

REVISIONS TO THE STATE IMPLEMENTATION PLAN (SIP)
FOR THE CONTROL OF OZONE AIR POLLUTION

ATTAINMENT DEMONSTRATION
FOR THE
DALLAS/FORT WORTH NONATTAINMENT AREA

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION
P.O. BOX 13087
AUSTIN, TEXAS 78711-3087

September 21, 1994

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Background

The Federal Clean Air Act (FCAA) Amendments of 1990 designated four counties in the Dallas/Fort Worth (DFW) area (Collin, Dallas, Denton, and Tarrant) as nonattainment for failing to meet the National Ambient Air Quality Standard (NAAQS) for ozone. An area is classified as moderate, serious, severe, or extreme depending on the area's ozone design value and the percentage by which the design value exceeds the NAAQS of 120 parts per billion (ppb). The DFW Ozone Nonattainment area, having a design value of 141 ppb, is classified as a moderate area with an FCAA mandated schedule for attainment of the ozone NAAQS by November 15, 1996.

The FCAA requires states containing ozone nonattainment areas with a classification of moderate or greater to amend their State Implementation Plans (SIP) to achieve a reduction of emissions of volatile organic compounds (VOC) in the nonattainment areas to a level 15 percent below 1990 levels as a first step toward attainment. This SIP revision is referred to as the 1993 Rate-of-Progress (ROP) SIP. The Texas Natural Resource Conservation Commission (TNRCC) submitted the SIP amendment for the 15 percent reduction for DFW in two parts, with the first part on

November 10, 1993, and the second part on May 4, 1994. The 15 percent ROP reductions are shown in Table 9-b-1. These reductions must be accomplished by November 1996. The FCAA also requires, in general, that moderate nonattainment areas submit attainment demonstrations no later than November 15, 1993, showing through modeling that the areas would attain the standard by 1996. The attainment demonstration SIP must include any controls, above and beyond those adopted in the 15 percent ROP SIP necessary to demonstrate attainment. Moderate areas which opt to use the Urban Airshed Model (UAM) are allowed an extra year, and are thus required to submit the attainment demonstration plans no later than November 15, 1994. The TNRCC opted to use the UAM and, therefore, will submit the attainment demonstration SIP by November 15, 1994.

Basis for Attainment

The UAM modeling results (Appendices 9-b-1 through 9-b-4) show that, with controls providing approximately 80 percent of the 15 percent VOC reduction, 1996 attainment year emissions from the DFW airshed are insufficient to generate ozone concentrations in excess of the NAAQS. The UAM modeling domain (or airshed) for DFW is shown in Figure 9-b-1. The specific controls modeled included the reasonably available control technology (RACT) catch-ups (Collin and Denton Counties), Stage II vehicle

Table 9-b-1. ESTIMATES TOWARDS ROP SIP - DALLAS/FORT WORTH

EMISSIONS INVENTORY	1990	Percent	Growth	1996	Percent
Area Sources	174.25	32.1%	6.0%	184.79	30.5%
Point Sources	66.64	12.3%	8.2%	72.10	11.9%
On-road Mobile Sources	204.35	37.7%	18.0%	241.14	39.8%
Off-road Mobile Sources	97.44	18.0%	11.0%	108.19	17.8%
TOTALS	542.68		11.7%	606.22	

ESTIMATED REDUCTIONS

MANDATED RULES	96 Projected TPD	Reduction TPD	% of Required	Cumulative %
Catchups	9.82	4.19	2.9%	2.9%
Vehicle Refueling (Stage II)	22.39	18.19	12.5%	15.3%
Aircraft Stage 3	5.40	0.60	0.4%	15.7%
Other VOC storage, transport	0.06	0.05	0.0%	15.8%
FMVCP Tier I	241.14	1.83	1.3%	17.0%
Basic I/M w/IM240 test	241.14	43.79	30.0%	47.0%
Major Source Bakeries	0.91	0.12	0.1%	
SUBTOTAL		68.77	47.1%	

PHASE I RULES

Auto Refinishing	14.74	4.51	3.1%	50.2%
Municipal Landfills	6.36	3.49	2.4%	52.6%
CAFB Fire Training Pit Closures	1.20	1.20	0.8%	53.4%
RE Improvements	73.37	4.77	3.3%	56.7%
Gas Utility Engines	65.21	6.53	4.5%	61.2%
Reform Gas (on-road)	241.14	33.18	22.7%	83.9%
Reform Gas (off-road)	80.93	3.17	2.2%	86.1%
TCMs	241.14	6.94	4.8%	90.8%
SUBTOTAL		63.79	43.7%	

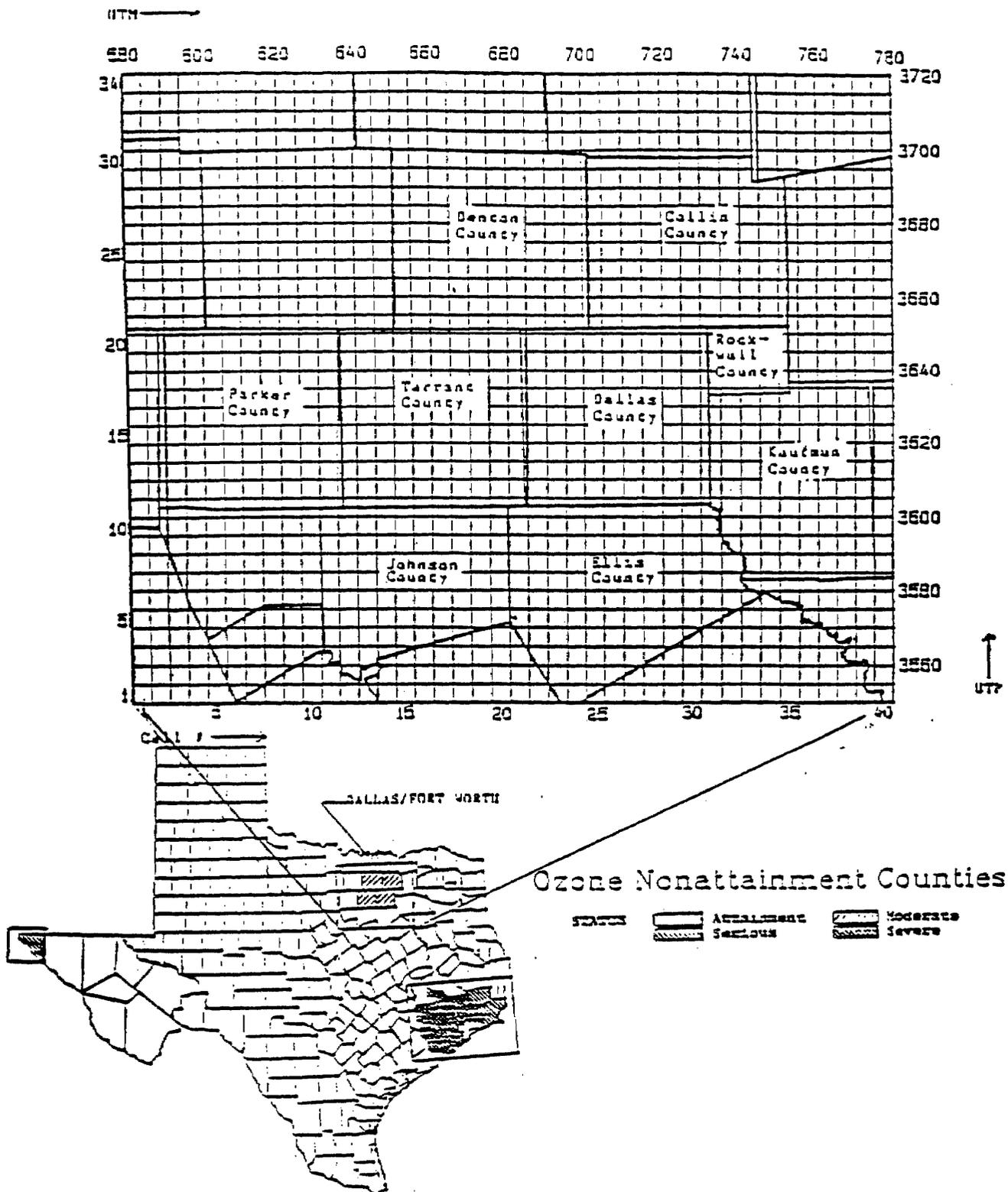
PHASE II RULES and *CONTINGENCY RULES

Acetone replacement	0.87	0.29	0.2%	91.0%
Architectural Coatings	31.08	7.31	5.0%	96.0%
Consumer/Comm Products	32.08	3.45	2.4%	98.4%
Gasoline Terminals	7.66	2.17	1.5%	99.9%
Fugitives	0.11	0.07	0.0%	99.9%
Wood Furniture	10.38	1.35	0.9%	100.9%
*Vessel Cleaning	0.25	0.20	0.1%	101.0%
*Dry Cleaning-Naphtha	3.55	1.96	1.3%	102.3%
*Offset Printing	1.92	0.85	0.6%	102.9%
*Commercial Bakeries	0.91	0.15	0.1%	103.0%
*I/M Improvement	241.14	4.52	3.1%	106.1%
*TCMs	241.14	2.03	1.4%	107.5%
*I/M & FMVCP 1997	241.14	3.83	2.6%	110.1%
*Utility Engines 1997	65.21	6.65	4.6%	114.7%

SUBTOTAL	34.82	23.9%	
Target Improvement	145.93	100.0%	26.9%
Phase I/II/Mandated Rules	147.20	100.9%	
Excess (Shortfall)	1.27	0.9%	
Required Contingency	16.28		3.0%
Target+Contingency	162.21	100.0%	29.9%
Total Reductions ID'd	167.38	103.2%	
Excess (Shortfall)	5.17	3.2%	

7/8/94

Figure 9-b-1. DFW/UAM MODELING DOMAIN



refueling, the Tier I controls of the Federal Motor Vehicle Control Program, the basic inspection and maintenance program with the IM240 test option, closure of the Carswell Air Force Base fire training pit, rule effectiveness improvements, transportation control measures, the small gasoline utility engine controls, and reformulated gasoline for on-road vehicles. The full 15 percent controls were not modeled due to time constraints, and since attainment could be demonstrated with only a portion of these controls, it was not necessary to model the full 15 percent.

The TNRCC believes that because attainment was demonstrated with only VOC controls, nitrogen oxide (NO_x) controls do not contribute to attainment, and therefore, are unnecessary for the DFW nonattainment area. The TNRCC filed a petition (Appendix 9-b-5) in accordance with §182(f) of the FCAA to exempt the DFW area from NO_x RACT and NO_x conformity requirements.

Modeling Procedures and Results

The TNRCC used version IV of the UAM, a U.S. Environmental Protection Agency (EPA)-approved photochemical grid model, to perform the modeling. All modeling activities were performed as outlined in the TNRCC's EPA-approved UAM modeling protocols, and in accordance with EPA's "Guideline for Regulatory Application of the Urban Airshed Model." Appendices 9-b-1 through 9-b-4 describes in detail the modeling procedures and results.

Four historical ozone exceedance episodes, or "base cases," were selected for the modeling demonstration. Meteorological models were employed to simulate the weather patterns characteristic of each episode. Concurrently, models of emissions of NO_x, VOC, and carbon monoxide were developed to characterize the chemical speciation, and the spatial and temporal distributions of these ozone precursors. These modeling emission distributions were based upon data collected for the 1990 Base Year Emissions Inventory. Once acceptable characterizations of emissions and meteorology were developed for each ozone episode, the UAM was executed for each ozone episode.

Predicted ozone concentrations for each episode were compared with observed data to assess model performance. A series of sensitivity and diagnostic model executions were also performed for each episode to characterize the UAM's ability to successfully replicate ozone production in each instance. Model performance was judged to range from acceptable to very good for three episodes, and was determined to be unacceptable for one episode. The three episodes with acceptable performance are: June 18, 1987; August 25-26, 1988; and July 31-August 1, 1991. For the three acceptable episodes, Table 9-b-2 compares measured and base case modeled ozone concentrations in ppb at the location of the maximum ozone concentration. Information regarding the performance of the three acceptable episodes is given in Appendix 9-b-3.

Table 9-b-2. Selected Ozone Episodes - Dallas/Fort Worth

Episode	Exceedance Dates	Maximum Ozone Concentration (ppb)		Maximum Modeled Precursor Concentration (ppb)	
		Measured	Modeled	NO _x	VOC
June, 1987	6/18/87	160	169	64	367
August, 1988	8/25/88	130	131	83	395
	8/26/88	160	144	83	342
July-August, 1991	7/31/91	130	133	93	474
	8/01/91	170	155	85	693

To demonstrate attainment of the ozone NAAQS, modeling was conducted with a 1996 projected emissions inventory for each of the base case episodes. Demographic and economic forecasting methods were used to project the growth in various activities to the summer of 1996. These activities include industrial and small business employment and automotive traffic. This projected growth was coupled with the emission reductions expected under the 15 percent ROP plan (shown in Table 9-b-3) to develop the projected 1996 modeling emissions inventory. Table 9-b-4 summarizes the 1996 projected modeling inventory by general source category. Biogenic VOC emissions were assumed to be the same in 1996 as for the base cases.

A summary of the results of the modeling with the 1996 projected inventory is displayed in Table 9-b-5. In each case, the predicted domain-wide maximum ozone concentration is below the NAAQS of 120 ppb. This establishes that implementation of the 1993 ROP SIP would achieve timely attainment of the NAAQS.

Table 9-b-3. Modeled 15% ROP SIP VOC Reductions

Source Category	15% ROP SIP Reduction (Tons/Day)	Modeled Reduction (Tons/Day)
Mandated Rules		
Catchups	4.19	4.03
Vehicle Refueling (Stage II)	18.19	18.19
Aircraft Stage 3	0.60	0.00
Other VOC Storage, Transport	0.05	0.00
FMVCP Tier I	1.83	1.80
Basic I/M with IM240 Test	43.79	49.23
SUBTOTAL	68.65	73.25
Phase I Rules and Phase II Rules		
Auto Refinishing	4.51	0.00
Municipal Landfills	3.49	0.00
CAFB Fire Training Pit Closure	1.20	1.20
Rule Effectiveness Improvements	4.77	3.32
Gasoline Utility Engines	6.53	6.53
Reform Gasoline (on-road)	33.18	28.74
Reform Gasoline (off-road)	3.17	0.00
Major Source Bakeries	0.12	0.00
Acetone Replcement	0.29	0.00
Architectural Coatings	7.31	0.00
Consumer/Commercial Products	3.45	0.00
Gasoline Terminals	2.17	0.00
Fugitive Emissions	0.07	0.00
Wood Furniture	1.35	0.00
Transportation Control Measures	6.94	6.94
SUBTOTAL	78.55	46.73
Contingency Rules		
Dry Cleaning-Naphtha	1.96	0.00
Offset Printing	0.85	0.00
Commercial Bakeries	0.15	0.00
Vessel Cleaning	0.20	0.00
I/M Improvement	4.52	0.00
Transportation Control Measures	2.03	0.00
I/M & FMVCP (1997)	3.83	0.00
Utility Engines (1997)	6.65	0.00
SUBTOTAL	20.19	0.00
TOTAL	167.38	119.98

Table 9-b-5. Attainment Demonstration for Dallas/Fort Worth

Episode	Exceedance Dates	Maximum Ozone Concentration (ppb)			Maximum Modeled Precursor Concentration (ppb)	
		Measured	Modeled		NO _x	VOC
			Base Case	Attainment Demonstration		
June, 1987	6/18/87	160	169	115	72	154
August, 1988	8/25/88	130	131	103	100	356
	8/26/88	160	144	110	89	192
July - August, 1991	7/31/91	130	133	103	119	524
	8/01/91	170	155	119	93	640

APPENDIX 9-b-1

**Dallas/Ft. Worth Ozone Nonattainment Area
Base Case Report: Modeling Domain/Episode
Selection/ Meteorology/Air Quality
(April 1994)**

APPENDIX 9-B-2

**Dallas/Ft. Worth Ozone Nonattainment Area
Base Case Emissions Report
(April 1994)**

APPENDIX 9-b-3

**Dallas/Fort Worth Ozone Nonattainment Area
Base Case Report - Performance Evaluation
(June 1994)**

APPENDIX 9-b-4

**1996 Dallas/Fort Worth Ozone Attainment
Modeling Report
(July 1994)**

APPENDIX 9-b-5

**Petition for Section 182(f) Exemption from
NO_x RACT Requirements for the Dallas/
Fort Worth Ozone Nonattainment Area
(June 17, 1994)**