AIR DISPERSION MODELING CHECKLIST

For Non-PSD Construction Permit Applications

This modeling checklist applies only to construction permit applications for sources not subject to the Prevention of Significant Deterioration (PSD) regulations. Sources must be located in attainment areas. It complements the Iowa Department of Natural Resources' (DNR's) "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Projects" and is designed to standardize the modeling procedures and documentation requirements for non-PSD, New Source Review (NSR) air dispersion modeling analyses.

This checklist should be completed and included in the modeling analysis report submitted to the DNR for all non-PSD construction permit projects that require modeling. This checklist can be completed electronically or manually. All elements of the checklist should be addressed and the text of the checklist shall not be altered in any manner.

This checklist is applicable to all criteria pollutants except VOCs (including ozone). The DNR modeling staff should be contacted for guidance on modeling VOCs and non-criteria pollutants, if such modeling is requested by the permit engineer.

Use of this checklist will help modelers avoid common errors such as:

- Emission rates or stack parameters that are unacceptable and require revision by the permitting engineer.
- Modeled emission rates or parameters that do not match the permit application forms.
- Buildings/property boundary/emission unit locations that do not match the plot plan.
- Emission units omitted.
- Incorrect volume source dimensions.
- Terrain elevations missing or incorrect.
- Sources with horizontal or obstructed exhaust modeled with an incorrect exit velocity.
- Use of the incorrect model or model version.
- Receptor grid extent is insufficient.

Send the original copy of the modeling analysis report to the construction permit engineer that requested the modeling analysis and/or is reviewing the permit application. Modeling analysis reports become an addendum to the permit application.

For PSD modeling analyses, information and modeling guidance is available on the DNR Air Quality Bureau's dispersion modeling website[1].

Questions related to this checklist and air dispersion modeling can be answered by calling 515-725-8200. Ask to speak to a member of the Air Dispersion Modeling Team.

[1] http://www.iowadnr.gov/Environmental-Protection/Air-Quality/Modeling

1. GENERAL INFORMATION (Leave project number blank if unknown.)

Submittal Date: _____ Project Number (leave blank if unknown): _____

Facility Name: _____

2. DISPERSION MODEL SELECTION AND OPTIONS

a. Which model is being used?

☐ AERMOD, most recent version

☐ Other Model, including AERSCREEN used as a screening tool (include name and version):

_____

Note: The most recent version of a dispersion model shall be used unless the use of an older version has been approved in advance by the DNR modeling staff. The latest version of most regulatory models can be obtained from the EPA's SCRAM website[2].

b. Regulatory default options selected?

☐ Yes

☐ No Provide justification for the selection of each non-regulatory default option. Non-regulatory default options selected without the prior approval of the DNR modeling staff may result in rejection of the modeling analysis if the justification provided is not acceptable to the DNR modeling staff.

c. Was the urban modeling option utilized?

☐ Yes This option is generally not used in Iowa. If this option is used, provide an explanation of the reason why it was used, as well as a detailed description of each urban area, the surface parameters, and a list of the sources assigned to each area.

☐ No

d. Pollutants/averaging periods modeled for significance (mark as applicable):

☐ PM_{10} (24-hour)
☐ $PM_{2.5}$ (24-hour)
☐ $PM_{2.5}$ (annual)
☐ NO_x (1-hour)
☐ NO_x (annual)
☐ SO_2 (1-hour)
☐ SO_2 (3-hour)
☐ CO (1-hour and 8-hour)
☐ O_3 (8-hour)

If modeling for significance, ensure the highest-first-highest value is evaluated. For $PM_{2.5}$ and the 1-hr SO_2 and NO_2 standards, the highest-first-highest values may be averaged over the 5 years of meteorological data.

e. Pollutants/averaging periods modeled for the NAAQS (mark as applicable):

☐ PM_{10} (24-hour)
☐ $PM_{2.5}$ (24-hour)
☐ $PM_{2.5}$ (annual)
☐ NO_x (1-hour)
☐ NO_x (annual)
☐ SO_2 (1-hour)
☐ SO_2 (3-hour)
☐ CO (1-hour and 8-hour)
☐ O_3 (8-hour)
☐ Lead (3-month)
☐ Other _____

Model each pollutant/averaging period marked above as specified in DNR's "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Projects". If modeling the highest, 6th-high form of the PM_{10} standard, verify that the MULTYEAR option is used so that the model will calculate the highest, 6th-high concentration from the entire 5-year meteorological data set, instead of for each year, or use the concatenated meteorological data set. If there are lead sources, ensure that the latest EPA "leadpost" executable is used. This may be obtained from DNR or at EPA's SCRAM website.

f. Were any NO_2 sources modeled using the Tier 2 ARM2 method?

☐ Yes Verify that procedures were used in accordance with EPA's 1-hour NO2 NAAQS guidance memoranda. Justify the use of any value other than 0.5 for the minimum ambient-equilibrium ratio.

g. Were any NO_2 sources modeled using the Tier 3 method?

☐ Yes Verify that procedures were used in accordance with EPA's 1-hour NO2 NAAQS guidance memoranda. Include a

[2] https://www.epa.gov/scram

summary in the modeling report describing if the Ozone Limiting or Plume Volume Molar Ratio method was used, as well as justification for any in-stack NO_2/NO_x ratio other than the default 0.5.

☐ No

3. SOURCE INFORMATION

a. Emission rates.

☐ New sources, and those that will be modified or require permit modification as a result of the project, must be modeled at their potential or proposed allowable hourly emission rates. Allowable emission rates must match the construction permit forms. Otherwise, the permits will include a limit based on the modeled emission rate. In accordance with Appendix W, modeled emissions should not be averaged over non-operating periods.

☐ If comprehensive modeling is required, existing sources may be modeled at their potential or actual emission rates, so long as the sources will not be modified or require permit modification as a result of the project. If used, actual emission rates must be supported by one or more of the acceptable methods listed in the DNR's "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Projects."

b. Fugitive emissions.

☐ All emissions which can be reasonably captured and vented to the atmosphere must be included in the modeling analysis. True fugitive emissions, such as haul roads and storage piles, may be excluded from the analysis, unless the DNR has reason to believe that they are the cause of a NAAQS violation.

c. Internally-Vented Emissions

☐ Emissions that are vented inside of a building should be modeled as a volume source or a series of volume sources based on the guidance found in the dispersion model user guide. Alternatively, the DNR has created a spreadsheet that can be used to automatically determine the volume source dimensions to use when modeling internal emissions. The tool is available on the Air Quality Bureau's website[3]. The applicant may use an alternative method for modeling internally venting sources with prior approval. No building enclosure credit will be given for sources of $PM_{2.5}$.

d. Are any sources being permitted to operate at variable loads (i.e. 50% or 75% capacity)?

☐ Yes If the source(s) permit will include conditions for operation at variable loads, loads such as 50 and 75 percent of design capacity should also be modeled. The load causing the highest predicted concentration, in addition to the design load, should be included in the refined modeling. Alternatively, the lowest temperature and exit velocity, and highest emission rate expected to occur at any load can be combined to produce a conservative estimate without requiring an analysis of multiple operating loads.

☐ No

e. Are daily or annual operating restrictions, or variations due to physical plant limitations included in the modeling analysis?

☐ Yes Apply the guidance outlined in the "DNR Suggested Methodology for Modeling Restricted Hours of Operation" guidance document, and include a summary of the method(s) used along with all calculations in the modeling analysis report. Any such variation or restriction used in the modeling analysis will be included in the permit as an enforceable limit.

☐ No

f. Are there any stacks with horizontal, downward, or obstructed vertical discharges?

☐ Yes Stacks with a horizontal discharge should be modeled using the POINTHOR source type in AERMOD. Care should be exercised when modeling horizontal point sources to ensure that downwash is included. Model stacks with a downward discharge with an exhaust gas exit velocity of 0.001 m/s and the actual stack tip diameter. Stacks with an obstructing rain cap on top of the stack should be modeled using the POINTCAP source type in AERMOD. Refer to the DNR's stack and vent guidance[4] document for additional details and examples of stack types that are considered unobstructed.

☐ No

g. Have the exhaust gases from several existing stacks been combined (merged) into one stack?

☐ Yes Credit for the merging of exhaust gas streams cannot be used in the dispersion modeling analysis unless the applicable requirements of 40 CFR Part 51.100(hh)(2) are met. If merged exhaust streams were modeled provide justification.

☐ No

[3] https://www.iowadnr.gov/Environmental-Protection/Air-Quality/Modeling#249517-source-characterization-guidancetools

[4] https://www.iowadnr.gov/portals/idnr/uploads/air/dispmodel/stacks_and_vents.pdf

h. Do any SO_2 or NO_2 sources operate intermittently?

☐ Yes These sources can be omitted from the 1-hour SO_2 and NO_2 NAAQS analyses. Verify procedures to identify and include, or eliminate, these sources were performed in accordance with EPA's 1-hour NO_2 NAAQS guidance memoranda.

☐ No

i. Were default background concentrations used?

☐ Yes

☐ No Site-specific background concentrations require approval by the DNR. If prior approval was not requested please provide justification for the proposed background concentration(s). The most recent data from a previously-approved site-specific background monitor may be used without additional justification.

j. Were source and building base elevations based on plant survey data?

☐ Yes

☐ No AERMAP-derived base elevations may be used when survey data are not available, but care should be taken to use elevations that are as accurate as possible.

k. Buildings

☐ Include all downwash structures in the modeling analysis, including structures not located on the facility's property if applicable. Downwash structures outside of 5L may be excluded from the analysis. (Note: "L" is defined as the lesser of the height or maximum projected width for a particular tier or structure.) Lattice-type structures such as switchyards, water towers, elevated storage tanks, and portable equipment mounted on a moveable base should be excluded from the modeling analysis. Perform a building downwash analysis using the latest version of the Building Profile Input Program (BPIP-PRIME) after determining the source and building base elevations.

l. Good Engineering Practice (GEP) stack heights

☐ All proposed and/or existing stack height(s) greater than the formula good engineering practice (GEP) stack height(s) should be modeled using a stack height equal to the formula GEP stack height(s).

4. RECEPTOR AND TERRAIN INFORMATION

a. Receptor spacing.

☐ Observe the following receptor spacing requirements:

- No more than 50 meter spacing along property lines.
- No more than 50 meter spacing if located within approximately 0.5 kilometers of the property line.
- No more than 100-meter spacing between 0.5 and 1.5 kilometers from the property line.
- No more than 250-meter spacing between 1.5 and 3.0 kilometers from the property line.
- No more than 500-meter spacing beyond 3.0 kilometers from the property line.

Note: Utilizing receptors with spacing different from that specified above will not be accepted by the DNR modeling staff unless approved in advance. In all cases, it is the applicant's responsibility to ensure that the receptor spatial coverage and density is adequate enough to determine the worst-case predicted ground-level concentrations in off-property areas not controlled by the applicant.

b. Extent of receptor grid(s)

☐ The receptor grid(s) must extend at least 500 meters from the property line, and should capture all nearby terrain features that exceed the height of the tallest stack being modeled. Receptors should also be included along nearby facility property lines. It is only necessary to include receptors in a NAAQS analysis where the project impact is shown to exceed the SIL. However, if unknown, extend the receptor grid to at least 500 meters from the property line.

☐ Predicted concentrations must be decreasing near the edges of the receptor grid(s).

c. Ambient Air

☐ Within the extent of the receptor grid(s), receptors must be included in all areas not owned or controlled by the applicant, and areas to which the public has access. Public facilities, such as universities and business parks must include receptors on all parts of the property to which the public has access.

Receptors may be excluded from an applicant's property and buildings. With the DNR's prior approval, receptors may also be excluded from on-property easements, such as railways, provided that the facility owner or operator is willing to ensure public access to the right-of-way or easement is precluded. Permit applicants who obtain permission from the DNR to exclude on-property easement receptors from the modeling analysis must document in the modeling analysis report submitted to the DNR how public access is, or will be, precluded. Public roads or highways will continue

to be modeled as ambient air.

If adjacent facilities will be modeled together, and the boundary between them is not accessible to the general public, only the individual impacts from each facility need to be evaluated along the shared boundary.

d. Terrain elevations

☐ Terrain elevations must be applied by using the latest version of AERMAP.

e. AERMAP domain

☐ The domain used in AERMAP must encompass all significant terrain at or above a 10% slope from each and every receptor (the theoretical maximum distance at which terrain in Iowa could exceed a 10% slope is 3.6 km).

5. METEOROLOGICAL DATA

a. Meteorological station.

Mark the applicable box in Table 1 to indicate which meteorological data set was used in the modeling analysis. Refer to the meteorological station and data set map located on the DNR Air Quality Bureau's meteorological data webpage[5] to determine which meteorological data set to use in the modeling analysis.

Table 1: Meteorological Stations and Elevations

Station Call Sign	Station Location	Data Period	Station ID	Elevation (meters)	Check if Used
KALO	(Waterloo)	2015-2019	94910	265	☐
KAMW	(Ames)	2015-2019	94989	280	☐
KBRL	(Burlington)	2015-2019	14931	210	☐
KBTA	(Blair)	2015-2019	00436	396	☐
KCID	(Cedar Rapids)	2015-2019	14990	256	☐
KDBQ	(Dubuque)	2015-2019	94908	317	☐
KDEH	(Decorah)	2015-2019	04916	353	☐
KDSM	(Des Moines)	2015-2019	14933	286	☐
KDVN	(Davenport)	2015-2019	94982	228	☐
KEST	(Estherville)	2015-2019	94971	401	☐
KFOD	(Fort Dodge)	2015-2019	94933	332	☐
KFSD	(Sioux Falls)	2015-2019	14944	433	☐
KIOW	(Iowa City)	2015-2019	14937	198	☐
KLWD	(Lamoni)	2015-2019	94991	346	☐
KMCW	(Mason City)	2015-2019	14940	362	☐
KMIW	(Marshalltown)	2015-2019	94988	294	☐
KMLI	(Moline)	2015-2019	14923	180	☐
KOMA	(Omaha)	2015-2019	14942	299	☐
KOTM	(Ottumwa)	2015-2019	14950	255	☐
KSPW	(Spencer)	2015-2019	14972	407	☐
KSUX	(Sioux City)	2015-2019	14943	334	☐
		-			☐

If an alternate dataset and/or period of record is being used, including pre-approved prognostic meteorological data, provide the period and a brief explanation of the reason why it was used in the modeling analysis records.

b. Profile base elevation.

☐ The profile base elevation used in the modeling analysis must match the station elevation shown in Table 1.

[5] http://www.iowacleanair.gov/Modeling/Meteorological-Data

6. DETERMINATION OF IMPACT ON AIR QUALITY

a. Do the predicted impacts from the project source(s) exceed the applicable significant impact levels listed in Table 1 of the "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications"? (Note: For lead, skip to step 6b.)

☐ Yes List Pollutant(s): _____

Comprehensive modeling is required for each pollutant whose concentration exceeds the applicable significant impact levels.

☐ No List Pollutant(s): _____

No further modeling is required for these pollutants. Go to Section 7.

b. Are there other sources at this facility, or nearby sources as defined in the "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications" of the pollutant(s) in question?

☐ Yes List Pollutant(s): _____

Model the other sources of the pollutant(s) in question with the source(s) being permitted. Add the appropriate default background concentration(s) from Table 4 of the "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications" to the modeled values or apply a site-specific background methodology as specified in the "Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications" and check that the resulting predicted impact(s) are less than the applicable NAAQS (Table 2 of the "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications".) Indicate the locations of the nearby sources on a map of the area.

☐ No List Pollutant(s): _____

Add the appropriate default background concentration(s) from Table 4 of the "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications" to the modeled values from the source(s) being permitted or apply a site-specific background methodology as specified in the "Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications" and check that the resulting predicted impact(s) are less than the applicable NAAQS (Table 2 of the "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications").

c. Does the project have a significant contribution at any modeled non-attainment receptor(s) for the time period(s) that the violation(s) are predicted to occur? (Note: A significant contribution is defined as a predicted impact greater than the applicable significant impact level(s) provided in Table 1 of the "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications".)

☐ Yes A source(s) that significantly contributes to a modeled exceedance of the NAAQS will not be permitted unless an equivalent ambient impact reduction is demonstrated at the modeled non-attainment receptor(s).

☐ No Go to Section 7 below.

7. MODELING DATA SUBMITTAL REQUIREMENTS

a. Modeling report.

☐ Include a discussion on the proposed operating scenarios and the methodology used to model them.

☐ For point sources, provide all assumptions, calculations, and figures necessary to justify the emission rates and stack parameter values used, if this information is not available in the permit application.

☐ For area, volume, and open-pit sources, provide all assumptions, calculations, and figures used to determine the emission rate, area, sides, rotation angles, heights of release, initial dispersion coefficients and volume (open-pit), if this information is not available in the permit application.

☐ Summarize and discuss in the modeling analysis report the modeling results relative to all applicable standards and guidelines.

☐ Ensure that the applicable information requested for site plans under Modeling Data Submittal Requirements in DNR's "Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Project" is included in the modeling analysis report, if it has not been included in the permit application.

b. Electronic files.

☐ All dispersion model, BPIP-PRIME, and AERMAP input and output files should be submitted to the DNR for review. Data obtained from the DNR, such as terrain or meteorological files, do not need to be submitted. The files can be compressed and attached to the permit application within Iowa EASY Air as a ".zip" file. They may also be emailed to the modeler assigned to the project, if known. Email attachments must be limited to 10 MB, and may not contain an ".exe" or ".zip" file extension. Alternatively, they can be submitted on a CD, DVD, or flash drive.