Appendix G

Screening Level Health Risk Assessment for the TU MSHCP

SCREENING LEVEL
HEALTH RISK ASSESSMENT
FOR THE
TEHACHAPI UPLAND MULTIPLE SPECIES
HABITATCONSERVATION PLAN

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1.0 INTRODUCTION

1.1 Background/Methodology

This screening level health risk assessment (HRA) was prepared to estimate the potential cancer risks associated with diesel particulate matter (DPM) emissions resulting from off-road equipment that would be used during construction of residential and commercial development under the Proposed Tehachapi Upland Multiple Species Habitat Conservation Plan (Proposed TU MSHCP) Alternative. Due to the uncertainty of the location of actual construction, the associated DPM emissions, and the location of potential receptors, it is not possible to determine exactly where future receptors (either residences or workplaces) would be located at any given time over the course of construction. As a result, a scenario was developed to estimate the cancer risks to potential sensitive receptors resulting from ongoing construction activities in their general vicinity. In this scenario, a 5-acre construction site was selected to represent a reasonable simulation of the average acreage in which construction activity (e.g., grading, building construction) would occur over an extended period. The purpose of the analysis is to determine whether sensitive receptors in the vicinity of the simulated construction site would be exposed to a cancer risk of greater than 10 in one million,[1] and if they would be exposed to this level of risk, to determine an allowable proximity of future construction activity to sensitive receptors to avoid significant health impacts.

[1] This analysis looks to the San Joaquin Valley Air Pollution Control District (SJVAPCD) guidance, which provides that cancer risks are significant if the probability of contracting cancer for the Maximally Exposed Individual exceeds 10 in one million. Although these significance thresholds were developed by the air districts for use by state and local agencies in the CEQA process - rather than Federal agencies in the NEPA process - they represent the expert opinions of the relevant air districts regarding levels at which emissions of certain air pollutants represent significant impacts.

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2.0 SOURCES AND RECEPTORS

2.1 Construction Phase Emissions of TACs

During the construction phase of any development, DPM will be temporarily generated from equipment exhaust. For this analysis, Dudek has assumed that DPM consists of particulate matter with an aerodynamic diameter less than or equal to 10 micrometers. No other significant toxic air contaminant (TAC) emissions would be associated with construction.

As indicated in the Section 4.3 of the *Tehachapi Upland Multi-Species Habitat Conservation Plan Supplemental Draft Environmental Impact Statement* (SDEIS), construction activities associated with residential and commercial development under the Proposed TU MSHCP Alternative were divided into seven 4-year phases over a 28-year construction period. Additional details regarding the calculation of construction emissions and the estimated emissions can be found in Section 4.3 and Appendix F of the SDEIS.

The area in which construction would occur will vary depending on the type and magnitude of the activity (e.g., grading, building construction). It is unlikely that construction equipment would be presented near potential receptors for an extended period of time. That is, the construction equipment would move throughout a larger construction area. For purposes of this analysis, it was assumed that construction activity could exist within a 5-acre area near receptors during a 4-year phase. While the area may be larger or smaller, this area is believed to represent a reasonable simulation of possible construction activity for the purpose of this screening level HRA.

Construction-related emissions of DPM would vary substantially, depending on the level of activity, length of construction period, specific construction operations, and types of equipment. The maximum DPM emissions from off-road diesel equipment[2] would occur during the first 4-year phase of construction (2013-2016). Over the course of this phase, off-road equipment exhaust emissions of DPM would total 4.57 tons distributed over a 903-acre Phase 1 site (refer to Section 4.3 and Appendix F of the SDEIS). This is equivalent to an emission rate of approximately 1.44 $x10^{-3}$ pounds per hour distributed over the simulated 5-acre site used for the purposes of this analysis as shown in the following calculation:

[2] While DPM emissions would also be generated by heavy-duty diesel delivery and haul trucks and smaller diesel worker trucks, their emissions would be widely distributed and not generally concentrated in one location near potential receptors. Thus, only the DPM emissions from off-road diesel equipment were analyzed.

$$4.57 \text{ tons/phase} \times 2000 \text{ lbs/ton} \div 4 \text{ years/phase} \times 5 \text{ acres}/903 \text{ acres} \div (365 \text{ days/yr} \times 24 \text{ hrs/day}) = 1.44 \times 10^{-3} \text{ lbs/hr}$$

While the construction activity would likely occur 8 to 10 hours per day and approximately 250 days per year, the cancer risk is calculated on an annual basis; thus, the hourly emission rate may be annualized as well, provided this emission rate is applied in the dispersion model to all hours of the day and all days of the year. Due to the effect of meteorological conditions, this approach tends to result in a more conservative (higher) estimate of the modeled concentrations.

2.1 Potential Receptors

As the residential and commercial development would proceed, residences and workplaces would be located in the vicinity of construction of future development. The specific location of these receptors is not known. Cancer risks to sensitive receptors, such as residents, were determined for this analysis because such receptors are assumed to be exposed for a longer period (e.g., 24 hours per day, 350 days per year) than workplace receptors (e.g., 8 hours per day, 245 hours per year).

As the proposed project is built out, sensitive receptors (new residential development, schools, etc.) may be located near construction activities. As previously mentioned, the purpose of this analysis is to determine whether the maximum cancer risk would exceed 10 in one million and if so, the allowable proximity of future construction activity to sensitive receptors to avoid significant health impacts.

3.0 AIR DISPERSION MODELING

The EPA-approved dispersion model AMS/EPA Regulatory Model (AERMOD), Version 7.1.0 (Lakes Environmental 2011) was used to calculate the health impacts associated with DPM emissions from off-road construction equipment (AERMOD output files are included in Appendix A). The AERMOD Terrain Preprocessor (AERMAP) was not used for this analysis, since the model is not modeling a particular site but rather a simulated 5-acre construction site that could occur anywhere within the overall development area. Accordingly, AERMOD was run assuming flat terrain (i.e., the receptors are at the same elevation as the base of the DPM source area).

3.1 Site-Specific Meteorological Data

AERMOD-ready meteorological data available from the Tejon Ranch Company were used in the AERMOD model. Three years of on-site meteorological and air quality data (2005 through 2007) were collected from a monitoring station located in Lebec, California at a location approximately 300 meters east of Interstate 5. The meteorological data files were obtained from Erler & Kalinowki, Inc., which had performed an HRA for Environmental Impact Report for the Tejon Mountain Village project (Kern County 2009) using the Lebec data processed with the AERMOD Meteorological Preprocessor program (AERMET) (Cuadrado 2011). A wind rose illustrating prevailing wind speeds and directions for the period from 2005 through 2007 is shown in Figure 1. As shown, the wind direction data show a strong northwest-southeast pattern.

3.2 Source Modeling

Emissions from diesel mobile equipment were modeled using the area source option in AERMOD. 49 area sources with dimensions of 20 meters by 20 meters were utilized to create an approximately 5-acre source area with emissions dispersed equally throughout. A constant emission rate of 1.44 $x10^{-3}$ pounds per hour over the 5-acre source area was used for modeling purposes (refer to Section 2.1). This emission rate was divided among the 49 area sources, resulting in an emission rate of 2.95 x 10^{-5} pounds per hour for each area source. Based on California Air Resources Board (CARB) risk assessments for mobile DPM sources, a release height of 4.15 meters was utilized for all area sources, and an Initial Vertical Dimension (IVD) of 0.965 was calculated based on SJVAPCD guidance (IVD = release height / 4.3). The emission rate was applied to each hour of day and all days of the year, as indicated previously. For additional details regarding source modeling protocol, please refer to the AERMOD input file in Appendix A.

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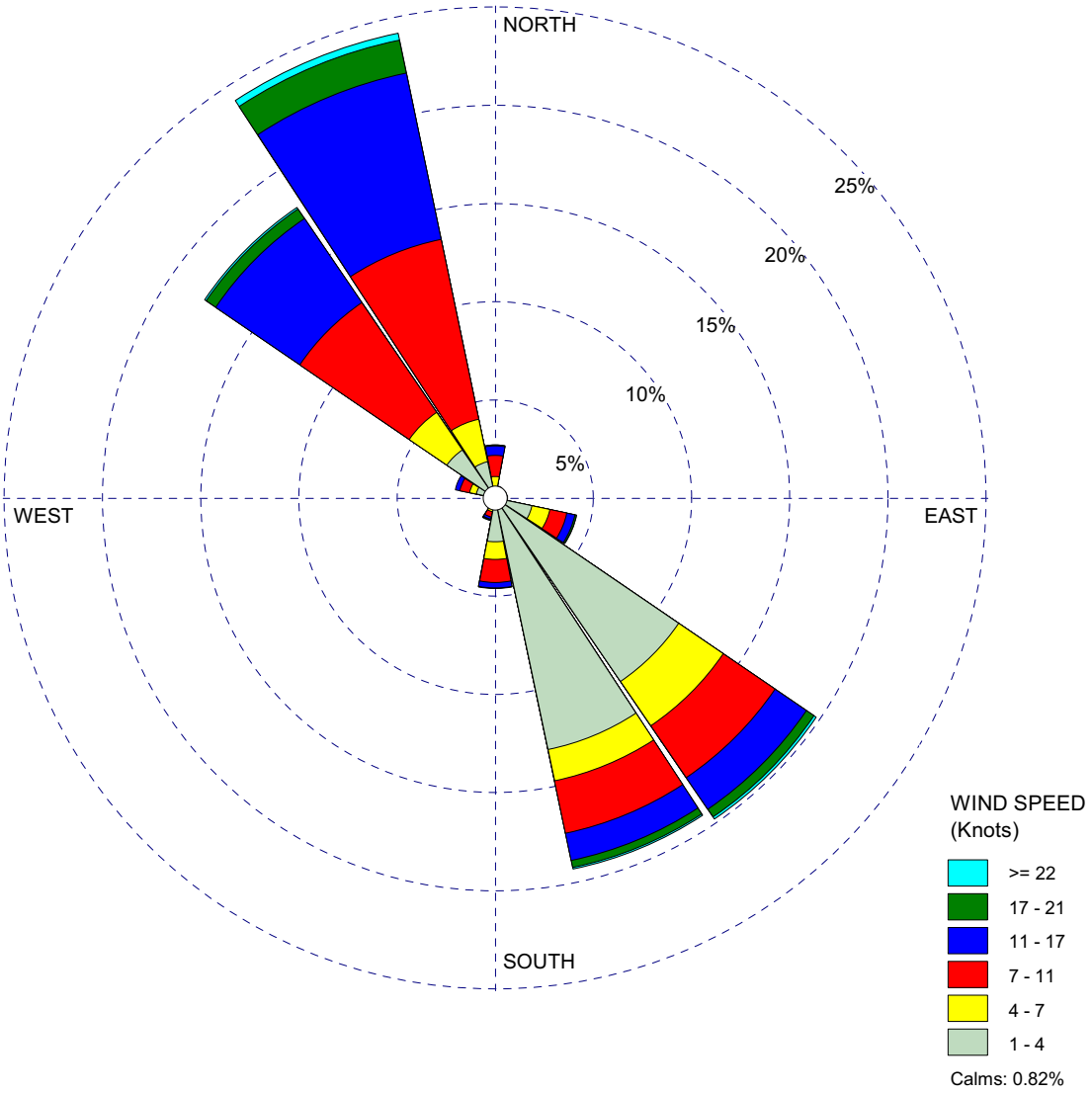

DATA PERIOD:	CALM WINDS:	TOTAL COUNT:
Start Date: 1/1/2005 - 00:00 **End Date: 3/30/2008 - 23:00**	**0.82%**	**28397 hrs.**
	AVG. WIND SPEED:	DATE:
	7.50 Knots	**6/21/2011**

DUDEK

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FIGURE 1

Wind Rose of Station #23187 - Lebec Monitoring Station, CA

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3.3 Receptor Modeling

A nested grid of receptors was set up around the 5-acre source area. A receptor interval spacing of 25 meters, starting at the boundary of the source area, was used around the perimeter out to 100 meters (consistent with SJVAPCD guidance). The receptor interval increased to 50 meters within 250 meters of the source area, 100 meters within 500 meters of the source area, 250 meters within 1,000 meters of the source area, and 500 meters within 2,000 meters of the source area. The default ground-level elevation value for receptor locations was used (i.e., AERMOD calculates airborne concentrations at ground level). For additional details regarding source modeling protocol, please refer to the AERMOD input file in Appendix A.

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4.0 EVALUATION OF CANCER RISK

4.1 DPM Concentration

The maximum predicted concentration of DPM would be 0.025 $\mu g/m^3$ and would be located along the northwestern boundary of the 5-acre source area. Additional information is included in the AERMOD output file (Appendix A).

4.2 Cancer Risk Calculation

The cancer risk calculations were performed by multiplying the modeled DPM concentrations from AERMOD by the appropriate risk values. The exposure and risk equations that are used to calculate the cancer risk at residential receptors are taken from the California Environmental Protection Agency Office of Environmental Health Hazard Assessment (OEHHA) manual for health risk assessments prepared under the Air Toxics Hot Spots program (OEHHA 2003).

The potential exposure pathway for DPM includes inhalation only. Sensitive receptors in the vicinity of any given phase of construction would be exposed to DPM concentrations over a 4-year period; therefore, the cancer risk calculations for all exposures assume that a receptor is exposed continuously for 4 years. Cancer risks were evaluated using the factors and equations identified in the OEHHA risk assessment manual (OEHHA 2003), which are indicated below:

Cancer risk = C_{air} * (Slope Factor * DBR * A * EF * ED * 10^{-6} / AT)

where:

C_{air}	=	concentration of DPM in microgram per cubic meter ($\mu g/m^3$)
Slope Factor	=	1.1 $(mg/kg\text{-}day)^{-1}$ for DPM,
DBR	=	breathing rate in liter per kilogram of body weight per day (393)
A	=	inhalation absorption factor (1 for DPM)
EF	=	exposure frequency in days per year (350)
ED	=	exposure duration in years (4)
AT	=	averaging time period over which exposure is averaged in days (25,550 days for 70 years)

This equation can be simplified to the following:

Cancer risk = C_{air} * 23.69 * 10^{-6} = C_{air} * 23.69 "in one million"

Utilizing a maximum DPM concentration of 0.025 $\mu g/m^3$ (maximum predicted concentration from AERMOD) in the above equation results in a cancer risk of 0.6 in one million, which is less than 10 in one million.

5.0 CONCLUSIONS

Based on this analysis, the health impacts resulting from construction activities associated with the proposed project would not exceed an incremental cancer risk of 10 in one million, since the maximum anticipated cancer risk was 0.6 in one million. As a result, construction activities near sensitive receptors over the course of project construction are not anticipated to create significant health impacts to those receptors.

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6.0 REFERENCES

Cuadrado, Claudia. 2011. Email communication between Claudia Cuadrado (Erler & Kalinowski, Inc.) and David Deckman (Dudek). June 1.

Kern County (Kern County Planning Department). 2009. Tejon Mountain Village Final Environmental Impact Report. SCH no. 2005101018. Encinitas, California: Prepared by Dudek for Kern County Planning Department. October 2009.

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OEHHA (California Environmental Protection Agency Office of Environmental Health Hazard Assessment). 2003. Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August.

SJVAPCD (San Joaquin Valley Air Pollution Control District). 2006. Guidance for Air Dispersion Modeling (Draft). August.

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APPENDIX A

AERMOD Modeling Files