UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711
October 15, 1992

MEMORANDUM

SUBJECT: PM-10 State Implementation Plan (SIP) Model Input Emissions

FROM: For Dean A. Wilson, Meteorologist
Techniques Evaluation Section, SRAB (MD-14)

TO: Regional Modeling Contact, Regions I-X

As you know the Model Clearinghouse has a policy whereby an advance concurrence is sought from all the Regional Offices on responses that may have national implications. Pursuant to that policy, attached is a proposed response to Region VIII dealing with procedures for determining PM-10 model input emissions, including secondary particulate precursor emissions, for the Denver PM-10 SIP.

Note that we are agreeing with Region VIII that sources of primary particulate should be modeled according to the top portion of Table 9.1, Guideline on Air Quality Models (Revised). We are also agreeing with Region VIII's judgments on operating levels and operating factors for calculating expected emissions from precursors of secondary particulate by reasoning that these judgments are within the flexibility afforded by the guidance. To support this latter position the Clearinghouse reasons that for purposes of calculating model input emissions, such precursors are akin to ozone precursors. The attached memorandum goes through an analysis which concludes that the "other background sources" portion of Table 9.1, with some interpretation, is applicable to both ozone and secondary particulate precursors. This in turn allows Region VIII to exercise professional judgment on operating levels and operating factors for determining emissions from precursor sources.

Consistent with past practice regarding concurrences of this type and commensurate with Region VIII's need for a timely response, please complete your review with 5 working days. Because of the implications of this memorandum, including its attachment, for ozone modeling, you may wish to coordinate your comments with the Regional Ozone modeling contact. Please call me with your comments at 919-541-5683 by October 22, or you may

fax them to 919-541-2357. Chet Wayland (919-541-4603) is available to discuss implications for ozone modeling.

Attachment

cc: K. Baugues
G. Blais
I. Cohen
T. Ellsworth
S. Holman
B. Johnson
R. Teter
C. Wayland

ATTACHMENT

DRAFT: October 5, 1992

MEMORANDUM

SUBJECT: Denver PM-10 State Implementation Plan (SIP) Modeling Issues

FROM: Joseph A. Tikvart, Chief
Source Receptor Analysis Branch (MD-14)

TO: Kevin Golden, Regional Meteorologist (8ART-TO)
Assessment Modeling & Emissions Section, Region VIII

Larry Svoboda, Chief
Assessment, Modeling and Emissions Section (8ART-TO)

In response to your request to Dean Wilson, the Model Clearinghouse has reviewed your position with respect to the appropriate emissions for input to air quality simulation models used in the Denver PM-10 attainment demonstration. Based on a number of discussions we had with you, and internally within the Office of Air Quality Planning and Standards, we conclude that your position is supportable since it lies within the flexibility afforded by the guidance. The only difference is in interpretation of the Guideline on Air Quality Models (Revised). Specifically, Table 9.1 applies in principle to secondary pollutants as well as primary pollutants. The following summarizes our viewpoints in that respect.

First, it should be noted that the Guideline is premised on making best estimates or unbiased estimates, when recommended refined models are applied. In order to make such unbiased estimates it is necessary, among other things, to input emissions that also reflect a best estimate of reality. This has sometimes been incorrectly interpreted to mean actual emissions. Such actual emissions may not necessarily reflect reality if the sources should ever operate at permitted levels in terms of fuel usage, operating levels or hours of operation. Table 9.1 of the Guideline was developed to reflect this need to make a best estimate, recognizing that such estimates need to also consider how the sources are really permitted to operate.

A basic feature of Table 9.1 is that all stationary point sources that are to be explicitly modeled should be modeled at their emission limit. This is independent of whether they are sources undergoing a review of their emissions limits or are "background" sources. This position is reinforced by the

material in the document "Procedures for Preparing Emissions Projections," referenced in your memorandum. While modeling at emissions limits is clearly required, the second and third columns of Table 9.1 offer some flexibility on what operating level and operating factor should be used in calculating the model emissions input, depending on the "classification" of the source and on averaging time. By source "classification" we mean whether the source(s) are undergoing emissions limit review or whether they are "nearby" or "other" background sources. The distinction between "nearby" and "other" is only useful when dealing with a single source or a few sources undergoing emissions limit review, but are in the midst of other sources whose limits are not up for review.

Clearly for area wide SIP's, emissions limits for all modeled sources are reviewable, and the guidance in Section 9.1 seems to indicate that the top portion of Table 9.1 is applicable for such SIP's. The top portion of Table 9.1 essentially says that, for short-term standards, sources should be modeled at maximum operating levels and the modeling should reflect continuous operation, 24 hours per day, 365 days per year, unless restricted to a lesser operating rate by a permit condition.

As you have noted, this guidance seems to be at variance with the recommendations on model input emissions for ozone precursors described in the Procedures for Preparing Emissions Projections. However, the attached memorandum demonstrates that the Procedures and the Guideline are really consistent. The memorandum rationalizes that ozone is not a source-specific emission but is formed by the combination of precursors of nitrogen oxides, volatile organic compounds and to some degree, carbon monoxide, through photochemical reactions. The attachment reasons that Table 9.1 really is applicable to ozone, in that it is appropriate to view ozone precursors as background sources. As noted above, for area wide SIP's it is not logical to make a distinction between nearby and other background sources. We believe that, recognizing the need to reflect the "best estimate philosophy," ozone precursors should be modeled as other background sources, with the bottom portion of Table 9.1 being applicable. The only slight difference between the guidance at the bottom of Table 9.1 and the ozone procedures is that for ozone an expected operating level and operating factor are used in calculating the emissions input to the model. The procedures for calculating emissions for background sources in Table 9.1 were developed for true background sources and not for sources whose emissions limits are under review. However, they were developed with the best estimate philosophy in mind. In order to maintain that philosophy for modeling ozone precursors, judgments need to be allowed on both the operating level and the operating factor. Thus we conclude that the bottom portion of Table 9.1 is applicable to ozone modeling with allowances for judgment on

operating rates, consistent with guidance contained in the Procedures for Preparing Emissions Projections.

Since secondary particulate precursors can be viewed in a similar fashion to ozone precursors, an analogous logic to the above would apply to secondary particulate precursors. Thus we conclude that the "other background sources" portion of Table 9.1 applies to precursors of secondary particulate. Again, for the 24-hour PM-10 standard, flexibility should be allowed in both the expected operating level and the operating factor in order to ensure that the best estimate of the potential expected high-second-high concentration is assured.

You have noted that sources of primary particulate can cause hot spots whereas sources of secondary particulate, because of the atmospheric residence time of the precursors, do not result in such hot spots. As you point out, secondary particulate would be expected to behave more like ozone, exhibiting a concentration pattern with relatively flat localized gradients. Following this rationale, you have concluded that sources of primary particulate larger than 100 tons per year of potential emissions should be modeled according to the top portion of Table 9.1 in order to ensure that the hot spots are identified. For secondary particulate, you indicate that in principle they should be modeled like ozone, i.e., at expected operating rates. Your logic is consistent with the above rationale on the applicability of Table 9.1. Thus, it is supportable.

You also note that many of the large sources of particulate precursors in Denver are currently operating at well below their design level and operating schedule. In order to ensure protection of the PM-10 standards, there is a need to model some of them, i.e., the 14 largest sources, with input emissions calculated at maximum operating rates. This is also consistent with the flexibility afforded for emissions calculations for other background sources in Table 9.1. In this case you have exercised judgment in order to ensure that the expected potential high-second-high concentration is estimated, and that judgment is that the 14 sources should be modeled at maximum operating level and for continuous operation. Thus, we can support your position.

If you have any questions please contact Dean Wilson at 919-541-5683.

Attachment

cc: T. Helms
D. Mobley
J. Paisie

ATTACHMENT
DRAFT: 10\8\92

MEMORANDUM

SUBJECT: Allowable Emissions and Current Modeling Guidance

FROM: Chet Wayland, SRAB

TO: Joe Tikvart, Chief
Source Receptor Analysis Branch

In response to the recent concern over the use of allowable emissions for future year projections in association with the State implementation plan (SIP) attainment demonstrations for ozone, an analysis of the existing modeling and emissions guidance was performed to ensure consistency. The documents in question are Procedures for Preparing Emissions Projections (EPA-450/4-91-019) and Guideline On Air Quality Models (Revised) (EPA-450/2-78-027R). The issue of projection of allowable emissions for SIP modeling is discussed in both and is summarized below.

Procedures for Preparing Emissions Projections (Page 13)

"Any emission projection made for use in SIP modeling shall use an allowable emission rate for that purpose. Methods used to estimate future activity levels are not affected by the choice between actual and allowable emission rates. Thus, allowable emissions are not based on the maximum worst case condition, with the plant operating at full load (8760 hrs/yr), but are calculated by multiplying the **anticipated** operating rate by the **maximum** allowable emission rate."

Guideline On Air Quality Models (Revised) (page 9-4, 9-5, 9-6)

"In stationary point source applications for compliance with short term ambient standards, SIP control strategies should be tested using the emission input shown on Table 9-1. When using a refined model, sources should be modeled sequentially with these loads for every hour of the year. To evaluate SIP's for compliance with quarterly and annual standards, emission input data shown on Table 9-1 should be used again."

Ozone is not a source-specific emission, but is formed by the combination of precursors of NOx and VOC (and some degree CO) through photochemical reactions. Therefore, the precursor emissions (VOC, NOx, CO) would be considered as other background sources. Ozone is also measured for compliance under a short term ambient standard (daily maximum hourly value). Table 9-1 defines the emission requirements for other background sources based on a short term standard as: (1) **"maximum allowable emission limit or federally enforceable permit limit,"** (2) **"annual operating level when actually operating, averaged over the most recent 2 years unless it is determined that this period is not representative**, and (3) **"continuous operation unless source operation is constrained by a federally enforceable permit condition."**

In the case of ozone modeling, each of the three emission requirements listed above should be adhered to with some interpretation as follows:

(1) The maximum allowable emission limit or federally enforceable permit limit requires no interpretation. This is simply the emission limit (e.g., pounds of VOC per gallon of solids applied) allowed by the operating permit and is the only way to completely test the control strategy under any enforceable limit or regulation.

(2) The annual operating level should be interpreted as the anticipated operating level for the peak ozone season (e.g., summer) as this period is more representative of the operating conditions under which ozone formation occurs.

(3) As discussed above, ozone is primarily formed through photochemical reactions with various precursors driven by sunlight. Many sources operate continuously and the majority of the remaining sources operate during normal daytime conditions. Therefore, continuous operation should be interpreted as the anticipated operation during the peak ozone season.

Using these interpretations with respect to the operating level and operating schedule (factors), Table 9-1 can be viewed as saying that an **anticipated** operating rate and a **maximum** allowable emission limit should be used for emission input for SIP modeling.

Summary

In comparing the two guidance documents with respect to emission input for SIP modeling exercises, it is fairly clear that the guidance is consistent. The uncertainty in the guidance is more an issue of semantics and interpretation than an inconsistency. Both require an anticipated operating rate (not

maximum) and a maximum allowable emission limit or rate. The Procedures for Preparing Emissions Projections guidance defines the anticipated operating rate as a combination of the anticipated operating level and operating schedule, respectively, while defining the permitted limit as the enforceable emissions rate. The Guideline On Air Quality Models (Revised) actually defines each component individually as an operating level, operating factor (schedule) and the permitted limit as an emission limit. Therefore, with some interpretation and judgement, there does not appear to be any inconsistency between previous modeling guidance published initially in 1986 and the most recent guidance on emission projections published in May 1991.

cc: Ned Meyer
Dean Wilson
Sheila Holman