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# 2017 Appendix W Final Rule

### Final Rule Information:

On December 20, 2016, the Administrator signed a final rule that revises the *Guideline on Air Quality Models*. The *Guideline* provides EPA-recommended models and other techniques, as well as guidance for their use, for predicting ambient concentrations of air pollutants. EPA's finalized changes, enhance the formulation and application of the agency's AERMOD dispersion model, prescribe modeling techniques for secondarily formed fine particle and ozone pollution for single sources and makes various editorial improvements. The final rule was published in the Federal Register on January 17, 2017, and the effective date of this action has been deferred to May 22, 2017.

- Fact Sheet (PDF) <[https://epa.gov/sites/production/files/2021-01/documents/appendix\\_w-fact\\_sheet.pdf](https://epa.gov/sites/production/files/2021-01/documents/appendix_w-fact_sheet.pdf)>(3 pp, 21 K, 12-21-2016)
- Federal Register Version of Final Rule (PDF) <[https://epa.gov/sites/production/files/2020-09/documents/appw\\_17.pdf](https://epa.gov/sites/production/files/2020-09/documents/appw_17.pdf)>(54 pp, 761 K, 01-17-2017) - *Guideline on Air Quality Models* ("Appendix W" to 40 CFR Part 51)
- First Federal Register Extension of Effective Date to March 21, 2017 (PDF) <[https://epa.gov/sites/production/files/2021-01/documents/appendixw\\_2017-03212017\\_extension.pdf](https://epa.gov/sites/production/files/2021-01/documents/appendixw_2017-03212017_extension.pdf)>(3 pp, 199 K, 01-26-2017)
- Second Federal Register Extension of Effective Date to May 22, 2017 (PDF) <[https://epa.gov/sites/production/files/2021-01/documents/appendixw\\_2017-05222017\\_extension.pdf](https://epa.gov/sites/production/files/2021-01/documents/appendixw_2017-05222017_extension.pdf)>(2 pp, 195 K, 03-20-2017)

- Rule Docket (ID No. EPA-HQ-OAR-2015-0310) [🔗](#)  
<<http://www.regulations.gov/#!documentdetail;d=epa-hq-oar-2015-0310-0001>>

## Technical Support Material and Final Model Updates Related to Final Rule:

### Updates to EPA's AERMOD Modeling System

The EPA is finalizing the following updates to the AERMOD Modeling System to address a number of technical concerns expressed by stakeholders:

1. An option incorporated in AERMET to adjust the surface friction velocity ( $u^*$ ) to address issues with AERMOD model overprediction under stable, low wind speed conditions.
2. A buoyant line source option, based on the BLP model, has been incorporated in AERMOD.
3. Updates to the NO<sub>2</sub> Tier 2 and Tier 3 screening techniques coded within AERMOD, including the replacement of the Ambient Ratio Method (ARM) Tier 2 option with a revised ARM2 option and the replacement of the Plume Volume Molar Ratio Method (PVMRM) Tier 3 option with a revised PVMRM option.
4. Modifications to AERMOD formulation to address issues with overprediction for applications involving relatively tall stacks located near relatively small urban areas (no user input is required).
5. Regulatory options in AERMOD to address plume rise for horizontal and capped stacks based on the July 9, 1993, Model Clearinghouse memorandum, with adjustments to account for the PRIME algorithm for sources subject to building downwash.

Please follow these links to the updated release version (v16216) of the AERMOD Modeling System. Model code and executables, as well as supporting documentation and test cases, are available. For easy of reference, the technical support and users' guide documentation that is included in the final rule docket is also provided below.

#### **Model Code and Executable**

- AERMOD <<https://epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod>>
- AERMET <<https://epa.gov/scram/meteorological-processors-and-accessory-programs#aermet>>

#### **Supporting Documentation**

## Updates to EPA's AERMOD Modeling System

- User's Guide for the AMS/EPA Regulatory Model (AERMOD) (PDF)  
<[https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/aermod\\_userguide.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/aermod_userguide.pdf)>(321 pp, 1.6 MB, 08-21-2019, 454-B-19-027)
- User's Guide for the AERMOD Meteorological Preprocessor (AERMET) (PDF)  
<[https://gaftp.epa.gov/air/aqmg/scram/models/met/aermet/aermet\\_userguide.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/met/aermet/aermet_userguide.pdf)>(310 pp, 3 MB, 08-21-2019, 454-B-19-028)
- Model Formulation and Evaluation Document (PDF)  
<[https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/aermod\\_mfed.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/aermod_mfed.pdf)>(177 pp, 3.3 MB, 08-01-2019, 454-B-16-014)
- Technical Support Document (TSD) for AERMOD/BLP Development and Testing  
<[https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/aermod\\_blp\\_tsd.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/aermod_blp_tsd.pdf)>(43 pp, 1.0 MB, 12-01-2016, 454-B-16-009)

## Status of AERSCREEN

The EPA is finalizing AERSCREEN as the recommended screening model for simple and complex terrain for single sources and options for multi-source screening with AERMOD in the Screening Models and Techniques subsection of the *Guideline*.

### **Model Code and Executable**

- AERSCREEN <<https://epa.gov/scram/air-quality-dispersion-modeling-screening-models#aerscreen>>

### **Supporting Documentation**

- AERSCREEN User's Guide (PDF)  
<[https://gaftp.epa.gov/air/aqmg/scram/models/screening/aerscreen/aerscreen\\_userguide.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/screening/aerscreen/aerscreen_userguide.pdf)>(115 pp, 2.6 MB, 12-01-2016, 454-B-16-004)

## Updates to 3-Tiered Demonstration Approach for NO<sub>2</sub>

The EPA is finalizing several modifications to the NO<sub>2</sub> Tier 2 and 3 screening techniques incorporated into AERMOD. For the Tier 2 approach, the EPA is replacing the existing Ambient Ratio Method (ARM) option with a revised ARM2 option. Because ARM2 is based on hourly measurements of the NO<sub>2</sub> to NO<sub>x</sub> ratios and provides more detailed estimates of this ratio based on the total NO<sub>x</sub> present, the EPA is incorporating a modified version of ARM2 as the new second tier NO<sub>x</sub> modeling approach. For the Tier 3 approach, the EPA is incorporating the existing detailed screening options of the Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM) into the regulatory version of AERMOD. In addition, the EPA is replacing the previous PVMRM option with a revised PVMRM option (proposed with the option name PVMRM2), that utilizes relative dispersion coefficients to estimate plume volume during convective conditions and total dispersion coefficients during stable conditions.

### ***Supporting Documentation***

- Technical support document (TSD) for NO<sub>2</sub>-related AERMOD modifications (PDF)  
<[https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/aermod\\_no2\\_changes\\_tsd.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/aermod_no2_changes_tsd.pdf)>(32 pp, 1.6 MB, 12-01-2015, 454-B-15-004)
- Ambient Ratio Method Version 2 (ARM2) for use with AERMOD for 1-hr NO<sub>2</sub> Modeling - Development and Evaluation Report (PDF)  
<[https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/arm2\\_development\\_and\\_evaluation\\_report-september\\_20\\_2013.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/preferred/aermod/arm2_development_and_evaluation_report-september_20_2013.pdf)>(95 pp, 2.2 MB, 09-20-2013)

## Status of CALINE3 Models

The EPA is finalizing replacement of CALINE3 with AERMOD as the preferred appendix A model for refined mobile source applications including fine particle pollution (PM<sub>2.5</sub>, PM<sub>10</sub>), and carbon monoxide (CO) hot-spot analyses. The final action is based on the more scientifically sound basis for AERMOD, improved model performance over CALINE3, and the availability of more representative meteorological data. The transition period for the use of AERMOD for these refined modeling applications was extended to 3 years and the use of CAL3QHC for CO screening analyses was retained.

### ***Supporting Documentation***

- Technical Support Document (TSD) for Replacement of CALINE3 with AERMOD for Transportation Related Air Quality Analyses (PDF)  
<[https://epa.gov/sites/production/files/2021-01/documents/cal3\\_aermod\\_replacement\\_tsd.pdf](https://epa.gov/sites/production/files/2021-01/documents/cal3_aermod_replacement_tsd.pdf)>(37 pp, 589 K, 12-09-2016, 454-B-16-006)

## Addressing Single-Source Impacts on Ozone and Secondary PM<sub>2.5</sub>

For this final revision to the *Guideline*, the EPA has determined that advances in chemical transport modeling science indicate it is now reasonable to provide more specific, generally-applicable guidance that identifies particular models or analytical techniques that may be used under specific circumstances for assessing the impacts of an individual source on ozone and secondary PM<sub>2.5</sub>. In order to provide the user community flexibility in estimating single-source secondary pollutant impacts and given the emphasis on the use of chemical transport models for these purposes, the EPA is finalizing a two-tiered demonstration approach for addressing single-source impacts on ozone and secondary PM<sub>2.5</sub>. The first tier involves use of technically credible relationships between precursor emissions and a source's impacts that may be published in the peer-reviewed literature; developed from modeling that was previously conducted for an area by a source, a governmental agency, or some other entity and that is deemed sufficient; or generated by a peer-reviewed reduced form model. The second tier involves application of more sophisticated case-specific chemical transport models (e.g., photochemical grid models) to be determined in consultation with the EPA Regional Office and conducted consistent with new EPA single-source modeling guidance. The appropriate tier for a given application should be selected in consultation with the appropriate reviewing authority and be consistent with EPA guidance.

### Supporting Documentation

- Status of Guidance for Ozone and PM<sub>2.5</sub> Permit Modeling (PDF)  
<[https://epa.gov/sites/production/files/2021-01/documents/20170117-o3\\_pm25\\_permit\\_modeling\\_guidance\\_memo.pdf](https://epa.gov/sites/production/files/2021-01/documents/20170117-o3_pm25_permit_modeling_guidance_memo.pdf)>(2 pp, 451 K, 01-17-2017) - *Revised on this page on 01-17-2017*
- DRAFT Guidance for Ozone and Fine Particulate Matter Permit Modeling (PDF)  
<[https://epa.gov/sites/production/files/2020-09/documents/draft\\_guidance\\_for\\_o3\\_pm25\\_permit\\_modeling.pdf](https://epa.gov/sites/production/files/2020-09/documents/draft_guidance_for_o3_pm25_permit_modeling.pdf)>(137 pp, 5 MB, 02-10-2020, 457-P-20-002)
- Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM<sub>2.5</sub> under the PSD Permitting Program (PDF) <[https://epa.gov/sites/production/files/2020-09/documents/epa-454\\_r-19-003.pdf](https://epa.gov/sites/production/files/2020-09/documents/epa-454_r-19-003.pdf)>(74 pp, 3 MB, 04-30-2019, 454-R-19-003)

**Addressing Single-Source Impacts on Ozone and Secondary PM<sub>2.5</sub>**

- Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM<sub>2.5</sub> (PDF)  
<[https://epa.gov/sites/production/files/2020-09/documents/epa-454\\_r-16-005.pdf](https://epa.gov/sites/production/files/2020-09/documents/epa-454_r-16-005.pdf)>(33 pp, 273 K, 12/02/2016, 454-R-16-005)

**Status of CALPUFF and Assessing Long-Range Transport for PSD Increment and Regional Haze**

The EPA is taking final action to codify the screening approach to address long-range transport for purposes of assessing NAAQS and/or PSD increments; removing CALPUFF as a preferred model in appendix A for such long-range transport assessments; and confirming our recommendation to consider CALPUFF as a screening technique along with other Lagrangian models that may be used as part of this screening approach without alternative model approval. As detailed in the preamble of the proposed rule, this final action does not affect the use of CALPUFF under the FLM's guidance regarding AQRV assessments (FLAG 2010). This change also does not affect the EPA's recommendation in the 2005 BART Guidelines to use CALPUFF in the BART determination process nor does it alter consideration of CALPUFF in the near-field as an alternative model for situations involving complex terrain and complex winds.

**Supporting Documentation**

- Technical Support Document (TSD) for AERMOD-Based Assessments of Long-Range Transport Impacts for Primary Pollutants (PDF) <[https://epa.gov/sites/production/files/2021-01/documents/appw\\_lrt\\_tsd.pdf](https://epa.gov/sites/production/files/2021-01/documents/appw_lrt_tsd.pdf)>(72 pp, 5 MB, 12-20-2016, 454-B-16-007)
- Reassessment of the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report: Revisions to Phase 2 Recommendations (PDF)  
<[https://epa.gov/sites/production/files/2021-01/documents/iwaqm\\_phase2\\_reassessment\\_2016.pdf](https://epa.gov/sites/production/files/2021-01/documents/iwaqm_phase2_reassessment_2016.pdf)>(62 pp, 1 MB, 12-19-2016, 454-R-16-007)



## Role of EPA's Model Clearinghouse

The EPA's Model Clearinghouse <<https://epa.gov/scram/air-quality-model-clearinghouse>> has been a fundamental aspect of communication between the EPA Region Offices and with the broader permitting community on technical modeling and compliance demonstration issues for almost three decades. The Model Clearinghouse serves a critical role in helping resolve issues that arise from unique situations that are not specifically addressed in the *Guideline on Air Quality Models* or necessitate the consideration of an alternative model or technique for a specific application or range of applications. The Model Clearinghouse ensures that fairness, consistency, and transparency in modeling decisions are fostered among the Regional Offices and the state, local, and tribal agencies.

For this final revision to the *Guideline*, the EPA is codifying the long-standing process of the Regional Offices consulting and coordinating with the EPA's Model Clearinghouse <<https://epa.gov/scram/air-quality-model-clearinghouse>> on all approvals of alternative models or techniques. While the Regional Administrators are the delegated authority to issue such approvals under section 3.2 of the *Guideline*, all alternative model approvals will only be issued after consultation with the EPA's Model Clearinghouse and formal documentation through a concurrence memorandum which demonstrates that the requirements within section 3.2 for use of an alternative model have been met.

### **Supporting Documentation**

- 2016 Model Clearinghouse Operational Plan (PDF) <[https://epa.gov/sites/production/files/2020-10/documents/mch\\_operational\\_plan-2016\\_version.pdf](https://epa.gov/sites/production/files/2020-10/documents/mch_operational_plan-2016_version.pdf)> (56 pp, 1 MB, 12-19-2016, 454-B-16-008)
- Air Quality Analysis Checklist (PDF) <[https://epa.gov/sites/production/files/2020-09/documents/air\\_quality\\_analysis\\_checklist-revised\\_20161220.pdf](https://epa.gov/sites/production/files/2020-09/documents/air_quality_analysis_checklist-revised_20161220.pdf)> (13 pp, 77 K, 12-20-2016)
- EPA's Model Clearinghouse Information Storage and Retrieval System (MHISRS) <<http://cfpub.epa.gov/oarweb/mchisrs/>>

## Updates on Use of Meteorological Input Data for Regulatory Dispersion Modeling

The EPA is finalizing the use of prognostic mesoscale meteorological models to provide meteorological input for regulatory dispersion modeling applications in the Meteorological Input Data subsection of the *Guideline on Air Quality Models*. This update will provide more flexibility and improve the meteorological inputs used for near-field dispersion modeling applications where there is no representative NWS station, and it is prohibitive or not feasible to collect adequately representative site-specific data.

The EPA is also releasing an updated version of the Mesoscale Model Interface Program (MMIF) <<https://epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#mmif>> program that converts the prognostic meteorological data into a format suitable for dispersion modeling applications. The most recent 3 years of prognostic data are recommended for regulatory model applications. Use of the prognostic data is contingent on the concurrence of the appropriate reviewing authorities and collaborating agencies that the data are of acceptable quality and representative of the modeling application.

### **Model Code**

- MMIF <<https://epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#mmif>>

### **Supporting Documentation**

- MMIF User's Guide (PDF) <[https://gaftp.epa.gov/air/aqmg/scram/models/related/mmif/mmifv3.4.1\\_users\\_manual.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/related/mmif/mmifv3.4.1_users_manual.pdf)> (72 pp, 338 KB, 03-11-2019)
- Guidance on the Use of the Mesoscale Model Interface Program (MMIF) for AERMOD Applications (PDF) <[https://gaftp.epa.gov/air/aqmg/scram/models/related/mmif/mmif\\_guidance.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/related/mmif/mmif_guidance.pdf)> (21 pp, 565 KB, 04-23-2018, 454-B-18-005)
- Evaluation of Prognostic Meteorological Data in AERMOD Applications (PDF) <[https://gaftp.epa.gov/air/aqmg/scram/models/related/mmif/mmif\\_evaluation\\_tsd.pdf](https://gaftp.epa.gov/air/aqmg/scram/models/related/mmif/mmif_evaluation_tsd.pdf)> (183 pp, 8.3 MB, 04-23-2018, 454-R-18-002)
- Model Change Bulletin, Test Cases, and Additional Information <<https://epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#mmif>>

## 11th Conference on Air Quality Modeling and Public Hearing Information for Proposed Rule

On July 14, 2015, the EPA also announced the 11th Conference on Air Quality Modeling and invited the public to participate in the conference. The conference, mandated by Section 320 of the Clean Air Act, was held on the EPA RTP Campus from August 12th through 13th, 2015. The conference was focused on the proposed revisions to the *Guideline on Air Quality Models* (CFR Title 40, Part 51, Appendix W) and served as the public hearing for these proposed revisions.

- 11th Modeling Conference - Informational Website - *Includes Supporting Material for Proposed Rule* <<https://epa.gov/scram/11th-conference-air-quality-modeling>>

Please direct any additional questions concerning the 11th Conference on Air Quality Modeling or related to the proposed rulemaking to Mr. George Bridgers, email: [Bridgers.George@epa.gov](mailto:Bridgers.George@epa.gov).

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