Procedures for Modeling PM2.5

October 4, 2011

Background:

Significant Impact Levels (ug/m^3)

24 hour = 1.2
Annual = 0.3

PM2.5 Conversion Ratios[1]

NO_X = 2.629 lbs NO_X/PM2.5
SO_X = 1.0 lbs SO_X/ PM2.5

Options:

Tier 0 - No Net Increase

1. Modeling of PM2.5 impacts will not be required for projects with no net increase in permitted PM2.5 emissions.

Tier I – Minor PM2.5 NSR Projects Only

1. For minor NSR sources, primary PM2.5 will be modeled and secondary formation of PM2.5 will be exempted until guidance is developed / provided by EPA and the District has developed streamlining tools and guidance to address secondary formation from these sources.
   - A Minor PM2.5 NSR Project is defined as a project that is less than 100 tons per year of PM2.5 or a project at a Major PM2.5 Source with an increase less than 10 ton per year of PM2.5, and less than 40 tons per year of NO_X, and less than 40 tons per year of SO_X, as provided in District Rule 2201 Sections 3.24.1 and 3.18.1.4.

Tier II – AERMOD PM2.5 Modeling – Major PM2.5 NSR Projects

1. Use the Air Resource Board's (ARB's) Particulate Matter (PM) Speciation Profile to determine PM2.5 emissions based on PM10 emission estimates.
2. Model primary PM2.5 using 5-years of meteorological data to determine maximum annual and 24-hour primary PM2.5 concentrations. Compare the results to the PM2.5 Significant Impact Levels (SILs) or 0.3 micrograms per cubic meter annual average concentration and 1.2 micrograms per cubic meter 24-hour concentrations. The SILs are never-to-be-exceeded values. If the primary PM2.5 concentrations exceed the SILs, there is no need to proceed further. Go to Tier III.

   Please note: 1) A post processor will be needed to combine each of the files below (PM2.5– 24Hr, NO_2– 24Hr, and SO_2 – 24Hr) and 2) The PM2.5 modeling evaluation will be limited to the months of October thru March (Modeled PM2.5 Season) as they provided the chemistry needed for the formation of secondary PM2.5. This period encompass the District's actual PM2.5 season which is from approximately November thru February. By including a month before and after the actual period it will ensure that any seasonal variation is considered / included in the modeled results.

[1] The conversion ratios provided here for NOx and SOx are extremely conservative compared to EPA's previous default ratios of 40:1 and 100:1. Therefore the use of these ratios for evaluating secondary formation is expected to overestimate emissions. The District is working to refine these numbers and will update this document as needed to reflect any updated information and analysis.

3. Model primary PM2.5 emissions during Modeled PM2.5 Season using 5-years of meteorological data. Create a post-file of the results of 24-hour concentrations.
4. Model nitrogen oxides emissions during Modeled PM2.5 Season using 5-years of meteorological data. Create a post-file of the results of 24-hour concentrations.
    a. Calculate secondary formation of nitrates using a conversion ratio of 2.629 lbs of oxides of nitrogen per lb. of PM2.5.
5. Model oxides of sulfur emissions during Modeled PM2.5 Season using 5-years of meteorological data. Create a post-file of the results of 24-hour concentrations.
    b. Calculate secondary formation of sulfates using a conversion ratio of 1.0 lbs of oxides of sulfur per lb. of PM2.5.
6. Using a post-processor, combine the predictions of primary and secondary PM2.5 formation to determine total annual and 24-hour average concentrations at each receptor. Compare the maximum total PM2.5 concentrations to the SILs.
7. If below SILs no further modeling required, project passes.

Tier III – Offsets Required

The source fully offsets all Primary PM2.5 and Secondary PM2.5 (oxides of nitrogen, and oxides of sulfur) emissions, project passes.

Options for Future Consideration

CALPUFF Modeling (EPA Approved)

Option A – Modeling for Each Project:

1. Use the CALPUFF model with meteorological data from Valley airports to model the specific source.

Option B – Streamlining Tool (Look-up Chart):

1. Model common sources that are known to cause trouble.
2. Use the modeling results to create a matrix to estimate secondary concentrations.

CALPUFF Modeling (Non-EPA version)

1. Collect any evaluation studies that may be available for the new version of CALPUFF and/or for its chemical mechanism.
2. Provide evidence for the new version to the Board and ask them to accept it as a refined model for certain classes of sources.
3. Establish a protocol for modeling consultants to use in providing studies to the District to support permit applications.