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

MAR 3 1 1994

MEMORANDUM

SUBJECT: Green Island Resource Recovery Facility - Modeling Emission Inventory

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

TO: Kenneth Eng, Chief
Air Compliance Branch, Region II

In response to your request, the Model Clearinghouse has reviewed your analysis and position on the selection of nearby background sources to be explicitly modeled for the subject Prevention of Significant Deterioration (PSD) permit. While we have some caveats, clarifications and suggestions, which follow, the bottom line is that we agree with your position that the methodology used to select the background sources, in this case, is acceptable. The main reason that we can agree with your position is that once the objective method of selecting the sources was carried out, it is our understanding that there was an examination of the results and a subjective professional judgment made to ensure that all sources that should have been included were indeed included. In fact, as a result of that oversight, the State did make some additions to the sources to be modeled.

Briefly, the State's procedure can be summarized as follows:

1. Inventory maximum allowable emissions of background emission points within the significant impact area (SIA) of the primary source.

2. Use SCREEN2 flat terrain results to determine the concentration gradient downwind of each background source stack as:

$$GRAD = \frac{X_{MAX,X} - X_{MAX,X+1000}}{1000}$$

3. Determine the distance (D) between the primary source and the background source and compute $GRAD/D^2$.

4. Rank the importance of each background source stack to the National Ambient Air Quality Standards (NAAQS) analysis as $GRAD/D^2$.

5. Explicitly model all background source stacks above a cut point equal to 1% of the maximum $GRAD/D^2$ on the ranked stack list.

6. Use professional judgment to identify any additional background sources that should be included in the NAAQS analysis.

From a technical viewpoint, the use of the $GRAD/D^2$ method for the initial selection of sources appears to "directionally correct" toward a goal of selecting the sources that will have the most important effects on air quality in the receptor grid. For example, the GRAD, or concentration gradient, downwind from the maximum concentration would be important for identifying short stack or downwashing sources that might have a large localized impact, depending on their emissions. On the other hand, the importance of such sources is diminished by the D^2 term at locations more distant from the primary source seeking a permit, where presumably the primary source has a lower impact. There are some phenomena, e.g., impacts on terrain or interactions between more than two sources, that the methodology does not appear to be able to capture. Such phenomena presumably will be considered during the oversight process and professional judgment can be used at that time to select any important sources not already included in the modeling inventory.

Comparing the method with the language in the Guideline on Air Quality Models (Revised) suggests that the objective method will also be directionally correct toward conformance with that guidance. However, it will not consider many of the subtleties that professional judgment would consider, such as the juxtaposition of monitors with modeling impacts in the receptor grid area, or the temporal/spatial interaction of background sources and between background sources and the primary source. I understand that these, as well as other subtle but important, considerations were taken into account in the final selection of nearby sources to be modeled at Green Island.

The main problem with the $GRAD/D^2$ and most other objective techniques that have been proposed to address the guidance is that in order to make sure that all of the sources of importance are included, one ends up selecting some sources that probably should not have been included. What this does is to make the estimates conservative, and as long as this is acceptable to the control agency, it is fine. The guidance states "the number of sources is expected to be small except in unusual circumstances." We note that in the Green Island case, a total of about 25 sources were ultimately selected by the objective method. Even considering that there are 202 sources total in the area,

modeling 25 of them explicitly at the allowable emissions, and adding that to "representative" monitoring data may result in double counting and perhaps overestimates.

A few other more minor comments are:

1. It is not clear to us why the inclusion of all PSD sources is relevant to the guidance for performing the analysis for the NAAQS.

2. The next to last sentence of the December 22, 1993 letter from the State to Region II does not seem quite right to us. Since monitoring plays no role in PSD increment calculations, it does not seem that concentration gradient is a relevant concept in the selection of sources to be modeled, even for sources outside of the significant impact area (SIA).

3. We understand your statement on page 2 of your memo regarding the selection of the "top 1% of the maximum $GRAD/D^2$ value" to mean that all sources that exhibited a $GRAD/D^2$ value greater than 1% of the maximum $GRAD/D^2$ were selected for modeling.

4. It is not clear to us why the concentration gradient at the boundary would be a useful indicator of sources outside of the SIA that need to be explicitly modeled. However, we are not concerned because the oversight process will presumably catch the important sources of that nature.

In summary, we agree that the use of the objective $GRAD/D^2$ method proposed by New York State for ranking the importance of nearby sources to be modeled for the Green Island NAAQS analysis is acceptable. It is clear that the technique will not stand on its own but when coupled with oversight judgment, it provides a complete list of sources suitable for modeling concentrations at receptors within the SIA. The subsequent modeling will normally produce conservative concentration estimates.

Finally, it should be recognized that while the $GRAD/D^2$ may also prove useful in future applications where a single source's emission limit is being set, other methods can also be proposed. The selection of source cutoff at 1% of maximum $GRAD/D^2$ value is subjective and would certainly need to be revisited on any future application of the technique. As you know, our recommended method for implementing the guidance is to make the final selection of nearby background sources on a case-by-case basis, using trial and error techniques and professional judgment.

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

cc: Dennis Atkinson
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bcc: Regional Modeling Contact, Regions I-X (with copy of incoming memorandum and list of FY-94 Clearinghouse memoranda)

FY-94 MODEL CLEARINGHOUSE MEMORANDA

Date	Region	Subject
11/18/93	X	Building Wake Effects on Volume Sources at FMC Corporation
11/24/93	IV	CP&L Stack Height Increase
12/07/93	VI	Revised Technical Comparison Document--Phelps Dodge
01/19/94	IV	Test Proposal for Wind Tunnel Modeling of Plume Impact Under Stable Stratification for the Cane Run Station (CRS) in Louisville, Kentucky
02/02/94	IV	Wind Tunnel Report for Determining Equivalent Building Height Determinations for the Cape Industries Facility of Wilmington, North Carolina
03/16/94	V	Air Quality Model Evaluation Protocol for Cyprus Northshore Mining Company
03/21/94	VIII	Denver Carbon Monoxide Attainment Demonstration
03/31/94	II	Green Island Resource Recovery Facility - Modeling Emission Inventory