



AS-125

96

Air Monitoring Report 1994



Monitoring Operations Division

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Air Monitoring Report 1994

Prepared by
Monitoring Operations Division
(512)239-1716

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November 1996



Barry R. McBee, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
John M. Baker, *Commissioner*

Dan Pearson, *Executive Director*

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Texas Natural Resource Conservation Commission
Monitoring Operations Division
Data Management & Analysis Section

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Data Analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Usefulness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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ATTN: PAT WOOD, MC 165
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Abbreviations/Acronyms

Pollutants

CO	carbon monoxide
NO ₂	nitrogen dioxide
O ₃	ozone
PM ₁₀	particulate matter of ten microns or less
SO ₂	sulfur dioxide

Measurement Units

pH	a measure of acidity
ppb	parts per billion (volume ratio)
ppm	parts per million (volume ratio)
µg/m ³	micrograms (10 ⁻⁶ grams) per cubic meter

Other

2nd Day	second highest daily maximum one-hour average
Ann	annual
AIRS	Aerometric Information Retrieval System
CMSA	Consolidated Metropolitan Statistical Area
days/yr	days per year
EPA	U. S. Environmental Protection Agency
Exc	Exceedances (number of times NAAQS was exceeded)
Exp Exc	Expected Exceedances (for O ₃ and PM ₁₀ using EPA methods)
Hr	hour
HRM	Houston Regional Monitoring Corporation
MSA	Metropolitan Statistical Area
MX	Mexico
NAAQS	National Ambient Air Quality Standard(s)
NADP	National Atmospheric Deposition Program
NM	New Mexico
No.	number
NTN	National Trends Network
PMSA	Primary Metropolitan Statistical Area
Qtr(s)	quarter (calendar)
SETRPC	Southeast Texas Regional Planning Commission
TCLMCM	Texas City/La Marque Community Air Monitoring Network
TNRCC	Texas Natural Resource Conservation Commission

Introduction

This report provides a summary of routine air quality measurements collected in 1994 by the Texas Natural Resource Conservation Commission (TNRCC) and the following government organizations: City of Dallas, City of Fort Worth, City of Houston, El Paso City-County Health District, Galveston County Health District, and the New Mexico Air Quality Bureau. It also includes measurements from the following private monitoring networks: Houston Regional Monitoring Corporation (HRM), Southeast Texas Regional Planning Commission (SETRPC), and the Texas City/La Marque Community Air Monitoring Network (TCLMCM).

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six air pollutants: ozone (O₃), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), respirable particulate matter (PM₁₀), and lead. The TNRCC monitored gaseous pollutants — ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide — on a continuous basis with one-hour averages recorded for every hour of the day every day. Particulate matter and lead were sampled on a noncontinuous basis with one 24-hour average recorded once every sixth day at most sites, although a few sites monitor every day or every other day.

In addition, the TNRCC and the National Atmospheric Deposition Program (NADP) collected rain samples across the state to monitor for acid rain.

Table 1 shows the pollutant concentrations required to exceed the national standards

as expressed in the units used in this report. Figure 1 shows the total number of TNRCC, other government and private monitoring sites in Texas for each pollutant.

Table 1. Air Pollution Concentrations Required to Exceed the NAAQS

Pollutant	Averaging Period	Primary NAAQS	Secondary NAAQS
O ₃	1-hr ☆	125 ppb	125 ppb
CO	1-hr ☆☆	35.5 ppm	35.5 ppm
	8-hr ☆☆	9.5 ppm	9.5 ppm
SO ₂	3-hr ☆☆	—	550 ppb
	24-hr ☆☆	145 ppb	—
	Annual ☆☆☆	35 ppb	—
NO ₂	Annual ☆☆☆	54 ppb	54 ppb
PM ₁₀	24-hr ☆	155 µg/m ³	155 µg/m ³
	Annual ☆☆☆	51 µg/m ³	51 µg/m ³
Lead	Quarter ☆☆☆	1.55 µg/m ³	1.55 µg/m ³

- ☆ Not to be at or above this level on more than three days over three years
- ☆☆ Not to be at or above this level more than once per calendar year
- ☆☆☆ Not to be at or above this level

Primary NAAQS — The levels of air quality that the EPA judges necessary, with an adequate margin of safety, to protect the public health.
 Secondary NAAQS — The levels of air quality that the EPA judges necessary to protect the public welfare from any known or anticipated adverse effects.

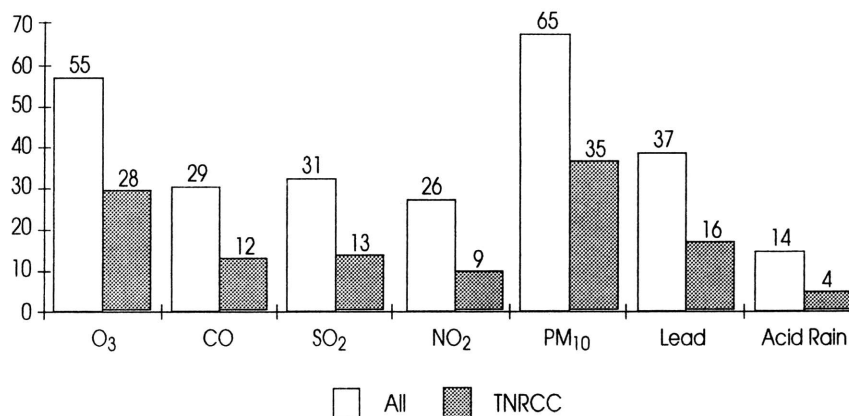


Figure 1. Number of Texas Air Monitoring Sites in 1994

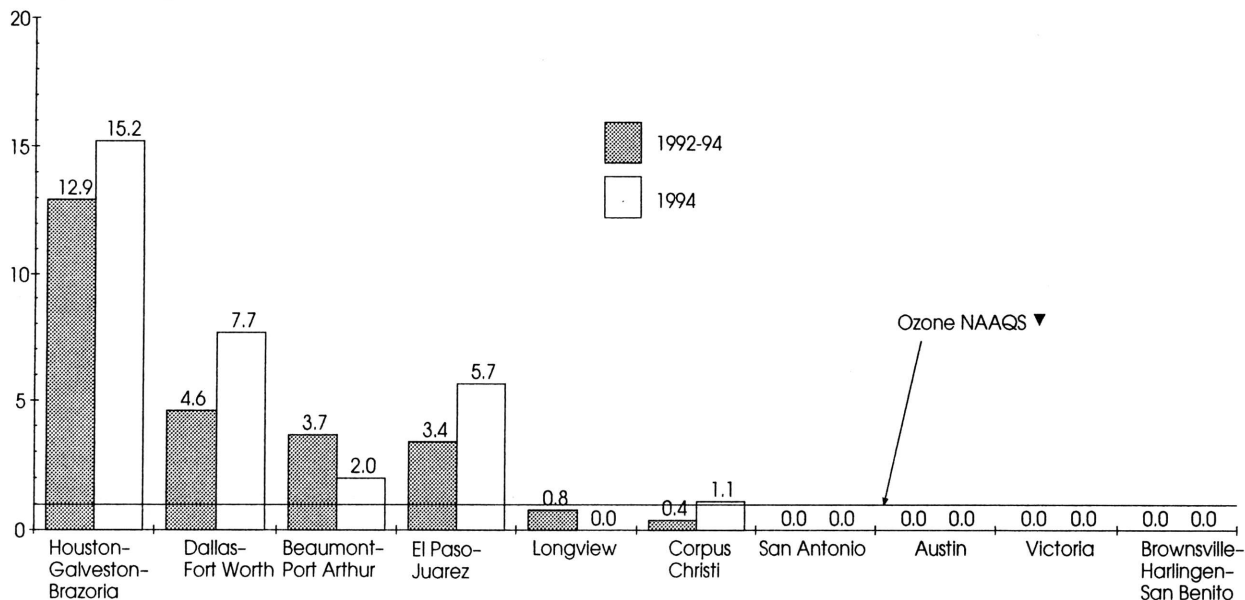
Air Pollutant Summary

In Texas during 1994, the state, other government and private monitoring networks measured concentrations of ozone, carbon monoxide, and particulate matter

above the levels defined by the national standards. Measured concentrations of nitrogen dioxide, sulfur dioxide, and lead were below the standards.

Figures 2 through 11 display comparisons of peak air pollutant measurements for metropolitan and regional areas where the pollutants are monitored. Each graph shows

Annual Average Expected Number of Days Exceeding the NAAQS



▼ Annual average not to exceed 1.0 day per year over a three-year period

Figure 2. Highest Number of Ozone Exceedances in 1994 at any Site

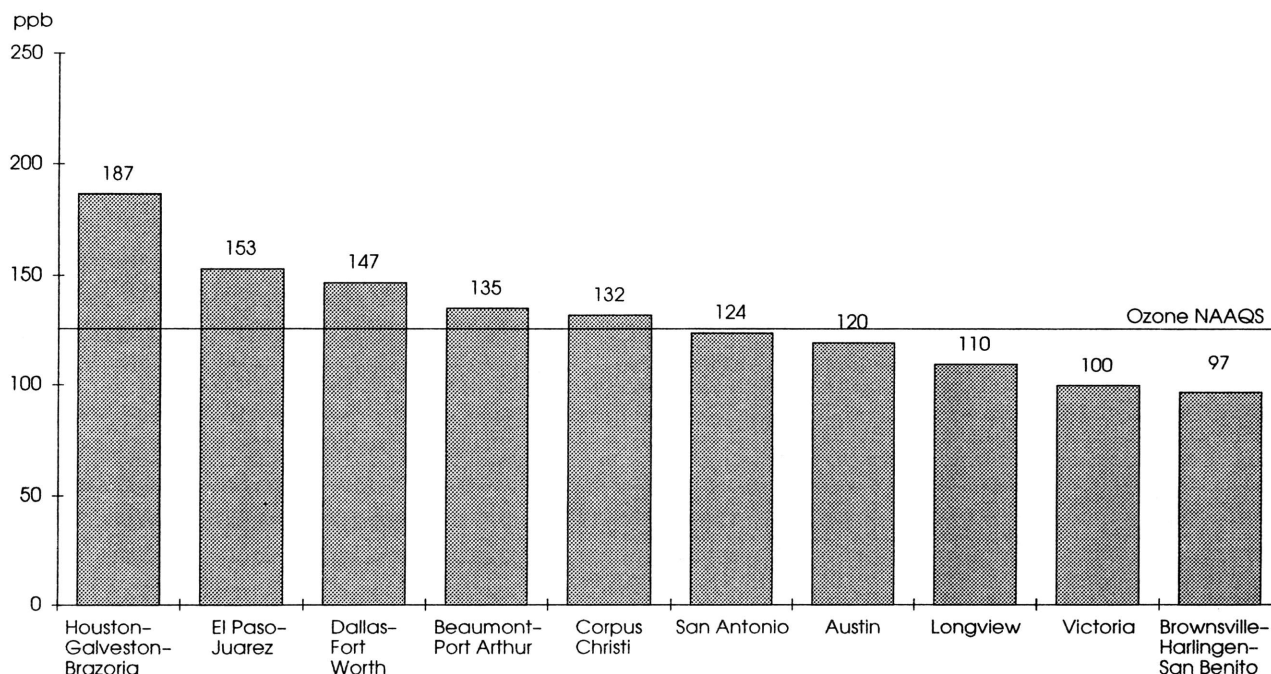


Figure 3. Highest Ozone One-Hour Averages in 1994

the highest measurement recorded at any one site in each of the areas. The graphs for carbon monoxide and sulfur dioxide also include the second highest measurements, which are used for standard determinations.

Ozone measurements above the national standard of 124 parts per billion (ppb) were recorded in the Beaumont-Port Arthur, Dallas-Fort Worth, El Paso, Houston-Galveston-Brazoria, and

Corpus Christi metropolitan areas. Measurements of ozone did not exceed 124 ppb during 1994 at any of the monitoring sites in the Austin, Tyler-Longview-Marshall, San Antonio, Brownsville, and Victoria areas. The highest ozone one-hour average measurement during 1994 was 187 ppb in the Houston area.

Houston-Galveston-Brazoria, Beaumont-Port Arthur, Dallas-Fort Worth, and El Paso are ozone nonattainment areas

based on the number of expected exceedance days of the ozone standard. Calculating the expected number of exceedance days is EPA's method for compensating for missing ozone measurements. The calculation is used to determine whether or not an area is in attainment of the standard. An exceedance day is any day when the maximum one-hour ozone concentration is greater than 124 ppb.

Monitors recorded eight-hour concentrations of carbon monoxide above 9.5 parts per million (ppm) only in El Paso, where a high measurement of 9.9 ppm was observed. In nearby Juarez, Mexico, the highest eight-hour average was 9.1 ppm. Only one of the six U.S. sites in El Paso recorded violations of the eight-hour carbon monoxide standard.

Only one of the eight Texas sites in the El Paso-Juarez area recorded a daily respirable particulate matter measurement above 155 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Respirable particulate matter consists of small, airborne particles that can be inhaled and lodge in the lungs. The highest El Paso 24-hour measurement was $194 \mu\text{g}/\text{m}^3$. In Juarez the highest 24-hour measurement was $725 \mu\text{g}/\text{m}^3$, and at adjacent New Mexico sites the peak was $491 \mu\text{g}/\text{m}^3$.

Table 2 provides a summary listing of pollutant measurements taken at each site with a comparison to the standard for all of the air pollutants. Additional summary information is provided about each pollutant in the following sections of this chapter.

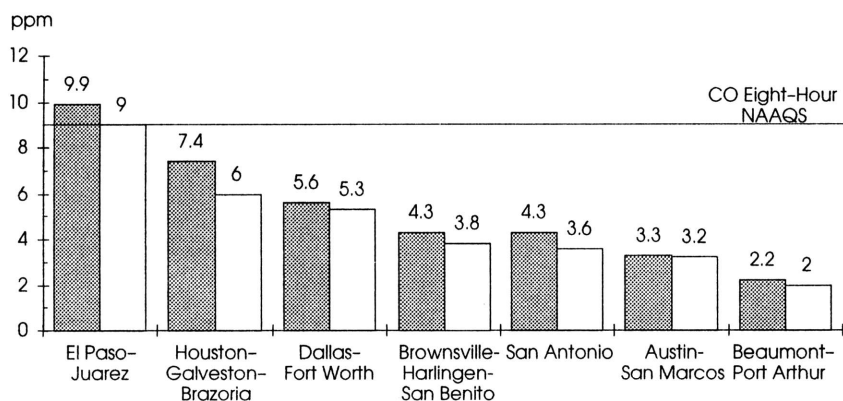


Figure 4. Highest and Second Highest CO Eight-Hour Averages in 1994

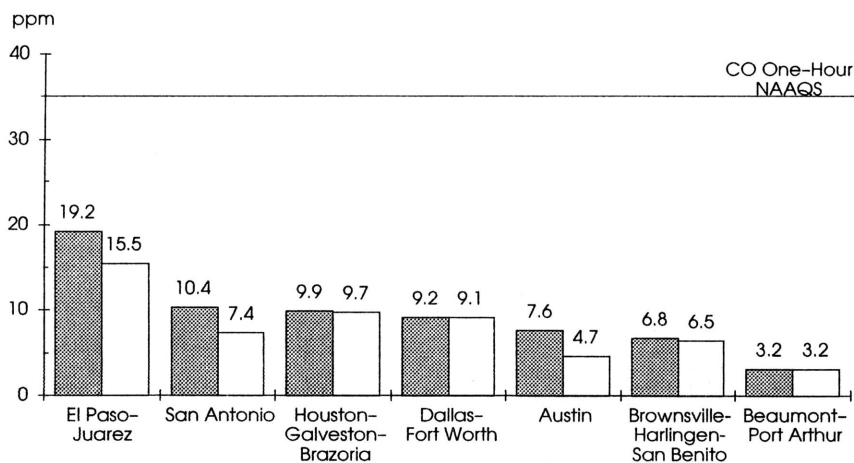


Figure 5. Highest and Second Highest CO One-Hour Averages in 1994

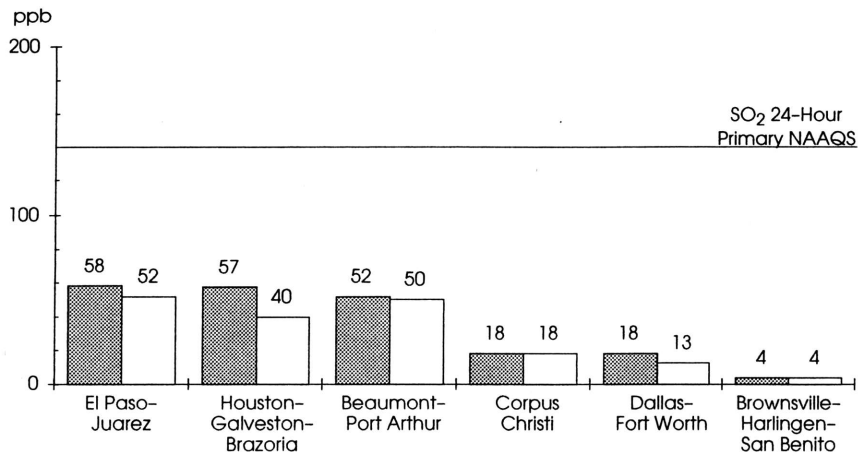


Figure 6. Highest and Second Highest SO₂ 24-Hour Averages in 1994

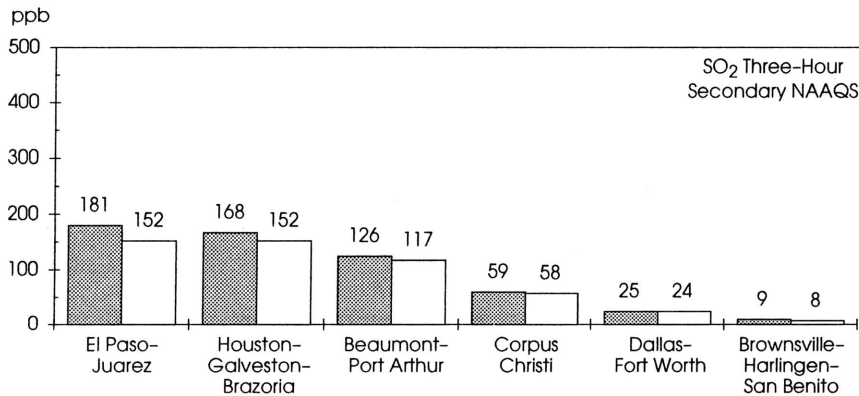


Figure 7. Highest and Second Highest SO₂ Three-Hour Averages in 1994

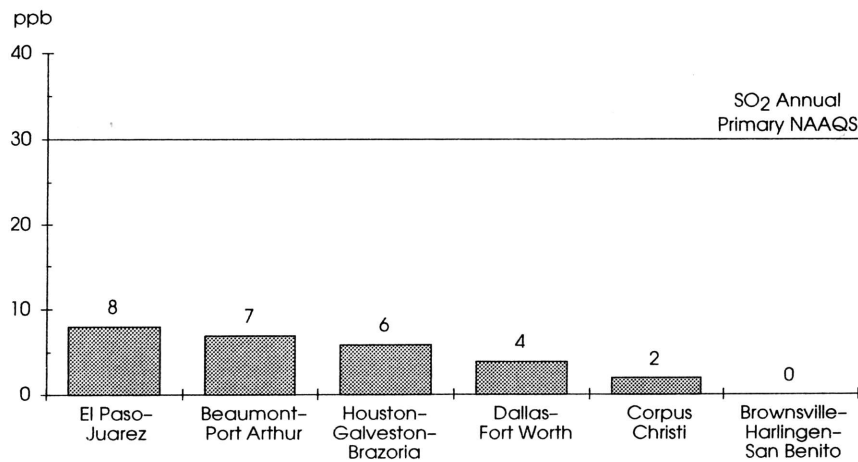


Figure 8. Highest SO₂ Annual Averages in 1994

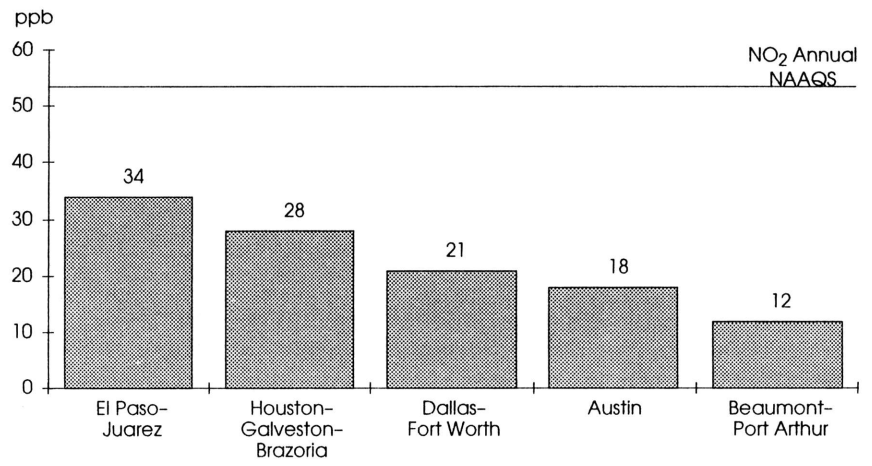


Figure 9. Highest NO₂ Annual Averages in 1994

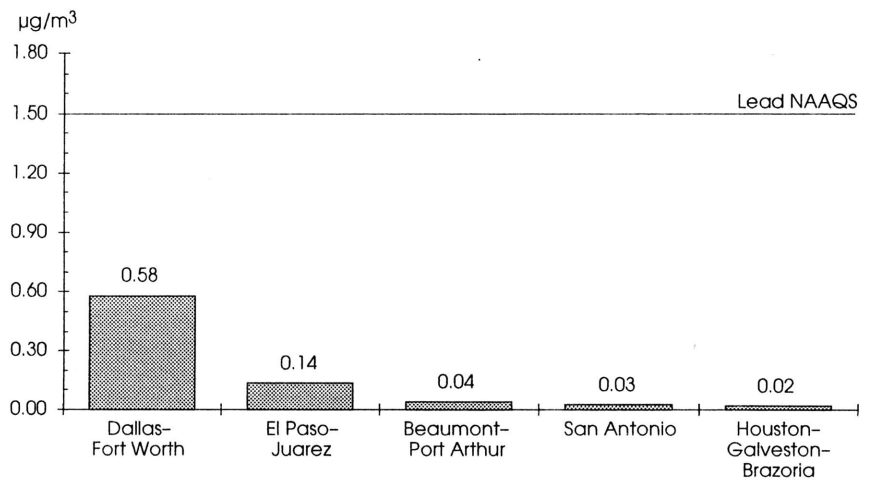


Figure 10. Highest Lead Quarterly Averages in 1994

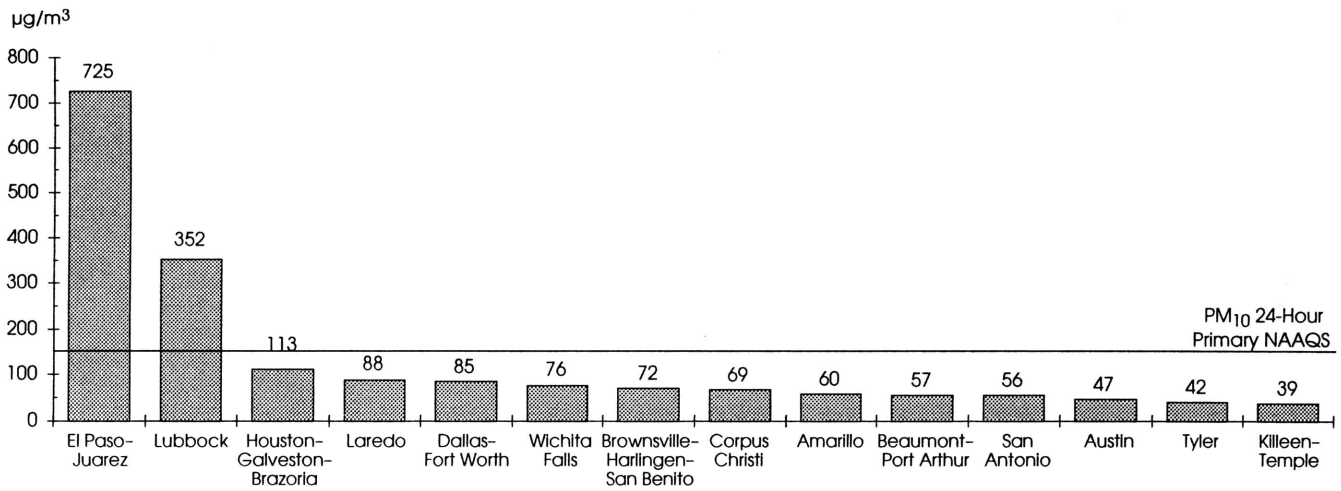


Figure 11. Highest PM₁₀ Daily Averages in 1994 (Including Exceptional Event Days)*

* Days when unusual, uncontrollable events occurred (primarily dust storms)

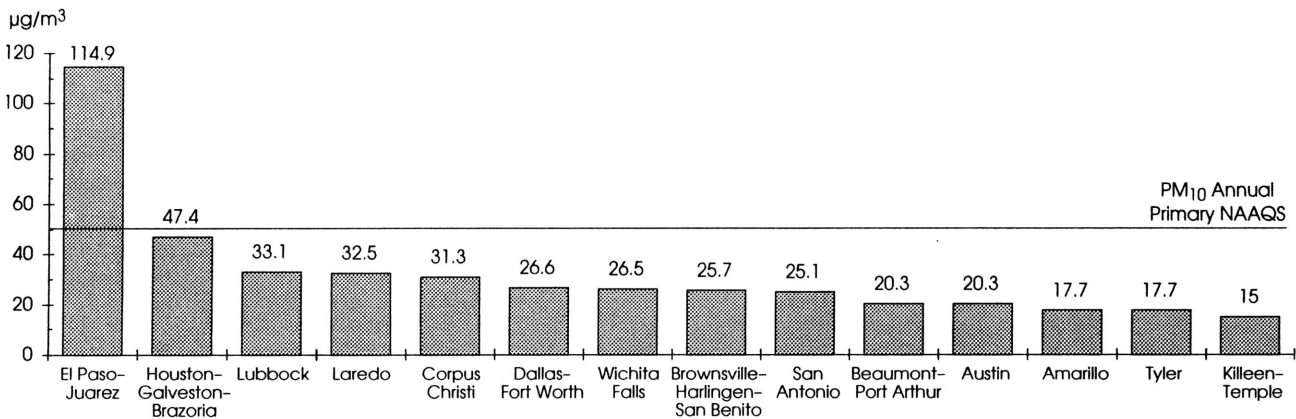


Figure 12. Highest PM₁₀ Annual Averages in 1994 (Including Exceptional Event Days)*

* Days when unusual, uncontrollable events occurred (primarily dust storms)

Table 2. 1994 Pollutant Summary by Monitoring Site

Location	O3		CO		SO2			NO2	PM10			Lead	
	High Hr (ppb)	Exp Exc (days)	2nd 1-Hr (ppm)	2nd 8-Hr (ppm)	2nd 24-Hr (ppb)	2nd 3-Hr (ppb)	Ann Avg (ppb)	Ann Avg (ppb)	High Day (µg/m3)	Exp Exc (days)	Exp Ann (µg/m3)	High Qtr (µg/m3)	Exc Qtr
NAAQS †	125	1.1	35.5	9.5	145	550	35	54	155	1.1	51	1.55	0
Amarillo MSA (Region 1)													
Amarillo									60	0.0	17.7		
Austin-San Marcos MSA (Region 11)													
Bergstrom	101	0.0											
Downtown 32			4.7	3.2				18					
East									45	0.0	20.3		
North 25	120	0.0											
Northwest 3	110	0.0											
Ridgetop									47	0.0	20.2		
Beaumont-Port Arthur MSA (Region 10)													
Beaumont 2	135	1.1	3.2	2.0	50	117	7	12	57	0.0	20.3	0.02	0
Marina												0.04	0
Port Arthur 28	105	0.0			28	64	3						
SETRPC 40	135	2.0						5					
SETRPC 42	114	0.0						7					
SETRPC 43	131	2.0						9					
West Orange 9	127	1.1						9					
Brazoria PMSA (Region 12)													
Clute 11	123	0.0											
Brownsville-Harlingen-San Benito MSA (Region 15)													
Brownsville	97	0.0	6.5	3.8	4	8	0		72	0.0	25.7		
San Benito									62	0.0	22.5		
Corpus Christi MSA (Region 14)													
Leopard									65	0.0	24.8		
Navigation									69	0.0	31.3		
Tuloso 21	111	0.0			10	24	‡ 2						
West 4	132	1.1			13	58	1						
Dallas PMSA (Region 4)													
Bonnieview	82	‡						‡ 11					
Boys Club									65	0.0	28.9	0.08	0
Cedar Hill									74	0.0	21.4		
Chalk Hill									47	0.0	22.1	0.02	0
Coit									48	0.0	24.0		
Colony	120	0.0											
Convention									53	0.0	25.4	0.04	0
Dallas N 5	115	0.0						16			0.02	0	
Denton Airport 33	140	4.6											
Douglas											0.02	0	
Earhart											0.04	0	
Ervay			9.1	5.3									
Farmers Branch											0.02	0	
Frisco 1 (Acker)											0.14	0	
Frisco 3 (5th St)											0.58	0	
Frisco 5 (C31)	126	1.2											
Frisco 6 (Gould)											0.37	0	
Frisco 7 (North)									85	0.0	26.6	0.18	0
Frisco 8 (NW)											0.24	0	
Hinton	86	‡	5.9	3.9	18	24	‡ 4	‡ 21					
Lancaster									50	0.0	23.8		
M L King											0.03	0	
Midlothian 7									83	0.0	23.7		
Midlothian 13									68	0.0	21.8		
Midlothian 14									79	0.0	23.4		
Midlothian Twr									28	0.0	19.4		
Midlothian OFW									26	0.0	17.3		
Midlothian 84									79	0.0	22.4		
Midlothian 12 Chaparral												0.25	0
Morrell									54	0.0	29.3	0.05	0
Nolen											0.05	0	
Rector											0.05	0	
Sargent											0.05	0	
Terrell Virginia											0.04	0	

Table 2. 1994 Pollutant Summary by Monitoring Site (continued)

Location	O3		CO ≈		SO2 ◊			NO2	PM10			Lead	
	High Hr (ppb)	Exp Exc (days)	2nd 1-Hr (ppm)	2nd 8-Hr (ppm)	2nd 24-Hr (ppb)	2nd 3-Hr (ppb)	Ann Avg (ppb)	Ann Avg (ppb)	High Day (µg/m3)	Exp Exc (days)	Exp Ann (µg/m3)	High Qtr (µg/m3)	Exc Qtr
NAAQS †	125	1.1	35.5	9.5	145	550	35	54	155	1.1	51	1.55	0
El Paso TX NM MX (Region 6)													
Advance MX	146	2.0	15.5	8.9					341	81.1	114.9		
Anthony NM									154	0.0	40.7		
Chamizal	120	0.0	13.3	7.6					143	0.0	218.0		
Downtown 6	131	2.2	14.5	7.1	31	148	7	34				0.11	0
East 30	153	5.7	9.8	5.7									
Ivanhoe			10.4	4.4					66	0.0	20.9		
Kern					23	116	5					0.13	0
La Union NM	100	0.0			5	17	1						
Lindbergh									52	0.0	18.3		
NE Clinic									80	0.0	22.2	0.09	0
Pestalozzi MX									145	0.0	47.6		
Sunland Race Track NM												0.03	0
Riverside									97	0.0	31.0		
Socorro									91	0.0	31.5		
Sunland Park NM	137	2.1			40	152	7		491	3.3	93.3	0.03	0
Techno MX	130	3.0	13.2	9.0					227	7.1	45.8		
Tillman			12.8	7.6					194	2.3	37.3	0.14	0
UTEP 12	152	1.0	9.8	5.0	31	135	8	23					
Vilas									62	0.0	38.6		
Zenco MX									725	27.2	83.1		
Fort Worth-Arlington PMSA (Region 4)													
Downtown 16			5.9	3.7								0.03	0
FAA									42	0.0	19.3		
Geddes									44	0.0	19.8		
Keller 17	147	7.7											
NW 13	121	0.0	5.1	2.7	6	10	2	17					
Worth Heights									42	0.0	21.2	0.02	0
Galveston-Texas City PMSA (Region 12)													
Fire Station									52	0.0	23.2		
Nessler Pool									58	0.0	25.1		
TCLMCM 34th St	163	6.0			19	55	3	11					
TCLMCM Ave A					14	40	2						
TCLMCM Seawall					18	61	3	9					
Texas City 10	137	2.4			52	152	6		38	0.0	21.0	0.02	0
Houston PMSA (Region 12)													
Aldine 8	172	12.7	6.6	4.3				13	54	0.0	24.8		
Baytown 24					19	49	4						
Bingle									50	0.0	26.1	0.01	0
City Site									64	0.0	28.8		
Clinton	150	3.1	5.1	4.0	20	67	5	22	113	0.0	47.4		
Crawford	187	3.0	7.2	4.9				28	67	0.0	28.7		
Croquet	139	3.2			11	31	3						
Deer Park 18	169	7.7			12	29	3						
East 1	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
Fulton												0.01	0
Harris NW 26	173	15.2											
HRM 1	170	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HRM 3	151	5.1	NA	NA	NA	NA	NA	NA	NA	NA	NA		
HRM 4	178	4.0	NA	NA	NA	NA	NA	NA	NA	NA	NA		
HRM 7	138	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA		
HRM 8	129	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA		
HRM 10	161	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA		
HRM 11	145	2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Kress									69	0.0	34.4	0.01	0
Lang	167	4.1	9.7	6.0				22					
Manchester 22	154	7.8			35	86	5						
Monroe	147	2.1			19	39	5		61	0.0	27.8		
N Wayside	136	4.2			12	45	4						
Shell Westhollow	157	NA											
Pasadena									57	0.0	29.3		

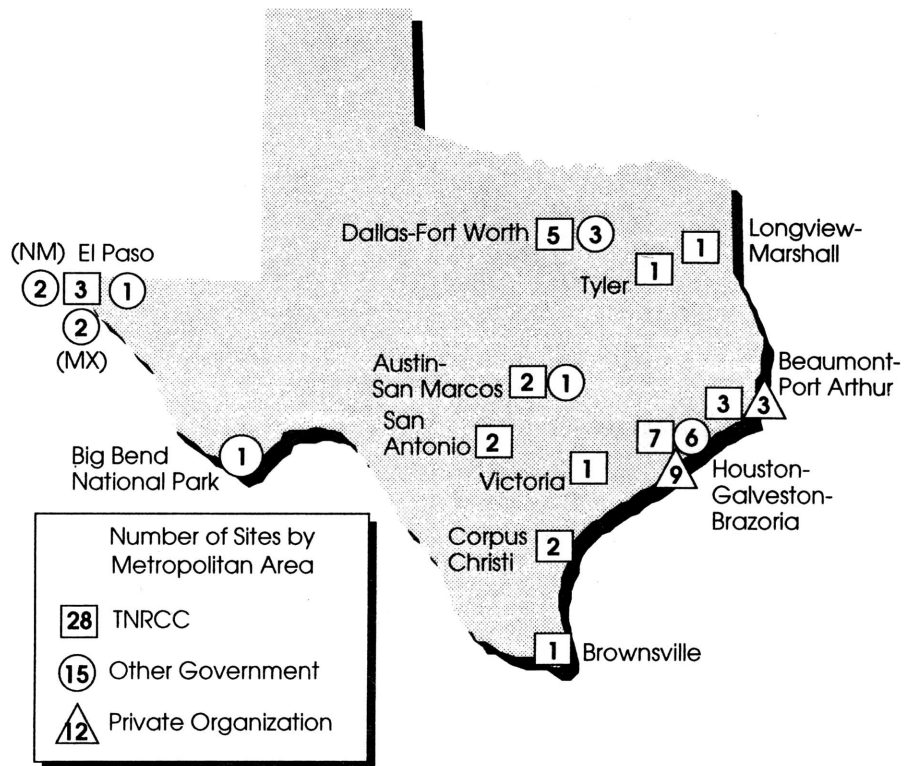
Table 2. 1994 Pollutant Summary by Monitoring Site (continued)

Location	O ₃		CO ≈		SO ₂ ◊			NO ₂	PM ₁₀			Lead	
	High Hr (ppb)	Exp Exc (days)	2nd 1-Hr (ppm)	2nd 8-Hr (ppm)	2nd 24-Hr (ppb)	2nd 3-Hr (ppb)	Ann Avg (ppb)	Ann Avg (ppb)	High Day (µg/m ³)	Exp Exc (days)	Exp Ann (µg/m ³)	High Qtr (µg/m ³)	Exc Qtr
NAAQS ¶	125	1.1	35.5	9.5	145	550	35	54	155	1.1	51	1.55	0
Killeen-Temple MSA (Region 9)													
Temple									39	0.0	15.0		
Laredo MSA (Region 15)													
Laredo									88	0.0	32.5		
Longview-Marshall MSA (Region 5)													
Longview 19	104	0.0											
Lubbock MSA (Region 2)													
Lubbock									103	0.0	23.0		
Wolforth									352	5.2	33.1		
San Antonio MSA (Region 13)													
Airport												0.03	0
Downtown 27			6.0	3.3									
East Kelly									56	0.0	25.1		
ITC									53	0.0	23.4	0.02	0
North 7	124	0.0	7.4	3.6					44	0.0	19.5		
Northwest 23	110	0.0											
Tyler MSA (Region 5)													
Tyler	110	‡							42	0.0	17.7		
Wichita Falls MSA (Region 3)													
Wichita Falls									76	0.0	26.5		
Victoria MSA (Region 14)													
Victoria 87	100	0.0											

- ¶ Air pollution concentration required to exceed the NAAQS
- ◊ Block averages, rounded to hundredths
- NA Data not available
- ‡ Less than 75% completeness; not valid for NAAQS comparison
- ≈ Running averages, truncated to tenths
- ∅ Station was not operational; moving to another location

Ozone

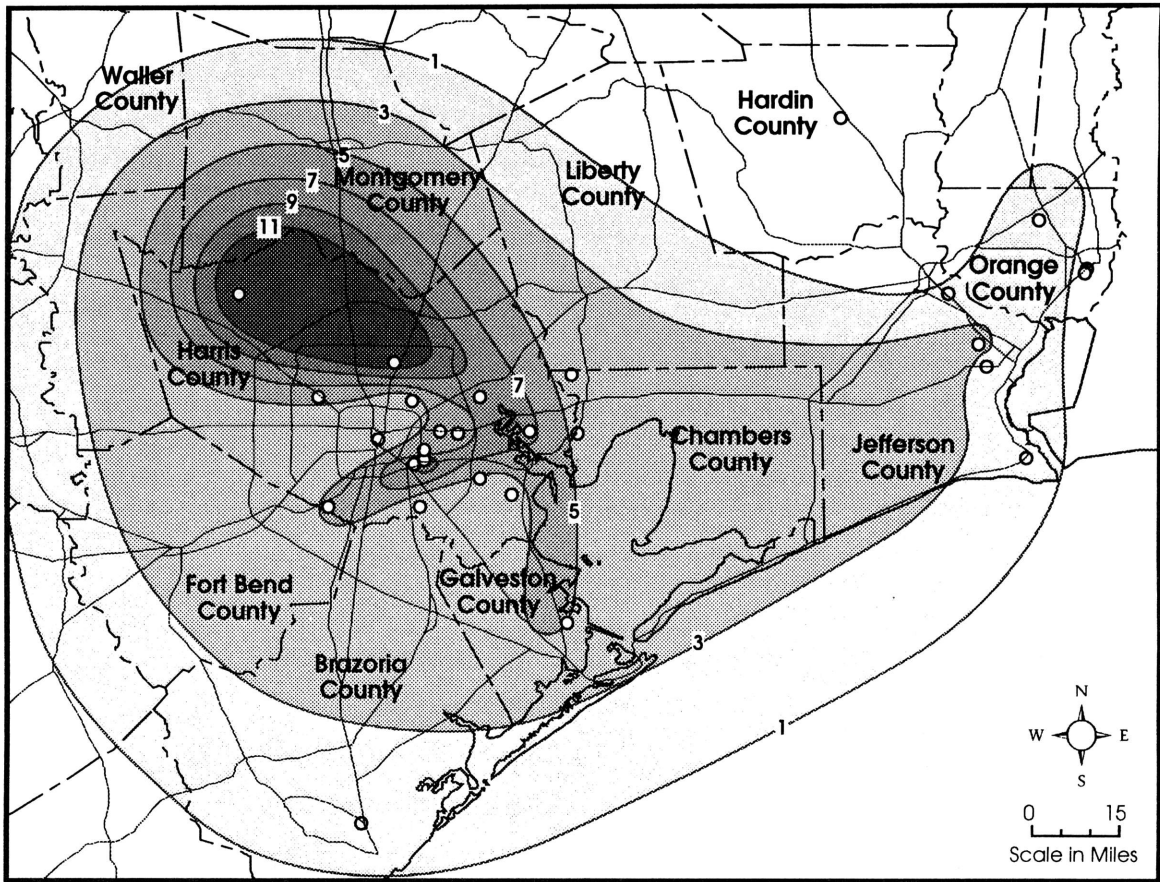
During 1994, the TNRCC, other government and private networks continuously monitored ozone at 51 sites in Texas. In addition, New Mexico and Mexico each operated two ozone monitors across their respective borders from El Paso. Map 1 shows the distribution of ozone monitors across the state. Unlike other gaseous pollutants, ozone is not emitted directly into the atmosphere. Instead, it is created in the atmosphere by the action of sunlight on volatile organic compounds and nitrogen oxides. In Texas, higher levels of ozone usually occur on sunny days with light winds, primarily from March through October. An ozone exceedance day is counted if the measured peak one-hour average ozone concentration exceeds the standard. Then, the expected exceedance days are determined from the actual number of measured exceedances with adjustments to account for missing data according to EPA guidelines. In order to demonstrate attainment of the standard, the average annual number of expected exceedances must not exceed 1.0 day per year over a three-year period.



Map 1. O₃ Monitoring Sites 1994

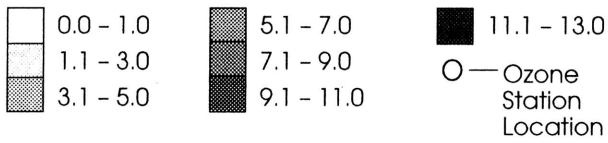
Maps 2, 3 and 4 show the distribution of the number of expected ozone exceedances for 1992 through 1994 for the Houston, Dallas-Fort Worth, and El Paso areas. Table 3 provides a summary of ozone measurements for 1994 and expected exceedances for 1992-1994. The listings include all of the TNRCC, other government and private monitoring sites and listings are grouped alphabetically by metropolitan area. The monitoring sites for each area are arranged in descending order

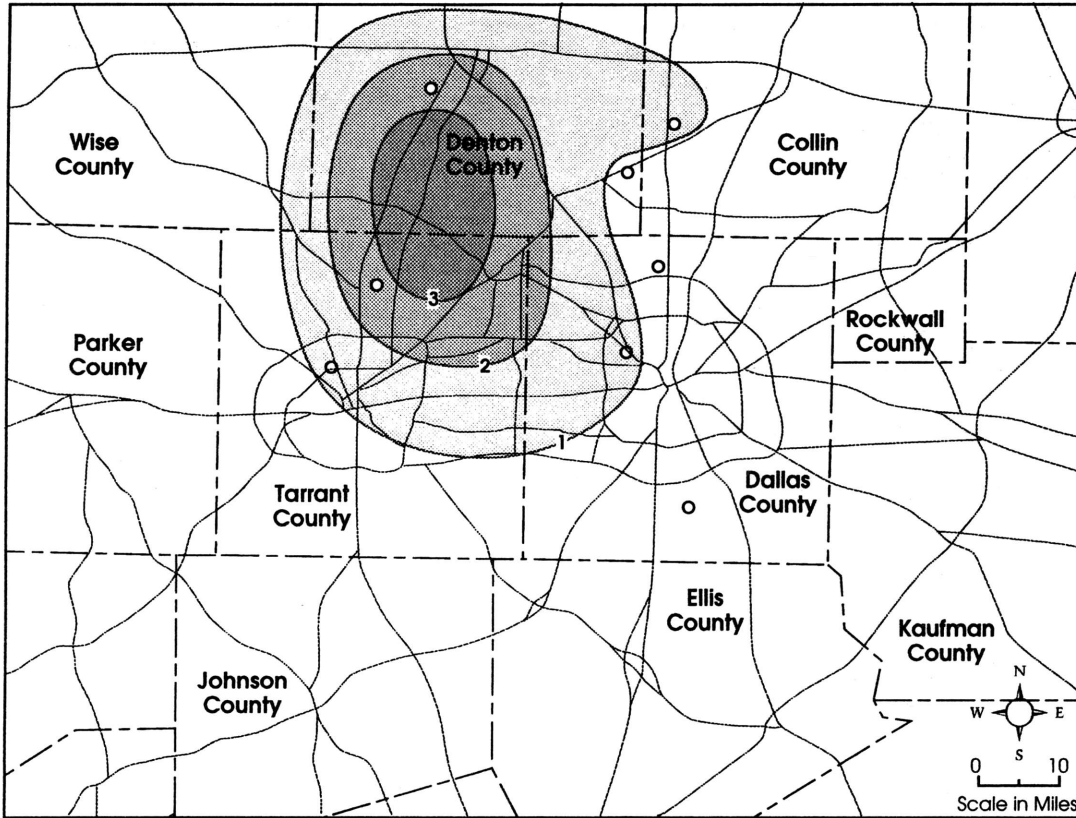
from the highest measured one-hour concentration. The Aerometric Information Retrieval System (AIRS) number for each site is listed along with the site name. The AIRS number is part of the EPA's system for keeping track of air monitoring sites nationwide. The percent completeness shown in this table is based on the ozone season and indicates the percentage of the ozone season for which valid data were obtained according to EPA guidelines.



Map 2. Southeast Texas Expected Annual Ozone Exceedances
1992-94

Key

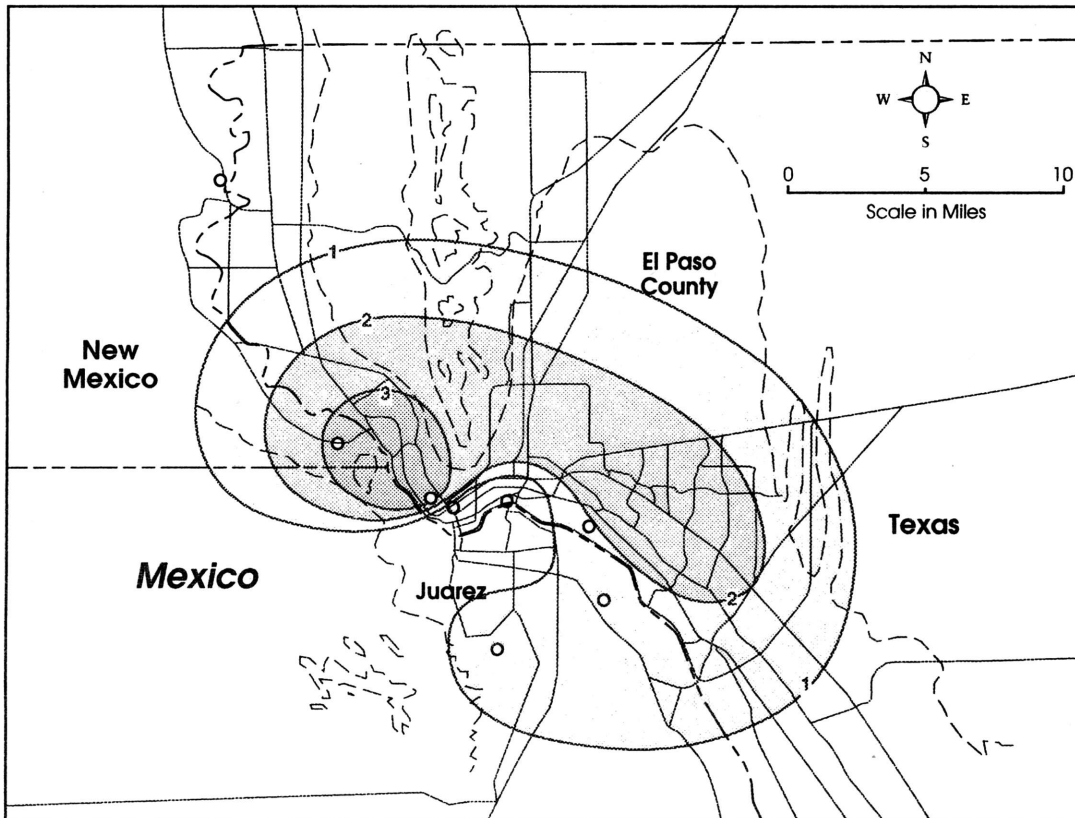




**Map 3. Dallas-Fort Worth Expected Annual Ozone Exceedances
1992-94**

Key

- 0.0 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- — Ozone Station Location



**Map 4. El Paso Expected Annual Ozone Exceedances
1992-94**

Table 3. 1994 Ozone Summary

AIRS	Site Name	1-Hr High (ppb)	2nd Day 1-Hr High (ppb)	Exp Exc (days/yr)	Exp Exc 1992-94 (days/yr)	Δ Percent Completeness
NAAQS ¶		125			#1.1	
Austin-San Marcos MSA (Region 11)						
4530003S	Austin N C25	120	101	0.0	0.0	94
4530014S	Austin NW C03	110	102	0.0	0.0	96
4530018L	Bergstrom	101	98	0.0	**0.0	NA
Beaumont-Port Arthur MSA (Region 10)						
2450101P	SETRPC 40	135	129	2.0	2.3	98
2450009S	Beaumont C02	135	121	1.1	1.1	88
2450102P	SETRPC 43	131	126	2.0	3.7	100
3611001S	West Orange C09	127	118	1.1	0.7	91
3611100P	SETRPC 42	114	111	0.0	2.7	100
2450011S	Port Arthur C28	105	99	0.0	1.0	84
Brownsville-Harlingen-San Benito MSA (Region 15)						
0650006S	Brownsville C80	97	85	0.0	**0.0	80
Corpus Christi MSA (Region 14)						
3550025S	West C04	132	103	1.1	0.4	90
3550026S	Tuloso C21	111	108	0.0	0.3	80
Dallas-Fort Worth CMSA (Region 4)						
4392003S	Keller C17	147	146	7.7	2.9	90
1210033S	Denton Airport C33	140	138	4.6	**4.6	86
0850005S	Frisco C31	126	122	1.2	*1.2	88
4391002S	Ft Worth NW C13	121	120	0.0	1.3	91
1210054L	Colony	120	118	0.0	0.8	91
1130045S	Dallas N C05	115	113	0.0	0.7	91
1130069L	Hinton	86	84	NA	*1.1	33
1130055L	Bonnieview	82	NA	*	*0.0	45
El Paso-Juarez TX NM MX (Region 6)						
1410028S	East C30	153	143	5.7	1.9	83
1410037S	UTEP C12	152	124	1.0	3.4	89
0060004L	Advance MX	146	137	2.0	**2.0	NA
0130017S	Sunland Park NM	137	136	2.1	*3.1	96
1410027S	Downtown C06	131	125	2.2	0.7	87
0060001L	Techno MX	130	130	3.0	**3.0	NA
1410044L	Chamizal	120	115	0.0	0.0	77
0130008S	La Union NM	100	98	0.0	0.3	99
Houston-Galveston-Brazoria CMSA (Region 12)						
2011037L	Crawford	187	142	3.0	4.2	93
2010804P	HRM 4	178	157	4.0	7.5	98
2010029S	Harris NW C26	173	172	15.2	12.9	88
2010024S	Aldine C08	172	160	12.7	*11.1	91
2010801P	HRM 1	170	160	6.0	9.5	99
2011003S	Deer Park C18	169	142	7.7	*5.0	76
2010047L	Lang	167	150	4.1	5.7	91
1670056P	TCLMCM 34th St	163	160	6.0	**6.0	NA
0710900P	HRM 10	161	150	3.0	4.4	99
2010066P	Shell Westhollow	157	155	*	NA	34
2010059S	Manchester C22	154	152	7.8	8.4	87
2010803P	HRM 3	151	148	5.1	6.8	97
2011035L	Clinton	150	143	3.1	6.2	92
2010062L	Monroe	147	127	2.1	3.9	92
0710901P	HRM 11	145	141	2.0	4.7	99
2010051L	Croquet	139	127	3.2	5.2	88
2010807P	HRM 7	138	138	3.0	7.1	99
1671002S	Texas City C10	137	125	2.4	3.8	81
2010046L	N Wayside	136	129	4.2	4.6	91
2010808P	HRM 8	129	114	1.0	4.1	97
0391003S	Clute 11	123	112	0.0	1.9	86
2011034S	East C01	Ø	Ø	Ø	Ø	Ø

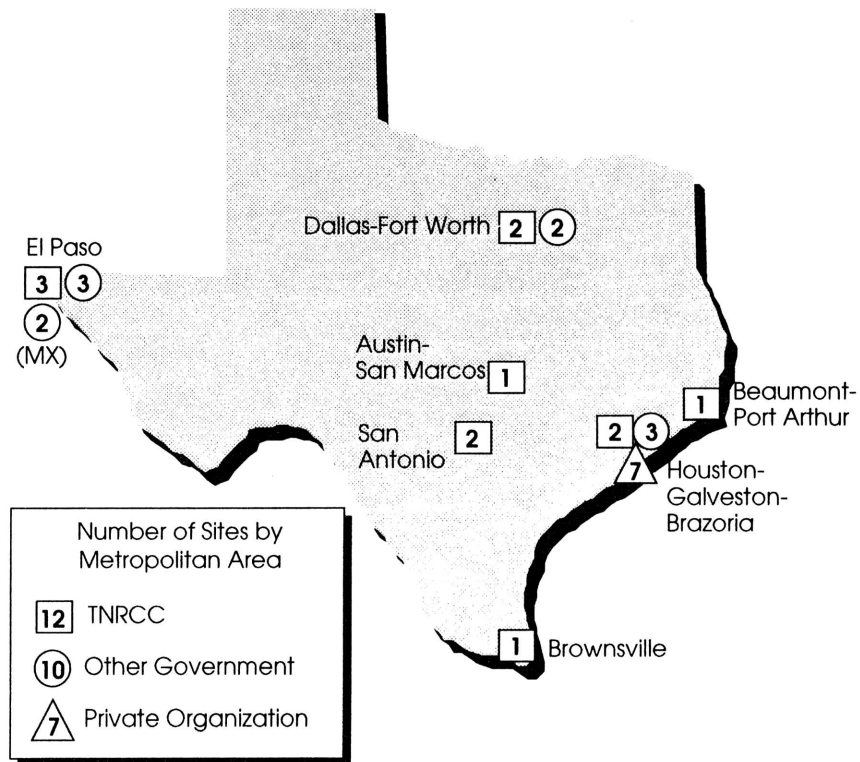
Table 3. 1994 Ozone Summary (continued)

AIRS	Site Name	1-Hr High (ppb)	2nd Day 1-Hr High (ppb)	Exp Exc (days/yr)	Exp Exc 1992-94 (days/yr)	Δ Percent Completeness
NAAQS ¶¶		125			#1.1	
San Antonio MSA (Region 13)						
0290036S	North C07	124	109	0.0	0.0	94
0290032S	Northwest C23	110	101	0.0	0.0	91
Tyler-Longview-Marshall MSA (Region 5)						
5240004S	Tyler C86	110	99	*	***	35
1830001S	Longview C19	104	104	0.0	0.8	89
Victoria MSA (Region 14)						
4690003S	Victoria C87	100	94	0.0	0.0	86

- ¶¶ Air pollution concentration required to exceed the NAAQS
- Δ Based on complete days during ozone season according to EPA convention
- NA Data not available
- * Each * indicates one year not meeting EPA completeness criteria; not valid for NAAQS comparison
- # Expected number of days with highest one-hour concentration of 125 ppb or more; annual average must be 1.1 or more days per year over a three-year period to exceed the standard
- L Local governmental agency monitoring site (added to end of AIRS site number)
- P Private monitoring site (added to end of AIRS site number)
- S State monitoring site (added to end of AIRS site number)
- ∅ Station was not operational; moving to another location

Carbon Monoxide

Carbon monoxide is produced by the incomplete combustion of carbon-containing fuels, most notably by gasoline-powered engines, power plants, and wood fires. During 1994, carbon monoxide was continuously monitored at 27 sites in Texas. It also was measured by Mexico at two sites across the border from El Paso as shown on Map 5. Two standards have been established for carbon monoxide. To violate one of these standards, two or more one-hour averages of 35.5 ppm or greater or two or more eight-hour averages of 9.5 ppm or greater must be measured at one site during a calendar year. The eight-hour standard has been exceeded periodically in El Paso during the winter months during very stable atmospheric conditions. The one-hour standard for carbon monoxide has never been exceeded in Texas.



Map 5. CO Monitoring Sites 1994

Table 4 provides a summary of 1994 carbon monoxide measurements. The table listings are grouped alphabetically by metropolitan area

and arranged in descending order from the highest eight-hour average.

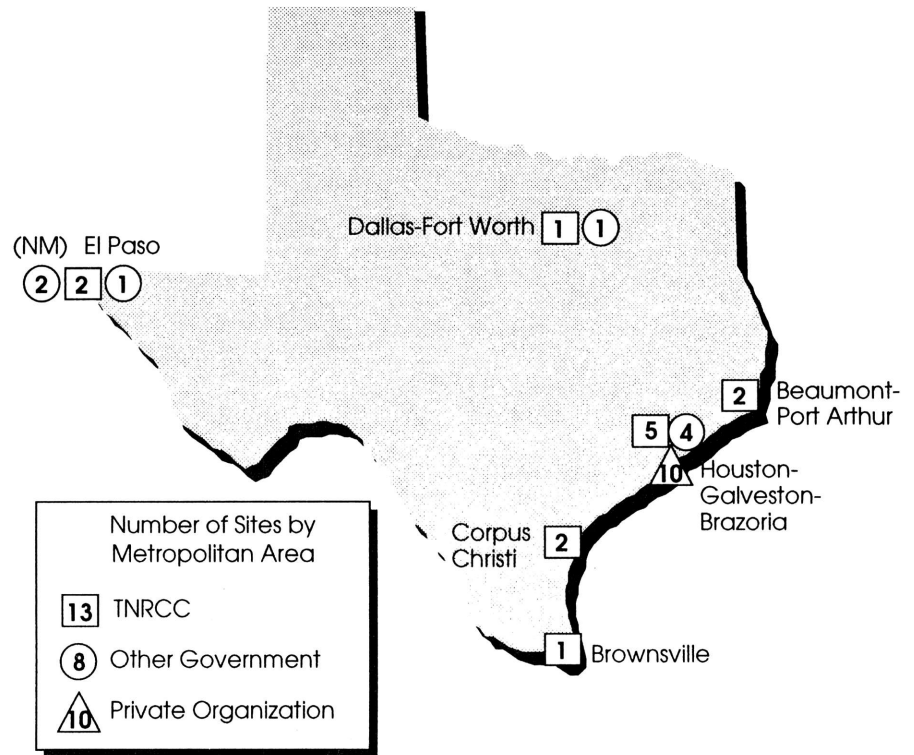
Table 4. 1994 Carbon Monoxide Summary

AIRS	Site Name	8-Hr ≈			1-Hr			Percent Completeness
		High (ppm)	2nd (ppm)	No. of Exc	High (ppm)	2nd (ppm)	No. of Exc	
NAAQS †		9.5			35.5			
Austin-San Marcos MSA (Region 11)								
4530017S	Downtown 32	3.3	3.2	0	7.6	4.7	0	86
Beaumont-Port Arthur MSA (Region 10)								
2450009S	Beaumont 2	2.2	2.0	0	3.2	3.2	0	89
Brownsville-Harlingen-San Benito MSA (Region 15)								
0650006S	Brownsville 80	4.3	3.8	0	6.8	6.5	0	82
Dallas-Fort Worth CMSA (Region 4)								
1130053L	Dallas Ervay	5.6	5.3	0	9.2	9.1	0	94
4391003S	Ft Worth Dtn 16	4.7	3.7	0	6.3	5.9	0	86
1130069L	Dallas Hinton	‡ 3.9	‡ 3.9	0	‡ 6.0	‡ 5.9	0	33
4391002S	Ft Worth NW 13	3.3	2.7	0	5.4	5.1	0	93
El Paso-Juarez TX NM MX (Region 6)								
1410027S	Downtown 6	9.9	7.1	1	14.8	14.5	0	93
0060004L	Advance MX	‡ 9.1	‡ 8.9	0	‡ 15.6	‡ 15.5	0	50
0060001L	Techno MX	‡ 9.0	‡ 9.0	0	‡ 19.2	‡ 13.2	0	63
1410002L	Tillman	8.0	7.6	0	14.2	12.8	0	76
1410044L	Chamizal	7.6	7.6	0	13.7	13.3	0	75
1410028S	East 30	7.2	5.7	0	9.9	9.8	0	85
1410037S	UTEP 12	5.9	5.0	0	10.1	9.8	0	89
1410029L	Ivanhoe	‡ 4.9	‡ 4.4	0	‡ 10.8	‡ 10.4	0	8
Houston-Galveston-Brazoria CMSA (Region 12)								
2010047L	Lang	7.4	6.0	0	9.9	9.7	0	94
2011037L	Crawford	6.1	4.9	0	7.5	7.2	0	93
2010024S	Aldine 8	4.3	4.3	0	7.4	6.6	0	88
2011035L	Clinton	4.3	4.0	0	5.3	5.1	0	92
2011034S	East 1	∅	∅	∅	∅	∅	∅	∅
2010801P	HRM 1	NA	NA	NA	NA	NA	NA	NA
2010803P	HRM 3	NA	NA	NA	NA	NA	NA	NA
2010804P	HRM 4	NA	NA	NA	NA	NA	NA	NA
2010807P	HRM 7	NA	NA	NA	NA	NA	NA	NA
2010808P	HRM 8	NA	NA	NA	NA	NA	NA	NA
0710900P	HRM 10	NA	NA	NA	NA	NA	NA	NA
0710901P	HRM 11	NA	NA	NA	NA	NA	NA	NA
San Antonio MSA (Region 13)								
0290046S	Downtown 27	4.3	3.3	0	7.2	6.0	0	96
0290036S	North 7	3.7	3.6	0	10.4	7.4	0	92

- † Air pollution concentration required to exceed the NAAQS
- NA Data not available
- ‡ Less than 75% completeness; not valid for NAAQS comparison
- L Local governmental agency monitoring site (added to end of AIRS site number)
- P Private monitoring site (added to end of AIRS site number)
- S State monitoring site (added to end of AIRS site number)
- ≈ Running averages, truncated to tenths
- ∅ Station was not operational; moving to another location

Sulfur Dioxide

Sulfur dioxide is produced by burning sulfur-containing fuels, smelting metallic ores containing sulfur, and removing sulfur from fuels. Sulfur dioxide was monitored continuously at 29 TNRCC, other government and private sites in Texas during 1994. In addition, two sites were operated by New Mexico across the state line from El Paso. All are shown in on Map 6. There are three sulfur dioxide standards. Sulfur dioxide measurements violate the 24-hour standard with an average of 145 ppb or more during a 24-hour period (from midnight to midnight) more than once a year. The annual average level of sulfur dioxide must be 35 ppb or higher to exceed the annual standard. A three-hour average sulfur dioxide level must be 550 ppb or higher more than once during a calendar year to violate the secondary standard. The Houston, Beaumont-Port Arthur, El Paso, and



Map 6. SO₂ Monitoring Sites 1994

Galveston-Texas City areas have historically shown the highest measured sulfur dioxide levels in the state.

Table 5 shows a summary of sulfur dioxide measurements during 1994. The table listings are grouped alphabetically by

metropolitan area and arranged in descending order from the highest three-hour average.

Table 5. 1994 SO2 Summary

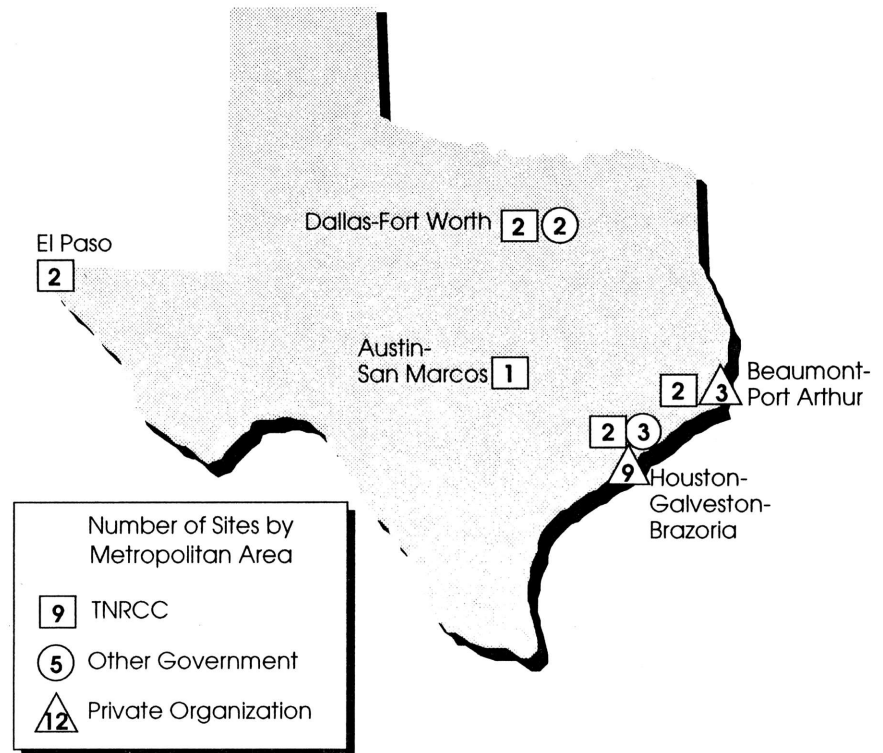
AIRS	Site Name	◊ 3-Hr			◊ 24-Hr			Annual Average (ppb)	Percent Completeness
		High (ppb)	2nd (ppb)	No. of Exc	High (ppb)	2nd (ppb)	No. of Exc ‡		
NAAQS ¶			500			140		30	
Beaumont-Port Arthur MSA (Region 10)									
2450009S	Beaumont C02	126	117	0	52	50	0	7	90
2450011S	Port Arthur C28	82	64	0	28	28	0	3	84
Brownsville-Harlingen-San Benito MSA (Region 15)									
0610006S	Brownsville 80	9	8	0	4	4	0	0	75
Corpus Christi MSA (Region 14)									
3550025S	West 4	59	58	0	18	13	0	1	91
3550026S	Tuloso 21	26	24	0	11	10	0	‡ 1.6	71
Dallas-Fort Worth CMSA (Region 4)									
1130069L	Hinton	25	24	0	18	18	0	‡ 4	33
4391002S	Ft Worth NW C13	10	10	0	6	6	0	2	90
El Paso-Juarez TX NM MX (Region 6)									
0130017S	Sunland Park NM	181	152	0	57	40	0	7	96
1410027S	Downtown C06	159	148	0	36	31	0	7	91
1410037S	UTEP C12	135	135	0	41	31	0	8	87
1410033L	Kern	131	116	0	42	23	0	5	93
0130008S	La Union NM	35	17	0	6	5	0	1	98
Houston-Galveston-Brazoria CMSA (Region 12)									
1671002S	Texas City C10	168	152	0	58	52	0	6	91
2010059S	Manchester C22	115	86	0	37	35	0	5	88
2011035L	Clinton	82	67	0	23	20	0	5	92
1670056P	TCLMCM 34th St	81	55	0	27	19	0	3	98
1670057P	TCLMCM Seawall	73	61	0	18	18	0	3	98
2010046L	N Wayside	73	45	0	12	12	0	4	87
2010004S	Baytown C24	66	49	0	21	19	0	4	92
2011003S	Deer Park C18	51	29	0	14	12	0	3	82
1670055P	TCLMCM Ave A	43	40	0	14	14	0	2	98
2010062L	Monroe & Swiss	43	39	0	19	19	0	5	90
2010051L	Croquet	35	31	0	15	11	0	3	92
2011034S	East C01	∅	∅	∅	∅	∅	∅	∅	∅
2010801P	HRM 1	NA	NA	NA	NA	NA	NA	NA	NA
2010803P	HRM 3	NA	NA	NA	NA	NA	NA	NA	NA
2010804P	HRM 4	NA	NA	NA	NA	NA	NA	NA	NA
2010807P	HRM 7	NA	NA	NA	NA	NA	NA	NA	NA
2010808P	HRM 8	NA	NA	NA	NA	NA	NA	NA	NA
0710900P	HRM 10	NA	NA	NA	NA	NA	NA	NA	NA
0710901P	HRM 11	NA	NA	NA	NA	NA	NA	NA	NA

- ¶ Air pollution concentration required to exceed the NAAQS
- ◊ Block averages, rounded to hundredths
- NA Data not available
- ‡ Less than 75% completeness; not valid for NAAQS comparison
- L Local governmental agency monitoring site (added to end of AIRS site number)
- ¥ Must be two or more to violate the NAAQS
- P Private monitoring site (added to end of AIRS site number)
- S State monitoring site (added to end of AIRS site number)
- ∅ Station was not operational; moving to another location

Nitrogen Dioxide

Although there are several oxides of nitrogen produced by high-temperature fuel combustion, the only standard is for an annual average of nitrogen dioxide. The annual average level of nitrogen dioxide must be 54 ppb or higher to violate the standard. This annual standard has never been exceeded in Texas. In fact, the highest annual average has been no more than 34 ppb in Houston and El Paso during the past five years. The TNRCC, and other government and private organizations operated continuous nitrogen dioxide monitors at 26 sites in the Austin, Beaumont-Port Arthur, Dallas-Fort Worth, El Paso, and Houston areas during 1994, as shown in Map 7.

Table 7 shows a summary of nitrogen dioxide measurements during 1994. The table



Map 7. NO₂ Monitoring Sites 1994

listings are grouped alphabetically by metropolitan area and arranged in descending

order from the highest one-hour average.

Table 6. 1994 NO2 Summary

AIRS	Site Name	1-Hr		Annual Average (ppb)	Percent Completeness
		High (ppb)	2nd (ppb)		
NAAQS ¶				54	
Austin-San Marcos MSA (Region 11)					
4530017S	Downtown 32	69	69	18	94
Beaumont-Port Arthur MSA (Region 10)					
2450009S	Beaumont 2	72	69	12	81
3611001S	West Orange 9	57	53	9	88
2450102P	SETRPC 43	56	55	9	98
3611100P	SETRPC 42	48	46	7	99
2450101P	SETRPC 40	40	37	5	95
Dallas-Fort Worth CMSA (Region 4)					
1130045S	Dallas N 5	115	108	16	94
4391002S	Ft Worth NW 13	80	74	17	92
1130069L	Hinton	77	75	‡ 21	33
1130055L	Bonnieview	49	48	‡ 11	41
El Paso-Juarez TX NM MX (Region 6)					
1410027S	Downtown 6	192	163	34	90
1410037S	UTEP 12	155	119	23	84
Houston-Galveston-Brazoria CMSA (Region 12)					
1670057P	TCLMCM Seawall	141	95	9	96
2011037L	Crawford	107	101	28	83
2011035L	Clinton	102	98	22	84
2010047L	Lang	86	85	22	82
2010024S	Aldine 8	68	67	13	86
1670056P	TCLMCM 34th St	68	63	11	98
2011034S	East 1	∅	∅	∅	∅
2010801P	HRM 1	NA	NA	NA	NA
2010803P	HRM 3	NA	NA	NA	NA
2010804P	HRM 4	NA	NA	NA	NA
2010807P	HRM 7	NA	NA	NA	NA
2010808P	HRM 8	NA	NA	NA	NA
0710900P	HRM 10	NA	NA	NA	NA
0710901P	HRM 11	NA	NA	NA	NA

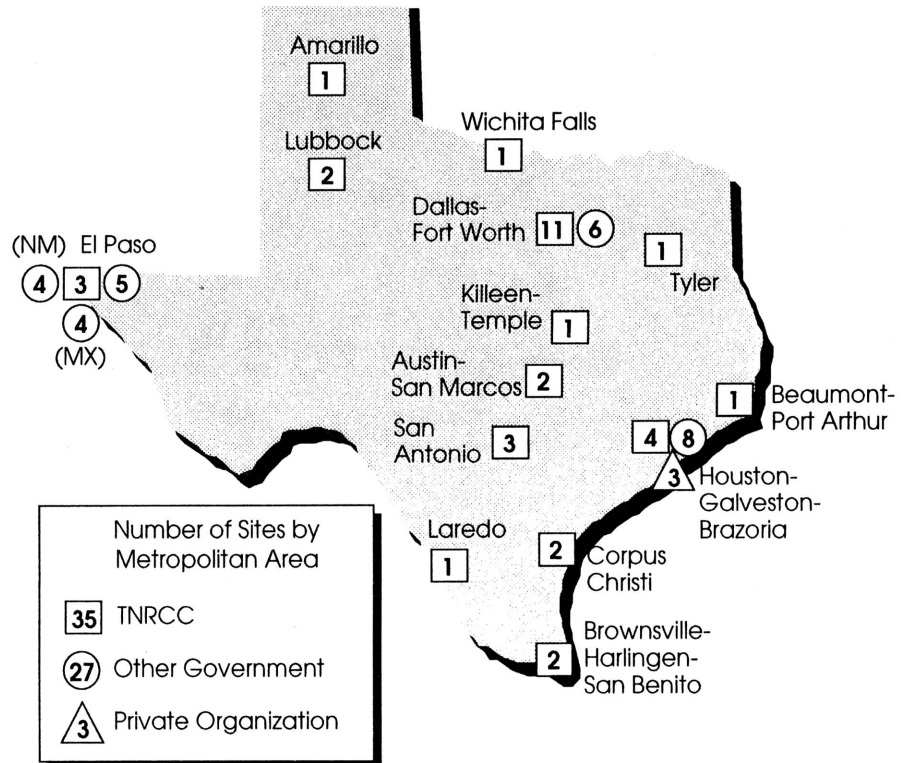
- ¶ Air pollution concentration required to exceed the NAAQS
- NA Data not available
- ‡ Less than 75% completeness; not valid for NAAQS comparison
- L Local governmental agency monitoring site (added to end of AIRS site number)
- P Private monitoring site (added to end of AIRS site number)
- S State monitoring site (added to end of AIRS site number)
- ∅ Station was not operational; moving to another location

Respirable Particulate Matter

Particulate matter in the atmosphere is produced by many natural and man-made sources. It includes both solid and liquid particles, except for water or ice, that can be emitted directly into the air or formed by chemical reactions in the atmosphere. Respirable particulate matter, particles below about 10 microns in size, are more likely to be deposited deep in the lungs, where they present the most direct health concern.

To violate the 24-hour standard for respirable particulate matter, the expected number of exceedance days must be 1.1 days or more over a three-year period. An exceedance day is each day that a 24-hour average of $155 \mu\text{g}/\text{m}^3$ or more is measured. EPA-required calculations are used to arrive at the number of expected exceedance days to account for missing data.

To violate the annual standard, the annual average concentration must be $51 \mu\text{g}/\text{m}^3$ or greater over a three-year period. Each annual average must be calculated from four complete calendar quarterly averages. For a calendar



Map 8. PM_{10} Monitoring Sites 1994

quarter to be complete, at least 75 percent of the scheduled samples must be valid. El Paso had the highest 1994 measured levels of respirable particulate matter.

During 1994, the TNRCC, and other government and private organizations monitored this pollutant at 57 sites in Texas. It was also monitored adjacent to El Paso at four sites in New Mexico and four sites in Mexico. See Map 8. The sampling schedules are either

daily, every other day, or every sixth day, depending upon the expected probability of the site exceeding the standard.

Table 7 provides a summary of the 1994 respirable particulate matter measurements at each monitoring site. The table listings are grouped alphabetically by metropolitan area and arranged in descending order from the highest 24-hour average.

Table 7. 1994 PM10 Summary +

AIRS	Site Name	24-Hr High (µg/m3)	Exp Exc	Exp Exc 1992-94 (day/yr)	Annual Average (µg/m3)	Valid Days	No. of Samples	Percent Completeness	Valid Qtrs
NAAQS †		155		# 1.1	51				
Amarillo MSA (Region 1)									
3750004S	Amarillo	60	0.0	0.0	17.7	17.0	58	95	4
Austin-San Marcos MSA (Region 11)									
4530010S	Ridgetop	47	0.0	0.0	20.2	20.0	60	98	4
4530016S	East Austin	45	0.0	0.0	20.3	21.0	59	97	4
Beaumont-Port Arthur MSA (Region 10)									
2450009S	Beaumont C02	57	*0.0	0.0	*20.3	24.0	53	87	3
Brownsville-Harlingen-San Benito MSA (Region 15)									
0610004S	Brownsville	72	0.0	0.0	25.7	28.0	60	98	4
0612002S	San Benito	62	0.0	0.0	22.5	23.0	59	97	4
Corpus Christi MSA (Region 14)									
3550020S	Navigation	69	0.0	0.0	31.3	31.0	57	95	4
3550012S	Leopard	65	0.0	0.0	24.8	26.0	58	93	4
Dallas-Fort Worth CMSA (Region 4)									
0850007S	Frisco 7	85	0.0	0.0	26.6	27.0	55	90	4
1390007S	Midlothian 7	83	0.0	0.0	23.7	23.0	57	93	4
1390014S	Midlothian 14	79	0.0	0.0	23.4	23.0	55	90	4
1390084S	Midlothian 84	79	*0.0	0.0	*22.4	20.0	46	75	3
1130072S	Cedar Hill	74	0.0	0.0	21.4	20.0	59	97	4
1390013S	Midlothian 13	68	*0.0	0.0	*21.8	***	46	75	3
1130057S	Boys Club	65	0.0	0.0	28.9	28.0	59	97	4
1130018L	Morrell	54	0.0	0.0	29.3	29.0	58	95	4
1130050L	Convention	53	0.0	0.0	25.4	27.0	59	97	4
1130020L	Lancaster	50	0.0	0.0	23.8	23.0	71	97	4
1130035L	Coit	48	0.0	0.0	24.0	26.0	60	98	4
1130070S	Chalk Hill	47	0.0	0.0	22.1	22.0	58	95	4
4390060L	Geddes	44	0.0	0.0	19.8	20.0	58	95	4
4390023S	Worth Heights	42	0.0	0.0	21.2	23.0	61	100	4
4390029L	FAA	42	0.0	0.0	19.3	19.0	60	98	4
1390015S	Midlothian Twr	28	*0.0	0.0	*19.4	***	9	15	0
1390016S	Midlothian OFW	26	*0.0	0.0	*17.3	***	9	15	0
El Paso-Juarez TX NM MX (Region 6)									
0060003L	Zenco MX	725	4.0	27.2	83.1	58.0	54	89	4
0130017S	Sunland NM ∞	491	*3.0	3.3	*93.3	***	139	38	1
0060004L	Advance MX	341	12.0	81.1	114.9	115.0	54	89	4
0060001L	Techno MX	227	*1.0	7.1	*45.8	46.0	45	74	2
1410002L	Tillman	194	2.0	2.3	37.3	38.0	328	90	4
0130016S	Anthony NM	154	0.0	0.0	40.7	39.0	182	99	4
0060002L	Pestalozzi MX	145	*0.0	0.0	*47.6	***	52	85	3
1410044L	Chamizal	143	*0.0	0.0	*21.8	23.0	280	77	3
0130017S	Sunland NM	106	*0.0	0.0	*36.5	32.0	239	65	2
1410038L	Riverside	97	0.0	0.0	31.0	30.0	57	93	4
1410043S	Socorro	91	0.0	0.0	31.5	35.0	56	92	4
1410010L	NE Clinic	80	0.0	0.0	22.2	21.0	59	97	4
1410029L	Ivanhoe	66	0.0	0.0	20.9	22.0	59	97	4
0130016S	Anthony NM ∞	65	*0.0	0.0	*35.5	***	17	5	0
1410041S	Vilas	62	0.0	0.0	38.6	40.0	59	41	4
1410045S	Lindbergh	52	0.0	0.0	18.3	20.0	59	97	4
Houston-Galveston-Brazoria CMSA (Region 12)									
2011035L	Clinton	113	0.0	0.0	47.4	42.0	61	100	4
2010054L	Kress	69	0.0	0.0	34.4	33.0	58	95	4
2011037L	Crawford	67	0.0	0.0	28.7	29.0	59	97	4
2010007L	City Site	64	*0.0	0.0	*28.8	***	36	59	2
2010062L	Swiss & Monroe	61	0.0	0.0	27.8	28.0	60	98	4
1670053L	Tx City Nessler	58	*0.0	0.0	*25.1	***	44	72	2
2015002S	Pasadena	57	*0.0	0.0	*29.3	***	48	79	3
2010024S	Aldine C08	54	0.0	0.0	24.8	25.0	57	93	4
1670004L	Tx City Fire Sta	52	0.0	0.0	23.2	23.0	58	95	4
2010045L	Bingle	50	*0.0	0.0	*26.1	25.0	53	87	3
1671002S	Texas City C10	38	*0.0	0.0	*21.0	***	39	64	1
2011034S	East C01	∅	∅	∅	∅	∅	∅	∅	∅
2010801P	HRM 1	NA	NA	NA	NA	NA	NA	NA	NA
2010803P	HRM 3	NA	NA	NA	NA	NA	NA	NA	NA
2010807P	HRM 7	NA	NA	NA	NA	NA	NA	NA	NA

Table 7. 1994 PM10 Summary + (continued)

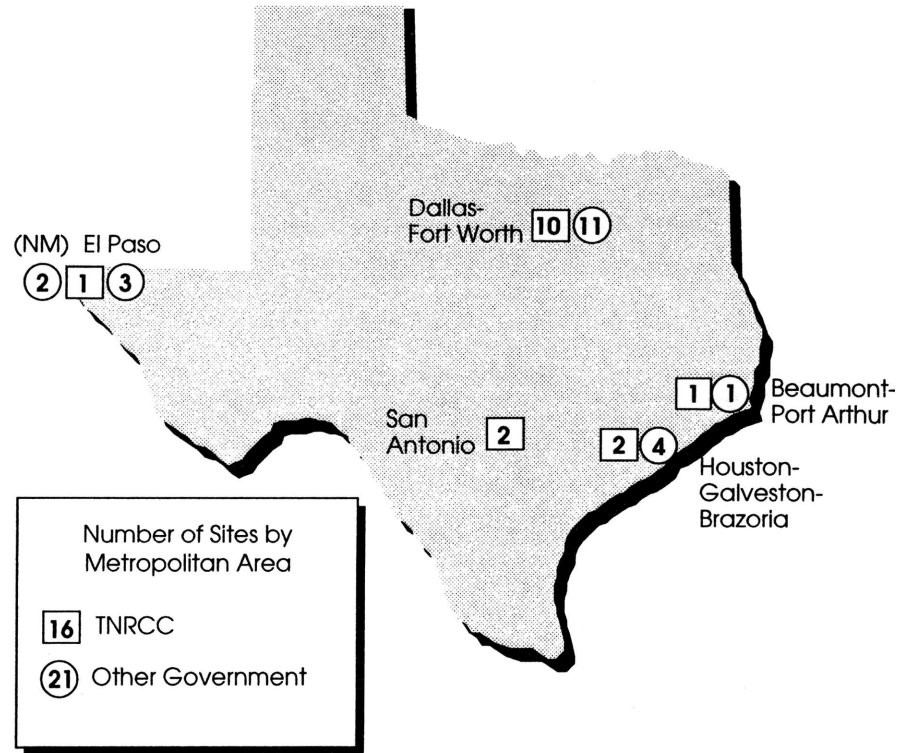
AIRS	Site Name	24-Hr High ($\mu\text{g}/\text{m}^3$)	Exp Exc	Exp Exc 1992-94 (day/yr)	Annual Average ($\mu\text{g}/\text{m}^3$)	Valid Days	No. of Samples	Percent Completeness	Valid Qtrs
NAAQS †		155		# 1.1	51				
Killeen-Temple MSA (Region 9)									
0270001S	Temple	39	0.0	0.0	15.0	16.0	57	93	4
Laredo MSA (Region 15)									
4790015S	Laredo	88	*0.0	0.0	*32.5	30.0	47	77	2
Lubbock MSA (Region 2)									
3030025S	Wolfforth	352	*4.0	5.2	*33.1	***	300	82	2
3030001S	Lubbock	103	0.0	0.0	23.0	22.0	170	94	4
San Antonio MSA (Region 13)									
0290042S	East Kelly	56	0.0	0.0	25.1	26.0	59	97	4
0290034S	Texas Culture	53	0.0	0.0	23.4	25.0	61	100	4
0290036S	North 7	44	0.0	0.0	19.5	20.0	60	98	4
Tyler MSA (Region 5)									
4230003S	Tyler	42	0.0	0.0	17.7	19.0	60	98	4
Wichita Falls MSA (Region 3)									
4850002S	Wichita Falls	76	*0.0	0.0	*26.5	***	44	72	2

- † Air pollution concentration required to exceed the NAAQS
- ∞ Continuous PM10 samplers
- NA Data not available
- * Each * indicates one year not meeting EPA completeness criteria; not valid for NAAQS comparison
- + Including exceptional event days when unusual, uncontrollable events occurred (primarily dust storms)
- # Expected number of days at or above 155 $\mu\text{g}/\text{m}^3$; annual average must be 1.1 or more days per year over a three-year period to exceed the standard
- L Local governmental agency monitoring site (added to end of AIRS site number)
- P Private monitoring site (added to end of AIRS site number)
- S State monitoring site (added to end of AIRS site number)
- ∅ Station was not operational; moving to another location

Lead

Lead was analyzed from particulate filters collected at 35 monitoring sites in Texas by the TNRCC and other government organizations during 1994. In addition, New Mexico operated two monitors across the state line from El Paso. All these sites are shown in Map 9. Lead occurs in the ambient air as particulate matter and is collected on high-volume filters with other particulate matter. The filters are subjected to x-ray fluorescence or atomic absorption analysis to determine lead content. The standard is violated if the average concentration of lead measured during one calendar year quarter is $1.55 \mu\text{g}/\text{m}^3$ or greater.

In the past, the lead standard was exceeded only at monitoring sites near active lead smelters. The highest lead levels in 1994 were recorded at



Map 9. Lead Monitoring Sites 1994

sites that were near lead smelters in the Dallas and El Paso metropolitan areas.

Table 8 provides a summary of the 1994 lead measurements at each monitoring site.

The table listings are grouped alphabetically by metropolitan area and arranged in descending order from the highest quarterly average.

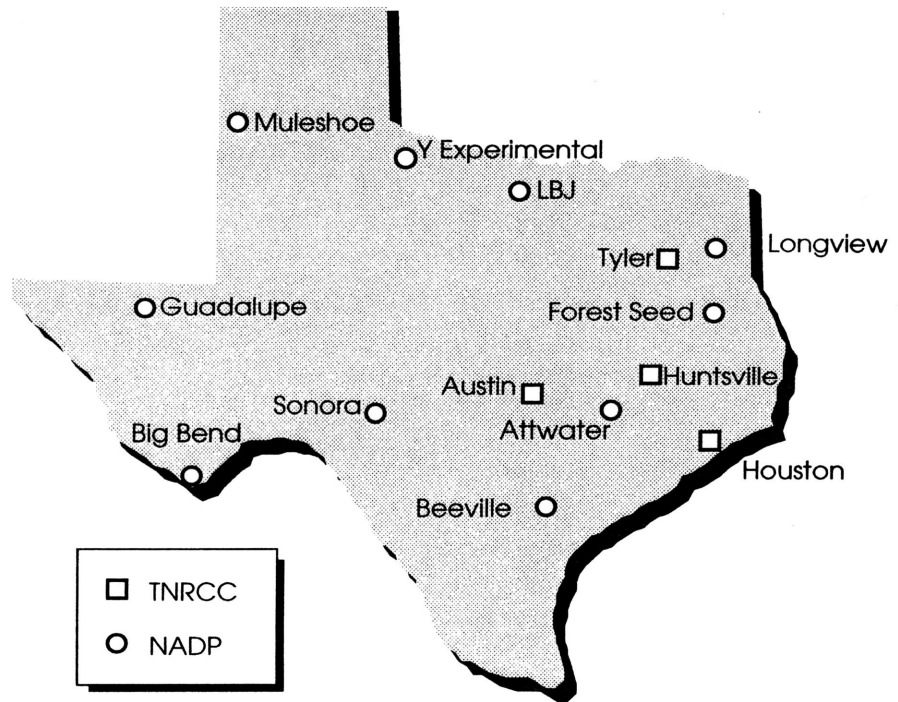
Table 8. 1994 Lead Summary

AIRS	Site Name	Qtr High ($\mu\text{g}/\text{m}^3$)	No. of Qtrs Exc NAAQS	Valid Days	Valid Qtrs
NAAQS †		1.55			
Beaumont-Port Arthur MSA (Region 10)					
2451010L	Beaumont Marina	0.04	0	56	4
2450009S	Beaumont 2	0.02	0	55	4
Dallas-Fort Worth CMSA (Region 4)					
0850003S	Frisco 5th St Ω	0.58	0	59	4
0850006S	Frisco Gould Ω	0.37	0	57	4
1390012L	Midlothian 12	0.25	0	53	3
0850008S	Frisco NW (8)	0.24	0	57	4
0850007S	Frisco North (7)	0.18	0	55	4
0850001S	Frisco Acker Ω	0.14	0	60	4
1130057L	Boys Club Ω	0.08	0	358	4
1130018L	Morrell	0.05	0	60	4
1130064L	Sargent Ω	0.05	0	61	4
1130065L	Rector Ω	0.05	0	61	4
1130066L	Nolen Ω	0.05	0	61	4
1130050L	Convention	0.04	0	61	4
1130061L	Earhart	0.04	0	60	4
2570003S	Terrell Virginia	0.04	0	59	4
1130046L	M L King	0.03	0	61	4
4391003S	Ft Worth Dtn 16	0.03	0	61	4
1130029L	Douglas	0.02	0	61	4
1130045S	Dallas N 5	0.02	0	58	4
1130070L	Chalk Hill	0.02	0	56	4
1130071S	Farmers Branch	0.02	0	61	4
4390023S	Worth Heights	0.02	0	61	4
El Paso-Juarez TX NM MX (Region 6)					
1410002L	Tillman	0.14	0	61	4
1410033L	Kern	0.13	0	61	4
1410027S	Downtown 6	0.11	0	51	3
1410010L	Northeast	0.09	0	60	4
0130004S	Sunland Racetrack NM	0.03	0	61	4
0130017S	Sunland Park NM	0.03	0	61	4
Houston-Galveston-Brazoria CMSA (Region 12)					
1671002S	Texas City 10	0.02	0	47	3
2010045L	Bingle	0.01	0	53	3
2010048L	Fulton	0.01	0	60	4
2010054L	Kress	0.01	0	59	4
2011034S	Houston East C01	∅	∅	∅	∅
2010801P	HRM 1	NA	NA	NA	NA
San Antonio MSA (Region 13)					
0290050S	Airport	0.03	0	61	4
0290034S	Texas Culture	0.02	0	61	4

- † Air pollution concentration required to exceed the NAAQS
- NA Data not available
- L Local governmental agency monitoring site (added to end of AIRS site number)
- P Private monitoring site (added to end of AIRS site number)
- Ω Site near lead emissions source
- S State monitoring site (added to end of AIRS site number)
- ∅ Station was not operational; moving to another location

Acid Rain

The TNRCC and the federal government monitored acid at 14 sites in Texas during 1994. The TNRCC participated in the National Atmospheric Deposition Program (NADP) and National Trends Network (NTN) by sponsoring automated samplers in Longview and Forest Seed that captured rainfall over one-week periods. These samples were forwarded to the NADP for analysis and the results were published. The TNRCC also conducted seven-day rainfall sampling at Huntsville and event monitoring at seven additional locations shown in Map 10. Event samples were collected during individual rainstorms, and pH and conductivity of the samples were measured immediately in the field. The samples were then forwarded to Austin where pH and conductivity measurements were repeated. Samples taken at Longview and Tyler had the lowest average pH in 1994.



Map 10. Acid Rain Monitoring Sites 1994

The pH scale is a logarithmic measure of acidity or alkalinity. A pH of 7 is neutral, with higher numbers corresponding to increased alkalinity and lower numbers to increased acidity. Unpolluted rainwater has a slightly acidic pH of 5.6. This acidity is caused by the formation of

carbonic acid from carbon dioxide in the atmosphere. Acid rain is primarily caused by sulfuric and nitric acids that are the result of man-made emissions of sulfur dioxide and nitrogen dioxide.

Table 9 provides a summary of acid rain measurements during 1994.

Table 9. 1994 Acid Rain Summary

Site	Average pH	Maximum pH	Minimum pH	No. of Samples
Longview π	4.45	6.23	3.83	41
Austin α	5.06	6.12	4.35	22
Forest Seed π	4.50	6.31	4.00	40
Huntsville α	4.62	8.09	4.20	20
Tyler α	4.42	4.99	4.16	3
Houston α	4.96			1
Attwater π	4.69	6.11	4.09	42
L.B.J. π	4.83	6.72	4.14	34
Beeville π	4.79	6.78	4.13	38
Muleshoe π	5.20	6.71	4.16	26
Sonora π	4.84	6.41	4.15	38
Big Bend π	5.22	6.79	4.71	26
Guadalupe π	5.22	6.86	4.56	28
Y Experimental π	4.75	5.92	3.67	29

π NADP/NTN site
 α TNRCC site

Note: NADP sites use different methodology for collecting samples.
 Note: Acidity (pH) of unpolluted rainwater is 5.6. Lower values are more acidic and higher values are less acidic. All averages are based on laboratory statistics.

