Wyoming Department of Environmental Quality/Air Quality Division
Guidance for Submitting Major Source/PSD Modeling Analyses

This guidance document describes dispersion modeling techniques that are acceptable for evaluating near-field (at or within 50 kilometers [km]) and far-field (beyond 50 km) air quality impacts from major air pollution sources in Wyoming. This guidance also specifies the modeling information which should be included with a permit application to the Wyoming Air Quality Division (AQD).

A modeling protocol must be submitted to the AQD for review and approval prior to the submittal of any modeling analysis. Contact Nathan Henschel at (307) 777-7346 for information on the required content for the modeling protocol or for further information on these modeling guidelines.

Contact Cole Anderson at (307) 777-5924 or Josh Nall at (307) 777-7816 to set up a pre-application meeting before any modeling analyses are submitted in support of a proposed Prevention of Significant Deterioration (PSD) application. The need for pre-construction monitoring (if any) will also be discussed at the pre-application meeting. As early as possible in the permitting process, applicants should prepare a project description and Q/D calculations in accordance with the FLAG 2010 guidance document for review and submittal to the appropriate Federal Land Manager(s) (FLM) by the AQD. The FLM will determine the need for Class I area Air Quality Related Values (AQRV) analyses for the project.

Consult Chapter 2 of the *Wyoming Air Quality Standards and Regulations* (WAQSR) for detailed information on ambient air quality standards within the state, and Section 4 of Chapter 6 of the WAQSR for detailed information on PSD permitting requirements.

New for 2014

Land Use Planning: Chapter 6, Section 2(c)(iv) of the WAQSR requires that proposed facilities be located in accordance with proper land use planning. Permit applicants must provide documentation to the AQD to demonstrate that the proposed location for a new facility is acceptable to the appropriate state or local agencies. In addition, the Wyoming Governor's Executive Order 2011-5 (*Greater Sage-Grouse Core Area Protection*) requires that new development or land uses be authorized only when the activity will not cause declines in the Greater Sage-Grouse populations. Permit applicants proposing new development or land uses will be required to demonstrate to the AQD that proposed locations are outside of Core Population Areas and outside of the two (2) mile buffers from occupied leks, or the applicant must provide documentation to the AQD demonstrating that the Wyoming Game & Fish Department has been contacted and the potential impacts to the Greater Sage-Grouse populations have been evaluated.

NEAR-FIELD MODELING

1. Model Selection

All near-field analyses should be conducted with the latest version of the EPA AERMOD model.

2. Receptor Grid

A. Generate a base receptor grid using UTM coordinates in Cartesian arrays as follows:

- ≤50-meter (m) spacing along the ambient boundary/facility fenceline
- 100-m spacing from the ambient boundary to a distance of 1.0 kilometer (km) from the grid origin (the grid origin should be centered at the approximate mid-point of the modeled sources at the facility in question)
- 250-m spacing from 1.0 km to 3.0 km
- 500-m spacing from 3.0 km to 10.0 km
- 1000-m spacing from 10.0 km to 25.0 km (and beyond)

The receptor grid should be expanded beyond 25 km if the initial grid does not capture the full extent of the significant impact of the proposed source(s). Fine-spaced (100-m or less) receptors should be used to refine the maximum predicted impacts if they occur in an area with receptor spacing of 250-m or more.

B. AERMAP processing should make use of the number of NED files needed to fully determine the hill height scale for each receptor (10% slope). The NED files should be either 1 arc-second/30-meter resolution files or 1/3 arc-second/10-meter resolution files. Electronic copies of the NED/DEM files as well as the AERMAP input and output files should be provided with the application.

3. Meteorological Data

Applicants should use the most recent five-year period of meteorological data that are representative of the project area. At least one year of on-site meteorological data may be used to fulfill this requirement. Document and submit Quality Assurance (QA) procedures that were followed in preparing any meteorological data.

The AQD has developed AERMET-derived meteorological data for several locations in Wyoming. Contact the Division for specific guidance on selecting and obtaining the correct meteorological data prior to submitting any modeling analyses.

Note: Applicants should use the EPA's AERSURFACE tool to determine surface characteristics for input to AERMET for surface meteorological data processing. Additionally, EPA's AERMINUTE program should be used to supplement the standard hourly met data with 1-minute ASOS data.

4. Modeling Approach

A. Model all sources associated with the proposed project using the base receptor grid to determine the radius of impact (ROI) for each pollutant, averaging period, and meteorological year. The ROI should be based on the most distant receptor at which the proposed project produces a predicted impact that equals or exceeds the Class II area modeling significance level(s). If the modeling analysis demonstrates that the project produces a modeled concentration that is less then the Class II modeling significance level(s) for a particular pollutant and all applicable averaging periods, no further modeling analyses are required for that pollutant unless the AQD has determined that further analyses are warranted. If a significant impact is predicted, proceed to an analysis to determine compliance with the WAAQS and PSD increments. A table listing the Class II modeling significance levels and WAAQS is included below.

B. For the WAAQS analysis, obtain inventories of nearby/regional sources and background concentrations from the AQD. Applicants submitting PSD applications may also need to collect emissions data that include sources located in adjacent states in order to construct a representative emissions inventory. Contact the AQD with any questions on developing emissions inventories to be used in dispersion modeling analyses.

The modeling receptor grid for the WAAQS analysis should consist of only those base grid receptors that fall within the ROI from the facility in question. For multi-year analyses, use the year of meteorology that yields the largest ROI to determine the reduced receptor grid to use in the WAAQS analysis.

C. All applicants must include building downwash into the modeling analysis for the proposed facility, and should include downwash from any facility that is located directly adjacent to the facility undergoing review. Electronic copies of the building downwash analysis files (input and output files) should be provided with the application.

D. AERMOD should be run using all regulatory defaults options.

Note: Modeling for NO_2 should follow the recommended methods described in current EPA guidance memos.

5. Data Submission

A. Provide a plot plan for the facility in question that is drawn to scale and depicts the fence line, emission sources, and downwash structures (buildings). The plot should be labeled with tick marks, referenced to the Universal Transverse Mercator (UTM) coordinate system, and geo-referenced to a common horizontal datum [e.g., North American Datum (1983), or NAD83]. Applicants should make sure that all coordinates input to the model (receptor locations, source locations, and building corners) are based on a common datum. The application should clearly state which datum was used.

New for September 2014

The AQD has developed an electronic Inventory, Monitoring, Permitting, And Compliance Tracking (IMPACT) system. Facility and source location within IMPACT will be based on the WGS84/NAD83 datum. Applicants are therefore encouraged to produce modeling analyses that are based on the WGS84/NAD83 datum.

B. Submit a table which provides the emission rates for each emission source and the corresponding stack parameters for the operational scenarios proposed in the permit application. Provide the UTM coordinates for each source, and indicate the UTM datum that was used.

Include for point sources:

- Stack Emission Rate
- Stack Release Height
- Stack Exhaust Temperature
- Stack Release Velocity
- Stack Exit (Inner) Diameter

Include for modeled Area and volume sources:

- Source Emission Rate
- Source Release Height
- Initial Lateral Dimension (sigma-y)
- Initial Vertical Dimension (sigma-z)

Applicants should provide justification for the selection of area and volume source inputs, relating the actual dimensions of the source to EPA guidance for the selection of area/volume source dimensions.

C. Submit the following plots:

- A plot showing all receptor locations (base grid and any reduced grids used for full-impact modeling) used in the modeling analysis along with the facility fenceline
- Plots which identify the maximum modeled impact for each pollutant and respective averaging period

D. Provide a summary table which lists the maximum modeled concentrations for each year that was used in the modeling simulations, and include the receptor locations of the maximum impacts.

E. All modeling input/output files (AERMET/AERSURFACE, AERMAP, BPIP and AERMOD) should be provided to the AQD on CD/DVD or external hard drive. Provide a table which lists the file names along with a description of what each file represents. Include the Surfer file (*.bln) that represents the facility fenceline. Contact the AQD for an indication of how many copies of the modeling report to submit.

F. As required by WAQSR Chapter 6, Section 4 (b)(i)(B), the applicant must assess impacts to the following Air Quality Related Values (AQRVs) for Class II Areas:

- Soils and Vegetation
- Secondary Growth Impacts

G. The application should include an inhalation risk assessment for Hazardous Air Pollutants (HAP). Specifically, an applicant should conduct a Tier 1 (screening level) inhalation risk assessment of HAPs to estimate the chronic carcinogenic risks for the project. The analysis should follow the facility-specific assessment guidance developed by the EPA as described in the document *Air Toxics Risk Assessment Reference Library, Volume 2, Facility-Specific Assessment**, but the analysis should use the AERMOD model and the base receptor grid that is used for other AERMOD modeling.

*(http://www2.epa.gov/sites/production/files/2013-08/documents/volume_2_facilityassess.pdf).

Dose-response values for use in the screening level analysis for chronic carcinogenic risk from HAPs can be found in Table 1 on EPA's Air: Fate, Exposure, and Risk Analysis Website at the following link:

http://www2.epa.gov/fera/dose-response-assessment-assessing-health-risks-associated-exposure-hazardous-air-pollutants

6. Miscellaneous

A. Horizontal/Capped Sources: Non-default, BETA test options for modeling capped point sources and horizontal stacks have been included in AERMOD beginning with version 06341 (source types POINTCAP and POINTHOR). For sources not subject to building downwash, POINTCAP/POINTHOR read actual stack parameters and internally perform adjustments to properly account for effective stack diameter (maintaining buoyancy), plume rise, and stack-tip downwash in accordance with the EPA Model Clearinghouse Memorandum dated July 9, 1993. For sources subject to PRIME downwash, the use of the effective stack diameter from POINTCAP/POINTHOR can result in unrealistic results. The basics of the Clearinghouse memo have been adapted for PRIME plume rise calculations within the BETA test options, but this adaptation has not yet been fully validated. Applicants should consult with the AQD if modeling horizontal/capped point sources that are subject to building downwash.

B. Parallel Coded AERMOD: A memo issued by the EPA Air Quality Modeling Group on December 11, 2007 addresses the regulatory status of AERMOD as incorporated into commercial software packages. The memo stresses that a strictly "proprietary" version of AERMOD cannot be considered as an EPA-preferred model for regulatory modeling demonstrations. Additionally, commercial software GUIs that contain a version of the AERMOD model kernel that has been altered, e.g., parallelized to reduce model run time, must have an associated demonstration of equivalency to the EPA version of the model. Applicants intending to use parallelized versions of AERMOD should submit sufficient information to the AQD to satisfy the requirements of the December 11, 2007 EPA memo.

C. Flares: Flares are typically modeled as point sources, but to properly account for the heat release and flame length of a flare, it may be necessary to calculate an equivalent stack diameter and equivalent release height. Several methods for calculating equivalent flare release parameters can be found in the literature, but currently no single method is widely accepted. Any use of equivalent release parameters for a flare should be fully documented for consideration by the AQD.

FAR-FIELD MODELING

Based on the location and the magnitude of the emissions from a proposed project or modification, Class I area impact analyses may be required. These analyses may include, at a minimum; visibility, acid deposition, and an assessment of Class I increment consumption. The required impact analyses will be determined in part by the FLM. An applicant may be excused by the FLM from an AQRV analysis for a given project based on Q/D calculations, but the WAQSR requires a demonstration that Class I increments are protected for all projects.

All modeling analyses submitted in support of a permit application that are based on a long-range transport model such as CALPUFF should contain the following:

- The source code and executable files based on the version of the particular models used in the analyses if standard programs were recompiled (e.g., CALMET, CALPUFF, POSTUTIL, CALPOST)

- Identification of the compiler and the compiler options that were used in generating the executable files

The following table lists the Wyoming Ambient Air Quality Standards (WAAQS) and Class II area modeling significance levels.

Wyoming Ambient Air Quality Standards (WAAQS) and Modeling Significance Levels

Pollutant	Averaging Period	WAAQS ($\mu g/m^3$)	Modeling Significance Levels ($\mu g/m^3$)
Particulate Matter-10 microns	Annual	50	1
	24-hour	150	5
Particulate Matter-2.5 microns[1]	Annual	15	0.3
	24-hour	35	1.2
Sulfur Dioxide	Annual[2]	80	1
	24-hour[2]	365	5
	3-hour	500 (ppb)[3]	25
	1-hour	75 (ppb)[4]	3 (ppb)[4]
Nitrogen Dioxide	Annual	100	1
	1-hour	189[5]	7.5[5]
Ozone	8-hour	75 (ppb)	----
Carbon Monoxide	8-hour	10,000	500
	1-hour	40,000	2,000
Lead	Calendar	1.5	----
Hydrogen Sulfide	1-hour	40/70[6]	----
Fluorides	24-hour	----[7]	----

1 Annual $PM_{2.5}$ standard is the annual arithmetic mean averaged over three (3) years. The 24-hour $PM_{2.5}$ standard is the 3-year average of the 98th percentile of the daily 24-hour average concentration.

2 Annual and 24-hour SO_2 standards remain in effect for one (1) year following the effective date of the initial designations under section 107(d)(1) for the 1-hour SO_2 NAAQS. After such a time period, the standards will be revoked, but must continue to be protected under the PSD program for as long as they remain in effect for a PSD area.

3 3-hour SO_2 standard is the revised secondary standard set forth by EPA, not to be exceed more than once per year.

4 1-hour SO_2 standard is the 3-year average of the 99th percentile of the daily maximum 1-hour average concentration. The 1-hour SO_2 modeling significance level is an interim SIL set forth by EPA based on four percent (4%) of the 1- hour WAAQS.

5 1-hour NO_2 standard is the 3-year average of the 98th percentile of the daily maximum 1-hour average concentration. The 1-hour NO_2 modeling significance level is an interim SIL set forth by EPA based on approximately four percent (4%) of the 1- hour WAAQS.

6 Wyoming's standards for H_2S are 40 $\mu g/m^3$ (½ hour average not to be exceeded more than two times in any five consecutive day period), and 70 $\mu g/m^3$ (½ hour average not to be exceeded more than two times per year).

7 Wyoming has statewide and regional ambient air standards for fluorides, measured as hydrogen fluoride. Consult Wyoming's Air Quality Standards & Regulations (WAQSR) Chapter 2, Section 9(a)(i) & (a)(ii).