ENVIRON

MEMORANDUM

To: NETAC Technical Committee

From: Greg Yarwood

Date: March 12, 2002

Subject: Revised 1-hour ozone attainment demonstration for East Texas reflecting board orders proposed in 2002

Introduction

A 1-hour ozone control strategy was developed for East Texas in 1999 based on ozone modeling with the CAMx model (see the report "Ozone Modeling for the Tyler-Longview-Marshall Area of East Texas" revised August 3, 2001 for details). The "1999 modeling" developed base cases for two ozone episodes, June 18-23, 1995 and July 14-18, 1997. Both ozone models were developed to be suitable for use in a Sate Implementation Plan (SIP) by performing comprehensive model performance evaluations, diagnostic and sensitivity testing, future year modeling for 2007 and future year control strategy evaluations. The 1999 modeling showed that reductions in NOx emissions were required to reduce 1-hour ozone levels in East Texas below the level of the 1-hour ozone standard. Finally, a control strategy was developed in 1999 that demonstrated attainment of the 1-hour ozone standard for 2007. This "attainment demonstration" strategy included Federal programs, TNRCC SIP reductions for ozone nonattainment areas in Texas and local commitments from three companies with major sources in East Texas: TXU, Texas Eastman and AEP (then CSW).

In 2001 and 2002, the TNRCC developed a SIP revision for Northeast Texas to make enforceable the attainment demonstration strategy from the 1999 modeling. Developing the engineering solutions to implement the NOx reductions and the board orders to enforce these reductions resulted in some changes to the original emission reduction plan. These changes were documented in an October 18, 2001 memorandum. Further small changes to the AEP emission reductions occurred in finalizing the board orders. The purpose of this memorandum is to document the revised emission reductions and ozone attainment demonstration that result from the proposed board orders as of March 2002. These emission reductions are called the "2002 control plan."

Summary of Key Findings

Table 1 summarizes the NOx emission reductions under the 1999 and 2002 control plans. There were changes in the emission reductions for each facility between the 1999 and 2002 control plans, but the total ton/day reductions are greater under the 2002 control plan than the

1999 control plan.

Table 1. Reductions in 2007 NOx emissions for the 1999 and 2002 control plans.

Facility	Percent Reduction		Ton/day Reduction	
	1999 Control Plan	2002 Control Plan	1999 Control Plan	2002 Control Plan
AEP Wilkes	22%	44%	2.8	5.6
AEP Knox Lee	12%	16%	0.9	1.1
AEP Pirkey	30%	29%	7.6	7.5
AEP Total			11.2	14.2
TXU Marin Lake	40%	42%	39.2	40.7
TXU Monticello	26%	27%	17.2	17.8
TXU Stryker Creek	31%	7%	4.7	1.0
TXU Total			61.1	59.5
Texas Eastman	38%	39%	6.8	7.0
Grand Total			**79.2**	**80.7**

Table 2 shows the highest 1-hour ozone values in 2007 under the 1999 and 2002 control plans. This value must be 124 ppb or lower to demonstrate attainment of the 1-hour ozone standard.

Table 2. Maximum modeled 1-hour ozone values in East Texas in 2007 under the 1999 and 2002 control plans

	2007 Peak 1-hour Ozone (ppb)
1999 Control Plan	118.6
2002 Control Plan	117.8

The peak ozone level is slightly lower (117.8 ppb) with the 2002 control plan than with the 1999 control plan, and is below the 124 ppb attainment demonstration target. Therefore, the main conclusion from the revised modeling is:

- The control plan embodied in the final board orders for AEP, Texas Eastman and TXU is suitable for inclusion in the Northeast Texas SIP revision to demonstrate attainment of the 1-hour ozone standard in East Texas in 2007.

EMISSIONS REDUCTIONS

AEP

The proposed orders for AEP include rolling 30-day average limits on NOx emission rates expressed in lb/mmBtu. The 2007 strategy emissions were estimated by assuming that units would emit at this 30-day average limit. The proposed emission rate limit is 0.17 lb/mmBtu for Wilkes units 2 and 3 and 0.18 lb/mmBtu for Knox Lee unit 5. The TNRCC proposed an emission rate limit of 0.23 lb/mmBtu for Pirkey. Pirkey emissions were lowered to a 0.22 lb/mmBtu emission rate in order for the Wilkes and Knox Lee rates to slightly increase from the originally proposed rate of 0.15 lb/mmbtu. Table 3 shows the 2007 base case emissions, the 2007 control strategy emissions, and the control strategy reduction expressed in tons/day and as a percentage.

TXU

The proposed orders for TXU also include rolling 30-day average limits on NOx emission rates. The proposed limit is 0.2 lb/mmBtu for Martin Lake units 1, 2 and 3 and for Monticello units 1, 2 and 3. The TNRCC proposed an emission factor of 0.27 lb/mmBtu for Stryker Creek Unit 1, but TXU had already made a reduction on Unit 2 which was enforceable. Stryker Creek Unit 2 emissions were calculated using a 0.12 lb/mmBtu emission rate limit. No reduction was made to emissions from Stryker Creek Unit 1. Table 4 shows the 2007 base case emissions, the 2007 control strategy emissions, and the control strategy reduction expressed in tons/day and as a percentage.

Texas Eastman

The proposed order for Texas Eastman identifies a series of changes affecting many different pieces of equipment. Table 5 lists the reduction in 2007 NOx emissions for each of these changes. Table 5 also includes related emission reductions from the 2000 board order and the replacement of two coal fired boilers (UD047B13 and UD047B14) by a co-generation plant (GT-HRSG#1 and GT-HRSG#2). The co-gen emissions are not actually Texas Eastman emissions, but are included in this analysis because Texas Eastman agreed to off-set the co-gen emissions as a part of their overall NOx reduction commitment. The total NOx emission reduction is 6.994 tons/day. This is a 39% reduction from the 2007 base case NOx emissions for Texas Eastman of 17.93 tons/day. Table 5 also shows the VOC reductions for the Texas Eastman sources.

Table 3. Reductions in AEP NOx emissions due to the proposed 2007 emission rate limits.

Facility	2007 Base Case		2007 Strategy		Reduction	
	lb/mmBtu	ton/day	lb/mmBtu	ton/day	ton/day	Percent
Wilkes						
Unit 1	N/A	1.5	N/A	1.5	0.0	0%
Unit 2	0.31	5.3	0.17	2.9	2.4	45%
Unit 3	0.38	5.8	0.17	2.6	3.2	55%
All units		12.6		7.0	5.6	44%
Knox Lee						
Unit 2	N/A	0.3	N/A	0.3	0.0	0%
Unit 3	N/A	0.3	N/A	0.3	0.0	0%
Unit 4	N/A	2.1	N/A	2.1	0.0	0%
Unit 5	0.24	4.4	0.18	3.2	1.1	26%
All units		7.1		6.0	1.1	16%
Pirkey	0.31	25.4	0.22	17.9	7.5	29%

Note: N/A = information not available

Table 4. Reductions in TXU NOx emissions due to the proposed 2007 emission rate limits.

TXU	2007 Base Case		2007 Strategy		Reduction	
	lb/mmBtu	ton/day	lb/mmBtu	ton/day	ton/day	Percent
Martin Lake						
Unit 1	0.34	31.4	0.2	18.5	12.9	41%
Unit 2	0.31	30.5	0.2	19.7	10.8	35%
Unit 3	0.38	36.2	0.2	19.2	17.0	47%
All units		98.1		57.3	40.7	42%
Monticello						
Unit 1	0.29	21.7	0.2	14.9	6.8	31%
Unit 2	0.30	21.6	0.2	14.6	7.0	32%
Unit 3	0.24	22.8	0.2	18.8	4.0	18%
All units		66.1		48.3	17.8	27%
Stryker Creek						
Unit 1	0.53	9.4	0.53	9.4	0.0	0%
Unit 2	0.15	5.8	0.12	4.8	1.0	18%
		15.2		14.2	1.0	7%

Table 5. Reductions in Texas Eastman NOx emissions (ton/day) due to the proposed orders and other enforceable measures.

FIN	EPN	NOx Reduction	VOC Reduction
EP009B1	009B1	0.080	0.003
EP009B2	009B2	0.092	0.003
EP009B3	009B3	0.095	0.003
EP009C1A	009C1A	0.089	0.003
EP009C1B	009C1B	0.089	0.003
EP009C1C	009C1C	0.089	0.003
EP009C4A	009C4A	0.083	0.003
EP009C4B	009C4B	0.083	0.003
OX061H1	061CD6	0.024	0.011
	061CD7	0.017	0.009
OX061H1B	061H1B	0.004	0.000
OX061H5	061CD12	0.054	0.030
	061CD17	0.027	0.014
OX061H7	061CD14	0.019	0.009
	061CD61	0.062	0.029
OX062C16	062C16	0.389	0.016
OX062C17	062C17	0.389	0.016
OX062C19	062C19	0.392	0.016
OX062C20	062C20	0.384	0.016
OX062C22	062C22	0.219	0.232
OX062C7	062C7	0.281	0.011
OX062C9	062C9	0.181	0.007
OX062H11A	062CD18A	0.014	0.013
	062CD18B	0.026	0.013
	062CD18C	0.026	0.013
OX062H11B	062CD18A	0.024	0.011
	062CD18B	0.024	0.011
	062CD18C	0.024	0.011
OX062H13A	062CD26	0.038	0.017
	062CD28	0.038	0.017
OX062H13B	062CD26	0.036	0.016
	062CD28	0.036	0.016
OX062H15	062H15	0.003	0.000
OX062H16	062H16	0.003	0.000
OX062H17	062CD28	0.037	0.017
	062CD32	0.037	0.018
UD009PE1	009PE1	0.130	0.008
UD009PE2	009PE2	0.130	0.008
UD040PE3	040PE3	0.389	0.023
UD047B13	047B13	2.110	0.014
UD047B14	047B14	2.420	0.014
UD063PE3	063PE3	0.389	0.023
OX062H21	062H21	0.020	0.001
GT-HRSG#1		-1.051	N/A
GT-HRSG#2		-1.051	N/A
Grand Total		**6.994**	**0.703**

Note: N/A = information not available

OZONE MODELING

The June 1995 Regional Scale Model (RSM) and the July 1997 Urban Scale Model (USM) were re-run using the revised emission levels for major sources shown in Tables 3-5, above. While Tables 3-5 focus on NOx emission changes, because these are most important, changes to VOC emissions resulting from the proposed board orders were also accounted for in the modeling. The new model runs were called control strategy 19 (abbreviated to Cntl 19). The final control strategy modeled in 1999 was Cntl 16 and the 2007 base case was run Cntl 15 (see the ozone modeling report for details).

The daily maximum 1-hour ozone levels in 2007 for the June 1995 RSM are shown in Table 6 and for the July 1997 USM in Table 7. These tables correspond to Tables 6-10 and 6-11 in the ozone modeling report. The maximum ozone levels for control strategy 19 and 16 are very similar, consistent with the relatively small changes to the NOx emissions between these runs. The highest ozone level anywhere in the East Texas subdomain is slightly lower with the 2002 control plan (117.8 ppb) than with the 1999 control plan (118.6 ppb). Since 117.8 ppb is less than the attainment demonstration target of 124 ppb, the 2002 control plan demonstrates attainment of the 1-hour ozone standard in East Texas in 2007.

Table 6. Daily maximum ozone (ppb) for the June 1995 episode future year base case (cntl 15) and control strategy cases (cntl16 and cntl19). Values greater than 124 ppb are in bold.

Model Run	Longview		Tyler		East Texas Subdomain	
	22-June	23-June	22-June	23-June	22-June	23-June
Cntl 15 - base	117.5	122.1	83.0	84.8	**127.4**	**136.2**
Cntl 16 – 1999 control plan	110.0	110.6	79.7	79.5	117.6	117.7
Cntl 19 – 2002 control plan	109.5	110.1	79.7	79.3	116.9	116.8

Table 7. Daily maximum ozone (ppb) for the July 1997 episode future year base case (cntl15) and control strategy cases (cntl16 and cntl19).

Model Run	Longview		Tyler		East Texas Subdomain	
	16-July	17-July	16-July	17-July	16-July	17-July
Cntl 15 - base	107.3	101.9	82.1	113.2	115.7	120.0
Cntl 16 – 1999 control plan	99.3	94.3	79.4	101.7	118.6	113.7
Cntl 19 – 2002 control plan	98.7	94.0	79.4	101.2	117.8	113.5

8-Hour Ozone

The impact of the revised control strategy on 8-hour ozone levels was also evaluated. Table 8 shows the projected 8-hour ozone levels calculated using EPA's design value scaling methodology (see the 1999 ozone modeling report for details). Table 8 corresponds to Table 7-2 in the 1999 ozone modeling report. Comparing the scaled design values for runs Cntl 16 and Cntl 19 shows that there is essentially no difference between the 1999 and 2002 control plans. The highest scaled design value under both plans is 85 ppb at the Longview monitor. However, the 8-hour ozone modeling will be updated when modeling is completed for an August 1999 episode period in the near future.

Table 8. Design value scaling calculations for 8-hour ozone. Scaled design values of 85 ppb or greater are shown in bold.

Future Scenario	**Base Year Scenario**	**Tyler**		**Longview**		**Screened Cells**		
		RRF	**Scaled DV**	**RRF**	**Scaled DV**	**No. of Cells**	**RRF Max**	**Scaled DV**
2007 base	base1	0.976	**87**	0.984	**90**	6	0.977	**89**
Strategy 1	base1	0.931	83	0.937	**85**	6	0.894	81
Strategy 2	base1	0.945	84	0.970	**88**	6	0.966	**88**
Strategy 3	base1	0.939	84	0.961	**87**	6	0.961	**87**
Strategy 4	base1	0.896	80	0.895	81	6	0.830	76
Strategy 5	base1	0.856	76	0.844	77	6	0.756	69
Strategy 6	base1	0.859	76	0.876	80	6	0.818	74
Strategy 7	base1	0.851	76	0.861	78	6	0.811	74
Strategy 8	base1	0.809	72	0.840	76	6	0.799	73
Strategy 9	base1	0.849	76	0.872	79	6	0.841	77
Strategy 10	base1	0.825	73	0.863	79	6	0.829	75
Strategy 11	diag2	0.959	**85**	0.980	**89**	10	0.984	**90**
Strategy 12	diag2	0.941	84	0.944	**86**	10	0.922	84
Strategy 13	base1	0.975	**87**	0.984	**90**	6	0.976	**89**
Strategy 15 - Final 2007 Base Case	base2	0.972	**87**	0.978	**89**	4	0.981	**89**
Strategy 16 – 1999 control plan	base2	0.930	83	0.933	**85**	4	0.909	83
Strategy 17	diag2	0.939	84	0.937	**85**	10	0.913	83
Strategy 19 – 2002 control plan	base2	0.929	83	0.930	**85**	4	0.906	82

Ozone Isopleth Plots

The remainder of this memorandum shows daily maximum ozone isopleth plots for the 2002 control plan. Plots are shown for the June 1995 and July 1997 episode days and for 1-hour and 8-hour ozone. These plots correspond to Figures 6-11 through 6-14 and 7-10 through 7-13 in the 1999 ozone modeling report.

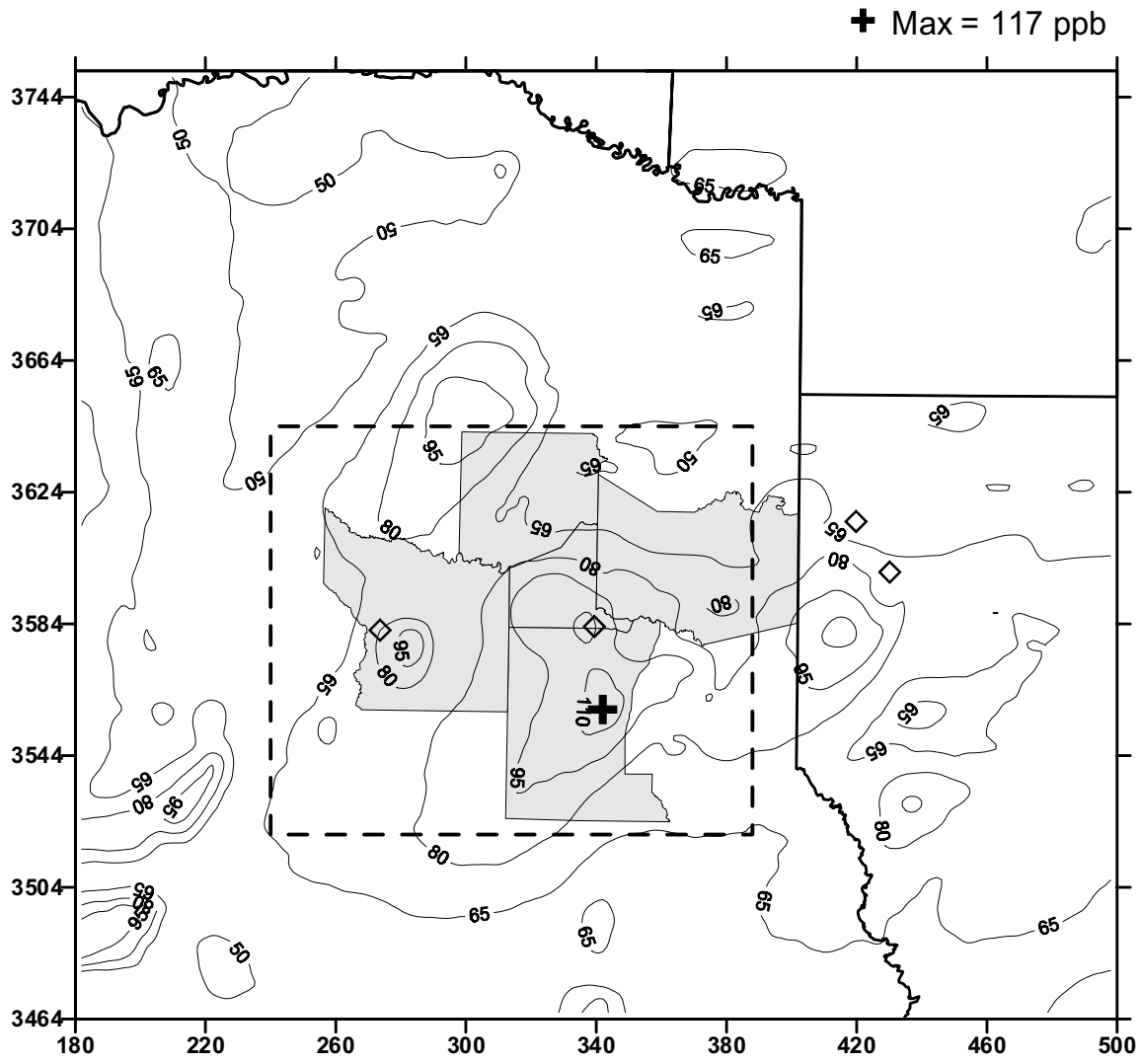

Figure 1. Isopleth of daily 1-hour maximum ozone for the final control strategy (as of March, 2002) for June 22, 1995.

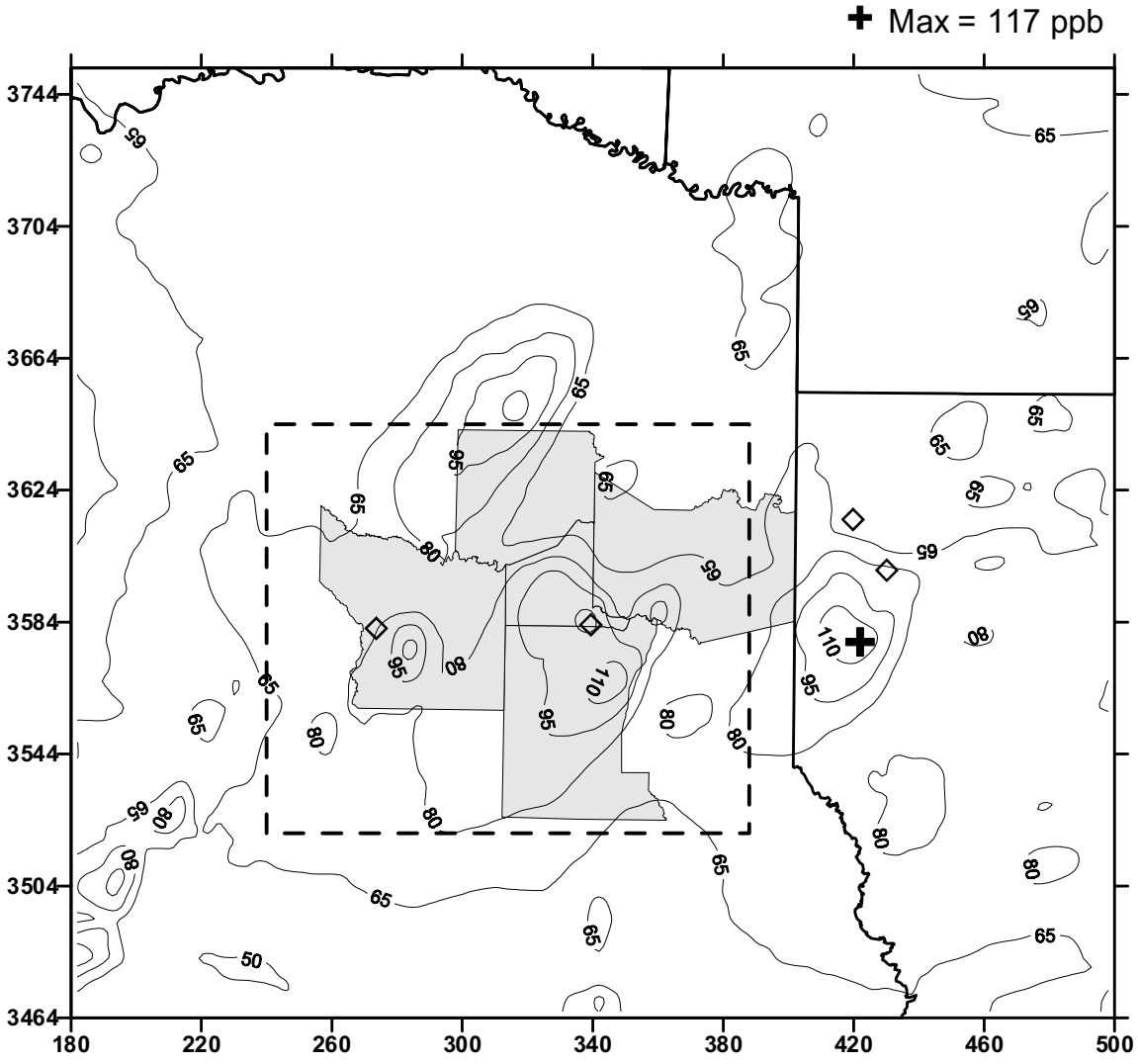

Figure 2. Isopleth of daily maximum 1-hour ozone for the final control strategy (as of March, 2002) for June 23, 1995.

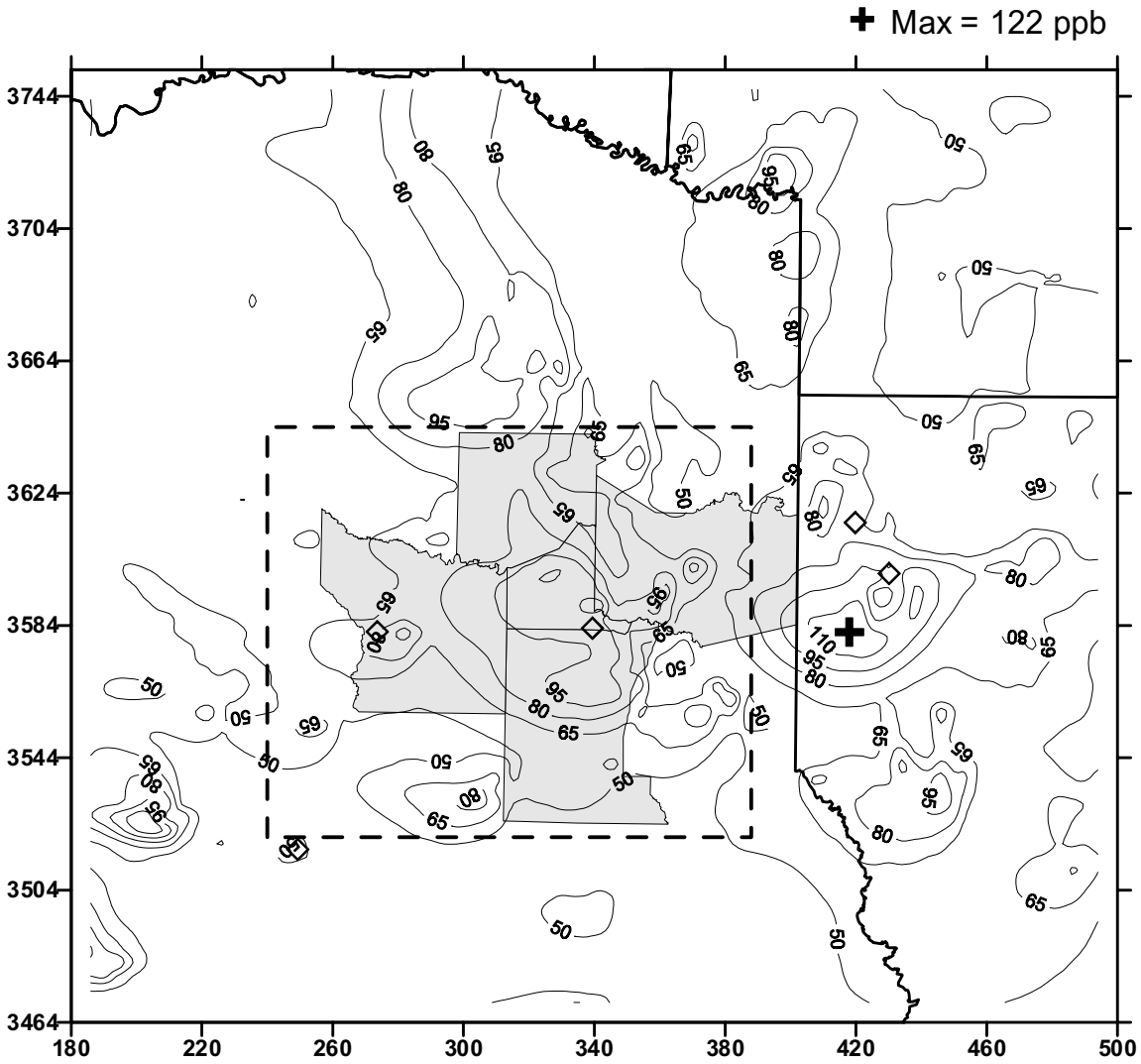

Figure 3. Isopleth of daily maximum 1-hour ozone for the final control strategy (as of March, 2002) for July 16, 1997.

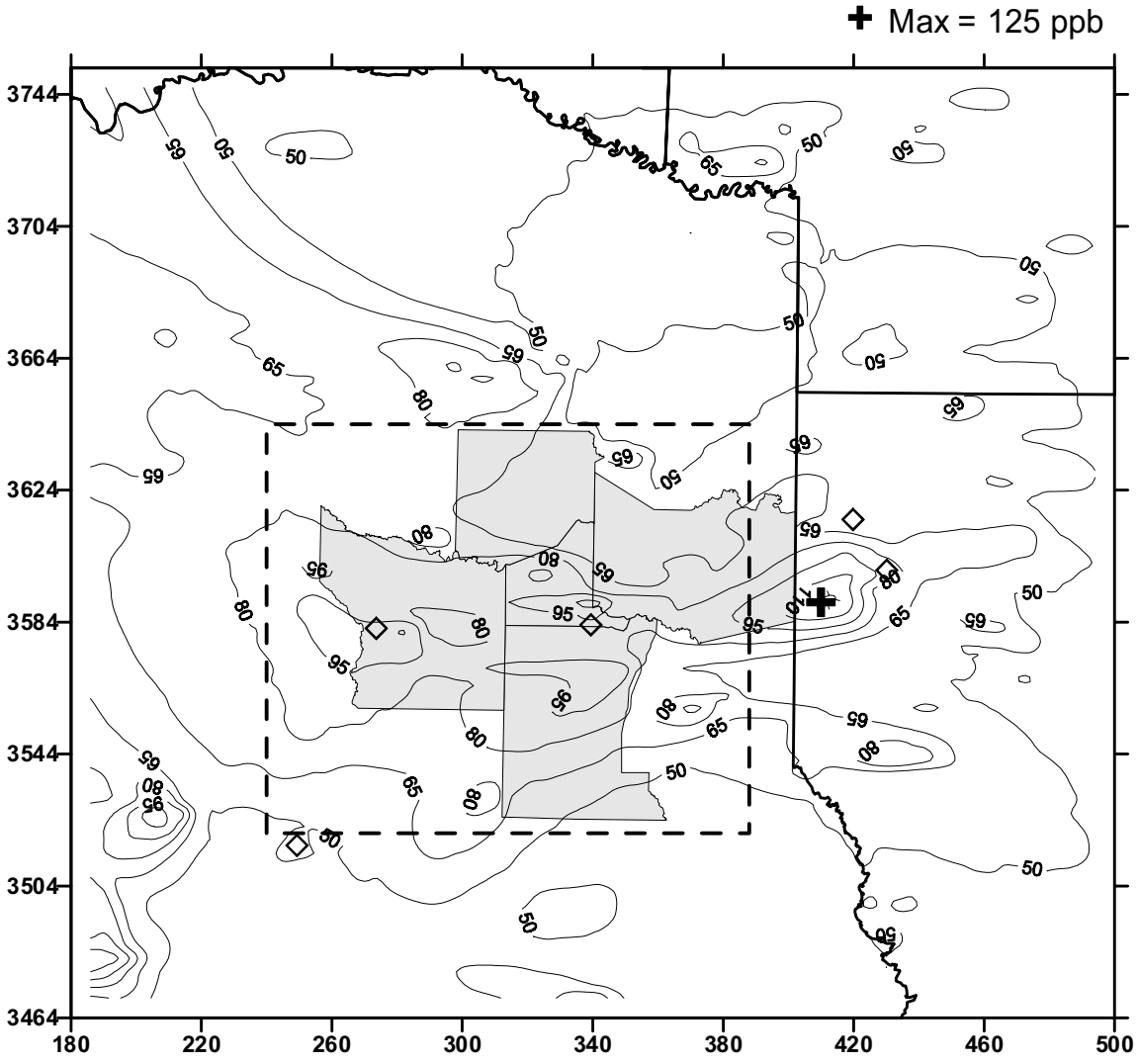

Figure 4. Isopleth of daily maximum 1-hour ozone for the final control strategy (as of March, 2002) for July 17, 1997.

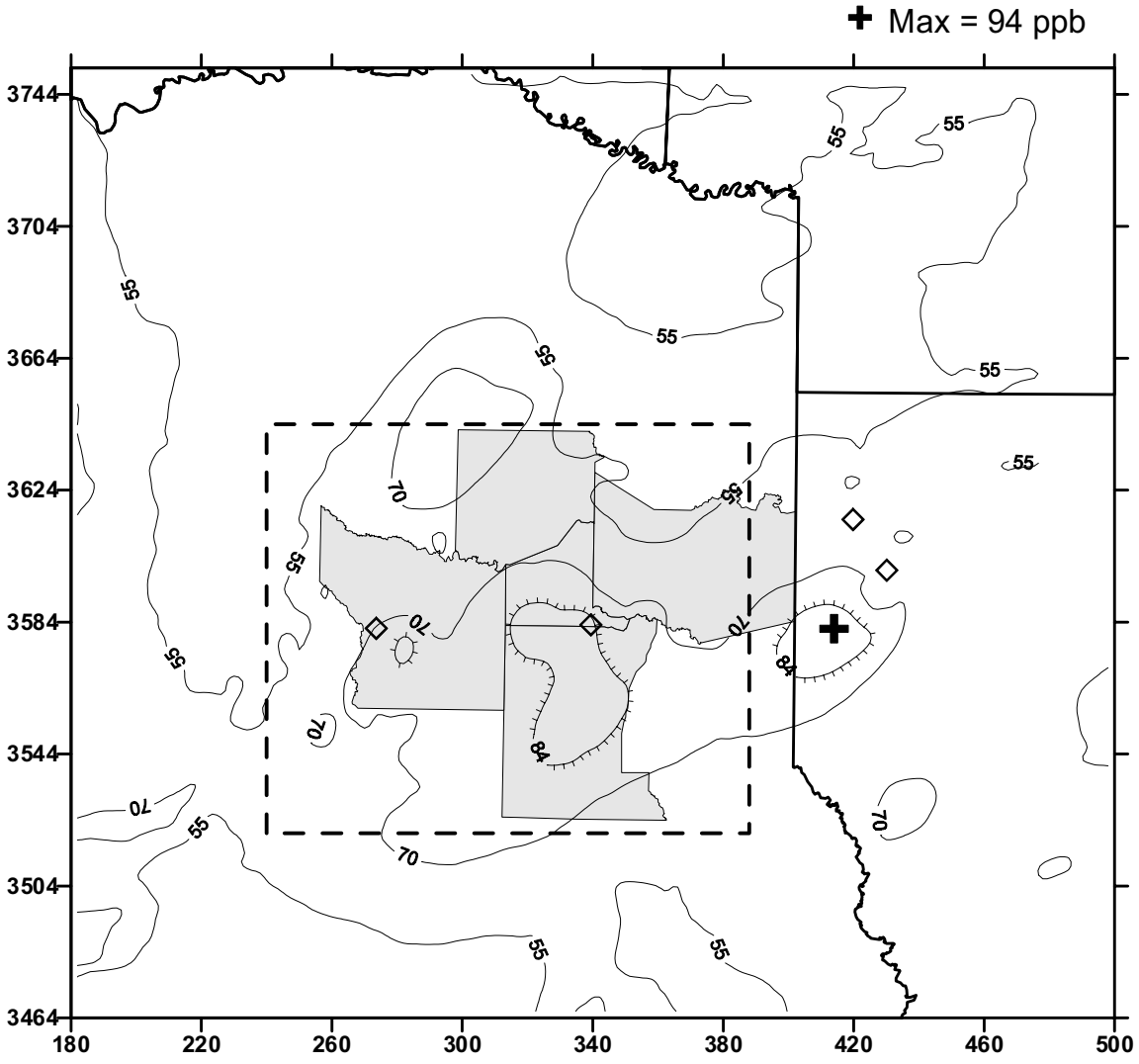

Figure 5. Isopleth of daily maximum 8-hour ozone for the final control strategy (as of March, 2002) for June 22, 1995.

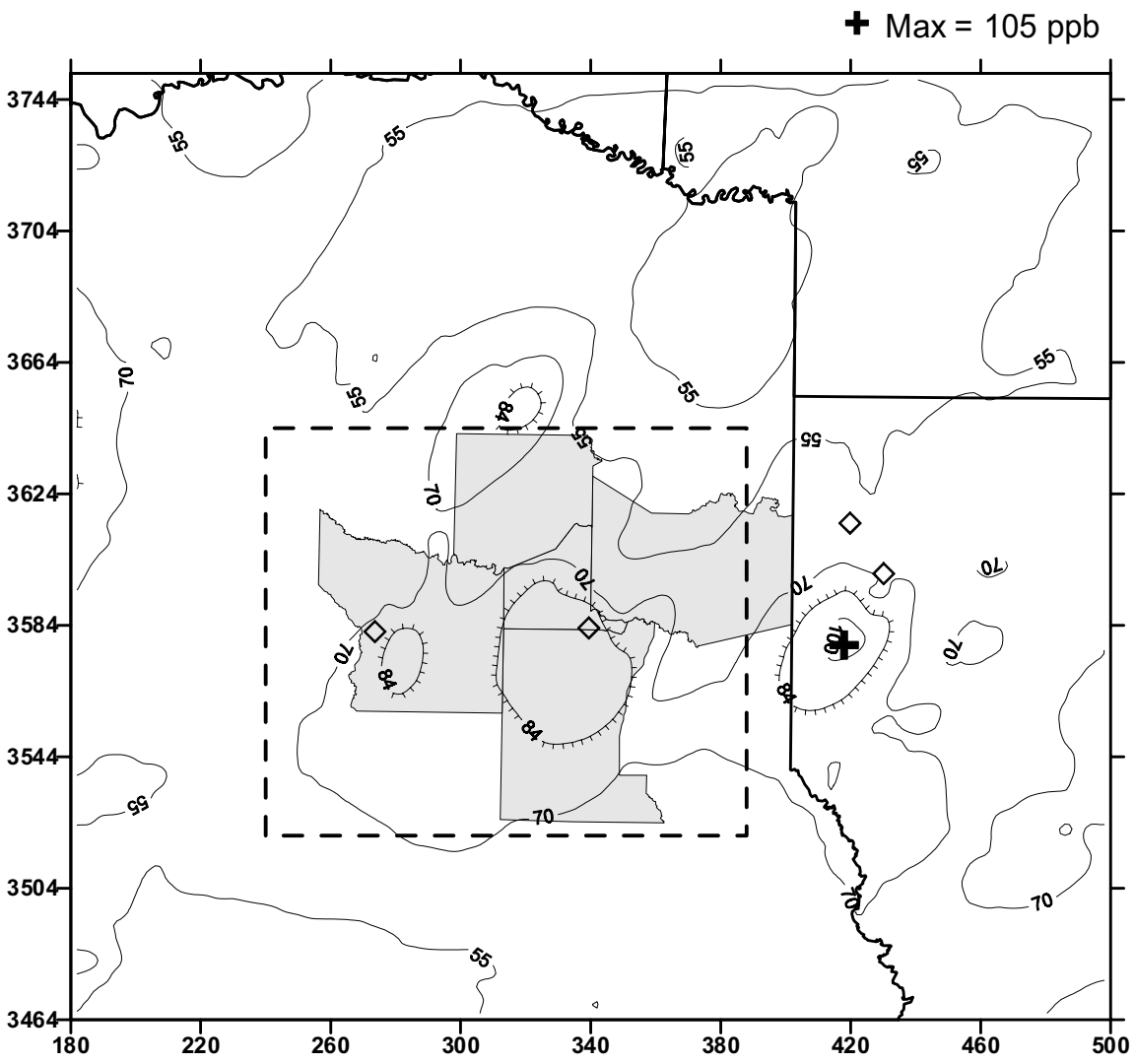

Figure 6. Isopleth of daily maximum 8-hour ozone for the final control strategy (as of March, 2002) for June 23, 1995.

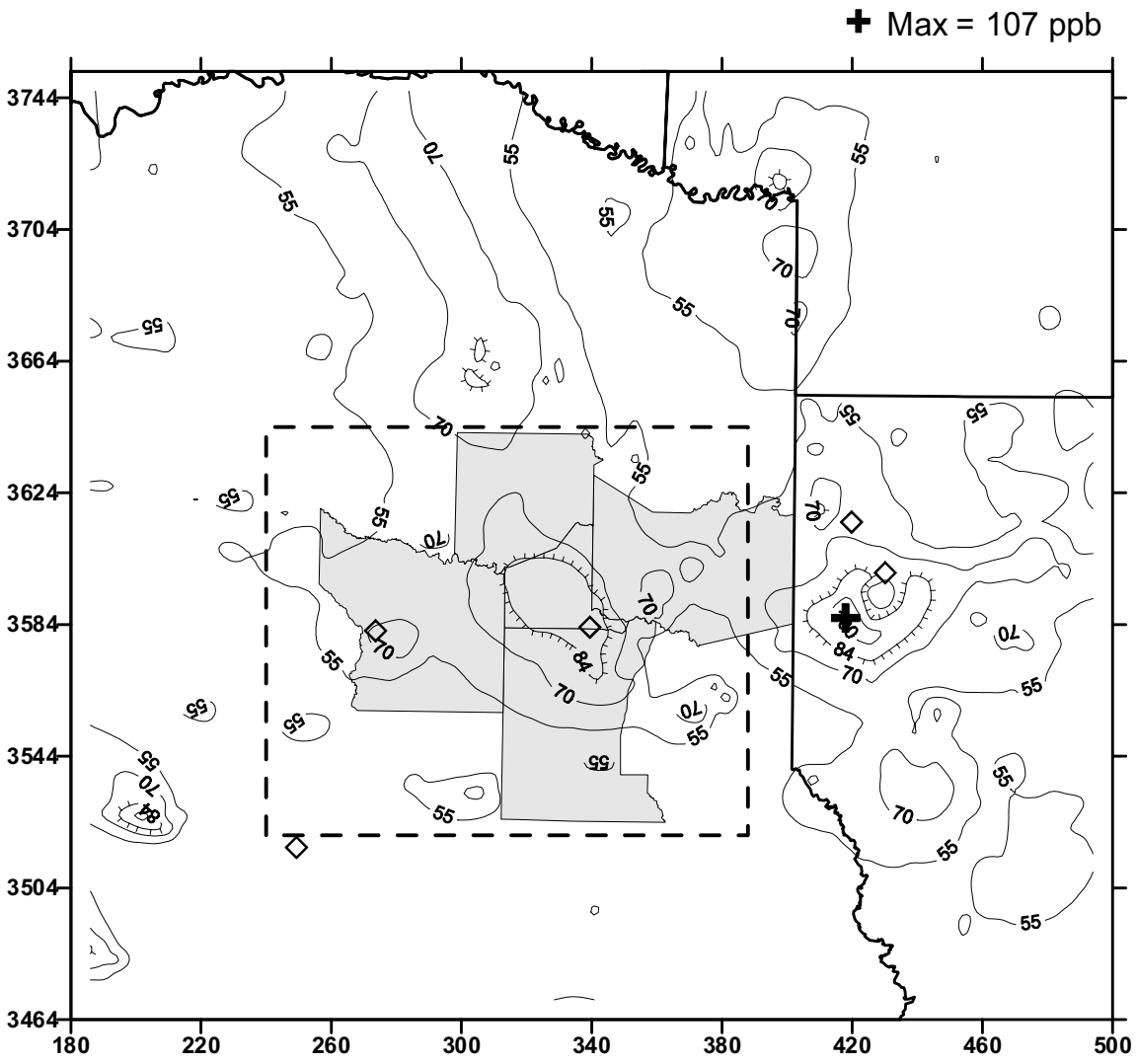

Figure 7. Isopleth of daily maximum 8-hour ozone for the final control strategy (as of March, 2002) for July 16, 1997.

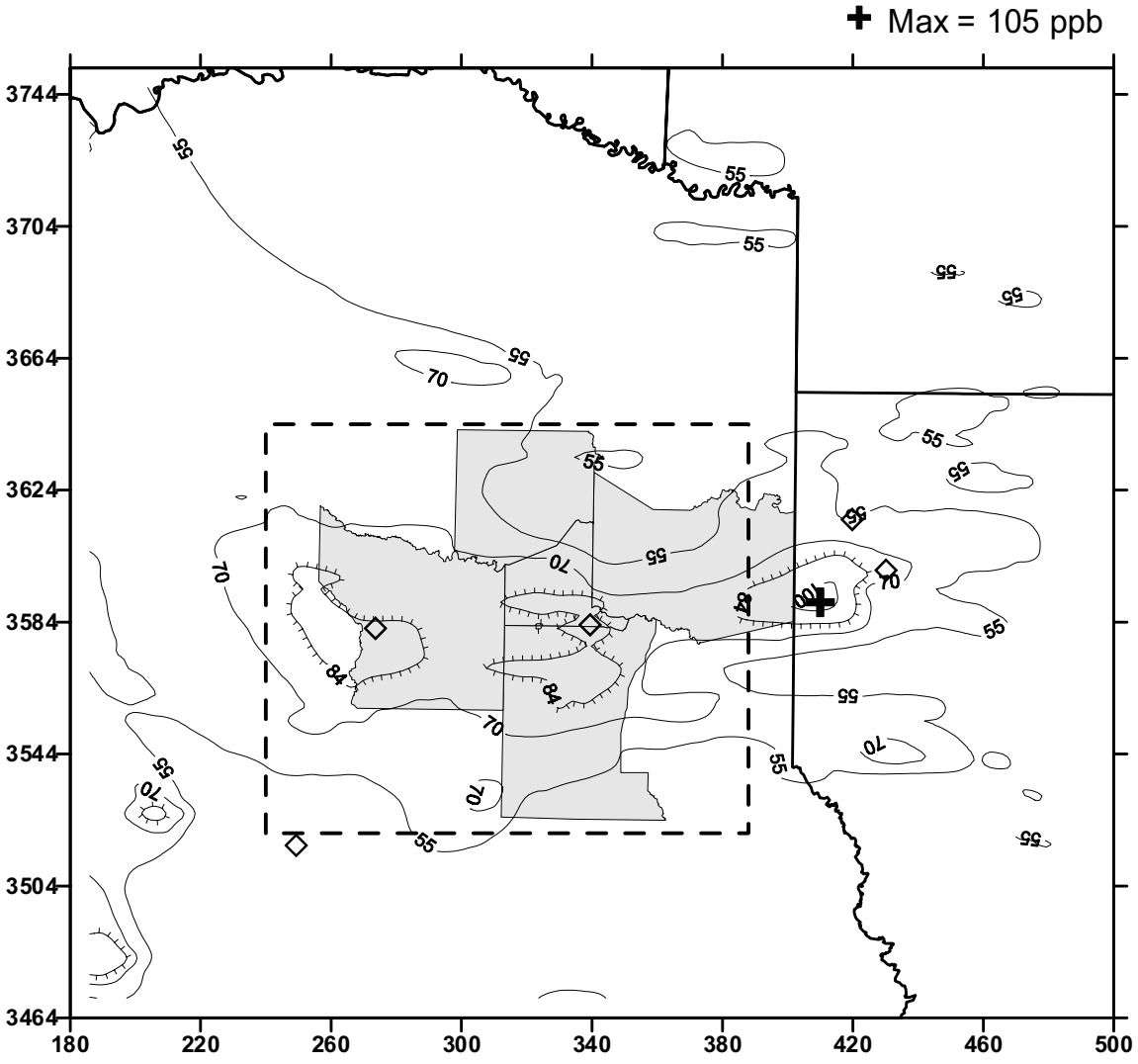

Figure 8. Isopleth of daily maximum 8-hour ozone for the final control strategy (as of March, 2002) for July 17, 1997.