Implementing Appendix W for Refined Hot-Spot Analysis

David Kall, FHWA
Michael Claggett, FHWA

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• What is Appendix W? How did it change in 2017?
• What is AERMOD? How does it work?
• What activities are involved in a PM Quantitative Hotspot (Refined) Analysis?
• Summary
WHAT IS APPENDIX W?
HOW DID IT CHANGE IN 2017?
  – [https://www.epa.gov/scram/air-quality-dispersion-modeling](https://www.epa.gov/scram/air-quality-dispersion-modeling)

• Provides EPA’s preferred models, other techniques, and guidance for estimating ambient concentrations of air pollutants (dispersion modeling)

• Used for SIP modeling, permitting, conformity and other air quality assessments

• For FHWA, affects CO and PM hot-spot analyses for transportation conformity purposes
January 17, 2017 Final Rule revised Appendix W

CO Screening Analysis
- Continue to rely on 1992 CO guidance that employs CAL3QHC

Refined mobile source applications
- AERMOD replaces CALINE as preferred model after transition period
- Continue to choose AERMOD or CALINE3/CAL3QHCR for any refined analysis started before the end of the 3-year transition period (January 17, 2020)
Defining Analysis Terms

• **Hot-Spot Analysis**
  – an estimation of likely future localized pollutant concentrations and a comparison of those concentrations to the relevant NAAQS (40 CFR 93.101)

• **Screening model***
  – simple techniques using preset, worst-case meteorology
  – conservative estimates of air quality impacts

• **Refined model***
  – detailed treatment of physical and chemical atmospheric processes,
  – detailed and precise input data
  – more specialized concentration estimates

*Paraphrased from Appendix W Section 2.2
Project-Level Hot-Spot Analysis

Wind Direction

Increasing Pollutant Concentration

Background

Highway

Highway Contribution + Background Contribution
WHAT IS AERMOD?
HOW DOES IT WORK?
AERMOD

- American Meteorological Society/EPA Regulatory Model (AERMOD)
  - steady-state plume model
  - air dispersion based on planetary boundary layer turbulence structure and scaling concepts
Plume Dispersion from Highways

adapted from Benson, 1979
AERMOD options for modeling transportation projects:

- Volume
- Area/Line
- RLINE

- Expected to be released as a beta option in a new version of AERMOD
Highway Air Dispersion Model

Emissions
- Highway Configuration
- Traffic Parameters
- Emission Factors

Meteorology
- Wind Speed
- Wind Direction
- Atmospheric Stability
- Mixing Height

Dispersion Model
- Transport and Diffusion
- Traffic-Induced Turbulence
- Chemical Transformation

Receptor Concentration
WHAT ACTIVITIES ARE INVOLVED IN A PM QUANTITATIVE HOT-SPOT (REFINED) ANALYSIS?
1. Methodology

- Applicable pollutants and NAAQS to be evaluated
- Scaled map of the project area
- General approach, including:
  - analysis year(s)
  - project alternatives
  - proposed method for developing background concentrations
  - project-specific traffic and meteorology data to be used
- Schedule for conducting the analysis and points of coordination
2. Background Concentrations

- Determine background concentrations from other and nearby sources
  - Based on ambient air monitoring data or urban-scale modeling
  - Critical input for particulate matter (PM) hot-spot analyses – should be determined at the start of the analysis
3. Emissions Modeling

1. Methodology
2. Background concentrations
3. Emissions modeling
   - Obtain project-specific traffic data
   - Prepare link-specific inputs of project-scale traffic activity
   - Run the emissions model to estimate emissions inputs to dispersion modeling
     - Link-specific emissions
     - Emissions factor look-up tables
   - Estimate emissions from re-entrained road dust (PM), construction, and additional sources, as applicable
4. Dispersion modeling
5. Design values and NAAQS comparison
4. Dispersion Modeling

- Select a highway air dispersion model
- Compile data inputs
  - Receptor locations
  - Highway configuration
  - Emissions
  - Meteorology
- Run the highway air dispersion model to estimate the project contribution at each receptor location
The key outcome of a project-level hot-spot analysis
  – Compute design values:
    • Highway contribution + background concentrations
    • Ambient concentration statistics appropriate for comparison to National Ambient Air Quality Standards (NAAQS)
  – Are design values ≤ NAAQS?

May consider available mitigation and/or control options to minimize impacts
Appendix W was updated in 2017 to replace CALINE with AERMOD for refined hot-spot analysis
- 3-year transition period ends January 17, 2020

Two options for modeling highway projects in AERMOD, soon to be three

PM hot-spot analyses require a considerable amount of time and effort
Contact Information

- David Kall, FHWA HQ Air Quality Team
  - Email: David.Kall@dot.gov
  - Phone: 202-366-6276
- Michael Claggett, FHWA Resource Center, Air Quality Team Leader
  - Email: Michael.Claggett@dot.gov
  - Phone: 505-870-0105