APPENDIX A

Alternate Methods of Control

I. Statement of Goals and Rationale

On March 1, 1994, the Texas Natural Resource Conservation Commission (TNRCC) proposed rules regarding replicable procedures for providing an alternative to site-specific State Implementation Plan (SIP) revisions for designated ozone nonattainment areas. The intent of the TNRCC was to develop Alternate Means of Control (AMOC) rules that incorporate replicable procedures that correspond with state regulations and protect the integrity of the SIP. The current federally approved SIP requires a site-specific SIP revision for alternate compliance methods. A site-specific SIP revision often takes more than a year for the United States Environmental Protection Agency (EPA) to approve after submittal by the TNRCC. The AMOC procedures streamline the process for case-by-case review of site-specific SIP revisions for designated ozone nonattainment areas while achieving additional emission reductions. The TNRCC adopted the AMOC rules on July 13, 1994. The adopted rules establish procedures for requesting the Executive Director's approval of an AMOC plan in lieu of complying with control requirements of Chapter 115, relating to the Control of Air Pollution from Volatile Organic Compounds, and provide the flexibility to identify alternative emission reductions. The goals of the AMOC rules are to improve and enhance environmental quality, allow a source to more effectively control emissions from its facility, allow for innovative control technology, and provide an economic alternative for a source that might be forced to shutdown because it could not otherwise comply with Chapter

115. Thus, the intent of the flexibility provided to the regulated community is to allow the control of air pollution through less costly control strategies while also achieving environmental standards. The AMOC rules allow persons impacted by the AMOC program the opportunity to develop and implement pollution prevention measures and innovative emissions reductions technology while utilizing common sense to satisfy the Federal Clean Air Act (FCAA) regarding volatile organic compound (VOC) emissions. The AMOC rules provide the regulated community the leeway to tailor control strategies to the particular needs and circumstances that are characteristic of a specific facility or source. The AMOC rules will assist in monitoring the reasonableness of the Reasonably Available Control Technology (RACT) determinations. Staff will monitor the total number of AMOC applications in order to ensure that Chapter 115 rules and regulations are reasonable and the technology required reasonably available. The AMOC process will thus help identify the most cost-effective regulations.

The TNRCC understands the need for a balance between flexibility for the facilities to implement regulations and oversight by the EPA to review and approve alternative requirements based on criteria established in the SIP. The issue of delays experienced with site-specific SIP revision procedures is addressed in the AMOC rules which include an expedited review and an EPA oversight function of a 45-day veto authority while requiring the reduction of emissions to attain and maintain national ambient air quality standards (NAAQS).

Although the AMOC program was not designed to be a true market-based approach to emissions regulations, the AMOC rules encourage the use of innovative approaches and plans to achieve compliance by the most cost-effective means. The AMOC rules are intended to address situations where it is technically or economically impracticable to achieve compliance with specific regulatory requirements. Regulations written in the past were evaluated and determined to be reasonable and cost-effective. The regulations were written in order to obtain emission reductions on an industry-wide basis, but have not always allowed for unique situations at specific facilities. Therefore, the regulations may not be the most cost effective means to provide the desired emission reduction. Facilities are frequently in a better position to identify alternative means of control and thus can assist the State in identifying unnecessary complexities regarding regulatory requirements. The TNRCC has incorporated cost-effective options in recent rulemaking efforts and streamlined the procedures for approving alternative means of compliance. The TNRCC maintains an approach to allow facilities to meet or exceed the reductions that were targeted by the FCAA Amendments, but in ways that may be significantly less expensive than the traditional "command-and-control" style of regulation.

The Economic Incentive Plan (EIP) guidance was utilized in the development of the TNRCC AMOC rules. The EIP rules were promulgated on March 15, 1994, and published in the Federal Register on April 7, 1994. The identification of the EIP as guidance is of importance due to the discretionary nature of the AMOC program the TNRCC is adopting. Thus, the TNRCC does not consider the provisions of the EIP as binding. Furthermore, the EPA Region 6 stated in the comments provided during the public comment period that "the TNRCC does not need to include all of the specific criteria in the plan because the EPA will still be in the review process." Although the TNRCC does not consider the AMOC rules to be an EIP, the TNRCC has attempted to address in the revised AMOC rules and narrative the areas that EPA identified as lacking desired detail.

The existing regulations contain provisions allowing facilities to seek approval of alternate means of complying with controls that are specifically required by the regulations. The existing procedure, which requires a site-specific SIP, is seldom used because it has been time-consuming. The AMOC rules will provide a more expeditious site-specific revision to the SIP for applications that meet the stringent requirements of the AMOC rules.

II. Program Scope

The TNRCC AMOC program does not interfere with other requirements of the FCAA. The AMOC rules provide replicable procedures for sources seeking approval for alternatives to achieve emission reductions in lieu of complying with Chapter 115. In addition, the emission reductions required by the program are quantifiable; consistent with SIP attainment and Reasonable Further Progress (RFP) demonstrations; surplus to reductions required by, and credited to, other implementation plan provisions to avoid double counting of reductions; enforceable at both the State and Federal levels; and permanent over the entire duration of the program. The TNRCC is not claiming additional reduction credit for the AMOC program.

III. Program Baseline

The AMOC rules provide for alternative emission reductions greater than or equal to reductions specified in VOC rules. The AMOC emission reductions are based upon actual emissions rather than allowable emissions. No AMOC plan may be approved unless actual emissions are reduced by an appropriate factor below the level that would occur under the otherwise applicable rules in Chapter 115. The additional reduction is recognized as a discount factor, and the overall AMOC limit will result in an emissions cap which would not otherwise exist for a facility. To ensure that an AMOC plan will achieve real emission reductions, a comparison must be made between the emissions under the AMOC plan and the emissions that would result if the source complied with Chapter 115.

Chapter 115 establishes limits on production/control efficiencies or specifies minimum requirements for control technology. Thus, the determination of emission limits must be on a case-by-case basis using actual emissions of the source rather than the allowable emissions. The source must use historic operational information, based on data from a single production year, to quantify the emissions that would have been present if the source complied with current Chapter 115 requirements and/or the future requirements that the source seeks to avoid. This quantification will be the source's emissions baseline for evaluating the AMOC plan. The AMOC rules adopted on July 13, 1994, provide for a 1990 base year (or subsequent years if a source in an AMOC plan was not operational prior to 1990). This year is used since the Emissions Inventory (EI) required by the FCAA is based upon 1990 to determine the emissions level from which the TNRCC must reduce to demonstrate RFP. The EI data for 1990 is expected to be more comprehensive and reliable than that for other years.

IV. Replicable Emission Quantification Methods

The quantification of emissions must be accomplished using methods specified by the Executive Director. The methods include approved direct measurement of emissions, either continuously or periodically; calculation equations which are a function of process or control system parameters, activity levels, and/or throughput or production rates; and mass balance calculations which are a function of inventory, usage, and/or disposal records. Although the TNRCC requires emission reductions within the AMOC program, limits the AMOC program to site-specific AMOC plans, and conducts an engineering evaluation to ensure the relative integrity of the AMOC reduction calculations; EPA approval of an AMOC plan is required due to the flexibility in the quantification procedures.

If a short-term emissions standard other than a 24-hour emissions limit is provided for within the AMOC rules, the EIP requires a statistical demonstration that the NAAQS are not endangered. A statistical demonstration has been prepared to justify the use of the "short-term maximum daily potentials to emit" and to confirm that this short-term limit concept will not endanger the NAAQS. Establishing short-term maximum daily emission potentials will prevent large increases in maximum daily potentials to emit. A one part per billion (1 ppb) increase in the ozone level was defined as the level of significance for the TNRCC evaluation of all AMOC plans. The AMOC program will utilize Urban Airshed Model (UAM) data to determine approvability of an AMOC application which will result in limiting the availability of AMOC plans to the established modeling domain. The UAM was used to determine that an increase of 4 tons per day (TPD) in the Houston/ Galveston (H/G) area would increase the ozone level by 1 ppb. Thus, the sum of all increases of maximum daily potential to emit over the H/G area will be limited to 4 TPD. If the nonattainment areas continue to fail to meet the standards, a reduction in the amount of emissions permissible or a reduction in the number of

AMOC applications may result. The limitation upon the total of the maximum daily potential to emit is based on the whole non-attainment area, however, ozone formation is sensitive to the location of VOC emissions. Therefore, to prevent one or a few sources from utilizing all of the established limit in a small geographic area that could cause a significant increase in the measured or modeled ozone concentration, each AMOC plan involving multiple sources will be limited to a total increase of 200 pounds in the maximum daily potential to emit. The maximum daily potential to emit is not intended to be an enforceable limit. However, the criteria/provisions of the AMOC plan used to establish the maximum daily potential to emit are enforceable components of the AMOC plan.

V. Monitoring, Testing, Recordkeeping and Reporting (MTRR)

The AMOC program requires emission reductions that extend beyond equivalency with reductions identified in Chapter 115, yet provides flexibility to identify an alternative source to achieve the reductions. The MTRR required by the AMOC rules will assist in ensuring emission reductions occur on an annual basis with short-term flexibility that will not adversely affect the NAAQS.

VI. Projected Results and Audit/Reconciliation Procedures

Routine ongoing air program management procedures should be sufficient to fulfill the audit and reconciliation requirements.

The TNRCC is committed to conducting periodic reviews of the compliance records for AMOC plans. However, it is the position of the TNRCC that audit/reconciliation procedures are not appropriate for the AMOC program since the TNRCC is not claiming additional credit for AMOC emission reductions. The AMOC program assumes a one-hundred percent rule penetration since the AMOC rules require an applicant to approach the TNRCC with an AMOC application. Provisions exist within the AMOC rules to ensure that the emission reductions are surplus to Chapter 115 reductions and that reductions are not double counted. The AMOC rules note that reductions for which the TNRCC has claimed credit in a SIP may not be utilized as reductions in an AMOC plan. The concept of an "environmental benefit" was incorporated into the AMOC rules as part of the AMOC emission reduction. The AMOC rules do not allow trading outside a TNRCC account nor do the rules provide for the banking of emission reduction credits, or the generation of revenue. An additional benefit from the AMOC rules is improved emission inventory data that may enhance and lend increased certainty to state planning efforts. Furthermore, the AMOC rules will assist in developing tracking procedures while the incorporation of emission caps over time will reduce growth related emissions. An improved emission inventory supports TNRCC plans, effective regulations, and meaningful measures of progress for achieving environmental quality.

The AMOC rules provide for a 45-day additional EPA review which thus results in EPA veto authority of each AMOC plan. The veto authority was proposed in order to help ensure EPA Region 6 support for the AMOC replicable procedures and to achieve maximum flexibility with the AMOC rules. The EPA oversight was maintained since the AMOC rules incorporate SIP flexibility, an expedited review, Executive Director discretion, and site-specific trading issues. Since the AMOC rules incorporated select concepts from the Emissions Trading Policy Statement (ETPS) and the EIP rather than the full guidance, the TNRCC staff agreed that a 45-day veto authority was a reasonable request for an interim rule. However, it is the TNRCC position that EPA's insistence that the AMOC rules meet or substantially meet requirements of the EIP guidelines negates any necessity for inclusion of the EPA veto in the AMOC rules.

A further component of the AMOC rules is that an AMOC plan becomes void upon the compliance date of new regulations that impact the identified alternative emission reductions. The AMOC applicant is held responsible for ensuring that the emission reductions within an AMOC plan remain surplus for all sources identified in the AMOC plan. The AMOC applicant has the responsibility of identifying new alternative emission reductions or complying with the provisions within Chapter 115. AMOC applications to amend or revise an AMOC plan shall be submitted through the complete AMOC process.

VII. Implementation Schedule

The TNRCC has the authority to develop an AMOC plan with provisions that become enforceable under Chapter 115. EPA maintains review and oversight for the AMOC program in that EPA receives the AMOC request at the same time as the TNRCC, may participate during the designated comment period, and has veto authority. The AMOC program will be implemented as AMOC applications are submitted as SIP revisions.

VIII. Administrative Procedures

As set forth in the AMOC rules, an AMOC plan shall be approved if it meets all the applicable criteria and procedures for Approval of AMOC Plans; Calculations for Determining AMOC Reductions; Procedures for AMOC Submittal; Public Notice Format; and Review of Approved AMOC Plans and Termination of AMOC Plans. The adopted AMOC rules provide EPA the authority to review AMOC plans on a case-by-case basis. In light of the provision for the EPA's case-by-case review, the TNRCC has maintained the position that the EIP provisions for MTRR as well as auditing and reconciliation need not be on the level of stringency as requested by EPA. Routine air program management procedures in combination with the AMOC procedures are sufficient to fulfill the audit and reconciliation requirements.

The TNRCC intends to implement a program for reviewing AMOC applications in a timely manner, approving AMOC plans that meet the established criteria, verifying that actual emission reductions are occurring, and recording and tracking AMOC plans and the impacts.

IX. Enforcement Mechanism

Enforcement of the AMOC plans will be incorporated into the routine inspection process utilized by the TNRCC. Each AMOC plan will be site-specific with enforceable limits clearly noted so that regional inspectors are able to identify the sources subject to AMOC provisions, the limits imposed upon those sources, and the required MTRR.

If a source violates the provisions of an AMOC plan it is clearly in violation of Chapter 115. The source is potentially subject to not only violating the provisions of the AMOC plan, but also violating the underlying requirements of Chapter 115. Thus, the EPA concern regarding penalties is addressed with provisions in Chapter 115 and managed as provided for with current air quality planning standards.

To reiterate, the AMOC rules involve case-by-case, site-specific trades within the same TNRCC account number and eliminate the banking provisions for emission reduction credits. The AMOC rules allow the Executive Director to select quantification methods most appropriate for the wide variety of sources covered by the rules. Additional safeguards are provided for in the emission offset limits established between identified sources while the MTRR requirements will be implemented to the degree necessary to assure compliance as established in Chapter 115 or current standards for air quality planning. MTRR are necessary to ensure that an AMOC holder is complying with the AMOC rules in reducing emissions. Tighter requirements for quantifying emission reductions are a tradeoff for increased flexibility. However, any further replicable procedures would undermine the flexibility created within the AMOC rules.

In considering the EIP enforcement mechanism requirement, it is important to minimize the regulatory barriers by streamlining what is currently considered an excessive government process for approving site-specific SIPs or AMOCs. The lack of timeliness is a big factor. The AMOC rules replace the site-specific SIP approval process with a compressed timeframe, and also provide a mechanism that is flexible yet maintains a state and federally enforceable program.

Table 16 of the main document lists expected staffing levels for the Office of Air Quality. No change is expected in staffing levels for enforcement.

The TNRCC believes that incorporating all nine criteria of the EIP, would create barriers to the AMOC process. The barriers would result in AMOCs undergoing an unreasonable process in order to identify emission reductions for sources which do not jeopardize the NAAQS.

Since the EIP promulgates rules which either may or must be adopted by states upon failure to submit an adequate showing that an applicable Rate of Progress (ROP) or a specific emissions milestone has been met or upon failure to attain NAAQS, the TNRCC believes that the State should not be held to all EIP guidance criteria. The AMOC rules allow for flexible approaches which benefit both the environment and the regulated entities, the rules allow for less costly control strategies, and provide incentives for the development and implementation of pollution prevention measures and innovative emission reduction technology in addition to being consistent with state air quality planning. The AMOC rules are general in nature so as to avoid limiting innovation on the part of AMOC applicants and allow the TNRCC the flexibility to develop a program tailored to the specific needs of the regulated community in Texas while progressing towards the goals of NAAQS attainment.

Impact on Ozone Levels of Short Term VOC Increases Resulting from Proposed AMOC Rules

Introduction

The changes to 30 Texas Administrative Code (TAC) allow "Alternate Means of Control" (AMOC) of volatile organic compound (VOC) emissions for certain sources provided there is a resulting overall net reduction of emissions on an annual basis. Section 115.911 of 30 TAC would allow an AMOC to take place even if there were an increase in the daily VOC emission rate, as long as that increase was less than 200 pounds/day. The total number of AMOC's allowed with short-term emission increases is to be limited such that the total increase in VOC emissions for all AMOC's within a nonattainment area never exceeds 4 tons/day. This report documents the development of the 4 tons/day value as the increment of VOC that would not cause a significant increase in the maximum daily ozone concentration. A "significant increase" has been defined to be 1 ppb (part per billion by volume).

The goal was to identify a limit of VOC increases that could be applied to all four ozone nonattainment areas in Texas: Houston/ Galveston (H/G), Beaumont/Port Arthur (B/PA), Dallas/Fort Worth (D/FW), and El Paso. The H/G area was of primary concern since the nonattainment status for this area is rated as "severe", which is a worse rating than that for the other three areas, and because it was felt that the H/G area would have the most use of AMOC plans by industry. The B/PA nonattainment area was included in all analyses performed for the H/G area since these two areas were modeled as one domain. For each of these two areas, an extensive set of Urban Airshed Model (UAM) runs had previously been conducted for historic, high ozone episodes. The performance of the model for these areas has been extensively analyzed and reported [TNRCC, 1994c]. For the D/FW and El Paso areas, modeling with the 1993 ROP SIP controls was sufficient to demonstrate attainment; consequently, an extensive set of sensitivity modeling results was not available as was the case for H/G and B/PA. Thus, the analysis to determine a limit for VOC increases focused on the H/G and B/PA sensitivity modeling.

To better understand the UAM results, terminology regarding VOC must be clarified. The term VOC as used in 30 TAC refers to total emissions of hydrocarbons with methane excluded; which is consistent with emission inventory values for VOC collected and reported by TNRCC. However, during the pre-processing of VOC data for input to the UAM model, the unreactive components (with regard to ozone production) are removed from the inventory. The VOC component that is actually input to the model is referred to as reactive organic gases (ROG). The ROG values associated with an emission source are always less than or equal to the corresponding VOC values.

Method

The UAM has been approved by the EPA for photochemical modeling of ozone for regulatory purposes. The UAM predicts hourly ozone concentrations for each grid cell in the geographic domain. The modeling domain is made larger than the nonattainment area of concern to lessen the influence of boundary concentrations. This procedure produces more accurate UAM results. The UAM requires hourly emission data, meteorological data, and boundary concentration data for the duration of the episode being modeled.

The goal is to determine the degree to which VOC emissions may fluctuate without causing more than a 1 ppb increase in ozone levels. The most accurate approach would be to model various plant (or grid cell) specific increases in emissions and determine the sensitivity of ozone to these changes. However, the number of scenarios that would need to be modeled before one could perform an adequate analysis on the results is too numerous to be practical. In addition, the results would likely be highly variable. In lieu of this impractical approach, existing model runs for uniform, domain-wide changes in anthropogenic ROG emissions were used. Since the actual spatial distribution of AMOC's that will take place is not known, these "across-the-board" changes were felt to be the only feasible approach.

For the combined H/G and B/PA area, UAM model runs are available for three historic high ozone episodes [TNRCC, 1994c]:

May 16-19, 1988; July 27 - August 1, 1990; and October 10-13, 1991. Based on EPA's recommended statistical tests, the best model performance for the H/G area was obtained for the July 29, 1990 episode day, and for the B/PA area, the best model performance occurred for May 18, 1988. These dates were therefore chosen for conducting analyses of the sensitivity of modeled ozone to changes in the ROG emissions. The episode day of July 30, 1990 was included since it exhibited adequate performance for this type of analysis in both the H/G and B/PA areas. The H/G and B/PA areas were modeled as one large domain with the area east of a north-south line at the UTM easting coordinate of 350 kilometers (zone 15) referred to as the B/PA area and the area west of the line referred to as the H/G area. This north-south boundary line is far enough west to include pertinent portions of Hardin County in the B/PA area and far enough east to include pertinent portions of Chambers County in the H/G area. Figure 1 shows the modeling domain for H/G and B/PA area and an example of the spatial distribution of anthropogenic ROG emissions.

As stated earlier, the D/FW area did not have a corresponding set of model runs for determining the relationship of maximum ozone concentration to changes in ROG emissions. However the ROG and NO_x emission values for this area have some implications which will be discussed in the Results section of this report.

In accordance with §818 of the 1990 FCAA Amendments, the UAM modeling for El Paso did <u>not</u> include any emissions from the adjoining Ciudad Juarez, Mexico [TNRCC, 1994e]. Because of the §818 approach used for El Paso, it is inappropriate to apply the AMOC analysis to the existing modeling results for this non-attainment area.

Results

For H/G and B/PA, Tables 1 and 2 summarize the calculation of the amount of ROG emission change (ΔROG) required to obtain an incremental change in ozone concentration (ΔO_3) of 1 ppb. The UAM model runs were originally conducted in order to investigate the sensitivity of maximum ozone concentration to a wide range of changes in total anthropogenic ROG emissions. For this report, only the points nearest the base case value (100% of emissions) were used to calculate ΔROG values. The estimated VOC increases required to increase the maximum ozone concentration 1 ppb range from 4.7 to 6.6 tons/day for H/G and from 4.7 to 7.1 tons/day for B/PA.

Figure 2 shows the predicted maximum ozone concentration for all variations in the anthropogenic ROG emissions that were performed for two levels of base case development of the 7/29/90 episode day for H/G and B/PA. The term "base case" refers to the set of emission, meteorological, and boundary concentration data that represent a historic episode day. Base Case 3 is the final and most accurate representation of the 7/29/90 episode day. Base

Case 2 was an intermediate base case. Both of these base cases have been documented elsewhere [TNRCC, 1994c].

The graph labeled "Base Case 3 (Final)" in Figure 2 corresponds to the results reported in Table 1. However, the model runs for Base Case 3 did not go beyond the 100% base case level of emissions. Since short-term <u>increases</u> of ROG resulting from AMOC's are of concern, a graph for Base Case 2 is included to indicate the behavior of the maximum ozone concentration when the anthropogenic ROG increases beyond the base case value. The UAM model runs for Base Case 2 included anthropogenic ROG levels of 125% and 150% of the base case amount. Since the graphs in Figure 2 are relatively linear in the proximity of the 100% value, it seems adequate for this analysis to use neighboring points with ROG changes of up to +/- 25% from the base case value. Given that the ROG changes are "across-the-board", probably no additional accuracy would be obtained by modeling smaller ROG changes than the 15% and 25% results used here.

No analyses are reported for the D/FW area. However, a consideration of the larger ROG/NO_x emission ratio for this area indicates that changes in ozone concentration would be less sensitive to changes in ROG as compared to the H/G area. For H/G, the ratio of total ROG to total NO_x emissions is about 1.7 (e.g. 2204/1354 = 1.6 for 5/18/88 and 2362/1277 = 1.8 for 7/29/90).

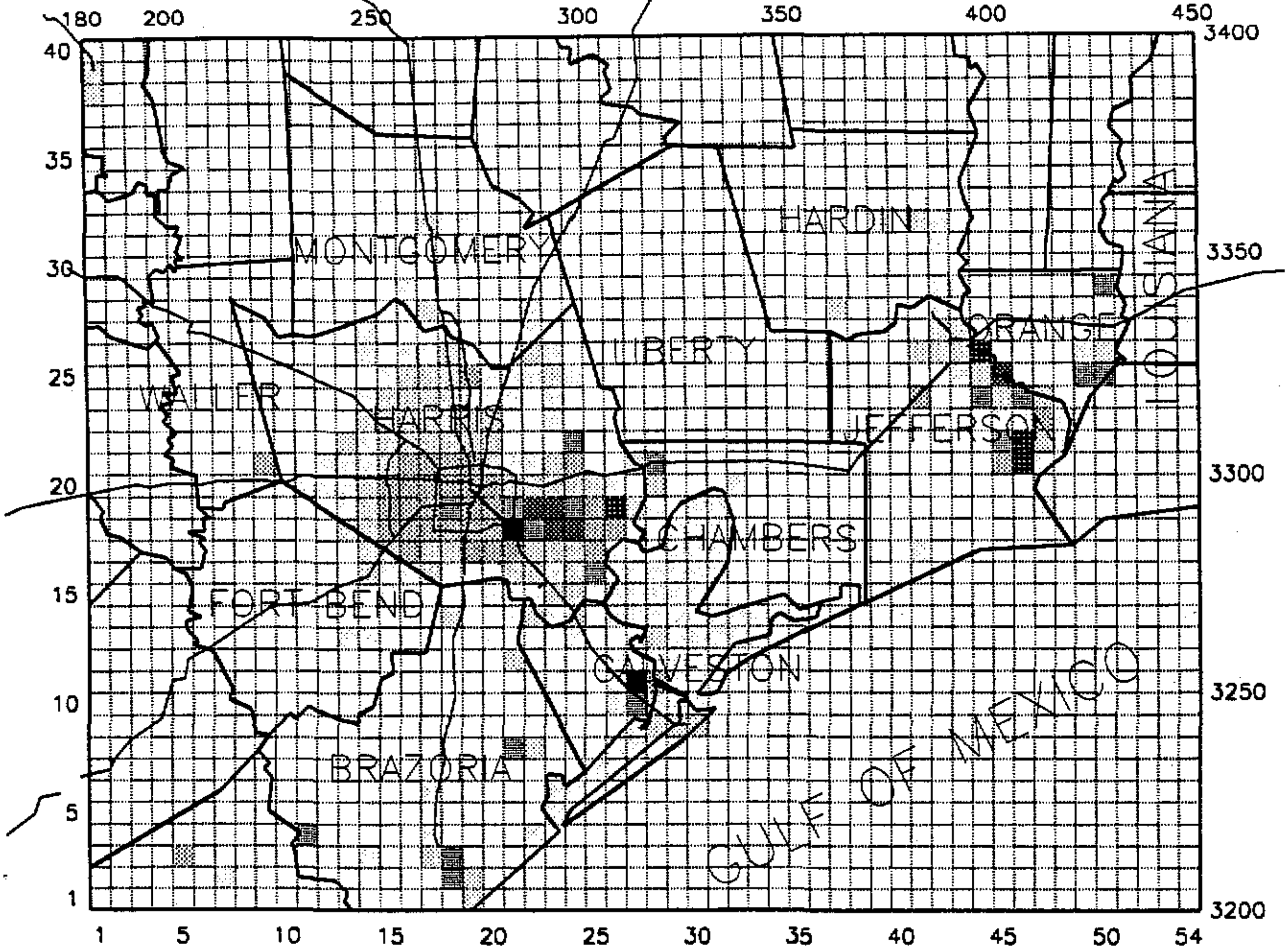
For D/FW this ratio is about 2.0 (e.g. 1774/840 = 2.1 for 6/18/87, 1765/900 = 2.0 for 8/26/88, and 1475/795 = 1.9 for 8/1/91 [TNRCC, 1994d]). Thus, a larger increase of ROG should be required in the D/FW area to raise ozone levels by 1 ppb than in the H/G area.

As discussed in the Methods section, no analyses are reported for El Paso. Currently, the only feasible approach is to apply the results for the other nonattainment areas to El Paso.

Figure 1.

HG/BPA Anthropogenic ROG Emissions, 7/29/90

Final Base Case

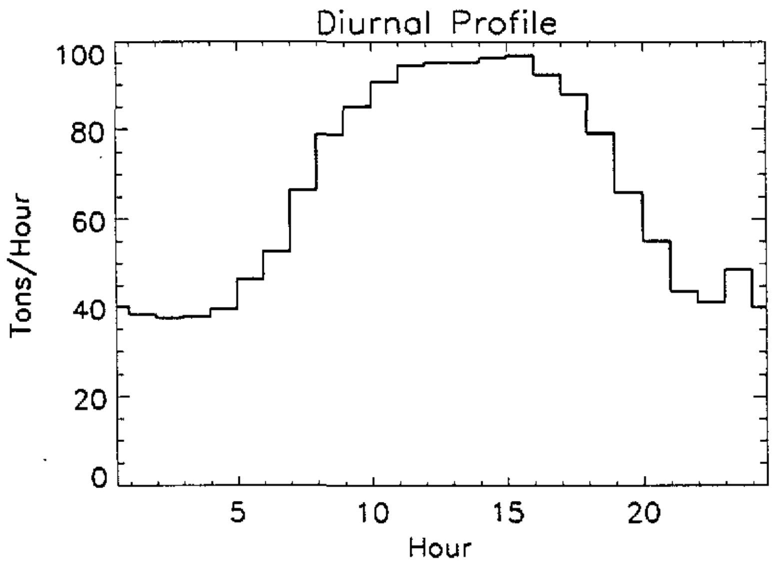


Legend: Tons/Day

< 1	1– 2
2– 5	5–10
10–20	20–30
30–40	> 40

Emissions Summary

County	Tons/Day
Brazoria	125.18
Chambers	80.51
Fort Bend	38.25
Galveston	146.21
Harris	707.65
Liberty	19.61
Montgomery	48.66
Waller	13.62
H–G SUBTOTAL:	1179.69
Hardin	27.20
Jefferson	216.51
Orange	89.65
B–PA SUBTOTAL:	333.36
DOMAIN TOTAL:	1610.50



PLOT DATE/TIME: 09/23/1994 15:29:31 DATA FILE: /uam/hbpa/ptsrce/ptsource.bin.072990+lo_anthro.bin.072990+

Table 1. UAM Modeling Results of Ozone Sensitivity to Changes in ROG Emissions for Houston/Galveston.								
Episode Date	Sens Type	Emissions (tons/day) Base	Sens	Maximum O_3 (ppb) Base	Sens	ΔROG	ΔO_3	$\frac{\Delta ROG}{\Delta O_3}$
5/18/88	85a	2204	1986	173	140	218	33	6.6
7/29/90	75a	2362	2050	263	197	312	66	4.7
7/30/90	75a	2479	2139	253	200	340	53	6.4

Table 2. UAM Modeling Results of Ozone Sensitivity to Changes in ROG Emissions for Beaumont/Port Arthur								
Episode Date	Sens Type	Emissions (tons/day) Base	Sens	Maximum O_3 (ppb) Base	Sens	ΔROG	ΔO_3	$\frac{\Delta ROG}{\Delta O_3}$
5/18/88	85a	768	708	163	153	60	10	6.0
7/29/90	75a	855	765	165	146	90	19	4.7
7/30/90	75a	869	777	174	161	92	13	7.1

Sensitivity (Sens) types for Tables 1 and 2:

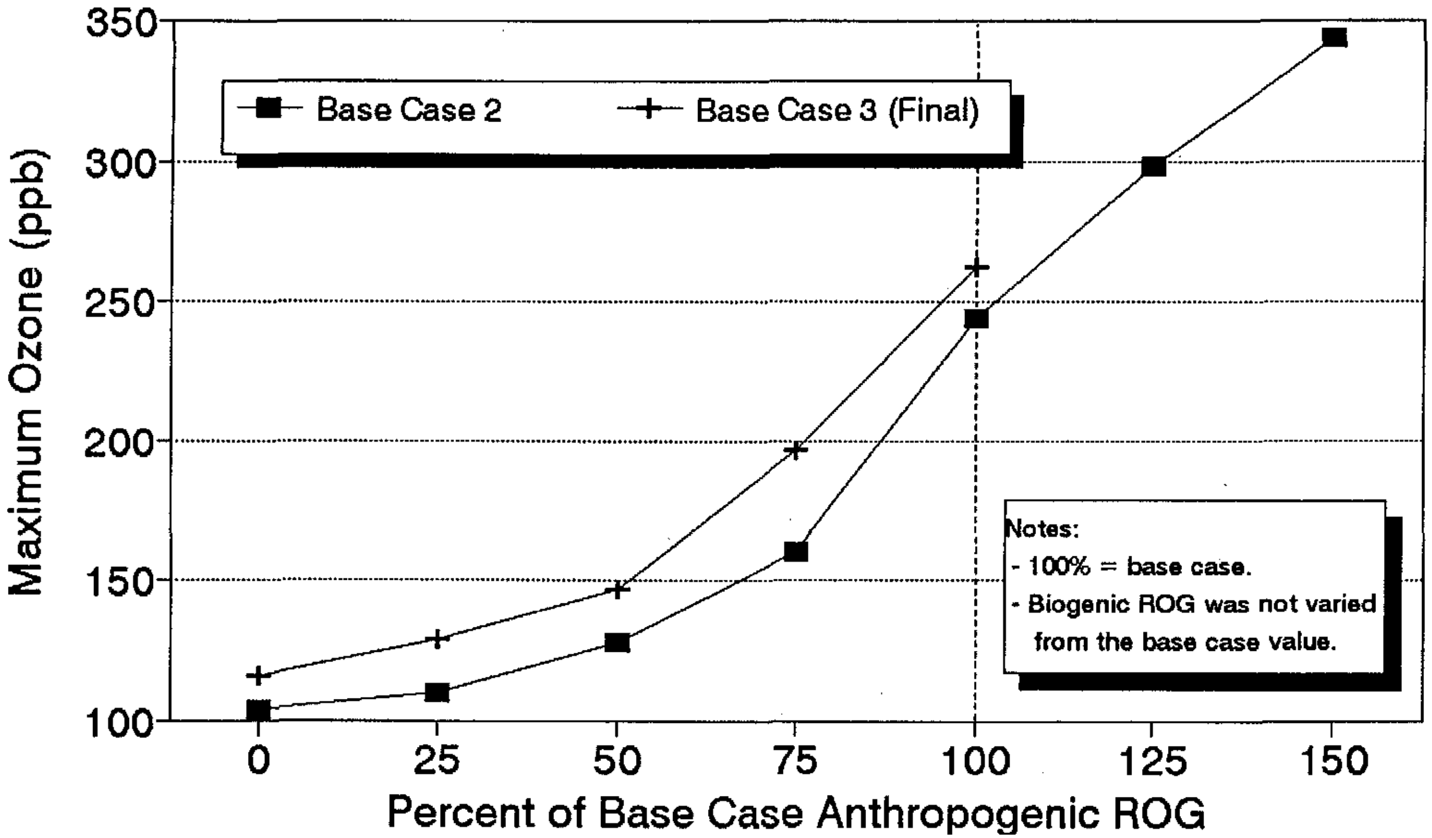
85a: UAM model run with base case anthropogenic ROG emissions multiplied by 0.85; emissions shown are total ROG (anthropogenic + biogenic).

75a: UAM model run with base case anthropogenic ROG emissions multiplied by 0.75; emissions shown are total ROG (anthropogenic + biogenic).

Figure 2.

Maximum Ozone vs. Anthropogenic ROG

Houston/Galveston, 07/29/90



Conclusions

The results indicate that a 4 ton/day increase of VOC emissions should not cause a 1 ppb increase in the maximum ozone concentration. This conclusion assumes that the AMOC's will be spatially distributed. However even if the AMOC's with short-term emission increases are concentrated in one area, the increases of emissions would have to all occur simultaneously and during a critical time period in order for the increased emissions to have a significant effect on ozone production. Furthermore, for the impact on ozone to be significant, the area where the increases are occurring would likely need to be VOC limited (i.e. an area where the ratio of ambient VOC/NO_x concentration is small enough that changes in ozone production are primarily controlled by the concentration of VOC rather than the concentration of NO_x). It is felt that the certain benefit of annual reductions of VOC resulting from AMOC's will offset the uncertain probability of AMOC's occurring in such a fashion as to cause any significant short-term increase of ozone. For El Paso, the conclusions assume a transferability of results from the other nonattainment areas.

The analyses have some built-in conservative factors. One is the use of the episode maximum. This value is generally more sensitive to changes in emissions than somewhat lower levels of ozone. A second factor is the seeming unlikelihood, as described above, of the AMOC plans with short-term increases having a strong synergistic effect toward the production of ozone. A third is that in all likelihood there will be AMOC plans which result in reductions of VOC emissions over the same time periods as AMOC plans with short-term VOC increases; there has been no attempt to include these future reductions of VOC emissions in these analyses since the AMOC requires an overall reduction in the annual VOC emissions. For a particular time period area wide reductions of VOC emissions could result from AMOC plans whose short-term increases occur during other time periods or from AMOC plans which do not have any short-term increases. A fourth conservative factor is that the emission changes applied to the model are changes in ROG, while the AMOC rule limits changes of VOC; thus, modeling a 4 ton/day increase in ROG means that an increase greater than 4 tons/day of VOC is being modeled.

Although the results may appear to support an allowable short-term VOC increase that is slightly larger than 4 tons/day, it must be kept in mind that the results are based on domain-wide changes of total anthropogenic VOC's. The analyses were not focused on the specific types of VOC changes that are likely to occur under the AMOC program. It seems likely that the maximum ozone concentration will be more sensitive to certain localized changes in VOC emissions as compared to domain-wide changes. Thus a margin-of-safety is desirable until further analyses can be performed.

References

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TNRCC, 1994d. "Dallas/Fort Worth Base Case Report: Emissions", Texas Natural Resource Conservation Commission, Office of Air Quality, Air Quality Planning Division, Modeling Section, Austin, Texas.

TNRCC, 1994e. "El Paso Ozone Nonattainment Area §818 Demonstration Report", Texas Natural Resource Conservation Commission, Office of Air Quality, Air Quality Planning Division, Modeling Section, Austin, Texas.