New Source Review (NSR) Reform

Modeling Guidance: Policies and Procedures

Prepared by:

Dennis Becker
Craig Thorstenson

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Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155

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Disclaimer
The Minnesota Pollution Control Agency (MPCA) reserves the right to change this modeling guidance document at any time. This is a "living" document and we will be updating it periodically (for example, as EPA makes changes to the New Source Review program). We welcome your suggestions to improve this document. Please provide comments to the authors of this document:

Permitting-Related Items (When to do Modeling)
Craig Thorstenson
Craig.Thorstenson@pca.state.mn.us
(651) 296-8766

Modeling-Related Items (How to do Modeling)
Dennis Becker
Dennis.Becker@pca.state.mn.us
(651) 297-7364

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1.0 Abbreviations and Acronyms

Air Emissions Risk Analysis (AERA)
Air Quality Related Values (AQRV)
Air Quality Standards (AQS)

Best Available Control Technology (BACT)
Boundary Waters Canoe Area (BWCA)
Building Profile Input Program (BPIP)

Code of Federal Regulations (CFR)
Clean Units (CU)
Clean Unit Designation (CUD)

Dispersion Information Screening Procedures for Emission Risk Screening Evaluations (DISPERSE)

Federal Register (FR)

Minnesota Ambient Air Quality Standards (MAAQS)

National Ambient Air Quality Standards (NAAQS)
New Source Review (NSR)

Plantwide Applicability Limitations (PAL)
Pollution Control Projects (PCP)
Prevention of Significant Deterioration (PSD)

Significant Emission Rate (SER)
Significant Impact Area (SIA)
Significant Impact Level (SIL)
State Implementation Plan (SIP)

Tons Per Year (TPY)
Total Facility Emission Limitations (TFEL)
Voyageurs National Park (VNP)
Volatile Organic Compounds (VOC)

2.0 Introduction

In the Federal Register dated December 31, 2002, the U.S. Environmental Protection Agency (EPA) took final rule action on "Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR): Baseline Emissions Determination, Actual-to-Future Actual Methodology, Plantwide Applicability Limitations, Clean Units, Pollution Control Projects", hereafter, NSR Reform. (On July 30, 2003, EPA announced that it will reconsider parts of the NSR Reform rule finalized on Dec. 31, 2002. Some reconsiderations may affect portions of this document.)

Minnesota Pollution Control Agency (MPCA) staff has developed several documents to implement these changes to the federal regulations in Minnesota. (These documents can be accessed at http://www.pca.state.mn.us/air/permits/nsr.html.) This document provides guidance on modeling policies and procedures for NSR Reform provisions.

This document contains modeling policies and procedures for individual NSR Reform actions:

- clean units
- pollution control projects (PCPs)
- plantwide applicability limitations (PALs)

This document does not consider situations where these actions are part of larger projects (e.g., multiple NSR Reform projects, hybrid projects, etc.). It provides modeling policy and guidance only for the NSR reform provisions.

This guidance supplements "MPCA Air Dispersion Modeling Guidance for Minnesota Title V Modeling Requirements and Federal Prevention of Significant Deterioration Requirements" (Version 2 released July 28, 2003) which is available at:

www.pca.state.mn.us/air/modeling.html.

The MPCA's most recent version of the document titled "Facility Air Emissions Risk Analysis Guidance" should also be consulted to determine if a particular project would trigger the need for an Air Emissions Risk Analysis. It is available at:

http://www.pca.state.mn.us/air/atguide.html

3.0 Overview

The goal of this document is to create easy-to-understand modeling procedures that are consistent with New Source Review Reform regulations and ensure protection of air quality.

This document is intended for source owner/operators when they seek:

- An initial Clean Unit designation;
- To renew a Clean Unit designation;
- Approval of a Pollution Control Project with an increase in a collateral pollutant;
- To create a Plantwide Applicability Limit
- To make modifications under a Plantwide Applicability Limit; or
- To renew a Plantwide Applicability Limit.

This document does not provide modeling guidance for major modifications under the Prevention of Significant Deterioration (PSD) regulation or for changes that cause a unit to lose its Clean Unit designation.

Each procedure outlined in the document begins with the assumption that a modeling analysis is required. For Clean Units, modeling is required for the pollutant for which BACT or "BACT-equivalent" controls have been installed; for Pollution Control Projects, modeling is required for the pollutant with an increased emission rate; and for a Plantwide Applicability Limit, modeling is required for the pollutant being limited. This document presents certain scenarios (or "off-ramps") that eliminate the requirement for additional modeling. Off-ramps have been established for each of the main areas evaluated in a New Source Review modeling analysis:

1) Minnesota/National Ambient Air Quality Standards modeling;
2) Class II PSD increment modeling;
3) Class I PSD increment modeling;
4) Class I visibility modeling;
5) modeling for "other PSD pollutants".

NSR requires a modeling analysis for "other PSD pollutants." This, however, is rare. This document does not specifically require modeling for other PSD pollutants unless:

- the source is seeking a Clean Unit designation for any of the other PSD pollutants,
- the Pollution Control Project increases one of the other PSD pollutants, or
- the source wishes to include other PSD pollutants as part of a PAL.

Some off-ramps require agency pre-approval. The MPCA requires pre-approval in these situations as they are much more complex, often involving emissions from other facilities. The MPCA wants to be sure that all parties are in agreement on approaches and assumptions as streamlined modeling approaches are considered.

The primary concerns when modeling for additional impacts are the Class I Air Quality Related Values (AQRVs). AQRVs include visibility, soils and vegetation. For the purposes of this policy, only visibility modeling must be considered. This is based upon agency staff opinion that visibility is generally the most restrictive AQRV and focusing on visibility will streamline the modeling process. To facilitate protection of the AQRVs, the policy requires modeling for visibility for Clean Unit(s) and Pollution Control Projects unless the source qualifies for an off-ramp based upon emissions and the distance of the source from Class I areas. For PAL projects, the policy requires modeling for visibility on a case-by-case basis. The agency plans to notify Federal Land Managers of applications for Clean Unit designations, Pollution Control Projects, and Plantwide Applicability Limitations for projects located within 300 kilometers of a Class I area.[1]

The MPCA anticipates a source will use existing current and representative modeling wherever possible in evaluating whether it qualifies for a particular off-ramp. (See Attachment A for a definition of current and representative modeling.) Otherwise, it will need to conduct (additional) streamlined modeling if appropriate. As a last resort, the source could conduct (additional) refined modeling if no simpler options apply.

Although this document specifies situations where a source does not need to conduct additional or new modeling, a source can always choose to do more comprehensive modeling than what is outlined in this guidance. In addition, under state policy, in some instances modeling may be necessary for pollutants not regulated under PSD (such as chemicals called "air toxics").

The MPCA has developed guidance titled "Facility Air Emissions Risk Analysis Guidance". The most recent version should be consulted to determine if a particular project would trigger the need for an Air Emissions Risk Analysis. It is available at:

http://www.pca.state.mn.us/air/atguide.html

[1] Note: Visibility is not an AQRV for the Rainbow Lakes Wilderness Area and visibility has not been approved as a surrogate for other AQRVs at the Rainbow Lakes area. For projects located within 300 kilometers of the Rainbow Lakes area, the MPCA will notify the Rainbow Lakes Federal Land Manager of the project and will consult with the Federal Land Manager to determine whether modeling may be required for the project. It is recommended that the MPCA be contacted as early as possible to allow time to determine whether modeling may be required for the project.

4.0 Clean Unit Designation Modeling Guidance

4.1 Introduction

A Clean Unit designation (sources subject to 40 CFR 52.21(x) or (y)) provides a benefit for sources that have installed state-of-the-art air pollution control equipment in the past or will install it in the future. The emission unit controlled by the control equipment is designated to be a "Clean Unit" and can be modified, subject to certain restrictions, and no emission increase is considered to occur.

The Clean Unit designation applies only for the pollutants that the source seeks this designation for and that meet the requirements outlined in 40 CFR 52.21(x) or (y). The rule states "the Clean Unit designation applies individually for each pollutant emitted by the emissions unit". For example, a source operator with an emissions unit such as a low NO_x dryer burner could seek a Clean Unit designation for NO_x, but not for the other pollutants it emits.

This section contains the modeling policy for clean units only. It does not consider clean units as part of other larger projects (e.g., hybrid projects). When determining if modeling is required, emissions of each pollutant from all units for which a Clean Unit designation is being sought must be summed to determine if an off-ramp is applicable. In other words, if a Clean Unit designation is being sought for two units which each have allowable emissions of 6.85 lb/hr and 30.0 tons/year of NOx, then allowable emissions from the units must be summed to determine if an off-ramp is applicable. In the example mentioned, emissions of 13.7 lb/hr of NOx (2 x 6.85 lb/hr) and 60.0 tons/year of NOx (2 x 30.0 tons/year) would be used to determine if an off-ramp is applicable.

In the Clean Unit modeling procedure outlined below, we start from the assumption that a modeling analysis is required and then describe situations (off-ramps) that eliminate or reduce the requirement for additional (new) modeling. Off-ramps have been established for each of main areas evaluated in a New Source Review modeling analysis:

1) Minnesota/National Ambient Air Quality Standards modeling;
2) Class II PSD increment modeling;
3) Class I PSD increment modeling;
4) Class I visibility modeling;
5) modeling for "other PSD pollutants".

An evaluation of the modeling needs for each area should be conducted independently of the evaluation for the other areas.

Other PSD pollutant modeling (see Section 4.2, Step 5) has rarely been required by the MPCA. This category would be of interest only for those sources seeking a Clean Unit designation for any of these other PSD pollutants, such as hydrogen sulfide.

The procedure described in section 4.2 lists the specific situations in which additional (new) modeling would not be required (off-ramps). Below is the general reasoning supporting the existence of some of the off-ramps:

- The unit has been issued an NSR permit in the last ten years and qualifies as a Clean Unit. (The NSR reform rule requires this to be an automatic designation with certain qualifications. We anticipate that initially this will be the most common mechanism for emission units to qualify as a clean unit.)
- The unit's allowable emission rates are less than PSD significant emission rates. (The MPCA has rarely required modeling for these types of increases.)
- The Clean Unit designation request is for VOCs only. (There is no ambient air quality standard for this class of pollutants, and modeling for ozone is performed on a regional basis.)
- The source can demonstrate through modeling that the unit's impact is less than significant impact levels (SIL). (The MPCA deems that this impact will be of negligible consequence to ambient air quality as the SIL values are often just 1 to 2 percent of ambient air quality standards.)
- The source can demonstrate through modeling that the impact from all sources plus the monitored background plus the significant impact levels is less than the air quality standard. (In PSD modeling the MPCA generally requires a future growth "cushion" equal to SIL values. This is important to accommodate future PSD projects, post minor source baseline date condition changes, etc. This off-ramp is established to retain that cushion for future growth.)
- With agency pre-approval, the source can demonstrate that the sum of the impact from facility emissions, monitored background and some multiplier of SIL is less than the air quality standards to qualify as a clean unit. (The multiplier for the SIL and the background level used is dependent on the distance that the facility is from other sources. The closer the other sources, the more conservative the SIL multiplier and background level used.)

The MPCA anticipates a source will use existing current and representative modeling wherever possible in evaluating whether it qualifies for a particular off-ramp. (See Attachment A for a definition of current and representative modeling.) Otherwise, it will need to conduct (additional) streamlined modeling if appropriate. As a last resort, the source could conduct (additional) refined modeling if no simpler options apply. Many projects will easily pass the representative tests in slow growth areas. In fast growth areas, passing the representative tests may be more difficult.

4.2 Clean Unit Modeling Policy Steps

Unless an off-ramp exists for each step, modeling is required for an initial Clean Unit designation or to renew a Clean Unit designation.

Step 1: Conduct Minnesota / National Ambient Air Quality Standards modeling unless at least one off-ramp exists.

MN/NAAQS Modeling Off-Ramps (evaluate for each pollutant/averaging time):

a) The unit automatically qualifies as a Clean Unit under 52.21(x)(3)(i) and (ii) (units that have been issued an NSR permit in the last ten years). This off-ramp does not exist for units for which the original Clean Unit designation has expired in accordance with 52.21(x)(5) or is lost pursuant to 52.21(x)(2)(iii) or re-qualifies pursuant to 52.21(x)(3).
Note: clean units re-qualify either via a new major NSR permit (implies full NSR modeling), or via 52.21(y) (implies lesser modeling).

b) The source operator is requesting a Clean Unit designation for VOCs only.

c) Allowable emissions from the Clean Unit(s) < significant emission rates (SERs) [see 52.21(b)(23)(i)].

d) The most recent modeling is current and representative[2] and indicates that the impact from Clean Unit(s) < significant impact levels (SILs) [see 51.165(b)].

e) The most recent modeling is current and representative and indicates that the impact from ALL sources[3] + monitored background[4] + 1.0*SIL < AQS.

f) No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 50 km and the most recent modeling is current and representative and indicates that the impact from the entire facility + low monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval.

g) No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 25 km and the most recent modeling is current and representative and indicates that the impact from the entire facility + semi-low monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval.

h) No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 10 km and the most recent modeling is current and representative and indicates that the impact from the entire facility + semi-high monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval.

i) No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 5 km and the most recent modeling is current and representative and indicates that the impact from the entire facility + high

[2] "current and representative" are discussed in Attachment A.
[3] "ALL sources" means the facility itself and nearby facilities. Only facilities required to submit an emission inventory to the MPCA need to be considered for modeling purposes.
[4] different monitored background values are shown in table 6 on page 26 of "MPCA Guidance for Title V and PSD Air Dispersion Modeling (July 2003)" located at http://www.pca.state.mn.us/air/modeling.html

monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval.

Situations not covered by off-ramps (f) through (i) may be covered by off-ramp (j).

j) Most recent modeling is current and representative and indicates that the impact from the entire facility + low monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval and it does not apply for cases as described in Attachment B.

Step 2: Conduct Class II PSD increment modeling unless at least one off-ramp exists.

Class II PSD Increment Modeling Off-Ramps (evaluate for each pollutant/averaging time)

a. The minor source baseline date has not been triggered for any county where the Clean Unit is expected to cause a significant impact.

b. The unit automatically qualifies as a Clean Unit under 52.21(x)(3)(i) and (ii). This off-ramp does not exist for units for which the original CU designation has expired in accordance with 52.21(x)(5) or is lost pursuant to 52.21(x)(2)(iii) or re-qualifies pursuant to 52.21(x)(3).

c. The source operator is requesting a Clean Unit Designation for VOCs only.

d. Allowable emissions from the Clean Unit(s) < significant emission rates (SERs) [see 52.21(b)(23)(i)].

e. The most recent modeling is current and representative and indicates that the increment impact from the Clean Unit(s) < significant impact levels (SILs).

f. The most recent modeling is current and representative and indicates that the increment impact from ALL sources + 1.0*SIL < Class II PSD Increments.

g. No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 50 km and the most recent modeling is current and representative and indicates that the increment impact from the entire facility + 1.5*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

h. No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 25 km and the most recent modeling is current and representative and indicates that the increment impact from the entire facility + 2.0*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

i. No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 10 km and the most recent modeling is current and

representative and indicates that the increment impact from the entire facility + 2.5*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

j. No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 5 km and the most recent modeling is current and representative and indicates that the increment impact from the entire facility + 3.0*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

Step 3: Conduct Class I PSD increment modeling unless at least one off-ramp exists.

Class I PSD increment Modeling Off-Ramps (evaluate for each pollutant/averaging time):

a. The unit automatically qualifies as a Clean Unit under 52.21(x)(3)(i) and (ii). This off-ramp does not exist for units for which the original Clean Unit designation has expired in accordance with 52.21(x)(5) or is lost pursuant to 52.21(x)(2)(iii) or re-qualifies pursuant to 52.21(x)(3).

b. The source operator is requesting a Clean Unit Designation for VOCs only.

c. Cumulative allowable emissions from the Clean Unit(s) < significant emission rates (SERs) [see 52.21(b)(23)(i)].

d. Cumulative Clean Unit allowable emissions < 27 pounds/hour for facilities at least 50 km from all Class I areas[5].

e. Cumulative Clean Unit allowable emissions < 50 pounds/hour for facilities at least 100 km from all Class I areas.

f. Cumulative Clean Unit allowable emissions < 92 pounds/hour for facilities at least 200 km from all Class I areas.

g. The Clean Unit(s) are located a distance from a Class I area which is beyond currently acceptable limits of available dispersion modeling techniques (currently 300 km).

h. The most recent modeling is current and representative and indicates that the increment impact from the Clean Unit(s) < 1 ug/m3 (24-hour average) – see page C.28 of NSR Workshop Manual.

i. The most recent modeling is current and representative and indicates that the increment impact from ALL sources + 1.0*SIL < Class I PSD Increments.

[5] Attachment D shows the distances in kilometers from PSD Class I areas.

j. No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 50 km and the most recent modeling is current and representative and indicates that the increment impact from the entire facility + 1.5*SIL < Class I PSD Increments. This off-ramp requires agency pre-approval.

k. No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 25 km and the most recent modeling is current and representative and indicates that the increment impact from the entire facility + 2.0*SIL < Class I PSD Increments. This off-ramp requires agency pre-approval.

l. No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 10 km and the most recent modeling is current and representative and indicates that the increment impact from the entire facility + 2.5*SIL < Class I PSD Increments. This off-ramp requires agency pre-approval.

m. No other facilities emitting the pollutant for which a Clean Unit designation is sought are located within 5 km and the most recent modeling is current and representative and indicates that the increment impact from the entire facility + 3.0*SIL < Class I PSD Increments. This off-ramp requires agency pre-approval.

Step 4: Conduct Class I visibility modeling per Steps 4A and 4B unless the most recent modeling is current and representative and indicates that emissions from the Clean Unit(s) are not predicted to adversely impact visibility in a Class I area or the Clean Unit(s) are located a distance from a Class I area which is beyond currently acceptable limits of available dispersion modeling techniques (currently 300 km). See Attachment D for PSD Class I areas and buffer distances.

Note: It is possible for a Clean Unit to be located less than 50 km from a Class I area and 50 km to 300 km from a different Class I area. In this case, it will be necessary to complete both Steps 4A and 4B to determine if modeling is necessary.

Note: Visibility is not an AQRV for the Rainbow Lakes Wilderness Area and visibility has not been approved as a surrogate for other AQRVs at the Rainbow Lakes area. For projects located within 300 kilometers of the Rainbow Lakes area, the MPCA will notify the Rainbow Lakes Federal Land Manager of the project and will consult with the Federal Land Manager to determine whether modeling may be required for the project. It is recommended that the MPCA be contacted as early as possible to allow time to determine whether modeling may be required for the project.

Step 4A: For Clean Unit(s) within 50 km of any Class I area, conduct short-range Class I visibility modeling (e.g., VISCREEN or PLUVUE plume modeling) unless the ratio of Q_1/D_1 is less than 6.0, where Q_1 and D_1 are as defined below.

Q_1 = Sum of the emission rates (in lb/hr) from the Clean Unit(s) of PM-10, H2SO4 and NOx.

D_1 = Distance (in km) to the nearest Class I area.

Step 4B: For Clean Unit(s) beyond 50 km and within 300 km of any Class I area, conduct long-range Class I visibility modeling (e.g., CALPUFF or CALPUFF-LITE or other approved techniques) unless the ratio of Q_2/D_2 is less than 1.0, where Q_2 and D_2 are as defined below.

Q_2 = Sum of the emission rates (in lb/hr) from the Clean Unit(s) of PM-10, SO2, H2SO4 and NOx. Inclusion of H2SO4 is only required if emissions information (AP-42 data, stack testing data, manufacturer's data, etc.) is readily available.

D_2 = Distance (in km) to the nearest Class I area.

Example for Step 4:

A Clean Unit(s) is located 30 km from a Class I area and 60 km from another Class I area. The unit(s) has the following emissions:

PM-10 emissions = 20.0 lb/hr
H2SO4 emissions = 10.0 lb/hr
NOx emissions = 30.0 lb/hr
SO2 emissions = 30.0 lb/hr

Q_1 (Sum of PM-10, H2SO4 and NOx emissions = (20.0 + 10.0 + 30.0) lb/hr
= 60.0 lb/hr

D_1 = 30 km

Therefore, Q_1/D_1 = 60.0 / 30.0 = 2.0

Since Q_1/D_1 is less than 6.0, short-range Class I visibility modeling is not required.

Q_2 (Sum of PM-10, H2SO4, NOx and SO2 emissions) = (20.0 + 10.0 + 30.0 + 30.0) lb/hr
= 90.0 lb/hr

D_2 = 60 km

Therefore, Q_2/D_2 = 90.0 / 60.0 = 1.5.

Since Q_2/D_2 is greater than 1.0, long-range Class I visibility modeling is required.

Step 5: Conduct modeling for "Other PSD Pollutants" if seeking a Clean Unit Designation for any of these pollutants.

Modeling for the "other PSD pollutants"[6] is rare. Modeling is not specifically required for a clean unit designation unless the source is seeking a Clean Unit designation for any of the "other PSD pollutants". In this situation, the MPCA urges the applicant to contact one of the agency's permitting staff (when to model) or modeling staff (how to model).

4.3 Selected Federal Rule Citations for Modeling Requirements for Clean Units

Select citations from Part 52 of Title 40 Code of Federal Regulations are included here to aid the reader in understanding the various off-ramps described in the previous section.

Re-qualifying for a Clean Unit designation

52.21(x)(3) states, "After the original Clean Unit expires in accordance with paragraph (x)(5) of this section or is lost pursuant to paragraph (x)(2)(iii) of this section, such emissions unit may re-qualify as a Clean Unit under either paragraph (x)(3)(iii) of this section, or under the Clean Unit provisions in paragraph (y) of this section."

52.21(x)(3)(iii) states, "*Re-qualifying for the Clean Unit designation.* The emissions unit must obtain a new major NSR permit …". For any new major NSR permit, a modeling analysis is required under 52.21(k), so a modeling analysis is required for any re-qualification as a Clean Unit under 52.21(x)(3)(iii).

52.21(y)(3)(iv) states, "Re-qualifying as a Clean Unit. The emissions unit must obtain a new permit…, and the emissions unit must meet the requirements in paragraphs (y)(3)(i)(a) and (y)(3)(ii) of this section." 52.21(y)(3)(ii) states, "*Impact of emissions from the unit.* The Administrator must determine that the allowable emissions from the emissions unit will not cause or contribute to a violation of any national ambient air quality standard or PSD increment, or adversely impact an air quality related value…". To demonstrate compliance with the NAAQS and PSD increments and to demonstrate no adverse impact on an AQRV, a modeling analysis is necessary.

Clean Unit Designation for Units which Achieve an Emission Limitation Comparable to BACT

52.21(y) establishes requirements for Clean Unit designations for emissions units which do not qualify as Clean Units under 52.21(x), but which are achieving a level of emissions control comparable to BACT. A unit designated as a Clean Unit under 52.21(y) must meet the requirements of 52.21(y)(3)(ii), which states, "*Impact of*

[6] 40 CFR 52.21(b)(23)(i) lists the "other PSD pollutants". They are fluorides, sulfuric acid mist, hydrogen sulfide (H_2S), total reduced sulfur (including H_2S), reduced sulfur compounds (including H_2S), municipal waste combustor organics (measured as octa-chlorinated dibenzo-p-dioxins and dibenzofurans), municipal waste combustor metals (measured as particulate matter), and municipal solid waste landfill emissions (measured as non-methane organic compounds).

emissions from the unit. The Administrator must determine that the allowable emissions from the emissions unit will not cause or contribute to a violation of any national ambient air quality standard or PSD increment, or adversely impact an air quality related value…". To demonstrate compliance with the NAAQS and PSD increments and to demonstrate no adverse impact on an AQRV, a modeling analysis is necessary.

4.4 Modeling Procedures for Clean Units

If additional modeling is required, a source should conduct modeling in accordance with 40 CFR Part 51, Appendix W (Guideline on Air Quality Models), New Source Review Workshop Manual, or MPCA Modeling Guidance as appropriate. This generally means using agency-approved screening models (e.g., SCREEN3), refined models (e.g., ISCST3, ISC-PRIME, AERMOD), and related information (e.g., receptors, meteorology, nearby sources, background, future growth at 1.0*SIL, etc.) Projects with fewer units may be best served by screening models (e.g., SCREEN3). Projects with more units may be better served by refined models (e.g., AERMOD).

In areas with little or no terrain, it may be possible to use a new MPCA screening tool for criteria and air toxic pollutants called "Dispersion Information Screening Procedures for Emission Risk Screening Evaluations (DISPERSE), Version 1.0, October 21, 2003". The use of this tool for regular NSR and NSR Reform purposes requires agency pre-approval because it is only a preliminary/crude screening tool (e.g., no terrain). Many projects may find this screening tool helpful as it requires fewer resources than other modeling options. It is available at:

http://www.pca.state.mn.us/air/atguide.html

5.0 Pollution Control Project Modeling Guidance

5.1 Introduction

A project identified as a Pollution Control Project (PCP) (sources subject to 40 CFR 52.21(z)) is excluded from major NSR if the project is found to be environmentally beneficial and if the collateral emissions increase from the project will not cause or contribute to a NAAQS / PSD Increment violation or adversely impact an air quality related value. For the purposes of the PCP modeling guidance, it is assumed that the project has been demonstrated to be environmentally beneficial.

This guidance is for sources who seek approval of a pollution control project with an emissions increase in a collateral pollutant. If there is no emissions increase in collateral pollutants, then modeling is not required.

In the PCP modeling procedure outlined below, we start from the assumption that a modeling analysis is required and then describe situations (off-ramps) that eliminate or reduce the requirement for additional (new) modeling. Off-ramps have been established for each of the main areas evaluated in a New Source Review modeling analysis:

1) Minnesota/National Ambient Air Quality Standards modeling;
2) Class II PSD increment modeling;
3) Class I PSD increment modeling;
4) Class I visibility modeling;
5) modeling for "other PSD pollutants".

An evaluation of the modeling needs for each area should be conducted independently of the evaluation for the other areas.

Other PSD pollutant modeling (see Section 5.2, Step 5) has rarely been required by the MPCA. This category would be of interest only for those PCP projects which have a collateral emissions increase for any of these other PSD pollutants, such as hydrogen sulfide.

The procedure described in Section 5.2 lists the specific situations in which additional (new) modeling would not be required (off-ramps). Below is the general reasoning supporting the existence of some of the off-ramps:

- The PCP collateral emission increase is less than the PSD significant emission rates. (The MPCA has rarely required modeling for these types of increases.)
- The PCP will only cause an increase in VOC emissions. (There is no ambient air quality standard for this class of pollutants, and modeling for ozone is performed on a regional basis.)
- The source can demonstrate through modeling that the impact from the PCP collateral emission increase is less than the significant impact levels (SILs). (The MPCA deems that this impact will be of negligible consequence to ambient air

quality as the SIL values are often just 1 to 2 percent of ambient air quality standards.)

- The source can demonstrate through modeling that the impact from all sources (including the PCP collateral emission increases) plus the monitored background plus the significant impact levels is less than the air quality standard. (In PSD modeling the MPCA generally requires a future "growth" cushion equal to SIL values. This is important to accommodate future PSD projects, post minor source baseline date condition changes, etc. This off-ramp retains that cushion for future growth.)
- With agency pre-approval, the source can demonstrate that the sum of the impact from facility emissions (including the collateral emissions increase from the PCP), monitored background and some multiplier of the SIL is less than the air quality standards. (The multiplier for the SIL and the background level used is dependent on the distance that the facility is from other sources. The closer the other sources, the more conservative the SIL multiplier and background level used.)

The MPCA anticipates a source will use existing current and representative modeling wherever possible in evaluating whether it qualifies for a particular off-ramp. (See Attachment A for a definition of current and representative modeling.) Otherwise, it will need to conduct (additional) streamlined modeling if appropriate. As a last resort, the source could conduct (additional) refined modeling if no simpler options apply. Many projects will easily pass the representative tests in slow growth areas. In fast growth areas, passing the representative tests may be more difficult.

For PCPs only, when modeling to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) for an annual averaging period, the projected actual emissions increase from the PCP may be used. However, when modeling to demonstrate compliance with the Minnesota Ambient Air Quality Standards (for all averaging periods including annual) and the NAAQS with averaging periods less than an annual averaging period, the potential collateral emissions increase from the PCP must be used.

5.2 Pollution Control Projects (PCPs) Modeling Policy Steps

Unless an off-ramp exists for each step, modeling is required for approval of a Pollution Control Project with an increase in a collateral pollutant.

Step 1: Conduct Minnesota / National Ambient Air Quality Standards modeling unless at least one off-ramp exists.

<u>MN/NAAQS Modeling Off-Ramps (evaluate for each pollutant/averaging time):</u>

a) The PCP will only cause a collateral emissions increase in VOC emissions.

b) PCP collateral emission increases [allowable emissions] < significant emission rates (SERs) [see 52.21(b)(23)(i)].

c) The most recent modeling is current and representative[7] and indicates that the impact from the PCP collateral emission increases < significant impact levels (SILs) [see 51.165(b)].

d) The most recent modeling is current and representative and indicates that the impact from ALL sources[8] (including the PCP collateral emission increases) + low monitored background[9] + 1.0*SIL < AQS.

e) No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 50 km and the most recent modeling is current and representative and indicates that the impact from the entire PCP facility (including PCP) + low monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval.

f) No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 25 km and the most recent modeling is current and representative and indicates that the impact from the entire PCP facility (including PCP) + semi-low monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval.

g) No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 10 km and the most recent modeling is current and representative and indicates that the impact from the entire PCP facility (including PCP) + semi-high monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval.

h) No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 5 km and the most recent modeling is current and representative and indicates that the impact from the entire PCP facility (including PCP) + high monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval.

i) Most recent modeling is current and representative and indicates that the impact from the entire PCP facility (including PCP) + low monitored background + 1.0* SIL < AQS. This off-ramp requires agency pre-approval and it does not apply for cases as described in Attachment B. Situations not covered by off-ramps (e) through (h) may be covered by this off-ramp.

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[7] "current and representative" are discussed in Attachment A.

[8] "ALL sources" means the facility itself and nearby facilities. Only facilities required to submit an emission inventory to the MPCA need to be considered for modeling purposes.

[9] different monitored background values are shown in table 6 on page 26 of "MPCA Guidance for Title V and PSD Air Dispersion Modeling (July 2003)" located at http://www.pca.state.mn.us/air/modeling.html

Step 2: Conduct Class II PSD increment modeling unless at least one off-ramp exists.

Class II PSD Increment Modeling Off-Ramps (evaluate for each pollutant/averaging time)

a. The minor source baseline date has not been triggered for any county where PCP collateral emission increases are expected to cause a significant impact.

b. The PCP will only cause a collateral emissions increase in VOC emissions.

c. The PCP collateral emission increases < SERs [see 52.21(b)(23)(i)].

d. The most recent modeling is current and representative and suggests that the impact from PCP collateral emission increases < significant impact levels (SILs).

e. The most recent modeling is current and representative and suggests that the impact from ALL increment sources + 1.0*SIL < Class II PSD Increments.

f. No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 50 km and the most recent modeling is current and representative and indicates that the increment impact from PCP facility increment sources + 1.5*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

g. No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 25 km and the most recent modeling is current and representative and indicates that the increment impact from PCP facility increment sources + 2.0*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

h. No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 10 km and the most recent modeling is current and representative and indicates that the increment impact from PCP facility increment sources + 2.5*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

i. No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 5 km and the most recent modeling is current and representative and indicates that the increment impact from PCP facility increment sources + 3.0*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

Step 3: Conduct Class I PSD increment modeling unless at least one off-ramp exists.

Class I PSD Increment Modeling Off-Ramps (evaluate for each pollutant/averaging time):

a. The PCP will only cause a collateral emissions increase in VOC emissions.

b. The PCP collateral emission increases < SERs [see 52.21(b)(23)(i)].

c. The PCP collateral emission increases < 27 pounds/hour for facilities at least 50 km from all Class I areas[10].

d. The PCP collateral emission increases < 50 pounds/hour for facilities at least 100 km from all Class I areas.

e. The PCP collateral emission increases < 92 pounds/hour for facilities at least 200 km from all Class I areas.

f. The PCP is located a distance from a Class I area which is beyond currently acceptable limits of available dispersion modeling techniques (currently 300 km).

g. The most recent modeling is current and representative and suggests that the impact from PCP collateral emission increases < 1 ug/m3 (24-hour average) per page C.28 of NSR Workshop Manual.

h. The most recent modeling is current and representative and suggests that the impact on a Class I area from ALL increment sources (including PCP) + 1.0*SIL < Class I PSD Increments.

i. No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 50 km and the most recent modeling is current and representative and indicates that the increment impact from PCP facility increment sources + 1.5*SIL < Class I PSD Increments. This off-ramp requires agency pre-approval.

j. No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 25 km and the most recent modeling is current and representative and indicates that the increment impact from PCP facility increment sources + 2.0*SIL < Class I PSD Increments. This off-ramp requires agency pre-approval.

[10] Attachment D shows the distances in kilometers from PSD Class I areas.

k. No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 10 km and the most recent modeling is current and representative and indicates that the increment impact from PCP facility increment sources + 2.5*SIL < Class I PSD Increments. This off-ramp requires agency pre-approval.

l. No other facilities emitting the pollutant for which there is a collateral emissions increase are located within 5 km and the most recent modeling is current and representative and indicates that the increment impact from PCP facility increment sources + 3.0*SIL < Class I PSD Increments. This off-ramp requires agency pre-approval.

Step 4: Conduct Class I visibility modeling per Steps 4A and 4B unless the most recent modeling is current and representative and indicates that the emissions increase from the PCP is not predicted to adversely impact visibility in a Class I area or the PCP is located a distance from a Class I area which is beyond currently acceptable limits of available dispersion modeling techniques (currently 300 km). See Attachment D for PSD Class I areas and buffer distances.

Note: It is possible for a PCP to be located less than 50 km from a Class I area and 50 km to 300 km from a different Class I area. In this case, it will be necessary to complete both Steps 4A and 4B to determine if modeling is necessary.

Note: Visibility is not an AQRV for the Rainbow Lakes Wilderness Area and visibility has not been approved as a surrogate for other AQRVs at the Rainbow Lakes area. For projects located within 300 kilometers of the Rainbow Lakes area, the MPCA will notify the Rainbow Lakes Federal Land Manager of the project and will consult with the Federal Land Manager to determine whether modeling may be required for the project. It is recommended that the MPCA be contacted as early as possible to allow time to determine whether modeling may be required for the project.

Step 4A: For a PCP within 50 km of any Class I area, conduct short-range Class I visibility modeling (e.g., VISCREEN or PLUVUE plume modeling) unless the ratio of Q_1/D_1 is less than 6.0, where Q_1 and D_1 are as defined below.

Q_1 = Sum of the PCP collateral emission increases (in lb/hr) of PM-10, H2SO4 and NOx.

D_1 = Distance (in km) to the nearest Class I area.

Step 4B: For a PCP beyond 50 km and within 300 km of any Class I area, conduct long-range Class I visibility modeling (e.g., CALPUFF or CALPUFF-LITE or other approved techniques) unless the ratio of Q_2/D_2 is less than 1.0, where Q_2 and D_2 are as defined below.

Q_2 = Sum of the PCP collateral emission increases (in lb/hr) of PM-10, SO2, H2SO4 and NOx. Inclusion of H2SO4 is only required if emissions information (AP-42 data, stack testing data, manufacturer's data, etc.) is readily available.

D_2 = Distance (in km) to the nearest Class I area.

Example for Step 4:

A PCP is located 40 km from a Class I area and 60 km from another Class I area. The collateral emissions increase from the project is as follows:

NOx emissions = 40.0 lb/hr
SO2 emissions = 40.0 lb/hr

Q_1 (Sum of PM-10, H2SO4 and NOx emissions increase) = 40.0 lb/hr + 40.0 lb/hr = 80.0 lb/hr

D_1 = 40 km

Therefore, Q_1/D_1= 80.0 / 40.0 = 2.0

Since Q_1/D_1 is less than 6.0, short-range Class I visibility modeling is not required.

Q_2 (Sum of PM-10, H2SO4, NOx and SO2 emissions increase) = 40.0 lb/hr + 40.0 lb/hr
= 80.0 lb/hr

D_2 = 60 km

Therefore, Q_2/D_2 = 80.0 / 60.0 = 1.33

Since Q_2/D_2 is greater than 1.0, long-range Class I visibility modeling is required.

Step 5: Conduct modeling for "Other PSD Pollutants" if the Pollution Control Project results in an emissions increase for one of the "other PSD Pollutants".

Modeling for the "other PSD pollutants"[11] is rare. Modeling is not specifically required for PCPs unless the source emits any of the "other PSD pollutants". In this situation, the MPCA urges the applicant to contact one of the agency's permitting staff (to determine when to model) or modeling staff (to determine how to model).

5.3 Selected Federal Rule Citations for Modeling Requirements for Pollution Control Projects (PCPs)

Select citations from Part 52 of Title 40 Code of Federal Regulations are included here to aid the reader in understanding the various off-ramps described in the previous section.

[11] 40 CFR 52.21(b)(23)(i) lists the "other PSD pollutants". They are fluorides, sulfuric acid mist, hydrogen sulfide (H_2S), total reduced sulfur (including H_2S), reduced sulfur compounds (including H_2S), municipal waste combustor organics (measured as octa-chlorinated dibenzo-p-dioxins and dibenzofurans), municipal waste combustor metals (measured as particulate matter), and municipal solid waste landfill emissions (measured as non-methane organic compounds).

52.21(z)(2)(ii) states, "*Air quality analysis*. The emissions increases from the project will not cause or contribute to a violation of any national ambient air quality standard or PSD increment, or adversely impact an air quality related value (such as visibility) that has been identified for a Federal Class I area by a Federal Land Manager and for which information is available to the general public".

52.21(z)(3) establishes the content requirements for notices or permit applications for pollution control projects. 52.21(z)(3)(v) requires the owner or operator to submit a "Demonstration that the PCP will not have an adverse air quality impact (e.g., modeling, screening level modeling results, or a statement that the collateral emissions increase is included within the parameters used in the most recent modeling exercise) as required by paragraph (z)(2)(ii) of this section. An air quality impact analysis is not required for any pollutant that will not experience a significant emissions increase as a result of the project."

5.4 Modeling Procedures for Pollution Control Projects

If additional modeling is required, a source should conduct modeling in accordance with 40 CFR Part 51, Appendix W (Guideline on Air Quality Models), New Source Review Workshop Manual, or MPCA Modeling Guidance as appropriate. This generally means using agency-approved screening models (e.g., SCREEN3), refined models (e.g., ISCST3, ISC-PRIME, AERMOD), and related information (e.g., receptors, meteorology, nearby sources, background, future growth at 1.0*SIL, etc.) Projects with fewer units may be best served by screening models (e.g., SCREEN3). Projects with more units may be better served by refined models (e.g., AERMOD).

In areas with little or no terrain, it may be possible to use a new MPCA screening tool for criteria and air toxic pollutants called "Dispersion Information Screening Procedures for Emission Risk Screening Evaluations (DISPERSE), Version 1.0, October 21, 2003". The use of this tool for regular NSR and NSR Reform purposes requires agency pre-approval because it is only a preliminary/crude screening tool (e.g., no terrain). Many projects may find this screening tool helpful as it requires fewer resources than other modeling options. It is available at:

http://www.pca.state.mn.us/air/atguide.html

Note: For PCPs only, when modeling to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) for an annual averaging period, the projected actual emissions increase from the PCP may be used. However, when modeling to demonstrate compliance with the Minnesota Ambient Air Quality Standards (for all averaging periods including annual) and the NAAQS with averaging periods less than an annual averaging period, the potential collateral emissions increase from the PCP must be used.

6.0 Plantwide Applicability Limitations (Actuals PALs) Modeling Guidance

6.1 Introduction

A facility may obtain an Actuals PAL (Actuals Plantwide Applicability Limitation) [sources subject to 40 CFR 52.21(aa)] based on the baseline actual emissions of all emissions units at the source that emit or have the potential to emit the PAL pollutant. Once an Actuals PAL is obtained, changes can be made for 10 years without triggering major NSR if plantwide emissions remain below the Actuals PAL. In the remainder of this policy, the term "PAL" shall mean "actuals PAL".

This modeling guidance is intended for sources seeking to create a PAL for their facility, to make modifications under a PAL, or to renew a PAL.

In the PAL modeling procedure outlined below, we start from the assumption that a modeling analysis is required and then describe situations (off-ramps) that eliminate or reduce the requirement for additional (new) modeling. Off-ramps have been established for each of the main areas evaluated in a New Source Review modeling analysis:

1) Minnesota/National Ambient Air Quality Standards modeling;
2) Class II PSD increment modeling;
3) Class I PSD increment modeling;
4) Class I visibility modeling;
5) modeling for "other PSD pollutants".

An evaluation of the modeling needs for each area should be conducted independently of the evaluation for the other areas.

Other PSD pollutant modeling (see Section 6.2, Step 5) has rarely been required by the MPCA. This category would be of interest only for those PAL projects where a PAL is requested specifically for one of the "other PSD pollutants".

Unless an off-ramp exists, modeling is required for: a) any facility wishing to establish or renew a PAL; or b) any physical change or change in the method of operation at a facility with a PAL which results in an increase in potential emissions of the PAL pollutant greater than the emission rates shown in Minn. R. 7007.1450, subp. 2 (the emission calculation method of Minn. R. 7007.1200, subp. 3 shall be used) or which causes the modeling used when establishing the PAL to no longer be representative. For this reason in its initial modeling for a PAL, a facility may choose to model a number of scenarios.

The procedure described in Section 6.2 lists the specific situations in which additional (new) modeling would not be required (off-ramps). Below is the general reasoning supporting the existence of some of the off-ramps:

- The PAL is only for VOC emissions. (There is no ambient air quality standard for this class of pollutants, and modeling for ozone is performed on a regional basis.)

- The source can demonstrate through modeling that the impact from all sources (based on allowable emissions) plus the monitored background plus twice the significant impact levels is less than the air quality standard. (In PSD modeling the MPCA generally requires a future "growth" cushion equal to SIL values. This is important to accommodate future PSD projects, post minor source baseline date condition changes, etc. Although clean units and pollution control projects set future growth at one times the SIL values, PAL projects set future growth at twice the SIL values to address possible unforeseen adverse future changes noted in Attachment A. Clean units and pollution control projects don't have the uncertainty of unforeseen adverse changes.)
- With agency pre-approval, the source can demonstrate that the sum of the impact from the PAL facility allowable emissions, monitored background and some multiplier of the SIL is less than the air quality standards. (The multiplier for the SIL and the background level used is dependent on the distance that the facility is from other sources. The closer the other sources, the more conservative the SIL multiplier and background level used.)

The MPCA anticipates a source will use existing current and representative modeling wherever possible in evaluating whether it qualifies for a particular off-ramp. (See Attachment A for a definition of current and representative modeling.) Otherwise, it will need to conduct (additional) streamlined modeling if appropriate. As a last resort, the source could conduct (additional) refined modeling if no simpler options apply. Many projects will easily pass the representative tests in slow growth areas. In fast growth areas, passing the representative tests may be more difficult.

Additional Requirements

If compliance with the Minnesota / National Ambient Air Quality Standards and PSD Increments cannot be demonstrated at maximum allowable emission rates for all sources at the facility which emit the PAL pollutant, then long-term and short-term modeling-based Total Facility Emission Limitations (TFELs) must be developed per section 6.4.

Prior to re-issuance of the part 70 permit for the facility, new long-term and short-term TFELs must be reassessed if there are any "undesirable" changes at the facility. (See Attachment A for an explanation of undesirable changes.)

Prior to renewal of the PAL permit (i.e., every 10 years), new long-term and short-term TFELs must be reassessed.

In addition, the source operator should refer to state modeling policy for other non-PSD pollutants to determine if additional modeling is necessary. This policy is described in a document titled "Facility Air Emissions Risk Analysis Guidance". The most recent version is available at:

http://www.pca.state.mn.us/air/atguide.html

6.2 Plantwide Applicability Limitations (Actuals PALs) Modeling Policy Steps

Unless an off-ramp exists, modeling is required for:

a) any facility wishing to establish or renew a PAL; or
b) any physical change or change in the method of operation at a facility with a PAL which results in an increase in potential emissions of the PAL pollutant greater than the emission rates shown in Minn. R. 7007.1200, subp. 2 (the emission calculation method of Minn. R. 7007.1200, subp. 3 shall be used) or which causes the modeling used when establishing the PAL to no longer be representative.

Step 1: Conduct Minnesota / National Ambient Air Quality Standards modeling unless at least one off-ramp exists.

MN/NAAQS Modeling Off-Ramps (evaluate for each pollutant/averaging time):

a) The source operator is requesting a PAL only for VOCs. (Note: Although modeling is not required for VOCs under this policy, other state policies may require modeling for VOCs which are classified as air toxics.)

b) The most recent modeling is current and representative[12] and indicates that the impact from ALL sources [13](including emissions from proposed new or modified sources) + low monitored background[14] + 2.0*SIL < AQS.

c) No other facilities emitting the PAL pollutant are located within 50 km and the most recent modeling is current and representative and indicates that the impact from PAL facility + low monitored background + 2.0* SIL < AQS. This off-ramp requires agency pre-approval.

d) No other facilities emitting the PAL pollutant are located within 25 km and the most recent modeling is current and representative and indicates that the impact from PAL facility + semi-low monitored background + 2.0* SIL < AQS. This off-ramp requires agency pre-approval.

e) No other facilities emitting the PAL pollutant are located within 10 km and the most recent modeling is current and representative and indicates that the impact from PAL facility + semi-high monitored background + 2.0* SIL < AQS. This off-ramp requires agency pre-approval.

f) No other facilities emitting the PAL pollutant are located within 5 km and the most recent modeling is current and representative and indicates that the impact from entire PAL facility + high monitored background + 2.0* SIL < AQS. This

[12] "current and representative" are discussed in Attachment A.
[13] "ALL sources" means the facility itself and nearby facilities. Only facilities required to submit an emission inventory to the MPCA need to be considered for modeling purposes.
[14] different monitored background values are shown in table 6 on page 26 of "MPCA Guidance for Title V and PSD Air Dispersion Modeling (July 2003)" located at http://www.pca.state.mn.us/air/modeling.html

off-ramp requires agency pre-approval.

g) Most recent modeling is current and representative and indicates that the impact from entire PAL facility + low monitored background + 2.0* SIL < AQS. This off-ramp requires agency pre-approval and it does not apply for cases as described in Attachment B. Situations not covered by off-ramps (c) through (f) may be covered by this off-ramp.

Step 2: Conduct Class II PSD increment modeling unless at least one off-ramp exists.

Class II PSD Increment Modeling Off-Ramps (evaluate for each pollutant/averaging time)

a. The minor source baseline date has not been triggered for any county where the PAL facility is expected to cause a significant impact.

b. The source operator is requesting a PAL only for VOCs. (Note: Although modeling is not required for VOCs under this policy, other state policies may require modeling for VOCs which are classified as air toxics.)

c. The most recent modeling is current and representative and suggests that the impact from ALL increment sources (including emissions from proposed new or modified sources) + 2.0*SIL < Class II PSD Increments.

d. No other facilities emitting the PAL pollutant are located within 50 km and the most recent modeling is current and representative and indicates that the increment impact from PAL facility + 2.5*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

e. No other facilities emitting the PAL pollutant are located within 25 km and the most recent modeling is current and representative and indicates that the increment impact from PAL facility + 3.0*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

f. No other facilities emitting the PAL pollutant are located within 10 km and the most recent modeling is current and representative and indicates that the increment impact from PAL facility + 3.5*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

g. No other facilities emitting the PAL pollutant are located with 5 km and the most recent modeling is current and representative and indicates that the increment impact from PAL facility + 4.0*SIL < Class II PSD Increments. This off-ramp requires agency pre-approval.

Step 3: Conduct Class I PSD increment modeling unless at least one off-ramp exists.

Class I PSD Increment Modeling Off-Ramps (evaluate for each pollutant/averaging time):

a. The source operator is requesting a PAL only for VOCs.

b. PALs < 27 pounds/hour for facilities at least 50 km from all Class I areas[15].

c. PALs < 50 pounds/hour for facilities at least 100 km from all Class I areas.

d. PALs < 92 pounds/hour for facilities at least 200 km from all Class I areas.

e. PAL facilities located at least 300 km from all Class I areas.

f. The most recent modeling is current and representative and suggests that the impact on a Class I area from ALL increment sources (including emissions from proposed new or modified sources) + 2.0*SIL < Class I PSD Increments.

Step 4: Conduct Class I modeling if required by the MPCA.

Class I modeling for PAL projects will be required on a case-by-case basis due to the potential variability of PAL projects. The MPCA should be contacted to determine if visibility modeling and/or other Class I modeling is necessary for a particular project.

Step 5: Conduct modeling for "Other PSD Pollutants" if seeking Plantwide Applicability Limits for any of these pollutants.

Modeling is generally required for PAL projects seeking a PAL for any of the "other PSD pollutants"[16]. In this situation, the MPCA urges the applicant to contact one of the agency's permitting staff (to determine when to model) or modeling staff (to determine how to model).

6.3 Selected Federal Rule Citations for Modeling Requirements for Plantwide Applicability Limitations (Actuals PALs)

Select citations from Part 52 of Title 40 Code of Federal Regulations are included here to aid the reader in understanding the various off-ramps described in the previous section.

[15] Attachment D shows the distances in kilometers from PSD Class I areas.

[16] 40 CFR 52.21(b)(23)(i) lists the "other PSD pollutants". They are fluorides, sulfuric acid mist, hydrogen sulfide (H_2S), total reduced sulfur (including H_2S), reduced sulfur compounds (including H_2S), municipal waste combustor organics (measured as octa-chlorinated dibenzo-p-dioxins and dibenzofurans), municipal waste combustor metals (measured as particulate matter), and municipal solid waste landfill emissions (measured as non-methane organic compounds).

52.21(aa)(1)(iii) states, "Except as provided under paragraph (aa)(1)(ii)(c) of this section, a major stationary source shall continue to comply with all applicable Federal or State requirements, emission limitations, and work practice requirements that were established prior to the effective date of the PAL." The MPCA interprets "all applicable Federal or State requirements" to include the MN/NAAQS and PSD increments.

52.21(aa)(5) states, "PALs for existing major stationary sources shall be established, renewed, or increased through a procedure that is consistent with §§ 51.160 and 51.161 of this chapter." 40 CFR 51.160 requires State Implementation Plans to include procedures to demonstrate compliance with the NAAQS.

52.21(aa)(8)(ii)(b) states, "The Administrator shall have discretion to reopen the PAL permit for the following:

(1)….
(2)….
(3) Reduce the PAL if the reviewing authority determines that a reduction is necessary to avoid causing or contributing to a NAAQS or PSD increment violation, or to an adverse impact on an air quality related value that has been identified for a Federal Class I area by a Federal Land Manager and for which information is available to the general public."

6.4 Modeling Procedures for Plantwide Applicability Limitations

A facility owner/operator should conduct modeling in accordance with 40 CFR Part 51, Appendix W (Guideline on Air Quality Models), New Source Review Workshop Manual, and/or MPCA Modeling Guidance as appropriate (e.g., Attachment C).

A facility owner/operator will need to develop long-term and short-term Total Facility Emission Limitations (TFELs) using highest-to-lowest normalized impacts for all applicable regulatory programs as described in Attachment C. To account for future growth, set future growth = 2.0*SIL to address possible unforeseen "undesirable" future changes noted in Attachment A (e.g. emission shifts to shorter stacks, cooler stacks, lower air flow rates, or closer ambient locations).

<u>For Your Information</u>
- Clean units and PCPs don't have the additional uncertainty of unforeseen changes.
- Most PAL projects may be too complex to use the MPCA AERA/DISPERSE tools.
- Most PAL projects will probably benefit by using refined models (e.g., AERMOD).

Attachment A: Definition of Current and Representative Modeling

Current Modeling Means:

- Less than 10 years old.

Rationale: State Implementation Plan maintenance areas are on a 10 year schedule, CU renewals & PAL renewals are on a 10 year schedule, and NSR Reform applicability look back period is now 10 years, too.

Representative Modeling Means:

- No undesirable on-site dispersion changes (e.g., shorter stacks or reduced plume rise*).
- No undesirable on-site emission changes (e.g., new or modified (increased hourly, daily, or annual) emissions).
- No undesirable on-site building changes (e.g., building changes near stack that adversely change Building Profile Input Program (BPIP) output**).
- No undesirable off-site dispersion changes (e.g., shorter stacks or reduced plume rise* in project significant impact area (SIA), or 3 km, whichever is greater).
- No undesirable off-site emission changes (e.g., new or modified (increased hourly, daily, or annual) emissions in project SIA, or 3 km, whichever is greater).
- No undesirable off-site building changes (e.g., building changes near stack that adversely change BPIP output**).
- No undesirable regional changes (e.g., rural/urban/land use land cover changes within ~3 km of facility; Auer method or other EPA-approved methods).
- No other undesirable changes (e.g., higher monitored background concentrations or higher modeled background concentrations).

Rationale: In order to ensure that the most recent modeling conducted is still representative of current conditions at and near the facility, it is necessary to check that no undesirable changes have taken place that would significantly alter the results of the previous modeling. However, negligible (2 percent) changes may be acceptable – recall 40 CFR Part 51, Appendix W, section 3.2.2.c (page 18452 of Federal Register dated April 15, 2003) model equivalency test uses 2 percent.

Note: Passing the representative tests should be easy in slow growth areas. Passing the representative tests may be more difficult in fast growth areas.

* Reduced plume rise examples include, but are not limited to, installing heat recovery, rain hats, and non-vertical releases.

** It should reflect BPIP-PRIME unless all company building cavity areas are fenced.

Attachment B: Nearby Significant Sources by Distance using Potential Allowable Emissions

This section describes situations where some off-ramps (i.e., Clean Unit step 1.j, PCP step 1.i, and PAL step 1.g) cannot be used. The North Carolina Department of Environmental Management describes the "20D" approach as follows:

> *"Whether to include a potentially interacting source can be determined using the North Carolina Department of Environmental Management '20D' approach. Under this approach, the modeler may exclude sources whose potential allowable emissions in tons/yr are less than 20 times the distance between the two sources in kilometers."*

In other words:

Exclude nearby facilities whose potential allowable emissions (in tons per year, TPY) are less than 20 times the distance (D in kilometers) between the two facilities.

"20D" Language
This modeling off-ramp does not apply if any nearby facilities have potential allowable emissions (tons per year, TPY) greater than 20 times the distance (D, kilometers) between the two facilities.

In other words:

This modeling off-ramp does not apply if any nearby facilities (within "D" kilometers of the CU/PCP/PAL project) have potential allowable emissions greater than "20D" TPY.

Examples
This off-ramp does not apply if there are any nearby facilities:

- within 1 km with potential allowable emissions > 20 TPY, or
- within 10 km with potential allowable emissions > 200 TPY, or
- within 100 km with potential allowable emissions > 2000 TPY, or
- within "D" km with potential allowable emissions > "20D" TPY.

Restrictions
Repeat for each applicable pollutant and averaging time.

Attachment C: Total Facility Emission Limitation (TFEL) Concepts, Relationships, Examples, Hints, and Programs

TFEL Concepts

Develop long-term and short-term Total Facility Emission Limitations (TFELs) using highest-to-lowest normalized impacts (i.e., CHI/Q values, where CHI is the modeled concentration and Q is the modeled emission rate).

TFEL modeling procedure:

- generate PLOTFILE concentration (CHI) files for each emission unit
- calculate CHI/Q values (e.g., PLOTFILE CHI values divided by emission rate, Q)
- sort/rank CHI/Q values
- from highest-to-lowest CHI/Q values, sum Q (i.e., TFEL) while summing CHI until you exceed MN//NAAQS or PSD increments adjusted for nearby sources, future growth, and background conditions

- conceptual TFEL example for NAAQS:
    - If CHI1/Q1 > CHI2/Q2 > CHI3/Q3 > CHI4/Q4 > CHI5/Q5, then
    - TFEL = Q1 + Q2 + Q3 when
    - CHI1 + CHI2 + CHI 3 = NAAQS (adjusted for nearby sources, background, and future growth)

- conceptual TFEL example for PSD increments:
    - If CHI1/Q1 > CHI2/Q2 > CHI3/Q3 > CHI4/Q4 > CHI5/Q5, then
    - TFEL = Q1 + Q2 + Q3 when
    - CHI1 + CHI2 + CHI 3 = PSD inc. (adjusted for nearby sources, background, and future growth)

Repeat for each receptor and select the lowest TFEL.

Repeat for all applicable PAL pollutants and averaging times (i.e., each pollutant-averaging time has its own TFEL).

Repeat for all applicable regulatory programs: MN/NAAQS, PSD increments, etc.

TFEL Relationships

TFEL = N-most potent TFEL source emission rates provided the corresponding total impact meets standards.

The total impact = N-most potent TFEL source impacts + Other Nearby Sources + Background + Future Growth.

TFEL Examples

TFEL examples 1 to 3 are progressively more complex.

TFEL Hints

In many cases, small sources, particularly those with short stacks close to ambient air, will have the largest CHI/Q values, and will dominate the impact. Please consider taking emission limitations on operations of these sources and/or modifying their dispersion characteristics (e.g., fuel combusted, stack location, stack height) to reduce CHI/Q values to best fit the entire facility's impact within ambient standards, PSD increments, or air quality related values (AQRV).

TFEL Programs

MPCA may develop FORTRAN computer programs or Excel spreadsheets to calculate TFEL values as the need arises.

TFEL Example1

This example calculates a TFEL for SO2 24-hour averages for 5 TFEL sources (3 stack/vents (SV) and 2 fugitive sources (FS)) each with 24-hour impacts of 100 ug/m3. The 24-hour SO2 standard is 365 ug/m3.

Other nearby modeled sources (miscellaneous non-TFEL sources labeled MISCSRCS) collectively consume 50 ug/m3 and background sources (BKG_&_FG) consume 15 ug/m3 (including 5 ug/m3 for future growth):

SOURCEID	EMIS.RATE (Q, #/HR)	24-HR IMPACT (CHI, UG/M3)	CHI/Q VALUE	CHI/Q RANK
TFELSV01	1.00	100.00	100.0	1
TFELSV02	2.00	100.00	50.0	2
TFELSV03	3.00	100.00	33.3	3
TFELFS01	4.00	100.00	25.0	4
TFELFS02	5.00	100.00	20.0	5
MISCSRCS	NA	50.00	NA	NA
BKG_&_FG	NA	15.00	NA	NA

Largest CHI/Q Source

Impact = TFELSV01 + MISCSRCS + BKG_&_FG

Impact = 100.0 ug/m3 + 50.0 ug/m3 +15.00 ug/m3 = 165 ug/m3.

Because this impact is less than the 24-hour SO2 ambient standard of 365 ug/m3, add next TFEL source.

2 Largest CHI/Q Sources

Impact = TFELSV01 + TFELSV02 + MISCSRCS + BKG_&_FG

Impact = 100.0ug/m3 +100.0ug/m3 + 50.00 ug/m3 +15.00 ug/m3 = 265 ug/m3.

Because this impact is less than the 24-hour SO2 ambient standard of 365 ug/m3, add next TFEL source.

3 Largest CHI/Q Sources

Impact = TFELSV01 + TFELSV02 + TFELSV03 + MISCSRCS + BKG_&_FG

Impact = 100.0ug/m3 +100.0ug/m3 + 100.0ug/m3 + 50.00 ug/m3 +15.00 ug/m3 = 365 ug/m3.

Because this impact is at the 24-hour SO2 ambient standard of 365 ug/m3, calculate 24-hour SO2 TFEL.

24-Hour SO2 TFEL Calculation

24-Hour SO2 TFEL = TFELSV01 + TFELSV02 + TFELSV03

24-Hour SO2 TFEL = 1.00 #/hour + 2.00 #/hour + 3.00 #/hour = 6.00 #/hour.

Adding any additional sources will exceed the 24-hour SO2 standard (with background and future growth).

TFEL Example2

This example calculates a TFEL for SO2 24-hour averages for 5 TFEL sources (3 stack/vents (SV) and 2 fugitive sources (FS)) each with different 24-hour SO2 impacts. The 24-hour SO2 standard is 365 ug/m3.

Other nearby modeled sources (miscellaneous non-TFEL sources labeled MISCSRCS) collectively consume 50 ug/m3 and background sources (BKG_&_FG) consume 15 ug/m3 (including 5 ug/m3 for future growth):

SOURCEID	EMIS.RATE (Q, #/HR)	24-HR IMPACT (CHI, UG/M3)	CHI/Q VALUE	CHI/Q RANK
TFELSV01	1.00	30.00	30.0	2
TFELSV02	2.00	10.00	5.0	5
TFELSV03	3.00	75.00	25.0	3
TFELFS01	4.00	40.00	10.0	4
TFELFS02	5.00	200.00	40.0	1
MISCSRCS	NA	50.00	NA	NA
BKG_&_FG	NA	15.00	NA	NA

Largest CHI/Q Source

Impact = TFELFS02 + MISCSRCS + BKG_&_FG

Impact = 200.0 ug/m3 + 50.0 ug/m3 +15.00 ug/m3 = 265 ug/m3.

Because this impact is less than the 24-hour SO2 ambient standard of 365 ug/m3, add next TFEL source.

2 Largest CHI/Q Sources

Impact = TFELFS02 + TFELSV01 + MISCSRCS + BKG_&_FG

Impact = 200.0ug/m3 +30.0ug/m3 + 50.00 ug/m3 +15.00 ug/m3 = 295 ug/m3.

Because this impact is less than the 24-hour SO2 ambient standard of 365 ug/m3, add next TFEL source.

3 Largest CHI/Q Sources

Impact = TFELFS02 + TFELSV01 + TFELSV03 + MISCSRCS + BKG_&_FG

Impact = 200.0ug/m3 +30.0ug/m3 + 75.0ug/m3 + 50.00 ug/m3 +15.00 ug/m3 = 370 ug/m3.

Because the above impact exceeds the 24-hour SO2 ambient standard of 365 ug/m3, calculate 24-hour SO2 TFEL.

24-Hour SO2 TFEL Calculation

TFELSV01 + TFELSV02 + Part of TFELSV03

5.00 #/hour + 1.00 #/hour + Part of 3.00 #/hour.

The fractional part of TFELSV03 is its fractional impact that meets the ambient standard (70 ug/m3 out of 75 ug/m3). Therefore, TFELSV03 must be restricted to 3.00 #/hour * (70/75) = 2.80 #/hour.

Therefore, 5.00 #/hour + 1.00 #/hour + 2.80 #/hour = 8.80 #/hour is the resulting 24-hour SO2 TFEL.

Adding any additional sources will exceed the 24-hour SO2 standard (with background and future growth).

TFEL Example3

This example calculates a TFEL for SO2 24-hour averages for 5 TFEL sources (3 stack/vents (SV) and 2 fugitive sources (FS)) totaling 15 #/hour each with different 24-hour SO2 impacts. The 24-hour SO2 standard is 365 ug/m3.

Other nearby modeled sources (miscellaneous non-TFEL sources labeled MISCSRCS) collectively consume 40 to 70 ug/m3 and background sources (BKG_&_FG) consume 15 ug/m3 (including 5 ug/m3 for future growth):

SOURCEID	EMIS.RATE (Q, #/HR)	Receptor #1 24-HR IMPACT (CHI, UG/M3)	Recp1 CHI/Q VALUE	Recp1 CHI/Q RANK
TFELSV01	1.00	30.00	30.0	2
TFELSV02	2.00	10.00	5.0	5
TFELSV03	3.00	75.00	25.0	3
TFELFS01	4.00	40.00	10.0	4
TFELFS02	5.00	200.00	40.0	1
MISCSRCS	NA	70.00	NA	NA
BKG_&_FG	NA	15.00	NA	NA

SOURCEID	EMIS.RATE (Q, #/HR)	Receptor #2 24-HR IMPACT (CHI, UG/M3)	Recp2 CHI/Q VALUE	Recp2 CHI/Q RANK
TFELSV01	1.00	20.00	20.0	4
TFELSV02	2.00	50.00	25.0	3
TFELSV03	3.00	150.00	50.0	1
TFELFS01	4.00	40.00	10.0	5
TFELFS02	5.00	200.00	40.0	2
MISCSRCS	NA	60.00	NA	NA
BKG_&_FG	NA	15.00	NA	NA

SOURCEID	EMIS.RATE (Q, #/HR)	Receptor #3 24-HR IMPACT (CHI, UG/M3)	Recp3 CHI/Q VALUE	Recp3 CHI/Q RANK
TFELSV01	1.00	60.00	60.0	1
TFELSV02	2.00	10.00	5.0	5
TFELSV03	3.00	30.00	10.0	4
TFELFS01	4.00	100.00	25.0	2
TFELFS02	5.00	100.00	20.0	3
MISCSRCS	NA	50.00	NA	NA
BKG_&_FG	NA	15.00	NA	NA

SOURCEID	EMIS.RATE (Q, #/HR)	Receptor #4 24-HR IMPACT (CHI, UG/M3)	Recp4 CHI/Q VALUE	Recp4 CHI/Q RANK
TFELSV01	1.00	100.00	100.0	1
TFELSV02	2.00	50.00	25.0	3
TFELSV03	3.00	60.00	20.0	4
TFELFS01	4.00	40.00	10.0	5
TFELFS02	5.00	200.00	40.0	2
MISCSRCS	NA	40.00	NA	NA
BKG_&_FG	NA	15.00	NA	NA

TFEL Example3 (Continued)

This example shows the impact of all sources. It progressively deletes or scales the least important TFEL sources until meeting the 24-hour SO2 standard of 365 ug/m3.

Receptor 1
Impact = Impact of the most-important-to-least-important TFEL Sources + MISCSRCS + BKG_&_FG
Impact = TFELFS02 + TFELSV01 + TFELSV03 + TFELFS01 + TFELSV02 + MISCSRCS + BKG_&_FG
Impact = 200.0ug/m3 +30.00ug/m3 +75.00ug/m3 + 40.00ug/m3 +10.00ug/m3 +70.00ug/m3 + 15.00ug/m3=440 ug/m3
Impact = 200.0ug/m3 +30.00ug/m3 +75.00ug/m3 + 40.00ug/m3 + 0.00ug/m3 +70.00ug/m3 + 15.00ug/m3=430 ug/m3
Impact = 200.0ug/m3 +30.00ug/m3 +75.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 +70.00ug/m3 + 15.00ug/m3=390 ug/m3
Impact = 200.0ug/m3 +30.00ug/m3 +50.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 +70.00ug/m3 + 15.00ug/m3=365 ug/m3
TFEL = 5.00 #/hour + 1.00 #/hour + 2.00 #/hour = **8.00 #/hour** for receptor 1.

The fractional part of TFELSV03 is its fractional impact that meets the ambient standard (50 out of 75 ug/m3). Therefore, TFELSV03 must be restricted to 3.00 #/hour * (50/75) = 2.00 #/hour for receptor 1.

Receptor 2
Impact = Impact of the most-important-to-least-important TFEL Sources + MISCSRCS + BKG_&_FG
Impact = TFELSV03 + TFELFS02 + TFELSV02 + TFELSV01 + TFELFS01 + MISCSRCS + BKG_&_FG
Impact = 150.0ug/m3 +200.0ug/m3 +50.00ug/m3 + 20.00ug/m3 +40.00ug/m3 +60.00ug/m3 + 15.00ug/m3=535 ug/m3
Impact = 150.0ug/m3 +200.0ug/m3 +50.00ug/m3 + 20.00ug/m3 + 0.00ug/m3 +60.00ug/m3 + 15.00ug/m3=495 ug/m3
Impact = 150.0ug/m3 +200.0ug/m3 +50.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 +60.00ug/m3 + 15.00ug/m3=475 ug/m3
Impact = 150.0ug/m3 +200.0ug/m3 + 0.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 +60.00ug/m3 + 15.00ug/m3=425 ug/m3
Impact = 150.0ug/m3 +140.0ug/m3 + 0.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 +60.00ug/m3 + 15.00ug/m3=365 ug/m3
TFEL = 3.00 #/hour + 3.50 #/hour = **6.50 #/hour** for receptor 2.

The fractional part of TFELFS02 is its fractional impact that meets the ambient standard (140 out of 200 ug/m3). Therefore, TFELSV03 must be restricted to 5.00 #/hour * (140/200) = 3.50 #/hour for receptor 2.

Receptor 3
Impact = Impact of the most-important-to-least-important TFEL Sources + MISCSRCS + BKG_&_FG
Impact = TFELSV01 + TFELFS01 + TFELFS02 + TFELSV03 + TFELSV02 + MISCSRCS + BKG_&_FG
Impact = 60.00ug/m3 + 100.0ug/m3 +100.0ug/m3 +30.00ug/m3 +10.00ug/m3 +50.00ug/m3 + 15.00ug/m3=365 ug/m3
TFEL = 1.00 #/hour + 4.00 #/hour + 5.00 #/hour + 3.00 #/hour + 2.00 #/hour = **15.00 #/hour** for receptor 3.

Since this impact is at the 24-hour SO2 ambient standard, it reflects the entire facility for receptor 3.

Receptor 4
Impact = Impact of the most-important-to-least-important TFEL Sources + MISCSRCS + BKG_&_FG
Impact = TFELSV01 + TFELFS02 + TFELSV02 + TFELSV03 + TFELFS01 + MISCSRCS + BKG_&_FG
Impact = 100.0ug/m3 +200.0ug/m3 +50.00ug/m3 +60.00ug/m3 +40.00ug/m3 + 40.00ug/m3 + 15.00ug/m3=505 ug/m3
Impact = 100.0ug/m3 +200.0ug/m3 +50.00ug/m3 +60.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 + 15.00ug/m3=465 ug/m3
Impact = 100.0ug/m3 +200.0ug/m3 +50.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 + 15.00ug/m3=405 ug/m3
Impact = 100.0ug/m3 +200.0ug/m3 +10.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 + 0.00ug/m3 + 15.00ug/m3=365 ug/m3
TFEL = 1.00 #/hour + 5.00 #/hour + 0.40 #/hour = **6.40 #/hour** for receptor 4.

The fractional part of TFELSV02 is its fractional impact that meets the ambient standard (10 out of 50 ug/m3). Therefore, TFELSV03 must be restricted to 2.00 #/hour * (10/50) = 0.40 #/hour for receptor 4.

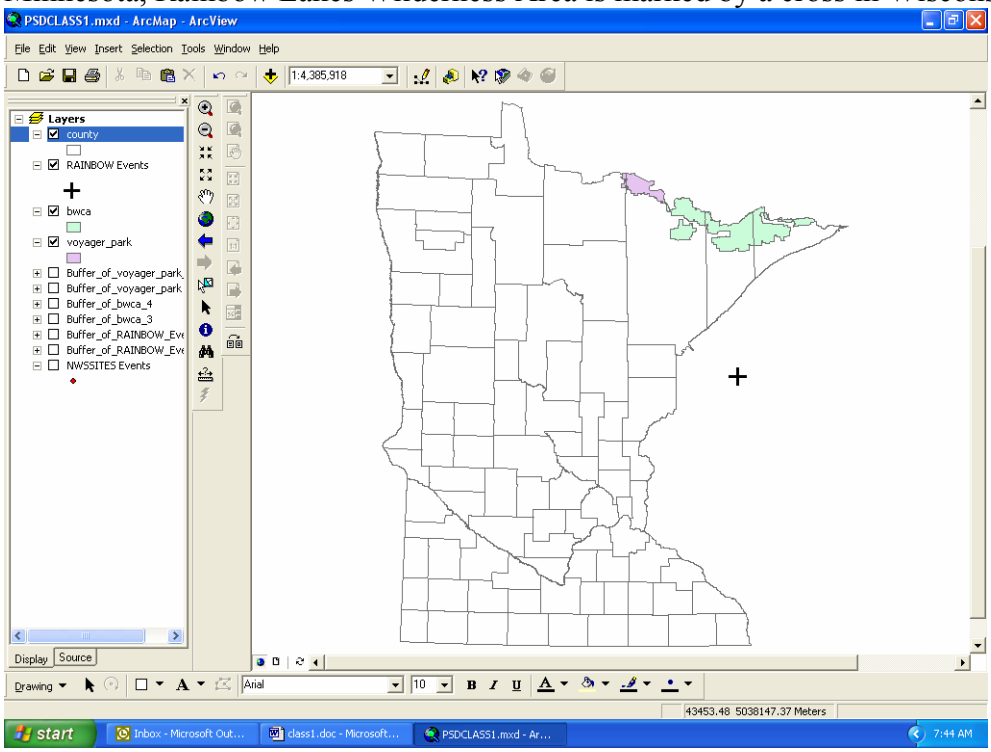
Resulting 24-Hour SO2 TFEL
The smallest TFEL at any receptor is 6.40 #/hour – see receptor 4.

Therefore, the resulting 24-Hour SO2 TFEL is 6.40 #/hour.

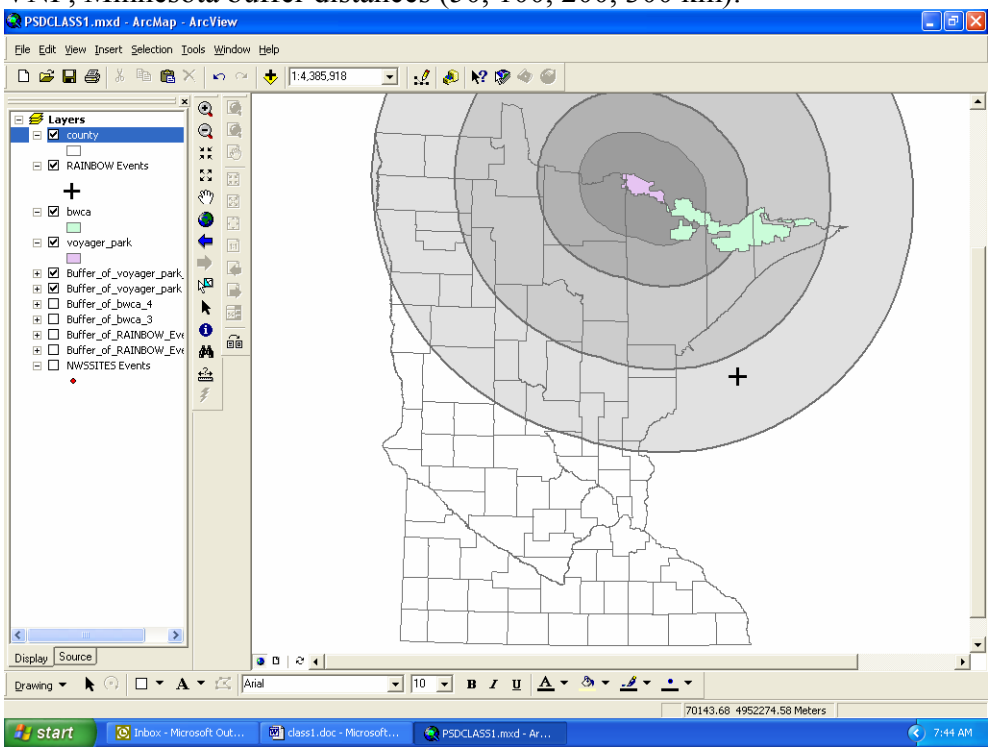
Adding any additional sources will exceed the 24-hour SO2 standard (with background and future growth).

Attachment D: PSD Class I Areas & Buffer Distances

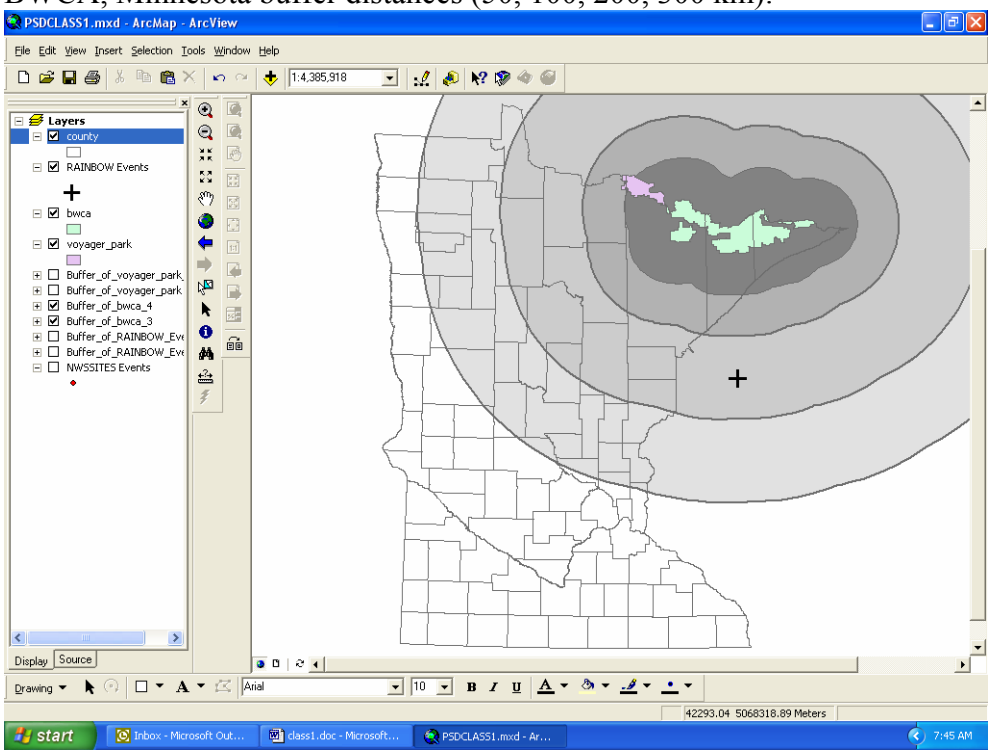
PSD Class I Areas (Voyageurs National Park and BWCA are shaded areas in northern Minnesota, Rainbow Lakes Wilderness Area is marked by a cross in Wisconsin):



VNP, Minnesota buffer distances (50, 100, 200, 300 km):



BWCA, Minnesota buffer distances (50, 100, 200, 300 km):



Rainbow Lakes, Wisconsin buffer distances (50, 100, 200, 300 km):