DISPERSION MODELING OF CONSTRUCTION-GENERATED PM$_{10}$ EMISSIONS

1.0 INTRODUCTION

The purpose of these guidelines is to ensure that all dispersion modeling conducted for construction projects in Sacramento County are performed consistently and use methodologies and input parameters that have been evaluated and approved by the District. These guidelines are the result of sensitivity tests conducted for multiple input parameters required by AERMOD, as well as modeling guidance established by the U.S. Environmental Protection Agency (EPA), California Air Resources Board (ARB), and other air districts in California.

This modeling guidance provides instructions for selecting the input parameters required by the AERMOD dispersion model with or without one of the proprietary software interface programs such as Lakes Environmental's ISC-AERMOD View, the BEEST suite made by Bee-Line Software, or BREEZE Software made by Trinity Consultants. Regardless of whether interface software is being used or which type, the input parameters required by AERMOD and the selection of those parameters are provided in this guidance.

AERMOD consists of multiple "pathways" that require input data before a dispersion run can be performed. Each of the key input parameters for modeling construction-generated emissions of PM$_{10}$ are presented under each of AERMOD's pathways below.

2.0 MODELING GUIDANCE

2.1 CONTROL PATHWAY

The Control Pathway allows the user to specify the overall job control options such as dispersion options, pollutant type, and averaging times. The following parameters shall be selected in this pathway:

Pollutant Type: PM$_{10}$ (pre 97 National Ambient Air Quality Standard)

Averaging Time: Select an averaging time of 24 hours because the metric of the California Ambient Air Quality Standard for PM$_{10}$ is a 24-hour average.

Dispersion Coefficient: Choose either Rural or Urban using the Land Use Procedure or Population Density Procedure, as recommended by the EPA (70 FR 68218, November 9, 2005).

2.2   SOURCE PATHWAY

The Source Pathway allows the user to specify the source input parameters and source group information such as emission source types, and variable emission rates. The following parameters shall be selected in this pathway:

Source Characterization: Construction-generated emissions of PM$_{10}$ shall be characterized using multiple volume sources. One set of multiple ground-level (i.e., a **release height** of 0 meters) volume sources shall be used to characterize fugitive PM$_{10}$ dust emissions and another set of elevated volume sources with a **release height** of 5.0 meters shall be used to represent PM$_{10}$ exhaust emissions generated by construction equipment that will be active on the project site.

The number of volume sources in each set (i.e., fugitive and exhaust) shall be equal. Thus, every individual volume source in the set representing fugitive PM$_{10}$ dust emissions shall have a corresponding volume source in the set of representing PM$_{10}$ exhaust emissions with the same **X- and Y-coordinates**. Only the release heights of the two sets of volume sources shall be different.

The **base elevation** of all volume sources (and receptors) shall be 0 meters, unless the project site contains variable elevations.

The **lateral length** (in both the X- and Y directions) of every volume source shall be equal.

Spacing and Layout of Volume Sources: Each set of volume sources shall be spaced evenly across the project site as much as possible according to the following parameters.

- At least 50% of the project site area shall be covered by each set of volume sources.

- For each acre of the modeled site there shall be a minimum of 4 volume sources representing fugitive PM$_{10}$ dust emissions and a minimum of 4 volume sources representing PM$_{10}$ exhaust emissions.

- The distance from each vertex (e.g., a corner of a rectangular shaped site) of the project site boundary to the center of the nearest volume source shall not exceed the length of the side of a single volume source.

Thus, a square-shaped site shall always have a square number of volume sources.

Initial Lateral Dimension: The initial lateral dimension shall be equal to the distance (laterally along the X- or Y-axis) between center points of volume sources divided by 2.15, as recommended in EPA's User's Guide for the Industrial Source Complex Dispersion Models.

Initial Vertical Dimension: The initial vertical dimension of all volume sources shall be 1.0 meter.

Emission Rates: Emission rates shall be based on the level of construction activity and the number and types of equipment that will be used to grade the maximum daily acreage of the project. Typically, maximum daily mass emission levels of fugitive PM$_{10}$ dust and equipment PM$_{10}$ exhaust shall be estimated using the CALEEMOD model, AP-42 emission factors for heavy construction operations, exhaust emission rates listed on the Data Entry worksheet of the District's Roadway Construction Emissions Model, or other District-approved methodology.

Emission rate estimates that are based on CALEEMOD-generated mass emission levels (expressed pounds per day) can account for the implementation of the District's Basic Construction Emission Control Practices, which result in a default 55% reduction of fugitive PM$_{10}$ dust emissions from soil disturbance activities, as described in Section 3.4.1, Basic Construction Emission Control Practices. The fugitive PM$_{10}$ dust emission rates can be further reduced to a combined 75% if the project also implements the District's Enhanced Construction Emission Control Practices, as described in Section 3.4.2, Enhanced Construction Emission Control Practices. Similarly, the emission rates used for PM$_{10}$ exhaust emissions (from off-road equipment) may account for the 45% reduction resulting from implementation of the District's Enhanced Exhaust Control Practices, which reduce exhaust emissions from off-road diesel equipment, as also described in Section 3.4.2, Enhanced Construction Emission Control Practices. Reductions may also be applied for the implementation of any other PM$_{10}$ control measures, or to emission rates estimated using the Roadway Construction Emissions Model or AP-42 guidance, with approval from the District.

The total maximum daily mass emissions from each emissions source (i.e., fugitive dust and equipment exhaust) shall be converted to a rate (grams per second) based on the number of hours in which construction activity would occur each day. Then divide this rate by the number of volume sources in the set that represents the respective source type and enter into the AERMOD model for each volume source.

2.3   RECEPTOR PATHWAY

The Receptor Pathway allows the user to specify the receptor locations for a particular model run, and define the number and type of receptors in the project area. The following parameters shall be selected in this pathway:

Discrete Receptors: Discrete receptors shall be added to ensure that specific nearby sensitive receptors are represented in the model. In this context sensitive receptors include residences, schools, places of employment, recreational areas, or any other locations where one or more individuals are anticipated to be for an extended, continuous period of time.

Receptor Grid: A receptor grid may be used to represent an area of nearby sensitive receptors such as a residential neighborhood, commercial area, or recreational field. The District recommends that the spacing of a receptor grid be 10 meters.

At a minimum, the modeling shall account for all receptor locations located within one quarter of a mile from the construction site boundary.

If desired, the modeling may want to include a grid of receptors that encompasses the entire area around the construction site. Generally, the District recommends the use of a uniform grid of receptors (e.g., fence line, polar, or Cartesian grid) that extends approximately twice the maximum width of the construction site being modeled. For example, if the maximum daily disturbed area is a rectangle that is 2,000 feet wide and 1,000 feet long then the receptor grid shall extend at least as far as 4,000 feet from all boundaries of the disturbance area. Thus, a Cartesian receptor grid would cover an area that is 6,000 feet wide and 5,000 feet long. The District generally recommends that the tiers of the receptor grid be spaced 10 meters apart at 10-meter intervals.

Fence Line Receptors: It is not necessary to include any fence line receptors unless sensitive receptors are located along the fence line.

Flagpole Height: The flagpole height of all receptors shall be 1.8 meters, unless otherwise known.

2.4   METEOROLOGY PATHWAY

The Meteorology Pathway allows the user to specify the input meteorological data file and other meteorological variables, including the range of dates to process from the meteorological files. It is important that all modeling in Sacramento County use the meteorological data that is approved by the District. The processed meteorological data will consist of a processed surface met data file (*.sfc) and a processed profile met data file (*.pfl).

2.5   OUTPUT PATHWAY

The Output Pathway allows the user to specify the output options for a particular run.

For the purposes of modeling construction-generated PM$_{10}$ emissions, the highest modeled 24-hour concentrations will be needed. The user can select the number of highest estimated concentration values generated by AERMOD. This tabular output will consist of a table showing the highest 24-hour concentrations of PM$_{10}$ estimated, the coordinates of the receptor at which each of these concentrations occur, and the date from the met data when each concentration occurs. Thus, it is possible that more than one of the highest concentrations could occur at the same receptor point but on different dates.

In the ISC-AERMOD View software developed by Lakes Environmental this is known as a High Values Table interface. Also, in this particular software interface, the user shall select the 1st Highest Maximum Values Table, rather than use the built-in method of discarding high values in the MAXTABLE Viewer tool.

3.0   ADDITIONAL INPUT PARAMETERS

Selections for all input parameters not mentioned in this memorandum shall be made according to guidance from the following sources:

- EPA's AERMOD Implementation Guide.

- Revision to EPA's Guideline on Air Quality Models as presented in (70 FR 68218, November 9, 2005).

- Any additional guidance provided by the District.