in 1994.

Although these standards will only apply to new engines, they will result in gradual reductions in emissions as new trucks replace older ones. On average, it may take ten years for the majority of the benefits of new vehicle standards to be achieved.

California Air Resources Board Diesel fuel regulations - California Air Resources Board regulations presently limit the sulfur content of motor vehicle Diesel fuel sold in the South Coast Air Quality Management District to 0.05% by weight. This is one tenth of the sulfur which would otherwise be permitted under the ASTM standards for number 1 and number 2 Diesel fuel. In 1993, this restriction will be extended statewide. A maximum aromatic hydrocarbon content of 10% by volume will also take effect at that time. The reduction in sulfur contributes directly to a 90% reduction in SO_2 emissions, and also helps to reduce PM10 emissions somewhat. The California Air Resources Board expects the reduction in aromatics (which are currently around 30%) to further reduce PM10 and NOx emissions. Diesel NOx emissions are projected to be reduced by about 4% by this measure, while particulate emissions would be reduced about 5-10%.

South Coast Air Quality Management District smoke enforcement program - Under an interagency agreement between the South Coast Air Quality Management District and the California Highway Patrol, a limited number of California Highway Patrol officers have been assigned full-time to smoke enforcement activities. These officers patrol freeways and other roads in the South Coast Air Quality Management District, observing and citing vehicles which emit excessive smoke. In addition, the District has a widely publicized program encouraging motorists to call a toll-free number to report smoking vehicles, including trucks.

Cited vehicles must be repaired to reduce their smoke emissions. Since cited vehicles are typically "gross emitters" of PM10 and VOC, their repair should greatly reduce PM10 and VOC emissions from cited vehicles. Furthermore, the possibility of a citation serves to encourage truck owners to improve their maintenance practices. Both effects contribute to lower VOC and PM10 emissions than would otherwise be experienced. These benefits are not presently quantifiable, however.

<u>California Air Resources Board/California Highway Patrol smoke enforcement and anti-tampering program</u> - This new program was mandated in SB 1123, and the details are not yet completely established. A pilot program was completed last year, but the program results are not yet available. A key element of the plan is that trucks pulling into California Highway Patrol weight and safety inspection stations will be visually checked for smoke emissions, and apparent high emitters will be flagged out of line for a confirmatory test, after which they may be cited. Anti-tampering inspections of engine emission controls may also be carried out. Anti-smoke inspections may also be carried out in other California Highway Patrol enforcement activities. Cited vehicles will be required to undergo repair to reduce their smoke emissions. Both the citations themselves and the desire to avoid them should help to improve the general maintenance and sensitivity to excess smoke emissions in the heavy-duty truck fleet. This program is expected to contribute to a significant reduction in average smoke and PM10 emissions from heavy-duty Diesel trucks. The specific extent of these benefits is not yet quantifiable, however.

<u>California Air Resources Board low emission vehicle regulations</u> - In a series of workshops recently, the California Air Resources Board staff have proposed to create several new categories of "low emission" vehicles. Manufacturers would be required to make these low emission vehicles a certain percentage of their California sales, with the required percentage beginning at less than 10%, and escalating to 100% by the year 2000. The intent is, first, to ensure that low-emission vehicles are available for fleet owners to purchase in order to comply with South Coast Air Quality Management District Rule 1601; and later, to phase in low-emission vehicles across the board. The present proposals cover only passenger cars and light-duty trucks, but a separate rulemaking addressing medium-duty and heavy-duty vehicles is also planned. The emissions standards proposed for light-duty vehicles are extremely stringent. Compared to California 1994 light-duty standards -- already the strictest in the world -- they would cut the permissible emission levels for NOx by 50%, and for non-methane HC by 70%.

California Air Resources Board staff have stated their intention to develop similarly technology-forcing emissions standards for medium-duty and heavy-duty vehicles, beginning in Fall, 1990. So far, there has been no public indication of what these standards might entail. However, based on California Air Resources Board's stated concerns about heavy duty vehicle emissions, a recent California Air Resources Board proposal concerning light-heavy duty Diesels (which would effectively ban them), and the technology-forcing approach California Air Resources Board is taking with light-duty vehicles, the

California Air Resources Board is expected to propose a significant reduction in the heavy-duty Diesel NOx standard, from the present 5.0 g/BHP-hr to around 2 or 3 g/BHP-hr. This standard will be very difficult, and may be impossible, to meet using even advanced-technology Diesel engines. It may thus force the use of alternative fuels in the affected vehicles.

If these technology-forcing emissions standards are actually proposed and adopted, engine manufacturers would be forced to commercialize and market engines using alternative fuels such as methanol and natural gas, or using reformulated gasoline with advanced electronic controls and catalyst systems. This would result in a further emissions reduction of the order of 50% in both PM10 and NOx emissions, compared to Diesel engines meeting California Air Resources Board's 1994 emissions standards. VOC and CO emissions may not be reduced, however, and could well be increased, since Diesel engines have inherently low emissions of these pollutants.

South Coast Air Quality Management District Rule 1601 - The South Coast Air Quality Management District has been developing this rule for some time. A draft of the rule was presented at a public workshop held October 21, 1988. No further revisions have been made public yet, but another public announcement and workshop are anticipated in the near future, with rule adoption sometime late in 1990.

As outlined in the October 21, 1988 proposal, Rule 1601 would apply to all vehicle fleets containing 15 or more vehicles registered in the South Coast Air Quality Management District. The owner or lessee of any such fleet would be prohibited from adding any new vehicle to it (including any newly-purchased used vehicle) unless the new vehicle were a "low emission" vehicle, or unless the fleet already contained the required percentage of LEVs.

The South Coast Air Quality Management District staff have indicated that, in its initial form, Rule 1601 will apply only to light-duty vehicles, but that it is planned to extend it to heavy-duty vehicles as soon as the California Air Resources Board adopts low emission vehicle emissions standards for them. Once this occurs, any heavy-duty vehicle fleet containing 15 or more vehicles would be required to begin phasing in low emission vehicles. Most garbage companies hauling waste to the Eagle Mountain landfill will probably operate more than 15 vehicles, and would thus be covered by these requirements. This would assure that low emission vehicles would be introduced into these fleets relatively early, thus helping to maximize the potential benefits.

As discussed above, however, it would still take about ten years before the majority of the benefits of this measure would be achieved.

Locomotive Emissions

Diesel engine exhaust emissions from railway locomotives will contribute to the cumulative environmental impact of the project.

These emissions will result from the operation of Southern Pacific Railroad locomotives hauling the waste from the Los Angeles/Orange County area to the Ferrum Junction siding and Eagle Mountain Railway locomotives hauling the waste trains from the Ferrum Junction siding to the landfill site, as well as from train switching and idling. Emissions from the Southern Pacific locomotives are not under Mine Reclamation Corporation's control. However, a study of locomotive emissions and regulatory strategies by the California Locomotive Emissions Advisory Committee is presently under way. Authority for the U.S. Environmental Protection Agency to regulate locomotive emissions is also included in several of the Clean Air Act amendment bills presently under consideration in Congress, raising the possibility of federal emissions regulation as well. Some potential control measures which might be required under these regulations include:

1. Reduction in idling emissions by shutting down locomotives whenever they will not be needed for at least one hour;

2. Use of low-sulfur, low aromatic fuel meeting California requirements for motor vehicle Diesel fuel;

3. Stringent emissions standards for Diesel engines used in new locomotives;

4. Retrofit of emissions controls such as retarded injection timing, low-temperature aftercooling, combustion modifications, and revised engine speed-load schedules to existing locomotives;

5. Use of catalytic trap-oxidizer systems on new or existing Diesel locomotives to reduce PM10 and VOC emissions;

6. Use of selective catalytic reduction on new or existing Diesel locomotives to reduce NOx emissions;

7. Use of alternative "clean" fuels such as methanol, LPG, or natural gas in locomotive engines; and/or

8. Electrification of railway operations.

Any of the foregoing measures could theoretically be applied to the Eagle Mountain railway locomotives as well. This could occur as a result of new regulatory mandates from the California Air Resources Board or the U.S. Environmental Protection Agency, or on a voluntary basis, as part of a mitigation strategy.

Operational measures to reduce emissions - Locomotive engines are traditionally left idling when they are not in use - which is typically more than 50% of the time. By issuing instructions to the engineers to shut down the engines whenever they will not be needed during the next hour, it will be possible to reduce this idling time by around 10 hours per locomotive per day, with a savings of approximately 60 gallons per locomotive per day in fuel. (The one hour period is based on the need to reduce engine wear which would be associated with excessive starts, and reducing emissions during extended idling.) If emissions were strictly proportional to fuel consumption, this would reduce emissions by about 24 lb of NOx, 4 lb of VOC, 14 lb of CO, and 1 lb of PM10 per locomotive per day. In fact, NOx emissions per unit of fuel tend to be somewhat lower at idle than under other conditions, while VOC, CO, and PM10 emissions are typically much higher. Thus, the reduction in NOx would be somewhat less than 24 lb/locomotive-day, while the reductions in VOC, CO, and PM10 would be higher than the values shown above.

Other operational measures to minimize locomotive fuel consumption would also have the effect of reducing emissions. These would include regular preventive maintenance of the engines, with special attention given to fuel injector performance. In the case of the Eagle Mountain Railway locomotives, engineers should be instructed to report any signs of excessive smoke (greater than 20% opacity) so that the engine could be scheduled for repairs. Smoke opacity measurements should be made using an end-of-stack opacity monitor after each engine is rebuilt, and at each scheduled service interval or unscheduled engine maintenance thereafter. (An opacity monitor is a device which shines a light across the exhaust stack to determine how much smoke is present.) A record of each machine's opacity measurements and related repairs should be kept as part of its maintenance record. This will allow maintenance personnel and supervisors to identify both short-term and long-term changes in smoke opacity which would signal the need for maintenance to reduce emissions.

Preventive maintenance and monitoring of smoke emissions will help to ensure that the engine is performing at peak efficiency, and that VOC and PM10 emissions are as low as possible. In addition to these direct benefits, an aggressive preventive maintenance program will help ensure locomotive reliability, reducing the need to assign extra locomotives against the possibility that one or more units is in substandard condition. This will further reduce fuel consumption and pollutant emissions.

Low sulfur/low aromatic fuel - California Air Resources Board regulations limiting the sulfur and aromatic content of Diesel fuel do not apply to fuel used in locomotives. Typical railroad Diesel fuel has a sulfur content as high as 0.5% by weight, and 30-40% aromatic hydrocarbons by volume. Use of Diesel fuel meeting California Air Resources Board sulfur standards would reduce SO_2 emissions by 90%. Particulate emissions would also be reduced by about 0.07 g/BHP-hr, or roughly 15-30%, due to the reduction in sulfate particles. This would add about $0.02 per gallon to the cost of the fuel, or about $3.50 per pound of SO_2 eliminated. Use of fuel containing no more than 10% aromatic hydrocarbons, as well as low sulfur, should further reduce PM10 and possibly NOx emissions. Estimates of the emissions benefit for on-highway truck engines are of the order of 4% reduction in NOx and 5-10% reduction in PM10. If a similar percentage reduction were seen in locomotive engines, NOx emissions would be reduced by about 0.5 g/BHP-hr, and PM10 emissions by about .02-.04 g/BHP-hr. Low-aromatic fuel is anticipated to cost about $.10 extra per gallon.

Locomotive emissions standards - Studies presently under way in California, as well as current Clean Air Act proposals, make it appear very likely that locomotive engine emissions standards may be established by the U.S. Environmental Protection Agency, the California Air Resources Board, or both within the next decade. These regulations will probably require at least a 50% reduction in NOx emissions, and will likely mandate some reduction in PM10 as well. It is likely that these standards will be applied both to new locomotives and to existing locomotives at the time they undergo a major engine overhaul.

To comply with these regulations, locomotive engine manufacturers would be required to develop emissions-controlled versions of their engines. These emission-controlled engines will probably include at least the following: low-temperature charge-air cooling, retarded injection timing, electronic control of injection timing and fuel quantities, combustion chamber modifications, and changes to piston rings, valve seals, etc. to reduce oil consumption. Retrofit packages incorporating these modifications would then be installed during engine overhaul.

The availability of new locomotive engines meeting emissions standards and/or retrofit packages to bring existing locomotives up to those standards will depend on the whether and when such standards are established, as well as on the degree of stringency they exhibit. These are presently uncertain. Therefore, the timing and magnitude of any emissions reductions due to such standards cannot be quantified at this point. At the present time, there are no such kits available.

Emission control retrofits - Even in the absence of a specific low-emissions retrofit package, a number of modifications could be made to reduce locomotive emissions. These modifications will be discussed only with reference to the Eagle Mountain railway locomotives, as the project would have no control over Southern Pacific locomotives, and there are presently no regulatory proposals to this end. Potential modifications to the GE locomotives planned for use at Eagle mountain include the following (effects are given in parentheses).

1. Upgrade fuel injection systems to current technology (reduce fuel consumption 2-2.5%, reduce smoke, PM10 and VOC emissions).

2. Retard fuel injection timing by a fixed 4-6° increment (reduce NOx probably 35-40%, reduce power, increase fuel consumption, smoke, PM10)

3. Upgrade turbochargers to current technology (reduce fuel consumption, smoke, and PM10, increase power output).

4. Install separate-circuit aftercooling to reduce charge air temperature (reduce fuel consumption, NOx, smoke, and PM10, increase power output).

5. Modify engine and dynamic brake speed schedules, introduce multi-step dynamic brake speeds (reduce fuel consumption, smoke, and emissions).

6. Add eddy-current clutch for radiator fan (reduce parasitic loads and fuel consumption).

Except for items 2 and 4, these are all standard engineering changes, fully supported and documented by General Electric. The cumulative effect of these standard changes should be to reduce fuel consumption by about 10%. Smoke (and presumably PM10 and VOC emissions) should also be reduced substantially by these changes.

Retarding the injection timing 4° and lowering the intercooler temperature has been shown to give nearly a 50% reduction in NOx emissions from an EMD 645 locomotive engine without increasing smoke or VOC emissions to an unacceptable level. Similar measures would likely produce significant benefits in these General Electric engines. A demonstration program would be required in order to verify the extent of the NOx benefits, as well as any detrimental effects on other emissions.

<u>Trap-oxidizer systems</u> - Catalytic trap-oxidizers have been shown to be highly effective in reducing Diesel engine emissions of PM10, VOC, and toxic air contaminants. Reductions of 80-90% in particulate matter and 50-80% in VOC are typical. A trap-oxidizer system could thus be especially effective in counteracting the increase in PM10 and VOC emissions which is otherwise likely as a result of retarding injection timing for NOx control. Low-sulfur fuel is required to ensure that the platinum-group catalysts use do not create a problem with excessive sulfate emissions, and fuel consumption is typically increased by 2-5%.

The difficulty of ensuring reliable regeneration and adequate durability has prevented trap-oxidizer deployment in highway vehicles (except for a limited number of Mercedes passenger cars) up to the present time. With their high load factors and predictable duty cycles, locomotives could be good candidates for trap-oxidizer application, however. To date, however, trap-oxidizers have not been demonstrated on any engine approaching that of a locomotive in size. Trap-oxidizer size is limited by thermal stresses and manufacturing constraints. The large engine size and high exhaust flowrate of a locomotive would require that a large number (10-20) of trapping elements be arranged in parallel. While this poses no problem in principle, the resulting volume, heat radiation from the hot surfaces, etc. could create a difficult packaging problem within the confined space of a locomotive.

Questions about the efficacy, durability, and impacts on engine performance, reliability, and safety of trap-oxidizers in locomotive service would have to be answered before this measure could be considered feasible for the Eagle Mountain project.

Selective Catalytic Reduction - Selective catalytic reduction control technology can reduce NOx emissions up to 90%. The technology involves injecting ammonia in the post-combustion region upstream of a catalyst. The ammonia reacts with NOx in the combustion products and forms nitrogen and steam. The catalyst assists this process by causing the reaction to occur at lower temperatures.

SCR technology is currently being used to control NOx emissions from electric utility boilers, refinery heaters and boilers, gas-fired IC engines, and gas-fired gas turbines. In addition, SCR technology has been installed on a number of spark-ignited engine installations and a few pilot injection dual fuel engines. However, SCR technology has been applied to fuel oil-fired diesel engines as a control alternative for NOx emissions only on a very limited basis and not for continuous utility applications.

There are only a few commercial projects in which SCR has been applied to diesel engines. In the United States (Massachusetts), there is currently a 5 MW diesel engine project on which SCR is being used as a NOx control technology. This unit is equipped with a Steuler molecular sieve catalyst system. However, this unit is completely different from typical marine Diesel engines. The Massachusetts engine is basically a diesel-ignited, natural gas-fired engine and, therefore, does not run solely on low sulfur diesel fuel oil. The engine has been in operation for two years and to date has accumulated nearly 7000 hours of operation on diesel fuel. The operator indicates that the SCR unit is operating satisfactorily and is having no difficulty achieving the guaranteed 90% NOx reduction. However, severe system control problems were experienced at startup. Although ammonia slip is not measured, there is no detectable ammonia odor.

One engine manufacturer (SWDiesel) has indicated that there is a 6 MW dual fuel engine in West Germany which is equipped with the Steuler SCR system. Like the engine in Massachusetts, the 6 MW dual fuel engine operates chiefly on natural gas. SWD has also identified one small mine locomotive diesel engine, commissioned in March 1988, which has also been equipped with an SCR system. This engine operates intermittently and for a limited number of hours.

Nitrogen Nergas Corporation has demonstrated a base metal catalyst on several types of diesel-powered engines in Southern California. The Nitrogen Nergas SCR unit has been applied to diesel-powered dredge barges, standby engines and drilling rigs up to approximately 6000 hp in size. The applications include three Caterpillar diesel engines on an oil drilling rig in Ventura County; three 1200 hp to 400 hp diesel engines manifolded to a single SCR unit on a dredge barge; three large standby diesel engines at Xerox

Corporation; a 600 hp Caterpillar diesel water pump engine owned by Eastern Municipal Water District; and two rock crushers. The longest operating experience is on the dredge barge engine, which has accumulated approximately 8000 hours of operation in 18 months. These applications are more similar to marine diesel engines because they operate on 100% diesel fuel. However, they are not directly comparable because some marine diesels are nearly twice the size of the largest engine (or larger) on which the SCR system has been demonstrated and because the engines have not been in long term, continuous service.

In addition to the lack of demonstrated full-time, continuous diesel service, one of the most significant unknown operating factors associated with this technology is catalyst plugging that decreases the amount of catalyst surface area available for the reaction to proceed and eventually renders the catalyst inactive. SO_3, which is formed by the oxidation of SO_2, reacts with the ammonia to form ammonium bisulfate (a particulate emission) which could cause fouling of the SCR system. This problem is not as acute with a dual-fuel engine, because long periods of operation on diesel fuel do not occur. The Nitrogen Nergas catalyst system uses a guardbed configuration to remove some of the particulate sulfate from the exhaust stream before it comes in contact with the catalyst material. This seems to be effective in extending catalyst life by protecting it from substances that would cause plugging and poisoning. However, it adds additional complexity to the system as well as increasing required maintenance.

Haldor Topsoe of Denmark has developed a titanium oxide monolith catalyst that has been demonstrated in fuel oil service on two residual oil-fired ship engines. The Haldor Topsoe DENOX SCR system was installed on the main engine of two Korean vessels for testing under controlled conditions. The ships' engines are switched to low sulfur diesel fuel prior to startup of the SCR unit, and the SCR unit is completely bypassed during residual fuel oil firing. These engines are 10,680 hp slow-speed diesel engines. Typical operation of these SCR units will be approximately 12-14 hours each month. The operation of the SCR systems was tested during five journeys, with total testing period of approximately 40 hours. NOx removal efficiency has been measured at over 90%.

Other disadvantages to SCR systems include difficult ammonia control problems, increased maintenance costs to clean the catalyst, high capital and operating costs, and the necessary handling and storing of ammonia. Depending upon the formulation of the catalyst, the spent catalyst material may be considered hazardous waste and would contribute to the shortage of available landfill sites for this material. In addition, the presence of sulfur in the diesel fuel may result in the formation of ammonium bisulfate and contribute additional particulate emissions.

As discussed above, there is a great deal of uncertainty about the reliability of SCR systems in diesel engine applications. The ammonia handling requirements and the complexity of auxiliary equipment associated with SCR systems further enhance the concerns about the operation and maintenance of this control technology. Effective SCR operation requires close control of ammonia injection rates as engine operating conditions vary.

Several operators of diesel engines equipped with SCR have described serious ammonia control system problems experienced on startup that made it difficult to maintain stable and consistent NOx emission reductions. While these problems were eventually resolved, they, along with uncertainty regarding quantities of catalyst material required, ammonia injection rates, loss in catalyst efficiency and increases in backpressure, are some of the potential problems that add to the uncertainty regarding system performance and cost.

Based on the status of selective catalytic reduction technology as applied to Diesel engines, selective catalytic reduction for the Eagle Mountain Railway Diesel locomotives cannot be considered technically feasible at the present time.

Alternative fuels - Use of alternative fuels such as methanol, natural gas, or LPG could significantly reduce locomotive emissions. No locomotive engines using these fuels are presently available. However, a large number of high-powered, medium-speed, lean-burn engines are presently in use in stationary applications, burning natural gas and other gaseous fuels. These engines closely resemble locomotive engines in their technical characteristics, and in some cases are directly derived from Diesel engines which are used in locomotive service. There have also been some laboratory experiments using methanol in two-stroke locomotive engines. However, the economics of natural gas are more favorable, the technology is better developed, and the potential for reducing overall emissions is greater.

Diesel engines can be modified to use natural gas in either of two ways. The first is dual fuel operation, in which the natural gas charge is ignited by injecting a small amount of Diesel fuel. These engines exhibit good performance and low emissions at high loads, but HC and CO emissions tend to increase dramatically under low-load conditions. Dual-fuel engines normally idle on Diesel fuel alone. The alternative is spark ignition operation, in which the Diesel injector is replaced by a spark plug (or spark plug and prechamber, in larger engines), and the engine runs on 100% natural gas. Unlike dual-fuel engines, these engines require throttling to control power output, and tend to have relatively high light-load fuel consumption. Because the Diesel combustion is completely eliminated, however, emissions can be very low. NOx emissions less than 1.5 g/BHP-hr are routinely demonstrated using this technology in stationary source applications. This can be compared to 12-14 g/BHP-hr for present uncontrolled locomotive engines, and a probable minimum of 5-6 g/BHP-hr with the maximum feasible Diesel NOx control. Particulate emissions (which tend to go up dramatically with Diesel NOx control) are also reduced to very low levels using this technology.

Before spark-ignition natural gas engines could be used in locomotives, it would be necessary to develop and demonstrate the requisite technology. Two approaches to this are possible. In the first approach, an existing Diesel locomotive engine would be replaced by a commercially available natural gas engine. Two good candidate engines for this replacement are the Caterpillar 3600 series natural gas engines and the Waukesha AT series. Both of these engine series are derived from Diesel engines used in locomotives. The second approach would be modify the existing Diesel locomotive engine to use natural gas fuel.

Natural gas fuel storage for locomotive engines would require attention in either case. Natural gas can be stored on a vehicle either as a cryogenic liquid (LNG) or a highly compressed gas (CNG). CNG storage requires about 5 times the volume of Diesel fuel for equivalent energy, while LNG requires about twice the volume. For the Eagle Mountain Locomotives, sufficient CNG storage for one day's operation could probably be placed on board the locomotive, replacing the Diesel fuel tank. Longer hauls would require a CNG tender, or the use of LNG, either on-board the locomotive or in a cryogenic tender. Both compressed gases and liquified natural gas are routinely shipped in special railcars, so these tenders would involve little in the way of new technology. The only difference from a regular cargo shipment would be in the provision of a fuel connection between tender and locomotive.

The use of an alternative fuel in Diesel locomotive engines would have to be evaluated further before it could be considered feasible for the Eagle Mountain project.

<u>Electrification</u> - Technology for railway electrification is readily available -- both EMD and General Electric offer electric locomotives -- and has been widely adopted in other countries. Electrification also offers some significant advantages in the area of locomotive power and reliability, maintenance requirements, and operational characteristics. The major impediments to its use in the U.S. are the high costs of the catenary cable systems to supply the electricity, plus the associated costs of extensive modifications to railway signal systems to make them compatible with electric traction. The need to purchase substantial quantities of new electric locomotives is also a deterrent - electric locomotives are more than twice as expensive as current Diesel-electrics.

Electrification (at least of main lines) is one of the principal locomotive emissions control measures now under consideration by the Locomotive Emissions Advisory Committee and California Air Resources Board. If adopted, this requirement would presumably affect the Southern Pacific mainline used to transport waste from Los Angeles to Ferrum Junction. This possibility will not be considered further here, however. Instead, this evaluation examines the feasibility of electrifying the 52-mile Eagle Mountain Railway line between Ferrum Junction and the landfill site.

The characteristics of the Eagle Mountain-Ferrum Junction line are poorly suited to electric locomotive operation. Electric locomotives can generate up to twice the traction horsepower of a Diesel locomotive. However, the maximum tractive force they can generate is limited by the coefficient of friction of the wheels on the rail, and by the temperature limits of the traction motors. These are no greater than for a Diesel locomotive. Thus, to pull a heavy train up a steep grade requires the same number of locomotives, whether Diesel or electric. The only difference is that the electric locomotives will be able to pull it faster. Where sharp turns and the physical limitations of the track restrict maximum speed, however, this advantage cannot be put to full use. Thus, an electric locomotive provides relatively little advantage over a Diesel-electric unit costing only half the price when new, and available used at less than half that cost.

A more detailed analysis of the relative costs and benefits of electrification of the Eagle Mountain railway would have to be conducted before this could be considered a feasible measure.

Landfill Equipment Emissions

Exhaust pollutant emissions from the Diesel engines used in landfill and waste-handling equipment at the Eagle Mountain Mine site will contribute to the cumulative environmental impact of the project. Conceivable measures which could be taken to mitigate this impact include:

1. Operational measures, such as limiting time spent with the engine idling by shutting down equipment when not in use;

2. Regular preventive maintenance to prevent emissions increases due to engine problems;

3. Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle Diesel fuel;

4. Purchase and use of turbocharged and intercooled Diesel engines when available, with retarded injection timing;

5. Purchase and use of low-emitting Diesel engines meeting California emissions standards for highway trucks;

6. Purchase and use of landfill equipment meeting California emissions standards for construction equipment, when these take effect;

7. Use of catalytic trap-oxidizer systems on Diesel engines;

8. Use of alternative "clean" fuels such as methanol, LPG, or compressed natural gas in landfill equipment engines; and/or

9. Electrification of landfill equipment operations.

Operational measures to reduce emissions - Operational measures to conserve fuel and reduce emissions include minimizing engine idle time, using only the number of machines required for a given volume of waste handled, and minimizing queueing time for loading and unloading through efficient scheduling. Idle time will be minimized by instructing equipment operators to shut down their machines rather than letting them idle for more than five minutes. Operational managers will be instructed to schedule machines and operators to match the anticipated waste volume, and to match the numbers of container haulers to the container handling capacity at each end to avoid excessive queue formation. This will help to reduce operating costs and wear and tear on equipment as well as emissions.

Preventive maintenance - All landfill equipment should be subject to regular preventive maintenance in order to detect and prevent mechanical problems which can lead to increased emissions. These mechanical problems include clogged air filters, worn or damaged turbochargers, and problems with the fuel injection system. Equipment operators and supervisors should be instructed to report any evidence of excessive smoke or other symptoms so that the equipment can be scheduled for maintenance in a timely fashion. Smoke opacity measurements should be made using an end-of-stack opacimeter upon receipt of the equipment, and at each scheduled service interval or unscheduled engine maintenance thereafter. A record of each machine's opacity measurements should be kept as part of its maintenance record. This will allow maintenance personnel and supervisors to identify both short-term and long-term changes in smoke opacity which would signal the need for maintenance to reduce emissions.

Low sulfur/low aromatic fuel - California Air Resources Board regulations limiting the sulfur and aromatic content of motor vehicle Diesel fuel will take effect in 1993. According to California Air Resources Board staff, construction vehicles and other landfill machinery are included in the California Air Resources Board's expanded definition of a "motor vehicle". Thus, this regulation will require all landfill equipment to use low-sulfur/low aromatic fuel. Since landfill equipment engines are technically similar to those used in trucks, the reduction in emissions will probably be of the same order and that projected for truck engines by California Air Resources Board. The reduction in sulfur will reduce SO_2 emissions by 90%, and will reduce PM10 emissions by roughly 0.07 g/BHP-hr, which is roughly 10-20% of anticipated PM10 emissions. Based on California Air Resources Board's projections for truck engines, the reduction in aromatic content should reduce NOx emissions by about 4%, and lead to a further 10-20% reduction in PM10 emissions.

Turbocharging/intercooling/retarded injection timing - NOx and particulate emissions from Diesel engines can be reduced through a combination of turbocharging, intercooling (to the lowest temperature practical), and retarded injection timing, especially at high loads. Turbocharged and intercooled engines should be chosen for all major Diesel equipment purchased for use in the landfill, unless (a) there are no suitable equipment models available with turbocharging and intercooling, either as standard equipment or as an available option; or (b) the manufacturer demonstrates that the engine achieves similar emissions performance by some other means. This latter exception would include on-highway certified engines, or engines meeting California Air Resources Board emissions standards for construction equipment.

Except in the case of engines which are already emission-controlled (in which timing is normally retarded already), all Diesel engines in landfill equipment should have their fuel injection timing adjusted to a retarded setting. The degree of timing retardation used should be chosen to reduce NOx as much as possible, while minimizing the increase in smoke, PM10, and VOC emissions due to the retarded timing. The optimal degree of timing retardation will vary from one engine model to another, and should be selected in consultation with the engine manufacturer.

Use of on-highway engines - In addition to turbocharging, low-temperature intercooling, and retarded injection timing, Diesel engines certified to meet California's 1991 emission standards for on-highway vehicles will exhibit a number of other emissions-related modifications and control technologies. These will generally include electronic control of fuel injection timing and quantity, increased fuel injection pressure, and optimization of piston and combustion chamber design to reduce emissions. These engines will be required to emit no more than 5.0 g/BHP-hr NOx and 0.25 g/BHP-hr of particulate matter. Achieving these targets will require extensive engine optimization, so that these on-highway certified engines will generally exhibit lower emissions overall than off-highway engines retrofitted with specific emissions controls. Engines meeting 1994 on-highway standards will achieve even lower PM10 emissions, probably through the use of catalytic trap-oxidizers or catalytic converters in conjunction with still more advanced emission control technology.

Among the landfill equipment, the container carriers and liner-construction dump truck will closely resemble on-highway trucks, and should be equipped with on-highway certified engines. It may also be possible to use these engines (or very similar engines utilizing nearly the same technology) in other landfill equipment such as the dozers, compacters, loaders, scrapers, and off-highway trucks. This will not always be possible, however, due to the important differences in duty cycle, torque rise requirements, engine mounting, and cooling requirements between construction machinery and on-highway trucks. The feasibility of using an on-highway certified engine should be reviewed for each piece of landfill equipment, and such engines should be used unless (1) there is no suitable engine available or (2) the mounting and installation requirements, or duty cycle limitations, make it infeasible to use any available engines in the specific equipment under consideration.

California Air Resources Board construction equipment standards The California Air Resources Board is expected to issue a workshop notice containing proposed emissions standards for construction equipment within the next two months. The California Air Resources Board's current plan is to have regulations comparable to the 1991 on-highway emissions standards in stringency. These regulations would go into effect in 1996. Landfill equipment meeting these regulations would presumably become available in late 1995. When this happens, any subsequent equipment purchases should be limited to equipment meeting these requirements. Exceptions will be the container haulers and water tankers, which should continue to be purchased with on-highway certified engines.

Catalytic trap-oxidizers - Catalytic trap-oxidizers have been shown to be highly effective in reducing Diesel engine emissions of PM10, VOC, and toxic air contaminants. Reductions of 80-90% in particulate matter and 50-80% in VOC are typical. These systems could thus be especially effective in counteracting the increase in PM10 and VOC emissions which is otherwise likely as a result of retarding injection timing for NOx control. Low-sulfur fuel is required to ensure that the platinum-group catalysts use do not create a problem with excessive sulfate emissions.

The difficulty of ensuring reliable regeneration and adequate durability has prevented trap-oxidizer deployment in highway vehicles (except for a limited number of Mercedes passenger cars) up to the present time. With their higher load factors and predictable duty cycles, construction and mining machines are excellent candidates for trap-oxidizer application, and they have been employed successfully in several mining operations. To date, trap-oxidizer usage has not been demonstrated in landfill operations, however, and there is presently no commercial trap system available for landfill equipment. In addition, trap-oxidizer use would raise a number of questions concerning effects on safety, performance, reliability, and durability of landfill equipment.

These questions would have to be answered before trap-oxidizer systems could be considered feasible for installation on Diesel fueled landfill equipment.

Alternative fuels - Replacement of Diesel engines with engines using alternative fuels such as methanol, LPG, or natural gas could conceivably reduce pollutant emissions. At present, no such engines are available in any of the equipment types planned to be used in landfill operations. A number of engines using methanol and compressed natural gas are under development for use in on-highway trucks, however, and the first such engines (the Detroit Diesel 6V-92 methanol engine and Cummins L10 natural gas engine)are expected to be commercially introduced in transit buses in 1991. These engines are expected to be rated at 240 to 270 HP. This is too low a power rating for most of the landfill equipment planned.

Additional engines are expected to be introduced in response to future California Air Resources Board low emission vehicle (LEV) regulations. These engines could be used directly in the container haulers, and could conceivably be adapted for use in dozers, compactors, and other items of landfill equipment. However, this is unlikely to occur significantly before 1996, the year in which California Air Resources Board's planned emissions standards for construction equipment would take effect. Thus, it would be necessary to compare the emissions benefits and costs of alternative fuel use with those for Diesel equipment meeting California Air Resources Board emission standards.

Electrification - Replacement of Diesel or alternative-fuel prime movers with electric motors would produce virtually a 100% reduction in exhaust emissions. Successful electrification of landfill operations requires that a reliable supply of electric power be provided to the equipment at all times. Battery systems capable of delivering the power and energy densities required for landfill equipment do not yet exist. This limits the range of equipment which could feasibly be electrified to those which do not move, or which have only a very limited range of motion. These would include the container unloading cranes in the container handling yard, the pug mill used for liner material preparation, and the belts which may be used for the transportation and loading of cover material. Electrifying the overhead crane is estimated to reduce Diesel consumption by 308 gallons per day, while electrifying the pug mill would save 84 gallons per day, for a total of 392 gallons, or 5% of the total fuel consumed in the landfill operation. The reduction in emissions would also be roughly 5%.

In addition to the foregoing, it is also conceivable that waste could be transported from the container handling area to the landfill face using an electric conveyor, rather than container handling vehicles shuttling between the two. This would not be practical, however. For efficient and sanitary landfill operation, waste must be deposited near the working face so that bags, etc. are not broken open and scattered during transportation. The working face will advance as much as 250 feet per day, however. As a result, it would be necessary to continually reposition the electric conveyors. The resulting downtime (as well as reliability problems) would have a severely deleterious effect on the efficiency of operation.

The same concept could be applied to the cover material, however. A conveyor could transport cover material roughly 75% of the distance to a staging area, where a truck would haul it the remaining distance.

Mitigation for On-Site Material Handling Impacts

Particulate emissions from material handling operations will contribute to the cumulative environmenal impact of the project. These emissions will be regulated by U.S. Environmental Protection Agency new source performance standards and several South Coast Air Quality Management District regulations. Affected sources will include the processing of coarse and fine tailing. As the solid waste is comparatively damp and large in particle size, no particulate emissions have been observed from the handling or processing of this material at operating landfills, and none are expected with the proposed project. Regulations which will establish control technology requirements for these operations were discussed in Section I.6. above.

No mitigation measures, beyond compliance with applicable regulations, have been identified for on-site material handling operations.

Mitigation for Landfill Gas Generation and Combustion Impacts

Fugitive landfill gas emissions from the landfill surface and combustion emissions from the flaring of landfill gas will contribute to the cumulative environmental impact of the project. These emissions will be regulated by South Coast Air Quality Management District Rules 1150.1 and 1401. The first directly regulates emissions from landfills while the latter two, if adopted, will require the analysis and limit the emissions of toxic compounds from any new or modified facility.

Techniques for compliance with these rules are described in Section I.6.E above.

In addition, to compliance with these rules, Mine Reclamation Corp. has committed to two additional mitigation measures to reduce landfill gas generation and combustion impacts.

First, if the landfill gas generation rate exceeds 10 million cubic feet per day, either an energy recovery system will be installed to replace the flares, or the flares will be equipped with oxidation catalysts. As final decisions on energy recovery options have not been made, this analysis will focus only on control of emissions from the flares. A proposal to substitute energy recovery equipment for the flares will be subject to future environmental review.

Oxidation catalysts can oxidize concentrations of carbon monoxide and hydrocarbons in the flare exhaust to form carbon dioxide and water. In order to avoid catalyst damage, it will be necessary to modify the flares to recover energy from the exhaust and reduce stack exit temperatures to 850° or less. The catalysts will consist of blocks of platinum-coated ceramic honeycomb. A number of these blocks will be mounted in a stainless steel frame to produce a porous wall through which all of the exhaust gas will pass. Each catalyst will be located a sufficient distance downstream of the flare burner so as to receive cooled exhaust gas at the temperature which is optimum for catalyst efficiency. The design control efficiency of the catalyst for carbon monoxide will be 90%, and for non-methane hydrocarbons will be 50%. Catalyst life is expected to be guaranteed by the vendor to be a minimum of two years of continuous operation.

Second, if the landfill gas generation rate exceeds 50 million cubic feet per day, the flares will be additionally equipped with urea injection systems. These systems will inject aqueous solutions of urea into areas of 1400°-1750° F temperature regime upstream of the oxidizing catalysts. The urea solution will reaction with oxides of nitrogen in the flare exhaust to produce molecular nitrogen, carbon dioxide, and water. The control effectiveness of urea injection for oxides of nitrogen from a flare is estimated at 30% or higher. For this analysis, the lower end of this range is used to conservatively overestimate emissions.

Mitigation for Fugitive Dust Impacts

Fugitive dust emissions due to the handling or passage of vehicles over native material and tailing will contribute to the cumulative environmental impact of the project. Primary sources will include the movement of vehicles over project roads, the excavation of tailing, the spreading and compaction of cover material, and the construction of landfill systems. Landfill systems include access roads and landfill gas pipelines.

Road Surfaces - Fugitive dust emissions from road surfaces should be mitigated by either water application, aggregate and dust palliative application, or paving. For roads which are under construction or are very temporary, such as the landings from which container haul trucks will dump, frequent watering should be used to maintain surface moisture contents above 4%. At maximum onsite traffic levels and peak evaporation rates, the water application rate may reach 3 gallons per square yard per hour in order to maintain the 95% control efficiency.

Chemical dust suppressants applied to the surface of compacted coarse tailing should be used to control fugitive dust emissions on transitional roads. Transitional roads are those which will be periodically reconstructed, such as the landfill circumference road. Upon completion of periodic reconstruction, the road will be surfaced with a course of tailing. This material should be compacted and sprayed with a solution of water and chemical additive. The solution application rate will depend on the type of additive used (ie., asphalt emulsion, petroleum resin, acrylic cement, etc.) and concentration of the solution. Research data should be used to select two to four commercial products for onsite testing during project startup. Demonstration sections of treated roadway should be visually inspected on a daily basis to determine the duration of dustless operation. The additive which is most cost-effective in maintaining negligible visible emissions should be chosen for ongoing project use. The results of the field study should also be used to determine the necessary chemical reapplication interval.

For onsite roads which will be permanent in location, such as those providing access to and movement within the container transfer yard, paving should be used to control fugitive dust. In the construction of these roads, coarse tailing or other suitable aggregate should be used to provide an acceptable structural base to support project vehicles. Two to three inches of asphalt concrete should be applied as an overlay. As necessary, paved roads should be cleaned with mechanical sweepers to maintain levels of loose surface material below those which would produce visible emissions.

Tailing Excavation - Fugitive dust emissions from the excavation of coarse and fine tailing should be mitigated by prewatering. The moisture content which achieves nearly dustless conditions upon excavation and loadout of the tailing should be used as a standard measure for tailing acceptability. The roadbed used by loaders to deliver the tailing to each mixing circuit should also be watered to maintain the same minimum moisture content.

If it is found effective in reducing fugitive dust emissions, material in the processed coarse tailing storage pile should be watered prior to loadout into haul trucks. Because this pile is expected to contain only a small fraction of fine material, and because surface application may not allow penetration of water to the interior of the pile, it is not obvious that watering at this juncture will have an impact on emissions generated by the subsequent handling of this material. During initial application of cover material, tests should be conducted to determine the effectiveness of this practice. If visible emission reductions are achieved during testing, this practice should become a standard operating procedure for the project.

Miscellaneous Sources - Fugitive dust from other excavation activities should be mitigated by surface prewatering. These activities include the clearing of sloughed material on pit benches, the excavation of landfill gas pipeline ditches, and the maintenance of unpaved road surfaces. A high pressure pump mounted on one of the water trucks should be used to spray the surface of bench material prior to removal. This same vehicle should be used to spray the surface of cover material during spreading if such a practice is found effective during initial testing. Areas to be excavated for landfill gas pipeline installation should be prewatered with a portable sprinkler system. Rear spray water trucks should be used to wet courses of fill in the reconstruction of transitional roads, and should prewater areas targeted for road grading and ditch cleaning.

Mitigation Measures Recommended for Project Approval

Based on the discussion in the preceding section, the following mitigation measures are recommended for project approval. Measures which are outside the jurisdiction of the lead agencies are suggested to address significant cumulative air quality impacts.

Mitigation Measure AQ-1: Truck Emission Standards - Trucks used to haul solid waste to the transfer stations, and trucks used to haul solid waste to the landfill, shall comply with all applicable California motor vehicle pollution control regulations. All new trucks used to haul solid waste to the landfill, and purchased after the effective date of new, more stringent California motor vehicle pollution control regulations, shall comply with those regulations.

Implementing Agencies: California Air Resources Board
California Department of Motor Vehicles
California Highway Patrol

Mitigation Measure AQ-2: Diesel Fuel Quality - Trucks used to haul solid waste to the transfer stations, and trucks used to haul solid waste directly to the landfill, shall use Diesel fuel which complies with all applicable California Air Resources Board regulations for on-highway Diesel motor vehicle fuel.

Implementing Agencies: California Air Resources Board

Mitigation Measure AQ-3: South Coast Air Quality Management District Smoke Enforcement Program - Trucks used to haul solid waste to the transfer stations, and trucks used to haul solid waste to the landfill, shall be subjected to random checks for excessive smoke by the California Highway Patrol.

Implementing Agencies: California Highway Patrol
South Coast AQMD

Mitigation Measure AQ-4: California Highway Patrol Diesel Truck Inspection Program - Trucks used to haul solid waste to the transfer stations, and trucks used to haul solid waste to the landfill, shall be subjected to periodic checks for excessive smoke and emissions control system tampering at California Highway Patrol weight and safety inspection stations.

Implementing Agencies: California Highway Patrol
California Air Resources Board

Mitigation Measure AQ-5: State Low Emission Vehicle Regulations - Trucks used to haul solid waste to the transfer stations, and trucks used to haul solid waste to the landfill, shall be low emission vehicles as defined in state regulations, to the extent required by regulations of the California Air Resources Board and the South Coast Air Quality Management District (such as proposed Rule 1601).

Implementing Agencies: South Coast AQMD
California Air Resources Board
California Department of Motor Vehicles

Mitigation Measure AQ-6: Locomotive Operating Procedures - Mine Reclamation Corp. shall ensure that Diesel locomotives on the Eagle Mountain railway are shut down when the engines will not be needed for one hour or more. Mine Reclamation Corporation shall ensure that Diesel locomotives on the Eagle Mountain railway receive regular preventive maintenance, in accordance with the engine manufacturers' recommendations. This maintenance will include daily visual checks for excessive smoke by the engineers, and smoke measurements with an end-of-stack opacity meter of each engine at each scheduled maintenance interval, and at each unscheduled maintenance event. Locomotives which are observed to have excessive opacity, in excess of 20%, shall be removed from service and adjusted and/or repaired within three working days of the observation. A record of all visual and instrument checks for excessive smoke, as well as associated repairs, shall be maintained by Mine Reclamation Corporation along with the routine maintenance logs for each engine.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-7: Diesel Fuel for Locomotive Operations - All Diesel locomotives on the Eagle Mountain railway shall be fueled with Diesel fuel which meets the requirements of the California Air Resources Board for on-highway motor vehicle Diesel fuel. Mine Reclamation Corporation shall maintain a record of all Diesel fuel purchases which includes a statement by the supplier that the fuel complies with this requirement.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-8: Diesel Locomotive Emission Standards - All Diesel locomotive engines purchased by Mine Reclamation Corporation for use on the Eagle Mountain railway shall comply with all applicable state and federal emission control requirements.

Implementing Agencies: U.S. Environmental Protection Agency
California Air Resources Board

Mitigation Measure AQ-9: Diesel Locomotive Low Emission Retrofits - Prior to the commencement of routine operations on the Eagle Mountain railway, Mine Reclamation Corporation shall prepare, or have prepared, a study comparing the relative costs of modifying the existing Kaiser Diesel locomotive engines to reduce their oxides of nitrogen emissions, or purchasing replacement Diesel engines, such that their oxides of nitrogen emissions are not greater than approximately 6 grams per brakehorsepower-hour at maximum rated load. Upon completion of this study, Mine Reclamation Corporation shall modify the existing Kaiser Diesel locomotive engines to achieve the lower NOx level, or shall replace existing engines which new engines which achieve the lower NOx level.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-10: Electrification of the Eagle Mountain Railway - When landfill gas generation is sufficient to warrant the construction of an energy recovery facility at the project site, Mine Reclamation Corporation shall prepare, or have prepared, a study of the cost/effectiveness of electrifying the

Eagle Mountain railway to reduce emissions from locomotive emissions.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-11: Landfill Equipment Operating Procedures - Mine Reclamation Corporation should ensure that equipment operators at the landfill shut down their engines if the equipment will be idle for fifteen minutes or longer. Mine Reclamation Corporation should schedule the number of machines and operators to match the anticipated waste volumes, and should match the number of container haulers to the container handling capacity to avoid excessive queueing.

Mine Reclamation Corporation should ensure that Diesel fueled equipment at the landfill receive regular preventive maintenance, in accordance with the engine manufacturers' recommendations. This maintenance should include daily visual checks for excessive smoke by the operations or maintenance staff. Equipment which is observed to have excessive opacity, in excess of 20%, shall be removed from service at the end of the next work shift, and adjusted and/or repaired within three working days of the observation. A record of all visual and instrument checks for excessive smoke, as well as related repairs, shall be maintained by Mine Reclamation Corporation along with the routine maintenance logs for each item of equipment.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-12: Diesel Fuel for Landfill Equipment - All Diesel-fueled equipment at the landfill should be fueled with Diesel fuel which meets the requirements of the California Air Resources Board for on-highway motor vehicle Diesel fuel. Mine Reclamation Corporation should maintain a record of all Diesel fuel purchases which includes a statement by the supplier that the fuel complies with this requirement.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-13: On-Highway Engines for Landfill Equipment - Prior to purchasing any Diesel-fueled equipment for operation at the landfill, Mine Reclamation Corporation should evaluate the feasibility of purchasing the equipment with engines which are certified by the California Air Resources Board for use in on-highway trucks. If such engines are available, Mine Reclamation Corporation should purchase the equipment with equivalent on-highway engines, unless (1) there is no suitable engine available; or (2) the mounting and installation requirements, or duty cycle limitations, make it infeasible to use available on-highway engines in that equipment.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-14: Low NOx Engine Design for Landfill Equipment - For any Diesel-fueled landfill equipment for which there are no suitable on-highway equivalent engines, Mine Reclamation Corporation should purchase the equipment with engines which are equipped with turbochargers and intercoolers (or aftercoolers). In addition, Mine Reclamation Corporation should maintain these engines with the fuel injection timing retarded to a level recommended by the engine manufacturer for reduced NOx emissions, but which will not result in excessive visible smoke emissions.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-15: Construction Equipment Emission Standards - Mine Reclamation Corporation should ensure that all landfill equipment which it purchases complies with all applicable federal and state emission control standards.

Implemented by: California Air Resources Board
U.S. Environmental Protection Agency

Mitigation Measure AQ-16: Electrification of Landfill Equipment - Mine Reclamation Corporation should purchase and operate electric versions of the following equipment, in lieu of Diesel (or other) fueled versions at the landfill site:

- container loading/unloading cranes
- pug mills used for liner material preparation
- crushers used for liner material preparation
- conveyors for transporting cover material 75% of the distance from the preparation area to the landfill face.

Implemented by: Mine Reclamation Corp.
Monitored by: Riverside County

Mitigation Measure AQ-17: Control of Flare Emissions - When the flare gas generation rate exceeds five million cubic feet per day, Mine Reclamation Corp. shall conduct an analysis of the technical and economic feasibility of recovering energy from the flared landfill gas. If the analysis indicates that energy recovery is feasible, Mine Reclamation Corp. shall take the steps necessary to design, permit, and construct the energy recovery facilities before the landfill gas generation rate exceeds 10 million cubic feet per day.

If the analysis indicates that energy recovery is not feasible and the landfill gas generation rate exceeds eight million cubic feet, Mine Reclamation Corp. shall take the steps necessary to retrofit an oxidation catalyst system to the flares which is capable of achieving at least an 80% reduction in carbon monoxide emissions and a 50% reduction in non-methane hydrocarbon emissions. The oxidation catalyst system shall be installed and operating before the landfill gas generation rate exceeds 10 million cubic feet per day.

In the event that an oxidation catalyst system is not commercially available at that time, Mine Reclamation Corp. shall submit revised applications to the air pollution control agencies reflecting the higher carbon monoxide and non-methane hydrocarbon emission rates from the flares.

If an energy recovery facility is not constructed and the landfill gas generation rate exceeds 45 million cubic feet per day, Mine Reclamation Corp. shall take the steps necessary to retrofit a urea injection system (or equivalent system) capable of achieving at least a 30% reduction in oxides of nitrogen emissions. The urea injection system shall be installed and operating before the landfill gas generation rate exceeds 50 million cubic feet per day.

Implemented by:	Mine Reclamation Corp.
Monitored by:	South Coast AQMD
	U.S. Environmental Protection Agency

Mitigation Measure AQ-18: Temporary Road Surfaces - Mine Reclamation Corp. shall apply water as a dust suppressant to all road surfaces during construction operations sufficient to maintain nominal surface moisture contents above 4%. In addition, for all road surfaces or staging areas which are used during normal project operations for a period of thirty days or less, Mine Reclamation Corp. shall apply water as a dust suppressant sufficient to maintain nominal surface moisture contents above 4%.

Implemented by:	Mine Reclamation Corp.
Monitored by:	South Coast AQMD
	Riverside County

Mitigation Measure AQ-19: Transitional Road Surfaces - For all road surfaces, excluding construction roads, which are used during normal operations for a period of more than thirty days, but which are periodically reconstructed or relocated, Mine Reclamation Corp. shall apply chemical dust suppressants on a base of compacted coarse tailing to minimize fugitive dust emissions. The chemical dust suppressant shall be selected based on a field evaluation of candidate suppressants conducted upon startup of the project.

Mitigation Measure AQ-20: Permanent Road Surfaces - Mine Reclamation Corp. shall pave all onsite roads which will be fixed in their locations for the life of the project. These roads shall be periodically cleaned with mechanical sweepers to minimize the buildup of loose surface material.

Mitigation Measure AQ-21: Tailing Excavation - Mine Reclamation Corp. shall pre-water tailing piles prior to excavation.

If necessary and effective, Mine Reclamation Corp. shall apply water as a dust suppressant to processed coarse tailing prior to their loadout into haul trucks.

Mitigation Measure AQ-22: Miscellaneous Fugitive Dust Sources - Mine Reclamation Corp. shall apply water as a dust suppressant prior to clearing material from pit benches, excavating landfill gas collection pipe ditches, during reconstruction of transitional roads, and during any other operations which could result in visible fugitive dust emissions which can be seen from locations outside the project boundary.

Mitigation Measure AQ-23: Weather Data Collection/Revised Air Quality Modeling Analysis - Prior to the receipt of waste material for disposal at the landfill site, Mine Reclamation Corp. shall complete the acquisition of at least twelve months of valid meteorological data at the site. The data shall be collected in accordance with a monitoring plan reviewed and approved by the South Coast Air Quality Management District and the Environmental Protection Agency.

Prior to the receipt of waste material for disposal at the landfill site, Mine Reclamation Corp. shall complete a revised air quality modeling analysis and screening level health risk assessment analysis using site specific meteorological data. If this analysis indicates that there is a potential for significant adverse impacts due to operation of the facility, Mine Reclamation Corp. shall develop and submit for approval additional mitigation strategies which will reduce remaining significant impacts, if any, to levels of insignificance.

The following measures are not considered to be feasible at the present time, for the reasons discussed in the preceding sections:

- Use of catalytic trap oxidizers on new or existing Diesel locomotives;
- Use of selective catalytic reductions systems on new or existing Diesel locomotives;
- Use of alternative fuels such as methanol, LPG, or compressed natural gas in Diesel locomotives;
- Use of catalytic trap oxidizers on new Diesel fueled landfill equipment
- Use of alternative fuels such as methanol, LPG, or compressed natural gas in new Diesel fueled landfill equipment

However, should any of these technologies be required by applicable federal, state or local regulations, Mine Reclamation Corporation should take steps to comply with these regulations as expeditiously as possible.

Summary of Remaining Project Impacts After Mitigation

Table 34 shows the effect of the recommended mitigation measures on total project emissions; Table 35 presents the same information for the sources which under within the direct control of Mine Reclamation Corp. Figures 33 and 34 present the same data graphically.

The data show that the recommended mitigation measures have the greatest benefits for reducing emissions of oxides of nitrogen and sulfur dioxide. The oxides of nitrogen reductions are due to the use of low NOx emitting engines in locomotives and on-site landfill equipment, as well as the electrification of portions of the operation. The NOx reductions associated with the use of a urea injection system on the flare at maximum flare gas production levels are not shown as a credit in these tables, since they have been incorporated into the project design and are reflected in all estimates of project emissions. This is because it is anticipated that this level of control may be required by regulation at the future date.

The sulfur dioxide reductions are due to the use of ultra-low sulfur fuel in all Diesel burning equipment owned by Mine Reclamation Corp. The use of this fuel results in associated reductions in particulate matter emissions as well. The use of an electric conveyor to transfer cover material for a portion of the distance which would otherwise be traveled by trucks on transitional roads results in a further reduction in particulate emissions.

In addition, the project design reflects substantial reductions (up to 95%) in particulate emissions due to a variety of dust suppression techniques, since it is likely that these measures would be required in order to comply with South Coast Air Quality Management District requirements. Consequently, all estimates of project emissions (with and without mitigation) reflect these reductions.

Relatively small reductions in carbon monoxide and volatile organic compounds (hydrocarbons) are expected beyond those already included in the project design to ensure that flare gas emissions of that pollutant do not exceed applicable regulatory trigger levels. The remaining sources of carbon monoxide and VOC's are Diesel engines, which have inherently low levels of these pollutants.

Table 34

Eagle Mountain Project
Effect of Mitigation on Project Emissions
(tons/year)

Activity	NOx	CO	PM10	VOC	SO2
		Without Mitigation			
Transfer Stations	325	98	35	30	40
Trains	1986	803	56	181	277
On-Highway Trucks	189	89	27	29	39
On-Site Vehicle Exhaust	515	173	38	30	53
On-Site Fugitive Dust*			140		
Landfill Gas Flares*	216	149	123	154	57
Project Total, Without Mitigation	3231	1312	419	424	466
		With Mitigation			
Transfer Stations	252	109	22	23	20
Trains	1775	803	51	181	197
On-Highway Trucks	189	89	27	29	39
On-Site Vehicle Exhaust	292	130	18	19	9
On-Site Fugitive Dust*			125		
Landfill Gas Flares*	216	149	123	154	57
Project Total, With Mitigation	2724	1280	366	406	322
REDUCTION DUE TO MITIGATION:					
Tons	507	32	53	18	144
Percent	(16%)	(2%)	(13%)	(4%)	(31%)

*Project design incorporated mitigation measures; see text for details.

Table 35

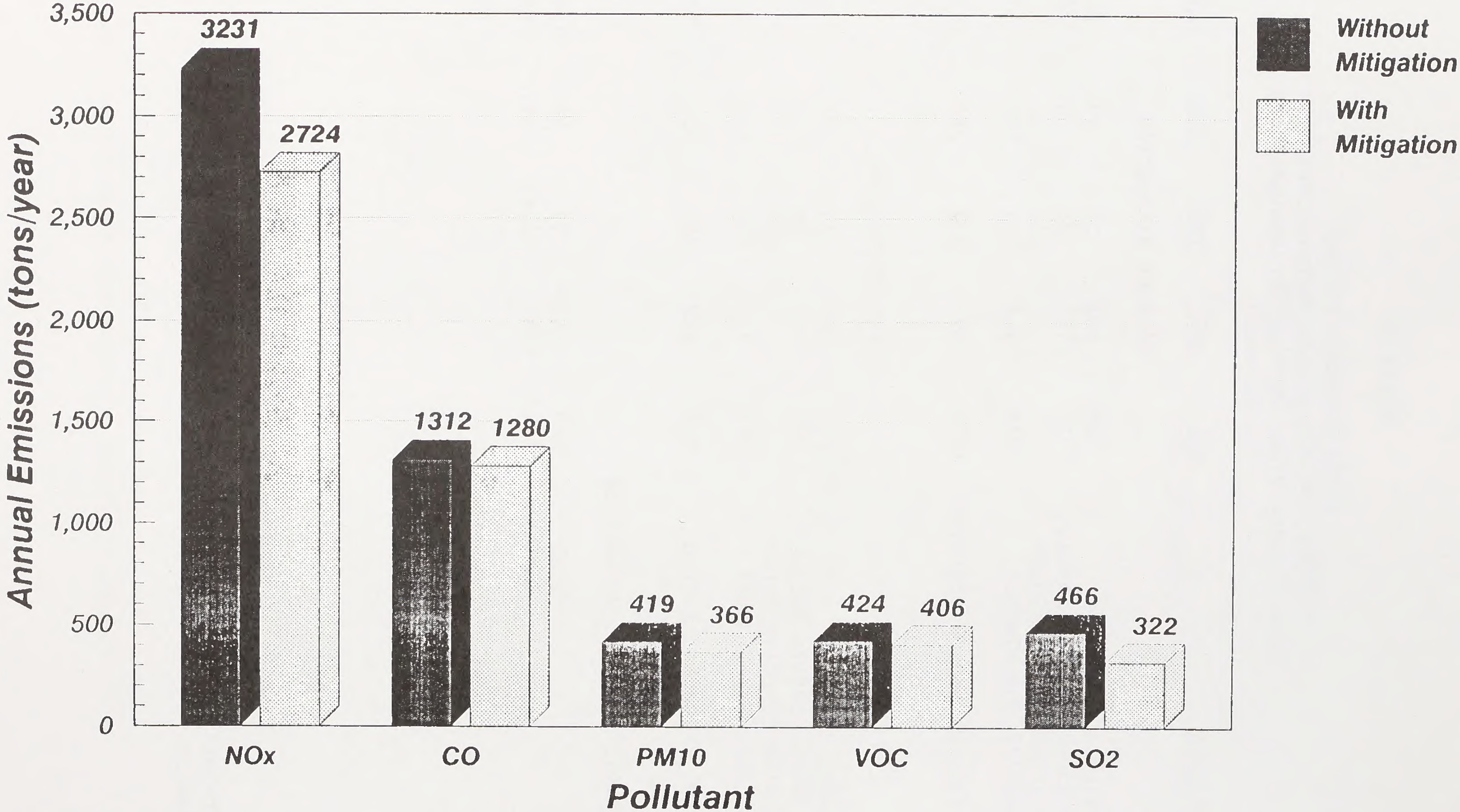
Eagle Mountain Project
Effect of Mitigation on Emissions
from Sources Owned by Mine Reclamation Corp.
(tons/year)

Activity	NOx	CO	PM10	VOC	SO2
		Without Mitigation			
Trains	504	203	21	79	89
On-Site Vehicle Exhaust	515	173	38	30	53
On-Site Fugitive Dust*			140		
Landfill Gas Flares*	216	149	123	154	57
Total, Without Mitigation	1235	525	322	263	199
		With Mitigation			
Trains	294	203	17	79	9
On-Site Vehicle Exhaust	292	130	18	19	9
On-Site Fugitive Dust*			125		
Landfill Gas Flares*	216	149	123	154	57
Total, With Mitigation	802	482	283	252	75
REDUCTION DUE TO MITIGATION					
Tons	433	43	39	11	124
Percent	(35%)	(8%)	(12%)	(4%)	(62%)

*Project design incorporated mitigation measures; see text for details.

Figure 33

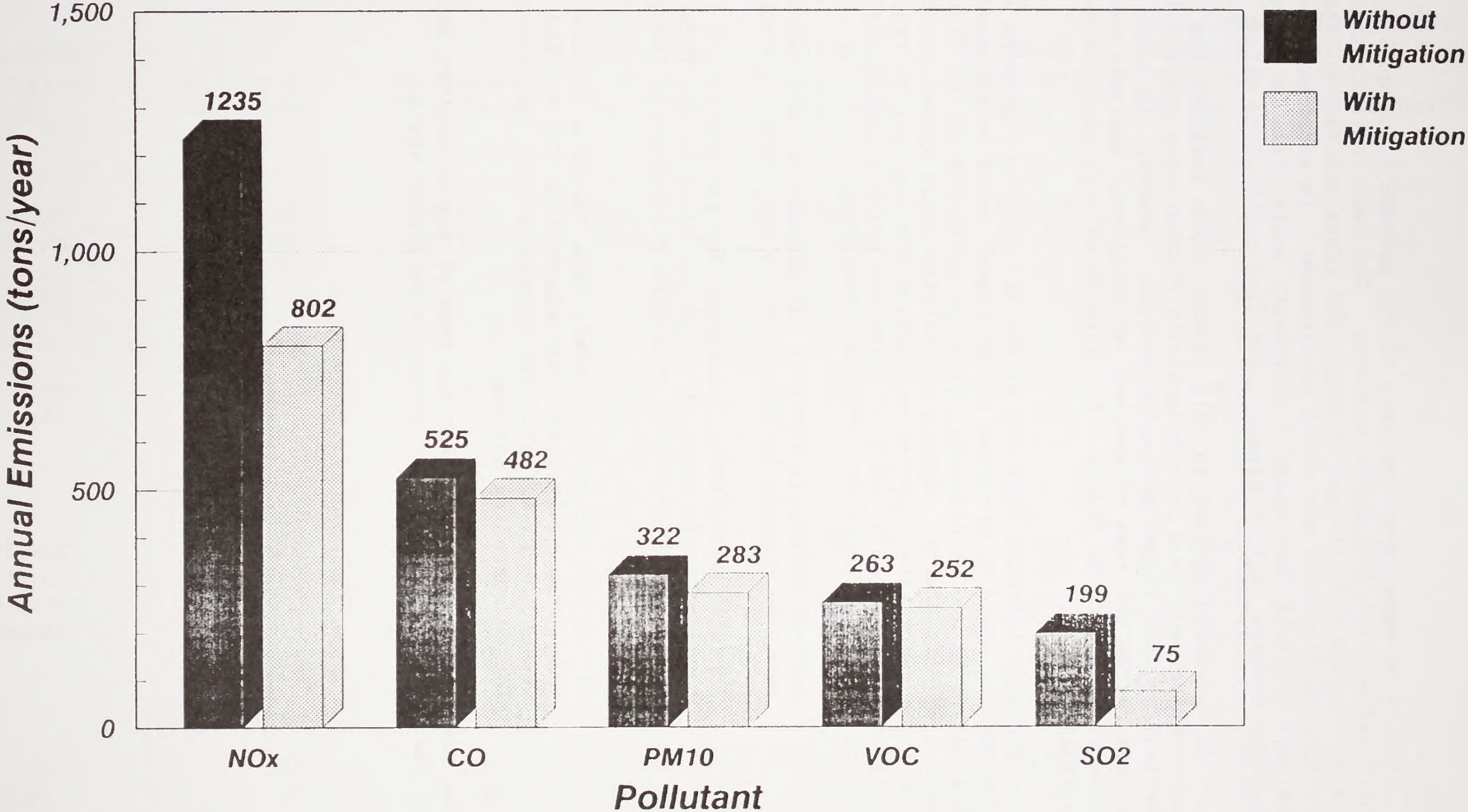
Eagle Mountain Project
Mitigation Benefits



Sierra Research
August 1990

Figure 34

Eagle Mountain Project
Mitigation Benefits - MRC Sources Only



Sierra Research
August 1990

Table 36 shows a re-analysis of the project's air quality impacts which reflect the mitigation measures. The data indicate that the state standard for nitrogen dioxide, and state and federal standards for fine particulates may still be exceeded. In addition, the analysis projects that Class I increments would still be exceeded for nitrogen dioxide, sulfur dioxide, and fine particulate matter.

As discussed earlier in this report, these analyses are conservative, and tend to substantially overestimate project impacts, particularly for longer averaging periods. However, in order to further narrow the area of concern, an additional analysis was performed without the flares. The results of this analysis are shown in Table 37.

The data indicate that all of the air quality standards and Class I increments would be achieved if the flares could be replaced with an alternative method of disposal, with the exception of the state and federal PM10 standards. Upon a re-analysis using actual weather data from the project site, further mitigation measures may be required. As discussed previously, each of these air quality impact analyses reflect a high degree of conservatism, including:

- maximum potential landfill gas generation rates which may never be reached in the project's dry, desert location;

- landfill operations, locations, and gas generation rates are based on projections 30 years (or more) in the future, but reflect only currently available air pollution control technologies;

- all of the air quality models were run in a screening mode, which results in worst case assumptions for weather and overestimates of pollutant concentrations, particularly for longer averaging periods.

Upon the collection of at least one year of actual weather data, the air quality modeling analysis should be performed again.

Table 36

Maximum Impact of Proposed Eagle Mountain Project
on Ambient Air Quality
(with mitigation)
(all concentrations in micrograms per cubic meter)

Pollutant/ Averaging Time	California Standards	National Standards	Maximum Offsite Concen- tration	Maximum Background (1986-88)	Maximum Cumulative Impact	Maximum Impact at Class I Area	Allowable Class I Area Increment
CO							
1-hour	23,000	40,000	186.7	14,950	15,137	----	----
*8-hour	10,000	10,000	130.7	6,344	6,475	----	----
NO2							
1-hour	470	---	283.5	207	491	----	----
*Annual	---	100	25.7	32	58	7.7	2.5
SO2							
1-hour	655	---	63.9	210	274	----	----
*3-hour	---	1300	57.5	---	---	17.6	25
*24-hour	131	365	25.2	58	83	7.8	5
*Annual	---	80	6.3	5	11	1.9	2
PM10							
*24-hour	50	150	72.9	368	441	17.7	10.0
*Annual	30	50	18.2	65	83	4.4	5.0

*For project impacts:
3-hour = 0.9 x 1 hour
8-hour = 0.7 x 1 hour
24-hour = 0.4 x 1 hour
annual = 0.1 x 1 hour

Table 37

Maximum Impact of Proposed Eagle Mountain Project
on Ambient Air Quality
(with mitigation; with no gas flaring)
(all concentrations in micrograms per cubic meter)

Pollutant/ Averaging Time	California Standards	National Standards	Maximum Offsite Concen-tration	Maximum Background (1986-88)	Maximum Cumulative Impact	Maximum Impact at Class I Area	Allowable Class I Area Increment
CO							
1-hour	23,000	40,000	86.8	14,950	15,037	----	----
*8-hour	10,000	10,000	60.8	6,344	6,405	----	----
NO2							
1-hour	470	---	197.7	207	405	----	----
*Annual	---	100	8.1	32	40	2.0	2.5
SO2							
1-hour	655	---	6.3	210	216	----	----
*3-hour	---	1300	5.7	---	---	1.4	25
*24-hour	131	365	1.0	58	59	0.3	5
*Annual	---	80	0.3	5	5	0.1	2
PM10							
*24-hour	50	150	72.9	368	441	3.6	10.0
*Annual	30	50	18.2	65	83	0.9	5.0

*For project impacts:
3-hour = 0.9 x 1 hour
8-hour = 0.7 x 1 hour
24-hour = 0.4 x 1 hour
annual = 0.1 x 1 hour

5) Assessment of Significance

Ozone - Table 38 compares the impacts of the Proposed Action with various significance criteria for ozone. In this table, hydrocarbon emissions are used to evaluate the significance of ozone impacts; there are no approved techniques available which can be used to estimate the change in ambient ozone concentrations due to any of the alternatives.

Compared with a baseline of zero emissions, the Proposed Action would be expected to have a significant impact on ozone, due to significant increases in hydrocarbon emissions.)

Within the South Coast Air Basin, the increases in emissions of hydrocarbons due to increased transport of waste are more than offset by the expected decrease in flare emissions. Consequently, the Proposed Action is expected to have a beneficial impact on hydrocarbon emissions within the South Coast Air Basin, while resulting in a significant increase in the Desert Air Basin. Since both regions experience violations of the state and federal ozone standards, the overall impacts for ozone would be considered significant for the Proposed Action.

Nitrogen Dioxide - Table 39 compares the impacts of the Proposed Action with various significance criteria for nitrogen dioxide. Once again, the Proposed Action is shown to result in significant impacts for this pollutant.

Carbon Monoxide - The impact of the Proposed Action on carbon monoxide is shown in Table 40. The data show that, compared with a baseline of zero emissions, the Proposed Action would have a significant impact on carbon monoxide. The Proposed Action would reduce carbon monoxide emissions in the South Coast Air Basin - where state and federal air quality standards are exceeded - while increasing emissions in the Desert areas which still meet the standards. Since the air quality modeling analyses in Section IV.B.4.c show that the Eagle Mountain Project would not result in a violation of any state or federal air quality standard for carbon monoxide, the overall impacts of the Proposed Action on carbon monoxide are expected to be insignificant, and beneficial within the South Coast Air Basin.

Sulfur Dioxide - Table 41 shows the impacts of the Proposed Action on sulfur dioxide. The data show that the Proposed Action would result in a significant impact for this pollutant.

Particulate Sulfates - Since particulate sulfates are formed in the atmosphere from emissions of sulfur dioxide, conclusions regarding the significance of sulfur dioxide impacts would be applicable to sulfates as well.

Table 38

Assessment of Significance for Ozone
Eagle Mountain Project

Measure of Significance	Level	Project Without Mitigation	Project With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	2,326	2,225
AQMD major NSR	100 tons/year	424	406
AQMD major PSD	25 tons/year	424	406
AQMD sig incr PSD	25 tons/year	424	406
EPA major source	100 tons/year	424	406
EPA major mod	40 tons/year	424	406
Ozone Measurement Accuracy and Reporting Precision			
ARB accuracy	0.54 pphm		
ARB reporting	1 pphm		
Other Measures			
Zero molecule	0 lbs/day	2,326	2,225

Table 39

Assessment of Significance for Oxides of Nitrogen
Eagle Mountain Project

Measure of Significance	Level	Project Without Mitigation	Project With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	17,699	14,927
AQMD major NSR	100 tons/year	3,231	2,724
AQMD major PSD	25 tons/year	3,231	2,724
AQMD sig incr PSD	25 tons/year	3,231	2,724
EPA major source	100 tons/year	3,231	2,724
EPA major mod	40 tons/year	3,231	2,724
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	10 ug/m3 ann	27	26
EPA Class I ann	10 ug/m3 ann	27	26
EPA de minimum ann	14 ug/m3 ann	27	26
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.18 pphm 1-hr	18	15
ARB report 1h	1 pphm 1-hr	18	15
ARB report ann	0.1 pphm ann	1.4	1.4
Other Measures			
Zero molecule	0 lbs/day	17,699	14,927

Table 40

Assessment of Significance for Carbon Monoxide
Eagle Mountain Project

Measure of Significance	Level	Project Without Mitigation	Project With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	7,189	7,013
AQMD major NSR	100 tons/year	1,312	1,280
AQMD major PSD	25 tons/year	1,312	1,280
AQMD sig incr PSD	25 tons/year	1,312	1,280
EPA major source	100 tons/year	1,312	1,280
EPA major mod	40 tons/year	1,312	1,280
Concentration Based Measures - Industrial Sources			
EPA Class I 24 hr	1 ug/m3 24-hr	75	75
EPA de minimus 8h	575 ug/m3 8-hr	132	131
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.02 ppm 1-hr	0.16	0.16
ARB report 1h	1 ppm 1-hr	0.16	0.16
ARB report 8h	0.1 ppm 8-hr	0.12	0.12
Other Measures			
Zero molecule	0 lbs/day	7,189	7,013

Table 41

Assessment of Significance for Sulfur Dioxide
Eagle Mountain Project

Measure of Significance	Level	Project Without Mitigation	Project With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	2,554	1,763
AQMD major NSR	100 tons/year	466	322
AQMD major PSD	25 tons/year	466	322
AQMD sig incr PSD	25 tons/year	466	322
EPA major source	100 tons/year	466	322
EPA major mod	40 tons/year	466	322
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	2 ug/m3 ann	7	6
AQMD Class I 24h	5 ug/m3 24-hr	26	25
AQMD Class I 3h	25 ug/m3 3-hr	64	58
EPA Class I ann	2 ug/m3 ann	7	6
EPA Class I 24h	5 ug/m3 24-hr	26	25
EPA Class I 3h	25 ug/m3 3-hr	64	58
EPA de minimus 24h	13 ug/m3 24-hr	26	25
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.33 pphm 1-hr	2.7	2.4
ARB reporting 1h	1 pphm 1-hr	2.7	2.4
Other Measures			
Zero molecule	0 lbs/day	2,554	1,763

Fine Particulates - The impacts on fine particulates of the Proposed Action is shown in Table 42. Once again, the data show that the Proposed Action results in significant impacts for this pollutant.

For this pollutant, the shift in landfill operations outside of the South Coast Air Basin results in a decrease in emissions which outweighs the increase due to transportation; consequently, the Proposed Action would result in a net air quality benefit within the South Coast Air Basin. However, given the fact that both the Basin and Desert portions of Southern California exceed state and federal air quality standards for fine particulates, the overall impacts would still be considered significant.

Regional Visibility - Regional visibility is affected by emissions of hydrocarbons, oxides of nitrogen, sulfur dioxide, and particulate matter. Based on the analyses contained in preceding sections, the Proposed Action would be expected to have a significant effect on regional visibility. Overall, the Proposed Action would be expected to result in a slight benefit in regional visibility in the South Coast Air Basin, and an adverse impact in the desert areas.

Acid Deposition - Acid deposition in California results from pollutants formed from oxides of nitrogen and sulfur oxides emissions. Based on the analyses contained in the preceding sections, the Proposed Action would be expected to have a significant effect on acid deposition.

Toxic Air Pollutants - The screening level risk assessment shown in Section II.4.A.2) indicates that the risk from toxic air contaminants associated with the Eagle Mountain Project is greater than the 1 in a million level which is typically assumed to represent a significant impact. Although the analyses presented in this report assume that landfill gas generation rates would be the same for both in-basin and desert sites, the drier climate and lower moisture content in the waste would be expected to result in lower generation rates for the Proposed Action. The lower gas generation rates would result in less flaring, which in turn would mean lower emissions of toxic air contaminants.

Based on all of these factors, a significant impact is expected from toxic air contaminants, and further health risk assessments and mitigation measures should be required.

Global Warming - "Greenhouse" gases which could contribute to the global warming effect are generated by the operation of landfill equipment; the flaring of landfill gases; and the transportation of waste material. The Proposed Action would result in the generation of gases which could contribute to global warming. However, the state of knowledge regarding global warming is not adequate to allow an assessment of the significance of the impacts of any individual project at the present time.

Table 42

Assessment of Significance for Fine Particulates (PM10)
Eagle Mountain Project

Measure of Significance	Level	Project Without Mitigation	Project With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	2,301	2,009
AQMD major NSR	100 tons/year	419	366
AQMD major PSD	25 tons/year	419	366
AQMD sig incr PSD	25 tons/year	419	366
EPA major source	100 tons/year	419	366
EPA major mod	40 tons/year	419	366
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	5 ug/m3 ann	19	18
AQMD Class I 24h	10 ug/m3 24-hr	77	73
EPA Class I ann	5 ug/m3 ann	19	18
EPA Class I 24h	10 ug/m3 24-hr	77	73
EPA de minimus 24h	10 ug/m3 24-hr	77	73
Measurement Accuracy and Reporting Precision			
ARB accuracy 24h	1.2 ug/m3 24-hr	77	73
ARB reporting 24h	1 ug/m3 24-hr	77	73
ARB reporting ann	0.1 ug/m3 ann	19	18
Other Measures			
Zero molecule	0 lbs/day	2,301	2,009

Overall Assessment of Significance

Based on the analyses contained in the preceding sections, the Proposed Action would be expected to have a significant effect on air quality. However, the Proposed Action could result in air quality benefits in the South Coast Air Basin for ozone, carbon monoxide, and particulate matter, at the expense of increased impacts in desert areas. The improvements in South Coast Air Basin would pass through to the desert areas over the San Gorgonio Pass; however, these benefits would not be sufficient to outweigh the direct adverse impacts in the desert.

B. Reduced Operations Alternative

1) Emissions Impacts

Emissions from the Reduced Operations Alternative will be associated with the same activities as the Proposed Action, although to a lesser extent. These activities will occur both offsite, such as the operation of urban transfer stations, and on-site, including all of the operations at the Eagle Mountain site. They will involve both stationary sources, such as the landfill gas flares, and mobile equipment, such as the trains hauling waste. By emission type, project sources can be grouped into four classes: motor vehicles, fugitive dust sources, fugitive vapor sources, and stationary combustion sources. Motor vehicles include train locomotives, on-highway haul trucks, and off-highway highway equipment. Fugitive dust sources include short-term construction activities, landfill road use, mine tailing reclamation, and solid waste covering. Fugitive vapor sources include the landfill, and stationary combustion sources include the landfill gas flares.

Motor vehicles will generate "tailpipe" emissions and, in the case of on-site vehicles, fugitive dust from unpaved roads and cover material handling. Processing of daily cover material will produce particulate emissions as ore tailing are reclaimed by screening and crushing. As the refuse begins to decompose, gas will be generated by the anaerobic activity in the landfill. The gas will consist primarily of methane and carbon dioxide with trace concentrations of other substances either produced by the bacterial activity or evaporated from materials disposed of in the landfill. The gas will be collected through a series of underground pipes and will be disposed of by flaring. The burning of the landfill gas in flares will result in the production of combustion emissions. Each of these sources is discussed in more detail below.

Construction Operations

The emissions associated with construction of the Reduced Operations Alternative will be the same as those described in Section II.4.A.1) for the Proposed Action.

Transfer Stations

The basic transfer station operations under the Reduced Operations Alternative would be the same as those described in Section II.4.A.1) for the Proposed Action. Equipment activity rates, emission factors, and daily emissions for a typical transfer station will be the same as those shown previously in Table 19 for the Proposed Action. However, under the Reduced Operations Alternative, only five transfer stations will be needed. Total emissions from the five stations are shown in Table 43.

Solid Waste Transport

Under the Reduced Operations Alternative, solid waste will be transported to Eagle Mountain by two modes: trains and trucks. Approximately 88% of the waste will be transported by train, primarily from the Los Angeles basin, while the remainder will be hauled from central or eastern Riverside County by truck. Waste will arrive at Eagle Mountain in 20-25 ton containers compacted at urban transfer sites. Both transportation modes will produce exhaust emissions from the combustion of diesel fuel in internal combustion engines.

The configurations of trains and trucks will be the same under the Reduced Operations Alternative as described above for the Proposed Action; however, fewer train and truck deliveries would occur.

A summary of fuel use and emissions for train operations under the Reduced Operations Alternative is shown in Table 44. This represents an average day with 4.1 trains making the round trip.

Under the Reduced Operations Alternative, an estimated 12% (2000 tons per day) of waste will be transported to the project site by on-highway trucks. It is anticipated that within 75 miles driving distance from the project, the cost of transporting solid waste in containers from transfer stations using tractor-trailers will be less expensive than shipping it by rail. As a result, up to 50 trucks will make two trips per day to the project site with 20-25 ton loads. An analysis of the emissions from this activity, calculated at a maximum daily trip distance of 300 miles per truck, appears in Table 45.

On-Site Material Handling (except Fugitive Dust)

As a category, on-site construction equipment is the largest source of gaseous emissions on the project site. Cumulatively, on-site construction equipment consumes nearly 6,600 gallons of diesel fuel per day. About 28% of this fuel is consumed by the fleet of trucks which will haul containers from the rail line to the landfill face, while the remainder is distributed among five other general categories of operations. The emission rates of equipment grouped within these categories are listed in Table 46.

Table 43

Eagle Mountain Project
Transfer Station Emissions (Total)
Reduced Operations Alternative Without Mitigation

Vehicle Type	Number	Hr/Day	Fuel Gal/Hr
Rubber-tired Loader	14	20	6
Container Handler	6	20	6
Train Car Spotter	2	5	7

	Emission Factors (lb/1000 gal)*				
Vehicle Type	NOx	CO	PM10	VOC	SO2
Rubber-tired Loader	325.18	81.00	31.70	23.48	33.54
Container Handler	325.18	81.00	31.70	23.48	33.54
Train Car Spotter	466.05	287.22	49.70	68.87	33.30

Vehicle Type	Number	Mileage Per Day
Transfer Truck/Trailer	21	450

	Emission Factors (gm/VMT)**				
Vehicle Type	NOx	CO	PM10	VOC	SO2
Transfer Truck/Trailer	15.65	7.40	2.28	2.44	3.21

	Emissions (lb/day)				
Vehicle Type	NOx	CO	PM10	VOC	SO2
Rubber-tired Loader	546.31	136.08	53.25	39.44	56.34
Transfer Truck/Trailer	326.13	154.09	47.42	50.90	66.89
Container Handler	234.13	58.32	22.82	16.90	24.15
Train Car Spotter	32.62	20.11	3.48	4.82	2.33
Total	1139.19	368.60	126.97	112.07	149.71

References:

*"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), Table 7-1 converted to lbs/1000 gal. based on 0.4 lbs fuel/BHP and 7.1 lbs/gal. fuel.

**California Air Resources Board's EMFAC7D/BURDEN7B models for 1995 calendar year, Southeast Desert Air Basin

Table 44

Eagle Mountain Project
Train Emissions - Average Operating Day
Reduced Operations Alternative Without Mitigation

System	Fuel Use (gal/locomotive)	Number of Locomotives	Fuel Use (gal/trip)
Southern Pacific			
Basin to Ferrum	489	4	1956
Ferrum to Basin	570	2	1140
		Total	3096
Eagle Mountain			
Ferrum to Landfill	403	3	1209
Landfill to Ferrum	83	3	249
		Total	1458

	Pollutant				
	NOX	CO	PM10	VOC	SO2
Southern Pacific					
Emission Factor (lb/1000 gal)*	558	226	13	38.4	71
Emissions (lb/train)	1728	700	40	119	220
Emissions (lb/day)	7105	2877	166	489	904
Emissions (tons/yr)	1297	525	30	89	165
Eagle Mountain					
Emission Factor (lb/1000 gal)^	403	162	17	63	71
Emissions (lb/train)	588	236	25	92	104
Emissions (lb/day)	2416	971	102	378	426
Emissions (tons/yr)	441	177	19	69	78
Total System					
Emissions (lb/train)	2315	936	65	211	323
Emissions (lb/day)	9521	3849	267	867	1330
Emissions (tons/yr)	1738	702	49	158	243

References:

*"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), factors for mixed GE and EMD locomotives.

^"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), factors for GE locomotives.

Table 45

Eagle Mountain Project
Delivery Truck Emissions
Reduced Operations Alternative Without Mitigation

Truck Delivery Rate =	2000	tons/day
Truck Capacity =	20	tons/trip
Trip Length (round trip) =	150	miles
Total Haul Miles =	15000	miles/day

On-Highway Trucks	NOX	CO	PM10	VOC	SO2
Emission Factors, gm/VMT*	15.65	7.40	2.28	2.44	3.21
Total Emissions, lb/day	517.66	244.59	75.28	80.79	106.18
Total Emissions, ton/yr	94.47	44.64	13.74	14.75	19.38

Reference:

*California Air Resources Board's EMFAC7D/BURDEN7B models for 1995 calendar year, Southeast Desert Air Basin

TABLE 46

Eagle Mountain Project
Onsite Mobile Equipment Exhaust Emissions
Reduced Operations Alternative Without Mitigation

			Fuel	Emission Factors (lb/1000 gal)*					Emissions (lb/day)				
	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
CONTAINER HANDLING YARD													
Overhead Crane	3	11	7	487.19	195.27	35.22	23.09	36.47	112.54	45.11	8.14	5.33	8.42
Container Handler	2	10	6	325.18	81.00	31.70	23.48	33.54	39.02	9.72	3.80	2.82	4.02
WASTE HAULING													
Container Hauler	26	10	7	318.92	89.22	19.57	14.48	34.83	580.44	162.38	35.61	26.35	63.39
LANDFILL FACE													
Crawler Tractor	8	10	14	258.27	64.57	27.00	14.48	33.30	289.26	72.31	30.24	16.22	37.30
Refuse Compactor	10	10	16	463.32	208.57	30.52	34.44	39.13	741.31	333.71	48.84	55.10	62.61
COVER EXCAVATION													
Rubber-Tired Loader	2	10	11	325.18	81.00	31.70	23.48	33.54	71.54	17.82	6.97	5.17	7.38
COVER HAULING													
Off-Highway Truck	4	10	7	318.92	89.22	19.57	14.48	34.83	89.30	24.98	5.48	4.05	9.75
APPLICATION OF DAILY COVER													
Crawler Tractor	2	10	14	258.27	64.57	27.00	14.48	33.30	72.31	18.08	7.56	4.05	9.32

TABLE 46 (Continued)

Eagle Mountain Project
Onsite Mobile Equipment Exhaust Emissions
Reduced Operations Alternative Without Mitigation

			Fuel	Emission Factors (lb/1000 gal)*					Emissions (lb/day)				
DUST CONTROL AND ROAD MAINTENANCE	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
12,000-Gal Tanker	2	11	20	318.92	89.22	19.57	14.48	34.83	140.33	39.26	8.61	6.37	15.32
Motor Grader	2	10	7	279.40	60.26	24.65	14.09	34.20	39.12	8.44	3.45	1.97	4.79
LINER CONSTRUCTION	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
Frontend Loader	1	8	5	325.18	81.00	31.70	23.48	33.54	13.01	3.24	1.27	0.94	1.34
Pugmill	1	8	10.5	392.10	178.83	35.22	43.04	36.47	32.94	15.02	2.96	3.62	3.06
Dump Truck	1	8	6	318.92	89.22	19.57	14.48	34.83	15.31	4.28	0.94	0.69	1.67
Crawler Tractor	1	8	6	258.27	64.57	27.00	14.48	33.30	12.40	3.10	1.30	0.69	1.60
Compactor	1	8	6	463.32	208.57	30.52	34.44	39.13	22.24	10.01	1.47	1.65	1.88
BENCH CLEARING	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
Crawler Tractor	1	8	6	258.27	64.57	27.00	14.48	33.30	72.31	18.08	7.56	4.05	9.32
MISCELLANEOUS	Number	Hr/Day	Gal/Hr	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
Backhoe	1	2	3	466.05	287.22	49.70	68.87	33.30	2.80	1.72	0.30	0.41	0.20
Utility Truck	1	2	5	318.92	89.22	19.57	14.48	34.83	3.19	0.89	0.20	0.14	0.35
Grader	1	2	5	279.40	60.26	24.65	14.09	34.20	2.79	0.60	0.25	0.14	0.34
					GRAND TOTAL, lb/day				2352.1	788.8	174.9	139.8	242.1
							tons/yr		429.3	143.9	31.9	25.5	44.2

Reference:

*"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), Table 7-1 converted to lbs/1000 gal. based on 0.4 lbs fuel/BHP and 7.1 lbs/gal. fuel.

At the peak of landfill activity, container haul trucks will be in almost constant motion. The disposal of 16,000 tons of solid waste in 20-25 ton containers will require 640-660 trips by the truck fleet each day between the container handling yard and the active face of the landfill. Operating during 10 hours of daylight each day, the 26 trucks will each complete a circuit of loading and dumping every 24 minutes.

All other sources of emissions associated with on-site material handling would be the same as those described previously for the Proposed Action. However, the level of emissions from these activities would be reduced to the levels shown in Table 46 under the Reduced Operations Alternative.

Landfill Gas Generation and Combustion

Estimates of landfill gas generation, and associated emissions impacts, are the same for the Reduced Operations Alternative as for the Proposed Project. These estimates are discussed in Section II.4.A.1).

Fugitive Dust

Fugitive dust emissions from the Reduced Operations Alternative involve the same types of activities as discussed in Section II.4.A.1) for the Proposed Action, but will occur to a lesser degree.

A summary of computed fugitive dust emissions under the Reduced Operations Alternative is shown in Table 47.

Overall Project Impacts - Emissions

Total emissions from all sources under the Reduced Operations Alternative at maximum projected operating levels are shown in Table 48. These emission levels include controls that the project must incorporate in order to comply with South Coast Air Quality Management District and U.S. Environmental Protection Agency emission standards. The emissions are reported in terms of pounds per day and tons per year.

TABLE 47

Eagle Mountain Project
Fugitive Dust Emissions
Reduced Operations Alternative Without Mitigation

Activity	Annual Process Rate	Process Rate Units	Emission Factor* (lb/unit)	Control Factor* (%)	TSP Emission Rate (lb/hr)	PM10 Factor* (%)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (lb/day)	PM10 Emission Rate (ton/yr)
Waste Hauling	1146703	VMT	9.50	95%	149.16	0.22	32.82	328.16	59.89
Cover Excavation	3650	hr	5.70	90%	0.57	0.13	0.08	0.75	0.14
Cover Processing	1752000	ton	0.27	89%	14.53	0.52	7.61	76.14	13.90
Truck Loading	1752000	ton	0.01	0%	5.088	0.50	2.54	25.44	4.64
Cover Hauling	172624	VMT	16.80	95%	39.72	0.22	8.74	87.39	15.95
Cover Dumping	1752000	ton	0.01	0%	5.09	0.50	2.54	25.44	4.64
Cover Spreading	3650	hr	5.70	0%	5.70	0.13	0.75	7.50	1.37
Road Watering	56210	mi	9.38	90%	13.13	0.22	2.89	31.78	5.80
Road Grading	14600	mi	0.23	50%	0.45	0.54	0.24	2.44	0.45
Liner Excavation	2920	hr	34.23	90%	3.42	0.28	0.96	7.70	1.41
Liner Hauling	43800	VMT	9.38	90%	14.07	0.22	3.10	24.76	4.52
Bench Clearing	2920	hr	13.10	30%	9.17	0.16	1.48	11.87	2.17
Backhoe	730	hr	0.04	30%	0.03	0.76	0.02	0.04	0.01
Utility Truck	730	mi	3.79	90%	0.38	0.22	0.08	0.17	0.03
Grader	730	hr	0.23	50%	0.11	0.54	0.06	0.12	0.02
Windblown Fugitive Dust					0.00			0.18	0.03
			TOTALS		260.6		63.9	629.9	115.0

Table 47 (continued)
Footnotes

1. Waste Hauling, Cover Hauling, Road Watering, Liner Hauling, and Utility Truck Use: The emission factors are computed from AP-42 "Compilation of Air Pollutant Emission Factors", 11.2.6-1 (Industrial Paved Roads), using unpaved entry areas (multiplier = 7), 4 traffic lanes, 6% silt fraction, 5900 lb/mile surface dirt loading, and vehicle weights of 43 (waste hauling, road watering, and liner hauling), 94 (cover hauling), and 8 (utility truck use) gross tons loaded (for 50% of travel) and 18 (waste hauling, road watering, and liner hauling), 44 (cover hauling), and 8 (utility truck use) gross tons empty (for 50% of travel). The control efficiency is computed from EPA-450/3-88-008 "Control of Open Fugitive Dust Sources" with 0.80 mm/hr evaporation rate, 80 vehicle/hr traffic flow, 60 minute application interval, 3.00 gal/yd2 application rate for road watering, or sufficient watering to raise surface moisture content from 1% to 5%, or (from EPA-600/2-87-102 "Evaluation of the Effectiveness of Chemical Dust Suppressants on Unpaved Roads) monthly application of 0.30 gallons/yd2 of a 5:1 solution of water and Soil Cement. The PM10 conversion factor is from AP-42, 11.2.6-3 (Industrial Paved Roads).

2. Cover Excavation, Cover Spreading, Liner Excavation, and Bench Clearing: The emission factors are computed from AP-42, 8.24-5 (Western Surface Coal Mines, bulldozing overburden) with 1.0% (cover excavation and cover spreading), 20% (liner excavation), and 2% (bench clearing) silt contents (estimated from discussions with facility personnel) and 1% (cover excavation, cover spreading, and bench clearing) and 4% (liner excavation) moisture contents (estimated). The control factors are estimated from field data collected during the excavation of tailings at a former asbestos mine near Copperopolis, California. The PM10 conversion factor is computed from AP-42, 8.24-5 (Western Surface Coal Mines, bulldozing overburden).

3. Cover Processing: The emission factor is computed as the sum of emission factors for the stationary equipment included in the cover processing operation: 0.12 pounds/ton - dump hopper (from AP-42, 8.24-3, Metallic Minerals, dry transfer), 0.01 pounds/ton - belt transfer at base of dump hopper (from AP-42, 11.2.3-3, Aggregate Handling and Storage Piles, with 7.5 mph average wind and 1% moisture content), 0.02 pounds/ton - cone crusher (from AP-42, 8.19.2-4, Crushed Stone primary crushing at 1.5% moisture content), and 0.12 pounds/ton - pile stacker (from AP-42, 8.24-3, Metallic Minerals dry transfer). The average wind speed is taken from ARB's "California Surface Wind Climatology" for Desert Center and the moisture contents are estimated. The control efficiency is computed as a composite weighted by emissions from each of the stationary sources: 80% - dump hopper (estimated from vendor literature and inspection of hoppers equipped with hollow cone spray nozzles), 99% - belt transfer and cone crusher (estimated from vendor literature and MD-20 "Control of Particulate Emissions" for pulse-jet baghouses), 95% - pile stacker (estimated from vendor literature and inspection of stackers with drop height controllers,

Table 47 (continued)

Footnotes

midbelt deluge sprays, and head pulley solid cone nozzles). The PM10 conversion factor is an emission-weighted average covering each item of stationary equipment: 50% - dump hopper (from ARB "Information for Applying the State Ambient Air Quality Standards for PM10 to the Permitting of New and Modified Stationary Sources"), 100% - belt transfer and cone crusher (all emissions from baghouse assumed to be PM10), 60% - pile stacker (from AP-42, 8.23-4, Metallic Minerals, transfer of material with 4.0% moisture content).

4. Truck Loading, Cover Dumping: The emission factors are computed from AP-42, 11.2.3-3 (Aggregate Handling and Storage Piles), with 7.5 mph average wind speed (ARB, Desert Center) and 1% moisture content (estimated). The PM10 conversion factor is from the ARB PM10 permitting manual.

5. Road Grading, Backhoe Use, and Miscellaneous Grading: The emission factors are computed from AP-42, 8.24-5 (Western Surface Coal Mines, grading) with vehicle speeds of 2 mph (estimated for road and miscellaneous grading) and 1 mph (estimated for backhoe use). The control factors are estimated from EPA-450/3-88-008 with 0.80 water evaporation rate, 4 vehicle passes per hour, 8 hour water application interval, and 0.15 gallon/yd2 water application rate for road and miscellaneous grading, and are estimated from inspection of pipeline construction projects for backhoe use. The PM10 conversion factor is from AP-42, 8.24-5 (Western Surface Coal Mines, grading).

Table 48

Eagle Mountain Project
Total Project Emissions
Reduced Operations Alternative Without Mitigation

Activity	(lb/day) NOx	CO	PM10	VOC	SO2	(ton/yr) NOx	CO	PM10	VOC	SO2
Offsite Sources:										
Transfer Stations	1139	369	127	112	150	208	67	23	20	27
Trains	9521	3849	267	867	1330	1738	702	49	158	243
On-Highway Trucks	518	245	75	81	106	94	45	14	15	19
Subtotal, Offsite	11178	4463	469	1060	1586	2040	814	86	193	289
Onsite Sources:										
Onsite Vehicle Exhaust	2352	789	175	140	242	429	144	32	26	44
Onsite Fugitive Dust			630					115		
Landfill Gas Flares	1182	816	676	845	310	216	149	123	154	57
Subtotal, Onsite	3534	1605	1481	985	552	645	293	270	180	101
PROJECT GRAND TOTAL	14712	6068	1950	2045	2138	2685	1107	356	373	390

2) Project Impacts - Ambient Concentrations

Project Impacts Near the Landfill Site

Using the same methodology as for the Proposed Action, an analysis was performed of the impacts of the Reduced Operations Alternative on ambient concentrations of pollutants. This analyis was performed for the area surrounding the landfill site; for the boundary of the nearest Class I area, the Joshua Tree National Monument; and for a typical rail crossing in the South Coast Air Basin.

As discussed in Section II.4.A.2) above, all of the analyses described below were performed with a high degree of conservatism, with the result that the concentrations shown are much higher than the levels which would likely be experienced.

Table 49 presents the results of the air quality modeling analysis. As discussed above, the analysis was performed in a screening mode, with a high degree of conservatism. Consequently, actual project impacts would be expected to be significantly lower than those shown.

The data indicate that the project's unmitigated impacts would represent the following fractions of the most stringent ambient air quality standards for each pollutant:

Carbon Monoxide	1%
Nitrogen Dioxide	65%
Sulfur Dioxide	20%
Fine Particulates (PM10)	126%

These levels are predictions of the worst case project impacts at any location outside of the project boundary. These concentrations are projected, in the absence of mitigation measures, at a location towards the northwest corner of the community of Eagle Mountain. The analysis is based on the extreme worst case assumption that the elevation of the landfill has risen to near the rim of the present mine site, while the size of the tailing pile has been substantially reduced. Thus, these conditions would reflect worst case operations after at least 30 years of project operations.

Impact on Class I Areas

Table 49 also presents the results of the modeling analysis at the Joshua Tree boundary, and compares these values with the allowable Class I area "increments". (It is expected that the Reduced Operations Alternative would not be subject to a formal PSD review, since project emissions would be below the regulatory thresholds for review. However, these increments of allowable growth can be used as one basis to evaluate the significance of this Alternative's impacts.

The analysis indicates that, in the absence of mitigation, the impacts for this Alternative will exceed allowable increments at the

Table 49

Maximum Impact of Reduced Operations Alternative on Ambient Air Quality (without mitigation) (all concentrations in micrograms per cubic meter)

Pollutant/ Averaging Time	California Standards	National Standards	Maximum Offsite Concen-tration	Maximum Background (1986-88)	Maximum Cumulative Impact	Maximum Impact at Class I Area	Allowable Class I Area Increment
CO							
1-hour	23,000	40,000	184.3	14,950	15,134	----	----
*8-hour	10,000	10,000	129.0	6,344	6,473	----	----
NO2							
1-hour	470	---	306.4	207	513	----	----
*Annual	---	100	26.8	32	59	8.0	2.5
SO2							
1-hour	655	---	69.8	210	281	----	----
*3-hour	---	1300	62.8	---	---	18.6	25
*24-hour	131	365	26.2	58	84	8.0	5
*Annual	---	80	6.5	5	12	2.0	2
PM10							
*24-hour	50	150	63.2	368	431	17.7	10.0
*Annual	30	50	15.8	65	81	4.4	5.0

*For project impacts:
3-hour = 0.9 x 1 hour
8-hour = 0.7 x 1 hour
24-hour = 0.4 x 1 hour
annual = 0.1 x 1 hour

Joshua Tree boundary for all three pollutants for which increments have been established: nitrogen dioxide, sulfur dioxide, and fine particulates (PM10). As in the case of the Proposed Action, this conclusion will probably change upon a re-analysis using actual weather data from the project site.

Cumulative Impacts at the Project Site

The data indicate that, in the absence of mitigation measures, the Reduced Operations Alternative could result in exceedances of the state air quality standards for nitrogen dioxide and fine particulate matter. Emissions of carbon monoxide and sulfur dioxide are not expected to results in violations of air quality standards for those pollutants, even in combination with emissions from other sources.

Impacts at Typical Rail Crossings

Impacts at typical rail crossings under the Reduced Operations Alternative would be identical to those discussed in Section II.4.A.2) for the Proposed Action. However, the number of trains per day would be approximately 12% lower, thus reducing the frequency with which these impacts would occur.

Screening Level Health Risk Assessment

Since landfill gas generation rates would be the same under the Reduced Operations Alternative as under the Proposed Action, the results of the screening level health risk assessment described in Section II.4.A.2) would be applicable to the Reduced Operations Alternative as well.

3) Consistency with Regulatory Programs

Consistency with Federal Requirements

Comparison with Prevention of Significant Deterioration Significance Levels - The determination as to whether the Reduced Operations Alternative will be subject to Prevention of Significant Deterioration review is based on its emissions. As in the case of the Proposed Action, the "source" which could be subject to review includes the landfill gas flares and the mineral processing equipment. Except for a minor reduction in the emissions associated with on-site mineral processing equipment, the summary of emissions shown in Table 33 for the Proposed Action would be applicable to the Reduced Operations Alternative as well. The additional mitigation proposed for the flares under the Proposed Action would be applicable to the Reduced Operations Alternative as well, and would result in that Alternative's emissions being reduced to levels which would not require PSD review.

New Source Performance Standards for Non-Metallic Mineral Processing Plants (40CFR60.670) - As in the case of the Proposed Action, the cover processing operations under the Reduced Operations

Alternative would be subject to, and is expected to comply with, the applicable federal New Source Performance Standards.

Consistency with Local Requirements

<u>Prohibitory Rules</u> - The South Coast Air Quality Management District limits the emissions of various pollutants from many sources in the District, including landfill flares and other gas combustion devices. These rules will apply to the Reduced Operations Alternative, and this Alternative would comply with them. The applicable rules, discussed in Section II.4.A.3), are:

Rule 401 (Visible Emissions)
Rule 403 (Fugitive Dust)
Rule 404 (Particulate Matter - Concentration)
Rule 405 (Solid Particulate Matter - Weight)
Rule 409 (Combustion Contaminants)
Rule 431.1 (Sulfur Content of Gaseous Fuels)
Rule 53 (Specific Air Contaminants)
Rule 1150.1 (Control of Gaseous Emissions from Active Landfills)
Rule 1401 (Toxic Air Contaminants)

<u>New Source Review Rules</u> - The South Coast Air Quality Management District New Source Review rules (contained in Regulation II and Regulation XIII of the SCAQMD Rules and Regulations) govern the preconstruction review of new and modified stationary sources that emit nonattainment pollutants. The discussion of this rule with respect to the Proposed Action would apply to the Reduced Operations Alternative as well.

4) Mitigation

This discussion of mitigation measures includes regulatory actions by other agencies which are reasonably foreseeable, or which have future effective dates, as well as measures which can be implemented by the applicant. Regulatory measures which are already in effect are discussed in the Regulatory Setting portion of Section I.6, above. Estimates of project emissions reflect those measures required to comply with currently adopted regulations.

Truck Emissions

The same mitigation measures discussed in Section II.4.A.4) for the Proposed Action would be applicable to the Reduced Operations Alternative as well.

Locomotive Emissions

The same mitigation measures discussed in Section II.4.A.4) for the Proposed Action would be applicable to the Reduced Operations Alternative as well.

Landfill Equipment Emissions

The same mitigation measures discussed in Section II.4.A.4) for the Proposed Action would be applicable to the Reduced Operations Alternative as well.

Mitigation for On-Site Material Handling Impacts

The same mitigation measures discussed in Section II.4.A.4) for the Proposed Action would be applicable to the Reduced Operations Alternative as well.

Mitigation for Landfill Gas Generation and Combustion Impacts

The same mitigation measures discussed in Section II.4.A.4) for the Proposed Action would be applicable to the Reduced Operations Alternative as well.

Mitigation for Fugitive Dust Impacts

The same mitigation measures discussed in Section II.4.A.4) for the Proposed Action would be applicable to the Reduced Operations Alternative as well.

Mitigation Measures Recommended for Approval of the Reduced Operations Alternative

Based on the discussion in the preceding section, the same mitigation measures recommended for the Proposed Action are recommended as well for the Reduced Operations Alternative. These measures, which are discussed in more detail in Section II.4.A.4), are:

Mitigation Measure AQ-1:	Truck Emission Standards
Mitigation Measure AQ-2:	Diesel Fuel Quality
Mitigation Measure AQ-3:	South Coast Air Quality Management District Smoke Enforcement Program
Mitigation Measure AQ-4:	California Highway Patrol Diesel Truck Inspection Program
Mitigation Measure AQ-5:	State Low Emission Vehicle Regulations
Mitigation Measure AQ-6:	Locomotive Operating Procedures
Mitigation Measure AQ-7:	Diesel Fuel for Locomotive Operations
Mitigation Measure AQ-8:	Diesel Locomotive Emission Standards
Mitigation Measure AQ-9:	Diesel Locomotive Low Emission Retrofits
Mitigation Measure AQ-10:	Electrification of the Eagle Mountain Railway
Mitigation Measure AQ-11:	Landfill Equipment Operating Procedures
Mitigation Measure AQ-12:	Diesel Fuel for Landfill Equipment
Mitigation Measure AQ-13:	On-Highway Engines for Landfill Equipment
Mitigation Measure AQ-14:	Low NOx Engine Design for Landfill Equipment

Mitigation Measure AQ-15: Construction Equipment Emission Standards
Mitigation Measure AQ-16: Electrification of Landfill Equipment
Mitigation Measure AQ-17: Control of Flare Emissions
Mitigation Measure AQ-18: Temporary Road Surfaces
Mitigation Measure AQ-19: Transitional Road Surfaces
Mitigation Measure AQ-20: Permanent Road Surfaces
Mitigation Measure AQ-21: Tailing Excavation
Mitigation Measure AQ-22: Miscellaneous Fugitive Dust Sources
Mitigation Measure AQ-23: Weather Data Collection/Revised Air Quality Modeling Analysis

Summary of Remaining Project Impacts After Mitigation

Table 50 shows the effect of the recommended mitigation measures on total project emissions; Table 51 presents the same information for the sources which under within the direct control of Mine Reclamation Corp.

The data show that the recommended mitigation measures have the greatest benefits for reducing emissions of oxides of nitrogen and sulfur dioxide. The oxides of nitrogen reductions are due to the use of low NOx emitting engines in locomotives and on-site landfill equipment, as well as the electrification of portions of the operation. The NOx reductions associated with the use of a urea injection system on the flare at maximum flare gas production levels are not shown as a credit in these tables, since they have been incorporated into the project design and are reflected in all estimates of project emissions. This is because it is anticipated that this level of control may be required by regulation at the future date.

The sulfur dioxide reductions are due to the use of ultra-low sulfur fuel in all Diesel burning equipment owned by Mine Reclamation Corp. The use of this fuel results in associated reductions in particulate matter emissions as well. The use of an electric conveyor to transfer cover material for a portion of the distance which would otherwise be traveled by trucks on transitional roads results in a further reduction in particulate emissions.

In addition, the project design reflects substantial reductions (up to 95%) in particulate emissions due to a variety of dust suppression techniques, since it is likely that these measures would be required in order to comply with South Coast Air Quality Management District requirements. Consequently, all estimates of project emissions (with and without mitigation) reflect these reductions.

Relatively small reductions in carbon monoxide and volatile organic compounds (hydrocarbons) are expected beyond those already included in the project design to ensure that flare gas emissions of that pollutant do not exceed applicable regulatory trigger levels. The remaining sources of carbon monoxide and VOC's are Diesel engines, which have inherently low levels of these pollutants.

Table 50

Eagle Mountain Project - Reduced Operations Alternative
Effect of Mitigation on Project Emissions
(tons/year)

Activity	NOx	CO	PM10	VOC	SO2
		Without Mitigation			
Transfer Stations	208	67	23	20	27
Trains	1738	702	49	158	243
On-Highway Trucks	94	45	14	15	19
On-Site Vehicle Exhaust	429	144	32	26	44
On-Site Fugitive Dust*			115		
Landfill Gas Flares*	216	149	123	154	57
Project Total, Without Mitigation	2685	1107	356	373	390
		With Mitigation			
Transfer Stations	165	72	16	16	15
Trains	1554	702	45	158	173
On-Highway Trucks	94	45	14	15	19
On-Site Vehicle Exhaust	244	109	15	16	8
On-Site Fugitive Dust*			103		
Landfill Gas Flares*	216	149	123	154	57
Project Total, With Mitigation	2273	1077	316	359	272
REDUCTION DUE TO MITIGATION:					
Tons	412	30	40	14	118
Percent	(15%)	(3%)	(11%)	(4%)	(30%)

*Project design incorporated mitigation measures; see text for details.

Table 51

Eagle Mountain Project - Reduced Operations Alternative
Effect of Mitigation on Emissions
from Sources Owned by Mine Reclamation Corp.
(tons/year)

Activity	NOx	CO	PM10	VOC	SO2
		Without Mitigation			
Trains	441	177	19	69	78
On-Site Vehicle Exhaust	429	144	32	26	44
On-Site Fugitive Dust*			115		
Landfill Gas Flares*	216	149	123	154	57
Total, Without Mitigation	1086	470	289	249	179
		With Mitigation			
Trains	257	177	15	69	8
On-Site Vehicle Exhaust	244	109	15	16	8
On-Site Fugitive Dust*			103		
Landfill Gas Flares*	216	149	123	154	57
Total, With Mitigation	717	435	256	239	73
REDUCTION DUE TO MITIGATION					
Tons	369	35	33	10	106
Percent	(34%)	(7%)	(11%)	(4%)	(59%)

*Project design incorporated mitigation measures; see text for details.

Table 52 shows a re-analysis of the project's air quality impacts which reflect the mitigation measures. The data indicate that the state standard for nitrogen dioxide, and state and federal standards for fine particulates may still be exceeded. In addition, the analysis projects that Class I increments would still be exceeded for nitrogen dioxide, sulfur dioxide, and fine particulate matter.

As discussed earlier in this report, these analyses are conservative, and tend to substantially overestimate project impacts, particularly for longer averaging periods.

5) Assessment of Significance

Ozone - Table 53 compares the impacts from the Reduced Operations Alternative to various significance levels for ozone. In this table, hydrocarbon emissions are used to evaluate the significance of ozone impacts; there are no approved techniques available which can be used to estimate the change in ambient ozone concentrations due to any of the alternatives.

Compared with a baseline of zero emissions, the Reduced Operations Alternative would be expected to have a significant impact on ozone, due to significant increases in hydrocarbon emissions.

Within the South Coast Air Basin, the increases in emissions of hydrocarbons due to increased transport of waste are more than offset by the expected decrease in flare emissions. Consequently, the Reduced Operations Alternative is expected to have a beneficial impact on hydrocarbon emissions within the South Coast Air Basin, while resulting in a significant increase in the Desert Air Basin. Since both regions experience violations of the state and federal ozone standards, the overall impacts for ozone would be considered significant for the Reduced Operations Alternative.

Nitrogen Dioxide - Table 54 shows the impacts of the Reduced Operations Alternative on nitrogen dioxide. Once again, this Alternative is shown to result in significant impacts for this pollutant.

Carbon Monoxide - The impacts of the Reduced Operations Alternative on carbon monoxide is shown in Table 55. The data show that, compared with a baseline of zero emissions, this Alternative would have a significant impact on carbon monoxide. However, this alternative would reduce carbon monoxide emissions in the South Coast Air Basin - where state and federal air quality standards are exceeded - while increasing emissions in the Desert areas which still meet the standards. Since the air quality modeling analyses in show that the Reduced Operations Alternative would not result in a violation of any state or federal air quality standard for carbon monoxide, the overall impacts of this Alternative on carbon monoxide are expected to be insignificant, and beneficial within the South Coast Air Basin.

Table 52

Maximum Impact of Reduced Operations Alternative
on Ambient Air Quality
(with mitigation)
(all concentrations in micrograms per cubic meter)

Pollutant/ Averaging Time	California Standards	National Standards	Maximum Offsite Concen-tration	Maximum Background (1986-88)	Maximum Cumulative Impact	Maximum Impact at Class I Area	Allowable Class I Area Increment
CO							
1-hour	23,000	40,000	183.4	14,950	15,133	----	----
*8-hour	10,000	10,000	128.4	6,344	6,472	----	----
NO2							
1-hour	470	---	276.8	207	484	----	----
*Annual	---	100	25.4	32	57	7.6	2.5
SO2							
1-hour	655	---	63.7	210	274	----	----
*3-hour	---	1300	57.3	---	---	17.6	25
*24-hour	131	365	25.1	58	83	7.8	5
*Annual	---	80	6.3	5	11	1.9	2
PM10							
*24-hour	50	150	59.8	368	438	17.6	10.0
*Annual	30	50	14.9	65	80	4.4	5.0

*For project impacts:
3-hour = 0.9 x 1 hour
8-hour = 0.7 x 1 hour
24-hour = 0.4 x 1 hour
annual = 0.1 x 1 hour

Table 53

Assessment of Significance for Ozone
Eagle Mountain Project - Reduced Operations Alternative

Measure of Significance	Level	Reduced Operations Alternative Without Mitigation	Reduced Operations Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	2,045	1,969
AQMD major NSR	100 tons/year	373	359
AQMD major PSD	25 tons/year	373	359
AQMD sig incr PSD	25 tons/year	373	359
EPA major source	100 tons/year	373	359
EPA major mod	40 tons/year	373	359
Ozone Measurement Accuracy and Reporting Precision			
ARB accuracy	0.54 pphm		
ARB reporting	1 pphm		
Other Measures			
Zero molecule	0 lbs/day	2,045	1,969

Table 54

Assessment of Significance for Oxides of Nitrogen
Eagle Mountain Project - Reduced Operations Alternative

Measure of Significance	Level	Reduced Operations Alternative Without Mitigation	Reduced Operations Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	14,712	12,454
AQMD major NSR	100 tons/year	2,685	2,273
AQMD major PSD	25 tons/year	2,685	2,273
AQMD sig incr PSD	25 tons/year	2,685	2,273
EPA major source	100 tons/year	2,685	2,273
EPA major mod	40 tons/year	2,685	2,273
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	10 ug/m3 ann	27	25
EPA Class I ann	10 ug/m3 ann	27	25
EPA de minimus ann	14 ug/m3 ann	27	25
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.18 pphm 1-hr	16	15
ARB report 1h	1 pphm 1-hr	16	15
ARB report ann	0.1 pphm ann	1.4	1.4
Other Measures			
Zero molecule	0 lbs/day	14,712	12,454

Table 55

Assessment of Significance for Carbon Monoxide
Eagle Mountain Project - Reduced Operations Alternative

Measure of Significance	Level	Reduced Operations Alternative Without Mitigation	Reduced Operations Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	6,068	5,902
AQMD major NSR	100 tons/year	2,685	1,077
AQMD major PSD	25 tons/year	2,685	1,077
AQMD sig incr PSD	25 tons/year	2,685	1,077
EPA major source	100 tons/year	2,685	1,077
EPA major mod	40 tons/year	2,685	1,077
Concentration Based Measures - Industrial Sources			
EPA Class I 24 hr	1 ug/m3 24-hr	74	74
EPA de minimus 8h	575 ug/m3 8-hr	139	138
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.02 ppm 1-hr	0.16	0.16
ARB report 1h	1 ppm 1-hr	0.16	0.16
ARB report 8h	0.1 ppm 8-hr	0.12	0.12
Other Measures			
Zero molecule	0 lbs/day	6,068	5,902

Sulfur Dioxide - Table 56 shows the impacts of the Reduced Operations Alternative on sulfur dioxide. The data show that this Alternative would result in a significant impact for this pollutant.

Particulate Sulfates - Since particulate sulfates are formed in the atmosphere from emissions of sulfur dioxide, conclusions regarding the significance of sulfur dioxide impacts would be applicable to sulfates as well.

Fine Particulates - The impacts on fine particulates of the Reduced Operations Alternative is shown in Table 57. Once again, the data show that this Alternative is expected to result in significant impacts for this pollutant. However, the shift in landfill operations outside of the South Coast Air Basin results in a decrease in PM10 emissions which outweighs the increase due to transportation; consequently, the Reduced Operations Alternative would result in a net air quality benefit within the South Coast Air Basin. However, given the fact that both the Basin and Desert portions of Southern California exceed state and federal air quality standards for fine particulates, the overall impacts would still be considered significant.

Regional Visibility - Regional visibility is affected by emissions of hydrocarbons, oxides of nitrogen, sulfur dioxide, and particulate matter. Based on the analyses contained in preceding sections, the Reduced Operations Alternative would be expected to have a significant effect on regional visibility. Overall, this Alternative would be expected to result in a slight benefit in regional visibility in the South Coast Air Basin, and an adverse impact in the desert areas.

Acid Deposition - Acid deposition in California results from pollutants formed from oxides of nitrogen and sulfur oxides emissions. Based on the analyses contained in the preceding sections, the Reduced Operations Alternative would be expected to have a significant effect on acid deposition.

Toxic Air Pollutants - Each of the project alternatives is expected to have the same impact with respect to air toxics, which are associated with the combustion of flare gases. Although the analyses presented in this report assume that landfill gas generation rates would be the same for both in-basin and desert sites, the drier climate and lower moisture content in the waste would be expected to result in lower generation rates for the desert site alternatives. The lower gas generation rates would result in less flaring, which in turn would mean lower emissions of toxic air contaminants.

The screening level risk assessment shown in Section II.4.A.2) indicates that the risk from toxic air contaminants associated with the Proposed Action is greater than the 1 in a million level which is typically assumed to represent a significant impact.

Table 56

Assessment of Significance for Sulfur Dioxide
Eagle Mountain Project - Reduced Operations Alternative

Measure of Significance	Level	Reduced Operations Alternative Without Mitigation	Reduced Operations Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	2,138	1,490
AQMD major NSR	100 tons/year	390	272
AQMD major PSD	25 tons/year	390	272
AQMD sig incr PSD	25 tons/year	390	272
EPA major source	100 tons/year	390	272
EPA major mod	40 tons/year	390	272
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	2 ug/m3 ann	7	6
AQMD Class I 24h	5 ug/m3 24-hr	26	25
AQMD Class I 3h	25 ug/m3 3-hr	63	57
EPA Class I ann	2 ug/m3 ann	7	6
EPA Class I 24h	5 ug/m3 24-hr	26	25
EPA Class I 3h	25 ug/m3 3-hr	63	57
EPA de minimus 24h	13 ug/m3 24-hr	26	25
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.33 pphm 1-hr	2.7	2.4
ARB reporting 1h	1 pphm 1-hr	2.7	2.4
Other Measures			
Zero molecule	0 lbs/day	2,138	1,490

Table 57

Assessment of Significance for Fine Particulates
Eagle Mountain Project - Reduced Operations Alternative

Measure of Significance	Level	Reduced Operations Alternative Without Mitigation	Reduced Operations Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	1,950	1,727
AQMD major NSR	100 tons/year	356	316
AQMD major PSD	25 tons/year	356	316
AQMD sig incr PSD	25 tons/year	356	316
EPA major source	100 tons/year	356	316
EPA major mod	40 tons/year	356	316
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	5 ug/m3 ann	16	15
AQMD Class I 24h	10 ug/m3 24-hr	63	60
EPA Class I ann	5 ug/m3 ann	16	15
EPA Class I 24h	10 ug/m3 24-hr	63	60
EPA de minimus 24h	10 ug/m3 24-hr	63	60
Measurement Accuracy and Reporting Precision			
ARB accuracy 24h	1.2 ug/m3 24-hr	63	60
ARB reporting 24h	1 ug/m3 24-hr	63	60
ARB reporting ann	0.1 ug/m3 ann	16	15
Other Measures			
Zero molecule	0 lbs/day	1,950	1,727

Based on all of these factors, a significant impact is expected from toxic air contaminants for the Reduced Operations Alternative as well, and further health risk assessments and mitigation measures should be required.

Global Warming - "Greenhouse" gases which could contribute to the global warming effect are generated by the operation of landfill equipment; the flaring of landfill gases; and the transportation of waste material.

The operation of landfill equipment would result in approximately 14% fewer emissions of "greenhouse" gases, as compared with the Proposed Action. Overall, the Reduced Operations Alternative would result in the generation of gases which could contribute to global warming. However, the state of knowledge regarding global warming is not adequate to allow an assessment of the significance of the impacts of any individual project at the present time.

Overall Assessment of Significance

Based on the analyses contained in the preceding sections, the Reduced Operations Alternative is expected to have a significant effect on air quality. However, the Reduced Operations Alternative could result in air quality benefits in the South Coast Air Basin for ozone, carbon monoxide, and particulate matter, at the expense of increased impacts in desert areas. The improvements in South Coast Air Basin would pass through to the desert areas over the San Gorgonio Pass; however, these benefits would not be sufficient to outweigh the direct adverse impacts in the desert.

C. Rail Access Only Alternative

1) Emissions Impacts

Emissions from the Rail Access Only Alternative will be associated with the same activities as the Proposed Action, although to a less extent and excluding truck delivery activities. These activities will occur both offsite, such as the operation of urban transfer stations, and on-site, including all of the operations at the Eagle Mountain site. They will involve both stationary sources, such as the landfill gas flares, and mobile equipment, such as the trains hauling waste. By emission type, project sources can be grouped into four classes: motor vehicles, fugitive dust sources, fugitive vapor sources, and stationary combustion sources. Motor vehicles include train locomotives and off-highway highway equipment. Fugitive dust sources include short-term construction activities, landfill road use, mine tailing reclamation, and solid waste covering. Fugitive vapor sources include the landfill, and stationary combustion sources include the landfill gas flares.

Motor vehicles will generate "tailpipe" emissions and, in the case of on-site vehicles, fugitive dust from unpaved roads and cover material handling. Processing of daily cover material will produce particulate emissions as ore tailing are reclaimed by screening and crushing. As the refuse begins to decompose, gas will be generated by the anaerobic activity in the landfill. The gas will consist primarily of methane and carbon dioxide with trace concentrations of other substances either produced by the bacterial activity or evaporated from materials disposed of in the landfill. The gas will be collected through a series of underground pipes and will be disposed of by flaring. The burning of the landfill gas in flares will result in the production of combustion emissions. Each of these sources is discussed in more detail below.

Construction Operations - The emissions associated with construction of the Rail Access Only Alternative will be the same as those described in Section II.4.A.1) for the Proposed Action.

Transfer Stations - The basic transfer station operations under the Rail Access Only Alternative would be the same as those described in Section II.4.A.1) for the Proposed Action, with the exception of the Riverside/San Bernardino truck station. Equipment activity rates, emission factors, and daily emissions for a typical transfer station are shown previously in Table 19 for the Proposed Action. Under this Alternative, only six transfer stations will be needed. Total emissions from these six stations are shown in Table 58.

Solid Waste Transport - Under the Reduced Operations Alternative, solid waste will be transported to Eagle Mountain only by trains. Waste will arrive at Eagle Mountain in 25 ton containers compacted at urban transfer sites. Rail transportation will produce exhaust emissions from the combustion of diesel fuel in internal combustion engines. The configurations of trains will be the same as under the Proposed Action.

Fuel use and emissions for train operations under the Rail Access Only Alternative would be the same as for the Proposed Action, as shown in Table 21 above.

On-Site Material Handling (except Fugitive Dust) - As a category, on-site construction equipment is the largest source of gaseous emissions on the project site. Cumulatively, on-site construction equipment consumes nearly 6,600 gallons of diesel fuel per day. Nearly 28% of this fuel is consumed by the fleet of trucks which will haul containers from the rail line to the landfill face, while the remainder is distributed among five other general categories of operations. The emission rates of equipment grouped within these categories are the same as those shown in Table 46 above for the Reduced Operations Alternative.

At the peak of landfill activity, container haul trucks will be in almost constant motion. The disposal of 16,000 tons of solid waste in 25 ton containers will require 640 trips by the truck fleet each day between the container handling yard and the active face of the landfill. Operating during 10 hours of daylight each day, the 26

Table 58

Eagle Mountain Project
Transfer Station Emissions (Total)
Rail Access Only Alternative Without Mitigation

Vehicle Type	Number	Hr/Day	Fuel Gal/Hr
Rubber-tired Loader	18	20	6
Container Handler	12	20	6
Train Car Spotter	2	5	7

Vehicle Type	Emission Factors (lb/1000 gal)* NOx	CO	PM10	VOC	SO2
Rubber-tired Loader	325.18	81.00	31.70	23.48	33.54
Container Handler	325.18	81.00	31.70	23.48	33.54
Train Car Spotter	466.05	287.22	49.70	68.87	33.30

Vehicle Type	Number	Mileage Per Day
Transfer Truck/Trailer	24	450

Vehicle Type	Emission Factors (gm/VMT)** NOx	CO	PM10	VOC	SO2
Transfer Truck/Trailer	15.65	7.40	2.28	2.44	3.21

Vehicle Type	Emissions (lb/day) NOx	CO	PM10	VOC	SO2
Rubber-tired Loader	702.39	174.96	68.46	50.71	72.44
Transfer Truck/Trailer	372.72	176.11	54.20	58.17	76.45
Container Handler	468.26	116.64	45.64	33.81	48.29
Train Car Spotter	32.62	20.11	3.48	4.82	2.33
Total	1575.99	487.82	171.78	147.52	199.51

References:

*"Feasibility and Cost Effectiveness of Controlling Emissions from Diesel Engines in Rail, Marine, Construction, Farm and Other Mobile Off-Highway Equipment", Radian Corporation (2/88), Table 7-1 converted to lbs/1000 gal. based on 0.4 lbs fuel/BHP and 7.1 lbs/gal. fuel.

**California Air Resources Board's EMFAC7D/BURDEN7B models for 1995 calendar year, Southeast Desert Air Basin

trucks will each complete a circuit of loading and dumping every 24 minutes.

In the container handling yard, overhead cranes and container handlers will also operate continuously during peak periods. Cranes will transfer loaded waste containers from rail cars to container haul trucks and empty containers from returning haul trucks back to rail cars. All of this transfer equipment will be powered by diesel engines and generate exhaust emissions during operation.

Other combustion emissions sources under the Rail Access Only Alternative would be the same as those described in Section II.4.B.1) for the Reduced Operations Alternative.

Landfill Gas Generation and Combustion - Estimates of landfill gas generation, and associated emissions impacts, are the same for the Rail Access Only Alternative as for the Proposed Project. These estimates are discussed in Section II.4.A.1).

Fugitive Dust - Fugitive dust emissions from the Rail Access Only Alternative involve the same types of activities as discussed in Section II.4.B.1) for the Reduced Operations Alternative.

Overall Project Impacts - Emissions - Total emissions from all sources under the Rail Access Only Alternative at maximum projected operating levels are shown in Table 59. These emission levels include controls that the project must incorporate in order to comply with South Coast Air Quality Management District and U.S. Environmental Protection Agency emission standards. The emissions are reported in terms of pounds per day and tons per year.

2) Project Impacts - Ambient Concentrations

Ambient concentrations associated with the Rail Access Only Alternative would be the same as those discussed in Section II.4.B.2) for the Reduced Operations Alternative.

3) Consistency with Regulatory Programs

The Rail Access Only Alternative would demonstrate consistency with applicable federal and local air quality requirements in the same manner as the Reduced Operations Alternative, discussed in Section II.4.B.3).

4) Mitigation

The same mitigation measures discussed above for the Reduced Operations Alternative would be applicable to the Rail Access Only Alternative, with the exception of those measures directed towards on-highway trucks. The same mitigation measures recommended for the Proposed Action are recommended as well for the Rail Access Only Alternative, with the exception of truck mitigation measures. These

Table 59

Eagle Mountain Project
Total Project Emissions
Rail Access Only Alternative Without Mitigation

Activity	NOx (lb/day)	CO (lb/day)	PM10 (lb/day)	VOC (lb/day)	SO2 (lb/day)	NOx (ton/yr)	CO (ton/yr)	PM10 (ton/yr)	VOC (ton/yr)	SO2 (ton/yr)
Offsite Sources:										
Transfer Stations	1576	488	172	148	200	288	89	31	27	37
Trains	10881	4399	306	990	1520	1986	803	56	181	277
On-Highway Trucks	0	0	0	0	0	0	0	0	0	0
Subtotal, Offsite	12457	4887	478	1138	1720	2274	892	87	208	314
Onsite Sources:										
Onsite Vehicle Exhaust	2352	789	175	140	242	429	144	32	26	44
Onsite Fugitive Dust			630					115		
Landfill Gas Flares	1182	816	676	845	310	216	149	123	154	57
Subtotal, Onsite	3534	1605	1481	985	552	645	293	270	180	101
PROJECT GRAND TOTAL	15991	6492	1959	2123	2272	2919	1185	357	388	415

measures, which are discussed in more detail in Section II.4.A.4), are:

Mitigation Measure AQ-6:	Locomotive Operating Procedures
Mitigation Measure AQ-7:	Diesel Fuel for Locomotive Operations
Mitigation Measure AQ-8:	Diesel Locomotive Emission Standards
Mitigation Measure AQ-9:	Diesel Locomotive Low Emission Retrofits
Mitigation Measure AQ-10:	Electrification of the Eagle Mountain Railway
Mitigation Measure AQ-11:	Landfill Equipment Operating Procedures
Mitigation Measure AQ-12:	Diesel Fuel for Landfill Equipment
Mitigation Measure AQ-13:	On-Highway Engines for Landfill Equipment
Mitigation Measure AQ-14:	Low NOx Engine Design for Landfill Equipment
Mitigation Measure AQ-15:	Construction Equipment Emission Standards
Mitigation Measure AQ-16:	Electrification of Landfill Equipment
Mitigation Measure AQ-17:	Control of Flare Emissions
Mitigation Measure AQ-18:	Temporary Road Surfaces
Mitigation Measure AQ-19:	Transitional Road Surfaces
Mitigation Measure AQ-20:	Permanent Road Surfaces
Mitigation Measure AQ-21:	Tailing Excavation
Mitigation Measure AQ-22:	Miscellaneous Fugitive Dust Sources
Mitigation Measure AQ-23:	Weather Data Collection/Revised Air Quality Modeling Analysis

Summary of Remaining Project Impacts After Mitigation

Table 60 shows the effect of the recommended mitigation measures on total project emissions; Table 61 presents the same information for the sources which under within the direct control of Mine Reclamation Corp. The data show that the recommended mitigation measures have the greatest benefits for reducing emissions of oxides of nitrogen and sulfur dioxide. The oxides of nitrogen reductions are due to the use of low NOx emitting engines in locomotives and on-site landfill equipment, as well as the electrification of portions of the operation. The NOx reductions associated with the use of a urea injection system on the flare at maximum flare gas production levels are not shown as a credit in these tables, since they have been incorporated into the project design and are reflected in all estimates of project emissions. This is because it is anticipated that this level of control may be required by regulation at the future date.

Table 60

Eagle Mountain Project - Rail Access Only Alternative
Effect of Mitigation on Project Emissions
(tons/year)

Activity	NOx	CO	PM10	VOC	SO2
		Without Mitigation			
Transfer Stations	288	89	31	27	37
Trains	1986	803	56	181	277
On-Highway Trucks	0	0	0	0	0
On-Site Vehicle Exhaust	429	144	32	26	44
On-Site Fugitive Dust*			115		
Landfill Gas Flares*	216	149	123	154	57
Project Total, Without Mitigation	2919	1185	357	388	415
		With Mitigation			
Transfer Stations	225	98	20	21	19
Trains	1775	803	51	181	197
On-Highway Trucks	0	0	0	0	0
On-Site Vehicle Exhaust	244	109	15	16	8
On-Site Fugitive Dust*			103		
Landfill Gas Flares*	216	149	123	154	57
Project Total, With Mitigation	2460	1159	312	372	281
REDUCTION DUE TO MITIGATION:					
Tons	459	26	45	16	134
Percent	(16%)	(2%)	(13%)	(4%)	(32%)

*Project design incorporated mitigation measures; see text for details.

Table 61

Eagle Mountain Project - Rail Access Only Alternative
Effect of Mitigation on Emissions
from Sources Owned by Mine Reclamation Corp.
(tons/year)

Activity	NOx	CO	PM10	VOC	SO2
			Without Mitigation		
Trains	504	203	21	79	89
On-Site Vehicle Exhaust	429	144	32	26	44
On-Site Fugitive Dust*			115		
Landfill Gas Flares*	216	149	123	154	57
Total, Without Mitigation	1149	496	291	259	190
			With Mitigation		
Trains	294	203	17	79	9
On-Site Vehicle Exhaust	244	109	15	16	8
On-Site Fugitive Dust*			103		
Landfill Gas Flares*	216	149	123	154	57
Total, With Mitigation	754	461	258	249	74
REDUCTION DUE TO MITIGATION					
Tons	395	35	33	10	116
Percent	(34%)	(7%)	(11%)	(4%)	(61%)

*Project design incorporated mitigation measures; see text for details.

The sulfur dioxide reductions are due to the use of ultra-low sulfur fuel in all Diesel burning equipment owned by Mine Reclamation Corp. The use of this fuel results in associated reductions in particulate matter emissions as well. The use of an electric conveyor to transfer cover material for a portion of the distance which would otherwise be traveled by trucks on transitional roads results in a further reduction in particulate emissions.

In addition, the project design reflects substantial reductions (up to 95%) in particulate emissions due to a variety of dust suppression techniques, since it is likely that these measures would be required in order to comply with South Coast Air Quality Management District requirements. Consequently, all estimates of project emissions (with and without mitigation) reflect these reductions.

Relatively small reductions in carbon monoxide and volatile organic compounds (hydrocarbons) are expected beyond those already included in the project design to ensure that flare gas emissions of that pollutant do not exceed applicable regulatory trigger levels. The remaining sources of carbon monoxide and VOC's are Diesel engines, which have inherently low levels of these pollutants.

5) Assessment of Significance

Ozone - Table 62 compares the impacts from the Rail Access Only Alternative to various significance levels for ozone. In this table, hydrocarbon emissions are used to evaluate the significance of ozone impacts; there are no approved techniques available which can be used to estimate the change in ambient ozone concentrations due to any of the alternatives.

Compared with a baseline of zero emissions, the Rail Access Only Alternative would be expected to have a significant impact on ozone, due to significant increases in hydrocarbon emissions.

Within the South Coast Air Basin, the increases in emissions of hydrocarbons due to increased transport of waste are more than offset by the expected decrease in flare emissions. Consequently, the Rail Access Only Alternative is expected to have a beneficial impact on hydrocarbon emissions within the South Coast Air Basin, while resulting in a significant increase in the Desert Air Basin. Since both regions experience violations of the state and federal ozone standards, the overall impacts for ozone would be considered significant for the Rail Access Only Alternative.

Nitrogen Dioxide - Table 63 shows the impacts of the Rail Access Only Alternative on nitrogen dioxide. Once again, this Alternative is shown to result in significant impacts for this pollutant.

Table 62

Assessment of Significance for Ozone
Eagle Mountain Project - Rail Access Only Alternative

Measure of Significance	Level	Rail Access Only Alternative Without Mitigation	Rail Access Only Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	2,232	2,037
AQMD major NSR	100 tons/year	388	372
AQMD major PSD	25 tons/year	388	372
AQMD sig incr PSD	25 tons/year	388	372
EPA major source	100 tons/year	388	372
EPA major mod	40 tons/year	388	372
Ozone Measurement Accuracy and Reporting Precision			
ARB accuracy	0.54 pphm		
ARB reporting	1 pphm		
Other Measures			
Zero molecule	0 lbs/day	2,123	2,037

Table 63

Assessment of Significance for Oxides of Nitrogen
Eagle Mountain Project - Rail Access Only Alternative

Measure of Significance	Level	Rail Access Only Alternative Without Mitigation	Rail Access Only Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	15,991	13,480
AQMD major NSR	100 tons/year	2,919	2,460
AQMD major PSD	25 tons/year	2,919	2,460
AQMD sig incr PSD	25 tons/year	2,919	2,460
EPA major source	100 tons/year	2,919	2,460
EPA major mod	40 tons/year	2,919	2,460
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	10 ug/m3 ann	27	25
EPA Class I ann	10 ug/m3 ann	27	25
EPA de minimus ann	14 ug/m3 ann	27	25
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.18 pphm 1-hr	16	15
ARB report 1h	1 pphm 1-hr	16	15
ARB report ann	0.1 pphm ann	1.4	1.4
Other Measures			
Zero molecule	0 lbs/day	15,991	13,480

Carbon Monoxide - The impacts of the Rail Access Only Alternative on carbon monoxide is shown in Table 64. The data show that, compared with a baseline of zero emissions, this Alternative would have a significant impact on carbon monoxide. However, this alternative would reduce carbon monoxide emissions in the South Coast Air Basin - where state and federal air quality standards are exceeded - while increasing emissions in the Desert areas which still meet the standards. Since the air quality modeling analyses in show that the Rail Access Only Alternative would not result in a violation of any state or federal air quality standard for carbon monoxide, the overall impacts of this Alternative on carbon monoxide are expected to be insignificant, and beneficial within the South Coast Air Basin.

Sulfur Dioxide - Table 65 shows the impacts of the Rail Access Only Alternative on sulfur dioxide. The data show that this Alternative would result in a significant impact for this pollutant.

Particulate Sulfates - Since particulate sulfates are formed in the atmosphere from emissions of sulfur dioxide, conclusions regarding the significance of sulfur dioxide impacts would be applicable to sulfates as well.

Fine Particulates - The impacts on fine particulates of the Rail Access Only Alternative is shown in Table 66. Once again, the data show that this Alternative is expected to result in significant impacts for this pollutant. However, the shift in landfill operations outside of the South Coast Air Basin results in a decrease in PM10 emissions which outweighs the increase due to transportation; consequently, the Rail Access Only Alternative would result in a net air quality benefit within the South Coast Air Basin. However, given the fact that both the Basin and Desert portions of Southern California exceed state and federal air quality standards for fine particulates, the overall impacts would still be considered significant.

Regional Visibility - Regional visibility is affected by emissions of hydrocarbons, oxides of nitrogen, sulfur dioxide, and particulate matter. Based on the analyses contained in preceding sections, the Rail Access Only Alternative would be expected to have a significant effect on regional visibility. Overall, this Alternative would be expected to result in a slight benefit in regional visibility in the South Coast Air Basin, and an adverse impact in the desert areas.

Acid Deposition - Acid deposition in California results from pollutants formed from oxides of nitrogen and sulfur oxides emissions. Based on the analyses contained in the preceding sections, the Rail Access Only Alternative would be expected to have a significant effect on acid deposition.

Table 64

Assessment of Significance for Carbon Monoxide
Eagle Mountain Project - Rail Access Only Alternative

Measure of Significance	Level	Rail Access Only Alternative Without Mitigation	Rail Access Only Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	6,492	6,346
AQMD major NSR	100 tons/year	1,185	1,159
AQMD major PSD	25 tons/year	1,185	1,159
AQMD sig incr PSD	25 tons/year	1,185	1,159
EPA major source	100 tons/year	1,185	1,159
EPA major mod	40 tons/year	1,185	1,159
Concentration Based Measures - Industrial Sources			
EPA Class I 24 hr	1 ug/m3 24-hr	74	74
EPA de minimus 8h	575 ug/m3 8-hr	139	138
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.02 ppm 1-hr	0.16	0.16
ARB report 1h	1 ppm 1-hr	0.16	0.16
ARB report 8h	0.1 ppm 8-hr	0.12	0.12
Other Measures			
Zero molecule	0 lbs/day	6,492	6,346

Table 65

Assessment of Significance for Sulfur Dioxide
Eagle Mountain Project - Rail Access Only Alternative

Measure of Significance	Level	Rail Access Only Alternative Without Mitigation	Rail Access Only Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	2,272	1,538
AQMD major NSR	100 tons/year	415	281
AQMD major PSD	25 tons/year	415	281
AQMD sig incr PSD	25 tons/year	415	281
EPA major source	100 tons/year	415	281
EPA major mod	40 tons/year	415	281
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	2 ug/m3 ann	7	6
AQMD Class I 24h	5 ug/m3 24-hr	26	25
AQMD Class I 3h	25 ug/m3 3-hr	63	57
EPA Class I ann	2 ug/m3 ann	7	6
EPA Class I 24h	5 ug/m3 24-hr	26	25
EPA Class I 3h	25 ug/m3 3-hr	63	57
EPA de minimus 24h	13 ug/m3 24-hr	26	25
Measurement Accuracy and Reporting Precision			
ARB accuracy 1h	0.33 pphm 1-hr	2.7	2.4
ARB reporting 1h	1 pphm 1-hr	2.7	2.4
Other Measures			
Zero molecule	0 lbs/day	2,272	1,538

Table 66

Assessment of Significance for Fine Particulates
Eagle Mountain Project - Rail Access Only Alternative

Measure of Significance	Level	Rail Access Only Alternative Without Mitigation	Rail Access Only Alternative With Mitigation
		Zero Baseline	Zero Baseline
Emissions Based Measures - Industrial			
AQMD BACT/OFFSETS	0 lbs/day	1,959	1,713
AQMD major NSR	100 tons/year	357	312
AQMD major PSD	25 tons/year	357	312
AQMD sig incr PSD	25 tons/year	357	312
EPA major source	100 tons/year	357	312
EPA major mod	40 tons/year	357	312
Concentration Based Measures - Industrial Sources			
AQMD Class I ann	5 ug/m3 ann	16	15
AQMD Class I 24h	10 ug/m3 24-hr	63	60
EPA Class I ann	5 ug/m3 ann	16	15
EPA Class I 24h	10 ug/m3 24-hr	63	60
EPA de minimus 24h	10 ug/m3 24-hr	63	60
Measurement Accuracy and Reporting Precision			
ARB accuracy 24h	1.2 ug/m3 24-hr	63	60
ARB reporting 24h	1 ug/m3 24-hr	63	60
ARB reporting ann	0.1 ug/m3 ann	16	15
Other Measures			
Zero molecule	0 lbs/day	1,959	1,713

Toxic Air Pollutants - Each of the project alternatives is expected to have the same impact with respect to air toxics, which are associated with the combustion of flare gases. Although the analyses presented in this report assume that landfill gas generation rates would be the same for both in-basin and desert sites, the drier climate and lower moisture content in the waste would be expected to result in lower generation rates for the desert site alternatives. The lower gas generation rates would result in less flaring, which in turn would mean lower emissions of toxic air contaminants.

The screening level risk assessment shown in Section II.4.A.2) indicates that the risk from toxic air contaminants associated with the Proposed Action is greater than the 1 in a million level which is typically assumed to represent a significant impact.

Based on all of these factors, a significant impact is expected from toxic air contaminants for the Rail Access Only Alternative as well, and further health risk assessments and mitigation measures should be required.

Global Warming - "Greenhouse" gases which could contribute to the global warming effect are generated by the operation of landfill equipment; the flaring of landfill gases; and the transportation of waste material.

The operation of landfill equipment would result in approximately 14% fewer emissions of "greenhouse" gases, as compared with the Proposed Action. Overall, the Rail Access Only Alternative would result in the generation of gases which could contribute to global warming. However, the state of knowledge regarding global warming is not adequate to allow an assessment of the significance of the impacts of any individual project at the present time.

Overall Assessment of Significance

Based on the analyses contained in the preceding sections, the Rail Access Only Alternative is expected to have a significant effect on air quality. However, the Rail Access Only Alternative could result in air quality benefits in the South Coast Air Basin for ozone, carbon monoxide, and particulate matter, at the expense of increased impacts in desert areas. The improvements in South Coast Air Basin would pass through to the desert areas over the San Gorgonio Pass; however, these benefits would not be sufficient to outweigh the direct adverse impacts in the desert.

D. No Project Alternative

The No Project Alternative assumes that Southern California's landfill needs will continue to be met through use of existing and additional capacity within the South Coast Air Basin. Under this alternative, truck traffic associated with residential and commercial waste pickups would be identical to that associated with the Eagle Mountain project. (These impacts were assumed to be identical for all cases, and thus were not quantified.) In addition, it was assumed that there would be a slight increase in truck travel distances to transfer stations and/or landfills. This increase in truck traffic was based on the following estimates of replacement and expanded landfill capacity:

Origin of Waste Material	Estimated Quantity (tons/day)	Additional Round Trip Distance
Orange County	2,000	0 miles
Riverside County	2,000	0 miles
San Bernardino County	2,000	60 miles
San Gabriel Valley	7,000	0 miles
Central LA/SF Valley	5,000	20 miles
Weighted Average	18,000	12.2 miles

1) Emissions Impacts

For this case, no use of rail was assumed. With respect to waste handling equipment at the landfill, project emissions were assumed to be associated with landfill face operations; cover excavation, hauling, and daily application; and road maintenance. Landfill gas generation was conservatively assumed to be the same as the amount estimated for the Eagle Mountain project, although the higher moisture levels and rainfall in the South Coast Air Basin would be expected to result in more landfill gas generated for each ton of waste buried. Compliance with applicable dust control regulations and best available control technology was assumed for this alternative; however, the use of advanced controls to reduce flare emissions was <u>not</u> assumed, as existing flares (or other gas disposal equipment) would be used under the No Project Alternative.

The emissions associated with this alternative are summarized in Table 67.

2) Project Impacts - Ambient Concentrations

Due to the large number of existing landfill sites, it is not reasonably possible to estimate the ambient pollutant concentrations at these sites. Ambient concentrations may be either higher or lower depending on local geography and weather patterns.

3) Consistency with Regulatory Programs

It is assumed that existing landfill operations are in compliance with all applicable air quality rules and regulations. It is not clear whether the expansions required to continue accommodating the 20,000 tons/day of waste which would otherwise go to the Eagle Mountain landfill would require additional air quality permits.

Table 67

No Project Alternative
Total Project Emissions

	(lb/day)					(ton/yr)				
Activity	NOx	CO	PM10	VOC	SO2	NOx	CO	PM10	VOC	SO2
Transfer Stations	1780	539	192	162	221	325	98	35	30	40
Trains	0	0	0	0	0	0	0	0	0	0
On-Highway Trucks	337	159	49	53	69	61	29	9	10	13
Onsite Vehicle Exhaust	1722	615	134	111	175	314	112	24	20	32
Onsite Fugitive Dust			721					132		
Landfill Gas Flares	1689	8164	676	1689	310	308	1490	123	308	57
PROJECT GRAND TOTAL	5528	9477	1772	2015	775	1008	1729	323	368	142

5) Assessment of Significance

Ozone - Table 68 compares the impacts from the No Project Alternative to various significance levels for ozone. In this table, hydrocarbon emissions are used to evaluate the significance of ozone impacts; there are no approved techniques available which can be used to estimate the change in ambient ozone concentrations due to any of the alternatives.

Compared with a baseline of zero emissions, the No Project Alternative would be expected to have a significant impact on ozone, due to significant levels of hydrocarbon emissions.

Nitrogen Dioxide - Table 69 shows the impacts of the No Project Alternative on nitrogen dioxide. Once again, this Alternative is shown to result in significant impacts for this pollutant.

Carbon Monoxide - The impacts of the No Project Alternative on carbon monoxide is shown in Table 70. The data show that, compared with a baseline of zero emissions, this Alternative would have a significant impact on carbon monoxide.

Sulfur Dioxide - Table 71 shows the impacts of the No Project Alternative on sulfur dioxide. The data show that this Alternative would result in a significant impact for this pollutant.

Particulate Sulfates - Since particulate sulfates are formed in the atmosphere from emissions of sulfur dioxide, conclusions regarding the significance of sulfur dioxide impacts would be applicable to sulfates as well.

Fine Particulates - The impacts on fine particulates of the No Project Alternative is shown in Table 72. Once again, the data show that this Alternative is expected to result in significant impacts for this pollutant.

Regional Visibility - Regional visibility is affected by emissions of hydrocarbons, oxides of nitrogen, sulfur dioxide, and particulate matter. Based on the analyses contained in preceding sections, the No Project Alternative would be expected to have a significant effect on regional visibility.

Acid Deposition - Acid deposition in California results from pollutants formed from oxides of nitrogen and sulfur oxides emissions. Based on the analyses contained in the preceding sections, the No Project Alternative would be expected to have a significant effect on acid deposition.

Table 68

Assessment of Significance for Ozone
Eagle Mountain Project - No Project Alternative

Measure of Significance	Level	Project Without Mitigation Zero Baseline
Emissions Based Measures - Industrial		
AQMD BACT/OFFSETS	0 lbs/day	2,015
AQMD major NSR	100 tons/year	368
AQMD major PSD	25 tons/year	368
AQMD sig incr PSD	25 tons/year	368
EPA major source	100 tons/year	368
EPA major mod	40 tons/year	368
Ozone Measurement Accuracy and Reporting Precision		
ARB accuracy	0.54 pphm	
ARB reporting	1 pphm	
Other Measures		
Zero molecule	0 lbs/day	2,015

Table 69

Assessment of Significance for Oxides Nitrogen
Eagle Mountain Project - No Project Alternative

Measure of Significance	Level	Project Without Mitigation
		Zero Baseline
Emissions Based Measures - Industrial		
AQMD BACT/OFFSETS	0 lbs/day	5,528
AQMD major NSR	100 tons/year	1,008
AQMD major PSD	25 tons/year	1,008
AQMD sig incr PSD	25 tons/year	1,008
EPA major source	100 tons/year	1,008
EPA major mod	40 tons/year	1,008
Concentration Based Measures - Industrial Sources		
AQMD Class I ann	10 ug/m3 ann	27
EPA Class I ann	10 ug/m3 ann	27
EPA de minimum ann	14 ug/m3 ann	27
Measurement Accuracy and Reporting Precision		
ARB accuracy lh	0.18 pphm 1-hr	18
ARB report lh	1 pphm 1-hr	18
ARB report ann	0.1 pphm ann	1.4
Other Measures		
Zero molecule	0 lbs/day	5,528

Table 70

Assessment of Significance for Carbon Monoxide
Eagle Mountain Project - No Project Alternative

Measure of Significance	Level	Project Without Mitigation Zero Baseline
Emissions Based Measures - Industrial		
AQMD BACT/OFFSETS	0 lbs/day	9,477
AQMD major NSR	100 tons/year	1,729
AQMD major PSD	25 tons/year	1,729
AQMD sig incr PSD	25 tons/year	1,729
EPA major source	100 tons/year	1,729
EPA major mod	40 tons/year	1,729
Concentration Based Measures - Industrial Sources		
EPA Class I 24 hr	1 ug/m3 24-hr	75
EPA de minimus 8h	575 ug/m3 8-hr	132
Measurement Accuracy and Reporting Precision		
ARB accuracy 1h	0.02 ppm 1-hr	0.16
ARB report 1h	1 ppm 1-hr	0.16
ARB report 8h	0.1 ppm 8-hr	0.12
Other Measures		
Zero molecule	0 lbs/day	9,477

Table 71

Assessment of Significance for Sulfur Dioxide
Eagle Mountain Project - No Project Alternative

Measure of Significance	Level	Project Without Mitigation
		Zero Baseline
Emissions Based Measures - Industrial		
AQMD BACT/OFFSETS	0 lbs/day	775
AQMD major NSR	100 tons/year	142
AQMD major PSD	25 tons/year	142
AQMD sig incr PSD	25 tons/year	142
EPA major source	100 tons/year	142
EPA major mod	40 tons/year	142
Concentration Based Measures - Industrial Sources		
AQMD Class I ann	2 ug/m3 ann	7
AQMD Class I 24h	5 ug/m3 24-hr	26
AQMD Class I 3h	25 ug/m3 3-hr	64
EPA Class I ann	2 ug/m3 ann	7
EPA Class I 24h	5 ug/m3 24-hr	26
EPA Class I 3h	25 ug/m3 3-hr	64
EPA de minimus 24h	13 ug/m3 24-hr	26
Measurement Accuracy and Reporting Precision		
ARB accuracy 1h	0.33 pphm 1-hr	2.7
ARB reporting 1h	1 pphm 1-hr	2.7
Other Measures		
Zero molecule	0 lbs/day	775

Table 72

Assessment of Significance for Fine Particulate
Eagle Mountain Project - No Project Alternative

Measure of Significance	Level	Project Without Mitigation Zero Baseline
Emissions Based Measures - Industrial		
AQMD BACT/OFFSETS	0 lbs/day	1,772
AQMD major NSR	100 tons/year	323
AQMD major PSD	25 tons/year	323
AQMD sig incr PSD	25 tons/year	323
EPA major source	100 tons/year	323
EPA major mod	40 tons/year	323
Concentration Based Measures - Industrial Sources		
AQMD Class I ann	5 ug/m3 ann	19
AQMD Class I 24h	10 ug/m3 24-hr	77
EPA Class I ann	5 ug/m3 ann	19
EPA Class I 24h	10 ug/m3 24-hr	77
EPA de minimus 24h	10 ug/m3 24-hr	77
Measurement Accuracy and Reporting Precision		
ARB accuracy 24h	1.2 ug/m3 24-hr	77
ARB reporting 24h	1 ug/m3 24-hr	77
ARB reporting ann	0.1 ug/m3 ann	19
Other Measures		
Zero molecule	0 lbs/day	1,772

Toxic Air Pollutants - Each of the project alternatives is expected to have the same impact with respect to air toxics, which are associated with the combustion of flare gases. Although the analyses presented in this report assume that landfill gas generation rates would be the same for both in-basin and desert sites, the more moist climate and higher moisture content in the waste would be expected to result in higher generation rates for the No Project Alternative. The higher gas generation rates would result in more flaring, which in turn would mean higher emissions of toxic air contaminants.

Global Warming - "Greenhouse" gases which could contribute to the global warming effect are generated by the operation of landfill equipment; the flaring of landfill gases; and the transportation of waste material. Overall, the No Project Alternative would result in the generation of gases which could contribute to global warming in an amount less than that generated under the Proposed Action.

Overall Assessment of Significance

Based on the analyses contained in the preceding sections, the No Project Alternative is expected to have a significant effect on air quality.

5. COMPARISON OF ALTERNATIVES

A comparison of the emissions associated with each of the four project alternatives is shown in Figures 35-39 for each of the criteria pollutants.

With respect to oxides of nitrogen, the data in Figure 35 show that each of the alternatives would result in a substantial increase in oxides of nitrogen emissions compared to the No Project Alternative, due principally to the emissions associated with long distance transportation of 16 - 20 thousand tons of waste per day. While the mitigation measures would reduce these impacts somewhat, the remaining impacts would still be significant. As discussed previously, the NOx emissions from the No Project Alternative would be considered significant as well.

For carbon monoxide, each of the alternatives results in a decrease in emissions, as shown in Figure 36. This is due to the anticipated lower CO emission rate from new flares (or other combustion devices) equipped with oxidizing catalysts. This reduction would also be seen if gas generation rates in the drier desert climate prove to be lower than those currently experienced in the South Coast Air Basin.

The PM10 emissions from the alternatives are shown in Figure 37. The data indicate that total PM10 emissions are approximately equal, regardless of the alternative. The Reduced Operations and Rail Only Alternatives, with mitigation, result in slightly lower PM10 emissions than the No Project Alternative.

Figure 35

Eagle Mountain Project

Comparison of Alternatives - Oxides of Nitrogen

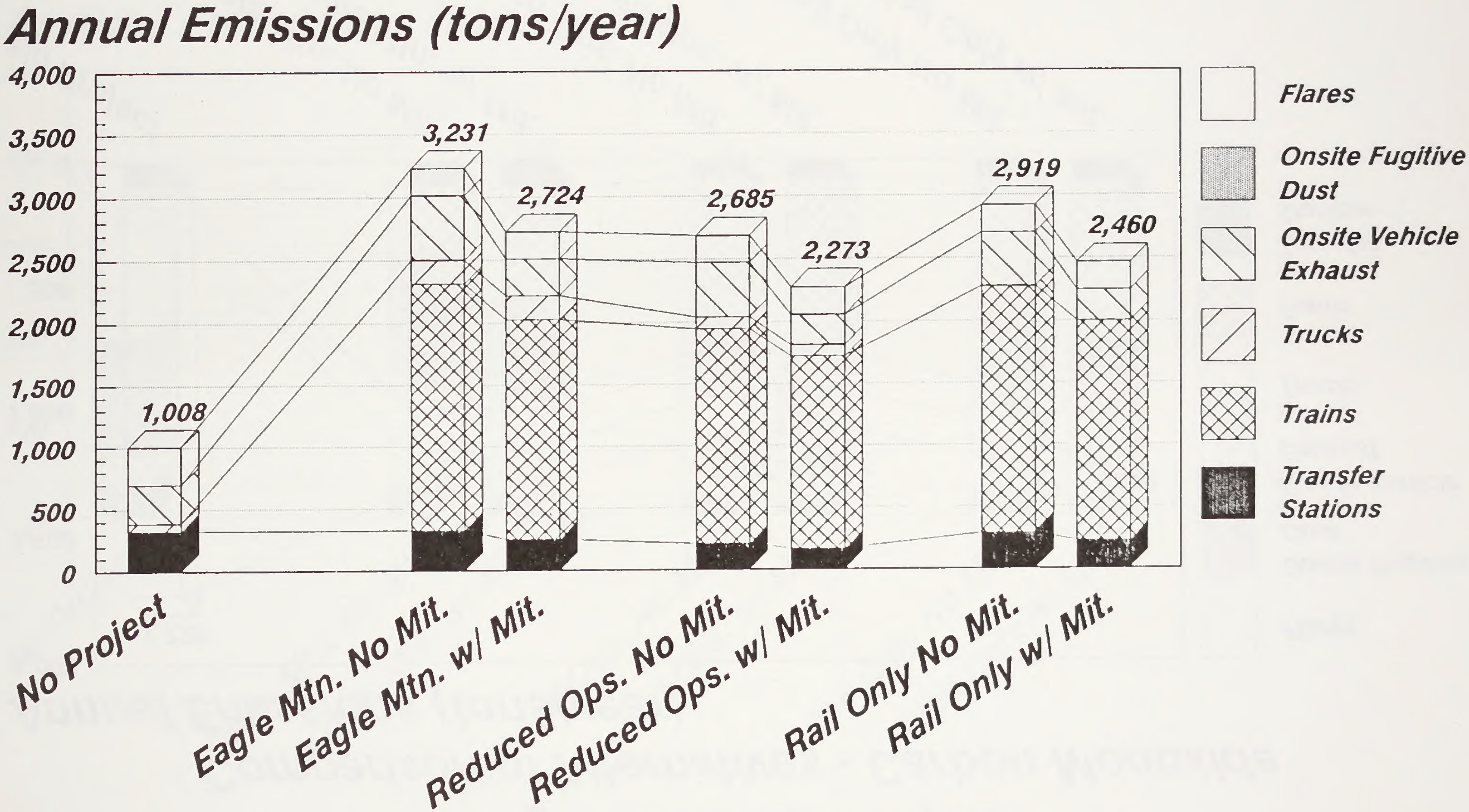


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Figure 36

Eagle Mountain Project

Comparison of Alternatives - Carbon Monoxide

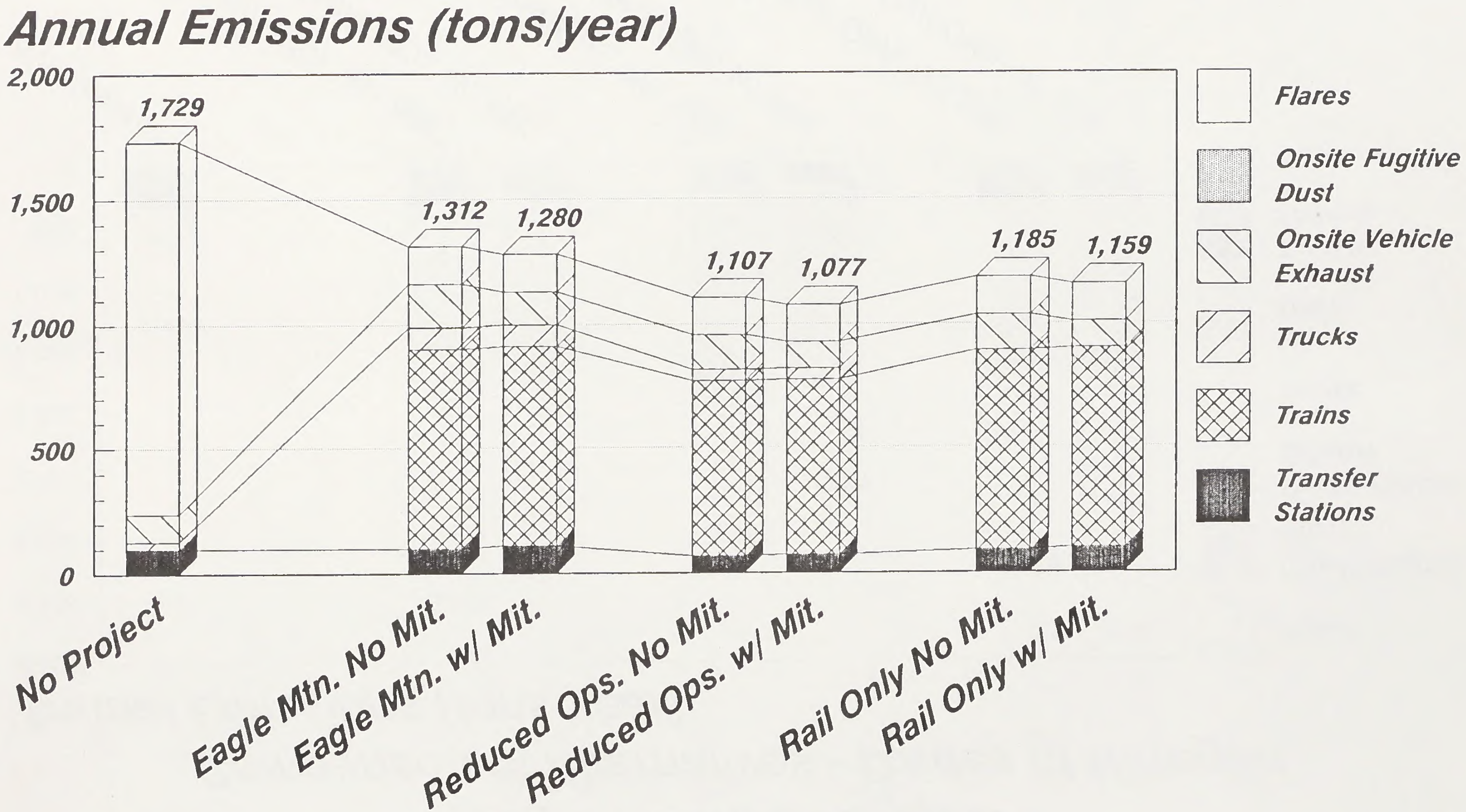

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Figure 37

Eagle Mountain Project

Comparison of Alternatives - Particulates (PM10)

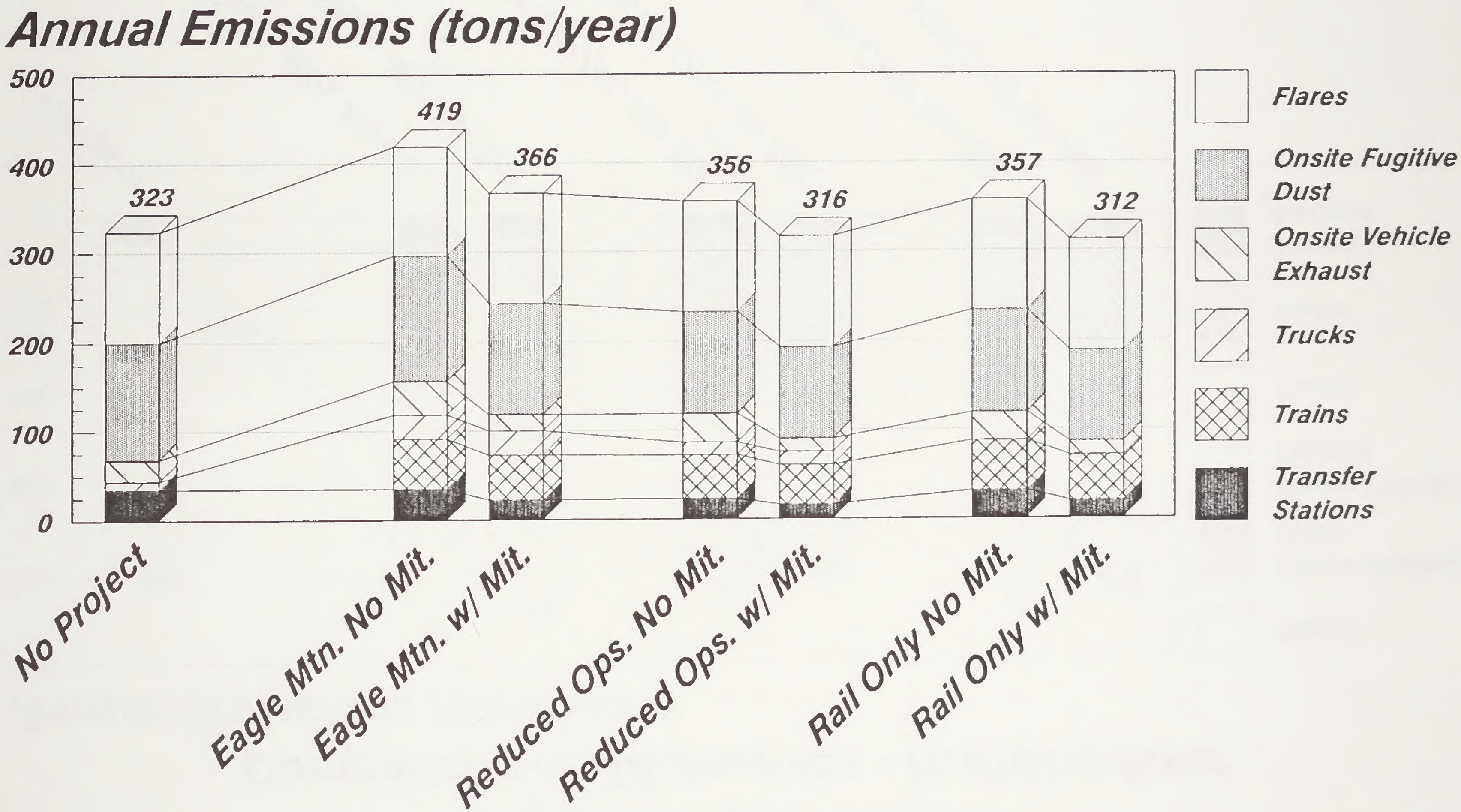

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Figure 38

Eagle Mountain Project

Comparison of Alternatives - Hydrocarbons

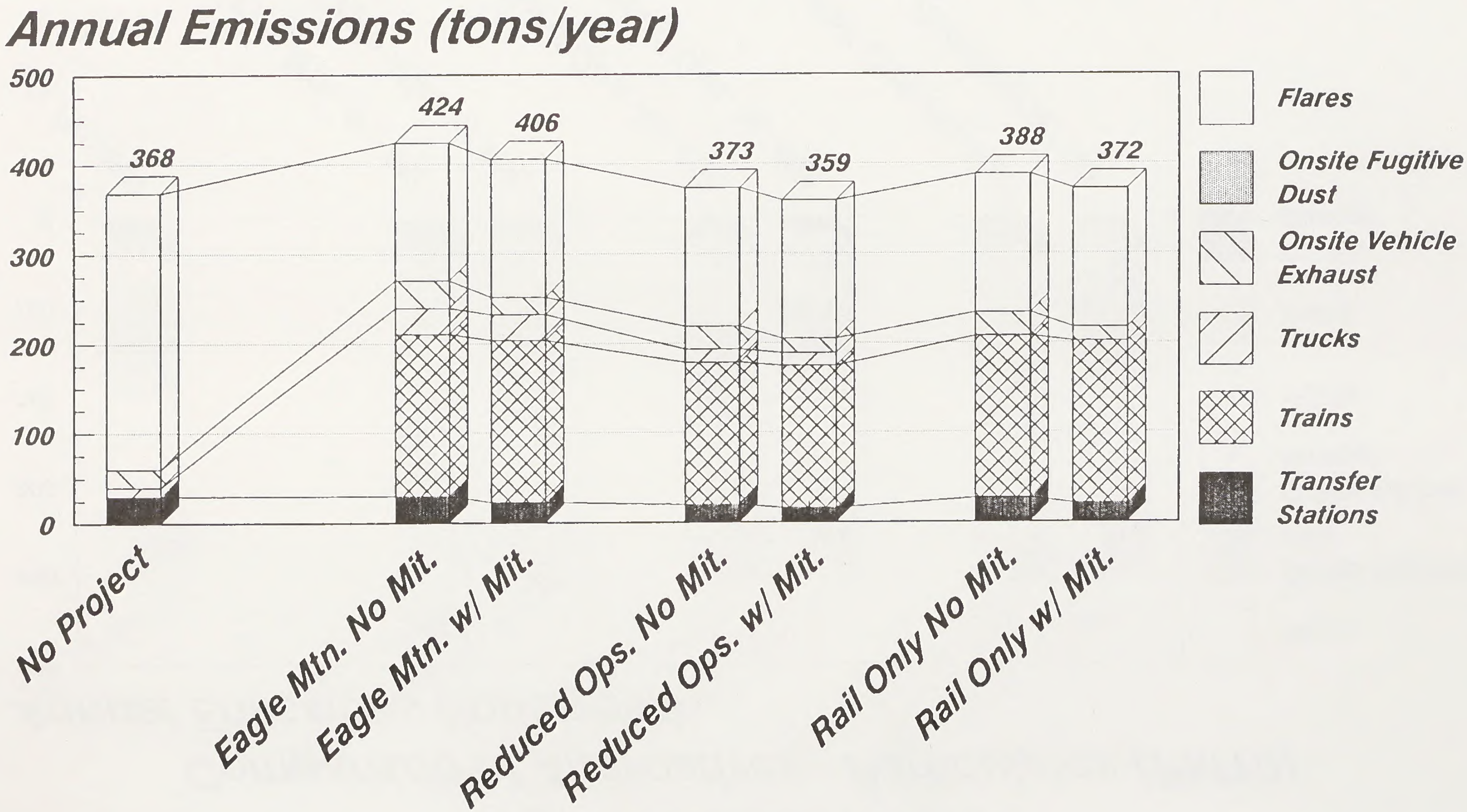

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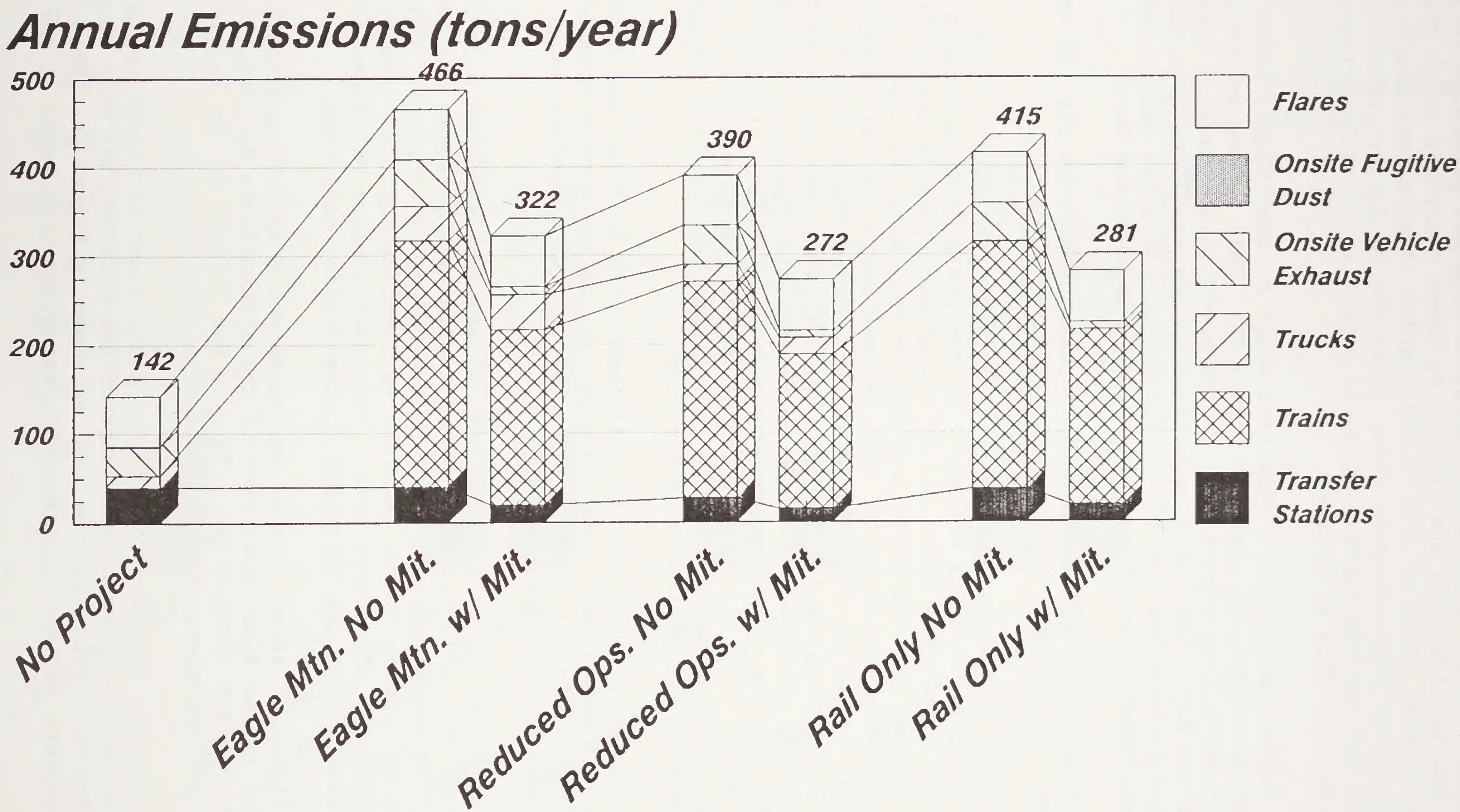
Figure 39

Eagle Mountain Project

Comparison of Alternatives - Sulfur Oxides



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Non-methane hydrocarbon emissions data are presented in Figure 38. The results here are similar to those described above for particulates. Both of the 16,000 ton/day alternatives would result in HC emissions comparable to those under the No Project Alternative. The 20,000 ton/day operations would result in a small increase in emissions of this pollutant.

Sulfur oxides (SOx) emissions would be much higher under any of the alternatives, as shown in Figure 39. This is due to the use of sulfur-containing diesel fuel to transport 16-20 thousand tons of waste per day. The large reductions in SOx emissions associated with mitigation measures are due to the use of ultra-low sulfur fuel oil in all equipment owned or operated by Mine Reclamation Corp.

Figures 40-44 present the same data, separated for the two air basins in which air quality impacts would be felt.

Figure 40 shows the NOx emissions from the alternatives. The data indicate that NOx emissions in the South Coast Air Basin (SCAB) would be comparable under all of the alternatives to the No Project Alternative; the principal increase in NOx emissions comes in the Southeast Desert Air Basin. The Reduced Operations Alternative would actually result in lower NOx emissions in the South Coast Air Basin than the No Project Alternative; however, this conclusion must be viewed with caution, since the No Project Alternative disposes of 20,000 tons/day of waste, while the Reduced Project Alternative disposes of only 16,000 tons/day of waste. On an equivalent waste basis, the Proposed Action with mitigation results in a 118 ton/year increase in NOx emissions in the SCAB.

Figure 41 shows that CO emissions, both in total and in the SCAB, would be substantially reduced under all of the alternatives compared with the No Project Alternative. However, CO emissions would increase in the desert air basin.

With respect to particulates, Figure 42 shows that each of the alternatives would result in a substantial reduction in the South Coast Air Basin compared with the No Project Alternative. This is due to the relocation of the numerous particulate-emitting landfill operations to the desert site. Total particulate emissions are increased due to the increased transportation emissions.

Figure 43 shows that HC emissions would also be substantially reduced in the SCAB under each of the alternatives as compared with the No Project Alternative. This is due largely to the relocation of flare gas emissions to the desert site.

Finally, SOx emissions in the South Coast Air Basin would be the same or slightly lower under each of the alternatives when compared with the No Project Alternative, as shown in Figure 44. This is due to a balance between increased SOx emissions from waste

Figure 40

Eagle Mountain Project
Basin Impacts - Oxides of Nitrogen

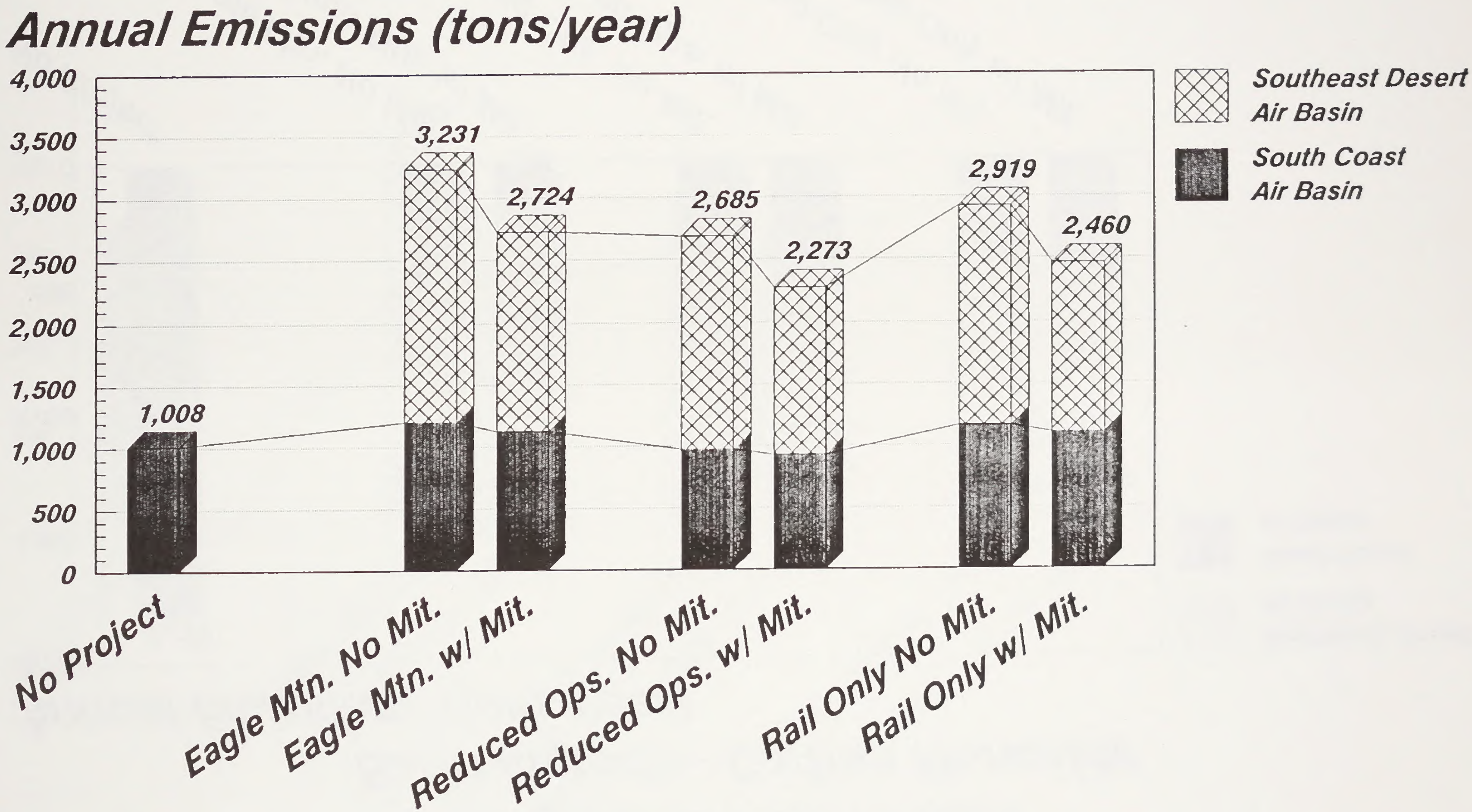

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Figure 41

Eagle Mountain Project
Basin Impacts - Carbon Monoxide

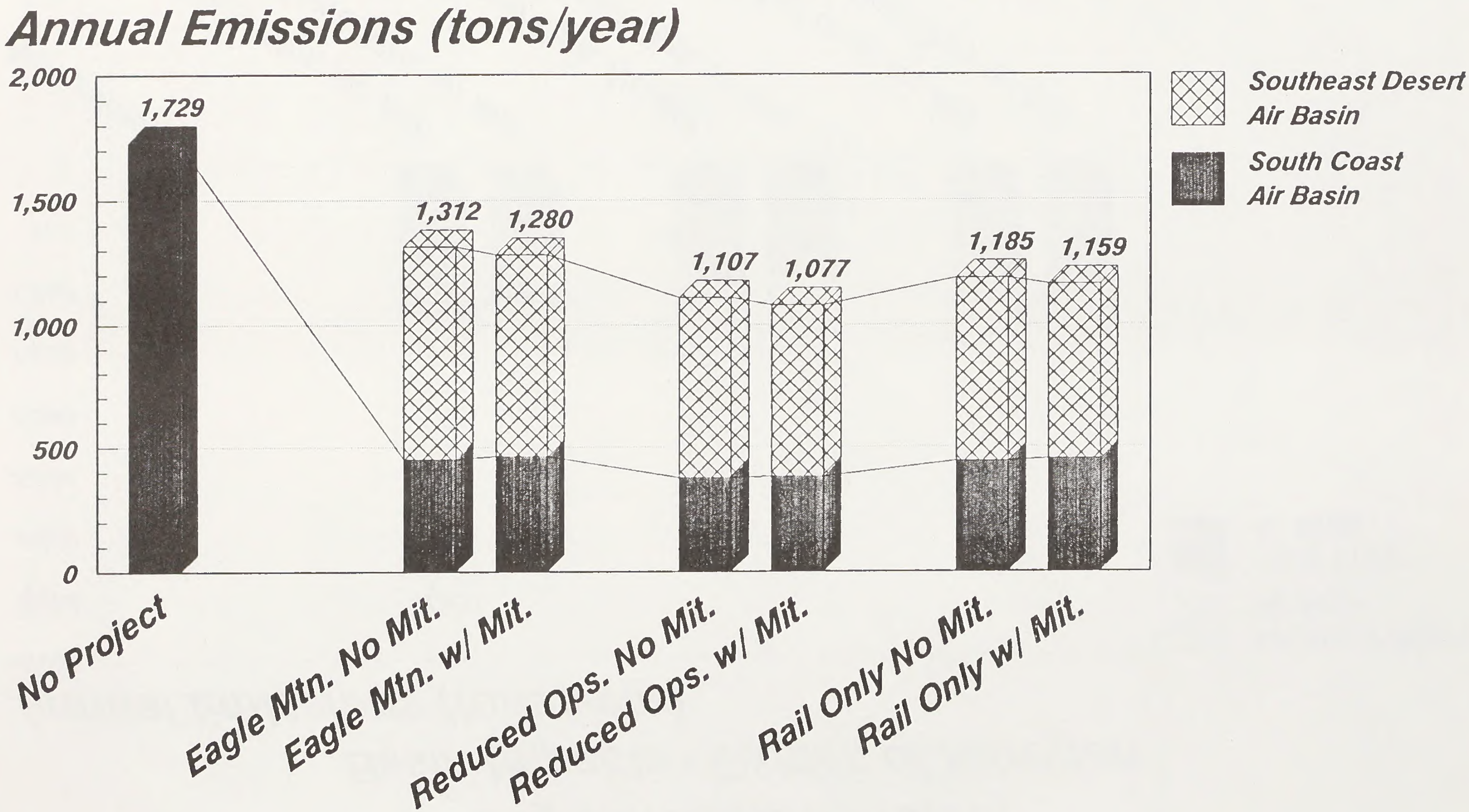

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Figure 42

Eagle Mountain Project

Basin Impacts - Particulates (PM10)

Annual Emissions (tons/year)

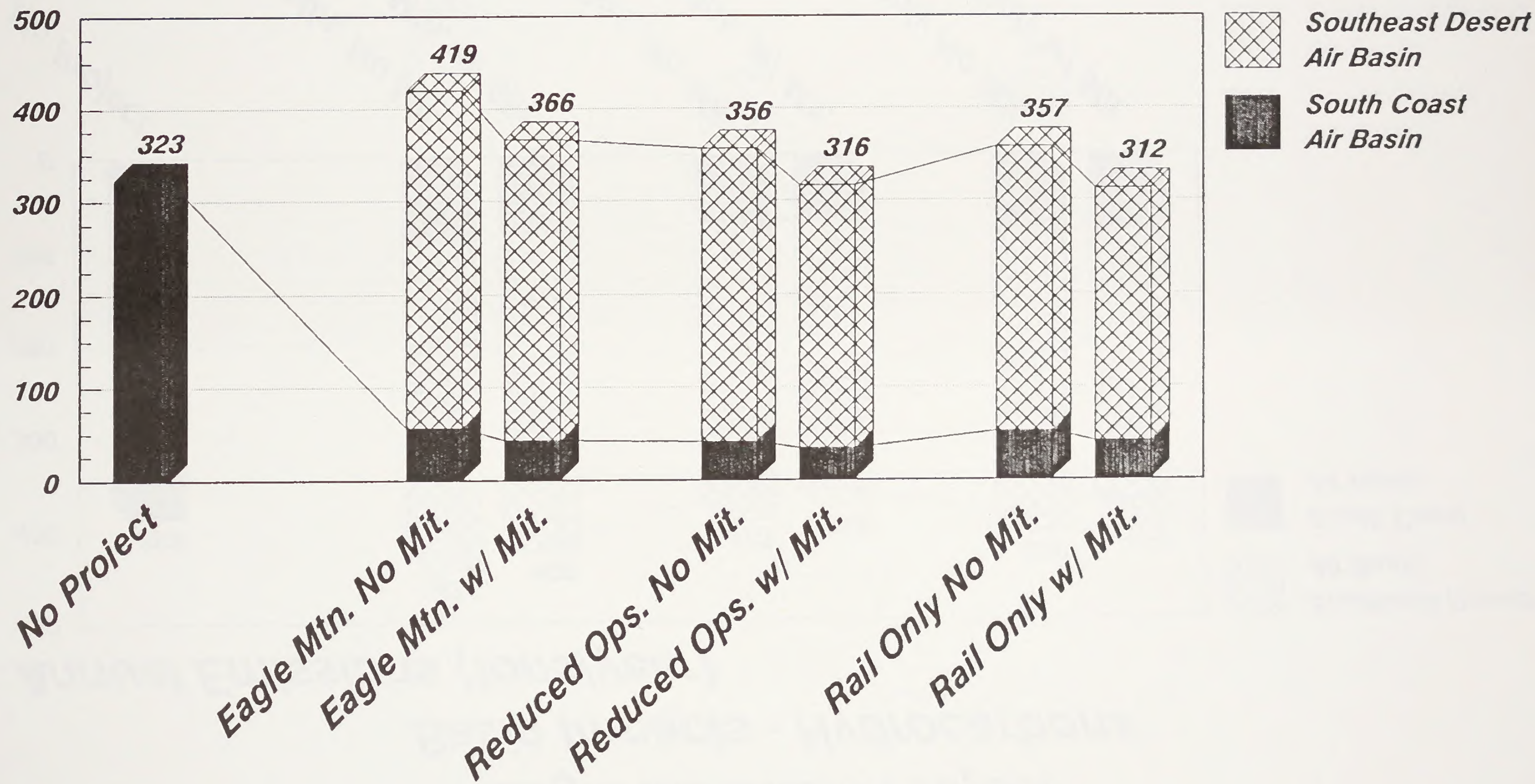

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Figure 43

Eagle Mountain Project
Basin Impacts - Hydrocarbons

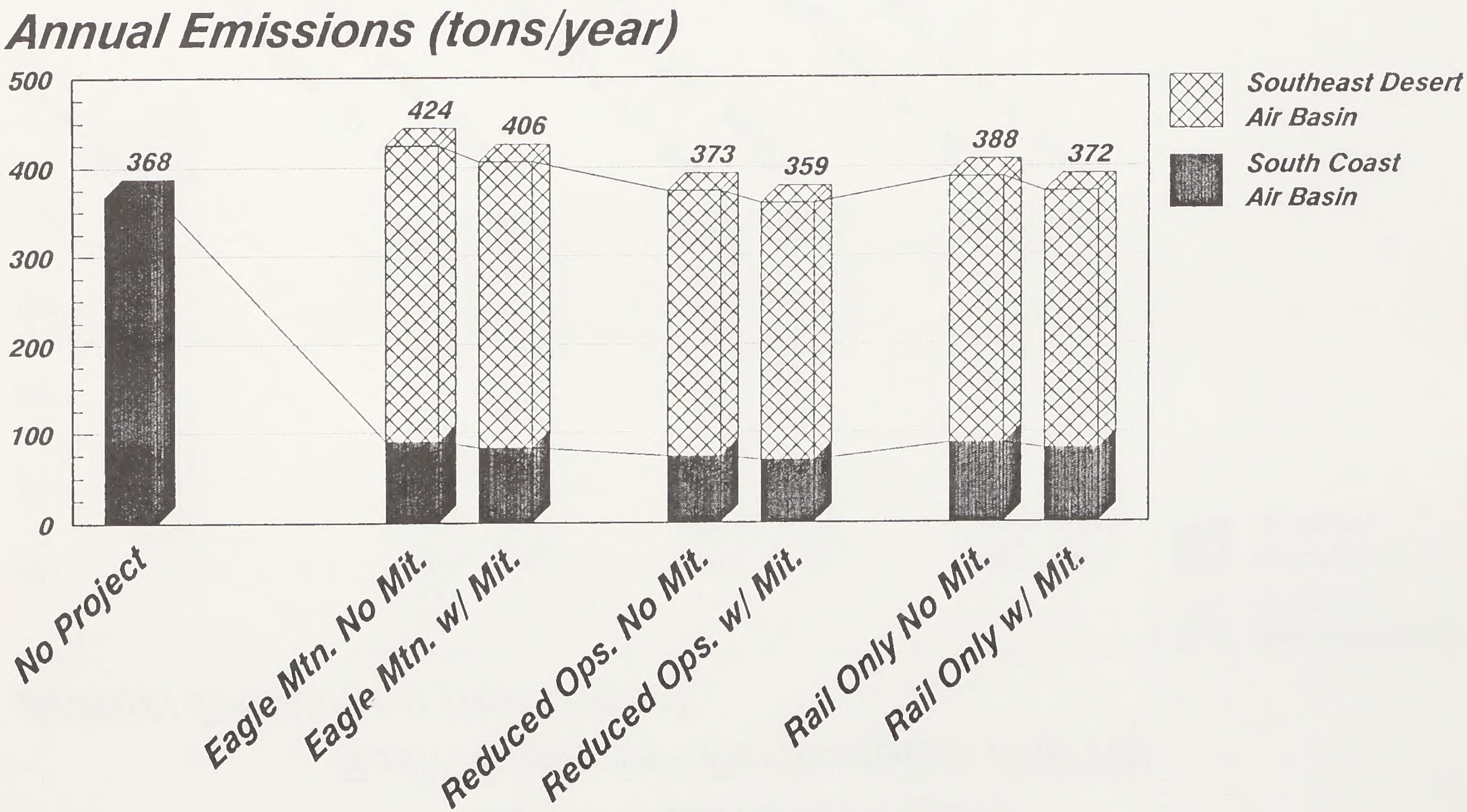

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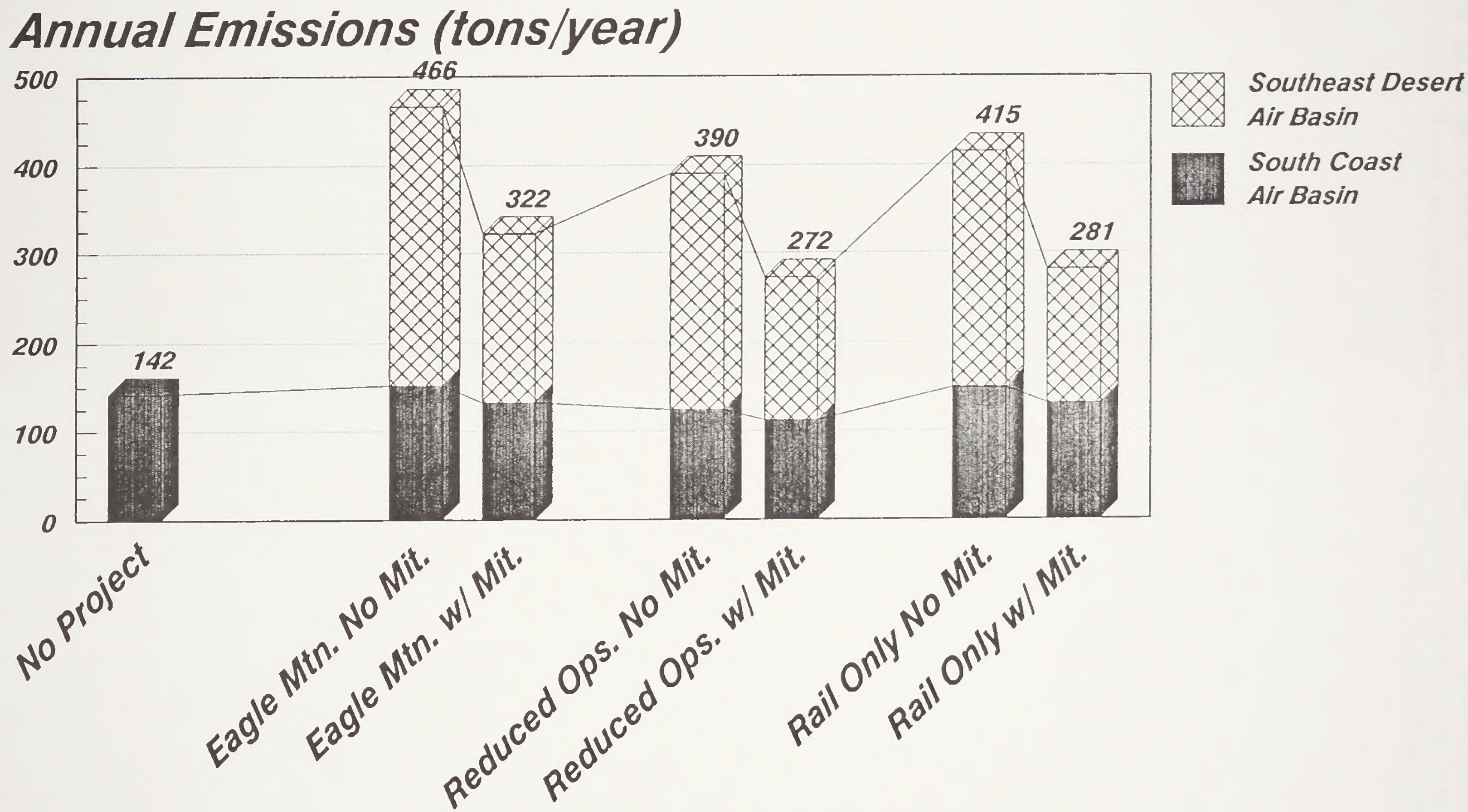
Figure 44

Eagle Mountain Project
Basin Impacts - Sulfur Oxides



Sierra Research
August 1990

transportation, and decreased SOx emissions associated with the relocation of waste handling operations from the South Coast Air Basin landfills to the desert site.

APPENDIX F

BIOLOGICAL TECHNICAL REPORT
FOR
EAGLE MOUNTAIN LANDFILL PROJECT

Prepared for

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I. SUMMARY

The proposed project is the establishment of a Class III (inert and municipal solid waste only) landfill at Eagle Mountain Mine using primarily the existing pit formerly operated as an iron ore mine. Waste generated in southern California will be transported to the project site by rail (maximum of six trains daily) and truck (200 two-way trips daily). The proposed project extends over approximately 4,659 acres in the Eagle Mountains and also includes 52 miles of Kaiser railroad right-of-way and the construction of an additional rail spur. Truck traffic would use the existing Eagle Mountain Road after road improvements are made, and a new road extension will be built along the eastern border of the landfill site. The last two miles of the Eagle Mountain Road extension will terminate at a work area east of the present ore pit. The railroad will also be realigned and a new spur will follow the Eagle Mountain Road extension to the work area. Other aspects of the proposed project are repair and maintenance facilities, systems for collection and disposal of leachate and landfill gas (LFG), and an energy recovery plant.

Within the proposed project boundaries are Bureau of Land Management (BLM) lands. The BLM proposes to transfer their holdings in the Eagle Mountain landfill project area to private ownership in exchange for private lands with biological resource values. These private lands, owned by Kaiser, were included in the biological resources assessment.

The federal- and state-listed threatened desert tortoise was observed in the study area. Sign of tortoises, and tortoises in burrows, were observed near the Eagle Mountain landfill site, Kaiser railroad corridor, and on most of the offered Kaiser property parcels.

One federal- and state-listed endangered species, desert pupfish, was captured in the Salt Creek tributary south of the Salt Creek railroad trestle in a 1990 survey by the California Department of Fish and Game (CDFG). Possible appropriate habitat exists under the trestle as well as up and downstream from the trestle.

Of the wildlife species of concern observed or detected, six were on the Eagle Mountain landfill site: desert tortoise, Nelson's bighorn sheep, California leaf-nosed bat, LeConte's thrasher, and black-tailed gnatcatcher. Six species (desert tortoise, bighorn sheep, LeConte's thrasher, black-tailed gnatcatcher, badger, and northern harrier) were found along the railroad corridor, and four species (desert tortoise, bighorn sheep, LeConte's thrasher, and black-tailed gnatcatcher) were on most of the Kaiser Steel Resources properties.

No listed state or federal plant species was observed within the bounds of the proposed project, and there is no indication of a potential for any state or federal listed plants to occur in the area. One Category 2 candidate plant species was observed within the proposed landfill project boundaries: Alverson's foxtail cactus. This cactus was observed along the railroad and Eagle Mountain Road corridor as well. A second Category 2 candidate plant species was observed within the right-of-way corridor of the railroad: Orocopia sage. Plant species of special concern observed within Kaiser Steel Resources parcels include a few individuals of California barrel cactus in the section north of Interstate 10 (I-10), and a population of Orocopia sage occurs in the parcels south of I-10. Two plant species were observed in the railroad corridor which appear only on California Native Plant Society (CNPS) lists: crucifixion thorn and unicorn-plant.

Impacts will occur to sensitive plants and wildlife on some of the selected public lands and on some of the private lands at the proposed Eagle Mountain landfill site, along the Eagle Mountain railroad right-of-way, and Eagle Mountain Road including the proposed road extension and rail spur. No anticipated impacts will occur on the Kaiser properties (offered properties) to be traded to the BLM. Significant impacts will occur to desert tortoise, Nelson's bighorn sheep, black-tailed gnatcatcher, California leaf-nosed bat, and Alverson's foxtail cactus. Impacts to three permanent water sources and several washes and drainages will occur at the proposed landfill site, along Eagle Mountain Road, and during maintenance construction of the railroad.

II. INTRODUCTION

A. ENVIRONMENTAL SETTING

The Eagle Mountain Mine is located along the northern edge of the Colorado Desert (Figure 1). The Colorado Desert is considered a northwestern extension of the Sonoran Desert, extending into Arizona, Baja California, and Sonora, Mexico. Features of the Colorado Desert are the Salton Basin, comprising the undrained Salton Sea, and the plains and bajadas of the lower Colorado River Valley (Burk 1977). General geological features of the area surrounding the project site are north to northwest trending mountain ranges with alluvium-filled basins and drainages between the ranges. A large number of Colorado Desert plants also occur in the Mojave Desert and Arizona Sonoran Desert. Several species only occur in the lower elevations of the Colorado Desert. Reduced summer rainfalls in the Colorado Desert limit the characteristic diversity and number of tree species found in the eastern portions of the Sonoran Desert.

Habitat Management Areas (HMAs), managed by the BLM, occur in the vicinity of the proposed project. BLM HMAs include desert tortoise habitat in the Chuckwalla Bench and Chuckwalla Valley, and three Nelson's bighorn sheep management areas. Two BLM Areas of Critical Environmental Concern (ACEC) are also in the vicinity of the proposed project boundary, south of I-10. The Eagle Mountain railroad right-of-way passes through the western extent of the Chuckwalla Bench ACEC, which has been established primarily for protection of the desert tortoise. The rail line also bisects the Salt Creek ACEC near Ferrum Junction, which has been established to protect the desert pupfish and Yuma clapper rail.

The proposed landfill site consists of 4,659 acres of private and public lands in the Eagle Mountains, and is comprised of rugged mountain terrain including the old mine pit, and tailing and overburden piles surrounding the open pit mine. Elevations range from 2,800 feet in the northeast portions of the site to 710 feet in the bottom of the mine pit. Elevations on the bajadas in the eastern and southern portions of the site range from 1,234 feet in the southwestern corner to 983 in the southeastern corner.

Eagle Mountain Road and the Eagle Mountain rail line traverse the bajadas of the eastern edge of the Eagle Mountains. The bajadas drain from west

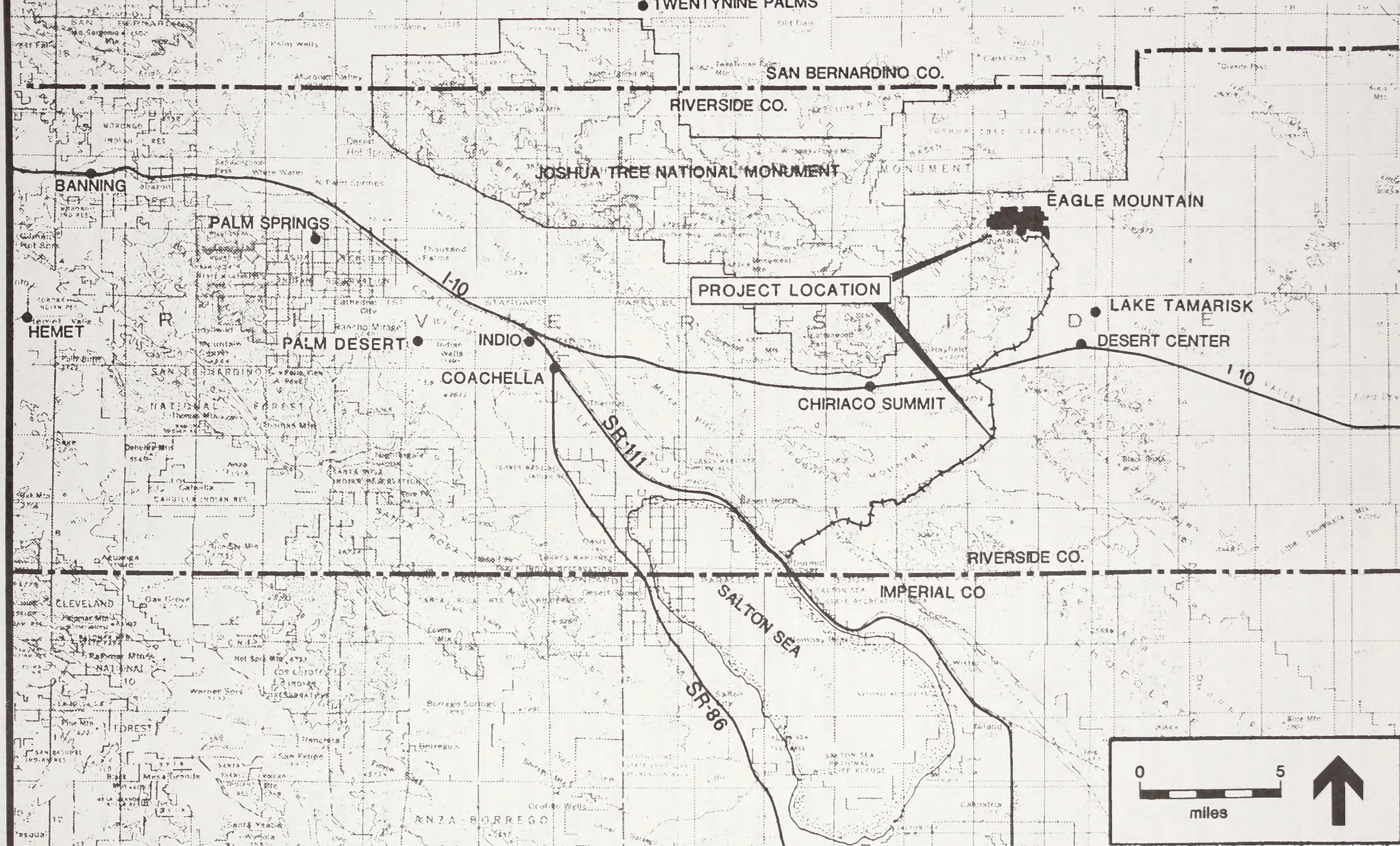

FIGURE 1. PROJECT LOCATION RELATIVE TO EASTERN RIVERSIDE COUNTY

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to east. The railroad continues southwest of the Eagle Mountains and crosses Chuckwalla Valley and I-10. From the freeway the railroad continues south through the Chuckwalla Bench area and then runs between the Orocopia and Chuckwalla mountains along Salt Creek. The railroad follows the Salt Creek drainage between the Orocopia and Chocolate mountains heading in a southwesterly direction until the railroad connects with the Southern Pacific Railroad line at the northeast edge of the Salton Sea, at Ferrum Junction. Elevation along the Eagle Mountain rail line remains at approximately 1,500 feet until the railroad reaches Salt Creek. Elevation drops steadily to a low of 149 feet below sea level near the Salton Sea. Topography along the railroad is flat or gently sloping alluvial fans.

Drainage patterns on the Eagle Mountain landfill site generally flow from west to east, creating steep washes and drainages throughout the undisturbed portions of the site. South of Chuckwalla Valley, drainages flow from the Orocopia and Chuckwalla mountains and form alluvial fans descending toward Salt Creek. Salt Creek flows southwest, draining into the Salton Sea approximately one mile south of the Eagle Mountain railroad connection at Ferrum Junction. Many sandy, gravelly washes of varying sizes cross under the railroad from Chuckwalla Valley to the area where the railroad crosses the Coachella Canal.

Surface features within the mine area, along the railroad right-of-way, and along the Eagle Mountain Road extension range from sandy washes to steep, rock-covered slopes. Some of the flat areas on the upper bajadas have little soil and desert pavement predominates. The mountain areas are composed of metasedimentary and granitic rocks. The eastern portion of the proposed landfill area is within a valley composed of sedimentary soils of predominantly sand and gravel deposits derived from the surrounding mountains.

B. PROJECT DESCRIPTION

The proposed project is the establishment of a Class III landfill at a site consisting of approximately 4,659 acres of private and public (selected) lands in the Eagle Mountains in northeastern Riverside County (Figures 1 and 2). The site is approximately 10 miles north of Desert Center, 200 miles east of Los Angeles, and approximately 50 miles west of the Arizona border. The site is bordered on the north by the northeastern ridge of the Eagle Mountains, on the east by Chuckwalla Valley, on the south by the townsite community of Eagle Mountain, and on the west by the Eagle Mountains. Joshua Tree National Monument is approximately two miles north of the project site.

The landfill at Eagle Mountain Mine will primarily use the existing East Pit, formerly operated as an iron ore mine. Mine Reclamation Corporation (MRC) proposes to use portions of the mine site and associated tailing as a regional site for the land disposal of solid waste generated in southern California, and for retrievable storage of recyclable materials contained in municipal wastes. Transport of solid waste to the project site will be accomplished by rail (up to a maximum of six trains per day, or 12 one-way trips) and truck (400 one-way trips per day). Landfilling activities will occur during daylight hours only. Receiving yards for the solid waste will operate 24 hours a day. MRC has leased approximately 4,569 acres of the Eagle Mountain Mine and 52 miles of Eagle Mountain railroad right-of-way from Kaiser Steel Resources. MRC will operate the landfill and related facilities for approximately 115 years.

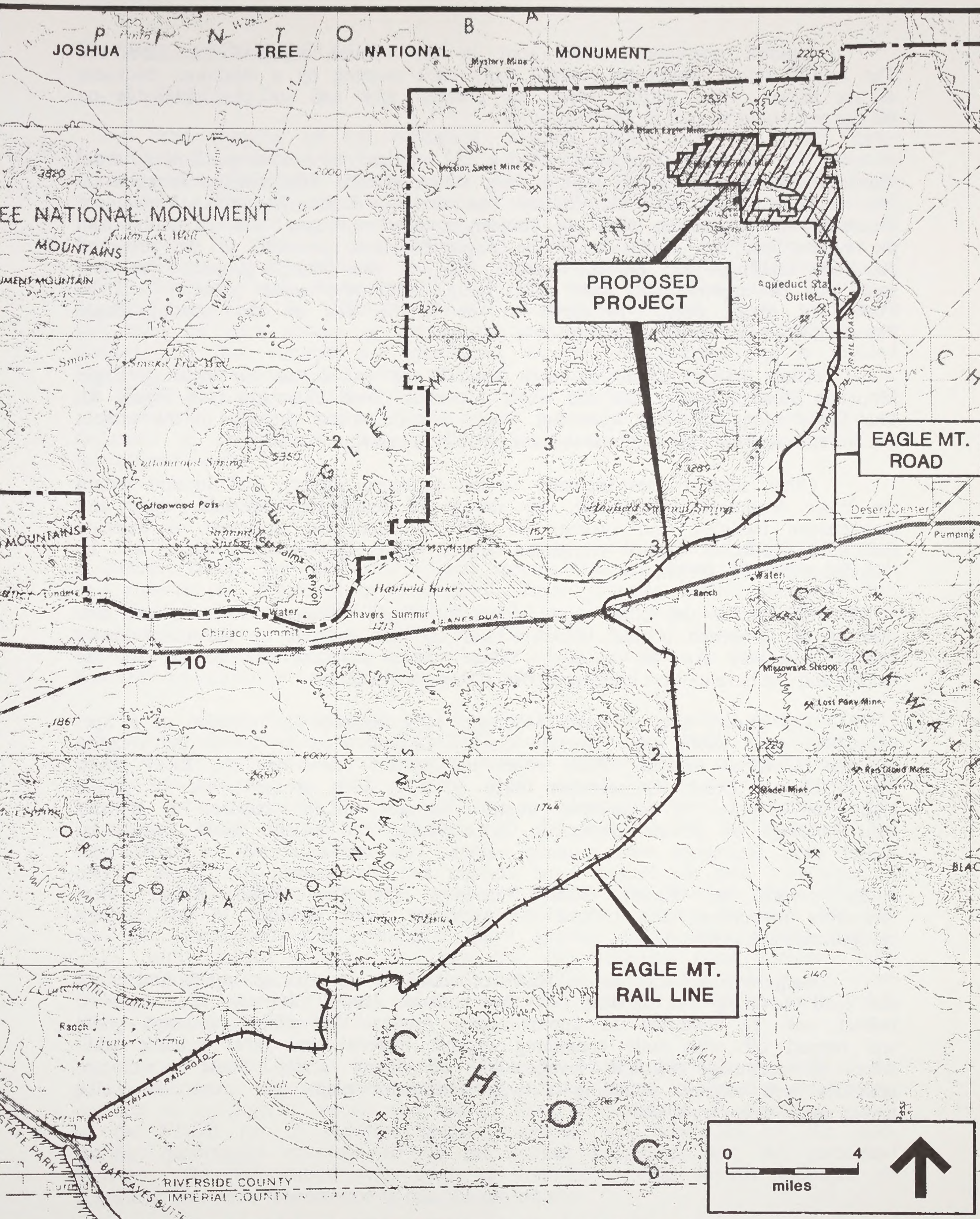

FIGURE 2. PROJECT LOCATION ON U.S.G.S. 1:250,000 SCALE MAP, SALTON SEA SHEET

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Landfill operations would start in the central area of the East Pit. The landfill refuse would be covered daily each evening by a minimum thickness of six inches. Mine tailing, which are crushed rock and soil, are available on the site and would be used for the daily cover.

The proposed project includes 52 miles of existing Kaiser Steel Resources-owned railroad and right-of-way, which extends from Ferrum Junction on the northeast corner of the Salton Sea to the Eagle Mountain Mine (see Figure 2). In conjunction with the project, a new rail spur will be built from the current rail line southeast of the Eagle Mountain townsite to the proposed container handling yard on the eastern edge of the landfill project. The new spur will be approximately two miles long. Additional waste material will be hauled by trucks from I-10 north to the landfill site on the existing Eagle Mountain Road and a proposed extension of this road.

Truck traffic to the proposed landfill site would use the existing Eagle Mountain Road (County) and the Eagle Mountain Road extension (see Figure 2). The Eagle Mountain Road extension would provide access directly to the project site and run parallel to the proposed two and a half-mile rail spur extension.

Other support uses included in the proposed project, and located within the Eagle Mountain project site, are storage of recyclable materials, repair and maintenance facilities, and systems for the collection and treatment of leachate and LFG. Pollution control equipment and/or an energy recovery plant will be included in the LFG system.

Residential and other uses within the Eagle Mountain townsite are outside of the proposed project boundary and are not covered by the discretionary actions necessary for the landfill. Where these activities are related to the landfill and can have indirect biological effects, they are discussed.

The project area at Eagle Mountain Mine requires the creation of a Specific Plan Area within the Riverside County General Plan to permit the creation of this municipal landfill. Also, within the project boundaries are BLM lands. The California Desert Conservation Area (CDCA) Plan prohibits use of public lands for disposal of municipal waste. Therefore, BLM proposes to transfer their holdings to private ownership in exchange for private lands owned by Kaiser Steel Resources with resource values. This exchange will be carried out in accordance with the Federal Land Policies and Management Act. Those private lands, owned by Kaiser Steel Resources (hereafter called Kaiser Steel Resources properties), and offered for exchange, were included in this biological resources assessment.

Requirements for the closure of landfills incorporate rehabilitation of the land covering the landfill. At the end of landfill activity, the disturbed habitat will be modified to approximately original (pre-mining activity) grade and topped off with soils containing organic material and other suitable additives to encourage natural revegetation of desert scrub. Some postclosure activities will remain, including a water treatment plant, gas extraction wells, and an energy recovery system.

III. SURVEY METHODOLOGY

A. GENERAL

The purpose of the biological resource survey was to collect semi-quantifiable data to determine the level of impacts to habitats and species occurring or potentially occurring on the project site. The proposed Eagle Mountain landfill project site, including the 52-mile rail line and associated facilities as described above, was surveyed over a 12-day period from October 30 to November 11, 1989, and on November 28, 1989 and June 24, 1990, for a total of 69 person-days. Two additional surveys were conducted during the spring of 1990, for bats and desert pupfish. Survey dates, locations, and man-hours expended are listed in Table 1. Detailed descriptions of the survey methodologies used for each portion of the project are described below. The surveys are divided into foot surveys and specialized surveys. The project site is divided into the Eagle Mountain landfill site and the associated selected public lands, the Eagle Mountain railroad right-of-way, Eagle Mountain Road corridor and rail spur, and the Kaiser properties (Kaiser-owned parcels to be traded to the BLM or dedicated as compensation for significant biological impacts, also referenced as the "offered" lands).

1. Foot Surveys

All field surveys conducted for each portion of the project included a directed search for plant and animal species that are listed by state or federal agencies as threatened or endangered. These agencies include the U.S. Fish and Wildlife Service (USFWS) and the CDFG. Other plant and animal species considered sensitive by the CNPS, the California Natural Diversity Data Base (NDDB), and the BLM were also included in the searches. A total of 550 man-hours (69 man-days) were expended during this survey.

Prior to conducting the field surveys, data searches were performed using information obtained from the CNPS (Smith and Berg 1988), the NDDB, the BLM, CDFG, and USFWS to generate baseline information as to what significant species are known to occur in the study area. Field surveys centered on locating these significant species, as well as identifying new locations of any significant species of plant or animal with the potential for occurrence in the region.

The information lists used to generate the baseline data cover a wide variety of sources. CNPS maintains a list of the status of state and federal rare, threatened, and endangered plant species, which they publish periodically with updated information. Their list also includes plant species CNPS documents as being rare or of limited distribution, and those that require more information to determine status. Most information used by CNPS in these publications is included by the NDDB.

The NDDB is a program within the Natural Heritage Division of the CDFG that is an ongoing and continuously updated record of location information on rare or endangered species and natural biotic communities. A computer search of the NDDB list of sensitive species locations was conducted for the topographic quadrangles encompassed by the project boundaries and the associated facilities. The information was used to confirm specific known locations of significant biological resources on or near the project site.

TABLE 1
SUMMARY OF
EAGLE MOUNTAIN LANDFILL PROJECT SURVEYS
1989-1990

Location	Size	Dates	Man-Hours
Foot			
Mine area	4,659 acres	November 7, 8, 28 (1989)	104
Railroad	52 miles	October 30, 31 (1989) Nov. 1, 2, 3, 9, 10, 11 (1989)	312
Eagle Mtn. Rd.	13.5 miles	November 6 (1989), June 24 (1990)	54
Kaiser properties	4.4 sq. mi.	November 9, 11 (1989) January 30 (1990)	80
Total			550
Small-mammal trapping			
Railroad	Two 140-m trap lines (38 traps)	November 9 (1989)	
Kaiser property	One 4,000 sq. m. trap grid (38 traps)	January 30 (1990)	
Sensitive Bat			
Mine area	Adit, buildings, and water sources	May 25-28 (1990) December 2-7 and 14-16 (1990)	
Desert Pupfish			
	Eight traps in pond; 1.5 hours	May 21 (1990)	
	Salt Creek tributary 100 traps; 24 hours	June 8, 9, 16 (1990)	

Additional information on the distribution of important species in the vicinity of the project site was obtained from the California Desert Conservation Area Plan (CDCA) (BLM 1980), a list of BLM sensitive species in the area, a list of federally endangered species (updated August 1990) for Riverside County provided by the USFWS, listings of California State listed species (updated April 1990) provided by CDFG, recent biological assessments, and agency surveys (Anderson, pers. comm., 1989; Bleich, pers. comm., 1989; Nicol 1986; Bradstrom, pers. comm., 1989; Karl 1989; Bureau of Reclamation [BOR] 1989; Woodward-Clyde n.d.; Anderson 1983). Scientists, various agency personnel, and local residents were contacted regarding sensitive species sightings, pertinent research projects, and impacts observed to species potentially occurring within the vicinity of the project site.

Vegetation communities were mapped for all portions of the project site, the Eagle Mountain railroad right-of-way, the Eagle Mountain Road corridor, and the Kaiser Steel Resources properties. A checklist of plant species encountered was created. Some voucher specimens were taken back to the lab for identification. Important plant species locations were indicated on appropriate base maps used for each portion of the project site. A checklist of wildlife species was also created. Noteworthy wildlife species observations or their sign (such as scat, tracks, calls, or burrows) were marked on the same base maps as the sensitive plant sightings.

The results of the foot surveys were limited by seasonal and other factors. The size and rugged terrain of the Eagle Mountain Mine area made it difficult to survey all areas thoroughly; however, the surveys in the mine area were concentrated in those areas not disturbed by mining activities and contained within the proposed footprint of the future landfill project. As time permitted, other undisturbed areas outside of the project footprint were also surveyed. Surveys in the mine area were adequate to determine the presence of the significant species expected to occur on this portion of the project.

The botanical surveys, conducted during the fall, were sufficient to locate any federal-listed, federal-candidate, state-listed, and BLM-sensitive plant species with the potential for occurrence in the study area. Although spring surveys would increase the total number of plant species observed (mostly spring annuals), they would not likely produce significant changes to the results of the current surveys. This conclusion is based upon the number of significant species observed during the surveys in relation to the baseline information generated for the study area, which includes plant species documented to exist in the area and those with potential for occurrence. Only six of the potential plant species of concern are listed as federal candidate species as well as BLM-sensitive species. Each of these six species are perennials that would have been easily identified during the conducted surveys. Three were observed within the project area, one species which had the potential for occurrence was not observed within the project area, and two species have a very low probability of occurrence in the project area due to lack of appropriate habitat (see Section C. Biological Resources of Special Concern: 1. Plant Species).

Summer resident wildlife species that either migrate or hibernate during the winter, and which potentially may utilize the area, may not have been observed during the current survey. Other species, such as amphibians or reptiles, may have remained undetected due to their restricted temperature or humidity-related behavior patterns. Many of these cold-blooded species remain inactive during extreme climatic conditions. Although burrows of the desert tortoise (*Gopherus agassizii*) are visible all year, direct observations of this species were limited because tortoises hibernate from November to March. Surveys conducted during daylight hours preclude direct observation of wildlife species active primarily at night, although sign of nocturnal wildlife is sometimes present.

2. Specialized Surveys

Livetrapping surveys were conducted to assess the presence of small-mammal species on a representative Colorado Desert scrub community along the Eagle Mountain railroad and on a Kaiser Steel Resources parcel. The railroad trapping was conducted approximately one-half mile south of I-10, and the Kaiser Steel Resource parcel trapping was located approximately five miles north of the Coachella Canal. Both surveys were conducted to enhance efforts to detect the assemblage of nocturnal species found in the general vicinity of the project site.

The railroad trapping grid had 28 Sherman folding live traps placed in two parallel trap lines approximately 10 meters apart for a trap line length of 140 meters. Each trap was baited with wild bird seed, placed and opened at dusk, and then checked the following morning. Data were collected on species trapped, sex, reproductive condition, hind foot length, and tail length. The Kaiser property trapping grid consisted of four lines of seven traps each for a total of 4,000 square meters.

Two surveys for desert pupfish were conducted to determine its occurrence in appropriate habitat on the south end of the railroad. Surveys were conducted in the spring when the highest number of adults and young are distributed in ponds and streams. The tributary of Salt Creek has permanent water flowing under the railroad tressel. This tributary was surveyed for pup-fish on June 8, 9, and 16, 1990 by Allen Schoener (Schoener, pers. comm., 7/90). One hundred traps were baited and placed in the water for 24 hours before checking for fish. Data were collected on the number of each species collected.

A two-acre, alkali pond, located approximately one-quarter mile north of the Salt Creek tributary, was surveyed for pupfish on May 21, 1990. Eight minnow traps were placed randomly along the western shore of the pond, baited with canned cat food, and left submerged for 1.5 hours in the afternoon. Traps were carefully hauled into shore underwater and then quickly checked for fish to prevent the fishes' desiccation. The trapping was conducted by Kim Nichol, CDFG fisheries biologist.

Bat surveys were conducted by Dr. Pat Brown on May 25-28, 1990, and in December of 1990, to determine the presence/absence of species of concern in the mine area. The report prepared for this survey is included in Attachment 1. All appropriate mine shafts, buildings, and water sources were surveyed for bat use, with special emphasis placed on locating any night and day roosting sites, maternity roosting sites, and winter roosts. Survey methods included walking into adits and buildings during the day, mist-netting at night, use of a bat detector and a night vision scope. A detailed description of the methods and location of use are in Attachment 1.

B. EAGLE MOUNTAIN LANDFILL SITE SURVEY

Surveys were conducted on foot, in representative habitats and topographic areas, to obtain a sample of information from both the private and public (selected) lands on the project site. Initial surveys were concentrated in undisturbed areas of the proposed landfill site that were within the footprint of the landfill project. Existing roads and trails were used to gain access to these undisturbed portions of the site. From a departure point on a road, surveyors walked a loop route covering both ridges and ravines. Departure points were selected to obtain the most coverage of this rugged terrain. Figure 3 shows the survey routes. A triangle of area was surveyed in the approximate location of the proposed railroad spur and Eagle Mountain Road extension using the same methodology. Directed searches were made for significant plant and wildlife species, and in particular sign of bighorn sheep. All known permanent watering sites within the project boundaries were surveyed for sign of bighorn sheep. Buildings and mine tunnels encountered were searched for signs of bats.

In the flatter portions of the proposed landfill area, and in undisturbed desert scrub habitat, searches were made for desert tortoise. In areas observed to be potential tortoise habitat, surveys were conducted by walking meandering loops throughout the habitat. Noteworthy wildlife species sightings and their sign, as well as significant plant sightings, were mapped on 1,000-foot scale aerial photographs.

C. EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY SURVEY

The Eagle Mountain railroad right-of-way survey was conducted on foot along the entire length of the 52-mile rail line. A 100-foot-wide swath within the rail right-of-way was walked in a meandering line on both sides of the railroad and included the area between the rails. Surveys were conducted with one surveyor on each side of the railroad and one surveyor (approximately 25 miles of the railroad) directly on the railbed. Directed searches were made for significant plant and wildlife species, especially sign of desert (e.g., tortoise burrows, pallets, scat, tracks, shell fragments, and individuals). Tortoise pallets are temporary or daily-use beds the animals use during activity throughout the day. Noteworthy plant and wildlife sightings, or their sign, were mapped on U.S.G.S. 7.5-minute topographic maps.

D. EAGLE MOUNTAIN ROAD CORRIDOR SURVEY

Eagle Mountain Road was surveyed on foot noting potential habitat for important plant and animal species. The foot surveys were conducted by walking a meandering line along a 200-foot-wide corridor with the existing road as the centerline. The first two miles of the road, beginning in the north, were surveyed by walking the route with one surveyor on each side of the road. The habitat continued unchanged and appeared to be inappropriate for desert tortoise, and sightings of significant plant species were sporadic; therefore, the remainder of Eagle Mountain Road was surveyed by making frequent stops along the road. At each stop, two surveyors explored a 100-foot corridor on each side of the road. Eagle Mountain Road was surveyed on-foot from I-10 north for four miles. At this point sporadic surveys were again conducted to the intersection of the Eagle Mountain Road with the Eagle Mountain Road extension. Sightings of species of special concern, or their sign, were mapped on U.S.G.S. 7.5-minute topographic maps.

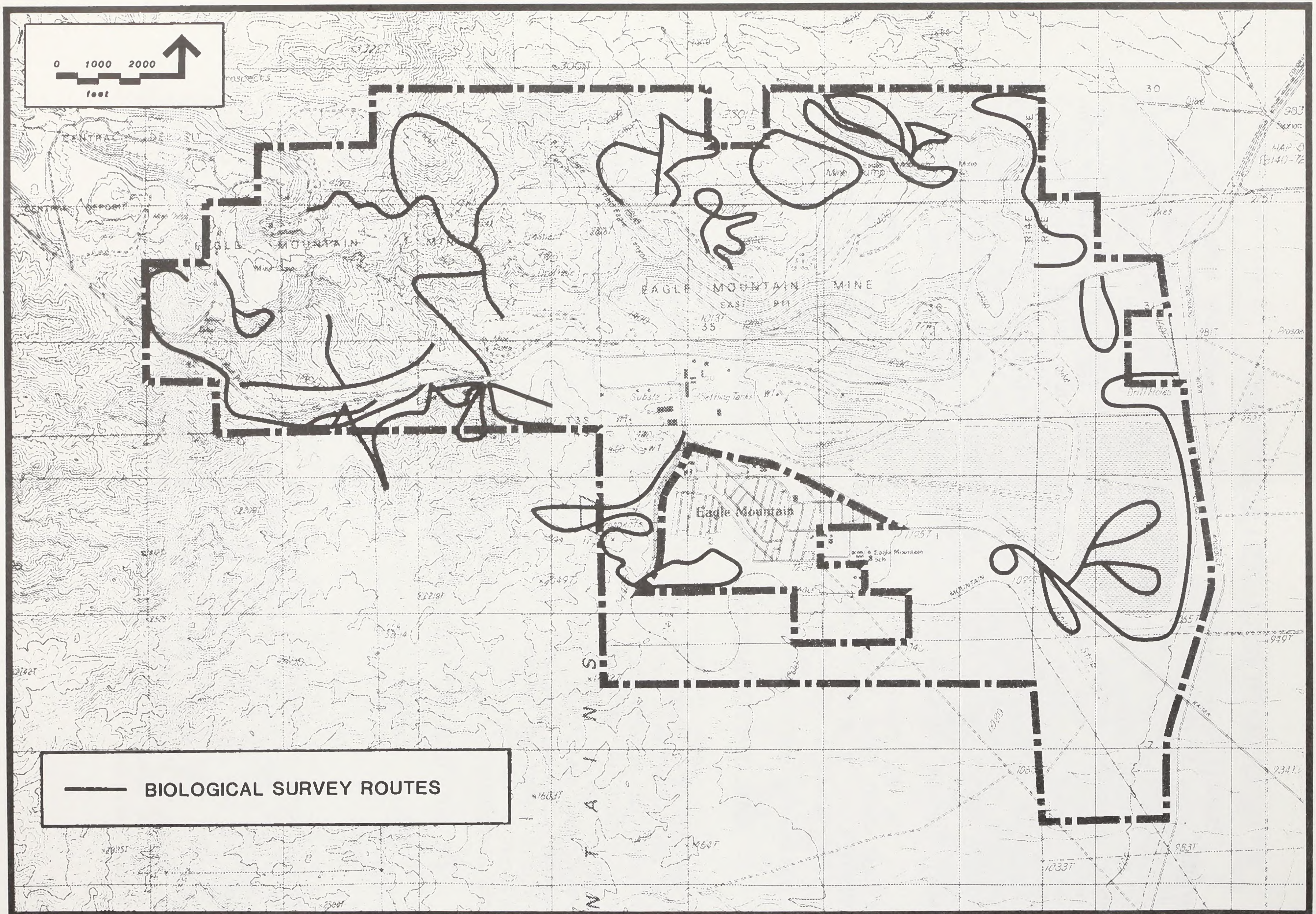

FIGURE 3. PROPOSED EAGLE MOUNTAIN LANDFILL SITE BIOLOGICAL SURVEY ROUTES

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E. KAISER STEEL RESOURCES PROPERTIES SURVEY

The offered Kaiser Steel Resources properties (offered lands) were assessed for biological resources by conducting foot surveys consisting of parallel transects approximately one-quarter mile apart. Directed searches were made for significant plant and wildlife species, especially desert tortoise and its sign. Noteworthy species sightings or sign were mapped on U.S.G.S. 7.5-minute topographic maps.

IV. EXISTING CONDITIONS

A. HABITATS

The vegetation within the survey limits of the project can be described in three general plant communities: Sonoran creosote bush scrub, desert dry wash woodland, and desert chenopod scrub. Plant community names and descriptions follow those used by CDFG (Holland 1986). Elements from both the Mojave and Colorado deserts (a division of the Sonoran desert) are represented in the flora due to the location of the project within the transition zone between these two desert regions. Habitat categories are discussed in detail below and their locations in the project area are shown on Figures 4a-c and 5a-e. Plant species nomenclature follows Munz (1974) and Jaeger (1969). The plants observed on the site are listed in Table 2.

1. Sonoran Creosote Bush Scrub

The most prominent community type represented in the study area is Sonoran creosote bush scrub. This vegetation type is common on nearly all the lower slopes, bajadas, and sandy flats in the project area. The dominant plant in this community is the creosote bush (*Larrea tridentata*). Creosote bush is present in monotypic stands in certain areas throughout the project area; however, it is commonly associated with two other shrub species, cheese-bush (*Hymenoclea salsola*) and bur-sage (*Ambrosia dumosa*). Smaller subshrubs found in spaces between the dominant shrubs include desert straw (*Stephanomeria pauciflora*), sweet bush (*Bebbia juncea*), jojoba (*Simondsia chinensis*), white and little-leaved ratany (*Krameria grayi* and *K. parvifolia*, respectively), and shadscale (*Atriplex canescens*).

The lower bajadas and flats within this community type have a greater abundance of cactus species than the Salton Sink or steep rocky slopes of the Eagle Mountains. The most common species of cacti are the golden cholla (*Opuntia echinocarpa* var. *echinocarpa*) and pencil cholla (*Opuntia ramosissima*). Beavertail cactus (*Opuntia basilaris*), hedgehog cactus (*Echinocereus engelmannii*), and nigger-heads cactus (*Echinocactus polycephalus*) also occur in the area, but at much lower densities.

Small areas of Sonoran mixed woody and succulent scrub occur within the area mapped as creosote bush scrub. These localized areas are more common in areas halfway between the existing Eagle Mountain Mine and the Salton Sea adjacent to the Eagle Mountain rail line. This community type is recognized by the presence of larger numbers of individuals of the following species: ocotillo (*Fouquieria splendens*), golden cholla, pencil cholla, Mohave yucca (*Yucca schidigera*), and catclaw shrubs (*Acacia greggii*).

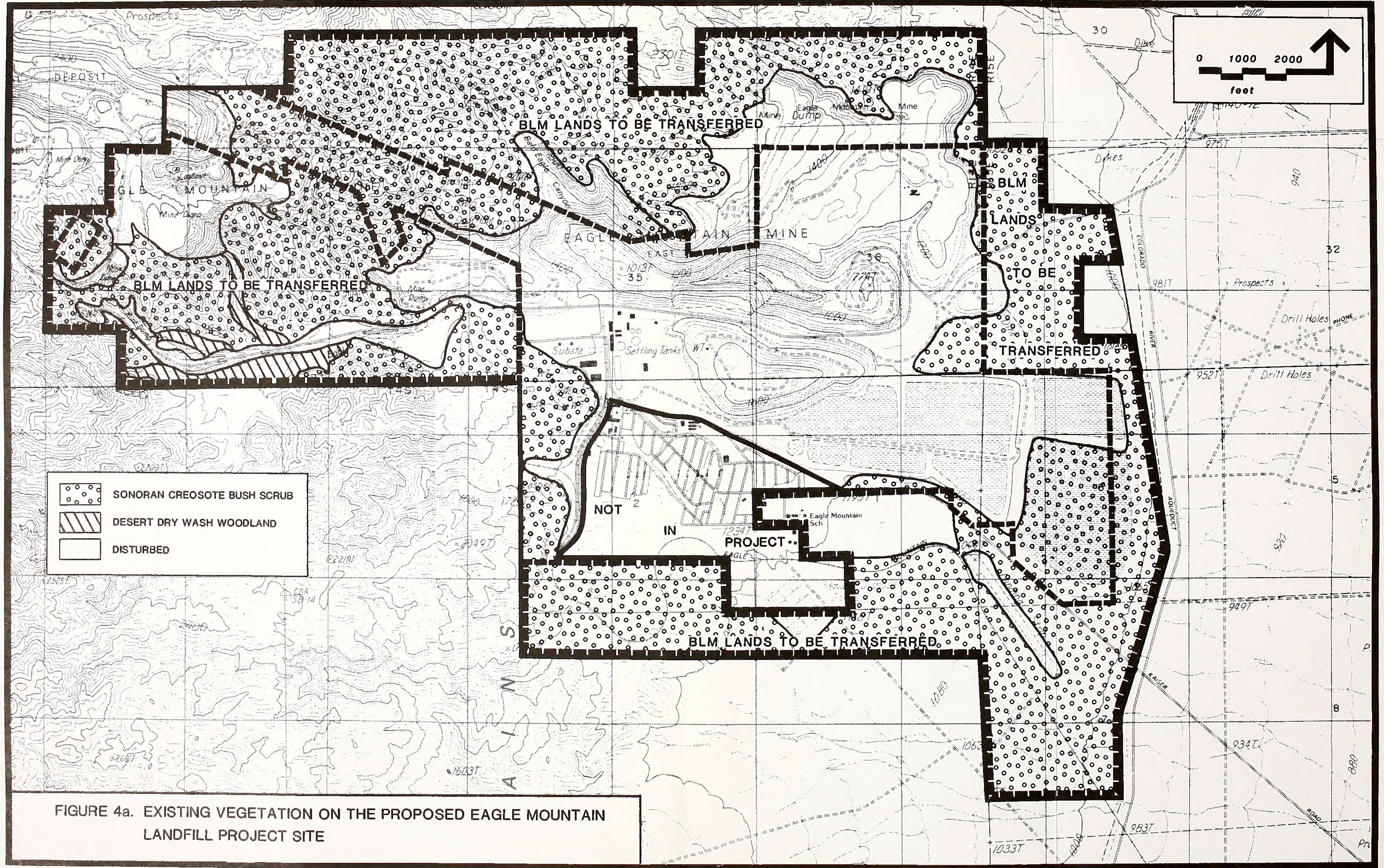

FIGURE 4a. EXISTING VEGETATION ON THE PROPOSED EAGLE MOUNTAIN LANDFILL PROJECT SITE

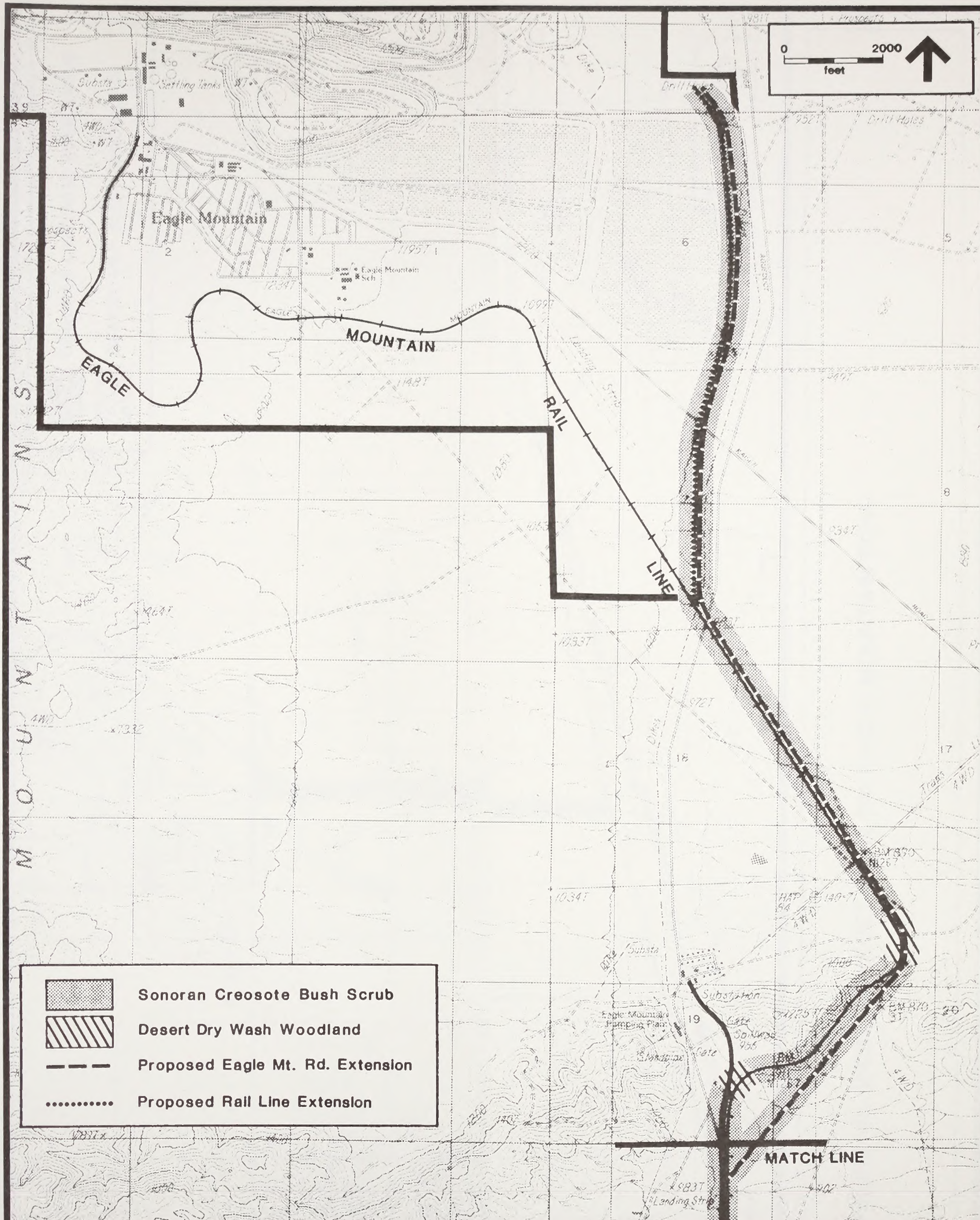

FIGURE 4b. EXISTING VEGETATION ON EAGLE MOUNTAIN ROAD EXTENSION AND RAILROAD SPUR MAP 2 OF 2

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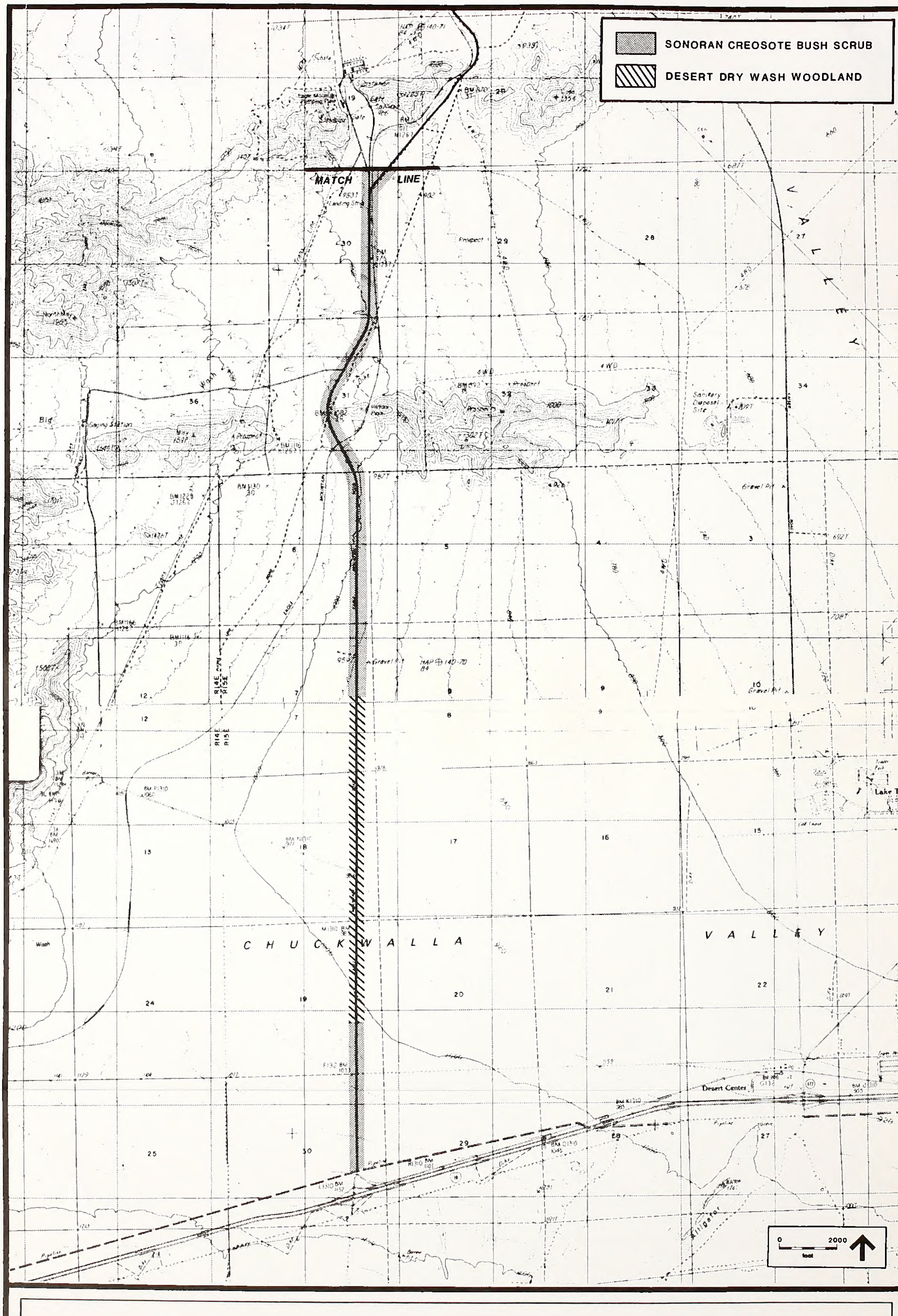

FIGURE 4c. EXISTING VEGETATION ON EAGLE MOUNTAIN ROAD

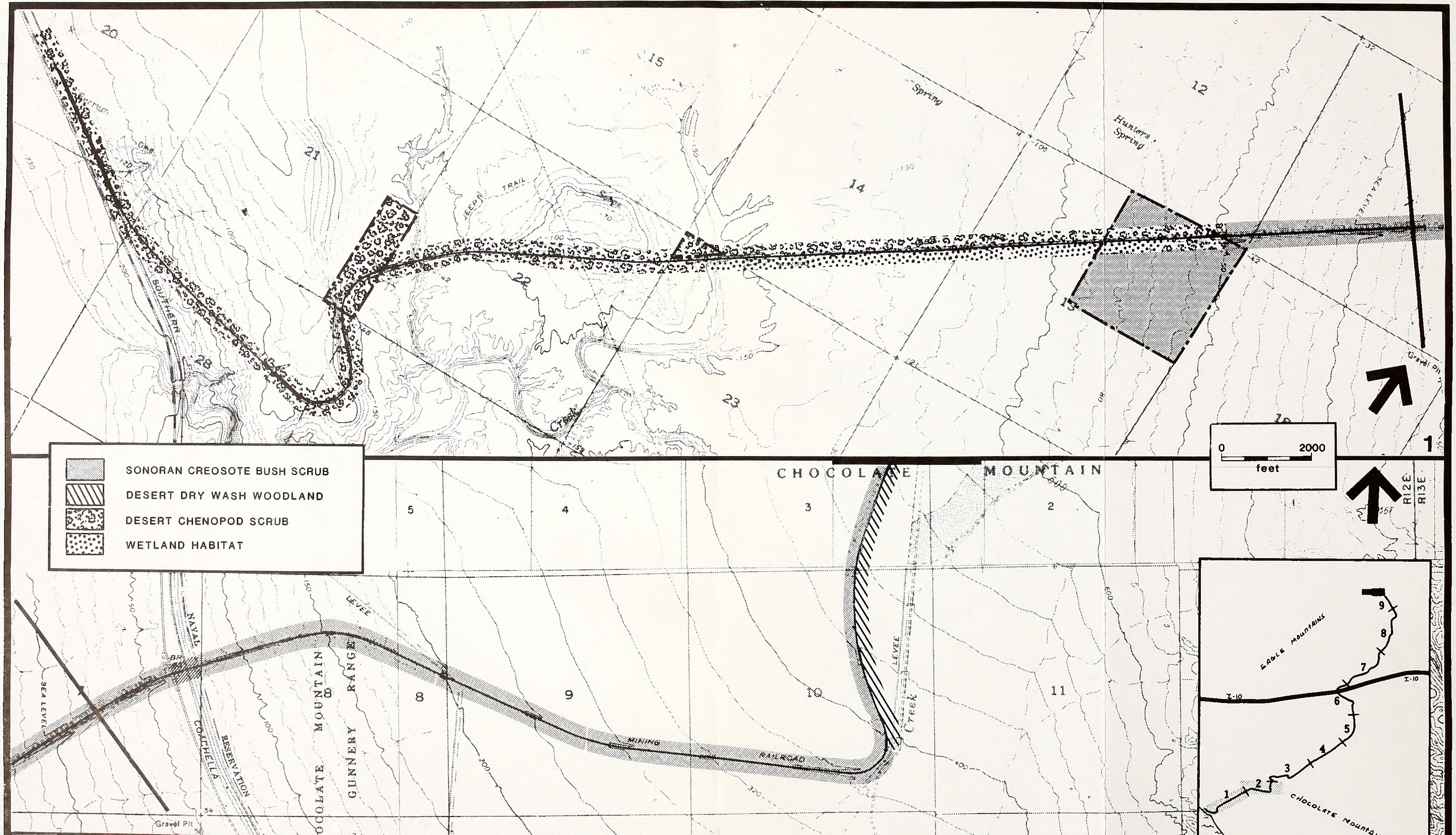

FIGURE 5a. EXISTING VEGETATION ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY AND KAISER STEEL RESOURCES PROPERTIES (OFFERED LANDS). PANELS 1 AND 2 OF 9

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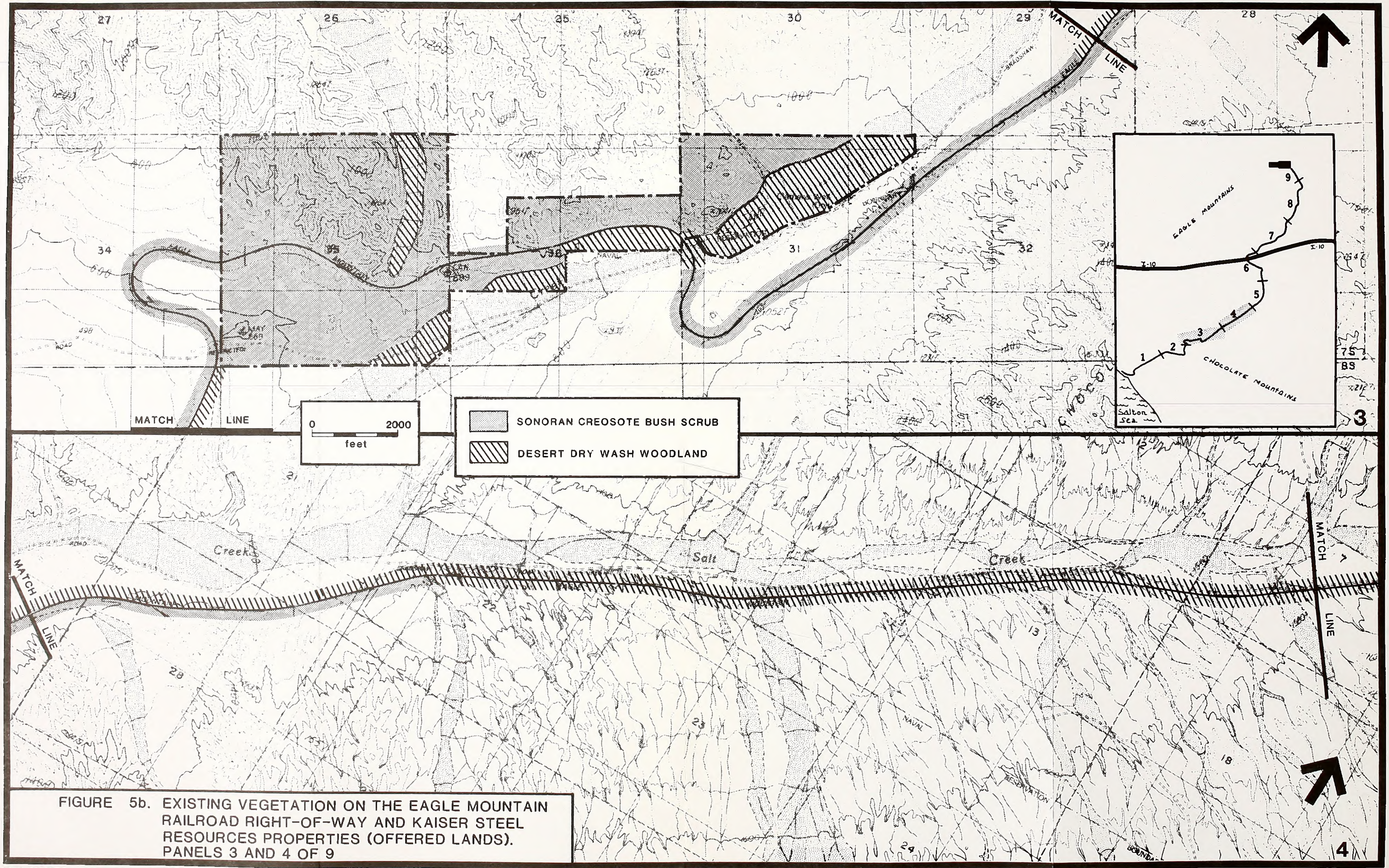

FIGURE 5b. EXISTING VEGETATION ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY AND KAISER STEEL RESOURCES PROPERTIES (OFFERED LANDS). PANELS 3 AND 4 OF 9

R-2100B

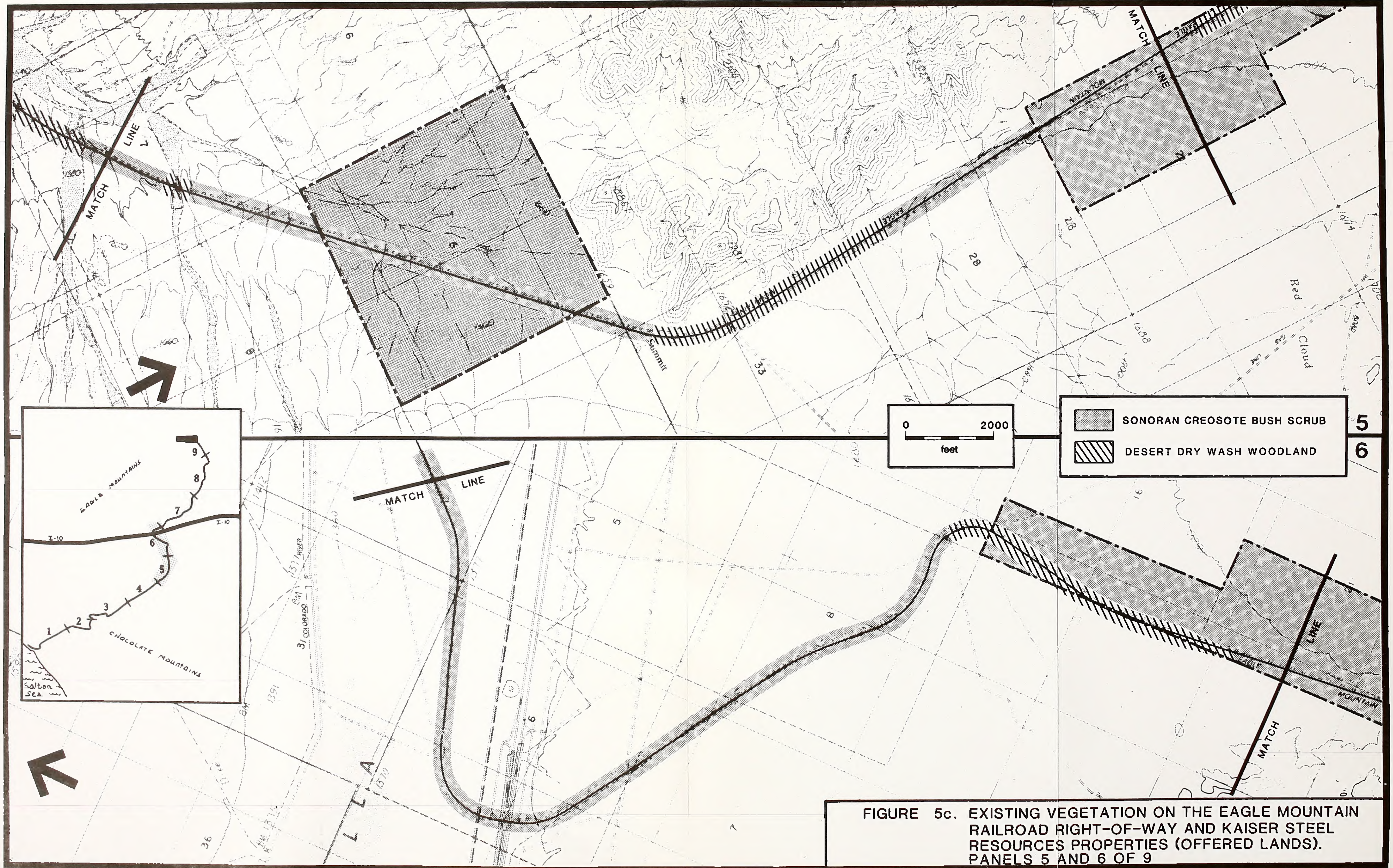

FIGURE 5c. EXISTING VEGETATION ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY AND KAISER STEEL RESOURCES PROPERTIES (OFFERED LANDS). PANELS 5 AND 6 OF 9

R-2100B 12/89

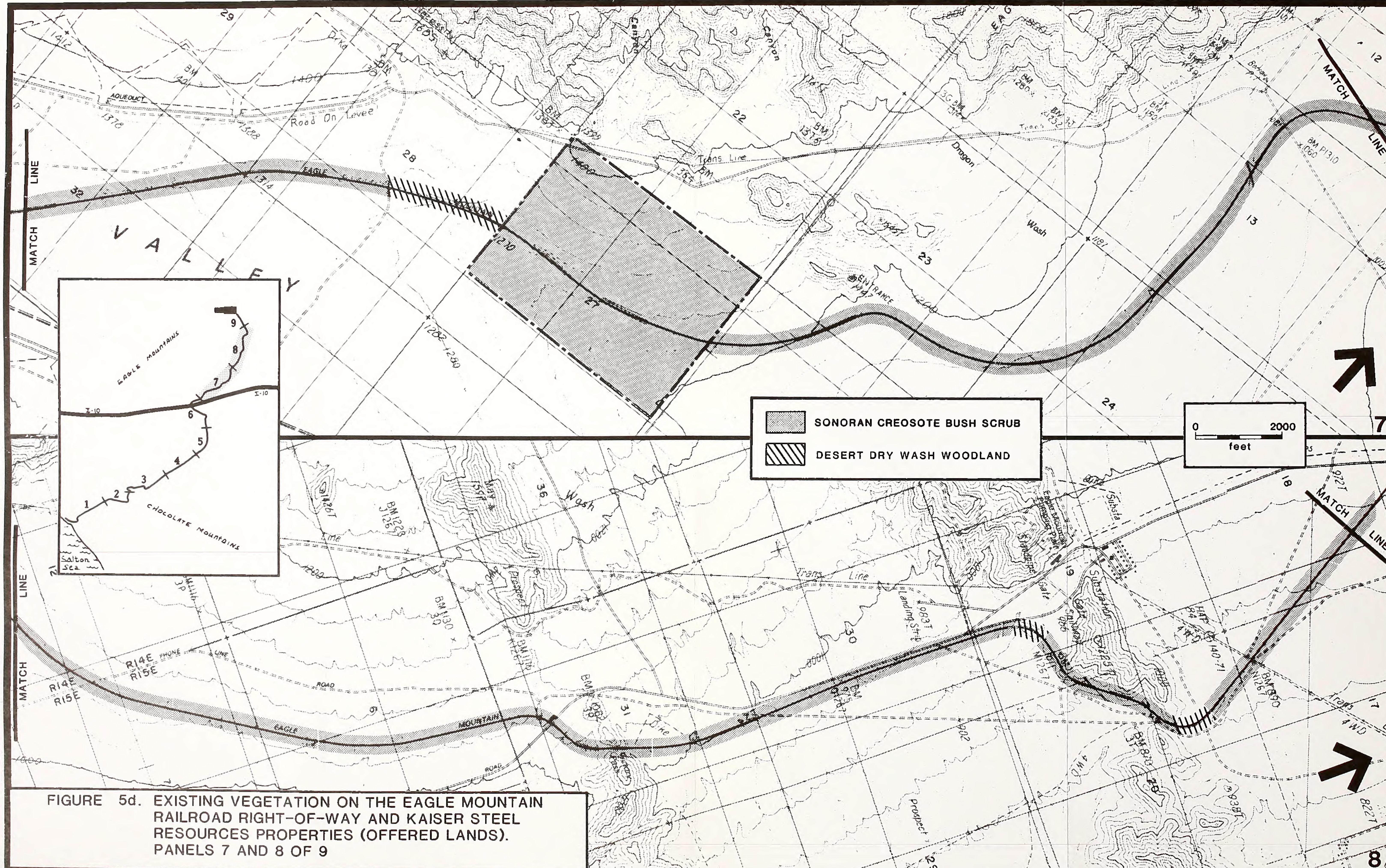

FIGURE 5d. EXISTING VEGETATION ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY AND KAISER STEEL RESOURCES PROPERTIES (OFFERED LANDS). PANELS 7 AND 8 OF 9

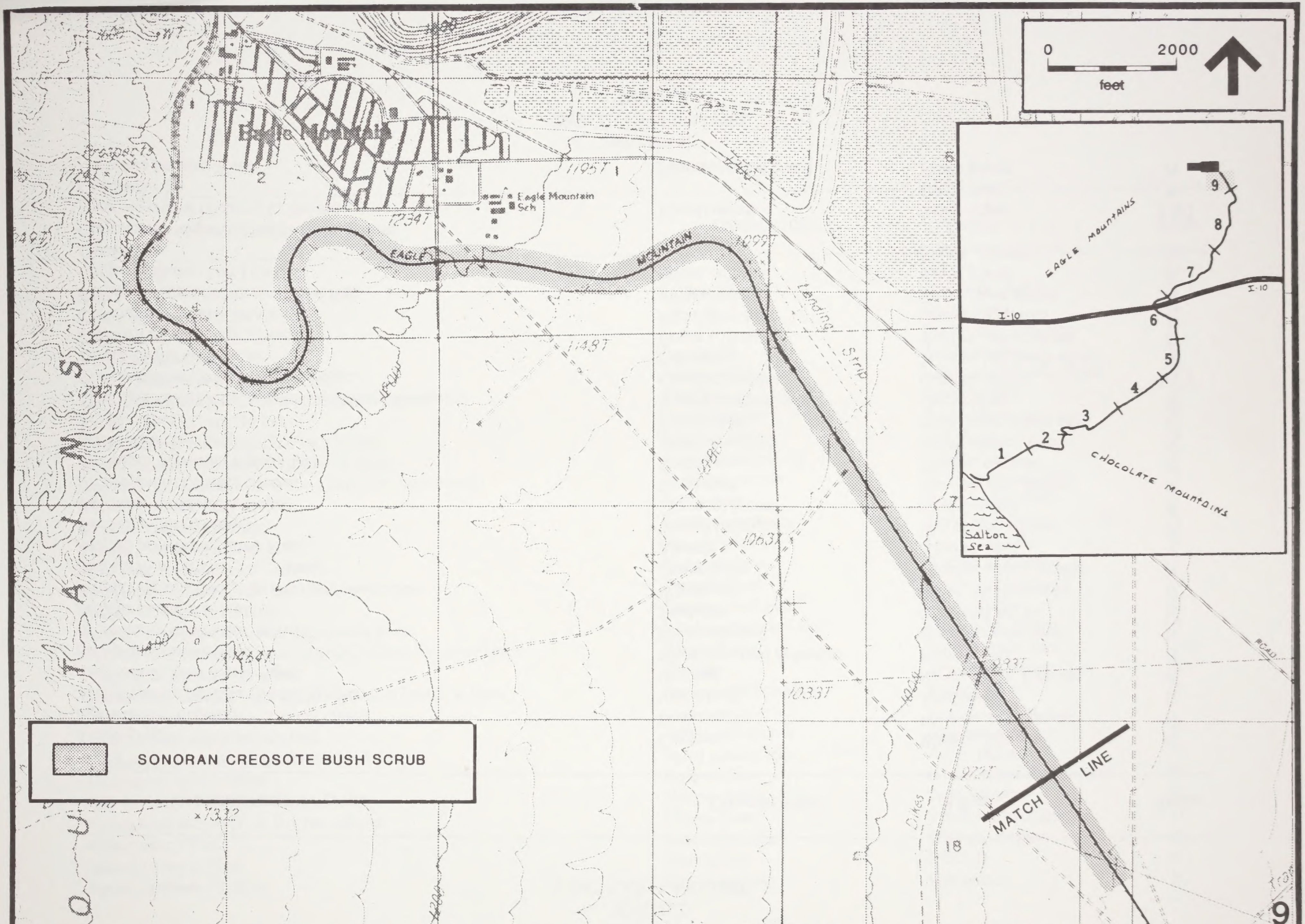

FIGURE 5e. EXISTING VEGETATION ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY, PANEL 9 OF 9

RECON

TABLE 2
VASCULAR PLANT LIST

Scientific Name	Common Name	Habitat	Status
Acacia greggii	Catclaw	Washes, canyons	N
Agave deserti Engelm.	Desert agave	Washes, rocky slopes	N
Allenrolfea occidentalis (Wats.) Kuntze.	Iodine bush	Alkaline sink	N
Ambrosia dumosa (Gray) Payne.	Bur-sage	Rocky slopes, flats, etc.	N
Asclepias albicans Wats.	White-stemmed milkweed	Rocky slopes	N
Asclepias subulata Dcne. in A.DC.	Rush milkweed	Washes, sandy areas	N
Atriplex canescens Nutt.	Shadscale	CD/CSS/CMC/G	N
Atriplex elegans (Moq.) D. Dietr. ssp. *fasciculata*	Wheelscale	Saline, alkaline areas	N
Atriplex hymenelytra (Torr.) Wats.	Desert-holly	Alkaline slopes, washes	N
Atriplex polycarpa (Torr.) Wats.	Allscale	Alkaline soils	N
Baccharis emoryi Gray	Emoryi baccharis	Wet places, washes	N
Baccharis sarothroides Gray	Chaparral broom	Sandy washes	N
Bebbia juncea (Benth.) Greene.	Sweet bush	Gravelly fans, washes	N
Brandegea bigelovii (Wats.) Cogn.	Brandegea	Washes, canyons	N
Brickellia incana Gray.	Wooly brickellia	Sandy washes, flats	N
Bromus rubens L.	Foxtail chess	Waste areas, roads, etc.	I
Camissonia boothii ssp. *desertorum* (Munz) Raven.	Woody bottle-washer	Open places	N
Castela emoryi (Gray) Moran & Felger.	Crucifixion thorn	Gravelly places	3-1-1
Cercidium floridum Benth.	Palo verde	Washes, low sandy areas	N
Chilopsis linearis (Cav.) Sweet.	Desert willow	Washes, watercourses	N
Chorizanthe rigida (Torr.) T. & G.	Rigid spiny-herb	Open stony places	N
Chrysothamnus paniculatus (Gray) Hall.	Rabbit-brush	Rocky, open places	N
Coldenia plicata (Torr.) Cov.	Plicate coldenia	Sandy places	N
Condalia sp.		Slopes, canyons	N
Coryphantha vivipara (Nutt.) Britton & Rose var. *alversonii* (Coulter) L. Benson.	Foxtail cactus	Stony slopes	3-2-2
Cryptantha sp.		Sandy flats	N
Cucurbita palmata Wats.	Palmate-leaved gourd	Sandy places	N

TABLE 2
VASCULAR PLANT LIST
(continued)

Scientific Name	Common Name	Habitat	Status
Dalea emoryi Gray.	Emory dalea	Dry, open places	N
Dalea mollissima (Rydb.) Munz.		Rocky flats	N
Dalea parryi (T&G)		Rocky and sandy flats	N
Dalea spinosa Gray	Smoke tree	Sandy washes	N
Datura meteloides A. DC	Jimson weed	Sandy and gravelly slopes	N
Distichlis spicata (L.) Greene var. *stricta* (Torr.) Beetle	Saltgrass	Alkaline soils	N
Ditaxis serrata (Torr.) Heller	Serrate ditaxis	Rocky places	N
Ditaxis neomexicana (Muell.-Arg.) Heller.	Common ditaxis	Dry slopes	N
Echinocactus polycephalus Engelm. & Bigel.	Nigger-heads cactus	Rocky slopes	N
Echinocereus engelmannii (Parry) Lem. var. *engelmannii*	Hedgehog cactus	Gravelly slopes, flats	N
Encelia farinosa Gray ex Torr.	Brittle-bush	Rocky slopes, flats	N
Ephedra californica Wats.	California ephedra	Dry slopes, flats	N
Ephedra nevadensis Wats.	Nevada joint-fir	Dry slopes, hills	N
Eriogonum inflatum Torr. & Frem.	Desert trumpet	Washes and mesas	N
Eriogonum deflexum Torr. ssp. *deflexum*	Skeletonweed	Washes and slopes	N
Euphorbia micromera Boiss.	Sonoran sand-mat	Sandy places	N
Euphorbia polycarpa Benth. var. *hirtella* Boiss.	Small seeded sand-mat	Dry slopes, washes	N
Ferocactus acanthodes (Lem.) Britton & Rose var. *acanthodes*	Barrel cactus	Rocky slopes, fans	?-3-2
Fouquieria splendens Engelm.	Ocotillo	Dry, rocky places	N
Galium angustifolium Nutt. ssp. *gracillimum* Demp. & Steb.	Narrow-leaf bedstraw	Rocky places	N
Haplopappus acradenius (Greene) Blake ssp. *eremophilus* (Greene) Hall.	Alkali goldenbush	Alkaline soils	N
Haplopappus gooddingii (A. Nels.) M. & J.	Spiny goldenbush	Rocky places	N
Hibiscus denudatus Benth.	Rose-mallow	Rocky slopes and canyons	N
Hilaria rigida (Thurb.) Benth. ex Scribn.	Galleta grass	Sandy places	N
Hymenoclea salsola (T. & G.) var. *salsola*	Cheese-bush	Sandy washes, flats	N
Hyptis emoryi Torr.	Desert-lavender	Washes, canyons	N
Isomeris arborea Nutt.	Bladderpod	CSS/CD	N
Juncus xiphioides E. Mey.	Iris-leaved rush	Wet places	N

TABLE 2
VASCULAR PLANT LIST
(continued)

Scientific Name	Common Name	Habitat	Status
Krameria grayi Rose & Painter.	White ratany	Dry sandy, rocky areas	N
Krameria parvifolia Benth. var. *imparata*	Little-leaved ratany	Dry sandy, rocky areas	N
Larrea tridentata (Sesse & Moc. ex DC.) Cov.	Creosote bush	Dry slopes, plains	N
Lycium sp.	Box-thorn	Washes and slopes	N
Mammillaria microcarpa Engelm.	Graham nipple cactus	Rocky slopes	N
Nicotiana trigonophylla Dunal in A. DC.	Desert tobacco	Rocky areas	N
Nolina bigelovii (Torr.) Wats.	Nolina	Dry slopes	N
Notholaena parryi D. C. Eat.	Parry cloak fern	Rocky slopes	N
Olneya tesota Gray.	Desert-ironwood	Washes	N
Opuntia basilaris Engelm. & Bigel. var. *basilaris*	Beavertail cactus	Dry benches, fans	N
Opuntia echinocarpa Engelm. & Bigel. var. *echinocarpa*	Golden cholla	Dry mesas, flats	N
Opuntia ramosissima Engelm.	Pencil cactus	Dry slopes, mesas	N
Palafoxia linearis (Cav.) Lag. var. *linearis*	Spanish needles	Sandy places	N
Pectis papposa Harv. & Gray ex Gray.	Chinch weed	Washes, flats	N
Petalonyx thurberi G. ssp. *thurberi*	Sandpaper plant	Sandy, gravelly areas	N
Phoradendron californicum Nutt.	Mistletoe	Parasite on desert trees	N
Phragmites australis (Cav.) Trinius ex Steudel.	Common reed	Wet places	N
Physalis crassifolia Benth. var. *crassifolia*	Ground-cherry	Sandy and rocky areas	N
Plantago sp.	Plantain	Mesas and flats	N
Pleurocoronis pluriseta (Gray) King & Robinson.	Arrow leaf	Rocky places	N
Pluchea sericea (Nutt.) Cov.	Arrowweed	Wet places	N
Proboscidea althaeifolia (Benth.) Dcne.	Unicorn-plant	Sandy places	N
Prosopis glandulosa Torr. var. *torreyana* (L. Benson) M. C. Jtn.	Mesquite	Washes, low places	N
Prosopis pubescens Benth.	Screw-bean mesquite	Washes and canyons	N
Psathryotes rammosissima (Torr.) Gray.	Velvet rosette	Hard, dry soils, flats	N
Salsola iberica Sennen & Pau.	Russian thistle	Disturbed areas	I
Salvia columbariae Benth.	Chia	Mesas and flats	N
Salvia greatai Bdg.	Orocopia sage	Dry washes and fans	2-1-3
Sarcostemma hirtellum (Gray) R. Holm.	Rambling milkvine	Washes	N
Simmondsia chinensis (Link.) C.K. Schneid.	Goatnut or jojoba	Dry slopes and flats	N

TABLE 2
VASCULAR PLANT LIST
(continued)

Scientific Name	Common Name	Habitat	Status
Sphaeralcea sp.	Globemallow	Rocky slopes, canyons	N
Stephanomeria pauciflora (Torr.) Nutt.	Desert straw	Washes, flats	N
Suaeda torreyana Wats.	Torrey sea-blite	Alkaline areas	N
Tamarix sp.	Tamarisk	Washes, wet places	I
Typha sp.	Cattail	Wet places	N
Washingtonia robusta	Fan palm	Introduced, wet areas	N
Yucca schidigera Roezl ex Ortgies	Mohave yucca	Sandy flats	N

OTHER TERMS

N = Native to locality
I = Introduced species from outside locality
1-2-3 = Rare species CNPS code

Two topographic features within the area mapped as creosote bush scrub have variations in the density and dominance of species. These are the steep rocky slopes of the desert mountains in the project area, and sites where a desert pavement has formed. The steep rocky slopes of the Eagle Mountains, Orocopia Mountains, and Chocolate Mountains have lower densities of the common elements of the creosote bush scrub as the terrain becomes steeper and rockier. Desert pavement areas lack sufficient soil to support a high diversity of plant species.

2. Desert Dry Wash Woodland

The many washes and drainages dissecting the bajadas on the alluvial fans typically support a variety of desert tree species. Larger washes, and washes at the bottoms of bajadas, have larger individuals of trees and greater species diversity than the smaller drainages on the upper bajadas. The Salt Creek area of the Eagle Mountain railway is a good example of a large wash with abundant tree species.

The most common trees found in the large washes are the smoke tree (*Dalea spinosa*), palo verde (*Cercidium floridum*), and ironwood *(Olneya tesota)*. Variation in dominance between these species exists depending upon the size and location of the wash. Smaller washes on the upper bajadas tend to have only palo verde trees, while washes and drainages in the steep mountains often lack trees. Shrub and subshrub species common in the washes and drainages include desert-lavender (*Hyptis emoryii*), sweet bush, cheese-bush, jimson weed (*Datura metaloides*), catclaw, and rush milkweed (*Ascelpias subulata*).

Drainages and washes near the foothills of the steep mountains, and in the mountains surrounding the existing Eagle Mountain Mine, have very few trees, and when they are present the trees are mostly palo verde. These drainages and small washes are dominated by the desert-lavender bush. A common subshrub in these mountain drainages is arrow leaf (*Pleurocoronis pluriseta*), along with rose mallow (*Hibiscus denudatus*) and sweet bush.

The dominant vegetation in washes and drainages changes as the elevation drops below sea level south of the Coachella Canal towards the Salton Sea. The soils in this area become increasingly alkaline, limiting the distribution of the more common wash species. These alkaline drainages and washes are often vegetated with tamarisk scrub. This community is dominated by the tamarisk tree (*Tamarix* sp.). Arrowweed scrub is common in areas between tamarisk groves, and this community type is dominated by shrubs of arrowweed *(Pluchea sericea)*. Wet drainages just south of the Coachella Canal have localized areas of cattail (*Typha* sp.) and iris-leaved rush (*Juncus xiphioides*). A few fan palms (*Washingtonia* sp.) have been introduced into these drainages.

Wetland vegetation in alkaline sink areas consists of low-growing perennial plants adapted to tolerate high alkalinities and salt concentrations. The drier margins of these areas are vegetated predominantly with salt grass (*Distichlis spicata*) and various species of saltbush (*Atriplex* spp.). The wetter areas in the lower portions of the sink are either dominated by iodine bush (*Allenrolfea occidentalis*) and Torrey sea-blite (*Suaeda torreyana*) or completely devoid of any vegetation. The bare areas of the sink had a salt crust on the surface of the soil at the time of the survey.

3. Desert Chenopod Scrub

The lower portions of the bajada from just below sea level to the Salton Sea are vegetated with alkali- and salt-tolerant chenopod scrubs. Desert chenopod scrub consists of a gradient of plant communities that coincides with the increasing salinity and alkalinity of the substrate. The plant communities of the chenopod scrub range from Desert saltbush scrub at elevations near sea level to Desert sink scrub in the wet alkaline sink areas below sea level, and then back to Desert saltbush scrub along the last portion of the Eagle Mountain rail line before it joins the Southern Pacific rail line at Highway 111.

Desert saltbush scrub communities within the Chenopod scrub complex are dominated by a variety of saltbush species that include shadscale, wheel-scale (*Atriplex elegans*), desert-holly (*Atriplex hymenelytra*), and allscale (*Atriplex polycarpa*). The Desert sink scrub community of the chenopod scrub complex is dominated by iodine bush and Torrey sea-blite, along with scattered individuals of various saltbush species. This community type occurs in areas of poorly drained soils with high salinity and alkalinity where a salt crust often forms on the surface of the ground. Inclusions of Desert greasewood scrub and Alkali-seep areas are found within the Desert sink scrub community. Desert greasewood scrub is similar in species composition to the desert sink scrub; however, the densities and overall diversity of species is much lower. Alkali-seep areas are dominated by salt grass and other salt-tolerant herbs, and exist where soils are permanently moist.

B. WILDLIFE

Wildlife habitat ranges from steep, rough terrain to gently sloping bajadas and supports a diversity of wildlife species. In the lands surrounding the proposed Eagle Mountain landfill site, steeper rocky areas are relatively undisturbed, while areas along the railroad have been--moderately impacted by roads, off-road-vehicle activity, and camping. Overall, the area is generally high quality Colorado Desert habitat suitable for a wide variety of large, far-ranging species. Microhabitats exist for smaller wildlife species and are typical for undisturbed portions of the Colorado Desert. Habitat in the Eagle Mountains is rocky and strewn with large boulder outcrops. Drainages and washes on the project have moderately dense vegetation providing more cover than the more barren slopes of the Eagle Mountains. On the flatter portions of the project site, habitat ranges from almost barren, rocky areas to ocotillo and bur-sage dominated landscapes. These habitats are interspersed with small and large sandy washes. Much of the habitat has large open areas of sand or desert pavement.

Habitat south of the Coachella Canal supports most of the same species found north but differs in having small areas of wetland and alkaline sink habitats. Evidence of small mammals is sparse in these areas, but the amount of cover probably helps to support the same number and species of birds seen throughout the project. Large mammals, including coyote and mule deer, are also present in these areas. These more mesic areas probably support an additional variety of species. For example, waterfowl and wetland-associated mammals were observed while surveying Salt Creek. Zoological nomenclature for birds follows the American Ornithologists' Union Checklist (1982), for mammals, Jones et al. (1982), and for amphibians and reptiles, Jennings (1983).

On the proposed landfill site (including private and public selected lands), 4 reptile species, 12 mammal species, and 24 bird species (Table 3) were observed or detected by sign during field surveys. Reptiles most commonly observed were side-blotched lizard (*Uta stansburiana*) and long-tailed brush lizard (*Urosaurus graciosus*). Commonly observed or detected mammals were Nelson's bighorn sheep, black-tailed hare (*Lepus californicus*), and coyote (*Canis latrans*). Common birds in the undisturbed portions of the Eagle Mountain Mine site include rock wren (*Salpinctes obsoletus obsoletus*), verdin (*Auriparus flaveceps acaciarum*), black-throated sparrow (*Aimophila bilineata deserticola*), and white-crowned sparrow (*Zonotrichia leucophrys*). The disturbed portions of the Eagle Mountain site support fewer numbers of wildlife species. Those species observed are usually associated with disturbed areas and included the house finch (*Carpodacus mexicanus frontalis*) and the introduced house sparrow (*Passer domesticus*).

Habitat along the proposed Eagle Mountain Road extension is similar to habitat found on the flatter portions of the Eagle Mountain landfill site, and species diversity does not differ appreciably. The Eagle Mountain railroad traverses through several microhabitats which resulted in the observation of additional wildlife species. The Kaiser Steel Resources properties and proposed open space parcel also offer varied microhabitats. Most of the species observed were the same as those on the Eagle Mountain landfill site (see Table 3). A total of 7 reptile species, 10 mammal species, and 29 bird species were identified during the survey. Species commonly seen included western whiptail (*Cnemidophorus tigris*), side-blotched lizard, black-tailed hare, desert woodrat (*Neotoma lepida*), kangaroo rat species (*Dipodomys* spp.), Gambel's quail (*Callipepla gambelii*), verdin, rock wren, ruby-crowned kinglet (*Regulus calendula*), and black-throated sparrow. Habitat in washes and drainages supports the same species at increased densities. Wetland habitat within the railroad corridor is too small to support many vertebrate species. The Coachella Canal supports a few nonnative fish species.

Live-trapping near the Eagle Mountain railroad resulted in capture of three individuals of the common small mammal, Merriam's kangaroo rat (*Dipodomys merriami*). Live-trapping on one of the offered Kaiser Steel Resources parcels resulted in seven individuals of four species captured in a relatively small grid (4,000 square meters). Species captured were Merriam's kangaroo rat, desert pocket mouse (*Perognathus penicillatus*), canyon mouse (*Peromyscus crinitus*), and southern grasshopper mouse (*Onychomys torridus*).

C. BIOLOGICAL RESOURCES OF SPECIAL CONCERN

Significant biological resources which may be affected by the implementation of the landfill project are described below. Sensitivity ratings are based on established ratings used by USFWS in the Federal Register, ratings used by CDFG as established in the California Fish and Game Code, and, for plants, ratings used by CNPS. Federal and state endangered and threatened species are those species listed under the respective Endangered Species Acts as being in danger of becoming extinct. Federal candidate species are ranked in the following way: Category 1 species are those species for which the agencies have sufficient biological information to support a proposal for listing as endangered or threatened; Category 2 candidate species are those species where the extent of the threat and/or distribution data are not sufficient to warrant federal listing at this time; and Category C3c candidates are species which were

TABLE 3
WILDLIFE SPECIES OBSERVED

Common Name	Scientific Name	Habitat	Status
Reptiles and Amphibians			
Desert tortoise*	*Gopherus aggassizi*	CDS	FT, CT, BSS
Horned lizard+	*Phyrnosama* spp.	CDS	
Side-blotched lizard*	*Uta stansburiana*	CDS	
Long-tailed brush lizard*	*Urosaurus graciosus*	CDS	
Desert iguana	*Dipsosaurus dorsalis*	DS	
Western whiptail*	*Cnemidophorus tigris*	CDS	
Red racer+	*Coluber constrictor*	CDS	
Mammals			
California leaf-nosed bat	*Macrotis*	C,U	
Western pipistrel	*Pipistrellus hesperus*	F	
Racoon+	*Procyon lotor*	FM	
Ringtail	*Bassariscus astutus*	C	CFP
American badger+	*Taxidea taxus*	CDS	S
Striped skunk-	*Mephitis mephitis*	CDS	
Coyote*	*Canis latrans*	CDS	
Desert kit fox*	*Vulpes macrotis*	CDS	
Bobcat+	*Lynx rufus*	CDS	
Valley pocket gopher+	*Thomomys bottae*	CDS	
Merriams kangaroo rat+	*Dipodomys merriami*	CDS	
Desert woodrat*	*Neotoma lepida*	CDS	
Desert pocket mouse+	*Perognathus penicillatus*	CDS	
Canyon mouse+	*Peromyscus crinitus*	CDS	
Southern grasshopper mouse+	*Onychomys torridus*	CDS	
Blacktail hare*	*Lepus californicus*	CDS	
Cottontail rabbit-	*Sylvilagus auduboni*	CDS	
Mule deer*	*Odocoileus hemionus*	CDS	
Nelson's bighorn sheep*	*Ovis canadensis nelsoni*	CDS	CFP, BSS
White-tailed antelope squirrel*	*Ammospermophilus leucarus*	CDS	

TABLE 3
WILDLIFE SPECIES OBSERVED
(continued)

Common Name	Scientific Name	Habitat	Status
Birds			
Black-necked stilt+	*Himantopus mexicanos*	FM	
Northern harrier+	*Circus cyaneus hudsonius*	CDS	S
Red-tailed hawk*	*Buteo jamaicensis*	CDS	
American kestrel*	*Falco sparverius*	CDS+,U-	
California quail-	*Callipepla californica*	CDS	
Gambel's quail*	*Callipepla gambelii gambelii*	CDS+,U-	
Mourning dove+	*Zenaida macroura*	CDS	
Greater roadrunner+	*Geococcyx californianus*	CDS	
Great horned owl-	*Bubo virginianus*	O-	
Lesser nighthawk	*Chordeiles acutipennis*	U	
Poor-will+	*Phalaenoptilus nuttallii*	CDS	
White-throated swift-	*Aeronautes saxatalis*	F	
Anna's hummingbird-	*Archilochus anna*	U	
Ladder-backed woodpecker*	*Dendrocopos scalaris*	CDS	
Common flicker+	*Colaptes auratus*	CDS	
Black phoebe+	*Sayornis nigricans*	CDS	
Say's phoebe+	*Sayornis saya*	CDS	
Horned lark*	*Eremophila alpestris*	CDS+,U-	
Violet-green swallow+	*Tachycineta thalassina*	Ag,U	
Common raven+	*Corvus corax clarionensis*	CDS	
Loggerhead shrike*	*Lanius ludovicianus*	U	
Verdin*	*Auriparus flaviceps*	CDS	
Cactus wren+	*Campylorhynchus brunneicapillus*	CDS	
Rock wren*	*Salpinctes obsoletus*	CDS	
Thrasher spp.-	*Toxostoma* sp.	CDS	
Western bluebird+	*Sialia mexicana occidentalis*	CDS	
American robin-	*Turdus migratorius*	U	
Ruby-crowned kinglet*	*Regulus calendula*	CDS+,U-	
Blue-gray gnatcatcher-	*Polioptila caerulea*	CDS	
Black-tailed gnatcatcher+	*Polioptila melanura*	CDS	S
Phainopepla+	*Phainopepla nitens*	CDS	

TABLE 3
WILDLIFE SPECIES OBSERVED
(continued)

Common Name	Scientific Name	Habitat	Status
Lesser goldfinch+	*Carduelis psaltria*	CDS	
House finch*	*Carpodacus mexicanus*	U	
Yellow warbler	*Dendroica coronata*	U	
Yellow-rumped warbler+	*Dendroica coronata*	CDS	
Black-throated sparrow*	*Aimophila bilineata*	CDS	
Sage sparrow+	*Aimophila belli*	CDS	
White-crowned sparrow*	*Zonotrichia leucophrys*	CDS	
Dark-eyed junco*	*Junco hyemalis*	CDS	
Western meadowlark-	*Sturnella neglecta*	CDS	
<u>Introduced Species</u>			
House sparrow-	*Passer domesticus*	U	

<u>Habitats</u>

Ag = Agriculture
CDS = Colorado desert scrub
F = Flying overhead
FM = Freshwater marsh
O = Open places, waste places, roadsides, burns, etc.
U = Urban
C = Mine tunnel

<u>Status</u>

S = California species of special concern
CFP = California fully protected
CT = California threatened
FE = Federally endangered
FT = Federally threatened
BSS = Federal Bureau of Land Management sensitive species

+ Railroad, kaiser parcel surveys, and Eagle Mountain Road
- Eagle Mountain Mine surveys
* Both of the above

once considered higher-category candidates, but which have now been found to be too widespread and/or not threatened at this time. BLM sensitive species corresponded with all federal listed and federal candidate species. California fully protected species are those determined by the California Fish and Game Commission to warrant protection from harm.

The CNPS ranking system for plants is as follows: List 1B species are plants considered by CNPS as being rare, threatened, or endangered in California and elsewhere; List 2 species are those plants considered by CNPS to be rare, threatened, or endangered in California but which are more common elsewhere; List 3 species are plants on a review list and these species are considered rare enough to warrant listing as List 1 or 2 species, but they lack sufficient information to actually upgrade them at this time; and List 4 species are plants considered by CNPS to be of limited distribution, and this listing denotes species on a watch list to be monitored for any changes in the status of their populations.

1. Plant Species

Sensitive plant species with the potential for occurrence within the proposed Eagle Mountain landfill site including the BLM selected lands, Eagle Mountain railway right-of-way and proposed spur, Eagle Mountain Road right-of-way and extension, and the Kaiser Steel Resources properties offered for exchange or habitat compensation are discussed below. No listed state or federal plant species were observed or are expected within the bounds of the project, and there is no indication of a potential for any plants of this status to occur in the area. This conclusion is based on the results of extensive field surveys and baseline data generated from data searches for known occurrences of plant species in this portion of the desert.

Plant species of special concern observed or with the potential for occurrence in the study area are listed in Table 4. Historic occurrences of some of these species in the vicinity of the project are shown in Figure 6. Plant species within two candidate categories of the Federal Register have the potential for occurrence in the project area. All four list ratings of the CNPS are represented in the plant species of special concern with the potential for occurrence within the project boundaries.

a. Proposed Eagle Mountain Landfill

1) Observed. Alverson's foxtail cactus (*Coryphantha vivipara* var. *alversonii*) is a federal Category 2 candidate species, a BLM sensitive species, and a CNPS List 1B species. This small cactus occurs on stony slopes at elevations between 2,000 and 5,000 feet in the transition zone between the Mojave and Colorado deserts in Riverside County and near Bard, Imperial County. A population also occurs at Pagumpa, in extreme northwestern Arizona. It grows in clumps ranging from a single head to as many as 40 heads. Alverson's foxtail cactus was observed frequently in areas of Eagle Mountain Mine. Large populations of this foxtail cactus occur in the southwest portion of the mine along Eagle Creek, mostly in the washes north of the mining road (about 200 individuals observed), and in the southeast portion of the mine from near the landing strip to north of Kaiser Road and west of Eagle Mountain Road (about 80 individuals observed) (Figure 7). Most of the populations of this species occur on

TABLE 4
PLANT SPECIES OF SPECIAL CONCERN OCCURRING (*) OR WITH THE POTENTIAL TO OCCUR IN THE PROJECT AREA

Scientific Name	Common Name	Habitat	Status§
Astragalus crotalariae		Sandy flats, fans	4
Astragalus insularis Kell. var. *harwoodii* Munz & McBurney	Sand-flat locoweed	Dunes and sandy places	2
Astragalus lentiginosus Dougl. var. *borreganus* Jones	Dapple-pod	Dunes and sandy valleys	4
Cassia covesii Gray	Senna	Dry washes	2
Castela emoryi (Gray) Moran & Felger.*	Crucifixion thorn	Dry gravelly areas	2
Colubrina californica Jtn.	California snake-bush	Dry canyons	4
Coryphantha vivipara (Nutt.) Britton & Rose var. *alversonii* (Coulter) L. Benson*	Alverson's Foxtail cactus	Stony slopes	1B,C2,BSS
Cryptantha costata Bdg.	Ashen forget-me-not	Sandy and gravelly areas	4
Cryptantha holoptera (Gray) Macbr.	Rough-stemmed forget-me-not	Rocky places	4
Cynanchum utahense (Engelm.) Woodson.	Debolita	Dry sandy places	4
Ditaxis californica (Bdg.) Pax & K.Hoffm.	California ditaxis	Washes, rock benches	1B,C2,BSS
Ferocactus acanthodes (Lem.) Britton & Rose var. *acanthodes**	Barrel cactus	Rocky slopes, flats	3,C3c,BSS
Lycium parishii Gray.	Parish thornbush	Dry washes, flats	2
Opuntia munzii C.B. Wolf	Munz cholla	Dry gravelly areas	1B,C2,BSS
Pilostyles thurberi Gray		Stem parasite on *Dalea*	4
Proboscidea althaeifolia (Benth.) Dcne*	Unicorn-plant	Sandy areas	4
Salvia greatai Bdg.*	Orocopia sage	Dry washes and fans	1B,C2,BSS
Xylorhiza cognata (Hall) Cronq. & Keck.	Mecca aster	Gypsum clays	4
Xylorhiza orcuttii (Vasey & Rose) Cronq. & Keck.	Orcutt aster	Gypsum soils	1B,C2,BSS

§Status
- C2 = Threat and/or distribution data are insufficient to support federal listing
- C3c = Federal; too widespread and/or not threatened
- BSS = Bureau of Land Management sensitive species
- 1B = Plants rare, threatened, or endangered in California and elsewhere
- 2 = Plants rare, threatened, or endangered in California but more common elsewhere
- 3 = Plants that CNPS needs more information for - A review list
- 4 = Plants of limited distribution - A watch list

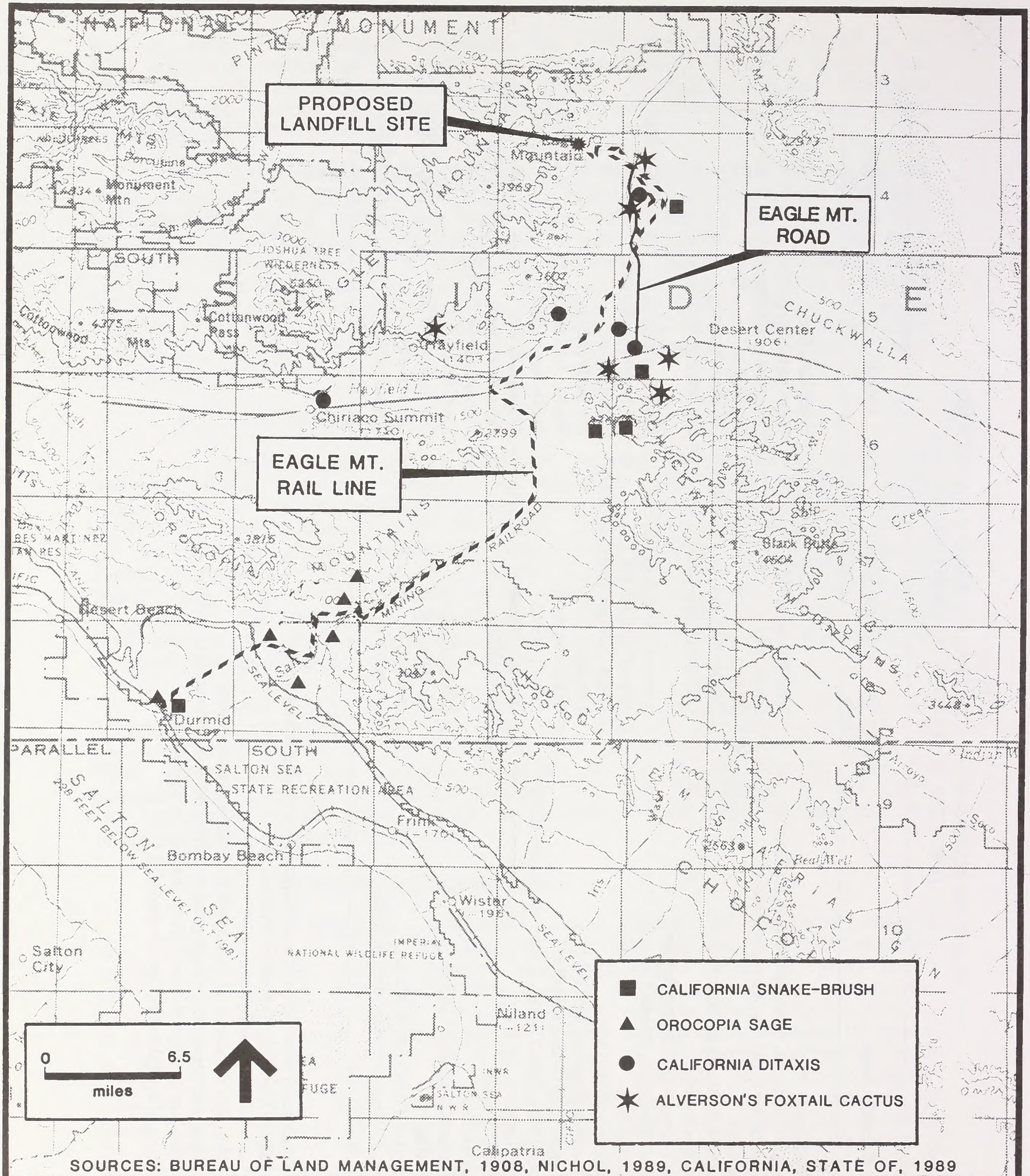

FIGURE 6. HISTORIC RECORDED DISTRIBUTION OF PLANT SPECIES OF SPECIAL CONCERN

RECON

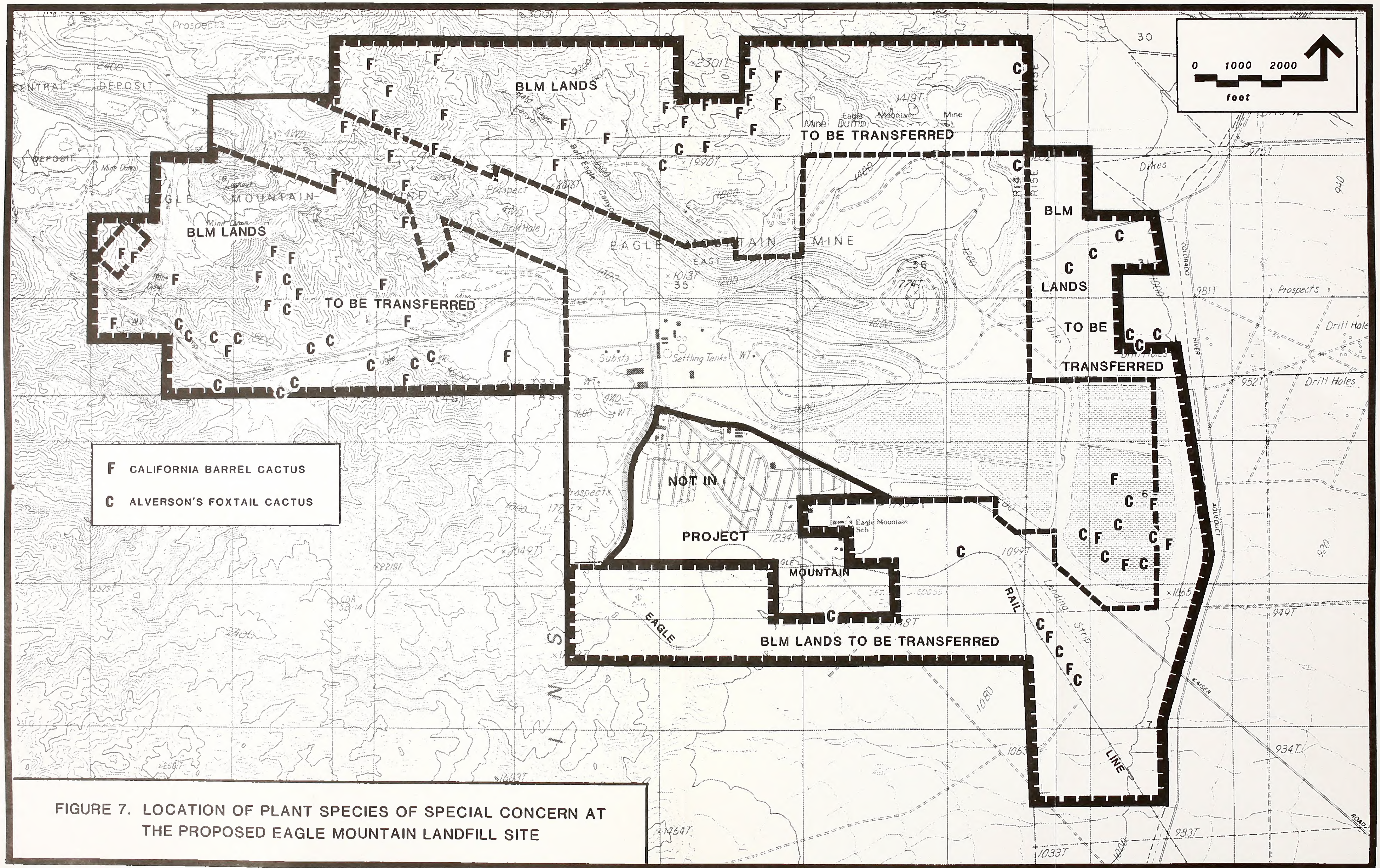

FIGURE 7. LOCATION OF PLANT SPECIES OF SPECIAL CONCERN AT THE PROPOSED EAGLE MOUNTAIN LANDFILL SITE

public (selected) lands on the landfill site because of the less disturbed state of these lands.

California barrel cactus (*Ferocactus acanthodes* var. *acanthodes*) is a BLM sensitive species, occurs on List 3 of the CNPS rating, and was recently down-listed to federal Category C3c. This handsome columnar cactus usually grows as a single stem on steep, rocky slopes and canyon walls as well as gravelly flats at elevations below 2,000 feet. A rather large population of California barrel cactus occurs throughout the undisturbed slopes around the mine and in the fine tailings pond in the southeastern portion of the existing mine (see Figure 7). More than 800 barrel cacti occur within the project boundaries at the proposed landfill site. As was true for Alverson's foxtail cactus, most of the California barrel cactus populations occur on the less disturbed public (selected) lands.

2) Not Observed. California ditaxis (*Ditaxis californica*) is a Category 2 candidate species, a BLM sensitive species, and a CNPS List 1B species. It is a small perennial plant that has known historic occurrences in the area of Eagle Mountain Road and the Eagle Mountain rail line. California ditaxis is a species distinguished from the other species of the genus *Ditaxis* primarily by the lack of pubescence on the foliage (Munz 1974). It has a dual blooming period (March-May and October-December) and it would have been identifiable during the survey period conducted for this project. Two other species of *Ditaxis* (*D. serrata* and *D. neomexicana*) were observed along the railway and Eagle Mountain Road to the south of the mine, and although there are historic occurrences of California ditaxis documented in the vicinity of the Eagle Mountains, it is not anticipated (based on the results of the field surveys) that these populations lie within the proposed project area (Eagle Mountain Mine site, Eagle Mountain Road corridor, or the Eagle Mountain railway corridor).

Orcutt aster (*Xylorhiza orcuttii*) is a federal Category 2 candidate, a BLM sensitive species, and is considered a List 1B species by CNPS. It is a perennial subshrub with showy purple flowers with yellow centers. This species prefers the gypsum soils found in the desert region. It has known historic occurrences in canyons on the southwest side of the Salton Sink, especially west of Imperial County. This distribution is well south of the project area and the lack of gypsum soils in the study area makes the potential for occurrence of this species within the bounds of the entire project low.

Munz cholla (*Opuntia munzii*) is a federal Category 2 candidate, a BLM sensitive species, and a List 1B CNPS plant. It is a large, treelike cholla known to occur in the Chocolate Mountains south of the Chuckwalla Bench to eastern Imperial County in dry gravelly places. This distribution is well south of the study area. This cholla is easily identified by its stature alone. This species would have been observed if within the study area; therefore, the potential for occurrence within the entire study area is low.

California snake-bush (*Colubrina californica*) is considered a List 4 species by CNPS. It is a tall, rather spinescent shrub with the branches covered with a fine grayish pubescence. It has known historic occurrences in the vicinity of the project area. This species would have been easily identified if encountered within the project area; therefore, based on the results of the surveys, the potential for this species to occur in the entire project area is low.

Mecca aster (*Xylorhiza cognata*) is considered a List 4 species by CNPS. It is a small shrub that has a lavender flower with a yellow center. It grows on gypsum clays and sandstone cliffs in steep canyons. The closest known historic location for this species is in Box Canyon near Mecca (Jaeger 1969) 40 to 50 miles to the west of the study area. The lack of gypsum clays in the mine area makes the potential for occurrence of this species in the study area low.

Pilostyles (*Pilostyles thurberi*) is a very small stem parasite that is found on species of the genus *Dalea,* especially on Emory dalea (*Dalea emoryi*). This species is a CNPS List 4 plant. Only the small brown flowers and associated small bracts are visible on the outside of the host plant, making this species difficult to detect. The absence of the host species at the mine site makes the potential for occurrence of this species in this area of the project low. The host plant for this species does occur along a portion of the Eagle Mountain railway (see discussion of the railway corridor below).

Crucifixion thorn (*Castela emoryi*) is a CNPS List 2 plant. It is easily recognizable by its spiny habit and greenish stems. This species is easily identifiable year-round and, therefore, would have been observed if present at the mine site. This species was observed within the railway corridor (see discussion of Eagle Mountain railroad below).

Unicorn-plant (*Proboscidea althaeifolia*) is a low-growing perennial in sandy places of the desert region. It has distinct woody fruits with long curved horns that make it identifiable long after the plant dies back during the summer. It would have been observed if in the mine area; therefore, the potential for occurrence of this species at the mine site is low. This species was observed within the railway corridor (see discussion below).

Several other annual species of desert plants are listed by CNPS as having the potential for occurrence in the study area. One CNPS List 2 species, the sand-flat locoweed (*Astragalus insularis* var. *hardwoodii*) is potential in the area. CNPS List 4 annual species include locoweed (*Astragalus crotalariae*), dapple-pod (*Astragalus lentiginosus* var. *borreganus*), ashen forget-me-not (*Cryptantha costata*), and rough-stemmed forget-me-not (*Cryptantha holoptera*). These species would have been difficult to identify at the time of the survey since they bloom and set seed during the late winter and spring months (February-May). It is not anticipated that large populations of these species occur at the mine site due to the steepness of the terrain and the very shallow soils on the slopes. Currently, the slopes around the mine support a widely scattered and limited array of perennial shrubs and cacti.

Additional perennial shrubs and herbs occurring on CNPS List 2 and having the potential for occurrence not only in the mine area but also within the entire project study area include senna (*Cassia covesii*), Parish thornbush (*Lycium parishii*), and spear-leaf (*Matela parvifolia*). One CNPS List 4 perennial species, debolita (*Cynanchum utahense*), could also occur in the area. Each of these species would have been easily identified if encountered during the surveys; thus, based on the results of the field visits, the potential for occurrence of large populations of any of these perennial species in the entire study area is low.

b. Eagle Mountain Railroad Right-of-Way. Two federal Category 2 candidate species were observed within the survey corridor of the railroad (Figures 8a-e): Alverson's foxtail cactus and Orocopia sage (*Salvia greatai*). A federal Category 3c plant, California barrel cactus, also occurs along the railway. Two other plant species were observed which appear only on CNPS lists, unicorn-plant and crucifixion thorn.

A few scattered individuals of Alverson's foxtail cactus occur within the 200-foot survey corridor of the railroad. The sightings were of individuals or small groups (less than 10 plants). None were observed along the railroad south of I-10. No large concentrations or populations of this species occur within the survey corridor.

Orocopia sage is a Category 2 candidate species, a BLM sensitive species, and is considered a List 1B plant by CNPS. This sage shrub has distinct spinose margined leaves and grows along dry washes and alluvial fans below 600 feet elevation from the Orocopia Mountains to the Chocolate Mountains in Riverside County. The species has known historic occurrences in the vicinity of the Eagle Mountain railroad line. These locations were verified during the current surveys as several populations of this species were observed along the southern portion of the railway (see Figures 8a and 8b). A significant population of Orocopia sage occurs in the vicinity of the Eagle Mountain railway from just northeast of the trestle crossing over Salt Creek south to the area adjacent to the levee north of the Coachella Canal. No individuals were observed within the boundaries of the survey in the proposed Eagle Mountain landfill area, Eagle Mountain Road extension, or railway north of I-10.

A few widely scattered individuals of California barrel cactus occur in very low numbers within and adjacent to the railway survey corridor. No large concentrations or populations of this species occur within 200 feet of the rail line along the Eagle Mountain railroad.

Fewer than five individuals of crucifixion thorn occur widely scattered along the railway just to the north of the Coachella Canal. A large historic population of this species once occupied the area now inundated by the Hayfields Reservoir (Jaeger 1969).

A small number of individuals of unicorn-plant occur in sandy soils along the surveyed railroad corridor north of I-10 (see Figure 8b). No large populations of this species were observed on the surveys.

c. Eagle Mountain Road Improvements, Road Extension, and Railroad Spur. Scattered individuals of Alverson's foxtail cactus and California barrel cactus occur within the 200-foot survey area along the existing Eagle Mountain Road (Figures 9a-b). No large concentrations or populations of these species were observed along or adjacent to this road. No other sensitive plant species were observed within this survey corridor. The proposed Eagle Mountain Road extension and new railroad spur is shown on Figure 9b. The current alignment of this road extension and rail spur would pass through areas containing Alverson's foxtail cactus and California barrel cactus.

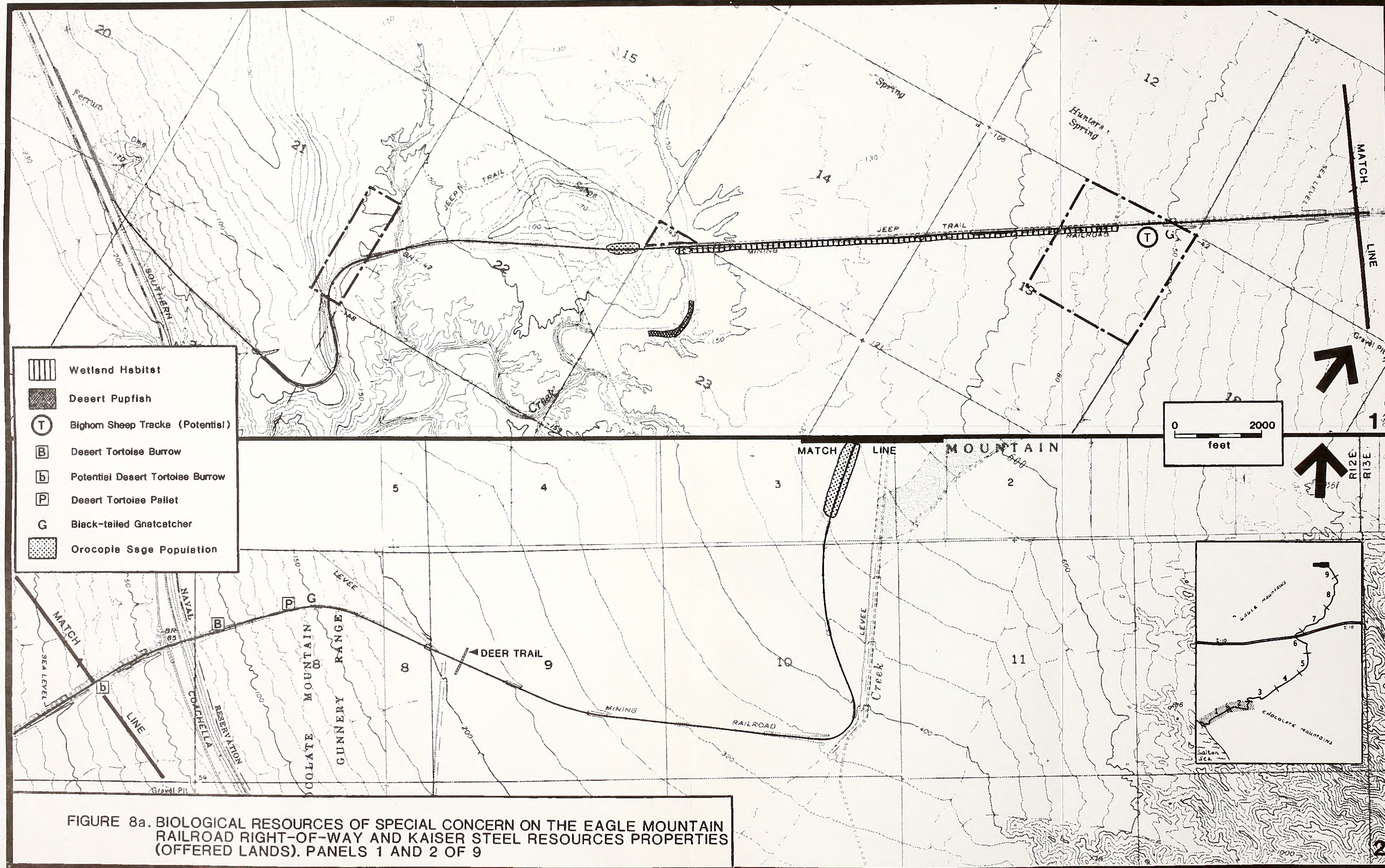

FIGURE 8a. BIOLOGICAL RESOURCES OF SPECIAL CONCERN ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY AND KAISER STEEL RESOURCES PROPERTIES (OFFERED LANDS). PANELS 1 AND 2 OF 9

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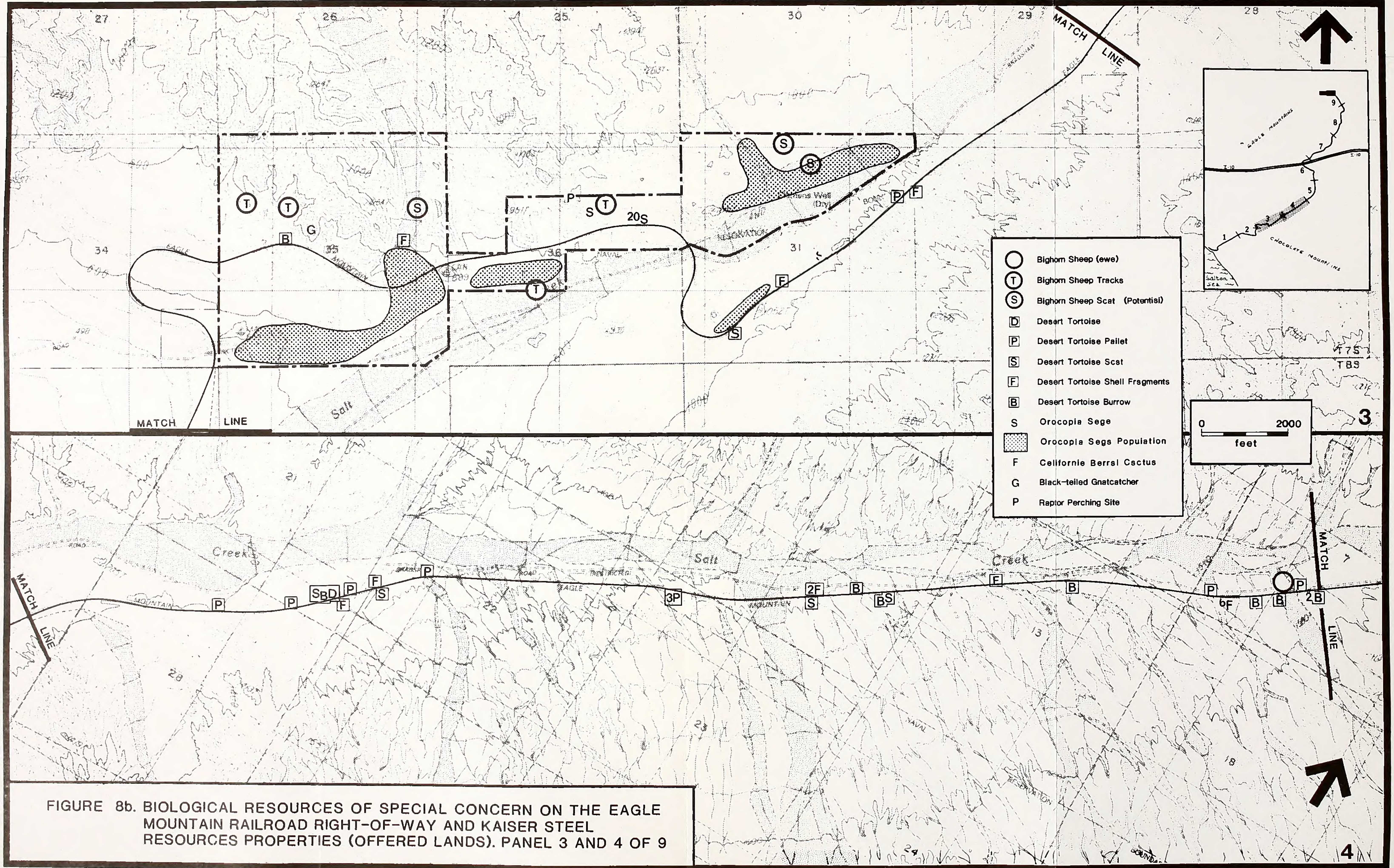

FIGURE 8b. BIOLOGICAL RESOURCES OF SPECIAL CONCERN ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY AND KAISER STEEL RESOURCES PROPERTIES (OFFERED LANDS). PANEL 3 AND 4 OF 9

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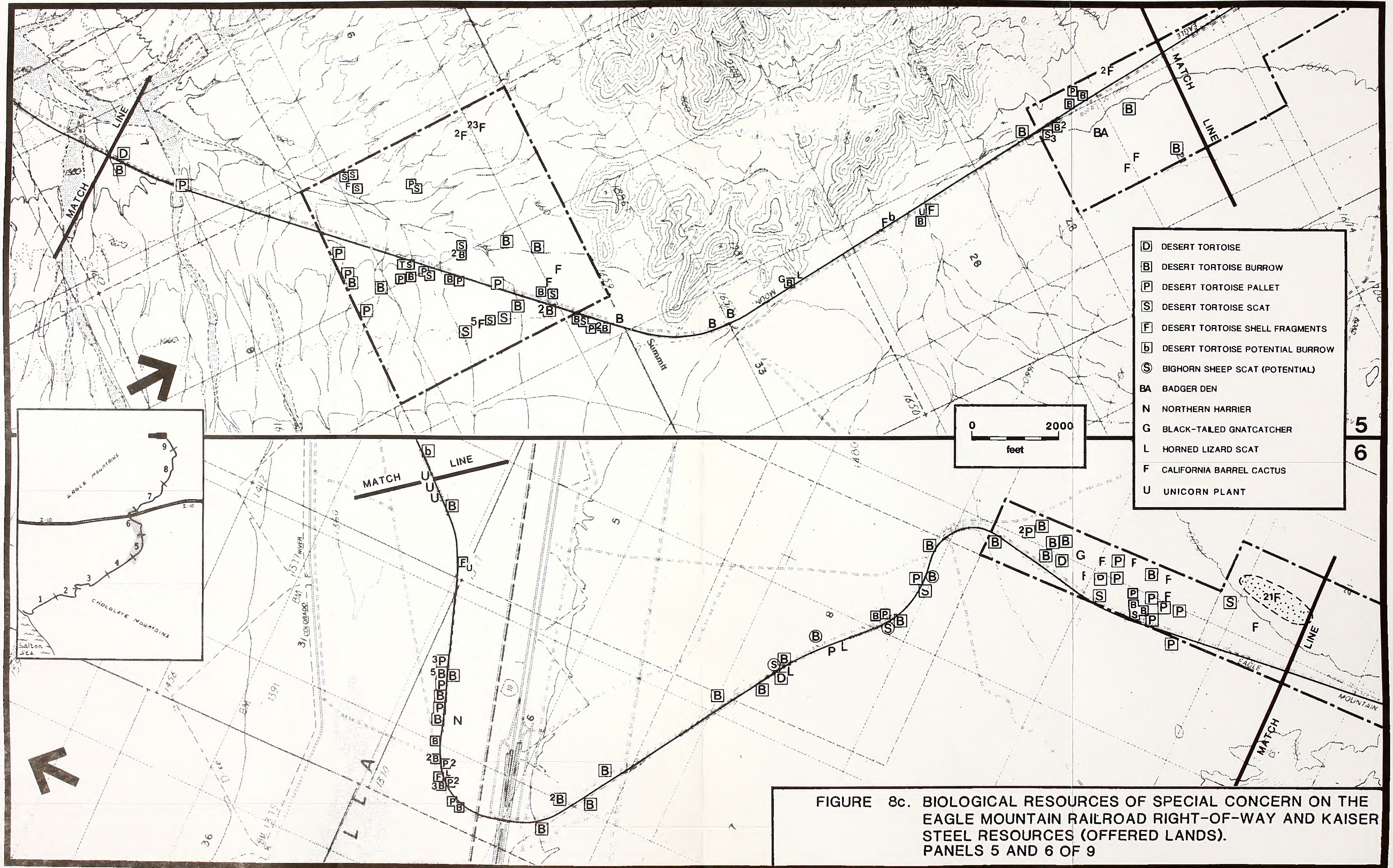

FIGURE 8c. BIOLOGICAL RESOURCES OF SPECIAL CONCERN ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY AND KAISER STEEL RESOURCES (OFFERED LANDS). PANELS 5 AND 6 OF 9

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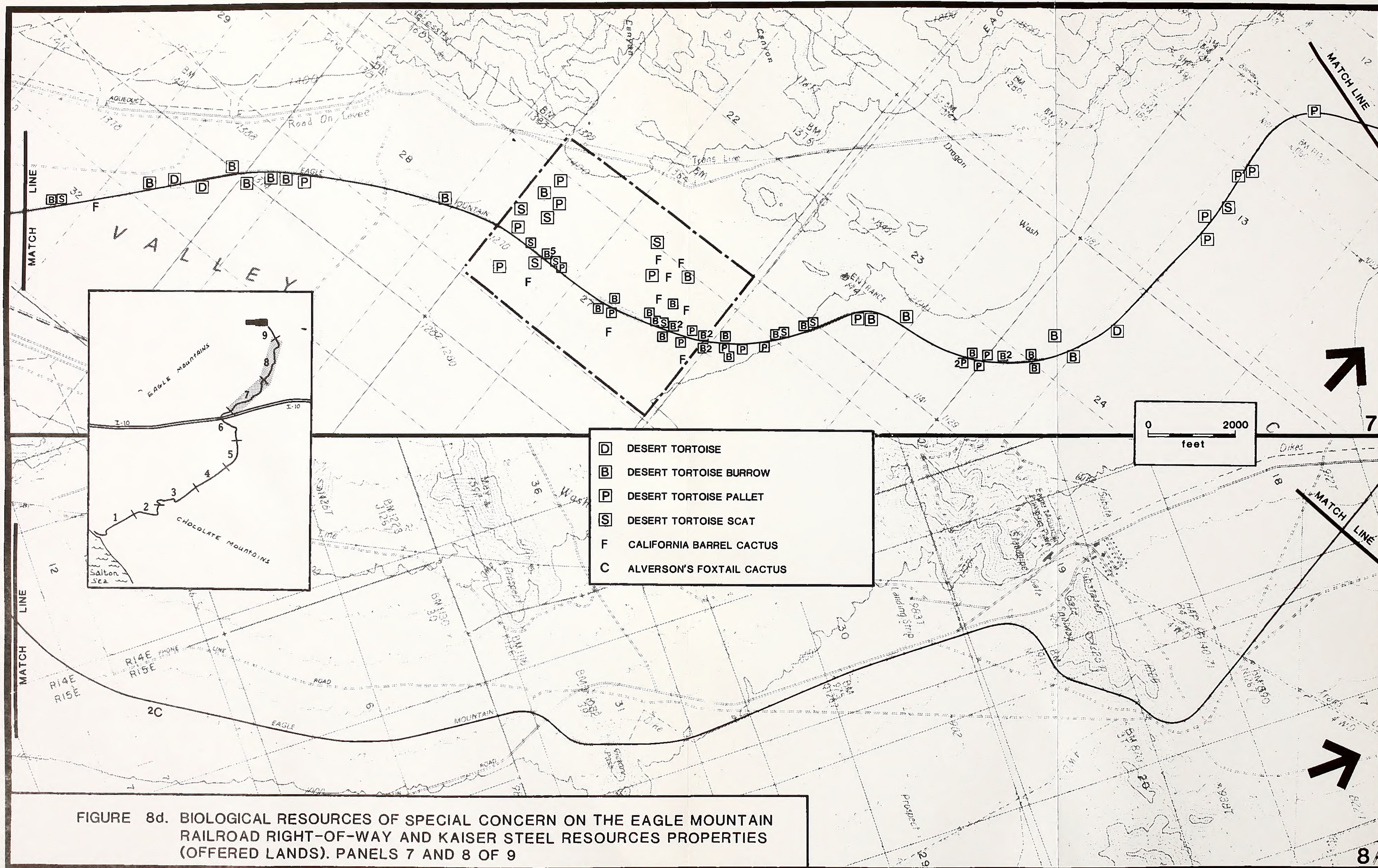

FIGURE 8d. BIOLOGICAL RESOURCES OF SPECIAL CONCERN ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY AND KAISER STEEL RESOURCES PROPERTIES (OFFERED LANDS). PANELS 7 AND 8 OF 9

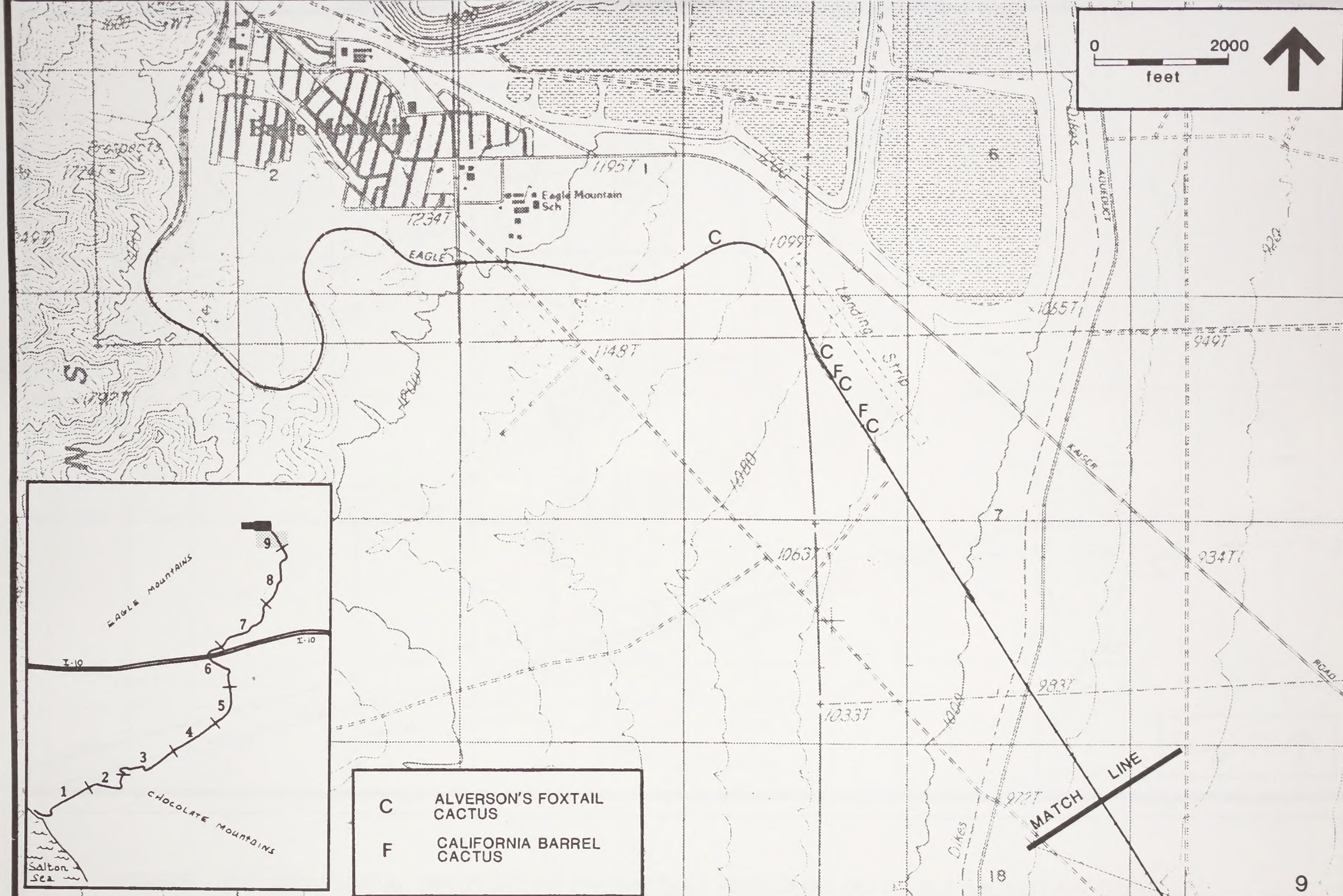

FIGURE 8e. BIOLOGICAL RESOURCES OF SPECIAL CONCERN ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY, PANEL 9 OF 9

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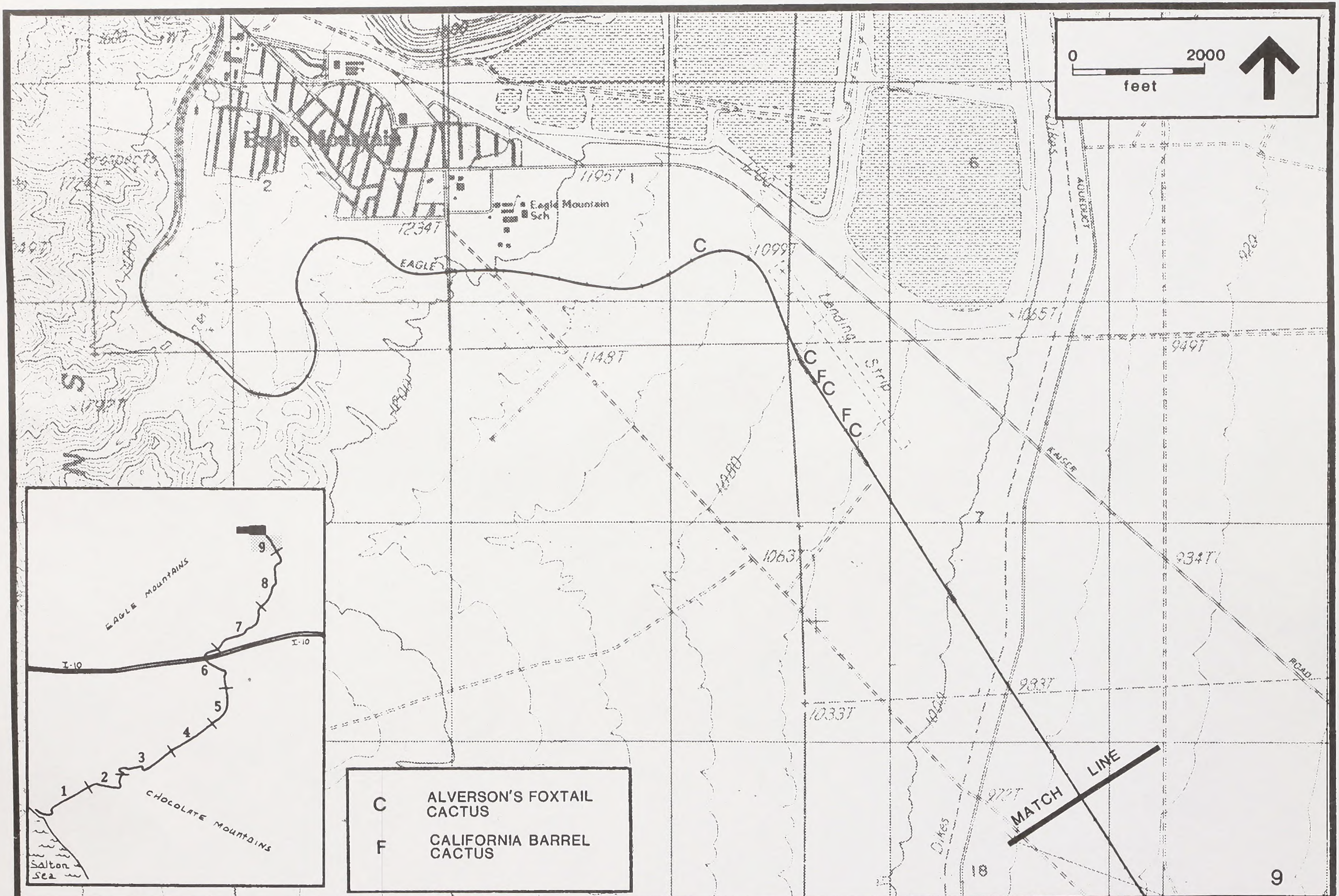

FIGURE 8e. BIOLOGICAL RESOURCES OF SPECIAL CONCERN ON THE EAGLE MOUNTAIN RAILROAD RIGHT-OF-WAY, PANEL 9 OF 9

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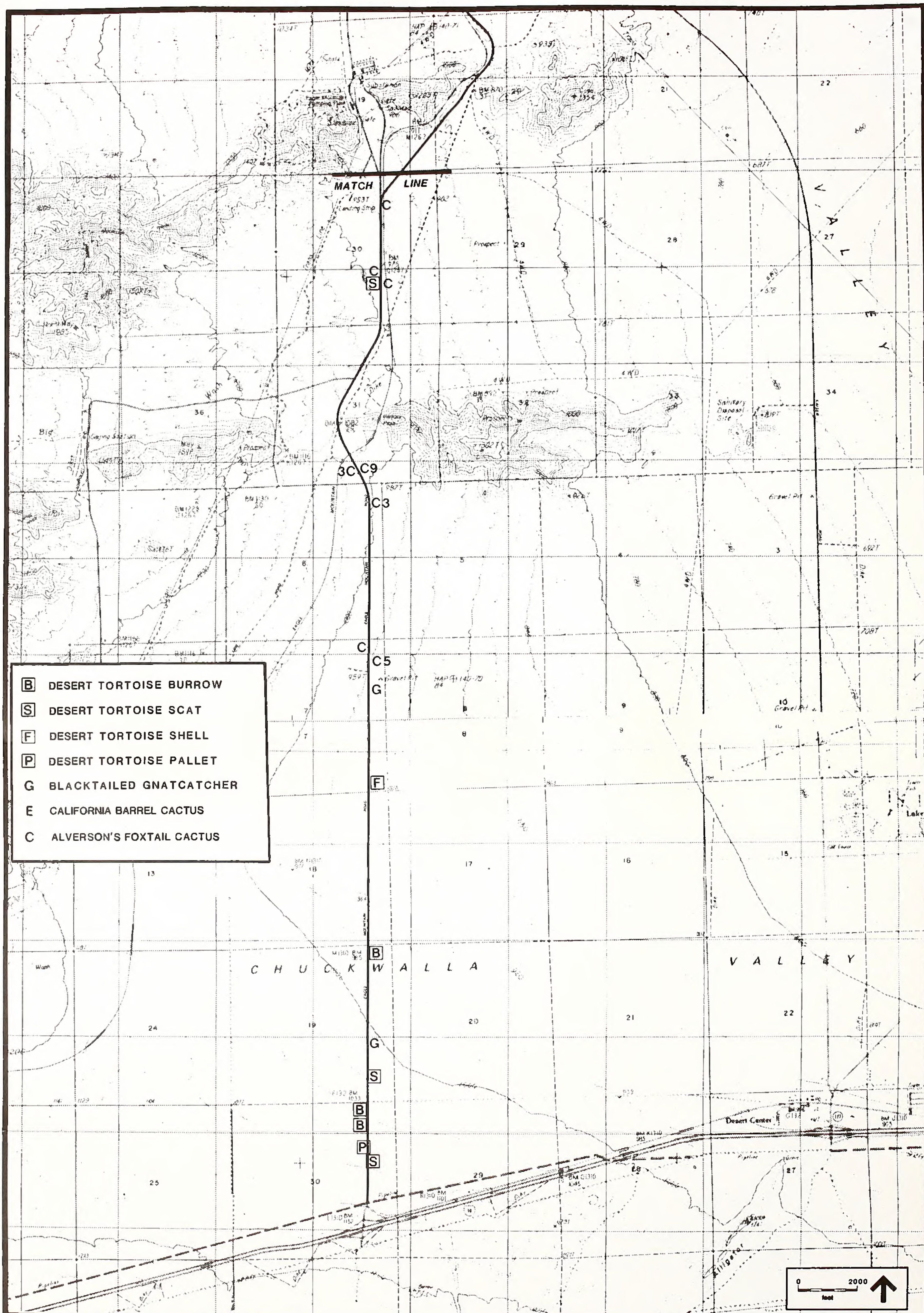

FIGURE 9a. BIOLOGICAL RESOURCES OF SPECIAL CONCERN ON EAGLE MOUNTAIN ROAD AND SPUR LOCATION MAP 1 OF 2

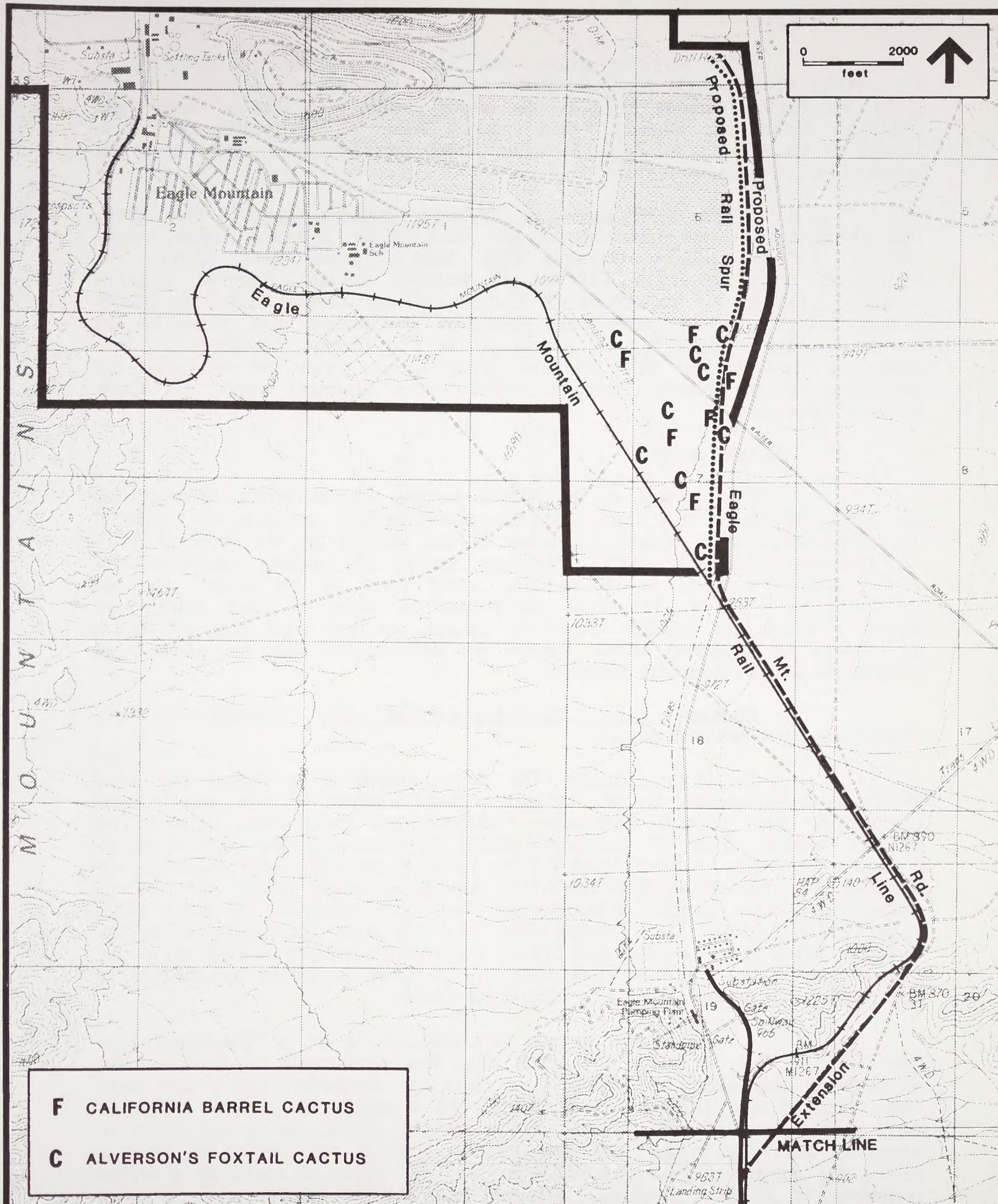

FIGURE 9b. BIOLOGICAL RESOURCES OF SPECIAL CONCERN ON EAGLE MOUNTAIN ROAD EXTENSION AND RAILROAD SPUR
MAP 2 OF 2

RECON

Other sensitive species that have the potential for occurring in the corridor of the Eagle Mountain Road extension are similar to those discussed under the Eagle Mountain Mine section above, especially California ditaxis and California snake-bush. Both of these species have historic occurrences documented in the vicinity of Eagle Mountain Road; however, these plants were not observed within the survey corridor.

d. Kaiser Steel Resources Properties (Offered Lands). Two sensitive plant species were observed on the Kaiser Steel Resources-owned parcels surveyed for this project, Orocopia sage and California barrel cactus. The Section 27 parcel north of I-10 in the Hayfield Spring 7.5-minute U.S.G.S. quadrangle has a few individuals of California barrel cactus within its boundaries (see Figure 8b). A rather large population of Orocopia sage occurs on the parcels covering Sections 31, 35, and 36 of the Red Canyon 7.5-minute U.S.G.S. quadrangle (see Figure 8a). Sensitive plant species with the potential for occurrence on the parcels surveyed include those discussed under the Eagle Mountain Mine site.

2. Wildlife Species

A record search of the NDDB system and distribution literature for the Eagle Mountain Mine area and associated facilities revealed the potential for significant wildlife species to occur in the vicinity of the proposed project (State of California 1989). Thirty-one species of concern, determined by various wildlife agencies to be declining, could occur on the project site and are listed in Table 5. The local distributions of some of these species are shown in Figure 10. Wildlife species of concern, or their sign, observed during the surveys are described below. Species not detected but with the potential to occur on the project site are also discussed.

a. Proposed Eagle Mountain Landfill Site. Significant wildlife observations are shown on Figure 11.

1) Desert Tortoise. The desert tortoise is a federal and State of California threatened species. It ranges from southern Nevada and extreme southwestern Utah through southeastern California and southwestern Arizona into northern Mexico (State of California 1989). In California, the tortoise occurs in northeastern Los Angeles, eastern Kern and southeastern Inyo counties, and most of San Bernardino, Riverside, and Imperial counties. Based upon genetic studies, two major genetic subpopulations have been identified (Jennings 1985, Spang et al. 1988). The dividing line between these subpopulations is the Colorado River. The tortoises east of the Colorado River are referred to as the Sonoran population. Those tortoises west of the Colorado River, including those on the project site, are designated as the Mojave population.

The desert tortoise is considered to be a "K-selected" species, meaning that it has a low birth rate, low recruitment of juveniles into the breeding population, low mortality in older age categories, and a low population turnover rate (Hohman et al. 1980). As a result, the number of adults may remain constant for relatively long periods, during which the ratio of adults to other age groups may vary widely. Next to the number of breeding adults, the number of juveniles likely to join the ranks of adults is a critical component of a stable population. However, assessing the number of juveniles in

TABLE 5
WILDLIFE SPECIES OF SPECIAL CONCERN OCCURRING OR WITH THE POTENTIAL TO OCCUR ON THE PROPOSED PROJECT AND ASSOCIATED FACILITIES

Common Name	Scientific Name	Habitat*	Status
<u>Fish</u>			
Desert pupfish+	*Cyprinodon macularius*	Ponds	FE,BSS,CE
<u>Reptiles and Amphibians</u>			
Flat-tailed horned lizard	*Phrynosoma mcalli*	CDS,sandy soils	C1,CCE,BSS
Desert tortoise+	*Gopherus agassizi*	CDS,MDS	FT,CT,BSS
<u>Mammals</u>			
California leaf-nosed bat+	*Macrotus californicus*	Caves, mines	C2,S,BSS
Townsend's big-eared bat+	*Plecotus townsendii*	CDS,mines,buildings	S
Pocketed freetail bat	*Nyctinomo femorosaccus*	CDS,boulders,cliffs	S
Spotted bat	*Eudermos maculatum*	SDS, mines	C2
California mastiff bat	*Eumops perotis*	SDS,C,mines	C2,S
American badger+	*Taxidea taxus*	G,CDS	S
Mountain lion	*Felis concolor*	CDS,mountain ranges	S
Nelson's bighorn sheep+	*Ovis canadensis nelsoni*	CDS,mountain ranges	CFP,BSS
<u>Birds</u>			
Black-shouldered kite	*Elanus caeruleys*	CDS,washes	CFP
Golden eagle	*Aquila chrysaetos canadensis*	CDS	S,CFP,BEPA,BSS
Prairie falcon	*Falco mexicanus*	CDS(ridges)	S
Peregrine falcon	*Falco peregrinus*	CDS, mountain ranges	FE,CE,BSS
Northern harrier+	*Circus cyaneus*	CDS	S
Swainson's hawk	*Buteo swainsoni*	M	C2,CT
Burrowing owl	*Athene cunicularia*	CDS	S

TABLE 5
WILDLIFE SPECIES OF SPECIAL CONCERN OCCURRING
OR WITH THE POTENTIAL TO OCCUR
ON THE PROPOSED PROJECT AND ASSOCIATED FACILITIES
(continued)

Common Name	Scientific Name	Habitat*	Status
Yuma clapper rail	*Rallus longirostris yumaenesis*	FM	FE,BSS,CT
California black rail	*Laterallus jamaicensis coturniculus*	FM	BSS,CT,C1
Long-eared owl	*Asio otus*	CDS,washes	S
Gila woodpecker	*Centurus uropygialis*	M	CE
Purple martin	*Progne subis*	CDS	S
Eagle Mountain scrub jay	*Aphelocoma coerulescens cana*	PJ	C2C
Bendire's thrasher	*Toxostoma bendirei*	CDS	S
LeConte's thrasher	*Toxostoma leconteii*	CDS	S
Crissal thrasher	*Toxostoma crissale*	CDS	S
Virginia's warbler	*Vermivora virginiae*	M	S
Yellow warbler	*Dendroica petechia*	M,washes	S
Yellow-breasted chat	*Icteria virens*	M,washes	S
Black-tailed gnatcatcher+	*Polioptila melanura*	CDS	S

*For detailed habitat requirements, see text.
+Detected during surveys, 1989-1990.

<u>Habitats</u>

CDS = Colorado desert scrub
FM = Freshwater marsh
G = Grassland, pasturelands, etc.
M = Migrant only
MDS = Mojave desert scrub
C = Caves, mine tuneel
PJ = Pinyon/juniper woodland

<u>Status</u>

S = California species of special concern
CFP = California fully protected
CT = California threatened
CE = California endangered
CCE = California candidate endangered
BSS = Federal Bureau of Land Management sensitive species
BEPA = Federal Bald Eagle Protection Act
C1 = Federal Category 1
C2 = Federal Category 2
C2C = Federal Category 2 candidate
FE = Federal endangered
FT = Federal threatened

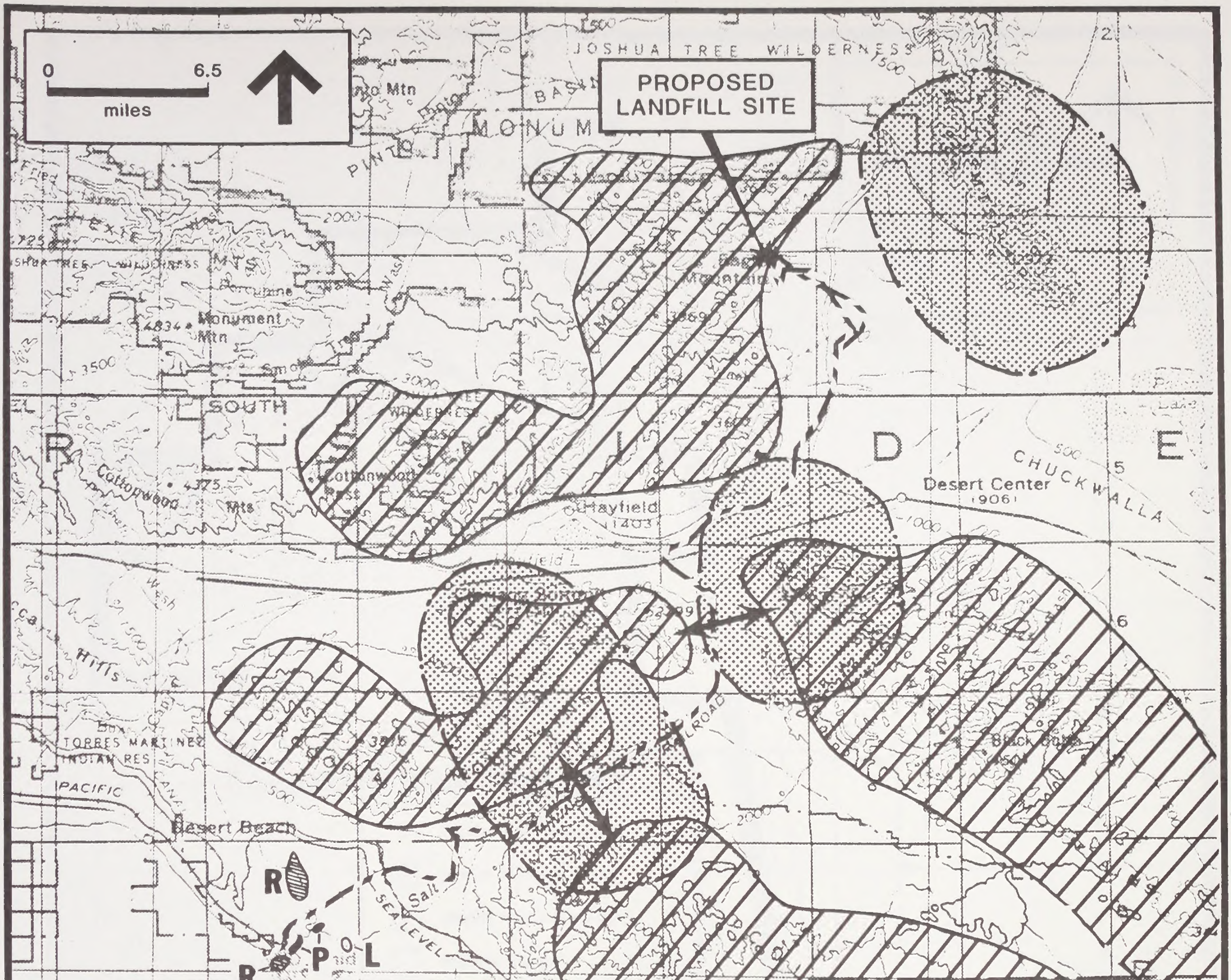

FIGURE 10. HISTORIC RECORDED DISTRIBUTION OF SOME WILDLIFE SPECIES OF SPECIAL CONCERN

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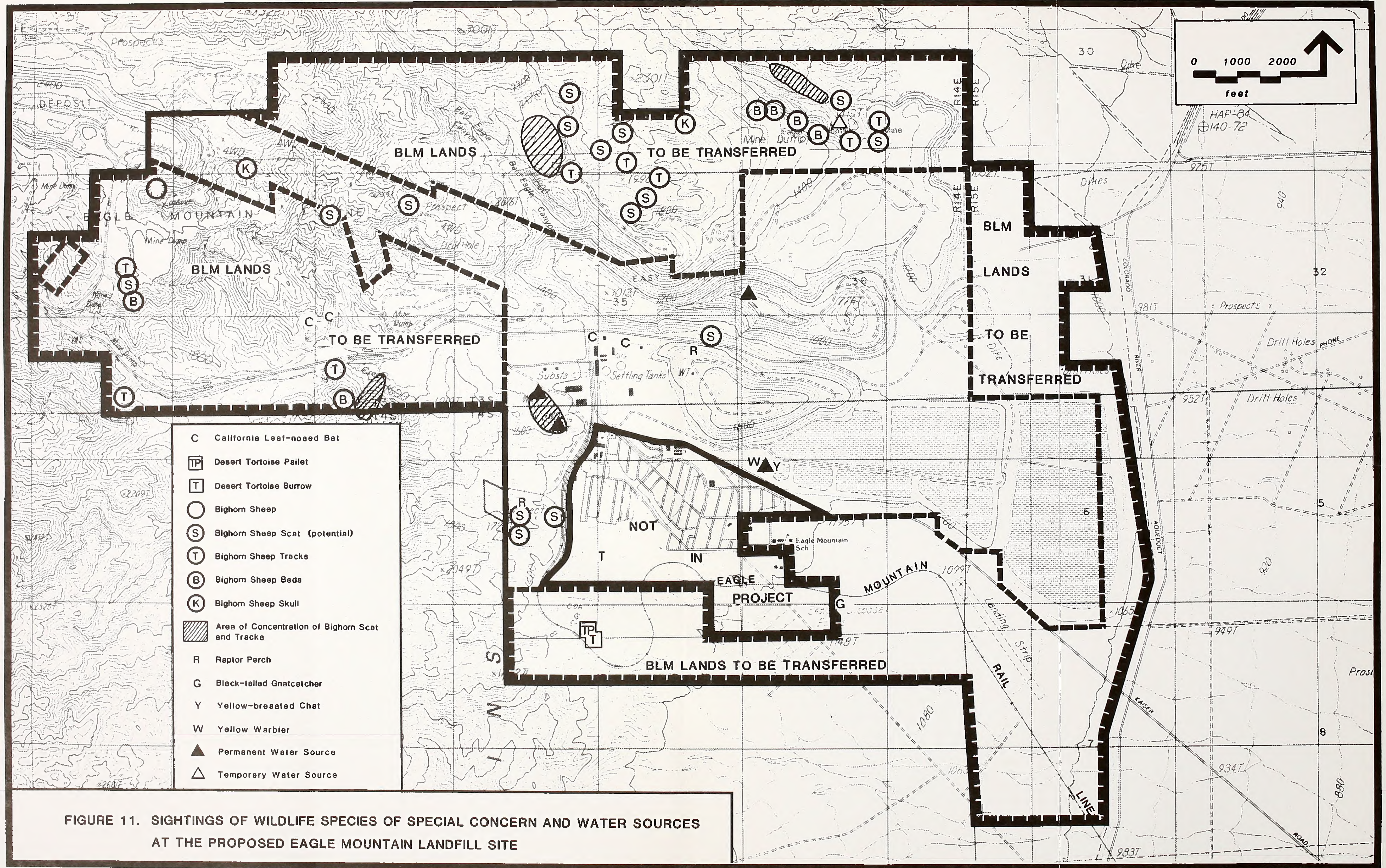

FIGURE 11. SIGHTINGS OF WILDLIFE SPECIES OF SPECIAL CONCERN AND WATER SOURCES AT THE PROPOSED EAGLE MOUNTAIN LANDFILL SITE

a population is very difficult, and an optimum value for the adult/juvenile ratio is not currently known.

Tortoises are active only during the warmer months of the year, with greatest activity in the spring. Their active season begins in early March and ends in late October or early November. They remain inactive in their burrows during the winter months. Tortoises are also relatively inactive during the peak of summer, when ambient temperatures are highest. There is evidence that the daily activity pattern of this species is dictated by air temperature. Tortoises are active primarily between ambient temperatures of 65 to 105 degrees Fahrenheit (18 to 42 degrees Celsius) (Karl, unpublished data), often resulting in a bimodal daily activity pattern, early morning and late afternoon. Rainfall also can stimulate tortoise activity, as they will emerge from their burrows to drink rainwater, even if ambient temperatures are not optimal (Nagy and Medica 1986).

The preferred diet of the desert tortoise consists primarily of ephemeral forbs and grasses, and perennial grasses (Burge and Bradley 1976, Hansen et al. 1976, Coombs 1979, Nagy and Medica 1986).

Courtship and mating typically occur in the spring, but not all adult tortoises within a population reproduce during a particular year. Nests are dug by the female tortoise, and anywhere from 2 to 14 eggs deposited (Ernst and Barbour 1972; Turner et al. 1986). Incubation time ranges from 98 to 135 days (Hohman et al. 1980). A breeding female may lay from one to three clutches in a summer (Turner et al. 1984, 1986).

Based upon data for desert tortoises in California, Arizona, Nevada, and Utah, the average home range of a tortoise is estimated to be between 27 and 131 acres (11 to 53 hectares) (Berry et al. 1986). Females typically have smaller home ranges than males. Long-term movement patterns for individual tortoises and whole populations are not well understood. It is not known how far an individual tortoise travels over the course of its lifetime, and in what patterns. It is also not known which individuals and groups are likely to migrate to other habitat areas, how long such movements take, and what conditions prompt or prohibit such movement (RECON 1990).

The desert tortoise sign found near the proposed Eagle Mountain landfill site is in a flat area south of the Eagle Mountain townsite on a parcel of public (selected) lands and outside of the project boundary. Any potential impacts to desert tortoise in this area from townsite development will be dealt with in the environmental documents to be prepared for the Specific Plan Area of the Eagle Mountain townsite.

2) Nelson's Bighorn Sheep. Nelson's bighorn sheep is a State of California fully protected species and a BLM sensitive species. Its current distribution extends from southern Colorado, Nevada, and Utah south to California, Arizona, New Mexico, Texas, and Mexico. In California, Nelson's bighorn sheep occur from the White Mountains on the north to the Mexican border and east to the Colorado River (Monson 1980). Monson (1980) stated that approximately 100 bighorn occurred in Joshua Tree National Monument and vicinity. Bighorn sheep prefer rough, rocky, and steep terrain. They depend on their climbing and hiding ability in this rough terrain to escape predators.

Bighorn sheep foraging areas consist of summer, fall-winter, and spring range. Summer range provides permanent water sources, fall-winter range is usually similar to the summer range, and spring range includes rugged terrain for lambing (McQuivey 1978). Optimal foraging distance is one mile or less from watering sources (Hansen 1980). The maximum foraging range must be within six miles of watering sources (Hansen 1980). Plant productivity in the desert depends on the amount and timing of rainfall. Rainfall patterns differ considerably between and among months and years and, in the area of the project site, are concentrated in the winter. The relationship of plant productivity and rainfall makes the availability of sheep forage unpredictable. In addition, a wide range of habitats is needed to support bighorn sheep because many plant species are productive only during certain rainfall patterns. Thus, bighorn must be able to move to good foraging areas between seasons.

Blong and Pollard (1968) found Peninsular bighorn sheep in the Santa Rosa Mountains requiring water sources daily during the heat of the summer. Ewes, lambs, and young rams stayed within two miles of water during the summer, while rams were observed traveling over three miles from water sources and returning to water less frequently (Blong and Pollard 1968).

Bighorn sheep move between mountain ranges. Although the reasons for this intermountain movement are unknown, corridors have been documented for sheep in the California desert area by the BLM. A summary of intermountain movements by mountain sheep (Schwartz, Bleich, and Holl 1986) and observations during sheep transplant programs indicate that bighorn sheep can travel long distances. For example, during a release program by BLM and Nevada Department of Wildlife (NDOW), one radio-collared ram was observed to travel 100 miles (Armentrout, pers. comm., 1990). Schwartz, Bleich, and Holl (1986) suggest that because of these movements, bighorn sheep may consist of "metapopulations" with a population occurring in each mountain range that is a subpopulation. These migrations increase the potential for genetic variability within the "megapopulation." They further conclude that these subpopulations would vary in numbers and genetic structure as habitat changes within a mountain range, creating a variable population structure through time. Bighorn sheep also appear to require large amounts of space because they become nervous and "run-down" in crowded conditions (Hansen 1980).

Populations of Nelson's bighorn sheep occur in the Eagle (50), Orocopia (50), Chuckwalla (35-40), and Chocolate mountains (100) in the broad vicinity of the proposed landfill site and the Eagle Mountain railroad right-of-way (see Figure 10). Habitat management plans have been developed for bighorn sheep in Orocopia and Chuckwalla mountain ranges (Figure 12). Ability of bighorn sheep to move between mountain ranges in search of seasonal forage and water is critical for sheep survival (Woodward-Clyde n.d.). Movement patterns are affected by forage and water availability, topography, climatic conditions, breeding activity, and sex of individuals (McQuivey 1978). Sheep corridors may exist between the Eagle and Coxcomb Mountain ranges (Weaver, pers. comm., 1990). Although the Eagle Mountain population appears stable, the Coxcomb subpopulation appears to be declining recently (Weaver, pers. comm., 1990).

Results of an aerial survey of the Eagle Mountains conducted by CDFG (U.S. Department of the Interior 1986) showed approximately 50 bighorn sheep residing in the mountains. Their report also indicates seven watering

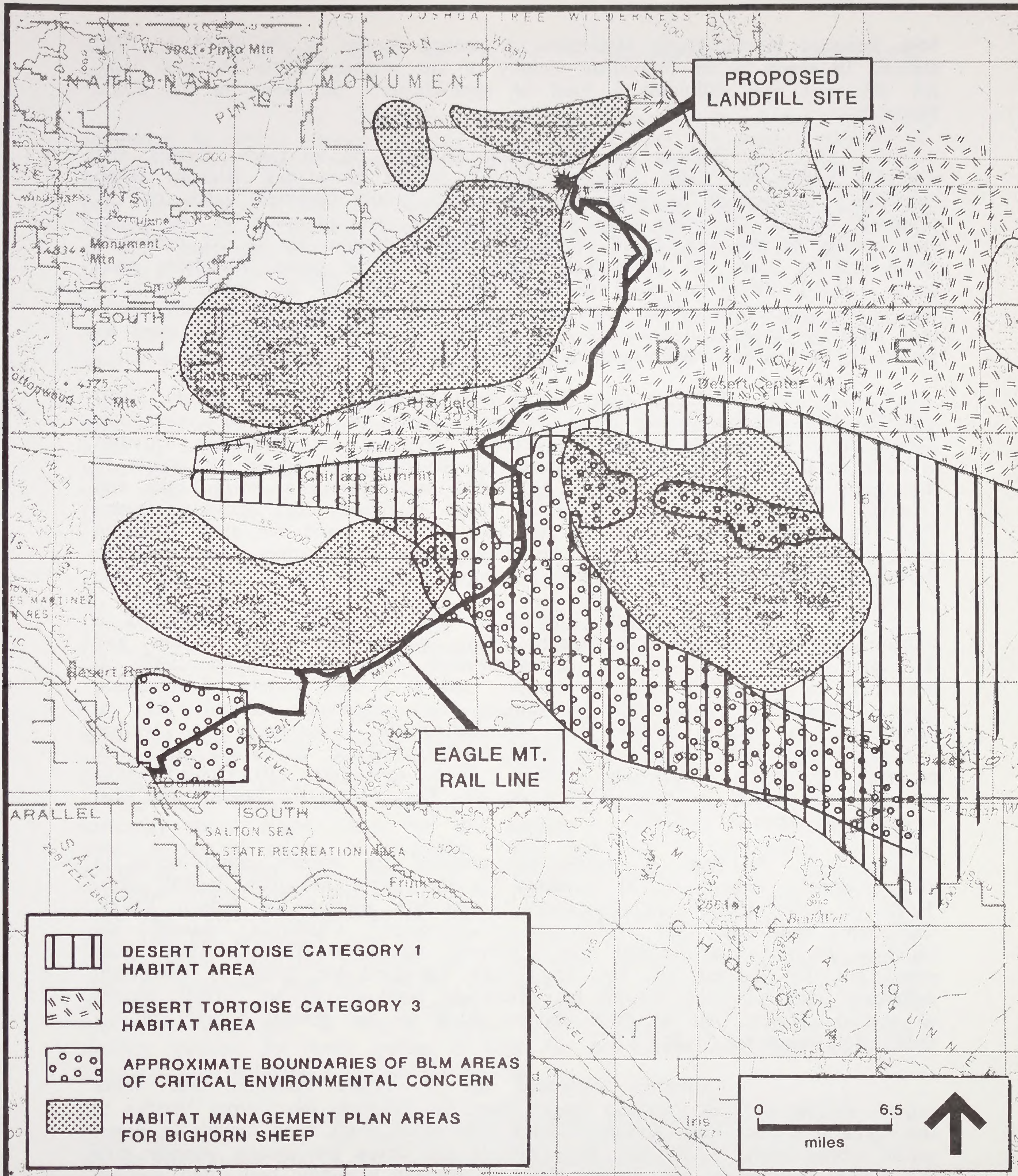

FIGURE 12. HABITAT MANAGEMENT AREAS

RECON

hole locations in the Eagle Mountains. A second survey by the BLM in 1990 showed 19 sheep in the immediate vicinity of the proposed Eagle Mountain landfill site, and also estimated a total of approximately 50 sheep in the Eagle Mountains.

Bighorn sheep sign was observed on all roads, ravines, and ridgetops within the Eagle Mountain landfill project boundaries. Bighorn sheep extensively use habitat on both the private and public (selected) lands on the proposed landfill site. One potential bedding area was observed in the northeast portion of the site. Local residents regularly observe up to 20 individual sheep drinking from the leaky water tanks west of the camp (Anderson, pers. comm., 1989). Sheep are also observed wandering through the tailing areas of the mining operations. Mine operators report that sightings of bighorn sheep near mine operations and roads in the past were common. Sheep would stand by the sides of the road and watch machinery pass (Anderson, pers. comm., 1989).

Evidence from mining personnel (Anderson, pers. comm., 1989) suggests that bighorn sheep may habituate somewhat to mining operations. Studies have shown that sheep will become habituated to construction activities as long as they can see the disturbance and the disturbance does not appear to the sheep to be dangerous to them (Campbell and Remington 1981; Leslie and Douglas 1980). Sheep habituated to the large machinery and activities associated with earlier mining operations and they did not avoid the area. Although bighorn sheep may habituate to human activity, this process may cause stress to the sheep, which could directly or indirectly affect their health.

3) Black-Tailed Gnatcatcher. The black-tailed gnatcatcher is a California species of special concern. This species occurs in washes and drainages throughout the deserts of southeastern California (Atwood 1988). It occurs up to about 2400 feet in elevation and in a wide variety of vegetation types. Black-tailed gnatcatcher populations have become reduced due to destruction of brush habitat and off-road-vehicle disturbances in washes (Remsen 1979). Brood parasitism by brown-headed cowbirds (*Molothrus ater*) may account for some population declines near agriculture. Black-tailed gnatcatchers were found in most washes on the Eagle Mountain landfill site that support dense native tree species.

4) Bats. A number of sensitive bat species could occur in mines, tunnels, caves, or old buildings in the Eagle Mountain landfill area. Three of these species are Category 2 candidate species for federal listing, California leaf-nosed bat (*Macrotus californicus*), California mastiff bat (*Eumops perotis*), and spotted bat (*Euderma maculata*). The California leaf-nosed bat, the spotted bat, the Townsend's big-eared bat (*Plecotus townsendii pallescens*) and pocketed freetail bat (*Tadarida femorosacca*) are CDFG species of special concern. All of these species occur in the general vicinity of the project site (Woodward-Clyde n.d.).

California leaf-nosed bat is locally common near water sources (Brown n.d.) in mountain ranges along the Colorado River from Needles to the Mexican border. Most specimens have been taken from mine tunnels in desert scrub habitat below 1,000 feet. Mine tunnels and caves are usually warmer than 80 degrees Fahrenheit and greater than 60 percent humidity with high ceilings (Brown n.d.). Brown states that most of the population of California leaf-nosed bats in the California desert are located in approximately 10 mine tunnel sites.

The California mastiff bat occurs from central California southward to central Mexico and has been recorded from the western portions of the southeastern desert region of California (Williams 1986). The nearest known location for this species is near Mecca in Riverside County. California mastiff bats form day roosts in large cracks of exfoliating granite. Cracks are approximately 2 inches wide and 12 inches deep, and narrow to at least one inch at their upper end. The crack must be at least six to nine feet from the ground for bats to launch into flight.

The spotted bat occurs from Montana south to northern Mexico and Baja California. They roost in caves and buildings in arid habitats and usually are observed singly. Little else is known about this species.

Townsend's big-eared bat is often found in mine tunnels but may also use caves. This bat occurs throughout the California deserts from sea level to 8,000 feet (Brown n.d.). The most important requirement is that the roost sites are completely free of human disturbance; one visit to a roost site will cause the bats to abandon it. No nursery colonies have been found in California (Brown n.d.).

Pocketed free-tailed bat is found to roost in crevices on cliffs. The only known roost site in California, in the Anza-Borrego Desert, is no longer occupied and no roost sites for this species are currently known (Brown n.d.). An adult was recently captured in Joshua Tree National Monument (Brown n.d.). Very little information of these bats' biology or distribution has been collected for eastern California.

The California leaf-nosed bat and sign of Townsend's big-eared bat were observed during directed surveys of the mine area (see Figure 11 and Attachment 1). A diurnal roosting site for the leaf-nosed bat was found in the mine tunnel (adit) west of the east pit. Pregnant female bats were captured in the night roosts, indicating that the diurnal roosting site may also be a maternity roost. Night roosts for this species were found in three additional sites. A second survey in December 1990, indicated that the mine adit also serves as a winter roost, and is a significant resource for the leaf-nosed bat. No other winter roost sites were found in the vicinity of the Eagle Mountain Mine (see Attachment 1). Sign of Townsend's big-eared bat was also found in the adit. The bat droppings observed near the entrance to the adit were in a typical formation signifying evidence of a maternity roost. However, the droppings were at least one year old and no individuals were observed during the survey. A complete description of the surveys including methodology and results are found in Attachment 1. Water supplies in the project site are an important limiting resource for many species of bats. No bat roosts were found on public (selected) lands at the Eagle Mountain landfill site.

5) Wildlife Species With the Potential for Occurrence. The following species were not observed during the field surveys, but could occur on the site given known wildlife distributions and habitat preferences.

The golden eagle (*Aquila chrysaetos canadensis*) is a California fully protected species and a BLM sensitive species. It is also protected by the Federal Bald Eagle Protection Act. This species was a common resident throughout California prior to the 1940s (Remsen 1979). In 1979, 500 pairs were estimated in California (Remsen 1979). Secondary poisoning, loss of open habitat, shooting, and nest robbing are cited as the main cause of eagle declines in abundance. Golden eagles do not reside near towns or cities. Golden eagles inhabit open country with nearby cliffs, ledges, or tall trees for nesting and open country for foraging. BLM (1980) has identified three areas of potential foraging habitat near the vicinity of the project site (see Figure 10). One of these areas is the flat, open habitat east of the Eagle Mountain Mine.

Golden eagles were not observed in the mine area during the survey; however, potential perching and roosting sites were observed in undisturbed and disturbed habitat. Not all of the site was surveyed, especially the most inaccessible areas where the eagles may use rock outcrops, ledges, and ridgetops for perching and roosting. No appropriate nesting habitat was observed on the site. Foraging habitat was observed on the flatter portions of the mine project and in ravines and washes of the Eagle Mountains.

Peregrine falcon (*Falco peregrinus*) is a federal and state listed endangered species. Its fast flight and dramatic stoops made it a favorite bird of falconers and its populations were reduced by nest robbing. In addition, this species was severely reduced in abundance by secondary pesticide poisoning. Peregrine falcons are extremely rare in the west, where they nest in remote cliffs and have been released and established on some city buildings. This species forages primarily on waterfowl. It was once a common wintering bird along the Colorado River (Bernard and Brown 1977). In the Eagle Mountain area, this species probably is found only during the winter season (Woodward-Clyde n.d.). It may use undisturbed cliff areas in the project area for roosting or perching.

Prairie falcon (*Falco mexicanus*) is a CDFG species of special concern. Populations have been reduced by grassland conversion, falconry, collecting, pesticide poisoning, and shooting (Remsen 1979). This species is found throughout the western United States in open rangeland, ridges, mountains, and deserts. It nests in undisturbed, inaccessible cliffs, ledges, and rocky bluffs near open valleys (Bernard and Brown 1977). Prairie falcon populations in 1979 (Remsen 1979) were reported to be stable in the deserts of California. Prairie falcons have been reported to nest in many of the mountain ranges in the Colorado Desert (Woodward-Clyde n.d.).

No prairie falcons were observed during the survey. Inaccessible cliffs and ledges that could be used by these birds as nesting sites may not have been seen due to limited access to many of these sites. Undisturbed habitat in the proposed Eagle Mountain landfill area could be used by foraging prairie falcons.

The burrowing owl (*Athene caniculara*) is a CDFG species of special concern and is protected under the Federal Migratory Bird Act. Burrowing owls range throughout California in arid grasslands and open shrub communities. They are found in high concentrations in the Imperial Valley and in sparse numbers in desert scrub habitats (Bernard and Brown 1977). They typically construct nests in burrows of other animals for use as cover and for raising young. Burrowing owls usually nest in flat to rolling hilly terrain and not in steep, rocky soils. A burrowing owl may use more than one burrow system in its territory. Burrow size ranges from three inches to nine inches in diameter. Loss of habitat, especially conversion to irrigated agricultural practices, is the primary reason for population reduction and has led CDFG to consider listing the species.

Burrowing owls would only be found in the flatter portions of the Eagle Mountain project boundaries. They would probably not nest in the washes on the proposed landfill site. No burrowing owls or their nests were observed during the surveys. However, not all habitat was observed in enough detail to determine if this species occurs in the area.

Gila woodpecker (*Centurus uropygialis*) is a CDFG endangered species. This medium-sized woodpecker is a resident of California only in the riparian habitat of the Colorado River and very rarely in cottonwood trees of the Imperial Valley (Remsen 1979; Bernard and Brown 1977). No riparian habitat exists in the mine area for this species to breed, but it has been infrequently observed foraging in habitat found within areas of the Woodward-Clyde (n.d.) study boundaries of the Colorado Desert.

Swainson's hawk (*Buteo swainsoni*) is a CDFG threatened species and a federal Category 2 species for listing. Swainson's hawks are very rare raptors throughout their range in California. Populations have been declining since the 1930s, and this decline may have been caused by pesticides, conversion of occupied habitat to irrigated intensive agriculture, and elimination of riparian woodland (Remsen 1979). Swainson's hawks occur in open grasslands, brushlands, and forested habitats. They utilize riparian forests for breeding sites and use open habitat nearby to forage for their primary food source, voles. The Swainson's hawk is observed occasionally in Imperial Valley and along the Colorado River during spring and fall migrations (Bernard and Brown 1977). This species may concentrate during migration in wildflower fields hunting for insects. It has not been documented as a breeder in the vicinity of the project site (BOR 1989).

Black-shouldered kite (*Elanus caeruleys*) is a California fully protected species. Kites nest in riparian woodlands, live oaks, and sycamores and forage over grasslands, open brushland, and open fields. This species forages almost exclusively on voles and small mammals. They are found in marshy bottomlands with clumps of trees during the winter (Bernard and Brown 1977). They are dependent on rapidly disappearing riparian habitat and their populations may become restricted due to this habitat loss. Woodward-Clyde (n.d.) states that kites may occur in any of the habitats found within their study boundaries, which included the Colorado and Mojave deserts of eastern California.

Eagle Mountain scrub jay (*Aphelocoma coerulescens cana*) is a subspecies of scrub jay only known to occur in the pinyon/juniper woodland habitat on the upper elevations of Eagle Mountain, in Joshua Tree National Monument (Peterson 1990). This bird is believed to have originated by hybridization between coastal and interior jay populations (Peterson 1990). The population is estimated at only 40-50 birds confined primarily to 150 of pinyon/juniper woodland near the peak of Eagle Mountain (Peterson 1990, Hays, pers. comm., 1991). This subspecies has been proposed by the USFWS as a Category 2 Candidate species. The status of this bird is likely to change as more information is collected. Eagle Mountain is located approximately 18 miles from the landfill site. No scrub jays were observed on the project site during any of the biological surveys.

Three thrasher species including Bendire's thrasher (*Toxostoma bendirei*), LeConte's thrasher (*Toxostoma leconteii*), and Crissal thrasher (*Toxostoma crissale*) are CDFG species of special concern. They all utilize fairly dense, shrubby habitats such as those typically found in the washes of the mine project site. Occurrences have been documented in the Colorado and Mojave deserts of eastern California (Woodward-Clyde n.d.).

Bendire's thrashers usually breed in woodlands or *Opuntia*-dominated vegetation, but a few unsubstantiated reports of this species have been from the desert scrub between Needles and Blythe (Bernard and Brown 1977). Bendire's thrasher would probably be observed during migration. LeConte's thrashers breed from Antelope Valley to the Anza-Borrego Desert. This species is found in very sparse desert scrub, especially around desert washes (Bernard and Brown 1977). Crissal thrasher is found in dense brush and wash vegetation near riparian woodlands from the Colorado River to Palm Springs, although it is not common (Bernard and Brown 1977).

The long-eared owl (*Asio otus*) is a California species of special concern. Long-eared owls nest in wooded washes, drainages, and oases (Bernard and Brown 1977). They may winter roost in groves of large tamarisk trees, such as those at Lake Tamarisk near Eagle Mountain Mine.

Four migrant species of passerine birds may be found in washes with brushy vegetation: Virginia's warbler (*Vermivora virginiae*), purple martin (*Progne subis*), yellow warbler (*Dendroica petechia*), and yellow-breasted chat (*Icteria virens*). These species would only be found during the spring and fall migrating seasons, and they may use the habitat for foraging or resting areas. Purple martin is a very rare migrant, although it is regularly seen at the Salton Sea (Bernard and Brown 1977).

American badger (*Taxidea taxus*) is a California species of special concern that is found in dry, open habitats of many types. Although the distribution of this species extends well beyond California, numbers of badger have declined significantly throughout California. This species has declined due to habitat loss in western and southern parts of the state, poisoning, and trapping for the fur trade (Williams 1986). A regional study of the southern Mojave and northern Colorado Desert basin in California revealed "uncommon" abundances of badger throughout the area (Woodward-Clyde n.d.). Badgers have been recorded in the Pinto Basin of Joshua Tree National Monument just north of the proposed Eagle Mountain landfill site (Williams 1986).

b. Eagle Mountain Railroad Right-of-Way

1) Desert Tortoise. The Eagle Mountain railroad right-of-way falls within the BLM CDCA. Portions of the railroad fall within the Chuckwalla Bench ACEC and within Category 1 and 3 designated desert tortoise habitat, as shown in Figure 12. Category 1 habitat areas are those which are the most important for management consideration and Category 3 is the lowest. Portions of the CDCA have been surveyed by BLM for tortoise densities (Berry and Nicholson 1984). Tortoise densities of 100 to 250 animals per square mile have

been reported in habitat along the Eagle Mountain railroad just south of I-10 (Figure 13). Lower tortoise densities of 20 to 50 animals per square mile have been documented adjacent to the high density habitat along the Eagle Mountain railroad north and south of the interstate.

Desert tortoises and their sign were observed throughout most of the habitat within the railroad corridor south of the mine to the Coachella Canal (see Figures 8a-e). Portions of the railroad right-of-way north of I-10, and directly south of I-10, showed the most sign in each mile of railroad corridor surveyed. At least one sign of desert tortoise was observed along every mile of the railroad corridor from approximately 10 miles north of I-10 south to the Coachella Canal.

2) Bighorn Sheep. Locations of evidence for bighorn sheep utilizing the habitat along the railroad right-of-way are shown in Figures 8a-e. Probable bighorn sheep scat and tracks were observed south of I-10 as far south as the Coachella Canal and in the parcels owned by Kaiser Steel Resources to be offered in trade to the BLM in Salt Creek. One ewe was observed within the 200-foot railroad corridor in badlands in the Salt Creek wash.

As discussed above, bighorn sheep move between mountain ranges. Potential corridors for bighorn sheep movement occur between the Chocolate and Orocopia mountains, the Eagle and Coxcomb mountains, and between the Chuckwalla and Orocopia mountains (see Figure 10). Two of these corridors are bisected by the Eagle Mountain railroad right-of-way.

3) Desert Pupfish. The desert pupfish (*Cyprinodon macularius*) is a federal and state endangered species. It is a minnow-sized member of the killifish family and is found in the lower Colorado and Gila Rivers from southern Arizona to eastern California and northern Sonora, Mexico (Lee 1980). Populations have become established in the Salton Sea. Desert pupfish occur in a wide variety of habitats with harsh environmental fluctuations in oxygen, temperature, and salinities (Lee 1980). Desert pupfish populations fluctuate widely between years and seasons and are particularly regulated by the amount of rainfall occurring during the winter season. As smaller pools begin to dry during the summer, the fish move to other pools which maintain water throughout the dry season.

In a survey conducted by CDFG in 1986, a population of 70 pupfish was found approximately one-quarter mile south of the Eagle Mountain railroad trestle crossing the tributary of Salt Creek (see Figure 10) (Nicol, pers. comm., 1986). This location is approximately two and one half miles upstream from the Salton Sea (NW/4 Section 23 T8S R11E). Surveys conducted in early June, 1990 found 125 pupfish in the same area of the tributary to Salt Creek; however, a flash flood in June reduced the pupfish population to 2 fish by June 16. Transplanted populations occur in the BLM reserve at Rancho Dos Palmas, which is located upstream approximately two miles north of the Kaiser railroad trestle.

The area directly under the Eagle Mountain railroad trestle in the tributary noted above is potentially appropriate desert pupfish habitat and may be used by this species. The tributary provides a potential corridor underneath the railroad for movements of pupfish up- and downstream of the railroad crossing.

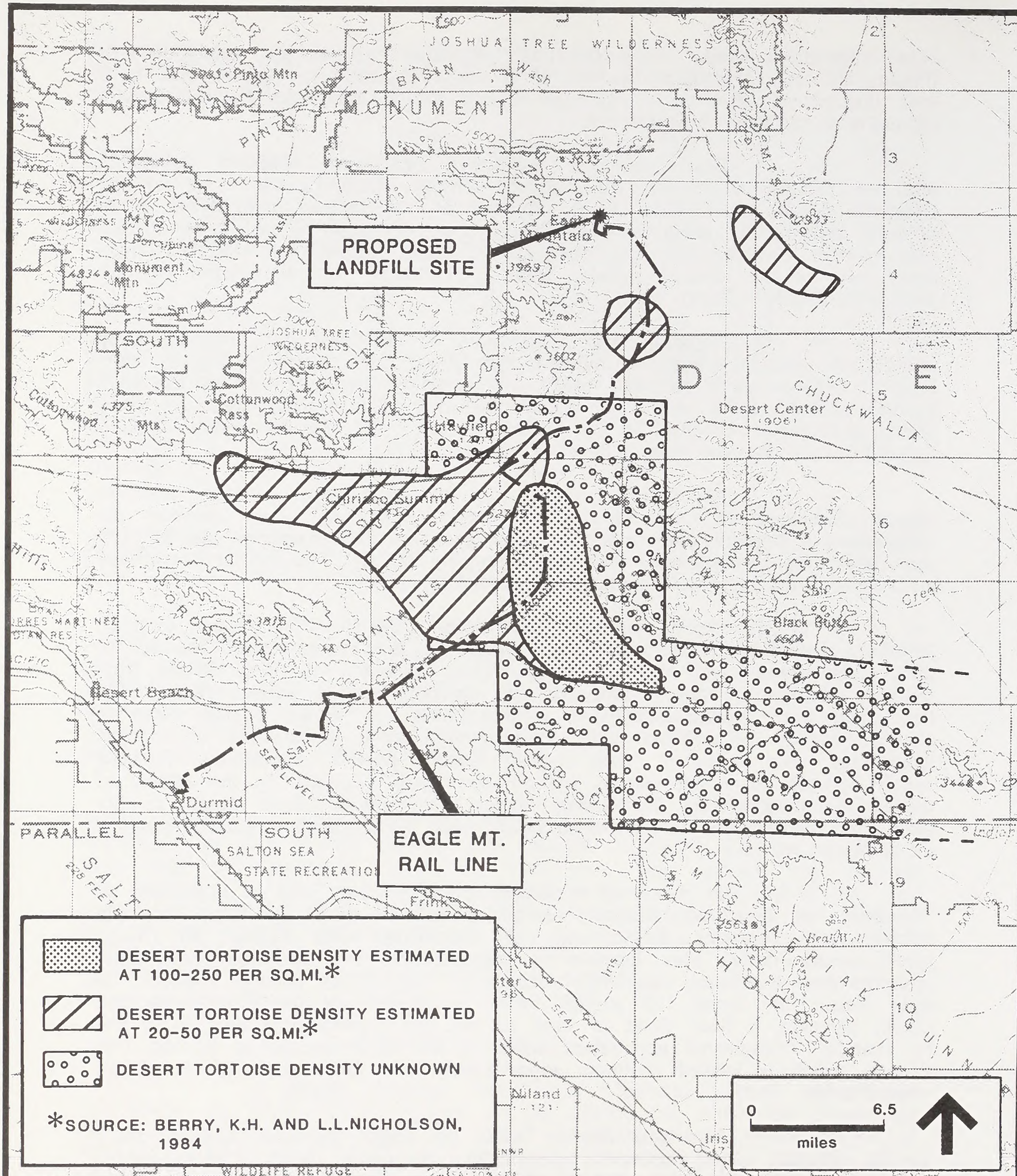

FIGURE 13. DESERT TORTOISE DISTRIBUTION

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Surveys conducted by CDFG in May and June, 1990, found no pupfish in an alkali pond within the railroad right-of-way (on the northwest side of the railroad) east of the Salt Creek tributary. Pupfish could enter this pond in years of high rainfall and during flooding of Salt Creek (Nicol, pers. comm., 1990). The results of the pupfish survey indicates that no pupfish or any other fish species occur in the pond, nor were any invertebrates or algae were observed.

4) Flat-Tailed Horned Lizard. The flat-tailed horned lizard (*Phrynosoma mcalli*) is a CDFG candidate for endangered status and a USFWS Category 1 candidate for listing as threatened or endangered. This species occurs in areas of flat topography in sandy soils from fine, windblown soils to more stabilized dunes and soils that are more coarse (Dunham 1989). They are generally associated with creosote bush/bur-sage vegetation communities (Stebbins 1985). This species does not occur in dense vegetation, tamarisk-arrowweed thickets, or major dune systems (Dunham 1989). Horned lizards are also restricted to areas occupied by ants, their primary food source.

Two sightings of flat-tailed horned lizard scat were made along the railroad right-of-way approximately 1.5 miles south of I-10. In general, habitat along the railroad corridor would not support flat-tailed horned lizard because of the lack of windblown sands.

5) Black-Tailed Gnatcatcher. Black-tailed gnatcatchers were observed utilizing habitat along the railroad corridor, especially in the vegetation of the drainages and washes. Gnatcatchers were commonly observed in ironwood, smoke tree, and palo verde trees. Gnatcatchers were observed intermittently from the proposed Eagle Mountain landfill site to the saltbush scrub habitat south of Coachella Canal. All habitat could be utilized by gnatcatchers.

6) American Badger. One badger burrow was observed along the railroad south of I-10 (see Figure 8c).

7) Northern Harrier. The northern harrier (*Circus cyaneus*) is a California species of special concern. It ranges throughout California in grasslands, fields, and salt and freshwater marshes. This species utilizes a wide variety of habitats for foraging, and it nests on or near the ground in grassland, slough, marsh, and brushy habitats. Populations of northern harriers have declined since the 1940s due to habitat loss, drainage and rechannelization of wetlands, and grazing (Remsen 1979). Northern harriers are a resident in appropriate habitats in the vicinity of the project site (Woodward-Clyde n.d.) and would be expected to utilize the open desert habitat of flat and rolling terrain for winter foraging. One northern harrier was observed foraging over desert wash habitat north of I-10 (see Figure 8c).

8) Wildlife Species With the Potential for Occurrence. Yuma clapper rail (*Rallus longirostris yumaenesis*) is a federally endangered species, a CDFG threatened species, and a BLM sensitive species. It nests in marshes along the Colorado River and at the Salton Sea. Distributions vary yearly depending upon local water conditions (State of California 1980). Clapper rail habitat consists of freshwater marshes dominated by emergent vegetation, shallow water, and high ground for nesting areas. Primary food sources are crayfish, although they will feed on small fish, clams, and aquatic insects.

Surveys conducted by the BOR in 1988 (1989) revealed approximately eight Yuma clapper rails in March and six in April in the Salt Creek marsh area near Dos Palmas Ranch. Clapper rail habitat is shown in Figure 10.

No Yuma clapper rails were observed within 100 feet of the railroad bed during this survey. Clapper rails need over seven hectares of habitat to breed and forage (Eddleman 1989). They spend very little time outside of the nesting area. Because habitat along the railroad is much smaller than documented clapper rail habitat requirements, no clapper rails are expected to occur along the railroad corridor. Yuma clapper rails have been documented less than one mile from the railroad right-of-way (BOR 1989).

California black rail (*Laterallus jamaicensis coturniculus*) is a CDFG endangered species, a Category 1 candidate for federal listing, and a BLM sensitive species. This small, secretive bird lives in freshwater marshes and coastal marshes. This species has been reported from marshes in the Colorado River system and along the Coachella Canal (State of California 1980). A recent survey by the BOR (1989) reported black rails in the Salt Creek area north of the railroad and in similar habitat as the Yuma clapper rail.

No California black rails were observed during the survey. No habitat of appropriate size was found along the railroad corridor. Black rails are not known to travel very far from their breeding territories to forage or roost. Thus, no rails are expected to utilize the marsh vegetation along the railroad right-of-way.

Peregrine falcon may forage for waterfowl in the Salton Sea and Salt Creek area, and also use nearby cliffs for roosting and perching. No appropriate roosts or perches occur in the railroad corridor. Peregrine falcons have only been observed wintering in the area of the project site (Woodward-Clyde n.d.).

Gila woodpecker would be found only as a vagrant or migrating species in the habitat along the railroad corridor. It may utilize this habitat for foraging or roosting during migration.

Golden eagle foraging habitat has been identified by BLM along two stretches of the railroad (see Figure 10). No golden eagles were observed during the survey, but time spent along the railroad was too limited to have discerned the foraging use of the area by such a mobile species.

Prairie falcons and black-shouldered kites may use the habitat along the railroad corridor for foraging for small mammals. No appropriate nesting sites were found in the corridor.

No burrowing owls or their burrows were observed during the survey. Burrowing owls may nest in habitat adjacent to the railroad corridor and use the corridor for foraging for small mammals.

Three sensitive thrasher species could potentially occur in habitat along the railroad, including Bendire's thrasher, LeConte's thrasher, and Crissal thrasher. An unidentified thrasher call was heard during the survey and may belong to any of these three species. Thrashers may breed and forage in the denser vegetation of the washes that cross the railroad right-of-way.

Most of the sensitive bird species, if found in the area, would only use the railroad corridor for foraging. These species include black-tailed kite, Swainson's hawk, long-eared owl, and purple martin. As discussed above, Virginia's warbler, yellow warbler, and yellow-breasted chat would only be found in the railroad corridor during the spring and fall migration period.

c. Eagle Mountain Road Improvements, Road Extension, and Railroad Spur. No sensitive wildlife species were observed along the Eagle Mountain Road extension or rail spur corridors. A few signs of desert tortoise activity were found along the Eagle Mountain Road corridor (see Figure 9a).

Habitat in the Eagle Mountain Road corridor is generally made up of very open brush vegetation and pavement plains. Some of the habitat is very rocky, with a few drainages and one major wash crossing the corridor. Species potentially utilizing this habitat are few and include badger, black-tailed gnatcatcher, and the three sensitive thrasher species. Although much of this area is classified as Category 3 desert tortoise habitat, little sign of tortoise activity was found during the field survey. Other species potentially utilizing the site as foraging or wintering habitat include black-shouldered kite, golden eagle, prairie falcon, northern harrier, long-eared owl, and the migrant species described above.

d. Kaiser Steel Resources Properties and Proposed Open Space Parcel. These properties are very similar in the wildlife habitats found on them and probably support a similar diversity of species. The species described above in detail which would potentially occur on these parcels are American badger, burrowing owl, black-tailed gnatcatcher, and the three thrasher species.

Desert tortoises and their sign, including burrows, pallets, and scat, were observed in most areas of these parcels. In the parcel north of I-10, the habitat gradually changed from good tortoise habitat in the southwest to low potential tortoise habitat in the northeast. The two parcels directly south of I-10 also showed sign of a relatively dense population of tortoises. The parcels just north of Coachella Canal showed little sign of utilization by tortoises. Only one shell was observed and one burrow was seen in the berm along the railroad. No tortoise sign was observed in any of the three parcels south of the Coachella Canal.

Potential Nelson's bighorn sheep scat and tracks were observed in the parcels owned by Kaiser Steel Resources to be traded to BLM in Salt Creek wash. Nelson's bighorn sheep may also use some of the parcels just south of I-10, as part of their summer range or as a movement corridor. The quarter-section parcel south of the Coachella Canal (NE/4 Section 19) had sign of bighorn sheep.

Most of the significant bird species, if found in the area, would use the habitat in the parcels for foraging. These species include golden eagle, prairie falcon, northern harrier, black-tailed kite, Swainson's hawk, long-eared owl, and purple martin. As discussed above, Virginia's warbler, yellow warbler, purple martin, and yellow-breasted chat would be found during the spring and fall migration.

All parcels either supported black-tailed gnatcatchers or had high potential to do so. No other sensitive wildlife species were observed on these parcels.

V. EVALUATION OF IMPACTS

Impacts discussed in this section are based on the general engineering plans and operation procedures prepared to date. The current plan is a general level document; additional levels of detail will allow more specific analysis of potential impacts. Because the landfill will operate over a long period of time, additional impact analyses may be required. Implementation of the project plan would eventually result in use of approximately 1,150 acres of natural habitat within the Landfill Specific Plan Area. Along the corridors of both the Eagle Mountain railroad and the Eagle Mountain Road extension, and additional 1,260 acres may be subject to temporary disturbances or effects related to railroad and truck operations. This figure is the area of the entire 200-foot-wide corridors which were surveyed, and does not represent a quantitative determination of actual impacts. Table 6 summarizes these areas.

Impacts would occur to significant plant and wildlife species at the proposed Eagle Mountain landfill site, along the Eagle Mountain railroad right-of-way, and along the Eagle Mountain Road extension. No impacts will occur on the Kaiser Steel Resources properties to be offered to BLM, except indirect effects from railroad operations.

Impacts to desert habitat would occur with improvements and widening of the Eagle Mountain Road and its extension. The existing road will be widened by 20 feet which, with the proposed right-of-way would impact approximately 76.4 acres of desert habitat, while the construction of the road extension and railroad spur would have a right-of-way of 110 feet and impacts to 73.6 acres of desert habitat.

During maintenance and rehabilitation activities along the railroad, the storage of equipment and material, parking of vehicles and other staging activities would be confined to three existing staging areas at Ferrum, Summit, and Red Cloud. These sites are already disturbed; therefore, no additional habitat would be impacted.

A. REGULATORY ISSUES

Drainages within the Eagle Mountain Mine and along the railroad and Eagle Mountain Road come under the jurisdiction of the U.S. Army Corps of Engineers (USACE), since they qualify as "waters of the United States" under Section 404 of the Clean Water Act. The USACE is responsible for administering these regulations and the permit required is a 404 permit. As part of the permit process, the USACE may request that the USFWS and the Environmental Protection Agency provide input.

The CDFG has jurisdiction over the drainages and the Coachella Canal through Section 1600-1603 of the Fish and Game Code. Any diversion or alteration to major washes and drainages or impacts to wetland habitats would require an agreement with CDFG whose current policy is to allow no net loss of wetland habitat quantity or quality. Section 1600-1603 requires that an Agreement between the developer and CDFG be accomplished regarding the mitigation for

TABLE 6
SUMMARY OF AREAS SUBJECT TO POTENTIAL IMPACTS
FOR EAGLE MOUNTAIN LANDFILL PROJECT

Site	Approximate Natural Habitat (acres)	Miles
Eagle Mountain landfill		
Landfill perimeter	991	
Drainage channel	3	
Facilities*	154	
Total	1,148	
Eagle Mountain railline right-of-way		
Category 1	0	10
Category 3	0	18
Uncategorized	0	24
Total	0	52
Eagle Mountain Road, road extension, and rail spur (Category 3)#	150	13
TOTAL	1,298	

*Parking lots, staging facility, and railroad spur.

#BLM desert tortoise habitat areas; Category 1 most important.

habitat lost as part of the "Streambed Alteration." Typically, this involves the same or similar mitigation program proposed for the federal permit.

B. PLANTS

For each development area (Eagle Mountain landfill site, Eagle Mountain railroad right-of-way, Eagle Mountain Road and the Kaiser Steel Resources properties), a discussion outlining the impacts to sensitive plant species and their habitats is presented. An impact summary for the entire project is included in Table 7.

1. Proposed Eagle Mountain Landfill Site

Two main concentrations of Alverson's foxtail cactus occur at the proposed landfill site. One concentration occurs in the southern portion of the proposed storage area (165 acres; at least 80 plants) and one concentration occurs along the southwestern perimeter of the landfill footprint in the Eagle Creek Wash on the north side of the mine road (125 acres; at least 200 plants). The 125 acres of Alverson's foxtail cactus habitat within Eagle Creek Wash will be impacted by the landfill. Approximately 7.6 acres of habitat for this species in planning area 4 will be impacted by the Eagle Mountain Road Extension and Railroad spur. Both of these cactus concentrations occur primarily on public (selected) lands. These impacts are considered significant.

Measures to reduce localized significant impacts to the Alverson's foxtail cactus population at the proposed landfill site shall involve the preservation of a portion of the Alverson's foxtail cactus population and its habitat on the proposed landfill site in open space with a conservation easement. Approximately 157.4 acres of Alverson's foxtail cactus habitat in planning area 4 in the Specific Plan storage area will be preserved. Much of this conservation easement is on public (selected) lands.

Impacts are expected to occur to a portion of the population of California barrel cactus in the proposed landfill area. A large proportion of the individuals of this population would be contained in areas designated for open space. Impacts to this species are not considered to reach a level of significance requiring mitigation based on the relative magnitude of the losses from this project in relation to the overall distribution of the species.

Based on survey results and distributional data for other sensitive plant species with the potential for occurrence in the proposed Eagle Mountain landfill area, no significant impacts are anticipated.

2. Eagle Mountain Railroad Right-of-Way

Five plant species of concern were found within the 200-foot right-of-way corridor along the railroad: California barrel cactus, Alverson's foxtail cactus, Orocopia sage, unicorn-plant, and crucifixion thorn. Among these, only the Orocopia sage has the potential for significant impacts because the shrubs are concentrated in a small area. Large impacts are not expected to occur to this species since rehabilitation and maintenance activities along the railroad will not involve large disturbances. The potential for the loss of a few individuals growing immediately next to the railroad tracks and access road can

TABLE 7
SUMMARY OF IMPACTS TO SENSITIVE BIOLOGICAL RESOURCES
AND THEIR MITIGATION
AT THE PROPOSED EAGLE MOUNTAIN LANDFILL PROJECT

Species	Impacts	Impacted Habitat (acres) of Potential Habitat	Mitigation/Compensation
	LISTED SPECIES		
Desert pupfish	Loss of individuals and habitat, degraded habitat	<1	Monitoring program, emergency accident plan including biologist, construction design modifications
Desert tortoise	Loss of habitat and potential loss of individuals, potential increased raven predation, potential reduction in gene flow and population fragmentation	150	Preoperation surveys and relocation, raven control plan, railroad and roadway barriers and culverts, employee education, off-site preservation of 375 acres of Category 1 tortoise habitat, monitoring programs
Peregrine falcon	Not significant		
Swainson's hawk	Not significant		
Yuma clapper rail	Not significant		
California black rail	Not significant		
Gila woodpecker	Not significant		
Eagle Mtn. scrub jay	Small potential for increased raven predation upon jay eggs and young from a landfill-caused increase in the regional raven population	371	Raven monitoring and control program

TABLE 7
SUMMARY OF IMPACTS TO SENSITIVE BIOLOGICAL RESOURCES
AND THEIR MITIGATION
AT THE PROPOSED EAGLE MOUNTAIN LANDFILL PROJECT
(continued)

Species	Impacts	Impacted Habitat (acres) of Potential Habitat	Mitigation/Compensation
	OTHER SENSITIVE SPECIES		
Alverson's foxtail cactus	Loss of many individuals at proposed landfill site	158.3	Transplant program designed to relocate individual cactus to areas to be rehabilitated at the proposed landfill site.
California barrel cactus	Not significant		
Orocopia sage	Not significant, potential for small losses of individuals		Avoidance, minimize unavoidable impacts by restricting maintenance activities in areas supporting Orocopia sage populations.
Crucifixion thorn	Not significant		
Unicorn-plant	Not significant		
Flat-tailed horned lizard	Not significant		
Bat species*	Potential loss of roosting areas, hibernacula, water sources		Preservation of adit opening
American badger	Not significant		

TABLE 7
SUMMARY OF IMPACTS TO SENSITIVE BIOLOGICAL RESOURCES
AND THEIR MITIGATION
AT THE PROPOSED EAGLE MOUNTAIN LANDFILL PROJECT
(continued)

Species	Impacts	Impacted Habitat (acres) of Potential Habitat	Mitigation/Compensation
Nelson's bighorn sheep	Loss of four water sources, loss of habitat stress from landfill operations	994	Create and enhance off-site water sources, telemetry monitoring study, preservation of 644 acres of habitat on-site, firearm restrictions
Black-shouldered kite	Not significant		
Golden eagle	Not significant		
Prairie falcon	Not significant		
Northern harrier	Not significant		
Burrowing owl	Not significant		
Long-eared owl	Not significant		
Black-tailed gnatcatcher	Not significant, habitat is abundant in the project vicinity	994	
LeConte's thrasher	Not significant, habitat is abundant in the project vicinity	994	
Other birds*	Not significant		

*See text for description of species.

probably be avoided. Unavoidable impacts to this species at this level of disturbance would not be considered a significant impact. The other four sensitive species present in the survey corridor occur as widely scattered individuals along the railway. Losses to Alverson's foxtail cactus, California barrel cactus, unicorn-plant, and crucifixion thorn along the railroad would be minimal and not significant. However, the small losses of Alverson's foxtail cactus along the railway would contribute to the cumulative loss of this species over the entire project.

3. Eagle Mountain Road Improvements, Road Extension, and Railroad Spur

Widening the existing Eagle Mountain Road by 20 feet, in conjunction with the new right-of-way totaling 110 feet, will cause the loss of approximately 76.4 acres of desert habitat. Impacts caused by this improvement of the existing Eagle Mountain Road will not significantly impact any local populations of plant species of concern, however, the potential loss of low numbers of Alverson's foxtail cactus would contribute to the cumulative loss of this cactus throughout the entire project.

The proposed 110-foot-wide right-of-way for the proposed extension of Eagle Mountain Road and the accompanying railroad spur would impact a total of 25.7 acres of Alverson's foxtail cactus and California barrel cactus habitat in addition to the impacts from these improvements on habitat for these cactus mentioned under the Eagle Mountain Mine site above. This loss of Alverson's foxtail cactus habitat would be considered significant. No significant impacts are anticipated to other plant species of concern with the potential for occurrence within the road extension/railroad spur corridor.

4. Kaiser Steel Resources Properties (Offered Lands)

No anticipated impacts to plant species of concern will occur on the Kaiser Steel Resources properties to be traded to the BLM.

C. WILDLIFE

This section describes impacts to wildlife species of special concern at the proposed Eagle Mountain landfill site (both private and selected lands), the Eagle Mountain railroad right-of-way, and the Eagle Mountain Road, road extension, and rail spur. Table 7 provides a summary of impacts to sensitive wildlife species.

1. Proposed Eagle Mountain Landfill Site

a. Desert Tortoise. The landfill does not extend into desert tortoise habitat; thus, no direct construction impacts to desert tortoise habitat will occur in the landfill site area.

Indirect impacts to any tortoises in the vicinity of the Eagle Mountain landfill site, and to the Chuckwalla Valley tortoise population, could occur from raven predation upon juvenile tortoises. Landfills attract ravens because of the easily obtained food source and ravens have been observed traveling up to 30 miles from nesting territories to landfills. The additional food source from landfills does not discourage predation upon juvenile tortoises near the landfill and near the raven's territories. Additional food sources increase the size and number of raven clutches and the successful fledging of birds, thus, increasing the local raven population. A potential increase in the local raven population, coupled with the movement of ravens into habitat near the landfill, could result in increased tortoise losses from predation.

Joshua Tree National Monument currently has no raven control policy or program. However, recent surveys do not indicate that the desert tortoise and raven populations are out of natural balance in the monument (Moon, pers. comm., 1990). The park recently initiated a raven monitoring program, and they are developing a desert tortoise management plan. This plan would include raven predation monitoring, tortoise studies, raven nesting studies, raven counts, and number of tortoises found under nests (Moon, pers. comm., 1990).

b. Nelson's Bighorn Sheep. An impact to the bighorn sheep population in the Eagle Mountains is the removal of one permanent water source (the pond at the bottom of the east pit), the potential loss of two other permanent water sources (the two leaking water tanks on the south-central portion of the property), and the loss of one temporary water source (at the northeast corner of the mine) within the project boundary. All of these water sources are on private lands. The CDFG (U.S. Department of the Interior 1986) found only seven watering sources for bighorn sheep in the Eagle Mountains, thus making the loss of any watering source a severe reduction. Sheep range is limited by the lack of accessible water sources during the dry summer months.

Additional impacts to bighorn sheep will occur with the loss of approximately 994 acres of previously undisturbed natural land, which is appropriate habitat for sheep. Most of this habitat is on public (selected) lands. This habitat is considered prime sheep range (Weaver, pers. comm., 1990; Armentrout, pers. comm., 1990). Loss of habitat, along with waterhole removal, would force the population of sheep to utilize a smaller area, thus creating more stressful conditions and potentially impacting the health of the sheep. Stress predisposes sheep to diseases, and the loss of habitat restricts sheep to smaller areas, thus leading to a greater probability of spreading disease.

A few sheep bedding areas on public (selected) lands will be impacted because they are located within the perimeter of the landfill. Evidence suggests bighorn sheep beds may be used year after year and may be a limiting factor for sheep in an area (Hansen 1980).

Indirect impacts to sheep may occur if the landfill operation causes sheep to alter their use patterns in the habitat surrounding the landfill. Even though sheep are known to habituate to human activity, impacts may occur if sheep perceive landfill activities as harmful and avoid using habitat in the vicinity of the landfill. Although bighorn may remain in areas exposed to human disturbances, the degree of true habituation is not known. These sheep are creatures of habit and will continue to use important resource areas despite disturbance. It is likely that, despite the continued presence of bighorn in impacted areas, they would be under some degree of stress which could affect their susceptibility to disease and their reproductive success (Armentrout, pers. comm., 1990).

Use patterns in the currently disturbed portions of the landfill site will also be altered. Sheep currently cross through disturbed areas

(1,700 acres) as they move within their ranges, and to and from watering holes. Bighorn sheep will move out of the way of intensive landfill operations as they did during mining operations. As the landfill moves from one area of the mine pit to another, the sheep will likely move, utilizing new routes, as they must have done as mining moved to new ore deposits. Indirect impacts due to stress are likely to occur to sheep that use these disturbed portions of the landfill project.

Indirect impacts to sheep may occur with increased residential uses from the addition of over 150 employees to the vicinity of the project. Increased human activity and domestic pets are known to harass or stress sheep (Armentrout, pers. comm., 1990). Poaching could also increase due to the increased number of people in the area. If employees raise domestic livestock, impacts could occur to sheep by exposing them to livestock-related diseases (Armentrout, pers. comm., 1990). Bighorn sheep will move over 17 miles to investigate domestic sheep (Weaver, pers. comm., 1990), thus possibly exposing bighorn sheep to disease.

c. Black-Tailed Gnatcatcher. The implementation of the project would impact black-tailed gnatcatchers by the removal of nests, potential nesting sites, and foraging habitat. Approximately 994 acres of habitat, mostly on public (selected) lands, would be lost at the Eagle Mountain landfill site. The gnatcatcher uses vegetation in ravines, drainages, and washes found in the mountainous and flat areas of the site. Approximately 644 acres of potential habitat at the landfill site would remain in open space (Figure 14). Because of the abundance of habitat in the vicinity of the landfill site, impacts are not expected to be significant.

d. Raptors. Sensitive resident raptors, including the golden eagle, prairie falcon, long-eared owl, and burrowing owl, potentially use habitat on the site, but would not be significantly impacted. Since only two perching or roosting sites were observed on the site, losses would occur only to a small portion of their foraging habitat, which virtually encompasses the entire desert region. Both residents and migrants could forage over undisturbed desert nearby.

e. Bat Species. Significant impacts would occur to the California leaf-nosed bat at the Eagle Mountain landfill site. This species roosts in the large adit in an area that would be filled in approximately 35 years. The loss of the pond at the bottom of the east pit will not significantly affect this species since the town-site reservoir will continue to provide water. No significant impacts to bats are expected on public (selected) lands.

f. Birds. A small potential exists for a landfill-caused increase in the regional raven population to impact the Eagle Mountain scrub jay. Ravens may prey upon the eggs and young of scrub jays (Hays, pers. comm., 1991). Impacts to the jay from increased raven depredation would be considered significant.

None of the other sensitive resident birds considered to potentially occur on the site would be significantly impacted by the implementation of the project.

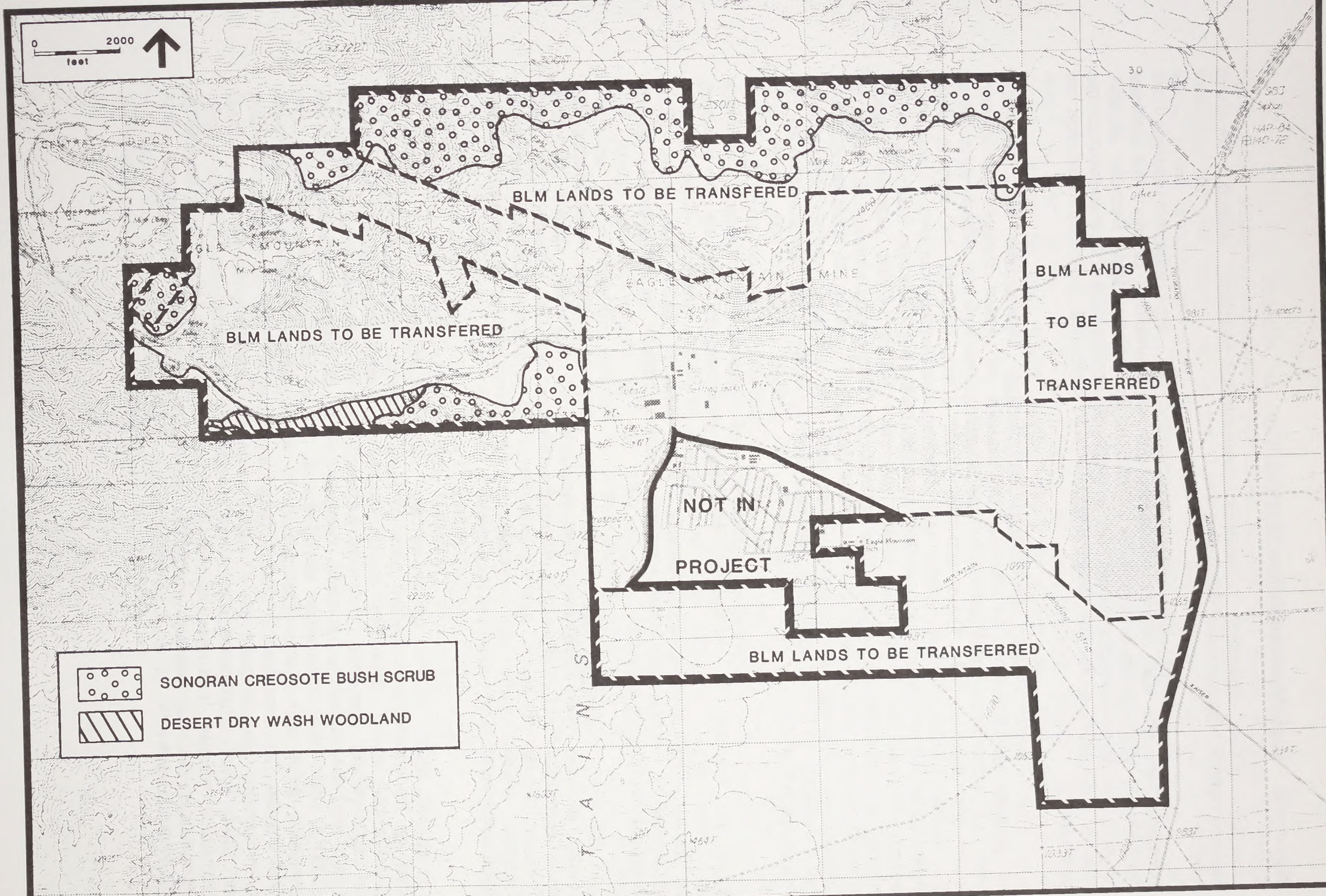

FIGURE 14. PROPOSED NATURAL OPEN SPACE ON THE EAGLE MOUNTAIN LANDFILL PROJECT SITE

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2. Eagle Mountain Railroad Right-of-Way

The following discussion describes potential impacts for the railroad right-of-way portion of the project.

a. Desert Tortoise. Implementation of the project involves the reintroduction of rail service. Desert tortoises currently occupy the habitat immediately adjacent to and sometimes within the railroad bed. Because of this, impacts to desert tortoises could occur with the resumption of maintenance and regular rail service. It has been seven years since the rail line was last in operation.

1) Track Maintenance and Repair. Maintenance and restoration to prepare the rail line for service will consist of minor repairs and replacement of segments of rail and ties, and cleaning out culverts which pass water under the railroad bed. These activities could affect tortoises by burying them in burrows within the rail bed, and burying unoccupied burrows. Unoccupied burrows are an important resource for tortoises because they move from burrow to burrow and use the burrows to escape inclement weather. These potential impacts would be temporary and would occur periodically along approximately 10 miles of railroad through BLM Category 1 tortoise habitat, 18 miles of Category 3, and 24 miles of uncategorized habitat. Monitoring of tortoise burrows within the rail corridor will be necessary before, during, and after repair activities to assess actual impacts.

During rehabilitation and routine maintenance activities along the railroad, the storage of equipment and material, parking of vehicles, and other staging activities will be confined to three currently disturbed sites at Ferrum, Red Cloud, and Summit. Total area of these three sites totals approximately five acres. No current tortoise habitat is anticipated to be impacted from staging activities.

2) Train-kills. Some tortoises may be hit by trains during the course of rail line operations. The frequency of train-kills cannot be accurately determined at this time. Although tortoise sign was observed in small amounts on the tracks, it appears that the berm and tracks form a barrier to tortoises which, while not completely preventing crossover travel, reduces significantly tortoise movements in these areas.

3) Noise. No scientific research has been conducted on the impacts of noise on the desert tortoise. Therefore, some educated assumptions need to be made in evaluating this potential impact. Peterson (1966) conducted a study on hearing capacities in 13 species of lizards, representing 7 families. His conclusions were that the reptilian ear was, in general, less sensitive to sounds and responded to a much narrower range of sound frequencies (400 to 3,000 Hz) than the mammalian ear. Because of its slightly more primitive ear, the wood turtle was found (Peterson 1966) to be even less sensitive to sound than lizards and sensitive to lower frequency sounds (500 to 1,000 Hz). The desert tortoise may respond in a similar manner. However, Peterson also found that those lizards that were more vocal tended to be more sensitive to sounds. The desert tortoise is known to use a variety of vocalizations (Patterson 1976), but whether this has resulted in greater sensitivity to sounds compared to other reptiles is not known.

Bondello et al. (1979) found that the Mojave fringe-toed lizard (*Uma scoparia*) experienced permanent hearing loss when exposed to sound levels of 100 dBL (95 dBA) for a cumulative time of 500 seconds. The maximum sensitivity of this species is in the 1,000 to 1,600 Hz range (Werner 1972). These sound intensity and frequency ranges are assumed to be typical for desert-dwelling lizards. Bondello and Brattstrom (1979) concluded that because of naturally low sound levels and sound attenuation in the hot dry air of desert habitats, desert lizard species were likely to have evolved acute senses of hearing. However, much of the importance of hearing involves prey acquisition and predator avoidance. Neither of these factors is likely as important to the desert tortoise as it is to carnivorous or insectivorous lizards. Herbivorous desert tortoises do not require acute hearing to forage for food, and predator avoidance does not involve a speedy escape, as it does in most lizards, but retreat into a shell. Also, the number of potential predators upon tortoises is considerably smaller than for lizards, except possibly for juvenile tortoises.

Detailed sound sensitivity curves have been determined for three species of tortoises, *Testudo horsfieldi*, *Geochelone carbonaria*, and *Kinixys belliana* (Wever 1978). *T. horsfieldi* was found to have excellent sensitivity in the range from 100-800 Hz and 60 dB. The sensitivity is at 20 dB or better all the way from 50 to 1500 Hz, with a range of 5 octaves. For a tortoise this is a proficient ear, but is poor compared to other vertebrates. For *G. carbonaria* the sensitivity is only fair, with the best frequency range being 80 to 400 Hz. The findings for *K. belliana* were similar to those above, and demonstrate an ear of average to good ability for frequencies of 30 to 600 Hz. In summary, the turtle/tortoise ear is well developed and sensitivity is good, but only in the low frequency range of 100 to 700 Hz.

Trains generate a wide range of sound frequencies caused by the movement of metal wheels over the metal rails, and by the impact of wheels with joints between lengths of rail. The range of sound frequencies expected from the Eagle Mountain railroad is within the 80 to 2,000 Hz range. Turtles and tortoises are sensitive to only a narrow range of frequencies (100-700 Hz) within the sound spectrum created by a passing train. Very low frequency ground vibrations (2-10 Hz) created by the impact of train wheels with rail joints are below the level of sensitivity of the tortoise's ear. These vibrations may be transmitted through the body of the tortoise and may be "heard" indirectly. However, measurements of electrical potentials on the auditory nerve after vibrations were introduced to a turtle's leg showed no response (Wever 1978).

Train noise levels were measured on two separate occasions and at two locations at a distance of 50 feet from Southern Pacific railroad tracks. On May 3, 1990, train noise measurements were taken along tracks in the Whitewater Preserve (for the Coachella Valley fringe-toed lizard), with a recorded maximum dBA of 95. In February of 1990, noise measurements were also taken adjacent to tracks at Corvina Beach, with a recorded peak noise level of 73.7 dBA. The expected noise level of passing trains along the Eagle Mountain railroad will likely fall within this 74 to 95 dBA range at a distance of 50 feet. The train length for each train trip is expected to be approximately 4,000 feet. If a speed of 30 to 40 miles per hour (mph) is anticipated, then maximum noise levels will last 55 to 73 seconds each train trip. With tortoises being inactive for the majority of the 24-hour day, it seems highly unlikely that they will experiencc cumulative noise impacts close to 500 seconds per day, the level of possible permanent hearing loss.

Several tortoise behavior patterns and physiological characteristics would likely help reduce potential noise impacts to tortoises. First, as mentioned previously, tortoises are likely not as sensitive to sounds as other reptiles or humans. Second, tortoises spend much of their time underground, which would greatly reduce the intensities of sound to which they would be exposed. When they are active they tend to be above ground in early mornings and late afternoons and inactive during the hottest portions of the day, at least in summer. Finally, tortoises spend November through February in an inactive state in their burrows and not exposed to significant train noise.

The anatomy and electrophysiology of the tortoise ear, plus tortoise behavior, strongly suggest that the tortoise's auditory sensitivity is confined to a very narrow frequency range and that is has no significant vocalizations or auditory-related behaviors. Little evidence exists to indicate that sound is an important feature in its natural history.

In an attempt to directly answer the question as to whether the desert tortoise is hindered or exluded from utilizing potential habitat along active rail lines, several surveys were conducted along active rail lines, some with traffic levels equal or greater than those planned for the Eagle Mountain rail line leading to the Eagle Mountain landfill site. All rail lines selected for survey were sufficiently removed from highways and roads to preclude their influence on the tortoise populations near the rail lines. On an initial reconnaissance survey in the vicinity of Mojave, California (February 6, 1991), two train rights-of-way were examined for tortoise activity. A 2.5-mile length of the Southern Pacific Railroad tracks between Mojave and Searles was walked, with all tortoise sign recorded up to 100 feet from both sides of the tracks. The surrounding tortoise habitat was of very high quality (Marlow, pers. comm., 1991). The train traffic on this rail line averages 2 trains per day (Waters, pers. comm., 1991). A total of 22 burrows/pallets were recorded along this 2.5-mile transect, with 19 of these being judged active within the past year. Eighteen of the 22 sign records were 40 to 60 feet from the tracks. This distance corresponded to the location of a large dirt berm north of the tracks placed for drainage control.

The second rail line examined was the Atchison Topeka and Santa Fe line between Mojave and Barstow, California. Within a one mile section of this track 11 tortoise burrows, 7 judged recently active, were found in the south face of the 8- to 10-foot tall berm supporting the railroad tracks. This track averages 20 trains per day (Waters, pers. comm., 1991). The surrounding habitat was relatively poor in quality for desert tortoise, with little creosote bush present.

In order to compare desert tortoise activity along an active rail line versus similar habitat away from the effects of the rail line, a set of tortoise burrow transects was run in the eastern Mojave Desert (March 2-3, 1991). The transects were set up along 6 miles of the Union Pacific Railroad tracks running from Barstow to Las Vegas, Nevada. The specific site was between the California-Nevada border and Nipton, California. This rail line averages 20 trains per day (Waters, pers. comm., 1991). All burrows within 30 feet of the tracks were recorded, and their conditions categorized. Burrows were placed in one of four possible categories: (1) Active - evidence of recent use (fresh tracks or scats; (2) Recently Active - no plant growth in the mouth of the burrow, no significant drifting of sand into the burrow mouth, or the presence of windblown trash; (3) Inactive - the presence of plant growth, sand, trash, or spider webs in the burrow mouth; and (4) Deteriorated - significant filling of burrow mouth with sand or collapse of burrow roof. A parallel 30-foot by 6-mile transect was run 0.25 mile west of the rail line in similar habitat. Habitat was creosote bush scrub. Figure 15 shows the results of the survey. A total of 20 tortoise burrows was found along the tracks, most within the track berm, while only 8 burrows were observed along the parallel transect away from the tracks. No active burrows were found due to the time of year of the survey. Tortoises had not yet emerged from their winter dormancy period.

The results of these surveys indicate that the desert tortoise is not excluded from utilizing habitat adjacent to active rail lines. The Eagle Mountain rail line is planned to carry a maximum of 12 train passages per day, well below the traffic levels on the surveyed rail lines discussed above. Circumstantial evidence strongly suggests that noise impacts to tortoises from train activity is not significant. Preliminary evidence suggests that railroad track berms may actually be an attractant to local tortoises because of the good burrowing substrate they provide (e.g., loose soil and vertical digging surface). Increased water runoff along the berm may also support more tortoise forage plants, although this is speculation. In conclusion, no significant noise-related impacts to the desert tortoise are expected from reactivation of the Eagle Mountain railroad.

4) Vibration. Within the Eagle Mountain railroad right-of-way the vibration from passing trains has the possibility of causing the collapse of tortoise burrows. It seems likely that buried tortoises could extricate themselves from most collapsed burrows since they are good diggers. Burrows most likely to collapse from vibration are those that are shallowest, making extrication easier. However, the results of the tortoise burrow survey presented in Figure 15 do not show a higher proportion of deteriorated (i.e., collapsed) burrows in the railroad track berm than in the areas removed from the effects of train-generated vibration. As is the case with noise impacts, there is strong evidence that train-related ground vibrations are not significantly impacting desert tortoises, or excluding them from using habitat along the tracks.

5) Tortoise Population Fragmentation. The reactivation of the railroad is likely to act as a barrier to east-west/west-east tortoise movements. Cross-track movements could be halted or hindered by tortoise deaths from train-kills. Any artificial barrier, such as some form of tortoise-proof fencing, that is installed along the railroad track to prevent tortoises from getting onto the track could aggravate this problem further. A physical barrier could potentially result in significant impacts to the two subpopulations of tortoises west of the tracks, one subpopulation south of I-10 (inhabiting 35,000 acres) and one north of I-10 (inhabiting 42,000 acres). A population viability analysis on the desert tortoise done by Gilpin (1990) in conjunction with the Desert Tortoise Short-Term Habitat Conservation Plan for Las Vegas, Nevada, strongly indicated that a minimum viable population of tortoises requires a population of 20,000 tortoises. At a density of 100 tortoises per square mile, it would be necessary to preserve intact 128,000 acres of contiguous habitat to sustain a viable tortoise population long-term (i.e., 500 years). If the subpopulations west of the Eagle Mountain rail line are permanently isolated and their long-term viability seriously threatened, their loss would be a significant impact. It is believed that population fragmentation could be a potentially serious threat to the desert tortoise.

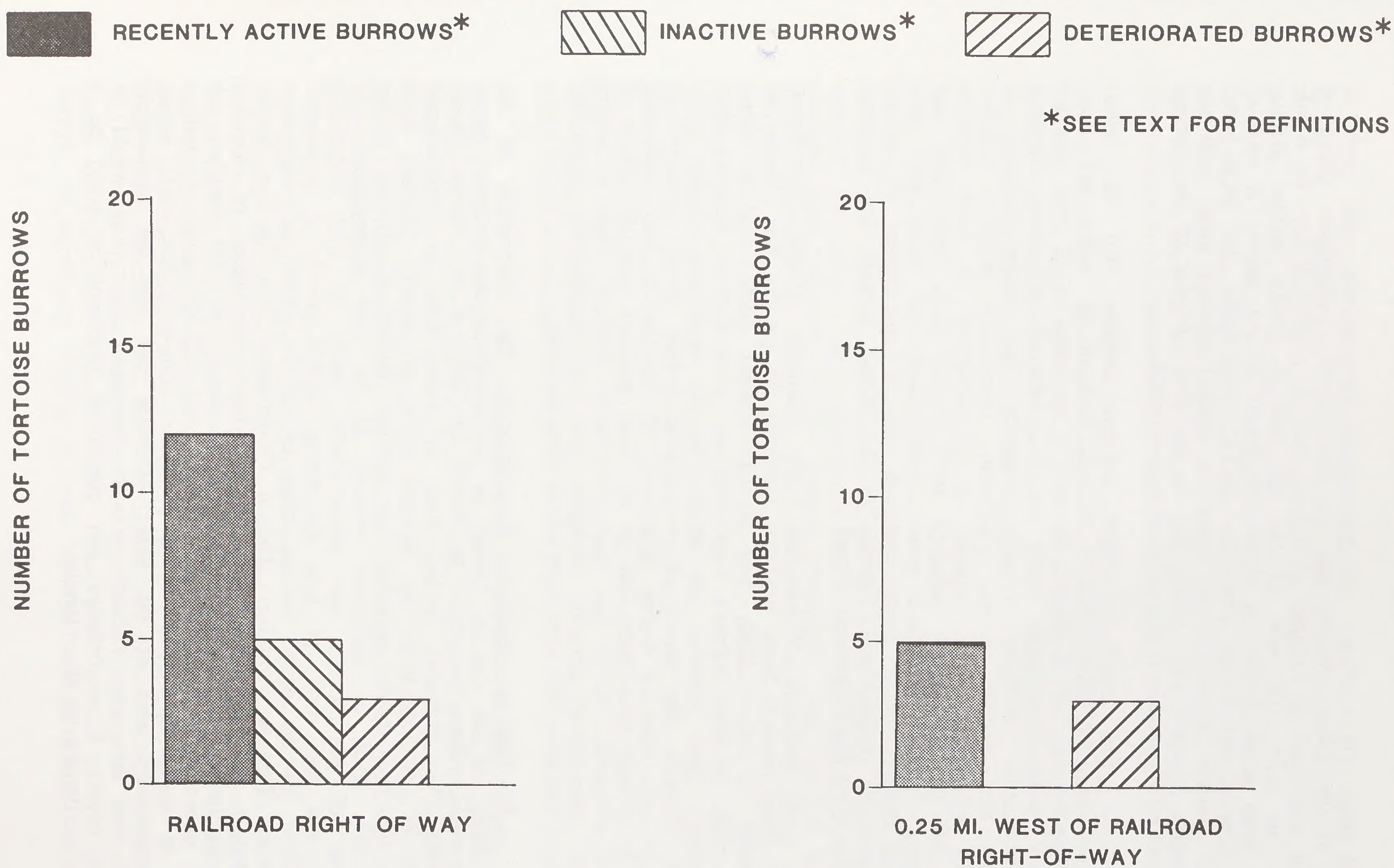

FIGURE 15. COMPARISON OF NUMBER OF DESERT TORTOISE BURROWS ALONG SIX MILES OF UNION PACIFIC RAILROAD WITHIN THE RIGHT-OF-WAY AND APPROXIMATELY 0.25 MILES FROM THE RIGHT-OF-WAY (AVERAGE OF 20 TRAINS PER DAY)

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b. Desert Pupfish. Pupfish were observed in Salt Creek tributary in 1982 (Nicol, pers. comm., 1989), a time near the end of several decades of train operations. Although earlier surveys were not intended to specifically assess the effect of the rail operations on the pupfish habitat, it is apparent that the pupfish population continued within the streambed immediately under the railroad trestle for some time. The frequency and length of trains anticipated with the proposed landfill are approximately the same as in the former mining operation. Therefore, few changes are anticipated in the overall quality of the habitat.

Because trash will be fully contained in closed containers and specially designed railcars, no trash will escape during train travel and no impacts are expected to occur to pupfish or their habitat from solid waste discharges during regular use of the railroad. However, direct and uncontrollable impacts may occur to pupfish if there is an accident along the trestle during rail operations. Furthermore, it should be expected that sometime during the 100-year life of the project maintenance or reconstruction of the trestle will become necessary. Major construction activities in the immediate area of pupfish habitat could have a significant impact. Direct kills of fish could occur if they are using habitat under the trestle at that time and if the water and substrate quality were adversely affected by construction. During the fall when water levels are lowest in the Salt Creek system, pupfish populations drop to about 100 individuals. Pupfish losses during this period could be even more critical than at other times of the year.

c. Yuma Clapper Rail. No impacts are anticipated to Yuma clapper rails or their habitat. This species is known to occur within one mile of the rail line, but no appropriate habitat exists within the 200-foot survey corridor for the railroad.

d. California Black Rail. No impacts are anticipated to occur to California black rails. This species occurs in the same general habitat as the Yuma clapper rail and no appropriate habitat exists within the railroad corridor.

e. Nelson's Bighorn Sheep. No impacts are expected to occur to Nelson's bighorn sheep with reimplementation of railroad service. The habitat is not prime sheep range and is a long, narrow strip. Only one case of rail death has been observed in California (Armentrout, pers. comm., 1990; Bleich, pers. comm., 1990) and, therefore, sheep are not expected to be directly injured or killed by moving trains. A significant impact may occur if sheep movement between ranges is disrupted by regular rail operation. Sheep populations in the Chocolate and Orocopia Mountains could be affected by restricted gene flow if the sheep refuse to cross the rail line. No evidence exists to indicate the sheep did not cross the railroad during previous operations and at least one deer trail was observed crossing over the tracks. This incidental evidence suggests that sheep will continue to move over the tracks after reintroduction of rail operations.

f. Flat-Tailed Horned Lizard. Reintroduction of railroad service may affect flat-tailed horned lizards residing within the railroad right-of-way during track maintenance activities. Any impacts to habitat would be small in scale and short-term. The horned lizard may avoid habitat near the railroad due to noise and vibration from passing trains. However, horned lizards use olfactory and visual clues for inter- and intraspecific communication (Tollestrup 1981), which would probably not be as disturbed by train noise as auditory signals could be in other species. Given the general lack of horned lizard habitat in the area these potential impacts would not be significant.

g. American Badger and Burrowing Owl. Implementation of the railroad may affect badgers and burrowing owls if their burrows are destroyed during maintenance. Though no burrowing owls were observed during the survey, they may move into the area during the lifetime of the project. Burrowing owls are especially vulnerable to burrow destruction because they use their burrows for nests as well as roosting sites. Both of these species are quite mobile and would be able to make use of the abundant habitat adjacent to the rail corridor. Impacts to these two species would not be significant.

h. Birds. Vegetation along the railroad provides nesting habitat for small resident birds, including black-tailed gnatcatcher, Bendire's thrasher, LeConte's thrasher, and Crissal thrasher. These species would move into the good-quality habitat surrounding the railroad, and not be significantly impacted.

3. Eagle Mountain Road Improvements, Road Extension, and Railroad Spur

a. Desert Tortoise. Significant impacts to desert tortoise habitat will occur with improvements and widening of the Eagle Mountain Road, and with the building of the extension of Eagle Mountain Road and the rail spur. Eagle Mountain Road will be widened from its current width of 20 feet to 40 feet, within a 110-foot-wide right-of-way. These road improvements will be carried out over a 7-mile length of the right-of-way, from I-10 north. Assuming a worst-case scenario, where the entire right-of-way is disturbed, 76.4 acres of Category 3 tortoise habitat would be lost.

The Eagle Mountain Road extension and rail spur are a continuation of the Eagle Mountain Road 110-foot-wide right-of-way. The proposed 40-foot-wide road extension follows a current 15-foot-wide dirt road for 3.5 miles, and creates a totally new road for 2.5 miles, where it ends at the Phase II handling yard. The new rail spur is also within this proposed 110-foot right-of-way for its final 2.5 miles. Again, assuming that the entire 110-foot right-of-way will be disturbed, a total of 73.6 acres of tortoise habitat would be lost. Therefore, for all road improvements, and road and rail construction, a total of 150 acres of Category 3 desert tortoise habitat would be permanently removed by the project (see Table 6), along with any tortoises residing in this habitat. Although this portion of the project is classified by the BLM as Category 3 desert tortoise habitat, little tortoise sign was seen during the most recent field surveys. The loss of 150 acres of habitat represents a worst-case scenario that assumes that the entire 110-foot-wide right-of-way will be disturbed. Actual impacts are likely to be less.

The projected 12- to 16-hour per day truck traffic along this road would have a significant impact upon the tortoises in the immediate vicinity of the road due to tortoise deaths from road kills. Nicholson (1978) found that on average tortoise density was reduced up to 800 meters from major roadways because of the road kill effect.

An increase in road traffic would cause an increase not only in tortoise road kills, but in the deaths of other wildlife species attempting to cross the road. This has the potential to increase the number of potential tortoise predators, especially the raven, which scavenges road kills. If the number of ravens increases, this could have a significant impact upon the local tortoise population because of the large number of juvenile tortoises ravens may take in the course of foraging for food.

As discussed under the topic of the Eagle Mountain rail line, high traffic flow along the road may act as a barrier to tortoise movement, thus causing population fragmentation and possible extinction of local subpopulations, a significant impact.

b. Nelson's Bighorn Sheep. No significant impacts are expected to occur to Nelson's bighorn sheep due to the implementation of Eagle Mountain Road portion of the project. Bighorn sheep and their sign were not observed along the Eagle Mountain Road corridor during the field surveys. In addition, no movement corridors have been identified for this species in the past in this area. Habitat along Eagle Mountain Road is very sparse, in many places made up of desert pavement, and is not considered good range for bighorn sheep.

c. Other Species of Special Concern. No other species of concern were observed or are expected to occur in the Eagle Mountain Road corridor. No significant impacts are anticipated in the area.

4. Kaiser Steel Resources Properties (Offered Lands)

No significant impacts are anticipated on the Kaiser Steel Resources properties to be traded to the BLM, except possibly indirect impacts (e.g., noise) to the desert tortoise from train operations.

VI. MITIGATION AND COMPENSATION MEASURES

An integral component of the Eagle Mountain Mine landfill project is the commitment to prepare and implement a comprehensive mitigation plan for the entire project. The mitigation plan shall establish the policies and programs for the implementation of a long-term management program for biological resources. The mitigation plan shall be reviewed and updated periodically (for example, every 10 years) to meet changing environmental laws and changes in the status of species. The mitigation plan shall be prepared with the cooperation and approval of USFWS, CDFG, and BLM. This section provides recommendations for mitigation measures which should be incorporated into the mitigation plan. A summary of these measures is provided in Table 7.

As required under Section 7 of the Endangered Species Act (1972) a formal consultation is required between the BLM and the USFWS to assess and mitigate impacts to federally listed threatened and endangered species. The mitigation plan proposed in this EIS will conform to the mitigation outlined in the Biological Assessment for the Eagle Mountain Mine Landfill Project currently being developed.

Mitigation measures will be monitored for implementation and effectiveness. Results of studies and monitoring will be used to modify the mitigation measures to reach the goals of the mitigation plan. Monitoring is consistent with BLM policy to implement monitoring activities that manage renewable resources for long-term viability, assist in evaluation of cumulative impacts to those resources, and evaluate compliance with stipulations contained in BLM decision documents (BLM 1988).

A. GENERAL PROJECT

Mitigation will include measures to avoid impacting natural habitat in the project boundaries. These measures can include placing staging areas for maintenance construction in areas that shall not impact sensitive species or their habitat, discouraging dumping of trash, and preventing off-road-vehicle use and other habitat-disturbing activities.

A worker education program, including on-site workers and contracted truck drivers, will begin before implementation of the landfill operation. The program will emphasize the legal protections afforded sensitive species and measures to minimize impacts to those species and their habitats. The program will include a handbook outlining the details of the protections and measures to be followed. The handbook can include agency addresses and telephone numbers to be used in the case of federally listed species involvement.

During the life of the 115-year project, all new construction, new maintenance construction, and activities that may potentially impact sensitive species will undergo environmental review by a qualified biologist and the appropriate public and private agencies.

B. SITE SPECIFIC

1. Proposed Eagle Mountain Landfill Site

a. Alverson's Foxtail Cactus. Impacts to Alverson's foxtail cactus and its habitat shall be mitigated by initiating a transplant program that will be conducted on suitable areas within the project boundary. This program shall be funded by the project proponent as a sponsored research program that will provide needed information on the rehabilitation of desert habitat using cactus transplants. The transplant program will involve the following steps:

1) Transplant trials shall be conducted on the following areas within the proposed land fill site to determine which areas are most suitable for the establishment of Alverson's foxtail cactus:

   a) Areas of Eagle Creek south of the mining road in locations where minor disturbance has occurred. This site is a portion of Special Planning Area 6 of the Eagle Mountain Landfill Specific Plan.

   b) Locations in lowlands adjacent to drainages on the northwest portion of Special Planning Area 6 where minor disturbances have occurred.

   c) Locations near the foothills of the Eagle Mountains on the upper Bajada area on the northeast portion of Special Planning Area 6.

d) Locations within Special Planning Area 4 where minor disturbances have occurred.

2) Prior to any transplants being taken from their original habitat, the natural density of the population (number of plants/acre) shall be estimated. Estimates of density can be made by counting the number of Alverson's foxtail cactus observed in quadrats along transects across the population. The resulting density figure will be used in the second stage of the transplant program.

3) The initial transplant trials shall utilize 10-15 percent of the Alverson's foxtail cactus population to be impacted by the proposed landfill in Eagle Creek to the north of the mining road. A proportion of the salvaged individuals will be transplanted to each trial habitat area.

4) The transplanted Alverson's foxtail cactus used for the initial trials shall be monitored once a month for one growing season (including a summer). After the trial period is complete, the location(s) having the greatest survivorship will become the site(s) for the completion of the transplant program.

5) Transplanting of Alverson's foxtail cactus, either for the initial planting trials or for the main transplanting effort, shall occur at the most appropriate time of year (late winter/early spring) to take advantage of the rainy season and to increase survivorship of the transplanted material.

6) Sites selected for the main transplant effort shall be planted with the remaining individuals of Alverson's foxtail cactus salvaged from the impact areas of the proposed landfill project at a density similar to that estimated for the natural population (see No. 2 above).

7) The final mitigation areas shall be monitored once a month for one growing season (including a summer) to measure survivorship of the cacti and determine the degree of success of the transplant program.

8) A final report summarizing the results of the transplant program shall be prepared by the project proponent and submitted to BLM, CDFG, and USFWS.

b. Desert Tortoise. To mitigate potential increases in raven populations from the presence of trash, a raven monitoring program will be enacted including one year of preconstruction monitoring. Monitoring shall conform to methodologies outlined by the BLM, and shall be conducted in concert with other raven monitoring programs (e.g., Joshua Tree National Monument) in the CDCA. Monitoring of ravens will continue throughout the life of the landfill project, or until the agencies determine that they are no longer necessary. Should monitoring indicate that the raven population is significantly increasing then an active raven control plan will be implemented immediately and will include one or more of the following control measures: nest destruction, poisoning, shooting, alteration of landfill operations, or any other measures that the responsible agencies deem appropriate. All necessary depredation permits, plus a comprehensive raven management/control program, will be developed and in place before landfill operations begin.

Exposed trash at the landfill site, which could attract ravens, will be minimized by daily burial of all deposited trash. A six-inch covering of dirt/mine tailings will be placed at the end of each work day. If other wildlife species (e.g., coyote, fox) are found to dig out and expose buried trash, thus allowing ravens access to the trash, then fencing will be placed to deny access to the burial sites. Fencing will only be placed if raven monitoring indicates a significant increase in the raven population in the vicinity of the landfill.

In addition to the above mentioned actions, the feasibility of closing the Desert Center landfill is being investigated. This County-operated refuse dump is currently used by ravens, and its closure would remove one local source of food for this species.

c. Nelson's Bighorn Sheep. The potential loss of three permanent water source and one temporary water source is considered a significant impact. As compensation for the loss of the three permanent water sources on-site, three new permanent water sources, ensuring year-round water availability will be constructed. These will be placed away from the mine site to encourage bighorn sheep to use the adjacent natural areas rather than the project site. The sites for the water sources and their design will be located and approved by biologists from the BLM and the CDFG. In addition, as compensation for the loss of one temporary water source, Buzzard Springs will be rehabilitated and cleared of tamarisk. A two-year baseline telemetry study, involving approximately 17 sheep, will be conducted to determine the home ranges of ewes currently using the project site. Ewe home ranges are smaller than those of rams, and ewes show higher fidelity to their home ranges. Thus, ewes do not move as readily as rams. New water sources will be placed in ewe home ranges to facilitate ease of ewes finding these new sources. This change in home range should decrease bighorn stress from landfill operations by luring sheep away from disturbances. New water sources will be placed in habitat at least one year before water sources are removed to enable sheep to habituate to the new water source. Range studies will be conducted to determine if the sheeps' ranges are expanding to include the new water sources. If not, sheep will be translocated to the new water sources to encourage the incorporation of the water sources into their home ranges.

Approximately 644 acres of bighorn sheep habitat will remain as natural open space around the periphery of the landfill project (see Figure 14). Not only will this habitat remain for sheep use, it will also act as a buffer zone between the landfill operation and the relocated sheep population. Virtually all of this proposed preserved habitat is located on public (selected) lands.

Expanding sheep range into areas remote from the landfill will decrease the chance of stress-related illnesses and of contact with potentially toxic substances at the landfill site.

An employee training program will be implemented and should include bighorn sheep habits and habitat needs. This employee awareness program would increase acceptance and knowledge that may help sheep residing near the project. Interested employees can provide useful observation data.

Domestic sheep will be banned from the mine property to prevent disease transmission to bighorn sheep. All dogs will be confined to fenced yards, or otherwise restrained, to prevent harassment of bighorn in the vicinity of the landfill operation. Only authorized individuals will be allowed to possess firearms on the property to assure that no poaching of bighorn occurs.

d. Bat Species. The California leaf-nosed bat population will be monitored during landfill operations prior to initiating activities near the adit. The mouth of the adit will be extended upward using concrete pipe to maintain an eight-foot diameter opening, the current adit dimension, above any landfill deposits, including the level of the final landfill contour. Since the roosting bats are between 250 and 1,300 meters inside the mine tunnel, and the bats are primarily active at times when the landfill operation is not, these bats should not be significantly disturbed (Brown, pers. comm., 1990, and Attachment 1). Other bat species are not expected to be significantly disturbed.

e. Eagle Mountain Scrub Jay. The proposed raven monitoring/control program discussed under desert tortoise mitigation would reduce any potential impacts to scrub jays from the Eagle Mountain landfill project to a level below significance.

2. Eagle Mountain Railroad Right-of-Way

a. Plant Species. Since impacts to the local population of Alverson's foxtail cactus within the rail line right-of-way will involve only a few individual plants, no additional mitigation to that being conducted at the proposed landfill site is necessary.

Mitigation measures for potential impacts to Orocopia sage will include avoidance of these plants by narrowing the disturbance corridor near the population to as small an area as possible. Prior to construction activities in the vicinity of the Orocopia sage populations, an on-site meeting between the construction supervisor and a qualified biologist shall take place to delineate specific areas to avoid and areas where unavoidable impacts can be minimized. This may include flagging individual shrubs for avoidance. Maintenance and construction staging areas will avoid areas containing Orocopia sage populations. Roads should be kept to their current width. Measures should be undertaken to alert employees to avoid off-road travel and other habitat disturbance activities in the areas where Orocopia sage is present.

b. Desert Tortoise. To mitigate and compensate for any potential loss from track maintenance of tortoises inhabiting the 200-foot-wide rail corridor, a preconstruction survey for occupied tortoise burrows will be conducted along each section of railroad track that is repaired. All occupied burrows within 100 feet of the track will be examined for the presence of tortoises and conspicuously marked by a qualified biologist. Any occupied tortoise burrows that collapse during repair and maintenance activities will be immediately excavated, and the tortoise translocated to an artificial burrow no less than 300 feet from the original burrow site (as recommended by the Desert Tortoise Council [1990]). Any above-ground tortoises found within the rail corridor during repair procedures will also be translocated if the on-site biologist believes it is threatened.

Tortoises train-kills will be mitigated for by placing tortoise-proof barriers, in concert with under-track culverts, along the railroad berm in areas of current high tortoise activity. Exact locations of barriers and culvert will be selected in the field with the direction of USFWS, BLM, and CDFG personnel. Several different tortoise barrier and culvert designs could be initially placed along the railroad corridor to study the effectiveness of the different designs. It is believed that the entire rail corridor should not be fenced, since this would fragment the tortoise population and be a much more significant impact to the desert tortoise population than the occasional tortoise train-kill. There is no guarantee that tortoises will use culverts under the tracks, so it is critical that they can still cross over the tracks and maintain population integrity. Ballast will also be placed between the tracks at intervals along the portions of the rail line without barriers to aid the escape of any tortoises caught between the tracks.

A long-term tortoise population monitoring program will be instituted that will monitor changes in tortoise populations as the project proceeds. This will include one year of preconstruction monitoring. Monitoring will be conducted in the immediate vicinity of the Eagle Mountain railroad corridor using transects paralleling and at incremental distances from the tracks. Other transects will be conducted in comparable habitat several miles from the rail line so that comparisons in population changes can be made. The monitoring program will show whether there are any long-term effects on the tortoise population from train noise and vibration. Although no noise or vibration-related impacts to desert tortoises are expected from rail line operation, further mitigation/compensation measures may be required should monitoring indicate negative effects.

One or more transects to monitor raven populations will also be conducted near the rail line, so that any negative changes in tortoise populations can be attributed to either natural causes (e.g., respiratory disease), raven predation, or noise. If a decline in tortoise populations beyond the 200-foot-wide rail corridor can be shown to be caused by noise impacts, then further mitigation measures could be necessary, such as, scheduling of train trips to coincide with periods of tortoise inactivity.

To mitigate for potential population fragmentation due to the active railroad acting as a tortoise barrier, existing culverts under the rail line will be cleaned out and repaired in such a way that they provide easy access for tortoises. New culverts may be placed in areas where current tortoise use of the railroad track berm is high. Tortoise-proof barriers placed parallel to the tracks will be oriented to guide tortoises to culverts. During the course of tortoise population monitoring culverts will be checked for evidence of tortoise use.

If culverts prove ineffective in allowing tortoise movements, then a translocation effort may be necessary. This would involve trading a few individual tortoises from each side of the tracks each year in order to exchange genetic material between disjunct populations. The feasibility of this measure has not been tested, however.

c. Desert Pupfish. Mitigation for potential impacts to pupfish habitat include continued monitoring of the pupfish population in the Salt Creek system by CDFG, development of a mitigation program for impacts caused by maintenance activities, and monitoring by a biologist of any emergency cleanup operations. These mitigation measures should be incorporated into Section 7 consultation and DOI Opinion Letter for implementation.

Annual surveys of the pupfish populations and habitat by the CDFG will continue along Salt Creek and its tributary under the train trestle. If train operations affect the habitat, MRC shall be notified and corrective actions should be developed in consultation with USFWS and CDFG. If maintenance of the trestle or railroad in the Salt Creek tributary must occur, mitigation measures shall be incorporated into the project plans to reduce potential impacts to desert pupfish. Plans for construction or major maintenance shall be reviewed by a qualified biologist. If construction is required on the trestle or rails crossing the tributary, construction plans shall include designs and specifications that will avoid impacts to desert pupfish. Storage and staging areas should be placed in locations which will not affect the habitat, and measures to avoid any discharge of pollutants will be incorporated.

In the event any rail accidents occur in the vicinity of desert pupfish habitat, a qualified biologist will be included as a response and cleanup team member. The cleanup operations will be monitored by the biologist so that additional adverse impacts are not incurred by the cleanup operation. Measures to restore the pupfish habitat in Salt Creek and its tributary in the event of an accident will be incorporated as part of the response plan. If an accident causes the loss of the local pupfish population, the habitat will be restocked with pupfish of the same genetic strain from the nearest suitable population. Measures will be incorporated into a Section 7 consultation and DOI Opinion Letter for implementation.

3. Eagle Mountain Road Improvements, Road Extension, and Railroad Spur

a. Plant Species. Impacts to the local population of Alverson's foxtail cactus within the Eagle Mountain Road, road extension, and rail spur rights-of-way will involve only a few individual plants; therefore, no additional mitigation over that being conducted at the proposed landfill site for this species is necessary.

b. Desert Tortoise. Although Eagle Mountain Road did not show many signs of desert tortoise activity, this county-maintained road is located in BLM classified Category 3 tortoise habitat. A preconstruction survey will be conducted by a qualified biologist, and all tortoises within the 150-acre construction zone will be removed to a safe distance (300 feet) in the immediate vicinity. As compensation for the loss of 150 acres of Category 3 desert tortoise habitat, habitat off-site will be purchased and dedicated as permanent open space. Using a BLM compensation formula, a multiplying factor of 2.5 has been calculated (Blymyer, pers. comm., 1991). Therefore, 375 acres (150 acres x 2.5) of desert tortoise habitat will be purchased as compensation for impacts. The exact parcel(s) to be purchased will be selected by the BLM.

To mitigate potential loss of tortoises to road traffic appropriate tortoise-proof barriers will be installed on both sides of Eagle Mountain Road. To allow for exchange of tortoises from one side of Eagle Mountain Road to the other, culverts, at ground level and with dirt floors, and/or bridges, will be placed along the road. Barriers will be aligned to guide tortoises to these undercrossings.

A mandatory local worker education program will begin before implementation of the landfill operation. The program will emphasize the legal protections afforded sensitive species and measures to minimize impacts to those species and their habitats. The program will include a handbook outlining the details of the protections and measures to be followed by each employee. The program will be extended to contracted truck drivers delivering solid waste to the project site, in order to increase awareness of potential desert tortoise occurrence along Eagle Mountain Road and to receive any reports of tortoise sightings or road kills for prompt removal.

The raven population along Eagle Mountain Road will be regularly monitored as part of the project-wide monitoring program. Increased traffic along this road is likely to increase the number of wildlife road kills available to scavenging ravens. If this raven population is found to increase, then an active raven control program will be instituted. An active raven control plan, along with appropriate depredation permits, will be developed and in place before landfill operations begin.

C. KAISER STEEL RESOURCES PROPERTIES (OFFERED LANDS)

No mitigation measures are required for the Kaiser Steel Resources properties.

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ATTACHMENT 1

A SURVEY FOR BATS OF THE EAGLE MOUNTAIN PROJECT SITE RIVERSIDE COUNTY, CALIFORNIA

Prepared by

PATRICIA E. BROWN, Ph.D.
WILDLIFE BIOLOGIST

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For

RECON
1276 Morena Boulevard
San Diego, CA 92110

June 27, 1990

INTRODUCTION

A field survey was conducted for sensitive bat species in the area of the Kaiser Eagle Mountain Mine in Riverside County, California, part of which is located in Sections 32 through 34 of Township 3 South, Range 14 East and Sections 1 and 2 of Township 4 South, Range 14 East in the unincorporated area of the County of Riverside, State of California. Although the area consists primarily of abandoned open pit iron mines, two underground mines occur on the property and could provide refugia for bats and other wildlife. Special attention was given to the California leaf-nosed bat (Macrotus californicus) and Townsend's Big-eared bat (Plecotus townsendii) which are California Department of Fish and Game (CDFG) Species of Special Concern and United States Fish and Wildlife Service (USFWS) Category 2 Candidate Species for Threatened or Endangered Status.

The California leaf-nosed bat is the most northerly representative of the Phyllostomatidae, a predominantly Neotropical family. Macrotus neither hibernates nor migrates and remains active all year in the southern deserts, where they inhabit warm, humid mine adits and shafts above the annual mean temperature. The winter roosts selected by Macrotus exhibit stable temperatures greater than 28 C and relative humidities above 22%. These mines appear to be located in geothermally-heated rock formations of moderate temperature. Except for the approximately two-hour nightly foraging period, Macrotus inhabits a stable warm, tropical environment. (During warmer months, the bats may select a more exposed night roost in which to rest between foraging periods.) Roosts with high temperature and humidity appear to be a limiting factor in the distribution of this species in California, since less than 5% of the mines in the mountains bordering the Colorado River contain Macrotus.

Townsend's big-eared bat is basically a cave-roosting species that has moved into man-made caves such as mines and buildings. Unlike many other bats, they are unable to crawl into crevices, and usually roost in exposed areas where they are vulnerable to disturbance. Plecotus is quite sensitive to human disturbance, and this appears to be the primary cause of population decline for this species. This bat is colonial during the maternity season, when compact clusters of up to 200 individuals might be found. Maternity roosts form in the spring and remain intact during the summer. Great fidelity exists for a roost site, and if undisturbed the bats will use the same roost for many generations.

In the winter, Plecotus hibernate in cool caves and mine tunnels. Hibernation is a critical time for the species, since disturbance which causes arousal may expend energy reserves needed to survive the winter. The hibernation period in the California desert will vary with ambient temperature, but is generally from late November through early March.

METHODS

The survey was conducted from May 25 through 28, 1990. Survey methods consisted of entering mines and buildings during the day, and noting any bats or guano present. If possible bats were captured in hand nets to determine species and reproductive status. Two underground mine workings occur on the project site. The main Kaiser mine was quite extensive with several levels that could be throughly explored. The Black Eagle Mine in the southwest corner consisted of a single shaft without a safe ladder and was not entered. In addition several buried inclined culverts and buildings were surveyed as potential bat roosts. Temperature and humidity readings were taken in those parts of the mines or buildings where bats or guano were found.

Mist nets were placed over the mine entrances to capture bats as they emerged at dusk. These bats were identified as to species, sex and reproductive status. The Macrotus were banded for subsequent individual identification. Recapture data provides information on longevity, movements and roost fidelity.

On two evenings, mist nets were placed over water sources which included a pond at the bottom of an open pit mine and the drinking water reservoir for the mine. A bat detector was used to monitor ultrasonic signals since many species emit distinctive sonar signals. A night vision scope was employed to watch bats flying over the ponds and exiting the mine in order to determine the species and approximate number present.

RESULTS

During the diurnal survey of the main adit, a population of approximately 60 leaf-nosed bats was found in a chamber in the second level about 1300 meters from the entrance. The temperature in this 40 foot high room was 83 F at ground level. No other diurnal roosting areas for this species was found in the mine, although guano and moth wings near the entrance suggest that this area is used for night roosting. After dusk, only 18 bats were observed exiting the mine, and only 2 males were captured in the mist nets set at the entrance. It is possible that the disturbance caused by entering the roost during the day inhibited their nighttime departure. Around the corner from the mine entrance, a concrete structure built into the hill contained a large amount of guano and moth wings. A male Macrotus was captured here approximately 3 hours after dusk. Other night roosts of

Macrotus were found in the two metal culverts just west of the main mill site, and in the long cylindical concrete building at the mill site. This may also be a diurnal retreat during certain times of the year, since the morning after our entrance into the mine, 20 bats were observed, including a male banded the night before at the mine. Of two bats captured in hand nets, one was a male and the other a pregnant female, approximately 3 weeks prior to parturition. It is possible that this is an alternate diurnal retreat that is used only after disturbance in the mine.

In addition to *Macrotus* guano in the mine, a two-foot diameter circle of *Plecotus* guano, which is diagnostic of a maternity roost, was found approximately 1000 meters from the entance on the first level. The guano was probably a year old, and no bats of this species were found in the mine.

A male pallid bat (*Antrozous pallidus*) was captured in the mist net set over the mine pit pond. Although many western pipistrelles (*Pipistrellus hesperus*) were monitored with the bat detector and observed flying around the nets over the pond and reservoir, none were captured. A Mexican free-tailed bat (*Tadarida brasiliensis*) was heard flying over the reservoir. A list of bat species which might occur at various times in the project site is given in Table 1.

DISCUSSION

The discovery of the leaf-nosed bat roost in the Kaiser Eagle Mountain mine represents the first record of this species from this mountain range. Most current known roosts are from mines in mountains bordering the Colorado River. A single *Macrotus* was found in the McCoy Mountains approximately 30 miles to the east by Dr. Brown in March 1989. A single specimen was collected by Grinnell in 1908 in Mecca which is about 50 miles to the southwest, although no roosts are now known from that area. This species roosts in warm mine tunnels, and the Eagle Mountain adit which was abandoned in 1972 fits these requirements. The capture of a pregnant female suggests that this is also a maternity roost. Additional surveys need to be conducted to determine if this is indeed the case, and if *Macrotus* also inhabits the mine during the winter.

Although no *Plecotus* were found during this survey, the presence of guano in the circular formation typical of depositions beneath a maternity roost is evidence of past roosting activity. Surveys should be conducted during other times of the year to determine if this sensitive species occurs on the project site.

RECOMMENDATIONS

1. Diurnal survey of the concrete building and culverts to determine if these are used by *Macrotus* when no disturbance has occurred in the mine adit.

2. Monitor the outflight of the mine adit at dusk and count bats without people previously entering the mine. This should be done in summer and winter.

3. Activity around the mine and concrete building should be curtailed and access to these areas restricted to avoid disturbance to a sensitive bat species.

4. Monitor the Black Eagle Mine at dusk to determine if bats inhabit the shaft.

5. Survey other mines in the Eagle Mountains to determine if the Kaiser adit is the only *Macrotus* roost in the region.

6. Conduct a survey at different times of the year for *Plecotus* (in the summer and winter).

TABLE I

1. Order Chiroptera	Bats
Family Phyllostomatidae	Leaf-nosed bats
Macrotus californicus*	California leaf-nosed bat
Family Molossidae	Free-tailed bats
Tadarida brasiliensis	Mexican free-tailed bat
Nyctinomops femorosaccus	Pocketed free-tailed bat
Eumops perotis	California mastiff bat
Family Vespertilionidae	Plain-nosed bats
Antrozous pallidus*	Pallid bat
Plecotus townsendii*	Townsend's big-eared bat
Pipistrellus hesperus*	Western pipistrelle or canyon bat
Eptesicus fuscus	Big brown bat
Myotis californicus	California Myotis
Myotis yumanensis	Yuma Myotis
Myotis volans	Long-legged Myotis
Myotis thysanodes	Fringed Myotis
Myotis leibii	Small-footed Myotis
Lasionycteris noctivagans	Silver-haired bat
Lasiurus cinereus	Hoary bat
Lasiurus ega	Western yellow bat
Euderma maculatum	Spotted bat

* evidence of presence on project site

Other vertebrates observed during survey 5/26/90 to 5/28/90

Reservoir

Western woodpee (2)
Yellow warbler (2)
Wilson's warbler (2)
Lucy's warbler (2)
Red-spotted toad

Pit at mine bottom

Western flycatcher (2)
Wilson's warbler
House finch (13)
Red-spotted toad

Residential area

Hooded oriole (1)
Black-headed grosbeak (1)
Lucy's warbler (3) breeding
Warbling vireo (1)
Yellow-breasted chat (1)

General in area

Red-tailed hawk
Raven
American kestrel
Turkey vulture

Memorandum

To : Fisheries Management, Region 5

Date : May 16, 1986

From : Department of Fish and Game – Kimberly Nicol

Subject : Desert Pupfish Survey, Salt Creek, Riverside County

A survey to determine if desert pupfish still occurred in the Salt Creek drainage, Riverside County, was conducted April 29 – May 1, 1986.

Twenty minnow traps baited with cat food were set overnight along Salt Creek from the Hwy. 111 crossing to the mining railroad tresler (Figure 1). Traps were set in depths 10-120 cm. Water temperature ranged from 17 to 33°C, and conductivity ranged from 3,400 – 34,000 umhos.

Seventy pupfish were caught. All pupfish were caught in a 250 m stretch of the creek between the powerline road and the mining railroad tresle, where the creek widens and forms pools with low flows. In these areas algae and detritus were abundant. Other areas in this section, besides where the pupfish were caught, appeared to provide good pupfish habitat but were too shallow to set traps.

Other species caught were mosquitofish (20), sailfin mollies (7), crayfish (27), and freshwater shrimp (8).

Other areas along the creek were not surveyed because an abundant growth of cattails and salt cedar made it impossible to get to the water in the creek.

I would like to thank Darlene McGriff, Patty Young, and Glenn Black of Fish and Game, and Faye Winters from BLM for their assistance in conducting these surveys.

Kimberly Nicol
Fishery Biologist
Region 5

Attachment

cc: G. Black
D. McGriff
C. Shaw
F. Winters, BLM
R. Bransfield, FWS

KN:dr

Rancho
Dos Palmas
Seep
Seep
9
10
Seeps
15
16
17
Seeps
Area surveyed
JEEP TRAIL
Pupfish trapped
22
BR-142
Creek
SOUTHERN
28
27
Salt

A WINTER SURVEY FOR BATS OF THE EAGLE MOUNTAIN PROJECT SITE
RIVERSIDE COUNTY, CALIFORNIA

Prepared by

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For

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February 15, 1991

INTRODUCTION

A winter field survey was conducted for sensitive bat species in the area of the Kaiser Eagle Mountain Mine in Riverside County, California, part of which is located in Sections 32 through 34 of Township 3 South, Range 14 East and Sections 1 and 2 of Township 4 South, Range 14 East in the unincorporated area of the County of Riverside, State of California. Although the area consists primarily of abandoned open pit iron mines, two underground mines occur on the property that can provide refugia for bats and other wildlife. In a preliminary survey conducted from May 25-28, 1990, the California leaf-nosed bat (Macrotus californicus) was discovered roosting in the main Kaiser Eagle Mountain Mine adit as well as one of the cement buildings on the mill site. Macrotus is a California Department of Fish and Game (CDFG) Species of Special Concern and a United States Fish and Wildlife Service (USFWS) Category 2 Candidate Species for Threatened or Endangered Status.

The discovery of the leaf-nosed bat roost in the Kaiser mine represented the first record of this species from the Eagle Mountains. Most current known roosts are from mines in mountains bordering the Colorado River. Single Macrotus were found in the McCoy Mountains approximately 30 miles to the east by Dr. Brown in March 1989 and December 1990. A single specimen was collected by Grinnell in 1908 in Mecca which is about 50 miles to the southwest, although no roosts are now known from that area. This species roosts in warm mine tunnels, and the Eagle Mountain adit which was abandoned in 1972, fits these requirements. The capture of a pregnant female suggested that this is also a maternity roost. Additional surveys were needed to determine if this is the case, and if Macrotus also inhabits the mine during the winter. To this end, a winter survey was conducted of the mines surveyed during May 1990, as well as mines in the Eagle and Coxcomb Mountains near the proposed project area in an effort to determine if other suitable alternate roosts exist for this species should the Kaiser adit be closed. This survey covered the mines found in the Eagle Mountains between Range 13 East and 15 East and between Township 2 South and 5 South, and in the Coxcomb Mountains within Range 16 East and Township 2 South . Since many of these areas are not adequately surveyed by USGS, section information is not available.

The California leaf-nosed bat is the most northerly representative of the Phyllostomatidae, a predominantly Neotropical family. Macrotus neither hibernates nor migrates and remains active all year in the southern deserts, where they inhabit warm, humid mine adits and shafts above the annual mean temperature. The winter roosts selected by Macrotus exhibit stable temperatures greater than 28 C and relative humidities above 22%. These mines appear to be located in geothermally-heated rock formations of moderate temperature. Except for the approximately two-hour nightly foraging period in the winter, Macrotus inhabits a stable warm, tropical environment. (During warmer months, the bats may select a more exposed night roost in which to rest between foraging periods.) Roosts with high temperature and humidity appear to be a limiting factor in the distribution of this species in California, since less than 5% of the mines in the mountains bordering the Colorado River contain Macrotus. During the late spring and summer, maternity roosts form near mine entrances where temperatures are now warm. This provides ready access for the mother to the young, when she returns to nurse them between nightly foraging bouts.

During this survey, special attention was paid for any evidence of Townsend's big-eared bat (Plecotus townsendii) which is also a CDFG Species of Special Concern and a USFWS Category 2 Candidate Species for Threatened or Endangered Status. Townsend's big-eared bat is basically a cave-roosting species that has moved into man-made caves such as mines and buildings. Unlike many other bats, they are unable to crawl into crevices, and usually roost in exposed areas where they are vulnerable to disturbance. Plecotus is quite sensitive to human disturbance, and this appears to be the primary cause of population decline for this species. This bat is colonial during the maternity season, when compact clusters of up to 200 individuals might be found. Maternity roosts form in the spring and remain intact during the summer. Great fidelity exists for a roost site, and if undisturbed the bats will use the same roost for many generations. In the winter, Plecotus hibernate in cool caves and mine tunnels. Hibernation is a critical time for the species, since disturbance which causes arousal may expend energy reserves needed to survive the winter. The hibernation period in the California desert will vary with ambient temperature, but is generally from late November through early March.

METHODS

The winter survey was conducted from December 2 through 7 and 14 through 16, 1990. On December 3, an aerial reconnaissance of the Eagle and Coxcomb Mountains was conducted from a single engine Cessna to pinpoint mine dumps, especially those of mines which were not shown on the topo maps. Ground survey methods consisted of entering mines during the day, and noting any bats or guano present. If possible bats were captured in hand nets to determine sex and reproductive status. Temperature and humidity readings were taken in those parts of the mines or buildings where bats or guano were found, as well as mines over 30 meters long that did not contain evidence of bats.

Mist nets were placed over the mine entrances to capture bats as they emerged at dusk. The Macrotus were banded for subsequent individual identification since recapture data can provide information on longevity, movements and roost fidelity. In the evening outside potential bat roosts, a bat detector was used to monitor ultrasonic signals since many species emit distinctive sonar signals. A night vision scope was employed to watch bats exiting the mines in order to determine the species and approximate number present.

RESULTS

The first question was to determine whether the bats were winter residents of the Eagle Mountains. Two underground mine workings occur on the project site. The main Kaiser mine adit is quite extensive with several levels that can be throughly explored. The bottom level forms a U-shape with two entrances. The Black Eagle Mine in the southwest corner of the project area consists of a single shaft with cross-cuts necessitating entry with a rope to reach the first level at 60 feet, while deeper levels cannot be safely accessed. In addition several buried inclined culverts and buildings were searched in which bats or guano were found during the May survey.

During the May survey of the main adit, a population of approximately 60 leaf-nosed bats was found in a chamber in the second level about 1300 meters from the entrance. The temperature in this 40 foot high room was 83 F at ground level in May and December. In May, no other diurnal roosting areas for this species was found in the mine, although guano and moth wings near the entrance suggested that this area is used for night roosting. During the winter survey, approximately 100 bats were observed in the second level chamber, while 21 bats were seen in a crevice in the ceiling about 800 feet from the entrance on the west side of the U. On December 3, 8 female and 5 male Macrotus were captured in a mist net while exiting the mine at dusk. Using the night vision equipment, 17 bats were observed exiting from the west side and 97 from the east side on December 6.

At the Black Eagle Mine on December 6, only two Macrotus were seen to exit within the hour after dusk. On the evening of December 15, Dr. Berry descended into the shaft to obtain temperature readings, while Dr. Brown observed with the night vision scope from above. At 2000 hours, a Macrotus entered the mine and continued flying down the shaft beyond the 60 foot level. The temperature at the first level was only 69 F and too cool for a roosting site, but the mine is reputed to be 600 feet deep, and so suitable habitat may exist. However, judging by the observations made at dusk, there are few resident bats at this time of year.

No bats were found in the two metal culverts just west of the main mill site, but evidence of large guano deposits suggest a night roost. During May, 20 leaf-nosed bats, including a pregnant female that was captured, were seen in the long cylindrical concrete building at the mill site during the day. In December, no bats were observed there, suggesting that this roost is used only during warmer periods.

Other mines visited in the Eagle Mountains included the Lucky Turkey #2, the Hard Digging Mine, and the Mystery Mine (all within Joshua Tree National Monument), and the Iron Chief, Mission Sweet, Rainbow's End, Storm Jade, Sentinel and Orofino to the south and west of the project site. The Iron Chief Mine is the largest and most extensive of the mines visited, but it was too cool for Macrotus, and only contained some scattered Myotis guano. The Lucky Turkey #2 contained a large amount of Macrotus guano at the rear of the 240 foot adit where a shaft came down from above, suggesting the possibility of a maternity roost in the summer. The 68 F temperature in December would be too cool for a winter roost. Two other unnamed adits located approximately a mile south of the Lucky Turkey #2, each about 150 feet deep with temperatures of 80 F, contained leaf-nosed bat guano, as well as that of the little brown bat (Myotis sp.) and pallid bat (Antrozous pallidus). No bats were seen at this time. The 30 foot prospect on the hill above the Mission Sweet contained scat of both desert tortoise (Xerobates agassizzi) and ringtail cat (Bassariscus astutus).

Only two adits of any extent were found in the Coxcomb Mountains. Located in a canyon on the northeast side of the range within Range 16 East and Township 2 South, they were not named on the topo sheets. The 100 foot adit at the head of the canyon contained no bat sign, while a possibly larger adit at a lower elevation was protected by a locked metal door. Both this entrance and a shaft above it were monitored at dusk, but no bats emerged.

DISCUSSION

As a result of surveys conducted in May and December, it appears that the leaf-nosed bat (Macrotus californicus) is a year-round resident of the Eagle Mountains. Winter roost sites for this species are limited in the California desert since they must be at least 80 F, which is warmer than the majority of mines. At least 100 leaf-nosed bats use the main Kaiser mine adit as a diurnal retreat, while possibly only a few bats inhabit the Black Eagle shaft. These were the only mines where leaf-nosed bats were found in the winter survey.

In the spring and summer, the temperatures in the mines, especially near entrances, is considerably warmer. In May, Macrotus were found in the main Kaiser adit, as well as the pseudo-mine concrete building by the mill site. The possibility exists that this is a maternity roost. The discovery of Macrotus guano in the Blind Turkey #2 adit and two others south of it, suggests that these might also be summer roosts.

Townsend's big-eared bat (Plecotus townsendii) was not encountered on the project site during either the May or December surveys. However, its occurrence cannot be totally ruled out since the Black Eagle was not monitored in May for bat outflights. The guano of the pallid bat (recently added to the list of CDFG Species of Special Concern) was found in the two adits west of the project site. This species roosts in mines and rock crevices and was also mist-netted over the pond in the bottom of the Kaiser pit during the spring survey.

RECOMMENDATIONS

1. Summer surveys of the concrete building and culverts is needed to determine if these are used by Macrotus when no disturbance has occurred in the main mine adit. Also in summer, the outflight of the Kaiser mine adit and the Black Eagle Mine should be monitored at dusk. The Blind Turkey #2 and the two unnamed mine adits where Macrotus guano was found should be checked in the summer to determine if maternity roosts exist in the Eagle Mountains off of the project site.

2. Since the Kaiser adit appears to be the main winter roost for Macrotus in the Eagle Mountains, it is desirable that this roost not be closed as the proposed project proceeds. Since the expected impact would be to cover the entrance with a growing garbage deposit, it might be possible to extend the adit at an angle upward by the addition of a culvert. To determine the effectiveness of this mitigation procedure, long-term monitoring at different seasons should be required. To that end, it is important that baseline values of population size be established based on monitoring over several years previous to the start of the project.

APPENDIX G

MINERAL RESOURCES

AFFECTED ENVIRONMENT

The most significant mineral resources identified in the Eagle Mountain area are precious and base metals and industrial minerals.

Precious Metals

Following suspension of iron ore mining, the open pits and areas along strike, in the footwall, and in the hanging wall of the iron one deposits were examined for precious metals by Kaiser; Pincock, Allen and Holt, Inc.; Homestake Mining Company; Newmont Mining Corporation; the Goldfield Corporation; and Kiewit Mining Company. No precious metals were detected at any of the above locations (personal Communications, 1990a).

Two samples were collected by Kaiser from the discharge point of fine plant tailings into tailings basins 3 and 6. Fire assaying of these samples did not indicate the presence of gold (see Appendix A, samples 384 and 385).

In addition, coarse plant tailings were sampled and analyzed for precious metals. Twenty samples were collected from different locations on the coarse tailings stockpile T-6. These samples were first evaluated by fire assaying at Eagle Mountain. These analyses showed traces of gold in two samples (see Appendix B-1, samples T-6-1 through T-6-20).

To confirm the above results, splits of the original 20 samples were sent to Skyline Labs, Inc. for gold and silver content analyses by atomic absorption. The results did not indicate the presence of gold in any samples; traces of silver were detected in six samples (see Appendix B-2).

Additional splits of the original 20 samples were sent to the Monitor Geochemical Laboratory. Analyses did not indicate the presence of gold in any of the samples; silver was detected in low (uneconomic) concentrations in three samples (see Appendix B-3).

Industrial Minerals

There are no developable industrial minerals within the boundaries of the Eagle Mountain project area, as determined by a field survey (Morton, 1991).

Iron Ore Resources

Approximately 100 million tons of ore has been produced by Kaiser from the Eagle Mountain Mine since 1948 when the first ore was shipped. Ore was processed at Kaiser's Fontana Steel mill. Steel making operations at Fontana became economically unfeasible during 1982 for several reasons, including the import of foreign steel into Southern California, high energy costs, high labor costs, high transportation costs, depressed market conditions, and demands from the U.S. EPA for an additional quarter billion dollars to upgrade air pollution controls at the Fontana plant (Collins, 1982). With closure of the Fontana plant, the Eagle Mountain Mine lost its principal market. The Fontana plant closure, increased mine operating costs, and lower grades of iron forced closure of the Eagle Mountain Mine.

Data regarding geologic iron deposits at the Eagle Mountain Mine in January 1983 (Kaiser Steel Resources, 1990; Personal Communications, 1990b) show that approximately 335 million tons of iron-bearing material grading from 34.7 to 48.5 percent iron exist in nine separate areas at the mine (see Table 1). In addition to net tonnages, Table 1 shows average iron content for each resource area and anticipated iron unit recovery (calculated based on Kaiser's recovery factors at the time of the mine closure).

Of the iron resources at Eagle Mountain, only about 170 million tons (0.45 percent of U.S. reserves) were considered by Kaiser to be economically recoverable at the time of the mine closure (see Table 2).

TABLE 1. EAGLE MOUNTAIN IRON RESOURCES
(As of January 1, 1983)

			Million Units	
	Metric Tons	% Fe	Total Fe Units	Recoverable Fe Units*
Measured Resources				
East Pit	28,431,454	39.7	1,128.7	756.2
East Pit - West Extension	7,177,775	46.7	335.2	224.6
Central - TV Hill	48,061,239	37.3	1,792.7	1,201.1
Central - Main	42,265,029	37.3	1,576.5	1,056.2
Central - West	22,231,617	38.3	851.5	570.5
Black Eagle - North	49,785,843	39.6	1,971.5	1,320.9
Black Eagle - South	11,236,800	40.2	451.7	302.7
Black Eagle - West Extension	1,597,826	38.6	61.7	41.3
Desert Eagle	28,044,000	48.5	1,360.1	911.3
Subtotal	238,831,583	39.9	9,529.6	6,384.8
Indicated Resources				
East Pit	10,639,420	42.4	451.1	302.2
East Pit - West Extension	5,503,346	44.3	243.8	163.3
Central - TV Hill	15,364,944	37.4	574.6	385.0
Central - Main	6,361,767	40.2	255.7	171.3
Central - West	8,536,628	38.5	328.7	220.2
Black Eagle - North	19,401,207	37.8	733.4	491.4
Black Eagle - South	5,058,600	34.7	175.5	117.6

TABLE 1 (continued)

	Metric Tons	% Fe	Million Units: Total Fe Units	Million Units: Recoverable Fe Units*
Black Eagle - West Extension	1,009,008	38.2	38.5	25.8
Desert Eagle	24,826,000	41.1	1,020.3	683.6
Subtotal	96,700,920	39.5	3,821.6	2,560.5
GRAND TOTAL	335,532,503	39.8	13,351.2	8,945.3

* An Fe unit recovery of 67 percent was used based on past plant performance and metallurgical tests on drill core.

TABLE 2. ECONOMICALLY RECOVERABLE RESOURCES AT EAGLE MOUNTAIN MINE IN 1983

	Bene Plant Ore			Pellet Plant Ore								
Pit	Metric Tons	% Fe	% S	Metric Tons	% Fe	% S	Metric Tons Total Ore	Total Fe Units	% of Total Fe Units	Metric Tons Waste	Metric Tons Total Material	S/R*
East Pit - Alluvial	21,133,604	24.7	0.05	279,169	40.3	0.40	21,412,773‡	5,220,000	8.4	59,783,151	81,195,924	2.79
East Pit - Midsection	2,786,920	47.7	0.18	2,009,851	48.9	0.93	4,796,771	2,312,178	3.6	14,516,376	19,313,147	3.03
East Pit - West Extension	3,577,598	44.2	0.13	3,246,212	50.3	0.73	6,823,810	3,214,143	5.1	33,728,814	40,552,624	4.94
Central	18,882,600	37.7	0.40	45,762,907	37.7	1.38	64,645,507	24,371,356	38.5	139,981,215	204,626,722	2.17
Black Eagle - North	3,947,404	33.5	0.08	31,074,285	39.1	1.76	35,021,689	13,472,426	21.3	123,730,217	158,751,906	3.53
Black Eagle - South	27,896,125	38.8	0.13	9,855,076	38.3	0.82	37,751,201	14,598,191	23.1	172,136,309	209,887,510	4.56
TOTAL	78,224,251	35.0	0.17	92,227,500	38.9	1.41	170,451,751	63,188,294	100.0	543,875,982	714,327,733	3.19

* S/R = Stripping ratio.

‡ Included in the total ore tonnage for the East Alluvial Pit is State-owned ore.

Open pit reserves based on an average stripping ratio of 3:1 exist in six discrete areas at Eagle Mountain. Percentage figures for each area reflect the percentage of the total reserves (resources economically recoverable in 1983). These areas are as follows:

- East Pit - Alluvial. Approximately 21 million metric tons (12.6 percent) of placer deposit.[4]

- East Pit - Midsection. Approximately 4.8 million metric tons (2.8 percent) of lode deposit.[5]

- East Pit - West Extension. Approximately 6.8 million metric tons (4.0 percent) of lode deposit.

- Central Pit. Approximately 65 million metric tons (37.9 percent) of lode deposit.

- Black Eagle - North. Approximately 35 million metric tons (20.5 percent) of lode deposit.

- Black Eagle - South. Approximately 37.7 million metric tons (22.1 percent) of lode deposit.

Approximately 92 million metric tons of iron reserves at Eagle Mountain (or 54 percent of the total open pit reserves at the mine) are magnetite mixed with pyrite. These deposits have an average iron content of 38.9 percent and an average sulfur content of 1.41 percent (see Table 2). Production of marketable concentrates from such crude ore requires a fairly sophisticated flow

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[4] The placer material consists of discrete particles of high-grade iron-bearing rock in an alluvial (sand or gravel) matrix.

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[5] Lode is defined as a fissure in rocks that is filled with minerals (i.e., a mineral deposit in consolidated rock). The term is used synonymously with "ore body," "reef," and "vein."

scheme involving mineral jigs, heavy media separation, and magnetic concentration with pelletization.

Similarly, approximately 78 million metric tons of iron reserves at Eagle Mountain (or 46 percent of total open pit reserves at the mine) are mixtures of magnetite and hematite, with small amounts of pyrite. These deposits have an average iron content of 35.0 percent and a sulfur content of 0.17 percent. Production of marketable concentrates from this type of crude ore requires even more sophisticated flow schemes than for magnetite.

In most reserve areas, iron exists in lode deposits which require sophisticated concentrators to produce saleable products. The only exception is the East Pit - Alluvial reserve area, where 21.4 million metric tons of iron reserves is present in placer deposits. Although this reserve area contains the lowest average iron content of any of the reserve areas, the ease with which concentrates could be obtained from this placer material in a relatively unsophisticated concentrator, combined with the relatively low mining costs likely to be experienced in this area, renders the East Pit - Alluvial reserve area a likely site for future mining.

The ore crushing and concentrating facilities at the Eagle Mountain Mine have been dismantled for salvage, and the mining equipment has been sold. In addition, much of the infrastructure required to support the operation was completely abandoned in 1986 with the suspension of mining activities. Consequently, no ore concentrating can presently be performed at the mine.

ENVIRONMENTAL CONSEQUENCES

Proposed Project

Impacts--

Sequence I of landfill operations would conform to the East Pit - Midsection ore reserve area. Landfill development in this area would thus prevent the open pit mining of 4.8 million metric tons (or 2.8 percent) of the remaining mineral reserves at the Eagle Mountain Mine.

Sequence II of landfill operations would take place in the East Pit - West Extension ore reserve area, which contains approximately 6.8 million metric tons (or 4.0 percent) of the remaining mineral reserves. This reserve area, however, has a very high stripping ratio of almost 5 tons of overburden per ton of ore, and is thus considered by Kaiser to be an underground mineral reserve (i.e., not an open pit reserve). Sequence II of landfilling operations would seriously impact such underground mining economically, but not completely preclude it. Landfilling operations conducted in subsequent sequences (i.e., Sequence III and the Final Sequence) would have similar impacts on underground mining potential.

The undeveloped portion of the Central Deposit reserve area, located east of the current Central Pit limits, would be impacted by landfilling operations late in Sequence III (years 36 through 86). This encroachment would prevent the mining of approximately 20.4 million metric tons (or 12 percent) of the open pit reserves at the mine. The remaining 44.6 million metric tons (or 25.9 percent) of the reserves are outside of the project area and thus would not be affected by the landfill project.

The final sequence of landfill operations (i.e., years 85 through 115) would impact the extreme eastern portion of the East Pit deposits (East Pit - Alluvial). These deposits contain approximately 21 million metric tons (or 12.6 percent) of the remaining open pit reserves, primarily as an iron ore placer deposit.

Approximately 72.7 million metric tons (or 42.6 percent) of iron reserves in the Black Eagle North and South reserve areas would be unaffected by the landfill project.

As discussed above, landfill operations would result in the following adverse impacts on recoverable mineral resources contained in the East Pit Midsection, Central Deposit, and East Pit - Alluvial ore reserve areas:

- Loss of access to 4.8 million metric tons of iron reserves located in the East Pit - Midsection (or 2.8 percent of the remaining reserves at the Eagle Mountain Mine), if this reserve area is not mined prior to commencement of landfilling operations.

- Loss of access to an additional 41.4 million metric tons of iron reserves located in the East Pit - Alluvial and Central Pit deposits (or 24.3 percent of the remaining open pit ore reserves at Eagle Mountain) if, this area is not mined prior to the commencement of landfilling operations in each of these areas.

- Loss of most reasonable and economic access to 6.8 million metric tons of underground mineable resources in the East Pit - West Extension, (or 4.0 percent of the mining reserves at Eagle Mountain) if these reserves are not mined prior to commencement of landfilling operations in this area.

Landfill development would have no adverse impacts on currently active exploration and mining activities at Eagle Mountain.

Elemental iron is one of the most plentiful raw materials in the world, constituting about 5 percent of the world's crust by weight (Labys, 1980). Although there are many types of iron-bearing materials, the two most widely distributed are hematite and magnetite. According to the United States Bureau of Mines (U.S. Bureau of Mines, 1991), 1990 world iron ore reserves are estimated to exceed 800 billion metric tons of crude ore[1] containing more than 230 billion metric tons of iron. The largest concentrations of the world's iron ore reserves are in the Soviet Union, Australia, Canada, United States, Brazil, and India (U.S. Bureau of Mines, 1991). Many countries in the world produce iron ore with high iron content[2] (i.e., more than 50 percent), which constitutes a direct-shipping ore[3].

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[1] The material, as mined in its natural state, is called crude ore.

[2] Grade denotes iron content in the mined material.

[3] If the mined material is sold with only minimal processing or screening, it is called direct-shipping ore.

U.S. iron resources are estimated to be about 110 billion metric tons ore containing approximately 27 billion metric tons of iron (U.S. Bureau of Mines, 1991). Of these resources, only 37.5 billion metric tons (containing 7.09 billion metric tons of iron) are considered to be economically recoverable (Bolis and Bekkala, 1987). Virtually all U.S. iron ore produced requires concentration and pelletization (U.S. Bureau of Mines, 1991).

The landfill operations at the Eagle Mountain Mine would result in the following losses in terms of U.S. iron reserves, if the specified reserves are not mined prior to commencement of landfilling operations:

- East Pit - Midsection Resources. Loss of 4.8 million metric tons or 0.01 percent of U.S. iron reserves.

- East Pit - Alluvial and Central Pit Resources. Loss of 41.4 million metric tons or 0.11 percent of U.S. iron resources.

- East Pit - West Extension. Loss of most reasonable and economic access to 6.8 million tons or 0.02 percent of U.S. iron resources.

Landfill development would have beneficial impacts on open pit mining at Eagle Mountain. Mining at Eagle Mountain is dependent on the availability of rail service over Kaiser's 52-mile rail line. With the suspension of mining activities, use of this rail line was discontinued in 1986. Landfill development would result in reactivation of this rail line, which could also be available for transport of iron ore concentrates or rock products.

Landfill development would share many of the costs that a small mining operation would otherwise bear alone, such as capital and O&M costs for the railroad, haul roads, electrical and water distribution systems, and maintenance and warehousing facilities.

Any future mining activities would, in turn, benefit landfill development. Specifically, overburden and plant tailing would be available to the landfill as cover material. In addition, mining excavations within the perimeter of the landfill would increase the available capacity of the landfill.

Mitigation--

The impacts of landfilling on mineral resources could be satisfactorily mitigated by the sequencing of landfilling operations, which would assure that the most potentially minable iron resources are impacted last. Such sequencing would provide time to recover the iron deposits contained in the Central Deposit and East Pit - Alluvial reserves of Eagle Mountain, if economically justified, prior to their being covered with refuse. However, if these areas are not mined before their respective impacting phases of landfilling commence, access to these resources would be lost.

Loss of access to the iron reserves contained in the East Pit - Midsection would not be mitigated.

Reduced Landfill Operations Alternative

Impacts--

This alternative may potentially result in adverse impacts on the East Pit - Midsection and Central Deposit iron ore reserve areas. The potential impacts are as follows:

- Loss of access to 4.8 million metric tons of iron reserves located in the East Pit - Midsection (or 2.8 percent of the remaining open pit reserves at Eagle Mountain), if this area is not mined prior to commencement of landfill operations.

- Loss of access to an additional 20.4 million metric tons of iron reserves contained in the Central Deposit area (or 12 percent of the remaining open pit reserves at Eagle Mountain), if this area is not mined prior to commencement of landfilling operations in this area.

- Loss of most reasonable and economic access to 6.8 million metric tons (or 4.0 percent) of underground mineable resources in the East Pit - West Extension if this area is not mined prior to commencement of landfilling operations in this area.

This alternative would result in the same beneficial impacts discussed above for the proposed project.

Mitigation--

The same mitigation measures discussed for the proposed project would apply.

Rail Access Only Alternative

Impacts--

This alternative would result in the same impacts as for the proposed project.

Mitigation--

The same mitigation measures discussed for the proposed project would apply to this alternative.

No Project Alternative

Impacts--

If development of the landfill does not occur, no on-site mineral resources will be impacted.

Mitigation--

No mitigation measures will be necessary.

REFERENCES

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Collins, W. E. Mineral Resources of the Eagle Mountains, Geology and Mineral Wealth of the California Transverse Ranges. South Coast Geological Society. 1982.

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Labys, W. C. Market Structure, Bargaining Power, and Resource Price Formation. Lexington Books; D. C. Heath and Company. 1990.

Morton, P. K. Mineral Potential Evaluation of Specified Unpatented Lands of Kaiser Steel Resources Proposed to be Traded to the Bureau of Land Management. Draft Report. March 1991.

Personal Communication. Letter from O. J. Anderson, Kaiser Steel Resources, to J. Zbozinek SCS Engineers. November 6, 1990a.

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U.S. Bureau of Mines. Mineral Commodity Summaries 1990. January 1991.

APPENDIX A

FIRE ASSAYING OF SAMPLES FROM DISCHARGE POINT
OF FINE PLANT TAILINGS INTO TAILINGS BASIN NOS. 3 AND 6
BY KAISER EAGLE MOUNTAIN

By [illegible]

[illegible]

Date 9/20/83

Sample Desig.	Lab No.	Dore Button Weight in grams	Cupelled Au + Ag Bead Weight mg	Cupelled Au + Ag Bead Weight oz/ton	Parted Au Weight mg	Parted Au Weight oz/ton	Bead - Au Wt. = Ag mg	Bead - Au Wt. = Ag oz/ton	AA Analysis oz/ton Au	AA Analysis oz/ton Ag	AA Analysis % Wt. Pb	AA Analysis % Wt. Cu
382	G. Hope	40.5		.065		.055		.01				
383	" "	44.3		.015		Nil		.015				
384	TP 6	44.9		.015		Nil		.015				
385	TP 3	33.5		Nil		Nil		Nil				

APPENDIX B

ANALYSES OF SAMPLES FROM COARSE TAILINGS STOCKPILE T-6 FOR PRECIOUS METALS

FIRE ASSAY REPORT

By [illegible] KH　　　　Date 3/1/85

Sample Desig.	Lab No.	Dore Button Weight in grams	Cupelled Au + Ag Bead Weight		Parted Au Weight		Bead - Au Wt. = Ag		AA Analysis oz/ton		AA Analysis % Wt.	
			mg	oz/ton	mg	oz/ton	mg	oz/ton	Au	Ag	Pb	Cu
LVL-25				Nil		Nil		Nil				
LVL-26				TRACE <.005		TRACE <.005		Nil				
T-6-1				Nil		Nil		Nil				
T-6-2				Nil		Nil		Nil				
T-6-3				.02		Nil		.02				
T-6-4				Nil		Nil		Nil				
T-6-5				.015		.015		Nil				
T-6-6				.015		Nil		.015				
T-6-7				Nil		Nil		Nil				
T-6-8				Nil		Nil		Nil				
T-6-9				.025		Nil		.025				
T-6-10				.015		Nil		.015				
T-6-11				.02		Nil		.02				
T-6-12				Nil		Nil		Nil				
T-6-13				Nil		Nil		Nil				
T-6-14				Nil		Nil		Nil				
T-6-15				Nil		Nil		Nil				
[illegible]				Nil		Nil		Nil				

APPENDIX B-1

FIRE ASSAYING OF SAMPLES FROM COARSE TAILINGS STOCKPILE T-6 BY KAISER EAGLE MOUNTAIN

By

Date 3/ /85

Sample Desig.	Lab No.	Dore Button Weight in grams	Cupelled Au + Ag Bead Weight		Parted Au Weight		Bead - Au Wt. = Ag		AA Analysis oz/ton		AA Analysis % Wt.	
			mg	oz/ton	mg	oz/ton	mg	oz/ton	Au	Ag	Pb	Cu
T-6-17				Nil		Nil		Nil				
T-6-18				Nil		Nil		Nil				
T-6-19				.045		.02		.025				
T-6-20				.015		Nil		.015				

APPENDIX B-2

ANALYSES OF SAMPLES FROM COARSE TAILINGS STOCKPILE T-6 FOR GOLD AND SILVER BY SKYLINE LABS, INC.

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. UPU 031
March 26, 1985
SHIPMENT NO. 1
PROJECT NO.: T-6
P.O. NO. 279-68968
PAGE 1 OF 1

KAISER STEEL CORPORATION
Attn: O.J. Anderson
P.O. Box 317
Desert Center, California 92239

Analysis of 20 Pulp Samples

ITEM	SAMPLE NO.	Au (ppm)	Ag (ppm)
1	T-6-1	<.02	<.2
2	T-6-2	<.02	.2
3	T-6-3	<.02	.2
4	T-6-4	<.02	<.2
5	T-6-5	<.02	<.2
6	T-6-6	<.02	<.2
7	T-6-7	<.02	.2
8	T-6-8	<.02	<.2
9	T-6-9	<.02	<.2
10	T-6-10	<.02	<.2
11	T-6-11	<.02	.2
12	T-6-12	<.02	<.2
13	T-6-13	<.02	<.2
14	T-6-14	<.02	<.2
15	T-6-15	<.02	.2
16	T-6-16	<.02	.2
17	T-6-17	<.02	<.2
18	T-6-18	<.02	<.2
19	T-6-19	<.02	<.2
20	T-6-20	<.02	<.2

REGISTERED ASSAYER CERTIFICATE No. 9425 WILLIAM L. LEHMBECK Arizona U.S.A.

William L. Lehmbeck
Manager

APPENDIX B-3

ANALYSES OF SAMPLES FROM COARSE TAILINGS
STOCKPILE T-6 FOR GOLD AND SILVER
BY MONITOR GEOCHEMICAL LABORATORY, INC.

Monitor Geochemical Laboratory, Inc.
P.O. Box 1428 * Hesperia, California 92345 * Phone (619) 244-3481

Certificate of Analysis

E6
CLIENT: KAISER STEEL
ATTENTION: B HENDERICKSON

DATE: 04/12/85
CLIENT PO : 68991
INVOICE NO. : 1074
LAB NO. : 1336
CC: JIM SUTTON

ANALYTICAL METHODS: Ag - Atomic Absorption
Au - Roasted Acid Digestion A.A.

SAMPLE #	R/Acid Au(ppm)	A.A. Ag(ppm)
T6-1	-.05	-0.1
T6-2	-.05	0.2
T6-3	-.05	0.2
T6-4	-.05	-0.1
T6-5	-.05	0.1
T6-6	-.05	-0.1
T6-7	-.05	-0.1
T6-8	-.05	-0.1
T6-9	-.05	-0.1
T6-10	-.05	-0.1
T6-11	-.05	-0.1
T6-12	-.05	-0.1
T6-13	-.05	0.1
T6-14	-.05	-0.1
T6-15	-.05	-0.1
T6-16	-.05	-0.1
T6-17	-.05	-0.1
T6-18	-.05	-0.1
T6-19	-.05	-0.1
T6-20	-.05	-0.1
	20	20

Gayle Glynn
Analyst

*Greater than 1000 ppm reported as percent(Assay)
**Break in numerical sequence

APPENDIX H

NOISE ASSESSMENT FOR THE EAGLE MOUNTAIN WASTE-BY-RAIL AND DISPOSAL SYSTEM COUNTY OF RIVERSIDE

July 17, 1990
Report No. 90-39.b

Prepared for

RECON REGIONAL ENVIRONMENTAL CONSULTANTS
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Prepared by

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NOISE ASSESSMENT FOR THE EAGLE MOUNTAIN WASTE-BY-RAIL AND DISPOSAL SYSTEM COUNTY OF RIVERSIDE

1.0 INTRODUCTION

The purpose of this report is to assess the potential noise impacts from the proposed Eagle Mountain Waste-By-Rail and Disposal System. The proposed Eagle Mountain Landfill site is a portion of the open pit mine located in the Eagle Mountains in the high desert area of eastern Riverside County. The site is located approximately 10 miles north of Desert Center, about 200 miles east of Los Angeles, and approximately 50 miles west of the Arizona border. The landfill site will occupy approximately 5,270 acres and is bordered by the Pinto Basin on the north, Chuckwalla Valley on the east, Chuckwalla Mountains on the south, and the Eagle Mountains on the west. Adjacent to the mine is the town of Eagle Mountain, built by the Kaiser Steel Corporation for the employees.

The project proposes to use a portion of the Eagle Mountain open pit mine for the land disposal of nonhazardous municipal solid waste generated in Southern California and retrievable storage of recyclables salvaged from municipal wastes. For site access, the project will utilize Kaiser's 52-mile industrial railroad connecting the mine with the Southern Pacific main line at Ferrum, California, and Kaiser's 5-mile road, connecting the mine with Interstate 10 by way of the Eagle Mountain Road.

The development of the Eagle Mountain Landfill site will increase the noise levels along roadways and rail lines that will serve the project. The primary roadways that will be utilized by the project are Interstate 10 Freeway and Eagle Mountain Road. The primary railroad noise source in the area is the Southern Pacific Railroad Line and the Eagle Mountain Rail Line from Ferrum to the Eagle Mountain Landfill.

The project is expected to generate future noise levels on surrounding areas from the loading stations, the rail lines and roadways that will be used as haul routes, and the proposed landfill operations. This report discusses background information on noise and community noise assessment criteria. This is intended to give the reader a greater understanding on noise and the criteria used to assess potential impacts from noise. The study will analyze the noise impact of the operations at the Eagle Mountain Waste-By-Rail and Disposal System site on adjacent land uses and will determine the ultimate noise levels that will exist on the Eagle Mountain Landfill site. This study will also analyze the noise impact of the rail and truck haul routes that will serve the project on adjacent land uses and will determine the ultimate noise levels that will exist along these routes. These levels will then be compared with applicable County/State noise criteria and, if necessary, potential mitigation measures will be suggested.

2.0 BACKGROUND

2.1 Noise Definitions and Assessment Criteria

Sound is technically described in terms of the loudness (amplitude) of the sound and the frequency (pitch) of the sound. The standard unit of measurement of the loudness of sound is the decibel (dB). Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the Richter Scale used to measure earthquakes. In terms of human response to noise, a sound 10 dBA higher than another is judged to be twice as loud; and 20 dBA higher four times as loud; and so forth. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). Noise level increases of less than 3 dBA are usually not considered significant. A noise level increase of 5 dBA will be readily noticeable to the human observer, although it will not be perceived as dramatically as a 10 dBA change. Examples of various sound levels in different environments are shown in Exhibit 1.

Sound levels decrease as a function of distance from the source as a result of wave divergence, atmospheric absorption, and ground attenuation. The sound wave form travels away from the source, the sound energy is dispersed over a greater area dispersing the sound power of the wave. The interaction of the sound waves with the ground also affects the noise levels. Soft surfaces such as grass are more absorptive than hard surfaces such as concrete where the amount of noise reduction is less. Atmospheric absorption also influences the levels that are received by the observer. The greater the distance traveled, the greater the influence and the resultant fluctuations. The degree of absorption is a function of the frequency of the sound as well as the humidity and temperature of the air. Turbulence and gradients of wind, temperature and humidity also play a significant role in determining the degree of attenuation.

Noise has been defined as unwanted sound and it is known to have several adverse effects on people. From these known effects of noise, criteria have been established to help protect the public health and safety and prevent disruption of certain human activities. This criteria is based on such known effects of noise on people as hearing loss (not a factor with community noise), communication interference, sleep interference, physiological responses and annoyance. Each of these potential noise impacts on people are briefly discussed in the following narratives:

> *HEARING LOSS* is, in general, not a concern in community noise problems. The potential for noise induced hearing loss is more commonly associated with occupational noise exposures in heavy industry or very noisy work environments with long term exposure. The Occupational Safety and Health Administration (OSHA) identifies a noise exposure limit of 90 dBA for 8 hours per day to protect from hearing loss. Noise levels in neighborhoods, even in very noisy airport environments near major international airports, are not sufficiently loud to cause hearing loss.
>
> *COMMUNICATION INTERFERENCE* is one of the primary concerns in environmental noise problems. Communication interference includes speech interference and activities such as watching television. Normal conversational speech is in the range of 60 to 65 dBA and any noise in this range or louder may interfere with speech. There are specific methods of describing speech interference as a function of distance between speaker and listener and voice level. Exhibit 2 shows the percent of sentence intelligibility with respect to various noise levels.
>
> *SLEEP INTERFERENCE* is a major noise concern in community noise assessment and, of course, is most critical during nighttime hours. Sleep disturbance is one of the major causes of annoyance due to community noise. Noise can make it difficult to fall asleep, create momentary disturbances of natural sleep patterns by causing shifts from deep to lighter stages and cause awakening. Noise may even cause awakening which a person may or may not be able to recall. Extensive research has been conducted on the effect of noise on sleep disturbance.

SOUND LEVELS AND LOUDNESS OF ILLUSTRATIVE NOISES IN INDOOR AND OUTDOOR ENVIRONMENTS
(A-Scale Weighted Sound Levels)

dB(A)	OVER-ALL LEVEL Sound Pressure Level Approx. 0.0002 Microbar	COMMUNITY (Outdoor)	HOME OR INDUSTRY	LOUDNESS Human Judgement of Different Sound Levels
130	UNCOMFORTABLY	Military Jet Aircraft Take-Off With After-burner From Aircraft Carrier @ 50 Ft. (130)	Oxygen Torch (121)	120 dB(A) 32 Times as Loud
120 110	LOUD	Turbo-Fan Aircraft @ Take Off Power @ 200 Ft. (90)	Riveling Machine (110) Rock-N-Roll Band (108-114)	110 dB(A) 16 Times as Loud
100	VERY	Jet Flyover @ 1000 Ft. (103) Boeing 707. DC-8 @ 6080 Ft. Before Landing (106) Bell J-2A Helicopter @ 100 Ft. (100)		100 dB(A) 8 Times as Loud
90	LOUD	Power Mower (96) Boeing 737, DC-9 @ 6080 Ft. Before Landing (97) Motorcycle @25 Ft. (90)	Newspaper Press (97)	90 dB(A) 4 Times as Loud
80		Car Wash @ 20 Ft. (89) Prop. Airplane Flyover @ 1000 Ft. (88) Diesel Truck, 40 MPH @ 50 Ft. (84) Diesel Train, 45 MPH @ 100 Ft. (83)	Food Blender (88) Milling Machine (85) Garbage Disposal (80)	80 dB(A) 2 Times as Loud
70	MODERATELY LOUD	High Urban Ambient Sound (80) Passenger Car, 65 MPH @ 25 Ft. (77) Freeway @ 50 Ft. From Pavement Edge, 10:00 AM (76 +or- 6)	Living Room Music (76) TV-Audio, Vacuum Cleaner	70 dB(A)
60		Air Conditioning Unit @ 100 Ft. (60)	Cash Register @ 10 Ft. (65-70) Electric Typewriter @ 10 Ft. (64) Dishwasher (Rinse) @ 10 Ft. (60) Conversation (60)	60 dB(A) 1/2 as Loud
50	QUIET	Large Transformers @ 100 Ft. (50)		50 dB(A) 1/4 as Loud
40		Bird Calls (44) Lower Limit Urban Ambient Sound (40)		40 dB(A) 1/8 as Loud
	JUST AUDIBLE	(dB[A] Scale Interrupted)		
10	THRESHOLD OF HEARING			

SOURCE: Reproduced from Melville C. Branch and R. Dale Beland, Outdoor Noise in the Metropolitan Environment. Published by the City of Los Angeles, 1970, p.2.

Exhibit 1

Examples of Typical A-Weighted Sound Levels

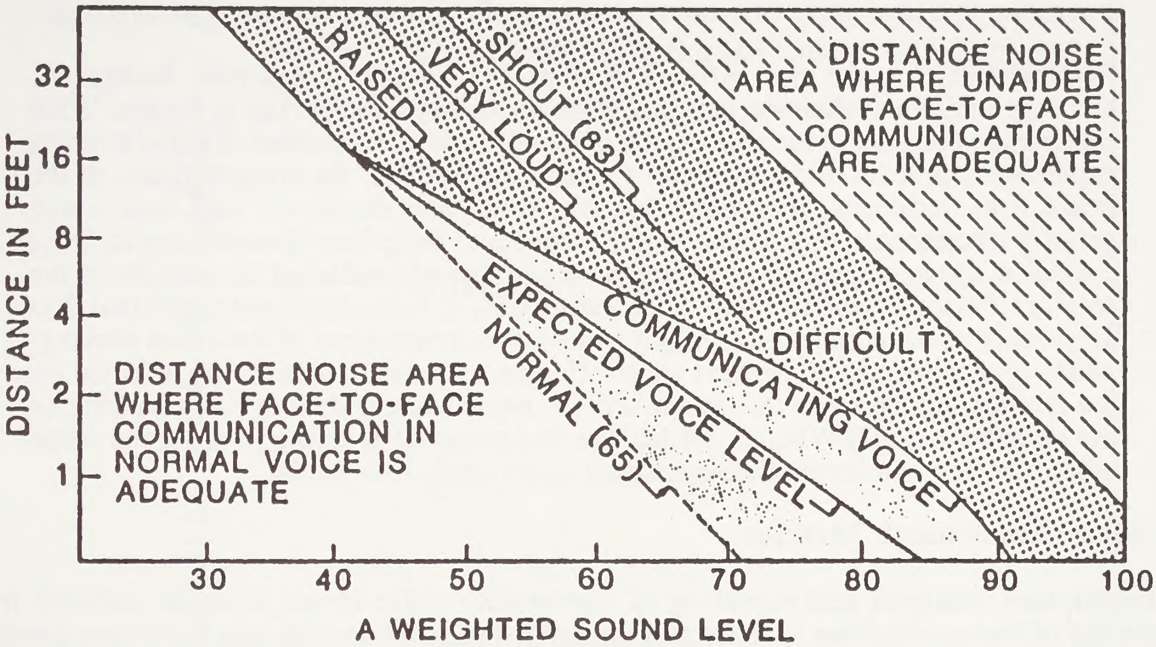


Exhibit 2

Noise and Speech Relationship

Recommended values for desired sound levels in residential bedroom space range from 25 to 45 dBA with 35 to 40 dBA being the norm. The National Association of Noise Control Officials has published data on the probability of sleep disturbance with various single event noise levels. Based on experimental sleep data as related to noise exposure, a 75 dBA interior noise level event will cause noise induced awakening in 30 percent of the cases.

PHYSIOLOGICAL RESPONSES are those measurable effects of noise on people which are realized as changes in pulse rate, blood pressure, etc. While such effects can be induced and observed, the extent is not known to which these physiological responses cause harm or are a sign of harm. Generally, physiological responses are a reaction to a loud short term noise such as a rifle shot or a very loud jet overflight.

ANNOYANCE is the most difficult of all noise responses to describe. Annoyance is a very individual characteristic and can vary widely from person to person. What one person considers tolerable can be quite unbearable to another of equal hearing capability. The level of annoyance, of course, depends on the characteristics of the noise (i.e., loudness, frequency spectra, time, and duration), and how much activity interference (e.g. speech interference and sleep interference) results from the noise. However, the level of annoyance is also a function of the attitude of the receiver. Personal sensitivity to noise varies widely. It has been estimated that 2 to 10 percent of the population is highly susceptible to noise not of their own making, while approximately 20 percent are unaffected by noise. Attitudes are affected by the relationship between the person and the noise source. (Is it our dog barking or the neighbor's dog?) Whether we believe that someone is trying to abate the noise will also effect our level of annoyance.

2.2 Noise Assessment Metrics

The description, analysis and reporting of community noise levels is made difficult by the complexity of human response to noise and the myriad of noise metrics that have been developed for describing noise impacts. Each of these metrics attempt to quantify noise levels with respect to community response. Community noise is generally not steady state and varies with time. Under conditions of non-steady state noise, some type of statistical metric is necessary in order to quantify noise exposure over a long period of time. Several rating scales have been developed for describing the effects of noise on people. They are designed to account for the previously described known effects of noise on people.

2.2.1 Land Use Compatibility Analysis

The predominant rating scales now in use in California for land use compatibility assessment are the Community Noise Equivalent Level (CNEL) and the Day Night Level (Ldn). CNEL represents a time weighted 24 hour average noise level based on the A-weighted decibel. Time weighted refers to the fact that noise that occurs during certain sensitive time periods is penalized for occurring at these times. The CNEL scale penalizes the evening time period (7 p.m. to 10 p.m.) noises by 5 dBA, while nighttime (10 p.m. to 7 a.m.) noises are penalized by 10 dBA. These time periods and penalties were selected to reflect people's increased sensitivity to noise during these time periods. Ldn is similar to CNEL except that the evening time period is not penalized. Typical noise levels in terms of the CNEL scale for different types of communities are presented in Exhibit 3. These scales are commonly used to assess traffic noise impacts.

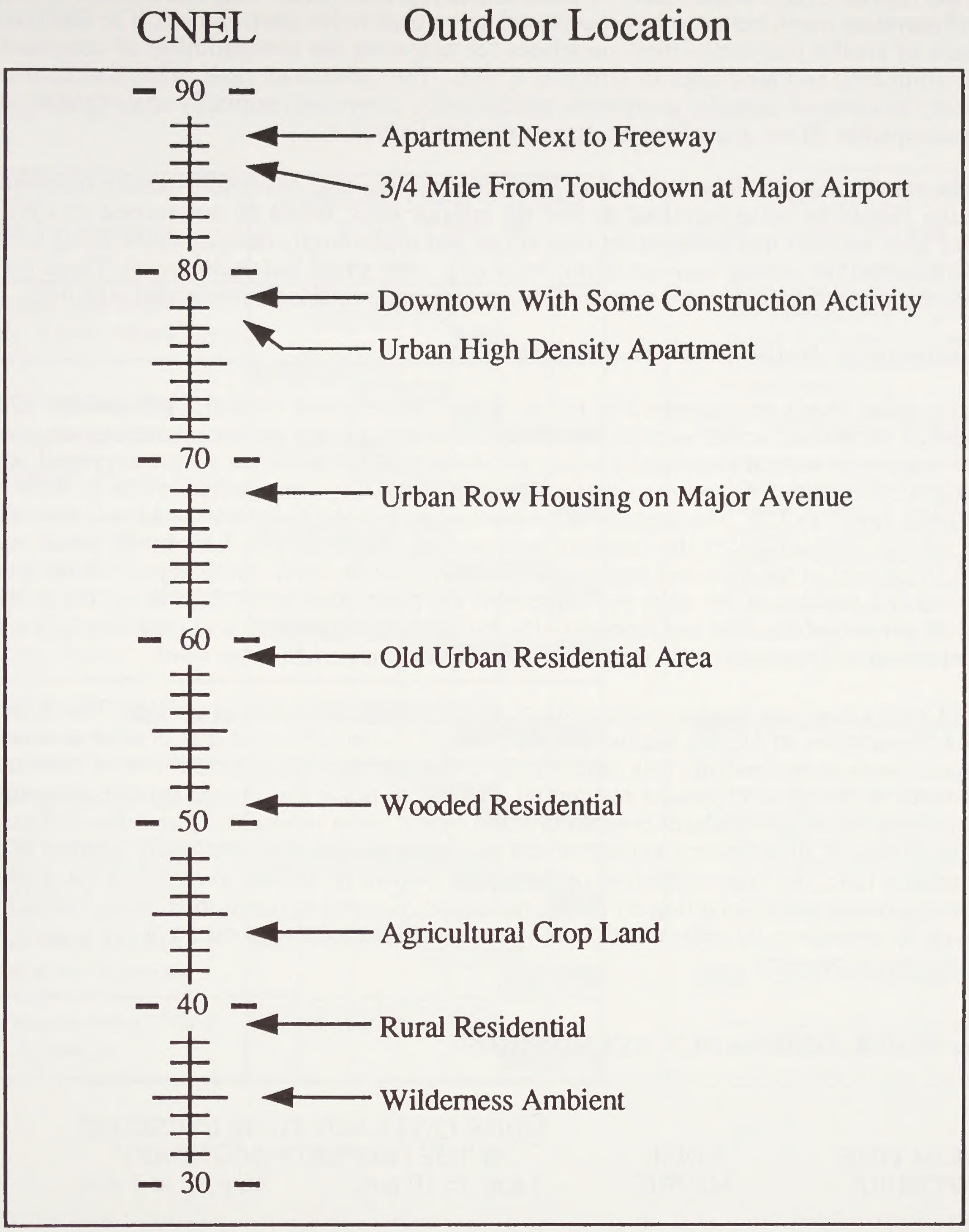


Exhibit 3

Typical Outdoor Noise Levels

State laws passed in the past few years now require that cities develop their Noise Elements in terms of the Ldn or CNEL scales. Both of these scales represent time weighted 24 hour average noise, and correlate much better to how people perceive their noise environment. The California Department of Health has established guidelines for assessing the compatibility of community noise environments and land uses in terms of CNEL. The guidelines rank noise and land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable. These guidelines are summarized in Exhibit 4.

In addition, the California Noise Insulation Standards require that new multi-family residential construction should be noise insulated so that the interior noise levels do not exceed 45 CNEL. Most cities have adopted this standard for both single and multi-family developments along with a 65 CNEL standard for private outdoor living areas (e.g., rear yards and patio areas). These noise criteria are designed to minimize the impacts from transportation noise on residential land uses.

2.2.2 Community Noise Ordinances

Community noise levels are measured in terms of the "A-weighted decibel," abbreviated dBA. Intermittent or occasional noises such as those associated with certain on-site operations are not of sufficient volume to exceed community noise standards that are based on a time averaged scale such as the CNEL scale. A common method of characterizing these noise levels is with the "percent noise level" or L%. The percent noise level describes the noise level which is exceeded during a certain percentage of the measurement period. For example, L50 is the noise level exceeded 50 percent of the time and represents the average noise level. Similarly, L1 is the noise level exceeded 1 percent of the time and represents the peak noise level, L90 is the noise level exceeded 90 percent of the time and represents the background noise level, and Lmax (or L0) is the noise level exceeded 0 percent of the time and represents the maximum noise level.

Riverside County does not have a noise ordinance that would apply to this project. The State of California Department of Health has developed a model noise ordinance that is used to control noise impacts such as the landfill. This model noise ordinance establishes exterior noise standards. The ordinance is designed to protect residential areas from noise sources on private properties. Table 1 presents the noise standards contained in the model noise ordinance. The noise ordinance is designed to control unnecessary, excessive and annoying sounds from stationary sources at the private property line. The noise ordinance requirements can not be applied to mobile noise sources such as heavy trucks when traveling on public roadways. Control of the mobile noise sources on public roads is preempted by federal and State laws. The noise ordinance does not apply to motor vehicles on private property.

Table 1
MODEL NOISE ORDINANCE STANDARDS

MAXIMUM TIME OF EXPOSURE	NOISE METRIC	NOISE LEVEL NOT TO BE EXCEEDED AT THE PROPERTY BOUNDARY	
		7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
30 Minutes/Hour	L50	50 dBA	45 dBA
15 Minutes/Hour	L25	55 dBA	50 dBA
5 Minutes/Hour	L8.3	60 dBA	55 dBA
1 Minute/Hour	L1.7	65 dBA	60 dBA

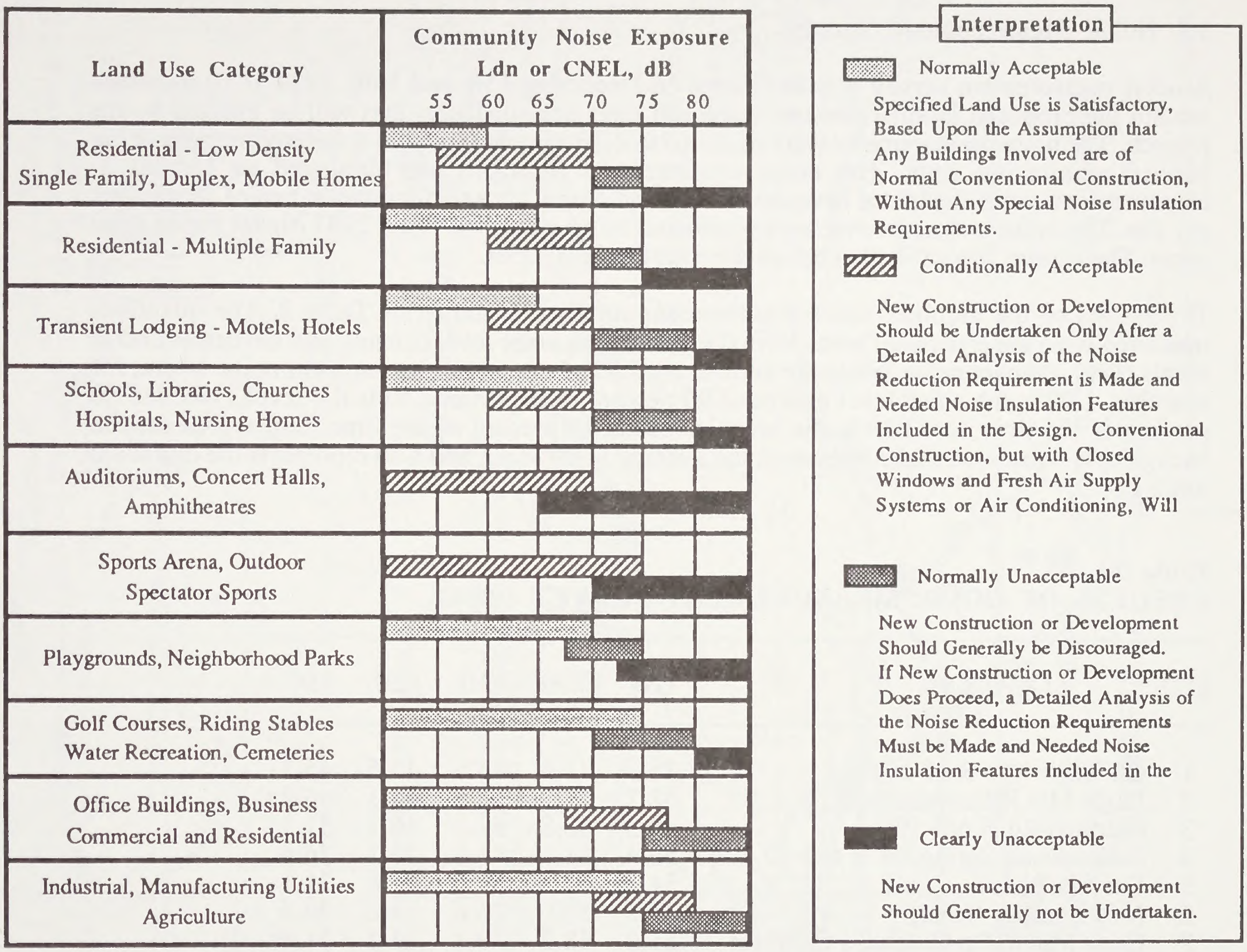


Exhibit 4

California Land Use Compatibility Studies

3.0 EXISTING NOISE LEVELS

The existing noise environment was determined through a comprehensive noise measurement survey and computer modeling effort. The noise measurement survey was designed to depict the background noise environment from the adjacent roadways. The existing noise levels were also established in the CNEL index by computer modeling the adjacent roadways for the current traffic characteristics and the railroad for the existing operations.

3.1 Noise Measurement Survey

A noise measurement survey was conducted on December 13th and 14th, 1989 at 10 locations around the proposed landfill site and along rail lines and roadways that will be utilized by the project. The noise measurements were designed to determine the ambient noise environment at the chosen monitoring sites. The noise measurement locations are displayed in Exhibit 5. Measurements were conducted between 10 a.m. and 6 p.m. for a minimum duration of 15 minutes per site. The noise measurements were conducted using a Bruel & Kjaer 2231 digital sound level meter. The system was calibrated before the measurement series.

The results of the ambient noise measurement survey are shown in Table 2. The quantities measured were the equivalent noise level (Leq), the peak noise level (Lmax), and the percent noise levels (L%). Percent noise levels are another method of characterizing ambient noise where, for example, L90 is the noise level exceeded 90 percent of the time, L50 is the level exceeded 50 percent of the time, and L10 is the level exceeded 10 percent of the time. L90 represents the background noise level, L50 represents the average noise level, and L10 represents the dominant noise level.

Table 2
RESULTS OF NOISE MEASUREMENT SURVEY (dBA)

SITE	LOCATION	Leq	Lmax	L10	L50	L90
1	Off Eagle Mtn Rd S of Site	45.9	47.6	46.6	45.6	45.1
2	Eagle Mtn RR crosses I-10	62.7	77.3	66.1	57.1	46.8
3	Chiriaco Rd N of I-10	58.3	68.8	62.1	56.1	51.1
4	Cottonwood Spring Rd N of I-10	56.4	81.7	46.6	30.1	26.6
5	Corvina Beach	54.2	72.2	57.6	41.6	31.1
6	N of Bombay Beach	34.2	38.0	36.6	33.6	30.6
7	Eagle Mtn RR at Coachella Canal Rd	27.2	38.2	30.1	24.1	21.6
8	1/4 mi. N of Eagle Mtn Jr & Sr HS	58.5	82.9	45.6	35.1	32.6
9	Express Way at Yucca	47.9	66.1	40.6	32.6	30.6
10	Corner of Yucca & Palm	49.4	68.1	40.1	35.6	32.2

The noise levels in the above table are due to traffic noise from the Interstate 10 Freeway, aircraft flyovers, and background noise in the area. As mentioned above, the L10 noise levels represent the dominant noise levels. The data in Table 2 shows that the L10 noise levels for sites 2 and 3 were greater than 60 dBA. Sites 2 and 3 were close to roadways and therefore, the dominant noise sources at these sites were due to traffic. Military jet flyovers caused the L10 noise level at site 5 to

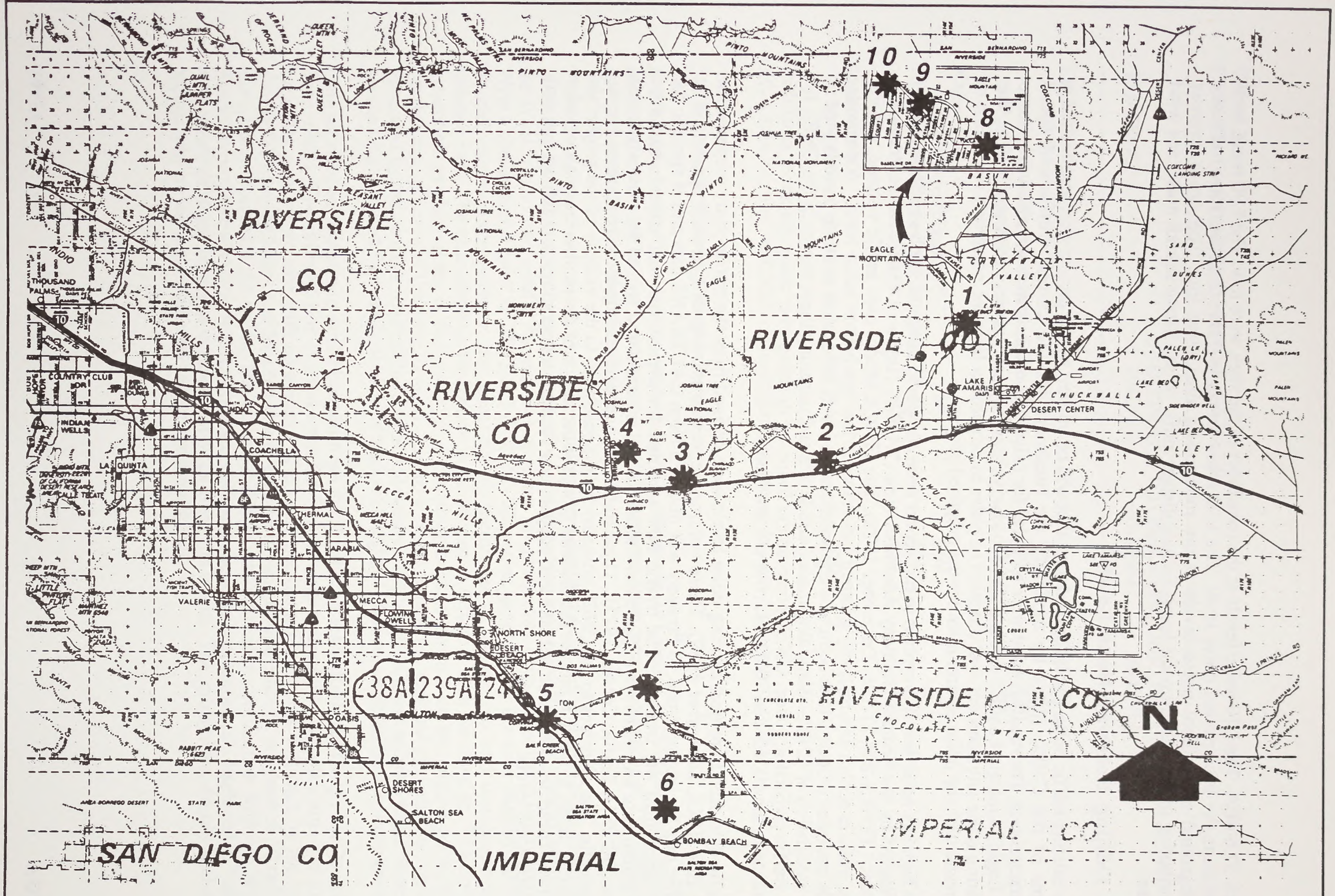


Exhibit 5

Noise Measurement Locations

reach 57.6 dBA. The L10 noise levels at the remainder of the sites were low. The L90 noise level represents the background noise level. The L90 noise levels in Table 2 above shows that the background or ambient noise levels at the monitoring sites were low. The noise sources contributing to the ambient noise levels include distant traffic noise, distant aircraft noise, and wind noise.

3.2 Existing Roadway Noise Levels

The existing traffic noise levels for roadways that will be utilized by the project were established in terms of the CNEL index by modeling the roadways for the current traffic and speed characteristics. The roadways that were modeled for existing conditions were the roadways near to the Eagle Mountain Landfill site and those roadways that may carry project generated traffic. The existing noise environment was modeled in order to establish a baseline noise level to which to compare with the noise environment for the proposed project.

The highway noise levels projected in this report were computed using the Highway Noise Model published by the Federal Highway Administration ("FHWA Highway Traffic Noise Prediction Model," FHWA-RD-77-108, December 1978). The FHWA Model uses traffic volume, vehicle mix, vehicle speed, and roadway geometry to compute the "equivalent noise level." A computer code has been written which computes equivalent noise levels for each of the time periods used in the calculation of CNEL. Weighting these noise levels and summing them results in the CNEL for the traffic projections used. CNEL contours are found by iterating over many distances until the distance to the 60, 65, and 70 CNEL contours are found.

Traffic data used to project existing noise levels were derived from the traffic study prepared for the EIR (DKS, December 1989). These volumes represent existing daily traffic volumes. The traffic mix for the Interstate 10 Freeway was obtained from CALTRANS data and is specific for this section of the freeway. The traffic mix assumed for the arterial roadways is based on measurements for roadways in Southern California and is considered typical for arterials in this area (OC EMA Traffic Census, 1975). These traffic volumes and assumptions are presented in the Appendix. The distances to the CNEL contours for the roadways in the vicinity of the project are given in Table 3. These represent the distance from the centerline of the road to the contour value shown. These projections do not take into account any barriers, topography, or buildings that may reduce noise levels.

Table 3
EXISTING ROADWAY NOISE LEVELS

ROADWAY	DISTANCE TO CNEL CONTOUR (FEET) 70-CNEL	65-CNEL	60-CNEL
Eagle Mountain Rd			
I-10 EB to I-10 WB	RW	RW	RW
I-10 WB to Ragsdale Rd	RW	RW	RW
N of Ragsdale Rd	RW	RW	RW
Kaiser Rd			
I-10 WB to Ragsdale Rd	RW	RW	43
Ragsdale Rd to Lake Tamarisk Dr	RW	RW	RW
N of Lake Tamarisk Dr	RW	RW	RW
Interstate 10			
Eagle Mountain Rd to Kaiser Rd	148	319	687

RW - Denotes that the CNEL contour does not extend beyond the roadway edge.

3.3 Existing Railroad Noise Levels

A Southern Pacific Railroad line runs parallel to Highway 111, south of Interstate 10. Noise measurements made at Site 5 measured a peak noise level from a train operation of 73.7 dBA at approximately 300 feet from the rail line.

The existing train noise levels along the rail line were established in terms of the CNEL index by modeling the railroad for the current operations. To determine train noise levels at various distances the Wyle Model was used ("Assessment of Noise Environments Around Railroad Operations," Wyle Laboratories Report WCR 73-5, July 1973). The noise generated by the train pass-by can be divided into two components; that generated by the engine or locomotive, and that due to the railroad cars. The characteristic frequency of the engine is different than for the cars. The noise generated by the engine is the result of the mechanical movements of the engine parts, the combustion process if the horn is used, and to a lesser extent the exhaust system. The noise generated by the cars is a result of the interaction between the wheels and the railroad track. A zero source height is used for the car noise, and a source height of 10 feet is utilized for the locomotive.

Data on railroad operations were obtained from the Southern Pacific Railroad (Hugh McDowell, June 1988). The railroad line is used only for freight train operations, and 40 trains per day typically pass by the site with an average of 65 cars per train. Five trains will pass by the site during the evening hours and four trains will pass by in the nighttime hours. A speed of 50 miles per hour is typical for the trains. The operational data was utilized in conjunction with the Wyle Model to project train noise levels. The results of the train noise projections are displayed in Table 4 in terms of noise levels at various distances from the tracks. The projections do not include topography or barriers which may reduce the noise levels.

Table 4
EXISTING RAILROAD NOISE LEVELS

DISTANCE (FT)	100	200	300	400	500	700	1000	2000	5000
CNEL (dBA)	74	70	67	64	62	60	57	51	44

In addition to the projections from the Wyle Train Noise Model, train noise measurements were made at the Whitewater preserve between Indian Avenue and the Gene Autry Trail on May 3, 1989 at 50 feet from the Southern Pacific Rail line. The results are shown below in Table 5.

Table 5
WHITEWATER PRESERVE TRAIN MEASUREMENT RESULTS (50 FT FROM TRACK)

Time	Direction	Maximum dBA	SEL dBA	LEQ(10) dBA	Duration
12:06 PM	East	85	99	71	82 Sec.
1:49 PM	East	95	107	79	133 Sec.
2:42 PM	West	90	105	77	131 Sec.
4:03 PM	East	89	101	73	48 Sec.
5:01 PM	East	90	100	72	142 Sec.
				(Peak 10 min.)	

The measurement data in the above table shows that train pass-bys can reach high maximum noise levels at a distance of 50 feet.

4.0 POTENTIAL NOISE IMPACTS

The potential noise impacts may be separated into four categories; (1) the impact of the sorting and loading facilities on the respective surrounding land uses, (2) the off-site impacts along haul routes due to waste transport via truck and rail, (3) the impact of the operations at the proposed landfill site (which include an unloading station on the premises of the proposed disposal site as well as landfill operations) on the surrounding land uses, and (4) the temporary on-site impacts due to construction noise.

An important part of a noise analysis is the identification of noise-sensitive land uses that may be impacted by the proposed project. This would include any residential properties, schools, or other noise-sensitive land uses adjacent to the project or situated along roadways or railroad lines that will carry project-generated traffic. In the case of the proposed project, the land uses immediate adjacent to the Eagle Mountain Landfill site consist of open space, and some scattered residential development southeast of the landfill site.

4.1 Loading Stations

Mine Reclamation Corporation (MRC) has identified three typical locations for sorting and loading stations in San Gabriel Valley. These three typical sites have been identified only for the purpose of analysis and should not be taken to be fixed or set loading sites. The three sites are located in the eastern half of San Gabriel Valley, south of Interstate 210 and north of Route 60. These three sites are; (1) "Valley Boulevard Site," located on Valley Boulevard in the City of Industry, (2) "Cypress Street Site," located on Cypress Street in the City of Irwindale, and (3) "La Verne Site," located north of Brackett Field in the City of La Verne. The three typical sites identified for the purpose of analysis are all shown in Exhibit 6.

The pieces of equipment that will be operating at the loading stations include scales, front end loaders, compactors, container top handlers, shuttle trucks, conveyors, and sweepers. Noise levels generated by these pieces of equipment may impact noise sensitive land uses near the loading stations. A more detailed analysis of each loading site will be required when final loading stations have been identified and more detailed information of the equipment that will be operating at the loading stations become available. The following paragraphs describe the individual sites in more detail.

4.1.1 Valley Boulevard Site: The Valley Boulevard Site is located in the northeast portion of the City of Industry, east of Brea Canyon Road, between the Southern Pacific and Union Pacific mainlines. The freeway access to the site will be provided via Interstate 10, Route 60, and Route 57. Also, there will be direct access for refuse collection trucks off the extension of Grand Avenue. Direct rail access will be provided by the construction of a spur off the Southern Pacific main line.

The site is surrounded by industrial developments and several undeveloped parcels. The existing zoning for the site is M Industrial. These land uses are very insensitive to noise and therefore, noise generated from the loading operations at the site should not adversely impact the surrounding areas.

4.1.2 Cypress Street Site: The Cypress Street Site is located in the southern portion of the City of Irwindale, parallel to an existing Southern Pacific rail line. The freeway access to the site will be provided via Interstates 605, 210, and 10. Primary arterials to the site include Irwindale Avenue and Arrow Highway, both of which are truck routes. Also, there will be direct access for refuse collection trucks on an extended driveway off of Cypress Street. Direct rail access will be provided by the existing spur off the Southern Pacific main line.

The existing zoning for the site and the surrounding parcels is M-2 Manufacturing. The property includes four acres of Southern Pacific property (a rail yard) and land in an adjacent parcel that is being developed as an industrial site. This land use of the surrounding areas to the site are very insensitive to noise and therefore, noise generated from the loading operations at the site should not adversely impact the surrounding areas.

4.1.3 La Verne Site: The La Verne Site is located north of Brackett Field and west of the City of Pomona boundary. The freeway access to the site will be provided via Interstates 10, 210, and 605. The major arterial routes to the site include Garey Avenue, Arrow Highway, and Foothill Boulevard. Also there will be direct access for refuse collection trucks along D Street. The Southern Pacific mainline is adjacent to the site, and direct rail access would be provided by construction of a rail spur.

The site is bordered to the east and west by an industrial park. To the south of the site is Brackett Field. To the north of the site, on the north side of the Southern Pacific mainline are residential

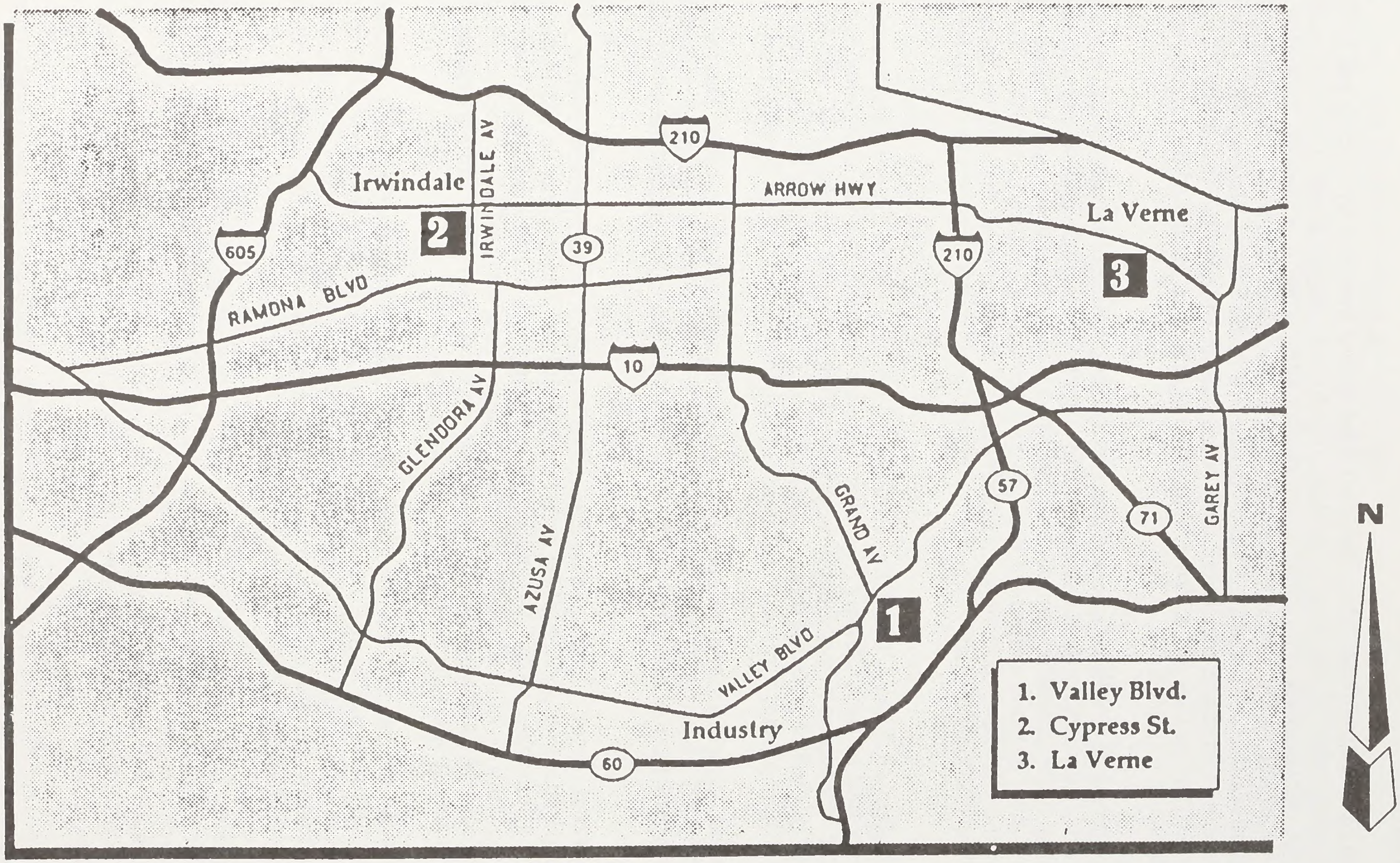


Exhibit 6

Proposed San Gabriel Valley Loading Stations areas. The industrial park areas located to the east and west of the site are insensitive to noise as is Brackett Field and therefore, noise generated from the loading operations at the site should not adversely impact the surrounding areas. However, the residential areas north of the site are considered to be noise sensitive land uses and noise from the loading operations may impact these residences. A more detailed study should be undertaken when more detailed plans of the loading facilities and operations are completed.

4.2 Waste Transport Noise

The transportation of the municipal solid wastes to the Eagle Mountain Landfill site will be accomplished by both rail and truck transport. Each are discussed in further detail in the following paragraphs.

4.2.1 Rail Transport

Rail transport will be along the Southern Pacific mainline from the loading stations to Ferrum in Riverside County. At Ferrum, the rail transport will be switched to a private line (Eagle Mountain Rail line) that runs directly to the Eagle Mountain disposal site from Ferrum (approximately 52 miles). For Phase 1, the rail line will run southwest of the Town of Eagle Mountain and terminate at the south edge of the middle pit area. For Phase 2, the rail line will continue up north along the eastern portion of the Eagle Mountain landfill boundary and terminate at the southeast edge of the pit. In conjunction with the Phase 2, a new rail spur will be built that will take off from the Eagle Mountain Rail line southeasterly of the existing landing strip and terminating in the container handling yard. The new spur will be approximately 2 miles long and will carry rail traffic to the eastern portion of the Eagle Mountain Landfill site and away from the town of Eagle Mountain.

It is expected that for Phase 1 of the project, a maximum of 1 train will operate per day in each direction (total of 2 trains for both directions) with 14 cars per train traveling at an average speed of 35 miles per hour. For Phase 2 of the project, a maximum of 6 trains will operate per day in each direction (total of 12 trains for both directions) with 14 cars per train traveling at an average speed of 50 miles per hour. The addition of the project generated train traffic will increase the existing train noise levels along the Southern Pacific Rail line. These noise increases due to the increases in train traffic were determined and are shown below in Table 6.

Table 6
NOISE LEVEL INCREASE ON SOUTHERN PACIFIC RAIL LINE DUE TO PROJECT GENERATED TRAIN TRAFFIC

Distance to CNEL Level	Existing CNEL Level	Project CNEL Level	Existing + Project CNEL Level	Noise Level Increase (dB)
PHASE 1				
100 ft.	74	62.0	74.3	+0.3
PHASE 2				
100 ft.	74	66.6	74.7	+0.7

In community noise assessment, changes in noise levels greater than 3 dBA are often identified as significant, while changes less than 1 dBA will not be discernible to local residents. In the range of 1 to 3 dBA residents who are very sensitive to noise may perceive a slight change. No scientific evidence is available to support the use of 3 dBA as the significance threshold. In laboratory testing situations humans are able to detect noise level changes of slightly less than 1 dBA. However, in a community noise situation the noise exposure is over a long time period, and changes in noise levels occur over years, rather than the immediate comparison made in a laboratory situation. Therefore, the level at which changes in community noise levels become discernible is likely to be some value greater than 1 dBA, and 3 dBA appears to be appropriate for most people.

As can be seen from the Table 6, the noise level increases of 0.3 dB for Phase 1 and 0.7 dB for Phase 2 that will be experienced by the residential areas assumed to be 100 feet away from the Southern Pacific Rail line is not considered to be significant.

To determine the noise levels due to the Eagle Mountain Rail line that will be utilized for the project between Ferrum and Eagle Mountain, the Wyle Train Noise Model was used to determine train noise levels at various distances. The railroad operations data used were obtained from the Eagle Mountain Waste-By-Rail and Disposal System project description. The noise levels that will be generated by the use of this rail line are shown below in Table 7.

Table 7
PROPOSED EAGLE MOUNTAIN RAILROAD NOISE LEVELS

DISTANCE (FT)	100	200	300	400	500	700	1000	2000	5000
PHASE 1									
CNEL (dBA)	62.0	58.1	54.9	52.7	50.9	48.3	45.6	40.2	33.1
PHASE 2									
CNEL (dBA)	66.6	62.8	59.6	57.3	55.6	53.0	50.2	44.8	37.8

There is currently a return-to-custody facility at the western portion of the Town of Eagle Mountain located approximately 150 feet from the currently unused Kaiser Rail line that will be utilized for Phase 1. This return-to-custody facility lies just outside the Eagle Mountain Landfill project boundary line and may experience noise levels of 60.3 CNEL due to project generated train traffic along the Kaiser Rail line. The train traffic during Phase 2 will be moved to the eastern portion of the landfill site, and will therefore, no longer pass by the return-to-custody facility at the west end of the Town of Eagle Mountain. Also, there may be some residential areas in Ferrum that are approximately 1,000 feet from the rail line. These residential areas in Ferrum will be exposed to train noise levels of 50.2 CNEL.

4.2.2 Truck Transport

The future traffic noise levels were established in terms of the CNEL index by modeling the roadways that will be utilized for the traffic characteristics. The traffic volumes that were used to estimate these noise levels were obtained from the traffic study prepared for this project by DKS

Associates on December 1989 and are summarized in the Appendix. The highway noise levels were computed using the "FHWA Highway Traffic Noise Prediction Model" described earlier. The roadways that were modeled for future plus project conditions were those roadways that may carry project generated traffic. Traffic distribution assumptions are the same as for existing conditions. This traffic data is presented in the Appendix.

The distances to the CNEL contours for the future without project traffic conditions are given in Table 8. They represent the distances from the centerline of the road to the contour value shown. Note that the projections do not take into account the effect of the topography or intervening barriers that will alter ambient noise levels. In addition, existing legislation is expected to reduce noise levels from future vehicles by 3 dBA or more. This reduction is not included in these projections. Table 9 shows the distances to the CNEL contours for the future with project traffic conditions.

Table 8
FUTURE (1995) WITHOUT PROJECT ROADWAY NOISE LEVELS

	DISTANCE TO CNEL CONTOUR (FEET)		
ROADWAY	70-CNEL	65-CNEL	60-CNEL
Eagle Mountain Rd			
I-10 EB to I-10 WB	RW	RW	RW
I-10 WB to Ragsdale Rd	RW	RW	RW
N of Ragsdale Rd	RW	RW	RW
Kaiser Rd			
I-10 WB to Ragsdale Rd	RW	RW	49
Ragsdale Rd to Lake Tamarisk Dr	RW	RW	RW
N of Lake Tamarisk Dr	RW	RW	RW
Interstate 10			
Eagle Mountain Rd to Kaiser Rd	185	399	860

RW - Denotes that the CNEL contour does not extend beyond the roadway edge.

Table 9
FUTURE (1995) WITH PROJECT ROADWAY NOISE LEVELS

ROADWAY	DISTANCE TO CNEL CONTOUR (FEET) 70-CNEL	65-CNEL	60-CNEL
Eagle Mountain Rd			
I-10 EB to I-10 WB	RW	RW	RW
I-10 WB to Ragsdale Rd	RW	RW	RW
N of Ragsdale Rd	RW	RW	RW
Kaiser Rd			
I-10 WB to Ragsdale Rd	RW	RW	49
Ragsdale Rd to Lake Tamarisk Dr	RW	RW	RW
N of Lake Tamarisk Dr	RW	RW	RW
Interstate 10			
Eagle Mountain Rd to Kaiser Rd	194	418	901

RW - Denotes that the CNEL contour does not extend beyond the roadway edge.

The impact of the project traffic on land uses along roadways that will carry project generated traffic is assessed by determining the noise levels along these roadways for (1) existing traffic levels, (2) future projected traffic levels without project, and (3) future projected traffic levels with project. The future (1995 projection) without project distance to CNEL noise contours were shown in Table 8 and the future (1995 projection) with project distance to CNEL noise contours were shown in Table 9.

Two comparisons were made to determine the impact due to project related traffic. The first comparison calculated the noise increase of the future plus project levels over the existing levels, and the second comparison calculated the noise increase of the future plus project levels over the future without project levels. Of the two comparisons, the latter is the more pertinent since it gives the noise increase due strictly to the project. The difference in noise levels will be caused by the increase in traffic due to the project. Table 10 shows the future without project noise levels, the future with project noise levels, and the increase in noise levels of the future with project over the future without project.

In community noise assessment, changes in noise levels greater than 3 dBA are often identified as significant, while changes less than 1 dBA will not be discernible to local residents. In the range of 1 to 3 dBA residents who are very sensitive to noise may perceive a slight change. No scientific evidence is available to support the use of 3 dBA as the significance threshold. In laboratory testing situations humans are able to detect noise level changes of slightly less than 1 dBA. However, in a community noise situation the noise exposure is over a long time period, and changes in noise levels occur over years, rather than the immediate comparison made in a laboratory situation. Therefore, the level at which changes in community noise levels become discernible is likely to be some value greater than 1 dBA, and 3 dBA appears to be appropriate for most people.

In addition to the noise level increase being significant, two other conditions must exist before the significant increase in noise level will constitute a significant impact. These two conditions are: (1) there must be some sort of noise sensitive land uses (such as residential areas) along the roadway that will be impacted, and (2) the ultimate traffic volume must be great enough to have a significant impact which means that the 65 CNEL noise contour must extend far enough from the roadway centerline to impact any residential areas.

Table 10
INCREASE IN NOISE LEVELS DUE TO PROJECT TRAFFIC

ROADWAY	CNEL NOISE LEVELS AT 100 FEET		
	FUTURE W/O PROJ CNEL	FUTURE W/ PROJ CNEL	INCREASE DUE TO PROJECT (dB)
Eagle Mountain Rd			
I-10 EB to I-10 WB	38.7	48.2	9.5
I-10 WB to Ragsdale Rd	41.0	51.0	10.0
N of Ragsdale Rd	39.0	50.9	11.9
Kaiser Rd			
I-10 WB to Ragsdale Rd	55.4	55.4	0.0
Ragsdale to Lake Tamarisk	48.2	48.7	0.5
N of Lake Tamarisk Dr	46.6	47.3	0.7
Interstate 10			
Eagle Mtn Rd to Kaiser Rd	74.0	74.3	0.3

The results show that there will be some increase in the noise levels due to the project. The roadway with the greatest increase in noise level is Eagle Mountain Road north of Ragsdale Road with an increase of 11.9 dB. The other links along Eagle Mountain Road from Interstate 10 to Ragsdale Road will also have large noise increases of 9.5 to 10 dB. All other roadways will experience increases in noise levels of less than 1 dB.

As stated earlier, in community noise assessment, changes in noise levels greater than 3 dBA are often identified as significant, while changes less than 1 dBA will not be discernible to local residents. Noise level changes in the range of 1 to 3 dBA are considered to be noticeable, but not significant.

Although the noise level increases along Eagle Mountain Road are great, the ultimate future with project traffic volumes are less than 2,000 ADT. With an ADT this low, the 60 CNEL noise contour for this roadway will not extend beyond the roadway edge and therefore, the noise increase impact along Eagle Mountain Road will be insignificant. The other roadways, namely Kaiser Road and Interstate 10, will experience noise level increases of less than 1 dB and will therefore, have an insignificant increase.

A land use map of the project area is currently unavailable, but scattered residential areas were observed along the roadways that will be serving the project as near as 100 feet from the roadway centerline. Also, residential areas were observed approximately 200 feet from the roadway centerline of Interstate 10. Table 11 below shows the noise levels that will be experienced by these worst case residential areas.

Table 11
NOISE LEVELS AT WORST CASE RESIDENTIAL AREAS
100 FEET FROM ROADWAY CENTERLINE

ROADWAY	CNEL @ 100 ft	CNEL @ 200 ft
Eagle Mountain Rd		
I-10 EB to I-10 WB	48.2	-
I-10 WB to Ragsdale Rd	51.0	-
N of Ragsdale Rd	50.9	-
Kaiser Rd		
I-10 WB to Ragsdale Rd	55.4	-
Ragsdale to Lake Tamarisk	48.7	-
N of Lake Tamarisk Dr	47.3	-
Interstate 10		
Eagle Mtn Rd to Kaiser Rd	-	69.8

As can be seen from the above table, the residential areas located along the roadways will not be exposed to significant noise levels in excess of 65 CNEL other than along Interstate 10 where existing noise levels already exceed 65 CNEL. This is a worst case analysis where residential areas were assumed to be 100 feet from the roadway centerline. There may be some undeveloped areas designated as residential that are adjacent to roadways that will carry project related traffic may have homes built on them in the future. If these homes are planned within the roadway 65 CNEL contour line, mitigation measures may be required. More detailed calculations should be preformed when a land use map that identifies the noise sensitive land uses around the Eagle Mountain Landfill site and along the rail and truck haul routes becomes available.

4.3 On-Site Noise

The on-site noise impacts will be attributable to a number of operations that will take place at the Eagle Mountain Landfill site. First, there is the container handling yard which will have the following: 1) railroad spur lines of sidings, 2) equipment for moving containers between the unit trains and the container handling vehicles (shuttle trucks), and 3) equipment for moving containers between the highway transport vehicles and container handling vehicles. Second, there are the internal haul routes, both permanent and temporary, that will be used to transport containers from the container handling yard to the working face of the landfill. Third, the containers will be dumped into the landfill.

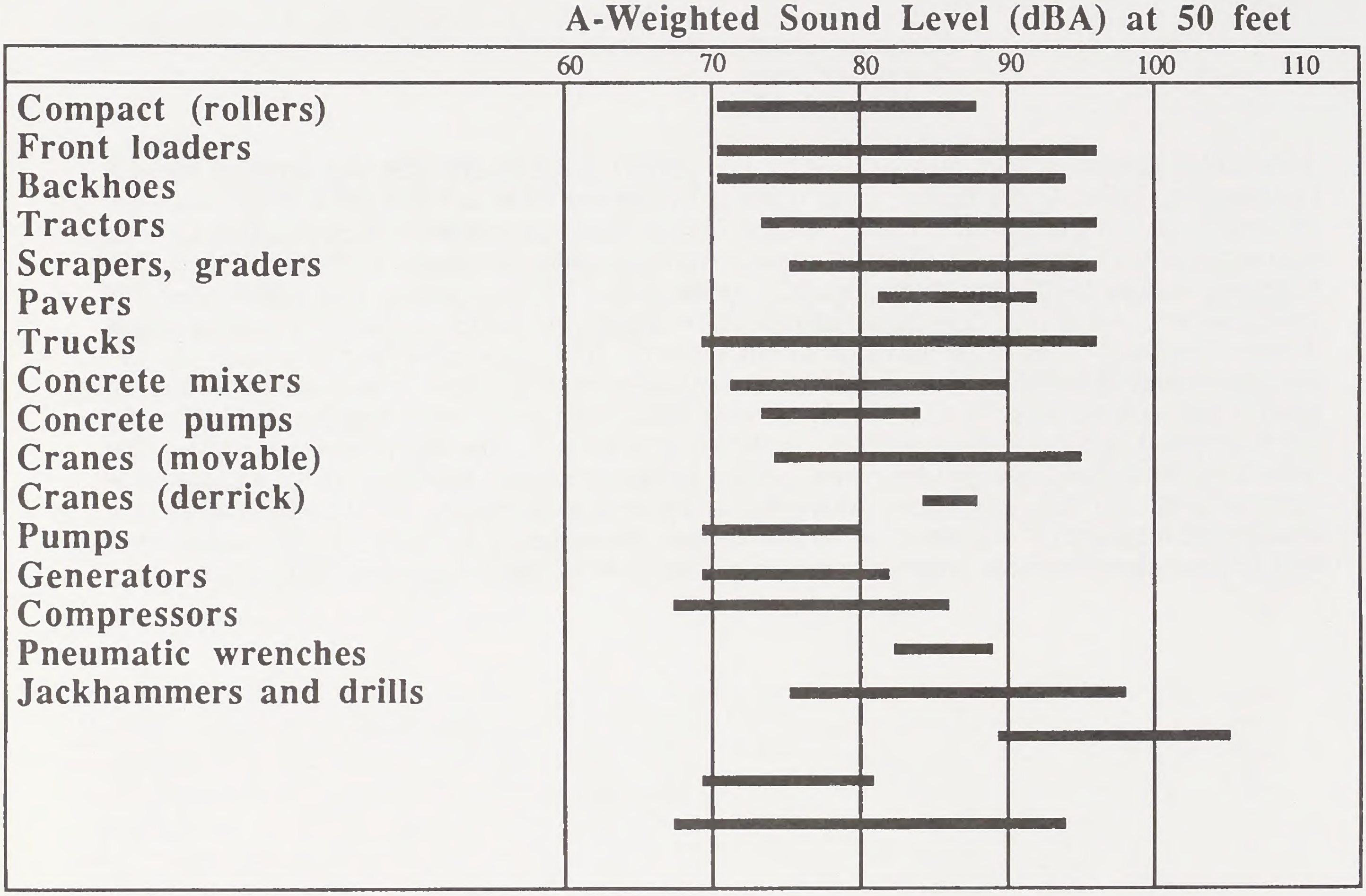
The landfill will have two phases. During Phase 1, the container handling yard will be located toward the middle of the pit on the south side of the pit. Landfill operations will fill the pit westward from the center of the pit. During Phase 2, the container handling yard will be moved to the eastern portion of the pit where the pit will then be filled northeastwardly and southeastwardly.

4.3.1 Container Handling Yard

Noise will be generated by a number of operations at the container handling yard. The primary sources of noise from operations at the yard are:

- *Container Handling Vehicles*
- *Overhead Cranes*
- *Container Handlers*

A list of the equipment that may be used for this project at the landfill site was supplied by SCS Engineering. Noise levels for the earth moving equipment to be used at the landfill site were obtained from Les Burgstrom of the Caterpillar Tractor Company in Peoria, Illinois during a phone conversation on February 27, 1990. The earth moving equipment made by Caterpillar Tractor Company include D-8N crawler tractors, 826 compactors, a 973 trac-loader, 12G graders, and 988 wheel loaders. All the numbers mentioned above are equipment model numbers for the Caterpillar Tractor Company. The noise level of 87 dBA for the 973 trac-loader was also used for the container handling vehicle. Noise levels for the remainder of the equipment that will be used at the landfill site were obtained from the table of construction equipment noise levels compiled by the Environmental Protection Agency (EPA) as shown in Exhibit 7. The equipment noise levels that were used from this table include; front loaders for the container handlers, backhoes, concrete mixers for the pugmill, and cranes (movable) for the overhead cranes. All the equipment noise levels were measured at a distance of 50 feet and are shown below in Table 12. The sound level data shown below represent the peak or maximum sound level that only occasionally occurs.



Source: "Handbook of Noise Control," by Cyril Harris, 1979.

Exhibit 7

Construction Equipment Noise Levels

Table 12
ON-SITE EQUIPMENT NOISE LEVELS FROM THE CATERPILLAR TRACTOR CO. (dBA)

EQUIPMENT	NO. OF VEHICLES	NOISE LEVEL @ 50 ft (dBA)	COMBINED NOISE LEVEL @ 50 FT (dBA)
LANDFILL OPERATION EQUIPMENT			
D-8N Crawler Tractor	15	84	95.8
826 Compactor	13	80	91.1
973 Trac-loader	7	87	95.5
12 G Graders	3	83	87.8
988 Wheeled Loader	5	82	89.0
Backhoes	1	94	94.0*
TOTAL NOISE LEVEL @ 50 FEET:			*101.0*
DISTANCE TO 75 dBA Lmax NOISE LEVEL (FT):			*993*
CONTAINER HANDLING YARD EQUIPMENT			
Container Handler	2	96	99.0*
Overhead Crane	4	95	101.0*
Container Handling Vehicle	32	87	102.1
TOTAL NOISE LEVEL @ 50 FEET:			*105.6*
DISTANCE TO 75 dBA Lmax NOISE LEVEL (FT):			*1,702*
PUGMILL EQUIPMENT			
Pugmill	1	90	90.0*
TOTAL NOISE LEVEL @ 50 FEET:			*90.0*
DISTANCE TO 75 dBA Lmax NOISE LEVEL (FT):			*281*

* Noise levels obtained from the EPA table.

In Table 12 above, the noise levels of all the equipment expected to operate at the landfill pit area, container handling yard, and pugmill were separated. Then, the equipment noise levels from each facility were summed up, and the distances to the 75 dBA noise level were found. Although Riverside County does not have a noise ordinance, 75 dBA is a typical Lmax noise level not to be exceeded at any time. Exhibit 8 shows the combined 75 dBA noise contour due to operations at the landfill, container handling yard, and pugmill. It should be noted that the 75 dBA contour for landfill pit operations shown in Exhibit 8 assumes that the noise source is from a single point placed at the outer edge of the landfill boundary. Under more typical landfill operating conditions, the noise source will be spread out throughout the landfill pit area. Site observations show that the closest residential land use to the landfill pit is approximately 2,250 feet away. Extrapolating the total on-site operations noise level to this distance of 2,250 feet gives a noise level of 74 dBA. This noise level will be audible at 2,250 feet, but it should be noted that the equipment noise levels obtained from the EPA table are not necessarily noise levels of the exact equipment that will be used for this project. The EPA table merely shows the range of noise levels measured for various pieces of equipment of a certain type, and the maximum noise levels of the loudest pieces of equipment measured were used in the calculation. Also, the earth moving operations at the Eagle Mountain landfill site will mostly take place inside of a landfill pit which will provide shielding for the noise. Finally, having the equipment dispersed throughout the landfill will dissipate the noise generation levels. Taking all of the above factors into consideration, the noise exposure at the residential area 2,250 feet from the landfill pit is expected to be considerably less than the calculation from the worst case scenario. The layout of the operations can be designed to reduce the noise levels on the site even further. A more accurate on-site noise projection should be calculated when more detailed equipment noise data becomes available.

4.4 Construction Noise

Construction noise will occur as a result of the development of the Eagle Mountain Landfill site and its potential noise impacts must be considered. Construction noise represents a short-term impact on ambient noise levels. Every effort must be made to ensure that during construction, excessive noise is not produced. Noise generated by construction equipment and construction activities can reach high levels. Construction equipment noise comes under the control of the Environmental Protection Agency's Noise Control Program (Part 204 of Title 40, Code of Federal Regulations).

The activities that will contribute to the construction noise include grading and establishment of Phase 1, grading and establishment of Phase 2, construction of a truck access road to the Phase 1 site, construction of a truck access road to the Phase 2 site, and loading between the south pile to the southeastern portion of the north pile.

There are existing residential land uses in the Town of Eagle Mountain situated approximately 1/3 mile southeast of the Eagle Mountain Landfill site. Exhibit 7 depicts the range in noise levels for construction equipment referenced to 50 feet. At 100 feet, these noise levels would be 6 dBA less; at 2000 feet 32 dBA less. Therefore, the residential areas in the Town of Eagle Mountain will not be adversely impacted by construction noise.

Residential areas will experience lower ambient noise during the nighttime. Therefore, the sound from the landfill operations are more likely to be audible. The early morning operations such as truck loading may commence as early as 6 a.m. Night-time noise will also include noise from container drop-off and maintenance operations. No landfill operations will take place during night-time hours. The sample model noise ordinance is 5 dB more restrictive during the nighttime hours. Although nighttime noise will more likely be audible, the noise levels associated with container drop-off and maintenance operations will still comply with the sample Model Noise Ordinance.

4.5 Noise Impacts on Threatened Species in the Project Area

The Environmental Protection Agency (Dufour, 1980) reviewed literature on the effects of sound on animals. The research categorized the effects into four general categories. These categories include: hearing impairment, communication masking, non-auditory physiological effects, and behavioral modifications. The effects of these sounds may include: "...loss of habitat and territory; loss of food supply; behavioral changes modifying mating, predation, migration; and changes in interspecific relationships including predator/prey and competition for food and shelter" (Kull et al., 1986).

It is important to point out that research into the effects of sound on animals is a very difficult task. Most research into the effects on animals are based on observations of behavioral responses that are subject to human interpretation, or laboratory electrophysiological response tests. It is difficult to draw a precise parallel between the behavioral response and any specific adverse effect on the animal.

4.5.1 Noise Impacts on the Coachella Valley Fringe-Toed Lizard: Concern has been expressed that sounds generated by the transport of wastes to the proposed Eagle Mountain Landfill site will adversely affect the Coachella Valley Fringe-Toed Lizard (Uma Scoparia). The fringe-toed lizard is listed as a threatened species by the United States Government, and an extensive program has been developed by local agencies in Coachella Valley to protect the lizard's habitat. These agencies have established preserves for the fringe-toed lizard, including the Whitewater Preserve located between Indian Avenue and Gene Autry Trail along the Southern Pacific Rail line that runs through this area and into Ferrum.

Researchers (Bondello et al., 1979) have studied the effects of off-road vehicle sounds on the fringe-toad lizard. This laboratory study investigated the effect of these sounds on the auditory response of the lizard. The study concluded that sound levels greater than 95 dBA (100 dB linear) of cumulative durations greater than 500 seconds results in hearing loss. Loss of hearing could result in reduced prey acquisition and predator avoidance. Without specifically supporting the conclusions of this study, the 95 dBA (100 dB linear) threshold will be used as the basis for the analysis of the acoustic impacts from the increased railroad noise onto the fringe-toad lizard habitat. The main issue to be examined as part of this review is:

- How will noise level increase due to the increase in train operations along the Southern Pacific Rail mainline through the Whitewater Preserve compare to the existing noise levels along the Rail line?

The rail line connecting Ferrum with the Eagle Mountain Landfill site will not pass through the Whitewater Reserve and will therefore, not affect the Coachella Valley Fringe-Toed Lizard. The major frequency range of concern for the fringe-toed lizard is between 900 and 3500 Hz (Bondello 1979, Fey 1988). This frequency range corresponds to the range of maximum acoustic sensitivity to the lizard, and therefore, is most likely the frequency range most important in terms of the detection of prey and predators. The frequency range of the railroad operations at a referenced distance of 100 feet is 80 Hz to 2000 Hz.

In summary, the increase of trains along the Southern Pacific mainline due to the project does not result in any new sources of noise onto the Whitewater reserve. The increase in the number of trains only increases the number of times per day that the preserve is exposed to those noises.

4.5.2 Noise Impacts on the Desert Tortoise

Concern has also been expressed that sounds from the transport of wastes to the Eagle Mountain site will adversely affect the Desert Tortoise. The desert tortoise is listed as a threatened species by the State of California and the United States Government. The main issues to be examined as part of this review are:

- How will noise level increases due to the increases in train operations along the Southern Pacific Rail mainline to and from the Eagle Mountain Landfill site compare to the existing noise levels along the Rail line?

- How will noise due to the use of the Eagle Mountain Rail line between Ferrum and the Eagle Mountain Landfill site compare to the existing noise levels along the currently abandoned Eagle Mountain Rail line?

The existing sound levels along the Eagle Mountain Rail line are insignificant since that line is currently abandoned. There has not been any extensive studies done on the desert tortoises, but one desert tortoise has been observed living at the edge of the railroad track grading area. Also, desert tortoise burrows have been found at the bed of the currently abandoned rail line between Ferrum and the Eagle Mountain Landfill site. It is unknown whether or not the desert tortoise burrows were created prior to the abandonment of the Eagle Mountain Rail Line. The effects of railroad noise on desert tortoises are currently not known, and a more detailed research should be conducted so that the effects of railroad noise on the desert tortoise population can be understood.

5.0 POTENTIAL VIBRATION IMPACTS

Potential impacts due to train pass-bys may include structural vibration in some of the existing residential areas along the rail line. In order to assess the degree of impact due to vibration, it is necessary to first estimate the amount of structural vibration due to the train pass-bys and then to determine the potential health significance of these vibrations.

5.1 Background

Vibration is measured in terms of acceleration. The two most common terms of scaling acceleration are in terms of meters per second squared or in multiples of the acceleration of gravity, commonly referred to as "g's." Exhibit 9 presents a rough indication of the level of vibration that can be expected for several types of activities. The exhibit is divided into three categories; (1) hand-arm, (2) whole body, (3) building.

When an element is excited it will vibrate at its own natural frequency. Similar to a string on a guitar; no matter how fast or how hard you pluck the string it will still vibrate at the same frequency or note. How hard you pluck the string will affect the amplitude or the loudness of the note. You have to change the physical properties of the guitar string, such the length, tension, or weight, to change the natural frequency of the string. Different building elements will have different natural frequencies. Similarly, the different elements that make up the human body have different natural frequencies. The natural frequency varies from person to person and varies depending if you are standing, siting, etc. Typical natural frequencies for both building elements and body elements are presented in Exhibit 10.

Stephens et. al. ("Guide to the Evaluation of Human Exposure to Noise From Large Wind Turbines," NASA Technical Memorandum 83288, March 1982) have compiled data for helicopters, aircraft, and wind turbines which show a correlation between wall, window, and floor vibration for various noise levels. These relationships are reproduced in Exhibit 11. To obtain acceleration levels of 0.001g in floors, walls, and windows, peak noise levels of approximately 95, 80, and 75 dB respectively are required.

Stephens et. al. have also identified the noise levels as a function of frequency that will produce perceptible building vibration. The curves developed for windows, walls, and floors are provided in as Exhibit 12. If noise levels exceed these curves then vibrations that are large enough to be perceived by humans may be evident. The curves are a general guide to the potential generation of perceptible vibrations.

Humans can perceive vibrations through two mechanisms; tactile and whole body. Tactile perception is the sense of touch. Whole body vibrations are experienced when the body as a whole is subjected to vibration, such as a person standing on a vibrating floor. The level at which tactile and whole body vibrations become perceptible differ. The levels of vibration that is perceptible to humans for both tactile and whole body vibrations are also presented in Exhibit 13. Below 1 Hz less vibrations is necessary to perceive whole body vibrations. Since most building elements have natural frequencies greater than 1 Hz, most vibrations will be perceived first through the sense of touch.

Level	Hand-Arm	Whole Body	Building
10g – 1.0g	Operation of a Jack Hammer	Riding Motorcycle	Building During Demolition
1.0g – 0.1g	Operation of a Chain Saw	Riding in Fork Lift or other Construction Equipment	Home Near Blasting Site
0.1g – 0.01g	Operating Controls for Heavy Equipment	Riding in Automobile or High Speed Train	Home Near Pile Driver
0.01g – 0.001g	Holding Smoking Pipe	Riding in Airplane or Ocean Liner	Home Near Railroad Line
0.001g – 0.0001g	Resting Hand on Cushioned Armrest	Riding in Space Capsule in Orbit	Home in Quiet Rural Area

Exhibit 9

Examples of Vibration Levels

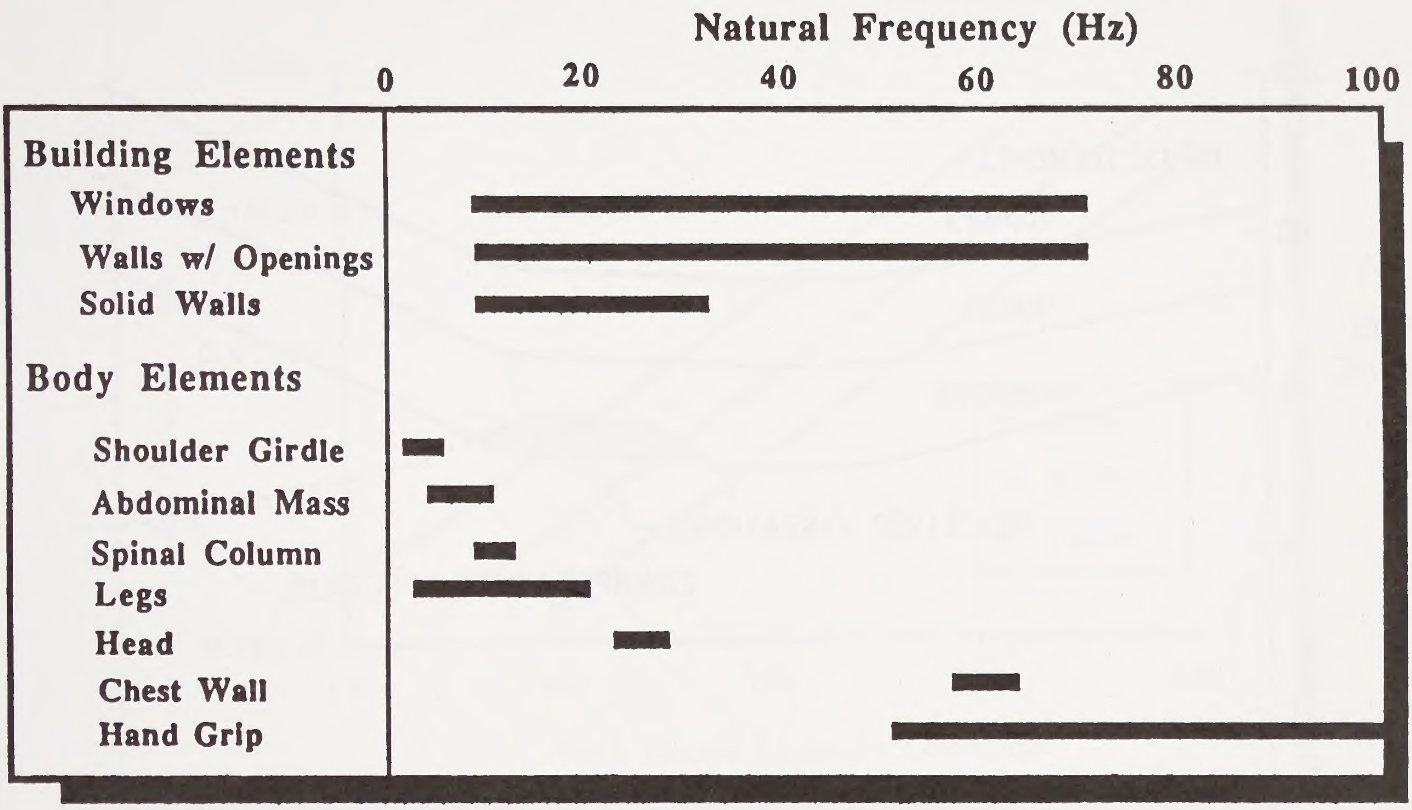


Exhibit 10 - *Examples of Natural Frequencies for Various Elements*

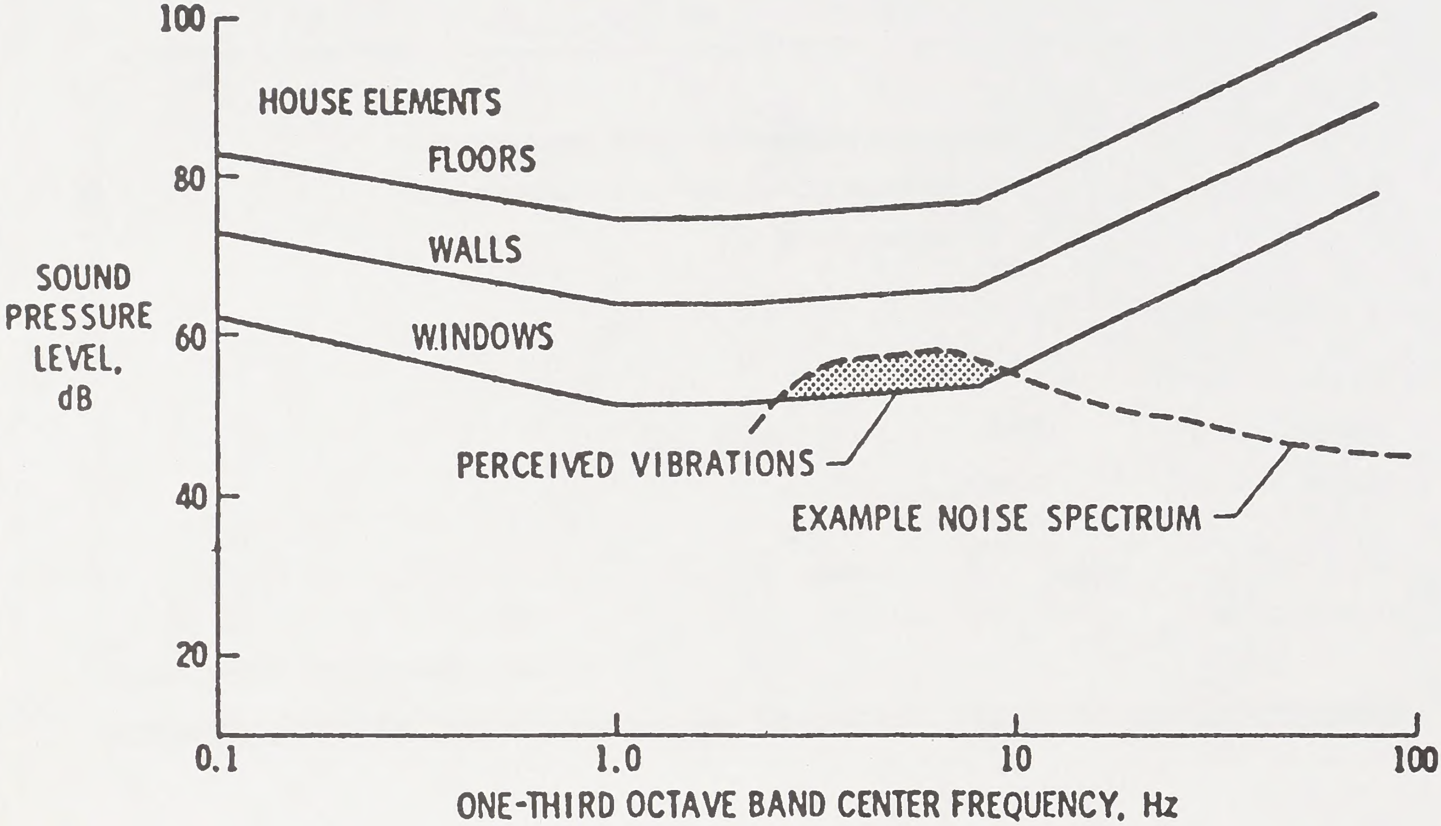


***Exhibit 11** - Sound Levels Sufficient to Cause Perceptible Vibrations*

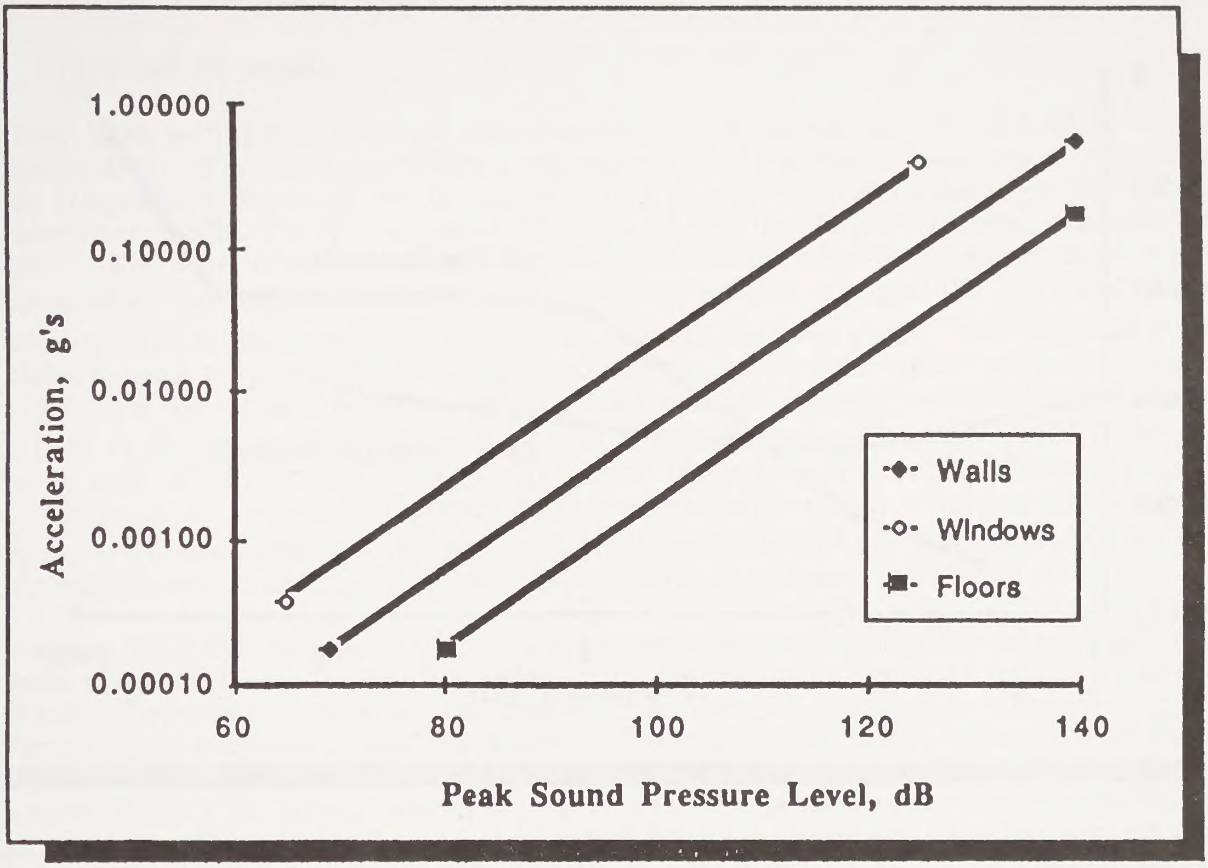


Exhibit 12

Acceleration Generated by Sound Pressure Levels

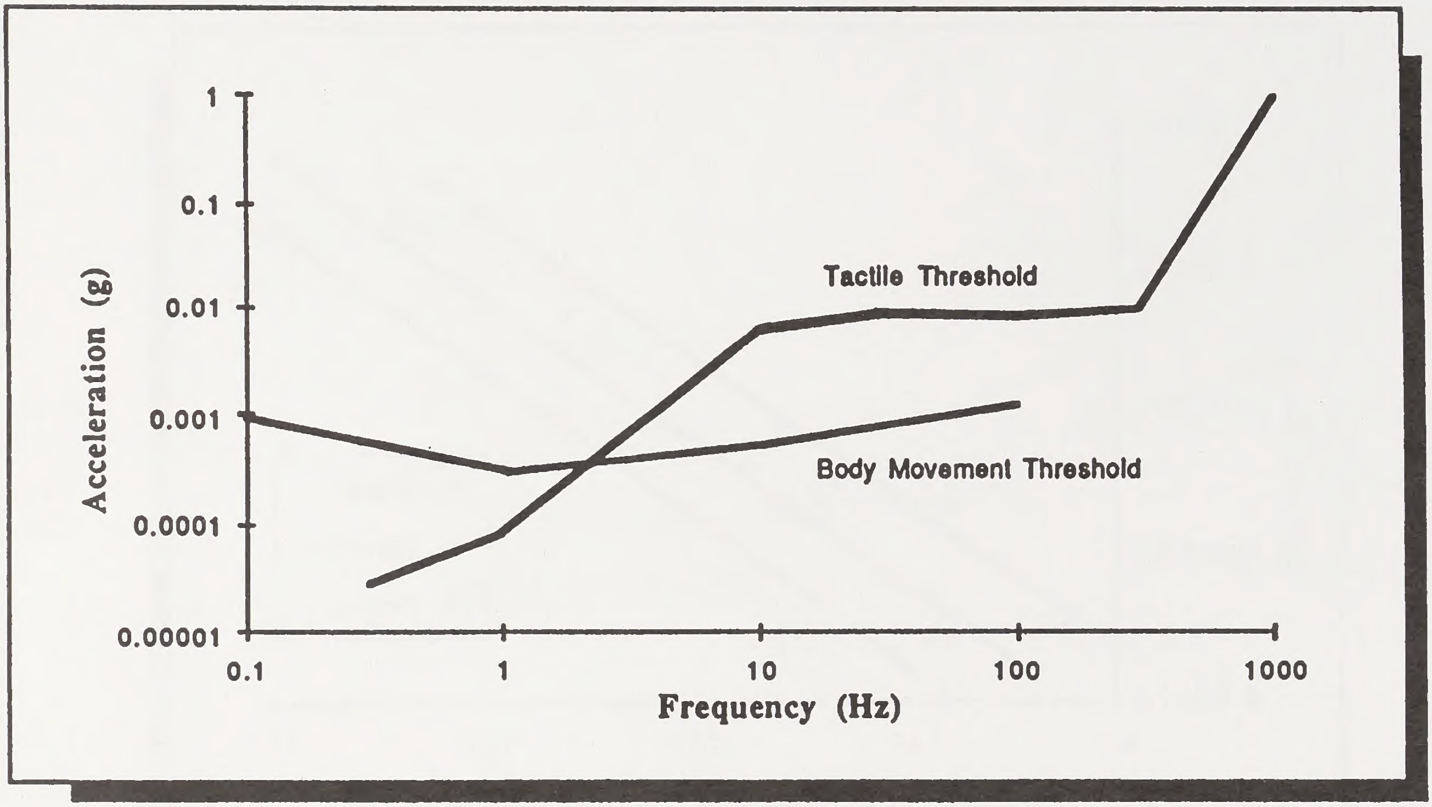


Exhibit 13

Perceptible Levels of Vibration

5.2 Structural Vibration Due To Train Pass-bys

Vibration levels generated by typical train pass-bys were measured on March 1, 1989. For vibration measurements, an accelerometer was set up 180 feet west of the railroad tracks. The equipment used for the vibration survey consisted of an Endevco Model 2272M1 accelerometer, a Bruel & Kjaer Model 2230 precision integrating sound level meter (used only as a signal conditioner), a Sony TCD-D10 digital tape recorder, and a Bruel & Kjaer Model 2123 real-time frequency analyzer. The system was calibrated before and after the measurements with an Endevco Model 4815M1 accelerometer simulator.

5.3 Vibration Exposure

Vibration levels of four train pass-bys were recorded and played back on a Bruel & Kjaer real-time frequency analyzer to obtain the different vibration levels for different frequencies. This showed which frequencies produced the largest vibration levels. Exhibit 14 displays the vibration measurement results. The first column of Exhibit 14 lists the frequency range of the recorded vibration signal in 1/3 octave increments. The next four columns show the measured acceleration in millimeters/sec^2 corresponding to each frequency in the first column. The sixth and seventh columns contain the minimum and maximum acceleration (in meters/sec^2) taken from all four of the trains for each frequency. Columns eight and nine are merely columns six and seven converted into "g's", and column ten and eleven are only columns eight and nine converted into decibels or dB's ("dB re 10^{-6} g" is a standard method of reported acceleration in terms of dB's). The three different units of vibration are presented in Exhibit 14 because of the many different ways that vibration levels are commonly reported in the research literature and in various surveys. In this analysis we will use vibration levels measured in dB relative to 10^{-6} g's . The other units are given for the reader should it be desirable to relate the vibration as measured in different units.

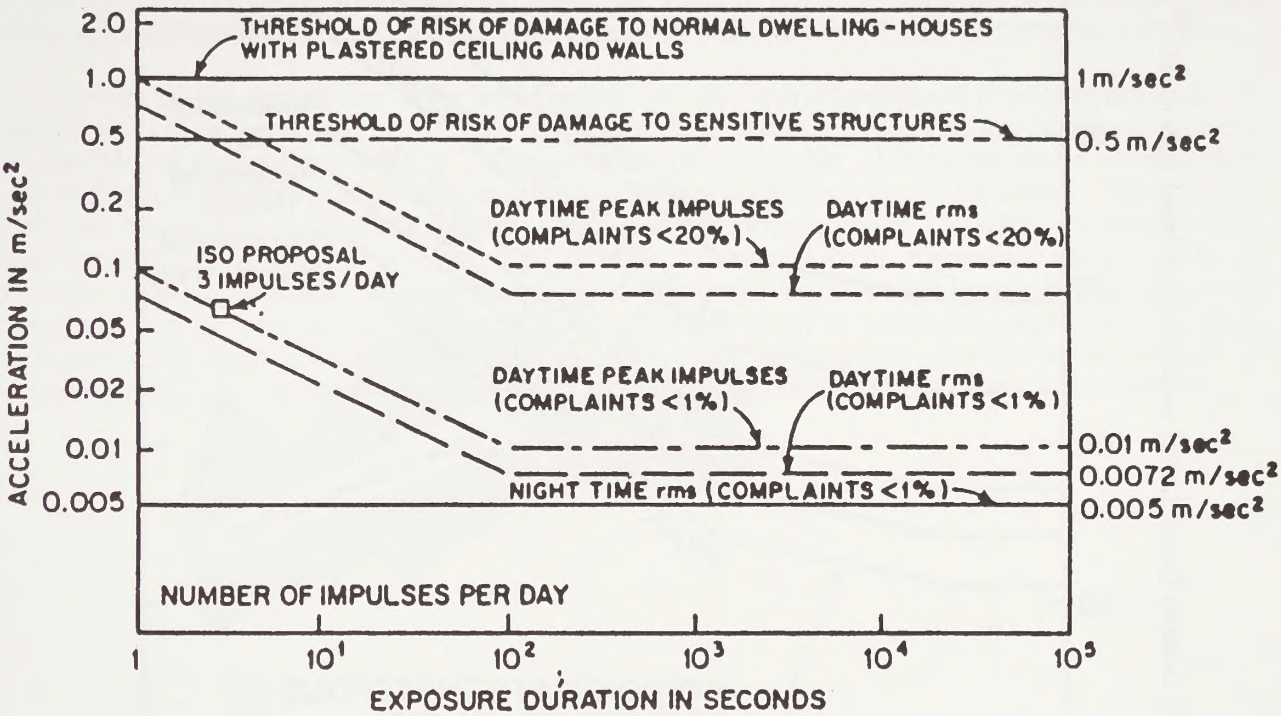
It should be noted that the County of Riverside nor any other municipality that we are aware of has adopted vibration limits for residential land uses. In reviewing literature on the subject, the following reference to vibration recommendations was found. A reference to vibration criteria for residential areas was found in the "Transportation Noise Reference Book", Edited by Paul Nelson, Butterworth & Co. (Publishers) Ltd., 1987. Exhibit 15 presents the criteria for building vibration exposure. Exhibit 16 shows combined response curves for annoyance due to vibration for residential areas. This exhibit shows that the threshold of perception at 8 Hz is about 54 dB where as the measured value on-site is about 66 dB. The graph in Exhibit 15 was referenced from "Transportation Noise Reference Book", page 16/11, fig. 16.13. It should be noted that the vibration levels recommended in residential structures are just barely above the point of perception. While there is no doubt that the vibration levels measured on-site are perceptible during train pass-bys, affects to planned residences are considered to constitute an annoyance or nuisance impact and are not of a magnitude to result in the structural damages or risk to human health. Floor vibration will occur at the site of measurements and in the immediate vicinity. This location, and the vibration levels recorded represent a "worst case" situation.

It is common to find residential areas this close or closer to railroad tracks without significant vibration problems. The vibration levels measured on-site may be due to several factors including the underlying rock or soil types or the condition of the track. Smooth continuous welded track that is well maintained can easily produce 10 dB less vibration compared to rough poorly maintained welded track.

	Measured Acceleration in millimeters/sec^2				Minimum Accel	Maximum Accel	Minimum	Maximum	Minimum dB's	Maximum dB's
1/3 octave					(m/sec^2)	(m/sec^2)	g's	g's	La dB re 10^-6 g	La dB re 10^-6 g
frequency	Train 1	Train 2	Train 3	Train 4	(of all trains)	(of all trains)				
6.3	14.40	6.61	16.50	9.23	.00661	.01650	.000674	.001684	56.6	64.5
8	18.80	6.32	9.31	7.37	.00632	.01880	.000645	.001918	56.2	65.7
10	12.80	7.34	8.03	8.80	.00734	.01280	.000749	.001306	57.5	62.3
12	13.80	6.60	7.17	8.11	.00660	.01380	.000673	.001408	56.6	63.0
16	14.30	8.06	7.30	7.82	.00730	.01430	.000745	.001459	57.4	63.3
20	12.90	7.76	10.10	7.02	.00702	.01290	.000716	.001316	57.1	62.4
25	22.20	8.53	13.50	7.99	.00799	.02220	.000815	.002265	58.2	67.1
31.5	22.70	7.92	11.40	5.07	.00507	.02270	.000517	.002316	54.3	67.3
40	26.90	5.47	8.03	4.78	.00478	.02690	.000488	.002745	53.8	68.8
50	22.70	4.07	4.73	3.17	.00317	.02270	.000323	.002316	50.2	67.3
63	18.40	4.23	4.51	5.35	.00423	.01840	.000432	.001878	52.7	65.5
80	13.90	4.46	3.44	4.86	.00344	.01390	.000351	.001418	50.9	63.0
100	8.84	3.56	4.73	6.03	.00356	.00884	.000363	.000902	51.2	59.1
125	12.80	3.22	3.61	12.90	.00322	.01290	.000329	.001316	50.3	62.4
160	13.60	3.69	2.57	7.36	.00257	.01360	.000262	.001388	48.4	62.8
200	7.30	4.18	3.48	6.79	.00348	.00730	.000355	.000745	51.0	57.4
250	9.30	6.68	4.00	11.60	.00400	.01160	.000408	.001184	52.2	61.5
315	7.40	3.65	3.69	4.54	.00365	.00740	.000372	.000755	51.4	57.6
400	6.01	2.21	1.67	4.02	.00167	.00601	.000170	.000613	44.6	55.8
500	7.90	2.94	2.63	2.98	.00263	.00790	.000268	.000806	48.6	58.1
630	6.80	2.46	2.33	2.74	.00233	.00680	.000238	.000694	47.5	56.8
800	4.70	1.74	1.53	2.06	.00153	.00470	.000156	.000480	43.9	53.6
1000	7.00	2.54	2.53	2.64	.00253	.00700	.000258	.000714	48.2	57.1
1250	5.10	1.96	1.87	2.01	.00187	.00510	.000191	.000520	45.6	54.3
1600	4.20	1.62	1.46	1.55	.00146	.00420	.000149	.000429	43.5	52.6
2000	6.20	2.41	2.34	2.42	.00234	.00620	.000239	.000633	47.6	56.0
2500	4.80	1.96	1.92	1.97	.00192	.00480	.000196	.000490	45.8	53.8

Exhibit 14

Train Vibration Measurement Results



(Source: C. Harris, 1979))

Exhibit 15

Criteria for Building Vibration Exposure

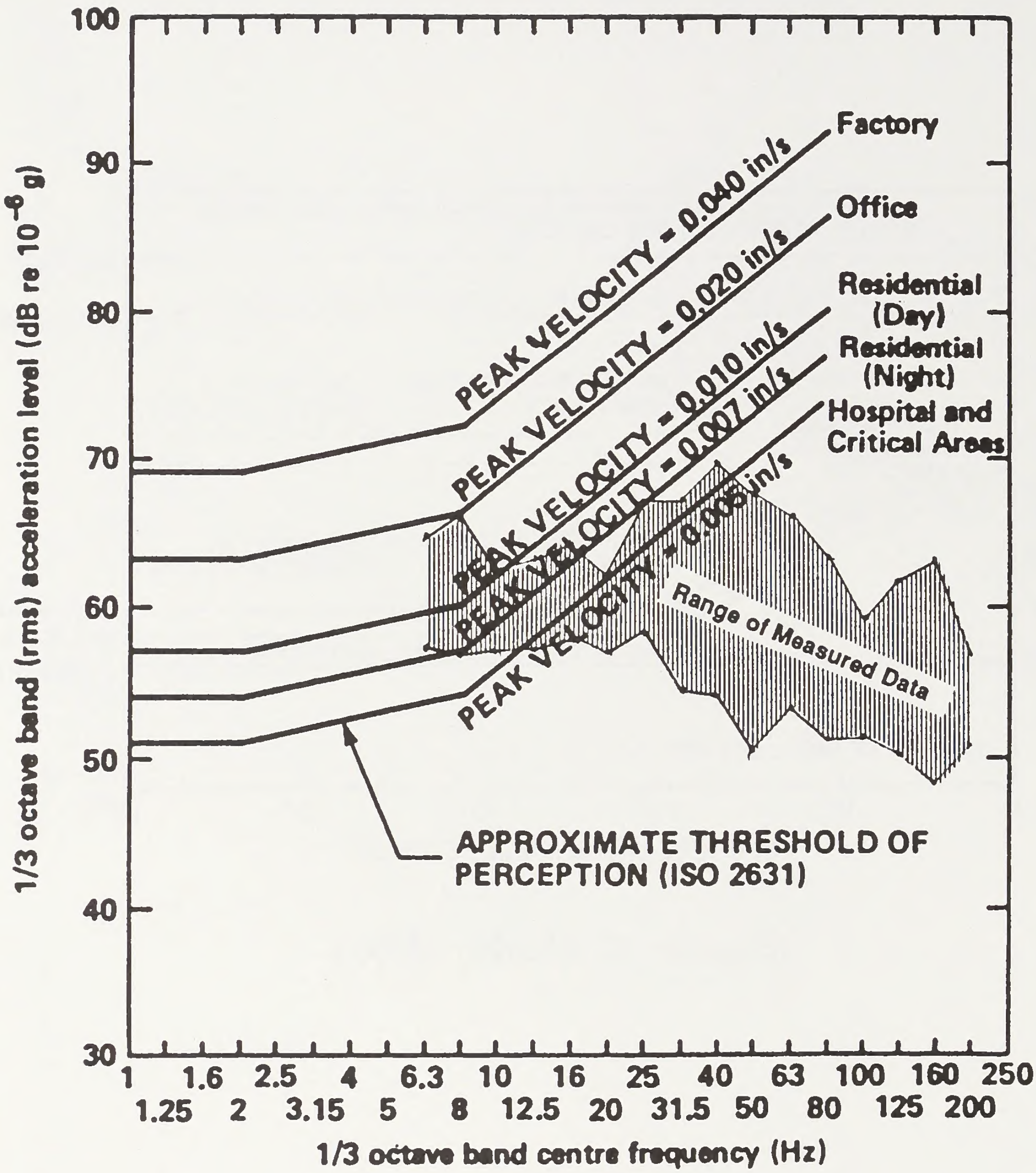


Exhibit 16 *- Combined Response Curves for Annoyance Due to Building Vibration*

6.0 MITIGATION MEASURES

6.1 Noise Mitigation

1) A detailed noise assessment of the loading stations and on-site equipment should be preformed when the final sites and types of equipment have been selected.

2) Devise a program that takes an inventory of the desert tortoise living along the rail lines and monitor them to determine if the increased train operations affect their population.

3) Construction of noise barriers along the portions of the rail lines that adversely impact residential areas once all noise sensitive land uses have been identified and topography is known.

4) A performance condition may be imposed on the unloading/landfill site operations. A performance condition would allow the site operations to proceed as long as specified noise levels (i.e., the Model Noise Ordinance or equivalent) are not exceeded. The noise limits contained in noise ordinances are designed to protect quiet residential areas from excessive noise. The analysis shows that the project would comply with typical noise ordinance levels. A noise ordinance would allow landfill operations to proceed, and provide protection from excessive noise levels. If problems arise, equipment or operations could be modified or noise barriers (temporary or permanent) may be built around the loading and unloading areas in such a way that would result in acceptable noise levels at the adjacent residential areas. The barriers may be walls or berms made of processing material. The local topography will determine the effectiveness of any noise barriers.

APPENDIX

Table A
EXISTING TRAFFIC VOLUMES AND SPEEDS

ROADWAY	ADT	SPEED (mph)
Eagle Mountain Rd		
I-10 EB to I-10 WB	63	35
I-10 WB to Ragsdale Rd	110	35
N of Ragsdale Rd	65	35
Kaiser Rd		
I-10 WB to Ragsdale Rd	3,000	35
Ragsdale Rd to Lake Tamarisk Dr	570	35
N of Lake Tamarisk Dr	400	35
Interstate 10		
Eagle Mountain Rd to Kaiser Rd	12,200	55

Table B
TRAFFIC DISTRIBUTION IN PERCENT OF ADT FOR ARTERIALS

TYPE OF VEHICLE	DAY	EVENING	NIGHT
Automobile	75.51	12.57	9.34
Medium Truck	1.56	0.09	0.19
Heavy Truck	0.64	0.02	0.08

Table C
FUTURE (1995) WITHOUT PROJECT TRAFFIC VOLUMES AND SPEEDS

ROADWAY	ADT	SPEED (mph)
Eagle Mountain Rd		
I-10 EB to I-10 WB	80	35
I-10 WB to Ragsdale Rd	135	35
N of Ragsdale Rd	85	35
Kaiser Rd		
I-10 WB to Ragsdale Rd	3,690	35
Ragsdale Rd to Lake Tamarisk Dr	705	35
N of Lake Tamarisk Dr	490	35
Interstate 10		
Eagle Mountain Rd to Kaiser Rd	17,080	55

Table D
FUTURE (1995) WITH PROJECT TRAFFIC VOLUMES AND SPEEDS

ROADWAY	ADT	SPEED (mph)
Eagle Mountain Rd		
I-10 EB to I-10 WB	715	35
I-10 WB to Ragsdale Rd	1,355	35
N of Ragsdale Rd	1,305	35
Kaiser Rd		
I-10 WB to Ragsdale Rd	3,720	35
Ragsdale Rd to Lake Tamarisk Dr	785	35
N of Lake Tamarisk Dr	570	35
Interstate 10		
Eagle Mountain Rd to Kaiser Rd	18,300	55

Table E
TRAFFIC DISTRIBUTION IN PERCENT OF ADT FOR FREEWAYS

TYPE OF VEHICLE	DAY	EVENING	NIGHT
Automobile	40.48	6.23	5.19
Medium Truck	4.16	0.64	0.53
Heavy Truck	33.35	5.13	4.28

APPENDIX I

CULTURAL RESOURCE SURVEY
OF THE
EAGLE MOUNTAIN MINE
AND THE KAISER INDUSTRIAL RAILROAD
CULTURAL RESOURCE PERMIT #CA881916

Prepared for

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RECON NUMBER 2100A
JUNE 9, 1991

TABLE OF CONTENTS

ATTACHMENTS

FIGURES

I. INTRODUCTION

In response to a proposal by Mine Reclamation Corporation to develop the Eagle Mountain Open Pit Iron Mine into a solid waste disposal site, a team of archaeologists from RECON conducted a cultural resource inventory of approximately 4,659 acres surrounding the mine, including approximately 3,271 acres of Bureau of Land Management (BLM) land slated for Kaiser Steel Resources, Inc. ownerships. The survey also included approximately 1,500 acres of Kaiser-owned lands located along the Chuckwalla Bench which will be exchanged for the BLM land. The 52-mile-long Kaiser railroad running from Eagle Mountains to Ferrum Junction and the existing Eagle Mountain Road and its proposed extension are proposed as access routes to the proposed landfill site. A 200-foot-wide corridor along all these access routes was surveyed (Figures 1 and 2).

Prior to commencing fieldwork, an achival record search was conducted using the resources of the Archaeological Research Unit of the University of California, Riverside. The information gathered from the record search is included with this report as Attachment 1.

Field investigation conducted in 1990 took 98 person-days, conducted simultaneously by two field teams. One team concentrated on the area north of Interstate 10, including the area surrounding the mine, while the other team was assigned to cover the rail corridor and acreage south of the highway. Each team of four archaeologists operated independently until the railroad corridor survey was completed, when the teams were joined to complete the survey of the mine area. In February and March, 1991, eight additional person days were expended completing the field survey of 480 acres of additional BLM exchange lands located on the southern portion of the Specific Plan Area and conducting additional documentation at site Riv-3798.

The survey discovered one previously unrecorded prehistoric site, field designation EMRR-1, as well as nine isolated prehistoric artifacts (Figure 3). EMRR-1 was assigned California trinomial CA-Riv-3798. No previously recorded historic sites were discovered. Department of Parks and Recreation forms (DPR-422a) were completed for each newly located site and isolate and are attached to this report as Attachment 2.

Riv-3216, which was mapped as lying within the area surveyed, was not relocated by the survey team. Riv-3798 consists of a scatter of potsherds and lithics on the southwest-facing slope of a knoll. A major portion of the site has been removed by the excavation of a 10-meter-deep and 20-meter-wide corridor for the railroad tracks.

Since the railroad tracks have cut into the site area, there is no cultural material near the tracks. The nearest relatively undisturbed ground lies about 10 meters to the north of the tracks.

Rehabilitation and use of the railroad and required maintenance activities (which are the only actions proposed for the project in this area) will not involve excavations or movement of dirt. Because the project will have no effect on the resource, no further evaluations are required.

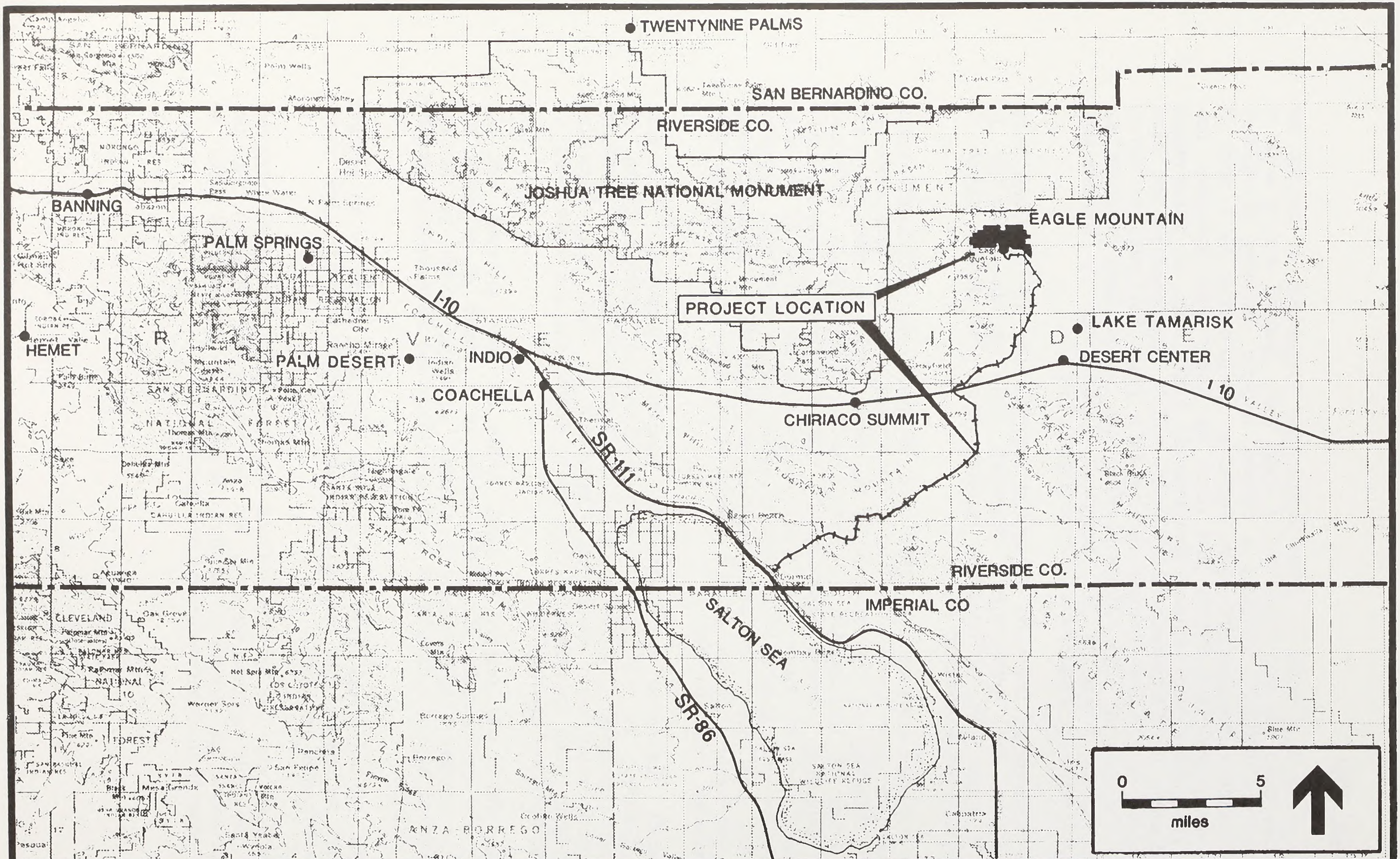

FIGURE 1. PROJECT LOCATION RELATIVE TO EASTERN RIVERSIDE COUNTY

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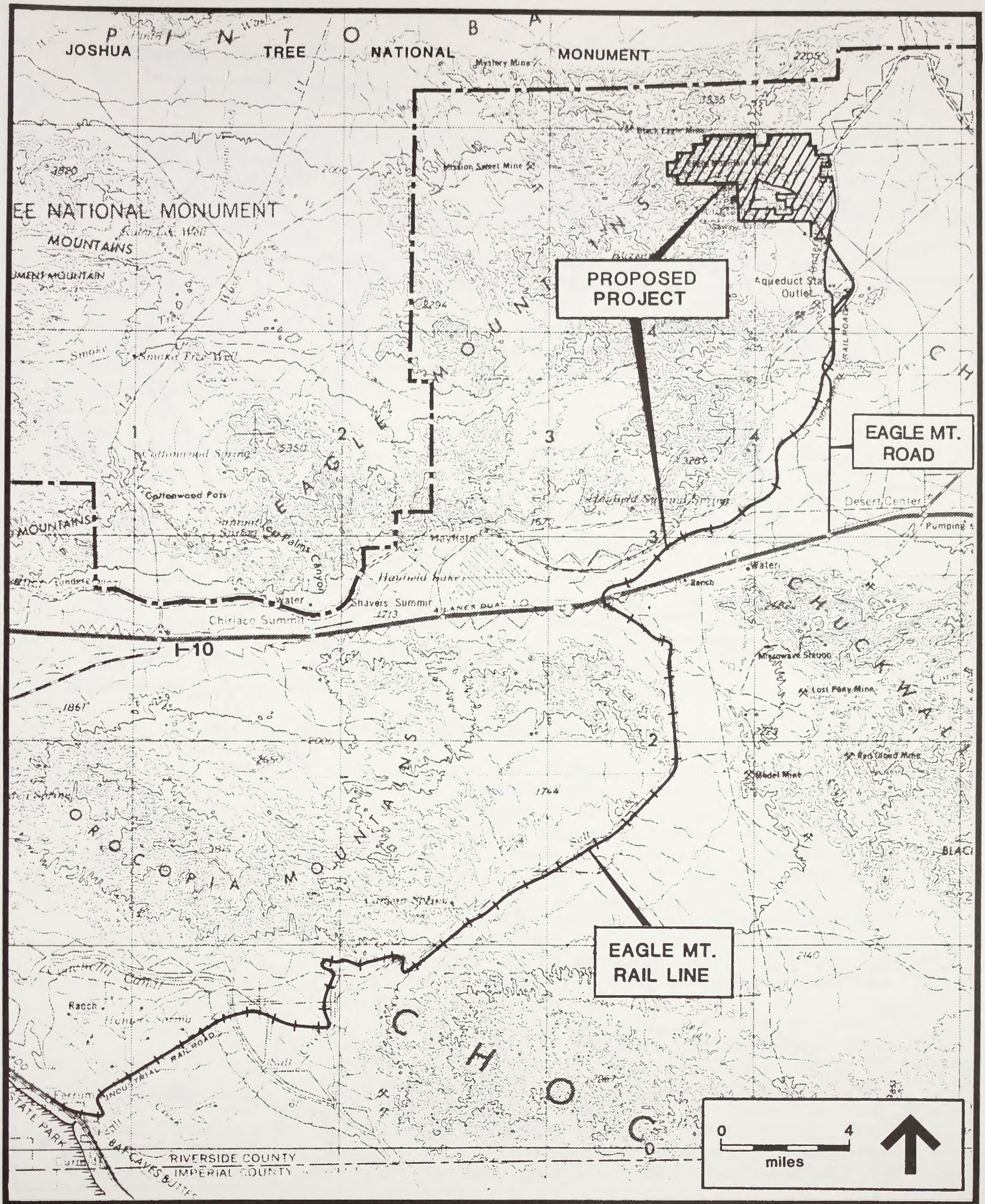

FIGURE 2. PROJECT LOCATION ON U.S.G.S. 1:250,000 SCALE MAP, SALTON SEA SHEET

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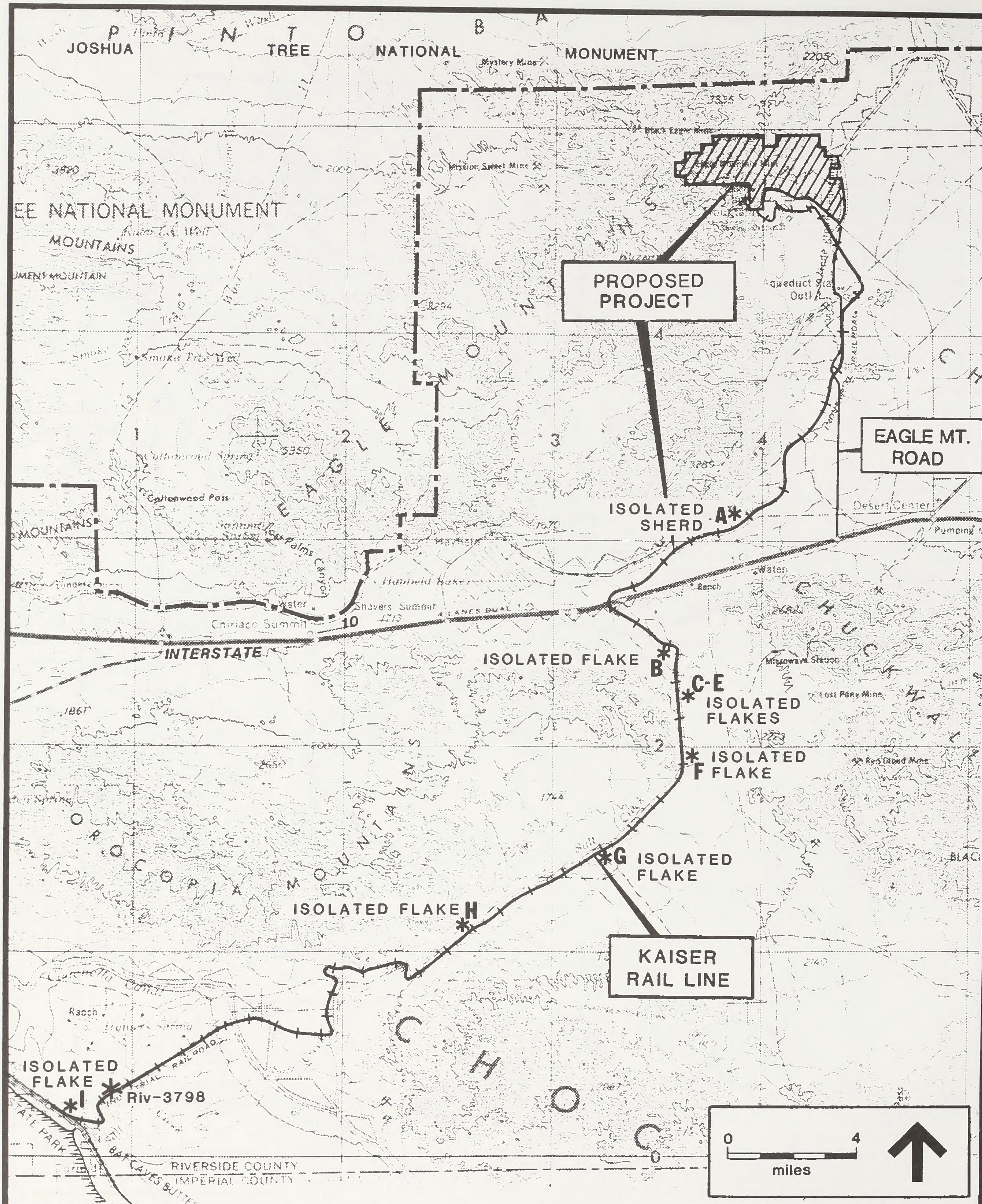

FIGURE 3. LOCATION OF CULTURAL RESOURCES

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II. CULTURAL BACKGROUND

A. REGIONAL OVERVIEW

The area surveyed extends 80 kilometers from the northeastern shore of the Salton Sea to the Eagle Mountains. Within so large an area, a diversity of prehistoric and historic cultural patters are to be expected, lending complexity to even the briefest of synopses. An additional complication is the scarcity of previous investigative data upon which to erect a regional framework.

Most general chronologies of California and desert prehistory begin with the recognition of a possible pre-Projectile Point culture, which would have been present earlier than 15,000 B.P. Advocates of such an early human presence in North America have not succeeded in convincing the scientific majority with their evidence, despite ongoing and vehement dialogue. Without the presence of human remains or unquestioned artifacts in a datable context, it is unlikely that a consensus will be reached (Moratto 1984).

By 15,000 B.P., "there can be little doubt that California was inhabited, albeit sparsely" (Moratto 1984:71). Sites such as Angeles Mesa, the Farmington Complex, and Rancho Murieta have yielded artifacts which have been dated by geomorphologic association at greater than 12,000 B.P. But "the best indicators of widespread occupation in terminal Pleistocene times are the Clovis-like fluted points . . . and related artifacts from numerous sites throughout California" (Moratto 1984:71).

By 14,000 B.P., the cool moist climate of the Late Pleistocene led to the formation of deep pluvial lakes in what are now the Colorado and Mojave deserts. These lakes reached their maximum extent after 11,000 B.P. and then receded during the ensuing 4,000 years until circa 7000 B.P., after which time only playas remained to mark their location (Moratto 1984).

1. The Big Game Hunting Tradition (BGHT)

The period from the end of the Pleistocene to the beginning of the Holocene saw the emergence of a definable culture across the middle of the continent. This Big Game Hunting Tradition is marked by a characteristic tool: the fluted point. These points, often called Clovis or Folsom points (after the type sites), are usually found at large animal kill sites and have been interpreted to represent a life-style dependent on hunting of large herbivores. Although fluted points strongly reminiscent of the Clovis types have been found in California, they have not been found in association with Great Plains type kill sites. This can be taken to indicate that the makers of these distinctive artifacts were not culturally committed to a big game hunting life-style but were able to adapt to more general hunting and foraging subsistence activities (E. Davis 1968, 1974; Davis and Shutler 1969; Hester 1973).

With the discussion restricted to California prehistory, the name "Fluted Point Tradition" (FPT) more accurately designates this culture, which by the weight of the evidence seems to have flourished from somewhat prior to 12,000 B.P. until sometime after 11,000 B.P. (Moratto 1984). Such dates must remain tentative, as the California materials have not been directly dated except by obsidian hydration and there is no independent evidence to confirm the proposed hydration rates. On typologic grounds, "their strong similarity to [radiocarbon] dated specimens farther east implies production in the millennium after 12,000 B.P." (Moratto 1984:87).

During this time frame, evidence is conclusive that many parts of California were inhabited, and sufficient data has been accumulated to allow some assessment of the cultural patterns then present. Three common traits have been identified which characterize the life-style of the FPT:

a. Inland sites are found on the margins of now vanished lakes.

b. Finished lithic artifacts are carefully crafted.

c. The assemblage includes a wide range of specialized and distinctive tool types.

The implication of these traits is that the people who developed the Fluted Point Tradition were, in interior California at least, followers of a generalized hunting and gathering life-style, which was not dependent on large migratory herd animals. These people were adept at exploiting the rich resources in the vicinity of permanent water supplies and were not required to develop the specialized hunting strategies seen in Great Plains sites of this period.

Coincident with the emergence of the Fluted Point Tradition in southeastern California, massive faunal extinctions occurred. The rapid climactic changes which also mark this period undoubtedly were the prime cause of these extinctions, but it is reasonable to assume that the appearance of a substantial population of humans who preyed on the larger herbivores was a significant contributing factor in the rapid demise of many of the previously abundant genera (Kurten and Anderson 1980).

2. <u>The Western Pluvial Lakes Tradition (WPLT)</u>

To describe the culture which apparently appeared subsequent to the Fluted Point Tradition, Bedwell (1970) defined a Western Pluvial Lakes Tradition which extended throughout the Great Basin and into the currently desert regions of southeastern California. By 10,000 B.P., this part of California from China Lake extending well into what is now Mexico held more than ten large bodies of fresh water (Snyder et al. 1964). The southernmost and largest of these pluvial lakes was Lake Cahuilla, which, unlike the others, was intermittently present at varying levels until approximately 500 B.P. (Rogers 1945).

Unlike the earlier periods, where information is fragmented and conclusions are highly tentative, this period in the prehistory of the California desert has been well investigated. Although much of the terminology is unique to the individual investigator, it is possible to lump the Playa, San Dieguito, Lake Mojave, and Death Valley I, as well as non-fluted point shoreline assemblages, into the Western Pluvial Lakes Tradition and clarify rather than obscure the close relationships among the assemblages representing these cultures (Bedwell 1970; Hester 1973). "In all probability, they represented regional variants of an early hunting tradition that prevailed over a wide area" (Wallace 1978:27).

The characteristics which unify the various subcultures under the WPLT are:

a. Sites are generally found on or near former pluvial lakes and marshes or along ancient streambeds.

b. The tool kits and faunal remains indicate that hunting was a primary subsistence activity. The presence of gathered vegetal matter in the diet may be assumed.

c. The assemblages lack ground stone elements.

d. The chip stone tool industry features percussion-flaked foliate points and/or knives, Silver Lake and Lake Mojave points, and a variety of long-stemmed points like those from Lind Coulee (Hester 1973).

e. Additional members of the stone tool kit include crescents, large scrapers fashioned on both flakes and cores, and drills and gravers.

Because most WPLT sites usually occur on exposed surfaces where stratification is absent, the relationship of the WPLT to the Fluted Point Tradition has not been defined with any exactitude. The FPT is apparently the elder of the two, though this is primarily based on cross-stratigraphic associations at other sites. Although WPLT assemblages do not exhibit the characteristic fluted point which defines the FPT, the two are "clearly . . . related both technically and economically" (Moratto 1984:93).

The wetlands adaptation that is embodied in the WPLT persisted as long as the climate was wet enough to keep the lakes in existence, but by circa 7000 B.P., the evaporation of the lakes in the face of a warming and drying climatological trend (Bedwell 1970) presented the aboriginal population with a severe challenge. The archaeological record reflects their cultural response.

3. The Late Cultural Sequence

The initial late cultural sequence for the Colorado Desert was developed by Malcolm Rogers (1929a, 1929b, 1945, 1966). Other investigators amended and expanded Rogers' sequence as new material was discovered. W. J. Wallace (1962) developed a four-stage sequence featuring absolute dates which differed significantly from those proposed by Rogers. Using the data from the Rose Spring site, Lanning (1963) proposed a chronology which was applicable to the northern portion of the California desert. To impose chronological discipline on an increasingly complex situation, Bettinger and Taylor (1974) published a chronology which made no attempt to order the cultural affiliations, but rather presented a series of definitive time markers in the form of projectile points. Warren and Crabtree also published this type of chronology (1972). Warren also published (1980) a slightly modified chronology which was accepted by Moratto (1984) for use in his synthesis of California prehistory. This sequence (from the end of the WPLT) consists of the Pinto period from 7000 B.P. to 4000 B.P., followed by the Gypsum period (4000 B.P. to 1500 B.P.), the Saratoga Springs period (1500 to 800 B.P.), and ending with the Protohistoric period, which includes all prehistoric events following 800 B.P. (Moratto 1984:409-430).

a. The Pinto Period. The Pinto period derives its name from the Pinto Basin site, where most of the early archaeology was done by Elizabeth and William Campbell (Campbell and Campbell 1935). Although very few sites dating from this period have been excavated, the "index fossil," a coarsely made, usually shoulderless point, has been recovered from surface finds over most of the area. No site in the Colorado Desert has yielded materials suitable for radiocarbon dating, but cross-dating by comparison with similar Pinto points from the Mojave desert indicates that the Colorado Desert materials are more recent than 5,000 B.P. (Hester 1973).

An unresolved problem concerning the Pinto period chronology derives from the absence of cultural material representing the earliest parts of the time span. Some investigators, noting the lack of material datable to between 7000 B.P. and 5000 B.P., argue that during this span, the Colorado Desert was probably unpopulated. This cultural hiatus is explainable by the warm, dry conditions which would have made life in the area difficult at best (Wallace 1962). Others, working with the same data, argue that if such a break in occupational history of the region did occur, the gap would be reflected by a discontinuity in the archaeological record. Since they do not detect any such disjuncture, these regions were necessarily occupied without significant interruption (Warren 1980).

Accepted generalizations concerning the life-style represented by the Pinto materials are based on the amount and type of artifacts recovered from the sites. The small assemblages reported for most sites indicate that these sites represent temporary or seasonal camps, and the artifact types argue for a subsistence pattern which depended on hunting as well as exploitation of available vegetal matter, but without a well-defined seed-milling technology. In addition to the characteristic Pinto points, the typical Pinto assemblage contains heavy keeled scrapers, manos, and flat, highly polished slabs whose exact use is the subject of some disagreement (Campbell and Campbell 1935; Rogers 1939). The Campbells describe these artifacts as milling stones, but Rogers disagrees, citing their smoothness as rendering them ineffectual for milling and proposing that they represent a surface upon which hides and/or fibrous plants such as yucca were scraped.

Temporal placement of the Pinto period is somewhat dependent on interpretation of the function of these smooth-surfaced stones, for if they were not adaptable to hard-seed milling, then the ability of the culture to prosper in arid conditions is questionable (Moratto 1984). If, however, conditions at the time represented by the Pinto Basin period were not arid, then the apparent unsuitability of these distinctive artifacts for milling does not pose a problem. Moratto (1984) proposes a series of alternating wet and dry periods, with the population expanding into the desert during the wetter periods and retreating to the margins of the desert and to scattered oases as the climate became more arid. While his remarks are directed at the Pinto period populations in the Mojave Desert to the north, they apply equally to the Colorado Desert.

b. The Gypsum Period. Just as the Pinto period is distinguishable from the earlier WPLT by its characteristic artifacts, the subsequent Gypsum period (4000 B.P. to 1500 B.P.) is similarly distinguished by a change in the types of projectile points recovered. Any combination of Humboldt Concave Base, Gypsum Cave, Elko Eared, or Elko Corner-notched points in the assemblage justify the assignment of the site to the Gypsum period (Moratto 1984). In addition to these diagnostic elements, leaf-shaped points and knives, rectangular knives, drills, large flake scrapers, choppers, and hammerstones are regularly present. For the first time in desert assemblages, manos and milling stones appear regularly.

The cultural affiliations of Gypsum period sites seem dependent on the background of the investigator, with strong reminiscences of both Great Basin (Heizer and Berger 1970; Hester 1973; Bettinger and Taylor 1974) and Southwestern (Rogers 1939) cultures. Both interpretations agree that the Gypsum period material is logically descendent from the earlier Pinto period, with the changes in the tool kit being evolutionary, rather than reflecting any radical shift in cultural patterns. A distinctive Southwest influence is seen in several sites (particularly Newberry Cave) in the form of split-twig figurines, which are "miniature animal figurines, constructed of a single long, thin willow branch, split down the middle, bent and folded so as to create a representation of an animal" (Moratto 1984:417).

Schroedl, in his analysis of these split-twig figurines (Schroedl 1977), determined that this class of artifact was found in two distinct locations. The first type of site where the figurines are found consists of a relatively inaccessible cave, and the figurines are not found in conjunction with any other cultural materials. In this context, the figurines are sometimes pierced by another twig, as if the animal was speared. In the second type of site, the caves are easily accessible, the figurines evidence no special consideration, and the figurines are located in conjunction with normal occupational debris. Where the cultural inventory included projectile points, Gypsum Cave points are most frequent. Schroedl (1977:263) interpreted this dichotomy as indicating a change in the way figurines were regarded. Where the figurines are found cached in remote caves, he infers religious significance; and where the figures are located in conjunction with other artifacts, he infers "toys or playthings."

Newberry Cave also is important for its pictographs, which apparently date from the same (Gypsum period) time as the split-twig figurines and which depict some sort of animal (C. A. Davis 1981). Davis interprets these as representing a bighorn sheep hunting ritual. A similar ritual has been inferred from petroglyphs in the Coso Mountain range (Grant et al. 1968). At Coso, the petroglyphs also illustrate the change from atlatl to bow and arrow, a transition which began within the Gypsum period.

Another Gypsum period site of importance is the late phase of Mesquite Flats, as it marks the appearance of mortars and pestles (Wallace 1977). These tools were employed in exploitation of mesquite pods well into the historic period, and their presence suggests that processing mesquite is also a Gypsum period innovation.

Another innovation, in the form of *Haliotis* and *Olivell*a shell beads, also appears during the Gypsum period. These beads occur over a wide area but in relatively small numbers in each site (Moratto 1984) and are proof of contact with coastal California natives.

The Gypsum period represents a period in which the Native American populations of the area became adapted to the dry desert conditions. Technological changes and innovations outlined earlier, as well as the appearance in the archaeological record of proof of trading, mark this period as the beginning of regional diversity, when the life-style of the desert peoples becomes easily distinguishable from that of the adjacent populations.

c. Saratoga Springs Period. Regional differences, which began to become apparent during the preceding Gypsum period, become more pronounced during the subsequent Saratoga Springs period (1500 B.P. to 800 B.P.). In the northwestern Mojave Desert, the change is defined where Rose Spring and Eastgate points replace the previously prevalent Elko and Humboldt points. These smaller points are interpreted to represent increased replacement of the atlatl by the bow and arrow, a change first depicted in the Gypsum period Coso petroglyphs mentioned earlier. Farther east in the Mojave, Anasazi influence is observed. The Anasazi were centered east and north of the California deserts and came to the region ostensibly to exploit deposits of turquoise. This is evidenced by large number of aboriginal mines (Rogers 1929a). Turquoise from the mines at Halloran Springs has been identified at the Snaketown (Arizona) site in levels dated 1500 to 1300 B.P. (Sigleo 1975).

In the Colorado Desert region, the accumulation of evidence points toward cultural influences from the lower Colorado River area, even though evidence which would conclusively decide the issue is lacking. Only the Willow Beach site, which is located in an area of Anasazi as well as Hakataya influence, contains cultural materials older than 1200 B.P., and the data recovered from there does not represent a transition from Gypsum to Saratoga Springs (Moratto 1984).

One apparent difference in the assemblage between Colorado Desert sites of this period when compared with coeval sites in the northwestern and eastern Mojave Desert is the prevalence, in Colorado Desert assemblages, of the triangular Cottonwood series of projectile points as opposed to the Rose Spring points found at the Mojave sites. These sites containing Cottonwood points correspond to Rogers' (1945) nonceramic Yuman culture. Another aceramic site containing Cottonwood series projectile points is Oro Grande, dated to 1100-900 B.P. (Rector et al. 1979). This site is located west and north of the Colorado Desert, but shares Hakataya affinity rather than the Anasazi influence found to the north and east.

As stated earlier, there is insufficient evidence to prove the inferred division of the region into two competing spheres of influence, Anasazi and Hakataya. The Anasazi entered the desert to exploit turquoise deposits, but no such clear goal can be attributed to the Hakataya. The occurrence of coastal shell in Colorado River sites of the period fuels the proposition that these desert incursions were trade expeditions, without long-term settlement.

Toward the end of the Saratoga Springs period, ceramics, in the form of Colorado Brown and Buff wares, appear in the Colorado Desert (May 1976). Also, Desert Side-notched points join the preexisting Cottonwood series points. Both of these artifact types are interpreted as evidence of increased Hakataya influence (Moratto 1984).

d. The Protohistoric Period. The period which follows the Saratoga Springs period is called the Protohistoric: from 1200 A.D. to European contact (Moratto 1984). During this period, the cultural divisions which had been developing for more than 1,000 years have become very visible, and the Colorado Desert was unified under strong Hakataya influence. This unification is visible in the archaeological record in the form of Brown and Buff wares and Desert Side-notched projectile points, which dominate the assemblages. The Hakatayan influence has spread into the southern Mojave Desert, following the withdrawal of the Anasazi after circa 1150 A.D. Further, trade with coastal California native groups is common, given the regular occurrence of shell items in the assemblages. Large well-developed village complexes along the Mojave River and in the Antelope Valley undoubtedly were supported by the increasing coastal-desert commerce (Smith 1963; Sutton 1981), though the Antelope Valley sites reflect more coastal than desert influence, while the opposite is true of the sites along the course of the Mojave. At least one large village complex has been documented in the Colorado Desert (Schaefer 1988). It is probable that occupants of this village traveled seasonally from the coastal mountain foothills to the Colorado River to exploit food resources.

The Mojave River trade route apparently was not a self-sustaining economic entity, because both Rogers (1945) and Sutton (1981) report a drop in apparent population levels and abandonment of sites toward the end of the period. Two explanations for this apparent decline in trade are suggested by Moratto (1984). One possibility is that the lakes in the Cronise Basin desiccated. The alternative is that the Chemehuevi tribe migrated from the north to a "blocking position" athwart the trade route.

The first Europeans to enter the Colorado Desert encountered a stable population whose adaptation to the arid surroundings was well developed. Although the accounts of these early travelers are often lacking in sufficient detail to clearly delineate the ethnographic boundaries which were in existence at the end of the Protohistoric period, subsequent reconstructions by several scholars portray the situation at that time with acceptable accuracy.

4. Regional Ethnography

At the time of first contact with the Spanish explorers, who were the first Europeans to enter the Colorado Desert, the region was host to five ethnographically distinct Native American tribal groups. These five groups, whose territories overlapped somewhat, were the Serrano in the northwest, the Chemehuevi to the northeast, the Cahuilla across the southern portion, and the Mohave and Halchidoma along the Colorado River at the eastern extremity (Figure 4).

The following ethnographic sketches are intended to identify these five native peoples within the context of this report. A large body of ethnographic literature exists which describes the lifeways of these peoples in detail. Such authors as Kroeber (Mojave), Bean (Cahuilla), and Laird (Chemehuevi) are recommended for in-depth treatment.

a. Serrano. The Serrano take their name from the Spanish word meaning mountain dweller. The area which they exploited is not clearly defined, due both to a lack of information and to a lack of territorially in their political organization (Strong 1929). The Serrano "nation" was composed of

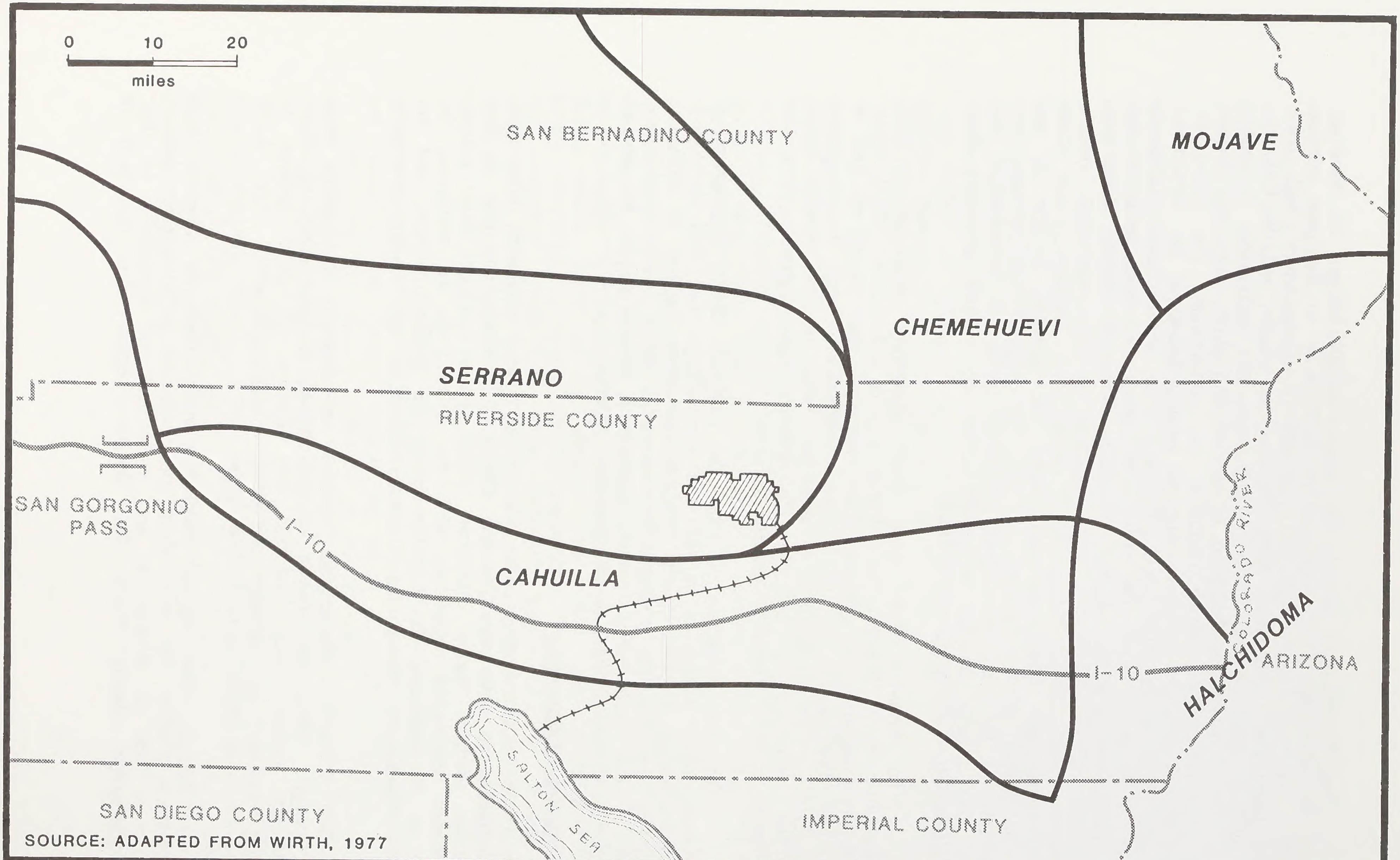

FIGURE 4. ETHNOGRAPHIC BOUNDARIES AT TIME OF EUROPEAN CONTACT

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independent local lineages, each of which occupied a preferred area, and territorial claims did not extend much beyond this local base. Linguistically, the Serrano dialects may be typed as belonging to the Serran group, Takic subfamily, of the Uto-Aztecan family (Moratto 1984:534).

Overall, the dialectically similar lineages which together made up the Serrano were located from the Cajon Pass on the west to just east of the present-day city of Twenty-Nine Palms and from the desert around Victorville south to today's Interstate 10. This is an area with a great deal of ecological diversity, a fact which forced considerable variability into the Serrano subsistence pattern (Bean and Smith 1978).

The location of Serrano settlements within this overall area were usually determined by the availability of water. Most settlements were in the foothills of the local mountain ranges, although some were situated in the desert near permanent water (Benedict 1924). From these locations, the Serrano carried out a round of hunting and gathering, supplemented to some degree by trade with neighboring lineages (Kroeber 1925).

Individual extended families occupied a rounded, domed dwelling, usually consisting of a willow framework thatched with tule reeds. This was frequently augmented by a wall-less ramada whose shade provided a more pleasant environment for household activity (Drucker 1937). Aside from the individual dwellings, each settlement usually had a ceremonial house, granaries, and a sweathouse. This last structure was located, where possible, next to a pool or stream (Strong 1929).

The Serrano industry utilized shell, wood, bone, stone, and plant fiber to fashion baskets, pottery, stone tools, storage pouches, and a variety of less utilitarian items including musical instruments of several kinds (Bean 1962-1972).

b. Chemehuevi. Of all the ethnographic groups whose territories abutted the survey area, the Chemehuevi are the least documented (King 1975). Originally the Chemehuevi, whose language may be classed as belonging to the Southern group of the Numic subfamily of the Uto-Aztecan family (Moratto 1984:534), resided in the High Desert, and ethnographers have indicated a close relationship with the Southern Paiute (Euler 1966; Heizer 1966). A short time prior to European contact, the Chemehuevi apparently moved into the project area between the Colorado River and the Coachella Valley (Kroeber 1925). After initial contact with the Spanish, the Chemehuevi formed an alliance with the Mojave and evicted the Halchidoma from the Lower Colorado River (Kroeber 1925). Circa 1867, a war erupted between the Mojave and the Chemehuevi, with the result that the Chemehuevi were forced from the lands bordering the Colorado River into the desert. After this defeat, the Chemehuevi tribe became fragmented, some members of the tribe settling around the present site of Twenty-nine Palms, a few taking up residence at Cabazon, and the majority returning piecemeal to the Colorado River area during the following decades (Wirth 1977).

Chemehuevi settlements consisted of groups of related nuclear families, and the size of the village waxed and waned with the seasonal round. The winter season saw the community reach its maximum size, while in the spring, families dispersed over the desert to take advantage of emergent plant growth.

These villages functioned as semipermanent home bases and featured shades, earth houses, and brush dwellings (Laird 1976).

The Chemehuevi subsistence strategy relied upon a seasonal round of hunting and gathering, augmented by agriculture. It has not been established how long the Chemehuevi have practiced agriculture. Laird (1976) indicates that there are no tribal memories of a preagricultural time. Trade probably played a small part of the Chemehuevi economic system (Davis 1961).

No uniquely Chemehuevi industry has been reported. In common with all of the native peoples of the Colorado Desert, at the time of contact they were constructing tools from stone, wood, and bone and producing baskets and pottery. Since the Chemehuevi are relative latecomers to the study area, the development of their culture is not documented in the archaeological record, and much of the technology which they were employing when first contacted seems to have diffused from the Mojave.

c. Mojave. The Mojave occupied the lands along the Colorado River, centered on the Mojave Valley, east of the Colorado River at the latitude of the present-day city of Needles. According to Schroeder (1952), these Yuman-speaking people arrived in the Mojave Valley from the desert to the west around 1150 A.D.

Once in place along the Colorado River, the Mojave developed an economy based on floodplain farming, augmented by gathering, fishing, and occasional hunting. Fishing provided the principal flesh food (Stewart 1983).

Settlement patterns among the Mojave did not include villages, but rather a rural pattern of dwellings in close proximity to arable land prevailed. The houses were occupied only during cold winter weather and were constructed of poles, thatched, and covered with sand and mud (Stewart 1983).

The Mojave culture is distinctly different from that of the majority of the Colorado Desert peoples in one important aspect. While most native peoples felt affinity primarily to their lineage, and secondarily to the area which they inhabited, the Mojave thought of themselves as one nation and relegated both kinship and village membership to secondary status (Kroeber 1976:727). Given this sense of identity, the propensity of the ethnohistoric Mojave for organized warfare becomes more understandable. K. M. Stewart (1947) describes the Mojave preoccupation with warfare as the result of actions by a warrior cult within the tribe and further states that according to his informant, "the people as a whole were pacifically inclined" (Stewart 1947:257).

Mojave technology was strictly utilitarian, with tools fashioned strictly to accomplish the task at hand. Kroeber (1925) attributes this indifference to craftsmanship to the Mojave practice of destroying all of the property of an individual as part of the funeral ceremony.

d. Halchidoma. These Yuman-speaking people occupied the lands along the Colorado River immediately south of Mojave territory and immediately north of that held by the Quechan (Yuma). Their history in the region terminates in 1827-29, when they were defeated by the Mojave and driven eastward from the Colorado River, where they were integrated with the Maricopa. Today, any

Maricopa who makes a claim for a Colorado River ancestry is called Halchidoma (Harwell and Kelley 1983).

Almost no data describes the life-style of the Halchidoma during their tenure in the study area. In all probability, their economy and industry were very similar to both of their river neighbors, consisting of floodplain farming, augmented by fishing and gathering. Also consistent with the pattern, their dwellings would be separated along the river to take advantage of good cropland, rather than concentrated into villages.

e. Cahuilla. The prehistoric territory of the Cahuilla covers the project area's western and southern flanks and extends from the San Bernardino Mountains on the west to the Oricopia Mountains on the east. Great geographic diversity exists within these boundaries, and the Cahuilla adapted to use the resulting diverse environment to advantage. The Cocopa-Maricopa Trail, a major prehistoric and historic trade route, crossed Cahuilla territory.

The language spoken by the Cahuilla belongs to the Cupan group of the Takic subfamily of the Uto-Aztecan family. Other Takic-speaking tribes which interacted with the Cahuilla were the Gabrielino and the Serrano, with whom many common traditions were shared (Bean 1978) and with whom intermarriage and trade were common.

Cahuilla villages were situated to take advantage of the protection from the desert winds provided by alluvial fans and canyons and to allow easy access to water and food sources. From these permanent bases a seasonal round of hunting and collecting could be conducted, and the number of occupants varied with the season. Houses were constructed of desert brush and were variably sized, with the chief's house being noticeably larger and used for ceremonial and recreational purposes. A sweathouse and granaries were also common features of the village (Bean 1972).

The economic system depended heavily on hunting, but the varied ecological zones occupied by the Cahuilla allowed them to develop a utilized flora of several thousand species (Bean and Saubel 1972). Preservation methods for both meat and vegetal material were well developed, and where water was adequate, agriculture was practiced.

Cahuilla industry was similarly varied, with stone, wood, and bone tools, pottery, and basketry all commonly utilized. No forms unique to the Cahuilla, and therefore capable of serving as archaeological markers, are reported (Kroeber 1908).

5. Regional History

Although the Spanish exploration of the American Southwest began prior to 1540, the region surrounding the project area was not penetrated until much later. Fernando de Alarcon may have reached the site of the present-day town of Yuma, Arizona, in 1540 (Bancroft 1886) while exploring the mouth of the Colorado River, but it was not until two centuries later that the Colorado Desert was penetrated by Europeans. In the interim, a party under Juan de Onate traveled down the Colorado River in 1604, and after 1699, Father Eustablio Kino would be established in residence at the junction of the Colorado and Gila rivers. The area east of the Colorado was regularly traveled during this century, being served by overland routes into what is now Mexico.

The initial European venture into the Colorado Desert was the journey of Father Francisco Garces, who in 1771 made his way from Sonora in Mexico to the San Jacinto Mountains, just west of the present site of the city of Palm Springs. During his journey, he lived among the Yuman-speaking tribes and won their trust, so that he was able to wander freely and receive help in the form of food, shelter, and guides. Upon his return to Sonora, his accounts of his travels were received with enthusiasm, and in 1775, an expedition under Captain Juan Bautista de Anza, guided by Garces, left the presidio of Tubac (Arizona) for the California coast. This party, which originally numbered in all 235 people (Bancroft 1886), reached the mission at San Gabriel on January 4, 1776.

De Anza's route, across the desert and over the San Gorgonio Pass, was made possible by the aid of the native peoples living along the route, from whom he was able to receive needed supplies and advice (Forbes 1964). The success of this expedition led to the establishment of two small settlements on the Colorado, but these were short-lived, being destroyed by the Yuma, who rebelled against Spanish domination in 1781. Father Garces was killed in this uprising, and the overland route to the coastal missions effectively closed (Warren and Roske 1981).

The next chapter in the history of the study area follows a 40-year hiatus. After control of Alta California passed from the Spanish to the Mexican authorities in 1820, interest was rekindled when a group of natives from the Cocomaricopa tribe arrived at San Gabriel and revealed to the Europeans a new route, to be known as the Cocomaricopa Trail. This route, which bisects the project area, originated east of Blythe and generally followed the route of Interstate 10, also crossing the San Gorgonio Pass. The Mexican government dispatched Jose Romero and Jose Estudillo to scout this new trail. Their first attempt, in 1823, failed; but in 1824 they succeeded in reaching the Colorado River at Blythe (Bean and Mason 1964). Mexican authorities concluded that this route was inferior to the more southern Yuma route.

The next trail to cross the Colorado Desert began near the town of Ehrenburg (Arizona) and continued to Los Angeles. Called the Bradshaw Trail after William P. Bradshaw, who opened the route in 1862, it crosses the survey area between Tabeseca Tank and Canyon Spring (Warren and Roske 1981). Frink's route, surveyed in 1855-57 but not opened until 1863, crosses the survey area in three places as it loops north of Desert Center, then south to generally parallel Bradshaw's route.

Between June 1875 and May 1876, U.S. Army Lieutenant Eric Berglund conducted two expeditions to determine the practicality of a proposal to use Colorado River water to irrigate the desert. His routes, from Ehrenburg to Los Angeles in 1875 and from Los Angeles to Ehrenburg in 1876, also crossed the study area (Warren and Roske 1981).

All of the early European incursions into the Colorado Desert shared one common goal: to facilitate transportation from the previously developed areas east of the Colorado to the emerging settlements on the California coast. Whether Spanish, Mexican, or American, these trailblazers regarded the Colorado

Desert as an obstacle rather than an opportunity. Figure 5 depicts the routes which transited the survey area.

With the exception of some very early Spanish efforts near the Colorado River, at the Cargo Muchacho Mountains in 1780-81 (Warren et al. 1981), exploitation of the mineral resources hidden in the mountains surrounding the Colorado Desert did not become an important reason for Europeans to visit this area until well after the country passed into American control in 1848. By 1875, the mountains surrounding the study area were dotted with recognized prospects (Shumway et al. 1980). The earliest of these claims were for gold and silver, but as the United States continued to expand, its burgeoning industries spurred the demand for a host of other minerals, including iron, manganese, copper, fluorite, gypsum, and salt (Warren et al. 1981).

Agricultural exploitation of the desert proper was, and continues to be, thwarted by the lack of water. Adjacent valleys, such as the Coachella, where the water table permitted wells to be dug, developed active farming and ranching communities, and cattle grazed on most of what is today the Imperial Valley. These enterprises were severely limited by the lack of freely available water, as was the case throughout most of California south of the 35th parallel. To cure this deficiency, proposals to tap the flow of the Colorado River had been made as early as 1859, when Dr. Oliver M. Wozencraft contemplated reclamation of the desert by diverting Colorado River water and went so far as to obtain rights from the California legislature (de Stanley 1966). This project was overcome by the Civil War. The U.S. Army, in 1875-76, sent Lt. Eric Berglund to survey possible routes for a canal, but no action resulted from his expedition.

The apparent surplus of water in the Colorado River was widely viewed as the answer to the chronic shortage in southern California, and efforts to match the supply and the demand continued. The initial efforts to divert the river to water the desert occurred in the area just south of the study area, when in 1886, the California Development Company was organized and excavated a canal along the United States-Mexico border. In some places, this canal was constructed on Mexican soil. By 1905, this canal was providing enough water that agriculture could replace cattle grazing in the Imperial Valley, and towns such as El Centro, Calexico, Heber, Brawley, and others were incorporated (Norris and Carrico 1978). But beginning in 1905, a series of natural events abetted by human mismanagement led to the temporary rerouting of the Colorado into the Salton Sink, creating a freshwater lake (Salton Sea) extending over 400 square miles by 1915, when the river was finally rechanneled (Lee 1963).

The demand for fresh water in the Los Angeles area spurred the next canal project, the Los Angeles Aqueduct. Construction of this part-canal, part-pipeline water system was accomplished between 1934 and 1941. Passing directly through the Eagle Mountains, this project had more effect on the study area than any other human endeavor except the mine itself. Beginning at the Parker Dam, water in the aqueduct is propelled by pumping plants which were constructed in the desert at Iron Mountain, Victory Pass, and Hayfield. To power the pumping plants, long-range electrical transmission lines were constructed and camps constructed to house the workers. The remains of electrical substations and camp and service facilities, including a hospital, remain evident adjacent to the project boundary.

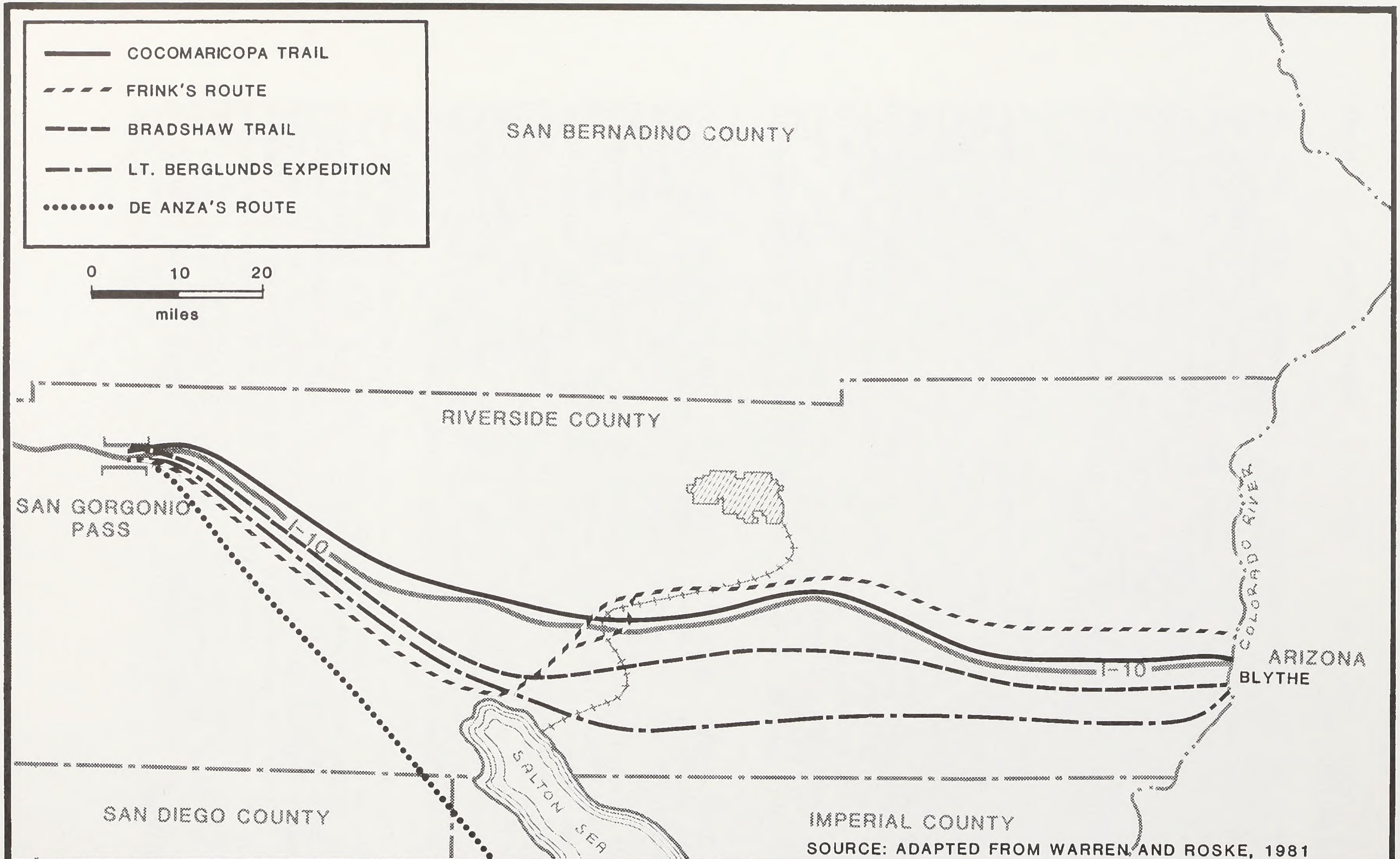

FIGURE 5. DESERT TRANSPORTATION AND COMMUNICATION ROUTES

RECON

During World War II, the study area was the home of the Desert Training Center, established by General George Patton in 1942. The center, which originally consisted of over 10,000 square miles, grew with the expanding war effort, until by 1944 it consisted of nearly three times its original size and spilled over into Arizona. By then, the name had been changed to California-Arizona Maneuver Area (CAMA), and over a million troops had participated in the full-scale training maneuvers. This period of history is memorialized at the General Patton Museum at Chiracio Summit, close to the site of Camp Young, one of the many military installations associated with the CAMA (Chiriaco, personal communication, 1989).

Another military activity which marginally affects the study area is the Chocolate Mountains Aerial Gunnery Range, currently used for both air-to-air and air-to-ground weapons training administered through the U.S. Marine Corps Air Station at Yuma. The Kaiser Industrial Railroad passes through the extreme northwest corner of the range, well distant from any of the targets.

This general historical sketch of the region has been necessarily brief, serving to place in perspective the considerations that compelled Europeans to first visit and then develop the Colorado Desert. In chronological order, the historic exploitation of the study area developed from four desires: the desire for an overland route to the Pacific Coast, the desire for mineral wealth, the desire to divert Colorado River water, and the desire to create realistic combat maneuver areas. Since the end of World War II, an additional desire, for space suitable for vehicular recreation, has driven additional development in the study area.

B. PREVIOUS RESEARCH

1. Prehistoric Research Projects in the Survey Area

Prior to the commencement of fieldwork, an archival record search was conducted at the Archaeological Research Unit of the University of California (UC), Riverside. Additional searches were also conducted using RECON's proprietary library and the records held at the Kaiser Eagle Mountain Iron Mine administration building. A copy of the UC Riverside record search is attached to this report.

The results of these searches revealed that only one previously recorded prehistoric site, Riv-3216, was located inside the boundaries of the survey area. This site was originally recorded in May, 1987, and revisited in November, 1987, at which time it was described as a "lithic scatter with several flakes and tools in two loci. Artifacts appear to be washing downhill. Other quartz tool noted previously but not relocated" (see Attachment 1). This site was recorded during a transmission line survey project (Imperial Irrigation District 230-kilovolt transmission line). The survey for that project also located three additional sites within one mile of the current project boundaries, Riv-477, Riv-3217, and Riv-3373.

An additional area of prehistoric cultural activity is the Canyon Spring area, where the railroad passes between the Oricopa Mountains and the Chocolate Mountains. This site, Riv-362, lies approximately one-half mile outside the survey boundaries and consisted of two potsherds when recorded in 1965.

One additional survey within the boundaries of the current project was conducted by the Archaeological Research Unit of UC Riverside on 160 acres immediately east of the East Pit at the Eagle Mountain Iron Mine. This survey found no evidence of cultural activity (Swenson 1978).

2. Summary of Historic Research

From the archival record search, only one area of historic cultural activity has been located within one mile of the boundaries of the project. This site, Riv-1571, is located about 500 meters northwest of the Kaiser industrial railroad just below Canyon Spring. Consisting of two rock walls, a possible tent pad, and a scatter of historic trash which contained no time-diagnostic artifacts, this site had been repeatedly vandalized by 1978, when it was recorded.

The recent history of the area emphasizes three major undertakings which affected the region during the 1930s and 1940s. The first of these, the Los Angeles Aqueduct, resulted in the temporary housing of several thousand workers in the area adjacent to Hayfield Spring. Remnants of their camps are still extant. The second, the California-Arizona Maneuver Area (CAMA), developed under General George S. Patton as a desert warfare training center during World War II, is also still recognizable. Both of these engineering projects, while regionally significant, impinge on the current project area only incidentally and any possible associated remains would be unaffected by the implementation of the project. A subterranean segment of the Aqueduct crosses underneath the Kaiser industrial railroad and the Kaiser truck road in Section 7, Township 4S Range 15E. Nothing identifiable associated with CAMA activity was located during the survey.

The third event is the mining of the iron deposits in the Eagle Mountains and the building of the Kaiser industrial railroad, which is the subject of this report. A number of individuals were helpful in providing information concerning this event.

The absence of formally recorded historic sites was not taken to indicate an absence of historical period cultural activity in the survey area. At the suggestion of Bureau of Land Management personnel, interviews were arranged with Mr. Joseph Chiriaco of Chiriaco Summit and Mr. Stanley Ragsdale of Desert Center. Both of these gentlemen have resided in the area for more than 50 years, and their recollections of activities in the area prior to opening of the Kaiser mine were very helpful. A wealth of information concerning the activities of the mine, including the period prior to the commencement of actual mining operations, was provided by Mr. Orlo Anderson, the mine manager for Kaiser Steel Resources and by Mr. Jerry Stokes, the Kaiser facilities manager.

3. Summary of Ethnographic Research

Since the proposed project crosses lands which were once controlled by currently identifiable groups of Native Americans, definition of the concerns of these Native Americans were of crucial interest. After consultation with Bureau of Land Management (BLM) personnel, an ethnographer whose research among the Native Americans of the area spans more than two decades was selected to solicit input from these Native American groups. The ethnographer is Dr. Lowell

John Bean and he was assisted by Mrs. Sylvia Vane. The results of their inquiries are appended to this report as Attachment 3.

C. HISTORY OF THE KAISER EAGLE MOUNTAIN IRON MINE

The story regarding the discovery of iron in the Eagle Mountains has all the qualities of a frontier legend. The following account is taken verbatim from a story by John Hilton, in the March 1949 issue of *Desert Magazine:*

> Sometime prior to 1881, a prospector named Joe Torres left Needles, California, for a prospecting trip. Joe knew the waterholes so well that he did not follow the established trails, but headed off across country on a fairly direct route to Mecca, prospecting the adjacent mountains as he went along.
>
> As he neared the the east end of the Eagle mountains one afternoon he crossed a ridge covered with huge boulders of iron ore. Joe wasn't interested in iron. He was after gold or silver.
>
> Suddenly the burro balked, with its feet planted on the flat top of a buried mass of iron ore. The animal refused to budge and Joe was puzzled. Jinny had never done this before on the dry hard mesa. She did have a great fear of mud or soft sand along the Colorado river and had given him some trouble in such spots. But here on a dry stretch of desert such obstinacy was beyond understanding. Joe tugged on the rope but Jinny wouldn't move. Then he got behind and pushed and used some language that was not too complimentary, but there was still no action. Jinny just stood rooted to the spot staring at her front feet - picking up first one and then the other and looking at it. Joe got out his prospecting pick and struck the black rock that seemed to be puzzling his traveling companion. It was hard and tough, but a few chips broke off. Amazingly, the fragments, instead of flying away as they should, were drawn back to the mother rock and stuck there. The rock was magnetic! The burro had iron shoes and there was a sticky feel under her feet which had her puzzled and frightened.
>
> Joe found that his pick would stick to the rock. Here was a curiosity that he should take with him to civilization, otherwise, no one would ever believe his story. The rock under Jinny was too big to take away so he began looking about him. He learned that although the black boulders looked alike, they were not all magnetic. It was some time before he located a piece which would attract his pick and was small enough for him to handle. Jinny, her curiosity finally satisfied, had meandered off and was contentedly munching a bunch of galletta grass.
>
> Several days later Joe and Jinny halted in front of the general store in Mecca and Joe unlashed a heavy black rock from his pack and stumbled up the steps with it. Jinny sighed with relief. Her curiosity had certainly increased her burden! Joe traded the curio to the storekeeper for some grub and the stone with nails and other metal objects clinging to it, rested on the store counter for many years.

Although Joe Torres was indisputably the first to make note of the magnetite deposit, he filed no claims. This was not the case with the next individual who encountered these resources.

Jack Moore left Banning on a prospecting trip in the fall of 1881, arriving in the Eagle Mountains by a circuitous route. On the first of November, he staked a claim on the iron deposit and returned with samples. Moore filed additional claims for gold and silver, recording these as well as the iron claim on December 1, 1881, and January 3, 1882. With his father and two others as partners, they organized the Eagle Mountain Mining District. But the group failed to keep up the assessment work necessary to validate their claim, and a new claim on the deposit of iron was filed by L. S. Barnes of Mecca, California.

Barnes had studied at the Colorado School of Mines and recognized the richness of the deposit from the original Torres' sample at the Mecca general store. He relocated the older Moore claims, determined that they had lapsed, and in 1895, began a process of consolidating the claims under his control. By 1912, Barnes had completed the project, and the next legend concerning the Eagle Mountain Iron Mine was about to be born.

Barnes' plan was to sell the consolidated claims on the ore to Henry E. Harriman, chief executive officer of the Southern Pacific Railroad. Harriman, despite his primacy in the railroad business, was at the mercy of the Steel Trust, led by J. P. Morgan's U.S. Steel. Barnes felt that by gaining ownership of the Eagle Mountain iron deposits, Harriman could use the threat of building his own steel industry on the West Coast as a lever to bring down the price the eastern steel interests were charging his railroad for rails. Harriman, according to the story, saw the worth of Barnes' idea and wrote him a check for the full asking price of $1,512,000 on the spot.

Whether Harriman felt that the idea of a West Coast steel industry was feasible or whether he was running a gigantic bluff is not recorded. But he did buy a steel mill site in San Pedro, California, and caused a rail spur to be surveyed. And the price charged to the Southern Pacific for rail by the eastern steel companies dropped dramatically. Harriman died before revealing his true intentions, and no action to develop the iron deposits was taken until World War II sparked the demand for steel in huge amounts (Hilton 1949; Belden 1964a).

During this period, the Joshua Tree National Monument was created and at first included the Eagle Mountain ore deposits. Within the confines of the monument, mining was forbidden.

At this point, Henry J. Kaiser entered the picture. Kaiser, initially a road contractor but more recently a member of the construction consortium which had built the Hoover and Bonneville dams, was building ships for the Navy and Merchant Marine on the West Coast. He needed steel. Already the owner of a steel mill at Fontana and iron ore from the Vulcan mine near Kelso in the Mojave Desert, he was able to convince the Harriman heirs to sell the Eagle Mountain claims. But there was one condition insisted upon by the heirs. All of the ore from the mine had to be shipped over the Southern Pacific Railroad.

This left Kaiser with two problems: he owned rights to a deposit of ore that he was not legally able to mine and he was required to move the ore over a railroad some miles away from the mine. A third problem temporarily surfaced when Harlan Bradt revealed that he held leases to some of the deposits. After a legal struggle, Kaiser attorneys succeeded in having Bradt's claims dismissed, leaving only the problem of the mining prohibition and the railroad.

Kaiser solved the prohibition problem by exerting sufficient political force to have the monument boundaries adjusted to meet his needs. Also, he decided to build a railroad of his own to connect with the Southern Pacific (Belden 1964b).

This work commenced in 1944, with surveyors identifying three possible routes. The first of these went over Shaver's (now Chiriaco) Summit to Indio, the second went down Box Canyon to Mecca, and the third down Salton (or Salt) Creek wash to meet the Southern Pacific at Duramid. The choice was determined by the need to limit the maximum grade with which the ore trains would have to contend to two degrees. This criteria favored the Salton Creek wash route, and after some difficulties in obtaining the right-of-way from the owners, construction began in August of 1947. The Kaiser Industrial Railroad was completed on June 23, 1948 (Backman 1949) and began regular ore shipments to the Fontana, California, mill.

With all of the elements in place, the mining operations continued to develop, and by 1971, the Eagle Mountain Iron Mine was the principal source of iron ore in California and accounted for over 90 percent of the state's iron production (Bureau of Mines 1971).

After 35 years of operations, changing economic conditions forced the suspension of mining activity in November 1982, and shipping ceased in April 1983 (Anderson, personal communication 1989). During the time that active ore extraction was ongoing, the Kaiser Eagle Mountain Iron Mine was the largest single private employer in Riverside County, with a work force of over 4,000.

Caring for this emerging community led to the construction of a company town at the mine site, with houses built by Kaiser and rented to the employees. Schools, fire, police, and recreation facilities were all established, and before cessation of mining operations, accommodations available in the town at the mine consisted of 416 houses, 185 trailer spaces, 383 dormitory rooms, and 32 apartments (Kaiser Steel Corporation 1981).

The decline from this peak of activity was rapid. By the end of 1983, only three employees remained at the mine site. Many of the houses had been purchased by outsiders and relocated, and others were left vacant, inviting vandalism. Gradually, the company increased the security and maintenance work force, which stands at over 20 individuals today (Stokes 1989). The school remains open, serving the surrounding region.

A privately run, low-security penal institution, the Eagle Mountain Return-to-Custody Facility, currently leases a portion of the town area, where it houses parole offenders. A few houses are rented to individuals who work in Desert Center and other neighboring communities.

III. FIELD INVESTIGATIONS

A. SURVEY CRITERIA

The objective of the survey was to provide a complete inventory of the cultural resources located within the boundaries of the project area. Where cultural resources were located, they were to be evaluated to determine their eligibility for the National Register of Historic Places.

1. Prehistoric Cultural Resources

Prehistoric cultural resources, at their most basic, consist of the artifacts and features which are the material remains of the Native American peoples who exploited the survey area prior to contact with the Europeans. Artifacts and features may occur in groups or as single occurrences. Groups of artifacts which are presumably related to each other and are found in surface densities equaling three items within a 25-meter radius or greater are generally recorded as sites, while artifacts found in surface densities less than three per 25-meter radius are recorded as isolates. Features are usually recorded as sites even though they occur singly. Cultural resources, either sites or isolates, must be recorded with the appropriate clearinghouse even if they fail to meet the stringent National Register criteria. All prehistoric cultural resources (sites and isolates) discovered during the survey were recorded.

2. Historic Cultural Resources

The material remnants of past lifeways are valuable to complete the picture of activity in the survey area even where a written record is available. As discussed in the Cultural Background section of this report, the historic period in the Colorado Desert is largely unwritten. Archaeological investigations are the principal remaining data source to bridge this gap in the historical record.

Placing a dividing line between what is or is not "historic" is an admittedly arbitrary procedure. For the purpose of this survey, the year 1939 was selected, for two reasons. First, anything demonstrably later than 1939 would be subject to more stringent eligibility rules for inclusion in the National Register solely due to being less than 50 years old, and second, the Eagle Mountain Mine and Kaiser industrial railroad, as industrial entities, are more recent than 1939. Since the mine and railroad both exemplify modern industrial technology, have been continuously modified, and were fully functional when idled by economic considerations, classifying such a complex or portions of it as "historic" is not expressly within the National Register criteria.

B. SURVEY METHODOLOGY

The Specific Plan area encompasses 4,659 acres at the Eagle Mountain Mine, much of which has been badly disturbed by past mining activities. The disturbance is so pervasive that any cultural resources which may have once existed on this portion of the property have been either carried away with the ore or covered by tailings piles, which in some instances are hundreds of feet thick. These disturbed areas were omitted from the survey.

In addition to the area surrounding the mine itself, 1,500 acres of sectioned land adjacent to the Kaiser Industrial Rail Road, a 200-foot-wide corridor along the 52 mile length of the railroad, and a 200-foot-wide corridor along the Kaiser Truck Road were also surveyed.

The topography varies from level, open desert to mountain slopes in excess of 100 percent. Given this diversity of terrain, it would not be reasonable or even possible to subject all parts of the project area to the standard archaeological survey pattern of parallel transects at a predetermined spacing. The undisturbed areas fall into three categories:

1. Mountain slopes, ridges, and intermontane saddles.

2. Relatively open, level desert.

3. Rail and road right-of-way.

For each of the above area types, different survey methods were employed:

1. <u>Mountain Slopes, Ridges, and Saddles</u>

Of the three types of terrain, the mountains and connecting saddles were the most difficult areas in which to maintain survey integrity. Access by even four-wheel-drive vehicles was denied by the deliberate placement of tailings piles across the mouth of every drainage. This barricade policy was instituted by the Kaiser Iron Mine to prevent access to these areas by mine workers (Stokes 1989), and the barriers work well. In order to reach the areas unscarred by mining activity, RECON survey crews usually found it necessary to climb the ridge face, traverse the spine, and then descend into the adjacent valley. While climbing, the survey teams were alert to detect the residue of prehistoric quarrying, as well as examining natural niches and overhangs for evidence of the type of caches which have been found in somewhat similar terrain to the west. The steepness of the terrain and the absence of water argue that any use of these mountains by aboriginal peoples must have been temporary, and expectations were that if prehistoric artifacts were discovered, they would be indicators of transhumance.

If the expectation of finding evidence of prehistoric activity on the slopes was low, this was counterbalanced by high hopes of locating evidence of the early historic mining period (prior to 1940). The entire surface of the project area is covered with cairns and posts which mark the various claims which have mostly passed into Kaiser Steel ownership over the years. The typical claim marker consists of a rock cairn one to two feet high, which supports a four-by-four timber some three to four feet high. The post is topped by a copy of the claim notice folded into a screw-top jar and secured to the top of the four-by-four. Exposure to sunlight over the years has rendered the claim notice forms so brittle that unfolding the paper in order to determine the age and ownership of the claim was not possible without destroying the document in the process. Apart from these claim markers, only modern litter remains to indicate that these steep slopes are ever visited.

The ridge tops were searched along their length, with special attention being given to possible rock alignments which may have been created by human activity. Also, the game trails, which from the evidence of droppings were created and are still frequented by bighorn sheep, were given special scrutiny for evidence of Native American use.

In several instances, relatively level saddles connect two adjacent peaks within a ridge system. These saddles are effectively shielded from the persistent winds and provide a location suitable for a comfortable dry camp. Each saddle was carefully checked for any evidence of such activity, either prehistoric or historic.

At the base of the steeper ridges, narrow drainages serve to rapidly remove the scant precipitation that does fall on the project area. Even though the project had received a substantial rain less than three weeks before the survey, no standing water was observed. Nonetheless, each of these drainages was examined for signs of cultural activity.

Archaeological visibility on this type of terrain is unparalleled. There is literally no soil cover, and the vegetation is accordingly sparse. The natural surface of the rock is patinated to a dark reddish brown, and flake scars, whether natural or man-made, stand out clearly. Modern trash, such as beer and soda cans and paper food wrappers, is easily detected at ranges measured in tens of meters. Any anomaly caused by cultural activity would be immediately apparent. The absence of cultural material reported by the survey party can be taken with confidence as a valid representation of an apparent absence of cultural activity within the project area. Specifically the absence of cultural activity which produces archaeologically discernable by-products.

2. Open, Level Desert

This type of terrain was located in two areas within the larger project area. Most of the land scheduled to be transferred to the BLM as part of the project falls into this category; as does the area at the mine along the eastern project border. Here the landform is such that a parallel transect approach is appropriate and effective. The survey crew, operating in teams of two to four people, walked approximately 15 to 20 meters apart over the parcel.

Archaeological visibility in these areas was excellent, though anomalies, whether artifacts or modern litter, were not so obvious as in the mountains. The vegetation is typical of the Lower Sonoran community, with occasional palo verde rising 15 to 20 feet above the sparse creosote scrub. Survey team members had no difficulty maintaining orientation throughout each transect, easily keeping the other team members in sight. When necessary to give an area a stricter scrutiny, the entire team stopped until all were ready to proceed.

Expectations for the desert areas were fairly high, as this type of topography was the least disturbed of any encountered within the project boundaries. That more remnants of cultural activity were not located in these areas can be explained best in terms of transitory, ephemeral use by both prehistoric and historic period desert travelers. Given the arid conditions and lack of exploitable resources, habitation sites are unlikely. Since the surveyed parcels did not include any areas where water was reliably available, with the exception of the Salt Creek and Hunter's Spring drainages, the lack of sites is somewhat understandable.

Can and bottle remnants are found scattered over the surface everywhere. Most cans and bottles are obviously modern litter and appear to have been transported to the area for the purpose of target practice. Some isolated bottles and cans may be considerably older, but no cans or bottles that were demonstrably older than circa 1950 were identified within the parcels surveyed.

3. Rail and Road Ways

The right-of-way for the Kaiser Industrial Railroad has its southern terminus at Ferrum, on the northeast shore of the Salton Sea, where it joins the Southern Pacific. From this point the line trends northeast through the pass between the Oricopa and Chocolate mountains, turns northward to pass between the Oricopa and Chuckwalla mountains, and then resumes its northeast direction after crossing Interstate 10. Skirting the eastern flank of the Eagle Mountains, the orientation of the right-of-way slowly backs around to the northwest as it approaches the mine. The 2 percent limitation on grade imposed by the fundamental design of railways ensures that, for all of its 52-mile length, the terrain within the 200' survey corridor will be essentially level.

Construction of the roadbeds entailed scraping away the natural soil for at least 20 meters on either side of the edge of the road and/or rail line (Backman 1949). The undisturbed portion of the 200-foot- (61-meter-) wide survey corridor through which the Kaiser Industrial Railroad passes is reduced by this disturbance, as well as by the nearly 10 meters occupied by the track bed itself, to a strip less than five meters wide on each side of the tracks. This severe and ongoing degradation of the natural land surface has been further aggravated by the jeep trails which have been created by railway maintenance crews and private off-road vehicles. These trails, which allow access to the railway and adjacent lands, are marked by the deposit of modern litter along their margins.

The description of the condition of the rail line applies equally to the right-of-way for the Kaiser Truck Road, with the additional disruptive factor of a parallel electric power line. The truck road was at one time paved along its entire five-mile length, but the cumulative effects of the environment and the lack of maintenance have reduced the southern two miles to a rough track, and the connection, just south of Victory Pass, with Eagle Mountain Road has been deliberately severed and blocked.

Because the Kaiser Truck Road is tentatively scheduled for realignment, the survey area was enlarged to include the area through which it might be rerouted.

To survey these rail and road rights-of-way, the archaeological field crew was divided into two-person teams, one on each side of the centerline, in the center of the lesser disturbed area which fringes the right-of-way. One team would commence and the other team would drive the vehicle ahead for a specified distance, usually two miles. Two miles were selected as the estimated distance that a survey team could cover in one hour. The second team would then park the vehicle and survey in the same direction as the first team. When the first team reached the vehicle, they would move it forward an additional two miles; thus, the two teams would leapfrog along the right-of-way. This method was selected as the most efficient use of assets, since it minimizes overlap and dead time while ensuring 100 percent coverage.

The width of the undisturbed strip alongside the road and rail ways averaged less than five meters, and there were no adverse environmental conditions which would have obscured artifacts or features from view.

IV. SURVEY RESULTS AND ANALYSIS

A. SURVEY RESULTS

The results of the survey verified that very little evidence can be found to support any contention of intensive exploitation of the project area by either Native Americans or settlers prior to 1940. There is always the possibility that such exploitation occurred and that the evidence has been subsequently erased by either natural forces or post-1940 human activity or both, but this is not felt to be probable. That this area was visited on an intermittent basis by both Native Americans and Europeans prior to 1940 is without a doubt the case, however the paucity of material remains testify to the brevity of such incursions.

1. Eagle Mountain Iron Mine Including BLM Exchange Lands

No evidence of prehistoric cultural activity was discovered by the survey team either within the Eagle Mountain Mine area or within the BLM exchange lands area. Pre-1940 cultural activity was undoubtedly present, but the degradation of the natural landscape, which is the natural consequence of open pit mining techniques, is so extensive that no evidence survives. This is known to have occurred in the case of Briest's camp, a miner's camp dating from the 1920s, which is now covered by tailings pile T-6 (Stokes, personal communication, 1989; Ragsdale, personal communication, 1989). Ragsdale remembers additional small mining camps in the vicinity of the Eagle Mountain mine, but none located within the project area. Most of the independent mining activity appears to have been west of the current project boundaries, in the vicinity of the Black Eagle and Iron Chief mines. Stokes confirmed this, adding that some remnants of these early mining camps are still evident.

2. Kaiser Exchange Lands

The parcels of land along the rail right-of-way which are scheduled to be transferred to BLM jurisdiction, were, with the exception of nine isolated artifacts, devoid of evidence of prehistoric activity. Three of the five isolates are individual flakes found in the surveyed portion of Section 21, Township 6 South, Range 14 East, about three miles south of Interstate 10. The fourth was a single flake found in Section 20, Township 8 South, Range 11 East. Four additional flakes were located in Sections 8 (Township 6 South Ranch 14 East), Section 13 (Township 7 South Range 13 East), Section 22 (Township 13 South Range 11 East) and Section 33 (Township 6 South Range 14 East). The remaining isolated artifact is a single sherd of Native American pottery, found in the approximate center of Section 27, Township 5 South, Range 14 East, in a wash descending from Difficult Canyon. These isolated artifacts have been recorded with the clearinghouse at the Archaeological Research Unit, UC Riverside (see Attachment 2).

The same area, Section 27, also contains a trash scatter of possible pre-1940 origin, located some 30 meters northeast of the site where the sherd was found, on the margin of the same wash. Three bottle fragments of purple glass were located in Section 27 just south of the railroad.

No other cultural materials other than obviously modern litter were located on any of the other exchange parcels.

3. Road and Rail Ways

The record search (see Attachment 1) indicated that Riv-3216 was located inside the corridor to be surveyed; however, this site was not relocated despite a careful search of the described location. The failure to relocate Riv-3216 is surprising in two regards: first, visibility in the area is excellent, and second, the description of the locational reference landmarks which are readily apparent. Nonetheless, there is no deposit of cultural material within the 200-foot right-of-way at the intersection of the rail line and the Imperial Irrigation District 230-kilovolt power line. The site record filed by D. Pinto of the Archaeological Research Unit at UC Riverside indicates that the "artifacts appear to be washing downhill," and it is possible that the two additional rainy seasons which have passed since Pinto's survey have resulted in further migration of the material which she located, to the area outside the narrow confines of the present survey corridor.

Close to the reported location of Riv-3216 there is a previously unrecorded locus of prehistoric cultural material, consisting of both chipped and ground stone artifacts and pottery sherds. This site, recorded as Riv-3798, is located 600 meters southwest of (and uphill from) the mapped position of Riv-3216. A site record form (DPR-422) for this site has been filed with the Archaeological Research Unit at UC Riverside (see Attachment 2). One hundred thirty-seven identified surface artifacts, consisting of Native American pottery sherds, stone tools, and lithic debitage, were mapped in situ (Figure 6).

What currently exists of the site is located on two sides of a railroad cut which has removed the center of the site. The railroad tracks and associated debris resulting from periodic repair (railroad ties, metal stakes, and metal) lie at the base of the 10-meter cut. A 3 to 5-meter high and 8-meter wide excavation backdirt pile of pink clay subsoil lies 6 meters southeast and paralleled to the southeast edge of the railroad cut. The eroded remains of a road track are located 14 meters from the edge of the northwest slope.

The 137 mapped surface artifacts were located on either side of the railroad cut, from the edge of the top of the cut to a distance of approximately 40 meters on the northwest and 23 meters on the southeast (see Figure 6). The mapped surface artifacts within this area were collected at the time of the initial survey. Field archaeologists felt the collection of this material was appropriate because the land was considered to be privately owned. Because of the mixed land ownership patterns of the area, it was not realized at the time of the survey and collection that the site was located on federal land and would require consideration under the Section 106 consultation process. A controlled surface collection was conducted. Each of the 48 surface plots references one individual lithic artifact or cluster of from 2 to 9 potsherds. A catalog of the recovered material and associated computer analysis sheets are included in Attachment 4. During the visits to the site, additional cultural materials were

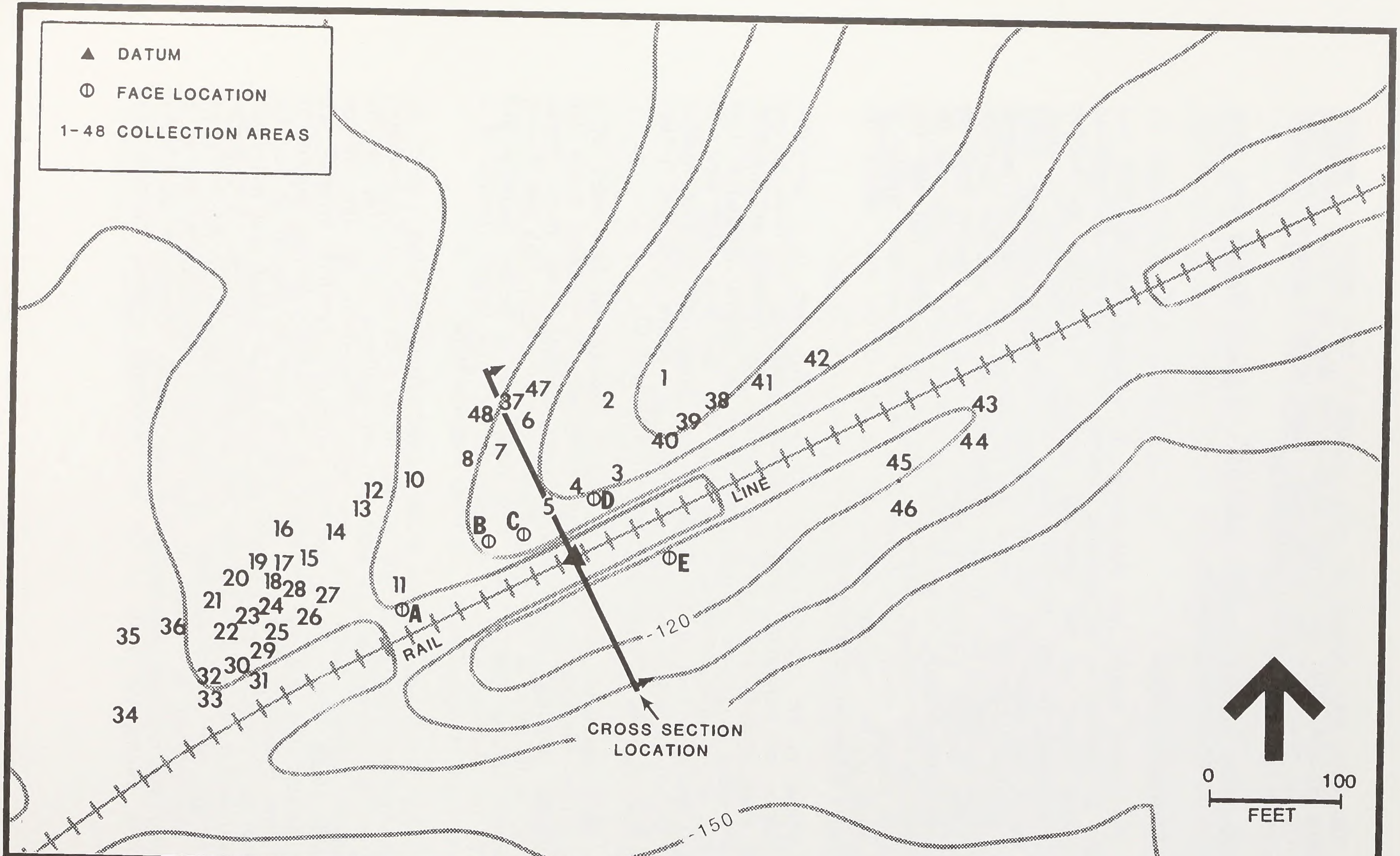

FIGURE 6. Riv-3798 SITE MAP

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observed at a distance of approximately 45 meters to the southeast on the far side of the backdirt pile which resulted from the excavation of the railroad cut.

A subsequent field visit to the site was conducted to obtain additional documentation regarding the nature of the stratigraphy at the site and to assess the potential for additional surface or subsurface cultural materials. A cross-section portraying the extent of the road erosion, railroad cut, and the backdirt pile, was reconstructed using transit and stadia rod (Figure 7). At five locations along the railroad cut slope (four on the northwest slope and one on the southeast slope), a clean face was cut to provide a detailed profile of the stratigraphy. This approach was discussed with Garth Portillo of the BLM Riverside office prior to the field visit. The locations of the faces are shown in Figure 6.

The soil profile observed in face D is shown in Figure 8. The four profiles observed in the northwest faces showed remarkable similarity in strata. The top stratum consists of a layer of sandy topsoil. As would be expected in a deflationary situation, this layer is progressively thinner as the top of the knoll is approached. The topsoil stratum is approximately 2 centimeters thick in face D (at the top of the knoll), and approximately 20 centimeters thick in face A (approximately 150 feet from the toe of the knoll slope). One potsherd was found in the topsoil stratum at face D, within two centimeters of the surface.

As can be seen in Figure 8, the remaining strata (from the surface to approximately 44 centimeters below the surface) consist of reddish/brown clayey sand, fine gray sand, coarse gray sand and small angular stone, fine gray sand, fine reddish brown sand, and fine dark gray sand. These observed soil strata reflect the lakebed depositional origins of the area. They extend to within 2 centimeters of the surface, and represent an absolute limit to the potential extent of any cultural materials.

The remaining face (E) was cut on the southeast slope. This area has been additionally disturbed by extensive erosion caused by the runoff from the backdirt pile of pink clay subsoil just to the southeast. The top 20 centimeters of this face consisted of the redeposited pink clay subsoil, the remaining 40 centimeters consisted of a grey/brown sterile sand.

A thorough resurvey of the site area (approximately 75 meters to the northwest and southeast of the railroad tracks, approximately 300 meters to the northeast of the site datum and approximately 120 meters to the toe of the knoll slope on the southwest) was conducted. Two additional potsherds and two flakes were observed within the previous surface collection area north of the railroad tracks. A widely dispersed scatter of potsherds was observed on the southeast side of the pink clay backdirt pile. This scatter has been heavily impacted by erosion caused by the runoff from the backdirt pile.

One additional disturbance factor at the site is the erosion down the slopes of the knoll which has been intensified by the railroad cut excavation, the placement of the backdirt pile, and an old road north of the railroad cut. The site revisit was conducted within four days of heavy rains which caused Salt Creek to wash out the access road which leads to the site. Additional erosional rills and cuts at the edge of the railroad cut along the road

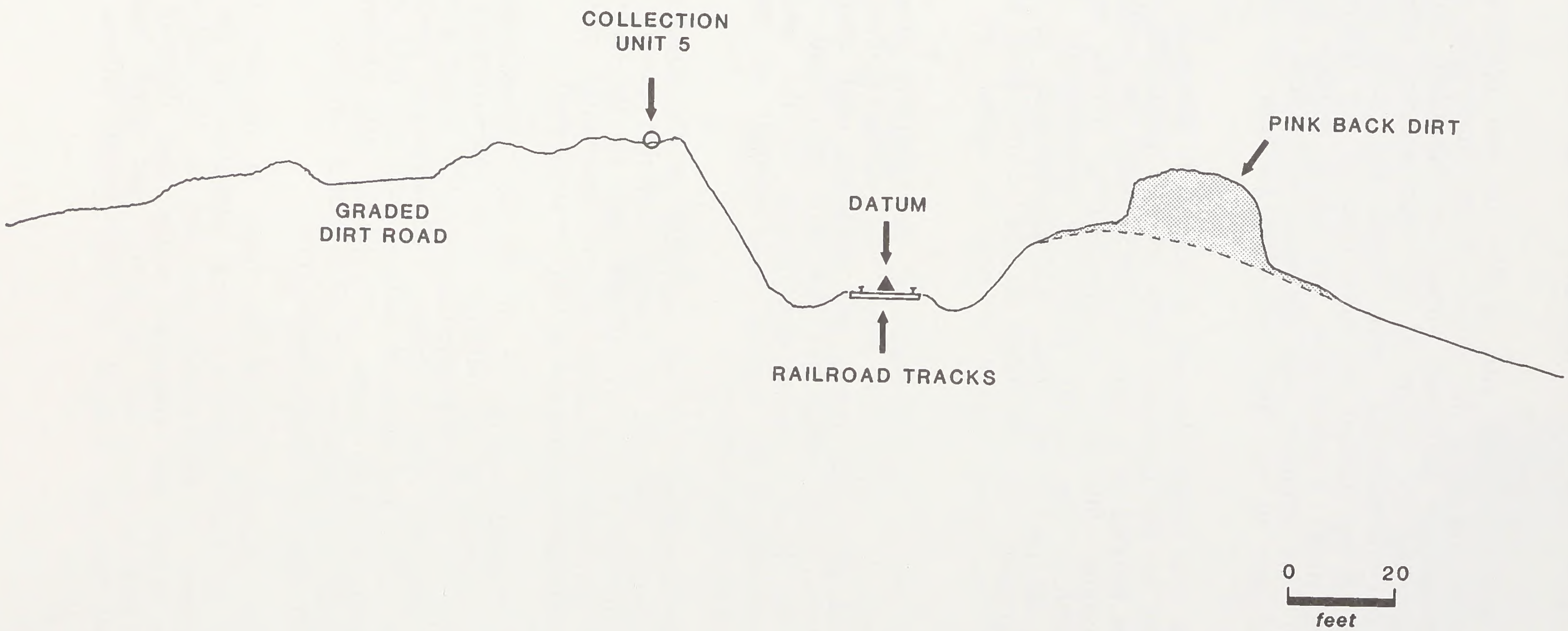

FIGURE 7. Riv-3798: CROSS SECTION OF RAILROAD CUT

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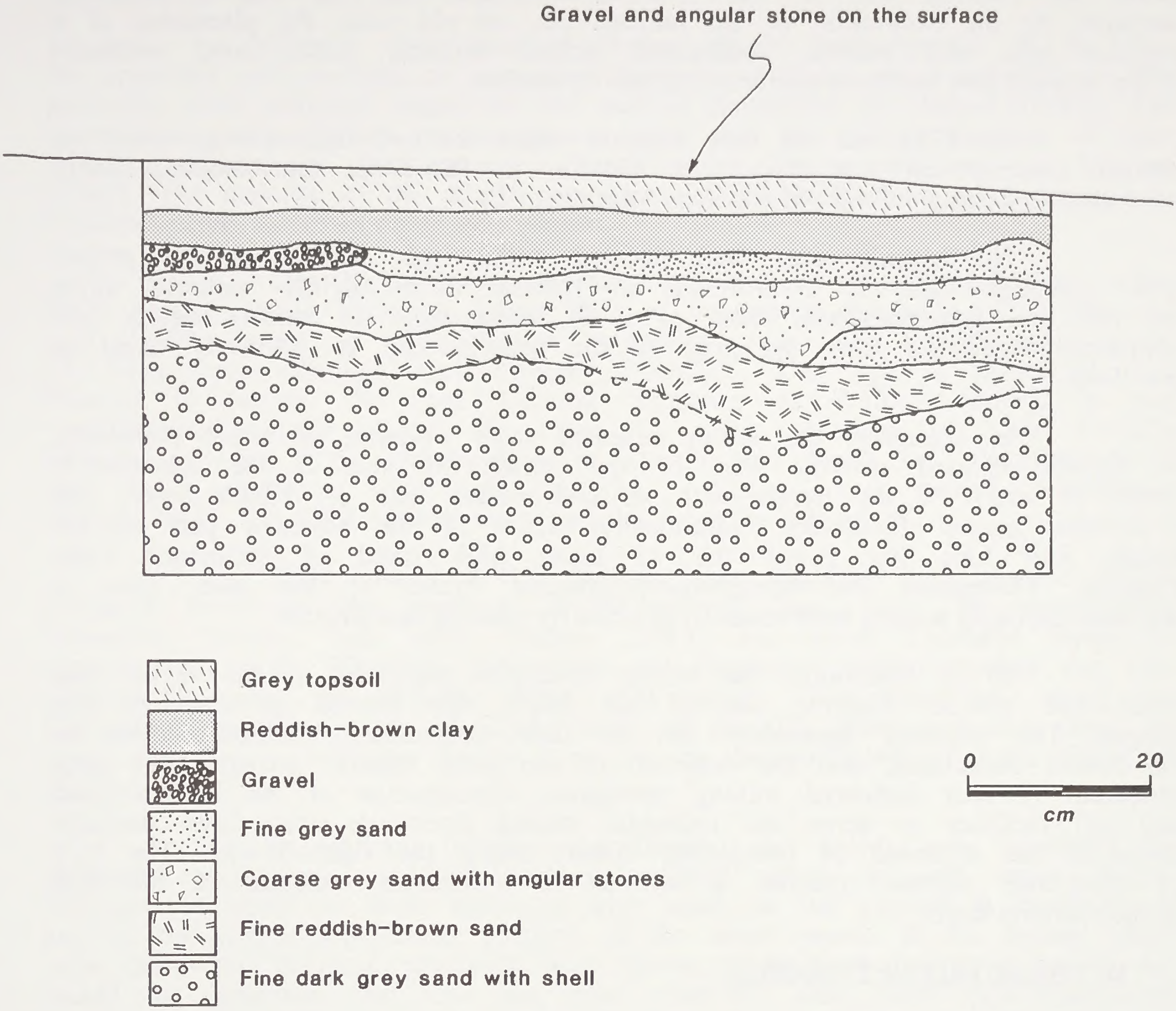


FIGURE 8. Riv-3798: PROFILE OF FACE D

remains northwest of the railroad cut, and on the northwest and southeast slopes of the backdirt pile and adjacent land surface were observed.

As a result of the initial survey activities and the subsequent site documentation visit, it was demonstrated that no subsurface site remains exist along the railroad cut. It was also demonstrated that the site is seriously damaged by the excavation of the railroad cut, an old road, the placement of a backdirt pile, and erosion. Additional surface artifacts were found southeast of the backdirt pile, and these also are disturbed by erosion.

Riv-3798 was the only location within the two rights-of-way where an artifact concentration was found. In addition to Riv-3798, four isolated flakes were identified along the right-of-way (see Attachment 2).

No historic sites were located within this portion of the project area. Although there is a profusion of cultural debris lightly scattered along the rail line and roadways, most of it is recognizable as modern debris (the ubiquitous Budweiser can) and none of the material can be positively dated as pre-1940.

In summary, the survey revealed scant evidence of either prehistoric or historic cultural activity. Part of the reason for this is the inhospitable nature of much of the terrain with its concomitant lack of reliable water and exploitable natural foodstuffs. Additionally, much of the southern part of the Kaiser Rail Line lies below the 12 meter high stand of prehistoric Lake Cahuilla. Throughout the transgression/regression cycles of the lake, sites in this zone are likely to have been seriously affected by washing and siltation.

In all likelihood, the Native American population in the region was small and mobile. Historic use of the lands was limited to travelers and miners. The travelers apparently left as little concentrated cultural debris as the Native Americans, and the evidence of the early miners' activities has been obscured by later industrial mining operations. Construction of the modern road and rail facilities to serve the industrial mining operations may have similarly destroyed the evidence of preexisting culture along the rights-of-way. The lack of observable cultural material is felt to be a reliable indicator of the lack of such activity there.

B. ANALYSIS OF FINDINGS

1. Riv-3798

As described above, the site is bisected by the Kaiser railroad cut which, along with an old road, a backdirt pile, and erosion, constitutes a major disturbance to the resource, compromising its research potential.

The site was shown to consist of surface artifacts only. This was confirmed through documentation of faced profiles of the railroad cut. There is no evidence that subsurface remains exist at the site.

The overall impression of this site is that the assemblage represents a disrupted remnant of a temporary camp, probably occupied briefly by a hunting and gathering party, possibly during the Protohistoric (Moratto 1984:424-430) period as defined in the Cultural Background section of this report. The relative profusion of pottery in the assemblage justifies this temporal assignment. The portable milling equipment (mano and metate) and the presence of both hunting and processing lithic tools contribute to the assessment. The area close to the site is marked on the USGS map as a seep, and although the survey party did not see any signs of surface water, the seep may have been an exploitable water source in past times.

a. Pottery. One hundred twelve sherds were located at the site. An inventory and analysis of recovered sherds is included in Attachment 4. The potsherds were analyzed based on the method developed by Waters (1981). The identification was verified by comparison with two San Diego Museum of Man reference collections: one assembled by Malcolm Rogers and one by Michael Waters. The majority of the sherds were typed as Salton Buff, a minor amount as Colorado Beige; no brown wares were present.

One hundred four sherds (773.1 grams) were identified as Salton Buff. Waters (1981) attributes Salton Buff to the period between A.D. 1,000 and A.D. 1,500, "based on its geological association with Lake Cahuilla and carbon 14 dates from shoreline sites (Waters 1981:22)." The type is associated with Patayan II (within the Late Cultural Sequence as defined above). It was "manufactured" along almost the entire 12 meter shoreline of Lake Cahuilla (Waters 1981:20). The classification of sherds was based on identification of rim forms, together with clay material, inclusion, and temper constituents (Waters 1981). Riv-3798 is within the geographic range for Salton buff.

Eight sherds (171.5 grams) were identified as Colorado Beige, primarily based on the presence of the typical direct rim, clay composition, inclusions, temper, and color. Waters (1981) has dated Colorado Beige to approximately A.D. 700-1050 and within the Patayan I period (within the Late Cultural Sequence as defined above). He states, "this type lies along the Colorado River, from north of Blythe south to the Gila River and east along the lower Gila . . . intrusive as far west as the eastern stand of Lake Cahuilla" (Waters 1981:67).

In addition to type classification, the sherds were measured for thickness and rim curvature, and color-typed using Munsell color charts. Comparisons based on these attributes were made in the attempt to determine if any of the sherds represented portions of the same vessel. If the sherds which were discovered in close proximity were shown to be from the same vessel, this would be evidence that the site was relatively free from post-depositional disturbance. Unfortunately, this was not the case, and no relationships could be demonstrated by this method. Six (5 percent) displayed evidence of contact with fire. Thicknesses ranged from 2 mm to 9 mm. None of the pottery was decorated.

Nineteen sherds (17 percent) were rim fragments. Vessel forms were projected based on the form of the rim sherds (see Attachment 4). The vessel forms were projected based on a method described in Wade (1985). Form names are based on those first described by Rogers (1936) and expanded upon by Waters (1981). Vessel forms represented included: seven bowl rims (radius average 11.5 centimeters), two pot rims (one radius of 9 centimeters and one undeterminable), 1 seed jar rim (radius of 9 centimeters), six jar rims (radius average of 9.6 centimeters), and two direct "chimney" rims for which no determination of vessel form could be made (rim radius of 2.5 and 8 centimeters). This represents a minimum of five vessels.

In general, the ceramic sherds were notable for their homogeneity of type. Based on the typology and chronology developed by Waters (1981), the deposition of ceramics dates sometime between A.D. 700 and 1500, with an emphasis on the period following A.D. 950 based on the preponderance of Salton Buff sherds. Vessel forms represent several activities including storage and cooking. Use of pottery for cooking can also be inferred from evidence of burning on some sherds.

b. Ground Stone. Two items were identified (see Attachment 4). The first is a dark gray tabular granitic material, with one surface polished from use. The roughly triangular fragment measures 200 mm by 120 mm by 30 mm thick. It is classified as a metate fragment. The second item is a mano made from similar material, with one working surface and a pronounced shoulder. It measures 160 mm by 100 mm by 60 mm and weighs 1,359 g.

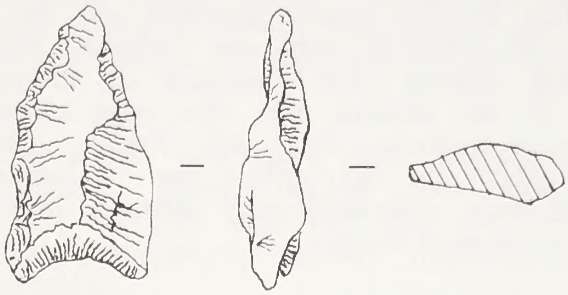
c. Lithics. Two points, four scrapers, and nine pieces of debitage were located (see Attachment 4). Several materials are represented: quartz, chalcedony, and fine-grained metavolcanics.

The two points are illustrated in Figure 9. One is constructed of black metavolcanic and shows some resemblance to the Rose Spring contracting stem type as defined in Heizer and Hester (1978) and Moratto (1984), although larger in size. Rose Spring points are dated to between A.D. 600-700 and A.D. 1100. Using Thomas' procedures for classification (1981), the point would be classified as a Gatecliff Contracting Stem. Thomas proposes a termination date for this series of approximately 1300 B.C. Point types of this variety are not well documented in the literature for the area. Its association with large quantities of Salton Buff provide an interesting potential for future chronological inquiry. This artifact is best described as a square-shouldered, square-stemmed projectile point. Its general size and morphology suggest that it was probably an atlatl dart point, rather than an arrow point.

Dart points are not generally associated with late period sites in this region. It has been a general assumption of most prehistorians that the bow was well established in the desert southwest by the time ceramics were introduced (Warren and Crabtree 1986). Comparisons between artifact surface erosion within the assemblage provides some evidence that this projectile point is not associated with the remainder of the surface collections. Under magnification, the dart point shows significant smoothing of all exposed edges and flake scars. None of the other lithics from the assemblage show similar effects.

One possible explanation is that the artifact was curated from a much older site in the vicinity and transported to this location. Alternately, this site may actually represent two distinct components that have been deflated and mixed on the surface. No other evidence for this is provided by the artifacts, however.

The second point is an asymmetrical Cottonwood triangular point of quartz. Cottonwood points date to the Late cultural sequence as defined



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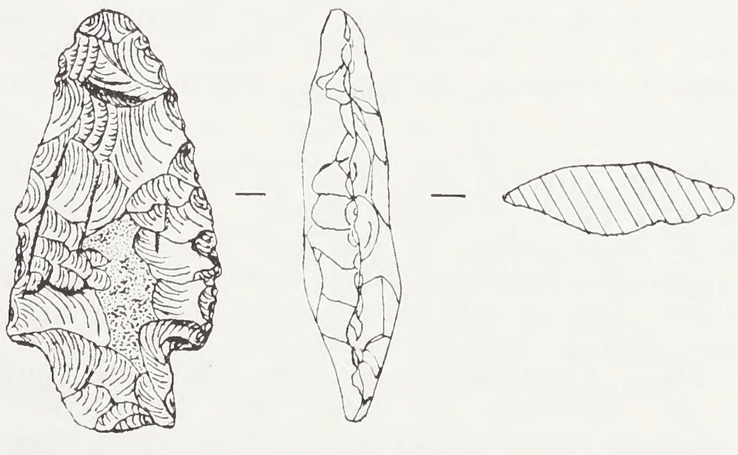

210-44

SCALE TO ACTUAL SIZE

FIGURE 9. PROJECTILE POINTS FROM RIV-3798

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above. Heizer and Hester (1978) date the Cottonwood series points to approximately A.D. 1300 to the historic period, within the period with which the Salton Buff ceramics are associated. This particular point is crude in execution, probably due to the poor nature of the material. It is best described as a Cottonwood series triangular base projectile point (Wilke 1974), probably used as an arrowhead.

The flaked lithic artifacts were analyzed based on an attribute system and provided with a traditional morphological label (see Attachment 4). Four scrapers are all made from small pieces of chalcedony, possibly core trimmings, which exhibit nibbling on at least one edge. Each of the four flaked lithic artifacts was analyzed according to attributes of its edges. Attributes were described for each "non-contiguous exclusive, damage event" or NEDE (Wade 1990). Ten NEDEs were described on the four scrapers: utilized only (three instances of nibbling and one instance of microstep flaking) and unifacially flaked and utilized (five instances of nibbling and one instance of microstep flaking). In the second case this edge damage may be partially the result of platform preparation. For all flaked lithic artifacts, the nature of the damaged edges do not reflect use in heavy processing. The limited range of tools and their associated edge damage implies that a limited set of economic activities occurred at the site.

No complete picture of the lithic reduction process on this site is discernible from the small amount of debitage recovered. Four different materials: quartz, quartzite, coarse, and fine-grained metavolcanics are represented among the nine flakes and pieces of shatter. Two of the quartz flakes appear to be bifacial thinning flakes, and were produced from a better quality material than the projectile point. One large bifacial thinning flake of a basalt or black metavolcanic is also present. This material appears to be similar, but not identical, to the material from which the larger projectile point (210-44) is composed. Pressure flaking is evident only on the two projectile points.

As a diffuse ceramic and lithic scatter this site is similar to many other sites within eastern Riverside county. The occurrence of both Salton Buff and Colorado Beige wares at this site seems to reflect general patterns of exchange or movement similar to those found within the Salton Basin. Many of the late prehistoric sites in and around Lake Cahuilla contain ceramic types from several adjacent regions, such as Tumco Buff, Salton Buff, and Tizon Brown ware (Dominici 1987). Co-occurance of these types and various exotic materials suggests that the inhabitants of these sites had either well-established trade connections or large ranges of movement which would bring them into contact with the sources of non-local items.

2. Prehistoric Isolates

a. Section 27 Sherd (EMRR-A). Not classifiable as one of the recognized Desert wares, the fragment is roughly triangular, approximately 50 mm on a side, and weighs 14.5 grams. It shows no evidence of being exposed to fire and bears no decoration or markings. A mixture of both mountain and sedimentary clays was used in the manufacturing process.

b. Section 21 Debitage (EMRR-C, EMRR-D, EMRR-E). The three isolates found on this parcel were all struck from different chalcedony (jasper) cores. All were interior (no cortex) flakes less than 30 mm in length. No inferences were drawn from these isolates.

c. Other Debitage (EMRR-B, EMRR-F, EMRR-G, EMRR-H, EMRR-I). No inferences were drawn from these single flakes. B, F, and G were fashioned of chalcedony; H was obsidian; and I was quartz. No cortex was observed on any of the isolated flakes. The largest of the lot was less than 40 mm overall. No distinguishing attributes were noted by the field team.

3. Section 27 Trash Scatter

The scatter includes approximately 50 cans, some 20 bottles, and other household articles: an enameled cook pot, a kitchen spoon, and a rubber-stamp pad. The diffusion of the scatter along the wash margin and the observation that some of the artifacts were half buried in the sand imply that this is a secondary deposition.

Within the scatter, several bottles and cans were identifiable as to function: mason jars, condiment bottles, liquor bottles, and milk bottles together with evaporated milk, No. 2 1/2 and 303 vegetable cans, and sardine and Spam cans. All cans and bottles were produced by modern methods, and their equivalents are currently commercially available.

Some products were identifiable by brand. Bottles which formerly contained Four Roses Blended Whiskey, Best Foods, and CHB honey; a medicinal product named Knoxall; and a lotion manufactured and/or distributed by A. S. Hinds were found intact. That some of the larger bottles (for example, the one-quart milk and the whiskey) were unbroken stands in sharp contrast to the normal "target practice" assortment of broken bottles evident elsewhere.

The type of materials found in this scatter are suggestive of housekeeping rather than camping or picnicking. During a conversation with Stanley Ragsdale, he mentioned that during the construction of the Eagle Mountain tunnel, as part of the Los Angeles Aqueduct, construction camps were situated at the point where the tunnel exits the Eagle Mountains. Apart from these organized and supervised camps provided by the large construction firms, individual workers camped in the washes below the Eagle Mountains hoping for jobs on a day-to-day basis. These "Stump Ranchers," to use Ragsdale's colorful term, built their shanties out of available resources, principally the substantial wooden crates in which blasting materials were transported.

It is possible that the scatter may represent the residue from one of these habitations, no artifacts capable of providing the requisite terminus ante quem were identified. The deposit cannot be positively dated earlier than 1940, and could easily be as recent as 1960 or even later. Its composition, size, and location suggest strongly that it is not an in situ deposit. Given that the integrity of the deposit is likely compromised by redeposition, that the range of artifacts is narrow, and that no evidence was discovered to date the project within the period of interest, this deposit is not considered to represent a historic resource, and recordation is not appropriate.

4. Section 27 Bottle Fragments

Even though "sun purpling" of glass is indicative of manufacture prior to World War I, the lack of association between the three bottle fragments and any other cultural material makes them useless for cultural analysis.

V. RECOMMENDATIONS

A. Riv-3798

As a result of the documentation it has been demonstrated that no subsurface site remains exist along the railroad cut. It has also been shown that the site is seriously damaged by the excavation of the railroad cut, an old road, the placement of a backdirt pile, and erosion. Additional surface artifacts are located southeast of the backdirt pile, and are also disturbed by erosion.

Actions related to the railroad which will result from implementation of the proposed project consist of transportation of trash along the rail line, rehabilitation of the railroad, and probable replacement of unstable tressels. No tressels exist within the site area. Rehabilitation of the railroad and required maintenance activities will include track straightening and alignment, ballast regulation, culvery cleanout and repair, vegetation control, and oiler maintenance. The proposed railroad rehabilitation activities will not involve excavations or movement of dirt.

No remains of site Riv-3798 are in proximity to the railroad, as the construction of the railroad created an 11-meter cut removing the center of the site. The cut faces documented during the field investigations revealed that no subsurface remains of the site exist in the remaining site area adjacent to the railroad. Therefore, because no project elements would disturb areas outside of the railroad cut, the project would have no effect on the remaining portion of site Riv-3798. No further action is recommended.

B. ISOLATES

1. National Register Assessment

The prehistoric isolates located by the survey fall into the named categories of archaeological sites generally ineligible as defined by the California Desert District of the BLM's Contractor Directives.

2. Recommendation

Recordation of these isolated artifacts has exhausted their potential to aid archaeological research, and no further action is recommended.

C. HISTORIC CULTURAL RESOURCES

No structures, sites, buildings or objects which qualify as historic cultural resources were located during the survey. Thus, assessment for the National Register is not applicable.

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VII. PROJECT STAFF

Charles S. Bull	Supervisory Archaeologist
Sue A. Wade	Senior Archaeologist
McMillan Davis	Project Archaeologist
Frank Ritz	Field Archaeologist and Historical Researcher
John L. Whitehouse	Field Archaeologist and Crew Leader (South)
Cheryl Bowden	Field Archaeologist and Laboratory Analyst
Russell Collett	Field Archaeologist
Karen Knight	Field Archaeologist
Carleen Leeper	Field Archaeologist
Carol Schultze	Field Archaeologist
Larry Tift	Field Archaeologist
Loretta Gross	Production Supervisor
Harry Price	Senior Technical Illustrator
Stacey Tomlinson	Production Specialist

ATTACHMENTS

ATTACHMENT 1

Attachment 1

On file at the County of Riverside, Bureau of Land Management (Palm Springs), and RECON.

ATTACHMENT 2

Attachment 2

On file at the County of Riverside, Bureau of Land Management (Palm Springs), and RECON.

ATTACHMENT 3

Cultural Systems Research, Inc.

823 Valparaiso Avenue, Menlo Park, California 94025

(415) 323-9261 • (415) 832-8489

February 27, 1990

Dr. Charles Bull
President, RECON
1276 Morena Blvd.
San Diego, CA 92110-3815

Re: Native American Consultation for Eagle Mountain (RECON Number 2100A)

Dear Dr. Bull:

We are sending you herewith a report on the study we have conducted for you to determine whether, and to what extent, the proposed use of Eagle Mountain Mine, northeast of Desert Center, for non-hazardous landfill will impact cultural resources of concern to Native Americans whose traditional territory lay in this area. Please let us know if there is any further information you need.

We shall be mailing a hard copy of the report as well as a disc copy, WordPerfect 4.2.

This has been an interesting project. We hope we'll be working with RECON again.

Sincerely,
CULTURAL SYSTEMS RESEARCH, INC.

Sylvia Vane

Sylvia Brakke Vane
Vice President

cc.
Mr. Dennis Miller, Chairman, Morongo Tribal Council
Mr. Richard Milanovich, Chairman, Agua Caliente Tribal Council
Mr. John James, Chairman, Twentynine Palms General Council
Mr. Daniel Eddie, Jr., Chairman, Colorado River Tribal Council
Ms. Nora Garcia, Chairperson, Fort Mohave Tribal Council
Mr. Robert Pride, Chairperson, Torres-Martinez Council
Ms. Christine Walker, Chairman, Chemehuevi Tribal Council
Ms. June Mike, Chairman, Twenty-Nine Palms General Council
Mr.Russell Kaldenberg, Bureau of Land Management, Palm Springs

ATTACHMENT NO. 3. Current Ethnology and Native American Concerns, by Cultural Systems Research, Inc.

NATIVE AMERICAN CONCERNS

Cultural Systems Research, Inc. (CSRI) has conducted a study for Regional Environmental Consultants (RECON) to determine whether, and to what extent, the proposed use of the Eagle Mountain Mine, northeast of Desert Center, for non-hazardous landfill will impact cultural resources of concern to Native Americans whose traditional territory lay in this area. This is a report on CSRI's findings.

METHOD

This study began with a consultation on January 10, 1990 between RECON Project Archaeologist McMillan Davis and Lowell John Bean, Ph.D., and Sylvia Brakke Vane, M.A., of CSRI. The project was described by Davis and other RECON staff members, and it was agreed that CSRI would complete a draft report by March 1, 1990.

CSRI's work on the project was conducted by Bean, Vane, and Ethnographer Jackson Young. Bean and Vane planned the research, and decided, on the basis of information gained in previous research, that the vicinity in which the Eagle Mountain mine is located would have been with the traditional territory of the Mojave, Chemehuevi, and Cahuilla Indians, and that therefore the following reservations should be given an opportunity to comment on the proposal to use the mine for landfill, as proposed by the Mine Reclamation Corporation: Fort Mojave Indian Reservation (Mojaves), Chemehuevi Indian Reservation (Chemehuevi), Colorado River Indian Reservation (Mojave and Chemehuevi), Twentynine Palms Indian Reservation (Chemehuevi), Morongo Indian Reservation (Cahuilla, Serrano, and Chemehuevi), Agua Caliente Indian Reservation (Cahuilla), Cabazon Indian Reservation (Cahuilla and Chemehuevi), and Torres-Martinez Indian Reservation (Cahuilla). Letters describing the project, and saying that we would be touch with them to make arrangements to visit the mine area were sent the chairpersons of the governing bodies of each of these reservations on January 17.

Commencing on January 24, Young made phone calls to each reservation. Vane and Young also discussed the project with several Mojave and Cahuilla elders with whom they have recently been working. It was eventually decided that a trip to the vicinity of the mine would be made on Monday, February 19.

It had been determined by February 19 that Morongo Indian Reservation, Agua Caliente Indian Reservation, and Cabazon Indian Reservation did not wish to visit the mine area, nor to make any statement with respect to the project. Fort Mojave Indian Reservation, and Chemehuevi Indian Reservation had expressed interest, but in the event did not join in the visit to the mine nor make a statement.

The participants in the visit to the mine area were Vane and Young from CSRI, a Chemehuevi and two Mojaves from the Colorado River Indian Tribes (CRIT), and a Cahuilla elder from Torres-Martinez Indian Reservation.

In the meantime, a search of the literature had been made by Vane to find evidence of use of the area by Native American groups, and a trip to Joshua Tree

National Monument headquarters was made by Bean and Vane on January 26. The purpose of this trip was to determine whether the collection of artifacts held at the monument included any found in the vicinity of the mine, and to examine any found and their provenience.

This report has been written by Vane and edited by Bean.

RESULTS OF RESEARCH

Territorial Boundaries. One purpose of the research was to determine whether the assumption that modern-day Mojave, Chemehuevi, and Cahuilla represent the descendants of most of the tribal groups that would traditionally have used the vicinity of the Eagle Mountain Mine is a reasonable assumption. Our study showed that the Eagle Mountains were probably used by the Cahuilla in the "ethnographic present," and by the Chemehuevi from the mid-nineteenth century on. They may have been used by the "Desert Mojave," at an earlier time. For as long as the present climatic conditions have existed, these mountains have probably been mainly a place to hunt mountain sheep and deer, an area of temporary, but not permanent, campsites. The Native Americans to whom we talked, using their interlocking fingers to demonstrate, spoke of this being an area where the territories of several groups might overlap, with now one group and then another coming in to hunt. The Chemehuevi spoke of its being primarily "Desert Mojave" territory, whereas the Mojaves assigned it to the Chemehuevi.

The Cahuilla consultant had himself come to hunt for mountain sheep and deer in the Eagle Mountains "fifty years ago" with John Hilton and another non-Indian. He remembers a large cottonwood tree and a stream that flowed mostly underground, coming to the surface only at intervals. He says the mine has changed the landscape so much that he cannot say exactly where this cottonwood tree and the stream would have been.

This consultant remembers an older tradition. There were about fifty wild burros in Borrego Valley. Led by Lupe Lugo, a number of young Cahuillas mounted on horseback chased the burros to Torro, thence to Tuva (now under the Salton Sea), on to Desert Center, and finally up into the Eagle Mountains. He also points out that in traditional times Cahuillas would come from what are now the Cahuilla and Santa Rosa reservations to Torro and then go on to Yuma--hence they must have known the trails and where the springs were.

Lupe Lugo, our consultant said, also drove cattle from the Coachella Valley to Blythe, and would have come through the Eagle Mountains with them.

Bean (1978:75) describes Cahuilla territory as extending as far south as the Chocolate Mountains and as far east as "a part of the Colorado Desert west of Orocopia mountain." Personnel at the Joshua Tree National Monument have been considering the Eagle Mountains as Cahuilla territory, though their collection does not contain artifacts that can be assigned a specific ethnic group. No Cahuilla oral literature pertaining to the Eagle Mountains is known to us.

Mojave traditional territory lies primarily along the Colorado River, where they are known to have lived ever since the Spanish explorer Oñate described finding "Amacavas" in 1604, but present-day Mojave say that the Mojave territory also included the whole of the Mohave Desert, and that they are concerned about anything that impacts that desert. Mojave oral literature (Kroeber 1948, 1951, and 1972), which consists primarily of songs that describe a journey, speaks mainly of the vicinity of the Colorado River, but some songs take the listener into what is now Arizona, as well as into the Mohave Desert in California. The Tehachapi Mountains and places along the Mohave River are mentioned fairly frequently. The only published reference that could possibly include the Eagle Mountain area was "A Mohave Historical Epic" (Kroeber 1951), in which two leaders from the Mohave Valley migrate to the Providence Mountains, thence to a mountain east of San Bernardino which may have been San Gorgonio Peak, and then, after a two day stay, went on to the "Kamia country" on the Colorado River via a place where *Haoikwa* and Quail lived. This place is unidentified, but it is said they lived on two different kinds of grass seeds while there (Kroeber 1951:77). This story, regardless of where this stopping place was, suggests an occasional foray into the Colorado Desert, and possibly the Eagle Mountain area, by the Mojaves.

Although our Chemehuevi consultant said that Chemehuevis and other Southern Paiutes came from as far away as Pahrump to hunt in or travel across the Eagle Mountian area, the main Chemehuevi use of the Eagle Mountain area would have been after several Chemehuevi families moved into the Coachella Valley reservations (into which they married), and especially the Twentynine Palms Reservation, set aside as a reservation after the Mojave-Chemehuevi war in the 1860s. The Eagle Mountains would have been a convenient hunting area for people living in the Twentynine Palms area.

Chemehuevi songs, as mapped by Laird (1976), pertained to an area closer to the Colorado River and not extending into this vicinity.

The Chemehuevi consultant noted a recent association of Chemehuevi with the Eagle Mountain Mine in that a nephew of hers, while living with a foster family, attended the Eagle Mountain High School.

Our consultants fell to talking of the real, as opposed to the fictional, Willie Boy. He was Chemehuevi, from the Wicke family, son of Mary Snyder of Morongo. He escaped via Whitewater and Twentynine Palms to the Parker area and was not killed by the posse that went after him. He took refuge in a cave north of Twentynine Palms and was brought food by a cousin. He had been a good hunter and knew the water holes in these mountains. After his death, his mother walked from Morongo to Parker--she also knew where to find food and water.

Impact of Project. None of the Native American consultants identified the Eagle Mountains as sacred or having special significance to their people. One of the Mojaves, emphasizing that he was speaking out of concern for all citizens and not just Indians, noted that wastes identified as non-hazardous had a way of turning out to be hazardous, and opposed using the site for landfill. All the CRIT consultants were concerned about the possibility of inadvertent dumping of materials that might turn out to be hazardous, their reservation having had such an experience itself. CRIT had contracted to let a firm dump several hundred truckloads of ground-up materials from automobile interiors on the reservation. The materials were allowed to aerate on the surface for a time, and were then covered with dirt. Unfortunately, chemical reactions occurring after several months brought about an explosion, and the landfill operation had to brought to an end. The materials had contained many PCBs.

CRIT consultants also pointed out that many eastern cities had run into trouble after wastes not known to be hazardous were used as landfill. They said they'd want assurances that such things would not happen.

The Chemehuevi consultant opposed using the site for landfill, observing that when the wind blows, materials from landfill sites blow into the air and affect its quality. She then added that such objections would apply anywhere, and this "would be as good a place as any."

The other Mojave asked what the effect of using the site for landfill would have on the desert tortoise population. He wanted to know the results of any studies of the impact on tortoises and other wild life. He referred to the fact that landfill sites attract and increase the population of ravens, who attack young tortoises, thereby increasing the stress on this endangered species.

The Cahuilla consultant said that he would not live to see any harm that might come from using the Eagle Mountain mine as a landfill site, and expressed the opinion that it was up to younger people to think about such impacts. Cahuilla reservation tribal councils we contacted did not express concern.

RECOMMENDATION. No mitigable impact on Native American values was demonstrated by this study, but CRIT consultants were concerned about the effect of using the Eagle Mountain mine as a landfill site might have on air quality, plants, and animals. The results of any studies of such impacts should be sent to CRIT. It would be advisable to send them to all the tribal groups consulted in this study.

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ATTACHMENT 4

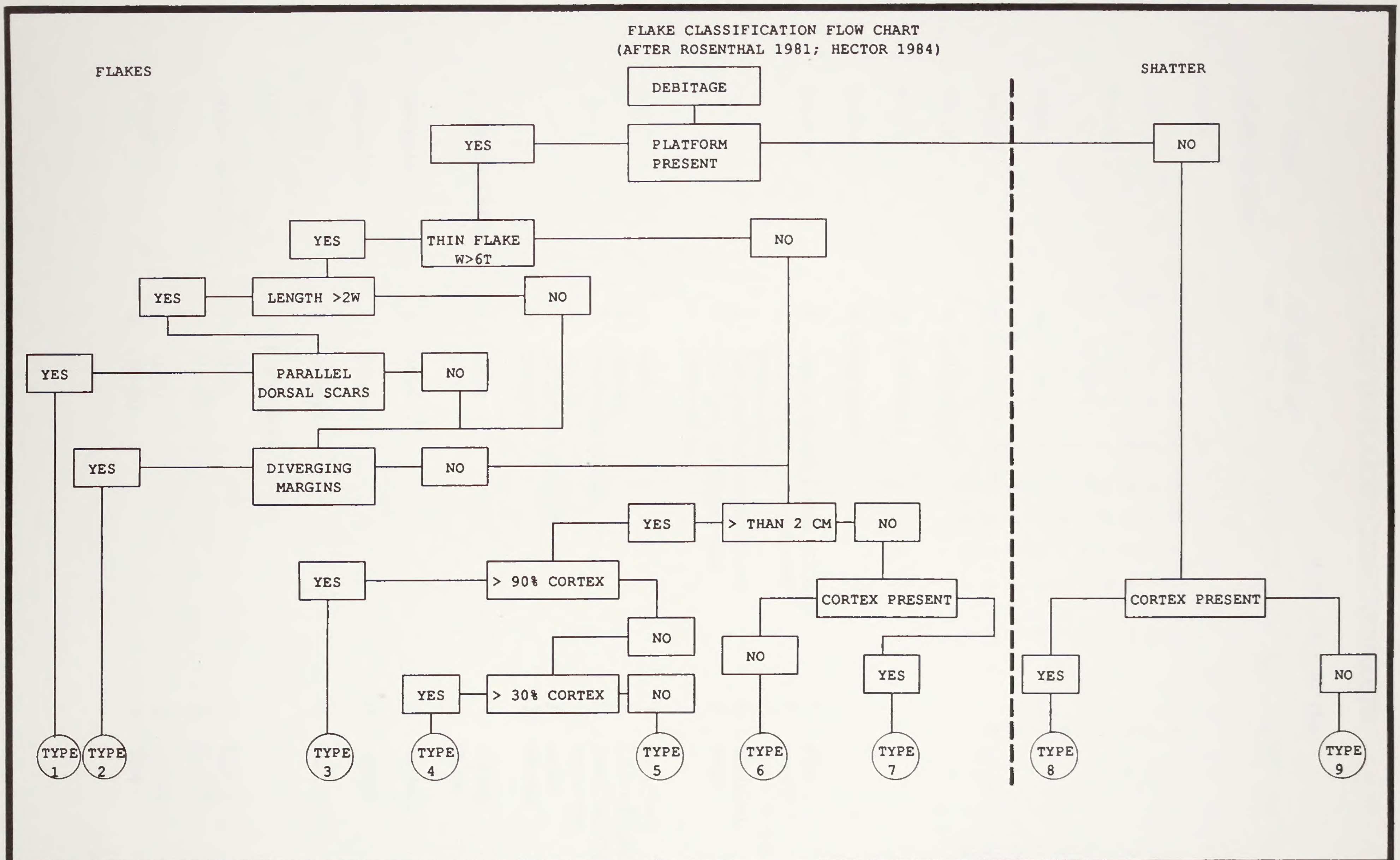
KEY TO FLAKES AND SHATTER

Item	Description
accession number	RECON: R000 WESTEC: W000
catalog number	
site number	00000 for SDi-#s W0000 for SDM-W-#s
locus	
unit	
category	2. debitage
feature	1. hearth 2. burial
level	10, 20, 30, . . .
material	1. coarse grained metavolcanic 2. coarse grained porphyritic metavolcanic 3. fine grained metavolcanic 4. fine grained porphyritic metavolcanic 5. quartzite 6. quartz 7. chert/chalcedony 8. obsidian 9. other
flake types	counts of each type within the material type specified; see attached flow diagram

FLAKE TYPOLOGY

Type	Bulb	Platform	Relative Length	Cortex	Dorsal Scars	Other	Assumed Process
1	Present	Present	2x w	--	2+	Parallel sides	Specialized blade type
2	Present	Present	--	--	--	Diverging, thin	Bifacial thinning
3	Present	Present	2+ cm	80%	0	--	Platform creation, cortex removal
4	Present	Present	2+ cm	30-80%	0-1	--	Cortex removal
5	Present	Present	2+ cm	-30%	1+	--	Core reduction, basic shaping
6	Present	Present	-2 cm	0%	1+	--	Finishing, resharpening
7	Present	Present	-2 cm	Present	1+	--	Trimming
8	Absent	Absent	--	Present	--	--	Shatter during primary reduction
9	Absent	Absent	--	Absent	--	--	Shatter during secondary reduction

Source: After Norwood, Bull, and Rosenthal 1981.



FLAKE CLASSIFICATION FLOW CHART (AFTER ROSENTHAL, 1981 AND HECTOR, 1984)

02/06/91

DEBITAGE - RAW LISTING

ACC	CAT	SITE	LOC	UNIT	FEA	LEV	FLD#	MA	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP9
** SITE EMRR1																	
R210	3	EMRR1	2			0		7	0	0	0	0	0	0	0	1	0
R210	8	EMRR1	6			0		1	0	0	0	0	1	0	0	0	0
R210	9	EMRR1	7			0		9	0	0	0	0	1	0	0	0	0
R210	10	EMRR1	8			0		7	0	0	0	0	0	0	0	1	0
R210	12	EMRR1	10			0		6	0	0	0	0	1	0	0	0	0
R210	16	EMRR1	12			0		7	0	0	0	1	0	0	0	0	0
R210	22	EMRR1	16			0		6	0	0	0	0	1	0	0	0	0
R210	48	EMRR1	40			0		7	0	0	0	0	0	0	0	0	1
R210	54	EMRR1	46			0		7	0	0	0	0	1	0	0	0	0
R210	54	EMRR1	46			0		7	0	0	0	0	1	0	0	0	0
** Subtotal **																	
									0	0	0	1	6	0	0	2	1

KEY TO FLAKED LITHIC ARTIFACTS

Item	Description	
catalog number		
locus		
unit		
feature	1. hearth 2. burial	
level	10, 20, 30, . . .	
weight	to the nearest gram	
length	in millimeters	
width	in millimeters	
thickness	in millimeters	
material	1. coarse grained metavolcanic 2. coarse grained porphyritic metavolcanic 3. fine grained metavolcanic 4. fine grained porphyritic metavolcanic	5. quartzite 6. quartz 7. chert/chalcedony 8. obsidian 9. other
label	1. core 2. blades 3. projectile points 4. knives 5. scrappers-unifacial 6. choppers	7. hammers 8. utilized flakes 9. modified flakes 10. crescentii 11. drills 12. blanks
production base	1. flake 2. core	3. cobble 4. other
condition	1. whole	2. broken
patination	1. present	0. absent
cortex	1. present	0. absent
type	1-14 see chart	
circumference	1. 0-90 2. 0-180	3. 0.270 4. 0-360
angle	1. 0-30 2. 30-60	3. 60-90 4. 90+

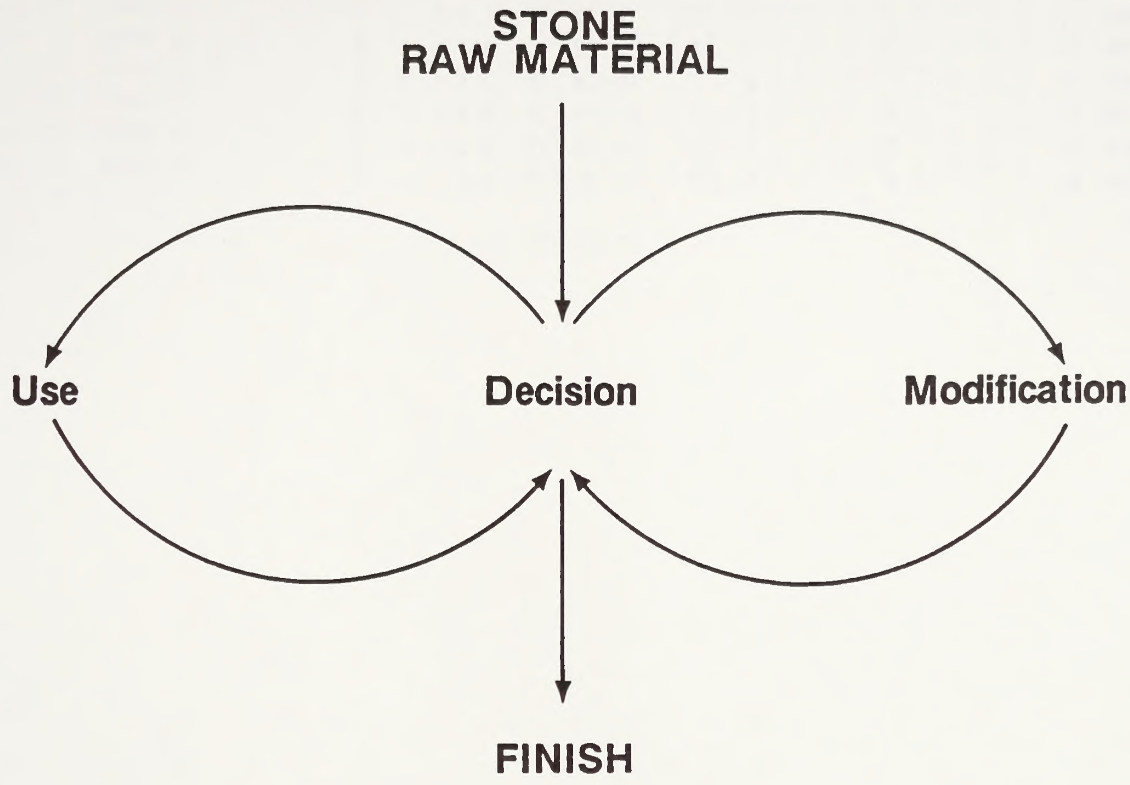
IDENTIFICATION OF NON-CONTIGUOUS, EXCLUSIVE DAMAGE EVENTS (NEDEs)

1	FLAKED		unifacial
2	FLAKED		bifacial
3	UTILIZED		rounding
4	UTILIZED		nibbling
5	UTILIZED		microstepping
6	UTILIZED		crushing
7	UTILIZED		battering
8	FLAKED & UTILIZED	UNIFACIAL	rounding
9	FLAKED & UTILIZED	UNIFACIAL	nibbling
10	FLAKED & UTILIZED	UNIFACIAL	microstepping
11	FLAKED & UTILIZED	UNIFACIAL	crushing
12	FLAKED & UTILIZED	UNIFACIAL	battering
13	FLAKED & UTILIZED	BIFACIAL	rounding
14	FLAKED & UTILIZED	BIFACIAL	nibbling
15	FLAKED & UTILIZED	BIFACIAL	microstepping
16	FLAKED & UTILIZED	BIFACIAL	crushing
17	FLAKED & UTILIZED	BIFACIAL	battering

NOTE: NEDEs--

- are continuous along a line not broken by an angle less than 90 degrees or undamaged area (noncontiguous)
- are continuous breakage of the same type (exclusive)
- can be interrupted by recent breakage and still be interpreted as continuous
- does not include platform preparation

Circumference--A circle defined by diameter equaling the maximum length of artifact



NEDES TASK EVENT PROCESS

02/06791

RAW LISTING FOR FLAKED LITHIC ARTIFACTS - DESCRIPTIVE

ACC	CAT	SITE	LOCUS	UNIT	FEA	LEV	FND	M	C	LB	WT	LN	WD	TH	P	PD	CR	NN
** SITE EMRR1																		
R210	13	EMRR1	10			0		7	1	5	10	24	36	16	2	0	1	4
R210	19	EMRR1	14			0		7	1	5	9	22	21	21	4	0	1	1
R210	32	EMRR1	26			0		7	1	5	21	32	43	14	4	1	0	2
R210	39	EMRR1	32			0		6	1	3	4	34	18	6	4	0	0	3
R210	44	EMRR1	37			0		3	1	3	11	54	26	8	4	0	0	5
R210	53	EMRR1	45			0		7	1	5	6	25	23	8	2	1	0	3
R210	53	EMRR1	45			0		7	1	5	6	25	23	8	2	1	0	3
** Subtotal **																		
											67	216	190	81				

02/06/91

RAW LISTING FOR FLAKED LITHIC ARTIFACTS - ATRIBUTES

ACC	CAT	SITE	LOCUS	UNIT	FEA	LEV	FND	M	C	LB	T1	C1	A1	T2	C2	A2	T3	C3	A3	T4	C4	A4	NN
** SITE EMRR1																							
R210	13	EMRR1	10			0		7	1	5	4	1	3	9	1	3	9	1	3	9	1	3	4
R210	19	EMRR1	14			0		7	1	5	10	1	3	0	0	0	0	0	0	0	0	0	1
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R210	44	EMRR1	37			0		3	1	3	2	2	1	2	2	1	2	1	2	2	1	2	5
R210	53	EMRR1	45			0		7	1	5	9	2	2	5	1	3	4	1	3	0	0	0	3
R210	53	EMRR1	45			0		7	1	5	9	2	2	5	1	3	4	1	3	0	0	0	3

KEY TO GROUND STONE

Item	Description	
accession number	RECON: R000	WESTEC: W000
catalog number		
site number	00000 for SDi-#s W0000 for SDM-W-#s	
locus		
unit		
category	5. ground stone	
feature	1. hearth 2. burial	
level	10, 20, 30, . . .	
material	1. granite 2. quartzite 3. andesite	4. sandstone 5. other
weight	to the nearest gram	
length	in millimeters	
width	in millimeters	
thickness	in millimeters	
condition	1. whole	2. broken
type	1. mano 2. pestle 3. slab	4. basin 5. bowl 6. other
shaped	1. unshaped	2. broken

(shaped manos/pestles are shouldered, bifacial, and have edge treatment to produce a tabular profile)

number of faces	1 face 2 faces	3 faces 4 faces
battering	1. end 2. side	3. both

side 1 (ground surface of metate):
length/width/depth in millimeters

side 2 (ground surface of metate):
length/width/depth in millimeters

02/06/91

RAW LISTING FOR GROUNDSTONE

ACC	CAT	SITE	LOC	UNIT	LEV	FDN	MT	WGT	LN	WD	TH	C	T	SH	F	B	L1	W1	D1	L2	W2	D2
** SITE EMRR1																						
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	49		41																			
R210		EMRR1			0		5	1287	214	141	33	2	3	1	1	0	170	95	5	0	0	0
	56		48																			
** Subtotal **																						
								5292									340	192	10	0	0	0
*** Total ***																						
								5292									340	192	10	0	0	0

KEY TO POTTERY ATTRIBUTES DATA LISTING

ACC:	ACCESSION #
CAT#:	CATALOG NUMBER
SITE#:	SITE NUMBER
WGHT:	WEIGHT to the nearest tenth gram
TYP:	POTTERY TYPE SB = Salton Buff CB = Colorado Beige
RM:	RIM Y = Yes N = No
MUNS-INT:	MUNSELL COLOR-INTERIOR
MUNS-EXT:	MUNSELL COLOR-EXTERIOR
TH:	THICKNESS

Riv-3798 pottery

ACC	CAT#	SITE#	TYP	WGHT	RM	MUNS-INT	MUNS-EXT	TH
R210	1	R3798	SB	2.8	Y	5 Y8/2	5 Y7/3	4
R210	2	R3798	SB	8.7	Y	7.5YR7/4	7.5YR5/4	5
R210	14	R3798	SB	21.5	N	10 YR7/2	10 YR7/1	5
R210	15	R3798	SB	12.8	Y	7.5YR6/4	7.5YR7/4	7
R210	17	R3798	CB	17.5	N	2.5 Y6/2	2.5 Y5/2	4
R210	20	R3798	SB	11.6	N	10 YR5/1	10 YR6/2	3
R210	23	R3798	SB	8.0	N	5 YR4/1	10 YR7/3	4
R210	33	R3798	SB	7.7	N	7.5YR6/4	7.5YR8/2	3
R210	45	R3798	SB	9.4	Y	10 YR6/3	10 YR6/1	6
R210	46	R3798	SB	5.1	N	7.5YRN4/	10 YR7/1	5
R210	47	R3798	CB	10.5	Y	10 YR7/3	10 YR7/2	4
R210	4A	R3798	SB	17.7	N	7.5YR8/2	5 YR6/6	4
R210	4B	R3798	CB	43.5	N	10 YR6/2	2.5YRN5/	7
R210	50	R3798	SB	3.5	N	10 YR7/2	7.5YRN4/	3
R210	51	R3798	SB	2.9	N	7.5YR6/4	10 YR7/3	5
R210	52	R3798	SB	9.2	N	7.5YR6/2	10 YR7/1	5
R210	55	R3798	SB	9.1	N	2.5YR6/6	2.5YRN6/	3
R210	5A	R3798	CB	11.8	Y	7.5YR7/2	7.5YR8/2	6
R210	5B	R3798	CB	10.0	Y	7.5YR8/2	7.5YR7/4	7
R210	6A	R3798	SB	12.4	Y	10 YR7/2	2.5 Y7/2	5
R210	6B	R3798	CB	49.5	N	7.5YR6/4	7.5YR7/2	7
R210	6C	R3798	SB	10.7	N	10 YR7/1	10 YR7/3	3
R210	6D	R3798	SB	4.2	N	7.5YR7/2	10 YR5/1	5
R210	7A	R3798	SB	6.4	N	10 YR7/2	10 YR5/2	4
R210	7B	R3798	SB	5.5	N	10 YR6/2	10 YR7/1	4
R210	7C	R3798	SB	3.1	N	10 YR7/2	2.5 Y6/2	4
R210	7D	R3798	SB	2.6	N	10 YR7/3	10 YR6/1	4
R210	11A	R3798	SB	1.0	N	10 YR6/2	2.5 Y7/2	2
R210	11B	R3798	SB	1.5	N	2.5 Y7/2	2.5 Y7/2	2
R210	11C	R3798	SB	14.8	N	5 YR6/2	5 YR7/4	6
R210	11D	R3798	SB	8.8	N	7.5YR7/2	7.5YR5/2	5
R210	11E	R3798	SB	6.5	N	5 YR6/3	5 YR5/3	4
R210	18A	R3798	CB	18.0	Y	7.5YR7/2	5 YR6/6	7
R210	18B	R3798	SB	3.1	N	5 YR6/1	5 YR6/6	4
R210	18C	R3798	SB	2.7	N	7.5YRN5/	5 YR6/3	4
R210	18D	R3798	SB	1.6	N	7.5YR6/2	7.5YR6/2	3
R210	18E	R3798	SB	4.3	N	7.5YR7/4	10 YR7/2	4
R210	21A	R3798	SB	10.2	Y	10 YR7/3	10 YR6/2	5
R210	21B	R3798	SB	18.3	N	10 YR6/2	10 YR6/2	4
R210	21C	R3798	SB	19.3	N	10 YR5/1	7.5YR7/4	3
R210	21D	R3798	SB	8.4	N	10 YR7/3	10 YR5/1	4
R210	21E	R3798	SB	19.5	N	2.5 Y8/2	10 YR7/3	8
R210	21F	R3798	SB	5.1	N	10 YR6/2	10 YR5/1	4
R210	21G	R3798	SB	2.0	N	7.5YR7/4	10 YR7/3	3
R210	24A	R3798	SB	16.3	Y	2.5 Y6/2	2.5 Y7/2	6
R210	24B	R3798	SB	15.9	N	10 YR7/2	10 YR5/1	5
R210	24C	R3798	SB	2.8	N	10 YR6/2	10 YR6/2	3
R210	24D	R3798	SB	5.7	N	10 YR7/2	10 YR5/2	5
R210	24E	R3798	SB	8.0	N	2.5 Y6/2	2.5 Y5/2	5
R210	24F	R3798	SB	3.7	N	2.5 Y7/2	2.5 Y5/2	4
R210	24G	R3798	SB	3.8	N	2.5 Y6/2	2.5 Y5/2	3

Riv-3798 pottery

ACC	CAT#	SITE#	TYP	WGHT	RM	MUNS-INT	MUNS-EXT	TH
R210	24H	R3798	SB	5.8	N	7.5YR7/4	10 YR7/4	5
R210	24I	R3798	SB	2.2	N	10 YR7/3	2.5 Y7/2	4
R210	25A	R3798	SB	7.3	Y	2.5 YN3/	2.5 YN4/	4
R210	25B	R3798	SB	1.9	N	10 YR6/3	5 YR6/4	2
R210	26A	R3798	SB	2.6	N	5 YR7/4	5 YR5/1	3
R210	26B	R3798	SB	3.5	N	10 YR7/2	5 YR4/3	3
R210	26C	R3798	SB	3.6	Y	10 YR7/1	5 YR4/2	3
R210	26D	R3798	SB	3.8	N	7.5YR6/2	10 YR6/2	4
R210	26E	R3798	SB	3.8	N	5 YR7/4	7.5YR6/2	2
R210	27A	R3798	SB	26.3	N	7.5YRN4/	7.5YRN5/	5
R210	27B	R3798	SB	10.6	N	10 YR6/2	10 YR5/1	4
R210	27C	R3798	SB	9.1	N	10 YR7/2	10 YR6/2	3
R210	27D	R3798	SB	19.0	N	7.5YR6/2	7.5YR6/2	4
R210	28A	R3798	SB	7.1	Y	5 YR7/4	5 YR7/4	5
R210	28B	R3798	SB	2.7	N	10 YR6/2	10 YR7/2	3
R210	29A	R3798	SB	3.8	N	10 YR6/2	2.5 Y6/2	3
R210	29B	R3798	SB	6.7	N	2.5 Y6/2	2.5 Y5/2	3
R210	29C	R3798	SB	4.1	N	2.5 Y6/2	2.5 Y5/2	3
R210	29D	R3798	SB	1.6	N	2.5 Y6/2	10 YR5/2	3
R210	29E	R3798	SB	2.0	N	2.5 Y6/2	10 YR5/2	3
R210	29F	R3798	SB	3.6	N	10 YR6/2	10 YR5/1	5
R210	29G	R3798	SB	1.9	N	10 YR6/2	10 YR6/2	3
R210	29H	R3798	SB	1.7	N	2.5 Y6/2	10 YR6/3	3
R210	29I	R3798	SB	2.0	N	2.5 Y6/2	2.5 Y5/2	3
R210	29J	R3798	SB	3.9	N	10 YR6/2	10 YR5/1	4
R210	30A	R3798	SB	9.6	Y	10 YR7/2	10 YR5/1	7
R210	30B	R3798	SB	5.1	N	10 YR7/1	10 YR5/1	5
R210	31A	R3798	SB	3.3	N	7.5YR6/2	7.5YRN5/	4
R210	31B	R3798	SB	3.4	N	7.5YRN5/	10 YR7/2	3
R210	31C	R3798	SB	1.6	N	5 YR5/4	10 YR6/2	4
R210	34A	R3798	SB	9.1	Y	10 YR7/2	10 YR7/2	5
R210	34B	R3798	SB	7.0	N	10 YR7/3	10 YR5/1	4
R210	35A	R3798	SB	3.7	Y	10 YR7/3	10 YR7/3	4
R210	35B	R3798	SB	18.3	N	10 YR5/1	10 YR6/2	4
R210	36A	R3798	SB	6.1	N	2.5 YN5/	10 YR6/1	2
R210	36B	R3798	SB	6.1	N	10 YR7/2	2.5 YN5/	4
R210	37A	R3798	SB	27.2	Y	10 YR7/1	7.5YR7/4	6
R210	37B	R3798	CB	10.7	N	10 YR6/1	10 YR6/3	5
R210	37C	R3798	SB	21.9	N	10 YR5/1	10 YR8/3	9
R210	37D	R3798	SB	7.9	N	10 YR7/2	10 YR5/1	3
R210	38A	R3798	SB	19.6	N	10 YR6/3	10 YR7/3	5
R210	38B	R3798	SB	2.2	N	7.5YR7/4	7.5YR6/4	5
R210	38C	R3798	SB	6.1	N	10 YR5/2	10 YR5/1	5
R210	40A	R3798	SB	9.7	Y	10 YR6/1	7.5YR6/4	7
R210	40B	R3798	SB	10.1	N	7.5YRN4/	10 YR7/1	6
R210	41A	R3798	SB	13.7	N	7.5YR6/4	10 YR8/3	3
R210	41B	R3798	SB	14.5	N	2.5YR6/4	7.5YR7/2	4
R210	41C	R3798	SB	8.4	N	7.5YR7/2	10 YR7/1	4
R210	42A	R3798	SB	24.3	N	10 YR6/1	10 YR5/1	3
R210	42B	R3798	SB	2.2	N	10 YR6/1	10 YR5/1	3
R210	42C	R3798	SB	5.7	N	10 YR6/1	10 YR5/1	3

Riv-379B pottery

ACC	CAT#	SITE#	TYP	WGHT	RM	MUNS-INT	MUNS-EXT	TH
R210	43A	R379B	SB	6.9	N	10 YR7/1	10 YR6/1	4
R210	43B	R379B	SB	7.3	N	10 YR6/2	10 YR5/1	4
R210	43C	R379B	SB	5.3	N	10 YR5/1	10 YR7/3	3
R210	A/1	R379B	SB	14.4	N	2.5YR5/6	10 YR6/6	6
*** Total ***								
				952.0				

APPENDIX J

PALEONTOLOGIC RESOURCE ASSESSMENT

EAGLE MOUNTAIN MINE SOLID WASTE DISPOSAL SITE

Robert E. Reynolds
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for

RECON
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December, 1989

Paleontologic Resource Assessment
Eagle Mountain Mine (MRC)

INTRODUCTION

Mine Reclamation Corporation (MRC) proposes to utilize a portion of the Eagle Mountain open pit mine as a regional solid waste disposal site. The usage in part includes retrieving recyclable materials. The proposal includes utilization of a portion of the Eagle Mountain mine as a land fill as well as access by road and access by the Kaiser Railroad. These are discussed herein as follows:

1a. Mine/landfill site, 1,650 acres
1b. Kaiser Road, 5 mile access
1c. Kaiser Railroad north of Interstate 10, approximately 12 miles, and
2. Kaiser Railroad south of Interstate 10, approximately 40 miles.

This paleontologic resource assessment includes a review of pertinent geologic literature and a check of paleontologic resource locality records in the Regional Paleontologic Locality Inventory at the San Bernardino County Museum. Based on this review, a preconstruction field survey of sensitive portions of the mine site, access roads, and railroad right of way was conducted to provide information on which a detailed plan for mitigation could be developed.

The area under assessment consists of two distinct geologic and geographic areas: the area north of Interstate 10 and the area south of Interstate 10. This report is divided into sections reflecting these distinct areas.

METHODS

The review of geologic literature was conducted in the library of the Earth Sciences Division at the San Bernardino County Museum, in the University of California, Riverside Department of Earth Sciences library, and in the personal reference collections of the author. The review of resource localities was conducted at the Regional Paleontologic Locality Inventory of the San Bernardino County Museum, the site files of the University of California, Riverside, and paleontologic site records from the Natural History Museum of Los Angeles County (LACM), Section of Vertebrate Paleontology.

The field survey was directed by Robert E. Reynolds, Curator of Earth Sciences, San Bernardino County Museum. Mr. Reynolds has had more than 25 years of field experience in paleontologic survey, assessment, and salvage in southern and central California, including San Bernardino, Riverside, and Imperial counties. He was assisted by Quintin Lake, James Steinmetz, James Bowden, Allen Tedrow, and Kathleen Springer, all employees of the Earth Sciences Division of the San Bernardino County Museum and each with experience in paleontologic resource assessment in Riverside and San Bernardino counties. The survey was conducted between November 30 and December 8, 1989. Field work was conducted under Bureau of Land Management paleontologic permit CA881416 with a Fieldwork Authorization Permit issued by the Bureau of Land Management, Indio Resource Area, Russell Kaldenberg, Area Manager.

Field work was conducted by teams who traversed portions of the parcels on foot at 30 meter intervals with intuitive deviations to inspect likely looking outcrops of sediments at the Eagle Mountain mine and along rights of way to the mine, which include the Eagle Mountain Road and the Kaiser Railroad. Teams of two persons paralleled the right of way center line, inspecting outcrops in washes and sediments exposed in railroad cuts and in access road cuts.

NORTH OF INTERSTATE 10

Location

The Eagle Mountain mine site, including the proposed land fill location, the Kaiser access road, and approximately 12 miles of the Kaiser Railroad are located north of Interstate 10 between Indio and Blythe. This portion is treated in one section because of similarities of geologic units.

1a. Mine/Disposal Site is located in portions of:

sections 25, 26, 27, 28, 33, 34, 35, 36, T.3S, R.14E;

section 31, T.3S, R.15E;

section 6, T.4S, R.15E; and

sections 1, 2, 12, T.4S, R.14E,

as shown on the Pinto Wells 7.5', Coxcomb Mountains 7.5', Victory Pass 7.5', and Buzzard Spring 7.5' quadrangle maps.

<u>1b. Eagle Mountain Road</u> is the proposed truck access, running north from Interstate 10. The north portion of this road may be relocated parallel to a proposed spur of the Kaiser Railroad. From the north, the access road crosses portions of:

sections 6, 7, 17, 18, 19, 20, 30, 31, T.4S, R.15E;

sections 6, 7, 18, 19, 30, T.5S, R.15E, SBBM

as shown on the Victory Pass 7.5' and Desert Center 7.5' quadrangle maps.

<u>1c. Kaiser Railroad</u> north of Interstate 10 runs to the Eagle Mountain mine. For clarity, the portion of the railroad north of Interstate 10 is discussed here; discussion of the portion of the railroad south of Interstate 10 follows. Kaiser Railroad north of Interstate 10 crosses the following sections:

sections 1, 2, 11, T.4S, R.14E SBBM;

sections 6, 7, 17, 18, 19, 20, 30, 31, T.4S, R.15E;

sections 12, 13, 23, 24, 26, 27, 28, 29, 31, 32, T.5S, R.14E; and

section 6, T.6S, R.14E, SBBM

as shown on the Victory Pass 7.5', Desert Center 7.5', and

Hayfield Spring 7.5' quadrangles.

Impacts

Impacts to sediments containing nonrenewable paleontologic resources may occur through project development and use.

1a. Mine/Landfill site. Proposed areas for fill, new structures, and laydown and staging areas would be developed by grading and excavation which could produce impacts to nonrenewable paleontologic resources in sedimentary rocks.

1b. Eagle Mountain Road. Upgrading, realignment, and development of drainage structures would involve excavation. Annual maintenance with excavation equipment might impact nonrenewable paleontologic resources in sedimentary rock units.

1c. Kaiser Railroad North. The rebuilding of the railroad grade, the addition of the proposed spur, development of new drainage structures and access roads, and annual maintenance would all be done with excavation equipment. Excavation into sediments could produce impacts to nonrenewable paleontologic resources.

Resources

The project includes the proposed disposal site at the Eagle Mountain mine, the truck access by Eagle Mountain Road, and approximately 12 miles of Kaiser Railroad lie north of Interstate 10 as it runs east/west between Chiriaco Summit and Desert Center. Rock units in this area are similar, and are discussed separately from rocks south of Interstate 10.

Geologic mapping summarized by C.W. Jennings (1967) indicates that the following rock types occur at the site and along the rights of way.

Gneissic rocks are of high metamorphic grade and have been subject to severe deformation. These rocks may range in age from Proterozoic to early Mesozoic. However, recrystallization involved in their formation precludes preservation of fossils.

Granitic rocks are late Mesozoic in age and because of their intrusive nature are in part responsible for the deformation of the metamorphic rocks listed above. Their mode of emplacement and crystallization precludes preservation of fossils.

Volcanic rocks north of Interstate 10 may be early to middle Miocene in age, circa 20 million years (m.y.), assuming that they are from the same volcanic event that took place in the Orocopia Mountains. The volcanic rock are not associated with sediments or volcaniclastic debris flows and consequently they have a low potential to contain vertebrate fossils. The proposed rights of way will not cross the Tertiary volcanic rocks.

Pleistocene alluvium occurs as dissected fanglomerates and terraces within the project area. These are expected to contain coarse, angular rocks near their source and grade into finer sediments away from their source. The potential for vertebrate fossils in these sediments would increase away from source as sediment clast size became finer and as sediments became stable and developed soil horizons.

Recent alluvium is located in valleys and in wash bottoms between outcrops of the above rock types. These recent, active sediments have low potential to produce paleontologic resources.

Review of the Regional Paleontologic Locality Inventory at the San Bernardino County Museum, and the paleontologic locality records at U.C. Riverside and from the Los Angeles County Museum of Natural History do not indicate that previous paleontologic assessments have been conducted at or near the Eagle Mountain mine site or along the road and railroad rights of way north of Interstate 10. Consequently, no paleontologic resource sites are known from the two sedimentary units encountered by the proposed project.

Results of Field Survey

Field survey was conducted along the road and railroad rights of way north of Interstate 10 and on portions of the Eagle Mountain Mine/proposed landfill site which contained Pleistocene alluvial sediments. Pleistocene alluvium at the eastern portion of the land fill site is very coarse and has a low potential to contain nonrenewable paleontologic resources. No impacts to paleontologic resources are expected during construction excavation related to the development of the proposed land fill or its operation at the Eagle Mountain mine.

The Kaiser Railroad north of Interstate 10 crosses and cuts through coarse Pleistocene fanglomerate. The high-energy method of emplacement of this coarse fanglomerate is not conducive to the preservation of paleontologic resources and the potential for their occurrence is low. No impacts from railroad grade construction of annual maintenance are expected.

Eagle Mountain Road runs north from Interstate 10 and crosses Recent alluvium and older Pleistocene alluvium. The Pleistocene alluvium crossed by Eagle Mountain Road is coarse, indicating high-energy deposition which is generally not conducive to the preservation of vertebrate fossils. Excavation related to road widening and annual maintenance in not expected to produce impacts to paleontologic resources along Eagle Mountain Road north of the Cal Trans right of way associated with Interstate 10.

However, within the Cal Trans right of way at the junction of Eagle Mountain Road and Interstate 10, and to the south of Interstate 10, are sediments conductive to the preservation of vertebrate fossils. These are moderately coarse to fine grained Pleistocene alluvial sediments which contain several horizons of loamy calichified soil with occasional calichified burrows and root casts. These deposits indicate stable alluvium that was receiving fine-grained sediments and which developed soil profiles, including calichification. The sediments are located on both sides of Eagle Mountain Road and within the fenced Cal Trans right of way, and include the access ramps to Interstate 10. Sediments extend southerly out of the Cal Trans right of way. If road construction and realignment is considered for this portion of Eagle Mountain Road near Interstate 10, a program to mitigate impacts to nonrenewable paleontologic resources should be developed for specific excavation plans.

SOUTH OF INTERSTATE 10

Location

2. Kaiser Railroad South of Interstate 10 runs from the Chuckawalla Valley across the Chuckawalla Bench to Chuckawalla Summit. It then parallels Salt Creek as it runs south of the Orocopia Mountains and north of the Chocolate Mountains. The Coachella branch of the All American Canal is near the elevation of the high shoreline of ancient Lake Cahuilla. Near this point, the Kaiser Railroad is north of Salt Creek and runs southwesterly to its terminus at Ferrum, on Highway 111 on the east side of the Salton Sea. The Kaiser Railroad crosses the following sections south of Interstate 10 to Ferrum on Highway 111.

sections 6, 7, 8, 9, 16, 17, 21, 28, 33, T.6S, R.14E;

sections 5, 7, 8, T.7S, R.14E;

sections 12, 13, 14, 21, 22, 23, 28, 29, 31, 32, T.7S, R.13E;

sections 34, 35, 36, T.7S, R.12E;

sections 3, 7, 8, 9, 10, T.8S, R.12E; and

sections 12, 13, 14, 20, 21, 22, 23, 27, 28, 29, T.8S, R.11E

as shown on the Hayfield Spring 7.5', East of Red Canyon 7.5', Red Canyon 7.5', Frink NW 7.5', and Durmid 7.5' quadrangles.

Impacts

2. Kaiser Railroad South. The rebuilding of the railroad right of way and grade, the development of new drainage structures and access roads, and annual maintenance would all be done with excavation equipment. Excavation for cuts within rights of way or excavation for fill outside of the reviewed rights of way could produce impacts to nonrenewable paleontologic resources in sensitive sedimentary deposits.

Resources

Lithologic units south of Interstate 10 are discussed below.

Gneissic rocks of high metamorphic grade in the eastern Orocopia Mountains, western Chuckawalla Mountains, and western Chocolate Mountains are referred to as "Precambrian" age by Jennings (1967) and may be older than 500 million years. The high grade of crystallization and severe deformation precludes preservation of fossils.

Orocopia Schist in the south and western Orocopia Mountains is now considered to be Mesozoic in age (Crowell and Walker, 1962). The Orocopia Schist figures prominently in discussions of amount of offset along the San Andreas Fault. The high degree of crystallization and deformation precludes preservation of fossils.

Granitic rocks span a period of time that includes the late Mesozoic. Their mode of emplacement and crystallization precludes preservation of vertebrate fossils.

The Maniobra Formation of Eocene age (Crowell, 1962; Crowell and Susuki, 1959)contains an important assemblage of invertebrate fossils which includes four gastropods and two pelecypods. The Maniobra Formation plays an important part in discussions of offset along the San Andreas Fault. The Maniobra Formation has the potential to contain vertebrate fossils. The Kaiser Railroad right of way and access roads will not come into contact with the Maniobra Formation.

The Diligencia Formation is now considered to include the Late Arikareean land mammal age of the early Miocene (Woodburne and Whistler, 1973). The following localities have produced vertebrate fossils:

LACM V7114	*Merychyus calaminthus*	oreodont
UCRV 7901	*Stenomylus* sp.	small camel

The vertebrate fossils provide age control for the continental sediments of the Diligencia Formation which figures prominently in the discussions of offset distances and rates along the San Andreas Fault. The fossil localities are approximately 2/3 mile distant from the Kaiser Railroad right of way and the formation itself is not encountered by the railroad right of way.

Tertiary volcanics interfinger the early Miocene Diligencia Formation and are mapped as being in the Upper Diligencia or overlying the Diligencia Formation within the Orocopia Mountains. To the southeast, in the Chocolate Mountains, Tertiary volcanics are mapped as sitting within or on top of Pliocene or Pleistocene fluviatile sediments on the northeast side of the San Andreas Fault. The volcanic rocks may provide datable horizons within the sedimentary units between early Miocene and late Pliocene times. These volcanic units south of Interstate 10 are generally associated with sedimentary units which have potential to contain vertebrate fossils. The Kaiser Railroad will not directly cross Tertiary volcanic rocks but is cut into sedimentary units which may interfinger with these volcanic sediments.

Pleistocene old alluvium. Fluviatile sediments include coarse fanglomerates and fine-grained fluviatile sediments which occur along the Kaiser Railroad right of way. These fluviatile sediments are coarse near their source and grade to finer sediments with soil horizons near the valley centers. In the northern Chocolate Mountains and in the western Chuckawalla Mountains, geologic mapping has distinguished older Pleistocene alluvial deposits from Pleistocene alluvium. Field relationships suggest that the latter is younger than the former. The field assessment determined that the Kaiser Railroad runs through moderately coarse to fine fluviatile sediments with several very well developed red loamy soil horizons. These are probably equivalent in age and may be distal depositional equivalents to the Pleistocene old alluvium mapped to the south and east. The Pleistocene old alluvium along the railroad right of way is distinguished from younger Pleistocene alluvium by deep weathering and because it may be somewhat deformed and may contain fault offsets that are not seen in the younger Pleistocene alluvium. Fine-grained portions of the Pleistocene old alluvium and the soil horizons have potential to contain paleontologic resources. Although no vertebrate fossils were located during the field survey, soil horizons have been shown to be relatively fossiliferous compared to coarse fluviatile deposits (Reynolds, 1985; Woodburne and Golz, 1972). The potential for paleontologic resources was reinforced during the field assessment when calichified casts of roots were located in the red soil horizons. A list of these sites includes:

SBCM 05.013.001	Chuckawalla Summit Sediments #1	root casts
SBCM 05.013.002	Chuckawalla Summit Sediments #2	root casts
SBCM 05.013.003	Chuckawalla Summit Sediments #3	root casts
SBCM 05.013.004	Chuckawalla Summit Sediments #4	root casts
SBCM 05.013.005	Chuckawalla Summit Sediments #5	root casts

The Pleistocene old alluvium along the Kaiser Railroad has potential to produce nonrenewable paleontologic resources. These resources may be impacted by excavation related to railroad rehabilitation and maintenance. A program to mitigate impacts to nonrenewable paleontologic resources is presented herein.

Pleistocene alluvium. Pleistocene fanglomerates and fluviatile sediments are mapped as occurring along the Kaiser Railroad right of way. These sediments are light gray in color and may sit unconformably upon the redder Pleistocene old alluvium. Along the railroad, these sediments are very coarse and consequently have a low potential to contain nonrenewable paleontologic resources.

Pleistocene lacustrine sediments. Pleistocene lacustrine deposits and interbedded fluviatile deposits are found above the high shoreline of Lake Cahuilla westward to the current shoreline of the Salton Sea. These in part are covered by a thin veneer of sediments from Holocene Lake Cahuilla and deltaic sediments from the Colorado River. However, downcutting wave action of Lake Cahuilla has exposed the Pleistocene lacustrine sediments over a broad area. The older sediments show deformation near the trace of the San Andreas Fault. North of Bombay Beach at Salt Springs, these older Lake sediments are nearly vertical and contain the Bishop Tuff, dated at 740,000 ybp (Rymer, 1989). Lacustrine sediments of the Borrego Formation, named from deposits on the west side of the Salton Sea, may be correlative with these older Quaternary lake sediments.

These tan to red older Pleistocene lake sediments are flat-lying or deformed, depending on their proximity to the San Andreas Fault. Therefore, a broad range of time may be represented by these vertical sediments near the fault branches and those flat-lying sediments that are relatively undeformed.

Their ages may range from middle Pleistocene at Bombay Beach, where the Bishop Tuff is exposed (74,000 ybp, Rymer 1989) to less than 35,000 ybp (K. Sieh, California Institute of Technology, personal communication to Reynolds, 1987; Reynolds, 1987a, 1989). North of Wister, the flat-lying sediments contain an articulated limb of Equus sp. (small), a Pleistocene horse.

Review of the Regional Paleontologic Locality Inventory at the San Bernardino County Museum identified the following resource localities in the vicinity of the Kaiser Railroad where sediments are exposed west of the Coachella Canal to the margin of the Salton Sea.

SBCM 05.012.001	Salt Creek #1	articulated Anodonta sp; 3 species of gastropods
SBCM 05.012.002	Salt Creek #2	fish, Physa sp., conispiral gastropods
SBCM 05.012.003	Salt Creek #3	fish, articulated Anodonta sp, Physa sp, conispiral gastropods
SBCM 05.012.004	Salt Creek #4	Anodonta sp, gastropods
SBCM 05.012.005	Salt Creek #5	fish, gastropods
SBCM 05.012.006	Salt Creek #6	Anodonta sp, Physa sp.
SBCM 05.012.007	Salt Creek #7	Anodonta sp, Physa sp.
SBCM 05.012.008	Frink Mineral Springs #1	Anodonta sp, several species of gastropods
SBCM 05.012.009	Frink Mineral Springs #2	Pelecypod (large species)
SBCM 05.012.010	Frink MIneral Springs #3	fish, large mammal, gastropod species including Physa sp.
SBCM 05.012.011	Frink Mineral Springs #4	fish, Corbicula

		sp, several species of gastropods
SBCM 05.012.012	Frink	Anodonta sp, Corbicula sp.
SBCM 05.012.013	Salt Creek N. #4	fish, ostracodes
SBCM 05.012.015	Salt Creek N, #6	Tryonia sp, Gyraulus sp.
SBCM 05.012.016	Salt Creek N. #7	Tryonia sp, ostracodes
SBCM 05.012.017	Salt Creek N, #8	ostracodes
SBCM 05.012.018	Salt Creek N. #9	Charophyta, Anodonta sp., Physella sp, Hydrobiidae, Amnicola sp, fish
SBCM 05.012.020	Salt Creek N. #11	fish, ostracodes
SBCM 05.012.021	Salt Creek S. #2	Solen sp.

Results of Field Survey

The field survey along the Kaiser Railroad reinforces the fossiliferous nature of the sediments between the Coachella Canal and Highway 111. The following resource localities were recorded during the field assessment.

SBCM 05.012.030	Salt Spring RR #1	Anodonta sp, Physa sp, Tryonia sp.
SBCM 05.012.031	Salt Spring RR #2	Lepus californicus
SBCM 05.012.032	Salt Spring RR #3	Anodonta sp, Tryonia sp.
SBCM 05.012.033	Salt Spring RR #4	marine? pelecypods
SBCM 05.012.034	Salt Spring RR #5	Anodonta sp, marine? pelecypod
SBCM 05.012.035	Salt Spring RR #6	Anodonta sp.
SBCM 05.012.036	Salt Spring RR #7	Anodonta sp, marine? pelecypod

SBCM 05.012.037	Salt Spring RR #8	*Anodonta* sp. *Tryonia* sp, *Physa* sp.
SBCM 05.012.038	Salt Spring RR #9	fish, *Anodonta* sp, *Physa* sp, *Tryonia* sp.
SBCM 05.012.039	Salt Spring RR #10	*Anodonta* sp, *Physa* sp, *Helisoma* sp.
SBCM 05.012.040	Salt Spring RR #11	large mammal bone, *Helisoma* sp.
SBCM 05.012.041	Salt Spring RR #12	*Anodonta* sp, *Physa* sp, *Tryonia* sp, *Helisoma* sp.
SBCM 05.012.042	Hunters Spring #1	*Physa* sp, *Tryonia* sp.
SBCM 05.012.043	Hunters Spring #2	*Anodonta* sp, *Physa* sp, *Tryonia* sp.
SBCM 05.012.044	Hunters Spring #3	*Anodonta* sp, *Physa* sp.
SBCM 05.012.045	Hunters Spring #4	*Anodonta* sp, *Tryonia* sp, *Physa* sp.
SBCM 05.012.046	Hunters Spring #5	fish, *Physa* sp, *Tryonia* sp.

Pleistocene lacustrine sediments along the Kaiser Railroad west of the Coachella Canal and the terminus of the railroad at Ferrum have potential to contain nonrenewable paleontologic resources. Impacts to these resources may occur due to excavation-related to railroad rehabilitation and maintenance. A program to mitigate impacts is proposed herein.

Recent alluvial sediments occur on slopes covering the above-listed rock units as well as in active washes located centrally in valleys. These recently active sediments have low potential to contain paleontologic resources.

SUMMARY OF FINDINGS

Sedimentary rocks with high potential to contain nonrenewable paleontologic resources occur at the Interstate 10 junction with Eagle Mountain Road and south of Interstate 10 in several sedimentary units along the Kaiser Railroad. Locations of sensitive sedimentary units are described herein and are shown on the accompanying sensitivity map.

Rock Units with Paleontologic Sensitivity

I-10 & Eagle Mt. Road	Pleistocene Old Alluvium (Qoa)	S/2 SE/4 sec. 30, T.5S R.1E (Desert Center 7.5')
Red Cloud Mine Junction	Qoa	SW/4 sec. 9, T.6S R.14E
Chuckawalla Summit Sediments	Qoa	secs 5, 7, 8, T.7S R.14E secs 12, 13, 14, T.7S R.13E
Hunters Spring	Pleistocene lacustrine	sec 7, T.8S R.12E; sec. 12, 13, 14, 20, 21, 22, 23, 27, 28, 29, T.8S R.11E

RECOMMENDATIONS

The above-listed portions of right of way associated with the Eagle Mountain mine reclamation plan crosses sediments with high potential to produce nonrenewable paleontologic resources. Twenty-three resource sites were located along the right of way during the field survey. Right of way improvements and maintenance may involve excavation directly as sediments with the right of way or for recovery of foil near the right of way. Excavation has the potential to impact nonrenewable paleontologic resources. A program to mitigate impacts to paleontologic resources is proposed in accordance with Federal and State guidelines and legislation for the preservation of significant nonrenewable paleontologic resources. The program outlined below is general for the right of way and will need to be applied to specific excavation proposals, such as borrow pits, when these are specified. The general program to mitigate impacts to nonrenewable paleontologic resources includes:

1. Pre-excavation survey to recover paleontologic resources exposed in areas of proposed excavation.

2. Monitoring of excavation by qualified paleontologic monitors to salvage resources as they are uncovered by excavation. This includes the recovery, removal, and processing of adequate samples of sediments containing small to microscopic vertebrate fossils. Monitors should be equipped to salvage fossils as they are unearthed, without unnecessary delays to excavation schedules. Monitors must be empowered to temporarily

halt or divert construction equipment if necessary to remove large or abundant fossil specimens.

3. Preparation of fossils to a point of identification. This includes wet screening of matrix containing fossils to recover small to microscopic vertebrate remains from sediments. Matrix must be removed from large specimens to reduce volume during storage. Specimens should be prepared to a point of stabilization and identification.

4. Identification of specimens, curation, and storage in an established repository with retrievable collections.

5. Preparation of a report of findings, including an itemized inventory of specimens accessioned into the museum's collections.

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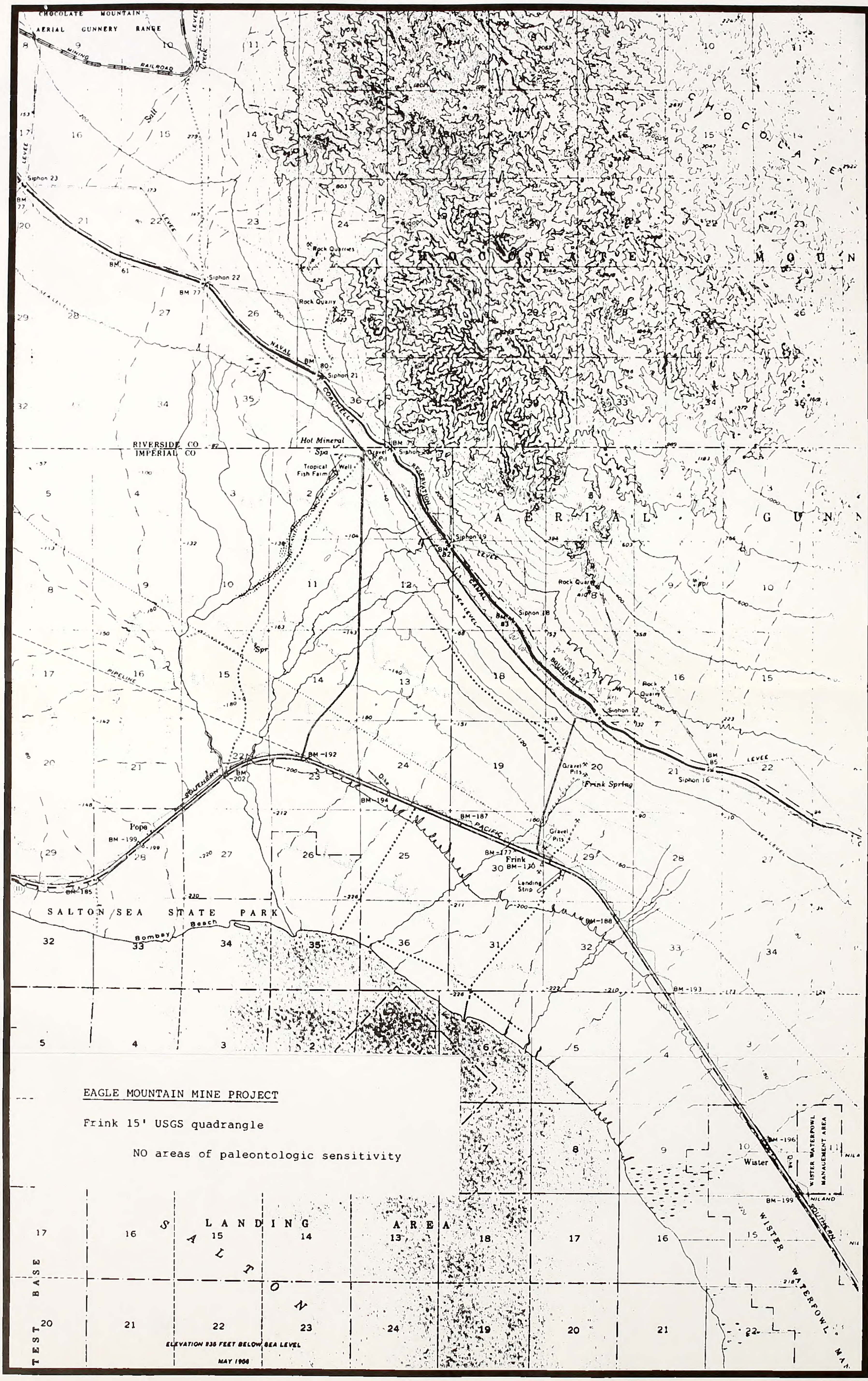
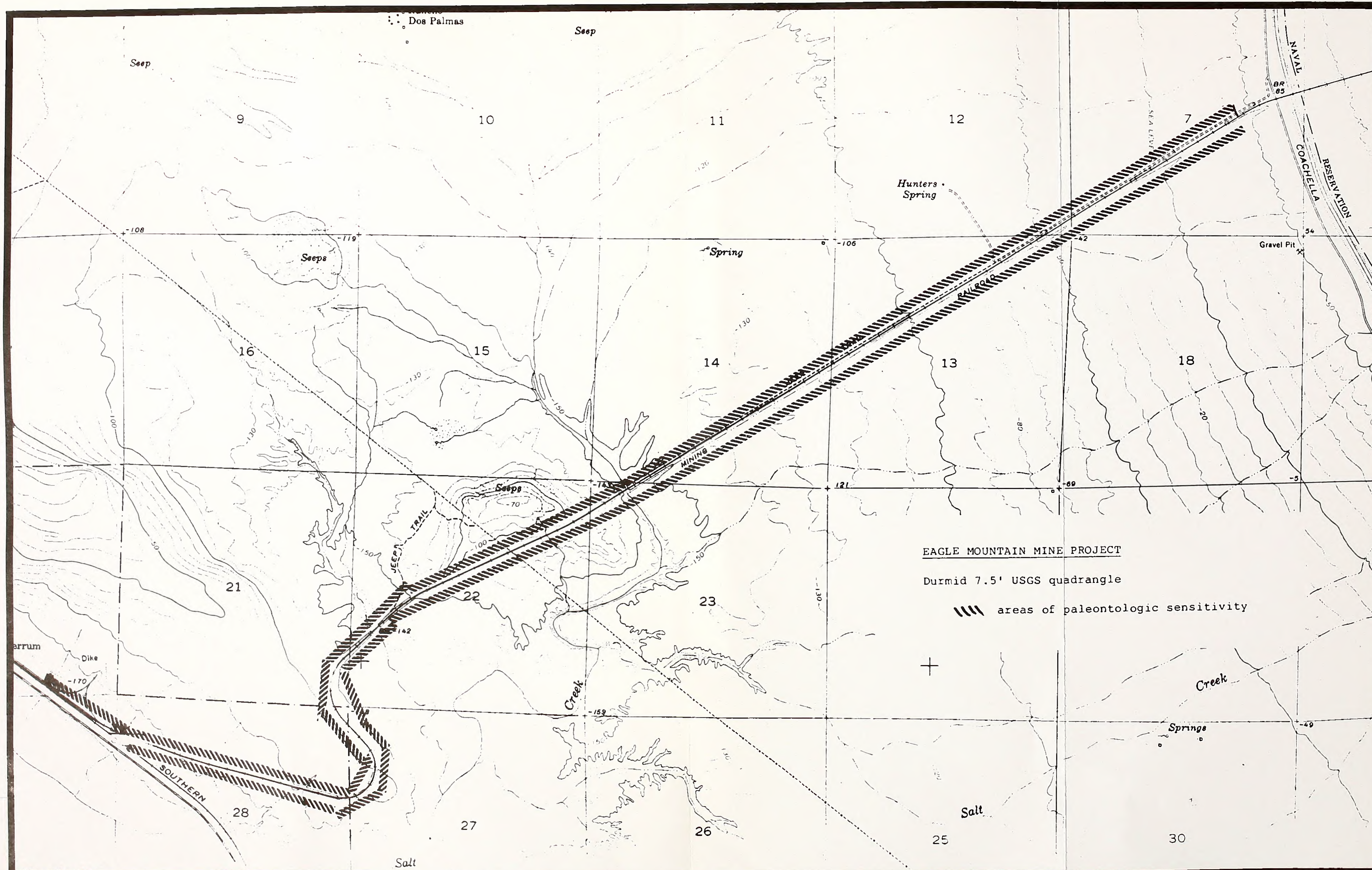
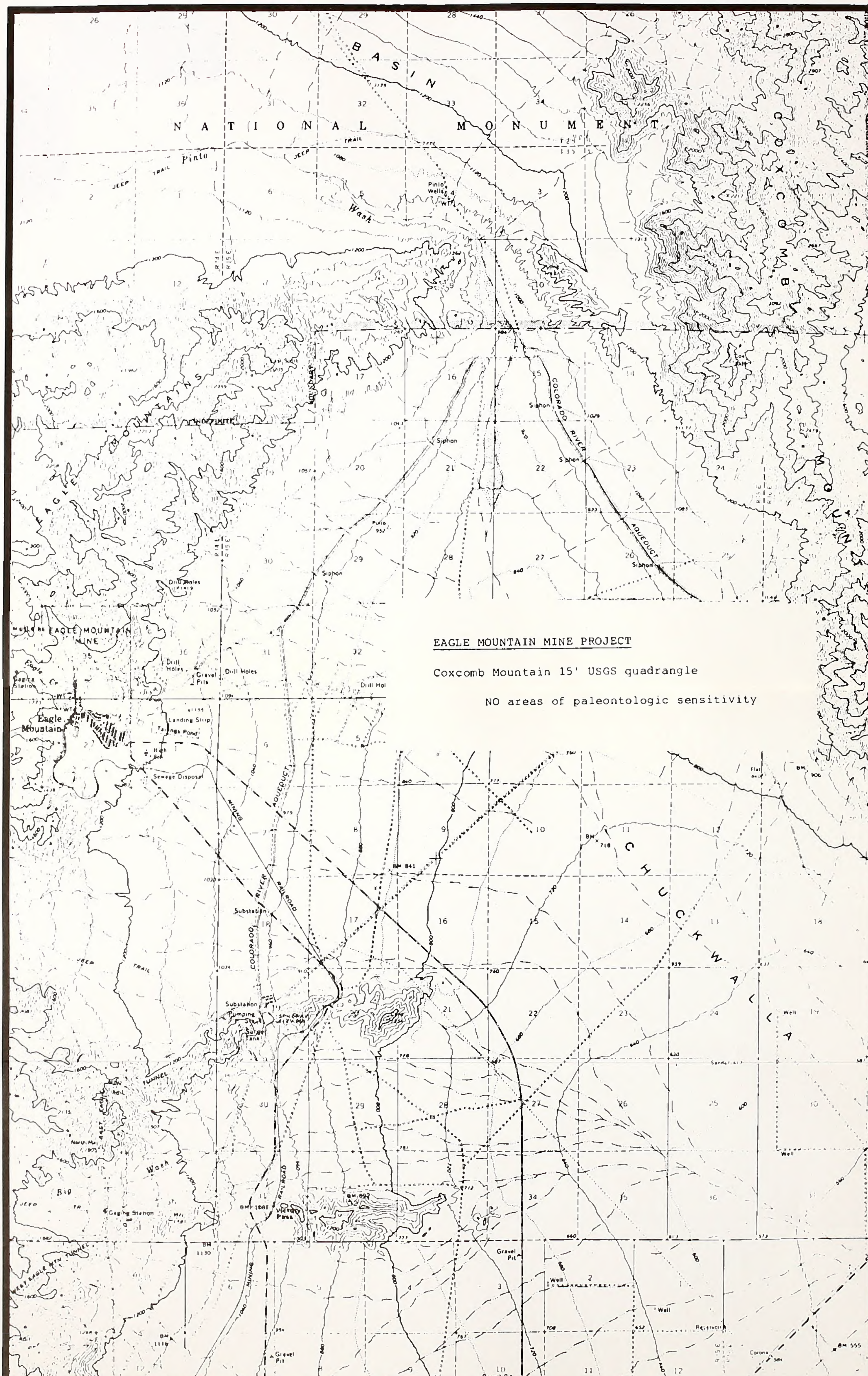


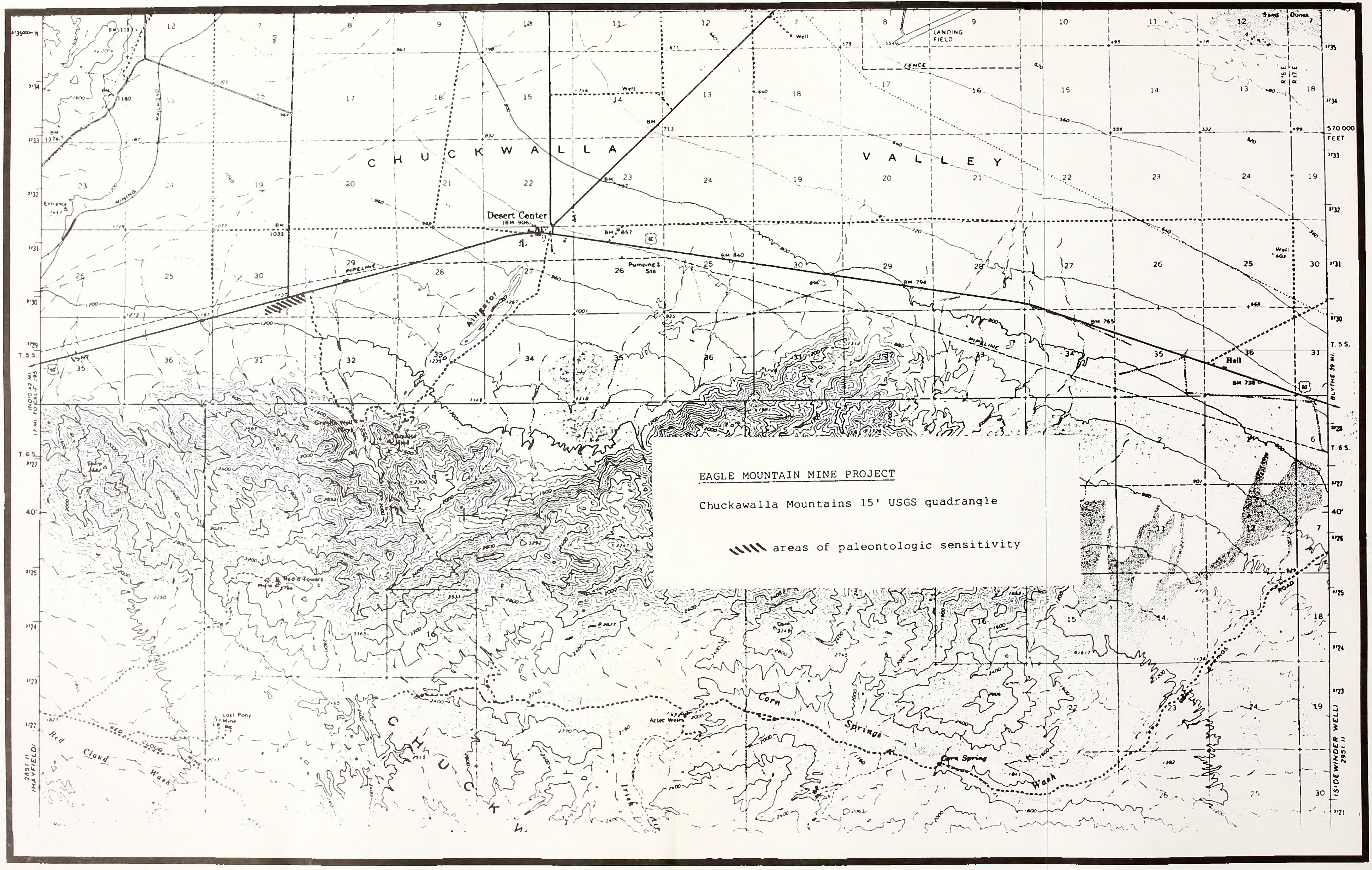
EAGLE MOUNTAIN MINE PROJECT

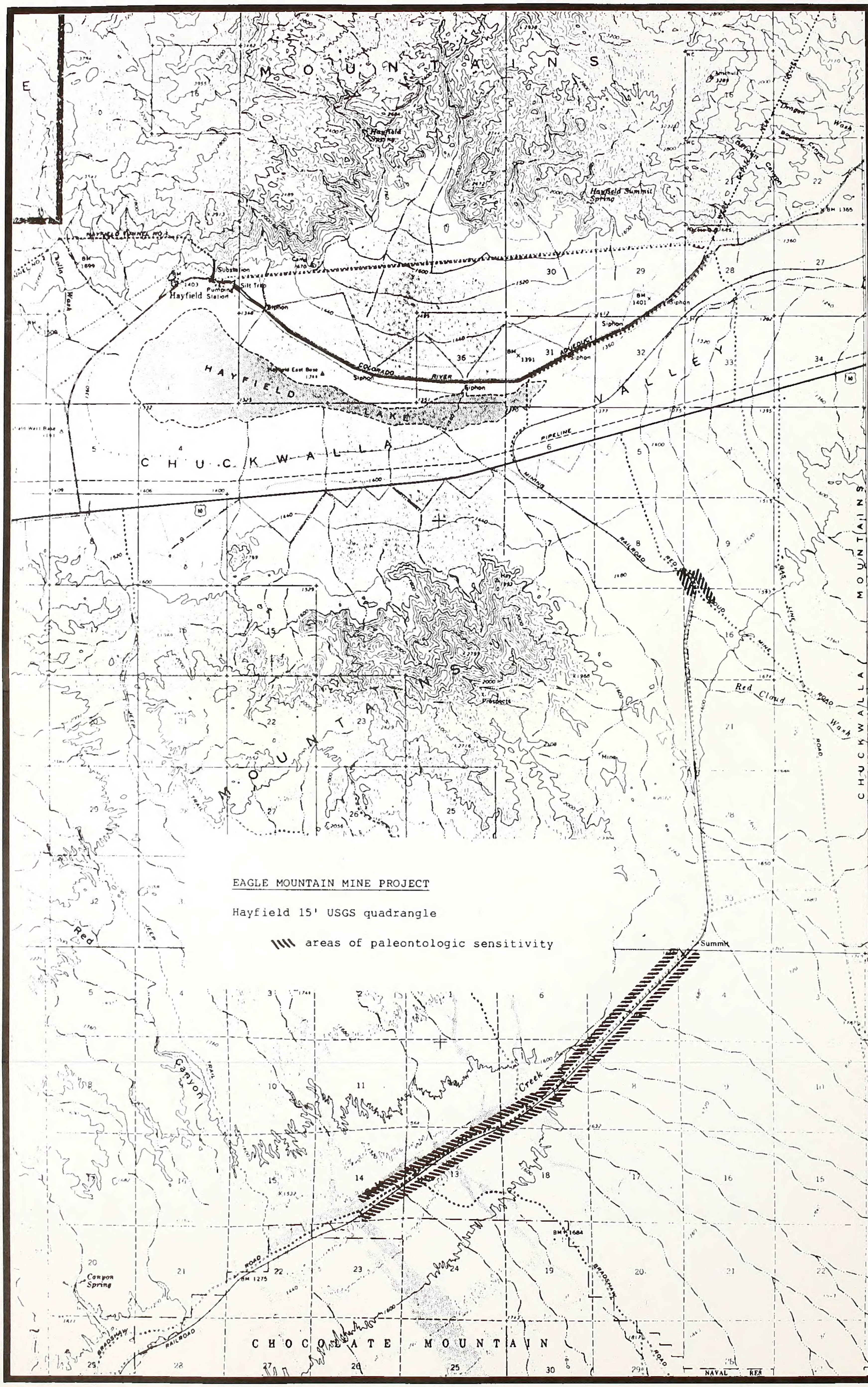
Frink 15' USGS quadrangle

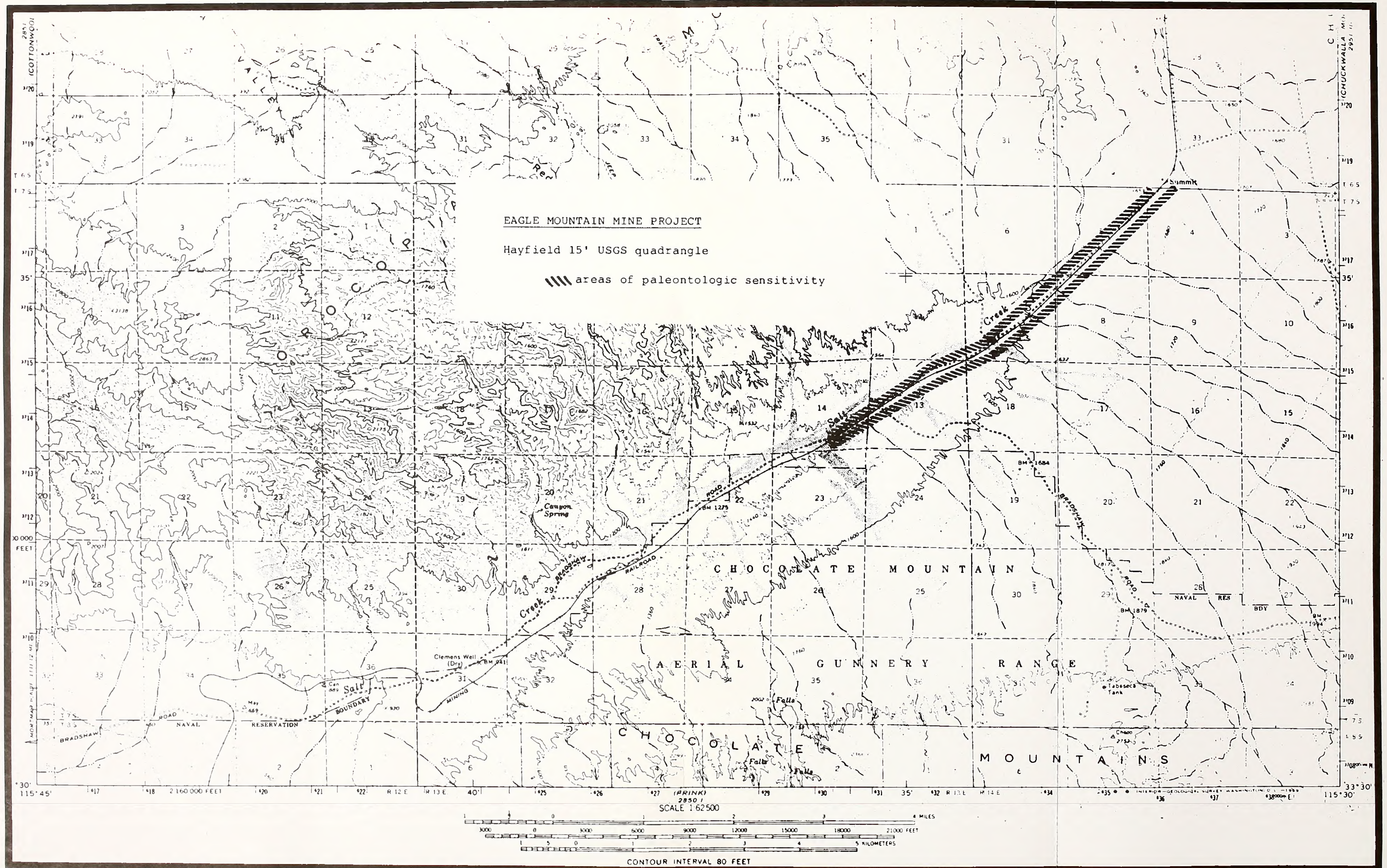
NO areas of paleontologic sensitivity


Dos Palmas
Seep
Seep
9
10
11
12
7
NAVAL
RESERVATION
COACHELLA
BR 85
Hunters Spring
-108
-119
Seeps
Spring
-106
-42
54
Gravel Pit
RAILROAD
MINING
16
15
14
13
18
130
150
100
80
-20
Seeps
-70
JEEP TRAIL
121
-69
-5
EAGLE MOUNTAIN MINE PROJECT
Durmid 7.5' USGS quadrangle
areas of paleontologic sensitivity
21
22
23
142
Dike
-170
Creek
-159
Creek
Springs
-49
SOUTHERN
28
27
26
25
30
Salt
Salt


EAGLE MOUNTAIN MINE PROJECT
Coxcomb Mountain 15' USGS quadrangle
NO areas of paleontologic sensitivity
BASIN
NATIONAL MONUMENT
COXCOMB MOUNTAINS
EAGLE MOUNTAINS
CHUCKWALLA
Pinto Wash
Pinto Wells
COLORADO RIVER AQUEDUCT
Siphon
Eagle Mountain
EAGLE MOUNTAIN MINE
Drill Holes
Gravel Pits
Landing Strip
Tailings Pond
Sewage Disposal
Substation
Pumping Station
Surge Tank
Victory Pass
Gravel Pit
Well
Big Wash
Gaging Station
JEEP TRAIL
MINING RAILROAD


EAGLE MOUNTAIN MINE PROJECT
Chuckawalla Mountains 15' USGS quadrangle
areas of paleontologic sensitivity
C H U C K W A L L A
V A L L E Y
Desert Center
PIPELINE
Pumping Sta
LANDING FIELD
FENCE
Alligator
Hell
Corn Springs
Corn Spring
Wash
Red Cloud Wash
Lost Pony Mine
Aztec Wells
Radio Towers
Granite Well
Sand Dunes
T.5 S.
T.6 S.
570 000 FEET
R16E R17E
INDIO 42 MI. 17 MI. TO CALIF 195
BLYTHE 59 MI.
2851 II (HAYFIELD)
(SIDEWINDER WELL) 2951 II


EAGLE MOUNTAIN MINE PROJECT
Hayfield 15' USGS quadrangle
areas of paleontologic sensitivity
MOUNTAINS
Hayfield Spring
Hayfield Summit Spring
Hayfield Station
Pumping Station
Substation
Silt Trap
Siphon
COLORADO RIVER AQUEDUCT
HAYFIELD LAKE
CHUCKWALLA VALLEY
PIPELINE
MINING
RAILROAD
RED CLOUD MINE ROAD
Red Cloud Wash
GAS LINE ROAD
MOUNTAINS
Prospects
Mine
CHUCKWALLA MOUNTAINS
Summit
Red Canyon
Canyon Creek
Canyon Spring
BRADSHAW ROAD
BRADSHAW TRAIL
CHOCOLATE MOUNTAIN
NAVAL RES
Dragon Wash
Corn Springs Wash
Hayfield East Base
BM 1684
BM 1275



EAGLE MOUNTAIN MINE PROJECT
Hayfield 15' USGS quadrangle
areas of paleontologic sensitivity
CHOCOLATE MOUNTAIN
AERIAL GUNNERY RANGE
CHOCOLATE MOUNTAINS
Salt Creek
Canyon Spring
Clemens Well (Dry)
Summit
Tabaseca Tank
NAVAL RESERVATION BOUNDARY
NAVAL RES BDY
BRADSHAW ROAD
RAILROAD
MINING
115°45'
115°30'
33°30'
35'
40'
SCALE 1:62 500
CONTOUR INTERVAL 80 FEET

APPENDIX K

MITIGATION MONITORING AND REPORTING PROGRAM

Section 21081.6 of the California Public Resources Code requires that any public agency approving a project for which an EIR has been prepared identifying significant environmental impacts and requiring mitigation and for which, therefore, specified public findings must be made, must also adopt a mitigation monitoring and reporting program. The program shall be designed to assure compliance of the project with adopted mitigation measures. Implementation of the mitigation monitoring and reporting program is not required as part of the EIR. For the information of the public and the decision maker, however, the following is the recommended mitigation monitoring and reporting program.

For many measures that would avoid, eliminate, or substantially reduce potential adverse impacts of the proposed project, regulation by statute assigns responsibility for implementation and requires monitoring and enforcement. Permits, formal agreements, and statutory requirements are included in this category. Such measures are subject to monitoring and reporting procedures under regulatory authority, so that no project-specific procedures are required. Where this is the case, the "Implementation" column in the Mitigation and Monitoring Program contains the note "Regulatory Agency."

In other cases, mitigation monitoring has been recommended that is project-specific. In those cases, the "Implementation" column in the Mitigation and Monitoring Program contains the note "Project-Specific." The responsibility for monitoring is then explained, along with a responsible official of a public agency to whom the accomplishment of monitoring must be reported.

APPENDIX K
MITIGATION MONITORING AND REPORTING PROGRAM

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	A. <u>Water Quality</u>		
1. Potential for pollution of groundwater due to migration of leachate.	a. Inspect and screen waste. Divert free liquid, hazardous materials, and high-moisture waste for disposal in a licensed disposal facility elsewhere.	1) Transfer station and materials recovery facility (MRF) operators to submit plan of operations including waste inspection system for each transfer station and MRF for review and approval by local agency.	Los Angeles, Orange, San Bernardino, and Riverside County Health Departments
		2) MRC to establish conditions to inspect and screen waste in waste contracts between each transfer station/MRF and MRC.	Riverside County Health Department, Lead Enforcement Agency (LEA)
		3) MRC to establish a load check program under conditions of the Solid Waste Facility Permit.	LEA
		4) MRC to screen all local waste delivered at site in same manner as transfer stations/MRFs.	LEA
		5) County Health Department to spot check incoming waste.	LEA

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	A. **Water Quality** (cont.)		
	b. Install an impermeable clay liner beneath all areas used for permanent deposit of waste. In the lowest elevations, a composite clay and plastic liner would be constructed.	1) MRC to prepare design and specifications for liner according to standards in Subchapter 15, state regulations, as part of the Report of Waste Discharge (ROWD) and Report of Disposal Site Information (RDSI) for review and approval by agencies.	Regional Water Quality Control Board (RWQCB) and LEA
		2) Agency staff to incorporate liner design and specifications into the conditions of the Waste Discharge Requirements.	RWQCB
		3) Agency staff to incorporate liner design and specifications into conditions of the Solid Waste Facility Permit.	LEA
		4) Agency staff to field test liner performance.	RWQCB and LEA
	c. Install a leachate collection system. Test and recycle, treat, or dispose of collected leachate at an appropriate licensed facility.	1) MRC to prepare design and specifications for leachate collection system according to standards in Subchapter 15, state regulations, as part of the ROWD	RWQCB and LEA

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	A. **Water Quality** (cont.)		
		and RDSI for review and approval by agencies.	
		2) Agency staff to incorporate leachate collection system design and specifications into the conditions of Waste Discharge Requirements.	RWQCB
		3) Agency staff to incorporate leachate collection system design and specifications into the conditions of the Solid Waste Facility Permit.	LEA
		4) MRC to monitor and periodically test groundwater.	RWQCB and LEA
2. Potential for storm water runoff from areas around the landfill to pollute ground or surface waters downstream.	a. Construct drainage facilities to divert 100-year event storm water flows around and away from the landfill.	1) MRC to prepare design and specifications for drainage facilities according to standards in Subchapter 15, state regulations, as part of the ROWD and RDSI for review and approval by agencies.	RWQCB, LEA, and Flood Control District

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	A. **Water Quality** (cont.)		
3. Potential for area storm water to come into contact with refuse and pollute groundwater or surface waters, including the Colorado River Aqueduct.	a. Collect storm water from refuse disposal and handling area and landfill equipment washwater. Send collected water to on-site detention and evaporation basins or if water comes into contact with refuse, treat it as leachate.	1) MRC to prepare design and specifications for drainage facilities according to standards in Subchapter 15, state regulations, as part of the ROWD and RDSI.	RWQCB
		2) MRC must prepare predischarge treatment plan for review and approval of agency.	RWQCB
4. Potential for landfill gases to contain volatile organic gases that could migrate into and pollute groundwater.	a. Install an impermeable clay liner beneath all areas used for permanent deposit of waste. In the lowest elevations, a composite clay and plastic liner would be constructed.	1) MRC to prepare design and specifications for liner according to standards in Subchapter 15, state regulations, as part of the ROWD and RDSI for review and approval by agencies.	RWQCB
	b. Install a landfill gas emission and migration control system.	1) MRC to submit design and specifications for landfill gas emission and migration control system according to standards in Subchapter 15, state regulations, as part of the ROWD and RDSI.	RWQCB

APPENDIX K
MITIGATION MONITORING AND
REPORTING PROGRAM
(continued)

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	A. **Water Quality** (cont.)		
		2) MRC must design system to conform with South Coast Air Basin (SCAB) Rule 1150.1	SCAB
5. Wastewater collected at the landfill site and treated at the existing Eagle Mountain wastewater treatment plant could contaminate treatment discharge.	a. Pretreat wastewater to remove oils, greases, organics, and lower biological oxygen demand.	1) MRC must prepare predischarge treatment plan for review and approval of agency.	RWQCB
6. Potential for runoff on completed landfill to permeate landfill mass and produce leachate.	a. Install an impermeable final cover with a final slope of no less than three to one in gradient to assure runoff.	1) MRC to submit Design standards established by the ROWD and Closure Plan for review and approval.	RWQCB and LEA
	b. Final cover will consist of "vegetative soil" to assure revegetation for erosion resistance.	1) MRC to submit design standards established by the ROWD and Closure Plan for review and approval.	RWQCB and LEA
	c. Install a system of groundwater extraction and monitoring wells.	1) MRC to prepare groundwater monitoring program consistent with state requirements to be incorporated into the waste discharge requirements, for review and approval by agency staff.	RWQCB

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	A. Water Quality (cont.)		
7. Potential for windblown litter to pollute surface waters off-site.	a. Install litter control fencing around all waste handling areas.	1) MRC to submit design and specifications for litter control system according to standards in Subchapter 15, state regulations, as part of the RDSI.	LEA
	b. Cover and compact daily waste.	1) MRC to submit plans for interim daily cover according to standards in Subchapter 15, state regulations, as part of the RDSI.	LEA
	c. Operate a litter pickup and disposal program at the landfill area.	1) MRC to submit plans for litter control according to standards in Subchapter 15, state regulations, as part of the RDSI.	LEA
8. Potential for water quality degradation from the landfill after its closure.	a. Continue groundwater monitoring, gas collection and control, and maintenance of landscaping and drainage with a certified availability of funds for post-closure activities for 30 years.	1) MRC to submit Design standards established by the ROWD and Closure Plan for review and approval.	RWQCB and LEA

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	B. Public Health and Safety		
1. Potential secondary impact for waste handling workers to be exposed to small amounts of hazardous wastes at waste transfer stations and material recovery facilities.	a. Inspect and screen waste to remove hazardous waste at local loading and transfer stations, with a load check program required for solid waste facility permits at each handling station.	1) Transfer station and materials recovery facility (MRF) operators to submit plan of operations including waste inspection system for each transfer station and MRF for review and approval by local agency.	Local LEAs
		2) MRC to establish conditions to inspect and screen waste in waste contracts between each transfer station/MRF and MRC.	LEA
2. Potential for exposure to small amounts of hazardous wastes to waste handling workers at the working face of the landfill where it is removed from the containers, spread out, and compacted.	a. Spot screen and inspect random transhipped loads at the landfill container handling yard.	1) MRC to establish a load check program under conditions of the Solid Waste Facility Permit.	LEA
	b. Inspect and screen all locally generated waste.	1) MRC to screen all local waste delivered at site in same manner as transfer stations/MRFs.	LEA
		2) County Health Department to spot check incoming waste.	LEA

APPENDIX K
MITIGATION MONITORING AND
REPORTING PROGRAM
(continued)

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	B. Public Health and Safety (cont.)		
	c. Remove, store, and dispose of any hazardous material recovered at a licensed disposal facility.	1) MRC to establish conditions to inspect and screen waste in waste contracts between each transfer station/MRF and MRC.	LEA
		2) Standards for safety will be established and controlled through the solid waste facility permit in conformance with the 1970 Occupational Health and Safety Act (OSHA), state Title 14 Minimum Standards for solid waste handling and disposal, and the 1977 Mine Safety and Health Administration Regulations (30CFR 56)	LEA, OSHA, and California Integrated Waste Management Board, Riverside County Solid Waste Division
3. Potential for landfill gases to migrate into work areas and enclosed spaces.	a. Install LFG collection system.	1) MRC to submit design and specifications for landfill gas emission and migration control system according to standards in Subchapter 15, state regulations, as part of the ROWD and RDSI.	RWQCB
		2) MRC must design system to conform with SCAB Rule 1150.1.	SCAB

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	B. Public Health and Safety (cont.)		
4. Potential for rail and truck accidents to spill waste	a. Local and state emergency plans are in place.	1) MRC to report immediately any accidental occurrence to local and state authorities.	Riverside County Planning Department (RCPD)
	b. MRC will operate its own emergency response plan.	1) MRC to establish emergency response plan under conditions of the RDSI and reviewed by the local fire department and LEA.	RWQCB, LEA, and Fire Department
5. Potential for subsurface or surface fires at the landfill or in refuse loads during transportation. Potential for railroad right-of-way fires.	a. Install LFG collection system.	1) MRC to submit design and specifications for landfill gas emission and migration control system according to standards in Subchapter 15, state regulations, as part of the ROWD and RDSI.	RWQCB
		2) MRC must design system to conform with SCAB Rule 1150.1.	SCAB
	a. Local and state emergency plans are in place.	1) MRC to report immediately any accidental occurrence to local and state authorities.	RCPD

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	B. Public Health and Safety (cont.)		
	b. MRC will operate its own emergency response plan.	1) MRC to establish emergency response plan under conditions of the RDSI and reviewed by the local fire department and LEA.	RWQCB, LEA, and Fire Department
	c. Surface fires would be controlled by conventional firefighting means. The Eagle Mountain fire station would add to the firefighting capability in the project vicinity.	1) MRC to establish emergency response plan under conditions of the RDSI and reviewed by the local fire department and LEA.	RWQCB, LEA, and Fire Department
	d. Waste handling, screening, and inspection of waste loads reduce potential for fires.	1) Transfer station and materials recovery facility (MRF) operators to submit plan of operations including waste inspection system for each transfer station and MRF for review and approval by local agency.	Los Angeles, Orange, San Bernardino, and Riverside County Health Depart-ments
		2) MRC to establish conditions to inspect and screen waste in waste contracts between each transfer station/MRF and MRC.	Riverside County Health Depart-ment, LEA

APPENDIX K
MITIGATION MONITORING AND
REPORTING PROGRAM
(continued)

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	B. Public Health and Safety (cont.)		
		3) MRC to establish a load check program under conditions of the Solid Waste Facility Permit.	LEA
		4) MRC to screen all local waste delivered at site in same manner as transfer stations/MRFs.	LEA
		5) County Health Department to spot check incoming waste.	LEA
	e. Regularly inspect railroad rights-of-way to remove vegetation and combustible material.	1) MRC to establish rail line inspection plan under conditions of the RDSI and reviewed by the local fire department and LEA.	LEA
6. Potential for increasing disease vectors.	a. Cover and compact waste daily. Control liter.	1) MRC to submit plans for interim daily cover according to standards in Subchapter 15, state regulations, as part of the RDSI.	RWQCB, LEA, and Fire Department
7. Potential for exposing land-fill workers to accident or harm from heavy equipment operations, noise, odors, and dust.	a. Develop procedures for employees handling waste, including use of personal protec-tive equipment, use of enclosed cabs on heavy equipment, rotation	1) Standards for safety will be established and controlled through the solid waste facility permit in conformance with the 1970 Occupa-tional Health and Safety Act	LEA

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	B. Public Health and Safety (cont.)		
	of worker assignments, and adequate supervision of personnel.	(OSHA), state Title 14 Minimum Standards for solid waste handling and disposal, and the 1977 Mine Safety and Health Administration Regulations (30CFR 56)	

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	C. Traffic and Transportation		
1. The proposed project is expected to have no significant impact on rail operations.	a. No mitigation is required for effects on rail operations.		
2. Motor vehicle delays for at-grade crossings will not be significant as evaluated by the state Public Utilities Commission and Southern Pacific Railway.	b. No mitigation is required for anticipated at-grade crossing delays.		
3. Local waste delivery and new employment will result in increased traffic in the vicinity of the landfill, though this is not considered a significant impact.	c. Project plans include new vehicle road access to the landfill site and a new intersection at Eagle Mountain Road Extension and Kaiser Road.	1) Prior to construction, all road and intersection designs will be subject to standards established by the Riverside County Transportation Department, Ordinance 461.	Riverside County Transportation Department

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
D. Air Quality			
The proposed project could result in reduced pollutant emissions in the South Coast Air Basin (SCAB) at the expense of increased emissions in the Southeast Desert Air Basin (SEDAB). Emissions reductions in the SCAB would not outweigh the impacts to the SEDAB, so that the project would have an overall significant impact on air quality. Mitigation will be required of the project as explained below, but mitigation will not reduce impacts to a level of insignificance.			
1. Site preparation and construction activities will result in the emission of pollutants and in the generation of fugitive dust.	a. Construction impacts are short-term and emissions from equipment will be controlled by air quality management district rules.	1) MRC to control dust by regular watering.	SCAQMD and LEA
		2) MRC to maintain vehicles in compliance with exhaust controls stipulated by state and federal standards. Smog check program by state, periodic inspection by other agencies.	California Air Resources Board (CARB), Department of Motor Vehicles, SCAQMD
2. Pollutants will be produced at transfer stations by waste loading vehicular exhaust.	a. Waste loading vehicles and equipment will be subject to applicable regulations of the CARB. No additional mitigation is available through this project.	1) MRC to maintain vehicles in compliance with exhaust controls stipulated by state and federal standards	EPA and CARB
3. Truck engines and diesel locomotive exhausts will produce emissions during transport of solid waste to the landfill.	a. Truck emissions will be subject to all heavy-duty diesel engine emission standards, motor vehicle diesel fuel standards,	1) MRC to maintain vehicles in compliance with exhaust controls stipulated by state and federal standards. Smog check program by	CARB), Department of Motor Vehicles, SCAQMD

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	D. <u>Air Quality</u> (cont.)		
	excessive visible diesel truck smoke enforcement, emissions equipment anti-tampering programs, anticipated new low emission vehicle regulations, and anticipated phase-in of low emission vehicles in fleets.	state, periodic inspection by other agencies.	
	b. Locomotive emissions will be subject to all regulations for emissions.	1) MRC to maintain locomotives under their control in compliance with exhaust controls stipulated by state and federal standards.	CARB and SCAQMD
4. Air pollutants will be generated by the exhausts of on-site, heavy mobile and stationary equipment used in handling solid waste and materials.	a. All MRC controlled vehicles and equipment shall comply with all applicable regulations and diesel fuel specifications as required by the CARB and the SCAQMD. Such engines and equipment shall be operated in accordance with the manufacturers' recommendations, receive regular preventive maintenance, and incorporate low NOx emissions	1) MRC to maintain vehicles in compliance with exhaust controls stipulated by state and federal standards.	CARB and SCAQMD

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	D. Air Quality (cont.)		
	design whenever feasible. Equipment shall be electrified whenever feasible.		
5. Potential source of air pollution due to landfill gases. Exposure to the trace toxic air contaminants in the landfill gas (LFG) could represent a health risk.	a. MRC shall install equipment for LFG control and conduct a health risk assessment in accordance with the provisions of Assembly Bill 2588 and of Proposition 65.	1) MRC to incorporate risk assessment into RDSI, for review and approval by agencies, and to perform monthly sampling of integrated surface samples for LFG with reports to agencies.	CARB, SCAQMD, and LEA
6. Handling and transfer of solid waste and cover material at the landfill site could generate excessive fugitive dust.	a. Dust generation will be controlled through compliance with the provisions of SCAQMD Rule 403.	1) MRC to control dust by paving permanent roads and by regular watering.	SCAQMD

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	E. <u>Land Use</u>		
1. Potential for incompatibility with existing residential and correctional uses near the landfill operations.	a. Restrict landfill truck traffic to the use of Eagle Mountain Road and Eagle Mountain Road Extension only.	1) Condition of the Eagle Mountain Landfill Specific Plan #252	RCPD
	b. Maintain a minimum setback of 25 feet from the landfill boundary for all landfill structures.	1) Same as 1. a. 1) above	RCPD
	c. Limit the height of all landfill structures to 60 feet.	1) Same as 1. a. 1) above	RCPD
	d. Maintain existing berm of course tailing material to obstruct views into the working areas of the landfill from off-site.	1) Same as 1. a. 1) above	RCPD
	e. Control fugitive dust from landfill operations through watering.	1) Dust generation will be controlled through compliance with the provisions of SCAQMD Rule 403.	SCAQMD

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	F. **Drainage**		
1. Potential drainage impacts to the landfill, the town of Eagle Mountain, and alluvial areas to the east.	a. Install a complete perimeter drainage system to accommodate the anticipated maximum peak flows for a 24-hour, 100-year storm. b. Improve the drainage system throughout the town of Eagle Mountain. c. Slope final landfill not greater than 3 percent.	1) Designs incorporated into ROWD and RDSI, to the satisfaction of agencies.	RWQCB, Riverside County Flood Control District, and RCPD

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	G. Biology		
1. Desert Tortoise. Permanent loss of individuals and habitat, increased raven predation, harassment of individuals (noise and vibration).	a. Preoperation surveys, monitoring, raven control plan, rail and road barriers and culverts, employee education, off-site habitat preservation (375 ac).	1) A qualified biologist will perform preconstruction surveys, and will monitor the repair and replacement of all permanent structures, such as railroad tracks and culverts, within tortoise habitat. Monitoring and other mitigation activities will be in accordance with the Section 7 consultation and agreement, and will continue as deemed necessary by agencies.	USFWS and BLM
		2) Tortoises threatened by track rehabilitation activities will be relocated to a suitable place. The handling and removal of tortoises will be conducted by a qualified biologist approved by USFWS and BLM.	USFWS and BLM
		3) A system of culverts and other structures will be placed under the railbed and Eagle Mountain Road in areas to be determined by baseline tortoise surveys and decided by BLM and USFWS. The	USFWS, BLM, and County Department of Transportation

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	G. Biology (cont.)		
		effectiveness of these crossings as passages for tortoises will be monitored concurrently with the tortoise population and raven monitoring programs.	
		4) Protective barriers will be placed on each side of the railroad tracks and Eagle Mountain Road, in areas approved by agencies.	USFWS, BLM, and County Department of Transportation
		5) Habitat loss will be mitigated by the purchase of desert tortoise habitat for transfer to permanent BLM ownership. The exact parcel(s) to be purchased for compensation will be selected by BLM.	BLM
		6) A detailed raven control plan, plus the appropriate permits, will be developed and in place before landfill operations begin. The plan will include a raven population monitoring program, a passive raven control program, and an	U.S. Department of Agriculture, USFWS, BLM, and CDFG

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	G. Biology (cont.)		
		active raven control program (raven destruction). All programs will be undertaken in conjunction with USFWS, BLM, and CDFG and with the Raven Management Plan for the California Desert Conservation Area.	
		7) A worker education program will be incorporated into the project, to the satisfaction of the resource agencies.	USFWS and BLM
2. Nelson's Bighorn Sheep. Loss of four water sources, loss of habitat, stress from noise and other human activity.	a. Create and enhance off-site water sources, monitoring program, on-site habitat preservation (644 acres).	1) A two-year monitoring study will be conducted to identify new locations to place permanent water sources, based on herd movements.	BLM and CDFG
		2) Three new permanent water sources will be placed far from the mine site to encourage bighorn sheep to use the surrounding natural areas. The sites for the water sources and their design will be approved by biologists at BLM and CDFG. Buzzard Springs will also be rehabilitated and	BLM and CDFG

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	G. Biology (cont.)		
		cleared of tamarisk. If sheep are not found to naturally expand their ranges to incorporate the new water sources, they will be translocated.	
		3) Approximately 644 acres of bighorn sheep habitat on-site will be preserved within the open space buffer areas surrounding the landfill.	RCPD
		4) MRC will incorporate information on bighorn sheep habits and habitat needs, as well as their protected status, into their employee training program, to the satisfaction of the resource agencies.	BLM and CDFG
		5) MRC will allow only authorized individuals to possess firearms on the landfill site to preclude the possibility of poaching or harassment of bighorn sheep, to the satisfaction of the resource agencies.	BLM and CDFG

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	G. Biology (cont.)		
		6) MRC will prohibit dogs on the landfill site unless they are confined or restrained, to the satisfaction of the resource agencies.	BLM and CDFG
3. Desert Pupfish. Potential loss of individuals and habitat, degraded habitat.	a. Monitoring program, emergency accident plan, construction design modifications.	1) Annual surveys of the pupfish populations and habitat will continue along Salt Creek and its tributary under the train trestle, by CDFG. Although no significant changes are expected, in the event there are any effects on the habitat which are caused by the train operations, these will be reported to MRC and corrective actions will be developed in consultation with USFWS and CDFG.	CDFG and USFWS
		2) Plans for construction or major maintenance will be reviewed by a biologist and will include designs and specifications that will avoid impacts to desert pupfish, to the satisfaction of resource agencies. Storage and staging areas will be placed in	CDFG and USFWS

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	G. Biology (cont.)		
		locations which will not affect the habitat, and measures to avoid any discharge of pollutants will be incorporated.	
		3) In the event of an accident near pupfish habitat, MRC will include a biologist as a response and cleanup team member. Measures to restore the pupfish habitat in Salt Creek and its tributary in the event of an accident shall be incorporated as part of the response. If restocking of pupfish is required in the aftermath of an accident, the nearest suitable genetic strain of pupfish will be the source of the transplantation. Procedures and results will be reported to, and approved by, the resource agencies.	CDFG and USFWS
4. Other Sensitive Wildlife. Potential loss of bat roosting areas, hibernacula. Possible increased raven predation on Eagle	a. Monitoring of bat roost sites, and maintenance of adit opening. Raven monitoring and control program.	1) MRC will monitor the California leaf-nosed bat population at the mine during landfill operations. MRC will design a	LEA and CDFG

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	G. Biology (cont.)		
Mountain scrub jay nestlings. Potential impacts to other sensitive species are not considered significant.		chimney constructed of large-diameter concrete pipe, or similar structure, to be installed over the mine adit to permit the ingress and egress of the bats. This chimney will be extended as the level of refuse increases. Design and construction must be approved by agencies.	
5. Sensitive Plant Species, Foxtail Cactus. Loss of many individuals at mine, storage yard.	a. Transplant program designed to relocate individual cactus to areas to be rehabilitated at the project site.	1) MRC will retain qualified biologists to conduct transplant trials to determine most suitable areas to receive plants, with reports and approvals to agencies.	BLM
		2) Transplantation will be monitored monthly for one growing season, with a final report to agencies.	BLM

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY

H. <u>Growth Inducement and Socioeconomics</u>

Since the proposed project would represent a socioeconomic benefit to the community of Eagle Mountain and no adverse regional socioeconomic impact is anticipated, no mitigation measures are required. The proposed project is not growth inducing.

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	I. Geology		
1. Potential for strong seismic event to trigger some slope failures within the existing pit walls and to cause loose materials to dislodge from existing benches.	a. Progressively scale loose rock and materials from benches above the working face of the landfill and construct berms to intercept fallen rock.	1) Prescriptive standards for site preparation established by SWFP/LEA and the County geologist.	LEA, RWQCB, and RCPD
2. Potentially expansive soils and slope instability could create significantly adverse conditions in the landfill area.	a. Expansive soils in the alluvial material in the landfill footprint shall be regraded to reduce expansive potential to a safe level; unsuitable soils shall be excavated and recompacted.	1) Grading plans for project shall incorporate recommendations of geology and soils reports, reviewed and approved by agencies.	LEA, RWQCB, and RCPD
3. Full development of the landfill would prohibit continued mining in the landfill area, including extraction of iron ore from portions of the Central Pit.	a. Phase project to allow areas with potential for mineral recovery to be developed last.	1) Phasing shall be made a condition of the specific plan.	RCPD

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	J. Visual, Recreation, and Wilderness Resources		
1. Potential for the landfill to visually contrast with the characteristics of the surrounding landscape.	a. Grading and landfill limits shall be clearly staked or fenced, construction access will be controlled, and ancillary activities will be confined to existing disturbed areas to minimize additional disturbance of the native landscape. b. The color and tone contrast of the final cover will use coarse overburden to blend tone and color with the native landscape. c. Final cover will include a top layer of vegetative soil to encourage regrowth of native plant material.	1) The mitigation measures a, b, and c shall be required as part of the Solid Waste Facility Permit and made conditions of the specific plan. Final cover conditions must be established to the satisfaction of agencies prior to acceptance of closure report.	LEA and RCPD
2. As landfill operations continue over several decades, the landfill mass will reach high enough elevations to be seen from the townsite of Eagle Mountain, with potential visual impacts on views from the town.	a. Revegetation of the covered landfill will proceed incrementally as areas reach final grade and receive final cover. As renewed employment revitalizes the community of Eagle Mountain, landfill operations will have a	1) Conditions of final cover subject to approval of the agencies. 2) Development within townsite to be governed by a separate specific plan.	LEA and RWQCB RCPD

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	J. Visual, Recreation, and Wilderness Resources (cont.)		
	beneficial aesthetic effect on the township.		
3. Windblown debris and dust from landfill operations could adversely affect the visual quality of the surrounding area.	a. Debris and dust will be controlled.	1) Debris and dust control measures described in the Water Quality and Air Quality sections of this table. Periodic inspections by LEA to enforce.	LEA
	b. Landfill operator can be contacted directly by Bureau of Land Management or Joshua Tree National Monument staff in case of litter problems, with provision for swift correction of the problems.	1) MRC will provide appropriate contact, to the satisfaction of agencies	LEA
4. Potential for significant impacts on views of night skies in the surrounding populated and recreational areas from project night lighting and headlight glare from trucks.	a. Nighttime operations requiring lights will be permitted only in the container handling yard, with only low-level security lighting allowed in the landfill area.	1) Condition of the Specific Plan	LEA and RCPD
	b. Lighting required for safety and security shall be directed and locational, fixtures shall have	1) Condition of the Specific Plan	LEA and RCPD

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	J. <u>Visual, Recreation, and Wilderness Resources</u> (cont.)		
	shields to cutoff upward radiation, light poles shall be the minimum height necessary.		
	c. Truck traffic will use Interstate 10 and Eagle Mountain Road and its Extension rather than Kaiser Road to reduce visibility from most residences in the area.	1) Condition of the specific Plan	LEA and RCPD
5. Potential for indirect impacts to Wilderness Study Areas (WSA) due to increased activity visible from WSAs.	a. Measures listed for 1., 2., 3., and 4. above will reduce visual impacts from key observation points (KOP).	1) Same as above	Same as above

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	K. Utilities and Services		
1. Fire protection impacts would occur due to inadequate fire personnel and equipment.	a. Contribute to required fire protection improvements, plans, and funding.	Conditions on the specific plan include the following:	
		1) MRC will submit a detailed plot plan of each planning area for review and approval and obtain a written agreement for fire protection services from the Riverside County Fire Department.	Riverside County Planning and Fire Departments
		2) MRC will submit a Fire/Life Safety and Emergency Response Plan to the Fire Department.	Same as above
		3) MRC will install fire hydrants and water mains on-site to provide the required fire flows.	Same as above
		4) MRC shall participate in the fire protection impact mitigation program as adopted by the Riverside County Board of Supervisors.	Same as above
		5) MRC will obtain clearance from the fire department prior to use or occupancy of any existing structures within the project boundary.	Same as above

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	12. Noise		
1. Operation of the proposed transfer stations could significantly affect adjacent land uses.	a. Local environmental review of all transfer stations will be required under CEQA when sites are proposed.	1) None with current project. Enforcement by local authorities for individual transfer stations.	Los Angeles, Orange, San Bernardino, and Riverside County Health Departments, and local governments
2. Increased noise levels along the Eagle Mountain rail corridor could affect residential uses in the Eagle Mountain townsite.	a. Provide adequate buffer distances between rail line and residential uses.	1) Project design and specific plan locate rail line away from existing residential uses. Future development in townsite to be governed by separate specific plan, to be approved by county.	Riverside County Planning Department
3. Truck traffic to the landfill could generate unacceptable noise levels to residences nearby.	a. Truck traffic required to use Eagle Mountain Road and extension for access.	1) MRC to construct access road in accordance with conditions in specific plan, to satisfaction of county, and limit project truck traffic to Eagle Mountain Road and its Extension.	LEA, RCPD, and County Transportation Department

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	12. <u>Noise</u> (cont.)		
4. Potential noise impact to residential areas due to landfill operations.	a. Maintain buffering distances and berms around fine tailing ponds.	1) MRC will construct project consistent with Specific Plan, county will review and approve site plans for individual planning areas.	RCPD
	b. Restrict landfilling operations to daylight hours.	1) MRC will limit all landfill operations, except in the container handling yard, to daylight hours as a condition of the Specific Plan.	LEA and RCPD

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY

M. Cultural Resources

No significant cultural resource site was identified that would be affected by the proposed project. No potential impact on native American concerns was identified. No mitigation is required.

IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	N. Paleontology		
1. Potential impacts to paleontological resources due to excavation involving improvements to Eagle Mountain Road and the I-10 interchange.	a. Paleontological monitoring program.	MRC will retain a qualified paleontologist to conduct a pre-excavation survey, monitor excavation activities, recover and curate fossils, and to prepare and submit a report of findings, to be reviewed and approved by agencies.	BLM and RCPD

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IMPACT	MITIGATION MEASURE	MONITORING ACTIVITIES	RESPONSIBLE AGENCY
	O. Energy Consumption/Generation		
1. Project implementation will require roughly 17,000 more gallons of diesel fuel per day than landfills located closer to the wasteshed until LFG recovery/ utilization in 12 to 27 years.	a. Implement a preventative maintenance program for the rail line and at the landfill site to maintain the operating efficiency of equipment and vehicles. All MRC-controlled vehicles shall be operated in accordance with the manufacturers' recommendations.	1) No monitoring beyond that required for air quality mitigation.	California Air Resources Board (CARB), Department of Motor Vehicles, and SCAQMD
	b. Install energy recovery system for LFG disposal, when feasible.	1) MRC will conduct cost effectiveness study at time additional pollution control equipment is required on LFG flares, for review and approval by agencies	RCPD and SCAQMD