

Air Dispersion Modeling Guidelines for Non-PSD, Pre-Construction Permit Applications

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Overview

Air dispersion modeling analyses are conducted to predict ground level ambient air concentrations of pollutants from facility emissions. According to 567 Iowa Administrative Code (IAC) 22.3 (1) “A construction permit shall be issued when the director concludes that...the expected emissions from the proposed source or modification in conjunction with all other emissions will not prevent the attainment or maintenance of the ambient air quality standards specified in 567 IAC 22.11.” Dispersion modeling is the primary tool used in air quality assessments to determine predicted attainment of the National Ambient Air Quality Standards (NAAQS). Air dispersion modeling allows the impacts from a source to be determined before a source is constructed or modified and is not restricted to the spatial and temporal limitations of an ambient monitor.

Additional guidance and Air Quality Bureau staff contact information can be found at the DNR website:

Homepage: <https://www.iowacleanair.gov>
Modeling: <https://www.iowadnr.gov/Environmental-Protection/Air-Quality/Modeling>
Permitting: <https://www.iowadnr.gov/Environmental-Protection/Air-Quality/Construction-Permits>
Contact info: <https://www.iowadnr.gov/environmental-protection/air-quality/air-quality-bureau>

These guidelines apply to construction permit applications that are not subject to the Prevention of Significant Deterioration (PSD) regulations. For PSD modeling analyses, the applicant should refer to the [Iowa DNR's PSD modeling guidelines](#)¹. Facilities that are associated with a State Implementation Plan (SIP) maintenance area, or that significantly impact a non-attainment area, may be required to conduct a comprehensive modeling analysis for the applicable pollutants regardless of the predicted impacts from the project.

Pollutants affected by these guidelines include all criteria pollutants except volatile organic compounds (VOCs) and ozone. If the Construction Permits Section requests modeling for these pollutants or for non-criteria pollutants, the DNR's Dispersion Modeling Team should be contacted for guidance on modeling.

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

When Is Air Dispersion Modeling Required?

The need to model a non-PSD project is determined by the DNR on a case-by-case basis. [Form MD](#)² describes the method the DNR will use to determine when modeling analyses will be required. This form is optional, but can help applicants determine if modeling will be required. There are unique circumstances that Form MD does not address that may trigger a modeling review. The need for a modeling analysis not explicitly required by the criteria on Form MD will be reviewed by DNR management before any analyses are conducted.

When dispersion modeling is required, applicants have the option to prepare and submit a complete dispersion modeling analysis according to these guidelines. The DNR will conduct the dispersion modeling when a modeling analysis has not been submitted by the applicant.

Modeling Protocol

A modeling protocol is not required for analyses that follow this guideline. However, a modeling protocol may be submitted to the DNR prior to conducting an analysis in which the applicant plans to use modeling techniques that are different from, or are not covered by, this document. By doing so, the DNR can communicate to the applicant the acceptability of the proposed methodology prior to conducting any extensive modeling, hopefully decreasing the chance of errors or inadvertent exclusion of required information. Changes to the protocol may occur as the analysis progresses; however, the protocol establishes a common understanding of the requirements. The DNR will provide an approval letter to document acceptance of the protocol.

¹ <https://www.iowadnr.gov/media/2175/download?inline>

² <https://www.iowadnr.gov/media/5461/download?inline>

Dispersion Modeling Analysis Procedure

The dispersion modeling analysis can be divided into two phases: the source impact analysis and the cumulative impact analysis.

The source impact analysis is conducted first and includes only new sources and those that will be modified or require permit modification as a result of the project. It is used to determine if a cumulative impact analysis is necessary. The source impact analysis is optional and can be skipped if it is clear that the project will be significant.

A cumulative impact analysis is required for each pollutant and averaging period for which the project exceeds the applicable Significant Impact Level (SIL). The cumulative impact analysis includes everything from the source impact analysis and other sources of emissions at the facility and nearby facilities (if applicable). Some sources do not need to be included in the analysis and are described in the Source Information section below.

The DNR provides a [Dispersion Modeling Checklist](#)³ that applicants can use to help avoid common dispersion modeling errors and prevent revisions to the modeling analysis.

Model Selection and Options

The latest version of the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) is preferred for conducting the dispersion modeling analysis. AERSCREEN may be used as a screening tool. For lead modeling, determining the design concentration requires the use of the EPA post-processor called "Leadpost." The latest version of each of these may be obtained from the [EPA's SCRAM website](#)⁴.

The regulatory default options should be used in the modeling analysis. The default option includes the use of stack-tip downwash and incorporates the effects of elevated terrain. The AERMOD model automatically selects the default options unless the user specifies to override these options. There are currently no portions of the state for which the urban modeling option should be used.

Source Information

Sources Generally Exempt from Non-PSD Modeling

Emission units that are listed as exempt in 567 IAC 22.1(2) are generally exempt from modeling. However, the decision to include any exempt source in the modeling analysis is ultimately up to the discretion of the permit engineer. Facilities using the small unit exemption should note that once the total combined emissions from all substantial small units using the exemption reaches the "cumulative notice threshold" as defined in 567 IAC 22.1(2)"w"(8), the facility must apply for construction permits for all substantial small units for which the cumulative notice threshold has been reached. These substantial small units may need to be included in the modeling analysis as a part of the construction permit project.

Ancillary emission units used only when the rest of the facility is not in operation can be excluded. The DNR may require a separate modeling analysis of these units to verify attainment with the short-term NAAQS where applicable.

Fugitive emissions from haul roads and material storage piles can be excluded, unless previously included in PSD modeling or if the DNR has received complaints where these sources were identified as the cause of the complaint. For ethanol facilities, haul roads are exempt from non-PSD modeling provided they have been issued a haul road construction permit(s) that requires best management practices (BMP).

Emission Rates

New or Modified Sources

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. Varying emission rates are not permissible unless included in the permit limitations or it can be demonstrated that the variance is a physical limitation. Refer to the

³ <https://www.iowadnr.gov/media/5321/download?inline>

⁴ <https://www.epa.gov/scram>

Operating Restrictions section below for guidance on modeling any such limits. Physical or operational limits should not be accounted for by averaging emissions over the period being evaluated.

Nearby Sources

All other sources located at the facility, and at nearby facilities, may be modeled at their actual emission rates. Actual emission rates must be supported by one of the following methods, in order of acceptability:

- a) Certified continuous emissions monitoring data
- b) The most recent DNR approved stack test results. Contact construction permitting staff to obtain guidance on calculating an emission rate for modeling based on stack test results.
- c) Mass balance calculations acceptable to the DNR
- d) AP-42 emission factors or other engineering estimates (as accepted by the DNR), or other data as accepted by the DNR

In many cases the total annual emissions reported in SLEIS can be divided by the total actual hours of operation. Data used to account for actual operations shall be based on the most recent two years, unless it is determined that this period is not representative. For minor sources that report emissions once every three years, the most recent 12 months of data should be used. If these minimum data requirements cannot be met, then the potential or permitted allowable emission rate should be used as applicable. If this is not considered representative contact the Construction Permit Section staff for additional guidance.

All calculations used to determine the emission rates for non-project sources must be submitted with the modeling analysis report. If this information is not submitted, the DNR will use allowable (permitted emission rates or standards). If the allowable emission rates produce a modeled violation then the facility will be required to make appropriate changes.

The DNR may require re-modeling if there is a significant change in the method of operation or emission levels.

Operating Restrictions

Sources that do not operate continuously or at a continuous rate may be modeled based on their applicable permit conditions or physical limitations. Please refer to the "[DNR Suggested Methodology for Modeling Restricted Hours of Operation](#)" document⁵.

Stacks and Vents – Vertical, Capped, Horizontal, and Downward

Emissions vented through a discrete stack or vent should be modeled using one of the point source options in AERMOD. Unobstructed vertical stacks should be modeled using the POINT source type. Stacks with an obstructing rain guard should be modeled using the POINTCAP source type. Stacks with rain guards that do not obstruct the flow at the point of release can be modeled using the POINT source type. Refer to the DNR's [stack and vent guidance](#)⁶ document for additional details and examples of stack types that are considered unobstructed. Stacks with a horizontal discharge should be modeled using the POINTHOR source type. Care should be exercised when using the POINTHOR source type to ensure that building downwash is included. Stacks with a downward discharge should be modeled using the POINT source type with an exit velocity of 0.001 m/s.

Indoor Venting Emission Units

Indoor venting units must be included in the modeling analysis as a volume source or series of volume sources whose dimensions are based on the size and shape of the building(s) unless the majority of the emissions will exit via a building vent or other opening, in which case the emissions should be modeled as exiting the building through the vent or opening. For guidance on modeling emission units that vent inside a building please use the [Volume Source Tool](#)⁷.

⁵ <https://www.iowadnr.gov/media/2172/download?inline>

⁶ <https://www.iowadnr.gov/media/2178/download?inline>

⁷ <https://www.iowadnr.gov/media/2184/download?inline>

Please note that the use of the building enclosure credit included on the above referenced spreadsheet is for use with PM₁₀ only and will not be applicable for the modeling of PM_{2.5} emissions.

Cooling Towers

Emissions from cooling towers must be included in the modeling analysis unless they are otherwise exempt (see “Sources Generally Exempt from Non-PSD Modeling” section above). Cooling towers should be modeled as a series of point sources, one for each cooling cell. The cooling tower structure should be included as a downwash structure.

Buoyant Line Sources

Some source types are exhausted to the atmosphere through a long series of vents rather than a single stack. If the exhaust from this type of source is significantly warmer than the ambient air the source should be modeled using the BUOYLINE source type in AERMOD to account for the buoyancy of the plume. Examples of such sources include coke ovens or blast furnaces.

Other Non-Standard Type Emission Units

Guidance for evaluating non-standard types of emission units is available on the DNR’s [dispersion modeling website](#)⁸. This guidance is intended to provide information on how the DNR would typically characterize non-standard sources in a dispersion model. Although this guidance does not preclude the use of other methodologies, the applicant may wish to discuss other methodologies with the DNR prior to conducting extensive modeling analyses.

Merged Streams

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. Include justification if merged exhaust streams were used in the modeling analysis.

Ambient Conditions

An emission point with a stack gas exit temperature equal to the interior temperature of the building where the emission unit is located should be modeled at 68° F per the definition of “standard conditions” in 567 IAC 22.1, unless the applicant can provide justification acceptable to the DNR that another temperature is representative of the interior building temperature. An emission point with a temperature equal to that of the ambient air should be modeled at 0° K (which instructs the model to vary the temperature of the source with the hourly ambient temperature in the meteorological dataset).

NO₂ Tiering Methods

EPA’s “Guideline on Air Quality Models” (Appendix W of 40 CFR Part 51) recommends a 3-tiered screening approach to estimate ambient concentrations of NO₂.

Tier 1

Assume all emitted NO_x is converted to NO₂.

Tier 2

The default ARM2 (Ambient Ratio Method, version 2) option is based on multiplying an ambient ratio of NO₂/NO_x by a modeled NO_x concentration to estimate ambient NO₂ concentrations. These ratios are based on ambient levels of NO₂ and NO_x derived from national data from the EPA’s Air Quality System (AQS). The ARM2 option applies an ambient ratio to the 1-hr modeled NO_x concentrations based on a formula derived empirically from ambient monitored ratios of NO₂/NO_x. The ARM2 option includes default upper and lower limits on the ambient ratio applied to the modeled NO_x concentration of 0.9 and 0.5, respectively. Per EPA guidance⁹, ARM2 will produce appropriately conservative results for a Tier 2 demonstration when either:

- Tier 1 (full conversion) 1-hour concentration is less than 150 ppb (282 µg/m³), or

⁸ <https://www.iowadnr.gov/environmental-protection/air-quality/modeling>

⁹ Memorandum dated September 30, 2014: “Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO₂ National Ambient Air Quality Standard.”

- The maximum NO₂/NO_x in stack ratio (ISR) of any source being modeled is less than 0.2.

If neither of these criteria are met, ARM2 may still be used by setting the minimum ARM2 ratio to match the maximum source ISR.

Tier 3

Perform a detailed analysis on a case-by-case basis using either the Ozone-Limiting Method (OLM) or Plume Volume Molar Ratio Method (PVMRM). Applicants using either of these methods should include an explanation and justification of the input data in the modeling report.

- OLM: works best for large groups of sources, area sources, and near-surface releases, including roadway sources
- PVMRM: works best for relatively isolated and elevated point source modeling

EPA has issued a series of guidance memoranda describing the use of the 3-tiered approach.¹⁰ The Tier 2 ARM2 method and the Tier 3 OLM and PVMRM methods are included as default options in the AERMOD dispersion model.

OLM and PVMRM require the specification of an in-stack ratio (ISR) for NO₂/NO_x, either for all modeled NO₂ sources or for each source individually. When an individual source ISR is specified, it will override the default ISR, if any. When possible, source-specific ISRs should be used¹¹. Supporting data should be provided with the modeling analysis to justify a source's anticipated NO₂/NO_x in-stack ratios, such as manufacturer test data, state or local agency guidance, peer-reviewed literature, and/or the EPA's NO₂/NO_x ratio database. In the absence of this information, the default ISR of 0.5 should be used. The default ambient equilibrium ratio is 0.9, but with justification may be overridden.

Additionally, OLM and PVMRM require the inclusion of ozone background. The DNR provides hourly background ozone data on the [DNR's Background Data website](#)¹².

It should also be noted that all three tiers of NO₂ modeling are classified as screening techniques and therefore negative emission rates should not be used to account for emission reductions. An alternative method would be to perform a modeling analysis on the existing configuration and a separate modeling analysis on the proposed configuration to determine the change in predicted concentration.

Intermittent Sources

The assumption of continuous operation for intermittent emission sources would in many cases result in them becoming the controlling emission scenario for determining compliance with a 1-hour NAAQS. Based on guidance from the March 1, 2011, EPA Memo ([Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO₂ National Ambient Air Quality Standard](#)¹³), the "EPA believes the most appropriate data to use for compliance demonstrations for the 1-hour NAAQS are those based on emissions scenarios that are continuous enough or frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations."

¹⁰Memorandum dated June 28, 2010: "Applicability of Appendix W Modeling Guidance to the 1-hour NO₂ National Ambient Air Quality Standard;" memorandum dated June 29, 2010: "Guidance Concerning the Implementation of the 1-hour NO₂ NAAQS for the Prevention of Significant Deterioration Program;" memorandum dated March 1, 2011: "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour National Ambient Air Quality Standard;" Memorandum dated September 30, 2014: "Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO₂ National Ambient Air Quality Standard." These documents can be obtained from the DNR or the EPA SCRAM website (<https://www.epa.gov/scram>).

¹¹The EPA has provided a *NO₂/NO_x In-Stack Ratio (ISR) Database* in which source-specific data can be both entered and/or utilized for Tier 3 OLM and PVMRM analyses; <https://www.epa.gov/scram/nitrogen-dioxidenitrogen-oxide-stack-ratio-isr-database>. Additionally, the California Air Pollution Control Officers Association (CAPCOA) Guidance Document on *Modeling Compliance of the Federal 1-Hour NO₂ NAAQS* may also be useful in determining source-specific ISRs.

¹² <https://www.iowadnr.gov/environmental-protection/air-quality/modeling/background-data>

¹³ https://www.epa.gov/sites/default/files/2020-10/documents/additional_clarifications_appendixw_hourly-no2-naaqs_final_03-01-2011.pdf

Based on EPA guidance, the DNR has concluded that any source that operates on a purely random schedule (including testing and maintenance) and is limited to operating for no more than 500 hours/yr can be considered an intermittent source. In addition, any source that meets the 500 hour/yr criterion, but operates on a scheduled basis for testing and maintenance purposes, can be considered an intermittent source if the scheduled testing and maintenance is limited to the time of the day with the most favorable dispersion conditions (between 9 AM and 4 PM). Intermittent sources may be excluded from the 1-hour NO₂ and SO₂ analyses.

Building Downwash

A building downwash analysis shall be conducted using the most recent version of EPA's Building Profile Input Program with Plume Rise Enhancements (BPIP-Prime). Off-property buildings that affect downwash must also be included in this analysis. Buildings should be represented using their peak height. The use of multiple building tiers with varying heights to approximate a sloped roof is not acceptable. Lattice-type structures such as switchyards, water towers, elevated storage tanks, and portable equipment mounted on a movable base should be excluded from the downwash analysis. In some cases, differences in source and building base elevations can affect the building downwash calculations. Therefore, the downwash analysis should be conducted after the source and building base elevations have been input into the model.

Receptor and Terrain Elevation Information

Ambient Air

By definition, "ambient air" is the portion of the atmosphere, external to buildings, to which the general public has access [567 IAC 22.1]. Therefore, facilities where the general public has access to the property (e.g. academic institutions, government buildings, hospitals, and business parks) must be modeled with receptors placed on the property of the facility. Applicants are encouraged to consider the effect that changes to their property boundary might have on future modeling analyses and subsequent permitting. A change in the property boundary alone will not trigger a modeling analysis, but the updated property boundary should be reflected in future analyses.

Receptors may be excluded from the modeling analysis, with the DNR's prior approval, for 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.

Receptor Spacing Requirements

Receptors should be placed along the property line at 50 meter intervals. Off property receptors should be placed at 50 meter intervals within at least 0.5 kilometers of the property line. If necessary to encompass the entire impact area, include receptors at 100 meter intervals from 0.5 kilometers out to 1.5 km, 250 m intervals from 1.5 km out to 3 km, and 500 meter intervals beyond 3 km. Receptor grids must be adequately dense and should use 50 meter receptor spacing to resolve the highest applicable concentrations.

Receptor grids must be adequate in extent so that concentrations are decreasing at the edges of the grid. If there is a significant terrain rise near the edge of the grid, the grid should be extended to include the area of terrain rise. Fine grids (50 m) should be placed over the area(s) of maximum concentration to ensure that the true maximum concentration is identified.

The receptor grid used in the cumulative impact analysis may be limited to those receptors where the project is predicted to cause a significant concentration. This serves to decrease model runtime and simplifies the process of determining whether or not the project will significantly contribute to any modeled violations. However, it also has the side-effect of requiring that the receptor grid be redefined each time changes are made to the project because areas of significant impact may change. For this reason it may be beneficial to instead retain the full receptor grid. In either case,

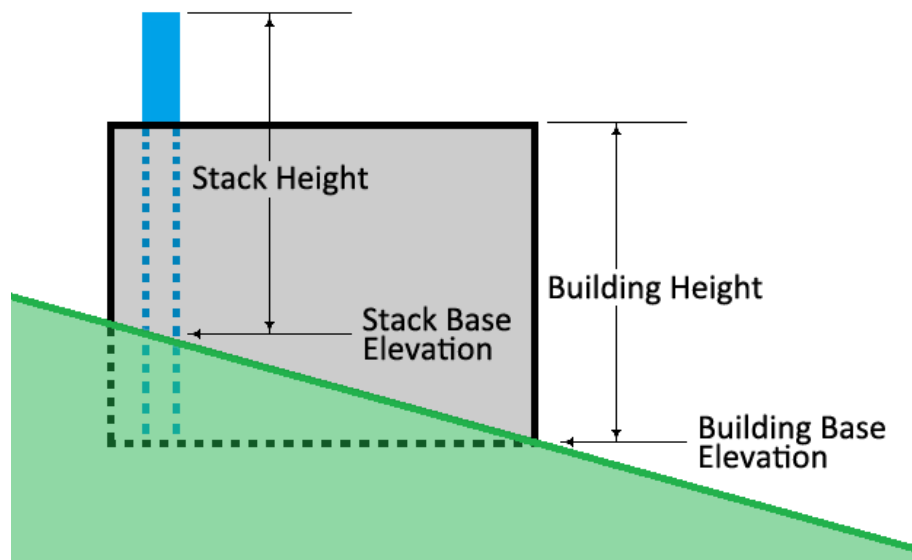
receptors should also be placed at 50-meter intervals along each offsite facility's ambient boundary in the source impact analysis so that they will be carried forward into the cumulative impact analysis if necessary.

Terrain Data

Whenever possible, the base elevations of the sources and buildings should be based on plant survey data. If this data is not available, the most recent version of AERMAP should be used to import terrain and source elevations from the National Elevation Dataset (NED). These data are available on the DNR's [elevation data webpage](#)¹⁴.

All terrain that would intersect a line projected at a 10% slope from each and every receptor must be included in the AERMAP domain.

Depending on the topography, the base elevation of a source may not necessarily match the base elevation of the building on, or near, which it is located. This is most notable when a building is built into the side of a hill. When this occurs, the elevation of the source should be based on the natural contour of the hill – as if the land had not been graded when the building was constructed – and the stack height should be the height of the top of the stack above that base elevation. Stack heights are based on the elevation above the ground. Therefore, if the base elevation is set higher than it truly is, the stack height will be artificially taller. The base elevation of the building should be the lowest elevation along the base of the building, and its height should be the height of the peak of the roof above that elevation.



Meteorological Data

The DNR maintains pre-processed meteorological data for AERMOD for several National Weather Service (NWS) station locations. This data is available on the DNR's [meteorological data webpage](#)¹⁵. The website also contains a summary of the meteorological data that are appropriate for use in each Iowa county, as well as the representivity analysis that was conducted to determine the appropriate meteorological stations. The profile base should be set to the station elevation of the station being used. The meteorological data sets located on the website include information on the profile base elevations for each station. As deemed necessary, prognostic meteorological data that is appropriate for the location of the applicant's facility may be used with the prior approval of the DNR modeling team. Meteorological data sets other than those provided on the website may be used with the prior approval of the DNR modeling team.

Determination of Impact on Air Quality

Source Impact Analysis

The purpose of this preliminary analysis is to evaluate the impact caused by the emissions from the project or the change associated with the modification. For projects that do not affect any existing sources this is accomplished by

¹⁴ <https://www.iowadnr.gov/environmental-protection/air-quality/modeling/elevation-data>

¹⁵ <https://www.iowadnr.gov/environmental-protection/air-quality/modeling/meteorological-data>

modeling only the new emission sources. If the project includes changes to the emission rates for existing sources the net change in emissions can be modeled. Projects involving changes to existing stack parameters will require special consideration. In these cases, the stack parameters and emission rates associated with the emission units both before and after the modification should be input into the same model run, with the emission units before the modification modeled as negative emissions and the emission units after the proposed modification modeled as positive emissions, each with the appropriate stack parameters.

The predicted concentrations caused by the project should be compared to the appropriate SILs listed in Table 1. A source impact analysis that indicates a project will cause concentrations less than the applicable SILs shall be sufficient to demonstrate that the project will not cause or contribute to a violation of the corresponding NAAQS. As such, no further modeling is required for the applicable pollutant and averaging period. Projects that cause concentrations that exceed a SIL should continue to a cumulative impact analysis for the corresponding NAAQS.

Table 1. Significant Impact Levels

Pollutant	Averaging Period	Significant Impact Levels ($\mu\text{g}/\text{m}^3$)	Modeling Value Rank
NO ₂	1-hr	7.5 ^a	H1H averaged over 5 years
	Annual	1 ^b	H1H
SO ₂	1-hr	7.9 ^c	H1H averaged over 5 years
	3-hr	25 ^b	H1H
PM _{2.5}	24-hr	1.2 ^b	H1H averaged over 5 years
	Annual	0.3 ^d	H1H averaged over 5 years
PM ₁₀	24-hr	5 ^b	H1H
CO	1-hr	2,000 ^b	H1H
	8-hr	500 ^b	H1H
O ₃	8-hr	2 ^e	H1H averaged over 5 years

^a The 1-hour NO₂ SIL has not been formally proposed. The SIL listed above (4 ppb, or 7.5 $\mu\text{g}/\text{m}^3$) reflects EPA guidance presented in the U.S. EPA Memo, *General Guidance for Implementing the 1-hour NO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO₂ Significant Impact Level*, June 28, 2010.

^b 567 IAC 33.3(20) and 40 CFR 51.165(b)(2)

^c The 1-hour SO₂ SIL has not been formally proposed. The SIL listed above (3 ppb, or 7.9 $\mu\text{g}/\text{m}^3$) reflects EPA guidance presented in the U.S. EPA Memo, *Guidance Concerning the Implementation of the 1-hour SO₂ NAAQS for the Prevention of Significant Deterioration Program*, August 23, 2010.

^d EPA suggests a lower annual PM_{2.5} SIL (0.13 $\mu\text{g}/\text{m}^3$) in their April 30, 2024 *Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program* document. The higher value presented here is in federal regulations at 40 CFR 51.165(b)(2). Iowa statute prohibits the DNR from implementing a rule that is more stringent than the applicable federal regulation, so the DNR will continue to use 0.3 $\mu\text{g}/\text{m}^3$ until such a time that the federal regulation is changed.

^e The 8-hour O₃ SIL has not been formally proposed. The SIL listed above (1 ppb, or 2 $\mu\text{g}/\text{m}^3$) reflects EPA guidance presented in the U.S. EPA Memo, *Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Program*, April 17, 2018.

Cumulative Impact Analysis

The cumulative impact analysis should include everything from the source impact analysis and existing sources that are part of the facility being evaluated. Adjacent facilities should be included in the modeling analysis if they have a Potential to Emit (PTE) that is greater than or equal to the applicable Significant Emission Rate (SER), or if the DNR has previously established that they need to be. The need to include an adjacent facility may be waived on a case-by-case basis (e.g. if their emissions are unlikely to interact). Please contact the DNR to determine if any nearby sources need to be included.

Modeled attainment of the NAAQS is based on the total ambient impact from the sources explicitly included in the analysis and the measured background levels. The NAAQS are listed in Table 2. Depending on the standard, the concentration that is compared to the NAAQS will vary. For example, the 3-hour SO₂ NAAQS must not be exceeded more than once per year, so the highest concentration at each receptor is ignored, and the highest of the remaining concentrations (highest-second-high, or “H2H”) must be considered.

Table 2. NAAQS Levels for Modeling Applications

Pollutant	Averaging Period	NAAQS (µg/m ³)	Modeling Value Rank
NO ₂	1-hr	188	H8H averaged over 5 years
	Annual	100	H1H
SO ₂	1-hr	196	H4H averaged over 5 years
	3-hr	1,300	H2H
PM _{2.5}	24-hr	35	H8H averaged over 5 years
	Annual	9.0 ^a /12.0	H1H averaged over 5 years
PM ₁₀	24-hr	150	H6H out of entire 5-year period
CO	1-hr	40,000	H2H
	8-hr	10,000	H2H
Lead	3-month rolling average	0.15	H1H
O ₃	8-hr	137	H4H averaged over 5 years

^a The current annual PM_{2.5} NAAQS became effective for PSD applications on 5/6/2024. The DNR will continue to implement the previous annual PM_{2.5} NAAQS (12 µg/m³) for non-PSD applications until our revised PM_{2.5} Infrastructure SIP is submitted to EPA (early 2027).

Background Concentrations

Appropriate background concentrations must be added to modeled concentrations before modeled attainment of the NAAQS can be determined. The DNR maintains default background concentrations that can be used with no additional justification. Applicants may also propose site-specific background concentrations. The most recent data from a previously-approved site-specific background monitor may be used without additional justification. Current background concentrations, and guidance for proposing site-specific background concentrations, are available on the DNR’s [background data webpage](#)¹⁶.

The default SO₂ background concentrations represent natural background levels. As such, nearby sources of SO₂ emissions should be explicitly modeled when using the default SO₂ background concentrations.

Time-varying background concentrations may be used in some cases with prior approval. Applicants should contact DNR for case-by-case guidance.

Rounding of Modeled Concentrations

Each NAAQS has its own rounding convention found in 40 CFR Part 50. For non-PSD projects the Iowa DNR allows the application of these rounding conventions to modeled concentrations in the cumulative impact analysis. Guidance for applying these rounding conventions to the modeled concentrations can be found in the “[Rounding of Modeled Concentrations for Comparison with the National Ambient Air Quality Standards](#)” document¹⁷.

Modeled Violations

A construction permit can be issued when predicted violations of the NAAQS are modeled by demonstrating that the project’s contribution to each violation does not exceed the applicable SIL(s) [567 IAC 33.3(20)]. If the project is predicted to significantly contribute to a modeled violation it can still be permitted by modifying new or existing sources

¹⁶ <https://www.iowadnr.gov/environmental-protection/air-quality/modeling/background-data>

¹⁷ <https://www.iowadnr.gov/media/2176/download?inline>

to reduce the combined impacts below the NAAQS. If existing sources will be modified they must be modeled at their potential, or proposed allowable, hourly rates.

Modeling Data Submittal Requirements

Modeling Report and Source Summary

If modeling will be submitted with the application then a modeling report should be included that summarizes the air dispersion model inputs, methodology, and results relative to all applicable standards and guidelines. The modeling report should include a summary of the source emission rates and parameters for all new and existing sources:

- Hourly emission rates for all applicable pollutants
- Stack height
- Diameter (or dimensions if rectangular)
- Flow rate (specify acfm or scfm)
- Temperature
- Exhaust type (vertical, obstructed, horizontal, etc.)
- Dimensions of fugitive sources (if applicable)
- Any enforceable operating restrictions

Applicants who are requesting that the DNR conduct the modeling analysis may also choose to provide this summary of source emission rates and parameters, which may help expedite the analysis. If this information is not included in the application the DNR will use the most current available information for sources that are not part of the project.

Site Plan

A site plan must be submitted with any construction permit application that will require a modeling analysis (regardless of who conducts the analysis). The site plan **MUST** contain ALL of the following:

- A North arrow oriented with true north, not plant north.
- A graphical scale (a printed bar on the map with tick marks indicating the true scale of the plot plan). A simple statement of “1 inch equals 10 feet” is not adequate by itself. The reason for this is that, when the map is enlarged or reduced, the true scale is no longer evident. When a graphical scale bar is printed on the map, it is resized along with the map if reduced in size for shipping, etc.
- All solid structures (buildings) on the facility property and the surrounding area (if they could influence plume downwash at the facility in question) must be shown along with the peak height of each building and/or tier. Lattice-type structures, such as substations, should not be included on the site plan.
- All emission points should be shown on the plot plan and must be labeled, including internal emissions and fugitive emissions (storage piles, haul roads, etc.).
- The property line, the fence line, and any other boundary that would preclude the public access, must be shown on the map. If necessary, a separate, smaller scale map may be included with the submittal to show the full extent of the boundaries.

The site plan may be submitted in either hard copy or electronic format. If submitted electronically it should be in AutoCAD’s DWG or DXF formats. Alternatively, the site plan may be converted into a PDF file (Adobe Acrobat) or any type of image file (BMP, JPG, TIF, etc.). Site plans that are submitted electronically allow the modeling team to import them directly into the modeling software, which tends to simplify and shorten the review process.

Modeling 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.

Electronic File Media

Electronic 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.