PM_{10} CEQA MITIGATION PLAN FOR THE PALOMAR ENERGY PROJECT ESCONDIDO, CALIFORNIA

By:

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SAN DIEGO, CALIFORNIA

A SEMPRA ENERGY DEVELOPMENT

Submitted to:

California Energy Commission

Prepared by:

ENSR INTERNATIONAL

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1.0 INTRODUCTION

The California Energy Commission (CEC) Preliminary Staff Assessment (PSA) contends that the Palomar Energy Project should be required to mitigate PM_{10} and PM_{10} precursor emissions. As discusssed below, Palomar Energy disagrees with this contention. However, Palomar Energy is aware of the CEC previous decision in the Otay Mesa Generating Project case (99-AFC-5) which required a contribution to the San Diego County Air Pollution Control District (SDAPCD) to fund PM_{10} mitigation projects. Therefore, Palomar Energy has also offered to provide PM_{10} mitigation in the form of funding for emissions reduction projects, as described in a mitigation plan submitted on May 8, 2002.

However, the PSA states that the May 8^{th} plan did not provide sufficient funding of PM_{10} mitigation projects. The PSA also notes that the plan does not provide sufficient specific information concerning PM_{10} emission reduction projects to be undertaken to determine the efficacy of Palomar Energy's proposed plan.

Palomar Energy stated in its September 27, 2002 comments on the PSA that it believes the mitigation plan previously submitted was a reasonable approach to the PM_{10} issue. However, Palomar Energy agreed at the September 19, 2002 PSA workshop to prepare a supplement to the May 8^{th} plan in order to provide additional detail. This document provides the additional information promised by Palomar Energy.

The following sections of this document present the specifics of the Palomar Energy PM_{10} emission reduction plan. The PSA lists the following elements that staff would like the mitigation plan to include:

- A clear explanation of the plan's objectives (e.g., an accounting of the PM_{10}/PM_{10} precursor emissions reductions to be provided or an illustration of the reduced exposure to local PM_{10} concentrations);
- A description of specific steps designed to provide the necessary reductions;
- How implementation will occur;
- Who is responsible for the implementation;
- Where the implementation will occur; and
- The timetable for implementation.

Section 2.0 discusses the issue of the Project's PM_{10} mitigation requirement, provides the objectives for the plan, and presents an overview of Palomar Energy's proposed plan. Section 3.0 provides additional background on the sources of PM_{10} emissions in San Diego County. Section 4.0 provides the basis for the amount of the proposed mitigation fee, including an accounting of the PM_{10}/PM_{10} precursor emissions for which reductions are to be provided. Section 5.0 presents mitigation measures that potentially could be implemented in the City of Escondido, including estimates of the PM_{10} emission reductions and costs associated with those measures, and a description of steps needed to deliver the reductions. Section 6 discusses Palomar Energy's proposed approach for implementation of the mitigation program, including how implementation will occur, who is responsible for the implementation, and the timetable for implementation.

2.0 PM_{10} EMISSION MITIGATION REQUIREMENTS AND PROPOSED MITIGATION PLAN OVERVIEW

The proposed Palomar Energy Project (the "Project") site is located in the City of Escondido in San Diego County, which is within the jurisdiction of the San Diego County Air Pollution Control District (SDAPCD). The San Diego region is in attainment with the national ambient air quality standards (NAAQS) for PM_{10}, but does experience some days that are in excess of the 24-hour PM_{10} California ambient air quality standard (CAAQS).

2.1 Palomar Energy Project PM_{10} Emission Requirements

Typically, new major emission sources that will be located in areas that do not attain the air quality standards are required by air quality regulations to provide "offsets" in order to mitigate the potential impacts of the new emissions. The SDAPCD Rule 20.3 is unique among California air district rules related to PM_{10} offset requirements. Most air districts have a requirement for PM_{10} offsets for new major sources of emissions. However the SDAPCD rule requires PM_{10} offsets only when the impacts of a project are determined to be significant. Therefore, an explicit determination of the significance of a project with respect to the local PM_{10} standards is required in order to determine the project's mitigation requirements.

Because the Project's potential to emit is greater than 100 tons per year of PM_{10}, SDAPCD Rule 20.3(d)(2) requires that an Air Quality Impact Analysis (AQIA) be completed for PM_{10}. Project PM_{10} emissions were modeled using the ISCST3 and AERMOD models. The analysis of air quality data in Escondido on days that were close to exceeding the 24-hour CAAQS showed that when combined with the background PM_{10} concentrations, no additional violations of the CAAQS would be expected. Based on a review of this modeling, the SDAPCD determined that the Palomar project does not have the potential to cause new exceedances of the PM_{10} 24-hour CAAQS, and therefore does not require PM_{10} mitigation under SDAPCD's rules.

The analysis performed pursuant to the SDAPCD's rule is not the only determination that the Palomar project's PM_{10} impacts should not be considered significant. As noted in the Palomar Energy Application for Certification (pg. 5.2-26), the maximum project PM_{10} impact was below 5 $\mu g/m^3$, which the U.S. Environmental Protection Agency (EPA) has defined as the 24-hour PM_{10} "Significant Impact Level (SIL)."

Projects with impacts below this level are not considered significant, and hence are not required to perform additional analyses with respect to the AAQS under Federal law. PM_{10} offsets are not required in San Diego County by the Federal Clean Air Act since the area is in attainment of the PM_{10} NAAQS.

In addition to the AQIA, a health risk assessment (HRA) of the Palomar emissions was completed to evaluate the emissions of toxic air contaminants (including certain particulate constituents) and potential impacts to public health. The HRA concluded that health risk from the Project would be less than ten percent of the significance level of ten-in-one-million at all receptor locations. The HRA also has been reviewed by the SDAPCD and was considered conservative.

Based on the foregoing analysis and rule requirements, neither the SDAPCD, the California Air Resources Board (ARB), nor the EPA require offsetting the Project's PM_{10} emissions or other mitigation of these emissions. Nevertheless, without applying an analytical methodology for such a determination, the Energy Commission staff contends that any increase in PM_{10} emissions in an area that is nonattainment for the PM_{10} NAAQS or CAAQS is a significant adverse impact under the California Environmental Quality Act (CEQA) that requires mitigation. To our knowledge, no other project located in San Diego is subject to a mitigation requirement beyond the SDAPCD rules such as that envisioned by CEC staff.

The CEC's authority to impose mitigation requirements is, of course, limited to mitigation of significant impacts pursuant to the CEQA Guidelines (14 CCR sec. 15041(a)). In the case of a possible contribution to a cumulative impact, such as a preexisting condition of exceedance of an ambient air quality standard, the Guidelines require mitigation only of "cumulatively considerable" contributions (Guidelines sections 15065, 15130). The analysis of PM_{10} impacts discussed above does not support such a finding. Thus, the existence of <u>any</u> new emissions in a non-attainment area does not per se establish a significant impact. Further, with regard to cumulative impacts, the Guidelines allow a lead agency to rely on a locally adopted standard to make a determination of significance. (Guidelines sec. 15064(h)). The analysis of the effects of PM_{10} emissions on ambient standards required under San Diego APCD Rule 20.3 constitutes such a standard.

In addition to these applicable CEQA principles, the Warren-Alquist Act generally directs the Commission to defer to the determinations of the local air pollution control district as to air quality regulatory matters. The Act and the Commission's siting regulations contain a specific procedure for preparation of a Determination of

Compliance with applicable air quality regulations by the air pollution control district, and inclusion in the Commission's final decision of findings and conclusions based upon the Determination of Compliance. (Pub. Res. Code sec 25523 (d)(1) and (2), 14 CCR secs. 1744.5, 1752.3). Further, standards for air and water quality are specifically excluded from the Commission's authority to adopt standards to be met related to designing or operating facilities to safeguard public health and safety that may be more stringent than those adopted by local or regional agencies (Pub. Res.Code sec. 25216.3(a)). If the Commission cannot adopt a generally applicable standard regarding air quality, Palomar Energy questions how the Commission could adopt its own ad hoc requirement concerning air quality that exceeds the requirements of locally adopted rules. We note that CEQA does not grant an agency new powers independent of the powers granted to the agency by other laws (Guidelines sec. 15040(b)).

In Data Request Number 14, CEC staff requested the applicant to investigate PM_{10} mitigation measures. While Palomar Energy does not believe that the Project's PM_{10} emissions individually or cumulatively result in a significant adverse impact under CEQA, potential PM_{10} mitigation measures were identified in a submittal to the CEC on May 8, 2002.

2.2 Palomar Energy's Proposed PM_{10} Mitigation Plan

According to the PSA, the Commission staff found that the Palomar project would cause significant direct and secondary PM_{10} impacts. Palomar Energy disagrees with the Commission staff that the project will cause a significant air quality impact. As noted above, the Palomar Energy Application for Certification (AFC) presented an analysis that demonstrated that the project would not cause new exceedances of the PM_{10} 24-hour ambient standards in the Escondido area. Palomar Energy also disagrees with the way the Commission staff have determined the project's PM_{10} "liability". However, Palomar Energy is aware of the Commission's previous decision in the Otay Mesa Project case (99-AFC-5) which required a contribution to the SDAPCD to fund PM_{10} mitigation projects. Therefore, Palomar Energy has also offered to provide PM_{10} mitigation in the form of funding for emissions reduction projects.

San Diego County, including the Escondido area, experiences exceedances of the 24-hour PM_{10} CAAQS. Therefore, the primary objective of Palomar Energy's PM_{10} mitigation plan is to identify PM_{10} and/or diesel particulate reduction projects that would reduce the regional particulate loading. The PSA recommends that the

Palomar Energy mitigation fee be used to preferentially target the Escondido area for emission reductions. While Palomar Energy considers its impacts to the local area to be insignificant, Palomar Energy recognizes the appropriateness of preferentially targeting emissions reductions within the City of Escondido and other nearby communities. However, it should be noted that, as discussed in the following sections of the Plan, there do not appear to be sufficient PM_{10} emission reduction opportunities within the City of Escondido to achieve a pound-for-pound reduction of PM_{10} if that were to be the objective. Reductions of diesel particulate, on the other hand, may provide additional benefits from a public health perspective.

Palomar Energy proposes to provide funding in the amount of $812,500 to the SDAPCD and/or City of Escondido for use in programs to reduce PM_{10}, PM_{10} precursor, or diesel particulate emissions within the San Diego Air Basin. The proposed approach of providing funding for use in emission reduction programs in the San Diego area is consistent with the CEC Final Decision in the Otay Mesa Generating Project siting case. In the Otay Mesa case, the applicant was required to provide CEQA mitigation in the form of a mitigation fee of $1.2 million to the SDAPCD to distribute to programs such as the Lower-Emission School Bus Retrofit Program, the Carl Moyer Program, or some other program designed to reduce PM_{10} and PM_{10} precursor emissions in the District. (See Otay Mesa Final Decision, 99-AFC-5, p.129).

3.0 BACKGROUND INFORMATION ON PM_{10} EMISSIONS IN SAN DIEGO COUNTY

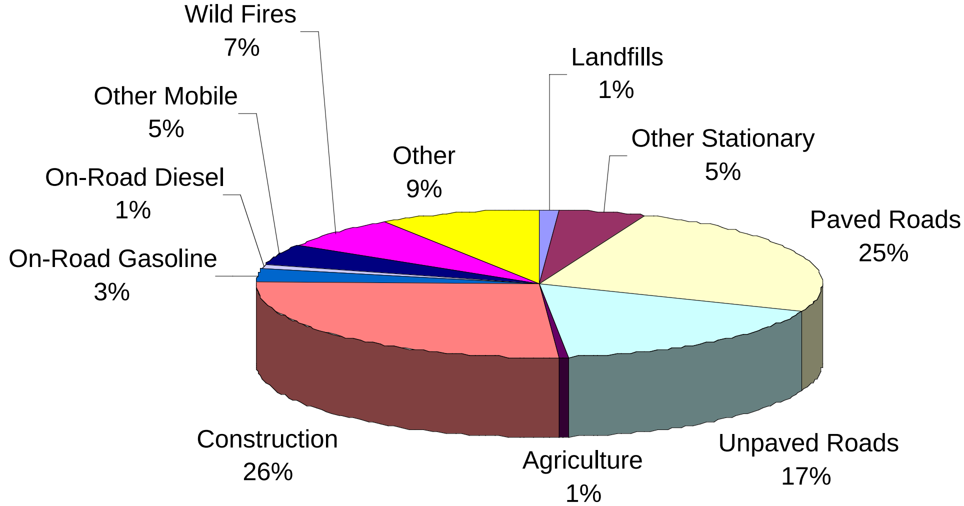
3.1 PM_{10} Emission Sources in San Diego County

As noted in Section 2.0, San Diego County currently experiences exceedances of the PM_{10} 24-hour CAAQS. Therefore, the sources of PM_{10} in the County were reviewed in order to identify potential avenues of emissions reductions.

Figure 3-1 depicts the percentage of PM_{10} emissions from both mobile and stationary sources within San Diego County. The mobile sources (i.e., "on-road diesel, "on-road gasoline" and "other mobile" sources) identified represent a very small combined percentage of the total (nine percent). "On-road diesel" is an area where large investments have been made over the past several years to reduce emissions generated by fleets (e.g., school buses, government agency vehicles, and public transit). Of the stationary sources, "construction" represents the largest category (26 percent). However, PM_{10} emissions from construction activities are addressed during the planning/permitting process for the projects to be constructed, and are not generally long-term sources at any one location. "Other" stationary sources are composed of different source types such as power plants, materials handling facilities, and other industrial and commercial businesses. The potential for PM_{10}/precursor emissions reductions is difficult to assess from these sources. While a small component (one percent) of the total PM_{10} emissions sources in the County, "landfills" appear to present the best opportunity to obtain cost-effective emission reductions, as discussed in the following sections of this Plan.

3.2 Stationary Source PM10 Emissions

Palomar Energy obtained information on stationary, permitted sources in San Diego County that have the largest emissions of PM_{10} in order to identify potential PM_{10} emission reductions. These data were obtained from a SDAPCD list dated March 11, 2002 that contained the most recent emission inventory estimates (actual emissions). This list included PM_{10} stationary sources in San Diego County with greater than one ton per year of emissions (a total of 84 stationary sources). The top ten PM_{10} emission sources are identified in Table 3-1. Three of the top ten sources are solid waste landfills (Miramar, Sycamore, and Otay), three are power plants, and the other four are aggregate/cement operations.



Source: California Air Resources Board California Emission Inventory Data, dated October 10, 2000

Figure 3-1 San Diego County PM_{10} Emission Sources

Table 3-1
San Diego Air Basin – Most Recent Emissions Inventory Estimates of Actual Stationary Source PM_{10} Emissions by Facility

Company Name	City	PM_{10} (tpy)	Year of Data	Report Date
Miramar Landfill	San Diego	460.4	2000	9/13/01
Cabrillo Power	Carlsbad	217.4	2000	1/29/02
Duke Energy Southbay Power	Chula Vista	159.5	2000	1/18/02
Sycamore Landfill	San Diego	117.7	2000	9/11/01
Hanson	San Diego	72.0	1997	11/18/99
CALMAT	Pala	68.8	1999	2/8/01
Otay Landfill	San Diego	66.1	2000	9/11/01
Vulcan	San Diego	53.7	1999	2/2/01
CALMAT	San Diego	47.9	1999	2/27/01
Goal Line LP	Escondido	42.4	2000	2/1/02

The combined PM_{10} emissions for the 84 stationary sources listed in the SDAPCD inventory are 1,920 tpy, five percent of the emissions inventory. Of this total, the combined PM_{10} emissions for the top ten sources are 1,306 tpy (68 percent). The combined PM_{10} emissions for the three landfills are 644 tons per year (34 percent of the emissions from the County's 84 major sources). A potential program is discussed below for PM_{10} control through the application of dust control measures on unpaved landfill roads. Control of landfill roads appears to be by far the most cost-effective and easily implemented measure to reduce PM_{10} emissions in San Diego County.

3.3 Landfills In San Diego County

There are seven operating, solid waste disposal, Class III facilities located within San Diego County. These are:

- Borrego Springs Landfill (Borrego Springs);
- Otay Landfill (Chula Vista);
- Ramona Landfill (Ramona);
- Sycamore Sanitary Landfill (San Diego);
- West Miramar Sanitary Landfill (San Diego);
- San Onofre Landfill (Camp Pendleton); and
- Las Pulgas Landfill (Camp Pendleton).

Relevant statistics for these seven landfills are contained in Table 3-2. There is also a proposed landfill (Gregory Canyon Landfill) currently in the permitting process. The proposed site for this landfill is in northern San Diego County approximately two miles from the community of Pala, which is approximately 25 miles from the Project site. Two landfills, Sycamore and West Miramar, were selected for further review based on a combination of factors: their total acreage (they are the two largest facilities), their relative proximity to the Project site (within 20 miles), their scheduled closure dates (Sycamore has the longest remaining operating life of the seven facilities, and West Miramar has the third longest), and their PM_{10} emissions.

Table 3-2
Solid Waste Disposal Sites (Class III) in San Diego County

Landfill Disposal Site Name	Operator	Location	Total Acreage	Anticipated Year of Closure	Approximate Distance from Project Site (miles)
Borrego Landfill	Allied Waste Industries	2449 Palm Canyon Road, Borrego Springs	42	2013	50
Otay Sanitary Landfill	Allied Waste Industries	1700 Maxwell Road, Chula Vista	250	2007	40
Ramona Landfill	Allied Waste Industries	20630 Pamo Road, Ramona	160	2006	15
Sycamore Sanitary Landfill	Allied Waste Industries	8514 Mast Blvd., San Diego	519	2015	20
West Miramar Sanitary Landfill	City of San Diego	5180 Convoy Street, San Diego	807	2011	20
San Onofre Landfill	U.S. Marine Corps	Camp Pendleton	32	2010	*
Las Pulgas Landfill	U.S. Marine Corps	Camp Pendleton	88	2009	*

* Exact location on base not determined

4.0 BASIS FOR PROPOSED PM_{10} MITIGATION FEE

The CEC PSA proposed setting the level of funding for PM_{10} mitigation based on a staff calculated CEQA liability for PM_{10} and PM_{10} precursors of 141 tons per year (tpy). This was based on a PM_{10} offset liability of 107.7 tpy and, 33.1 tpy of PM_{10} precursors (considering 100 percent of the Project's 33.1 tpy of SOx emissions as PM_{10} precursors). The CEC staff then derived a presumed cost of PM_{10} emission reduction credits (ERC) and used this amount times the emissions to derive a mitigation fee of $3.53 million. Palomar Energy does not agree with the staff's estimate of the emissions liability nor with using ERCs as a cost basis.

4.1 Palomar Energy Project Emissions

Palomar Energy estimated a PM_{10} potential to emit for the Project of 104.8 tpy. This emissions potential included a conservative estimate that 50% of the total dissolved solids (TDS) emitted as drift from the cooling tower would form into particles that are less than ten microns, i.e., PM_{10}. The SDAPCD has issued its Preliminary Determination Compliance (DOC) based on this maximum emissions level.

In quantifying the amount of PM_{10} emissions for the Palomar project, the PSA discusses the conversion of the TDS from the cooling tower drift to PM_{10}. The PSA argues that the information presented by Palomar is "theoretical" and that in the absence of test data, staff must assume that 100% of the TDS is emitted as PM_{10}. We note that the calculation of PM_{10} emissions from a majority of source types is more theoretical than actual. Any time an emission factor is used, the calculation could be deemed to be "theoretical".

The technical paper that was provided by Palomar Energy in response to CEC Data Request 4 presented a sound scientific procedure for estimating the conversion rate. Many other projects have been permitted with conversion factors of 50% or less. In Data Request 4, Energy Commission staff asked if the EPA and the SDAPCD had verified the 50% assumption. The response to Data Request 4 included a reference wherein the EPA indicated that 50% is a reasonable assumption. The total project potential to emit in the Preliminary DOC issued by the SDAPCD was based on a 50% conversion rate, and hence this rate is presumed to be verified by the District. The Commission staff should rely on the District's determination.

In terms of PM_{10} precursors, Palomar Energy will provide mitigation for ozone impacts in the form of NOx and VOC ERCs as required under SDAPCD rules. No mitigation is required for SOx emissions by SDAPCD rules. Palomar Energy submitted information (response to CEC Data Request 15 on April 9, 2002) that SOx is not expected to be a significant component of the PM_{10} concentrations observed in San Diego County. However, Palomar Energy acknowledges that there could be some contribution from SOx emissions to regional PM_{10} levels. As a very conservative estimate, 50% of the total SOx emissions could be assumed to be converted to PM_{10}. Palomar's SOx emissions have been estimated to be 33.1 tpy, so 50% of this amount would be 16.6 tpy.

For the reasons stated above, Palomar Energy proposes to base its PM_{10} mitigation funding on an emissions liability of 121.4 tpy – a PM_{10} potential to emit for the Project of 104.8 tpy plus 16.6 tpy attributable to PM_{10} precursors, based on a 50% conversion rate of Project SOx emissions to $PM_{10.}$

4.2 Mitigation Fee

In the PSA, the Commission staff proposed basing the mitigation fee on a presumed cost of PM_{10} ERC in San Diego County. However, as noted in the PSA, there have been no PM_{10} ERC transactions within San Diego County, and thus, the price derived by CEC staff is highly speculative. Regardless of the price, ERC do not provide a representative basis for costs of this type of mitigation program. The intent of the mitigation plan is to provide funding to undertake mitigation projects, not to attempt to purchase PM_{10} ERCs on the open market.

Instead, Palomar Energy proposed basing the fee on the funding level method approved for the Otay Mesa Generating Project. The Otay Mesa project is a 510 MW natural gas-fired power plant proposed for a site in southern San Diego County. As stated earlier, the CEC Final Decision requires the Otay Mesa applicant to provide a CEQA mitigation fee of $1.2 million to the SDAPCD to distribute to programs such as the Lower-Emission School Bus Retrofit Program, the Carl Moyer Program, or some other program designed to reduce PM_{10} and PM_{10} precursor emissions in the SDAPCD.

Basing the Palomar Energy fee on Otay Mesa methodology is a reasonable and appropriate approach for several reasons: 1) the funds are expected to be used for similar types of projects (e.g., diesel retrofits and replacement, dust control on unpaved roads) 2) the Palomar Energy emissions are lower than the Otay Mesa project, and thus the Palomar fee should be lower, and 3) the PM_{10} air quality in the vicinity of the Palomar Energy site is better than near Otay Mesa, e.g., from 1998 to 2000 there were 58 exceedances of the state 24-hour PM_{10} standard in the Otay Mesa area, and only four such exceedances in the Escondido area.

As shown in Section 5.0, there are insufficient measures that could be implemented within the City of Escondido to achieve a 121.4 tpy PM_{10} reduction, i.e., a pound-for-pound reduction to mitigate Project PM_{10} and PM_{10} precursor emissions. However, in the Otay Mesa Final Staff Assessment (FSA), Part Two, dated October 27, 2000, CEC staff acknowledged that there can be significant benefits with lower levels of emission reduction:

> The actual tonnage of PM_{10} the $1.7 million dollar [subsequently reduced by CEC staff to $1.2 million] mitigation fee will effectively reduce will be relatively small, approximately 8 tons per year. However, staff believes that there are significant air quality benefits. Diesel particulates are known carcinogens.[6] The retrofit program will reduce these carcinogen and ultra-fine PM_{10} (<$PM_{2.5}$) emissions at street level and reduce direct exposure to children. Staff also believes there are significant benefits to encouraging early adoption of the "clean diesel" technologies (much of CARB Risk Reduction Plan will not be implemented until 2007). Staff is also encouraged by the strong likelihood that the funds will be used, resulting in real contemporaneous emission reductions throughout San Diego. Given this, in conjunction with the applicant's proposed NO_X and VOC emissions reductions, will reduce the project's NO_X, VOC, SO_X, and PM_{10} emissions impacts to the extent feasible [Otay Mesa FSA, Part 2, pp. 38-39,41-42].

However, in order to achieve a pound-for-pound reduction, Palomar Energy proposes a secondary approach for establishing the mitigation fee --- the mitigation fee could be based on the cost of implementing PM_{10} emissions reductions in San Diego County, i.e., not only in the Escondido area. As described below, 121.4 tpy of PM_{10} reductions could be achieved by treating unpaved roads at two landfills in San Diego County. These landfills are located approximately 20 miles from the Project site. The amount of the proposed mitigation fee could also be based on the costs to implement this mitigation measure.

4.2.1 Characteristics of Unpaved Roads at Sycamore Sanitary and West Miramar Landfills

The majority of emissions from solid waste landfills are caused by vehicle travel on unpaved landfill roads. Permanently paving the majority of these roads on a landfill is not cost-effective since these roads do not have a long life span. For example, these roads are used to access waste disposal cells; after a cell has been filled, the road may no longer be needed and actually may be bulldozed out of existence. The use of cost-effective and PM_{10}-efficient surface treatments on unpaved landfill roads is a good alternative to paving for reducing PM_{10} emissions.

Management of the Sycamore Sanitary Landfill informed the applicant that the access road(s) to the landfill (e.g., access from Mast Boulevard) was paved by the County in approximately 1997 (Austin, 2002). However, there are approximately two miles of unpaved roads at this landfill. The situation at the West Miramar Landfill is similar, except that there is a total of 0.6 miles of unpaved road, of which 0.4 miles reportedly are heavily traveled. These unpaved roads are not permanent landfill roads, but have a limited life span [approximately three to six months (Mauk, 2002)].

4.2.2 Control of PM_{10} Emissions from Unpaved Landfill Roads

Reclaimed water is currently used for dust control on the unpaved roads at both landfills. Reclaimed water is applied up to twice per hour on unpaved roads at the West Miramar Landfill (Mauk, 2002). The application rate at Sycamore landfill is approximately 12 times per day (Austin, 2002). Based on information provided by West Miramar Landfill management, approximately 29,000,000 gallons of reclaimed water are used annually to control dust on the unpaved roads (Mauk, 2002). Approximately 5,000,000 gallons per year of reclaimed water are used at Sycamore Landfill for this purpose (Austin, 2002). No other dust control measures were reported to be in use for these roads.

Hot-asphalt paving of landfill roads to control emissions beyond the level achieved by current watering is not a cost-effective option, since these roads are not permanent. However, more effective dust control would come from applying a durable protective layer to these roads. A literature search was undertaken covering several commercially available dust control products. Two products were reviewed in more detail for their appropriateness for use at solid waste landfills: Soil-Sement® and Envirotac II®. Both products are fugitive dust suppressants that are used on unpaved roads in various situations (e.g., mining, military training, and landfills).

The main component of Envirotac II® is an acrylic copolymer (39 to 43 percent by weight), which is listed as nonhazardous in its Material Safety Data Sheet (MSDS). The main component of Soil-Sement® is acrylic and vinyl acetate polymer (five to 50 percent by weight), which is listed as nonhazardous in its MSDS. Both products are applied to the surface or mixed in with soil, forming a clear, plastic and resin bond. Soil-Sement® received ARB Equipment Precertification on April 11, 2002 in regards to its PM_{10} reduction efficiency. Based on the information provided by the manufacturer of Envirotac II®, they are seeking "official approval" from the South Coast Air Quality Management District.

There are other commercially available dust control products (e.g., products that are pine resin, lignosulfonate, magnesium chloride, calcium chloride, and petroleum-resin based). However, these were not reviewed in detail, since they were identified not to be as effective in reducing PM_{10} as Envirotac II® or Soil-Sement®. Using one of these two products on unpaved landfill roads would be expected to result in substantial reductions in PM_{10} emissions on a daily basis. However, additional investigation would be required into the suitability of these products for heavily traveled landfill roads. The performance of these products depends on several factors, including coverage rate used, depth of penetration and treatment, degree of soil compaction, type of soil, and volume and weight of the vehicle traffic.

4.2.3 Expected PM_{10} Reductions

Uncontrolled PM_{10} emissions from travel on the unpaved roads were estimated using the following emission factor equation from the EPA's "Compilation of Air Pollutant Emission Factors" (AP-42, Section 13.2.2, 1998):

$$EF = 2.6\ (s/12)^{0.8}\ (W/3)^{0.4}\ [(365 - p)]\ /365]\ /\ (M / 0.2)^{0.3}$$

where:

EF = PM_{10} emissions factor (lb/vehicle-mile-traveled)

s = surface material silt content (percent)

W = average vehicle weight (tons)

p = number of days per year with at least 0.01 inches of precipitation

M = dry surface material moisture content (percent)

This emission factor was multiplied by the daily number of one-way trips on the road and the length of the road to estimate daily uncontrolled PM_{10} emissions:

EUD = (EF) (ADT) (L)

where:

EUD = daily uncontrolled PM_{10} emissions (lb/day)

ADT = average daily on-way trips (number/day)

L = unpaved road length

The PM_{10} emission control efficiency from current watering was estimated using the following equation from the Mojave Desert Air Quality Management District's "Emission Inventory Guidance, Material Handling and Processing Industries" (2000):

CEW = 100 - (0.0012) (A) (D) (T) / (I)

where:

CEW = emission control efficiency from watering (percent)

A = average annual Class A pan evaporation rate (inches)

D = hourly traffic (vehicles per hour)

T = time between watering (hours)

I = water application intensity (gal/sq. yd)

Current daily emissions were then calculated from:

EWD = (EUD) (1 - CE / 100)

where:

EWD = daily PM_{10} emissions with watering (lb/day)

The Sycamore and West Miramar landfill operators provided estimates of the average daily number and weights of vehicles traveling on their unpaved roads, the lengths of the unpaved roads, and the frequency of watering. Default values from the SDAPCD procedure for calculating emissions from unpaved haul roads (October 5, 1998) were used for the surface material silt content and the number of days per year with 0.01 inches or more of precipitation. The average annual Class

A pan evaporation rate was estimated from Figure 13.2.2-2 in AP-42. The dry road surface material moisture content was assumed to be 0.2 percent. The water application intensity was assumed to be 0.11 gallons per square yard for Sycamore Landfill and was estimated to be 0.4 gallons per square yard for Miramar, based on road length, road width, watering frequency and annual water use.

Daily PM_{10} emissions after road surface treatment were estimated from:

ESD = EUD (1 - CES/100)

where:

ESD = daily PM_{10} emissions with unpaved road surface treatment (lb/day)

CES = control efficiency from surface treatment (percent)

A control efficiency of 85 percent was assumed, based on the ARB's pre-certification of Soil-Sement®.

The daily emission reduction that would be achieved by roadway surface treatment was then estimated as the difference between the daily PM_{10} emissions with watering and the daily emissions with surface treatment:

ERD = EWD - ESD

where:

ERD = daily PM_{10} emission reduction (lb/day)

The annual emission reduction from unpaved road surface treatment was estimated by multiplying the daily emission reduction by the number of landfill operating days per year, which was provided by the landfill operators:

ERA = (ERD) (O) / 2000

where:

ERA = annual PM_{10} emissions reduction from surface treatment (tons/yr)

O = landfill operating days per year

Details of the calculations are provided in the spreadsheets in Appendix A. Estimated current daily emissions, daily emissions with roadway surface treatment and daily and annual emissions reductions are listed in Table 4-1.

Table 4-1
Estimated PM_{10} Emissions Reduction from Landfill Unpaved Road Surface Treatment

Landfill	Current Daily PM_{10} Emissions (lb/day)	Daily PM_{10} Emissions with Surface Treatment (lb/day)	Daily PM_{10} Emissions Reductions (lb/day)	Annual PM_{10} Emissions Reductions (tons/yr)
Sycamore Sanitary Landfill	3,395 (2 miles)	1,245	2,150	280
West Miramar Sanitary Landfill	1,802 (0.4 miles)	951	851	111

4.2.4 Program Cost

To provide perspective on potential cost, the cost for enough Envirotac II® to cover approximately 2.5 miles of road (width of 30 feet), which is the approximate combined total miles of unpaved landfill roads at West Miramar and Sycamore, (one application diluted with water at a 4:1 ratio) is approximately $64,000. This does not include the cost of the equipment used to spread the mixture. However, the equipment currently used at the landfills for watering for dust control can be used. Based on the product data reviewed, one additional application would be required during the calendar year. Therefore, the annual cost would be approximately $128,000. However, additional research into the use of these products under similar landfill conditions would need to be conducted in order to verify the longevity of these products, i.e., whether two applications per year is the appropriate frequency.

As a comparison with current water costs, the annual cost of the 29,000,000 gallons of reclaimed water utilized in dust control at the West Miramar Landfill is approximately $31,030 (at approximately $0.00107 per gallon) (Mauk, 2002); the annual cost of the 5,000,000 gallons of reclaimed water utilized in dust control at the Sycamore Landfill is approximately $11,500 (at approximately $0.0023 per gallon) (Austin, 2002). Thus, the combined total annual water cost for the two landfills is approximately $42,500. These water costs do not take into consideration the cost of diesel fuel for the equipment utilized in dust control and other costs, such as vehicle maintenance and operator costs.

The incremental cost for applying a dust suppressant to the 2.5 miles of unpaved road at the two landfills is approximately $85,500 per year ($128,000 - $42,500).

4.3 Cost to Mitigate Palomar Energy Emissions

4.3.1 Comparative Cost Basis

The May 8, 2002 Palomar Energy PM_{10} Mitigation proposal calculated a mitigation fee of $787,500 for use by the SDAPCD to reduce emissions within the San Diego Air Basin. This amount was derived from the funding required for Otay Mesa project and the relative PM_{10} emissions of the two projects. Palomar Energy's annual potential to emit has been calculated to be 104.8 tons per year of PM_{10} compared to the Otay Mesa's permitted PM_{10} emissions of 160 tons per year. Hence, an equivalent funding level would be: (105 tons/year from Palomar) / (160 tons/year from Otay Mesa) x ($1,200,000) = $787,500.

As discussed above, Palomar Energy is willing to include some conversion (50%) of SOx emissions as a PM_{10} precursor. The Otay Mesa SOx permitted emissions are 39.4 tpy. Based on a similar calculation of the ratio of PM_{10} emissions plus 50% of the SOx emissions (Palomar 121.4 tpy vs. Otay Mesa 179.3 tpy), an equivalent funding level would be equal to $812,500.

4.3.2 Landfill PM_{10} Reduction Program Basis

The incremental cost of $85,500 per year calculated above would reduce PM_{10} emission at the two landfills by a total of 391 tpy, which corresponds to a cost-effectiveness of about $220/year per tpy reduction. The cost to reduce the 121.4 tpy of PM_{10} emissions from the proposed Project would then be:

($220/year per tpy) x 121.4 tpy = $26,708/year

To express the cost-effectiveness of the landfill PM_{10} reduction program in terms of pounds per year reduction (to facilitate comparison with other potential mitigation projects evaluated in the next section), 782,000lb/$85,500 = $9 per pound per year. The total cost over the 30-year lifetime of the Project would then be:

$26,686/year x 30 years = $801,240

Since PM_{10} and PM_{10} precursor emissions from the proposed project could be mitigated on a pound-for-pound reduction for this cost, Palomar Energy proposes this amount ($801,240) as an alternative PM_{10} mitigation fee basis.

5.0 POTENTIAL PM_{10} MITIGATION MEASURES WITHIN THE CITY OF ESCONDIDO

Although the application of dust suppressants to unpaved landfill roads described in the previous section would offset the PM_{10} emissions from the Project, Palomar Energy believes that is preferable to reduce PM_{10} emissions within the City of Escondido, where the Project is located. Palomar Energy has identified the following opportunities for reducing PM_{10} emissions through discussions with the City of Escondido, the Escondido Union High School District, and with the local solid waste disposal company, Escondido Disposal, Inc.

5.1 Heavy-Duty Diesel-Fueled Vehicle Particulate-Filter Retrofits

5.1.1 Program Description

As discussed in the Otay Mesa Final Staff Assessment, the Carl Moyer and Lower-Emission School Bus Programs have been developed to reduce emissions from diesel-fueled engines. The Carl Moyer Program is a statewide grant program that funds the extra capital cost of cleaner-than-required vehicles and equipment in order to provide air quality benefits. It has been successful in getting a large number of clean vehicles on the road today. This includes over 1,900 alternative-fueled vehicles statewide, especially transit buses and refuse trucks. The program also has replaced nearly 2,000 older diesel engines with new, cleaner diesel engines, primarily in marine vessels, off-road equipment, and agricultural irrigation pumps.

The Lower-Emission School Bus Program is designed to reduce California school childrens' exposure to both cancer-causing and smog-forming pollution. ARB has approved guidelines to implement this program for purchasing new, lower-emitting school buses, and for retrofitting buses with particulate filters to reduce particulate emissions. The program introduces new engine and after-treatment technology, as well as cleaner fuels. The program provides funding for both new alternative fuel school buses and associated infrastructure, and new intermediate emission diesel engines. A significant component of the program is the retrofit of 2,000 buses with diesel particulate filters, which will significantly reduce emissions from the in-use fleet.

According to the ARB web site (ARB, 2002b), diesel-fueled engines emitted about 5.4 tons per day of PM_{10} in the San Diego Air Basin during 2000, which is equivalent to about 2,000 tons per year. Additionally, ARB has identified particulate matter from diesel-fueled engines as a toxic air contaminant (TAC). On a statewide basis, the average potential cancer risk associated with these emissions is over 500 potential cases per million. Therefore, reducing emissions from diesel-fueled engines will not only reduce PM_{10} concentrations, but will also reduce health risks.

Particulate filters are control devices that can be retrofitted on some heavy-duty diesel-fueled engines to reduce particulate matter emissions by 85 percent or more. Retrofitting particulate filters to heavy-duty diesel-fueled vehicles in the City of Escondido was considered as a means to reduce PM_{10} emissions.

ARB has currently verified particulate filters produced by two manufacturers to achieve these emission reductions. As indicated in the verification letters from ARB (2002) to the manufacturers (provided in Appendix B of this Plan), the verifications apply to use with certain engines manufactured between 1994 and 2002. Therefore, particulate-filter retrofitting is only considered feasible for vehicles with these engines. Additionally, these vehicles must use ultra low-sulfur (15 ppm or less) diesel fuel to achieve the emissions reductions.

The Escondido Union High School District (EUHSD), Escondido Disposal, Inc., and the City of Escondido Department of Public Works were contacted to evaluate the feasibility of retrofitting their vehicles. It was concluded that additional PM_{10} emissions reductions could not be achieved by retrofitting vehicles operated by either EUHSD or Escondido Disposal. Although EUHSD operates several school buses that qualify for retrofits with the ARB-verified particulate filters, the school district has already received funding under California's Lower-Emission School Bus Program to retrofit all of these vehicles (Berkstresser, 2002). None of the vehicles operated by Escondido Disposal contain the engines listed by ARB, and so retrofitting its vehicles is considered not feasible.

The City of Escondido Department of Public Works operates 20 vehicles manufactured between 1994 and 2002 that are driven more than 3,000 miles annually. These vehicles include street sweepers, fire trucks, ambulances, paramedic vehicles, dump trucks, sewer cleaning vehicles, and utility vehicles.

5.1.2 Expected PM_{10} Reductions

The annual PM_{10} emission reduction that might be achieved by retrofitting the City of Escondido's vehicles was estimated assuming that retrofitting all 20 of the vehicles would be feasible.

Emission reductions from retrofitting the street sweepers was estimated using the following approach based on the approach used in Appendix E1 of the South Coast Air Quality Management District's (SCAQMD) Final Program Environmental Assessment for Proposed Fleet Vehicle Rules and Related Rule Amendments (SCAQMD, 2000):

> Annual emission reduction [lb/yr] = (number street sweepers) x (annual fuel use persweeper [gallons]) x (18.5 bhp-hr/gal) x (diesel std. [g/bhp-hr]) x (control efficiency [%] / 100) / (453.6 g/lb)

Annual fuel use for a street sweeper was estimated by SCAQMD (2000) to be 7,500 gallons. The heavy-duty diesel-fueled engine particulate matter emission standard for engines manufactured after 1994 is 0.1 g/bhp-hr. The resulting estimated emission reduction is:

> (3 sweepers) x (7,500 gal/sweeper) x (18.5 bhp-hr/gal) x (0.1 g/bhp-hr) x (85% control / 100) / (453.6 g/lb) = 78.0 lb/yr

The annual PM_{10} emission reduction that would be achieved by retrofitting the other 17 vehicles was estimated based on the approach used by SCAQMD (2000) for on-road heavy-duty public fleet vehicles:

> Annual emission reduction [lb/yr] = (annual mileage) x (2.6 bhp-hr/mi) x (diesel std. [g/bhp-hr]) x (control efficiency [%] / 100) / (453.6 g/lb)

The total annual mileage for the vehicles is estimated by the City of Escondido to be about 150,000, leading to an estimated emission reduction of:

> (150,000 mi/yr) x (2.6 bhp-hr/mi) x (0.1 g/bhp-hr) x (85% control / 100) / (453.6 g/lb) = 73.1 lb/yr

The total estimated annual PM_{10} emission reduction that would be achieved by retrofitting the 20 vehicles is 151 pounds.

5.1.3 Program Cost

In its April, 2001 guidelines for the Lower-Emission School Bus Program, ARB estimated the cost for retrofitting a vehicle with a particulate filter to be $6,000. The resulting cost for retrofitting all 20 vehicles would be about $120,000, leading to a cost-effectiveness of $120,000 / 151 lb per year = $795 per pound per year.

5.2 Replacement of Diesel-Fueled School Buses with "Green Diesel Technology™ " School Buses

5.2.1 Program Description

International Truck and Engine Corporation has developed diesel-fueled engines equipped with particulate filters for use in school buses that substantially reduce PM_{10} emissions relative to other new diesel-fueled engines. These engines have been certified to low emission levels by ARB and are in use in several school districts in California through the Lower-Emission School Bus Program. Replacement of older higher-emitting diesel-fueled school buses with Green Diesel Technology buses in the City of Escondido was considered to reduce both PM_{10} and TAC emissions.

EUHSD currently has five of these buses on order to replace existing buses. However, the school district currently operates three additional 1990 and older school buses that it wants to replace, but the district does not have the funds necessary to purchase new buses (Berkstresser, 2002). PM_{10} and TAC emissions could be reduced if funds were provided to EUHSD to replace these buses with Green Diesel Technology school buses.

5.2.2 Expected PM_{10} Reductions

The annual PM_{10} emission reduction that would be achieved by replacing these buses was estimated using the following approach from SCAQMD (2000)::

> Annual emission reduction [lb/yr] = (number buses) x (annual mileage) x (2.6 bhp-hr/mi) x (diesel std. [g/bhp-hr] - Green Diesel std.[g/bhp-hr]) / (453.6 g/lb)

Average annual mileage for each school bus is estimated by EUHSD (Berkstresser, 2002) to be 13,500. The emission standard for heavy-duty diesel engines manufactured between 1987 and 1990 is 0.6 g/bhp-hr, and the certification standard for Clean Diesel Technology school buses is engines is 0.01 g/bhp-hr. The resulting estimated emission reduction is:

> (3 buses) x (13,500 mi/bus) x (2.6 bhp-hr/mi) x (0.6 g/bhp-hr - 0.01 g/bhp-hr) / 453.6 g/lb = 137 lb/yr

5.2.3 Program Cost

The cost of a new 84-passenger Green Diesel Technology school bus is approximately $100,000 (State of California Department of General Services School Buses Contract Supplement No. 5, February 22, 2002). Therefore, the PM_{10}

reduction cost-effectiveness of replacing the three buses is estimated to be \$300,000 / 137 lb per year = \$2,190 per pound per year. Although the cost-effectiveness of the emission reductions is relatively poor, (nearly three times lower than retrofitting City of Escondido vehicles), replacing these buses would reduce exposure to diesel exhaust particulate matter, particularly for the school children who currently ride these older buses.

5.3 Replacement of Diesel-Fueled School Buses with Compressed Natural Gas-Fueled Vehicles

5.3.1 Program Description

An alternative to replacing the three EUHSD school buses with Green Diesel Technology buses would be to replace them with compressed natural gas (CNG) fueled buses. CNG-fueled engines are certified to achieve lower particulate matter emission rates than engines fueled with diesel fuel that do not employ Green Diesel Technology.

5.3.2 Expected PM_{10} Reductions

The annual PM_{10} emission reduction that would be achieved by replacing these buses was estimated using the following approach from SCAQMD (2000):

> Annual emission reduction [lb/yr] = (number buses) x (annual mileage) x (2.6 bhp-hr/mi) x (diesel std. [g/bhp-hr]- CNG std.[g/bhp-hr]) / (453.6 g/lb)

As stated previously, the annual mileage for each bus is estimated to be 13,500, and the emission standard for heavy-duty diesel engines manufactured between 1987 and 1990 is 0.6 g/bhp-hr. The certification standard for CNG-fueled engines is 0.03 g/bhp-hr. The resulting estimated emission reduction is:

> (3 buses) x (13,500 mi/bus) x (2.6 bhp-hr/mi) x (0.6 g/bhp-hr - 0.03 g/bhp-hr) / 453.6 g/lb = 132 lb/yr

5.3.3 Program Cost

The cost of a new 84-passenger CNG-fueled school bus is approximately \$130,000 (State of California Department of General Services School Buses Contract Supplement No. 5, February 22, 2002). Therefore, the PM_{10} reduction cost-effectiveness of replacing the three buses is estimated to be \$390,000 / 127 lb per year = \$3,071 per pound per year. The cost-effectiveness of the emission reductions is relatively poor (about 25 percent less cost-effective than the Green Diesel technology approach and four times less cost-effective than retrofitting City of Escondido vehicles). However, as with the Greed Diesel approach, replacing the older buses with CNG-fueled buses would reduce exposure to diesel exhaust particulate matter, particularly for the school children who currently ride these older buses.

5.4 Replacement of Diesel-Fueled Refuse Collection Trucks with CNG-Fueled Vehicles

5.4.1 Program Description

Escondido Disposal, Inc. currently operates 20 refuse collection trucks that were manufactured between 1982 and 1990 (Maddix, 2002). The company plans to replace these trucks over the next four years at a rate of five vehicles per year. Replacing these vehicles with CNG-fueled refuse collection trucks would reduce both PM_{10} and TAC emissions.

5.4.2 Expected PM_{10} Emission Reductions

The annual PM_{10} emission reduction that would be achieved by replacing these vehicles with CNG-fueled vehicles was estimated using the following approach from SCAQMD (2000):

> Annual emission reduction [lb/yr-vehicle] = (annual fuel use per vehicle [gallons]) x (18.5 bhp-hr/gal) x (diesel std. [g/bhp-hr] - CNG std.[g/bhp-hr]) / (453.6 g/lb)

Annual fuel use for each vehicle was estimated to be 7,917 gallons, based on an average mileage of 9,500 miles per year and 1.2 miles per gallon (Maddix, 2002). The diesel particulate matter emission standard for heavy-duty engines manufactured after 1993 is 0.1 g/bhp-hr. The resulting annual PM_{10} emission reduction achieved by replacing each vehicle with a CNG-fueled vehicle instead of a diesel-fueled vehicle is:

> (7,917 gal/vehicle) x (18.5 bhp-hr/gal) x (0.1 g/bhp-hr - 0.03 g/bhp-hr) / (453.6 g/lb)
> = 22.6 lb/yr

5.4.3 Program Cost

A CNG-fueled refuse truck costs about $50,000 more than a diesel-fueled refuse truck. Therefore, the cost-effectiveness for replacing each refuse truck with a CNG-fueled vehicle instead of a diesel-fueled vehicle is estimated to be $50,000 / 22.6 lb/yr = $2,212 per pound per year.

After the first five vehicles are replaced during 2003 at a total incremental cost of about $250,000, the total emission reduction would be 113 lb/yr. After all 20 vehicles have been replaced by 2006 at a total incremental cost of $1,000,000, the annual PM_{10} emission reduction would be about 452 lb/yr.

Although the cost-effectiveness of this approach is relatively poor (nearly three times less cost-effective than retrofitting City vehicles), and the reductions in emissions are small, replacing the refuse trucks with CNG-fueled vehicles would reduce exposure to diesel exhaust particulate matter.

5.5 CNG Refueling Station Construction

5.5.1 Program Description

Based on discussions with ENRG (CNG fuel station developers and operators) and Southern California Gas, there is currently no CNG refueling capacity in the City of Escondido (Blake and O’Neil, 2002). ENRG is in the process of developing a CNG refueling station for North County Transit District (NCTD) at their transit depot in Escondido. This refueling station is being designed to have some CNG capacity available to the public. However, the station is being planned primarily to support NCTD’s transit fleet. To provide additional capacity (e.g., a limited number of CNG-fueled school buses), then ENRG would need to install CNG compressors that could handle the increased CNG demand. As this station was scheduled for completion during summer 2002, it does not appear workable from a timing standpoint to build in additional capacity for the CNG-fueled vehicles under consideration here.

ENRG operates another NCTD fueling station in Oceanside. The U.S. Department of Energy’s Alternative Fuels Data Center web-site indicated there are 13 CNG refueling stations within a 25-mile radius of Escondido. The database identifies a “SDG&E Northeast” refueling station in Escondido. This station will be or has been closed. The remaining refueling stations in northern San Diego County are either on Camp Pendleton or on school-district property (i.e., Poway, San Marcos and Vista).

ENRG requires approximately 1,000 gallons per day of CNG-refueling activity to justify the construction of a new refueling station. They estimate that this equates to approximately a 20 to 30-truck CNG-fueled fleet of refuse collection trucks, school buses or some combination of the two. Construction of a new CNG refueling station in the City of Escondido would provide the refueling capacity for the previously listed projects that involve replacement of diesel-fueled vehicles with CNG-fueled vehicles.

5.5.2 Expected PM_{10} Emission Reductions

Construction of a CNG refueling station would not lead directly to PM_{10} emission reductions. However, it would enable the diesel-fueled vehicle replacement projects to be implemented, which would lead to PM_{10} and TAC emission reductions from the vehicles.

5.5.3 Program Cost

ENRG estimates that it costs between $600,000 to $675,000 to build a typical CNG refueling station with a capacity of about 1,000 gallons per day.

5.6 Increased City Street Sweeping

5.6.1 Program Description

According to the ARB web site (ARB, 2002b), entrained dust from travel on paved roads accounted for about 32.5 tons per day of PM_{10} emissions in the San Diego Air Basin during 2000, which is equivalent to about 12,000 tons per year. Ordinary vehicle tire wear has been found to deposit fine particles on and adjacent to roadways. These particles include metal and toxic compounds (SCAQMD, 1999). The emission factor for PM_{10} emissions from entrained paved road dust in the ARB emission estimation methodology 7.9 (ARB, 1997) increases with the silt loading on the roadway.

During a site visit to the Escondido monitoring station with Project representatives, SDAPCD speculated that PM_{10} levels observed at the site could be due to entrained road dust. Increased street sweeping in the City of Escondido may reduce the silt loading, thereby reducing PM_{10} emissions. The City of Escondido Department of Public Works currently operates three sweepers on a daily basis and sweeps most areas of the City weekly (Russell, 2002). Purchase of one or more additional sweepers for the City would allow streets to be swept more frequently.

5.6.2 Expected PM_{10} Reductions

Estimating the PM_{10} emissions reductions that might be achieved by increased City street sweeping would require estimates of the silt loading currently on City streets, as well as estimates of the reductions that would be achieved by more frequent sweeping. Further, estimates also would be needed of the traffic on the streets that would be swept more frequently. This information is not readily available, and so the potential emission reductions could not be quantified.

5.6.3 Program Cost

The cost of a new street sweeper is approximately $125,000, based on the most recent purchase of a street sweeper by the City of Escondido (Thomas, 2002).

5.7 Paving City of Escondido Yard

5.7.1 Program Description

The City of Escondido Department of Public Works uses a 10-acre unpaved yard for vehicle parking and other purposes, such as material storage. Vehicles travel and park on approximately half the area. Paving the area used for vehicle travel and parking (about five acres) would reduce PM_{10} emissions.

5.7.2 Expected PM_{10} Emission Reductions

Current PM_{10} emissions from travel on the unpaved surface were estimated using the emission factor equation for vehicle travel on unpaved roads in Section 3.2.3 above without emission controls. The average vehicle weight was assumed to be four tons, the silt content was assumed to be 15 percent (SDAPCD default), the number of weekdays per year with more than 0.01 inches precipitation was assumed to be 29 (SDAPCD default), and the surface moisture content was assumed to be 0.2 percent, leading to an uncontrolled emission factor of 3.2 pounds per vehicle-mile-traveled. The City of Escondido estimates that 20 to 30 trips are made across the yard each weekday, with each vehicle traveling an average of 1.5 miles on-site each day. The resulting annual PM_{10} emissions were estimated to be:

(3.2 lbs/VMT) x (20 vehicles/day) x (1.5 mi/veh.-day) x (260 days/yr) = 24,960 lbs/yr

PM_{10} emissions after paving were estimated using the following emission factor equation from AP-42, Section13.2.1, 2002, for PM_{10} emissions from entrained paved road dust:

Emission Factor [lb/VMT] = (0.016) x (silt loading [g/m^2]/2)$^{0.65}$ x (vehicle weight [tons]/3)$^{1.5}$ x (1 - (days/yr with > 0.01 in. precip.) / (4 x 365))

The default silt loading of 0.320 g/m^2 for local roads from ARB emission estimation methodology 7.9 (ARB, 1997) was used to calculate an emission factor of 0.0073 pounds per vehicle-mile-traveled. The resulting annual PM_{10} emissions after paving were estimated to be:

(0.0073 lbs/VMT) x (20 vehicles/day) x (1.5 mi/veh.-day) x (260 days/yr) = 56.9 lbs/yr

The resulting estimated PM_{10} emission reduction from paving is about 24,900 pounds per year (12.4 tpy).

5.7.3 Program Cost

Using cost construction estimation factors in R. S. Means Building Cost Construction Cost Data, 2001 Western Edition, the cost to pave five acres in Escondido is estimated to be approximately $320,000. This leads to a cost-effectiveness of $320,000/24,900 lb per year = $13 per pound per year.

5.8 Summary

Except for paving the City yard, the programs discussed above would produce relatively minor reductions of PM_{10}. However, the reductions would have a direct benefit within the City of Escondido. Several of these programs could be funded with the $812,500 mitigation fee proposed by Palomar Energy. In addition to the PM_{10} reductions discussed, these programs would reduce the risk from diesel particulates, which are generally believed to have a greater impact than PM_{10} on human health.

6.0 MITIGATION PROGRAM IMPLEMENTATION

Palomar Energy proposes to pay a one-time fee of $812,500 to the SDAPCD. The Otay Mesa project provides a useful precedent for how the proposed mitigation program could be structured for effective implementation. Condition AQ-75 of the Otay Mesa Decision provides as follows:

> The owner/operator shall provide $1.2 million, as a mitigation fee for potential PM_{10} and PM_{10} precursor impacts, to the District APCO to provide PM_{10} and PM_{10} precursor reductions throughout the District. The fees shall be provided to the District, who with guidance from CARB or the CEC, will allocate the funds to programs such as the Lower-Emission School Bus Retrofit Program, the Carl Moyer Program, or some other program designed to reduce PM_{10} and PM_{10} precursor emission in District.
>
> The District shall preferentially make available the mitigation fee funds to the Sweetwater Union High, the San Ysidro Elementary, the South Bay Elementary, or the Chula Vista Elementary School Districts for school bus retrofits. The preference shall be in the form of a first right of refusal given to the above districts for no more than 2 years from the date of the first fee payment by the owner. Any mitigation fee funds not used by the above school districts or available after 2 years from the date of the first fee payment by the owner shall be made available for other program-appropriate emission reductions through the District's program.
>
> Verification: The owner/operator shall provide the funds to the District APCO in two installments. The first payment of $0.6 million shall be provided no later than the date of delivery of the first combustion turbine to the project site. The second and last payment of $0.6 million shall be provided no later than 6 months after the date of delivery of the first combustion turbine to the project site. Copies of the payments shall be provided to the CEC CPM 20 days after delivery of the deposit to the District. (Otay Mesa Final Decision, pp. 165-166).

The following steps summarize the potential applicability of the Otay Mesa emission reduction program implementation approach to Palomar Energy:

- The mitigation fee would be provided to the SDAPCD, who would allocate funds to specific PM_{10} and PM_{10} precursor reduction projects of the types discussed in this Plan,
- Guidance for the SDAPCD's funding allocations would be provided by a state agency (ARB or the CEC),
- Funding would be preferentially allocated to Escondido area projects through a first-right-of-refusal approach, and
- Funding would be provided in two equal installments, the first by the date of delivery of the first combustion turbine to the site, and the second no later than 6 months after the first turbine delivery.

An alternative approach to ensure that funds were spent on PM_{10} and PM_{10} precursor reduction projects in Escondido would be to provide the mitigation fee in whole or in part directly to the City of Escondido. The City of Escondido then would implement projects such as those described in this Plan. If funding were provided directly to the City of Escondido, the SDAPCD could provide its expertise and experience to the City to help oversee implementation of local emission reduction projects.

Implementation of a PM_{10} reduction program at the landfills would also be conducted through the SDAPCD. The SDAPCD could conduct a pilot study to determine the rate of application of soil stabilization products that achieved the desired control efficiency. The SDAPCD would then work with the landfill operators to monitor the effectiveness of the program.

7.0 REFERENCES

7.1 Persons Contacted For This Study

Austin, Bob; Landfill Manager, Sycamore Sanitary Landfill, San Diego, CA

Berkstresser, Robert; Director, Transportation Department, Escondido Union High School District, Escondido, CA

Blake, Jim; Manager of CNG Programs, Southern California Gas, CA

Burlew, Chris; Sales Representative, Golden State Truck Center, Bakersfield, CA

Crabb, Mike; Western Sales Manager, Crane Carrier Company, Tulsa, OK

Emberton, Mike; Department of Public Works, City of Escondido, CA

Gates, Glen; Soil Stabilization Product Company, Inc., Merced, CA

Haradon, David and Jim O'Neill; Account Managers, ENRG, Seal Beach, CA

Maddix, Jerry; Fleet Manager, Escondido Disposal, Escondido, CA

Mauk, John; Refuse Disposal Services, Environmental Services Department, City of San Diego (West Miramar Landfill), San Diego, CA

O'Connell, Jim; A-Z Bus Sales, Inc., Colton, CA

Russell, Michael; Department of Public Works, City of Escondido, CA

Schwarm, Karl: City Manager's Department, City of San Marcos, CA

Spagnola, Chuck; Mobile Source Emission Reduction Section, San Diego Air Pollution Control District, San Diego, CA

Thomas, Pat, Director of Public Works, City of Escondido, CA

Vermillion, John; Vermillion's Environmental Products & Application Company, Inc., Rancho Cucamonga, CA

Wood, Trudy; Emissions Inventory Section, San Diego Air Pollution Control District, San Diego, CA

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APPENDIX A

Calculation of PM_{10} Emission Reductions from Landfill Unpaved Road Treatment

PM10 EMISSIONS REDUCTIONS FROM SYCAMORE CANYON LANDFILL
UNPAVED ROAD SURFACE TREATMENT

Average Vehicle Weight Calculation

Vehicle Type	Average Weight (tons)	Number per Day
Refuse Truck, Empty	30	300
Refuse Truck, Loaded	8	300
Public Vehicle	2	150
Average Weight (tons)	**15.6**	

Uncontrolled Emission Factor Calculation

Emission Factor [lb/VMT] = 2.6 $(s/12)^{0.8}$ $(W/3)^{0.4}$ [(365 - p)/365)] / $(M/0.2)^{0.3}$

s = surface silt content (percent)
W = average vehicle weight (tons)
p = number of days per year with at least 0.01 inches precipitation
M = surface moisture content (percent)

Reference: U.S. EPA Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.2, September 1998.

Road Surface Silt Content (%)	15
Surface Material Uncontrolled Moisture (%)	0.2
Days of Precipitation per Year	40
Weekdays with Precipitation per Year	29
Uncontrolled Emission Factor (lb/VMT)	**5.53**

Control from Watering

Control Efficiency [percent] = 100 - (0.0012 x A x D x T / I)

A = Class A pan evaporation rate (inches)
D = hourly traffic
T = time between watering (hours)
I = water application rate (gallons/square yard)

Reference: Mojave Desert Air Quality Management District Emission Inventory Guidance, Material Handling and Processing Industries, 2000.

Annual Average Class A Pan Evaporation (inches)	60
Daily Traffic	750
Operating Time per Day (hours)	9.5
Hourly Traffic	78.9
Times Watered per Day	12
Time between Watering (hours)	0.79
Water Application Rate (gallons per square yard)	0.11
Control Efficiency (%)	**59.1**
Controlled Emission Factor (lb/VMT)	**2.26**

Emissions with Watering

Road Length (miles)	2
Daily VMT (daily traffic x road length)	1500
Daily Emissions (pounds)	**3395.16**
Days Operation per Year	260
Annual Emissions (tons)	**441.37**

Emissions with Surface Treatment

Daily Emissions with No Control (pounds)	8,299.28
Surface Treatment Control Efficiency (percent)	85
Daily Emissions with Surface Treatment (pounds)	1,244.89
Annual Emissions with Surface Treatment (tons)	161.84
Daily Reduction from Surface Treatment (pounds)	**2,150.27**
Annual Reduction from Surface Treatment (tons)	**279.53**

APPENDIX B

California Air Resources Board Diesel Engine Particulate Filter Verification Letters

Winston H. Hickox
Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
9528 Telstar Avenue • P.O. Box 8001 • El Monte, California 91731 • www.arb.ca.gov

Gray Davis
Governor

October 10, 2001

Mr. Marty Lassen
Johnson Matthey
434 Devon Park Drive
Wayne, Pennsylvania 19087-1816

Dear Mr. Lassen:

The Air Resources Board (ARB) previously verified that the CRT catalyzed diesel particulate filter system reduces emissions of diesel particulate matter (PM) by 85 percent or greater with a number of engine families and applications, for an emissions durability of 150,000 miles, thereby qualifying the CRT filter system as a Level 3 retrofit device. The ARB has now reviewed your subsequent request for extending the verification of the CRT filter system to include a wider range of engines in on-road applications. Based on its evaluation of the data provided, ARB hereby approves the CRT as a Level 3 retrofit device for use with 1994-2001 model year diesel engines belonging to engine families listed in Attachment 1. All such engines are:

- Certified in California for on-road applications,
- Four-stroke,
- Certified at a PM emission level of at most 0.1 grams per brake horsepower-hour (g/bhp-hr), and
- Turbocharged.

The approved engines do not employ exhaust gas recirculation (EGR) and were not certified new with diesel particulate filters. For convenience, the engine families detailed in Attachment 1 are summarized by make and representative engine series names in Table 1 below.

Table 1. Overview of Engines in Attachment 1

Model Year	Make	Engine Series
1994-2001	Caterpillar	3116, 3126, 3176, 3306, 3406, C10, C12, C15, C16 (all horsepower)
1994-2001	Cummins	L10, M11, N14, ISB, ISC, ISL, ISM, ISX, Signature, B-series, C-series (all horsepower)
1994-2001	Detroit Diesel	Series 50, Series 60 (all horsepower)
1994-2001	International	T444, DT 466, 530, 7.3 DIT (all horsepower)
1994-2001	Mack	E7, EM7 (all horsepower)
1994-2001	Volvo	VE D7, VE D12 (all horsepower)

The aforementioned extension of verification is valid provided the following operating criteria are met:

1. The engine must be operated with a fuel that has a sulfur content of no more than 15 parts per million by weight.
2. The average engine exhaust temperature must be at least 270 degrees Celsius for 40 percent of the operating cycle.
3. The engine should be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
4. Johnson Matthey must install a backpressure monitor and indicator light on all vehicles retrofitted with a CRT filter system.

Since there may be significant variations from application to application, Johnson Matthey has indicated that it will review actual vehicle operating conditions and perform temperature datalogging prior to retrofitting a vehicle with the CRT filter system to ensure compatibility.

The ARB estimates that the CRT filter system will incur no discernible fuel economy penalty when used in a compatible application.

After reviewing the submitted data, the ARB does not find that the CRT filter system has an appreciable effect on overall emissions of oxides of nitrogen.

Thank you for participating in ARB's diesel retrofit verification program. Should you have any questions or comments, please contact Ms. Annette Hebert, Chief, Heavy-Duty Diesel In-Use Strategies Branch, at (626) 575-6973.

Sincerely,

//s//

Robert H. Cross, Chief
Mobile Source Control Division

Winston H. Hickox
Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor

October 3, 2001

Mr. Kevin Hallstrom
Engelhard Corporation
101 Wood Avenue
Iselin, New Jersey 08830-0770

Dear Mr. Hallstrom:

The Air Resources Board (ARB) previously verified that the DPX catalyzed diesel particulate filter reduces emissions of diesel particulate matter (PM) by 85 percent or greater with a number of engine families and applications, for an emissions durability of 150,000 miles, thereby qualifying the DPX as a Level 3 retrofit device. The ARB has now reviewed your subsequent request for extending the verification of the DPX to include a wider range of engines in on-road applications. Based on its evaluation of the data provided, ARB hereby approves the DPX (both MEX and NEX catalyst formulations) as a Level 3 retrofit device for use with 1994-2001 model year diesel engines belonging to engine families listed in Attachment 1. All such engines are:

- Certified in California for on-road applications,
- Four-stroke,
- Certified at a PM emission level of at most 0.1 grams per brake horsepower-hour (g/bhp-hr), and
- Turbocharged.

The approved engines do not employ exhaust gas recirculation (EGR) and were not certified new with diesel particulate filters. For convenience, the engine families detailed in Attachment 1 are summarized by make and representative engine series names in Table 1 below.

Table 1. Overview of Engines in Attachment 1

Model Year	Make	Engine Series
1994-2001	Caterpillar	3116, 3126, 3176, 3306, 3406, C10, C12, C15, C16 (all horsepower)
1994-2001	Cummins	L10, M11, N14, ISB, ISC, ISL, ISM, ISX, Signature, B-series, C-series (all horsepower)
1994-2001	Detroit Diesel	Series 50, Series 60 (all horsepower)
1994-2001	International	T444, DT 466, 530, 7.3 DIT (all horsepower)
1994-2001	Mack	E7, EM7 (all horsepower)
1994-2001	Volvo	VE D7, VE D12 (all horsepower)

The aforementioned extension of verification is valid provided the following operating criteria are met:

1. The engine must be operated with a fuel that has a sulfur content of no more than 15 parts per million by weight.
2. The average engine exhaust temperature must be at least 225 degrees Celsius.
3. The engine should be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
4. Engelhard must install a backpressure monitor and indicator light on all vehicles retrofitted with a DPX.

Since there may be significant variations from application to application, Engelhard has indicated that it will review actual vehicle operating conditions and perform temperature datalogging prior to retrofitting a vehicle with the DPX to ensure compatibility.

The ARB estimates that the DPX will incur no discernible fuel economy penalty when used in a compatible application.

After reviewing the submitted data, the ARB does not find that the DPX filter system has an appreciable effect on overall emissions of oxides of nitrogen.

Thank you for participating in ARB's diesel retrofit verification program. Should you have any questions or comments, please contact me at (916) 445-4383, or Ms. Annette Hebert, Chief, Heavy-Duty Diesel In-Use Strategies Branch, at (626) 575-6973.

Sincerely,

//s//

Michael P. Kenny
Executive Officer