ASSUMPTIONS FOR AIR QUALITY AND NOISE ANALYSES
Colusa ILA

- Building will be demolished and removed from the site.

  - Demolition will be accomplished with backhoe/excavator equipped with thumb and require 3 days at 8 hours per day.
  - Semi-end dump truck with a capacity of 20 tons will remove 70 cubic yards of debris.
  - Truck will travel one way distance to most distant landfill listed for site, assumed to be 100 miles.
  - A small diesel-powered saw will cut the existing concrete pad for 1 hour to allow placement of a new pad for 4 ILA huts plus generator.

- No grading will occur.

- Pad construction, trenching (& utility installation), shelter placement, and general construction operations will occur equal to that listed for ILA on vacant land.

- No access road will be constructed.

- Four amplification huts will be installed on a new pad constructed within the existing concrete pad.

- A 12-foot by 24-foot (288 square feet) section of the existing concrete pad will be reconstructed to support the housing to be erected around the 300 kilowatt (kW) emergency generator and engine.

- Two 1-foot wide fiber optic trenches are excavated between the existing building and the property line. The maximum combined trenching distance is 1000 feet.

- Specialized construction workers commute to the site the number of days required for each activity (e.g., trenching for fiber optic cable).

- General construction workers commute to site for sum of days required for the total set of activities.

- Wind erosion conservatively assumed to affect sum of disturbed site areas during sum of days needed for pad construction and trenching. The emission factor is derived in Attachment A.

- Fugitive dust from travel of construction vehicles over site is included in emission factor of 39.4 pounds of PM10 per day per acre of construction activity area. This emission factor is conservatively applied to the total time for activities associated with pad construction, trenching, and shelter placement times the area of the installed huts. The emission factor is derived in Attachment A.

- The fugitive dust generated by trenching for the fiber optic cables is simulated by a dirt/debris pushing emission factor published in the CEQA Air Quality Handbook of the South Coast Air Quality Management District. The emission factor is derived in Attachment A.

- Each piece of construction equipment is used at its full power emission factor to be conservative (i.e., load factor =1).

ADDITIONAL ASSUMPTIONS FOR AIR AND NOISE ANALYSES

1. Water Truck emissions are not considered, except for “Workaround” sites, because the generally small areal extent of the work areas will allow dust control water to be applied using a hose from a stationary supply point and no water truck will be required.

2. For generators, the exhaust emission factors are presented in grams per horsepower-hour (g/hp-hr) for the 300 kW generator only, not in lb/hr. For generators from 400 kW – 2,000 kW, the tabulated values are presented in lb/hr. The units are given in the column heading directly above the value in question.

   For example, in Table 3, the emission factor of 2,325 g/hr NO_x is calculated as follows:

   6.9 g/hp-hr x 337 hp = 2,325 g/hr

AIR QUALITY ANALYSIS METHODOLOGY

Purpose

The purpose of this document is to describe the methodology used to analyze the potential air quality impacts of the proposed project. The analysis allows a conclusion to be reached about the possible significance of project air emissions. Project activities that affect air quality are divided into two main categories, construction and operation, because each of these categories is subject to different regulations and emission limits.

The description of methodology in this document is organized according to the following analytical sequence:
- Identify sources of emissions
- Describe source activities and parameters
- Assemble emission factors
- Compute emissions
- Identify emission thresholds and determine significance

Identify sources of emissions

The construction of a project facility is separated into the following activities:
- Site grading
- Pad construction
- Trenching and utility installation
- Access road construction
- Shelter placement
- General construction activities

The potential maximum amount of equipment that would emit air pollutants is identified within each construction activity. For example, site grading would require the use of the following types of equipment:
- Grader
- Dozer
- Integrated tool carrier
- End dump truck
- Water truck
- Equipment delivery truck
- Construction worker light truck

The construction worker light truck accounts for emissions generated by commuting back and forth between home and the site. Similar commuting emissions are calculated for the trips of workers visiting the site for operations like generator testing and maintenance.

Besides the small contribution of the worker commute to operation emissions, the other source of operation emissions is the weekly test of the emergency standby engine.

Describe source activities and parameters

Each type of offroad equipment is specified in terms of maximum or full load power (e.g., horsepower or kilowatts), type of fuel (e.g., diesel or gasoline), and example manufacturer and model (e.g., Caterpillar 14G grader). The activity of each type of offroad equipment is described in terms of the potential maximum values of the following variables:
- number of pieces of specified type

- hours worked per day
- number of days worked to complete the activity

Similarly, the activity of each type of onroad equipment is described in terms of the potential maximum values of the following variables:
- capacity (e.g., 10 cubic yards for gravel truck)
- one-way distance for each trip
- number of trips per day
- number of days worked by each piece.

Assemble emission factors

An emission factor is the quantitative amount of pollutant that is emitted per unit time or per unit energy. Example units for emission factors include grams per horsepower–hour, pounds per hour, and grams per mile. Emission factors are usually available for the following five criteria pollutants:

- nitrogen oxides (NOx)
- reactive organic compounds (ROC), also known as volatile organic compounds (VOC), or reactive organic gases (ROG)
- particulate matter with aerodynamic diameter smaller than or equal to 10 micrometers (PM10)
- sulfur oxides (SOx)
- carbon monoxide (CO)
-

Emission factors for each type of equipment are assembled from Caterpillar, the United States Environmental Protection Agency, the South Coast Air Quality Management District, and other sources.

Compute emissions

The daily emission rate of a criteria pollutant from each offroad equipment type is computed as the product of the emission factor (e.g., grams per horsepower-hour), the horsepower rating, number of pieces of the equipment type, and number of hours of use per day. Similarly, the daily emission rate of a criteria pollutant from each onroad equipment type is computed as the product of the emission factor (e.g., grams per mile), number of one-way miles per trip (times two for round trip), number of pieces of the equipment type, and number of trips per day. If the different equipment types within an activity (e.g., site grading) were to operate simultaneously, then the daily emissions rates for the equipment types would be summed to obtain the total daily emission rate. Constraints on space to operate and noise level in this project will limit the use of construction equipment to one major piece (e.g., dozer) at a time. Hence, the maximum daily emission rate for the site would be the maximum of the different equipment rates.

The total emission for the project of a criteria pollutant from each equipment type is computed as the product of the daily emission rate and the number of days of work. The emissions for the different equipment types listed for an activity are summed to obtain the total for the activity. The emissions for the different activities are summed to obtain the total for the project.

The computation of PM10 emissions accounts for exhaust emissions from mobile construction equipment, fugitive emissions from construction activities, and exhaust emissions from the emergency generator engine, which is a stationary source.

Identify emission thresholds and determine significance

The analysis depends not only on site characteristics, but also on different rules and requirements in the various Air Quality Management Districts and Air Pollution Control Districts. Each air pollution control agency may publish quantitative emission rate thresholds that act as significance criteria. Separate emission rate thresholds may also be specified to define significance for construction as compared to operations. Thresholds may be specified in terms of daily emission rates in pounds per day, quarterly rates in tons per quarter, or 12-month rates in tons per year (i.e., not calendar year).

Project emission rates are compared with the threshold emission rates. If the project does not exceed a threshold emission rate, then the project is concluded to cause no significant impact on air quality.

Fugitive PM10 Emission Factors
Level 3 Communications

Disturbed Area - Heavy Construction Emissions

EF = k*1.2 ton PM10/acre-mo (USEPA, AP-42, Section 13.2.3, Subsection 13.2.3.3, page 13.2.3-1, January 1995)

where:

k = PM10 fraction: 0.5 (SCAQMD estimate, see next section)

B) EF = 39.43 lb/acre-day

SLOCAPCD specific

EF = 0.75 ton PM10/acre-month (SLOCAPCD, 1995)

EF = 50.00 lb/acre-day

Wind Erosion - Open Storage Piles

Emission Factor (SCAQMD. CEQA Air Quality Handbook, Table A9-9-E, November 1993, and

EF = k(1.7)(s/1.5)[(365-p)/235](f/15) lb/day/acre

Backhoe I	where:	s = Silt Content (percent):	7.5	(Overburden soil)
Vac Truck		p = Number of days >= 0.01 inches preci	0	(Worst case of no rain during construction)
Surveying Lt-Heavy		f = Percent time WS > 12 mph (5.4 m/sec	15	(site specific)
Lt-Heavy Duty Truc		k = PM10 fraction:	0.5	(SCAQMD estimate)
Worker Light Truck				

EF = 6.60 lb/acre/day (worst case)

Dirt/Debris Pushing Operations

Emission Factor (SCAQMD Table A9-9-F):

EF = [(0.45)(G^1.5)/(H^1.4)](I) lb/pushing-hour

where:	G = Silt Content (percent):	7.5	(Overburden soil)
	H = Moisture content of soil (percent):	14	
	I = Conversion factor kg/hr to lb/hr:	2.2046	

EF = 0.51 lb/pushing-hour (soil)

Fugitive PM10 Emission Factors
Level 3 Communications

Vehicles on Unpaved Roadways

Emission Factor (SCAQMD Table A9-9-D):

EF = 2.1 (G/12) (H/30) [(J/3)^0.7] [(I/4)^0.5] [(365-K)/365] lb/vmt

where	G = Silt Loading (%):	4 (gravel road)
	H = Mean Vehicle Speed (mph):	15 (average speed)
	J = Mean Vehicle Weight (tons):	varies, see table below
	I = Number of Wheels:	varies, see table below
	K = Number of Days > 0.01 in. Precipitat	0 (worst case)

Parameter	-		Cement		-	
	Loaded	Unloaded	Loaded	Unloaded	Loaded	Unloaded
J	34	12	20.9	13.5	98	76
I	18	18	10	10	4	4
EF lb/VMT	4.06	1.96	2.15	1.59	4.02	3.36

Parameter	Gravel Haul		Lt. Truck/Auto		Med/Heavy Duty Truck	
	Loaded	Unloaded	Loaded	Unloaded	Loaded	Unloaded
J	40	13	2.5	2	5	4
I	18	18	4	4	6	6
EF lb/VMT	4.58	2.07	0.31	0.26	0.61	0.52

Fugitive PM10 Emission Factors
Level 3 Communications

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NOISE ANALYSIS METHODOLOGY

1.0 Introduction

A noise analysis was conducted for the Level 3 Communications project in order to evaluate compliance with local noise standards. The analysis was conducted for all of the sites in California. The analysis included a review of the local noise standards applicable to each project site and calculation of noise levels.

2.0 Assumptions

2.1 Background Noise Levels

Because of the number of the sites involved and in order to simplify the analysis, background noise levels (ambient) for each site were established from published average background noise levels for areas based on land use (Schomer and Associates, 1991). These background levels were developed using monitoring studies performed in the Chicago area and conducted in a variety of land use settings that included the following:

Area Land Use Description	Background Ambient Noise Level (dBA)	
	Nighttime – L_{an} (10p.m.-7a.m.)	Daytime - L_{ad}
1. Noisy commercial and industrial	59	69
2. Moderate commercial and industrial, and noisy residential	52	60
3. Quiet commercial and industrial, and moderate residential	47	52
4. Quiet residential	41	46
5. Very quiet, sparse suburban or rural	35	40

The generic background data provided in the reference were by whole octave bands, from 31 to 8000 Hz. The background octave band levels were combined into an overall A-weighted L_{eq} level for each type of land use by applying the A-weight factors to each octave band level and then logarithmically adding the octave bands together. These combined overall L_{eq} levels, presented above, were used in the assessment. The A-weighting factors, by octave band, are provided below.

Octave Band	A-weight (dB)
31	-39.4
63	-26.2
125	-16.1
250	-8.6
500	-3.2
1000	0
2000	+1.2
4000	+1.0
8000	-1.1

The land use category for each site was established based on observations made during the site investigation.

2.2 Construction Equipment Noise Levels

Noise level data for a variety of construction equipment were evaluated. The data were obtained from *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances* (EPA, 1971). It was assumed for all sites, based on the referenced document, that the loudest equipment to be used in the proposed project has a rating of 84 dBA at 50 feet.
Operational Noise

The generators are assumed to operate only during daytime hours (usually 7 a.m. to 7 p.m.) and for a maximum of 30 minutes during any day.

3.0 Significance Criteria

Significance criteria were determined based on the applicable local noise standard for each project site. The standards were obtained either through personal communication with public employees/officials, or the town/city zoning code or other published information. This included standards for construction and operational noise where applicable.

4.0 Analysis Methodology

Construction and operation noise were calculated using a conservative approach where only the attenuation associated with distance (spreading of the sound wave) was considered. No credit was taken for any atmospheric absorption or attenuation which may be provided by natural or man-made barriers (e.g., intervening terrain, buildings). Attenuation with distance was calculated using the expression:

$$L_f = L_I - [20 \log_{10} (D/D_r)]$$

where:

L_f = Final noise level
L_i = Initial source noise level
D = Distance from source
D_r = Reference distance from source

Distances to the nearest receptors were obtained during the site investigations. Source noise levels for the construction equipment were obtained from the literature as described previously. Noise level data for the generator mechanical and exhaust noise were obtained from the manufacturer. At each site, the noise levels were extrapolated to the nearest receptor based on the above expression in order to arrive at a construction and operation noise level.

Compliance with the applicable threshold was then made by evaluating each noise source level at the receptor. In cases where the standard threshold required compliance with a one-hour L_{eq} level , the source level at the receptor was weighted equally with the daytime background ambient noise level, each for one half hour, and then compared to the threshold. When the standard specified an L_{dn} or CNEL level, the 1 hour L_{eq} level was used in a 24-hour time-weighted average with both daytime and nighttime ambient levels.

Both the L_{dn} and CNEL are composites of 24-hour noise levels which penalize evening (7p.m.-10p.m.) and nighttime noise to account for the greater sensitivity of receptors at those times; these are defined below:

L_{dn} — The L_{dn} is defined as the day-night noise level. It is the A-weighted sound level over a 24-hour period with an additional 10 dB penalty imposed on noise occurring between 10 p.m. and 7 a.m.

CNEL — The CNEL is defined as the community noise equivalent level. The CNEL was developed in California for evaluating noise levels in residential communities. The CNEL is similar to the L_{dn}, but adds an additional 5 dB penalty to noise occurring between 7 p.m. and 10 p.m.

The derived expressions for L_{eq}, L_{dn}, and CNEL, used in the analyses, are as follows:

$$L_{eq} = 10 \cdot \log \frac{[10^{(L_{ad}/10)} + 10^{(L_{ad}/10)} + 10^{(Lf/10)}]}{2}$$

$$L_{dn} = 10 \cdot \log \frac{\frac{[10^{(L_{ad}/10)} + 10^{(L_{ad}/10)} + 10^{(Lf/10)}]}{2} + [9 \cdot 10^{(L_{an}+10)/10}] + [14 \cdot 10^{(L_{ad}/10)}]}{24}$$

$$CNEL = 10 \cdot \log \frac{\frac{10^{(L_{ad}/10)} + 10^{(L_{ad}/10)} + 10^{(Lf/10)}}{2} + [9 \cdot 10^{(L_{an}+10)/10}] + [3 \cdot 10^{(L_{ad}+5)/10}] + [11 \cdot 10^{(L_{ad}/10)}]}{24}$$

5.0 Findings

The results of the analysis are discussed in the noise checklist for each site.

6.0 Design Features

Where needed, special design features would be incorporated to assure compliance with the standard. One or more of the following features would be incorporated as required.

Construction

- Limit the size of diesel powered equipment. Noise produced by construction equipment is usually dictated by the horsepower rating of the diesel engine. Limiting the size of the engines will result in lower offsite noise levels.
- Increase the distance of construction activities from the receptors. Increasing the distance separating the construction site from the receptors will take advantage of the noise attenuation associated with distance.
- Lease specially-muffled pieces of heavy construction equipment.

Operation

- Increase the distance of the generators from the receptors. Increasing the distance separating the construction site from the receptors will take advantage of the noise attenuation associated with distance.

- Increasing the insulating and/or transmission loss properties of the enclosures to be used on the generators will result in lower sound levels

CALCULATION OF COMBINED EXHAUST AND MECHANICAL NOISE FOR EACH GENERATOR WITHOUT NOISE ATTENUATION

<u>Total Noise Level 300 KW Generator</u>

Ne = Exhaust Noise Level @ 50 ft (dBA) =	*N/A*
Nm – Mechanical Noise Level @ est=50 ft (dBA) =	*N/A*
Ntot = Data provided by MFR =	***84***

<u>Total Noise Level 400 KW Generator</u>

Ne = Exhaust Noise Level @ 49.2 feet (est=50 ft) (dBA) =	90
Nm = Mechanical Noise Level @ 49.2 feet (est=50 ft) (dBA) =	*82*
*Ntot = 10*log (10^(Ne/10) + 10^(Nm/10)) =*	***91***

<u>Total Noise Level 800 KW Generator</u>

Ne = Exhaust Noise Level @ 49.2 feet (est=50 ft) (dBA) =	*92*
Nm = Mechanical Noise Level @ 49.2 feet (est=50 ft) (dBA) =	*88*
*Ntot = 10*log(10^(Ne/10) + 10^(Nm/10)) =*	***93.5***

<u>Total Noise Level 1250 KW Generator</u>

Ne = Exhaust Noise Level @ 49.2 feet (est=50 ft) (dBA) =	*95*
Nm – Mechanical Noise Level @ 49.2 feet (est-50 ft) (dBA) -	*88*
*Ntot = 10*log(10%(Ne/10) + 10^(Nm/10)) =*	***95.8***

<u>Total Noise Level 1750 KW Generator</u>

Ne = Exhaust Noise Level @ 49.2 feet (est=50 ft) (dBA) =	*95*
Nm = Mechanical Noise Level @ 49.2 feet (est=50 ft) (dBA) =	*92*
*Ntot = 10*log(10^(Ne/10) + 10^(Nm/10)) =*	***97***

<u>Total Noise Level 2000 KW Generator</u>

Ne = Exhaust Noise Level @ 49.2 feet (est=50 ft) (dBA) =	*96*
Nm – Mechanical Noise Level @ 49.2 feet (est=50 ft) (dBA) -	*92*
*Ntot = 10*log(10^(Ne/10) + 10^(Nm/10)) =*	***97.5***
	Use 98 dba