



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

19 AUG 1992

MEMORANDUM

SUBJECT: Transcontinental Gas Pipe Line Corporation's
Use of a Nonguideline Approach for Estimating
the Amount of NO that is Converted to NO₂

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

TO: Marcia L. Spink, Chief
Air Programs Branch, Region III (3AT10)

In response to your request, the Model Clearinghouse has reviewed the use of the proposed nonguideline technique for estimating annual average nitrogen dioxide (NO₂) concentrations at the Company's compressor station near Unionville, VA. We have also discussed other relevant information regarding this source and regulatory aspects of the analysis with Todd Ellsworth of your staff.

It is our understanding that the source is located in a rural area of Virginia and that background concentrations and contributions from other sources are essentially zero. Consequently, for purposes of comparison with the National Ambient Air Quality Standards (NAAQS), the concentration estimates need only reflect emissions from the compressor station. These estimates, using screening procedures recommended in the Guideline on Air Quality Models (Revised) (Guideline), were found to be above the NAAQS. Estimates using the Company's exponential decay procedures are below the NAAQS. Also, it appears from the State's December 12, 1991 letter to you that the highest concentrations were found to be associated with terrain interaction and downwash phenomena.

I asked Mr. Shao-Hang Chu of our Branch, who has considerable experience and expertise in atmospheric nitrogen oxides (NO_x) dispersion modeling and chemistry, to look at the procedure proposed by the Company for estimating NO₂ levels. Mr. Chu agrees that the proposed five minute half life for NO to be converted to NO₂ is conservative in most cases, as supported by the several literature studies that the company cites. At the same time Mr. Chu did note that there really is not enough data to clearly support the Company's assumption that 10 percent of the NO_x is initially released as NO₂.

As you have recognized, the Guideline recommends a 3-tiered screening approach to modeling NO₂. Apparently the source was unable to use the third level screen, application of the ozone limiting method on an hourly basis, due to lack of representative ambient NO₂ and ozone data in the area. (Incidentally, there appears to be some conflict between the lack of ambient NO₂ data and the previously mentioned assumption that the background ambient levels in the area are zero.) The important point to note here is that the Guideline recommendations are for screening procedures, and not refined models.

The Guideline, Section 3.2, also provides procedures for acceptance of a nonguideline model for a given situation. This Section essentially says that if there is no recommended refined model, then an alternative refined technique may be proposed for use. This proposed technique must be demonstrated to be applicable to the problem on a theoretical basis and that the data bases needed to operate the model are available. If these criteria are met, then either an on-site performance evaluation is necessary or a showing must be made that the proposed technique has not been shown to underpredict in similar circumstances.

Given these premises, our analysis of the situation is as follows. The proposed technique while arguably conservative in most circumstances, is not a refined model, but yet another screening technique, apparently somewhat less conservative than the first two levels of screening recommended in the Guideline. The Guideline does not contain any provisions for acceptance of alternative screening techniques. We also note that the half life data contained in the literature comes almost exclusively from aircraft sampling of power plant plumes. There does not appear to be any data taken from situations involving terrain interaction of plume downwash. It should be noted that there is a wide range of half lives cited in the literature, ranging from 1 minute to 10,000 minutes. This suggests that an exponential decay mechanism may not be descriptive of the atmospheric chemistry involving NO₂ formation and decay. This raises some questions about whether the Company's proposal is theoretically well founded, as required by the Guideline, Section 3.2.

Given the above facts, if the action for this source were regulatory and the Environmental Protection Agency (EPA) were required to approve it, we would probably recommend against accepting the proposed technique. It is a bit unclear whether we can regard the modeling at this stage to be more investigative in nature, preliminary to State implementation plan (SIP) revision. If we could take this viewpoint, the Clearinghouse opinion is that the half life analysis suggests that there is some uncertainty on whether emission reductions are necessary and that more information should be obtained to make a more definitive conclusion. If the "more study" option is compatible with the

EPA/State regulatory timeframe, then we suggest a couple of activities. As a minimum, the ambient NO₂ and ozone data necessary to conduct the third level Guideline screen should be collected. This would require the collection of at least one year of such data, in an area representative of the ambient conditions at the source. Preferably, a network of NO_x monitors should be installed to cover areas of expected high concentration. With careful planning, data from this latter option might be applicable in the "monitoring in lieu of modeling" approach described in Section 11.2.2 of the Guideline (see Attachment).

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

Attachment

cc: S. Chu
T. Ellsworth
D. Grano
J. Tikvart

bcc: Regional Modeling Contact, Regions I-X (with copy of incoming memorandum and list of FY-92 Clearinghouse memoranda)

11.2.2 Use of Measured Data in Lieu of Model Estimates

Modeling is the preferred method for determining emission limitations for both new and existing sources. When a preferred model is available, model results alone (including background) are sufficient. Monitoring will normally not be accepted as the sole basis for emission limitation determination in flat terrain areas. In some instances when the modeling technique available is only a screening technique, the addition of air quality data to the analysis may lend credence to model results.

There are circumstances where there is no applicable model, and measured data may need to be used. Examples of such situations are: (1) complex terrain locations; (2) land/water interface areas; and (3) urban locations with a large fraction of particulate emissions from nontraditional sources. However, only in the case of an existing source should monitoring data alone be a basis for emission limits. In addition, the following items should be considered prior to the acceptance of the measured data:

- a. Does a monitoring network exist for the pollutants and averaging times of concern;
- b. Has the monitoring network been designed to locate points of maximum concentration;
- c. Do the monitoring network and the data reduction and storage procedures meet EPA monitoring and quality assurance requirements;
- d. Do the data set and the analysis allow impact of the most important individual sources to be identified if more than one source or emission point is involved;
- e. Is at least one full year of valid ambient data available; and
- f. Can it be demonstrated through the comparison of monitored data with model results that available models are not applicable?

The number of monitors required is a function of the problem being considered. The source configuration, terrain configuration, and meteorological variations all have an impact on number and placement of monitors. Decisions can only be made on a case-by-case basis. The Interim Procedures for Evaluating Air Quality Models¹⁵ should be used in establishing criteria for demonstrating that a model is not applicable.

Sources should obtain approval from the Regional Office or reviewing authority for the monitoring network prior to the start of monitoring. A monitoring protocol agreed to by all concerned parties is highly desirable. The design of the network, the number, type and location

of the monitors, the sampling period, averaging time as well as the need for meteorological monitoring or the use of mobile sampling or plume tracking techniques, should all be specified in the protocol and agreed upon prior to start-up of the network.

FY-92 MODEL CLEARINGHOUSE MEMORANDA

<u>Date</u>	<u>Region</u>	<u>Subject</u>
10/16/91	IV	Dade County, Florida, Stack Height Increase
11/7/91	VI	Phelps Dodge--Hidalgo Modeling Protocol
11/15/91	VIII	ASARCO E. Helena Lead State Implementation Plan (SIP)
12/04/91	I	Proposal to Use a Non-Guideline Model to Satisfy Intermediate Terrain Policy in New Source Permitting (Pine State Power; Jay, Maine)
12/23/91	VIII	East Helena Lead SIP - Protocols for Design Value Determination, and Model "Verification"
12/26/91	VI	Information Copy of El Paso-Juarez PM-10 Modeling
01/13/92	I	NHARD Modeling Guideline
01/27/92	VIII	East Helena Lead SIP - Protocols for Design Value Determination and Model "Verification"; Clarification of Model Clearinghouse Memorandum of December 23, 1991
03/06/92	I	Modeling Credits for Stack Height Increases and Merging Flue Gases at Taunton Municipal Light Plant
04/06/92	V	Proposal for Resolving the SO ₂ State Implementation Plan Revision for Rhinelander, Wisconsin
06/23/92	I	Ozone Modeling Requirements for the Lewiston-Auburn and Knox-Lincoln Counties' Moderate Ozone Nonattainment Areas in Maine
08/03/92	X	Healy Clean Coal Visibility Analysis

FY-92 MODEL CLEARINGHOUSE MEMORANDA (Cont'd)

08/18/92

III

Transcontinental Gas Pipe Line
Corporation's Use of a Nonguideline
Approach for Estimating the Amount
of NO that is Converted to NO₂