UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
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MEMORANDUM

TO: Dean Wilson
Model Clearinghouse

FROM: Marius Gedgaudas, Chief Marius Gedgaudas
Compliance Section and Utah PM-10
Region VIII

SUBJECT: Utah PM-10, Secondary Sulfate and Nitrate Projections

In my November 20, 1989, memorandum, I stated that Utah had requested EPA's thoughts on how to calculate the effects of the reduction of precursor emissions on ambient levels of secondary particles. In that memorandum, we addressed only the source apportionment issue. We will now address the approach for estimating the effect of reducing precursor emissions.

We have agreed that the apportionment of secondary ammonium nitrate and ammonium sulfate due to precursor NOx and SOx can be estimated from the use of data from existing filters analyzed for these secondary particles when:

a. Kennecott was shut-down, but Geneva was operating,
b. Geneva was shut-down, but Kennecott was operating,
c. Both Geneva and Kennecott were shut-down,
d. Both Geneva and Kennecott were operating.

The effect of Geneva's primary and precursor emissions on ambient Utah County nitrate and sulfate levels would be obtained from the up/down scenarios above. This effect and the emissions inventory would be used to develop the relationship between precursor NOx and SOx emissions and the resultant reduction in secondary ammonium nitrates and sulfates. The secondary particle impact due to closing Geneva would be determined by subtracting the primary particle attribution which would be estimated by receptor modeling.

The fractional reduction in precursor emissions due to closing Geneva (Geneva's emissions divided by total Utah County emissions) divided by the fractional reduction in ambient secondary particulate levels for each of the two sets of gases would yield the proportionality constants for the relationship between secondary particles and their precursors. Separate proportionality constants would be developed for NOx and SOx.

If the relationship indicated a greater than one for one reduction (if the constant is greater than one), either the precursor emission inventory or the amount of primary nitrates or sulfates attributed to Geneva would have to be in error. A reconciliation process would then be followed until the constant is less than or equal to one, considering the error bounds of the analysis. No credit would be allowed for a constant greater than 1.0.

The same relationship would be used for the other Utah County sources, and a similar relationship would be determined in the same manner for Salt Lake County based on the Kennecott up/down scenarios. If the relationship for Kennecott in Salt Lake County is significantly different from that for Geneva in Utah County, the question will be whether this difference is due to differences in the availability of ammonia, or due to differences in dispersion of the precursors caused by Kennecott's taller stack. Careful analysis of the various scenarios may shed light on this issue, including analysis of the split between stack and fugitive emissions at Kennecott.

Another independent analysis is whether the relationship between the non-Geneva precursor emissions and the resultant levels of secondary particles measured when Geneva was closed is the same as the relationship for Geneva itself (this relationship would assume no secondary particles except background with no precursor emissions). Again a similar analysis should be done for Salt Lake County and Kennecott. Again, a reconciliation process will be required if relationships greater than one for one are calculated. This analysis would be used to determine if ammonia is limiting, and would be used as a cross-check.

Judgement based on careful analysis of the various scenarios and such factors as the effective stack height and source location would be used to determine which of the four (four for sulfates, four for nitrates) relationships should be used (assuming there are four significantly different constants) in projecting secondary particulate reductions for a specific source or source class. The most critical meteorological condition for which the constants are required is for winter stagnation.

The empirical data from the approach outlined above may also be used in conjunction with a simple box-type dispersion model that accounts for deposition and conversion to facilitate the projection of secondary particle levels. The conversion rates would be calculated from the empirical data.

Since Utah is moving on a fairly tight schedule, we would appreciate your review and concurrence and or comments on this approach by January 10, 1990. Please contact Lee Hanley at FTS 564-1766 or Dale Wells at FTS 564-1773 for any questions or comments.

cc: Tom Pace, OAQPS (MD15)
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