# Project Level PM Quantitative Hot-Spot Analysis –

# Consultation Document for Project of Air Quality Concern

*General Instructions: The Arizona Department of Transportation (ADOT) developed the following consultation document for projects that are administering Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) funding that is projects of air quality concern as determined through interagency consultation. The Purpose of this document is to describe the methods, models and assumptions used for a quantitative Hot-spot analysis as required in 40 CFR 93.105(c)(1)(i), 93.123, 93.116 and to document that the analysis follows the Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas.*

Completing a Particulate Matter (PM) Hot-Spot Analysis
The general steps required to complete a quantitative PM hot-spot analysis are outlined below and described in detail in the EPA Office of Transportation and Air Quality guidance document “Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas” EPA-420-B-15-084, November 2015.

Step 2

Determine Approach, Models and Data

Step 4

Estimate Dust and Other Emissions

Step 5

Set Up and Run Air Quality Model (AERMOD)

Step 1

*Determine the Need for Analysis\**

Step 7

Calculate Design Concentrations and Compare Build/No-Build Results \*\*

Step 8

Consider Mitigation or Control Measures \*\*

Step 3

Estimate On-Road Motor Vehicle Emissions

Step 6

Determine Background Concentrations

Step 9

Document Analysis \*\*

\* Described in the previous section (Air Quality Concern Questionnaire).
\*\* These Steps will be described and documented in a final air quality analysis report.
**Step 2: Determine the Approach, Models, and Data**

1. Describe the project area (area substantially affected by the project, 58 FR 62212) and emission sources.
2. Determine general approach and analysis year(s) – year(s) of peak emissions during the time frame of the transportation plan (69 FR 40056).
3. Determine National Ambient Air Quality Standards (NAAQS) and PM types to be evaluated.
4. Select emissions and dispersion models and methods to be used.
5. Obtain project-specific data (e.g., fleet mix, peak-hour volumes and average speed).

**Step 3: Estimate On-Road Motor Vehicle Emissions**

1. Estimate on-road motor vehicle emissions using MOVES.

**Step 4: Estimate Dust and Other Emissions**

1. Estimate road dust emissions using AP-42 Paved Roads.
2. Do emissions from other sources (e.g., locomotives) need to be considered?

**Step 5: Set Up and Run Air Quality Model (AERMOD)**

1. Obtain and input required site data (e.g., meteorological).
2. Input MOVES and AP-42 outputs (emission factors).
3. Determine number and location of receptors, roadway links, and signal timing.
4. Run air quality dispersion model and obtain concentration results.

**Step 6: Determine Background Concentrations**

1. Determine background concentrations from nearby and other emission sources excluding the emissions from the project itself.

**Step 7: Calculate Design Concentrations and Compare Build/No-Build Results**

1. Add step 5 results to background concentrations to obtain values for the Build scenario.
2. Determine if the design values allow the project to conform.

**Step 8: Consider Mitigation or Control Measures**

1. Consider measures to reduce emissions and redo the analysis. If mitigation measures are required for project conformity, they must be included in the applicable SIP and be enforceable.
2. Determine if the design values from allow the project to conform after implementing mitigation or control measures.

**Step 9: Document Analysis**

1. Determine if the project conforms or not based on the results of step 7 or step 8.

*To support the conclusion that a project meets conformity under 40 CFR 93.116 and 93.123, at a minimum the documentation will include:*

* *Description of proposed project, when it is expected to open, and projected travel activity data.*
* *Analysis year(s) examined and factors considering in determining year(s) of peak emissions.*
* *Emissions modeling data, model used with inputs and results, and how characterization of project links.*
* *Model inputs and results for road dust, construction emissions, and emissions from other source if needed.*
* *Air Quality modeling data, included model used, inputs and results and receptors.*
* *How background concentrations were determined.*
* *Any mitigation and control measures implemented, including public involvement or consultation if needed.*
* *How interagency and public participation requirements were met.*
* *Conclusion that the proposed project meets conformity requirements.*
* *Sources of data for modeling.*

Interagency Consultation

ADOT will circulate the following Tables along with the *Project Level Conformity – Particulate Matter Project of Air Quality Concern Questionnaire* to describe in detail how the steps listed in EPA hot spot guidance will be followed. It is requested that consulted parties provide comments or questions on the methods, models and assumptions within 30 business days, a non-response will be interpreted to mean that the party concurs with the planning assumptions as describe in the Table.

Please see the recommended methods, models and assumptions in Table 1 below and fill out the proposed inputs, parameters and data sources for the project in the following Table 2.

Table 1. Methods, Models and Assumptions

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| **Estimate On-Road Motor Vehicle Emissions (Step 3)** – Modeling highways and/or intersections for PM10(Contact ADOT if modeling off-network data such as terminals and parking lots or performing a PM2.5 analysis) |
| **MOVES3.1** | **Description** | **Reference** |
| Scale | *Onroad, Project Scale and Inventory* | EPA Hot Spot Guidance Section 4.4.2 |
| Time Spans | *4-weekday runs for each of the following months January (Quarter 1), April (Quarter 2), July (Quarter 3); October (Quarter 4) for each year. Each of these 4 runs will further be split by Morning peak hours, Midday Emissions, Evening Peak and Overnight hours as defined by TDM model.*  | EPA Hot Spot Guidance Sections 2.8, 4.3 & 4.4.3 |
| Geographic Bounds | *County (If a project spans multiple counties, see the EPA Guidance)* | EPA Hot Spot Guidance Section 4.4.4 |
| Onroad Vehicles | *All Fuels and Source Use Types will be selected.* | EPA Hot Spot Guidance Section 4.4.5 |
| Road Type | *Based on the project location* | EPA Hot Spot Guidance Section 4.4.6 |
| Pollutants and Processes | *Primary Exhaust PM10-Total(for Running Exhaust and Crankcase Running Exhaust), Break Wear Particulate, Tire Wear Particulate* | EPA Hot Spot Guidance Sections 2.5 & 4.4.7 |
| General Output and Output Emissions Detail | *Database will be created, Grams, Joules, Miles, Distance Traveled, Population will be selected. Output Aggregation is set to Hour and Link by default and the “for All Vehicle/Equipment Categories” and “Onroad” selections are optional in the Output Emissions Detail. After running MOVES3.1 for a particular hour/day/month scenario, the PM10\_Grams\_Per\_Veh\_Hour script (for Inventory mode) can be run on the output database.* | EPA Hot Spot Guidance Section 4.4.8, 4.4.9 & 4.6  |
| Create Input Database | *Input database will be created and modified for Project level using required Regional Inputs from latest Regional Conformity Analysis.* | EPA Hot Spot Guidance Section 4.4.10 andSee Project Data Manager below  |
| Project Data Manager | *Database will be created and MOVES3.1 templates will be created to include local project data and information provided by xx, e.g., Fuel, Age Distribution, Meteorology Data, to be consistent with the regional model. Links and Link Source Type will be specific to project as provided by the traffic study, any missing information will use default MOVES3.1 data.*  | EPA Hot Spot Guidance Sections 4.5 &Appendix D |
| Meteorology | *Same for build and no-build scenarios. A minimum of four hours (AM, PM, MD & ON), for one day (weekday) and for January, April, July and October is required. May use the County meteorology file for the county used in the latest SIP or regional conformity analysis.*  | EPA Hot Spot Guidance Section 4.5.1 |
| Age Distribution | *Same for build and no-build scenarios, unless something about the project would change them.* | EPA Hot Spot Guidance Section 4.5.2 |
| Fuel | *Same for build and no-build scenarios. Fuel files should be consistent with those used in the latest SIP or regional conformity analysis if local information is available. Otherwise, MOVES default fuel supply and formulation information can be used.* | EPA Hot Spot Guidance Section 4.5.3,PM hot-spot training slides Module 2 |
| I/M Programs | *No impact on PM emissions.* | EPA Hot Spot Guidance Section 4.5.4 |
| Retrofit Data | *If necessary. For example, a bus terminal project might include plans to mitigate emissions by retrofitting the bus fleet.* | Project specific modelingEPA Hot Spot Guidance Section 4.5.5 |
| Links | *Unique inputs needed for each run. Requires information on each link’s length (in miles), traffic volume (vehicle per hour), average speed (miles per hour) and road grade (percent).* | EPA Hot Spot Guidance Section 4.5.6 & Appendix D |
| Link Source Types | *Unique inputs needed for each run. Project-specific data are preferred. If the source type distribution can be represented by that of the regional fleet, the data used in the latest regional emissions analysis can be provided.*  | EPA Hot Spot Guidance Section 4.5.7 |
| Link Drive Schedules, Operating Mode Distribution | *Unique inputs needed for each run. Three options are available: 1. Provide average speed and road type through the Links Importer; 2. Provide a link drive schedule using the Link Drive Schedule Importer; 3. Provide a detailed operation distribution for the link.* | EPA Hot Spot Guidance Section 4.5.8 |
| Off-Network, Hotelling, Generic | *If necessary. For example, a project analysis includes areas where vehicles are not driving on the project links, but still contributing to the project’s emissions.* | EPA Hot Spot Guidance Section 4.5.9 |
| **Estimate Dust and Other Emissions (Step 4)**(AP-42 emission factors below should be based on SIP or Regional Conformity Analysis provided by ADEQ, MAG, PAG or YMPO depending on the project’s location) |
| **AP-42, Fifth Edition, 2011** | **Description** | **Reference** |
| Average Weight Vehicles | *All roads xx Ton, Freeway xx Ton,  Arterials  xx Ton*  | Source of Data TIP or RTP, Regional Conformity Analysis |
| Silt Loading |  *Section 13.2.1 Paved Roads from AP 42 will be used, consistent with the Regional analysis from xx. Emission factors for road and construction dust should be added to the emission factors generated for each link by MOVES3.1. Ex. Silt loading – Freeways .02 g/m^2, Arterials >10,000 ADT .067g/m^2, Low traffic roads <10,000 ADT .23g/m^2.* | EPA Hot Spot Guidance Section 6, When estimating emissions of re-entrained road dust from paved roads, site-specific silt loading data must be consistent with the data used for the project’s county in the regional emissions analysis (40 CFR 93.123(c)(3)). |
| Construction Dust | *If Construction Dust is temporary, it will not be included. If there are other sources (e.g., locomotives), they need to be considered.* | EPA Hot Spot Guidance Section 6.5 |
| Precipitation | *In xxx SIP/Regional Conformity used average of xx days with at least .01 inch of precipitation County*  | Source of Data TIP or RTP, Regional Conformity Analysis, SIP |
| **Set Up and Run Air Quality Model (AERMOD) (Step 5)** |
| **AERMOD v.21112** | **Description** | **Reference** |
| Model Setup (CO Pathway) | *Control Pathway defines the primary model settings.* | EPA Hot Spot Guidance Section 7.1, 7.2 & Appendix J, AERMOD User’s Guide Section 2.3.2 & 3.2 |
| TITLEONE | *Model title* |  |
| MODELOPT | *CONC FLAT (Use IAC if modeling nearby elevated source)* | Modeling Concentrations and Flat Terrain |
| AVERTIME | *24* | Average across each 24-hour period from the available met data |
| URBANOPT | *Population for Urban Area*  |  |
| FLAGPOLE | *1.8* |  |
| POLLUTID | *PM10* |  |
| Source Types and Characters (SO Pathway) | *For highway and interaction sources, characterize area sources with the LINE source keyword (Use IAC if volume sources are needed).* | EPA Hot Spot Guidance Section 7.3, 7.4 & Appendix J.2, J.3,AERMOD User’s Guide Section 2.3.3 & 3.3 |
| LOCATION | *Srcid Srctyp (LINE)* |  |
| SRCPARAM | *Srcid Lnemis Relhgt Width Szinit* | LINE Source parametersSee EPA Hot Spot Guidance Appendix J.3.1 |
| URBANSRC | *Srcid* | Urban source IDs |
| EMISFACT | *Emission rate=1, Use SEASHR* | Total 16 MOVES run=4 seasons x 4 time periods to 96 factors (4 seasons/24 hours) See PM hot-spot training slides (FHWA, 2022) |
| SRCGROUP | *GroupID or All* |  |
| Meteorological Data (ME Pathway) | *The meteorological data will be based on the pre-processed met files from ADEQ or the met files produced by AERMET program.* | EPA Hot Spot Guidance Section 7.5, Appendix J.4, AERMOD User’s Guide Section 2.3.5 & 3.5 |
| SURFFILE | *Surface file name* | \*.sfc |
| PROFFILE | *Profile (upper air) file name* | \*.pfl |
| SURFDATA | *Surface data station*  |  |
| UAIRDATA | *Upper air data station* |  |
| PROFBASE | *Met data station elevation* |  |
| Run Met Pre-Processor | *If necessary* | AERMET User’s Guide (for AERMOD) |
| Urban or Rural Sources | *Specifications for URBANOPT (CO Pathway) and URBANSRC (SO Pathway)* | EPA Hot Spot Guidance Section 7.5.5 & Appendix J.4,AERMOD Implementation Guide,Section 7.2.3 of Appendix W to 40 CFR Part 51 |
| Receptors (RE Pathway) | *Receptors should begin 5 m from roadway edge, extending up to 105 m (or further if needed). Spacing of 25 m is typically sufficient.* | EPA Hot Spot Guidance Section 7.6,AERMOD User’s Guide Section 2.3.4 & 3.4,Section 7.2.2 of Appendix W to 40 CFR Part 51,See PM hot-spot training slides |
| DISCCART | *X Y (Z)* | Z is optional if FLAGPOLE is already defined in CO Pathway. |
| GRIDCART | *Use a 3rd party program if available.* | e.g., AERMOD View |
| Output (OU Pathway) | *PLOTFILE and/or POSTFILE will be generated if necessary.* | EPA Hot Spot Guidance Appendix J.6,AERMOD User’s Guide Section 2.3.6 & 3.7 |
| RECTABLE | *24 6th* | Since PM should be one or less exceedance per year, with 5 years of met data, the 6th highest concentration at each receptor |
| PLOTFILE | *Optional* |  |
| POSTFILE | *Optional* |  |
| Model Runs | *Use AERMOD User’s Guide Appendix B to decode and correct errors.* | EPA Hot Spot Guidance Section 7.7,AERMOD User’s Guide Section 2.3.7, 2.3.8, 3.8 & Appendix B |
| **Determine Background Concentrations (Step 6)** |
| **Source Type** | **Description** | **Reference** |
| Nearby Sources | *If necessary* | EPA Hot Spot Guidance Section 8.2 |
| Other Sources (Ambient Monitoring Data) | *Using a Single Monitor (Most likely option) or Interpolating Between Several Monitors.**When using a single monitor:**Select a monitor with similar land use to the project, upwind from project, and isn’t impacted by Exceptional Events. Three years of monitoring data (20xx-20xx) using the 4th highest readings based on total number of sampling days of 1076 days, the 4th highest monitor value over these three years is xxx. To estimate the sixth-highest concentration, for each receptor, the six highest 24-hour concentrations from each quarter and year of meteorological data will be arrayed together and ranked, then added to the xxx monitor value.*  | EPA Hot Spot Guidance Section 8.3,PM hot-spot training slides Module 5 & 6  |

Table 2. Proposed Inputs, Parameters and Data Sources (Please Provide Any Project-Specific Data)

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| **Estimate On-Road Motor Vehicle Emissions (Step 3)** |
| **MOVES3.1** | **Input** | **Data Source/Detail** |
| Scale | *e.g., Onroad, Project Scale and Inventory* | MAG Regional Conformity Data (July, 2022) |
| Time Spans | *2050, 16 runs* | 4 seasons (Jan, Apr, July & Oct) x 4 weekday time periods (6-9AM, 9AM-4PM, 4-7PM & 7PM-6AM) |
| Geographic Bounds |  |  |
| Onroad Vehicles |  |  |
| Road Type |  |  |
| Pollutants and Processes |  |  |
| General Output and Output Emissions Detail |  |  |
| Create Input Database |  |  |
| Project Data Manager |  |  |
| Meteorology |  |  |
| Age Distribution |  |  |
| Fuel |  |  |
| I/M Programs |  |  |
| Retrofit Data |  |  |
| Links | *Please attach the link maps.* |  |
| Link Source Types |  |  |
| Link Drive Schedules, Operating Mode Distribution |  |  |
| Off-Network, Hotelling |  |  |
| **Estimate Dust and Other Emissions (Step 4)** |
| **AP-42, Fifth Edition, 2011** | **Parameter** | **Data Source/Detail** |
| Average Weight Vehicles |  |  |
| Silt Loading |  |  |
| Construction Dust |  |  |
| Precipitation |  |  |
| **Set Up and Run Air Quality Model (AERMOD) (Step 5)** |
| **AERMOD v.21112** | **Parameter** | **Data Source/Detail** |
| Model Setup (CO Pathway) |  |  |
| TITLEONE |  |  |
| MODELOPT |  |  |
| AVERTIME |  |  |
| URBANOPT |  |  |
| FLAGPOLE |  |  |
| POLLUTID |  |  |
| Source Types and Characters (SO Pathway) |  |  |
| LOCATION |  |  |
| SRCPARAM |  |  |
| URBANSRC |  |  |
| EMISFACT |  |  |
| SRCGROUP |  |  |
| Meteorological Data (ME Pathway) |  |  |
| SURFFILE |  |  |
| PROFFILE |  |  |
| SURFDATA |  |  |
| UAIRDATA |  |  |
| PROFBASE |  |  |
| Run Met Pre-Processor |  |  |
| Urban or Rural Sources |  |  |
| Receptors (RE Pathway) | *Please attach the receptor maps.* |  |
| DISCCART |  |  |
| GRIDCART |  |  |
| Output (OU Pathway) |  |  |
| RECTABLE |  |  |
| PLOTFILE |  |  |
| POSTFILE |  |  |
| Model Runs |  |  |
| **Determine Background Concentrations (Step 6)** |
| **Source Type** | **Description** | **Data Source/Detail** |
| Nearby Sources |  |  |
| Other Sources (Ambient Monitoring Data) | *Please attach the selected monitor’s location map and monitoring data with wind rose information.* |  |

References

*PM Hot-spot guidance*, EPA-420-B-21-037, October 2021.

*User’s Guide for the AMS/EPA Regulatory Model (AERMOD)*, EPA-454/B-21-001, April 2021.

*AERMOD Implementation Guide*, EPA-454/B-21-006, July 2021.

*User’s Guide for the AERMOD Meteorological Preprocessor (AERMET)*, EPA-454/B-22-006, June 2022.

Completing Quantitative PM Hot-spot Analyses: 3-Day Course, FHWA, October 2022.