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# AIR DISPERSION MODELING GUIDELINES For AIR QUALITY PERMITTING

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Environmental Health Department  
Air Quality Division  
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## INTRODUCTION

Albuquerque / Bernalillo County Air Quality Control Board (A/BCAQCB) Regulations 20.11.41.13.B.(6) NMAC and 20.11.42.12.A.(4).(j).(ii) NMAC require an applicant to demonstrate the effects that a proposed facility will have upon any New Mexico or National ambient air quality standard (NAAQS), or an applicable New Source Performance Standard (NSPS) or National Emission Standard for Hazardous Air Pollutants (NESHAP) limitation or any Air Quality Control Board rule. This demonstration must relate the expected emissions from the facility to the maximum off-site ambient air impact. The required information must be developed using an Environmental Protection Agency (EPA) approved dispersion model. These guidelines have been developed using the latest revision to Appendix W of 40 CFR 51 “Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions: Final Rule; Wednesday November 9, 2005”. This document is subject to change by the Division in order to be consistent with revisions to EPA guidelines, and to update modeling policies and procedures.

Initial evaluations of the facilities emissions can be made using the model SCREEN 3, which is available from the EPA's Technology Transfer Network as well as several different environmental engineering firms. The model inputs must reflect the estimated emission parameters of the source. SCREEN 3 should be run with the FULL METEOROLOGY option. The use of other meteorological conditions must be fully justified and documented in the modeling report. If the predicted ambient impacts modeled with SCREEN 3 are less than the above referenced standards and/or limitations for the emitted pollutants, then no further modeling analysis is needed.

If the SCREEN 3 ambient impacts are higher than the above referenced standards for the emitted pollutants, then additional modeling analyses will be required. Although EPA has stated that AERMOD is the preferred model for choice for additional analyses, ISC3 can also be used for minor source permitting actions (see details below). Both available from the sources mentioned above and should be run using a rectangular grid receptor array. Model inputs must reflect the estimated emission parameters of the source. Receptors should be spaced at 50 meter intervals along the fence line with a 100-meter by 100-meter receptor array for areas outside the fence line, out to 0.5 kilometers. If the radius of impact exceeds 0.5 kilometers, the receptor array spacing may be increased to 500 meters for those areas beyond 0.5 kilometers. The emission point or points, buildings and fence lines should be located using exact UTM coordinates, however the receptor grid may be located at an even 100 meter spacing.

A decision concerning rural vs. urban dispersion coefficients must be made. Use *URBAN / RURAL DISPERSION COEFFICIENTS CLASSIFICATION*, (Attachment A) to make this determination. Rural dispersion may frequently be used as a default since it is more conservative i.e. less dispersion, if this use does not produce ambient violations.

EPA's modeling guidelines (40 Code of Federal Regulations, Part 51) and Environmental Protection Agency, 40 CFR Part 51 “Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions: Final Rule; Wednesday November 9, 2005” (Guidelines) provides guidelines for air dispersion modeling. For topics that are not discussed in the Division's guidelines please refer to the EPA Guideline and contact the Air Quality Division.

## MODELING PROTOCOL

For minor stationary source permitting actions, a modeling protocol should be submitted and approved before modeling begins. For PSD or major stationary source permit applications, a modeling protocol shall be submitted and approved before modeling begins. The modeling protocol must describe the proposed action in detail and explain the choice of input parameters to be used.

## POLLUTANTS AND MODELS

1. Ozone
  - A. If VOC emissions are less than 500 tons per year, then there is no need to determine compliance with ozone standards.
  - B. If VOC emissions are 500 tons per year or more, then use the Scheffe screening technique outlined in Attachment B.
  - C. If the screening method does not demonstrate compliance with the ozone standards, then modeling with CAMX or CMAQ will be required. Contact the Division for more information.
2. All other pollutants shall be modeled using AERMOD, ISC3, SCREEN3 (until replaced by AERSCREEN), CALPUFF, or CALSCREEN. Exceptions must be approved by the Air Quality Division ('Division') on a case-by-case basis.
3. Seasonal restrictions:

AERMOD sometimes shows maximum 24-hour impacts during the springtime. Experience, on the other hand, shows the worst dispersion conditions for Bernalillo County occur during the late autumn and winter (i.e. the no-burn season). Thus it is unacceptable to use AERMOD results as justification for limiting hours of operation only during the spring and not during the winter. When operating hours are limited in the model solely to comply with the NAAQS/NMAAQs, winter and autumn operations should always be limited before spring and summer operations. For this reason, the Division prefers the use of ISC over AERMOD when there is a need to restrict hours of operation.

For example, suppose a facility (without a tall, buoyant smokestack) would like to be able to operate 24 hours a day, 6 days a week, all year. You've just run AERMOD and it's showing an exceedance of a 24 hour particulate standard on March 10. Do **not** bother to re-run AERMOD with only 16 hours of operation during March as a demonstration of compliance because that demonstration will be rejected. Instead, use ISC.

In fact, AERMOD shows maximum 24-hour impacts for Albuquerque as occurring in the spring often enough that the Division recommends using ISC from the beginning for modeling associated with minor source permitting actions. Until further notice, **AERMOD must be used with major source permitting actions.**

## **MODELING WAIVERS**

Some source's emissions are either minimal, intermittent or do not require air dispersion modeling for some other reason. The following are some examples of sources that do not have to provide air dispersion modeling upon application.

- Emergency Generators (less than 500 hours of annual operations)
- Gasoline Stations
- Dry Cleaners
- Natural Gas-Fired Boilers (please contact the Division for a case-by-case determination)
- Automotive Paint and Body
- Certain Soil Vapor Extraction Systems (please contact the Division for a case-by-case determination)
- Groundwater Stripping Systems

If a source is eligible for a modeling waiver then submit a brief report specifically addressing the request for a modeling waiver to the Division.

## **METEOROLOGICAL DATA**

AERMOD, ISC, and CALPUFF all require meteorological data files. For ISC and AERMOD, meteorological data files are available from the Division which uses Albuquerque airport data gathered by the National Weather Service. MM5 meteorological datasets are generally used for CALPUFF modeling. Some MM5 data has been obtained, but not tested, by the Division. For more information on the MM5 data, contact the Division.

CALPUFF modeling is required by the Division when an appropriate meteorological data set for use with AERMOD is not available. For example, meteorological datasets gathered west of the Sandia Mountains are not representative of conditions in Tijeras Canyon or to the east of the Sandias. Thus, dispersion modeling in canyons and east of the Sandia Mountains may require use of CALPUFF. (An alternative would be to gather a year of met data at the proposed facility site and use AERMOD.)

## PROCESSING METEOROLOGICAL DATA WITH AERMET

Meteorological data for use with AERMOD and AERMET are available on the Division's website. The 1993 and 1990-1995 (5-year) datasets that are ready for use with AERMOD were processed with the following surface characteristics: an albedo of 0.25 and a Bowen ratio of 4.0 for all seasons. Values of albedo and Bowen ratio were chosen by averaging satellite imagery of the surface characteristics over the Albuquerque metro area.

Surface roughness values were chosen to represent a 3-mile radius around the site of data collection. A roughness value of 0.5 meters was chosen for the northeast, northwest, and southwest quadrants. For the southeast quadrant, which includes the Albuquerque airport runways, a roughness value of 0.25 meters was chosen.

AERMOD shows little sensitivity to choice of albedo and Bowen ratio for low-level sources and non-buoyant sources. For tall, buoyant smokestacks, modelers will need to re-evaluate values used for Bowen ratio and albedo. Satellite image data for albedo and Bowen ratio are available on the Division's website. The albedo and Bowen ratio maps were derived from LANDSAT images using SEBAL<sup>NM</sup>. The maps for the City of Albuquerque were provided by Dr. Jan Hendrickx, Professor of Hydrology at New Mexico Tech ([hendrick@nmt.edu](mailto:hendrick@nmt.edu)). The data can be viewed and analyzed with Geographic Information System software.

The 5-year and 1-year model-ready datasets posted on the Division's website will suffice for most sources within the Albuquerque metro area. In the event that a tall, buoyant smokestack needs to be modeled, the Division has also posted the merged surface and upper air data. AERMET Stage 3 processing must be performed on the merged data to create a model-ready dataset. The input file used in the final stage of processing must be submitted to the Division.

Values of Bowen ratio and albedo must also be investigated for processing meteorological data outside of the Albuquerque metro area. Surface roughness values must be investigated for processing any site-specific meteorological data. The roughness length, albedo, and Bowen ratio values used in stage 3 processing must be discussed in the modeling report submitted to the Division. The Texas Commission on Environmental Quality (TCEQ) has published an excellent guide for choosing surface roughness values. It can be found at

<http://www.tceq.state.tx.us/permitting/air/modeling/aermet.html>

Upper air and surface data are also available for merging with on-site meteorological data. Be prepared to defend the quality of site-specific meteorological data used in AERMOD. Quality of site-specific data must be demonstrated with documentation.

## DESIGN CONCENTRATIONS

“Emission limits should be based on concentration estimates for the averaging time that results in the most stringent control requirements. The concentration used in specifying emission limits is called the design value or design concentration and is a sum of the concentration contributed by the primary source, other applicable sources, and -- for NAAQS assessments - the background concentrations.” -40 CFR Part 51, Guideline on Air Quality Models, Appendix W, 10.2.3.1.

The recommended procedures under 7.2.1 - “Design Concentrations”, of 40 CFR Part 51, Guideline on Air Quality Models, Appendix W, shall be used in order to determine the design concentrations for SO<sub>2</sub>, PM<sub>10</sub>, CO, Pb, NO<sub>2</sub>. For PM<sub>2.5</sub>, Appendix W refers to Appendix N of the NAAQS CFR which describes the computation of the 98<sup>th</sup> percentile, the form of the PM<sub>2.5</sub> standard. The NAAQS CFR, on page 61164, states the form of the standard was chosen because “it gives proportionally greater weight to days when concentrations are well above 35 µg/m<sup>3</sup> than to days when the concentrations are just above 35 µg/m<sup>3</sup>.”

It is tempting to compare the eighth highest, high modeled impact from a facility to the level of the standard, 35 µg/m<sup>3</sup>, because two percent of 365 days is seven days. That simple arithmetic may sometimes ignore the greater weight the form of the standard gives to days with 24-hour averages well above the standard.

An argument for using the eighth highest, high as a modeling impact must take into account the greater weight the form of the standard gives to days with 24-hour averages well above the standard. The Division will accept or reject such arguments on a case-by-case basis. Often, it will be easier to simply use the highest modeled impact in demonstrating compliance.

## BACKGROUND CONCENTRATIONS

The Division maintains an ambient air monitoring network consisting of monitors for particulate matter less than 10 microns ( $PM_{10}$ ), particulate matter less than 2.5 microns ( $PM_{2.5}$ ), nitrogen dioxide ( $NO_2$ ), and carbon monoxide (CO). Sulfur dioxide concentrations have been found insignificant in the western United States and monitoring of  $SO_2$  ceased a long time ago. Zero shall be used as the background for  $SO_2$  for all averaging times.

Attachment C displays a map of  $PM_{10}$  background levels for Bernalillo County and Attachment D zooms in to the Albuquerque metropolitan area.  $PM_{10}$  background levels for Bernalillo County were established upon review of the entire monitoring network and each of the monitoring stations. As a result of the USEPA revoking the Total Suspended Particulate Matter (TSP) standard and requirements for monitoring, the Air Quality Division discontinued ambient air monitoring for Total Suspended Particulate Matter (TSP) in May 1989. Therefore, established TSP background concentrations values are identical as those of  $PM_{10}$  background values.

This will sometimes complicate the calculation of a design concentration. In particular, if an adjacent property has a source of large (>10 microns) particles, then cumulative modeling will be required for the large particles.  $PM_{10}$  impacts are accounted for in the background value. Thus  $PM_{10}$  emissions must be subtracted from TSP emissions for the source on the adjacent property. To get the TSP design concentration, the maximum impact found in the cumulative model must then be added to background value for particles of 10 microns or less in diameter.

For  $PM_{2.5}$ ,  $6.5 \mu\text{g}/\text{m}^3$  will be used as the background value for all of Bernalillo County. A separate report, *Methodologies for Calculating Background Concentrations*, is available from the Division that explains in far greater detail how background levels of pollutants are calculated.

For  $NO_2$ ,  $31 \mu\text{g}/\text{m}^3$  shall be used as background for all of Bernalillo County for compliance with New Mexico's 24-hour standard;  $25 \mu\text{g}/\text{m}^3$  shall be used as background for compliance with the annual standards.

## PLUME DEPLETION

Particle size distributions used must be documented and justified. The modeling analysis submitted must explain the derivation of particle sizes, percentages/mass fractions, and densities for all particle size distributions used within the model.

Use of plume depletion is acceptable for modeling of both Total Suspended Particulate and PM<sub>10</sub>.

The following particle size distribution is acceptable for crushing of rock and stone:

**Table I: Particle Size Distribution**

Size Range (µm)	Mass Mean Diameter (µm)	Mass Fraction
2.5-5.0	3.88	0.06
5-10	7.77	0.205
10-15	12.66	0.16
15-20	17.62	0.175
20-30	25.33	0.225
30-45	38.0	0.175

The particle size distribution in Table I was derived from an article in the March 2006 issue of the Journal of Environmental Engineering entitled *Particulate Matter from the Stone Crushing Industry: Size Distribution and Health Effects*. The distribution in Table I can also be used for aggregate handling if the applicant shows that calculated TSP emissions include particles larger than 30 microns.

## MAPPING OF RESULTS

The modeling analysis must include aerial photographs overlaid with contours of modeled impacts for all pollutants and averaging times modeled. Use the most recent aerial imagery from the Bernalillo County GIS web site. At a minimum, streets, impact contours, and the source(s) being modeled must be labeled in the photograph. If there is a fence or wall, it should be outlined on the photograph as well. Coordinates used in the model must be correct to within 20 meters. Shapes and layouts must resemble aerial imagery. It is expected that contours of impacts are from the model only, i.e. do not include background values. If the contours are modified to include background, then that should be noted in bold with each aerial photograph.

## MODELING METHODOLOGIES

### MERGING PARAMETERS FOR MULTIPLE STACKS

If a source emits the same pollutant from multiple stacks within 100 meters of each other the stacks may be merged into one stack, if stack height, flow rates, and stack gas exit temperatures differ by no more than 20% each. Compute a value of M for each stack using the equation below and use the stack with the smallest M value as the "merging" stack. Sum the emissions from all stacks to obtain the "merged" emissions from the "merged" stack.

$$M = HVT / Q$$

where:

H = stack height (m).

V = stack gas volume flow rate (m<sup>3</sup>/s)

T = stack gas exit temperature (K)

Q = pollutant emission rate (g/s)

### USE OF EMISSIONS FACTORS

The maximum hourly emissions being requested must also be the hourly emissions used in the 24-hour model. It is inappropriate to use hourly emission factors to spread total daily emissions out over all potential operating hours. For example, if a concrete batch plant can produce its maximum daily throughput in 8 hours, but the plant wants the flexibility to operate during any time of day between 5 AM and 9 PM (16 hours), it is inappropriate to spread 8 hours of emissions out over 16 hours by using an hourly emissions factor of 0.5 (i.e. cutting the emission rate in half).

### MODELING BLOCKS OF TIME

If a modeling situation is complex (e.g. two facilities with different schedules operating on the same property) it may be necessary to model operations during successive blocks of time to discover the worst case scenario. For example, suppose plants A and B operate on the same piece of property. Plant A always operates from 7 AM to 5 PM, while plant B needs the flexibility to operate during any 8 hour block within a 24 hour period. Numerous scenarios may have to be modeled to find the worst case scenario. Document and submit the different scenarios studied.

### USE OF 0.6 CORRECTION FACTOR FOR FUGITIVE EMISSIONS

For release heights of 10 meters or less and **with ISC only**, it is appropriate to multiply fugitive emission rates by a factor of 0.6. The justification for doing this can be found at <http://www.tceq.state.tx.us/assets/public/permitting/air/memos/modadjfact.pdf>.

## **MODELING CHANGES IN FACILITY SOURCE CONFIGURATIONS**

In the case where volume or point sources need to be moved within the boundaries of a property or need to be replaced, it is acceptable to model the changes to sources. In other words, execute the model with the current or permitted configuration of sources; then execute the model with the proposed configuration of sources. Comparing the modeled impacts (current or permitted configuration and proposed configuration) from the two scenarios may show no significant increase in impacts or perhaps, even a decrease in impacts. In those cases, no further modeling is required to demonstrate compliance with NAAQS and NMAAQs.

## **MODELING PORTABLE SOURCES/RELOCATIONS**

In cases where an existing portable source is notifying the Division of relocating equipment, the Division may require air dispersion modeling. Please contact the Division Modeling Staff for a case-by-case determination.

## **MODELING PROPOSED MODIFICATIONS TO EXISTING FACILITIES**

In cases where facility/permittee has a source that is added to a current and long-standing source(s) that have contributed to the background levels, a company may model only the emissions associated with the proposed modification (i.e. addition of screen, crusher, etc.), then add the appropriate background concentration to the modeled concentration of the proposed modification. This methodology only works if an appropriate monitor is very close (i.e. across the street). If this situation applies to your company/client, the modeling protocol submitted should discuss the proposed addition of sources. Explain how air quality standards will be protected in both the modeling protocol and report submitted.

## HAUL ROADS

Careful examination of AP-42 for both Paved and Unpaved Roads shows the science of haul road modeling is dubious in nature. Furthermore, the WRAP Fugitive Dust Handbook published November 2004 shows paving of haul roads and keeping those roads clean results in nearly 100 percent control of PM10 emissions. Modeling of paved haul roads will not be required if the applicant is willing to implement reasonably available control measures as specified below or if the applicant implements a department approved best management practices plan.

Paved haul roads can be conditionally excluded from modeling. The conditions shall be enforceable permit conditions and at a minimum, these conditions include:

1. The applicant shall use any of the control measures to **prevent** visible emissions of fugitive dust from being generated as specified by 20.11.20.23.A and B NMAC:
  - a. Cleaning up spillage and trackout as necessary to prevent pulverized particulates from being entrained into the atmosphere
  - b. Using paved or gravel entry/exit aprons with devices, such as steel grates, capable of knocking mud and bulk material off vehicle tires;
  - c. Using on-site wheel washes; or
  - d. Performing regularly scheduled vacuum street cleaning or wet sweeping with a sweeper certified by the manufacturer to be efficient at removing particulate matter having an aerodynamic diameter of less than 10 microns (i.e. PM<sub>10</sub>)
  - e. Using dust suppressants applied in amounts and rates recommended by the manufacturer and maintained as recommended by the manufacturer
  - f. Using wet suppression
  - g. Using traffic controls, including decreased speed limits with appropriate enforcement; other traffic calming methods, vehicle access restrictions and controls; road closures or barricades; and off-road vehicle access controls and closures
2. Visible accumulation of particulate matter that is deposited on all paved haul roads shall be cleaned and/or mitigated as soon as possible. If visible fugitive emissions are observed off of paved haul roads utilizing the methods specified by 20.11.20.26 NMAC, one or a combination of the above control measures shall be implemented and completed to prevent any visible emissions of fugitive dust from being generated.

Not complying with the above minimum conditions shall be a violation of the applicant's permit.

### Procedure for Modeling Haul Roads

The Division has approved the use of volume sources for modeling haul roads. The following is a procedure to develop model input parameters (obtained from Texas Modeling Guidelines, 1999). Other methodologies may be accepted on a case-by-case basis and must be explained in detail. Companies/consultants need to document how they develop the emission factors and emission rates used in haul road modeling. They must justify (scientific studies, AP-42, etc.) values used to develop emission factors, such as percentage of silt on haul road surfaces.

***Volume Source Characterization of Haul Roads:*** Follow the steps described below.

***Volume Step 1:*** Determine the number of volume sources, N. Divide the length of the road by the width. The result is the maximum number of volume sources that could be used to represent the road.

***Volume Step 2:*** Determine the height of the volume source. The height will be equal to twice the height of the vehicle generating the emissions—round to the nearest meter.

***Volume Step 3:*** Determine the initial horizontal sigma for each volume.

- If the road is represented by a single volume, divide the length of the volume source by 4.3.
- If the road is represented by adjacent volumes, divide the length of the volume source by 2.15.
- If the road is represented by alternating volumes, divide twice the length of the volume source measured from the center point of the first volume to the center point of the next represented volume—by 2.15. Start with the volume source nearest to the property line. This representation is often used for long roads.

***Volume Step 4:*** Determine the initial vertical sigma. Divide the height of the volume source determined in Step 2 by 2.15.

***Volume Step 5:*** Determine the release point. Divide the height of the volume source by two. This point is in the center of the volume source.

***Volume Step 6:*** Determine the emission rate for each volume source used to calculate the initial horizontal sigma in Step 4. Divide the total emission rate equally among the individual volumes used to represent the road, unless there is a known spatial variation in emissions.

***Volume Step 7:*** Determine the UTM coordinate for the release point. The release point location is in the center of the base of the volume. This location must be at least one meter from the nearest receptor.

## PSD MODELING ANALYSES

### Air Quality Control Regions and PSD Baseline Dates

Major modifications that meet significance thresholds and new major sources require a PSD increment consumption analysis before construction begins. Increment analysis generally involves three steps:

- 1) Determine the Class II “significant impact area” for each pollutant and averaging time that triggered PSD review. Class II significance levels are found in Table VI.
- 2) Prepare an inventory of sources that expand or consume increment within the significant impact area. This may include sources outside the significant impact area.
- 3) Model the change in emissions to get a concentration change, and compare that concentration change to the applicable increment.

The following table serves as a tool to determine which sources to include in PSD increment modeling.

**Table II: PSD Increment Consumption and Expansion**

Sources that do not consume PSD increment	<ul style="list-style-type: none"><li>• Temporary construction emissions (sources involved in a construction project that will be completed in a year or less).</li><li>• Any facility or modification to a facility constructed before the PSD major source baseline date.</li><li>• Any minor source constructed before the PSD minor source baseline date.</li></ul>
Sources that consume PSD increment	<ul style="list-style-type: none"><li>• Any new emissions or increase in emissions after the PSD Minor Source Baseline date (for that AQCR and pollutant).</li><li>• Any new emissions or increase in emissions at a PSD Major source that occurs after the Major Source Baseline Date.</li></ul>
Sources that expand PSD increment	<ul style="list-style-type: none"><li>• A permanent reduction in actual emissions from a baseline source.</li></ul>

#### Notes:

- EPA memos written before the publication of the Draft NSR Workshop Manual indicate that PSD regulations were not intended to apply to temporary pilot projects. The memo clearly indicated that the pilot project did not need a PSD permit.
- If a minor source facility once existed but shut down before the minor source baseline date, then it would not be considered to be part of the baseline.
- An increase in emissions due to increased utilization of a facility, such as de-bottlenecking, are treated as any other increase in emissions.

**Table III: Minor Source Baseline Dates for Air Quality Control Region 152**

Pollutant	Trigger Date
NO <sub>2</sub>	3/26/97
SO <sub>2</sub>	5/14/81
PM <sub>10</sub>	3/26/97

**Table IV: Major Source Baseline Dates and Trigger Dates**

Pollutant	Major Source Baseline Date	Trigger Date
PM <sub>10</sub>	January 6, 1975	August 7, 1977
SO <sub>2</sub>	January 6, 1975	August 7, 1977
NO <sub>2</sub>	February 8, 1988	February 8, 1988

### **PSD Class I Area Receptors**

A modeling analysis of the PSD increment consumed at the nearest Class I areas must be performed by sources in AQCR 152 when a new major source is to be constructed or when a modification at a major source exceeds significance thresholds. Receptors should generally be placed along the boundaries of the Class I areas with medium (100 meter) spacing and in the interior with coarse (500 meter) spacing. If concentrations are above 75% of the PSD increment, then Fine (50 meter) grid spacing should be used near the hot spots.

### **PSD Class II Area Receptors**

Bandelier National Monument is the only PSD Class I area in AQCR 152. The remainder of AQCR 152, including the County of Bernalillo, is a Class II area. The receptor grid for the PSD Class II increment analysis should be the same as for NAAQS compliance modeling.

### **PSD Class I increment**

If the proposed construction of a PSD major source is within 100 km of a Class I area, then PSD increment consumption at the Class I area(s) must be determined and compared with the Class I PSD increment. The PSD permit process requires a more thorough Class I analysis, which is described below under “PSD Permit Application Modeling”.

## PSD PERMIT APPLICATION MODELING

PSD sources and requirements are defined in NMAC 20.11.61.15 NMAC to 20.11.61.17 NMAC. New PSD major sources and major modifications to PSD major sources must submit the following modeling requirements in addition to the regular NSR modeling requirements. Minor modifications to PSD major sources are only subject to regular NSR modeling requirements, as required under 20.11.41 NMAC.

Sources subject to PSD requirements should consult with the Division to determine how to proceed in the application process. For PSD applications, a modeling protocol is required for review. The following items are required for PSD permit applications and supersede other modeling requirements in this document.

### Meteorological Data

Applicants may need to collect one year of on-site meteorological and ambient data to satisfy PSD requirements. In some cases, it may be advantageous to begin collecting on-site meteorological and ambient data to ensure that it is available at a site that may become PSD in the future. A company considering a monitoring program is advised to consult with the Division as early as possible so that an acceptable data collection process, including instrument parameters, can be started. Generally, the following meteorological parameters will be measured: wind direction, wind speed, ambient air temperature, solar insolation,  $\Delta T$ , and  $\sigma_{\theta}$ . For further information on meteorological monitoring Refer to EPA's *Guideline on Air Quality Models* and *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*. Refer to *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* for ambient monitoring guidance. In addition, a monitoring protocol and QA plan **must** be submitted and approved prior to beginning collection of data for a PSD application if these data are to be used for the analysis.

In the absence of actual on-site data, the Division may approve the use of off-site data that the Division believes adequately representative for that location or the Division may approve the use of data produced by the model MM5.

### Ambient Air Quality Analysis

- If there is a Class I area within 100 km of the facility, then receptors must be located in the Class I area.
- If a model of a facility produces ambient concentrations in a Class I area greater than the significance levels in Table V, then the increment analysis for the Class I area should include all increment consuming sources within 100 km of the Class I area.
- If a model of the facility produces ambient concentrations in a Class II area greater than the significance levels in Table VI, then the Class II PSD increment analysis for the facility must include all increment consuming sources within the significant impact area.
- If the maximum modeled ambient impact is less than the significant level, then a full analysis is not required.

### **Additional Requirements of a Full Analysis (NMAC 20.11.61.16)**

In addition to demonstrating compliance with applicable PSD increments, the owner or operator of the proposed major stationary source or major modification shall provide an analysis of the impact that would occur as a result of the source or modification and general commercial, residential, industrial, and other growth associated with the source or modification.

- An analysis of Air Quality Related Values must be included in the PSD application. If the facility will have no impact on the AQRV, then that must be stated in the application (NSR Workshop Manual, Chapter D).
- There may be additional analyses required by the Federal Land Managers (FLM) for Air Quality Related Values (AQRVs). See Federal Land Managers' Air Quality Related Values Work Group (FLAG) for more information at: <http://www2.nature.nps.gov/air/Permits/flag/index.cfm>
- Visibility Analysis: A Class II Visibility Analysis is required to determine impact the facility will have upon Class II areas. Analyze the change in visibility of a nearby peak or mountain for this analysis. In the absence of nearby mountains, analyze the visibility of clear sky from nearby state or local parks.
- Soils analysis: What changes will occur to soil pH, toxicity, susceptibility to erosion, or other soil characteristics as a result of the project and indirect growth related to the project?
- Vegetation analysis: What changes will occur to type, abundance, vulnerability to parasites, or other vegetation characteristics as a result of the project and indirect growth related to the project? The owner or operator need not provide an analysis of the impact on vegetation having no significant commercial or recreational value.
- Growth analysis: The owner or operator shall also provide an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial, and other growth associated with the source or modification.

### **Emission trade-offs**

- If a facility is trading off emissions from another source that is not owned by the applicant, the applicant must produce a federally enforceable legal document that the state can use to force the emission reductions.

### **Emission Inventories**

- The most current inventory of sources must be used. It should contain all sources currently under review by the Division that would be located within the appropriate inventory area. The applicant should check with the modeling staff to ensure that the inventory is up to date.

### **BACT analysis**

- The analysis must follow current EPA procedures and guidelines.

**Table V: Class I PSD Significance Levels**

Pollutant	Averaging Period	FLM Recommended Significance Level ( $\mu\text{g}/\text{m}^3$ )	PSD Class I Increment ( $\mu\text{g}/\text{m}^3$ )
SO <sub>2</sub>	Annual	0.03	2
	24hr	0.07	5
	3hr	0.48	25
NO <sub>2</sub>	Annual	0.03	2.5
PM <sub>10</sub>	Annual	0.08	4
	24hr	0.27	8

**Table VI: Class II PSD Significance Levels**

Pollutant	Averaging Period	FLM Recommended Significance Level ( $\mu\text{g}/\text{m}^3$ )	PSD Class II Increment ( $\mu\text{g}/\text{m}^3$ )
SO <sub>2</sub>	Annual	1.0	20
	24hr	5.0	91
	3hr	25.0	512
NO <sub>2</sub>	Annual	1.0	25
PM <sub>10</sub>	Annual	1.0	17
	24hr	5.0	30

## Completeness requirements

A narrative report describing the modeling performed for the facility is required to be submitted with the modeling files. This report should be written so as to provide the public and the AQD with sufficient information to determine that the proposed construction will not cause or contribute to violations of air quality standards. The report needs to contain enough information to allow a reviewer to determine that modeling was done in a manner consistent and defensible with respect to available modeling guidance. Do not include raw modeling output in the report, only summaries and descriptions of the output.

It is suggested that reports be laid out according to the following outline. The outline may also be used as a checklist to determine if the analysis is complete.

- I. Applicant and consultant information
  - a. Name of facility and company.
  - b. Permit numbers currently registered for the facility.
  - c. Contact name, phone number, and e-mail address for the AQD to call in case of modeling questions.
- II. Facility and operations description
  - a. A narrative summary of the purpose of the proposed construction, modification, or revision.
  - b. Brief physical description of the location.
  - c. Duration of time that the facility will be located at this location.
  - d. A map showing UTM coordinates and the location of the proposed facility, on-site buildings, emission points, fence line, and property boundary.
- III. Modeling requirements description
  - a. List of pollutants at this facility requiring NAAQS and/or NMAAQs modeling.
  - b. If PSD, NSPS and NESHAP are applicable, then state any additional modeling requirements that result.
- IV. Modeling inputs
  - a. General modeling approach
    - i. The models used and the justification for using each model.
    - ii. Model options used and why they were considered appropriate to the application.
    - iii. Ozone limiting model options discussion, if used for NO<sub>2</sub> impacts.
    - iv. Background concentrations.
  - b. Meteorological data
    - i. A discussion of the meteorological data, including identification of the source of the data.
    - ii. The data itself and a discussion of the procedures used to quality-assure the data (if the Division did not provide the data).
    - iii. The stage3.inp file used in stage 3 processing and a discussion of the values chosen for Bowen ratio, albedo, and roughness length.
  - c. Receptor and terrain discussion
    - i. Description of the spacing of the receptor grids.
    - ii. List fence line coordinates and describe receptor spacing along fence line.
    - iii. Flat and complex terrain discussion, including source of elevation data.
  - d. Emission sources
    - i. Description of sources at the facility, including:

1. A summary of actual and modeled dimensions of all volume sources, whether the sources are elevated or surface based, and whether they are attached to a building or not.
  2. Describe treatment of operating hours
  3. Particle size characteristics, if plume depletion is used
  4. If the modeled stack parameters are different from those in the application, an explanation must be provided as to what special cases are being analyzed and why.
  5. Flare calculations used to determine effective stack parameters.
  6. A cross-reference from the model input source numbers/names to the sources listed in the permit application for the proposed facility.
- e. Building downwash
    - i. Dimensions of buildings
- V. Modeling files description
- a. A list of all the file names in the accompanying CD and description of these files.
  - b. Description of all scenarios modeled and which files go with which scenarios.
- VI. Modeling results
- a. If maximum impacts occur more than 50 meters from the fence line, then include a discussion of the radius of impact determination.
  - b. A summary of the modeling results including the maximum concentrations, location where the maximum concentration occurs, and comparison of the design concentration to the ambient standards.
  - c. For Title V sources, discuss Class I increment impact.
  - d. A table showing design concentrations corrected for elevation versus ambient air quality standards.
  - e. Aerial photographs overlaid with contours of maximum modeled impacts for each pollutant and each averaging time.
- VII. Summary/conclusions
- a. A statement that modeling requirements have been satisfied and that the permit can be issued.

**Bind Your Report!** Division modeling staff will not be responsible for loss of parts of your analysis and subsequent incomplete rulings. Three-ring binders or plastic side bindings are preferred.

Submit your report:

- I. An electronic copy (in MS Word format) of the modeling report.
- II. Input and output files for all model runs. Include BEEST (.BST) files, if available.
- III. Building downwash input and output files.
- IV. Met data, if not supplied by AQD.
- V. An electronic copy of the approved modeling protocol.
- VI. A paper copy of the modeling report. Only the narrative report should be printed. Do not include paper copies of modeling input and output files.
- VII. A map showing all sources along with UTM coordinates in meters.

**ATTACHMENT A**  
**URBAN / RURAL DISPERSION COEFFICIENTS CLASSIFICATION**

The following land use procedure should be used when determining whether urban or rural dispersion coefficients should be used when performing an ambient impact analysis using dispersion modeling. Should urban dispersion coefficients be required and your particular model gives you the option of URBAN-1, URBAN-2, or URBAN-3, the URBAN-3 dispersion coefficients should be selected.

1. Classify the land use within the total area,  $A_0$ , circumscribed by a 3 kilometer (km) radius circle about the source using the meteorological, land use, typing scheme proposed by Auer<sup>1</sup>.
2. If land use types I1, I2, C1, R2, and R3 (defined below) account for 50 percent or more of  $A_0$ , use urban dispersion coefficients; otherwise use appropriate rural dispersion coefficients.

**DEFINITION OF LAND USE TYPES**

(Meteorological Anomalies. Journal of Applied Meteorology, 17:636643.)

TYPE	USE AND STRUCTURES	VEGETATION
I 1	Heavy industrial - Major chemical, steel and fabrication industries; generally 3 - 5 story buildings with flat roofs.	Grass and tree growth extremely rare; < 5% vegetation
I 2	Light-moderate Industrial - Rail yards, Truck depots, Warehouses, Industrial parks, Minor fabrications; generally 1 - 3 story buildings with flat roofs.	Very limited grass, trees almost totally absent; < 5% vegetation
C 1	Commercial - Office and apartment buildings, hotels < 10 stories; with flat roofs.	Limited grass and trees; < 15% vegetation
R 2	Compact residential - Single, some multiple family dwellings with close spacing; generally < 2 story, pitched roof structures; garages (via alley); no driveways.	Limited lawn sizes and shade trees; <30% vegetation
R 3	Compact Residential - Old multi-family dwellings with close (< 2 meter) lateral separation; generally 2 story, flat roof structures; garages (via alley); no driveways.	Limited lawn sizes, old established shade trees; < 35% vegetation

**ATTACHMENT B**  
**Scheffe Ozone Screening Method**

**POINT SOURCES EMITTING VOC AND NO<sub>x</sub>**

Several photochemical models are appropriate for determining ozone impacts from sources emitting Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NO<sub>x</sub>). These models require extensive input data and can be quite resource-intensive to set up and run. The Division recommends the screening procedure documented in *Point Source Screening for Ozone Precursor Emissions*, by Richard D. Scheffe. Table VII and Table VIII from this document are reproduced below. The ozone concentration in parts per hundred million (pphm) determined from these screening tables should be added to the ozone background for comparison to the NAAQS. Please contact the Division to obtain an ozone background appropriate for the source you are modeling.

**Table VII**

Rural ozone increment (pphm) as a function of VOC emissions and VOC/NO<sub>x</sub> ratios.

VOC Emissions TPY	VOC/NO <sub>x</sub> Ratio		
	>20	5 - 20	< 5
50 TPY	0.4	0.4	1.1
75 TPY	0.4	0.4	1.2
100 TPY	0.4	0.5	1.4
300 TPY	0.8	1.0	1.7
500 TPY	1.1	1.4	1.9
750 TPY	1.6	1.9	2.3
1,000 TPY	2.0	2.4	2.7
1,500 TPY	2.7	3.0	3.3
2,000 TPY	3.4	3.8	3.7
3,000 TPY	4.8	5.2	4.3
5,000 TPY	7.0	7.5	4.8
7,500 TPY	9.8	10.1	5.1
10,000 TPY	12.2	12.9	5.4

Example calculation: Given

1. A rural VOC dominated source has the following emission parameters:
  - 100 Tons per year VOC and 30 Tons per year NO<sub>x</sub>
  - Therefore the VOC / NO<sub>x</sub> ratio = 100 / 30 = 3.33
2. Use the column in the above table headed < 5, since 3.33 < 5
3. On the row for VOC emissions, under the column for < 5 find the entry 1.4

4. The table, therefore, indicates a rural ozone increment for this source of 1.4 parts per hundred million (pphm). Local, background ozone levels will increase 1.4 pphm as a result of this sources' emissions.

As the table and calculation show, the incremental ozone increase due to emissions from a VOC dominated source depend on the gross VOC emissions and the VOC / NO<sub>x</sub> emissions ratio.

**Table VIII**

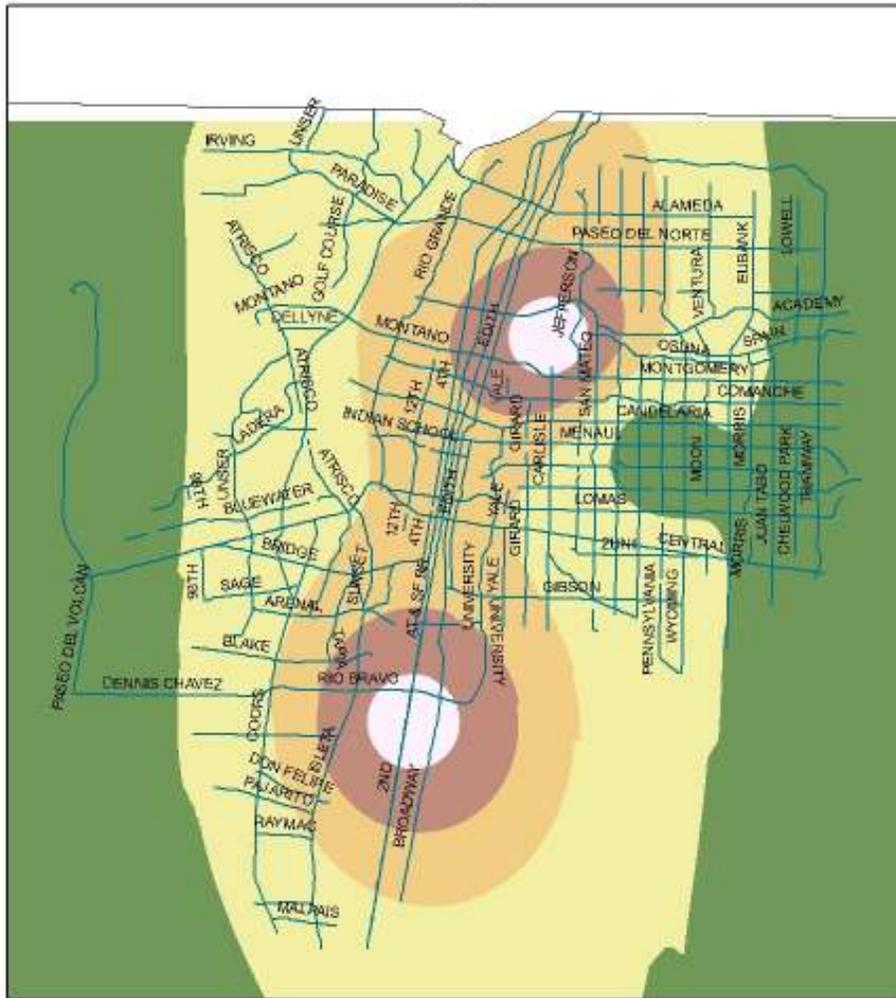
Urban ozone increment (pphm) as a function of VOC emissions and VOC/NO<sub>x</sub> ratios.

VOC Emissions TPY	VOC/NO <sub>x</sub> Ratio		
	>20	5 - 20	< 5
50 TPY	1.1	1.1	1.0
75 TPY	1.2	1.1	1.1
100 TPY	1.3	1.2	1.1
300 TPY	1.8	1.6	1.9
500 TPY	2.2	2.0	2.8
750 TPY	3.3	2.6	3.9
1,000 TPY	4.1	3.2	4.7
1,500 TPY	5.8	4.2	4.9
2,000 TPY	7.1	5.4	4.9
3,000 TPY	9.5	7.8	6.5
5,000 TPY	13.3	12.0	9.3
7,500 TPY	17.3	16.7	12.5
10,000 TPY	21.1	20.8	15.5

Urban ozone increments are calculated as in the example above except the urban table is used to determine the increment.



# TSP backgrounds



micrograms/m<sup>3</sup>

