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Month 2011

Guidance for 1-Hour SO_2 NAAQS SIP Submissions

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Office of Air Quality Planning and Standards

U.S. Environmental Protection Agency
Research Triangle Park, North Carolina

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Preface

In the final primary National Ambient Air Quality Standard for Sulfur Dioxide (SO_2 NAAQS) rulemaking, published at 75 FR 35520 (June 22, 2010), EPA provided initial guidance in the preamble concerning the Clean Air Act (CAA) provisions that states and emissions sources would need to address when implementing the new 1-hour SO_2 NAAQS. We stated that we intended to develop and seek public comment on additional guidance on modeling and the development of state implementation plans (SIPs) to be submitted under sections 110 and 191 of the CAA. To this end, EPA is issuing the draft guidance contained in this document so that states and other interested parties may comment on our preliminary recommendations for how to meet the section 110(a)(1) requirement that all areas submit a SIP no later than June 3, 2013, and the section 191 requirement that all areas that are designated as nonattainment under the 1-hour SO_2 NAAQS submit a SIP providing for attainment of that standard. This draft guidance is not final agency action, and imposes no binding or enforceable requirements. We intend to re-issue this guidance, revised as appropriate, after receiving and considering the public comments that we receive on this preliminary draft.

In addition to this guidance document, EPA is also planning a rulemaking to address some of the 1-hour SO_2 NAAQS implementation program elements. These elements include: (1) establishing that compliance with the 1-hour SO_2 NAAQS is appropriately based on the results of both air quality modeling and monitoring; (2) establishing the modeling requirements necessary to determine compliance with the 1-hour SO_2 NAAQS; (3) establishing the minimum scope of analysis required to demonstrate attainment and maintenance of the 1-hour SO_2 NAAQS to comply with the SIP requirements in CAA section 110(a)(1); (4) establishing a reasonable time period for sources to comply with any new emissions limitations states need to

establish in the 110(a)(1) SIPs to demonstrate attainment and maintenance of the 1-hour SO_2 NAAQS; (5) to set an attainment date for areas designated as unclassifiable; and (6) establishing the criteria for redesignating areas from "unclassifiable" to "attainment." These elements are also addressed in this guidance document. EPA will consider any comments that we receive on these elements in this draft guidance as we develop the proposed rulemaking. EPA will re-issue the guidance as expeditiously as practicably following the public comment period so that states can use the guidance to begin developing their plans as soon as possible. EPA will also propose a rulemaking that would codify the hybrid modeling and monitoring implementation approach in order to ensure compliance with the 1-hour SO_2 NAAQS in a timely manner.

EPA developed the proposed hybrid modeling and monitoring approach to show compliance with the 1-hour SO_2 NAAQS due to the unique challenges presented by this pollutant. EPA does not believe that this implementation approach is necessarily transferable to other NAAQS pollutants. For NAAQS pollutants other than SO_2, air quality monitoring is more appropriate for determining whether all areas are attaining the NAAQS, and there is comparatively less dependence upon conducting refined air quality modeling. EPA recommends that states coordinate with their respective EPA Regional Offices during the SIP development process, as early and often as possible, in order to ensure that critical issues related to the implementation of this approach are resolved as expeditiously as practicable in order for the SIP to be submitted and approved in a timely manner.

I. Purpose

This guidance document discusses the CAA statutory requirements that states need to address when implementing the new 1-hour SO_2 NAAQS based on the structure outlined in the CAA and existing rules. It supplements existing guidance documents and regulations, and contains additional guidance on attainment modeling (Appendix A), and developing SIPs under sections 110(a)(1)-(2) and 191-192 of the CAA.[1] In this document, we also describe in more detail how and when we expect states to demonstrate attainment, implementation, maintenance, and enforcement of the new 1-hour SO_2 NAAQS.

II. Background

On June 2, 2010, the Administrator signed a notice establishing a new 1-hour primary SO_2 NAAQS of 75 parts per billion (ppb), which is attained when the 3 year average of the 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb.[2] EPA revised the primary SO_2 NAAQS to provide the requisite protection of public health with an adequate margin of safety, as required by CAA section 109(b).

We explained in the preamble to the final NAAQS rule that we anticipate that most areas will initially be designated under CAA section 107(d) as "unclassifiable" for the revised primary SO_2 NAAQS, meaning that they would not initially be subject to the nonattainment area SIP requirements of CAA sections 191-192. This is because we do not expect most states to have either monitoring data or appropriate modeling information sufficient to determine whether those areas are meeting or not meeting the 1-hour SO_2 NAAQS for initial designations recommendations due to EPA in June 2011. However, we anticipate that unclassifiable areas

[1] See also SO_2 Guideline Document, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, EPA-452/R-94-008, February 1994.
[2] EPA publicly disseminated the signed notice on June 3, 2010. The new 1-hour SO_2 NAAQS became effective on August 23, 2010.

will contain sources of SO_2 emissions that could potentially cause or contribute to a violation of the primary SO_2 NAAQS. In such cases, EPA believes that a post-designation implementation approach that relies on robust state implementation plans submitted in accordance with CAA sections 110(a)(1)[3] and (2)[4] is appropriate and necessary to ensure public health protection under the 1-hour NAAQS. These SIPs have sometimes been referred to respectively as "maintenance" and "infrastructure" SIPs. To be approved, EPA believes such plans should provide for attainment and maintenance of the new 1-hour SO_2 NAAQS as expeditiously as practicable. In the final NAAQS preamble we explained that we believe it is reasonable to expect any necessary emissions controls and limits to be in place and effective no later than five years after initial area designations (or by approximately August 2017), which is consistent with the timeframe that would otherwise apply to any area designated as nonattainment in 2012.

For the primary 1-hour SO_2 NAAQS, we anticipate that initial designations will be promulgated by June 2012, two years following promulgation of the NAAQS. In guidance issued on the 1-hour SO_2 NAAQS designations process we indicated that an area that has monitoring data or refined modeling results showing a violation of the NAAQS would be designated as "nonattainment"; an area that has an appropriate demonstration showing no violations would be designated as "attainment"; and all other areas with sources that have the potential to cause or contribute to a violation of the NAAQS, which may include areas with SO_2 monitors showing no violations but without refined modeling that shows no violations, would be designated as "unclassifiable." Areas with no SO_2 monitors would be designated as "unclassifiable" as well, absent any other appropriate data to support a designation of "attainment" or "nonattainment." We anticipate that most areas of the country will be designated

[3] CAA section 110(a)(1) directs states to submit, no later than three years following promulgation or revision of a primary NAAQS, SIPs that provides for "implementation, maintenance, and enforcement of" the NAAQS.
[4] CAA section 110(a)(2) lists the programmatic elements that each SIP must contain.

as "unclassifiable" due to a lack of both monitoring and refined modeling information, in advance of states conducting further refined modeling at the time of designation.[5]

Subpart 5, of Part D, of Title I of the CAA (sections 191 and 192) describes the requirements that apply to areas designated nonattainment. A substantial set of longstanding guidance has been issued and continues to reflect EPA recommendations for interpreting these requirements, most notably in the General Preamble published in the Federal Register on April 16, 1992 (see, e.g., 57 FR 13498, at 13545). The guidance below addresses additional statutory state planning and control requirements that apply regardless of designation, such as infrastructure SIP elements.

A. Roles of EPA and state governments

The CAA assigns important roles to EPA and state governments to achieve the NAAQS. States have the primary responsibility for developing and implementing SIPs that contain measures necessary to achieve the air quality standards in each area once EPA has established the NAAQS. EPA provides technical tools, assistance, and guidance to states and tribes, including information on the potential control measures that may help areas attain the standards. Under section 110 of the CAA, and related provisions, states are directed to submit, for EPA approval, SIPs that provide for the attainment, implementation, maintenance, and enforcement of such standards through control programs directed at sources of SO_2 emissions. (CAA sections 110(a), and 191-192). If a state does not adopt and implement approved SIPs by the time periods provided in the CAA, EPA has the responsibility to adopt a federal implementation plan (FIP) to ensure that areas attain the NAAQS in an expeditious manner.

[5] See guidance memorandum on designations entitled "Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standard, March 24, 2011."

States, in conjunction with EPA, also administer the prevention of significant deterioration (PSD) program for SO_2. (CAA sections 160-169). The primary feature of this program is a requirement that certain stationary sources of air pollutants obtain a permit ("PSD permit") before commencing construction. (CAA section 165(a)(1)). To obtain such a permit, one of the things that a permit applicant must show is that the proposed source will not cause or contribute to a violation of any NAAQS. (CAA section 165(a)(3); 40 CFR 52.21(k); 40 CFR 51.166(k)). Most states implement the PSD permitting program under state regulations approved by EPA as part of a SIP.

Federal rules supplement state emissions control measures and provide for nationwide or regional reductions in emissions of SO_2 and other air pollutants. Under Title II of the CAA there are rules that limit the sulfur content of the fuel used by automobiles, trucks, buses, motorcycles, non-road engines and equipment, marine vessels and locomotives. Emissions of SO_2 are also limited by new source performance standards (NSPS) for stationary sources under sections 111 and 129 of the CAA; and the national emission standards for hazardous air pollutants (NESHAP) for stationary sources under section 112 of the CAA (such reductions resulting due to control of hazardous air pollutants (HAP) such as hydrogen chloride (HCl) under those rules). Title IV of the CAA, sections 402-416, specifically provides for major reductions in SO_2 emissions from fossil-fuel fired power plants. EPA has also promulgated the Cross State Air Pollution Rule (CSAPR) to define additional SO_2 emission reductions needed in the eastern United States by 2012 and 2014 to eliminate significant contribution of upwind states to downwind states' nonattainment, or inability to maintain, the $PM_{2.5}$ NAAQS pursuant to CAA section 110(a)(2)(D).[6] States may rely on these federal measures in their SO_2 SIPs.

[6] The final Cross State Air Pollution Rule (CSAPR) was signed by the EPA Administrator on July 6, 2011, and was published at 76 FR 48208, August 8, 2011

B. How this guidance applies to tribes

CAA section 301(d) authorizes EPA to treat eligible Indian tribes in the same manner as states under the CAA and requires EPA to promulgate regulations specifying the provisions of the statute for which such treatment is appropriate. EPA has promulgated these regulations – known as the Tribal Authority Rule or TAR – at 40 CFR Part 49. (63 FR 7254, February 12, 1998). The TAR establishes the process for Indian tribes to seek treatment-as-a-state eligibility and sets forth the CAA functions for which such treatment will be available. Under the TAR, eligible tribes may seek approval for all CAA and regulatory purposes other than a small number of functions enumerated at section 49.4. Implementation plans under section 110 are included within the scope of CAA functions for which eligible tribes may obtain approval. Section 110(o) also specifically describes tribal roles in submitting implementation plans. Eligible Indian tribes may thus submit tribal implementation plans (TIPs) covering their reservations and other areas under their jurisdiction.

The CAA and the TAR do not, however, direct tribes to apply for treatment as a state or implement any CAA program. In promulgating the TAR, EPA explicitly determined that it was not appropriate to treat tribes similarly to states for purposes of, among other things, specific plan submittal and implementation deadlines for NAAQS-related requirements. (40 CFR § 49.4(a)). In addition, where tribes do seek approval of CAA programs, including section 110 implementation plans, the TAR provides flexibility and allows them to submit partial program elements, so long as such elements are reasonably severable – *i.e.*, "not integrally related to program elements that are not included in the plan submittal, and are consistent with applicable statutory and regulatory requirements." (40 CFR § 49.7).

To date, very few tribes have sought treatment as a state for purposes of section 110 implementation plans. In the event that a tribe is unable to develop a plan that addresses the implementation of the 1-hour SO_2 NAAQS, the Administrator, pursuant to the discretionary authority explicitly granted to the Administrator under sections 301(a) and 301(d)(4) of the CAA, has the authority to promulgate a FIP to protect air quality. Consistent with the provisions of sections 304(a) and 301(d)(4), if a tribe does not submit a TIP meeting the completeness criteria of 40 CFR part 51, appendix V, or does not receive EPA approval of a submitted TIP, EPA has authority to develop a FIP to protect air quality in the affected area. (40 CFR 49.11(a)). In addition, upon request from a tribe that has undertaken the responsibility for developing a TIP to address the requirements to implement the 1-hour SO_2 NAAQS, EPA will provide assistance as necessary to complete the development of the plan.

III. Schedule for Implementation of the 1-hour SO_2 NAAQS

The timeline below shows the expected steps from promulgation of the new NAAQS through attainment, assuming timely action at each step and assuming that initial area designations are effective in August 2012:

Date	Action
June 2010	EPA issues 1-hour SO_2 NAAQS. This action starts the 2-year clock for CAA section 107 initial area designations and the 3-year clock for CAA section 110(a)(1)-(2) SIP submissions.
August 2010	Effective date of 1-hour SO_2 NAAQS. Under the PSD program, EPA and states that issue PSD permits under delegated federal authority begin requiring a demonstration in the permitting record that the proposed source will not cause or contribute to a violation of the 1-hour SO_2 NAAQS. States that issue PSD permits under a SIP-approved state program should also require such a demonstration for permits issued on or after August 23, 2010 to ensure that sources commencing construction in such states have permits that conform to the requirements of CAA section 165(a)(3).
June 2011	States submit initial area designations recommendations, based on available monitoring data and any refined modeling they choose to perform for designations purposes.
June 2012	EPA issues final initial area designations. Monitored or modeled violations would result in a designation of "nonattainment." Areas would be designated "attainment" if they submit appropriate modeling data (where needed) showing evidence of no violations and if all available monitoring data indicate attainment for the affected area. Generally, all other cases would be initially designated "unclassifiable."
June 2013	All states submit CAA section 110(a)(1)-(2) SIPs. SIPs address PSD and infrastructure requirements, and provide for implementation and maintenance of the 1-hr NAAQS in all areas throughout the state, particularly in areas initially designated unclassifiable and attainment. SIPs for unclassifiable areas would rely on refined modeling and any monitoring that demonstrates attainment and maintenance of the new SO_2 NAAQS as expeditiously as practicable, which EPA anticipates should be no later than the attainment deadline for areas initially designated nonattainment. SIPs should contain any additional federally enforceable control measures necessary to ensure maintenance of the NAAQS. Attainment demonstration SIPs for nonattainment areas have a separate deadline.
February 2014	Assuming designations are effective in August 2012, states submit SIPs for nonattainment areas consistent with CAA section 191-192 that demonstrate attainment as expeditiously as practicable and no later than 5 years from the effective date of designations (August 2017).
June-December 2014	EPA approves or disapproves timely submitted (by June 2013) and complete CAA section 110(a)(1)-(2) SIPs. EPA's action would be based on adequacy of the states' modeling demonstrations (and any obtained monitoring) showing attainment as expeditiously as practicable and continued maintenance of the NAAQS. Demonstrations can take into account SO_2 reductions from national and regional standards that require compliance by the attainment date. EPA would also have discretion to re-

Date	Action
	designate attainment and unclassifiable areas if SIPs are inadequate, as well as propose FIPs.
February-August 2015	EPA approves or disapproves timely submitted (by February 2014) and complete CAA section 191-192 attainment SIPs for areas initially designated nonattainment, with similar remedies as discussed above if SIPs are deficient.
June 2016	CAA section 110(c) deadline by which EPA must issue a final FIP for any area whose section 110(a)(1) SIP is disapproved in June 2014.
February 2017	CAA section 110(c) deadline by which EPA must issue a FIP for a nonattainment area whose section 192 SIP is disapproved in February 2015.
August 2017	If designations are effective in August 2012, CAA section 192 would require nonattainment areas to attain the 1-hour SO_2 NAAQS as expeditiously as practicable, but no later than August 2017. Depending on installation dates and impact of other regulations on SO_2, as discussed below, many areas will likely attain earlier than August 2017. EPA expects unclassifiable areas to attain on a similar schedule as nonattainment areas.

IV. Section 110(a)(1) and (2) NAAQS maintenance/infrastructure elements

CAA section 110(a)(1) specifies that states are to develop plans to implement, maintain, and enforce the new SO_2 NAAQS. For areas designated nonattainment, states will follow the more common and familiar attainment planning and emissions control requirements of CAA part D, section 172 and 191-192. For all other areas, states are expected to follow the more general requirements of CAA section 110(a). In the context of the 1-hour SO_2 NAAQS, EPA believes this means states are expected to develop and submit SIPs showing that all areas of the state will attain and maintain the 1-hour SO_2 NAAQS. This should be accomplished by evaluating whether significant sources of SO_2 emissions, either individually or in combination with other nearby sources, cause or contribute to violations of the 1-hour SO_2 NAAQS. Where sources of SO_2 are determined to cause or contribute to NAAQS violations, states should include in the

110(a)(1) SIPs sufficient permanent and enforceable control measures to ensure the NAAQS is attained and maintained as expeditiously as practicable.

For the short-term 1-hour SO_2 standard, EPA believes it is more accurate and efficient to use modeling to assess medium to larger sources and to rely on monitoring for groups of smaller sources and sources that may not be as conducive to modeling. We expect that states would focus performance of attainment demonstration modeling on areas with larger sources (e.g., those sources emitting over 100 tons per year (tpy) of SO_2), and any other sources that we anticipate to cause or contribute to a violation to determine compliance with the new SO_2 NAAQS[7].

Almost all SO_2 in the United States is emitted by stationary sources. EPA has promulgated requirements for low sulfur motor fuels that have substantially reduced on-road vehicle contributions to ambient SO_2 concentrations, such that on-road contributions may generally be addressed merely as part of the unmodeled background concentrations included in modeling analyses. Further restrictions will reduce other mobile source emissions (such as from ships and locomotives) in the next few years. Thus, only in exceptional cases would modeling of mobile source emissions be necessary.

A. Section 110(a)(1)-(2) SIP submission

The CAA establishes a 3-year deadline after revision of a NAAQS for states to submit SIPs under sections 110(a)(1) and (2) to EPA. Additionally, nonattainment area SIPs are due within 18 months from the effective date of the designation, under section 191 of the CAA. EPA anticipates that designations should be issued by June 2012 and take effect by August 2012.

[7] In cases where large sources of SO_2 emissions are located on the borders of other states, EPA suggests that these states coordinate with each other during the development of the SIP submittals for the affected areas.

Therefore, the nonattainment area SIP submission deadline is anticipated to be by no later than February 2014.

Section 192 requires nonattainment areas to achieve the 1-hour SO_2 NAAQS as expeditiously as practicable, but no later than 5 years after designation, which EPA expects to be by no later than August 2017. Section 110(a)(1), unlike section 192, does not specify a deadline by which states are required to show when they have met the requirements to implement, maintain, and enforce a NAAQS. However, EPA believes it is generally reasonable for attainment to be achievable in unclassifiable areas within the same five year timeframe as is mandated for nonattainment areas. In many cases, federally promulgated regulations, including the CSAPR for the eastern United States, and nationally applicable regulations mandating maximum achievable control technology (MACT), may result in attainment sooner than the five year timeframe. These regulations are expected to reduce emissions from certain source categories emitting large amounts of SO_2, such as Electric Generating Units (EGUs), industrial boilers, and solid waste incinerators.

In order to demonstrate attainment and maintenance, SIPs for unclassifiable areas, just as for nonattainment areas, should include enforceable emissions limitations, timetables for compliance, appropriate testing/reporting to assure compliance, and include air quality modeling for SO_2 sources showing that the SIP-adopted emissions limits are consistent with attainment of the 1-hour NAAQS. EPA believes it is reasonable to expect states to demonstrate, at a minimum, that major SO_2 sources ($\geq$ 100 tpy) are not causing or contributing to violations of the 1-hour SO_2 NAAQS.

Several recently promulgated and forthcoming national and regional rules will likely result in significant reductions in SO_2 emissions over the next several years. A limited

qualitative assessment based on the results of preliminary modeling of sample facilities indicates that effective SO_2 source control, such as the installation of SO_2 scrubbers, should generally suffice for areas to meet the 1-hour SO_2 NAAQS (see Brode 2010b). Exceptions could include unique sources with specific characteristics that contribute to higher ambient impacts (short stack heights, complex terrain, etc.). These national and regional rules are anticipated to lead to SO_2 reductions that will help achieve compliance with the new SO_2 NAAQS prior to August 2017. If, upon EPA review of SIP submittals that rely upon those reductions or other local control measures, it appears that states will nevertheless fail to attain or maintain the NAAQS, the CAA provides authorities for EPA to address these situations, including, as appropriate, disapproving SIP submittals, re-designating areas to nonattainment, issuing SIP calls, and promulgating FIPs. EPA will make decisions concerning what actions should be taken on SIP submittals on a case-by-case basis. EPA will also continue to work with states during the SIP development process in order to address SIP deficiencies and to ensure that SIPs are approved in a timely manner.

EPA expects that most areas of the country will be designated as unclassifiable for the 1-hour SO_2 NAAQS, due to a lack of both monitoring and refined modeling data concerning the attainment status of areas, in advance of states conducting further refined modeling at the time of designations. Areas that have both monitoring data and appropriate modeling results showing no violations would be designated as "attainment." For areas designated as attainment, we expect that section 110(a)(1) SIPs only need to ensure any applicable SO_2 emissions limits are permanent and enforceable, and address the "infrastructure" requirements set forth in section 110(a)(2). In such areas EPA expects that the PSD program required by section 110(a)(2)(C) will regulate future growth and should provide for continued maintenance of the standard.

B. Section 110(a)(1) SIPs

Section 110(a)(1) of the CAA directs each state, after reasonable notice and opportunity for public comment, to adopt and submit to EPA, within 3 years after promulgation, a SIP which provides for the implementation, maintenance, and enforcement of any new or revised NAAQS throughout the state. These plans should ensure timely attainment of the SO_2 NAAQS on a schedule that is as expeditious as would be required if an area had been designated nonattainment (i.e., no later than five years). The section 110(a)(1) SIP should also contain the following elements: (1) an attainment emissions inventory; (2) a control strategy, as appropriate; (3) a maintenance demonstration using an EPA-approved air quality dispersion model, as appropriate; (4) a contingency plan; and (5) a plan for verification of continued attainment of the standard. These elements are discussed in detail below.

1. Attainment emissions inventory

The state should develop an accurate attainment inventory to identify the level of emissions in the area sufficient to attain the 1-hour SO_2 NAAQS. This inventory should be consistent with EPA's most recent guidance on emissions inventories currently available, and should include the emissions for the time period associated with the modeling and monitoring data showing attainment. Major source size thresholds for SO_2 are currently listed as 100 tpy. However, in cases where sources, individually or collectively, that are below this level may potentially cause or contribute to a violation of the standard, these sources should also be included in the emissions inventory for the affected area. Future SO_2 emissions projections in the attainment emissions inventory can account for modeled controlled maximum allowable emissions levels associated with a sources' compliance with enforceable national, regional, or local rules that will occur by the SO_2 NAAQS compliance date.

2. Maintenance demonstration

In general, EPA does not believe that air quality monitoring alone is sufficient to demonstrate attainment and maintenance with the 1-hour SO_2 NAAQS. EPA does not generally expect that monitoring data alone will fully characterize short-term ambient concentrations around major stationary sources of SO_2, and as a result may not capture the maximum SO_2 impacts. For SO_2, the state could generally demonstrate attainment and maintenance of the NAAQS by using refined dispersion modeling (see Appendix W to 40 CFR Part 51) to show that the current or future mix of sources and enforceable emission rates in an identified area will not lead to a violation of the 1-hour SO_2 NAAQS.

In counties that do not have large sources, or any sources, of SO_2, refined modeling specific to those counties may not be needed to show that the county or portions of the county are in attainment of the NAAQS. Appendix C contains guidance for states on making a non-modeling technical attainment demonstration for areas meeting these criteria.

a. Refined dispersion modeling

With representative and appropriate meteorological and other input data, refined dispersion models are able to characterize air quality impacts from the modeled SO_2 sources across the domain of interest on an hourly basis with a high degree of spatial resolution, overcoming the limitations of an approach based solely on monitoring. By simulating plume dispersion on an hourly basis across a grid of receptor locations, dispersion models are able to estimate the detailed spatial gradients of ambient concentrations resulting from SO_2 emission sources across a full range of meteorological and source operating conditions. To capture such results on a monitor would normally require a prohibitively expensive air quality monitoring network. Further, as we have observed in prior actions (see., e.g., 43 FR 45993, 45997, 46000-

03 (October 5, 1978)), monitoring data would not be adequate to demonstrate attainment if sources are using stacks with heights that are greater than good engineering practice (GEP), or other prohibited dispersion techniques, since in those cases monitoring would implicitly reflect credit for such practices in contravention of section 123 of the CAA and our regulations at 40 CFR sections 51.100 and 51.118.

Refined dispersion modeling for the section 110(a)(1) SIP should follow EPA's *Guideline on Air Quality Models*, Appendix W to 40 CFR Part 51, which provides recommendations on modeling techniques and guidance for estimating pollutant concentrations in order to assess control strategies and determine emission limits. These recommendations were originally published in April 1978 and were incorporated by reference in the PSD regulations at 40 CFR sections 51.166 and 52.21 in June 1978 (43 FR 26382-26388). The purpose of Appendix W is to promote consistency in the use of modeling within the air quality management process. Appendix W is periodically revised to ensure that new model developments or expanded regulatory requirements are incorporated. The most recent revision to Appendix W was published on November 9, 2005 (70 FR 68218), wherein EPA adopted the American Meteorological Society (AMS) and Environmental Protection Agency (EPA) Regulatory Model (AERMOD) as the preferred dispersion model for a wide range of regulatory applications in all types of terrain. To support the promulgation of AERMOD as the preferred model, EPA evaluated the performance of the model across a total of 17 field study data bases (Perry, et al., 2005; EPA, 2003), including several field studies based on model-to-monitor comparisons of SO_2 concentrations from operating power plants. AERMOD is a steady-state plume dispersion model that employs hourly sequential preprocessed meteorological data to simulate transport and dispersion from multiple point, area, or volume sources for averaging times from one hour to

multiple years, based on an advanced characterization of the atmospheric boundary layer. AERMOD also accounts for building wake effects (i.e., downwash) on plume dispersion.

Appendix A contains modeling guidance supplemental to that provided in the preamble to the final rulemaking promulgating the 1-hour SO_2 NAAQS. It clarifies our recommendations on how to conduct refined dispersion modeling under Appendix W to support the implementation of the new 1-hour SO_2 NAAQS. Although AERMOD is identified as the preferred model under Appendix W for a wide range of applications and would be appropriate for most modeling applications to support the 1-hour SO_2 NAAQS, Appendix W allows flexibility to consider the use of alternative models on a case-by-case basis when an adequate demonstration can be made that the alternative model performs better than, or is more appropriate than, the preferred model for a particular application.

b. Source emissions threshold levels for the maintenance demonstrations

In most cases, we expect that the clearest way to determine whether an SO_2 source has the potential to emit (PTE) at levels that could cause or contribute to a violation of the 1-hour SO_2 NAAQS would be to conduct refined air quality dispersion modeling for the source in question in combination with any nearby sources. Based on data in EPA's 2008 National Emissions Inventory (NEI), there are over 33,000 SO_2 point sources in the United States. It is unlikely that every one of these sources has the potential to emit at levels that would violate or contribute to violations of the 1-hour SO_2 NAAQS. Several factors other than a source's emissions help determine its impact on ground level SO_2 concentrations. These factors include the influence of stack parameters (stack height, stack exit temperature, stack exit velocity, stack diameter), complex terrain (i.e., where receptor elevation is above the source elevation), building downwash, proximity of stacks to ambient air, as well as the urban or rural classification of the

area around the source. The discussion that follows suggests some ways in which states and sources might consider managing the overall burden of assessing whether SO_2 source emissions will adversely impact public health.

EPA recognizes the resource burden potentially involved in conducting refined air quality modeling for every source of SO_2 emissions. As one example, states might focus their limited modeling resources on the largest sources of SO_2, such as those sources that are emitting at least 100 tpy, in recognition that these sources emit nearly all the emissions of SO_2 (just over 99% of all SO_2 emissions in 2005 from point sources in the country). States might also focus on those sources located in areas where there is the highest potential for citizen exposure to elevated ambient SO_2 levels. Therefore, EPA is seeking comments and recommendations on reasonable approaches to determining which sources should be modeled.

EPA examined the 2005 NEI for purposes of judging how much of the inventory would be categorized as higher versus lower priority in such an approach. This inventory is based on actual emissions, which may not accurately reflect the distribution of sources on an allowable emissions basis, but EPA used this inventory because a comparable data base of allowable emissions is not available. The 2005 NEI identifies over 33,000 sources in the United States that emit SO_2. Of these sources, about 1928 sources are estimated to have actual emissions above 100 tpy. Furthermore, as noted above, the larger sources emit a preponderance of the SO_2 emissions. Accordingly, we expect these sources also represent a substantial share of the areas with potential to violate the SO_2 NAAQS. Thus, EPA believes that focusing limited resources on sources with emissions in excess of 100 tpy can address the areas of greatest concern with only a fraction of the workload that would be needed to address all sources that emit SO_2.

Given the influence of stack parameters and other factors on the concentrations that result from a given quantity of emissions, EPA recognizes that an approach that only considers sources emitting more than a specified emissions threshold may in some cases overlook sources that have lower emissions but nevertheless have the potential to cause or contribute substantially to violations of the standard. EPA also recognizes that EPA and the states have substantial experience with modeling SO_2 concentrations, and so EPA and the states have substantial experience in judging the kinds of circumstances that might be expected to have relatively high SO_2 concentrations. This suggests the possibility of hybrid approaches in which the state addresses all sources emitting more than a given threshold, and in addition addresses sources that by reasonable judgment might be expected to contribute to ambient SO_2 concentrations above the NAAQS. An example of this approach would be for a state to model all sources with emissions of at least 100 tpy as well as all smaller sources that are judged to be in circumstances that might create high ambient SO_2 concentrations, such as low stack heights, building downwash, complex terrain, or clustering of multiple sources. States may wish to also place priority on conducting additional analyses in areas where significant population exposure to elevated ambient SO_2 may be occurring.

An approvable CAA section 110(a)(1) SIP would need to appropriately and accurately assess the degree that sources throughout the state cause or contribute to violations of the SO_2 NAAQS, but it might not be necessary for states to address all sources of SO_2 in an area in order to demonstrate attainment and maintenance of the NAAQS. However, any source that is modeled at less than its PTE for purposes of demonstrating attainment of the standard should receive a SIP enforceable emission or operating permit limit that is consistent with the modeled levels. These decisions, of course, should be made by the state on a case-by-case basis depending

on the attainment needs of the affected area(s). We are seeking input on approaches such as those discussed above for states to identify appropriate threshold levels, as well as any other emissions-related parameters, or guiding principles, that may help states and EPA better focus on the sources of SO_2 most likely to cause or contribute to a violation of the new 1-hour SO_2 NAAQS and impact the most populated areas. For example, we welcome any supportable information on the configurations and operating characteristics for typical SO_2 sources that might be most likely to cause a violation (e.g., uncontrolled coal-fired power plants greater than 250MW with stack height less than 50 feet). Conversely, we would also appreciate supportable information on the configurations and operating characteristics for SO_2 sources that are not likely to cause a violation.

3. Control strategy

The SIP should reasonably attribute the expected improvement in the air quality for the affected area to SO_2 emission reductions resulting from controls that are permanent and enforceable.[8] If no emissions reductions are needed to ensure attainment and maintenance of the 1-hour SO_2 NAAQS, the SIP should indicate the mechanisms that the state will use to ensure the area remains in attainment. Attainment resulting from temporary reductions in emission rates (i.e., reduced production or shutdown due to temporary adverse economic conditions) or unusually favorable meteorological conditions would not qualify as an air quality improvement due to permanent and enforceable emissions reductions. In making the showing that the improvement in air quality (or already acceptable air quality) is due to permanent and

[8] This is consistent with EPA's existing policy on redesignations as stated in a memorandum titled "Section 107 designations policy Summary." (April 21, 1983). This memorandum indicates that in order for an area to be redesignated to attainment, the state should show that "actual enforceable emission reductions are responsible for the recent air quality improvement." We expect to apply the principles of this guidance to the section 110(a)(1) SIP submittals.

enforceable measures, the state should estimate the percent emission reductions achieved from national, regional, and local control measures.

The EPA expects that in order to meet the implementation, maintenance and enforcement plan goals of section 110(a)(1) for the 1-hour SO_2 NAAQS, states should consider all control measures that are reasonable to implement in light of the attainment and maintenance needs for the affected area(s). Where additional controls are necessary to attain it would be appropriate for the level of controls in these areas to be similar to that required in areas that are designated as nonattainment, to provide for the attainment and maintenance of the 1-hour SO_2 NAAQS as expeditiously as practicable. EPA expects that expeditious attainment in these areas will in many cases occur when national and regional control measures are implemented, and will be within 5 years of the effective date of designation of an area. This approach would allow states to take into consideration emission reductions that we expect to be achieved from the implementation of future controls from national and regional control measures well before 2017, as well as any needed local control measures. It would also help to reduce the risk of such areas failing to meet the NAAQS as expeditiously as nonattainment areas are expected to meet the standard**.**

a. National measures under development that are expected to help reduce SO_2 emissions

Several recent and upcoming EPA regulations have the potential to significantly reduce SO_2 emissions in the United States. The first of these regulations is the CSAPR which contains federally-imposed restrictions on SO_2 and NOx emissions from electricity generation units (EGUs) in 28 states in the eastern United States (76 FR 48208, August 8, 2011). This rule does not specify plant-specific emission limits. Instead, this rule establishes caps on total emissions from the set of affected facilities in each state, and provides for issuance of a number of

emissions allowances in each state corresponding to the applicable caps. It allows trading of allowances, so that each source may have more or less emissions so long as the source emits no more than the number of allowances it holds either through issuance or through purchase. Thus, the rule does not require that a specific degree of emissions control will be achieved at any particular facility. Nevertheless, the emission caps are such that the rule will result in substantial additional control of SO_2 and NOx emissions. This control is mandated by 2012 and 2014 (representing start dates for two stages of caps under CSAPR), which is well within expected attainment timeframes for the 1-hour SO_2 NAAQS. EPA expects these controls generally to suffice for achieving attainment. Therefore, for such facilities, negotiation and establishment of suitable emission limits will be far simpler than would be the case if the state and the company had to negotiate whether control equipment was necessary. Furthermore, the state has the option to negotiate with its sources to pursue a distribution of controls under CSAPR that optimizes the achievement of attainment of the SO_2 standard. For example, the state has the option under CSAPR to revise the allocation of allowances to mirror the distribution of emissions that best serves the purpose of attaining the SO_2 standard[9].

A second regulation that EPA is preparing would mandate maximum achievable control technology (MACT) at EGUs and is known as the Mercury and Air Toxics Standards (MATS). This regulation will be designed to address hazardous air pollutants (HAP) pursuant to section 112 of the CAA. HAPs listed under section 112(b) that are emitted by EGUs include mercury, hydrochloric acid (HCl), hydrogen fluoride (HF), dioxin, and various metals. SO_2 is a criteria

[9] In general, cap and trade programs require emission reductions from among a set of sources but do not require controls at particular sources. SO_2 concentrations are generally sensitive to emissions from individual nearby plants and less sensitive to region-wide restrictions common to trading programs. Therefore, to demonstrate attainment, it may be necessary to establish plant-specific SO_2 limits irrespective of any emission reductions that the facility may be implementing to address trading program requirements. For such demonstrations the allowable emissions should reflect the specific limits given in an enforceable document (e.g. a rule or permit).

pollutant and is not a HAP listed under CAA section 112(b). Nevertheless, for facilities that comply with this regulation by installing exhaust gas scrubbing equipment in order to control HCl and acid gas emissions, EPA expects such add-on controls to also reduce emissions of SO_2 substantially. EPA proposed this rule on May 3, 2011 (76 FR 24976). EPA is on a court ordered time line to finalize this rule by November 2011. EPA anticipates that the implementation of this rule will be completed no later than February of 2015.

A third regulation, published on March 21, 2011 (76 FR 15608), is known as the Industrial Boilers MACT. This rule establishes limits for mercury, dioxin, HCl, and assorted metals for industrial boilers. This rule does not establish limits on emissions of the non-HAP SO_2, but EPA expects this rule to result in widespread installation of exhaust gas scrubbing equipment that would reduce SO_2 emissions substantially. EPA has published a notice deferring compliance dates under this rule, and the rule is undergoing further review by EPA, but the following discussion of the possible impact of the Industrial Boilers MACT reflects impacts that could result from the rule as published on March 21, 2011.

b. SO_2 limits for sources using control measures to meet the Cross-state Air Pollution Rule and MACT rules

EPA envisions that control measures that sources use to comply with requirements of these federal rules will facilitate attainment and maintenance of the 1-hour SO_2 NAAQS, but states would need to ensure that the covered sources have, as appropriate, federally-enforceable 1-hour SO_2 emissions limits. As noted above, the CSAPR may result in many sources installing add-on controls or using other control measures, but the specific prospective impact of these rules at specific locations is uncertain. For SO_2 controls to be creditable for SO_2 NAAQS planning purposes, they need to apply to the source as enforceable 1-hour SO_2 emission limits on the specific source. The controls and associated 1-hour SO_2 emissions limits would need to

become permanent and enforceable under the SIP, even if they might not be required to be so under the CSAPR.

Unlike the CSAPR, the MACT rules would impose specific requirements, including HAP emissions limitations, for facilities in the subject source categories. While MACT standards generally do not specify the type of control measure or technology a source must use to meet an emission standard, they are based upon the HAP emissions performance that is achieved by an average of the best performing sources in the subject source category. Each facility that is subject to these rules would be subject to HAP emission limits that in many cases may necessitate installation of control equipment or the use of other control measures to substantially reduce SO_2 emissions. However, as promulgated, the Industrial Boilers MACT does not set specific limits on emissions of SO_2. Therefore, to rely upon SO_2 reductions resulting from this rule to assure attainment and maintenance of the 1-hour SO_2 NAAQS, states would need to also establish 1-hour SO_2 emission limits to assure that any control measures used to comply with MACT requirements are designed and/or operated to provide the necessary control of SO_2 emissions as well. If the MATS Rule is promulgated similarly, i.e., it sets emission limits for HAPs but does not set specific 1-hour SO_2 emission limits, then states would need to set 1-hour SO_2 emission limits for these facilities as well, to the extent such limits are needed to assure attainment and maintenance of the 1-hour SO_2 NAAQS.

c. What SO_2 control levels does EPA expect sources will achieve under the CSAPR and the MACT rules?

Source-specific factors can significantly influence the SO_2 emissions of facilities subject to the CSAPR and pertinent MACT rules. When a facility opts to comply with the CSAPR by installing SO_2 control equipment, the company may choose among various levels of SO_2 control efficiency, taking into account the number of SO_2 allowances it holds or plans to hold. Flue gas

desulfurization systems that have been installed under other emissions trading programs, such as the Acid Rain Program and the Clean Air Interstate Rule (CAIR), have commonly achieved between 90 and 98 percent control efficiency. Similarly, controls for HAPs may achieve varying degrees of efficiency. For example, facilities that install flue gas scrubbing equipment to comply with HCl emission limits in a MACT regulation may have varying fuel chlorine content, leading to varying degrees of control needed to meet HCl limits, and may use varying degrees of reagent for SO_2 removal. Controlled SO_2 emissions are also a function of the fuel sulfur content and various other factors. Dry sorbent injection is another control option, achieving SO_2 control efficiencies from 30 to 60 percent or higher. However, the actual post-control emission level that can be achieved at a particular facility is a function of several site-specific factors. The SIP to address the 1-hour SO_2 emission limits for specific facilities would need to reflect source-specific factors influencing control efficiency as well as the attainment and maintenance needs of the area.

4. Contingency Plan

Establishing contingency measures for the 1-hour SO_2 NAAQS may involve different considerations than for some other criteria pollutants. The analytical tools for quantifying the relationship between SO_2 reductions and resulting air quality improvements produce relatively certain results compared to the tools for other pollutants. Also, controls for SO_2 are generally well understood and are far less prone to compliance rate and control efficiency uncertainty relative to control plans for regional pollutants like ozone and fine particulate matter, since the latter typically involve many control assumptions for many small sources. Since SO_2 control measures are based on what is directly and quantifiably necessary to attain the SO_2 NAAQS, we expect that it would be unlikely for an area to implement the necessary and appropriate emission

controls yet fail to attain and maintain the NAAQS. Thus if a state provides a modeling analysis showing that compliance with specific SO_2 emission limits provides for attainment, if the pertinent source(s) continues to meet the limits, and there are no significant future changes to the area's inventory of allowable emissions or background concentrations, there would generally be no cause for implementing contingency measures. Therefore, EPA believes it would be appropriate, specifically for SO_2 programs, for states to adopt for contingency measure purposes a comprehensive program to identify sources of violations related to the SO_2 NAAQS and to undertake an aggressive follow-up for compliance and enforcement, including expedited procedures for establishing enforceable consent agreements with affected sources pending the adoption of any needed revised SIP for the area in question.

This approach to contingency measures for the SO_2 NAAQS would not, however, preclude a state from requiring additional contingency measures that are enforceable and appropriate for a particular source or source category. As stated previously, a contingency measure for an SO_2 SIP might be a consent agreement requiring a source to reduce emissions further in the event that certain contingency provisions are triggered. Alternatively, the source might adopt a contingency measure such as switching to low sulfur coal or reducing load until more permanent measures can be put into place to address emissions interfering with maintenance of the NAAQS. In either case, the contingency measures identified in the SIP should be implemented as expeditiously as practicable following the determination that the affected area is failing to attain or maintain the standard.

5. Verification of continued attainment

States should provide an indication of how they will track the progress of the section 110(a)(1) plan. In most cases, tracking compliance with applicable emission limits, along with

tracking whether background concentrations are changing, should suffice for verifying continued attainment. We expect that a need for more thorough tracking of emissions and air quality would arise mainly in areas with multiple area sources, areas with sources for which emissions are difficult to track, and areas where the success of the attainment plan may be particularly uncertain.

C. Redesignation to attainment for areas designated as unclassifiable

The CAA does not clearly specify the conditions for redesignating an area from "unclassifiable" to "attainment." CAA section 107(d)(3)(E) only addresses conditions for redesignating areas from "nonattainment" to "attainment." Nonetheless, EPA believes that for the 1-hour SO_2 NAAQS the criteria closely derived from section 107(d)(3)(E) would be appropriate. Accordingly, for an area initially designated as "unclassifiable" to be redesignated as attainment, EPA expects to apply the following criteria to meet the principles of CAA section 107(d)(3): (1) EPA has determined that the area is attaining the NAAQS; (2) the area has a fully approved section 110(a)(1) SIP; (3) EPA has determined that the attainment-level air quality in the affected area is attributable to any necessary permanent and enforceable emissions measures; (4) the area has met all of the requirements of section 110 of the CAA; and (5) the state has verified implementation of the approved 110(a)(1) SIP control measures. The following subsections provide additional details on the anticipated criteria for redesignation to attainment.

a. Attainment of the NAAQS

EPA would consider redesignating areas from unclassifiable to attainment if all relevant information indicates that the area is attaining the 1-hour SO_2 NAAQS. There are two components involved in making this demonstration that should be considered interdependently. The first component is monitoring data, in situations where there is one or more SO_2 air quality

monitors located within the affected area. Monitoring data indicate attainment of the NAAQS if the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb. The second component is modeling data. Since modeling is generally an essential means of addressing whether existing emissions limits suffice to provide for attainment at all ambient locations around sources, states may in most cases address this component by attesting that the relevant sources of SO_2 in the area are in compliance with limits that have been shown by suitable modeling to provide for attainment. The justification for redesignation from unclassifiable to attainment would need to include modeling information except where modeling is shown to be inappropriate (if, for example, sources are poorly characterized) or unnecessary (if an unclassifiable area is found to have only *de minimis* emissions). In most cases, EPA expects the modeling submitted as a part of the attainment demonstration for the plan would suffice to address this requirement.

b. Approved 110(a)(1) SIP meeting the requirements of section 110(k) of the CAA

The 110(a)(1) SIP for the area should be fully approved under section 110(k) of the CAA and satisfy all of the requirements that apply to the affected area. An area could not be redesignated to attainment if a required element of the plan is the subject of a disapproval action, a finding of failure to submit or to implement the SIP, a partial approval, a conditional approval, or a limited approval.

c. Attainment-level air quality for the affected area must be attributable to permanent and enforceable measures

The state should be able to reasonably demonstrate that attainment-level air quality is attributable to SIP-enforced emissions limits, where necessary. In making this showing, the state should provide reliable estimates of the percent reduction in SO_2 emissions from national, regional, and local measures that have been implemented in the affected area.

d. The area meets all of the requirements of section 110 of the CAA

For the purposes of redesignation, a state should meet all of the requirements of section 110 of the CAA prior to the submittal of the redesignation request. This would include meeting all of the requirements under section 110(a)(2) addressing the general infrastructure requirements necessary to provide for the implementation of the 1-hour SO_2 NAAQS.

e. Verification of attainment

The state would need to verify implementation of all control measures identified in the approved 110(a)(1) SIP, that all affected sources are in compliance with the control measures, and that any emissions reductions projected in the approved plan for the affected area have been realized.

V. SO_2 nonattainment area planning elements

A. SO_2 SIP planning

Any state containing an area designated as nonattainment for the SO_2 NAAQS is directed by the CAA to develop and submit to EPA a SIP meeting the requirements of subpart 5, of part D, of Title I of the CAA, providing for attainment by the applicable statutory attainment date. CAA sections 191(a) and 192(a). As indicated in section 191(a), all components of the SO_2 part D SIP are to be submitted within 18 months of the effective date of an area's designation as nonattainment.

Section 172 of the CAA addresses the general requirements for areas designated as nonattainment. Section 172(c) directs states with nonattainment areas to submit a SIP that contains an attainment demonstration showing that the affected area will attain the standard by the applicable statutory attainment date. To be approved, the SIP would need to show that the area will attain the standard as expeditiously as practicable, and "provide for the implementation

of all reasonably available control measures [RACM] as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology [RACT])." (CAA section 172(c)(1)).

SIPs submitted under part D of the CAA also need to provide for reasonable further progress (RFP). (CAA section 172(c)(2)). Given the fact that SO_2 concentrations are often dominated by emissions from a limited number of sources, and emissions controls often yield swift and dramatic air quality improvement, EPA expects to continue its historic policy of treating as RFP for SO_2 "adherence to an ambitious compliance schedule." (74 FR 13547, in the General Preamble published on April 16, 1992).

As a general matter, nonattainment area SIPs would need to include contingency measures that would be implemented in the event that an area fails to meet RFP or fails to attain the standards by its attainment date. (CAA section 172(c)(9)). These contingency measures should be fully adopted rules or control measures that take effect without further action by the state or the Administrator. However, given the relative certainty of attainment of the SO_2 NAAQS when sources are complying with emission limits found to provide for attainment, EPA expects to continue to address the requirement for SO_2 contingency measures as meaning "that the state agency [or other applicable authority] has a comprehensive program to identify sources of violations of the SO_2 NAAQS and to undertake an aggressive follow-up for compliance and enforcement, including expedited procedures for establishing enforceable consent agreements pending the adoption of revised SIPs." (57 FR 13547, April 16, 1992).

Emission inventories are also critical for the efforts of state, local, and federal agencies to attain and maintain the NAAQS. Section 191(a) in conjunction with section 172(c) directs areas

designated as nonattainment for SO_2 to submit an emission inventory to EPA no later than 18 months after designation as nonattainment. Sections 191(a) and 172(c) also direct states to submit such periodic emission inventories for SO_2 nonattainment areas as EPA may determine necessary to assure compliance with part D, of title I of the CAA. Where so determined, EPA may direct that the periodic inventory include emissions of SO_2 for point, nonpoint, mobile, and area sources.

B. New source review

Part D of title I of the CAA prescribes the procedures and conditions under which a new major stationary source or major modification may obtain permits to construct or modify in an area designated nonattainment for any criteria pollutant. States that already have a nonattainment area new source review (NA NSR) permitting program for SO_2 nonattainment areas may be able to use the existing program to authorize the construction and modification of major stationary sources of SO_2. Because there are very few existing SO_2 nonattainment areas, many states may not have NA NSR rules that apply to SO_2. Such rules would need to be developed specifically for any nonattainment for the new 1-hour SO_2 NAAQS. The NA NSR permitting requirements in section 172(c)(5) and 173 of the CAA are among "the requirements of this part" to be submitted to EPA as part of a revised SIP for a nonattainment area within 18 months of the effective date of a designation or redesignation to nonattainment. Until such time that EPA approves a state's revised SIP containing a NA NSR program for SO_2, on and after the effective date of a nonattainment designation for the new 1-hour SO_2 NAAQS, states may rely on the nonattainment area permitting requirements under 40 CFR part 51 appendix S to govern review and approval of permits for major stationary sources of SO_2.

In general, the NA NSR program is to ensure that the construction and modification of major stationary sources of SO_2 will not interfere with RFP toward the attainment of the new 1-hour SO_2 NAAQS. More specifically, the statutory NA NSR requirements include but are not limited to:

- The installation of Lowest Achievable Emissions Rate (LAER) control technology;
- The acquisition of emissions reductions to offset new emissions of nonattainment pollutant(s);
- Certification that all major sources owned and operated in the state by the same owner are in compliance with all applicable requirements under the CAA;
- A demonstration via an alternatives and siting analysis that the benefits of a proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification; and
- An opportunity for public comment on the proposed permit.

The NA NSR requirements apply on a pollutant-specific basis with respect to each nonattainment pollutant emitted by a source in amounts greater than the applicable major source threshold for the pollutant. (40 CFR 51.165(a)(1)(iv)). In areas that are designated as nonattainment for the 1-hour SO_2 NAAQS, the major source threshold is 100 tpy of SO_2. Similarly, NA NSR requirements apply to major modifications of such a source that result in a significant net emissions increase of the nonattainment pollutant. EPA's NA NSR requirements at 40 CFR 51.165(a) currently define as "significant" a net emissions increase of at least 40 tpy SO_2 (the significant emissions rate or SER for SO_2).

C. Conformity

Section 176(c) of the CAA requires that all federal actions conform to an applicable implementation plan developed pursuant to section 110 and part D of the CAA. The EPA rules at 40 CFR part 93 developed under the authority of section 176(c) prescribe the criteria and procedures for demonstrating and assuring conformity of federal actions to a SIP. Each federal agency must determine that any actions covered by the general conformity rule conform to the applicable SIP before the action is taken. The criteria and procedures for conformity apply only in nonattainment areas and those nonattainment areas redesignated to attainment since 1990 ("maintenance areas") with respect to the criteria pollutants under the CAA[10]. The general conformity rules apply one year following the effective date of designations for any new or revised NAAQS. The general conformity determination examines the impacts of direct and indirect emissions related to federal actions. The general conformity rule provides several options to satisfy air quality criteria, such as modeling or offsets, and requires the federal action to also meet any applicable SIP requirements and emissions milestones. The general conformity rule also requires that notices of draft and final general conformity determinations be provided directly to air quality regulatory agencies and to the public by publication in a local newspaper.

Transportation conformity is required under CAA section 176(c) to ensure that federally supported highway and transit project activities are consistent with ("conform to") the purpose of the SIP. Transportation conformity applies to areas that are designated nonattainment, and those areas redesignated to attainment after 1990 ("maintenance areas" with plans developed under CAA section 175A) for transportation-related criteria pollutants. Due to the relatively small amounts of sulfur in gasoline and on-road diesel fuel, transportation conformity does not apply to the SO_2 NAAQS. (40 CFR 93.102(b)(1)).

[10] Criteria pollutants are those pollutants for which EPA has established a NAAQS under section 109 of the CAA.

VI. Transition from the existing SO_2 NAAQS to a revised SO_2 NAAQS

In implementing the new 1-hour SO_2 NAAQS, states will need to insure that the health protection provided under the prior SO_2 NAAQS continues to be achieved as well as maintained. This means that states should continue implementing attainment and maintenance SIPs associated with the prior 24-hour and annual primary SO_2 NAAQS until such time as they are subsumed by any new EPA-approved SIPs reflecting planning and control requirements associated with the new NAAQS.

CAA section 110(l) provides that EPA may not approve a SIP revision if it interferes with any applicable requirement concerning attainment and RFP, or any other applicable requirement under the CAA. In addition, section 193 of the CAA prohibits the modification of a control, or a control requirement, in effect or required to be adopted as of November 15, 1990 (i.e., prior to the promulgation of the Clean Air Act Amendments of 1990), unless such a modification would ensure equivalent or greater emissions reductions.

In the final SO_2 NAAQS, EPA provided that the prior 24-hour and annual primary SO_2 NAAQS will remain in effect for one year following the effective date of the initial area designations under section 107(d)(1) for the new SO_2 NAAQS before being revoked in most attainment areas. (40 CFR 50.4(e)). Any existing SIP provisions under CAA sections 110, 191 and 192 associated with the annual and 24-hour SO_2 NAAQS would need to remain in effect, even after the 24-hour and annual primary SO_2 NAAQS are no longer in effect, including all currently implemented planning and emissions control obligations. This includes both those in the state's SIP and those that have been promulgated by EPA in FIPs. This will ensure that both the new nonattainment NSR requirements and the general conformity requirements for a revised standard are in place so that there will be no gap in the public health protections provided by

these two programs. It will also ensure that all nonattainment areas under the annual and/or 24-hour NAAQS and all areas for which SIP calls have been issued will continue to be protected by currently required control measures.

EPA also provided that the annual and 24-hour NAAQS remain in place for any current nonattainment area, or any area for which a state has not fulfilled the requirements of a SIP call, until the affected area submits, and EPA approves, a SIP with an attainment, implementation, maintenance and enforcement SIP which fully addresses the attainment and maintenance requirements of the new SO_2 NAAQS. (40 CFR 50.4(e)). The regulatory text provides that such a SIP must be submitted and approved pursuant to CAA section 191. This means that the SIP would need to meet part D nonattainment planning requirements under the new SO_2 NAAQS, as described above[11].

It is important to understand that for PSD purposes, even after the time that the annual and 24-hour SO_2 NAAQS are no longer in effect, the annual and 24-hour SO_2 increments contained in the CAA and PSD regulations will remain in effect. Thus, the owner or operator of a new or modified source will still be required to demonstrate compliance with the annual and 24-hour SO_2 increments, even when the corresponding SO_2 NAAQS no longer apply. The annual and 24-hour increments are established in section 163 of the CAA. Thus, they remain applicable even after EPA has revoked the SO_2 NAAQS for the annual and 24-hour averaging times. EPA does not believe that it can eliminate the annual and 24-hour SO_2 increments without appropriate legislative changes to the statutory SO_2 increments. For example, in 1990,

[11] The areas that are currently designated as nonattainment for the pre-existing SO_2 primary NAAQS are Hayden, AZ; Armstrong, PA; Laurel, MT; Piti, GU; and Tanguisson, GU. The areas that are designated nonattainment for both the primary and the secondary standards are East Helena, MT, Salt Lake Co, MT, Toole Co, UT, and Warren Co, NJ. (See http://www.epa.gov/oar/oaqps/greenbk/lnc.html). The Billings/Laurel, MT area is the only area currently subject to a SIP call.

Congress amended the CAA to make clear that EPA could substitute PM_{10} increments for the statutory PM increments that were based on the TSP indicator.

VII. Redesignation to attainment for areas designated as nonattainment

The latest date by which an area designated as nonattainment is required to attain the SO_2 NAAQS is determined from the effective date of the nonattainment designation for the affected area. As stated previously, assuming that designations for the 1-hour SO_2 NAAQS are effective in August 2012, states would submit SIPs for nonattainment areas by no later than February 2014. For areas designated nonattainment for the revised SO_2 NAAQS, approvable SIPs would need to provide for attainment of the NAAQS as expeditiously as practicable, but no later than 5 years from the effective date of the nonattainment designation for the area, or in this case by no later than August 2017. (CAA section 192(a)). The EPA expects to determine, under CAA section 179(c), whether an area has demonstrated attainment of the new SO_2 NAAQS by evaluating air quality monitoring and modeling data consistent with 40 CFR part 50, Appendix T and 40 CFR part 51, Appendix W.

A. Attainment of the NAAQS

There are five basic conditions provided under section 107(d)(3)(E) of the CAA that a nonattainment area would need to meet in order for EPA to redesignate it as attainment:

- EPA determines that the area has met the SO_2 NAAQS;
- EPA has fully approved the SIP for the area;
- EPA determines the improvement in air quality in the affected area is due to permanent and enforceable reductions in emissions;
- EPA has fully approved a maintenance plan meeting the requirements of section 175A of the CAA for the area; and

- the state containing the area has met all applicable requirements under section 110 and part D of the CAA.

These conditions are discussed in more detail in the 1994 SO_2 Guideline Document. (*See* http://www.epa.gov/ttn/oarpg/t1pgm.html).

B. Consequences of a nonattainment area failing to attain by the statutory attainment date

Any SO_2 nonattainment area that fails to attain by its statutory attainment date would become subject to the requirements of sections 179(c) and (d) of the CAA. EPA is required to make a finding of attainment or failure to attain no later than 6 months after the specified attainment date and publish a notice in the Federal Register. If EPA finds the area has failed to attain, the state would then need to submit an implementation plan revision no later than one year following publication of the Federal Register notice making the determination of the area's failure to attain. This submission would need to demonstrate that the standard will be attained as expeditiously as practicable, but no later than 5 years from the date of EPA's publication of the notice that the area failed to attain. In addition, section 179(d)(2) provides that the SIP revision is to include any specific additional measures as may be reasonably prescribed by EPA, including "all measures that can be feasibly implemented in the area in light of technological achievability, costs, and any nonair quality and other air quality-related health and environmental impacts."

Appendix A

Modeling Guidance for Nonattainment Areas and Section 110(a)(1) plans

1. Purpose

On June 2, 2010, Administrator Jackson signed a final rulemaking notice that revised the primary SO_2 NAAQS (75 FR 35520, published on June 22, 2010) after review of the existing two primary SO_2 standards, promulgated on April 30, 1971 (36 FR 8187).[12] EPA established the revised primary SO_2 standard at 75 parts per billion (ppb) which is attained when the 3-year average of the 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb. In the final rule preamble, EPA outlined a possible analytic approach to determining compliance with the new NAAQS that would include the use of both modeling and monitoring. EPA explained that this analytic approach to determining compliance with the new 1-hour NAAQS could be the technically appropriate and accurate means of assessing peak 1-hour SO_2 concentrations, and would be consistent with historic (past and more recent) implementation practice of using models to determine compliance with the SO_2 NAAQS.

This guidance explains the expected application of dispersion models to support the SIP process regarding:

1. The use of modeling in the development of CAA Section 191-192 SIPs for nonattainment areas, and
2. The use of modeling in the development of Section 110(a)(1) and (2) SIPs (commonly referred to as "maintenance" and "infrastructure" SIPs).

While this guidance explains the expected general application of dispersion models, there will be applications of dispersion models unique to specific areas, (i.e., there may be areas of the country where it is necessary to model unique specific sources or types of sources). In such cases, there should be consultation with the state or appropriate reviewing authority with the appropriate Regional Office modeling contact to discuss how best to model a particular source.

2. Guidance on Air Quality Models

This guidance is based on and is consistent with EPA's *Guideline on Air Quality Models*, also published as Appendix W of 40 CFR Part 51. Appendix W is the primary source of information on the regulatory application of air quality models for State Implementation Plan (SIP) revisions for existing sources and for New Source Review (NSR) and Prevention of Significant Deterioration (PSD) programs. Air quality modeling in this SIP process would need to employ air quality dispersion models[13] that properly address the source-oriented nature of SO_2 and, thus, should rely upon the principles and techniques in Appendix W.

[12] EPA publicly disseminated a copy of the signed notice on June 3, 2010, and therefore treats June 3, 2010, as the date of the rule's promulgation, for purposes of the deadlines in CAA section 107(d) and 110(a)(1).

[13] Dispersion modeling uses mathematical formulations to characterize the atmospheric processes that disperse a pollutant emitted by a source. Based on emissions and meteorological inputs, a dispersion model can be used to predict concentrations at selected downwind receptor locations.

Appendix W was originally published in April 1978 and was incorporated by reference in the regulations for the Prevention of Significant Deterioration of Air Quality, Title 40, Code of Federal Regulations (CFR) sections 51.166 and 52.21 in June 1978 [43 FR 26382-26388]. The purpose of Appendix W guidelines is to promote consistency in the use of modeling within the air quality management process. These guidelines are periodically revised to ensure that new model developments or expanded regulatory requirements are incorporated.

Clarifications and interpretations of modeling procedures become official EPA guidance through several courses of action: 1) the procedures are published as regulations or guidelines; 2) the procedures are formally transmitted as guidance to Regional Office managers; 3) the procedures are formally transmitted as guidance to Regional Modeling Contacts as a result of a Regional consensus on technical issues; or 4) the procedures are a result of decisions by the EPA's Model Clearinghouse that effectively establish national precedent. Formally located in the Air Quality Modeling Group (AQMG) of EPA's Office of Air Quality Planning and Standards (OAQPS), the Model Clearinghouse is the single EPA focal point for the review of criteria pollutant modeling techniques for specific regulatory applications. Model Clearinghouse and related Clarification memoranda involving decisions with respect to interpretation of modeling guidance are available at the Support Center for Regulatory Atmospheric Modeling (SCRAM) website.[14]

Recently issued EPA guidance of relevance for consideration in modeling for attainment and maintenance demonstrations includes:

- "Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 NAAQS" August 23, 2010—confirming that Appendix W guidance is applicable for NSR/PSD permit modeling for the new SO_2 NAAQS (U.S EPA, 2010a).
- "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" March 1, 2011– provides additional guidance regarding NO_2 permit modeling and also relevant to SO_2 (U. S. EPA, 2011a).
- "Area designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards" March 24, 2011 – provides guidance for designating areas for the purpose of implementing the 2010 revised primary SO_2 NAAQS, including modeling guidance (Attachment 3) (U. S. EPA, 2011b).

The guidance listed above, in addition to other relevant support documents can be found on the SCRAM website at http://www.epa.gov/ttn/scram/so2_modeling_guidance.htm. This website will be made publicly available at the time of release of this SO_2 implementation guidance document.

The following sections will refer to the relevant sections of Appendix W and other existing guidance with summaries as necessary. Please refer to those original guidance

[14] The Support Center for Regulatory Atmospheric Modeling (SCRAM) website is available at: http://www.epa.gov/ttn/scram/.

documents for full discussion and consult with the appropriate EPA Regional Modeling Contact if questions arise about interpretation on modeling techniques and procedures[15].

3. Model selection

Preferred air quality models for use in regulatory applications are addressed in Appendix A of EPA's *Guideline on Air Quality Models*. If a model is to be used for a particular application, the user should follow the guidance on the preferred model for that application. These models may be used without an area specific formal demonstration of applicability as long as they are used as indicated in each model summary of Appendix A. Further recommendations for the application of these models to specific source problems are found in subsequent sections of Appendix W. In 2005, EPA promulgated the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) as the Agency's preferred near-field dispersion modeling for a wide range of regulatory applications in all types of terrain based on extensive developmental and performance evaluation.

For SIP development under the 1-hour SO_2 primary NAAQS, AERMOD should be used unless use of an alternative model can be justified (Section 3.2, Appendix W), such as the Buoyant Line and Point Source Dispersion Model (BLP). As outlined in the August 23, 2010 clarification memo "Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard", AERMOD is the preferred model for single source modeling to address the 1-hour SO_2 NAAQS as part of the NSR/PSD permit programs (U.S. EPA, 2010a). AERMOD is appropriate for the SIP development process because SO_2 concentrations result from direct emissions from combustion sources so that concentrations are highest relatively close to sources and are much lower at greater distances due to dispersion. Given the source-oriented nature of this pollutant (see, e.g., 75 FR at 35570), dispersion models are the most appropriate air quality modeling tools to predict the near-field concentrations of this pollutant.

The AERMOD modeling system includes several components. The regulatory components are:

- AERMOD: the dispersion model (U.S. EPA, 2004a; U.S. EPA, 2011c)
- AERMAP: the terrain processor for AERMOD (U.S. EPA, 2004b, U.S. EPA, 2011d)
- AERMET: the meteorological data processor for AERMOD (U.S. EPA, 2004c; U.S. EPA, 2011e)
- BPIPPRIME: the building input processor (U.S. EPA, 2004d)

and non-regulatory components are:

- AERSURFACE: the surface characteristics processor for AERMET (U.S. EPA, 2008)
- AERSCREEN: a recently released screening version of AERMOD (U.S. EPA, 2011f)

[15] List of Regional Modeling Contacts by EPA Regional Office is available from SCRAM website at: http://www.epa.gov/ttn/scram/guidance_cont_regions.htm

Before running AERMOD, the user should become familiar with the user's guides associated with the modeling components listed above and the AERMOD Implementation Guide (AIG) (U.S. EPA, 2009). The AIG lists several recommendations for applications of AERMOD which would be applicable for SIP modeling.

4. Modeling Framework

Figure 1 presents a flow chart of the SIP modeling framework from identifying sources and emissions inputs to design value calculations. The general steps include the following:

1. Gather statewide information about SO_2 sources including source emissions and locations, as well as other pertinent source characteristics (e.g., building information for modeling building downwash). While maximum allowable emissions would be used in the refined SIP modeling demonstration, initial information gathering could be focused on actual emissions for larger sources of 100 tpy or more as an initial screening of sources to possibly include in refined modeling [16];
2. Map selected sources to identify any possible geographic clusters of sources within the state. It may also be useful to map monitor locations to identify source clusters around monitors, especially monitored areas that are expected to be designated nonattainment. The mapping of the sources and monitors will aid in identification of the appropriate modeling domain for each geographic area to be addressed in the SIP demonstration. The sources to be explicitly modeled within each area should include the larger sources and others that potentially contribute to violations for the state to have the greatest flexibility in determining controls across sources, as necessary, to attain the NAAQS;
3. Beginning with the maximum allowable emissions or federally enforceable emission limits, apply control strategies that may be employed from nationally enforceable rules[17];
4. Input the initially controlled emissions along with receptors, meteorology, and background concentrations into the dispersion model and calculate design values based on cumulative concentrations (all modeled sources and background);
5. If there are no predicted exceedances of the NAAQS from the initial dispersion modeling results, the area has demonstrated attainment;
6. If there are predicted exceedances of the NAAQS, additional control strategies would need to be implemented on sources and assessed, which may necessitate re-running the dispersion model;
7. If additional controls result in no predicted violations of the NAAQS, the area has demonstrated attainment.
8. If there are still predicted violations of the NAAQS, continue to assess additional controls until no predicted violations occur.

[16] Please note that sources may have actual emissions much lower than their allowable limits, so it may be prudent to gather information about sources that are lower than 100 tpy of actual emissions.

[17] See Section B.3 of the SO_2 SIP guidance document for more information about national rules.

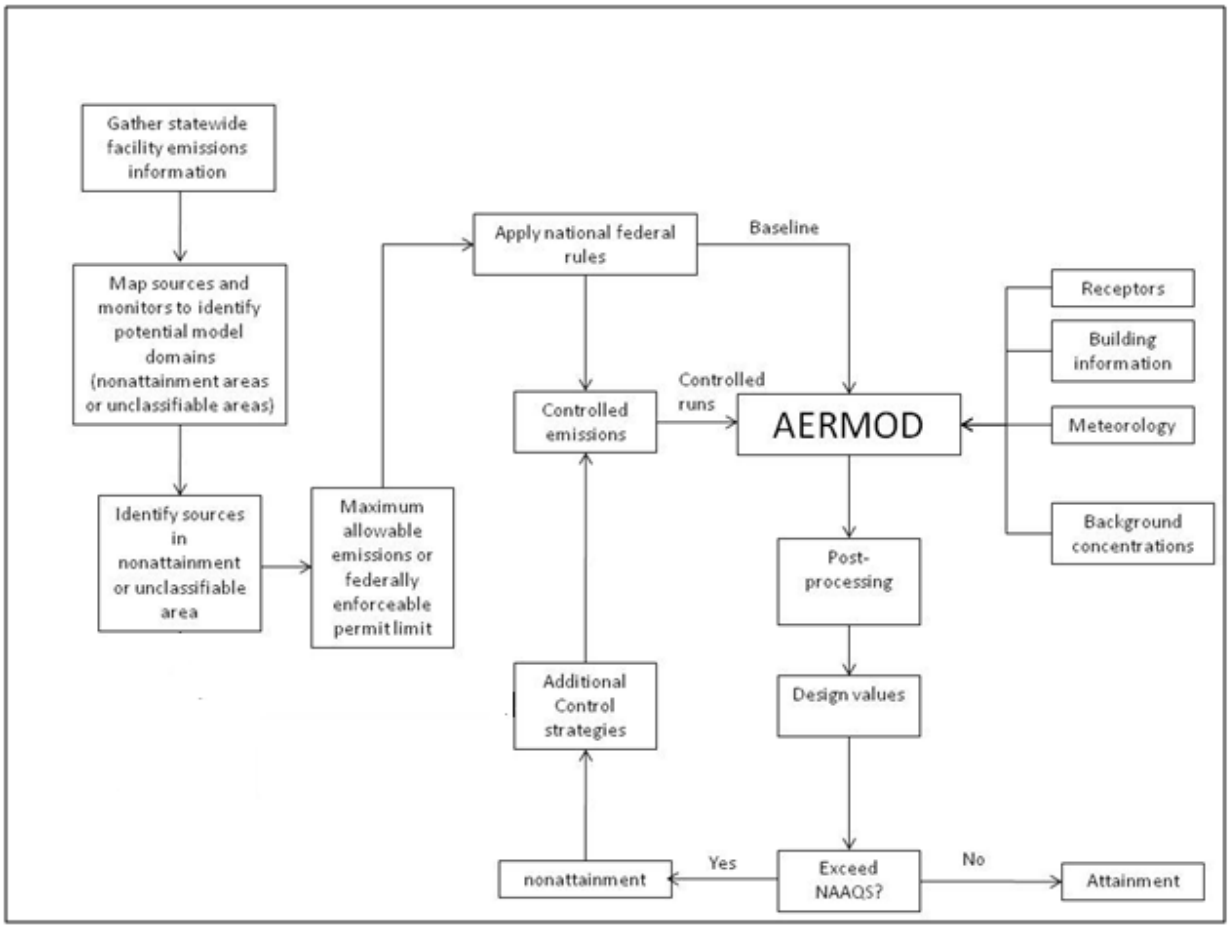

Figure 1. Flowchart of SO_2 Modeling Framework for SIP Demonstration.

The following sections provide details of the SO_2 modeling framework and each element in the modeling analysis for the SIP development effort. Section 5 describes the modeling domain and receptor grid. Section 6 describes the input emissions and controls, while Section 7 describes meteorological inputs. Section 8 describes the inclusion of background, and Section 9 describes the calculations of the design values.

5. Modeling domain

Selection of the modeling domain is important in terms of how many sources to explicitly model and what kind of receptor network to create. Two questions may arise in model domain selection:

1. Where to center the modeling domain?, and
2. How large should the modeling domain be? (i.e., in terms of the number of sources to model and size of the receptor network in order to account for the areas of impact).

If the nonattainment or unclassifiable area boundaries were determined using the five designations factors or refined dispersion modeling outlined in the March 24, 2011 designations guidance memo (U.S. EPA, 2011b), the modeling domain should encompass the nonattainment or unclassifiable area and be centered on the center of the designated area. The designated area should already include the sources thought to cause or contribute to a NAAQS exceedance, if a nonattainment area, or include sources, if any, that are thought to influence an unclassifiable area and be eligible for consideration in application of controls.

However, if the nonattainment or unclassifiable area is the presumptive county boundary and no efforts were made in the designations process to alter the designations area size or boundaries, states will need to consider the two questions above and consider the emission source selection process discussed in Section 5.1 below. If the modeling is being performed around a violating monitor, the domain should be centered on the violating monitor. If the modeling is being done for an area without a violating monitor, the domain should be centered on the dominant source or cluster of sources in an area, that is, the source or sources expected to contribute the most to SO_2 air quality levels. In both cases, the domain should then extend to include nearby sources that are thought to cause or contribute to a potential NAAQS violation or unclassifiable area, as explained further below in Section 5.1.

As stated in Section 4 and shown in Figure 1, the first step of the SIP modeling exercise is to determine the sources to include in the modeling. The determination of sources to include in modeling is a multi-step process. If modeling is being performed for a violating monitor, the first basic step would be to consider those sources within the nonattainment area defined in designations or those thought to cause or contribute to violations within 50 km of the monitor, the nominal distance within in which EPA considers most steady state Gaussian plume models to be applicable. States will need to consider sources throughout their state and determine the areas to focus on that appropriately account to these SO_2 sources

5.1. Determining sources to model

As stated above, the determination of sources to explicitly model for each area is a multi-step process:

1. As discussed in Section 4 and Figure 1, the first step in the implementation modeling is to gather statewide information about SO_2 sources and map them along with any nonattainment monitors to identify clusters of sources and, thereby, the geographic area(s) of concern. If monitors are mapped with the sources, clusters of sources can be identified around those monitored areas. It is reasonable to initially focus on the most significant sources of SO_2 emissions, e.g., sources emitting more than 100 tons (maximum allowable) [18] per year. Please note, however, that smaller sources can also cause or contribute to a NAAQS violation (75 FR 35552), especially sources with short stacks and/or located in complex terrain (i.e., where receptor elevation is above stack height), or sources with high maximum hourly emissions rates. As a first-tier screen it may be reasonable to use actual emissions in the screening process. If actual emissions

[18] See Section 6.1 for details regarding the use of maximum allowable vs. actual emissions.

are used, it may be necessary to map sources with actual emissions less than 100 tons/year, bearing in mind that actual emissions may be much less than maximum allowable or federally enforceable permit limit emissions, which will be the emissions inputs for the implementation modeling. States should use best professional judgment in determining an emissions threshold for mapping, or consult the appropriate Regional Office modeling contact.

2. Once the geographic areas of concern has been identified, the spatial distribution of sources within either the nonattainment area or 50 km of the violating monitor or dominant source should be spatially analyzed to determine what source(s) will need to be explicitly modeled. Again, it is reasonable to initially focus on the most significant sources of SO_2 emissions, e.g., sources emitting greater than 100 tons (maximum allowable) per year. While the analysis begins with a nonattainment area or initially assumes an area within 50 km of a violating monitor or dominant source, it may not be necessary to explicitly model all sources within these initial areas of consideration based on steps 3 and 4 below.
3. Sources should be examined and every effort made to determine if any sources can be accounted for without explicitly modeling them, i.e., use of monitored background concentrations (if available). Accounting for such sources through the use of a background monitor will depend upon whether that monitor reflects impacts from those sources.
4. Sources found not to be represented by monitored background may also be examined through the use of screening models to see if they should or should not be included in the refined modeling. We recommend the use of EPA's new screening model AERSCREEN (U.S. EPA, 2011f, U. S. EPA, 2011g) and following recommendations based on pre-existing screening guidance (U.S. EPA, 1992). For small isolated sources, screening may be useful on a source by source basis. However, for a cluster of small sources, their cumulative impact should also be assessed. Individual sources may not be significant by themselves, but in clusters together they may potentially cause or contribute to a NAAQS violation. Although AERSCREEN does not output a design value concentration based on the 99th percentile form of the 1-hour SO_2 standard, it does output the overall maximum 1-hour concentration which could be used as a conservative estimate for comparison with the NAAQS and EPA's suggested interim significant impact level (SIL) for the 1-hour SO_2 NAAQS of 3 ppb[19]. If the maximum 1-hour concentration output from AERSCREEN violates the NAAQS, it does not mean that the source is in nonattainment, but that the source should be evaluated using refined dispersion modeling (See Step 3 below for more details).

Figures 2 and 3 provide a hypothetical example of the screening process by mapping sources to identify possible nonattainment or unclassifiable areas and those sources to explicitly model. Figure 2 shows a partial map of a state with sources of 10 tons/year or greater of actual emissions indicated by circles of varying size based on emissions intensity. Also shown in

[19] The 3 ppb interim SIL for new 1-hour SO_2 NAAQS was suggested by EPA for states to consider using for the PSD program in the August 23, 2010 memorandum "Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program"

Figure 2, are violating SO_2 monitors as represented by stars. Based on this figure, an example application of the four step process is described below.

Step 1: In Figure 2, clusters of sources, especially around monitors can be seen. Any violating monitor is a nonattainment area with a geographic area defined in the designations process that constitutes the potential modeling domain. For example, for monitor 1, the modeling domain should encompass the 100+ ton per year sources within the designated nonattainment area. The modeling domain for monitor 2 could be the cluster of 100+ ton emitters in its vicinity, and the same for monitor 3. The cluster of sources northeast of monitor 3 could be combined into a separate area centered on the large 10,000+ ton emitter. To the southeast of monitor 3, the large 10,000+ ton source may be the center of a potential modeling domain that includes the monitor. Alternatively, the modeling domain could be centered at monitor 3 and include all large sources in its vicinity. These are just illustrative examples only and the states may have their own criteria for initially creating modeling domains.

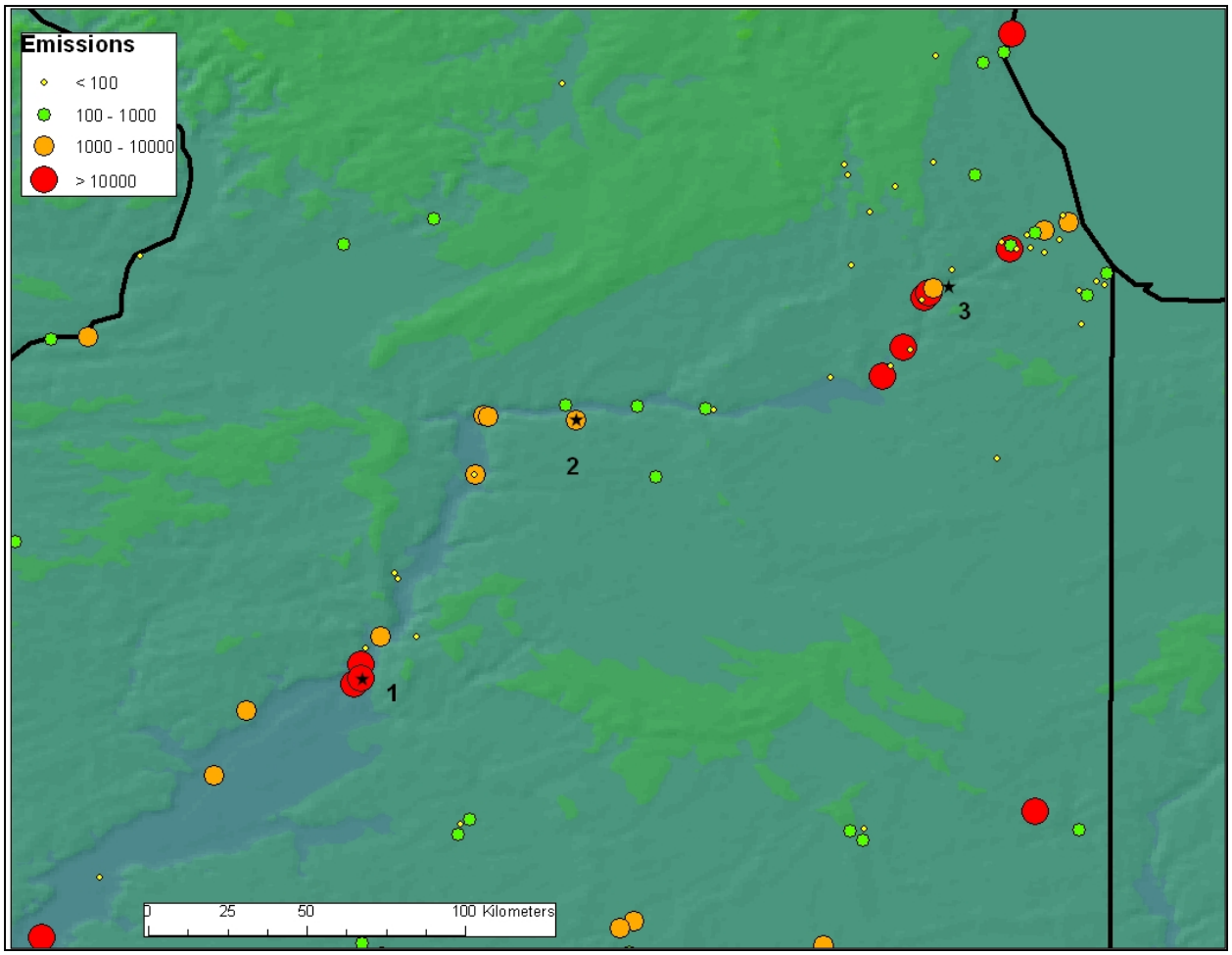

Figure 2. Example of screening process: Mapping of spatial distribution of sources to determine geographic areas of focus for SIP implementation.

Step 2: Figure 3 shows source emissions ranging from less than 100 to over 10,000 tons per year within the potential area to be modeled centered around a violating monitor (or dominant source(s). There are three 10,000+ ton emitters near the center and two 100 to 1,000 ton emitters west-southwest of the domain center. At this point, it could be initially assumed that all facilities greater than 100 tpy should be included in refined modeling before completing steps 3 and 4 below.

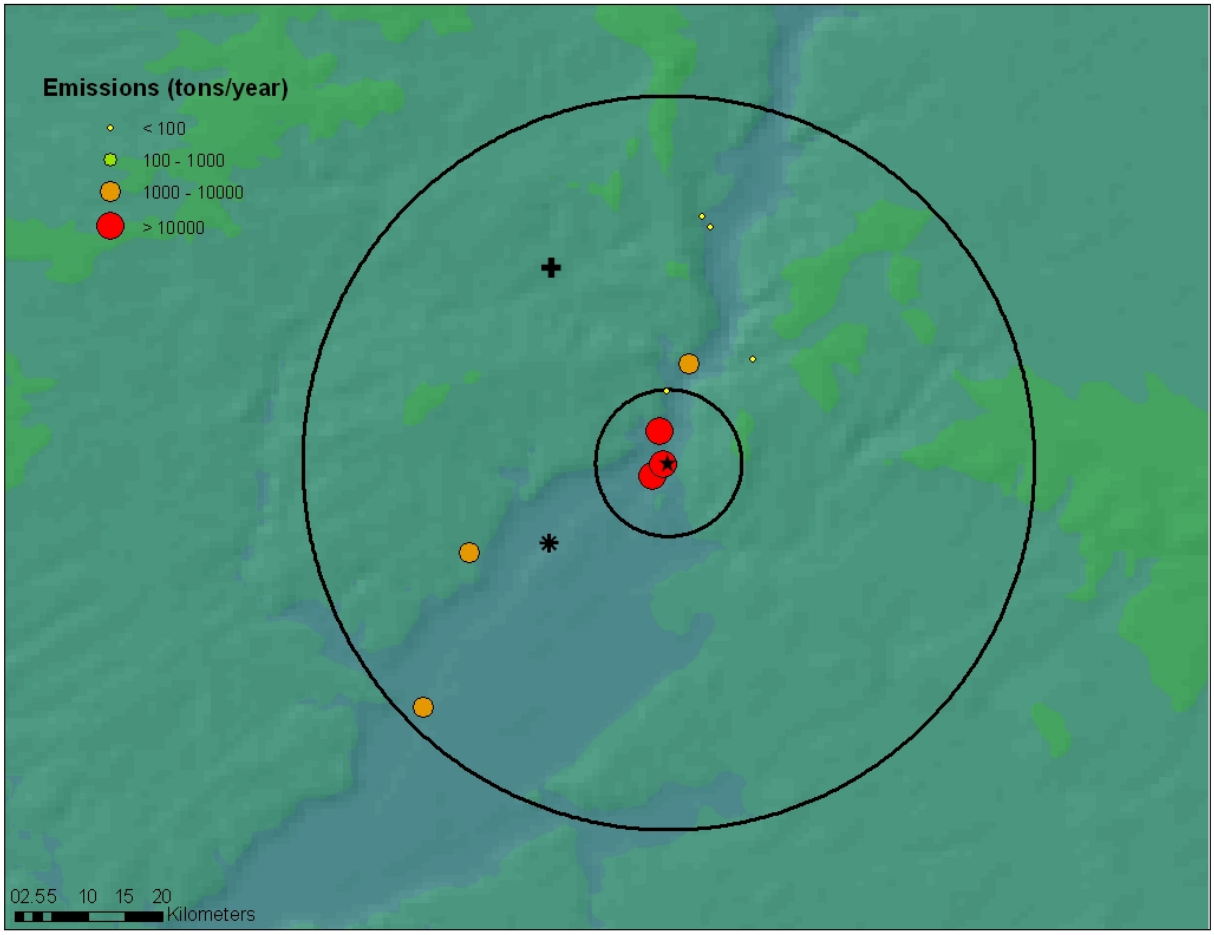

Figure 3. Illustrative example of possible modeling domain centered on violating monitor (star) with emissions (circles) within 50 km (large circle) and 10 km (inner circle).
Note: Other monitors are shown by plus sign and asterisks, while shaded contours represent terrain.

Step 3: Determine whether any source or sources can be accounted for by a representative background monitor. In Figure 3, there are two other monitors in the area, one north and one south-west of the domain center. The south-western monitor may be representative of the two sources in that part of the domain so that these sources would not be explicitly modeled and instead accounted for through inclusion of ambient data from this monitor. Background concentrations should be calculated following the guidance in Section 7 of this document.

Step 4: Screening modeling may be used to determine additional sources or combinations of sources to be excluded from refined modeling, especially smaller sources whose impacts may be

largely dependent on their stack parameters (height, exit velocity, etc.). AERSCREEN could be used to exclude such sources through screening modeling. AERSCREEN does not output an SO_2 design value but does output the overall maximum 1-hour concentration for an individual stack. If a facility contains more than one emission point or stack, each stack should be processed in AERSCREEN and the maximum 1-hour concentrations can be added together to represent impacts from the whole facility after running AERSCREEN. While AERSCREEN can be used with the surface characteristics of the source being screened, given the documented sensitivity of AERMOD to surface characteristics (Brode et al., 2008), it may be useful to also model the source in AERSCREEN using the surface characteristics of the meteorological site being used in the refined modeling, to ensure that the source is below *de minimis* impact levels with either set of surface characteristics. When analyzing AERSCREEN output, the following general criteria could be followed:

1. If the facility's maximum 1-hour concentration exceeds 75 ppb, then the source should be included in refined dispersion modeling.
2. If the facility's maximum 1-hour concentration is below 75 ppb but above the suggested interim 1-hour significant impact level of 3 ppb or the state's 1-hour SIL, it should be included in the refined modeling.
3. If the facility's maximum 1-hour concentration is below the suggested interim 1-hour significant impact level or the state's 1-hour SIL, that source may not have to be included in refined modeling. However, the facility should not be excluded on the sole basis of being below the SIL without first looking at surrounding sources and their maximum 1-hour concentrations. The case may arise when there are several small sources that singularly are below the SIL but their cumulative impact may lead to concentrations that contribute to violations of the NAAQS.

In summary, for the example in Figure 3, the smaller sources of emissions to the north of the domain center may be excluded from refined modeling if screening indicates they are not likely to cause or contribute to potential NAAQS violations. Other larger sources to the west southwest of the monitor may be represented by background monitors. The largest emitters within 10 km of the violated monitor would be included in refined modeling as they are likely contributing to potential NAAQS violations.

This is just one example of how to determine the modeling domain and sources to explicitly model. In some cases, an analysis out to 50 km may not be needed. Please consult with the appropriate EPA Regional Office modeler if there is uncertainty in deciding which sources to explicitly model, which sources to represent based on background monitoring, and/or which to exclude from refined modeling based on screening modeling.

5.2. Receptor grid

The model receptor grid is unique to the particular situation and depends on the size of the modeling domain, the number of modeled sources, and complexity of the terrain. Receptors should be placed in areas that are considered ambient air (i.e., where the public generally has access) and placed out to a distance such that areas of violation can be detected from the model output to help determine the size of nonattainment areas. Receptor placement should be of

sufficient density to provide resolution needed to detect significant gradients in the concentrations with receptors placed closer together near the source to detect local gradients and placed farther apart away from the source. In addition, the user should place receptors at key locations such as around facility fence lines (which define the ambient air boundary for a particular source) or monitor locations (for comparison to monitored concentrations for model evaluation purposes). The receptor network should cover the modeling domain. States may already have existing receptor placement strategies in place for regulatory dispersion modeling under NSR/PSD permit programs. If this strategy is considered adequate for the implementation modeling, states should continue with their respective receptor placement strategies.

If modeling indicates elevated levels of SO_2 (near the standard) near the edge of the receptor grid, consideration should be given to expanding the grid or conducting an additional modeling run centered on the area of concern. As noted above, terrain complexity should also be considered when setting up the receptor grid. If complex terrain is included in the model calculations, AERMOD requires that receptor elevations be included in the model inputs. In those cases, the AERMAP terrain processor (U.S. EPA, 2004b; U.S EPA, 2011d) should be used to generate the receptor elevations and hill heights. The latest version of AERMAP (version 09040 or later) can process either Digitized Elevation Model (DEM) or National Elevation Data (NED) data files. The AIG recommends the use of NED data since it is more up to date than DEM data, which is no longer updated (Section 4.3 of the AIG).

6. Source inputs

This section provides guidance on source characterization to develop appropriate inputs for dispersion modeling with the AERMOD modeling system. Section 6.1 provides guidance on use of allowable vs. actual emission levels, Section 6.2 discusses control strategies for emissions, Section 6.3 covers guidance on Good Engineering Practice (GEP) stack heights, Section 6.4 discusses dispersion techniques, Section 6.5 provides details on source configuration and source types, Section 6.6 provides details on urban/rural determination of the sources, and Section 6.7 provides general guidance on source grouping, which may be important for design value calculations.

6.1. Allowable vs. Actual emissions

Consistent with past SO_2 modeling guidance (Section 4.5.2 of U.S. EPA (1994)) and regulatory modeling for other programs (Appendix W, Section 8.1), dispersion modeling for the purposes of SIP development should be based on the use of maximum allowable emissions or federally enforceable permit limits. Also consistent with past and current guidance, in the absence of allowable emissions or federally enforceable permit limits, potential to emit emissions (i.e., design capacity) should be used. Because of the short-term nature of the new SO_2 NAAQS, the maximum short term or hourly emission rate should be input into AERMOD for each modeled hour. As stated in the August 23, 2010 memo (U. S. EPA, 2010a),

> "Since short-term SO_2 standards ($\leq$ 24 hours) have been in existence for decades, existing SO_2 emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO_2 standards should serve as a useful starting point, and may be adequate in

many cases for use in assessing compliance with the new 1-hour SO_2 standard since issues identified in Table 8-2 of Appendix W related to short-term vs. long-term emission estimates may have already been addressed."[20]

The necessary emissions information for attainment demonstration modeling should be available from existing SO_2 inventories used for permitting or SIP demonstrations. If short-term emissions are not readily available, they may be calculated using the methodology shown in Table 8-1 of Appendix W. For the short term NAAQS standards this is a product of the maximum allowable emission limit or federally enforceable emission limit, the operating level and operating factor. The operating level is defined in Section 8.1 of Appendix W as the actual or design capacity (whichever is greater) or federally enforceable permit condition. Appendix W also recommends modeling at 50% and 75% of capacity to determine the load that may cause the highest concentration because changes in stack parameters in loads less than 100% of capacity may cause higher ground level concentrations. The operating factor is assumed to be continuous operation[21]. For an example, calculation of short term emissions, see the June 28, 2010 memorandum "Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" (U. S. EPA, 2010b). Although the example is for NO_2, the calculation methodology would be the same for SO_2.

Regarding the use of allowable emissions and the modeling of intermittent emissions sources from such sources as emergency generators and startup/shutdown emissions, the inclusion of such emissions for the purpose of modeling for SO_2 attainment demonstrations should follow the recommendations in the March 1, 2011 memo "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" (U. S. EPA, 2011a). As stated in this memo, EPA believes the most appropriate data to use for compliance demonstrations for the 1-hour NO_2 NAAQS are those based on emissions scenarios that are continuous enough or frequent enough to contribute significantly to the annual distribution of maximum daily 1-hour concentrations. Although the referenced guidance in this memo is for NO_2 permit modeling, the common 1 hour averaging time and form of both the NO_2 and SO_2 standards makes this modeling guidance applicable to the 1-hour SO_2 NAAQS and, thus, applicable to SO_2 modeling in support of attainment and maintenance demonstrations. For more details, refer to the NO_2 memo. If any questions arise regarding preparation of emissions inputs for dispersions modeling including intermittent emissions from sources, then users should consult the appropriate EPA Regional Modeling Contact.

6.2. Controls

Once sources have been identified within the nonattainment or unclassifiable area that may cause or contribute to NAAQS violations, the process of identifying and modeling the effect of control strategies begins. In some cases, control of one source may allow an area to be in

[20] The August 23, 2010 memo refers to modeling for PSD and Table 8-2 refers to PSD applications.

[21] As stated in Table 8-1 of Appendix W, "If an operation does not occur for all hours of the time period of consideration (e.g. 3 or 24 hours) and the source operation is constrained by a federally enforceable permit condition, an appropriate adjustment to the modeled emission rate may be made. (e.g., if operation is only 8 a.m. to 4 p.m. each day, only these hours will be modeled with emissions from the source. Modeled emissions should not be averaged across non-operating time periods."

attainment, while in other cases, controls could be implemented on several sources to share the control responsibility to demonstrate the area to be in attainment. As stated in Section B.1 of the SIP guidance document, states should develop an accurate attainment inventory to identify the level of emissions in the area sufficient to attain the 1-hour SO_2 NAAQS and be consistent with EPA's most recent guidance on emissions inventories. These emissions are maximum allowable emissions levels that reflect enforceable national, regional, or local rules that will be in place within the timeframe for demonstrating attainment of the standard. When modeling with emissions from the emissions inventory, the input emissions should be reflective of implemented control strategies that will allow the area to be in attainment of the NAAQS. The controlled emissions should be tested using Table 8-1 of Appendix W. See Section B.3 of the SIP guidance document for more information about control strategies.

As stated in Section 4 and shown in Figure 1, the initial modeling for the SIP can include the national rules that will be in place by the attainment date. Therefore, if these initial controls allow for the area to be in attainment by the attainment date, additional controls may not be necessary. However, if additional controls are necessary to achieve attainment, identifying additional sources to control may be necessary (see Figure 1). Often these sources can be determined by analyzing spatial relationships between the sources and receptors whose concentrations exceed the NAAQS.

When identifying sources to control, control of a particular source that leaves other sources unchanged will obviously change hourly cumulative concentrations. This in turn, may change the daily maximum 1-hour concentration for a given receptor and day, and subsequently may alter the annual distribution of daily maximum 1-hour concentrations and the magnitude of the 4th highest concentration from the annual distribution. This would change the cumulative design value which may still be above the NAAQS but now driven by a different source that earlier may not have been identified as a source to control. Analysis of sources to control may need to be extended to percentiles below the 99th percentile of the annual distribution of daily maximum 1-hour concentrations. While the cumulative (all sources) design value is based on the multiyear average 99th percentile (i.e. 4th highest) of the annual distribution of the daily maximum 1-hour concentrations, lower percentiles, such as 98th (8th highest), 97th (11th highest), etc. can exceed the NAAQS level. A modeling analysis should include multiyear averages of the daily maximum 1-hour concentrations beginning with the 4th highest and proceeding downward to 5th, 6th, 7th, etc. highest until the cumulative impact at all receptors is below the NAAQS. Since the form of the standard is based on the maximum 1-hour concentration for each day, the analysis should be limited to the daily maximum 1-hour concentrations, not for example, 2nd or 3rd highest of the 1-hour concentrations for a day. Also, the rank, 4th, 5th, etc. highest, should be consistent across all averaged years, i.e. the Nth highest from the distribution of daily maximum 1-hour concentrations should be chosen for each year, not 4th highest for one year, and 5th highest for another year. AERMOD (version 11059 or later) has an output option, MAXDCONT, to aid in this type of analysis and is discussed in more detail in Section 8.2. Such an analysis will lead to a more comprehensive identification of sources to possibly control to reach attainment of the NAAQS.

6.3. Good Engineering Practice (GEP) stack height

Consistent with previous SO_2 modeling guidance (U.S. EPA, 1994) and Section 6.2.2 of Appendix W, for stacks with heights that are within the limits of Good Engineering Practice (GEP), actual heights should be used in modeling. Under EPA's regulations at 40 CFR 51.100, GEP height, H_g, is determined to be the greater of:

- 65 m, measured from the ground-level elevation at the base of the stack;

- For stacks in existence on January 12, 1979, and for which the owner or operator had obtained all applicable permits or approvals required under 40 CFR Parts 51 and 52

  $$H_g=2.5H$$

  provided the owner or operator produces evidence that this equation was actually relied on in designing the stack or establishing an emission limitation to ensure protection against downwash;

  For all other stacks,

  $$H_g=H + 1.5L,$$

  where H is the height of the nearby structure(s) measured from the ground-level elevation at the base of the stack and L is the lesser dimension of height or projected width of nearby structure(s), or

- the height demonstrated by a fluid model or a field study approved by EPA or the State/local agency which ensures that the emissions from a stack do not result in excessive concentrations of any air pollutant as a result of atmospheric downwash, wakes, eddy effects created by the source itself, nearby structures or nearby terrain features.

For more details about GEP, see the Guideline for Determination of Good Engineering Practice Stack Height Technical Support Document (U.S. EPA, 1985).

If stack heights exceed GEP, then GEP heights should be used with the individual stack's other parameters (temperature, diameter, exit velocity). For stacks modeled with actual heights below GEP, building downwash should be considered as this can impact concentrations near the source (Section 6.2.2b, Appendix W). If building downwash is being considered, the BPIPPRIME program (U.S. EPA, 2004d) should be used to input building parameters for AERMOD. More information about buildings and stacks is in Section 6.5.

6.4. Dispersion techniques

As stated in past SO_2 modeling guidance (U .S. EPA, 1994), the CAA and EPA regulations generally prohibit stationary sources from taking credit for dispersion techniques in determining

allowable emission limitations. As stated in Section 5.3 of the 1994 SO_2 modeling guidance prohibited dispersion techniques are:

- Using that portion of a stack in excess of good engineering practice stack height
- Varying the pollutant emission rate according to atmospheric conditions or ambient concentrations of that pollutant (referred to as intermittent or supplemental control systems – ICS or SCS) or,
- Increasing final exhaust gas plume rise by manipulating source process parameters, exhaust gas parameters, stack parameters or combining exhaust gases from several existing stacks into one stack, or other selective handling of exhaust gas streams so as to increase the exhaust gas plume rise.

Exceptions to the prohibitions are:

- Merging of gas streams in original design and construction, or as part of a change that includes installation of controls and a net reduction in allowable emissions affected by the change
- Utilizing techniques which increase final, exhaust gas plume rise, provided facility-wide allowable emissions of SO_2 are less than 5,000 tons per years
- Smoke management techniques involved in agricultural or silvicultural programs
- Episodic restrictions on residential wood burning and open burning and,
- Reheating after a pollution control system

6.5. Source configurations and source types

An accurate characterization of the modeled facilities is critical for refined dispersion modeling, including accurate stack parameters and physical plant layout. Accurate stack parameters should be determined for the emissions being modeled. Since modeling would be done with maximum allowable or potential emissions levels at each stack, the stack's parameters such as exit temperature, diameter, and exit velocity should reflect those emissions levels. Accurate locations (i.e. latitude and longitude or Universal Transverse Mercator (UTM) coordinates and datum)[22] of the modeled emission sources are also important, as this can affect the impact of an emission source on receptors, determination of stack base elevation, and relative location to any nearby building structures. Not only are accurate stack locations needed, but accurate information for any nearby buildings is important. This information would include location and orientation relative to stacks and building size parameters (height, and corner coordinates of tiers) as these parameters are input into BPIPPRIME to calculate building parameters for AERMOD. If stack locations and or building information are not accurate, downwash will not be accurately accounted for in AERMOD.

Emission source type characterization within the modeling environment is also important. As stated in the AERMOD User's Guide (U.S. EPA, 2004a; U.S. EPA, 2011c), emissions

[22] Latitudes and longitudes to four decimal places position a stack within 30 feet of its actual location and five decimal places place a stack within three feet of its actual location. Users should use the greatest precision available.

sources can be characterized as several different source types: POINT sources, capped stacks (POINTCAP), horizontal stacks (POINTHOR), VOLUME sources, OPENPIT sources, rectangular AREA sources, circular area sources (AREACIRC), and irregularly shaped area sources (AREAPOLY). Note that POINTCAP and POINTHOR are not part of the regulatory default option in AERMOD because the user must invoke the BETA option in the model options keyword MODELOPT while not including the "DFAULT" modeling option for these options to work properly. While most sources can be characterized as POINT sources, some sources, such as fugitive releases or nonpoint sources (emissions from ports/ships, airports, or smaller point sources with no accurate locations) may be best characterized as VOLUME or AREA type sources. Sources such as flares can be modeled in AERMOD using the parameter input methodology described in Section 2.1.2 of the AERSCREEN User's Guide (U. S. EPA, 2011f). If questions arise about proper source characterization or typing, users should consult the appropriate EPA Regional Modeling Contact.

6.6. Urban/rural determination

For any dispersion modeling exercise, the urban or rural determination of a source is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. Figure 4 gives example maximum 1-hour concentration profiles for a 10 meter stack (Figure 3a) and a 100 m stack (Figure 3b) based on urban vs. rural designation. The urban population used for the examples is 100,000. In Figure 4a, the urban concentration is much higher than the rural concentration for distances less than 750 m from the stack but then drops below the rural concentration beyond 750 m. For the taller stack in Figure 4b, the urban concentration is much higher than the rural concentration even as distances increase from the source. These profiles show that the urban or rural designation of a source can be quite important.

In addition, for SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half life[23] for urban SO_2 sources. This would only be done for urban sources when the POLLUTID keyword in AERMOD is set to "SO_2" and the MODELOPT keyword includes the DFAULT option. Rural sources within the same AERMOD run would not be affected. If the DFAULT option is not included with the MODELOPT keyword, the 4-hour half life would not be used and the user would specify the 4-hour half life using the HALFLIFE or DCAYCOEFF keywords in order to account for the chemical transformation. See Section 3.2.6 of the AERMOD User's Guide (U.S. EPA, 2004a) for more details about these keywords. If the user invokes the HALFLIFE or DCAYCOEEF option, then any rural sources included in the modeling would need to be run in separate AERMOD runs so that they are not subject to the 4-hour half life. Note that if the DFAULT option is used, the rural sources would not need to be in a separate run from the urban sources. Determining whether a source is urban or rural can be done using the methodology outlined in Section 7.2.3 of Appendix W and recommendations outlined in Sections 5.1 through 5.3 in the AIG (U.S. EPA, 2009). In summary, there are two methods of urban/rural classification described in Section 7.2.3 of Appendix W.

The first method of urban determination is a land use method (Appendix W, Section 7.2.3c). In the land use method, the user analyzes the land use within a 3 km radius of the source

[23] Over a 4-hour period, SO_2 concentrations decrease by half from the initial value.

using the meteorological land use scheme described by Auer (1978). Using this methodology, a source is considered urban if the land use types, I1 (heavy industrial), I2 (light-moderate industrial), C1 (commercial), R2 (common residential), and R3 (compact residential) are 50% or more of the area within the 3 km radius circle. Otherwise, the source is considered a rural source. The second method uses population density and is described in Section 7.2.3d of Appendix W. As with the land use method, a circle of 3 km radius is used. If the population density within the circle is greater than 750 people/km^2, then the source is considered urban. Otherwise, the source is modeled as a rural source. Of the two methods, the land use method is considered more definitive (Section 7.2.3e, Appendix W).

Caution should be exercised with either classification method. As stated in Section 5.1 of the AIG (U.S. EPA, 2009), when using the land use method, a source may be in an urban area but located close enough to a body of water or other non-urban land use category to result in an erroneous rural classification for the source. The AIG in Section 5.1 cautions users against using the land use scheme on a source by source basis, but advises considering the potential for urban heat island influences across the full modeling domain. When using the population density method, Section 7.2.3e of Appendix W states, "Population density should be used with caution and should not be applied to highly industrialized areas where the population density may be low and thus a rural classification would be indicated, but the area is sufficiently built-up so that the urban land use criteria would be satisfied..." With either method, Section 7.2.3(f) of Appendix W recommends modeling all sources within an urban complex as urban, even if some sources within the complex would be considered rural using either the land use or population density method.

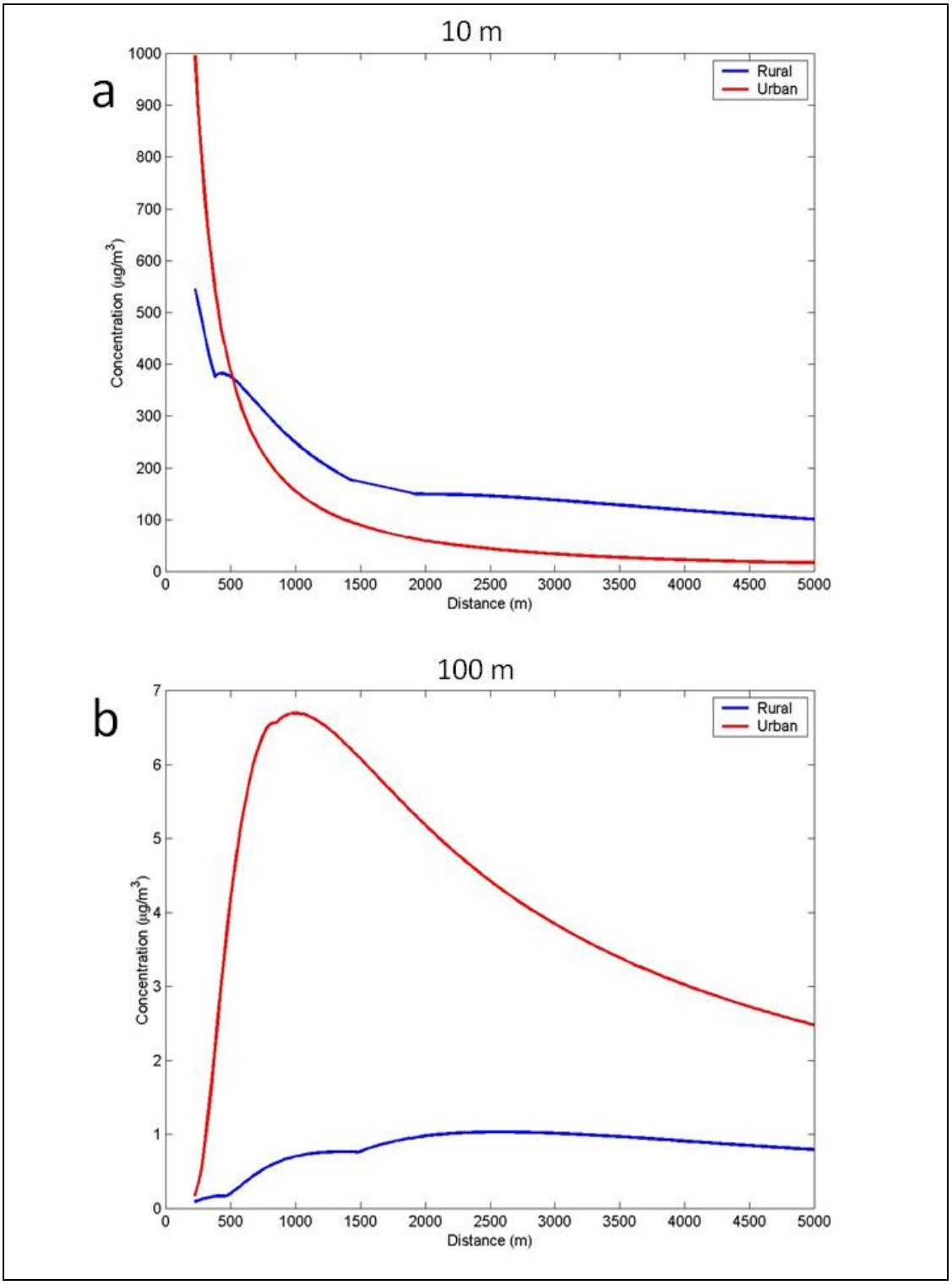

Figure 4. Urban (red) and rural (blue) concentration profiles for (a) 10 m buoyant stack release, and (b) 100 m buoyant stack release.

Another consideration that may need attention by the user and is discussed in Section 5.1 of the AIG relates to tall stacks located within or adjacent to small to moderate size urban areas. In such cases, the stack height or effective plume height for very buoyant sources may extend above the urban boundary layer height. The application of the urban option in AERMOD for these types of sources may artificially limit the plume height. The use of the urban option may not be appropriate for these sources, since the actual plume is likely to be transported over the urban boundary layer. Section 5.1 of the AIG gives details on determining if a tall stack should be modeled as urban or rural, based on comparing the stack or effective plume height to the urban boundary layer height. The 100 m stack illustrated in Figure 3b, may be such an example as the urban boundary layer height for this stack would be 189 m (based on a population of 100,000) and equation 104 of the AERMOD formulation document (Cimorelli, et al., 2004). This equation is:

$$z_{iuc} = z_{iuo}\left(\frac{P}{P_o}\right)^{1/4}$$

where z_{iuo} is a reference height of 400 m corresponding to a reference population P_o of 2,000,000 people.

Given that the stack is a buoyant release, the plume may extend above the urban boundary layer and may be best characterized as a rural source, even if it were near an urban complex. Exclusion of these elevated sources from application of the urban option would need to be justified on a case-by-case basis in consultation with the appropriate reviewing authority.

AERMOD requires the input of urban population when utilizing the urban option. Population can be entered to one or two significant digits (i.e., an urban population of 1,674,365 can be entered as 1,700,000). Users can enter multiple urban areas and populations using the URBANOPT keyword in the runstream file (U.S. EPA, 2004a; U.S. EPA, 2011c). If multiple urban areas are entered, AERMOD requires that each urban source be associated with a particular urban area or AERMOD model calculations will abort. Urban populations can be determined by using a method described in Section 5.2 of the AIG (U.S. EPA, 2009).

6.7. Source groups

In AERMOD, individual emission sources' concentration results can be combined into groups using the SRCGROUP keyword (Section 3.3.11 of the AERMOD User's Guide (U.S, EPA, 2004a). The user can automatically calculate a total concentration (from all sources) using the SRCGROUP ALL keyword. For the purposes of attainment demonstrations and design value calculations, source group ALL should be used, especially if all sources in the modeling domain are modeled in one AERMOD run. Design values should be calculated from the total concentrations (all sources and background). For the purposes of SIP modeling, individual source contributions outputs to the total concentration may be necessary to determine the effectiveness of control strategies. To avoid any confusion, source groups that are used to calculate the design value concentrations or determine source contributions to design values should be mutually exclusive (i.e. an emission source should not be in two source groups). This would be especially important if the design value concentrations are calculated outside of AERMOD by adding the individual groups together to calculate a total concentration (See

Section 8.1 of this document for examples). If individual source groups that are used in design value concentrations are not mutually exclusive, there would be double counting of concentrations when calculating design values either in AERMOD or outside of AERMOD.

7. Meteorological data

Section 7 gives guidance on the selection of meteorological data for input into AERMOD. Much of the guidance from Section 8.3 of Appendix W is applicable to SIP modeling and is summarized here. In Section 7.2.1, the use of a new tool, AERMINUTE (U.S. EPA, 2011h), is introduced. AERMINUTE is an AERMET pre-processor that calculates hourly averaged winds from ASOS (Automated Surface Observing System) 1-minute winds.

7.1. Surface characteristics and representativeness

The selection of meteorological data that are input into a dispersion model should be considered carefully. The selection of data should be based on spatial and climatological (temporal) representativeness (Appendix W, Section 8.3). The representativeness of the data is based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data are: National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), military stations, and others. Appendix W addresses spatial representativeness issues in Sections 8.3.a and 8.3.c.

Spatial representativeness of the meteorological data can be adversely affected by large distances between the source and receptors of interest and the complex topographic characteristics of the area (Appendix W, Section 8.3.a and 8.3.c). If the modeling domain is large enough such that conditions vary drastically across the domain then the selection of a single station to represent the domain should be carefully considered. Also, care should be taken when selecting a station if the area has complex terrain. While a source and meteorological station may be in close proximity, there may be complex terrain between them such that conditions at the meteorological station may not be representative of the source. An example would be a source located on the windward side of a mountain chain with a meteorological station a few kilometers away on the leeward side of the mountain. Spatial representativeness for off-site data should also be assessed by comparing the surface characteristics (albedo, Bowen ratio, and surface roughness) of the meteorological monitoring site and the analysis area. When processing meteorological data in AERMET (U.S. EPA, 2004c; U.S. EPA, 2011e), the surface characteristics of the meteorological site should be used [Section 8.3.c of Appendix Wand the AERSURFACE User's Guide (U.S. EPA 2008)]. Spatial representativeness should also be addressed for each meteorological variable separately. For example, temperature data from a meteorological station several kilometers from the analysis area may be considered adequately representative, while it may be necessary to collect wind data near the plume height (Section 8.3.c of Appendix W).

Surface characteristics can be calculated in several ways. For details see Section 3.1.2 of the AIG (U.S. EPA, 2009). EPA has developed a tool, AERSURFACE (U.S. EPA, 2008) to aid

in the determination of surface characteristics. The current version of AERSURFACE uses 1992 National Land Cover Data. Note that the use of AERSURFACE is not a regulatory requirement but the methodology outlined in Section 3.1.2 of the AIG should be followed unless an alternative method can be justified.

7.2. Meteorological inputs

Appendix W states in Section 8.3.1.1 that the user should acquire enough meteorological data to ensure that worst-case conditions are adequately represented in the model results. Appendix W states that 5 years of NWS meteorological data or at least one year of site-specific data should be used(Section 8.3.1.2, Appendix W) and should be adequately representative of the study area. If one or more years (including partial years) of site-specific data are available, those data are preferred. While the form of the SO_2 NAAQS contemplates obtaining three years of monitoring data, this does not preempt the use of 5 years of NWS data or at least one year of site-specific data in the modeling. The 5-year average based on the use of NWS data, or an average across one or more years of available site specific data, serves as an unbiased estimate of the 3-year average for purposes of modeling demonstrations of compliance with the NAAQ (See the August 23, 2010 Clarification Memorandum on "Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard" (U. S. EPA, 2010a). See the memorandum for more details on the use of 5 years of NWS data or at least one year of site-specific data and applicability to the NAAQS.

7.2.1. NWS data

NWS data are available from the National Climatic Data Center (NCDC) in many formats, with the most common one in recent years being the Integrated Surface Hourly data (ISH). Most available formats can be processed by AERMET. As stated in Section 7.1, when using data from an NWS station alone or in conjunction with site-specific data, the data should be spatially and temporally representative of conditions at the modeled sources.

A recently discovered issue with ASOS is that 5-second wind data that are used to calculate the 2-minute average winds are truncated rather than rounded to whole knots. For example, a wind of 2.9 knots is reported as 2 knots, not 3 knots. To account for this truncation of NWS winds (either standard observation or AERMINUTE output), an adjustment of ½ knot or 0.26 m/s is added to the winds in stage 3 AERMET processing. For more details refer to the AERMET User's Guide Addendum (U.S. EPA, 2011e) and/or the appropriate EPA Regional Modeling Contact.

7.2.1.1. AERMINUTE

In AERMOD, concentrations are not calculated for variable wind (i.e., missing wind direction) and calm conditions, resulting in zero concentrations for those hours. Since the SO_2 NAAQS is a one hour standard, these light wind conditions may be the controlling meteorological circumstances in some cases because of the limited dilution that occurs under low wind speeds which can lead to higher concentrations. The exclusion of a greater number of instances of near-calm conditions from the modeled concentration distribution may therefore

lead to underestimation of daily maximum 1-hour concentrations for calculation of the design value.

To address the issues of calm and variable winds associated with the use of NWS meteorological data, EPA has developed a preprocessor to AERMET, called AERMINUTE (U.S. EPA, 2011h) that can read 2-minute ASOS winds and calculate an hourly average. Beginning with year 2000 data, NCDC has made the 1-minute wind data, reported every minute from the ASOS network freely available. The AERMINUTE program reads these 2-minute winds and calculates an hourly average wind. In AERMET, these hourly averaged winds replace the standard observation time winds read from the archive of meteorological data. This results in a lower number of calms and missing winds and an increase in the number of hours used in averaging concentrations. For more details regarding the use of NWS data in regulatory applications see Section 8.3.2 of Appendix W and for more information about the processing of NWS data in AERMET and AERMINUTE, see the AERMET (U.S. EPA, 2004c; U. S. EPA, 2011e) and AERMINUTE User's guides (U.S. EPA, 2011h).

Since the release of AERMINUTE in 2011, some permitting agencies have expressed concern that the inclusion of AERMINUTE output in AERMOD will lead to an increase in the conservatism of AERMOD output. This perceived increase in conservatism is due to an increase in hours with lower wind speeds input into AERMOD. The purpose of AERMINUTE is not to lead more conservative concentration estimates, but to increase the data quality and representativeness of the meteorological inputs into AERMOD. Concentrations are not calculated for hours with reported calm winds or variable winds. These calm or variable winds are due to the METAR reporting code used to report ASOS observations. In the METAR coding used to report surface observations beginning July 1996, a calm wind is defined as a wind speed less than 3 knots and is assigned a value of 0 knots. The METAR code also introduced the variable wind observation that may include wind speeds up to 6 knots, but the wind direction is reported as missing, if the wind direction varies more than 60 degrees during the 2-minute averaging period for the observation. These are often hours of interest because these are light wind conditions and important for an hourly SO_2 standard. With the use of AERMINUTE, hourly averages can be calculated for those hours with reported calm or missing winds, because the 2-minute average winds in the one-minute data files have not been subjected to the METAR coding. In effect, AERMINUTE is obtaining data that was unavailable because of METAR coding, making the meteorological data more representative of the area.

7.2.2. Site-specific data

The use of site-specific meteorological data is the best way to achieve spatial representativeness. AERMET can process a variety of formats and variables for site-specific data. The use of site-specific data for regulatory applications is discussed in detail in Section 8.3.3 of Appendix W. Due to the range of data that can be collected onsite and the range of formats of data input to AERMET, the user should consult Appendix W, the AERMET User's Guide (U.S. EPA, 2004c; U. S. EPA, 2011e), and Meteorological Monitoring Guidance for Regulatory Modeling Applications (U.S. EPA, 2000). Also, when processing site-specific data for an urban application, Section 3.3 of the AERMOD Implementation Guide offers recommendations for data processing. In summary, the guide recommends that site-specific

turbulence measurements should not be used when applying AERMOD's urban option, in order to avoid double counting the effects of enhanced turbulence due to the urban heat island.

7.2.3. Areas without representative meteorological data

In areas with SO_2 sources where the state has determined that there is no representative meteorological data, it may be difficult to perform accurate refined dispersion modeling for the implementation modeling. In nonattainment or unclassifiable areas composed of isolated sources, it may be possible to use AERSCREEN (U.S. EPA, 2011g) to conservatively determine the attainment status of an area. As noted in Section 5.1, AERSCREEN does not output a design value metric to compare to the SO_2 NAAQS but does output the maximum 1-hour concentration which can be used as a conservative estimate to compare to the NAAQS. Any use of AERSCREEN or screening meteorology in the absence of hourly representative meteorological data should be considered carefully and in consultation with the appropriate Regional Office modeling contact.

Currently, the screening meteorology created by the MAKEMET processor for use with AERSCREEN cannot be used to calculate an SO_2 design value. If screening meteorology is used in AERMOD, the SO2 design value cannot be calculated. AERMOD will abort processing if screening meteorology is used and an SO_2 design value is requested in the input file.

7.2.4. Upper air data

AERMET requires full upper air soundings to calculate the convective mixing height. For AERMOD applications in the U.S., the early morning sounding, usually the 1200 UTC (Universal Time Coordinate) sounding, is typically used for this purpose. Upper air soundings can be obtained from the Radiosonde Data of North America CD for the period 1946-1997. Upper air soundings for 1994 through the present are also available for free download from the Radiosonde Database Access website. Users should choose all levels or mandatory and significant pressure levels[24] when selecting upper air data. Selecting mandatory levels only would not be adequate for input into AERMET as the use of just mandatory levels would not provide an adequate characterization of the potential temperature profile.

8. Background concentrations

The inclusion of ambient background concentrations is important in determining cumulative impacts. The modeled contribution to the cumulative analysis should follow the form of the standard and be calculated as described in Section 2.6.1.2 of the August 23, 2010 clarification memo on "Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard" (U. S. EPA, 2010a) This memo suggested a "first tier" approach to including a uniform monitored background contribution based on adding the overall highest hourly background SO_2 concentration from a representative monitor to the modeled design value. We recognize that this approach could be overly conservative in many cases and

[24] By international convention, mandatory levels are in millibars: 1,000, 850, 700, 500, 400, 300, 200, 150, 100, 50, 30, 20, 10,7 5, 3, 2, and 1. Significant levels may vary depending on the meteorological conditions at the upper-air station

may also be prone to reflecting source-oriented impacts, increasing the potential for double-counting of modeled and monitored contributions. As discussed in EPA's March 1, 2011 memo "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 Ambient Air Quality Standard" (U. S. EPA, 2011a), and the March 24, 2011 SO_2 designations guidance memo (U.S. EPA, 2011b) we recommend a less conservative "first tier" approach for a uniform monitored background concentration based on the monitored design values for the latest 3-year period, regardless of the years of meteorological data used in the modeling. Adjustments to this approach may be considered in consultation with the appropriate EPA Regional Modeling Contact with adequate justification and documentation of how the background concentration was calculated.

Section 8.2.2 of Appendix W gives guidance on background concentrations for isolated single sources and is also applicable for multi-source areas. One option is, as described in Section 8.2.2.b:

> "Use air quality data in the vicinity of the source to determine the background concentration for the averaging times of concern. Determine the mean background concentration at each monitor by excluding concentrations when the source in question is impacting the monitor… For shorter time periods, the meteorological conditions accompanying concentrations of concern should be identified. Concentrations for meteorological conditions of concern, at monitors, not impacted by the source in question, should be averaged for separate averaging time to determine the average background value. Monitoring sites inside a 90° degree sector downwind of the source may be used to determine the area of impact."

When no monitors are located in the vicinity of the sources being modeled a "regional site" (i.e., one that is located away from the area of interest but is impacted by similar natural and distant man-made sources) may be used to determine background (Section 8.2.2.c, Appendix W). In multi-source areas, background includes two components, nearby sources and other sources (Section 8.2.3 of Appendix W). Nearby sources are those sources that are expected to cause a significant concentration gradient in the vicinity of the source or sources under consideration, and should be explicitly modeled. Identification of nearby sources calls for professional judgment and consultation with the appropriate EPA Regional Modeling Contact. For other sources, such as natural sources, minor sources and distant major sources, the methodology of Section 8.2.2 should be used.

EPA's March 24, 2011 memo for SO_2 designations guidance (U.S. EPA, 2011b) describes an appropriate methodology of calculating temporally varying background monitored concentrations by hour of day and season (excluding periods when the source in question is expected to impact the monitored concentration). The methodology for SO_2 is to use the 99^{th} percentile concentration for each hour of the day by season and average across three years, excluding periods when the dominant source(s) are influencing the monitored concentration (i.e., 99^{th} percentile, or 4^{th} highest, concentrations for hour 1 for January or winter, 99^{th} percentile concentrations for hour 2 for January or winter, etc.). Recent updates included in AERMOD allow for the inclusion of temporally varying background concentrations in the design value

calculation in combination with modeling results. See the AERMOD User's Guide Addendum for more details (U. S. EPA, 2011c).

As an illustrative example Figure 5 shows the 1-hour SO_2 NAAQS level, the design value (the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations), and 3-year averages of the 99th percentile concentrations by season and hour of day. To calculate the 99th percentile concentration for a season and hour of day combination (no consideration for day of week), the second highest concentration for that combination should be selected. Also shown are 3-year averages of the 99th percentile concentration by hour of day (across all seasons), and the average concentration by hour of day across the three years[25]. In this example, the winter background concentrations show a distinct diurnal variability, with less for each of the other seasons.

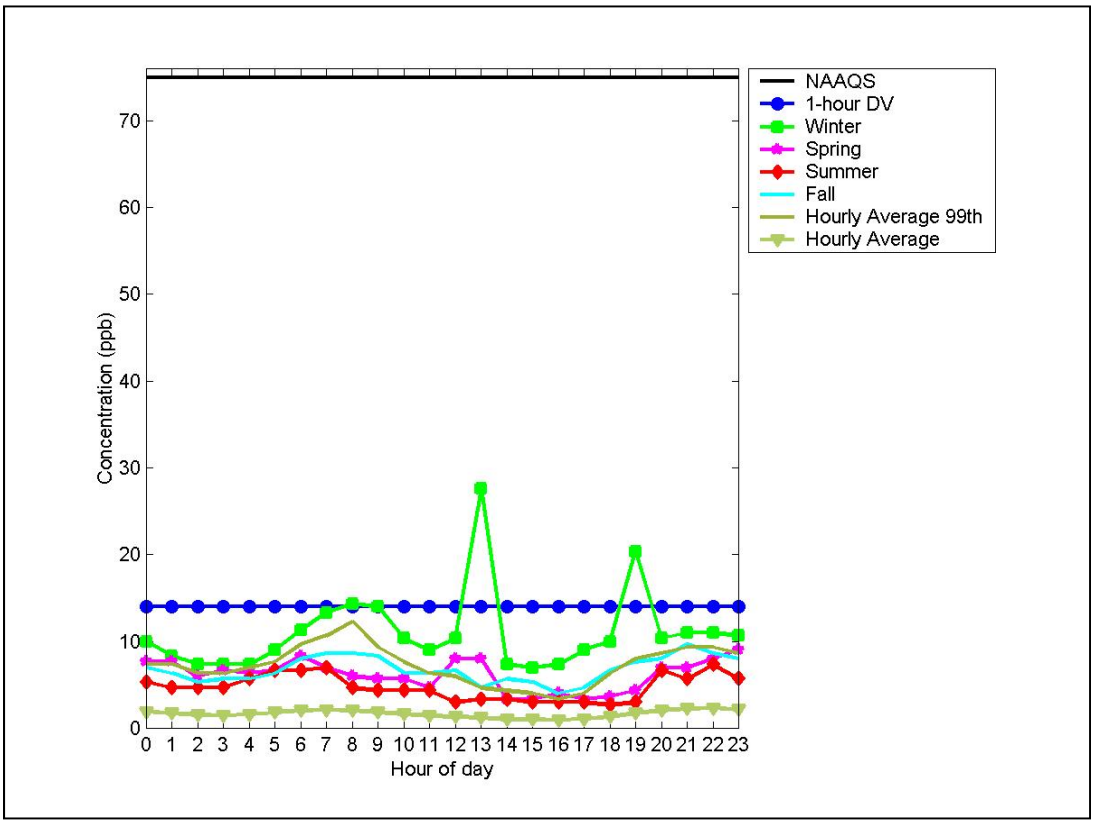

Figure 5. SO_2 monitored concentrations for various averaging times.

In summary background concentrations can be included as:

- Highest monitored hourly SO_2 background concentration
- "First tier" approach based on monitored design values added to modeled design values; or

[25]Modelers should use the 1st-highest value for more detailed pairings, such as month by hour-of-day or season by hour-of-day *and* day-of-week (consider day of week in calculating values).

- Temporally varying based on the 99th percentile monitored concentrations by hour of day and season added to modeled design values.

9. Determining design value metrics

Refined dispersion modeling for SIPs will provide predictions of SO_2 design values at each receptor that includes contributions from all modeled sources and background. Based on the form of the 1-hour SO_2 NAAQS, the design value should be calculated as the average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations averaged across the modeled years.

9.1. Design value calculation methodology

Whether design values are calculated within AERMOD or outside of AERMOD, to calculate a design value to compare against the standard, the following steps should be followed:

1. At each receptor, for each hour of the modeled period, calculate a total concentration across all sources including background concentrations if applicable. This can be done in AERMOD using SRCGROUP ALL or by adding individual source groups outside of AERMOD, using hourly POSTFILEs. If the user is totaling the concentrations outside of AERMOD, the source groups need to be mutually exclusive, i.e. no one source should be in multiple source groups.
2. From the total concentrations calculated in step 1, obtain the 1-hour maximum concentration at each receptor for each modeled day.
3. From the output of step 2, for each year modeled, calculate the 99th percentile (4th highest) daily maximum 1-hour concentration at each receptor. If modeling 5 years of meteorological data, this results in five 99th percentile concentrations at each receptor.
4. Average the 99th percentile (or 4th highest) concentrations across the modeled years to obtain a design value at each receptor.
5. Modeled source contributions to a NAAQS violation can be determined by analyzing the hourly concentrations from the individual source groups corresponding to the same hour as the 4th daily maximum 1-hour concentration from each year. See 75 FR at 35540. For example, a receptor has a 5-year average design value of 200.8 mg/m^3 (or approximately 77 ppb) and AERMOD was modeled for the period January 1, 2005 through December 31, 2009 for four source groups. From the AERMOD output, the user can determine the date of the 4th highest daily maximum 1-hour concentrations that are used to calculate the 5-year average design value. Table 1 shows the 4th highest daily maximum 1-hour concentrations for each year and associated dates that are used in the design value calculation.

Table 1. 4th highest daily maximum 1-hour concentrations (µg/m^3) for 2005-2009.

Date (YYMMDDHH)	Concentration
05080101	200.1
06073105	201.5
07080403	207.1
08072705	197.1
09080104	198.1
5-YEAR AVG.	200.8

If output by source group is available, the user can extract each source group's concentration at each of the hours listed in Table 1. Table 2 shows example source contributions for each hour shown in Table 1 and indicates that Source 1 is the main contributor to the design value for all hours.

Table 2. Source contributions to 4th highest daily maximum 1-hour concentrations (µg/m^3) and 5-year average design values.

Date (YYMMDDHH)	TOTAL	SOURCE 1	SOURCE 2	SOURCE 3	SOURCE 4
05080101	200.1	155.1	25.1	1.5	18.4
06073105	201.5	157.4	26.2	0.5	17.4
07080403	207.1	161.5	20.5	2.1	23.0
08072705	197.1	159.2	23.1	1.7	13.1
09080104	198.1	155.3	22.6	2.0	18.2
5-YEAR AVG.	200.8	157.7	23.5	1.6	18.0

When calculating design values and there are exceedances of the NAAQS, one may need to consider other percentiles below the 99th percentile as well. Examining percentiles below the 99th percentile would be useful in the context of determining sources that may be significant contributors to a NAAQS violation, i.e. a source's contribution may be above the SIL. There may be cases in which a source is not a significant contributor to the design value as defined in the NAAQS, but may be a significant contributor at a lower percentile that is still above the NAAQS level. Sources that fit this category should not be immediately discounted when determining sources to control for attaining the NAAQS. To calculate design values based on other percentiles, one can just step down through the 5th, 6th, 7th, etc. highest of the annual distributions of daily maximum 1-hour concentrations in steps 3 through 5 in the five steps listed above until no concentrations exceed the NAAQS level. The individual sources' contributions can then be determined to be significant or not.

9.2. Running AERMOD and implications for design value calculations

Recent enhancements to AERMOD include options to aid in the calculation of design values for comparison with the SO_2 NAAQS. These enhancements include:

- The output of daily maximum 1-hour concentrations by receptor for each day in the modeled period for a specified source group. This is the MAXDAILY output option in AERMOD.
- The output, for each rank specified on the RECTABLE output keyword, of daily maximum 1-hour concentrations by receptor for each year for a specified source group. This is the MXDYBYYR output option.
- The MAXDCONT option, which shows the contribution of each source group to the high ranked values for a specified target source group, paired in time and space. The user can specify a range of ranks to analyze, or specify an upper bound rank, i.e. 4th highest, and a lower threshold value, such as the NAAQS for the target source group. The model will process each rank within the range specified, but will stop after the first rank (in descending order of concentration) that is below the threshold, specified by the user. A warning message will be generated if the threshold is not reached within the range of ranks analyzed (based on the range of ranks specified on the RECTABLE keyword). This option may be needed to aid in determining which sources should be considered for controls.

For more details about the enhancements see the AERMOD User's guide Addendum (U. S. EPA, 2011c).

Ideally, all explicitly modeled sources, receptors, and background should be modeled in one AERMOD run for all modeled years. In this case, the use of the one of the above output options can be used in AERMOD to calculate design values for comparison to the NAAQS and determine the area's attainment status and/or inform attainment/nonattainment boundaries. The use of these options in AERMOD allows AERMOD to internally calculate concentration metrics that can be used to calculate design values and therefore lessen the need for large output files, i.e. hourly POSTFILES.

However, there may be situations where a single AERMOD run with all explicitly modeled sources is not possible. These situations often arise due to runtime or storage space considerations during the AERMOD modeling. Sometimes separate AERMOD runs are done for each facility or group of facilities, or by year, or the receptor network is divided into separate sub-networks. In some types of these situations, the MAXDAILY, MXDYBYYR, or MAXDCONT output option may not be an option for design value calculations, especially if all sources are not included in a single run. If the user wishes to utilize one of the three output options, then care should be taken in developing the model inputs to ensure accurate design value calculations.

Situations that would effectively preclude the use of the MAXDAILY, MXDYBYYR, and MAXDCONT option to calculate meaningful AERMOD design value calculations include the following examples:

- Separate AERMOD runs for each source or groups of sources.
    - SIP modeling includes 10 facilities for five years of NWS data and each facility is modeled for five years in a separate AERMOD run, resulting in 10 separate AERMOD runs.

- Separate AERMOD runs for each source and each modeled year.
    - 10 facilities are modeled for 5 years of NWS data. Each facility is modeled separately for each year, resulting in fifty individual AERMOD runs.

In the two situations listed above, the MAXDAILY, MXDYBYYR, or, MAXDCONT option would not be useful as the different AERMOD runs do not include a total concentration with contributions from all facilities. In these situations the use of hourly POSTFILES, which can be quite large, and external post-processing would be needed to calculate design values.

Situations in which the MAXDAILY, MXDYBYYR, or, MAXDCONT options may be used but may necessitate some external post-processing afterwards to calculate a design value include:

- The receptor network is divided into sections and an AERMOD run, with all sources and years, is made for each sub-network.
    - A receptor network of 20,000 receptors is divided into four 5,000 receptor sub-networks. Ten facilities are modeled with five years of NWS data in one AERMOD run for each receptor network, resulting in four AERMOD runs. After the AERMOD runs are complete, the MAXDAILY, MXDYBYYR, or, MAXDCONT results for each network can be re-combined into the larger network.
- All sources and receptors are modeled in an AERMOD run for each year.
- Ten facilities are modeled with five years of NWS data. All facilities are modeled with all receptors for each year individually, resulting in five AERMOD runs. MAXDAILY, MXDYBYYR, or, MAXDCONT output can be used and post-processed to generate the necessary design value concentrations. The receptor network is divided and each year is modeled separately for each sub-network with all sources.

    Ten facilities are modeled with five years of NWS data for 20,000 receptors. The receptor network is divided into four 5,000 receptor networks. For each sub-network, all ten facilities are modeled for each year separately, resulting in twenty AERMOD runs. MAXDAILY, MXDYBYYR, or, MAXDCONT output can be used and post-processed to generate the necessary design value concentrations.

10. Documentation

It is expected that the state would submit a modeling and analysis protocol that details the methodology and model inputs before commencement of the modeling exercise. This information should support the states' implementation plans and provide a basis for EPA's review and evaluation. The protocol should include the following:

- Characterization of the nonattainment problem or characterization of the modeled area in absence of a violating monitor,

- An emissions analysis around the violating monitor or area under consideration for the attainment and maintenance demonstration in absence of a violating monitor, and
- Methodology for preparing air quality and meteorology inputs including choice of meteorological data and representativeness of the data.

Additionally, post-modeling documentation should include:

- Summary and analysis of modeling results, and
- Provision of modeling data inputs and outputs in electronic form.

A meeting with the appropriate EPA Regional Modeling Contact and other technical and planning staff to discuss the modeling and analysis protocol is recommended before submitting the protocol and beginning any refined modeling. For example modeling protocols, please see the SCRAM website on SO2 Implementation at:
http://www.epa.gov/ttn/scram/so2_modeling_guidance.htm.

11. Summary

In summary, we emphasize the following key points of this modeling guidance:

- AERMOD is EPA's preferred near-field dispersion model for regulatory applications and is applicable for SO_2 SIPs modeling consistent with EPA's *Guideline on Air Quality Models*, also published as Appendix W of 40 CFR Part 51.
- Sources should be modeled with maximum allowable 1-hour or short-term emission rates in the SIP modeling based on continuous operations at the source.
- It is reasonable to initially focus on larger emitters, i.e. –100 or more tons per year but smaller sources, especially those with short stacks and/or located in complex terrain can possibly cause or contribute to NAAQS violations.
- Modeling should be done with five years of representative NWS meteorological data or at least one year of site specific meteorology.
- Background concentrations can be included as:
    - "First tier" approach based on monitored design values added to modeled design values; or
    - Temporally varying based on the 99^{th} percentile monitored concentrations by hour of day and season added to modeled design values.
- States should submit a modeling and analysis protocol that details the methodology and model inputs before commencement of the modeling exercise. This information should support the states' recommended SIPs, and provide a basis for EPA's evaluation of them.
- At any time during the SIP process when there are questions regarding modeling or interpretation of this guidance, the appropriate EPA Regional Modeling Contact should be consulted.

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Appendix B

Guidance on Section 110(a)(2) Infrastructure SIP Requirements

The Clean Air Act (CAA) directs states to address basic SIP requirements to assure attainment and maintenance of the standards. States are to submit these SIPs, pursuant to CAA sections 110(a)(1) and 110(a)(2), within 3 years after promulgation of a new or revised primary standard. Many of the section 110(a)(2) SIP elements relate to the general information and authorities that constitute the "infrastructure" of a state's air quality management program, and these have been in place since the initial SIPs were submitted in response to the 1970 CAA. It is the responsibility of each state to review its air quality management program's infrastructure SIP provisions in light of each new or revised NAAQS.

States should review and revise, as appropriate, their existing SO_2 SIPs to ensure that they are adequate to address the 2010 1-hour SO_2 NAAQS. States should, in consultation with EPA Regional Offices, follow applicable EPA regulations governing SIP submittals in 40 CFR Part 51. See, *e.g.*, Subpart H ("Prevention of Air Pollution Emergency Episodes"), Subpart I ("Review of New Sources and Modifications"), Subpart J (Ambient Air Quality Surveillance), Subpart K (Source Surveillance), Subpart L (Legal Authority), Subpart M ("Intergovernmental Consultation"), Subpart O (Miscellaneous Plan Content Requirements), Subpart P ("Protection of Visibility"), and Subpart Q ("Reports").

For many infrastructure SIP elements, a SIP submittal should refer to and include citations to relevant state regulations. See, *e.g.*, our guidance below regarding elements (F), (H), (J), and (M). For EPA's general criteria for SIP submittals, refer to 40 CFR Part 51, Appendix V, "Criteria for Determining the Completeness of Plan Submissions." For example, in accordance with Appendix V, paragraph 2.1(d), a SIP submittal would include a copy of the actual regulation that the state is submitting for approval and incorporation by reference into its SIP, if a copy of that regulation has not already been provided by the state.

Pursuant to section 110(a), states must provide reasonable notice and opportunity for public hearing for all infrastructure SIP submittals. Pursuant to EPA's regulations at 40 CFR Part 51, a SIP submittal is to include a certification by the state that the public hearing was held in accordance with EPA's procedural requirements for public hearings. See paragraph 2.1(g) of Appendix V to Part 51 and 40 CFR 51.102.

If a state believes that its existing (already approved) infrastructure SIP is adequate with respect to one or more section 110(a)(2) infrastructure elements (or sub-elements), then the state's SIP submission may be a certification that the existing SIP contains provisions that fully address those section 110(a)(2) infrastructure elements (or sub-elements) as applicable for the 2010 1-hour SO_2 NAAQS.[26] Such certification (*e.g.*, in the form of a letter to EPA from the Governor or her/his designee) should cite the applicable provisions in the existing SIP and provide a specific description of how compliance with each element is achieved. EPA's policy position is that a state's certification made in connection with the 2010 1-hour SO_2 NAAQS should be included in a SIP submittal only after the state has provided public notice and opportunity for public hearing on its certification.

Section 110(a)(2) of the CAA directs all states to develop and maintain an air quality management infrastructure that includes enforceable emission limitations, an ambient monitoring program, an enforcement program, air quality modeling capabilities, and adequate personnel, resources, and legal authority. Section 110(a)(2)(D) also directs SIPs to prohibit emissions, from within the state, that contribute significantly to nonattainment in any other state or that interfere with maintenance in any other state, or that interfere with programs under part C of the CAA to prevent significant deterioration of air quality or to protect visibility in any other state.

Two elements identified in section 110(a)(2) include requirements that are not governed by the 3-year submission deadline of section 110(a)(1). The requirements pertain to part D, of title I of the CAA, which addresses plan requirements for nonattainment areas. Therefore, the following section 110(a)(2) elements are considered by EPA to be outside the scope of infrastructure SIP actions: (1) section 110(a)(2)(C) to the extent it refers to permit programs (known as "nonattainment new source review") required under part D; and
(2) section 110(a)(2)(I) in its entirety. EPA does not expect infrastructure SIP submittals to include regulations or emission limits developed specifically for attaining the relevant standard. Those submittals are due at the time the nonattainment area planning requirements are due (18 months following designation).

[26] This certification does not serve as a demonstration for purposes of CAA section 110(l) that the state has in fact attained and maintained the 1-hour SO_2 NAAQS. That demonstration, which is part of a required attainment plan for unclassifiable areas, is specific to the 2010 1-hour SO_2 NAAQS and is addressed elsewhere in our implementation guidance.

Except as described above, subsections (A) through (M) of section 110(a)(2) set forth the infrastructure elements that a SIP should address in order to be approved by EPA. The elements are presented below in context of the 2010 1-hour SO_2 NAAQS.

Section 110(a)(2)(A): Emission limits and other control measures

> *"Each such plan shall [. . .] include enforceable emission limitations and other control measures, means, or techniques (including economic incentives such as fees, marketable permits, and auctions of emissions rights), as well as schedules and timetables for compliance, as may be necessary or appropriate to meet the applicable requirements of this chapter."*

EPA would not expect infrastructure SIP submissions to identify nonattainment emissions controls. Emissions limitations and other control measures to attain the 2010 NAAQS in areas designated nonattainment for the 2010 1-hour SO_2 NAAQS are on a different schedule from the section 110(a) infrastructure elements and will be reviewed and acted upon through a separate process. However, the infrastructure SIP submission should include a list or table referencing all SO_2 emission reduction measures adopted and relied on by the state to meet other CAA requirements. Such SO_2 emission reduction measures may be a required part of a "maintenance track" attainment plan for the SIP submittal due in June 2013. The measures identified by the state should show, through dispersion modeling, that affected areas would be projected to be in compliance with the NAAQS as expeditiously as practicable, which we would expect to be no later than the year 2017. The attainment plan elements are specific to the 2010 1-hour SO_2 NAAQS and are addressed elsewhere in our implementation guidance.

There are two issues that generally fall under this particular element of section 110(a)(2)(A) for which we are not prepared to issue guidance at this time. They are: (1) how states would need to address previously approved emissions limitations that may treat startup, shutdown and malfunction (SSM) events inconsistently with our longstanding guidance on excess emissions; and (2) how states would need to address previously approved variance provisions and "director's discretion" provisions that do not comport with EPA policy. We are currently discussing options for resolving these issues, taking into consideration several actions

on state provisions relating to SSM and director's discretion in which EPA is currently engaged[27] (*e.g.*, infrastructure SIPs for Utah and North Dakota). Also, EPA has proposed to enter a settlement agreement that would obligate EPA to respond by August 31, 2012, to a petition for rulemaking filed by the Sierra Club that concerns SSM provisions in 39 states' SIPs . (See notice published in the Federal Register on September 1, 2011, at 76 FR 54465.) Under terms of this "Ozone Settlement Agreement," by August 31, 2012 EPA would either grant or deny the SSM petition with respect to states' individual provisions and further would take final action (such as an SSM SIP Call) with respect to those provisions on which we grant the petition.

Nevertheless, in the meantime EPA wishes to provide infrastructure SIP guidance to the extent possible. Therefore, as general guidance, EPA can advise that states not make infrastructure SIP submissions that rely on previously approved but potentially flawed provisions. Further, we wish to make clear that for infrastructure SIP submissions such as for the 2008 Pb NAAQS, any "new" (*i.e.,* not already SIP-approved) provisions should be consistent with EPA's longstanding policies on SSM and director's discretion, which are briefly summarized as follows.[28] See page 25652 at http://69.175.53.6/register/2011/may/05/2011-10995.pdf. Because excess emissions might aggravate air quality so as to prevent attainment and maintenance of the NAAQS and compliance with other CAA requirements, EPA would view all periods of excess emissions as violations of the applicable emission limitation. Therefore, new provisions as part of an approvable SIP submittal could not exempt from enforcement excess emissions that may occur at a facility during a period of startup or shutdown. Further, new provisions as part of an approvable SIP submittal could not automatically exempt from enforcement excess emissions claimed to result from an equipment malfunction. In addition, new provisions as part of an approvable SIP submittal could not allow a state air director the discretion to determine whether an instance of excess emissions is a violation of an emission limitation, because such a determination could bar EPA and citizens from enforcing applicable requirements.

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[27] See *e.g.,* infrastructure SIPs for Utah and North Dakota. EPA has also proposed to enter a settlement agreement that would obligate EPA to respond by August 31, 2012, to a petition for rulemaking filed by the Sierra Club that concerns SSM provisions in 39 states' SIPs . (See notice published in the Federal Register on September 1, 2011, at 76 FR 54465.)

[28] For further description of EPA's policy on SSM and director's discretion, see, *e.g.*, a memorandum dated September 20, 1999, entitled, "State Implementation Plans: Policy Regarding Excess Emissions During Malfunctions, Startup, and Shutdown," from Steven A. Herman, Assistant Administrator for Enforcement and Compliance Assurance, and Robert Perciasepe, Assistant Administrator for Air and Radiation.

Section 110(a)(2)(B): Ambient air quality monitoring/data system

"Each such plan shall [. . .] provide for establishment and operation of appropriate devices, methods, systems, and procedures necessary to (i) monitor, compile, and analyze data on ambient air quality, and (ii) upon request, make such data available to the Administrator."

To meet section 110(a)(2)(B) requirements for this NAAQS, the state should provide in the SIP for a monitoring system to:

- Monitor air quality for SO_2 at appropriate locations throughout the state using EPA approved Federal Reference Method or equivalent monitors. States would need to install new SO_2 monitors in accordance with recent revisions to the SO_2 monitoring network requirements.
- Submit data to EPA's Air Quality System (AQS) in a timely manner, in accordance with EPA's air quality data reporting regulations. See 40 CFR 51.320, "Annual air quality data report."
- Submit approvable annual monitoring plans to EPA that describe how the state has complied with monitoring requirements and explain any proposed changes to the network.
- Provide the EPA Regional Office prior notification of any planned changes to monitoring sites or to the network plan.

Section 110(a)(2)(C): Programs for enforcement, PSD, and NSR

"Each such plan shall [. . .] include a program to provide for the enforcement of the measures described in subparagraph (A), and regulation of the modification and construction of any stationary source within the areas covered by the plan as necessary to assure that national ambient air quality standards are achieved, including a permit program as required in parts C and D of this subchapter."

The Prevention of Significant Deterioration (PSD) and nonattainment New Source Review (NNSR) programs contained in parts C and D of title I of the CAA, and collectively referred to as the major New Source Review (NSR) program, govern preconstruction review and

permitting of any new or modified major stationary sources of air pollutants regulated under the CAA as well as any precursors to the formation of that pollutant when identified for regulation by the Administrator.[29] The EPA rules addressing these programs can be found generally at 40 CFR 51.166 and 52.21 (for PSD), and 51.165, 52.24, and Part 51, Appendix S (for NNSR).

To meet section 110(a)(2)(C) requirements for this NAAQS, the SIP submittal should:

- Reference relevant state and federal regulations that provide for enforcement of SO_2 emission limits and control measures.
- Identify the various state regulations that govern permitting of new and modified stationary sources (minor and major) of SO_2 in the state.
- Revise its PSD program regulations to address any applicable EPA amendments to SO_2 PSD rules within 3 years from the date of such amendments.

For areas subject to a state's SIP-approved PSD program, the state should demonstrate that it is authorized to implement its existing PSD permit program to ensure that the construction and modification of major stationary sources does not cause or contribute to a violation of the new 1-hour primary SO_2 NAAQS. The state's PSD program should ensure that new or modified sources will apply the Best Available Control Technology to reduce SO_2 emissions in accordance with CAA sections 165(a)(3) and (4).

The state's PSD program should apply to sources that emit greenhouse gases (GHG) in accordance with EPA's Tailoring Rule.[30] Among other things, the state's PSD program must either: (i) limit PSD applicability to GHG-emitting sources by adopting the applicability thresholds included in the Tailoring Rule; or (ii) adopt lower GHG thresholds and show that the state has adequate personnel and funding to administer and implement those lower thresholds. Otherwise, the state is directed to remove from EPA's consideration for approval that portion of the SIP (or SIP submission) for which EPA rescinded our previous approval of the PSD program (in a rulemaking referred to as the "GHG PSD SIP Narrowing Rule").[31] To request such removal, a state may choose to follow the example of the letter request submitted by South

[29] The terms "major" and "minor" categorize a stationary source, for NSR applicability purposes, in terms of an annual emissions rate (tons per year, tpy) for a pollutant. Generally, a minor source is any source that is not "major." "Major" is defined in the applicable NSR regulations—PSD or nonattainment NSR.

[30] Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule; Final Rule. 75 FR 31514 (June 3, 2010).

[31] Limitation of Approval of Prevention of Significant Deterioration Provisions Concerning Greenhouse Gas-Emitting Sources in State Implementation Plans; Final Rule, 75 FR 82536 (December 30, 2010).

Carolina.[32]

If a state lacks a SIP-approved PSD program, it is subject to a federal implementation plan (FIP), and major stationary sources within its jurisdiction are subject to the federal PSD requirements in 40 CFR 52.21. Some states are subject to a FIP for PSD permitting of all regulated NSR pollutants, and fewer states are subject to a FIP for PSD permitting that is limited to GHG. Note that a state subject to a FIP for PSD permitting, whether applicable to all regulated NSR pollutants or limited to GHG, remains obligated to adopt and submit a PSD program for EPA approval that applies to all regulated NSR pollutants, including GHG. Until a state provides such a program, its SIP would not be approvable with respect to section 110(a)(2)(C).[33]

EPA has historically and recently interpretated that the status of an infrastructure SIP's approval with respect to the state's PSD program would not adversely affect a state's request for redesignation of an area from nonattainment to attainment. In the past, EPA has approved area redesignations without having approved infrastructure SIPs, on the basis that infrastructure SIPs do not involve nonattainment requirements, and with the expectation that infrastructure SIP requirements regarding PSD will be addressed for those areas once redesignation has become effective.

Minor NSR programs are subject to the statutory requirements in section 110(a)(2)(C) of the CAA, which requires "…regulation of the modification and construction of any stationary source …as necessary to assure that the [NAAQS] are achieved." These programs are to be established in each state within 3 years of the promulgation of a new or revised NAAQS.

EPA has not proposed to amend the PSD regulations with regard to the new 1-hour SO_2 NAAQS. As an interim measure, we have issued SO_2 modeling guidance to supplement the guidance contained in EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix S), which will assist states and prospective sources in carrying out the analyses necessary to satisfy

[32] South Carolina's letter request can be found at http://www.regulations.gov, at EPA-R04-OAR-2010-0721-0006.

[33] For sources subject to a FIP for PSD permitting, either the EPA Regional Office or the state acting as EPA's delegate is the permitting authority. EPA recognizes that many states have been implementing a PSD FIP program for some time. When a state is already subject to a FIP for PSD permitting (whether or not the state has been delegated authority to implement the PSD FIP), and EPA disapproves this element of the state's infrastructure SIP submittal, we expect the permitting authority would simply continue implementation of the PSD FIP, and EPA would have no additional FIP obligations. In addition, the state would not be subject to any potential mandatory sanctions in connection with such disapproval, as such sanctions do not apply to infrastructure SIP deficiencies.

the PSD requirements for SO_2.[34] That supplemental guidance recommended use of an interim significant impact level (SIL) of 3 ppb for modeling the 1-hour SO_2 impacts of proposed new major stationary sources and major modifications. States may wish to consider use of this recommended interim SIL to help determine the scope of the modeling analysis needed with regard to the 1-hour SO_2 NAAQS. States may also wish to use this recommended interim SIL to determine whether the proposed source's emissions, in conjunction with other emissions in the area, would cause or contribute to a violation of the 1-hour SO_2 NAAQS.

Section 110(a)(2)(D)(i): Interstate transport provisions

> *"Each such plan shall [. . .] contain adequate provisions:*
>
> *(i) prohibiting, consistent with the provisions of this subchapter, any source or other type of emissions activity within the state from emitting any air pollutant in amounts which will—*
>
> *(I) contribute significantly to nonattainment in, or interfere with maintenance by, any other state with respect to any such national primary or secondary ambient air quality standard, or*
>
> *(II) interfere with measures required to be included in the applicable implementation plan for any other state under part C of this subchapter to prevent significant deterioration of air quality or to protect visibility."*

Section 110(a)(2)(D)(i) provides for SIPs to include provisions prohibiting any source or other type of emissions activity in one state from contributing significantly to nonattainment, or interfering with maintenance, of the NAAQS in another state. (The preceding sub-elements, from subsection (2)(D)(i)(I), respectively refer to what may be called prongs 1 and 2.) Further, this section directs SIPs to include provisions prohibiting any source or other type of emissions activity in one state from interfering with measures required to prevent significant deterioration of air quality, or from interfering with measures required to protect visibility (*i.e.*, measures to

[34] *See* EPA memorandum titled "Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program," dated August 23, 2010. In this guidance, EPA recommends an interim screening tool to help determine when a source's proposed emissions increase would be considered to have a significant hourly ambient impact as part of the required source impact analysis for the new 1-hour SO_2 NAAQS.

address regional haze) in any state. (The preceding sub-elements, from subsection (2)(D)(i)(II), respectively refer to what may be called prongs 3 and 4.)

To address prongs 1 and 2 of section 110(a)(2)(D), the state's submission should include an assessment whether or not emissions from SO_2 sources located close to state borders (*e.g.*, within the 50-km modeling domain used to assess source-specific SO_2 impacts[35]) have associated interstate transport impacts and if so, address the impacts. The assessment might include, but is not limited to, information concerning emissions in the state, meteorological conditions in the state and the potentially impacted states, monitored ambient concentrations in the state and the potentially impacted states, the distance to the nearest area that is not attaining the NAAQS in another state, and air quality modeling. For areas designated as unclassifiable, this assessment could also be informed by the analysis conducted to satisfy 110(a)(1) maintenance SIP requirements.

EPA has proposed several rules that will or may reduce emissions of SO_2, such as the CSAPR, the Industrial Boilers MACT, and the MATS. The emissions reductions achieved under these rules should result in reduced impacts from transported SO_2 emissions and states should consider these measures, among others measures, in fulfilling the section 110(a)(2)(D)(i)(I) requirements.

Under section 110(a)(2)(D)(i)(II), the PSD sub-element (prong 3) may be met by the state's confirmation in a SIP submission that new major sources and major modifications in the state are subject to PSD and (if the state contains a nonattainment area for the relevant pollutant) NNSR programs that implement the 2010 1-hour SO_2 NAAQS.[36]

As described more fully under element (C) of this infrastructure SIP guidance, if a state lacks a SIP-approved PSD program, it is subject to a FIP, and major stationary sources within its jurisdiction are subject to the federal PSD requirements in 40 CFR 52.21. States relying on a FIP (whether applicable to all regulated NSR pollutants or limited to GHG) to satisfy the PSD sub-element of section 110(a)(2)(D)(i)(II) have programs that are technically deficient and not approvable. Although these programs are deficient and these states have not "submitted" anything to EPA, EPA would not be required to take further action with respect to this sub-

[35] See Section 5 Modeling domain in Appendix A, "Modeling Guidance for Nonattainment Areas and Section 110(a)(1) Plans."

[36] Memorandum issued by William T. Harnett, Director, OAQPS/AQPD, "Guidance on SIP Elements Required Under Sections 110(a)(1) and (2) for the 2006 24-Hour Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS)," dated September 25, 2009.

element because the federal rules represent a FIP that fully addresses PSD. In addition, mandatory sanctions would not apply because the deficiencies are neither with regard to a required submittal under part D nor in response to a SIP call under section 110(k)(5). As described in this infrastructure SIP guidance for element (C), such states remain obligated to adopt and submit a PSD program for EPA approval that applies to all regulated NSR pollutants. Until a state provides such a program, its SIP would not be approvable with respect to prong 3, the PSD sub-element of section 110(a)(2)(D)(i)(II).

The sub-element providing for protection of visibility (prong 4) under section 110(a)(2)(D)(i)(II) may be met by the state's confirmation that an approved regional haze SIP (or FIP) is in place. The development of the regional haze SIPs occurred in a collaborative environment among the states. Through this process, the states coordinated on emissions controls to protect visibility on an interstate basis. The regional haze rule also specifically requires that a state participating in a regional planning process include "all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process."[37] We anticipate that an approved regional haze SIP (or FIP) addressing this requirement will ensure that emissions from sources within the state are not interfering with measures to protect visibility in other states.

Section 110(a)(2)(D)(ii): Interstate and international transport provisions

> *"Each such plan shall [. . .] contain adequate provisions insuring compliance with the applicable requirements of sections 126 and 115 (relating to interstate and international pollution abatement)."*

Section 126(a) of the CAA directs each SIP to include provisions requiring a new or modified source to notify neighboring states of potential impacts from the source. States with SIP-approved PSD programs should have a regulatory provision in place, consistent with 40 CFR 51.166(q)(2)(iv), that requires such notification of other state and local agencies. States relying on federal program requirements of 40 CFR 52.21(q), which provide for notification of affected state and local air agencies, to satisfy this element have programs that are technically deficient and not approvable. Although these programs are deficient and these states have not

[37] 40 CFR 51.308(d)(3)(ii).

"submitted" anything to EPA, EPA would not be required to take further action with respect to this element because the federal rules represent a FIP that fully addresses the notification issue. In addition, mandatory sanctions would not apply because the deficiencies are neither with regard to a required submittal under part D nor in response to a SIP call under section 110(k)(5). As described in this infrastructure SIP guidance for element (C), such states remain obligated to adopt and submit a PSD program for EPA approval that applies to all regulated NSR pollutants, including GHG. Until a state provides such a program, its SIP would not be approvable with respect to section 110(a)(2)(D)(ii).

Sections 126(b) and 126(c) of the CAA affect a state only if the Administrator has been petitioned to make a finding of violation that is related to either interstate transport or international transport of emissions from sources in the state. Thus, unless a state has been the subject of such a petition, the state has no continuing obligations under sections 126(b) or 126(c).

Section 115 of the CAA authorizes the Administrator to require a state to revise its SIP under certain conditions to alleviate international transport. Because there are no pending actions pursuant to section 115 of the CAA, at this time EPA has no reason to approve or disapprove any existing state rules with regard to section 115 provisions.

Section 110(a)(2)(E): Adequate personnel, funding, and authority

"Each such plan shall [. . .] provide:

(i) necessary assurances that the state (or, except where the Administrator deems inappropriate, the general purpose local government or governments, or a regional agency designated by the state or general purpose local governments for such purpose) will have adequate personnel, funding, and authority under state (and, as appropriate, local) law to carry out such implementation plan (and is not prohibited by any provision of Federal or state law from carrying out such implementation plan or portion thereof),

(ii) requirements that the state comply with the requirements respecting state boards under section 128, and

(iii) necessary assurances that, where the state has relied on a local or regional government, agency, or instrumentality for the implementation of any plan provision, the state has responsibility for ensuring adequate implementation of such plan provision."

The SIP should assure that the state has adequate authority under its rules and regulations to carry out the state's SIP obligations with respect to the 2010 SO_2 NAAQS and to revise the SIP as necessary. See EPA's regulations at 40 CFR Part 51, subpart L ("Legal Authority") and subpart O ("Miscellaneous Plan Content Requirements"). For example:

- In accordance with EPA's regulations at subpart L, the SIP should show that the state has the legal authority to carry out the plan; the provisions of the state's laws or regulations that provide that authority are to be specifically identified in the SIP, and copies of the laws or regulations should be included in the SIP submittal. See 40 CFR sections 51.230 through 51.231.
- A state may assign responsibility for carrying out a portion of a SIP to a state government agency other than the state air pollution control agency, if the SIP demonstrates that such other agency has the necessary legal authority. Similarly, the state may authorize a local agency to carry out a SIP or portion of a SIP within the local agency's jurisdiction, if the SIP demonstrates that the local agency has the necessary legal authority; however, the authorizing state is not relieved of responsibility for carrying out the SIP. See 40 CFR 51.232, "Assignment of legal authority to local agencies."

  In accordance with EPA's regulations at subpart O, the SIP submittal should include copies of rules and regulations that show that the state has adopted the emission limitations and other measures necessary for attainment and maintenance of the 2010 SO_2 NAAQS. See 40 CFR 51.281, "Copies of rules and regulations."

Further, the SIP should assure that the state has adequate funding and personnel to implement the SO_2 NAAQS. See EPA's regulations at 40 CFR Part 51, subpart M ("Intergovernmental Consultation") and subpart O ("Miscellaneous Plan Content Requirements"). For example:

- In accordance with EPA's regulations at subpart M, the SIP should identify the organizations that will participate in developing, implementing, and enforcing the SIP. The SIP should identify the responsibilities of such organizations and include related agreements among the organizations. See 40 CFR 51.240, "General plan requirements."
- In accordance with EPA's regulations at subpart O, the SIP should describe resources for carrying out the SIP. Resources to be described include: (1) those available to the state (and local agencies, where appropriate) as of the date of SIP submittal; (2) those considered necessary during the 5 years following SIP submittal; and (3) projections regarding acquisition of the described resources. See 40 CFR 51.280, "Resources."

Section 110(a)(2)(F): Stationary source monitoring and reporting

"Each such plan shall [. . .] require, as may be prescribed by the Administrator:

(i) the installation, maintenance, and replacement of equipment, and the implementation of other necessary steps, by owners or operators of stationary sources to monitor emissions from such sources,

(ii) periodic reports on the nature and amounts of emissions and emissions-related data from such sources, and

(iii) correlation of such reports by the state agency with any emission limitations or standards established pursuant to this chapter, which reports shall be available at reasonable times for public inspection."

The SIP should provide citations to the state's regulations for source monitoring, recordkeeping, and reporting requirements applicable to SO_2.

In accordance with EPA regulations at 40 CFR Part 51, subpart K ("Source Surveillance"), the SIP should provide for monitoring the status of sources' compliance with the SO_2 NAAQS. For example, the SIP should include provisions for owners or operators of stationary sources to maintain records of emissions and other information as may be necessary to enable the state to determine whether the sources are in compliance, and the SIP should further

include provisions for the sources to periodically report that information to the state. See 40 CFR 51.211, "Emission reports and recordkeeping."

The SIP should include provisions for stationary sources subject to the SO_2 NAAQS to install, calibrate, maintain, and operate equipment for continuously monitoring and recording emissions, and the SIP should further include provisions for the sources to maintain the monitoring data and periodically submit it to the state. See 40 CFR 51.214, "Continuous emission monitoring."

In accordance with EPA regulations at 40 CFR Part 51, subpart A ("Air Emissions Reporting Requirements") and subpart Q ("Reports"), the responsible state agency should analyze the SO_2 emissions data and correlate such data with applicable emission limitations or standards. The SIP should provide for periodic reporting of emissions inventory data by the state to the Administrator (through the appropriate Regional Office). See ***e.g.***, 40 CFR 51.321. All reports should be made available to the public.

Section 110(a)(2)(G): Emergency episodes

> *"Each such plan shall provide for authority comparable to that in section 303 of this title and adequate contingency plans to implement such authority."*

Section 303 of the CAA provides authority to the EPA Administrator to restrain any source from causing or contributing to emissions which present an "imminent and substantial endangerment to public health or welfare, or the environment." Each state should have an approved SO_2 emergency episode plan in place. The plan should be updated as appropriate for purposes of implementing the 2010 SO_2 NAAQS. As part of the infrastructure SIP submittal, the plan should be consistent with emergency episode requirements in 40 CFR 51.150 through 51.153. Appendix L to 40 CFR Part 51 includes example regulations for Prevention of Air Pollution Emergency Episodes and can be used for an example. The emergency episode plan should include provisions to trigger successive actions to prevent air quality concentrations from reaching the "significant harm level" (SHL), which represents an imminent and substantial endangerment to public health.

Unless EPA in the future proposes and promulgates regulations to revise the emergency episode requirements related to section 110(a)(2)(G), EPA recommends that states follow the guidance as stated in 40 CFR 51.150.

To address the section 110(a)(2)(G) element, states with air quality control regions identified as either Priority I, Priority IA, or Priority II under the "Prevention of Air Pollution Emergency Episode" rules at 40 CFR 51.150 should develop emergency episode contingency plans.

- A Priority I Region means any area with ambient concentration greater than 100 $\mu g/m^3$ (0.04 ppm) annual arithmetic mean; 455 $\mu g/m^3$ (0.17 ppm) 24-hour maximum.
- A Priority IA Region means any area that is classified as Priority I primarily because of emissions from a single point source.
- A Priority II Region means any area that is not classified as a Priority I Region and has ambient concentrations between 60-100 $\mu g/m^3$ (0.02-0.04 ppm) annual arithmetic mean; 260-445 $\mu g/m^3$ (0.10-0.17 ppm) 24-hour maximum; any concentration above 1,300 $\mu g/m^3$ (0.50 ppm) 3-hour average.
- Areas that do not meet the above criteria are classified as Priority III and are not required to submit contingency plans under the regulations.

Significant harm level for SO_2: In accordance with 40 CFR 51.151, each plan for a Priority I region should include a contingency plan that provides for taking action necessary to prevent ambient pollutant concentrations at any location in the region from reaching the SHL for SO_2 of 2.620 $\mu g/m^3$ (1.0 ppm) 24-hour average.

Exemption of Contingency Plans for areas designated as "attainment" and "unclassifiable": Per 40 CFR 51.152(d)(1), areas designated as attainment or unclassifiable under section 107 of the CAA may, at the Administrator's discretion, be exempted from the requirements of 40 CFR 51.152 as the regulation relates to the requirement to develop contingency plans required under Priority I, IA, and II Regions.

Appendix L to 40 CFR Part 51 provides example regulations that states can use to inform decisions concerning air pollution emergency episodes. The example regulations provided in Appendix L reflect generally recognized ways of preventing air pollution from reaching levels that would cause imminent and substantial endangerment to the health of persons located within affected areas. Subpart H of 40 CFR Part 51 directs states to have emergency episode plans that contain alert levels, but it does not require adoption of the regulations as stated in Appendix L.

Section 110(a)(2)(H): Future SIP revisions

"Each such plan shall [. . .] provide for revision of such plan—

(i) from time to time as may be necessary to take account of revisions of such national primary or secondary ambient air quality standard or the availability of improved or more expeditious methods of attaining such standard, and

(ii) except as provided in paragraph (3)(C), whenever the Administrator finds on the basis of information available to the Administrator that the plan is substantially inadequate to attain the national ambient air quality standard which it implements or to otherwise comply with any additional requirements established under this chapter (CAA)."

The SIP should provide citations to the state regulatory provisions requiring the state to (1) revise its CAA section 110 plan from time to time as may be necessary to take into account revisions of such primary or secondary NAAQS or the availability of improved or more expeditious methods of attaining such standards; and (2) revise its CAA section 110 plan in the event the Administrator finds the plan to be substantially inadequate to attain the NAAQS. See 40 CFR 51.104, "Revisions."

Section 110(a)(2)(I): Nonattainment area plan or plan revision under Part D

"Each such plan shall [. . .] in the case of a plan or plan revision for an area designated as a nonattainment area, meet the applicable requirements of part D of this subchapter (relating to nonattainment areas)."

As noted in the introductory text of this appendix, EPA does not expect infrastructure SIP submissions to address subsection 110(a)(2)(I). Nonattainment area plans required under part D are required on a different schedule from the section 110 infrastructure elements and will be reviewed and acted upon through a separate process.

Section 110(a)(2)(J): Consultation with government officials, public notification, PSD and visibility protection

> *"Each such plan shall [. . .] meet the applicable requirements of section 121 of this title (relating to consultation), section 127 of this title (relating to public notification), and part C of this subchapter (relating to prevention of significant deterioration of air quality and visibility protection)."*

The SIP should reference the state rules that provide a process of consultation with general purpose local governments, designated organizations of elected officials of local governments, and any federal land manager having authority over federal land to which the plan applies, consistent with the requirements of CAA section 121.

The SIP should provide citations to regulations requiring the state to regularly notify the public of: instances or areas in which any primary NAAQS was exceeded; the associated health hazards; and ways in which the public can participate in regulatory and other efforts to improve air quality. See 40 CFR 51.285, "Public notification."

Pursuant to the CAA, a SIP should allow a state to implement any new PSD requirements that are triggered upon the effective date of any new NAAQS. However, sources in a state may be subject to the federal PSD requirements pursuant to 40 CFR 52.21, if a state does not have a SIP-approved PSD program. As described in this infrastructure SIP guidance for element (C), such states remain obligated to adopt and submit a PSD program for EPA approval that applies to all regulated NSR pollutants, including GHG. Until a state provides such a program, its SIP would not be approvable with respect to section 110(a)(2)(J).

With regard to the requirement of the plan to meet the applicable requirements for visibility protection, EPA would not expect to treat this provision as applicable for purposes of the infrastructure SIP approval process. EPA recognizes that states are subject to visibility protection and regional haze program requirements under part C of the Act (which includes sections 169A and 169B). However, in the event of the establishment of a new primary NAAQS, the visibility protection and regional haze program requirements under part C do not change. Thus, EPA has concluded that there are no new applicable visibility protection obligations under section 110(a)(2)(J) as a result of the 2010 SO_2 NAAQS.

Section 110(a)(2)(K): Air quality modeling/data

"Each such plan shall [. . .] provide for—

(i) the performance of such air quality modeling as the Administrator may prescribe for the purpose of predicting the effect on ambient air quality of any emissions of any air pollutant for which the Administrator has established a national ambient air quality standard, and

(ii) the submission, upon request, of data related to such air quality modeling to the Administrator."

The SIP should demonstrate that the state has the authority and technical capability to conduct air quality modeling in order to assess the effect on ambient air quality of relevant pollutant emissions; and that the state can provide relevant data as part of the permitting and NAAQS implementation processes. The SIP should also provide that, upon request, the state will submit current and future data relating to such air quality modeling to the Administrator. EPA anticipates that the predominant type of air quality modeling to be conducted with respect to implementing the SO_2 NAAQS will be source-oriented dispersion modeling with models such as AERMOD.

Section 110(a)(2)(L): Permitting fees

"Each such plan shall require the owner or operator of each major stationary source to pay to the permitting authority, as a condition of any permit required under this chapter, a fee sufficient to cover—

(i) the reasonable costs of reviewing and acting upon any application for such a permit, and

(ii) if the owner or operator receives a permit for such source, the reasonable costs of implementing and enforcing the terms and conditions of any such permit (not including any court costs or other costs associated with any enforcement action), until such fee requirement is superseded with respect to such

sources by the Administrator's approval of a fee program under subchapter (title) V of this chapter."

The SIP should provide citations to the regulations providing for collection of permitting fees under the state's EPA-approved title V permit program. See 40 CFR 70.9 ("Fee determination and certification"); 40 CFR Part 70, Appendix A ("Approval Status of State and Local Operating Permits Programs").

Section 110(a)(2)(M): Consultation/participation by affected local entities

"Each such plan shall [. . .] provide for consultation and participation by local political subdivisions affected by the plan."

To satisfy this element (M), and in accordance with EPA's regulations at 40 CFR Part 51, subpart M ("Intergovernmental Consultation"), the SIP should identify the organizations that will participate in developing, implementing, and enforcing the SIP. Further, the SIP should identify the responsibilities of such organizations and include related agreements among the organizations. See 40 CFR 51.240, "General plan requirements."

The SIP should identify policies or procedures requiring consultation and participation by local political subdivisions affected by the SIP. For example, the SIP should provide a citation to the state regulations that provide notice and opportunity for public hearing in accordance with EPA regulations at 40 CFR Part 51, subpart F ("Procedural Requirements"). Prior to submitting a SIP revision or a compliance schedule, the CAA and EPA regulations direct states to provide notice, provide the opportunity to submit written comments, and allow the public the opportunity to request a public hearing. See 40 CFR 51.102, "Public hearings."

Appendix C

Guidance on Non-modeling Technical Demonstration of Attainment

A state may have counties that do not have large sources, or any sources, of SO_2. For these counties, refined modeling may not be needed to show that all or portions are in attainment of the SO_2 NAAQS. This section offers guidance for conducting a non-modeling technical demonstration in cases where there are: (a) existing modeling results of nearby SO_2 sources, or (b) no existing modeling results or plans to model nearby (i.e. within 50 km) SO_2 sources. At any time during the SIP process when there are questions regarding non-modeling technical demonstrations or interpretation of this guidance, the appropriate EPA Regional Modeling Contact should be consulted. The first step in both cases is to map the SO_2 sources surrounding the county, extending out to 50 km beyond the county boundaries, if necessary.

A. Approach with existing modeling of nearby sources

If there are dispersion model results of those SO_2 sources within the buffer around the county boundary from other modeling efforts (i.e., modeling of nonattainment areas or large sources), those results may be used to determine the spatial extent of the impact of a particular source or sources. If a nearby source, or sources, has modeled SO_2 NAAQS violations, singularly or in a cumulative sense, the following questions should be considered:

1. How far do those violations occur from the sources?
2. How far are these sources from the county in question?

If violations occur at a distance that does not impact the county in question or parts of the county not already part of an existing nonattainment area, then it may be a reasonable conclusion that the sources will not cause or contribute to a violation in the portion of the county in question and that the unaffected portions of the county could be considered in attainment with the 1-hour SO_2 standard.

B. Approach with no modeling of nearby sources

In the absence of any prior modeling efforts, analysts may need to rely on their best professional judgment and consider the following questions for each SO_2 source within the 50 km county buffer:

1. How far is the source from the county in question?
2. What is the maximum allowable emission rate of the source? More emissions mean higher concentrations.
3. If the source has stacks, what are the stack parameters (height, temperature, exit velocity, and diameter)? A short stack may have local impacts but may not have impacts that extend that far, while a tall stack will have impacts farther away. If there are any available modeled results for similar stacks, what are their impacts and can they inform any nonattainment problem associated with the source in question?

4. If the source has fugitive emissions, how far can the impacts from those sources potentially extend?
5. Would downwash play a role in the dispersion of SO_2 from the source such that it impacts the county in question?
6. What are the terrain features around the source and county in question? Terrain can affect the travel of a plume from a source.
7. What is the meteorology around the source? Meteorology, together with terrain can influence the impact of a source in a particular location. A wind rose may be useful for this question to see if the wind blows from any of the sources toward the county.

Based on the answers to the questions above, analysts should then ask "Can this source potentially cause or contribute to a violation of the 1-hour SO_2 NAAQS in this county?" If the answer to that question is "no," for all of the sources thought to influence a county's attainment status, then it may be a reasonable conclusion that the county in question is in attainment. However, if there is a question that a source could cause or contribute to a violation of the 1-hour SO2 NAAQS in the county, then it may be necessary to perform refined dispersion modeling of the sources thought to influence the county.

C. Example of non-modeling approach

Figure C.1 shows an example of the methodologies outlined above for Collingsworth County, TX. This example is for illustrative purposes only. In Figure C.1, the total 2005 NEI SO_2 point source emissions in tons per year are shown for each surrounding county. While the displayed emissions are from the NEI, the exercise should be carried out using the maximum allowable or potential to emit emissions. Also shown in Figure C.1 is a 50 km buffer around Collingsworth County. The colored dots represent individual SO_2 facilities with colors denoting 2005 NEI annual SO_2 emissions (tons).

In Figure C.1, it can be seen that there are a few 100+ ton emitters near the 50 km buffer of Collingsworth County (i.e., only in Gray and Beckham Counties). Other than those two counties, all of the other counties within the 50 km buffer of Collingsworth County contain sources that are below 100 tons. If modeling was done for the 100+ ton sources in Gray and Beckham Counties, the existing modeling could show if there are any predicted violations that extend into Collingsworth County (See Section A). If the results indicate such potential violations in Collingsworth County, then portions of Collingsworth County may already be designated as nonattainment as part of the overall area. The attainment status of the remainder of Collingsworth County could be analyzed using the methodology described in Section B. If existing modeling does not show modeled violations in Collingsworth County, the attainment status for the entire county could be determined using methodology described in Section B.

Also shown in Figure C.1 are two wind roses showing 2006-2010 data for the National Weather Service ASOS stations in the area (i.e., Borger, TX in the northwest and Clinton, OK in the east). These wind roses could be used in the analyses of the other counties around Collingsworth County. Given that most of the surrounding counties contain emissions sources of less than one ton, they should not present a nonattainment problem for Collingsworth County. Also, given that the 30 ton emitter in Greer County, OK is outside the 50 km buffer of

Collingsworth County, it may not present a nonattainment problem in Collingsworth County given the distance from the county and prevailing wind patterns. If there is any question about the potential impact of a source to a low emitting county's nonattainment status the seven questions in Section B should be considered.

A similar approach could be applied in the other low emitting counties (e.g., Wheeler, Donley, Hall, etc).

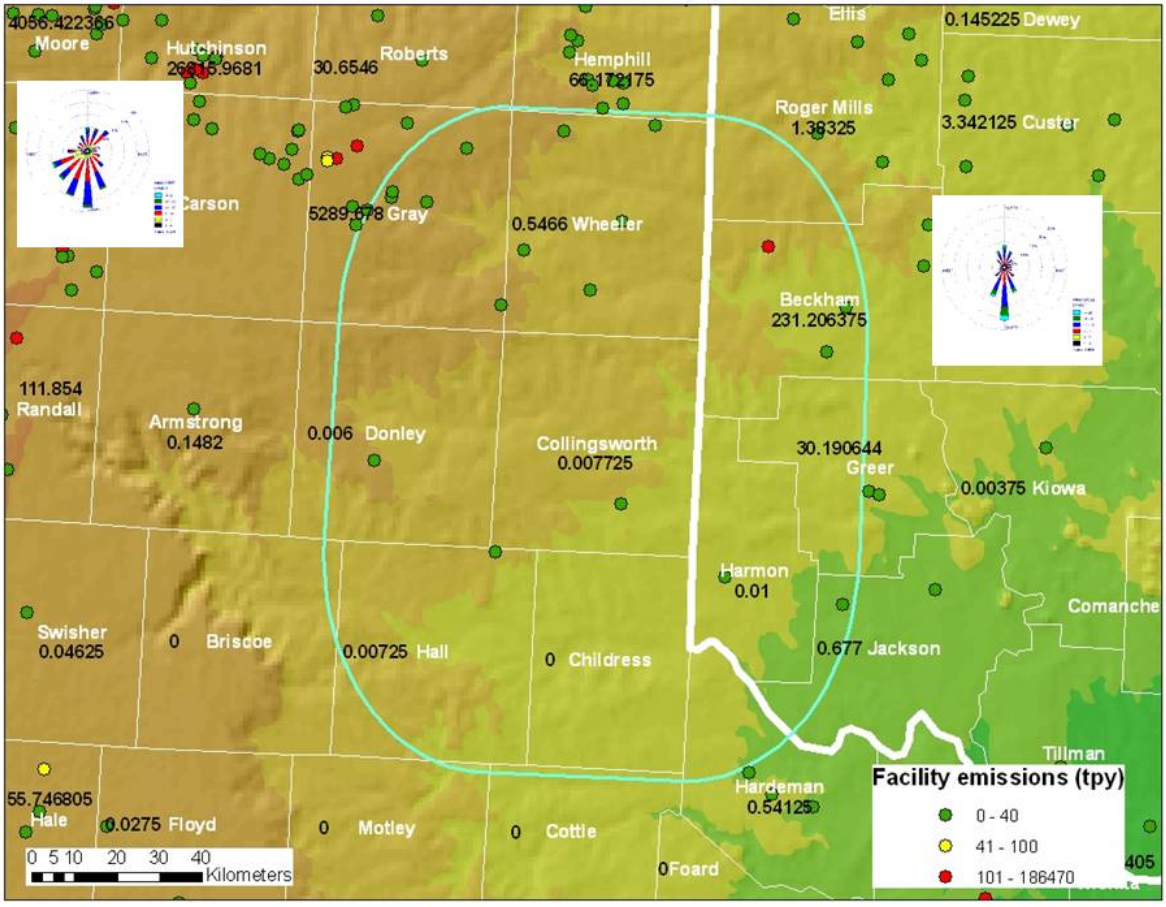

Figure C.1. Illustrative example of non-modeling technical analysis for Collingsworth County, TX.