TYLER/LONGVIEW/MARSHALL FLEXIBLE ATTAINMENT REGION

EMISSION INVENTORY

OZONE PRECURSORS, VOC, NOX AND CO

1999 EMISSIONS

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Section 1 BACKGROUND AND EMISSIONS SUMMARY

This document presents the 1999 emissions inventory for reactive volatile organic compounds (VOC) oxides of nitrogen (NO_x) and carbon monoxide (CO) from point, area, non-road mobile, on-road mobile, and biogenic sources for the core counties and major sources for perimeter counties in the Tyler/Longview/Marshall Flexible Attainment Region. Also provided are the 1999 stationary point source data from Louisiana DEQ for Caddo, Bossier and DeSoto Parishes.

This was not an update of the 1996 Emission Inventory. This Emissions Inventory was done with new data or new methods were available. Emissions are reported on an annual basis and ozone season, tons per day.

The basic format of this report, as well as its contents, was based on requirements contained in the 1990 Federal Clean Air Act and associated guidelines for the development of a base year emissions inventory provided by the U.S. Environmental Protection Agency. Adjustments were made to accommodate regional distinctions. A copy of the area and non-road mobile emission inventory was provided to the TNRCC in a format to be used to update the National Emission Trends (NET) data base.

BACKGROUND

The geographic area covered in this inventory includes the core counties of Gregg, Harrison, Rusk, Smith, and Upshur. A strict interpretation of the area would be the core county(ies) as well as the area encompassed by a 25-mile radius of surrounding core counties. As can be imagined, a strict 25-mile boundary does not coincide with county or other jurisdictional lines. For the purpose of developing a clearer definition of the planning area boundaries and to avoid unnecessary judgement calls pertaining to the precise location of particular facilities in relation to the borders, the inventoried boundaries were conservatively defined to include all portions of the surrounding counties.

Different State agencies contributed information to this inventory necessary for preparing emission estimates. The Texas Natural Resource Conservation Commission (TNRCC) through a contract with the Texas Transportation Institute (TTI) provided onroad emissions through the MOBILE emissions model. The TNRCC provided growth factors, information from their point source inventory, solid waste disposal site information, public owned wastewater treatment facility information, accidental release and spill information, and remediated storage tank information.

EMISSIONS SUMMARY

Consistent with the 1990 emissions inventory guidelines, stationary point sources of VOC emissions of ten tons per year or greater and NO_x and CO sources of 25 tons or greater were included in the inventory. Emissions totals are expressed as 1999 values using data for 1999, whenever available. The starting point for point source estimates was the existing TNRCC Point Source Data Base (PSDB) which contains process and emissions data submitted through inventory questionnaires and new source permit applications. This data base was updated by the TNRCC with questionnaire surveys distributed to major (100 tons per year) point sources during 1999. The surveys were structured using the guidelines in the EPA document **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone. Volume I**. Minor source emissions were provided by the TNRCC through a questionaire that they mailed out.

Area source totals were based on current population, employment, and local activity data. Where activity data was used it was generally combined with emission factors from EPA's **Compilation of Air Pollution Emission Factors. Volume I: Stationary Point and Area Sources. AP-42 (fourth edition)(AP-42)**, **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone. Volume I**, and the **Emission Inventory Improvement Program**.

Non-road mobile emissions totals were based on the **Non-road Mobile Model** and the **Procedures for Emissions Inventory Preparation. Volume IV: Mobile Sources**.

Biogenic emissions were done by Environ.

Table 1-1 at the end of this section is the Emission Inventory Summary for 1999 by county and major category for this project.

IMPROVEMENT OF 1996 EMISSION INVENTORY

The original 1996 area and off-road source emission inventory that was submitted December 1998 was improved in May 2001. The improvement was due to methodologies or information available that changed since the original 1996 EI was done. The categories that were improved are LPG-Industrial, Fuel Oil-Commercial/Distillate, Natural Gas-Commercial, LPG-Commercial, Natural Gas-Residential, LPG-Residential, Wood/Residential Fireplace, Oil & Gas Production, Pesticide Application, Open Burning, Agricultural Burning, Slash Burning, Prescribed Burning, and total Nonroad Mobile Sources. Tables 1-2 thru 1-6 show the change between the original 1996 EI emissions and the improved 1996 emissions for each category changed in each of the 5 core counties. As can be seen in some cases there was an emission increase and in some cases there was an emission decrease.

The following is a short explanation as why there was a change in emissions for each category or group of categories.

COMBUSTION; LPG-INDUSTRIAL, FUEL OIL-COMMERCIAL/DISTILLATE, NATURAL GAS-COMMERCIAL, LPG-COMMERCIAL, NATURAL GAS-RESIDENTIAL, LPG-

RESIDENTIAL, WOOD/RESIDENTIAL FIREPLACE

Information was found at the US Department of Energy, Energy Information Administration (EIA) information web site that provided better fuel use for the State. This will provide for a consistent source of information for future inventories. For all categories except Wood/Residential Fireplace the emissions went up and/or down but not by a significant amount. The Wood/Residential Fireplace emissions went up for VOC and CO because the information showed that more wood was burned than what was estimated in the original 1996 Inventory.

OIL & GAS PRODUCTION

Oil and gas emissions are combined under one SCC code, but this category has six separate sub-categories. Each sub-category has an individual emission factor, therefore each category is separately discussed.

Heaters: The AP-42 emission factors are the same for the 1996 and the 1996 improved EI. However, based on an area specific study, the heater sizes for both the Glycol Dehydrator and the in line heaters for gas transmission are smaller in BTU rating. Combustion emissions are linearly dependent on gas combustion/heater size. The combustion emissions are smaller for the revised 1996 inventory.

Tanks-Crude Oil: The emissions from the storage of crude oil at the well site are estimated on a derived emission factor per barrel of crude oil produced. To derive the emission factor, EPA Tanks Program 3.1 was used for the original 1996 inventory. A survey established the average tank size, number of tanks per well, and the tank turnovers. To improve this emission estimate for both the 1999 inventory and the revised 1996 inventory this same type of study was done specifically for the East Texas Region. The latest EPA model Tanks 4.0 was used. Different data and a different model produced a significantly lower emission factor for VOC emissions per barrel of produced crude.

Glycol Dehydration: The emissions for glycol dehydration are larger for the 1996 improved inventory. VOC emissions are a function of gas composition. The natural gas as produced in East Texas has more liquids and light ends that flash from the regeneration of glycol.

Fugitive Fitting: Both oil and gas wells have emissions from leaking valves, flanges and seals. The calculation of these emissions is based on component counts and service (gas or light liquid). In 1999 a special study was done for East Texas and this increased the previous VOC emission estimate.

Compressors: The compressor emissions are linearly dependent on amount of gas consumed/size of compressor. In 1999 a special study was done for East Texas and this increased the previous combustion emission estimate for NOX and CO.

Tanks-Condensate: A survey established the average tank size, number of tanks per well, and the tank turnovers. To improve this emission estimate for both the 1999 inventory and the revised 1996 inventory this same type of study was done specifically for the East Texas Region. The latest EPA model Tanks 4.0 was used. Different data and a different model produced a significantly lower emission factor for VOC emissions per barrel of produced condensate.

PESTICIDE APPLICATION

Information was found at the web site of the USDA - National Agricultural Statistics Service that provided harvested acres for each county. This source provided direct information that was not used in the original inventory. This source will provide for a consistent source of information for future inventories. VOC emissions from home use of pesticide was also included in the calculation that was not done in the original inventory. The emissions for VOC increased for all counties.

OPEN BURNING, AGRICULTURAL BURNING, PRESCRIBED BURNING

A special study was done to calculate emissions from Open Burning. A special study done by the University of Texas was used to estimate emissions for Agricultural Burning and Prescribed Burning. Since no emissions were calculated for the original 1996 Emission Inventory there was an increase in emissions for each county.

TOTAL NONROAD MOBILE SOURCES

Non-Road Mobile Emissions are the combined emissions from all non-road sources. The Non-Road Mobile Emission Model was used to calculate emissions except for the emissions from Rail Roads and Aircraft.

The calculation methodology was completely changed from TNRCC factors in the original 1996 Inventory to the Non-Road Mobile Emission Model for the improved 1996 Inventory for every thing except Rail Roads and Aircraft. The methodology for Rail Roads and Aircraft did not change. A special study was done with recreational water craft to determine lake usage and distribution in size of water craft. The results of this study was used as an input to the Non-Road Mobile Emission Model. A special study was done for construction equipment to determine equipment counts and distribution in size. The results of this study was used as an input to the Non-Road Mobile Emission Model. The Non-Road Mobile Emission Model calculated the other source groups based on default values in the model. The improved 1996 Emission Inventory showed that the emissions increased and/or decreased depending on the county.

TABLE 1-1
EMISSION INVENTORY SUMMARY FOR THE TYLER/LONGVIEW/MARSHALL AREA
FOR THE YEAR 1999

Emission Inventory as of 7/16/01

	Gregg		Harrison		Rusk		Smith		Upshur		16 Perimeter Counties		LA 3 Parishes		TOTAL	
	ton/yr	ton/day	ton/yr	ton/day	ton/yr	ton/day	ton/yr	ton/day	ton/yr	ton/day	ton/yr	ton/day	ton/yr	ton/day	ton/yr	ton/day
VOC																
Major	661.26	2.1117	4998.08	14.3017	696.79	1.9889	2278.48	8.1810	47.13	0.3034	8116.63	22.5381	5258.20	14.4060	22056.57	63.8308
Minor	468.62	1.2840	171.46	0.4698	0.00	0.0000	331.75	0.9090	231.43	0.6341					1203.27	3.2968
Area	5362.22	14.7765	5398.17	13.4191	4837.90	11.9245	5867.11	14.5872	5588.31	13.4778					27053.71	68.1850
Non-Road Mobil	812.37	2.8294	2008.68	5.4311	1441.60	4.1211	3184.49	9.2532	1200.55	3.2735					8647.69	24.9083
On-Road Mobile		6.6536		4.9477		2.4656		9.5899		1.6130					0.00	25.2697
Biogenic		152.4900		215.1300		191.1800		176.0700		172.3800					0.00	907.2500
TOTAL	7304.47	180.1451	12576.40	253.6993	6976.30	211.6801	11661.82	218.5903	7067.42	191.6817	8116.63	22.5381	5258.20	14.4060	58961.25	1092.7406
NOx																
Major	2915.10	10.9237	15178.86	48.9955	28879.06	84.1279	1165.81	3.1617	73.57	0.2273	59421.03	187.3144	13612.80	37.2953	121246.23	372.0459
Minor	502.87	1.3778	1309.83	3.5888	0.00	0.0000	233.31	0.6392	284.24	0.7788					2330.24	6.3846
Area	4451.52	12.5774	2896.02	7.9459	4763.57	13.0606	1945.53	5.4887	3073.11	8.3852					17129.76	47.4578
Non-Road Mobil	1657.36	5.5907	1335.49	4.2156	469.87	1.5325	2502.86	8.4942	841.95	2.7424					6807.52	22.5753
On-Road Mobile		12.7256		12.0630		4.1717		17.3720		3.4294					0.00	49.7615
Biogenic		0.4400		0.3300		0.3100		0.4400		0.4900					0.00	2.0100
TOTAL	9526.85	43.6351	20720.19	77.1387	34112.51	103.2026	5847.50	35.5958	4272.86	16.0531	59421.03	187.3144	13612.80	37.2953	147513.74	500.2351
CO																
Major	1412.72	5.1281	3873.56	11.7376	2106.49	6.0851	639.16	1.9365	49.11	0.1862	13764.49	42.0103	6691.50	18.3329	28537.03	85.42
Minor	319.67	0.8759	438.34	1.2010	0.00	0.0000	151.01	0.4138	220.00	0.6028					1129.02	3.09
Area	1804.27	3.6293	3696.23	7.0485	3917.69	8.2466	4678.38	8.4164	3056.98	5.4759					17153.55	32.82
Non-Road Mobil	11467.17	40.1346	3073.40	8.9222	3806.52	11.4859	13915.30	46.3206	1732.29	5.2523					33994.68	112.12
On-Road Mobile		67.8515		57.5666		22.0333		96.4600		14.4494					0.00	258.36
Biogenic															0.00	0.00
TOTAL	15003.82	117.6194	11081.52	86.4759	9830.70	47.8508	19383.85	153.5473	5058.39	25.9666	13764.49	42.0103	6691.50	18.3329	80814.28	491.8030

Please note that the Biogenic and On-Road mobile emissions are reported in ton/day and are not included in the totals for ton/year

Table 1- 2 Changes in 1996 Emission Inventory due to changes in improved methodology

Gregg County

AREA SOURCES	Code #	VOC ton/yr	NOx ton/yr	CO ton/yr	VOC ton/day	NOx ton/day	CO ton/day
COMBUSTION (HEATING & COOKING)							
LPG-INDUSTRIAL	**2102007000**						
original 1996 Emissions		22.65	1189.05	203.84	0.0726	3.8109	0.6533
Improved 1996 Emissions		37.69	1413.51	197.89	0.1208	4.5303	0.6342
Change in Emissions		**15.04**	**224.46**	**-5.95**	**0.0482**	**0.7194**	**-0.0191**
FUEL OIL-COMMERCIAL/DISTILLATE	**2103004000**						
original 1996 Emissions		0.04	4.33	1.08	0.0001	0.0083	0.0021
Improved 1996 Emissions		0.07	7.23	1.81	0.0001	0.0139	0.0035
Change in Emissions		**0.03**	**2.90**	**0.73**	**0.0001**	**0.0056**	**0.0014**
NATURAL GAS-COMMERCIAL	**2103006000**						
original 1996 Emissions		4.38	79.58	66.85	0.0084	0.1530	0.1286
Improved 1996 Emissions		3.60	65.50	55.02	0.0069	0.1260	0.1058
Change in Emissions		**-0.78**	**-14.08**	**-11.83**	**-0.0015**	**-0.0271**	**-0.0228**
LPG-COMMERCIAL	**2103007000**						
original 1996 Emissions		0.12	4.38	0.61	0.0002	0.0084	0.0012
Improved 1996 Emissions		0.03	0.94	0.13	0.0001	0.0018	0.0002
Change in Emissions		**-0.09**	**-3.44**	**-0.48**	**-0.0002**	**-0.0066**	**-0.0009**
NATURAL GAS-RESIDENTIAL	**2104006000**						
original 1996 Emissions		4.15	71.01	30.22	0.0034	0.0584	0.0248
Improved 1996 Emissions		4.42	75.56	32.15	0.0036	0.0621	0.0264
Change in Emissions		**0.27**	**4.55**	**1.93**	**0.0002**	**0.0037**	**0.0016**
LPG-RESIDENTIAL	**2104007000**						
original 1996 Emissions		0.07	2.49	0.35	0.0001	0.0020	0.0003
Improved 1996 Emissions		0.05	2.03	0.28	0.0000	0.0017	0.0002
Change in Emissions		**-0.02**	**-0.46**	**-0.07**	**-0.0000**	**-0.0004**	**-0.0001**
WOOD/RESIDENTIAL FIREPLACE	**2104008001**						
original 1996 Emissions		44.57	2.35	194.07	0.0366	0.0019	0.1595
Improved 1996 Emissions		970.31	11.02	1070.31	1.1430	0.0130	1.2608
Change in Emissions		**925.74**	**8.67**	**876.24**	**1.1064**	**0.0110**	**1.1013**
OIL & GAS PRODUCTION	**2310000000**						
original 1996 Emissions		23886.69	2642.18	447.15	65.4430	7.2388	1.2251
Improved 1996 Emissions		7287.19	4010.44	615.88	19.9649	10.9875	1.6873
Change in Emissions		**-16599.50**	**1368.26**	**168.73**	**-45.4781**	**3.7487**	**0.4623**
PESTICIDE APPLICATION	**2461800000**						
original 1996 Emissions		5.25			0.0219		
Improved 1996 Emissions		101.47			0.4217		
Change in Emissions		**96.22**			**0.3998**		
OPEN BURNING	**2610000000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		16.37	11.47	162.56	0.0449	0.0314	0.4454
Change in Emissions		**16.37**	**11.47**	**162.56**	**0.0449**	**0.0314**	**0.4454**
AGRICULTURAL BURNING	**2801500000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		4.78	0.75	29.84	0.0131	0.0021	0.0818
Change in Emissions		**4.78**	**0.75**	**29.84**	**0.0131**	**0.0021**	**0.0818**
PRESCRIBED BURNING	**2810015000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 1- 2 Changes in 1996 Emission Inventory due to changes in improved methodology

Gregg County							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
Improved 1996 Emissions		5.69	0.92	86.01	0.0156	0.0025	0.2357
Change in Emissions		**5.69**	**0.92**	**86.01**	**0.0156**	**0.0025**	**0.2357**
TOTAL NONROAD MOBILE SOURCES							
original 1996 Emissions		1824.41	986.85	14402.53	6.4811	3.3228	50.7822
Improved 1996 Emissions		987.67	1165.85	11826.98	3.5410	4.4850	41.8655
Change in Emissions		**-836.74**	**179.01**	**-2575.55**	**-2.9401**	**1.1622**	**-8.9166**

Table 1- 3 Changes in 1996 Emission Inventory due to changes in improved methodology

Harrison County							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
AREA SOURCES	**Code #**						
COMBUSTION (HEATING & COOKING)							
LPG-INDUSTRIAL	**2102007000**						
original 1996 Emissions		5.39	283.03	48.52	0.0173	0.9071	0.1555
Improved 1996 Emissions		8.97	336.46	47.10	0.0287	1.0784	0.1510
Change in Emissions		**3.58**	**53.43**	**-1.42**	**0.0115**	**0.1712**	**-0.0046**
FUEL OIL-COMMERCIAL/DISTILLATE	**2103004000**						
original 1996 Emissions		0.01	0.96	0.24	0.0000	0.0018	0.0005
Improved 1996 Emissions		0.02	1.60	0.40	0.0000	0.0031	0.0008
Change in Emissions		**0.01**	**0.64**	**0.16**	**0.0000**	**0.0012**	**0.0003**
NATURAL GAS-COMMERCIAL	**2103006000**						
original 1996 Emissions		0.97	17.56	14.75	0.0019	0.0338	0.0284
Improved 1996 Emissions		0.80	14.46	12.14	0.0015	0.0278	0.0233
Change in Emissions		**-0.17**	**-3.10**	**-2.61**	**-0.0003**	**-0.0060**	**-0.0050**
LPG-COMMERCIAL	**2103007000**						
original 1996 Emissions		0.03	0.97	0.14	0.0000	0.0019	0.0003
Improved 1996 Emissions		0.01	0.21	0.03	0.0000	0.0004	0.0001
Change in Emissions		**-0.02**	**-0.76**	**-0.11**	**-0.0000**	**-0.0015**	**-0.0002**
NATURAL GAS-RESIDENTIAL	**2104006000**						
original 1996 Emissions		1.95	33.34	14.19	0.0016	0.0274	0.0117
Improved 1996 Emissions		2.08	35.48	15.10	0.0017	0.0292	0.0124
Change in Emissions		**0.13**	**2.14**	**0.91**	**0.0001**	**0.0018**	**0.0007**
LPG-RESIDENTIAL	**2104007000**						
original 1996 Emissions		0.12	4.54	0.64	0.0001	0.0037	0.0005
Improved 1996 Emissions		0.10	3.72	0.52	0.0001	0.0031	0.0004
Change in Emissions		**-0.02**	**-0.82**	**-0.12**	**-0.0000**	**-0.0007**	**-0.0001**
WOOD/RESIDENTIAL FIREPLACE	**2104008001**						
original 1996 Emissions		79.59	4.20	346.58	0.0654	0.0035	0.2849
Improved 1996 Emissions		1732.84	19.67	1911.42	2.0413	0.0232	2.2517
Change in Emissions		**1653.25**	**15.47**	**1564.84**	**1.9759**	**0.0197**	**1.9668**
OIL & GAS PRODUCTION	**2310000000**						
original 1996 Emissions		2085.17	2348.01	397.36	5.7128	6.4329	1.0887
Improved 1996 Emissions		1609.20	3392.15	608.61	4.4088	9.2936	1.6674
Change in Emissions		**-475.97**	**1044.14**	**211.25**	**-1.3040**	**2.8607**	**0.5788**
PESTICIDE APPLICATION	**2461800000**						
original 1996 Emissions		3.50			0.0146		
Improved 1996 Emissions		103.16			0.4298		
Change in Emissions		**99.66**			**0.4153**		
OPEN BURNING	**2610000000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		48.06	33.69	477.25	0.1317	0.0923	1.3075
Change in Emissions		**48.06**	**33.69**	**477.25**	**0.1317**	**0.0923**	**1.3075**
AGRICULTURAL BURNING	**2801500000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		21.68	3.41	135.38	0.0594	0.0093	0.3709
Change in Emissions		**21.68**	**3.41**	**135.38**	**0.0594**	**0.0093**	**0.3709**
SLASH BURNING	**2810005000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 1- 3 Changes in 1996 Emission Inventory due to changes in improved methodology							
Harrison County							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
Improved 1996 Emissions		23.94	3.77	364.11	0.0656	0.0103	0.9976
Change in Emissions		**23.94**	**3.77**	**364.11**	**0.0656**	**0.0103**	**0.9976**
PRESCRIBED BURNING	**2810015000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		37.33	6.01	564.73	0.1023	0.0165	1.5473
Change in Emissions		**37.33**	**6.01**	**564.73**	**0.1023**	**0.0165**	**1.5473**
TOTAL NONROAD MOBILE SOURCES							
original 1996 Emissions		1880.27	1327.84	10257.72	8.1335	4.4242	40.2638
Improved 1996 Emissions		1969.18	304.02	3011.60	5.3106	1.1598	8.7562
Change in Emissions		**88.91**	**-1023.82**	**-7246.12**	**-2.8229**	**-3.2644**	**-31.5076**

Table 1- 4 Changes in 1996 Emission Inventory due to changes in improved methodology							
Rusk County							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
AREA SOURCES	**Code #**						
COMBUSTION (HEATING & COOKING)							
LPG-INDUSTRIAL	**2102007000**						
original 1996 Emissions		3.73	195.62	33.54	0.0119	0.6270	0.1075
Improved 1996 Emissions		6.20	232.55	32.56	0.0199	0.7453	0.1044
Change in Emissions		**2.47**	**36.93**	**-0.98**	**0.0079**	**0.1183**	**-0.0031**
FUEL OIL-COMMERCIAL/DISTILLATE	**2103004000**						
original 1996 Emissions		0.01	0.59	0.15	0.0000	0.0011	0.0003
Improved 1996 Emissions		0.01	0.99	0.25	0.0000	0.0019	0.0005
Change in Emissions		**0.00**	**0.40**	**0.10**	**0.0000**	**0.0008**	**0.0002**
NATURAL GAS-COMMERCIAL	**2103006000**						
original 1996 Emissions		0.60	10.91	9.17	0.0012	0.0210	0.0176
Improved 1996 Emissions		0.49	8.98	7.54	0.0009	0.0173	0.0145
Change in Emissions		**-0.11**	**-1.93**	**-1.63**	**-0.0002**	**-0.0037**	**-0.0031**
LPG-COMMERCIAL	**2103007000**						
original 1996 Emissions		0.02	0.60	0.08	0.0000	0.0012	0.0002
Improved 1996 Emissions		0.00	0.13	0.02	0.0000	0.0002	0.0000
Change in Emissions		**-0.02**	**-0.47**	**-0.06**	**-0.0000**	**-0.0009**	**-0.0001**
NATURAL GAS-RESIDENTIAL	**2104006000**						
original 1996 Emissions		1.40	23.87	10.16	0.0011	0.0196	0.0084
Improved 1996 Emissions		1.49	25.40	10.81	0.0012	0.0209	0.0089
Change in Emissions		**0.09**	**1.53**	**0.65**	**0.0001**	**0.0013**	**0.0005**
LPG-RESIDENTIAL	**2104007000**						
original 1996 Emissions		0.15	5.67	0.79	0.0001	0.0047	0.0007
Improved 1996 Emissions		0.12	4.64	0.65	0.0001	0.0038	0.0005
Change in Emissions		**-0.03**	**-1.03**	**-0.14**	**-0.0000**	**-0.0008**	**-0.0001**
WOOD/RESIDENTIAL FIREPLACE	**2104008001**						
original 1996 Emissions		90.98	4.81	396.21	0.0748	0.0040	0.3257
Improved 1996 Emissions		1980.97	22.49	2185.12	2.3336	0.0265	2.5741
Change in Emissions		**1889.99**	**17.68**	**1788.91**	**2.2588**	**0.0225**	**2.2484**
OIL & GAS PRODUCTION	**2310000000**						
original 1996 Emissions		6545.23	2658.14	449.85	17.9321	7.2826	1.2325
Improved 1996 Emissions		3384.72	3809.56	652.03	9.2732	10.4372	1.7864
Change in Emissions		**-3160.51**	**1151.42**	**202.18**	**-8.6589**	**3.1546**	**0.5539**
PESTICIDE APPLICATION	**2461800000**						
original 1996 Emissions		3.50			0.0146		
Improved 1996 Emissions		91.87			0.3828		
Change in Emissions		**88.37**			**0.3682**		
OPEN BURNING	**2610000000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		43.07	30.19	427.72	0.1180	0.0827	1.1718
Change in Emissions		**43.07**	**30.19**	**427.72**	**0.1180**	**0.0827**	**1.1718**
AGRICULTURAL BURNING	**2801500000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		22.38	3.52	139.77	0.0613	0.0096	0.3829
Change in Emissions		**22.38**	**3.52**	**139.77**	**0.0613**	**0.0096**	**0.3829**
SLASH BURNING	**2810005000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 1- 4 Changes in 1996 Emission Inventory due to changes in improved methodology							
Rusk County							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
Improved 1996 Emissions		15.19	2.39	230.99	0.0416	0.0065	0.6329
Change in Emissions		**15.19**	**2.39**	**230.99**	**0.0416**	**0.0065**	**0.6329**
PRESCRIBED BURNING	**2810015000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		23.05	3.55	352.19	0.0632	0.0097	0.9650
Change in Emissions		**23.05**	**3.55**	**352.19**	**0.0632**	**0.0097**	**0.9650**
TOTAL NONROAD MOBILE SOURCES							
original 1996 Emissions		1089.34	310.40	6775.56	4.4953	1.0979	25.7012
Improved 1996 Emissions		1524.47	388.21	4144.18	4.4263	1.4648	12.7497
Change in Emissions		**435.12**	**77.81**	**-2631.38**	**-0.0690**	**0.3669**	**-12.9515**

Table 1- 5 Changes in 1996 Emission Inventory due to changes in improved methodology

Smith County

		VOC	NOx	CO	VOC	NOx	CO
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
AREA SOURCES	**Code #**						
COMBUSTION (HEATING & COOKING)							
LPG-INDUSTRIAL	**2102007000**						
original 1996 Emissions		20.25	1063.24	182.27	0.0649	3.4077	0.5842
Improved 1996 Emissions		33.71	1263.95	176.95	0.1080	4.0510	0.5671
Change in Emissions		**13.46**	**200.71**	**-5.32**	**0.0431**	**0.6433**	**-0.0170**
FUEL OIL-COMMERCIAL/DISTILLATE	**2103004000**						
original 1996 Emissions		0.06	5.54	1.39	0.0001	0.0107	0.0027
Improved 1996 Emissions		0.09	9.25	2.31	0.0002	0.0178	0.0044
Change in Emissions		**0.06**	**5.54**	**1.39**	**0.0001**	**0.0107**	**0.0027**
NATURAL GAS-COMMERCIAL	**2103006000**						
original 1996 Emissions		5.60	101.87	85.57	0.0108	0.1959	0.1646
Improved 1996 Emissions		4.61	83.85	70.43	0.0089	0.1612	0.1354
Change in Emissions		**-0.99**	**-18.02**	**-15.14**	**-0.0019**	**-0.0347**	**-0.0291**
LPG-COMMERCIAL	**2103007000**						
original 1996 Emissions		0.15	5.61	0.79	0.0003	0.0108	0.0015
Improved 1996 Emissions		0.03	1.20	0.17	0.0001	0.0023	0.0003
Change in Emissions		**-0.12**	**-4.41**	**-0.62**	**-0.0002**	**-0.0085**	**-0.0012**
NATURAL GAS-RESIDENTIAL	**2104006000**						
original 1996 Emissions		5.17	88.29	37.57	0.0042	0.0726	0.0309
Improved 1996 Emissions		5.50	93.94	39.98	0.0045	0.0772	0.0329
Change in Emissions		**0.33**	**5.65**	**2.41**	**0.0003**	**0.0046**	**0.0020**
LPG-RESIDENTIAL	**2104007000**						
original 1996 Emissions		0.29	10.82	1.51	0.0002	0.0089	0.0012
Improved 1996 Emissions		0.24	8.85	1.24	0.0002	0.0073	0.0010
Change in Emissions		**-0.05**	**-1.97**	**-0.27**	**-0.0000**	**-0.0016**	**-0.0002**
WOOD/RESIDENTIAL FIREPLACE	**2104008001**						
original 1996 Emissions		122.76	6.49	534.60	0.1009	0.0053	0.4394
Improved 1996 Emissions		2672.89	30.35	2948.35	3.1487	0.0358	3.4732
Change in Emissions		**2550.13**	**23.86**	**2413.75**	**3.0478**	**0.0304**	**3.0337**
OIL & GAS PRODUCTION	**2310000000**						
original 1996 Emissions		2598.74	457.36	77.40	7.1198	1.2530	0.2121
Improved 1996 Emissions		938.90	816.90	128.23	2.5723	2.2381	0.3513
Change in Emissions		**-1659.84**	**359.54**	**50.83**	**-4.5475**	**0.9850**	**0.1393**
PESTICIDE APPLICATION	**2461800000**						
original 1996 Emissions		21.00			0.0875		
Improved 1996 Emissions		213.84			0.8910		
Change in Emissions		**192.84**			**0.8035**		
OPEN BURNING	**2610000000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		108.97	76.38	1082.04	0.2985	0.2093	2.9645
Change in Emissions		**108.97**	**76.38**	**1082.04**	**0.2985**	**0.2093**	**2.9645**
AGRICULTURAL BURNING	**2801500000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		31.82	5.15	200.04	0.0872	0.0141	0.5481
Change in Emissions		**31.82**	**5.15**	**200.04**	**0.0872**	**0.0141**	**0.5481**
SLASH BURNING	**2810005000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 1- 5 Changes in 1996 Emission Inventory due to changes in improved methodology							
Smith County							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
Improved 1996 Emissions		5.32	0.84	80.91	0.0146	0.0023	0.2217
Change in Emissions		**5.32**	**0.84**	**80.91**	**0.0146**	**0.0023**	**0.2217**
PRESCRIBED BURNING	**2810015000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		18.32	2.83	279.57	0.0502	0.0078	0.7660
Change in Emissions		**18.32**	**2.83**	**279.57**	**0.0502**	**0.0078**	**0.7660**
TOTAL NONROAD MOBILE SOURCES							
original 1996 Emissions		3578.69	1484.36	24102.97	14.2986	5.0956	89.1530
Improved 1996 Emissions		3259.57	1746.60	14124.30	9.6619	6.7750	47.5475
Change in Emissions		**-319.12**	**262.24**	**-9978.68**	**-4.6367**	**1.6794**	**-41.6055**

Table 1- 6 Changes in 1996 Emission Inventory due to changes in improved methodology

Upshur County							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
AREA SOURCES	**Code #**						
COMBUSTION (HEATING & COOKING)							
LPG-INDUSTRIAL	**2102007000**						
original 1996 Emissions		1.24	65.10	11.16	0.0040	0.2086	0.0358
Improved 1996 Emissions		2.06	77.39	10.83	0.0066	0.2480	0.0347
Change in Emissions		**0.82**	**12.29**	**-0.33**	**0.0026**	**0.0394**	**-0.0011**
FUEL OIL-COMMERCIAL/DISTILLATE	**2103004000**						
original 1996 Emissions		0.00	0.37	0.09	0.0000	0.0007	0.0002
Improved 1996 Emissions		0.01	0.62	0.16	0.0000	0.0012	0.0003
Change in Emissions		**0.01**	**0.25**	**0.07**	**0.0000**	**0.0005**	**0.0001**
NATURAL GAS-COMMERCIAL	**2103006000**						
original 1996 Emissions		0.38	6.84	5.74	0.0007	0.0131	0.0110
Improved 1996 Emissions		0.31	5.63	4.73	0.0006	0.0108	0.0091
Change in Emissions		**-0.07**	**-1.21**	**-1.01**	**-0.0001**	**-0.0023**	**-0.0019**
LPG-COMMERCIAL	**2103007000**						
original 1996 Emissions		0.01	0.38	0.05	0.0000	0.0007	0.0001
Improved 1996 Emissions		0.00	0.08	0.01	0.0000	0.0002	0.0000
Change in Emissions		**-0.01**	**-0.30**	**-0.04**	**-0.0000**	**-0.0006**	**-0.0001**
NATURAL GAS-RESIDENTIAL	**2104006000**						
original 1996 Emissions		0.78	13.36	5.69	0.0006	0.0110	0.0047
Improved 1996 Emissions		0.83	14.22	6.05	0.0007	0.0117	0.0050
Change in Emissions		**0.05**	**0.86**	**0.36**	**0.0000**	**0.0007**	**0.0003**
LPG-RESIDENTIAL	**2104007000**						
original 1996 Emissions		0.11	4.11	0.57	0.0001	0.0034	0.0005
Improved 1996 Emissions		0.09	3.36	0.47	0.0001	0.0028	0.0004
Change in Emissions		**-0.02**	**-0.75**	**-0.10**	**-0.0000**	**-0.0006**	**-0.0001**
WOOD/RESIDENTIAL FIREPLACE	**2104008001**						
original 1996 Emissions		88.30	4.66	384.51	0.0726	0.0038	0.3161
Improved 1996 Emissions		1922.47	21.83	2120.59	2.2647	0.0257	2.4981
Change in Emissions		**1834.17**	**17.17**	**1736.08**	**2.1921**	**0.0219**	**2.1820**
OIL & GAS PRODUCTION	**2310000000**						
original 1996 Emissions		2111.58	2777.26	470.01	5.7852	7.6089	1.2877
Improved 1996 Emissions		1859.24	3680.48	542.83	5.0938	10.0835	1.4872
Change in Emissions		**-252.34**	**903.22**	**72.82**	**-0.6914**	**2.4746**	**0.1995**
PESTICIDE APPLICATION	**2461800000**						
original 1996 Emissions		3.50			0.0146		
Improved 1996 Emissions		71.53			0.2980		
Change in Emissions		**68.03**			**0.2835**		
OPEN BURNING	**2610000000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		36.09	25.30	358.40	0.0989	0.0693	0.9819
Change in Emissions		**36.09**	**25.30**	**358.40**	**0.0989**	**0.0693**	**0.9819**
AGRICULTURAL BURNING	**2801500000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		19.00	2.98	118.64	0.0521	0.0082	0.3251
Change in Emissions		**19.00**	**2.98**	**118.64**	**0.0521**	**0.0082**	**0.3251**
SLASH BURNING	**2810005000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 1- 6 Changes in 1996 Emission Inventory due to changes in improved methodology							
Upshur County							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
		ton/yr	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
Improved 1996 Emissions		15.19	2.39	230.99	0.0416	0.0065	0.6329
Change in Emissions		**15.19**	**2.39**	**230.99**	**0.0416**	**0.0065**	**0.6329**
PRESCRIBED BURNING	**2810015000**						
original 1996 Emissions		0.00	0.00	0.00	0.0000	0.0000	0.0000
Improved 1996 Emissions		16.18	2.45	248.10	0.0443	0.0067	0.6798
Change in Emissions		**16.18**	**2.45**	**248.10**	**0.0443**	**0.0067**	**0.6798**
TOTAL NONROAD MOBILE SOURCES							
original 1996 Emissions		1051.79	765.13	5600.76	4.5897	2.5457	22.1418
Improved 1996 Emissions		1137.28	231.37	1654.00	3.1017	0.9327	5.0505
Change in Emissions		**85.49**	**-533.76**	**-3946.76**	**-1.4880**	**-1.6130**	**-17.0913**

Section 2 POINT SOURCES

INTRODUCTION AND SCOPE

For the purposes of this inventory, point sources are defined as stationary, commercial or industrial operations that emit more than 10 tons per year of VOC or 25 tons per year of NO_x and CO. Point sources are broken down into two subsets, major sources and minor sources. Major sources are sources that emit a criteria pollutant at an emission rate greater than 100 tons per year and are part of the TNRCC state wide emission inventory system. Minor sources are everything not identified as major. In order for the Tyler/Longview/Marshall inventory to be equal in approach and quality to a 1990 base year type ozone Nonattainment inventory minor point sources were added.

MAJOR SOURCES

METHODOLOGY AND APPROACH

As part of the statewide emissions inventory major industrial sources in the Tyler/Longview/Marshall area were inventoried by the TNRCC in 1999. The same inventory methodology, with minor improvements, created for the 1990 base year inventory was used. The major point source inventory consists of actual emissions for 1999. The TNRCC provided the list of major sources that is part of their PSDB.

QUALITY ASSURANCE MEASURES

In order to maintain the quality of data at the level submitted in the 1990 base year inventory, the same quality assurance measures developed for that inventory were used in the 1999 inventory.

SUMMARY OF POINT SOURCE EMISSIONS

Table 2-1 at the end of this section reflect the major point source emissions for 1999 by source, and total for each county emissions for the core counties.

Table 2-2 at the end of this section reflects the major point source emissions for 1999 by source and total emissions for all the perimeter counties.

MINOR SOURCES

METHODOLOGY AND APPROACH

Minor source emissions were provided by the TNRCC through a questioner that they mailed companies. The following is a copy the TNRCC summary.

1999 Near Non-Attainment Survey

Objective: To identify point source emissions in three near non-attainment areas.
Austin-San Marcos MSA
San Antonio MSA
Tyler-Longview MSA

Criteria: Sources that emit less than 100 TPY but exceed 10 TPY VOC and 25 TPY NOx

Data Sources Reviewed:

Internet Resources	**Information was not available.**
TNRCC Databases	**Not comprehensive in these areas.**
Library	**Hard copy available but labor intensive.**
Trade Organizations	**Difficulty in obtaining information.**
Chamber of Commerce	**Do not have a list.**
Thomas Register	**Mostly sales organizations.**
Business Databases	**Computer based but can access one record at a time.**
UT Business School	**CD ROM of Texas manufacturers**
Texas Sales Tax Records	**Comptroller provided copy on ZIP disk (667 thousand records)**

Method:

Determine viable Standard Industrial Codes (SIC)

1. **Selected CD ROM of Texas manufacturers and Sales Tax records.**
2. **Extracted SIC codes by county.**
3. **Prepared a spreadsheet listing company, address, principals, etc.**
4. **Manually reviewed the list and reduced from 4000 to 1000 entries.**
5. **Prepared a questionnaire form.**
6. **Provided TNRCC personnel with the mailing list and form.**
7. **TNRCC mailed questionnaire early 2000.**
8. **Organized the returned questionnaires into three categories: completed, incomplete and need follow up action. Filed alphabetically by account and county.**
9. **Designed a tracking database consisting of company identification number, company name, address, site name, etc. (File: H:\EVERYONE\Angelita\WORK\99Ntracking.db)**
10. **Designed an emissions database containing company identification number, company name, site coordinates and all criteria pollutant emissions. (File: H:\EVERYONE\Angelita\WORK\99emiss.db)**
11. **Performed quality assurance for each questionnaire using AP-42, Tanks program,**

and Das Buch Dos as references.

12. Re-mailed 75 questionnaires with proper physical addresses.
13. Referenced Etak at www.geocode.com/eagle.html-ssi to record the coordinates for companies that had NO_x emissions greater than 25 tons per year and/or VOC emissions greater than 10 tons per year.

1999 Near Non-Attainment Summary

Tyler-Longview MSA

Number Sent:	419
Returned Completed:	286
Triggering >10 or 25:	47
Total NO_x (TPY):	1781
Total VOC (TPY):	753

Non-Attainment 1999 Near Summary

Tyler-Longview MSA

Sources that emit less than 100 TPY but exceed 10 TPY VOC and 25 TPY NOx

Smith

Sources	No.	NO_x (TPY)	VOC (TPY)
Oil and gas extraction	3	49	64
Lumber and wood products	1	0	22
Paper and allied products	1	0	67
Rubber and plastic products	2	102	98

Gregg

Sources	No.	NO_x	VOC
Oil and gas extraction	6	190	67
Chemicals	1	0	20
Petroleum refining	1	45	30
Rubber and plastic products	1	0	68
Metal production	2	53	88
Fabricated metal products	1	53	10
Transportation services	1	0	16
Trigger Rule 101.10*	1	115	0

Harrison

Source: Technical Analysis Division, Industrial Emissions Assessment Section
Angelita Rodriquez and Jack Stankus
30 August 00

Sources	No.	NO_x	VOC
Oil and gas extraction	19	1030	42
Primary metal industries	1	25	10

Upshur

Sources	No.	NO_x	VOC
Oil and gas extraction	6	234	115
Lumber and wood products	1	0	36

*Not currently submitting emissions inventory

Source: Technical Analysis Division, Industrial Emissions Assessment Section
Angelita Rodriquez and Jack Stankus
30 August 00

Table 2-1 Magor Point Source Emissions Core Counties

COUNTY	AC_ACCOU	COMPANY	VOC TPY	NOx TPY	CO TPY	VOC TPD	NOx TPD	CO TPD
GREGG	GJ0003W	GAS SOLUTIONS	171.04	490.57	247.97	0.4803	1.7467	0.8720
GREGG	GJ0005S	SULPHUR RIVER GATHERING LP	24.79	337.53	249.21	0.0810	1.5936	1.2051
GREGG	GJ0026K	STROH BREWERY CO THE	30.94	49.72	14.79	0.1426	0.1181	0.0351
GREGG	GJ0027I	REXAM BEVERAGE CAN CO	130.31	5.48	1.15	0.3525	0.0000	0.0000
GREGG	GJ0035J	LE TOURNEAUINC	34.12	53.12	81.45	0.0924	0.1442	0.2194
GREGG	GJ0038D	PETRO-WAX LLC	35.20	8.19	6.53	0.0964	0.0224	0.0179
GREGG	GJ0042M	SOUTHWEST STEEL CASTING CO	38.60	31.57	52.72	0.1481	0.1052	0.1891
GREGG	GJ0043K	SOUTHWESTERN ELECTRIC POWER	38.48	1522.02	583.97	0.1389	6.0518	2.1107
GREGG	GJ0079M	KOCH MIDSTREAM SERVICES CO	9.31	99.66	38.49	0.0255	0.2731	0.1055
GREGG	GJ0082A	NORRIS CYLINDER CO	49.04	7.65	6.79	0.2195	0.0266	0.0186
GREGG	GJ0139T	CROSS TIMBERS OPERATING CO	22.15	123.26	121.64	0.0605	0.3500	0.3323
GREGG	GJ0160F	BORG WARNERAUTOMOTIVE PT SY	9.05	0.08	0.07	0.0362	0.0003	0.0003
GREGG	GJ0188G	KOCH GATEWAY PIPELINE CO	4.45	0.86	0.04	0.0122	0.0024	0.0001
GREGG	GJ0278E	RELIANT ENERGY FIELD SERVICES I	63.78	185.39	7.89	0.2256	0.4893	0.0221
TOTAL			661.26	2915.10	1412.72	2.1117	10.9237	5.1281
HARRISON	HH0005S	DYNEGY MIDSTREAM SERVICES LP	117.97	157.40	121.15	0.3242	0.4324	0.3327
HARRISON	HH0008M	MILLENNIUM RAIL INC	43.47			0.0000	0.0000	0.0000
HARRISON	HH0012V	DEPARTMENT OF THE ARMY	1.92	11.72	3.30	0.0000	0.0000	0.0000
HARRISON	HH0018J	HENDERSON BRICK CO OF BORAL B	0.74	10.79	37.00	0.0020	0.0293	0.1006
HARRISON	HH0019H	NORIT AMERICAS INC	228.35	453.37	1134.96	0.7711	1.4839	3.4536
HARRISON	HH0029E	MOBIL OIL CORPORATION	113.19			0.3077	0.0000	0.0000
HARRISON	HH0031R	NATURAL GASPIPELINE CO OF AMEI	1.58	13.84	2.80	0.0373	0.0378	0.0076
HARRISON	HH0036H	SNIDER INDUSTRIES INC	10.13	2.31	2.28	0.0319	0.0066	0.0068
HARRISON	HH0037F	SOUTHWESTERN ELECTRIC POWER	40.00	8718.82	871.09	0.1421	30.9897	3.0962
HARRISON	HH0038D	STEMCO MFG CO	78.57	0.48	0.42	0.2543	0.0007	0.0011
HARRISON	HH0041O	MOTIVA ENTERPRISES LLC	12.94	1.98	4.95	0.0354	0.0054	0.0135
HARRISON	HH0042M	EASTMAN CHEMICAL CO	3904.63	5542.66	1323.87	10.6791	15.1532	3.6182
HARRISON	HH0046E	REPUBLIC INDUSTRIES INC	102.83	0.11	0.18	0.3911	0.0004	0.0007
HARRISON	HH0067T	NATURAL GASPIPELINE CO OF AMEI	24.91	13.44	13.16	0.0719	0.0536	0.0516
HARRISON	HH0112Q	CROSS TIMBERS OPERATING CO	60.94	82.31	98.29	0.1730	0.2188	0.2629
HARRISON	HH0127D	AMOCO PRODUCTION CO	19.72	58.11	86.93	0.0540	0.1592	0.2382
HARRISON	HH0165S	REPUBLIC INDUSTRIES	125.82	0.69	0.58	0.3494	0.0019	0.0016
HARRISON	HH0171A	HUNTSMAN POLYPROPYLENE CORF	91.63	7.11	60.92	0.6144	0.0195	0.1669
HARRISON	HH0199B	RELIANT ENERGY FIELD SERVICES I	16.79	100.06	104.47	0.0573	0.3930	0.3656
HARRISON	HH0200S	TEJAS GAS CORP	1.96	3.67	7.23	0.0054	0.0100	0.0197
TOTAL			4998.08	15178.86	3873.56	14.3017	48.9955	11.7376
RUSK	RL0001O	ANDERSON HICKEY CO	0.05	0.97	0.19	0.0000	0.0000	0.0000
RUSK	RL0007C	EXXON CORPORATION	68.62	260.86	185.05	0.1875	0.6463	0.5056
RUSK	RL0012J	INTERNATIONAL PAPER CO	188.00	28.40	30.30	0.5156	0.0779	0.0831
RUSK	RL0020K	TXU ELECTRIC CO	332.63	28360.67	1773.49	0.9657	82.7788	5.1751
RUSK	RL0040E	SUN PIPE LINE CO	3.54			0.0000	0.0000	0.0000
RUSK	RL0041C	EXXON PIPELINE CO	50.88			0.1754	0.0000	0.0000
RUSK	RL0076G	TEJAS GAS PIPELINE CO	6.81	59.14	5.41	0.0186	0.1626	0.0149
RUSK	RL0086D	TROY MFG TEXAS INC	25.74			0.0699	0.0000	0.0000
RUSK	RL0096A	DUKE ENERGYFIELD SERVICES, INC	2.77	64.16	35.06	0.0076	0.1758	0.0960
RUSK	RL0097V	DUKE ENERGYFIELD SERVICES	17.76	104.86	76.99	0.0485	0.2865	0.2104
TOTAL			696.79	28879.06	2106.49	1.9889	84.1279	6.0851
SMITH	SK0004C	UNITED TECHNOLOGIES	58.53	0.79	0.24	0.1672	0.0014	0.0005
SMITH	SK0014W	MUSTANG FUEL CORP	5.66	44.94	45.71	0.0639	0.1231	0.1327
SMITH	SK0016S	THE TRANE COMPANY	199.66	16.88	14.18	0.9004	0.0520	0.0440
SMITH	SK0022A	LA GLORIA OIL AND GAS CO	1359.22	882.58	331.79	3.6924	2.3819	0.8811
SMITH	SK0041T	RANSOM INDUSTRIES INC	484.53	216.13	243.45	2.8350	0.5908	0.8677
SMITH	SK0043P	BONAR PACKAGING INC	71.78	2.29	1.93	0.1996	0.0058	0.0049
SMITH	SK0168R	PRESTIGIOUSACCESSORIES	10.86			0.0495	0.0000	0.0000
SMITH	SK0346R	FLOWERS BAKING COMPANY OF TY	88.24	2.19	1.84	0.2732	0.0067	0.0057
TOTAL			2278.48	1165.81	639.16	8.1810	3.1617	1.9365
UPSHUR	UA0008J	CHEVRON USA	16.76	0.78	1.57	0.2090	0.0279	0.0558
UPSHUR	UA0045D	TEJAS GAS OPERATING LLC	0.43	3.06	15.63	0.0012	0.0084	0.0430
UPSHUR	UA0156Q	INDIAN ROCKGATHERING CO LP	29.93	69.72	31.92	0.0932	0.1910	0.0874
TOTAL			47.13	73.57	49.11	0.3034	0.2273	0.1862

Table 2-2 Major Point Source Emissions Parimeter Counties								
COUNTY	AC_ACCOU	COMPANY	VOC TPY	NOx TPY	CO TPY	VOC TPD	NOx TPD	CO TPD
ANDERSON	AA0027U	PHILLIPS CHEMICAL CO	22.93	1.24	1.03	0.1099	0.0052	0.0043
ANDERSON	AA0035V	TXU FUEL CO	32.83	51.56	38.54	0.0918	0.1395	0.1057
ANDERSON	AA0044U	OWEN CORNING	27.97	60.09	28.99	0.0764	0.1642	0.0792
ANDERSON	AA0045S	MOSSBACHER PRODUCTION CO	1.43	0.74	0.84	0.0039	0.0020	0.0023
ANDERSON	AA0055P	EXXON PIPELINE CO	160.91			0.5111	0.0000	0.0000
ANDERSON	AA0059H	TXU FUEL CO	1.03	2.13	0.50	0.0029	0.0084	0.0028
ANDERSON	AA0064O	TXU LONE STAR PIPELINE CO	15.99	42.87	20.63	0.0228	0.1367	0.0980
ANDERSON	AA0069E	VALERO EASTEX PIPELINE CO	10.51	12.57	11.18	0.0277	0.0078	0.0080
ANDERSON	AA0096B	PINNACLE GAS TREATING INC	13.46	69.80	79.20	0.0368	0.1953	0.2155
CASS	CG0010G	INTERNATIONAL PAPER CO	2613.03	1713.35	1045.96	7.1464	4.7948	2.9012
CASS	CG0012C	SULPHUR RIVER GATHERING LP	140.30	168.99	146.91	0.4008	0.4857	0.4215
CASS	CG0036L	MCLEOD GAS GATHERING & PROCE	9.77	0.15	0.77	0.0267	0.0004	0.0021
CHEROKEE	CJ0010B	HYPERION ENERGY LP	16.56	49.11	42.23	0.0452	0.1342	0.1154
CHEROKEE	CJ0011W	WESTERN LITHOTECH	9.36		0.00	0.0359	0.0000	0.0000
CHEROKEE	CJ0026J	TXU ELECTRIC CO	69.61	2862.62	429.92	0.2949	12.4462	2.0134
CHEROKEE	CJ0051K	UNOCAL PIPELINE	123.28			0.3377	0.0000	0.0000
CHEROKEE	CJ0121O	MITCHELL ENERGY CORP	21.19	0.02	0.01	0.0579	0.0001	0.0000
HENDERSON	HM0003S	TEXAS INDUSTRIES INC	1.66	10.75	36.87	0.0048	0.0307	0.1054
HENDERSON	HM0008I	CROSS TIMBERS OPERATING CO	41.48	73.52	261.05	0.1133	0.2009	0.7132
HENDERSON	HM0010V	HUNT OIL CO	69.06	1278.53	894.29	0.1888	3.5548	2.4844
HENDERSON	HM0011T	TXU PROCESSING CO	29.21	285.96	149.29	0.0885	0.7915	0.4120
HENDERSON	HM0012R	TXU LONE STAR PIPELINE CO	33.79	119.99	34.80	0.1151	0.3792	0.1852
HENDERSON	HM0014N	SULPHUR RIVER GATHERING LP	37.15	163.49	288.11	0.1245	0.4955	0.9187
HENDERSON	HM0017H	TXU ELECTRIC CO	14.21	567.22	62.53	0.0760	3.0076	0.3655
HENDERSON	HM0024K	CHAN WEST OIL CORP	9.49	56.06	7.01	0.0000	0.0000	0.0000
HENDERSON	HM0048T	TXU LONE STAR PIPELINE CO	9.60	1.22	3.78	0.0288	0.0033	0.0104
HENDERSON	HM0160B	HUNT OIL CORP	0.44	33.35	23.20	0.0009	0.0747	0.0461
HENDERSON	HM0161W	HUNT OIL CO	19.09	1.12	0.94	0.0523	0.0031	0.0026
HOPKINS	HR0001N	SULPHUR RIVER RESOURCES LC	8.98	45.40	39.05	0.0195	0.1124	0.0971
HOPKINS	HR0018T	VALENCE OPERATING CO	27.14	298.15	186.05	0.0742	0.8146	0.5083
MARION	ME0006A	SOUTHWESTERN ELECTRIC POWEI	62.46	2528.19	953.70	0.2765	11.2091	4.2230
MARION	ME0007V	KOCH MIDSTREAM SERVS CO	30.12	78.34	73.00	0.0825	0.2146	0.2000
MARION	ME0019O	INTERNATIONAL PAPER	82.43	177.74	92.04	0.2258	0.4870	0.2522
MARION	ME0024V	RELIANT ENERGY GAS TRANSMISSI	5.14	65.27	38.36	0.0150	0.1788	0.1051
MORRIS	MS0008I	LONE STAR STEEL CO	116.26	254.52	628.22	0.3198	0.6992	2.0007
MORRIS	MS0011T	SOUTHWESTERN ELECTRIC POWEI	1.81	78.90	27.66	0.0135	0.5863	0.2066
MORRIS	MS0012R	T AND N LONE STAR WAREHOUSE	88.92			0.0000	0.0000	0.0000
NACOGDOCH	NA0017W	INTERNATIONAL PAPER CO	1217.54	142.65	474.53	3.3407	0.3908	1.3001
NACOGDOCH	NA0035U	JM CLIPPER CORP	151.72	5.09	4.10	0.4379	0.0141	0.0113
NACOGDOCH	NA0051W	FORETRAVELINC	15.30			0.0601	0.0000	0.0000
NACOGDOCH	NA0055O	CAL TEX LUMBER CO INC	196.90	9.77	26.57	0.7983	0.0406	0.0978
NACOGDOCH	NA0074K	TEJAS GAS CORPORATION	5.15	5.53	3.53	0.0000	0.0000	0.0000
NACOGDOCH	NA0075I	EXXON CORPORATION	82.59	93.25	13.21	0.2263	0.2555	0.0362
NACOGDOCH	NA0076G	EXXON CORPORATION	22.69	109.92	15.47	0.0622	0.3012	0.0424
NACOGDOCH	NA0100L	EXXONMOBIL PRODUCTION CO	10.50	134.46	91.32	0.0288	0.3684	0.2502
PANOLA	PB0002N	DUKE ENERGYFIELD SERVICES INC	413.98	2293.05	1236.87	1.1368	6.2823	3.3887
PANOLA	PB0003L	UNION PACIFIC RESOURCES	119.72	118.60	229.30	0.3401	0.3364	0.6549
PANOLA	PB0010O	LOUISIANA PACIFIC CORP	89.19	225.97	593.09	0.2487	0.6262	1.6163
PANOLA	PB0012K	KOCH GATEWAY PIPELINE CO	196.31	955.25	49.73	0.4199	2.6172	0.1363
PANOLA	PB0013I	KOCH GATEWAY PIPELINE CO	62.16	30.39	34.79	0.1703	0.0832	0.1195
PANOLA	PB0026W	VASTAR RESOURCES INC	20.43	2.52	30.51	0.0000	0.0000	0.0000
PANOLA	PB0029Q	SEAGULL MID-SOUTH INC	31.43	66.64	81.71	0.0866	0.1828	0.2067
PANOLA	PB0039N	SONAT EXPLORATION	10.61	48.70	34.09	0.0000	0.0000	0.0000
PANOLA	PB0052V	AMOCO PRODUCTION CO	53.29	387.30	68.12	0.1458	1.0612	0.1867
PANOLA	PB0053T	RELIANT ENERGY FIELD SERVICES	7.73	53.53	96.33	0.0000	0.0000	0.0000
PANOLA	PB0063Q	RELIANT ENERGY GAS TRANSMISSI	1.66	124.81	36.00	0.0046	0.3419	0.0986
PANOLA	PB0067I	DUKE ENERGYFIELD SERVICES	13.66	247.00	42.24	0.0373	0.6767	0.1157
PANOLA	PB0069E	EXXON CORPORATION	24.00	53.73	96.91	0.0656	0.1468	0.2648
PANOLA	PB0095D	DUKE ENERGYFIELD SERVICES	5.92	80.70	106.95	0.0162	0.2211	0.2930
PANOLA	PB0100M	EOG RESOURCES INC	17.77	343.83	258.84	0.0487	0.9418	0.7091
PANOLA	PB0226M	DUKE ENERGYFIELD SERVICES	15.90	71.95	100.96	0.0434	0.1966	0.2758
SHELBY	SI0007N	BRUCE HARDWOOD FLOORING L L (	70.61	8.15	47.13	0.0000	0.0000	0.0000

Table 2-2 Major Point Source Emissions Parimeter Counties								
COUNTY	AC_ACCOI	COMPANY	VOC TPY	NOx TPY	CO TPY	VOC TPD	NOx TPD	CO TPD
SHELBY	SI0034K	TEXAS EASTERN TRANSMISSION C(	6.89	64.28	9.05	0.0593	0.9577	0.1348
SHELBY	SI0035I	MOBIL OIL CORP	17.97	0.60	0.15	0.0417	0.0016	0.0004
TITUS	TF0012D	SOUTHWESTERN ELECTRIC POWEI	188.95	19392.13	1574.80	0.5772	59.4189	4.8113
TITUS	TF0013B	TXU ELECTRIC CO	194.13	20496.00	1680.87	0.5928	62.4283	5.2537
TITUS	TF0031W	MASTERCRAFTINDUSTRIES INC	60.66	0.00	0.02	0.0000	0.0000	0.0000
TITUS	TF0071K	BIG TEX TRAILERWORLD	41.65			0.1132	0.0000	0.0000
VAN ZANDT	VB0001S	SULPHUR RIVER GATHERING LP	16.80	18.50	29.83	0.0463	0.0447	0.0842
VAN ZANDT	VB0004M	SULPHUR RIVER GATHERING LP	16.71	26.51	20.33	0.0438	0.0743	0.0181
VAN ZANDT	VB0011P	UNION OIL COMPANY OF CALIFORN	38.53	407.02	301.12	0.1148	1.4456	0.9034
VAN ZANDT	VB0024G	UNOCAL PIPELINE	244.09			0.6687	0.0000	0.0000
WOOD	WO0007M	DUKE ENERGYFIELD SERVICES INC	20.79	176.48	46.58	0.0569	0.4832	0.1276
WOOD	WO0009I	EXXON COMPANY USA	188.99	2050.99	652.97	0.5122	5.9493	1.9856
WOOD	WO0020U	BRUIN PETROLEUM INC	12.09	22.78	29.82	0.0366	0.0622	0.0815
WOOD	WO0038B	EXXONMOBIL PIPELINE CO	104.57			0.3983	0.0000	0.0000
WOOD	WO0108F	AMOCO PIPELINE CO	128.42			0.5093	0.0000	0.0000
TOTAL			8116.63	59421.03	13764.49	22.5381	187.3144	42.0103

SECTION 3 AREA SOURCES

Introduction and Scope

In the area source portion of the emissions inventory, emissions were collected for those sources and activities that were too small and/or too numerous to be included individually in the point source inventory. This is an emission inventory for a base year of 1999. Emissions were reported on an annual basis and ozone season, tons per day. Area sources of VOC, NOx, and CO emissions were identified by using a list of sources provided by the TNRCC. **Emission Inventory Improvement Program Volume III, Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone Volume I**, **AP42** (Fifth edition)**, Contractor Special Studies** and **TNRCC Special Studies** were used as a guide on how to calculate emissions. The TNRCC was consulted on the many of the area source emission calculations. Area emission sources are divided primarily into two groups characterized by the emission mechanism: 1) evaporative emissions, and 2) fuel combustion emissions. Sources of evaporative losses include gasoline service station operations, solvent use in dry cleaning, solvent cleaning, surface coating operations, and leaking underground storage tanks. Fuel combustion sources include stationary source fossil fuel combustion, and structural fires. Table 3-1 lists each area source category included in this report. Included in this report are descriptions of each category, methodology used to estimate emissions, sources of data, and emission factors used.

Methodology and Approach

Methodologies used for estimating the area source activity levels and emissions came primarily from EPA sources: **Emission Inventory Improvement Program Vol III, Procedures for the Preparation of Emissions Inventories for Precursors of Carbon Monoxide and Ozone, Volume I**, and **AP-42** (Fifth edition). Some categories had special studies performed to obtain more area specific calculation of emissions. Emissions from categories such as the consumer products, architectural coating and automobile refinishing were calculated using methodologies provided by the TNRCC. The seasonal adjustment factors to calculate the ozone season emissions in tons per day came from Procedures - ,Volume I or as noted in the text. Additional information was provided by Texas State agencies, including the Texas Railroad Commission (TRC), the TNRCC, and the Department of Parks and Wildlife (TP&WD). County population numbers used for calculating emissions from specific categories came from the U.S. Bureau of the Census because the information was not available from the State Comptrollers Office. Population estimates reflect the U.S. Census projected 1999 population. Table 3-2 shows the County populations used for the 1999 Emissions Inventory. For the purposes of this study emission calculations were rounded to one-hundredth of a ton/yr and one-ten thousandth of a ton/day. If the source category was less than .01 ton/yr they were not included in the inventory. To avoid double-counting of emissions area source emissions were compared with point source emissions and corrected as necessary.

Table 3-1
Area Source Categories

COMBUSTION (HEATING & COOKING)
FUEL OIL-INDUSTRIAL/DISTILLATE
FUEL OIL-INDUSTRIAL/RESIDUAL
NATURAL GAS-INDUSTRIAL
LPG-INDUSTRIAL
FUEL OIL-COMMERCIAL/DISTILLATE
FUEL OIL-COMMERCIAL/RESIDUAL
NATURAL GAS-COMMERCIAL
LPG-COMMERCIAL
COAL, ANTHRACITE-RESIDENTIAL
COAL, BITUMINOUS-RESIDENTIAL
FUEL OIL-RESIDENTIAL/DISTILLATE
FUEL OIL-RESIDENTIAL/RESIDUAL
NATURAL GAS-RESIDENTIAL
LPG-RESIDENTIAL
WOOD/RESIDENTIAL FIREPLACE

BAKERIES

OIL & GAS PRODUCTION
COMPRESSOR COMBUSTION EMISSIONS
FUGITIVE FROM NATURAL GAS COMPRESSOR STATIONS
NATURAL GAS DEHYDRATION(GLYCALC) EMISSIONS
NATURAL GAS LIQUIDS STORAGE
CRUDE OIL STORAGE
INDUSTRIAL PROCESSES: NEC

COATING (PAINTING) OPERATIONS
ARCHITECTURAL COATINGS
AUTO REFINISHING
TRAFFIC MARKINGS
FACTORY FINISHED WOOD
WOOD FURNITURE
METAL FURNITURE
PAPER
METAL CONTAINERS
METAL COILS
MACHINERY & EQUIPMENT
LARGE APPLIANCES
ELECTRICAL EQUIPMENT
MOTOR VEHICLES
AIRCRAFT
MARINE COATINGS
RAILROAD
OTHER PRODUCT COATINGS
HIGH-PERFORMANCE MAINT.
OTHER SPEC. PURPOSE COATINGS

DEGREASING
SURFACE CLEANING COLD CLEANING - GENERAL

DRY CLEANING
DRY CLEANING - GENERAL

GRAPHIC ARTS
ADHESIVES APPLICATION: INDUSTRIAL
CUTBACK ASPHALT
EMULSIFIED ASPHALT
PESTICIDE APPLICATION

CONSUMER/COMMERCIAL SOLVENT USE
CONSUMER/COMMERCIAL SOLVENT USE-GENERAL

MARINE VESSEL LOADING LOSSES

SERVICE STATIONS
SERVICE STATIONS - TANK TRUCK UNLOADING
SERVICE STATIONS - VEHICLE REFUELING
SERVICE STATIONS - OTHER
SERVICE STATIONS - TANK BREATHING LOSSES
SERVICE STATIONS - TANK TRUCKS IN TRANSIT

WASTE DISPOSAL
OPEN BURNING
MUNICIPAL WASTE LANDFILLS
MUNICIPAL WASTEWATER TREATMENT (POTW)
LEAKING UNDERGROUND TANKS

FIRES
AGRICULTURAL BURNING
FOREST WILDFIRES
SLASH BURNING
PRESCRIBED BURNING
STRUCTURE FIRES

CATASTROPHIC/ACCIDENTAL RELEASES

Table 3-2 County Populations for 1999

County	Population
Gregg	113,155
Harrison	59,797
Rusk	45,819

Smith	169,693
Upshur	36,541

Quality Assurance Measures

Quality Assurance (QA) procedures for area sources rely mainly upon the quality of data used for each separate category. Data such as current population figures, fuel usage, and material usage routinely change annually. Sources of this information were contacted during the inventory for updates. Current EPA documents were also obtained to keep abreast of changes in emission factors. Other routine efforts such as checking calculations for errors, and conducting reasonableness and completeness checks were implemented.

Summary of Area Source Emissions

Area sources in the Tyler/longview/Marshall area were summarized as a part of this report for VOC, CO and NOX during the 1999 year. Tables 3.3 through 3.7 show the area source emissions by specific categories for each county in the study area.

Table 3-3 SUMMARY OF EMISSIONS FROM AREA SOURCES

GREGG COUNTY							
		VOC	NOx	CO	VOC	NOx	CO
AREA SOURCES	CODE#	ton/yr	ton/yr	ton/yr	ton/day	ton/day	ton/day
COMBUSTION							
FUEL OIL-INDUSTRIAL/DISTILLATE (1)	2102004000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-INDUSTRIAL/RESIDUAL (1)	2102005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-INDUSTRIAL (1)	2102006000	0.00	0.00	0.00	0.0000	0.0000	0.0000
LPG-INDUSTRIAL	2102007000	36.06	1352.20	189.31	0.1153	4.3223	0.6051
FUEL OIL-COMMERCIAL/DISTILLATE	2103004000	0.05	5.22	1.31	0.0001	0.0100	0.0025
FUEL OIL-COMMERCIAL/RESIDUAL (2)	2103005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-COMMERCIAL	2103006000	4.30	78.10	65.60	0.0082	0.1498	0.1258
LPG-COMMERCIAL	2103007000	0.02	0.93	0.13	0.0000	0.0018	0.0002
COAL, ANTHRACITE-RESIDENTIAL (2)	2104001000	0.00	0.00	0.00	0.0000	0.0000	0.0000
COAL,BITUMINOUS-RESIDENTIAL (2)	2104002000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/DISTILLATE (2)	2104004000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/RESIDUAL (2)	2104005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-RESIDENTIAL	2104006000	4.54	77.53	32.99	0.0037	0.0637	0.0271
LPG-RESIDENTIAL	2104007000	0.05	2.03	0.28	0.0000	0.0017	0.0002
WOOD/RESIDENTIAL FIREPLACE	2104008001	706.68	8.02	779.51	0.8325	0.0095	0.9183
BAKERIES	2302050000	19.80			0.0543		
OIL & GAS PRODUCTION	2310000000	2379.56	2908.79	323.10	6.5194	7.9693	0.8852
SURFACE COATING							
ARCHITECTURAL COATINGS	2401001000	127.30			0.4534		
AUTO REFINISHING	2401005000	51.49			0.1980		
TRAFFIC MARKINGS	2401008000	123.13			0.4736		
FACTORY FINISHED WOOD	2401015000	9.04			0.0348		
WOOD FURNITURE	2401020000	61.36			0.2360		
METAL FURNITURE(2)	2401025000						
PAPER(2)	2401030000						
METAL CONTAINERS(1)	2401040000						
METAL COILS(2)	2401045000						
MACHINERY & EQUIPMENT	2401055000	171.33			0.6589		
LARGE APPLIANCES(2)	2401060000						
ELECTRICAL EQUIPMENT(2)	2401065000						
MOTOR VEHICLES(2)	2401070000						
AIRCRAFT(1)	2401075000						
MARINE COATINGS(1)	2401080000						
RAILROAD(1)	2401085000						
OTHER PRODUCT COATINGS(2)	2401090000						
HIGH-PERFORMANCE MAINT.(2)	2401100000						
OTHER SPEC. PURPOSE COATINGS(2)	2401200000						
SURFACE CLEANING COLD CLEANING-GEN	2415300000	243.28			0.7798		
DRY CLEANING - GENERAL	2420000000	26.73			0.1025		
GRAPHIC ARTS	2425000000	73.55			0.2829		
ADHESIVES APPLICAITON: INDUSTRIAL (1)	2440020000						
CUTBACK ASPHALT	2461021000	71.95			0.1971		
EMULSIFIED ASPHALT	2461022000	30.95			0.2245		
PESTICIDE APPLICATION	2461800000	104.65			0.4349		
CONSUMER/COMMERCIAL SOLVENT USE-GEI	2465000000	380.77			1.0432		
MARINE VESSEL LOADING LOSSES (2)	2500000000	0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 3-3 SUMMARY OF EMISSIONS FROM AREA SOURCES

GREGG COUNTY							
		VOC	NOx	CO	VOC	NOx	CO
AREA SOURCES	CODE#	ton/yr	ton/yr	ton/yr	ton/day	ton/day	ton/day
GAS DISTRIBUTION							
SERVICE STATIONS - TANK TRUCK UNLOADIN	2501060053	228.23			0.7315		
SERVICE STATIONS - VEHICLE REFUELING	2501060100	353.59			0.9714		
SERVICE STATIONS - OTHER	2501060103	22.50			0.0618		
SERVICE STATIONS - TANK BREATHING LOSS	2501060201	32.14			0.0883		
SERVICE STATIONS - TANK TRUCKS IN TRANS	2505030120	3.86			0.0124		
OPEN BURNING	2610000000	19.27	13.51	191.36	0.0528	0.0370	0.5243
MUNICIPAL WASTE LANDFILLS	2620000000	33.76			0.0925		
MUNICIPAL WASTEWATER TREATMENT (POT\	2630020000	1.06			0.0029		
LEAKING UNDERGROUND TANKS	2660000000	3.43			0.0094		
FIRES							
AGRICULTURAL BURNING	2801500000	4.78	0.75	29.84	0.0131	0.0021	0.0818
FOREST WILDFIRES	2810001000	21.87	3.65	127.58	0.0489	0.0082	0.2853
SLASH BURNING	2810005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
PRESCRIBED BURNING	2810015000	3.57	0.56	54.27	0.0098	0.0015	0.1487
STRUCTURE FIRES	2810030000	1.65	0.21	8.98	0.0045	0.0006	0.0246
CATASTROPHIC/ACCIDENTAL RELEASES	2830000000	5.93			0.0239		
TOTAL AREA SOURCES		5362.22	4451.52	1804.27	14.7765	12.5774	3.6293
(1) covered in point source inventory (2) no sources found in source survey							

Table 3-4 SUMMARY OF EMISSIONS FROM AREA SOURCES

HARRISON COUNTY							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
AREA SOURCES	**CODE#**	**ton/yr**	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
COMBUSTION							
FUEL OIL-INDUSTRIAL/DISTILLATE (1)	**2102004000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-INDUSTRIAL/RESIDUAL (1)	**2102005000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-INDUSTRIAL (1)	**2102006000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
LPG-INDUSTRIAL	**2102007000**	8.96	336.10	47.05	0.0286	1.0744	0.1504
FUEL OIL-COMMERCIAL/DISTILLATE	**2103004000**	0.01	1.32	0.33	0.0000	0.0025	0.0006
FUEL OIL-COMMERCIAL/RESIDUAL (2)	**2103005000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-COMMERCIAL	**2103006000**	1.09	19.74	16.59	0.0021	0.0379	0.0318
LPG-COMMERCIAL	**2103007000**	0.01	0.23	0.03	0.0000	0.0005	0.0001
COAL, ANTHRACITE-RESIDENTIAL (2)	**2104001000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
COAL,BITUMINOUS-RESIDENTIAL (2)	**2104002000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/DISTILLATE (2)	**2104004000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/RESIDUAL (2)	**2104005000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-RESIDENTIAL	**2104006000**	2.13	36.41	15.49	0.0018	0.0299	0.0127
LPG-RESIDENTIAL	**2104007000**	0.10	3.72	0.52	0.0001	0.0031	0.0004
WOOD/RESIDENTIAL FIREPLACE	**2104008001**	1262.04	14.33	1392.10	1.4868	0.0169	1.6400
BAKERIES	**2302050000**	10.46			0.0287		
OIL & GAS PRODUCTION	**2310000000**	2525.61	2422.19	194.84	6.9195	6.6362	0.5338
SURFACE COATING							
ARCHITECTURAL COATINGS	**2401001000**	67.27			0.2396		
AUTO REFINISHING	**2401005000**	27.21			0.1046		
TRAFFIC MARKINGS	**2401008000**	123.64			0.4756		
FACTORY FINISHED WOOD	**2401015000**	43.89			0.1688		
WOOD FURNITURE	**2401020000**	9.44			0.0363		
METAL FURNITURE(2)	**2401025000**						
PAPER(2)	**2401030000**						
METAL CONTAINERS(1)	**2401040000**						
METAL COILS(2)	**2401045000**						
MACHINERY & EQUIPMENT	**2401055000**	52.40			0.2015		
LARGE APPLIANCES(2)	**2401060000**						
ELECTRICAL EQUIPMENT	**2401065000**	54.38			0.2091		
MOTOR VEHICLES(2)	**2401070000**						
AIRCRAFT(1)	**2401075000**						
MARINE COATINGS(1)	**2401080000**						
RAILROAD(1)	**2401085000**						
OTHER PRODUCT COATINGS(2)	**2401090000**						
HIGH-PERFORMANCE MAINT.(2)	**2401100000**						
OTHER SPEC. PURPOSE COATINGS(2)	**2401200000**						
SURFACE CLEANING COLD CLEANING-GEN	**2415300000**	128.56			0.4121		
DRY CLEANING - GENERAL	**2420000000**	14.13			0.0542		
GRAPHIC ARTS	**2425000000**	38.87			0.1495		
ADHESIVES APPLICAITON: INDUSTRIAL (1)	**2440020000**						
CUTBACK ASPHALT	**2461021000**	72.25			0.1979		
EMULSIFIED ASPHALT	**2461022000**	31.08			0.2254		
PESTICIDE APPLICATION	**2461800000**	100.69			0.4184		
CONSUMER/COMMERCIAL SOLVENT USE-GEI	**2465000000**	201.22			0.5513		
MARINE VESSEL LOADING LOSSES (2)	**2500000000**	0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 3-4 SUMMARY OF EMISSIONS FROM AREA SOURCES

HARRISON COUNTY							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
AREA SOURCES	**CODE#**	**ton/yr**	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
GAS DISTRIBUTION							
SERVICE STATIONS - TANK TRUCK UNLOADIN	**2501060053**	120.61			0.3866		
SERVICE STATIONS - VEHICLE REFUELING	**2501060100**	186.86			0.5133		
SERVICE STATIONS - OTHER	**2501060103**	11.89			0.0327		
SERVICE STATIONS - TANK BREATHING LOSS	**2501060201**	16.99			0.0467		
SERVICE STATIONS - TANK TRUCKS IN TRANS	**2505030120**	2.04			0.0065		
OPEN BURNING	**2610000000**	42.27	29.63	419.69	0.1158	0.0812	1.1498
MUNICIPAL WASTE LANDFILLS (2)	**2620000000**	0.00			0.0000		
MUNICIPAL WASTEWATER TREATMENT (POTV	**2630020000**	0.03			0.0001		
LEAKING UNDERGROUND TANKS	**2660000000**	1.33			0.0036		
FIRES							
AGRICULTURAL BURNING	**2801500000**	21.68	3.41	135.38	0.0594	0.0093	0.3709
FOREST WILDFIRES	**2810001000**	127.98	21.33	746.55	0.1996	0.0333	1.1641
SLASH BURNING	**2810005000**	22.00	3.46	334.57	0.0603	0.0095	0.9167
PRESCRIBED BURNING	**2810015000**	25.56	4.04	388.33	0.0700	0.0111	1.0640
STRUCTURE FIRES	**2810030000**	0.87	0.11	4.74	0.0024	0.0003	0.0130
CATASTROPHIC/ACCIDENTAL RELEASES	**2830000000**	42.65			0.0103		
TOTAL AREA SOURCES		5398.17	2896.02	3696.23	13.4191	7.9459	7.0485
(1) covered in point source inventory (2) no sources found in source survey							

Table 3-5 SUMMARY OF EMISSIONS FROM AREA SOURCES

RUSK COUNTY							
		VOC	NOx	CO	VOC	NOx	CO
AREA SOURCES	CODE#	ton/yr	ton/yr	ton/yr	ton/day	ton/day	ton/day
COMBUSTION							
FUEL OIL-INDUSTRIAL/DISTILLATE (1)	2102004000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-INDUSTRIAL/RESIDUAL (1)	2102005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-INDUSTRIAL (1)	2102006000	0.00	0.00	0.00	0.0000	0.0000	0.0000
LPG-INDUSTRIAL	2102007000	6.06	227.22	31.81	0.0194	0.7263	0.1017
FUEL OIL-COMMERCIAL/DISTILLATE	2103004000	0.01	0.75	0.19	0.0000	0.0014	0.0004
FUEL OIL-COMMERCIAL/RESIDUAL (2)	2103005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-COMMERCIAL	2103006000	0.62	11.20	9.40	0.0012	0.0215	0.0180
LPG-COMMERCIAL	2103007000	0.00	0.13	0.02	0.0000	0.0003	0.0000
COAL, ANTHRACITE-RESIDENTIAL (2)	2104001000	0.00	0.00	0.00	0.0000	0.0000	0.0000
COAL,BITUMINOUS-RESIDENTIAL (2)	2104002000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/DISTILLATE (2)	2104004000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/RESIDUAL (2)	2104005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-RESIDENTIAL	2104006000	1.53	26.07	11.09	0.0013	0.0214	0.0091
LPG-RESIDENTIAL	2104007000	0.12	4.64	0.65	0.0001	0.0038	0.0005
WOOD/RESIDENTIAL FIREPLACE	2104008001	1442.75	16.38	1591.44	1.6997	0.0193	1.8748
BAKERIES	2302050000	8.02			0.0220		
OIL & GAS PRODUCTION	2310000000	2087.08	4429.11	760.37	5.7180	12.1345	2.0832
SURFACE COATING							
ARCHITECTURAL COATINGS	2401001000	51.55			0.1836		
AUTO REFINISHING	2401005000	20.85			0.0802		
TRAFFIC MARKINGS	2401008000	131.59			0.5061		
FACTORY FINISHED WOOD	2401015000	29.28			0.1126		
WOOD FURNITURE	2401020000	110.92			0.4266		
METAL FURNITURE(2)	2401025000						
PAPER(2)	2401030000						
METAL CONTAINERS(1)	2401040000						
METAL COILS(2)	2401045000						
MACHINERY & EQUIPMENT	2401055000	12.71			0.0489		
LARGE APPLIANCES	2401060000						
ELECTRICAL EQUIPMENT(2)	2401065000						
MOTOR VEHICLES(2)	2401070000						
AIRCRAFT(1)	2401075000						
MARINE COATINGS(1)	2401080000						
RAILROAD(1)	2401085000						
OTHER PRODUCT COATINGS(2)	2401090000						
HIGH-PERFORMANCE MAINT.(2)	2401100000						
OTHER SPEC. PURPOSE COATINGS(2)	2401200000						
SURFACE CLEANING COLD CLEANING-GEN	2415300000	98.51			0.3157		
DRY CLEANING - GENERAL	2420000000	10.82			0.0415		
GRAPHIC ARTS	2425000000	29.78			0.1145		
ADHESIVES APPLICAITON: INDUSTRIAL (1)	2440020000						
CUTBACK ASPHALT	2461021000	76.89			0.2106		
EMULSIFIED ASPHALT	2461022000	33.07			0.2399		
PESTICIDE APPLICATION	2461800000	91.46			0.3801		
CONSUMER/COMMERCIAL SOLVENT USE-GEI	2465000000	154.18			0.4224		
MARINE VESSEL LOADING LOSSES (2)	2500000000	0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 3-5 SUMMARY OF EMISSIONS FROM AREA SOURCES

RUSK COUNTY							
		VOC	NOx	CO	VOC	NOx	CO
AREA SOURCES	**CODE#**	**ton/yr**	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
GAS DISTRIBUTION							
SERVICE STATIONS - TANK TRUCK UNLOADIN	**2501060053**	92.41			0.2962		
SERVICE STATIONS - VEHICLE REFUELING	**2501060100**	143.18			0.3933		
SERVICE STATIONS - OTHER	**2501060103**	9.11			0.0250		
SERVICE STATIONS - TANK BREATHING LOSS	**2501060201**	13.02			0.0358		
SERVICE STATIONS - TANK TRUCKS IN TRAN	**2505030120**	1.56			0.0050		
OPEN BURNING	**2610000000**	40.57	28.44	402.88	0.1112	0.0779	1.1038
MUNICIPAL WASTE LANDFILLS (2)	**2620000000**	0.00			0.0000		
MUNICIPAL WASTEWATER TREATMENT (POT	**2630020000**	0.01			0.0000		
LEAKING UNDERGROUND TANKS	**2660000000**	1.96			0.0054		
FIRES							
AGRICULTURAL BURNING	**2801500000**	22.38	3.52	139.77	0.0613	0.0096	0.3829
FOREST WILDFIRES	**2810001000**	57.10	9.52	333.06	0.1589	0.0265	0.9267
SLASH BURNING	**2810005000**	13.96	2.20	212.26	0.0382	0.0060	0.5816
PRESCRIBED BURNING	**2810015000**	27.65	4.32	421.12	0.0758	0.0118	1.1538
STRUCTURE FIRES	**2810030000**	0.67	0.08	3.64	0.0018	0.0002	0.0100
CATASTROPHIC/ACCIDENTAL RELEASES	**2830000000**	16.54			0.1724		
TOTAL AREA SOURCES		4837.90	4763.57	3917.69	11.9245	13.0606	8.2466
(1) covered in point source inventory (2) no sources found in source survey							

Table 3-6 SUMMARY OF EMISSIONS FROM AREA SOURCES

SMITH COUNTY							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
AREA SOURCES	**CODE#**	**ton/yr**	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
COMBUSTION							
FUEL OIL-INDUSTRIAL/DISTILLATE (1)	**2102004000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-INDUSTRIAL/RESIDUAL (1)	**2102005000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-INDUSTRIAL (1)	**2102006000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
LPG-INDUSTRIAL	**2102007000**	30.13	1129.83	158.18	0.0963	3.6115	0.5056
FUEL OIL-COMMERCIAL/DISTILLATE	**2103004000**	0.07	6.93	1.73	0.0001	0.0114	0.0028
FUEL OIL-COMMERCIAL/RESIDUAL (2)	**2103005000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-COMMERCIAL	**2103006000**	5.69	103.53	86.97	0.0109	0.1986	0.1668
LPG-COMMERCIAL	**2103007000**	0.03	1.23	0.17	0.0001	0.0024	0.0003
COAL, ANTHRACITE-RESIDENTIAL (2)	**2104001000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
COAL,BITUMINOUS-RESIDENTIAL (2)	**2104002000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/DISTILLATE (2)	**2104004000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/RESIDUAL (2)	**2104005000**	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-RESIDENTIAL	**2104006000**	5.64	96.40	41.02	0.0046	0.0792	0.0337
LPG-RESIDENTIAL	**2104007000**	0.24	8.85	1.24	0.0002	0.0073	0.0010
WOOD/RESIDENTIAL FIREPLACE	**2104008001**	1946.68	22.10	2147.30	2.2934	0.0260	2.5297
BAKERIES	**2302050000**	29.70			0.0814		
OIL & GAS PRODUCTION	**2310000000**	430.22	475.45	17.40	1.1787	1.3026	0.0477
SURFACE COATING							
ARCHITECTURAL COATINGS	**2401001000**	190.90			0.6799		
AUTO REFINISHING	**2401005000**	77.21			0.2970		
TRAFFIC MARKINGS	**2401008000**	188.16			0.7237		
FACTORY FINISHED WOOD	**2401015000**	33.08			0.1272		
WOOD FURNITURE	**2401020000**	9.44			0.0363		
METAL FURNITURE(2)	**2401025000**						
PAPER(2)	**2401030000**						
METAL CONTAINERS(1)	**2401040000**						
METAL COILS(2)	**2401045000**						
MACHINERY & EQUIPMENT	**2401055000**	183.45			0.7056		
LARGE APPLIANCES(2)	**2401060000**						
ELECTRICAL EQUIPMENT(2)	**2401065000**						
MOTOR VEHICLES(2)	**2401070000**						
AIRCRAFT(1)	**2401075000**						
MARINE COATINGS(1)	**2401080000**						
RAILROAD(1)	**2401085000**						
OTHER PRODUCT COATINGS(2)	**2401090000**						
HIGH-PERFORMANCE MAINT.(2)	**2401100000**						
OTHER SPEC. PURPOSE COATINGS(2)	**2401200000**						
SURFACE CLEANING COLD CLEANING-GEN	**2415300000**	364.84			1.1694		
DRY CLEANING - GENERAL	**2420000000**	40.09			0.1538		
GRAPHIC ARTS	**2425000000**	110.30			0.4242		
ADHESIVES APPLICAITON: INDUSTRIAL (1)	**2440020000**						
CUTBACK ASPHALT	**2461021000**	109.94			0.3012		
EMULSIFIED ASPHALT	**2461022000**	47.29			0.3430		
PESTICIDE APPLICATION	**2461800000**	217.22			0.9027		
CONSUMER/COMMERCIAL SOLVENT USE-GEI	**2465000000**	571.02			1.5644		
MARINE VESSEL LOADING LOSSES (2)	**2500000000**	0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 3-6 SUMMARY OF EMISSIONS FROM AREA SOURCES

SMITH COUNTY							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
AREA SOURCES	**CODE#**	**ton/yr**	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
GAS DISTRIBUTION							
SERVICE STATIONS - TANK TRUCK UNLOADIN	**2501060053**	342.26			1.0970		
SERVICE STATIONS - VEHICLE REFUELING	**2501060100**	530.27			1.4568		
SERVICE STATIONS - OTHER	**2501060103**	33.74			0.0927		
SERVICE STATIONS - TANK BREATHING LOSS	**2501060201**	48.21			0.1324		
SERVICE STATIONS - TANK TRUCKS IN TRANS	**2505030120**	5.78			0.0185		
OPEN BURNING	**2610000000**	108.13	75.79	1073.74	0.2963	0.2077	2.9417
MUNICIPAL WASTE LANDFILLS	**2620000000**	31.07			0.0851		
MUNICIPAL WASTEWATER TREATMENT (POTW	**2630020000**	0.05			0.0001		
LEAKING UNDERGROUND TANKS	**2660000000**	2.87			0.0079		
FIRES							
AGRICULTURAL BURNING	**2801500000**	31.82	5.15	200.04	0.0872	0.0141	0.5481
FOREST WILDFIRES	**2810001000**	96.84	16.14	564.90	0.0998	0.0166	0.5821
SLASH BURNING	**2810005000**	4.89	0.77	74.35	0.0134	0.0021	0.2037
PRESCRIBED BURNING	**2810015000**	19.54	3.04	297.88	0.0535	0.0083	0.8162
STRUCTURE FIRES	**2810030000**	2.47	0.31	13.47	0.0068	0.0009	0.0369
CATASTROPHIC/ACCIDENTAL RELEASES	**2830000000**	17.81			0.0457		
TOTAL AREA SOURCES		5867.11	1945.53	4678.38	14.5872	5.4887	8.4164
(1) covered in point source inventory (2) no sources found in source survey							

Table 3-7 SUMMARY OF EMISSIONS FROM AREA SOURCES

UPSHUR COUNTY							
		VOC	NOx	CO	VOC	NOx	CO
AREA SOURCES	CODE#	ton/yr	ton/yr	ton/yr	ton/day	ton/day	ton/day
COMBUSTION							
FUEL OIL-INDUSTRIAL/DISTILLATE (1)	2102004000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-INDUSTRIAL/RESIDUAL (1)	2102005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-INDUSTRIAL (1)	2102006000	0.00	0.00	0.00	0.0000	0.0000	0.0000
LPG-INDUSTRIAL	2102007000	2.58	96.92	13.57	0.0083	0.3098	0.0434
FUEL OIL-COMMERCIAL/DISTILLATE	2103004000	0.00	0.42	0.11	0.0000	0.0007	0.0002
FUEL OIL-COMMERCIAL/RESIDUAL (2)	2103005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-COMMERCIAL	2103006000	0.35	6.31	5.30	0.0007	0.0121	0.0102
LPG-COMMERCIAL	2103007000	0.00	0.08	0.01	0.0000	0.0001	0.0000
COAL, ANTHRACITE-RESIDENTIAL (2)	2104001000	0.00	0.00	0.00	0.0000	0.0000	0.0000
COAL,BITUMINOUS-RESIDENTIAL (2)	2104002000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/DISTILLATE (2)	2104004000	0.00	0.00	0.00	0.0000	0.0000	0.0000
FUEL OIL-RESIDENTIAL/RESIDUAL (2)	2104005000	0.00	0.00	0.00	0.0000	0.0000	0.0000
NATURAL GAS-RESIDENTIAL	2104006000	0.85	14.59	6.21	0.0007	0.0120	0.0051
LPG-RESIDENTIAL	2104007000	0.09	3.36	0.47	0.0001	0.0028	0.0004
WOOD/RESIDENTIAL FIREPLACE	2104008001	1400.14	15.90	1544.44	1.6495	0.0187	1.8195
BAKERIES	2302050000	6.39			0.0175		
OIL & GAS PRODUCTION	2310000000	3292.99	2889.74	294.79	9.0219	7.9171	0.8076
SURFACE COATING							
ARCHITECTURAL COATINGS	2401001000	41.11			0.1464		
AUTO REFINISHING	2401005000	16.63			0.0639		
TRAFFIC MARKINGS	2401008000	75.42			0.2901		
FACTORY FINISHED WOOD	2401015000	5.24			0.0202		
WOOD FURNITURE	2401020000	9.44			0.0363		
METAL FURNITURE(2)	2401025000						
PAPER(2)	2401030000						
METAL CONTAINERS(1)	2401040000						
METAL COILS(2)	2401045000						
MACHINERY & EQUIPMENT	2401055000	3.81			0.0147		
LARGE APPLIANCES(2)	2401060000						
ELECTRICAL EQUIPMENT(2)	2401065000						
MOTOR VEHICLES(2)	2401070000						
AIRCRAFT(1)	2401075000						
MARINE COATINGS(1)	2401080000						
RAILROAD(1)	2401085000						
OTHER PRODUCT COATINGS(2)	2401090000						
HIGH-PERFORMANCE MAINT.(2)	2401100000						
OTHER SPEC. PURPOSE COATINGS(2)	2401200000						
SURFACE CLEANING COLD CLEANING-GEN	2415300000	78.56			0.2518		
DRY CLEANING - GENERAL	2420000000	8.63			0.0331		
GRAPHIC ARTS	2425000000	23.75			0.0914		
ADHESIVES APPLICAITON: INDUSTRIAL (1)	2440020000						
CUTBACK ASPHALT	2461021000	44.07			0.1207		
EMULSIFIED ASPHALT	2461022000	18.96			0.1375		
PESTICIDE APPLICATION	2461800000	74.05			0.3077		
CONSUMER/COMMERCIAL SOLVENT USE-GEI	2465000000	122.96			0.3369		
MARINE VESSEL LOADING LOSSES (2)	2500000000	0.00	0.00	0.00	0.0000	0.0000	0.0000

Table 3-7 SUMMARY OF EMISSIONS FROM AREA SOURCES

UPSHUR COUNTY							
		VOC	**NOx**	**CO**	**VOC**	**NOx**	**CO**
AREA SOURCES	**CODE#**	**ton/yr**	**ton/yr**	**ton/yr**	**ton/day**	**ton/day**	**ton/day**
GAS DISTRIBUTION							
SERVICE STATIONS - TANK TRUCK UNLOADIN	**2501060053**	73.70			0.2362		
SERVICE STATIONS - VEHICLE REFUELING	**2501060100**	114.19			0.3137		
SERVICE STATIONS - OTHER	**2501060103**	7.27			0.0020		
SERVICE STATIONS - TANK BREATHING LOSS	**2501060201**	10.38			0.0285		
SERVICE STATIONS - TANK TRUCKS IN TRAN	**2505030120**	1.25			0.0040		
OPEN BURNING	**2610000000**	38.65	27.09	383.77	0.1059	0.0742	1.0514
MUNICIPAL WASTE LANDFILLS (2)	**2620000000**	0.00			0.0000		
MUNICIPAL WASTEWATER TREATMENT (POT	**2630020000**	0.00			0.0000		
LEAKING UNDERGROUND TANKS	**2660000000**	2.24			0.0061		
FIRES							
AGRICULTURAL BURNING	**2801500000**	19.00	2.98	118.64	0.0521	0.0082	0.3251
FOREST WILDFIRES	**2810001000**	4.78	0.75	29.84	0.0131	0.0021	0.0818
SLASH BURNING	**2810005000**	76.23	12.71	444.68	0.1272	0.0212	0.7418
PRESCRIBED BURNING	**2810015000**	13.96	2.20	212.26	0.0382	0.0060	0.5816
STRUCTURE FIRES	**2810030000**	0.53	0.07	2.90	0.0015	0.0002	0.0079
CATASTROPHIC/ACCIDENTAL RELEASES	**2830000000**	0.12			0.0000		
TOTAL AREA SOURCES		5588.31	3073.11	3056.98	13.4778	8.3852	5.4759
(1) covered in point source inventory (2) no sources found in source survey							

Discussion of Area Source Categories

This section provides a listing of the area source categories with a description of the source, the methodology and emission factors used to calculate emissions, and sources of data.

COMBUSTION

Fuel Oil Consumption

This subcategory consists, in turn, of five subheadings that further define the groups consuming fuel oil products. These are: Residential Distillate Consumption, Commercial/Institutional Distillate Consumption, Commercial/ Institutional Residual Consumption, Industrial Distillate Consumption and Industrial Residual Consumption.

RESIDENTIAL DISTILLATE CONSUMPTION

Introduction

In the state of Texas, only distillate oil is consumed in residences and the quantity consumed is low. It is low for at least two reasons: The most important reason is that Texas is a major natural gas producer so natural gas is the fuel most often used for residential heating. Secondly, for the most part, winters are not severe in Texas and regardless of the type of fuel used, consumption is low as a consequence. Previous work done by the TNRCC indicates that this category is insignificant.

Methodology

US Department of Energy, Energy Information Administration (EIA) information indicates the 1997 consumption statewide was less than 500 gallons. It was assumed that similar patterns existed for 1999. Emissions was not be calculated because of insignificant fuel usage.

COMMERCIAL DISTILLATE CONSUMPTION

Introduction

The total amount of distillate fuel oil consumed by commercial operations in Texas was obtained from the US Department of Energy, Energy Information Administration.

Methodology

Allocation, when only statewide consumption information is available, often means developing some reasonable proportional apportionment scheme. The strategy in this subcategory is to make the assumption that it is reasonable to allocate based on numbers of employees in the commercial

SIC codes. The statewide consumption figure available from the Energy Information Administration (EIA) is for SIC codes 50-87, and 89. Numbers of employees by SIC code per county are available from Census publications. The total number of gallons used statewide is multiplied by the number of employees per county for SIC codes 50 -89. That figure is, in turn, divided by the total number of employees in the SIC codes statewide to make each county's consumption proportionate in the same manner that SIC total county employment is to SIC code total state employment. The converted gallons are multiplied by the emission factors from AP-42 which are: VOC = 0.2 lb/1000 gal.; NOx = 20 lbs/1000 gal and CO = 5 lb/1000 gal. The number of pounds is converted to TPY by dividing by 2000. The seasonal adjustment factor is 0.6 and the activity days per week is 6 to yield tons per day.

Table 3-8 Commercial Distillate Consumption 1999

State/County	Num of Emp. SIC 50-87 + 89	Distillate 10^3 gallons
State	5071091	72240.000
Gregg	36672	522.409
Harrison	9271	132.070
Rusk	5257	74.888
Smith	48613	692.514
Upshur	2962	42.195

Example Calculation

Gregg County has 36,672 employees in SIC codes 50-87 and 89.
(72,240.00 X 10^3 gals) (36672 employees) / (5071091 statewide employees) = 522.409X10^3 Gal
(522.409X10^3 gal) (0.2 lb VOC/10^3 gal) /2000 = 0.05 TPY VOC
(0.05 TPY)(0.6)/(312 DPY) = 0.0001 TPD VOC

COMMERCIAL RESIDUAL CONSUMPTION

Introduction

Use of residual quality fuel by commercial operations in Texas based on previous work is even smaller in number of gallons than for use of distillate fuel oil. Energy Information Administration (EIA) estimates indicate that negligible gallons were used statewide.

Methodology

Emissions were not calculated because of insignificant fuel usage.

INDUSTRIAL DISTILLATE CONSUMPTION

Introduction

This should be reported as point source emissions. No emissions were calculated for area sources.

INDUSTRIAL RESIDUAL CONSUMPTION

Introduction

This should be reported as part of the point source emissions. No emissions were calculated for area sources.

Coal Consumption

RESIDENTIAL COAL CONSUMPTION

Introduction

Based on previous work there is no reported usage of coal for home heating in the 7 county area. This is supported by the EIA information. The annual usage reported by EIA was less than 500 tons total for the State. No emissions were calculated for area sources.

COMMERCIAL COAL CONSUMPTION

Introduction

Based on previous work commercial coal use is insignificant. The annual usage reported by EIA was less than 500 tons total for the state. This amount spread over county proportions of 5,071,091 statewide employees in SIC codes 50-87 and 89 results in insignificant emissions for the 7 county area. No emissions were calculated for area sources.

INDUSTRIAL COAL CONSUMPTION

Introduction

This should be reported as part of the point source emissions. No emissions were calculated for area sources.

Natural Gas Consumption

RESIDENTIAL NATURAL GAS CONSUMPTION

Introduction

The statewide consumption of natural gas used by residential homes in Texas was obtained from the US Department of Energy, Energy Information Administration. Numbers of residential users (households) per county are available from Census publications.

Methodology

The natural gas usage for each county was calculated by multiplying state wide gas usage by the ratio of homes using gas in a county to total homes using gas in the state.

The cubic feet are then multiplied by an emission factor and converted to TPY by dividing the product by 2000. The seasonal adjustment factor is 0.3 and the activity days per week is 7 to yield tons per day. Emission factors are: VOC = 5.5 lb/10^6 cubic feet; NO_x = 94 lb/10^6 cubic feet and CO = 40 lb/10^6 cubic feet.

Table 3-9 Residential Natural Gas Consumption 1999

State/County	Households using gas	Gas use 10^6 scf
State	3060161	235000.00
Gregg	21482	1649.68
Harrison	10087	774.61
Rusk	7223	554.68
Smith	26710	2051.15
Upshur	4043	310.48

Example Calculation

Gregg County has 21,482 natural gas customers.
(235000X10^6 scf state wide)(21482 households)/(3060161 households statwide) = 1649.68X10^6 scf in Gregg County
(1649.68X10^6 SCF) (5.5 lb VOC/10^6 cf)/2000 = 4.54 TPY VOC
(4.54 TPY) (0.3)/(365 DPY) = 0.0037 TPD VOC

COMMERCIAL NATURAL GAS CONSUMPTION

Introduction

The statewide consumption of natural gas used in commercial establishments in Texas was obtained from the US Department of Energy, Energy Information Administration. Numbers of commercial establishments users per county are available from Census publications.

Methodology

The statewide consumption was allocated to each county based on the number of employees in the commercial SIC codes (50-87 and 89). The number of million of cubic feet of gas was multiplied by the county number of commercial employees then divided by the state number of commercial employees. The converted cubic feet was multiplied by an emission factor then divided by 2000 to convert it to TPY. The emission factors are: VOC = 5.5 lb/10^6 cubic feet; NO_X = 100 lbs/10^6 cubic feet and CO = 84 lbs/10^6 cubic feet. The seasonal adjustment factor is 0.6 and the activity days per week is 6 to yield tons per day.

Table 3-10 Commercial Natural Gas Consumption 1999

State/County	Num of Emp. SIC 50-87 + 89	Natural Gas 10^6 scf
State	5071091	216000.00
Gregg	36672	1562.02
Harrison	9271	394.89
Rusk	5257	223.92
Smith	48613	2970.64
Upshur	2962	126.17

Example Calculation

Gregg County has 36,672 employees in SIC codes 50-87 and 89.
(216000 X 10^6 scf state wide) (36672 employees) / (5071091 statewide employees) =
1562.02X10^6 scf used in Gregg County
(1562.02X10^6 scf) (5.5 lb VOC/10^6 scf) /2000 = 4.30 TPY VOC
(4.30 TPY)(0.6)/(312 DPY) = 0.0082 TPD VOC

INDUSTRIAL NATURAL GAS CONSUMPTION

Introduction

This should be reported as part of the point source emissions. No emissions were calculated for area sources.

Liquid Petroleum Gas Consumption

RESIDENTIAL LPG CONSUMPTION

Introduction

The statewide consumption of LPG used by residential homes in Texas was obtained from the US Department of Energy, Energy Information Administration. Numbers of residential users per county are available from Census publications.

Methodology

The LPG usage for each county was calculated by multiplying statewide LPG usage by the ratio of homes using LPG in a county to total homes using LPG in the state.

The cubic feet are then multiplied by an emission factor and converted to TPY by dividing the product by 2000. The season adjustment factor is 0.3 and the activity days per week is 7 to yield tons per day. Emission factors for butane are: VOC = 0.4 lb/10^3 gal.; NO_x = 15 lbs/10^3 gal and CO = 2.1 lbs/10^3 gal. The higher factors for butane were used since no information is available as to whether the LPG is butane, propane, or a mixture of both.

Table 3-11 Residential LPG Consumption 1999

State/County	Households using LPG	LPG use 10^3 Gallons
State	473529	97104.00
Gregg	1322	271.10
Harrison	2417	495.64
Rusk	3014	618.06
Smith	5755	1180.15
Upshur	2184	447.86

Example Calculation

Gregg County has 1322 households that use LPG.
(97104X10^3 gal statewide)(1322 households)/(473529 households statewide) = 271.00X10^3 gal in

Gregg County
$(271.00X10^3$ gal) (0.4 lb VOC/10^3 gal)/2000 = 0.05 TPY VOC
(0.05 TPY) (0.3)/(365 DPY) = 0.0000 TPD VOC

COMMERCIAL LPG CONSUMPTION

Introduction

The statewide consumption of LPG used by commercial businesses in Texas was obtained from the US Department of Energy, Energy Information Administration. Numbers of commercial users per county are available from Census publications.

Methodology

Statewide consumption of LPG was allocated to each county according to county numbers of employees in Commercial SIC codes (50-87 and 89). The number of 10^3 gallons was multiplied by the county's number of Commercial employees then divided by the statewide number of Commercial employees. The number of gallons was then multiplied by an emission factor then divided by 2000 in order to convert from pounds to tons. The seasonal adjustment factor is 0.6 and the activity days per week is 6 to yield tons per day. Emission factors for butane are: VOC = 0.4 lb/10^3 gal; NO_x = 15 lb/10^3 gal and CO = 2.1 lb/10^3 gal. The higher emission factors for butane are being used since no information is available as to whether the LPG consumed was butane, propane, or a mixture of both.

Table 3-12 Commercial LPG Consumption 1996

State/County	Num of Emp. SIC 50-87 + 89	LPG 10^3 gallons
State	5071091	17136.00
Gregg	36672	123.92
Harrison	9271	31.33
Rusk	5257	17.76
Smith	48613	164.27
Upshur	2962	10.01

Example Calculation

Gregg County has 36,672 employees in SIC codes 50-87 and 89.

(17136.00 X 10^3 gals) (36672 employees) / (5071091 statewide employees) = 123.92X10^3 Gal
(123.92X10^3 gal) (0.4 lb VOC/10^3 gal) /2000 = 0.02 TPY VOC
(0.02 TPY)(0.6)/(312 DPY) = 0.0000 TPD VOC

INDUSTRIAL LPG CONSUMPTION

Introduction

The statewide consumption of LPG used by industrial facilities in Texas was obtained from the US Department of Energy, Energy Information Administration. Numbers of industrial users per county are available from Census publications.

Methodology

The statewide consumption is to be allocated to each county based on the number of employees in the industrial SIC codes 1-39 (since the total state consumption figure is for all those SIC codes). The statewide consumption of 10^3 gallons was multiplied by the county number of employees then divided by the state number on employees. The converted 10^3 gallons was multiplied by an emission factor then divided by 2000 to convert it to TPY. The seasonal adjustment factor is 1 and the activity days per week is 6 to yield tons per day. The emission factors are: VOC = 0.4 lb/10^3 gal; NOx = 21 lb/10^3 gal and CO = 3.6 lb/10^3 gal.

Table 3-13 Industrial LPG Consumption 1999

State/County	Num of Emp. SIC 1-39	LPG 10^3 gallons
State	1691072	17072034.00
Gregg	17859	180293.60
Harrison	4439	44813.44
Rusk	3001	30296.27
Smith	14922	150643.43
Upshur	1280	12922.10

Example Calculation

Gregg County has 17,859 employees in SIC codes 1-39.
(17072034.00X10^3 gals)(17859 employees)/(1691072 statewide employees) = 180293.60X10^3 Gal
(180293.60X10^3 gal) (0.4 lb VOC/10^3 gal) /2000 = 36.06 TPY VOC

(36.06 TPY)(1.0)/(312 DPY) = 0.1153 TPD VOC

WOOD/RESIDENTIAL FIREPLACE

Introduction

The burning of wood for home heating is calculated by county allocation of state wood use from the US Department of Energy, Energy Information Administration. The number of homes in the state and each county burning wood comes from 1990 US Census Data.

Methodology

County wood use equals (state wood use) times (county wood burning households)divided by (state wood burning households). Wood use is reported in tons.

Table 3-14 Residential Wood Use in Study Area

State/County	**Households Using Wood**	**Wood use Tons**
State	70382	903100.00
Gregg	481	6171.91
Harrison	859	11022.18
Rusk	982	12600.44
Smith	1325	17001.61
Upshur	953	12228.33

After obtaining TPY of wood used, that number was multiplied by an emission factor. The number of pounds is converted to TPY by dividing by 2000. The seasonal adjustment factor is 0.43 and the activity days per week is 7 to yield tons per day. The emission factors are: VOC = 229.0 lbs/ton; NO_x 2.6 lb/ton and CO = 252.6 lbs/ton. The factors used are for "Residental Total Wood Stoves and Fireplaces" since no information is available on specific types of stove and fireplace combinations used.

Example Calculation

Gregg County has 481 households that use wood.

(903100 tons state wide)(481 households in Gregg Co.)/(70382 households statewide) = 6171.91 tons in Gregg County
(6171.91 tons) (229 lb VOC/ton)/2000 = 706.68 TPY VOC
(706.68 TPY) (0.43)/(365 DPY) = 0.8325 TPD VOC

References

1. **Department of Energy/Energy Information Administration DOE/EIA, www.eia.doe.gov**
2. **U.S. Bureau of the Census, www.census.gov**
3. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I**, Publication No. EPA-450/4-91-016, U. S. Environmental Protection Agency, OAQPS, Research Triangle Park, NC, May 1991.
4. **AP-42, Fifth Edition, Volume I**, U. S. Environmental Protection Agency.
5. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency

BAKERIES

Introduction

The primary VOC emitted by the baking process is ethanol, which is formed by the yeast fermentation of bread and dough while it is baking. Although it is a natural, biological process emission, the emissions are significant. There are two commercial processes (straight dough and sponge dough) which account for the majority of emissions. No commercial bakeries were found in the East Texas area and therefore no emissions were subtracted from totals. Transportation of food is a significant trend. A drive by survey was done to assure that bakeries did exist in each county.

Methodology

A per capita consumption factor of 70 lbs. per person (EIIP guidance) was used to calculate VOC emissions from baking applications. The factor is applied to each county's total population. This factor is consistent with special EPA studies previously utilized. The emission factor used is 5 lb VOC/1000 pounds baked. A per capita emission rate of 0.175 tpy/1000 people was derived. The seasonal factor is 1 and the activity days per week are 7 for the daily emissions. Population data was obtained from U.S. Census data.

Example Calculation

Gregg County has a population of 113155.
(113.155X10^3 people)(0.175 tpy VOC/10^3 people) = 19.80 TPY VOC
(19.80 TPY)(1)/(365) = 0.0543 TPD VOC

References

1. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
2. **U.S. Census**, census projections.

OIL AND GAS PRODUCTION

Introduction

Emissions considered in this category come from crude oil and natural gas production in each County in 1999. The production information was obtained from the Oil & Gas Division of the Railroad Commission of Texas. TNRCC E.I. sources will be excluded to allow for uniform treatment of emissions based on total oil and gas production.

Methodology

CRUDE OIL & CONDENSATE TANKAGE

It will be assumed that the crude oil and natural gas condensate that will be produced, is stored in a tank at the production site before is transported off site to a processing plant. From surveys conducted the average size storage tank was ascertained. The production in each county was divided by the net throughput of the average tank. This provided the number of tanks on a county basis. The number of tanks were multiplied by the emissions per tank to obtain the tons of VOC emissions for crude oil and condensate per county. The emissions per tank were obtained by using the EPA Tanks 4.0 program.

Example Calculation:

For crude oil tanks the average tank was determined to be 15 feet high, 12 feet in diameter, and 210 bbl capacity. Average liquid height was 8 feet, turnovers were 24. Tanks 4.0 calculates an emission of 1790 lbs/yr for this tank. Gregg county produces 8846972 barrels per year. The emission for Gregg County is the product of 1790 lbs VOC/tank times 8846972 bbls/county divided by 210 bbls/tank and divided by 24 turnovers per year and 2000lbs/ton. The estimated emission is 1,571 tons/yr for Gregg county.

FUGITIVE EMISSIONS & NATURAL GAS TREATMENT

For natural gas and crude oil production there are fugitive emissions from leaking components in gaseous and light liquid service, combustion emissions from heaters, combustion emissions from compressors used to transfer the natural gas into production lines, and the VOC emissions from the dehydration of Natural Gas. Surveys were done to estimate the:

- average number of components in gas and liquid service,

- quantify the range and average horsepower of compressors,
- BTU rating of heaters and use of heaters.

Heater use includes gas dehydration and in line heating. Process emissions were calculated using average values of gas produced per well site. Total emissions for a county were obtained by multiplying the emissions per typical well site times total county production divided by typical production per well site. Fugitive emissions were based on the emission factors in EPA Document EPA-453/R-95-017. County Business Patterns were relied upon as a guide for emission distribution. Other sources were reviewed where County Business Patterns appear inadequate. Other sources that were used for business patterns are phone books or field verification where appropriate and the number of components in liquid and gas service for the typical natural gas well/oil well site in the East Texas area.

Table 3-15
Fugitive Emission Factors

Component	Service	EF - kg/hr/comp	Component	Service	EF - kg/hr/comp
VALVES	GAS	0.0045	PUMP	GAS	0.0024
	HV OIL	8.4E-06	SEALS	HV OIL	NA
	LT OIL	0.0025		LT OIL	0.013
	H20/OIL	9.8E-05		H20/OIL	2.4E-05
OTHERS	GAS	0.0088	CONNECTORS	GAS	0.0002
	HV OIL	3.2E-05		HV OIL	7.5E-06
	LT OIL	0.0075		LT OIL	0.00021
	H20/OIL	0.014		H20/OIL	0.00011
FLANGES	GAS	0.00039	OPEN LINES	GAS	0.002
	HV OIL	3.9E-07		HV OIL	0.00014
	LT OIL	0.00011		LT OIL	0.0014
	H20/OIL	2.9E-06		H20/OIL	0.00025

Example Calculation of Fugitive Emissions

For the example county (Gregg) there are 546 well sites. This number of well sites times the emissions per component (see table 3-15) was the emission estimate basis. Gaseous emissions were adjusted for percent VOC (1-0.75 methane). The number of components are as follows 19 valves, 1 relief valve in gaseous service; 31 flanges, 3 valves, and 5 open lines in liquid service. The calculation is (19 valves times 0.0045 kg/hr times 546 well sites times 25% VOC) plus (1 valve times 0.0045 kg/hr times 546 well sites times 25% VOC)plus (3 valves times 0.0025kg/hr times 546 well sites) plus (5 open lines times .0044 kg/hr times 546 well sites) times 1000 gm/kg times 8760 hrs/yr divided by 454 gm/lb divided by 2000 lbs/ton equals 195 tons per year for

Gregg County Gas Well fugitive emissions.

Example Calculation of Compressor Emissions

Compressor emissions were calculated based on Ap-42 emission factors (11 gm/hp-hr for NOX, 1.5 gm/hp-hr for CO, and 0.43 gm/hp-hr for VOC). Based on survey data the average hp/mmscf-day gas production is 191. Total production for each county is converted to mmscf/day to determine operating horsepower. The operating horsepower times 8760 hours per year times the emission factor for each pollutant divided by 454 gm/lb and divided by 2000 lb/ton yields ton per year per pollutant. An example calculation is as follows: Gregg County production 149.527mmscf/day times 191 hp/mmscf times 8760 hrs/yr times 11 gm/hp-hr divided by 454 gm/lb divided by 2000 lb/ton equals 3030.85 t/y NOX.

Example Calculation of Heater Emissions

Heater emissions were based on the emission factors in AP-42 and the size of combustion sources for a typical well site. The median or typical well site uses 1.00 mm BTU/hr of heat (two 0.5 mm BTU/hr heaters). Emissions are calculated based on 100 lb/mmscf for NOX, 84 lb/mmscf for CO and 5.5 lb/mmscf for VOC. The number of well sites was taken from Railroad Commission information for 1999. Operating hours per heater were taken as 8760 hrs/yr (continuous production). Forty seven out 63 well sites surveyed have in-line heaters. Wells not equipped with heaters add chemical antifreezes (alcohols). Fifteen out of sixty three well sites have glycol dehydrators. Wells not using dehydrators are tied to a common header and routed to a centralized compressor station which does have dehydration. This production pattern was used as an adjustment to the calculated emissions. The median size heater was 0.5 mm BTU/hr for the Glycol Dehydration and the median size heater for in-line production was 0.5 mm BTU/hr. For Gregg county 0.5 mm BTU/hr times 47/63 well site times 8760 hrs/yr times 100 lb/mmscf times 546 well sites plus 0.5 mm BTU /hr times 15/63 well sites times 100 lb/mmscf times 8760 hrs/yr times 546 well sites divided by 2000 lb/ton divided by 1000 BTU/mcf equals 117.67 T/Y NOX.

Example Calculation of Dehydrator Emissions

Dehydrator emissions were estimated using the Glycalc program and the characteristics of natural gas produced in the 5 East Texas counties. For the sample of wells studied the amount of VOC lost per mmscf of gas processed was 10.16 pounds. Emissions were estimated for each county based on total mmscf of gas produced times 10.16 pounds per mmscf divided by 2000 lbs/ton to yield ton per year VOC emissions. Combustion/heater emissions were accounted for in the above heater calculation. For Gregg county 54777.363 mmscf times 10.16 lbs VOC/mmscf divided by 2000 lbs/ton equals 277.25 t/y VOC. Tons per day equals 277.25 t/y times seasonal factor 1 divided by 365 days per year equals 0.7596 tons per day.
The seasonal factor is 1 and the activity days per week are 7 for the daily emissions.

Emission Summary

The following table is a summary of emissions by source for each county for the oil and gas category.

Table 3- 16 EMISSION SUMMARY OIL & GAS

	VOC T/Y	NOX T/Y	CO T/Y	VOC T/DAY	NOX T/DAY	CO T/DAY	
GREGG	6.47	117.68	98.85	0.02	0.32	0.27	HEATER
GREGG	277.25			0.76			DEHYDRATOR
GREGG	195.48			0.54			FUGITIVE GAS WELLS
GREGG	205.98			0.56			FUGITIVE OIL WELLS
GREGG	118.48	3030.85	413.30	0.32	8.30	1.13	COMPRESSORS
GREGG	380.98			1.04			TANK CONDENSATE
GREGG	1571.09			4.30			TANK CRUDE OIL
MAJOR	-309.18	-49.73	-25.18	-0.85	-0.14	-0.07	
MINOR	-67.00	-190.00	-163.87	-0.18	-0.52	-0.45	
TOTAL	2379.56	2908.79	323.10	6.52	7.97	0.89	
HARRISON	12.00	218.11	183.21	0.03	0.60	0.50	HEATER
HARRISON	300.18			0.82			DEHYDRATOR
HARRISON	362.32			0.99			FUGITIVE GAS WELLS
HARRISON	1215.72			3.33			FUGITIVE OIL WELLS
HARRISON	128.28	3281.48	447.47	0.35	8.99	1.23	COMPRESSORS
HARRISON	590.27			1.62			TANK CONDENSATE
HARRISON	93.52			0.26			TANK CRUDE OIL
MAJOR	-134.68	-47.39	-67.78	-0.37	-0.13	-0.19	
MINOR	-42.00	-1030.00	-368.06	-0.12	-2.82	-1.01	
TOTAL	2525.61	2422.19	194.84	6.92	6.64	0.53	
RUSK	12.59	228.89	192.26	0.03	0.63	0.53	HEATER
RUSK	384.64			1.05			DEHYDRATOR
RUSK	380.22			1.04			FUGITIVE GAS WELLS
RUSK	230.32			0.63			FUGITIVE OIL WELLS
RUSK	164.37	4204.75	573.38	0.45	11.52	1.57	COMPRESSORS
RUSK	429.86			1.18			TANK CONDENSATE
RUSK	617.99			1.69			TANK CRUDE OIL
MAJOR	-132.92	-4.53	-5.27	-0.36	-0.01	-0.01	
TOTAL	2087.08	4429.11	760.37	5.72	12.13	2.08	
SMITH	1.35	24.57	20.64	0.00	0.07	0.06	HEATER
SMITH	45.76			0.13			DEHYDRATOR
SMITH	40.81			0.11			FUGITIVE GAS WELLS
SMITH	55.80			0.15			FUGITIVE OIL WELLS
SMITH	19.56	500.27	68.22	0.05	1.37	0.19	COMPRESSORS
SMITH	105.09			0.29			TANK

							CONDENSATE
SMITH	227.98			0.62			TANK CRUDE OIL
MAJOR	-2.14	-0.39	-0.77	-0.01	-0.00	-0.00	
MINOR	-64.00	-49.00	-70.68	-0.18	-0.13	-0.19	
TOTAL	430.22	475.45	17.40	1.18	1.30	0.05	
	VOC	**NOX**	**CO**	**VOC**	**NOX**	**CO**	
	T/Y	**T/Y**	**T/Y**	**T/DAY**	**T/DAY**	**T/DAY**	
UPSHUR	4.87	88.58	74.41	0.01	0.24	0.20	HEATER
UPSHUR	283.78			0.78			DEHYDRATOR
UPSHUR	147.15			0.40			FUGITIVE GAS WELLS
UPSHUR	2035.51			5.58			FUGITIVE OIL WELLS
UPSHUR	121.27	3102.18	423.02	0.33	8.50	1.16	COMPRESSORS
UPSHUR	832.03			2.28			TANK CONDENSATE
UPSHUR	29.38			0.08			TANK CRUDE OIL
MAJOR	-45.99	-67.01	-42.70	-0.13	-0.18	-0.12	
MINOR	-115.00	-234.00	-159.94	-0.32	-0.64	-0.44	
TOTAL	3292.99	2889.74	294.79	9.02	7.92	0.81	

References

1. **Oil and Gas Well Production**, Texas Railroad Commission, Austin, TX.
2. **AP-42, U. S. Environmental Protection Agency, 5th ed., January 1995,**
3. **TANKS 4.0 program, U.S. Environmental Protection Agency**
4. **Protocal for Equipment Leak Estimates, EPA Document EPA-453/R-95-017**

SURFACE COATING

ARCHITECTURAL COATINGS

Introduction

Architectural surface coatings, or paints, are used primarily by homeowners and painting contractors to coat the interior and exterior of houses and buildings and on the surfaces of other structures such as pavements, curbs, and signs.

Methodology

Special Studies from TNRCC were used to calculate VOC emissions from architectural surface coatings. The emission factor after extrapolation to 1999 is 2.25 lbs voc per capita (see below). This per capita factor was multiplied by the appropriate county population. County populations came from the U.S. Census.

Architectural Coating Emission Factor Development

From a paper authored by Charlie Rubick and Steve Anderson (reference 1), staff members of the TNRCC, the information on Annual Use of Architectural Coatings was extracted. This same paper also provided information on growth rates of use for the different types of architectural coatings and the average solvent content of each coating type. The four coating types were Solvent Borne Exterior, Solvent Borne Interior, Water Borne Exterior, and Water Borne Interior. The exterior and interior solvent borne coatings are declining in use. This annual decline is 2.2 % for exterior and 1.9 % for interior. The water borne coatings are increasing in use. The annual increase is 2.4% for exterior and 2.1% for interior. Projecting the sales, using these growth factors, provided the national annual usage for 1999 in millions of gallons for the four categories. Multiplying the average solvent content per gallon of paint times the gallons of paint gave the national solvent loss for 1999. Dividing the solvent loss by the national population (U.S. Census projection) gave the per capita solvent loss for architectural coatings of 2.25 lb VOC/capita. This factor was then multiplied by the population of each county to estimate architectural coating solvent emissions for the county.

Example Calculation of Architectural Coatings Emissions

The seasonal factor is 1.3 and the activity days per week are 7 for the daily emissions. For Gregg County 2.25 lbs/capita times 113155 county population divided by 2000 lbs/ton equals 127.30 t/y. Tons per day equals 127.30 t/y times seasonal factor 1.3 divided by 365 days per year equals 0.4534 tons per day.

References

1. **Quantifying Architectural Painting VOC Air Emissions A Methodology With Estimates and Forecasts,** Steve P. Anderson and Charlie Rubick, TNRCC
2. **U.S. Census**, census projections

AUTOMOBILE REFINISHING

Introduction

Automobile refinishing is the repainting of automobiles, light trucks, and other vehicles. It does not include surface coating during manufacturing.

Methodology

A per capita emission factor was assigned to calculate VOC emissions from automobile refinishing based on an extrapolation of data developed in TNRCC Special Studies (reference 1). Current data indicates emissions decreasing at a decreasing rate. Least squares regression analysis was used to fit the TNRCC data curve and extend it to 1999.

Example Calculation of Automobile Refinishing Emissions

The daily emissions were calculated based on uniform seasonal, 13 week ozone season, 5 days per week. County populations came from the U.S. Census. For Gregg County 0.91 lbs/capita times 113155 county population divided by 2000 lbs/ton equals 51.49 t/y. Tons per day equals 51.49 t/y times seasonal factor 1 divided by 260 days per year equals 0.1980 tons per day.

References

1. **Quantifying Automobile Refinishing VOC Air Emissions A Methodology With Estimates and Forecasts,** Steve P. Anderson and Charlie Rubick, TNRCC
2. **U.S. Census**, census projections

TRAFFIC MARKINGS

Introduction

This category deals with the VOC emissions resulting from the evaporation of organic solvents during and shortly after the application of traffic paints used to mark pavement. Examples of these markings include the dividing lines to denote traffic lanes, lines to mark parking spaces, and crosswalks.

Methodology

These VOC emissions were estimated by multiplying the county lane miles by the appropriate emission factor in pounds VOC per lane mile per year in the **Emission Inventory Improvement Program** guidance document.

Example Calculation Traffic Markings Emissions

The daily emissions were calculated based on uniform seasonal, 13 week ozone season, 5 days per week. For Gregg County 69 lbs/yr/ln-mi times 3569003 lane miles divided by 2000 lbs/ton equals 123.13 t/y. Tons per day equals 123.13 t/y times seasonal factor 1 divided by 260 days per year equals 0.4736 tons per day.

References

1. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
2. **Teaxas Department of Transportation, TTI tables**.

INDUSTRIAL SURFACE COATINGS

Introduction

Surface coatings are applied to a wide variety of products, such as the categories listed below, and are almost entirely considered point sources. Their emissions should be documented in the point source section. However, in order to collect data from smaller sources that may not be reported as point sources, these categories were included as area sources.

Methodology

Per employee emission factors were used in calculating the emissions from these categories. Where SIC information were not available a lbs per capita number were used to estimate emissions. The emission factors for each category are from EPA's **Emission Inventory Improvement Program**. County populations were obtained from the U.S. Census. The categories and their lbs/year per employee emission factors are:

Table 3-17 Emission Factors for Industrial Surface Coating

Category	SIC Code(s)	Lbs./Yr. Per Employee
Furniture and Fixtures	25	944
Machinery and Equipment	35	77
Factory Finished Wood	2426-9, 243-245, 2492, 2499	131
Electrical Insulation	3357, 3612	290

Other industrial coatings categories were investigated: Metal furniture, Metal coils, Paper coating, Large Appliances, Automobile manufacturing, Other Product coatings, High Performance coatings and other Special purpose coatings were identified. Metal Container, and Railcar coating sources were included as a part of the point source inventory.

Example Calculation of Industrial Coatings Emissions
Furniture and Fixtures

The seasonal factor is 1 and the activity days per week are 5 per EPA and TNRCC guidance. For Gregg County 944 lbs/yr/employee times 130 employees divided by 2000 lbs/ton equals 61.36 t/y. Tons per day equals 61.36 t/y times seasonal factor 1 divided by 260 days per year equals 0.2360 tons per day.

References

1. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
2. **County Business Patterns, 1999, Texas**, Internet, U. S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census.

3. **U.S. Census**, census projections.
4. TNRCC Special Studies/literature search.

SURFACE CLEANING COLD CLEANING-GENERAL

Introduction

Degreasing operations employing cold solvent cleaning are used to remove grease, fats, oil, wax, or soil from the surface of metal, glass, or plastic articles.

Methodology

EPA provides per capita emission factors for individual categories of degreasing, and it also provides a composite emission factor for all of degreasing. This composite factor was selected from EIIP guidance to represent the overall category emissions. The emission factor times population of the individual county represents VOC emissions for the county total. The per capita factor of 4.3 lb/person/yr was used.

Example Calculation of Surface Cleaning Emissions

The daily emissions are calculated based on uniform seasonal, 13 week ozone season, 5 days per week. For Gregg County 4.3 lbs/capita times 113155 county population divided by 2000 lbs/ton equals 243.28 t/y. Tons per day equals 243.28 t/y times seasonal factor 1 divided by 260 days per year equals 0.9357 tons per day.

References

1. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone. Volume I**, EPA-450/4-91-016, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, May, 1991.
2. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency.
3. **U.S. Census**, census projections.

DRY CLEANING

Introduction

Emissions from dry cleaning facilities are most recently thought to come predominantly from the mineral spirits (naphtha) used in the dry cleaning process. The EPA emission factor of 1.8 lb/capita was reduced based on 1991 TNRCC Dallas Rule Effectiveness Study. The EPA calculated emission is reduced by 73.75% because perchlorethylene, a nonVOC, has been used as a replacement for naphtha.

Methodology

A per capita emission factor of 1.8 lb/capita was used to calculate VOC emissions reduced by 73.75%. This emission factor was used in lieu of 1800 pounds per year per employee as indicated in the EIIP document. It was felt that the TNRCC Dallas study was more representative of the East Texas area emissions. Daily emissions have a seasonal variation of 1 and activity days of 5.

Example Calculation

Gregg County population is 113155.
(113155 people)(1.8 lb/person)(1-0.7375)/(2000) = 26.73 TPY VOC
(26.73 TPY)(1)/(5X52) = 0.1025 TPD VOC

References

1. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone. Volume I**, EPA-450/4-91-016, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, May 1991.
2. **Texas Air Control Board FY 91 Rule Effectiveness Study Draft Final Report**, TACB Dallas/Ft Worth Region Staff, Fort Worth, Texas (817) 732-5531.
3. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
4. **U.S. Census**, census projections.

GRAPHIC ARTS

Introduction

The printing industry includes the printing of newspapers, books, magazines, fabrics, and other materials.

Methodology

An emission factor of 1.3 lbs VOC/capita was used to calculate VOC emissions from graphic arts facilities. **Emission Inventory Improvement Program Vol III** is the source of the emission factor. County populations came from the U.S. Census. County Business Patterns were relied upon as a guide for emission distribution. Other sources were reviewed where County Business Patterns appear inadequate. Other sources that were used for business patterns are phone books or field verification where appropriate.

Example Calculation of Graphic Arts Emissions

The daily emissions are calculated based on uniform seasonal, 13 week ozone season, 7 days per week. Twenty percent of the emissions occur on Saturday. This is the maximum emissions for the ozone season day. For Gregg County 1.3 lbs/capita times 113155 county population divided by 2000 lbs/ton equals 73.55 t/y. Tons per day equals 73.55 t/y times seasonal factor 1 times 0.20 divided by 52 weeks/year divided by 7days /week equals 0.2021 tons per day.

References

1. <u>**Emission Inventory Improvement Program**</u>**, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
2. **U.S. Census**, census projections.

ADHESIVES APPLICATION: INDUSTRIAL

Introduction

Emissions from industrial adhesive application should be reported as point source emissions. No emissions were calculated for area sources.

ASPHALT

Introduction

The two types of asphalt paving used for road paving and repair are cutback asphalt and emulsified asphalt.

Cutback asphalt is a type of liquified road surface that is prepared by blending or cutting back asphalt cement with various kinds of petroleum distillates. It is used as pavement sealant, tack coat, and a bonding agent between layers of paving material. Cutback asphalt is divided into 5 grades (MC30, MC800, MC3000, MC2400, and RC250). The different grades have a range of distillate from 5% to 40%. The emissions were distributed by the percent purchased of these grades.

Emulsified asphalt is used in the same applications as cutback asphalt. However, instead of blending asphalt cement with petroleum distillates as in cutback asphalt, emulsified asphalt use a blend of water with an emulsifier, which is generically referred to as soap.

To calculate emissions a special study was performed through interviews with City, County and State agencies that have responsibility for road maintenance. Budget dollars allocated to road maintenance were collected . Maintenance patterns for city and county roads were discussed.

Methodology

Emissions for asphalt usage were calculated using data from the interviews. Where there is not usage data for the study area emissions were calculated from an extrapolation of asphalt usage based on lane miles of roadway for the area and statewide usage summaries.

Table 3-18
County Lane Miles and County VOC Emissions

ASPHALT EMISSION CALCULATION CUTBACK			LBS	T/Y
	COUNTY LN-MI	STATE LN-MI	VOC	VOC
GREGG	3569003	569546571	143890.97	71.95
HARRISON	3583895	569546571	144491.37	72.25
RUSK	3814098	569546571	153772.43	76.89
SMITH	5453872	569546571	219882.96	109.94
UPSHUR	2185982	569546571	88131.92	44.07
		statewide total lbs voc	CUTBACK	22962326.00
ASPHALT EMULSION			LBS VOC	T/Y VOC
	COUNTY LN-MI	STATE LN-MI		
GREGG	3569003	569546571	61896.68	30.95
HARRISON	3583895	569546571	62154.95	31.08
RUSK	3814098	569546571	66147.32	33.07
SMITH	5453872	569546571	94585.68	47.29
UPSHUR	2185982	569546571	37911.16	18.96
		statewide total lbs voc	EMULSION	9877560.00

Example Calculation of Asphalt Emissions

The daily emissions are calculated based on uniform seasonal, 13 week ozone season, 7 days per week. The percent solvent per grade times pounds purchased per grade has been summed to yield 22962326 pounds for total of all grades. For Gregg County 22962326 lbs solvent statewide times 3569003 county ln-mi divided by 569546571 state ln-mi divided by 2000 lbs/ton equals 71.95 t/y. Tons per day equals 71.95 t/y times seasonal factor 1 divided by 365 days per year equals 0.1971 tons per day.

References

1. Darren Hazelit, Texas Department of Transportation, Austin, Texas, 512-232-1902.
2. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency

PESTICIDE APPLICATION

Introduction

Pesticides are defined as any substance used to kill or retard the growth of insects, rodents, fungi, weeds, or microorganisms. There are two sources of pesticide use, the agricultural pesticide application and non-agricultural (home) use.

Methodology

An emission factor of 3.5 lb. (averaged from the recommended 2-5 lbs. in the EIIP) per harvested acre was used to calculate VOC emissions from agricultural pesticide application. The factor was applied to each county's harvested acreage. For non-agricultural use, the factor of 1.65 lb VOC per capita in the **Emission Inventory Improvement Program** (EIIP) document Chapter 5 was used. The agricultural and non-agricultural pesticide use are added together for this category.

The seasonal factor is 1.3 and the activity days per week are 6 for the daily emissions. Population data was obtained from U.S. Census data. The harvested acres for each county was obtained from the web site of the USDA - National Agricultural Statistics Service, http://www.usda.gov/nass/.

Table 3-19 Harvested Acres in 1999

County	Acres
Gregg	6457
Harrison	29346
Rusk	30662
Smith	44129
Upshur	25088

Example Calculation

Agricultural Emissions
In Gregg County there were 6457 Harvested Acres.
(6457 acres)(3.5 lb VOC/acre)/(2000) = 11.30 TPY VOC
(11.30 TPY)(1.3)/(6X52) = 0.0470 TPD VOC

Non-agricultural Emissions
The Population of Gregg County is 113155 People.

(113155 people)(1.65 lb VOC/person)/(2000) = 93.35 TPY VOC
(93.35 TPY)(1.3)/(6X52) = 0.3879 TPD VOC

Total Pesticide Emissions
(11.30) + (93.35) = TPY VOC
(0.0470) + (0.3879) = TPD VOC

References

1. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone. Volume I**, EPA-450/4-91-016, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, May, 1991.
2. **USDA - National Agricultural Statistics Service.**
3. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
3. **U.S. Census**, census projections.

CONSUMER/COMMERCIAL SOLVENT

Introduction

Consumer and commercial products include household products, toiletries, aerosol products, rubbing compounds, windshield washing fluids, polishes and waxes, nonindustrial adhesives, space deodorants, moth control products, and laundry detergents and treatments. Organics in these products may act either as the carriers for the active product ingredients or as the active ingredients themselves. The Organics may be released to the atmosphere through immediate evaporation of an aerosol spray, evaporation after application, or direct release in the gaseous phase.

Methodology

A composite per capita emission factor of 6.73 lb/capita was used to calculate VOC emissions from consumer/commercial solvent use. TNRCC Special Studies (see reference 1) are the source of the emission factor.

Example Calculation of Consumer Solvent Emissions

The daily emissions are calculated based on uniform seasonal, 13 week ozone season, 7 days per week. For Gregg County 6.73 lbs/capita times 113155 county population divided by 2000 lbs/ton equals 380.77 t/y. Tons per day equals 380.77 t/y times seasonal factor 1 divided by 365 days per year equals 1.0432 tons per day.

References

1. TNRCC Special Studies/literature search
2. **U.S. Census**, census projections.

MARINE VESSEL LOADING LOSSES

Introduction

There are no sources in this category in the study area. Therefore no emissions were calculated.

GASOLINE DISTRIBUTION

Introduction

The Gasoline Distribution category is divided into appropriate subcategories due to different emission factors necessary to calculate VOC emissions.

TANK TRUCK UNLOADING

Tank truck unloading refers to the transfer of fuel from the tank truck to the service station tank. The VOC emission rate is affected by the method of filling (balanced or submerged). Tank truck unloading RVP, temperature(T) and pressure (P) were based on TNRCC guidance. The loading loss calculation is based on TNRCC temperature data which is county specific.

VEHICLE REFUELING

VOC emissions from refueling result from the displacement of vapors from the vehicle fuel tank by dispensed gasoline. The quantity of displaced vapors depends on gasoline temperature, gasoline Reid Vapor Pressure (RVP), and dispensing rate.

TANK BREATHING LOSSES

Emissions from VOC storage tanks are vapors from the tank liquid and may vary due to temperature and tank configuration.

TANK TRUCKS IN TRANSIT

VOC breathing losses from tank trucks in transit are caused by leaking delivery trucks, pressure in the tanks, and thermal effects on the vapor and liquid.

OTHER LOSSES

VOC emissions from spillage have been separated from the other categories.

DIESEL

VOC emissions were also calculated for diesel fuel. This category has historically low emissions. The result was less than 0.01 t/y and the emissions were not included.

Methodology

VOC emissions from all sources of the Service Station category were calculated by applying emission factors to the number of gallons of fuel processed for 1999. The emission factors used are as follows:

Tank Truck Unloading	(Emission factor calculated for each county)
Tank Truck Unloading balanced	0.3 lb/1000 gal.
Vehicle Refueling	11.0 lb/1000 gal.
Tank Breathing Loss	1.0 lb/1000 gal.
Tank Trucks in Transit	0.12 lb 1000 gal.
Other (spillage)	0.7 lb/1000 gal.

Emission factors came from AP-42 and were applied to 1999 gasoline sales for each county. Gasoline sales for the state (Texas Comptroller's data) were apportioned to county use data by the ratio of county Population, VMT, and vehicle registration to the state Population, VMT, and vehicle registration . The composite ratios were then used for the actual translation of state sales to county gasoline.

Tank truck unloading RVP, temperature(T) and pressure (P) were based on TNRCC guidance.

Sample Calculations of Gasoline Distribution Emissions

The daily emissions are calculated based on uniform seasonal, 13 week ozone season, 7 days per week except for tank truck unloading which is calculated based on a six day week. For Gregg county 64,290 thousand gallons times 11 lbs/1000 gallons divided by 2000 lbs/ton equals 353.59 t/y VOC for vehicle refueling. Tons per day equals 353.59 t/y times seasonal factor 1 divided by 312 days per year equals 1.1333 tons per day.

References

1. **Compilation of Air Pollution Emission Factors. Volume I: Stationary Point and Area Sources. AP-42 5th ed.**, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, January, 1995.
2. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone. Volume I**, EPA-450/4-91-016, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, May,

1991.
3. **U.S. Census**, census projections.

WASTE DISPOSAL

OPEN BURNING

Introduction

On-site incineration of solid waste includes the burning of domestic waste at a private residence, leaves, landscape refuse, or other refuse or rubbish by residential, commercial/institutional and industrial sources. The TNRCC Chapter 111 very strictly regulates all forms of open burning and is very prohibitive in allowing any burning to occur. Open burning that is allowed is discussed below.

There is some guidance on the subject of open burning provided by the Texas laws regulating the practice. A paraphrasing of the Health and Safety Code is that open burning is not permitted in any Texas city or any county with trash pickup. One of the problems is that people in rural areas still burn even if they have trash pickup service. The population of major cities in a county will be subtracted from county population to arrive at a rural population. It will be assumed that 2% of the city population and 40% of the rural population will not use trash pickup. Therefore, it is concluded that a worst-case analysis of open burning is that it would be confined to those people that do not use trash pickup.

Table 3-20 Populations used to arrive at County population not using trash pickup

County	1999 County Population	City Population*	Rural Population	Population not using trash Pickup
Gregg	113,155	104388	3506.8	5594.6
Harrison	59,797	30655	11656.8	12269.9
Rusk	45,819	17235	11433.6	11778.3
Smith	169,693	96016	29470.8	31391.1
Upshur	36,541	8939	11040.8	11219.6

* City population is population of all cities in county listed at Comptrollers web site

Methodology

The EIIP Volume III Chapter 16 gives a generation rate of 4.41 lb/person/day for total municipal solid waste. This generation rate was multiplied by the population without trash pickup in each county times 365 days/year divided by 2000 lb/ton to arrive at tons of waste per year. The waste amount was multiplied by appropriate emission factors. Emission factors were obtained from EIIP for open burning of municipal refuse (VOC = 8.56 lbs./ton; NO_x = 6 lbs./ton; CO = 85 lbs./ton). The seasonal adjustment factor is 1 and the activity days per week is 7 to yield tons per day.

Example Calculation

In Gregg County to calculate people that do no use trash pickup.
[(113155 County Population)-(104388 city population)](0.4) = 3506.8 rural population
(3506.8 people)(0.40) +(113155 people)(0.02) = 5594.6 total population not using trash pickup
(5594.6 people)(4.41 lb trash/person/day)(365 days)(8.56 lb VOC/ton)/(2000)(2000) = 19.27 TPY VOC
(19.27 TPY)(1)/(365) = 0.0528 TPD VOC

References

1. TNRCC Chapter 111 - Control of Air Emissions for Visible Emissions and Particulate Matter, September 16, 1996.
2. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
3. **U.S. Census**, census projections.

MUNICIPAL WASTE LANDFILLS

Introduction

Emissions from landfills are produced by three mechanisms: volatilization, chemical reaction, and biological decomposition of liquid and solid compounds into other chemical species.

Methodology

VOC emissions were calculated using the EPA - Landfill Air Emissions Estimation Model, Version 1.0. The following is a definition of terms and the values used in the model:

M_{NMOC} = mass emission rate of non methane VOC, tons per year
L_O = methane generation potential = 125 m^3/Mg
R = average annual acceptance rate, Mg/yr
k = methane generation rate constant = 0.04 yr^{-1}
t = age of landfill, years
C_{NMOC} = concentration of NMOC = 1170 ppm by vol. as hexane
3.6×10^{-9} = conversion factor
1.1023 tons = 1 Mg

The TNRCC Municipal Solid Waste Division provided data on refuse acceptance rate tonnage for 1999. The seasonal adjustment factor is 1 and the activity days per week is 7 to yield tons per day.

Example Calculation

Average acceptance rate in Gregg County 200 Mg/day = 52,000 Mg/yr
Model calculated emission rate for 1999 = 33.76 TPY VOC
(33.76 TPY)(1)/(365 days) = 0.0925 TPD VOC

References

1. "Municipal Solid Waste Division Permit Application Database Information, TNRCC
2. **AP-42, Volume I,** Fifth Edition, US Environmental Protection Agency, Section 2.4
3. **40CFR60, New Source Performance Standards, Supart WWW**
4. **EPA - Landfill Air Emissions Estimation Model**
5. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency

MUNICIPAL WASTEWATER TREATMENT

PUBLICLY OWNED TREATMENT WORKS (POTW)

Introduction

POTW are those entities owned by municipalities, school districts, trailer parks, municipal utility districts (MUD), and so on that have been charged with handling the wastewater discharge, or influent, from industries, from wastewater collection systems, and other miscellaneous sources. It is estimated that industry's contribution to the total annual flow is about 16%.

Methodology

Information was obtained from Charlie Rubick ,that was provide to him from the TNRCC Wastewater Permits Section, on daily average flows (in thousands of gallons) and number of months operated for each POTW in 1999 in the counties in the study area. The number of months was multiplied by 30.41 to arrive at number of days operated. The daily average flows are multiplied by number of days operated for each plant. All plants in a county will be summed to arrive at the total 10^3 gallons treated in each county. Total 10^3 gallons will be multiplied by 0.16 (industry's contribution to the total flow). This number, in turn, will be multiplied by an emission factor from Procedures Volume I of 0.11 lbs. of VOC per 10^3 gallons of wastewater. The product of this multiplication will be divided by 2000 to convert to tons per year of VOC. The seasonal adjustment factor is 1 and the activity days per week is 7 to yield tons per day.

Table 3-21 POTW Influent By County East Texas Area

County	Gallons 10^3
Gregg	120521.70
Harrison	3789.60
Rusk	830.19
Smith	6171.99
Upshur	326.62

Example calculation

Gregg county had 120521.70 X 10^3 gallons of annual wastewater influent
(120521.70X10^3 gal)(0.16)(0.11 lb VOC/10^3 gal)/(2000) = 1.06 TPY VOC
(1.06 TPY)(1)/(365 days) = 0.0029 TPD VOC

References

1. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources**, U.S. Environmental Protection Agency, Publication No. EPA-450./491-016, p. 3-14, May 1991 edition.
2. Information provided by Charlie Rubick, TNRCC 512-239-1478 as provided to him by the TNRCC Waste Water Permits Section.

LEAKING UNDERGROUND STORAGE TANKS

Introduction

This is a category for the 1999 Emissions Inventory dealing with old underground VOC storage tanks that have been unearthed for removal.

Methodology

The number of underground storage tank removals for each county was provided by Charlie Rubick of the TNRCC as it was provided to him from the Petroleum Storage Tank Division of the TNRCC. The following table will show the number of tanks removed in each county.

Table 3-22 Remediated Tanks in 1999

County	Tanks
Gregg	49
Harrison	19
Rusk	28
Smith	41
Upshur	32

The emission factor of 28 lbs/day of VOC emissions per event was developed by Radian Corporation under contract to the EPA Office of Air Quality Planning and Standards. This factor was used for emissions characterization. An average of 5 activity days per event was used. The seasonal adjustment factor is 1and the activity days per week are 7.

Example Calculation

Tanks removed in Gregg County in 1999 were 49.
(49 tanks removed)(28 lb VOC/tank)(5 days) = 3.43 TPY VOC
(3.43 TPY)(1)/(365 days) = 0.0094 TPD VOC

References

1. **Memorandum: VOC Emissions from Leaking Underground Storage Tanks**, Radian Corp., Research Triangle Park, NC, May, 1992.
2. **List of Underground Storage Tanks Removed in 1999**, Charlie Rubick, TNRCC, 512-239-1478

FIRES

AGRICULTURAL BURNING

Introduction

Agricultural burning is the burning of fields after the crop has been harvested.

Methodology

A study performed by the University of Texas, "Inventory of Air Pollutant Emissions Associated with Forest Grassland, and Agricultural Burning in Texas", was used to arrive at the emission estimates. The seasonal factor is 1 and the activity days per week are 7. The Growth factor is 1 which was provided by Charlie Rubick of the TNRCC.

Example calculation

Emissions from UT study for Gregg County in 1997 was 4.78 TPY VOC
(4.78 TPY)(1)/(365) = 0.0131 TPD VOC

References

1. **AP-42** U.S. Environmental Protection Agency, 5th Edition, Section 13.1
2. **Inventory of Air Pollutant Emissions Associated with Forest Grassland, and Agricultural Burning in Texas**, The University of Texas
3. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
4. Charlie Rubick, TNRCC, 512-239-1478

FOREST FIRES

Introduction

Forest fires, or wildfires, in Texas have consumed a large number of acres in 1999. There are several governmental agencies responsible for fire protection, maintenance of refuges, and fire reporting in Texas: U.S. Forest Service, Texas Forest Service, U.S. Fish and Wildlife, and National Park Service. The information from the Texas Interagency Coordination Center was used to calculate emissions because they have the most complete set of data for the East Texas area.

Methodology

The procedure for annual emissions is to multiply total annual acreage burned in each county times the fuel loading factor then multiply that product by an emission factor, obtained from AP-42. The procedure for ozone season daily emissions is to multiply acreage burned in June, July and August in each county times the fuel loading factor then multiply that product by the emission factor divided by 92 days. The fuel loading factors supplied by the Texas Forest Service is 15 tons/acre for Natural Forest. The emission factors are: VOC's: 24 lbs./ton, NOx: 4 lb./ton, and CO: 140 lb/ton.

Table 3-23 Total Acres Burned 1999

County	Natural Forest
Gregg	121.5
Harrison	711
Rusk	317.2
Smith	528
Upshur	423.5

Table 3-24 Acres Burned June, July & August 1999

County	Natural Forest
Gregg	25
Harrison	102
Rusk	81.2
Smith	51
Upshur	65

Example Calculation

In Gregg County for the 1999 year 121.5 acres of forest was burned.
(121.5 acres)(15 tons/acre)(24 lb VOC/ton)/(2000) = 21.87 TPY VOC
In Gregg County for the months of June, July and August 25 acres of forest was burned.
(25 acres)(15 tons/acre)(24 lb VOC/ton)/[(92)(2000)] = 0.0489 TPD VOC

References

1. AP-42 U.S. Environmental Protection Agency, 5th Edition, Section 13.1
2. Gill Hodges, Texas Interagency Coordination Center (936) 875-4796.

SLASH BURNING

Introduction

This type of burning is a forest management tool and consists of deliberately set fires to burn the slash (waste logs) in order to prepare the underlying ground for new tree planting.

Methodology

A study performed by the University of Texas, "Inventory of Air Pollutant Emissions Associated with Forest Grassland, and Agricultural Burning in Texas", was used to arrive at the emissions. The seasonal factor is 1and the activity days per week is 7. The Growth factor is 1 which was provided by Charlie Rubick of the TNRCC.

Example calculation

Emissions from UT study for Harrison County in 1997 was 22.00 TPY VOC
(22.00 TPY)(1)/(365) = 0.0603 TPD VOC

References

1. **AP-42** U.S. Environmental Protection Agency, 5th Edition, Section 13.1
2. **Inventory of Air Pollutant Emissions Associated with Forest Grassland, and Agricultural Burning in Texas**, The University of Texas
3. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
4. Charlie Rubick, TNRCC, 512-239-1478

PRESCRIBED BURNING

Introduction

Prescribed burning is also a forest management tool, but its primary purpose is to clear not only slash, but also underbrush that may serve as a host for destructive insects.

Methodology

A study performed by the University of Texas, "Inventory of Air Pollutant Emissions Associated with Forest Grassland, and Agricultural Burning in Texas", was used to arrive at the emissions. The emissions from prescribed burning of wildland was added to the prescribed burning of range for total prescribed burning. The seasonal factor is 1and the activity days per week is 7. The Growth factor is 1 which was provided by Charlie Rubick of the TNRCC.

Example calculation

Emissions from UT study for Gregg County in 1997 for prescribed burning of wildland was 1.24

TPY VOC
Emissions from UT study for Gregg county in 1997 for prescribed burning of range was 2.23 TPY VOC
Total for prescribed burning in Gregg County in 1997 was 3.57 TPY VOC
(3.57 TPY)(1)/(365) = 0.0098 TPD VOC

References

1. **AP-42** U.S. Environmental Protection Agency, 5th Edition, Section 13.1
2. **Inventory of Air Pollutant Emissions Associated with Forest Grassland, and Agricultural Burning in Texas**, The University of Texas
3. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
4. Charlie Rubick, TNRCC, 512-239-1478

STRUCTURE FIRES

Introduction

Structure fires result from unintentional actions, arson, or natural events. Structure fires covered in this category are accidental fires that occur in residential and commercial structures Structure fires can produce large amounts of emissions over a short period of time.

Methodology

The EIPP Volume III chapter 18 gives an average factor of 2.3 fires per 1000 people with a fuel loading factor of 1.15 tons per fire. The derived factor of 0.002645 tons/capita was used. The emission factors also came from the EIIP and were (VOC = 11 lb/ton; NOx = 1.4 lb/ton, CO = 60 lb/ton) The seasonal adjustment factor is 1 and the activity days per week is 7 to yield tons per day.

Example calculation

The population for Gregg County is 113155.
(113155 people)(0.002645 tons/person)(11 lb/ton)/(2000) = 1.65 TPY VOC
(1.65 TPY)(1)/(365) = 0.0045 TPD VOC

References

1. **Emission Inventory Improvement Program, EIIP Document Series, Volume III, EPA-454/R-97-004**, U.S. Environmental Protection Agency
2. **U.S. Census**, census projections

CATASTROPHIC/ACCIDENTAL RELEASES (SPILLS)

Introduction

There are a variety of types of oil spills (eg. tanker spills, tanker truck spills, pipeline ruptures and so on). Similarly, there are just as many types of fuels that are spilled, each with its particular evaporative qualities. Other factors affecting emissions are the time that it takes to clean up the spill (if it is cleaned up), weather, and whether or not the oil spill catches fire.

The information that is available, from the TNRCC, simply lists the material spilled (crude, gasoline, diesel, ammonia, wastewater, etc.), where it was spilled, when, and amount spilled. Given the information, the calculations of emissions was, of necessity, simple and direct.

Methodology

Provided the amounts from each spill. It is estimated that 10% of the weight of crude lost will evaporate; 20% of gas well liquid (condensate) and diesel will evaporate; 100% of the gasoline will evaporate. The number of gallons lost (after conversion from barrels) will be multiplied by 7 lbs./gal (~density of crude), by 6 lbs./gal. (~ density of condensate) 6 lbs/gal (~for diesel), and 5.5 lbs/gal (~for gasoline). The pounds were then be converted to TPY. The emissions for each spill were added together for each county. The material spilled during June, July, August was used for the ozone season. The emissions from the ozone season was divided by 92 days to arrive at tons per day.

Example calculation

Total emissions from spills in Gregg county using the above methodology was 5.93 TPY VOC
Emissions from spills in Gregg County for June, July and August using the above methodology was 2.1986 tons VOC
(2.1986 tons)/(92) = 0.0239 TPD VOC

References

1. TNRCC, Emergency Response Unit MC 142, 12124 Park 35 Circle, Austin, Texas 78753;. TNRCC file of Spills for a site by date

SECTION 4 NON-ROAD MOBILE SOURCES

Introduction and Scope

The base year for non-road mobile sources is 1999. Four categories were considered in Non-Road Mobile Sources: aircraft, marine vessels, locomotives, and small engines. Aircraft emissions estimates were based on activity data from the Texas department of Transportation, Aviation Division. Locomotive emissions estimates relied upon data from the Railroad Commission of Texas (RCT). Small Engines emissions were estimated from the Non-Road mobile source emissions model.

Methodology and Approach

Methodologies used for estimating the non-road mobile source activity levels and emissions come from EPA's **Procedures for Emission Inventory Preparation. Volume IV: Mobile Sources**, 1992, AP-42, ENVIRON Non-Road Mobile Model, and previous studies from the TNRCC.

Quality Assurance Measures

Quality assurance procedures for non-road mobile sources rely mainly upon the quality of data used for each separate category. Data such as current population figures, fuel usage, and operational events routinely change annually. Sources of this information were contacted during the inventory process for updates. Current EPA documents were obtained to keep abreast of changes in emission factors. Other routine efforts such as checking calculations for errors and conducting reasonableness and completeness checks were implemented.

Summary of Non-road Mobile Source Emissions

Total non-road mobile emissions from the Tyler/Longview/Marshall Area will be calculated for tons/yr and tons/day of VOC, tons/yr and tons/day of NO_x, and tons/yr and tons/day of CO during the 1999 study year.

Table 4-1 and Table 4-2 show the non-road mobile source emissions by specific categories for each county in the area for tons per year (yearly) and tons for typical summer weekday.

Table 4-1 SUMMARY OF YEARLY EMISSIONS FROM NON-ROAD MOBILE SOURCES

East Texas 1999 NONROAD Emissions Inventory

Tons per Year

SOURCE: EPA NONROAD model, Draft version, June 2000 release, with non-default growth and non-default populations and activity for construction and pleasure craft.

		Diesel			**Gasoline**			**CNG**			**LPG**			**Total VOC**	**Total NOx**	**Total CO**
County Name	**Source Category**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**			
Gregg County	Agricultural Equipment	1.89	18.24	3.14	0.32	0.07	7.44	0.00	0.04	0.17	0.00	0.00	0.00	2.21	18.35	10.75
	Airport Equipment	0.18	0.99	0.75	0.04	0.01	0.99	0.00	0.00	0.00	0.00	0.02	0.09	0.22	1.03	1.83
	Commercial Equipment	15.30	92.26	53.95	126.89	19.92	3337.59	0.01	6.25	25.99	0.01	5.67	21.59	142.21	124.10	3439.12
	Construction and Mining Equipment	83.41	634.37	385.18	21.10	1.96	283.49	0.00	0.00	0.01	0.00	1.05	4.01	104.51	637.38	672.68
	Industrial Equipment	20.75	123.19	82.11	20.81	7.19	496.85	0.01	9.58	36.42	0.16	125.28	476.53	41.74	265.23	1091.91
	Lawn and Garden Equipment (Com)	9.00	43.35	27.48	286.15	23.80	3939.79	0.00	0.00	0.00	0.00	1.15	4.41	295.16	68.31	3971.67
	Lawn and Garden Equipment (Res)	0.00	0.00	0.00	131.26	8.22	1911.27	0.00	0.00	0.00	0.00	0.00	0.00	131.26	8.22	1911.27
	Logging Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pleasure Craft	0.00	0.00	0.00	71.14	0.39	25.56	0.00	0.00	0.00	0.00	0.00	0.00	71.14	0.39	25.56
	Railroad Equipment	0.32	135.24	1.74	0.07	5.64	0.02	0.00	0.00	0.00	0.00	0.16	0.00	0.39	141.04	1.76
	Recreational Equipment	0.00	0.00	0.00	6.17	1.76	286.72	0.00	0.00	0.00	0.00	0.00	0.00	6.17	1.76	286.72
	Aircraft Total All Types	0.00	0.00	0.00	0.59	1.42	4.35	0.00	0.00	0.00	0.00	0.00	0.00	0.59	1.42	4.35
	Railroad Diesel	16.78	390.12	49.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.78	390.12	49.53
Gregg County Total		147.62	1437.76	603.88	664.56	70.39	10294.06	0.02	15.88	62.59	0.17	133.34	506.63	812.37	1657.36	11467.17
Harrison County	Agricultural Equipment	7.06	68.20	11.75	1.21	0.25	27.79	0.00	0.17	0.64	0.00	0.00	0.01	8.28	68.62	40.19
	Airport Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial Equipment	2.65	16.00	9.34	22.02	3.45	578.95	0.00	1.08	4.51	0.00	0.98	3.75	24.67	21.51	596.55
	Construction and Mining Equipment	13.93	105.98	64.35	3.51	0.33	47.17	0.00	0.00	0.00	0.00	0.17	0.67	17.44	106.48	112.18
	Industrial Equipment	6.93	40.33	26.48	5.18	1.78	123.93	0.00	2.37	9.03	0.04	30.93	117.91	12.16	75.41	277.34
	Lawn and Garden Equipment (Com)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Lawn and Garden Equipment (Res)	0.00	0.00	0.00	68.51	4.29	1000.04	0.00	0.00	0.00	0.00	0.00	0.00	68.51	4.29	1000.04
	Logging Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pleasure Craft	0.00	0.00	0.00	1819.26	7.98	665.32	0.00	0.00	0.00	0.00	0.00	0.00	1819.26	7.98	665.32
	Railroad Equipment	0.17	71.64	0.92	0.04	2.99	0.01	0.00	0.00	0.00	0.00	0.09	0.00	0.21	74.72	0.93
	Recreational Equipment	0.16	0.71	0.67	15.51	1.31	242.23	0.00	0.00	0.00	0.00	0.02	0.08	15.67	2.04	242.98
	Aircraft Total All Types	0.00	0.00	0.00	0.59	0.08	14.17	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.08	14.17
	Railroad Diesel	41.90	974.35	123.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.90	974.35	123.70
Harrison County Total		72.81	1277.21	237.21	1935.83	22.46	2699.60	0.00	3.62	14.17	0.04	32.19	122.41	2008.68	1335.49	3073.40
Rusk County	Agricultural Equipment	8.63	83.35	14.36	1.48	0.31	33.96	0.00	0.21	0.78	0.00	0.00	0.02	10.11	83.86	49.12
	Airport Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial Equipment	1.59	9.60	5.61	13.22	2.07	347.56	0.00	0.65	2.70	0.00	0.59	2.25	14.81	12.92	358.12
	Construction and Mining Equipment	14.61	111.12	67.47	3.68	0.34	49.48	0.00	0.00	0.00	0.00	0.18	0.70	18.29	111.64	117.65
	Industrial Equipment	4.22	24.25	15.75	2.43	0.84	58.27	0.00	1.11	4.24	0.02	14.49	55.21	6.68	40.68	133.47
	Lawn and Garden Equipment (Com)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Lawn and Garden Equipment (Res)	0.00	0.00	0.00	59.41	3.72	866.91	0.00	0.00	0.00	0.00	0.00	0.00	59.41	3.72	866.91
	Logging Equipment	10.36	86.26	63.65	512.88	6.69	1480.10	0.00	0.00	0.00	0.00	0.00	0.00	523.24	92.95	1543.75
	Pleasure Craft	0.00	0.03	0.01	785.61	3.42	286.75	0.00	0.00	0.00	0.00	0.00	0.00	785.61	3.45	286.76
	Railroad Equipment	0.13	54.77	0.71	0.03	2.29	0.01	0.00	0.00	0.00	0.00	0.07	0.00	0.16	57.12	0.71
	Recreational Equipment	0.16	0.71	0.67	18.59	2.19	385.15	0.00	0.00	0.00	0.00	0.02	0.08	18.75	2.92	385.90
	Aircraft Total All Types	0.00	0.00	0.00	1.94	0.31	56.47	0.00	0.00	0.00	0.00	0.00	0.00	1.94	0.31	56.47
	Railroad Diesel	2.59	60.31	7.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.59	60.31	7.66
Rusk County Total		42.30	430.38	175.88	1399.28	22.17	3564.66	0.00	1.97	7.73	0.02	15.35	58.26	1441.60	469.87	3806.52
Smith County	Agricultural Equipment	12.13	117.28	20.20	2.09	0.44	47.84	0.00	0.29	1.10	0.00	0.01	0.02	14.22	118.01	69.16
	Airport Equipment	0.32	1.78	1.35	0.07	0.03	1.77	0.00	0.00	0.00	0.00	0.04	0.16	0.39	1.84	3.27
	Commercial Equipment	13.94	84.03	49.17	115.50	18.15	3038.68	0.01	5.70	23.67	0.01	5.16	19.65	129.46	113.05	3131.18
	Construction and Mining Equipment	126.45	961.56	583.87	32.08	2.98	430.97	0.00	0.00	0.02	0.00	1.60	6.09	158.53	966.14	1020.95
	Industrial Equipment	34.07	234.69	130.57	36.00	11.33	1246.95	0.04	28.46	110.17	0.16	120.30	456.84	70.27	394.78	1944.53

Table 4-1 SUMMARY OF YEARLY EMISSIONS FROM NON-ROAD MOBILE SOURCES

East Texas 1999 NONROAD Emissions Inventory

Tons per Year

SOURCE: EPA NONROAD model, Draft version, June 2000 release, with non-default growth and non-default populations and activity for construction and pleasure craft.

		Diesel			**Gasoline**			**CNG**			**LPG**			**Total VOC**	**Total NOx**	**Total CO**
County Name	**Source Category**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**			
	Lawn and Garden Equipment (Com)	7.54	36.32	23.01	240.82	19.99	3306.44	0.00	0.00	0.00	0.00	0.97	3.69	248.36	57.27	3333.14
	Lawn and Garden Equipment (Res)	0.00	0.00	0.00	188.64	11.82	2741.83	0.00	0.00	0.00	0.00	0.00	0.00	188.64	11.82	2741.83
	Logging Equipment	0.88	7.39	5.45	43.98	0.57	126.90	0.00	0.00	0.00	0.00	0.00	0.00	44.86	7.96	132.35
	Pleasure Craft	0.02	0.12	0.03	2263.05	13.48	808.05	0.00	0.00	0.00	0.00	0.00	0.00	2263.07	13.60	808.08
	Railroad Equipment	0.47	199.65	2.57	0.11	8.33	0.02	0.00	0.00	0.00	0.00	0.24	0.00	0.57	208.23	2.60
	Recreational Equipment	0.32	1.42	1.35	34.35	3.53	631.92	0.00	0.00	0.00	0.00	0.05	0.16	34.67	4.99	633.43
	Aircraft Total All Types	0.00	0.00	0.00	5.64	4.91	18.57	0.00	0.00	0.00	0.00	0.00	0.00	5.64	4.91	18.57
	Railroad Diesel	25.81	600.25	76.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.81	600.25	76.20
Smith County Total		221.95	2244.49	893.77	2962.32	95.56	12399.96	0.05	34.45	134.96	0.17	128.36	486.62	3184.49	2502.86	13915.30
Upshur County	Agricultural Equipment	7.02	67.96	11.70	1.21	0.25	27.73	0.00	0.17	0.64	0.00	0.00	0.01	8.23	68.38	40.09
	Airport Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial Equipment	0.77	4.62	2.70	6.34	1.00	166.96	0.00	0.31	1.30	0.00	0.28	1.08	7.11	6.21	172.04
	Construction and Mining Equipment	14.18	107.84	65.48	3.61	0.34	48.48	0.00	0.00	0.00	0.00	0.18	0.68	17.79	108.35	114.65
	Industrial Equipment	3.27	20.42	11.94	1.91	0.60	66.07	0.00	1.50	5.82	0.01	6.40	24.26	5.19	28.92	108.09
	Lawn and Garden Equipment (Com)	0.39	1.86	1.18	12.40	1.03	169.72	0.00	0.00	0.00	0.00	0.05	0.19	12.78	2.94	171.09
	Lawn and Garden Equipment (Res)	0.00	0.00	0.00	38.54	2.42	559.20	0.00	0.00	0.00	0.00	0.00	0.00	38.54	2.42	559.20
	Logging Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pleasure Craft	0.00	0.00	0.00	1073.33	4.53	392.42	0.00	0.00	0.00	0.00	0.00	0.00	1073.33	4.53	392.42
	Railroad Equipment	0.10	42.38	0.55	0.02	1.77	0.01	0.00	0.00	0.00	0.00	0.05	0.00	0.12	44.20	0.55
	Recreational Equipment	0.16	0.71	0.68	12.57	0.44	100.44	0.00	0.00	0.00	0.00	0.02	0.08	12.73	1.18	101.20
	Aircraft Total All Types	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Railroad Diesel	24.72	574.81	72.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.72	574.81	72.97
Upshur County Total		50.61	820.60	167.20	1149.93	12.37	1531.03	0.00	1.99	7.76	0.01	6.99	26.30	1200.55	841.95	1732.29
5-County Area	Agricultural Equipment	36.74	355.02	61.15	6.31	1.31	144.75	0.00	0.87	3.34	0.00	0.02	0.08	43.05	357.23	209.31
	Airport Equipment	0.50	2.77	2.10	0.12	0.04	2.76	0.00	0.00	0.00	0.00	0.06	0.24	0.61	2.87	5.10
	Commercial Equipment	34.24	206.51	120.78	283.98	44.59	7469.74	0.02	14.00	58.17	0.02	12.68	48.32	318.26	277.79	7697.01
	Construction and Mining Equipment	252.59	1920.86	1166.34	63.98	5.94	859.59	0.00	0.01	0.03	0.00	3.18	12.15	316.57	1929.99	2038.11
	Industrial Equipment	69.24	442.87	266.85	66.34	21.74	1992.08	0.06	43.02	165.67	0.39	297.40	1130.75	136.02	805.03	3555.34
	Lawn and Garden Equipment (Com)	16.92	81.53	51.66	539.37	44.82	7415.96	0.00	0.00	0.00	0.00	2.17	8.29	556.30	128.52	7475.91
	Lawn and Garden Equipment (Res)	0.00	0.00	0.00	486.36	30.48	7079.25	0.00	0.00	0.00	0.00	0.00	0.00	486.36	30.48	7079.25
	Logging Equipment	11.24	93.65	69.10	556.86	7.26	1607.00	0.00	0.00	0.00	0.00	0.00	0.00	568.11	100.91	1676.10
	Pleasure Craft	0.02	0.15	0.03	6012.39	29.80	2178.10	0.00	0.00	0.00	0.00	0.00	0.00	6012.41	29.95	2178.13
	Railroad Equipment	1.18	503.68	6.49	0.27	21.02	0.06	0.00	0.00	0.00	0.00	0.61	0.01	1.45	525.31	6.57
	Recreational Equipment	0.81	3.55	3.38	87.18	9.23	1646.47	0.00	0.00	0.00	0.00	0.11	0.39	87.99	12.89	1650.24
	Aircraft Total All Types	0.00	0.00	0.00	8.76	6.71	93.55	0.00	0.00	0.00	0.00	0.00	0.00	8.76	6.71	93.55
	Railroad Diesel	111.80	2599.84	330.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	111.80	2599.84	330.06
5-County Area Total		535.28	6210.44	2077.94	8111.92	222.94	30489.30	0.08	57.90	227.21	0.41	316.24	1200.22	8647.69	6807.51	33994.67

Table 4-2 SUMMARY OF SUMMER WEEKDAY EMISSIONS FROM NON-ROAD MOBILE SOURCES

East Texas 1999 NONROAD Emissions Inventory

Tons per Typical Summer Weekday

SOURCE: EPA NONROAD model, Draft version, June 2000 release, with non-default growth and non-default populations and activity for construction and pleasure craft.

		Diesel			**Gasoline**			**CNG**			**LPG**			**Total VOC**	**Total NOx**	**Total CO**
County Name	**Source Category**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**			
Gregg County	Agricultural Equipment	0.0083	0.0796	0.0137	0.0013	0.0003	0.0321	0.0000	0.0002	0.0007	0.0000	0.0000	0.0000	0.0097	0.0801	0.0466
	Airport Equipment	0.0005	0.0028	0.0021	0.0001	0.0000	0.0026	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0006	0.0029	0.0050
	Commercial Equipment	0.0487	0.2938	0.1697	0.4073	0.0619	10.6810	0.0000	0.0198	0.0752	0.0000	0.0180	0.0687	0.4561	0.3935	10.9946
	Construction and Mining Equipment	0.3617	2.6980	1.6558	0.0849	0.0081	1.1659	0.0000	0.0000	0.0000	0.0000	0.0044	0.0169	0.4466	2.7105	2.8386
	Industrial Equipment	0.0654	0.3822	0.2553	0.0625	0.0228	1.5364	0.0000	0.0304	0.1152	0.0005	0.3972	1.5073	0.1284	0.8325	3.4142
	Lawn and Garden Equipment (Com)	0.0384	0.1813	0.1169	1.1141	0.0968	16.1484	0.0000	0.0000	0.0000	0.0000	0.0033	0.0128	1.1525	0.2815	16.2780
	Lawn and Garden Equipment (Res)	0.0000	0.0000	0.0000	0.3715	0.0229	5.4965	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3715	0.0229	5.4965
	Logging Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Pleasure Craft	0.0000	0.0000	0.0000	0.1896	0.0009	0.0561	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1896	0.0009	0.0561
	Railroad Equipment	0.0012	0.0060	0.0045	0.0003	0.0001	0.0098	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0015	0.0061	0.0144
	Recreational Equipment	0.0000	0.0000	0.0000	0.0171	0.0055	0.8200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0171	0.0055	0.8200
	Aircraft Total All Types	0.0000	0.0000	0.0000	0.0020	0.0040	0.0120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0020	0.0040	0.0120
	Railroad Diesel	0.0538	1.2504	0.1587	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0538	1.2504	0.1587
Gregg County Total		0.5781	4.8941	2.3768	2.2507	0.2232	35.9607	0.0001	0.0504	0.1912	0.0006	0.4229	1.6060	2.8294	5.5907	40.1346
Harrison County	Agricultural Equipment	0.0312	0.2978	0.0514	0.0050	0.0011	0.1198	0.0000	0.0007	0.0028	0.0000	0.0000	0.0001	0.0361	0.2996	0.1741
	Airport Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Commercial Equipment	0.0084	0.0509	0.0294	0.0707	0.0107	1.8534	0.0000	0.0034	0.0130	0.0000	0.0031	0.0119	0.0792	0.0682	1.9077
	Construction and Mining Equipment	0.0604	0.4507	0.2766	0.0141	0.0014	0.1940	0.0000	0.0000	0.0000	0.0000	0.0007	0.0028	0.0745	0.4528	0.4735
	Industrial Equipment	0.0211	0.1216	0.0798	0.0156	0.0056	0.3831	0.0000	0.0075	0.0285	0.0001	0.0980	0.3731	0.0368	0.2328	0.8645
	Lawn and Garden Equipment (Com)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lawn and Garden Equipment (Res)	0.0000	0.0000	0.0000	0.1940	0.0119	2.8769	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1940	0.0119	2.8769
	Logging Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Pleasure Craft	0.0000	0.0000	0.0000	4.8270	0.0175	1.4597	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	4.8270	0.0175	1.4597
	Railroad Equipment	0.0006	0.0032	0.0024	0.0001	0.0000	0.0052	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0032	0.0076
	Recreational Equipment	0.0005	0.0022	0.0022	0.0462	0.0041	0.7205	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0467	0.0064	0.7230
	Aircraft Total All Types	0.0000	0.0000	0.0000	0.0016	0.0002	0.0389	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0016	0.0002	0.0389
	Railroad Diesel	0.1343	3.1229	0.3965	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1343	3.1229	0.3965
Harrison County Total		0.2566	4.0494	0.8382	5.1743	0.0525	7.6516	0.0000	0.0117	0.0444	0.0001	0.1020	0.3881	5.4311	4.2156	8.9222
Rusk County	Agricultural Equipment	0.0381	0.3639	0.0628	0.0061	0.0013	0.1465	0.0000	0.0009	0.0034	0.0000	0.0000	0.0001	0.0442	0.3661	0.2127
	Airport Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Commercial Equipment	0.0051	0.0306	0.0177	0.0424	0.0064	1.1126	0.0000	0.0021	0.0078	0.0000	0.0019	0.0072	0.0475	0.0410	1.1452
	Construction and Mining Equipment	0.0634	0.4726	0.2900	0.0148	0.0014	0.2036	0.0000	0.0000	0.0000	0.0000	0.0008	0.0029	0.0782	0.4748	0.4965
	Industrial Equipment	0.0125	0.0716	0.0463	0.0073	0.0026	0.1800	0.0000	0.0035	0.0134	0.0001	0.0459	0.1747	0.0199	0.1237	0.4145
	Lawn and Garden Equipment (Com)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Lawn and Garden Equipment (Res)	0.0000	0.0000	0.0000	0.1682	0.0103	2.4938	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1682	0.0103	2.4938
	Logging Equipment	0.0366	0.2822	0.2114	1.5725	0.0212	4.5654	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.6091	0.3033	4.7768
	Pleasure Craft	0.0000	0.0001	0.0000	2.0845	0.0075	0.6291	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.0845	0.0076	0.6291
	Railroad Equipment	0.0005	0.0025	0.0018	0.0001	0.0000	0.0040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0025	0.0058
	Recreational Equipment	0.0005	0.0022	0.0022	0.0548	0.0068	1.1294	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0553	0.0091	1.1318
	Aircraft Total All Types	0.0000	0.0000	0.0000	0.0053	0.0008	0.1551	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0053	0.0008	0.1551
	Railroad Diesel	0.0083	0.1933	0.0245	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0083	0.1933	0.0245
Rusk County Total		0.1650	1.4188	0.6568	3.9560	0.0585	10.6193	0.0000	0.0065	0.0246	0.0001	0.0487	0.1851	4.1211	1.5325	11.4859
Smith County	Agricultural Equipment	0.0535	0.5120	0.0883	0.0086	0.0019	0.2062	0.0000	0.0012	0.0048	0.0000	0.0000	0.0001	0.0621	0.5152	0.2995
	Airport Equipment	0.0009	0.0049	0.0037	0.0002	0.0001	0.0047	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0011	0.0051	0.0088
	Commercial Equipment	0.0444	0.2676	0.1547	0.3707	0.0564	9.7221	0.0000	0.0181	0.0685	0.0000	0.0164	0.0626	0.4151	0.3585	10.0079
	Construction and Mining Equipment	0.5484	4.0895	2.5099	0.1290	0.0124	1.7721	0.0000	0.0000	0.0001	0.0000	0.0067	0.0257	0.6774	4.1086	4.3077
	Industrial Equipment	0.1050	0.7197	0.3987	0.1026	0.0355	3.6071	0.0001	0.0882	0.3400	0.0005	0.3814	1.4447	0.2082	1.2248	5.7906
	Lawn and Garden Equipment (Com)	0.0322	0.1519	0.0978	0.9372	0.0813	13.5480	0.0000	0.0000	0.0000	0.0000	0.0028	0.0107	0.9694	0.2360	13.6566
	Lawn and Garden Equipment (Res)	0.0000	0.0000	0.0000	0.5337	0.0329	7.8832	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5337	0.0329	7.8832

Table 4-2 SUMMARY OF SUMMER WEEKDAY EMISSIONS FROM NON-ROAD MOBILE SOURCES

East Texas 1999 NONROAD Emissions Inventory

Tons per Typical Summer Weekday

SOURCE: EPA NONROAD model, Draft version, June 2000 release, with non-default growth and non-default populations and activity for construction and pleasure craft.

		Diesel			**Gasoline**			**CNG**			**LPG**			**Total VOC**	**Total NOx**	**Total CO**
County Name	**Source Category**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**	**VOC**	**NOx**	**CO**			
	Logging Equipment	0.0031	0.0242	0.0181	0.1348	0.0018	0.3913	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1379	0.0260	0.4094
	Pleasure Craft	0.0000	0.0003	0.0001	6.0416	0.0296	1.7728	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.0417	0.0298	1.7729
	Railroad Equipment	0.0018	0.0089	0.0067	0.0004	0.0001	0.0145	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0022	0.0090	0.0212
	Recreational Equipment	0.0010	0.0045	0.0043	0.1017	0.0110	1.8627	0.0000	0.0000	0.0000	0.0000	0.0001	0.0005	0.1027	0.0156	1.8675
	Aircraft Total All Types	0.0000	0.0000	0.0000	0.0190	0.0090	0.0510	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0190	0.0090	0.0510
	Railroad Diesel	0.0827	1.9239	0.2442	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0827	1.9239	0.2442
Smith County Total		0.8730	7.7073	3.5267	8.3795	0.2718	40.8359	0.0001	0.1076	0.4134	0.0005	0.4075	1.5447	9.2532	8.4942	46.3206
Upshur County	Agricultural Equipment	0.0310	0.2967	0.0512	0.0050	0.0011	0.1195	0.0000	0.0007	0.0028	0.0000	0.0000	0.0001	0.0360	0.2985	0.1736
	Airport Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Commercial Equipment	0.0024	0.0147	0.0085	0.0204	0.0031	0.5341	0.0000	0.0010	0.0038	0.0000	0.0009	0.0034	0.0228	0.0197	0.5498
	Construction and Mining Equipment	0.0615	0.4586	0.2815	0.0145	0.0014	0.1993	0.0000	0.0000	0.0000	0.0000	0.0008	0.0029	0.0760	0.4608	0.4837
	Industrial Equipment	0.0095	0.0599	0.0346	0.0054	0.0019	0.1911	0.0000	0.0047	0.0179	0.0000	0.0203	0.0767	0.0150	0.0867	0.3203
	Lawn and Garden Equipment (Com)	0.0016	0.0078	0.0050	0.0482	0.0042	0.6952	0.0000	0.0000	0.0000	0.0000	0.0001	0.0005	0.0499	0.0121	0.7008
	Lawn and Garden Equipment (Res)	0.0000	0.0000	0.0000	0.1090	0.0067	1.6074	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1090	0.0067	1.6074
	Logging Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Pleasure Craft	0.0000	0.0000	0.0000	2.8465	0.0099	0.8609	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.8465	0.0099	0.8609
	Railroad Equipment	0.0004	0.0019	0.0014	0.0001	0.0000	0.0031	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0019	0.0045
	Recreational Equipment	0.0005	0.0022	0.0022	0.0381	0.0014	0.3151	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0386	0.0037	0.3175
	Aircraft Total All Types	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Railroad Diesel	0.0792	1.8423	0.2339	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0792	1.8423	0.2339
Upshur County Total		0.1863	2.6842	0.6182	3.0872	0.0297	4.5257	0.0000	0.0064	0.0245	0.0000	0.0222	0.0839	3.2735	2.7424	5.2523
5-County Area	Agricultural Equipment	0.1621	1.5501	0.2675	0.0259	0.0056	0.6242	0.0000	0.0038	0.0145	0.0000	0.0001	0.0003	0.1880	1.5595	0.9064
	Airport Equipment	0.0014	0.0077	0.0058	0.0003	0.0001	0.0073	0.0000	0.0000	0.0000	0.0000	0.0002	0.0007	0.0017	0.0080	0.0138
	Commercial Equipment	0.1090	0.6577	0.3800	0.9115	0.1386	23.9031	0.0001	0.0444	0.1683	0.0001	0.0402	0.1538	1.0207	0.8808	24.6053
	Construction and Mining Equipment	1.0954	8.1694	5.0139	0.2573	0.0247	3.5349	0.0000	0.0000	0.0001	0.0000	0.0133	0.0512	1.3527	8.2074	8.6000
	Industrial Equipment	0.2136	1.3549	0.8147	0.1934	0.0684	5.8978	0.0002	0.1343	0.5150	0.0012	0.9428	3.5765	0.4084	2.5004	10.8041
	Lawn and Garden Equipment (Com)	0.0722	0.3410	0.2197	2.0995	0.1823	30.3916	0.0000	0.0000	0.0000	0.0000	0.0062	0.0240	2.1718	0.5296	30.6353
	Lawn and Garden Equipment (Res)	0.0000	0.0000	0.0000	1.3765	0.0847	20.3577	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.3765	0.0847	20.3577
	Logging Equipment	0.0398	0.3063	0.2295	1.7073	0.0230	4.9567	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.7470	0.3293	5.1862
	Pleasure Craft	0.0000	0.0003	0.0001	15.9892	0.0654	4.7786	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	15.9893	0.0657	4.7787
	Railroad Equipment	0.0045	0.0225	0.0169	0.0010	0.0002	0.0366	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0055	0.0228	0.0536
	Recreational Equipment	0.0026	0.0112	0.0108	0.2579	0.0288	4.8477	0.0000	0.0000	0.0000	0.0000	0.0004	0.0012	0.2605	0.0403	4.8597
	Aircraft Total All Types	0.0000	0.0000	0.0000	0.0279	0.0140	0.2570	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0279	0.0140	0.2570
	Railroad Diesel	0.3583	8.3328	1.0579	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3583	8.3328	1.0579
5-County Area Total		2.0589	20.7539	8.0167	22.8199	0.6217	99.3362	0.0002	0.1825	0.6980	0.0013	1.0032	3.8079	24.5220	14.2285	110.8009

Discussion of Non-road Mobile Source Categories

This section provides a listing of the non-road mobile source categories with a description of the source, the methodology and emission factors used to calculate emissions, and sources of data.

AIRCRAFT EMISSIONS

Introduction

Emissions in aviation are generally divided between the combustion exhaust of the aircraft and refueling. Aircraft emissions were further divided into categories of: commercial aircraft, general aviation, military aircraft, with aircraft refueling a separate category. Emission factors or models were used as appropriate to estimate emissions from each category.

Methodology

COMMERCIAL and MILITARY:

Emissions were calculated based upon the distribution and frequency of use (landing and takeoff data from each airport by aircraft type). This data was input into the EDMS model and the appropriate emissions of VOC, NOX, and CO was a model output.The emission estimates from a Texas Transportation Institute study for Texas commercial airports were used where appropriate.

GENERAL AVIATION:

Emissions were calculated based upon the distribution and frequency of use (landing and takeoff data from each airport). This data was multiplied by the appropriate emission factor from **Procedures for the Emission Inventory Preparation Volume IV: Mobile Sources**, EPA 450/481-026d and the appropriate emissions of VOC, NOX, and CO were calculated.

References

1. **Procedures for the Emission Inventory Preparation Volume IV: Mobile Sources**, EPA 450/481-026d, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C.
2. "**Engine Emissions Data Base**," Federal Aviation Administration.
3. **Airport Activity Statistics of Certified Route Carriers**, Federal Aviation Administration.
4. Airport Master Record, Federal Aviation Administration, 1992.
5. **EDMS Emissions and Dispersion Modeling, System Version 3.0, 1998**, U.S. Department of Transportation, Federal Aviation Administration.

AIRCRAFT REFUELING

Introduction

The VOC emissions were calculated for the loading of Jet-A fuel into commercial aircraft, Jet-A fuel into military aircraft and aviation fuel into civilian aircraft. VOC emissions result when the refueling displaces the vapor-laden air in a partially empty fuel tank.

Methodology

Fuel data was obtained for the commercial airports in Texas. Aviation fuel was separated into Jet-A used for jet engines and turboprops, and into "100-no lead" that is used for the reciprocating engines.

For Jet-A, an emission factor (EF) was calculated from equation 1, paragraph 4-4-5, AP-42. The equation is shown below:

$$EF = \frac{12.46\ SPM}{T}\ \frac{\text{lbs - VOC}}{\text{1000 gal. of fuel}}$$

S = 1.45 (Table 4.4.1, *AP-42*)
P = 0.0085 = True psia (Table 4.3.2, *AP-42*)
M = 130 = Mol. wt. (Table 4.3.2, *AP-42*)
T = Temp. Degrees R = 460° + 60° = 520°

$$EF = 12.46 \left(\frac{1.45 \times 0.0085 \times 130}{520}\right)$$

$$EF = 0.038\ \frac{\text{lb. - VOC}}{\text{1000 gal}}$$

For General Aviation fuel AP-42 emission factors were used (11 lbs/1000 gal). This is the emission factor for Vehicle Refueling that is used for gasoline transfers. Where available the TTI results were substituted.

In addition to the methodology described above, another method was employed to estimate emissions from very small civilian airports. From the amount of fuel transferred into civilian aircraft at the larger commercial airports, it was determined that 1.75 gal/Landing-Take-Off was an average factor that could be used to calculate fuel usage due to refueling of the reciprocating type of engines. The 1.75 gal/Landing-Take-Off factor is from the TNRCC staff. This number was provided as a basis for estimating fuel sales for general aviation as a part of the first ETCOG near non-attainment inventory.

SAMPLE CALCULATIONS REFUELING

Aircraft				
Harrison				
Marshall		HC	0.394	LBS/LTO
2359	LTO'S	CO	12.014	LBS/LTO
		NOX	0.065	LBS/LTO
		REFUEL	4.61	GM/GAL

The TTI report covers Texas airports with commercial aviation. For those airports with general aviation as the only activity, emissions were calculated using EPA emission factors. All emissions except general aviation emissions at the Marshall and Harrison airports were extracted from the TTI report.

Example Calculation Aircraft Emissions

For the Marshall Airport in Harrison county 2359 Landing Take -Offs (LTO)times 12.014 lbs CO per LTO divided by 2000 lbs/ton equals 14.17 T/Y CO. Tons per day equals 14.17 t/y times seasonal factor 2.926 divided by 365 days per year equals 0.1136 tons per day.
Based on the TTI report, the daily summertime emissions are calculated with a weighted factor of 2.926 times annual operations.

References

1. **<u>Procedures for the Emission Inventory Preparation Volume IV: Mobile Sources</u>**, EPA 450/481-026d, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C.
2. "**Engine Emissions Data Base**," Federal Aviation Administration.
3. **<u>Airport Activity Statistics of Certified Route Carriers</u>**, Federal Aviation Administration.
4. **<u>AP-42</u>, U. S. Environmental Protection Agency, 5th ed., January 1995.**

MARINE VESSELS

Introduction

Marine vessels include large cargo and passenger ships, oil tankers, tugboats, and other steamships that use fuel oil and diesel as fuels. There are no Marine vessel emissions in the Tyler/Longview/Marshall area.

Methodology

Since there are no marine vessels in the area, no emissions were calculated.

LOCOMOTIVE EMISSIONS

Introduction

There were three Class I railroads operating in the study area in 1999: (1) Union Pacific Company; (2) Burlington Northern Santa Fe Railway company; (3) Kansas City Southern railway Company.

Complete information concerning railroad operations in Texas is difficult to retrieve. Although Texas has a regulatory agency for railroads, the Railroad Commission of Texas(RCT), the reporting requirements of the RCT do not include the types of information that are needed to calculate emissions. For instance, although the EPA guidance document (**Procedures, Volume IV**) states that railroads collect information on Gross Ton Mileage (GTM) by county, in fact most do not (this information is not required by the RCT). This lack of information impacts the methodology of the study because other methods must be used to allocate fuel consumption by county.

Information was obtained from the RCT giving the miles of track of a rail line segment in each county, the estimated trains per day on that rail line segment, and the average number train engines for the rail line segment. The Union Pacific Co. previously provided the average number of gallons of fuel per mile per engine. A review of RCT data determined that any small railroad companies operating in the area would be an insignificant source of emissions.

Methodology

The method was to calculate the number of miles traveled per engine and multiply that by the average number of gallons of fuel per mile per engine to arrive at the gallons used in each county. Calculated emissions were by multiplying the gallons of fuel burned by emission factors found in Table 3 of the EPA web site for New Locomotive Standards. These factors are: HC = .0220 lbs/gal; NO_x = .5947 lbs/gal and CO = 0.0586 lbs/gal. Hydrocarbon numbers were converted to VOC numbers by multiplying by 1.005, as suggested by the Procedures, Vol. IV manual. The seasonal adjustment factor is 1 and the activity days per week is 6 to yield tons per day.

Example Calculation

In Gregg county there is 17 miles of track on the Union Pacific rail line segment that runs between Dallas and Shreveport. That track is used 16 times per day with and average of 3.5 engines per train. The track is used 6 days per week or 312 days per year.

(17 miles)(16 trains)(3.5 engines/train)(3.5gal/mile/eng)(312 days/yr) = 1,039,584 gal of fuel
(1,039,584 gal)(0.022 lb VOC/gal)(1.005)/(2000) = 11.49 TPY VOC
(11.49 TPY)(1)/(312 DPY) = 0.0368 TPD VOC
(1,039,584 gal)(0.5947 lb NOx/gal)/(2000) = 309.12 TPY NOx
(309.12 TPD)(1)/(312 DPY) = 0.9908 TPD NOx
(1,039,584 gal)(0.0586 lb CO/gal)/(2000) = 30.46 TPY CO

(30.46 TPD)(1)/(312 DPY) = 0.0976 TPD CO

References

1. **<u>Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources</u>**, U.S. Environmental Protection Agency, Publication No. EPA-450/4-81-026d(Revised), 1992, Table 6-1, p. 204.
2. **Michael Jones, Railroad Commission of Texas**, Rail Division, 512-463-7191.
3. **Ed McCaddon, Union Pacific Co.,** Maintenance and fuel use Section, 402-271-2344.
4. EPA web site - http://www.epa.gov/orcdizux/regs/nonroad/locomotv/frm/42097051.htm.

NON-ROAD MOBIL SOURCES "SMALL ENGINES"

Introduction and Methodology

Emissions for this category were calculated by the NONROAD Mobile Emissions Model. A partial list of equipment in this category includes: farm equipment(tractors, combines, pumps), construction equipment (dozers, graders, cranes, compactors), and residential equipment (lawnmowers, edgers, trimmers), recreational equipment (4-wheelers, etc.). This is a very broad category and includes all combustion emissions from vehicles and equipment that are not registered to operate on Texas roads and highways. For each NONROAD major source category, the tons per year and the tons per day for VOC, NOX, and CO were calculated. Pollution Solutions undertook special studies to determine the population counts for construction equipment and activity factors for recreational water craft.

Construction Equipment Methodology

Construction equipment population estimates relied on both direct counts and scaled Houston survey data for diesel-powered equipment of greater than 25 horsepower. The direct counts were made based on interviews with rental equipment companies and sales outlets. Indirect calculation of equipment population was based on total dollars spent for road construction, new commercial and residential building permits, and municipal expenditures, mining (except oil and gas) employees (NAISC 212), aggregate (NAISC 327) employees, and landfill tonnage. Equipment populations were estimated either by direct count or indirect calculation for each of nine distinct ownership categories. Table 4-3 summarizes the construction equipment ownership categories accounted for, as well as the basis for the equipment population estimate in each category.

Table 4-3 Basic Equipment Population Estimate Methodologies

Construction Equipment Ownership Category	Surrogate or Survey Method Used to Estimate East Texas Equipment
Rental Companies	Local Survey Counts

State/County-Municipal Owners	TxDOT Lettings/County-Municipal Dollars
Municipal Contractors	Total Permit Dollars
Residential Contractors	Total Permit Dollars
Commercial Building Contractors	Total Permit Dollars
Heavy Highway Contractors	TxDOT Lettings
Industrial Construction and Maintenance	Total Permit Dollars
Mining and Aggregate Industry	Total Number of Employees
Landfill Industry	Yearly Tonnage

The TNRCC provided the results of a special study of diesel construction equipment over 25 horsepower for the Houston area. This study provided the basis for translating construction dollars or other surrogates into equipment inventories. Dollars spent for the Houston and East Texas counties were determined based on interviews with the state (TXDOT), city (city planning offices and budget divisions), and counties (county judge or responsible official for county precincts). This information was used to estimate the numbers of specific construction equipment types in East Texas, relative to the Houston area. Once the equipment inventory was determined, ENVIRON followed the methodology presented in the TNRCC study for inputting the data into the NONROAD model. This involved scaling the county-level data to state equipment population totals based on the models own county allocation scheme. ENVIRON thus created alternative equipment population input files that reflected these revised statewide diesel construction equipment population estimates, leaving all gasoline-powered and less-than-25-horsepower construction equipment unchanged. The Houston study also provided non-default activity estimates for many diesel construction equipment types for input into NONROAD. These values were used for the East Texas area as well. The NONROAD model thus estimated total East Texas emissions for small engines with the revised population counts for construction equipment.

The final non-default construction equipment population estimates for the 5-county East Texas area are presented in Table 4-4.

Table 4-4 Estimated 1999 Diesel Construction Equipment Population >25hp in the 5-County East Texas Area

Source Category Code	Equipment Type	Equipment Count
2270002003	Pavers	41
2270002015	Rollers	288
2270002018	Scrapers	10
2270002021	Paving Equipment	20
2270002024	Surfacing Equipment	79
2270002027	Signal Boards/Light Plants	23

2270002030	Trenchers	43
2270002033	Bore/Drill Rigs	150
2270002036	Excavators	315
2270002039	Concrete/Industrial Saws	16
2270002045	Cranes	107
2270002048	Graders	134
2270002051	Off-highway Trucks	24
2270002054	Crushing/Proc. Equipment	0
2270002057	Rough Terrain Forklifts	126
2270002060	Rubber Tire Loaders	445
2270002063	Rubber Tire Tractor/Dozers	9
2270002066	Tractors/Loaders/Backhoes	402
2270002069	Crawler Tractor/Dozers	325
2270002072	Skid Steer Loaders	81
2270002075	Off-Highway Tractors	2
2270002081	Other Construction Equipment	107

A discussion of how estimates in each ownership category were specifically handled is presented in the ensuing sections.

Rental Companies

Equipment owned by rental companies in the East Texas area were directly surveyed by Pollution Solutions. The estimates resulting from these direct inquiries were assumed to account for all rental contruction equipment in the 5-county area. Table 4-5 lists the rental companies surveyed.

Table 4-5 Construction Equipment Rental Companies Surveyed

3 Flags Rental	Dubose	NATIONS
AF-Enterprises	East Texas Machinery	Rent X
Ameco	Future(Case)	ROMCO
Clark	Hertz	RSC
DAR	Lift Truck Specialist	United Rental

The equipment population estimates for this ownership category for each equipment type are specified in Table 4-6.

Table 4-6 Surveyed 1999 >25hp Diesel Construction Equipment Owned by

East Texas Area Rental Companies

Source Category Code	Equipment Type	Equipment Count
2270002003	Pavers	2
2270002015	Rollers	37
2270002018	Scrapers	7
2270002021	Paving Equipment	0
2270002024	Surfacing Equipment	0
2270002027	Signal Boards/Light Plants	17
2270002030	Trenchers	15
2270002033	Bore/Drill Rigs	0
2270002036	Excavators	45
2270002039	Concrete/Industrial Saws	11
2270002045	Cranes	12
2270002048	Graders	27
2270002051	Off-highway Trucks	12
2270002054	Crushing/Proc. Equipment	0
2270002057	Rough Terrain Forklifts	109
2270002060	Rubber Tire Loaders	19
2270002063	Rubber Tire Tractor/Dozers	1
2270002066	Tractors/Loaders/Backhoes	128
2270002069	Crawler Tractor/Dozers	46
2270002072	Skid Steer Loaders	44
2270002075	Off-Highway Tractors	2
2270002081	Other Construction Equipment	62

State/County/Municipal Owners

The Houston survey results and road-related budgets provided the basis for estimating state, county, and municipally-owned construction equipment in the East Texas area. Pollution Solutions obtained the budget figures, provided in Table 4-7, directly from the applicable government agencies.

Table 4-7 Surrogates Used to Obtain Road-Related Construction Equipment Population Estimates for East Texas from Houston Area Data

Surrogate	Houston Area	East Texas Area	East TX$/ Houston$
County Road Maintenance	$257,938,001.00	$16,296,345.44	0.0632
City Road Maintenance	$864,204,807.00	$5,570,912.49	0.0064

TXDOT Highway Lettings	$64,405,258.00	$19,163,000.00	0.2975

The relationship between the Houston equipment population and the East Texas equipment population for each sector in this ownership category was assumed to be directly proportional to the sector budget amounts. The resulting estimated East Texas county- and municipally-owned construction equipment populations are presented Table 4-8.

Table 4-8 Estimates for 1999 >25hp Diesel Construction Equipment Owned by East Texas Area Counties and Municipalities

Source Category Code	Equipment Type	Houston Count	East Texas Count
2270002003	Pavers	28	1.4
2270002015	Rollers	135	9.8
2270002018	Scrapers	6	0.4
2270002021	Paving Equipment	6	0.4
2270002024	Surfacing Equipment	39	2.4
2270002027	Signal Boards/Light Plants	3	0.0
2270002030	Trenchers	16	0.6
2270002033	Bore/Drill Rigs	8	1.0
2270002036	Excavators	248	9.7
2270002039	Concrete/Industrial Saws	16	1.0
2270002045	Cranes	18	5.4
2270002048	Graders	134	11.5
2270002051	Off-highway Trucks	9	0.6
2270002054	Crushing/Proc. Equipment	0	0.0
2270002057	Rough Terrain Forklifts	3	0.4
2270002060	Rubber Tire Loaders	113	7.3
2270002063	Rubber Tire Tractor/Dozers	0	0.0
2270002066	Tractors/Loaders/Backhoes	551	25.3
2270002069	Crawler Tractor/Dozers	81	6.6
2270002072	Skid Steer Loaders	31	1.3
2270002075	Off-Highway Tractors	6	0.4
2270002081	Other Construction Equipment	22	0.9

Municipal Contractors

The construction equipment owned by municipal contractors were scaled from the Houston survey data to East Texas estimates using the dollar amount of residential and commercial building permits in each respective area. The surrogate values are shown in Table 4-9.

Table 4-9 Surrogates Used to Obtain Building-Related Construction Equipment Population

Estimates for East Texas from Houston Area Data

Surrogate	Houston Area	East Texas Area	East TX$/ Houston$
Residential/Commercial Building Permits	$1,179,277,018.00	$277,697,315.88	0.2355

The scaled equipment count in the municipal contractor ownership category is provided in Table 4-10.

Table 4-10 Estimates for 1999 >25hp Diesel Construction Equipment Owned by East Texas Area Municipal Contractors

Source Category Code	Equipment Type	Houston Count	East Texas Count
2270002003	Pavers	103	24.3
2270002015	Rollers	602	141.8
2270002018	Scrapers	13	3.1
2270002021	Paving Equipment	65	15.3
2270002024	Surfacing Equipment	112	26.4
2270002027	Signal Boards/Light Plants	11	2.6
2270002030	Trenchers	22	5.2
2270002033	Bore/Drill Rigs	25	5.9
2270002036	Excavators	613	144.4
2270002039	Concrete/Industrial Saws	19	4.5
2270002045	Cranes	0	0.0
2270002048	Graders	232	54.6
2270002051	Off-highway Trucks	44	10.4
2270002054	Crushing/Proc. Equipment	0	0.0
2270002057	Rough Terrain Forklifts	5	1.2
2270002060	Rubber Tire Loaders	485	114.2
2270002063	Rubber Tire Tractor/Dozers	0	0.0
2270002066	Tractors/Loaders/Backhoes	546	128.6
2270002069	Crawler Tractor/Dozers	558	131.4
2270002072	Skid Steer Loaders	49	11.5
2270002075	Off-Highway Tractors	0	0.0
2270002081	Other Construction Equipment	162	38.1

Residential Contractors

The equipment population for the residential contractor ownership category was also estimated based on the Houston study equipment population and total residential and commercial permitting. The results are shown in Table 4-11.

Table 4-11 Estimates for 1999 >25hp Diesel Construction Equipment Owned by East Texas Area Residential Contractors

Source Category Code	Equipment Type	Houston Count	East Texas Count
2270002003	Pavers	29	6.8
2270002015	Rollers	210	49.5
2270002018	Scrapers	0	0.0
2270002021	Paving Equipment	0	0.0
2270002024	Surfacing Equipment	125	29.4
2270002027	Signal Boards/Light Plants	0	0.0
2270002030	Trenchers	79	18.6
2270002033	Bore/Drill Rigs	30	7.1
2270002036	Excavators	264	62.2
2270002039	Concrete/Industrial Saws	0	0.0
2270002045	Cranes	0	0.0
2270002048	Graders	29	6.8
2270002051	Off-highway Trucks	0	0.0
2270002054	Crushing/Proc. Equipment	0	0.0
2270002057	Rough Terrain Forklifts	0	0.0
2270002060	Rubber Tire Loaders	272	64.1
2270002063	Rubber Tire Tractor/Dozers	0	0.0
2270002066	Tractors/Loaders/Backhoes	91	21.4
2270002069	Crawler Tractor/Dozers	328	77.2
2270002072	Skid Steer Loaders	29	6.8
2270002075	Off-Highway Tractors	0	0.0
2270002081	Other Construction Equipment	0	0.0

Commercial Building Contractors

The commercial building contractor category estimate employed the same method as residential and municipal contractors. The results follow in Table 4-12.

Table 4-12 Estimates for 1999 >25hp Diesel Construction Equipment Owned by East Texas Area Commercial Building Contractors

Source Category Code	Equipment Type	Houston Count	East Texas Count
2270002003	Pavers	0	0.0
2270002015	Rollers	0	0.0
2270002018	Scrapers	0	0.0
2270002021	Paving Equipment	0	0.0
2270002024	Surfacing Equipment	0	0.0
2270002027	Signal Boards/Light Plants	0	0.0

2270002030	Trenchers	0	0.0
2270002033	Bore/Drill Rigs	540	127.2
2270002036	Excavators	62	14.6
2270002039	Concrete/Industrial Saws	0	0.0
2270002045	Cranes	49	11.5
2270002048	Graders	61	14.4
2270002051	Off-highway Trucks	0	0.0
2270002054	Crushing/Proc. Equipment	0	0.0
2270002057	Rough Terrain Forklifts	0	0.0
2270002060	Rubber Tire Loaders	66	15.5
2270002063	Rubber Tire Tractor/Dozers	0	0.0
2270002066	Tractors/Loaders/Backhoes	44	10.4
2270002069	Crawler Tractor/Dozers	56	13.2
2270002072	Skid Steer Loaders	62	14.6
2270002075	Off-Highway Tractors	0	0.0
2270002081	Other Construction Equipment	0	0.0

Heavy Highway Contractors

The heavy highway ownership catogory estimate was again scaled from Houston data in the TNRCC study. The TXDOT highway lettings provided the surrogate for deriving East Texas construction equipment population numbers, presented in Table 4-13.

Table 4-13 Estimates for 1999 >25hp Diesel Construction Equipment Owned by East Texas Area Heavy Highway Contractors

Source Category Code	Equipment Type	Houston Count	East Texas Count
2270002003	Pavers	23	6.8
2270002015	Rollers	142	42.3
2270002018	Scrapers	0	0.0
2270002021	Paving Equipment	16	4.8
2270002024	Surfacing Equipment	68	20.2
2270002027	Signal Boards/Light Plants	13	3.9
2270002030	Trenchers	11	3.3
2270002033	Bore/Drill Rigs	31	9.2
2270002036	Excavators	114	33.9
2270002039	Concrete/Industrial Saws	0	0.0
2270002045	Cranes	156	46.4
2270002048	Graders	55	16.4
2270002051	Off-highway Trucks	2	0.6
2270002054	Crushing/Proc. Equipment	0	0.0
2270002057	Rough Terrain Forklifts	3	0.9
2270002060	Rubber Tire Loaders	100	29.8

2270002063	Rubber Tire Tractor/Dozers	25	7.4
2270002066	Tractors/Loaders/Backhoes	84	25.0
2270002069	Crawler Tractor/Dozers	132	39.3
2270002072	Skid Steer Loaders	5	1.5
2270002075	Off-Highway Tractors	0	0.0
2270002081	Other Construction Equipment	21	6.2

Industrial Construction and Maintenance Contractors

Table 4-14 shows the East Texas estimate for this ownership category, based on equipment population data in the Houston study and total residential and commercial building permit value.

Table 4-14 Estimates for 1999 >25hp Diesel Construction Equipment Owned by East Texas Area Industrial Construction and Maintenance Contractors

Source Category Code	Equipment Type	Houston Count	East Texas Count
2270002003	Pavers	0	0.0
2270002015	Rollers	35	8.2
2270002018	Scrapers	0	0.0
2270002021	Paving Equipment	0	0.0
2270002024	Surfacing Equipment	3	0.7
2270002027	Signal Boards/Light Plants	0	0.0
2270002030	Trenchers	0	0.0
2270002033	Bore/Drill Rigs	0	0.0
2270002036	Excavators	21	4.9
2270002039	Concrete/Industrial Saws	0	0.0
2270002045	Cranes	136	32.0
2270002048	Graders	14	3.3
2270002051	Off-highway Trucks	0	0.0
2270002054	Crushing/Proc. Equipment	0	0.0
2270002057	Rough Terrain Forklifts	60	14.1
2270002060	Rubber Tire Loaders	38	8.9
2270002063	Rubber Tire Tractor/Dozers	3	0.7
2270002066	Tractors/Loaders/Backhoes	78	18.4
2270002069	Crawler Tractor/Dozers	47	11.1
2270002072	Skid Steer Loaders	7	1.6
2270002075	Off-Highway Tractors	0	0.0
2270002081	Other Construction Equipment	0	0.0

Mining and Aggregate Industry

The East Texas equipment population used in the mining and aggregate industry was determined not based on budget values, but on number of employees. The Houston study again provided the base equipment population data. The County Business Patterns published by the U.S. Census provided the mid-March employment data. For the mining sector, only employees involved in non-oil and gas mining were included, under North American Industrial Classification System (NAISC) code 212. The aggregate employee count was found under the category of Nonmetallic Mineral Product Manufacturing (NAISC 327). Mining activity in East Texas is primarily coal mining while Houston mining is sand, gravel, or aggregate, so the actual equipment used in East Texas for mining may be significantly different than estimated here.

The numbers provided in Table 4-15 below are not exact values, because some companies provided only a size-range rather than an exact employee count. In those cases, the assumed size of the company was the midpoint of the size-range.

Table 4-15 Surrogates Used to Obtain Mining and Aggregate Construction Equipment Population Estimates for East Texas from Houston Area Data

Surrogate	Houston Area	East Texas Area	East TX #/ Houston #
Mining Employees	550	891	1.6200
Aggregate Employees	4,594	1,950	0.4245

The equipment population used was assumed to be proportional to the number of employees in each sector, resulting in the data in Table 4-16.

Table 4-16 Estimates for 1999 >25hp Diesel Construction Equipment Owned by the East Texas Area Mining and Aggregate Industry

Source Category Code	Equipment Type	Houston Count (Mining\Aggregate)	East Texas Count (Mining\Aggregate)
2270002003	Pavers	0	0.0
2270002015	Rollers	0	0.0
2270002018	Scrapers	0	0.0
2270002021	Paving Equipment	0	0.0
2270002024	Surfacing Equipment	0	0.0
2270002027	Signal Boards/Light Plants	0	0.0
2270002030	Trenchers	0	0.0
2270002033	Bore/Drill Rigs	0	0.0
2270002036	Excavators	0	0.0
2270002039	Concrete/Industrial Saws	0	0.0

2270002045	Cranes	0	0.0
2270002048	Graders	0	0.0
2270002051	Off-highway Trucks	0	0.0
2270002054	Crushing/Proc. Equipment	0	0.0
2270002057	Rough Terrain Forklifts	0	0.0
2270002060	Rubber Tire Loaders	296 (51/245)	186.6 (83/104)
2270002063	Rubber Tire Tractor/Dozers	0	0.0
2270002066	Tractors/Loaders/Backhoes	28 (28/0)	45.4 (45/0)
2270002069	Crawler Tractor/Dozers	0	0.0
2270002072	Skid Steer Loaders	0	0.0
2270002075	Off-Highway Tractors	0	0.0
2270002081	Other Construction Equipment	0	0.0

Landfill Industry

Landfills use construction equipment for moving, compacting, and covering municipal and hazardous waste. The most logical method for scaling the Houston survey estimates used the tonnage of material landfill. Conflicting information was received from TNRCC and ETCOG about operational municipal solid waste (MSW) landfills in the East Texas area. TNRCC supplied information that indicated that no MSW landfills were operating, while ETCOG indicated the total annual tonnage shown in Table 4-17. Both data sources indicated that no hazardous landfills were operating in the East Texas area.

Table 4-17 Surrogates Used to Obtain Landfill Construction Equipment Population Estimates for East Texas from Houston Area Data

Surrogate	Houston Area	East Texas Area	East TX tons/ Houston tons
Landfill Tons Per Year	5,445,966	128,969	0.0237

Using the higher estimate for MSW landfill tonnage results in the following equipment population estimates. However because of the insignificant equipment population total (when the higher estimates are used) and the confusion over the exact landfill tonnage, the landfill totals shown in Table 4-18 below were not included in the overall estimate of construction equipment.

Table 4-18 Estimates for 1999 >25hp Diesel Construction Equipment Owned by the East Texas Area Landfill Industry

Source Category Code	Equipment Type	Houston Count	East Texas Count
2270002003	Pavers	0	0.0
2270002015	Rollers	29	0.7
2270002018	Scrapers	2	0.0
2270002021	Paving Equipment	0	0.0
2270002024	Surfacing Equipment	0	0.0
2270002027	Signal Boards/Light Plants	0	0.0
2270002030	Trenchers	0	0.0
2270002033	Bore/Drill Rigs	0	0.0
2270002036	Excavators	13	0.3
2270002039	Concrete/Industrial Saws	0	0.0
2270002045	Cranes	0	0.0
2270002048	Graders	15	0.3
2270002051	Off-highway Trucks	4	0.1
2270002054	Crushing/Proc. Equipment	0	0.0
2270002057	Rough Terrain Forklifts	0	0.0
2270002060	Rubber Tire Loaders	2	0.0
2270002063	Rubber Tire Tractor/Dozers	0	0.0
2270002066	Tractors/Loaders/Backhoes	2	0.0
2270002069	Crawler Tractor/Dozers	46	1.1
2270002072	Skid Steer Loaders	0	0.0
2270002075	Off-Highway Tractors	0	0.0
2270002081	Other Construction Equipment	0	0.0

Pleasure Craft Methodology

For recreational boating, lake usage was obtained from the US Army Corps of Engineers, Ft Worth District for 25 lakes in the Ft Worth area. These lakes are generally in the northeast quarter of the state, from I35 to Louisiana and north of Hwy 290 to Oklahoma. Using data on the number of visitors to many of the lakes, it was calculated that for the Ft Worth District Lakes the average boat trips per year per acre was 5.89. This number was multiplied by the total lake surface acres in each of five East Texas counties to arrive at total boat trips in each county. The total boat trips was broken into equipment and fuel types based on county boat registration data obtained from the Texas Parks and Wildlife Department, Boat Registration Statistics Section. The average amount of boat motor use per boat trip was taken from the US Army Corps of Engineers' **Water Related Recreation Use Study on Lewisville Lake, Texas**. Visitors to Lewisville Lake were surveyed to determine the average total hours per boat trip and the percent of time during which the boat was running (Appendix B, Survey Forms, Questions 18 and 28). The given information resulted in an average 2.17 boat running hours per trip. This same value was used for all equipment and fuel types. In order to incorporate this information into EPA's NONROAD Mobile Emissions Model, the numbers of boat trips per county were input into the equipment population file at the county-level. Then the activity data for pleasure craft was changed in the appropriate file from the default hours per year to the determined boat hours per trip. The resulting NONROAD output reflected the modified recreational boating equipment counts and activity data.

References

1. **Houston/Galveston Attainment Demonstration and Post-1999 Rate-of-Progress SIP**, APPENDIX B, Documentation for the HGA Area Diesel Construction Emissions Project, August 2000.

2. US Army Corps of Engineers,**Water Related Recreation Use Study on Lewisville Lake, Texas**, Dec 1998, found at http://www.swf.usace.army.mil/links/OPs/Lewisville/Llrus/llrus/index_frameset.htm

3. U.S. Census Bureau, **1998 County Business Patterns**, found at http://www.census.gov/pub/epcd/cbp/download/cbpdownload.html

SECTION 5   ON-ROAD MOBILE SOURCES

Introduction

The on road emissions were provided by May McGarry-Barber of the TNRCC, phone 512-239-1987. The following is a print out of the emission summary by County as provided to Pollution Solutions. See the Appendix for a copy of the written report that was supplied with the emission summary.

Upshur Monday-Thursday September 1999
24 Hour
POUNDS OF VOC POLLUTION

COUNTY: Upshur

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RURAL OTHER PRIN ART	273.6	147.4	24.5	127.5	0.2	0.3	63.9	2.0	639.3
RURAL MINOR ARTERIAL	573.5	308.0	51.2	271.4	0.4	0.6	138.5	4.1	1347.9
RURAL MAJOR COLLECTO	331.4	173.7	29.1	151.1	0.3	0.4	80.7	2.1	768.8
RURAL MINOR COLLECTO	72.8	37.8	6.3	33.0	0.1	0.1	18.0	0.4	168.5
RURAL LOCAL	110.8	57.0	9.6	50.3	0.1	0.1	27.9	0.6	256.5
SMALL URBAN INTERSTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN MINOR AR	8.5	4.5	0.7	3.9	0.0	0.0	2.1	0.1	19.7
SMALL URBAN MAJOR CO	1.7	0.9	0.1	0.8	0.0	0.0	0.4	0.0	3.8
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	9.3	4.8	0.8	4.2	0.0	0.0	2.3	0.1	21.6

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MINOR ARTERIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MAJOR COLLECTO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN LOCAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0TOTALS	1381.7	734.0	122.4	642.2	1.1	1.5	333.9	9.3	3226.0

Upshur Monday-Thursday September 1999
24 Hour
POUNDS OF CO POLLUTION

COUNTY: Upshur

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RURAL OTHER PRIN ART	2244.5	1249.0	209.3	1775.9	0.5	0.5	327.8	4.5	5812.1
RURAL MINOR ARTERIAL	4687.6	2600.4	436.4	3495.6	1.0	1.1	670.2	9.4	11901.7
RURAL MAJOR COLLECTO	2867.5	1524.5	260.3	1804.4	0.5	0.6	365.8	5.7	6829.3
RURAL MINOR COLLECTO	654.5	342.3	58.7	393.1	0.1	0.1	81.1	1.3	1531.2
RURAL LOCAL	1039.9	536.2	92.1	613.0	0.2	0.2	127.7	2.1	2411.4
SMALL URBAN INTERSTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN MINOR AR	73.7	39.2	6.7	46.2	0.0	0.0	9.4	0.1	175.3
SMALL URBAN MAJOR CO	14.9	7.8	1.3	9.0	0.0	0.0	1.9	0.0	34.9
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	87.4	45.1	7.7	51.6	0.0	0.0	10.7	0.2	202.8

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MINOR ARTERIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MAJOR COLLECTO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN LOCAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0TOTALS	11670.1	6344.3	1072.5	8188.8	2.4	2.7	1594.5	23.5	28898.7

Upshur Monday-Thursday September 1999
24 Hour
POUNDS OF NOX POLLUTION

COUNTY: Upshur

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RURAL OTHER PRIN ART	467.3	221.5	39.8	284.8	1.0	1.1	613.1	0.6	1629.2
RURAL MINOR ARTERIAL	854.3	398.6	71.5	570.7	1.9	2.1	1148.9	1.0	3048.9
RURAL MAJOR COLLECTO	422.0	197.3	35.4	268.5	0.8	0.9	513.5	0.5	1439.0
RURAL MINOR COLLECTO	83.6	39.1	7.0	51.8	0.2	0.2	101.1	0.1	283.1
RURAL LOCAL	112.5	52.7	9.5	68.0	0.2	0.3	139.8	0.1	383.1
SMALL URBAN INTERSTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN MINOR AR	10.8	5.0	0.9	6.8	0.0	0.0	13.1	0.0	36.6
SMALL URBAN MAJOR CO	1.9	0.9	0.2	1.2	0.0	0.0	2.3	0.0	6.5
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	9.5	4.4	0.8	5.7	0.0	0.0	11.8	0.0	32.2

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN MINOR ARTERIAL	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN MAJOR COLLECTO	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN LOCAL	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
0TOTALS	1961.8	919.6	165.1	1257.6	4.1	4.6		
2543.5	2.3	6858.7						

-STEP: SUMALL ENDED AT: 03/27/2001 14:35:40

Smith Monday-Thursday September 1999
24 Hour
POUNDS OF VOC POLLUTION

COUNTY: Smith

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
Centroid Con.	1510.7	810.4	130.7	265.5	1.3	1.8	176.4	7.5	2904.3
Freeway	1945.3	1135.6	179.4	262.6	1.1	1.6	155.5	11.6	3692.7
Div. Circ. Prin Art	778.1	431.6	68.9	137.9	0.6	0.9	87.4	4.7	1510.1
Div. Prin. Art	2786.5	1535.8	245.6	493.3	2.3	3.2	314.0	16.3	5397.0
Undiv. Prin. Art.	1093.8	605.7	96.7	194.4	0.9	1.2	123.1	6.5	2122.4
Div Minor Art	224.7	122.3	19.6	39.3	0.2	0.3	25.7	1.2	433.4
Undiv Minor Art	1122.5	616.1	98.7	198.8	0.9	1.3	128.0	6.4	2172.7
Collector	490.6	267.9	43.0	86.0	0.4	0.6	55.9	2.8	947.2
0TOTALS	9952.2	5525.4	882.6	1677.8	7.7	10.8	1066.1	57.1	19179.8

Smith Monday-Thursday September 1999
24 Hour
POUNDS OF CO POLLUTION

COUNTY: Smith

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
Centroid Con.	14111.6	7600.7	1253.0	3211.9	2.8	3.1	821.5	26.8	27031.5
Freeway	27793.6	18391.0	2875.0	5502.0	3.6	4.1	1069.6	78.2	55717.1
Div. Circ. Prin Art	6519.4	3742.9	603.5	1708.0	1.4	1.6	413.9	12.2	13003.0
Div. Prin. Art	23906.2	13516.8	2188.9	6261.4	5.1	5.8	1513.4	45.1	47442.5
Undiv. Prin. Art.	9251.1	5278.2	851.7	2473.0	2.0	2.3	594.8	17.4	18470.5
Div Minor Art	1977.2	1094.2	178.8	468.6	0.4	0.4	117.9	3.7	3841.3
Undiv Minor Art	9699.4	5446.5	884.5	2435.1	2.0	2.3	601.0	18.2	19089.0
Collector	4268.0	2376.0	387.5	1026.6	0.9	1.0	257.1	7.9	8325.1
0TOTALS	97526.4	57446.3	9223.0	23086.6	18.2	20.5	5389.4	209.5	192920.0

1

Smith Monday-Thursday September 1999
24 Hour
POUNDS OF NOX POLLUTION

COUNTY: Smith

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
Centroid Con.	1579.4	756.4	133.3	421.4	3.3	3.8	946.7	1.6	3845.9
Freeway	3617.9	1824.3	320.5	755.0	9.0	10.2	2558.9	4.0	9099.8
Div. Circ. Prin Art	1104.5	528.5	92.7	313.9	2.4	2.7	674.6	1.2	2720.4
Div. Prin. Art	3868.0	1861.1	326.8	1060.0	8.3	9.5	2364.5	4.2	9502.3
Undiv. Prin. Art.	1556.2	747.6	131.2	433.2	3.4	3.8	960.6	1.7	3837.7
Div Minor Art	274.3	131.2	23.0	75.8	0.6	0.6	161.1	0.3	666.9
Undiv Minor Art	1452.0	694.2	121.9	408.5	3.1	3.5	883.7	1.6	3568.5
Collector	617.3	295.1	51.8	171.9	1.3	1.5	363.0	0.7	1502.5
0TOTALS	14069.5	6838.1	1201.3	3639.8	31.4	35.7	8913.1	15.1	34743.9

-STEP: SUMALL ENDED AT: 04/03/2001 10:08:26

Rusk Monday-Thursday September 1999
24 Hour
POUNDS OF VOC POLLUTION

COUNTY: Rusk

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RURAL OTHER PRIN ART	625.0	341.6	51.3	140.7	0.5	0.7	64.4	3.8	1228.0
RURAL MINOR ARTERIAL	307.5	167.7	25.2	70.5	0.2	0.3	32.8	1.9	606.2
RURAL MAJOR COLLECTO	584.8	310.8	47.2	128.7	0.5	0.6	63.0	3.2	1138.8
RURAL MINOR COLLECTO	189.7	99.8	15.2	41.4	0.2	0.2	20.8	1.0	368.3
RURAL LOCAL	234.9	122.5	18.7	51.4	0.2	0.3	26.2	1.1	455.3
SMALL URBAN INTERSTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	241.0	129.3	19.6	53.7	0.2	0.3	25.8	1.4	471.3
SMALL URBAN MINOR AR	129.6	68.8	10.5	28.5	0.1	0.1	14.0	0.7	252.3
SMALL URBAN MAJOR CO	43.1	22.7	3.5	9.4	0.0	0.0	4.7	0.2	83.7
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	168.8	88.1	13.5	36.9	0.1	0.2	18.8	0.8	327.2

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MINOR ARTERIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MAJOR COLLECTO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN LOCAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0TOTALS	2524.5	1351.4	204.6	561.4	2.0	2.8	270.4	14.0	4931.1

Rusk Monday-Thursday September 1999
24 Hour
POUNDS OF CO POLLUTION

COUNTY: Rusk

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RURAL OTHER PRIN ART	5174.8	2919.2	433.9	1986.2	1.1	1.3	330.6	9.0	10856.0
RURAL MINOR ARTERIAL	2531.6	1425.7	212.1	918.6	0.5	0.6	158.9	4.4	5252.4
RURAL MAJOR COLLECTO	5089.6	2737.3	418.9	1552.8	1.0	1.1	284.5	8.7	10094.0
RURAL MINOR COLLECTO	1712.6	905.6	139.9	499.8	0.3	0.4	93.2	3.0	3354.8
RURAL LOCAL	2209.9	1151.7	179.4	634.3	0.4	0.5	119.4	4.0	4299.5
SMALL URBAN INTERSTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	2045.4	1118.9	169.5	660.4	0.4	0.5	118.6	3.5	4117.0
SMALL URBAN MINOR AR	1130.2	607.1	93.0	343.6	0.2	0.2	63.0	1.9	2239.4
SMALL URBAN MAJOR CO	389.4	205.9	31.8	113.6	0.1	0.1	21.2	0.7	762.8
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	1588.5	827.9	128.9	455.9	0.3	0.3	85.9	2.8	3090.5

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN MINOR ARTERIAL	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN MAJOR COLLECTO	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN LOCAL	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
0TOTALS	21871.9	11899.3	1807.4	7165.3	4.3	4.9		
1275.3	38.0	44066.5						

Rusk Monday-Thursday September 1999
24 Hour
POUNDS OF NOX POLLUTION

COUNTY: Rusk

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RURAL OTHER PRIN ART	1074.5	509.4	84.5	286.9	2.3	2.6	656.8	1.1	2618.2
RURAL MINOR ARTERIAL	458.7	213.9	35.5	135.4	1.0	1.1	289.5	0.5	1135.7
RURAL MAJOR COLLECTO	743.1	346.9	57.7	208.6	1.5	1.7	422.2	0.7	1782.3
RURAL MINOR COLLECTO	217.5	101.6	16.9	59.5	0.4	0.5	122.8	0.2	519.4
RURAL LOCAL	238.1	111.2	18.6	63.5	0.5	0.5	138.2	0.2	570.9
SMALL URBAN INTERSTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	328.7	153.4	25.5	94.2	0.7	0.8	192.2	0.3	795.8
SMALL URBAN MINOR AR	163.7	76.4	12.7	45.9	0.3	0.4	92.9	0.2	392.4
SMALL URBAN MAJOR CO	49.5	23.1	3.8	13.5	0.1	0.1	27.9	0.0	118.1
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	171.2	80.0	13.4	45.7	0.3	0.4	99.3	0.2	410.4

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MINOR ARTERIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MAJOR COLLECTO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN LOCAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0TOTALS	3445.0	1616.0	268.5	953.2	7.2	8.0	2041.9	3.5	8343.3

-STEP: SUMALL ENDED AT: 03/27/2001 14:20:13

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Harrison Monday-Thursday September 1999
24 Hour
POUNDS OF VOC POLLUTION

COUNTY: Harrison

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	1844.2	996.3	159.9	559.2	1.0	1.4	310.4	11.6	3883.9
RURAL OTHER PRIN ART	320.6	168.1	26.9	128.8	0.2	0.3	74.0	2.2	721.2
RURAL MINOR ARTERIAL	464.0	242.6	38.9	189.7	0.4	0.5	110.9	3.1	1050.1
RURAL MAJOR COLLECTO	503.9	257.2	41.6	199.4	0.4	0.5	121.5	3.0	1127.5
RURAL MINOR COLLECTO	107.4	54.3	8.8	42.3	0.1	0.1	26.3	0.6	239.9
RURAL LOCAL	175.8	88.2	14.3	69.7	0.1	0.2	43.9	0.9	393.2
SMALL URBAN INTERSTA	94.0	50.8	8.1	28.5	0.1	0.1	15.8	0.6	197.9
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	382.3	196.9	31.7	152.7	0.3	0.4	91.5	2.4	858.2
SMALL URBAN MINOR AR	107.6	54.9	8.9	42.6	0.1	0.1	26.0	0.6	240.8
SMALL URBAN MAJOR CO	97.1	49.1	8.0	38.3	0.1	0.1	23.8	0.5	217.0
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	388.9	195.0	31.7	154.2	0.3	0.4	97.1	2.0	869.6

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0		
0.0	0.0	0.0						
URBAN MINOR ARTERIAL	7.6	3.8	0.6	3.0	0.0	0.0		
1.9	0.0	16.9						
URBAN MAJOR COLLECTO	2.0	1.0	0.2	0.8	0.0	0.0		
0.5	0.0	4.4						
URBAN LOCAL	33.4	16.7	2.7	13.2	0.0	0.0		
8.3	0.2	74.6						
0TOTALS	4528.7	2374.8	382.3	1622.4	3.1	4.2		
951.8	28.0	9895.3						

Harrison Monday-Thursday September 1999
24 Hour
POUNDS OF CO POLLUTION

COUNTY: Harrison

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	27121.3	16147.5	2606.4	11857.7	3.2	3.5	2138.5	77.5	59955.6
RURAL OTHER PRIN ART	2655.9	1428.0	230.7	1805.7	0.6	0.6	382.3	5.2	6508.9
RURAL MINOR ARTERIAL	3825.0	2051.7	331.9	2454.7	0.8	0.9	540.0	7.4	9212.4
RURAL MAJOR COLLECTO	4386.3	2258.0	372.0	2377.7	0.8	0.9	553.5	8.4	9957.6
RURAL MINOR COLLECTO	969.3	491.7	81.4	502.7	0.2	0.2	119.1	1.9	2166.5
RURAL LOCAL	1654.0	828.9	137.6	843.8	0.3	0.3	201.9	3.3	3670.1
SMALL URBAN INTERSTA	1381.7	822.6	132.8	604.1	0.2	0.2	108.9	3.9	3054.4
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	3247.0	1696.5	277.8	1859.2	0.6	0.7	424.4	6.2	7512.4
SMALL URBAN MINOR AR	938.0	482.6	79.5	507.4	0.2	0.2	118.2	1.8	2127.9
SMALL URBAN MAJOR CO	876.8	444.8	73.6	454.7	0.2	0.2	107.8	1.7	1959.8
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	3657.6	1833.0	304.3	1866.0	0.7	0.7	446.5	7.4	8116.1

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MINOR ARTERIAL	68.6	34.8	5.8	35.5	0.0	0.0	8.4	0.1	153.2
URBAN MAJOR COLLECTO	18.4	9.2	1.5	9.4	0.0	0.0	2.2	0.0	40.8
URBAN LOCAL	314.3	157.5	26.1	160.4	0.1	0.1	38.4	0.6	697.5
0TOTALS	51114.1	28686.7	4661.6	25339.0	7.7	8.5	5190.0	125.6	115133.2

Harrison Monday-Thursday September 1999
24 Hour
POUNDS OF NOX POLLUTION

COUNTY: Harrison

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
RURAL INTERSTATE	3364.1	1592.7	278.0	1544.8	8.1	8.9	5087.7	3.9	11888.1
RURAL OTHER PRIN ART	546.5	250.6	43.6	322.2	1.2	1.3	731.2	0.6	1897.2
RURAL MINOR ARTERIAL	687.6	310.5	53.9	446.4	1.5	1.7	947.0	0.8	2449.4
RURAL MAJOR COLLECTO	637.6	288.4	50.1	394.0	1.3	1.4	793.0	0.7	2166.5
RURAL MINOR COLLECTO	122.6	55.5	9.7	73.8	0.2	0.3	151.5	0.1	413.7
RURAL LOCAL	177.5	80.4	14.0	104.3	0.4	0.4	225.5	0.2	602.7
SMALL URBAN INTERSTA	171.4	81.1	14.2	78.7	0.4	0.5	259.2	0.2	605.6
SMALL URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN OTHER PR	518.2	234.2	40.7	326.8	1.1	1.2	662.7	0.6	1785.4
SMALL URBAN MINOR AR	135.7	61.4	10.7	83.8	0.3	0.3	168.6	0.2	460.8
SMALL URBAN MAJOR CO	110.9	50.2	8.7	66.8	0.2	0.2	137.0	0.1	374.2
SMALL URBAN MINOR CO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMALL URBAN LOCAL	392.6	177.8	31.0	230.7	0.8	0.9	498.7	0.4	1332.8

URBAN INTERSTATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN FREEWAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN OTHER PRIN ART	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URBAN MINOR ARTERIAL	8.5	3.8	0.7	5.1	0.0	0.0	10.5	0.0	28.7
URBAN MAJOR COLLECTO	2.0	0.9	0.2	1.2	0.0	0.0	2.5	0.0	6.7
URBAN LOCAL	33.6	15.2	2.7	19.7	0.1	0.1	42.7	0.0	114.0
0TOTALS	6908.7	3202.8	558.1	3698.3	15.4	16.9	9717.7	8.0	24125.9

-STEP: SUMALL ENDED AT: 03/27/2001 13:26:26

Gregg Monday-Thursday September 1999
24 Hour
POUNDS OF VOC POLLUTION

COUNTY: ALL COUNTIES

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
Centroid Con.	772.9	393.2	59.0	121.8	0.6	0.9	95.8	3.8	1448.1
Interstate	1395.4	764.4	112.2	180.4	0.8	1.1	128.5	8.3	2591.0
Div Major Hwy	965.4	509.4	75.6	150.4	0.7	1.0	112.7	5.9	1821.1
Undiv Major Hwy	799.9	425.1	63.1	126.8	0.6	0.9	91.5	5.0	1512.8
Div. Prin. Art.	1193.3	615.1	91.4	172.0	1.0	1.3	135.9	6.5	2216.5
Undiv. Prin. Art.	364.2	190.0	28.3	57.8	0.3	0.4	42.7	2.0	685.7
Div Minor Art	420.1	215.7	32.4	72.3	0.3	0.5	55.8	2.3	799.4
Undiv Minor Art	483.3	248.6	37.0	72.1	0.4	0.5	56.4	2.6	900.9
Div.Collector	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Undiv.Collector	697.6	358.6	54.0	123.1	0.6	0.8	93.0	3.7	1331.4
Intrazonal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0TOTALS	7092.1	3720.1	552.9	1076.7	5.4	7.5	812.4	40.0	13307.1

Gregg Monday-Thursday September 1999
24 Hour
POUNDS OF CO POLLUTION

COUNTY: ALL COUNTIES

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
Centroid Con.	7238.8	3699.2	564.9	1439.6	1.4	1.6	442.2	13.7	13401.3
Interstate	19868.1	12123.8	1742.8	3802.2	2.6	2.9	871.1	54.6	38468.0
Div Major Hwy	8664.4	4761.9	707.2	2134.2	1.7	2.0	577.2	17.2	16865.8
Undiv Major Hwy	7055.5	3917.8	579.9	1847.9	1.5	1.7	476.8	13.9	13894.9
Div. Prin. Art.	10616.9	5530.8	830.9	1983.4	2.1	2.3	627.5	19.6	19613.6
Undiv. Prin. Art.	3186.7	1699.0	253.7	736.5	0.7	0.7	202.3	5.8	6085.4
Div Minor Art	3777.3	1964.3	298.8	883.8	0.7	0.8	256.4	7.0	7189.2
Undiv Minor Art	4366.9	2268.2	342.1	850.8	0.9	1.0	261.5	8.1	8099.5
Div.Collector	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Undiv.Collector	6310.1	3286.1	500.9	1538.4	1.3	1.4	435.3	11.8	12085.2
Intrazonal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0TOTALS	71084.9	39251.0	5821.2	15216.8	12.8	14.3	4150.2	151.9	135703.0

1 Gregg Monday-Thursday September 1999

24 Hour

POUNDS OF NOX POLLUTION

COUNTY: ALL COUNTIES

VEHICLE TYPE

ROADWAY TYPE	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC	TOTALS
Centroid Con.	817.1	373.6	62.1	229.8	1.7	1.9	508.9	0.8	1995.9
Interstate	2615.3	1251.7	207.4	614.3	6.4	7.1	2043.5	2.9	6748.5
Div Major Hwy	1529.1	706.4	117.0	440.4	3.3	3.7	1051.3	1.7	3852.7
Undiv Major Hwy	1346.0	626.5	103.9	375.2	2.9	3.3	898.2	1.5	3357.6
Div. Prin. Art.	1442.8	659.6	108.9	386.4	2.9	3.3	835.0	1.5	3440.4
Undiv. Prin. Art.	504.2	231.9	38.3	141.2	1.1	1.2	309.0	0.5	1227.3
Div Minor Art	511.7	233.5	38.8	162.3	1.0	1.2	345.5	0.5	1294.5
Undiv Minor Art	568.4	260.1	43.0	154.9	1.2	1.3	338.4	0.6	1367.8
Div.Collector	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Undiv.Collector	846.1	386.4	64.4	275.0	1.8	2.0	589.9	0.9	2166.4
Intrazonal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0TOTALS	10180.7	4729.7	783.9	2779.5	22.2	24.8	6919.6	10.9	25451.2

-STEP: SUMALL ENDED AT: 04/04/2001 15:54:09

SECTION 6 BIOGENIC EMISSIONS

Introduction

The Biogenic emissions were provided by Gregg Yarwood of ENVIRON, phone 415-899-0704. The following is a print out of the memorandum and emission summary as provided to Pollution Solutions.

ENVIRON

MEMORANDUM

To: Mark Sweeney, ETCOG

From: Greg Yarwood, Gerry Mansell and Steve Lau

Date: Revised, June 19, 2001

Subject: Biogenic Emissions for Inclusion in the 1999 East Texas Emission Inventory

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Summary

ENVIRON and Pollution Solutions are preparing a 1999 emission inventory for the 5 county area of East Texas that is part of North East Texas Air Care (NETAC). This emission inventory will be submitted to the Texas Natural Resource Conservation Commission (TNRCC) and also will be used in ozone modeling for East Texas. This memorandum presents the biogenic emissions estimates for the 5 county area (Table 1), describes the methodology and assumptions for the emissions calculation, and compares the present inventory to the previous biogenic emission inventory (Yarwood et al., 1999a).

Table 1. Biogenic emissions (tons/day) for a typical summer day.

County	VOC	NOx
Gregg	152.49	0.44
Harrison	215.13	0.33
Rusk	191.18	0.31
Smith	176.07	0.44
Upshur	172.38	0.49
Total	**907.25**	**2.00**

The new biogenic emissions are based on:

- Version 2.2 of the GloBEIS biogenic emissions model (Yarwood et al., 1999b and 1999c; Guenther et al., 1999a and 1999b).
- The latest landuse/landcover (LULC) data for biogenic emissions developed by the TNRCC (Yarwood et al., 1999b; Wiedinmyer et al., 1999).
- Weather conditions for a typical summer day in East Texas in 1999.

The new inventory supersedes the previous biogenic emission inventory prepared for East Texas in 1998 (Yarwood et al. (1999c). The new emission totals are consistent with the assumptions in the final round ozone control strategy modeling for 1-hour ozone performed in

1999, so it is not expected that these updates to the biogenic inventory would change the control strategies for East Texas.

The emission totals presented in Table 1 are for a typical summer day condition. Biogenic emission inventories for ozone modeling will be re-calculated for the temperatures that actually occurred on the days being modeled (i.e., the biogenic emissions will be day specific) using the same model and LULC data.

GloBEIS2 Model and Input Data

Emissions were calculated using Version 2.2 of the GloBEIS biogenic emissions model (Yarwood et al., 1999b and 1999c;). GloBEIS2 includes options for calculating emissions using either the BEIS2 methodology or the updated BEIS99 methodology (Guenther et al., 1999a and 1999b). The BEIS99 option was used here because it represents improved science over BEIS2. GloBEIS also includes an option to adjust the BEIS99 emissions for seasonal variations in biomass density. The seasonal adjustment was not used because the TNRCC would like to further review the methodology before using it in emission inventories.

GloBEIS requires external data to describe the landuse/landcover, temperatures and solar radiation. The landuse/landcover (LULC) data were from the most recent study sponsored by the TNRCC (Yarwood et al., 1999b; Wiedinmyer et al., 1999).

Temperature and Cloud Cover Data

Representative temperature and cloud cover data for an ozone season day were developed as part of a TNRCC project to improve the 1999 emission inventory for all counties in Texas. The objective was to characterize typical conditions on a high ozone day in 1999, not to characterize any one particular day.

Surface temperatures were characterized by averaging over two periods (August 13-22, and September 13-20, 1999) when high ozone levels were observed in many parts of Eastern Texas. These periods are also the basis of photochemical modeling currently being developed for several ozone "near nonattainment areas" so the county level biogenic emissions developed here are generally representative of biogenic emissions being used in the 1999 ozone modeling. Hourly surface temperature observations archived by the National Climatic Data Center (NCDC) were analyzed to develop an average temperature profile for each county, as shown in Table 2. These temperature data are further described in the report on the preparation of the biogenic emission inventories for ozone modeling (Yarwood et al., 2001).

Table 2. Average hourly temperatures (K) for the 5 counties during summer 1999 (in Kelvin).

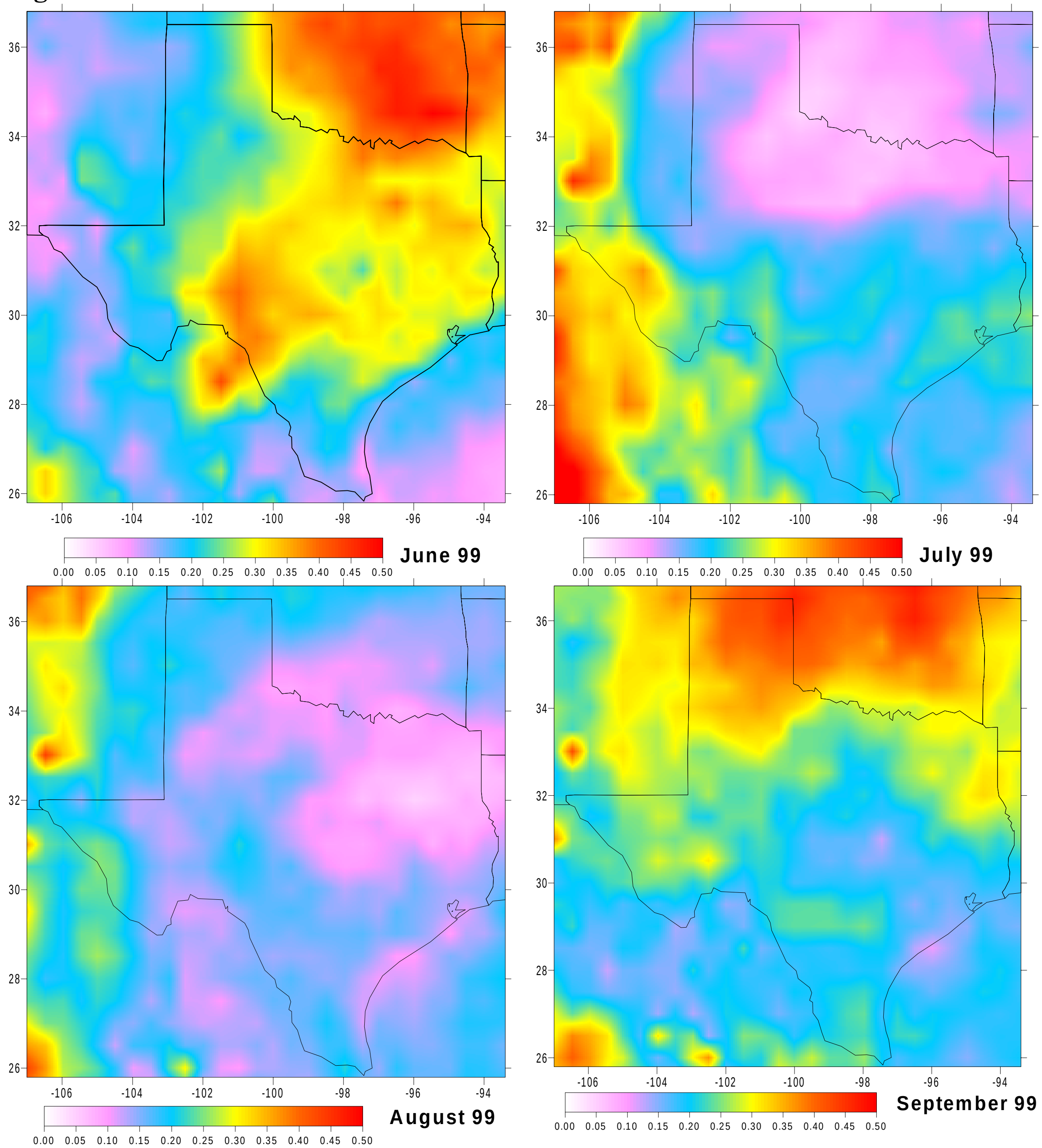
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Gregg	297.1	296.4	295.8	295.1	294.4	294.0	293.7	295.1
Harrison	296.9	296.1	295.5	294.8	294.2	293.7	293.4	294.9
Rusk	297.0	296.2	295.7	294.9	294.2	293.8	293.6	295.1
Smith	297.7	296.9	296.3	295.6	294.9	294.5	294.2	295.4
Upshur	297.2	296.4	295.8	295.2	294.5	294.0	293.7	295.1

	8	9	10	11	12	13	14	15
Gregg	297.7	300.1	302.0	303.7	305.0	306.0	306.9	307.1
Harrison	297.5	300.0	301.9	303.6	304.8	305.8	306.7	306.9
Rusk	297.8	300.4	302.3	304.1	305.4	306.3	307.2	307.4
Smith	298.0	300.3	302.2	304.0	305.3	306.3	307.2	307.4
Upshur	297.6	299.9	301.9	303.6	304.9	305.9	306.8	307.0

	16	17	18	19	20	21	22	23
Gregg	307.1	306.5	305.4	302.7	300.4	299.4	298.6	298.0
Harrison	306.8	306.3	305.1	302.4	300.2	299.2	298.3	297.8
Rusk	307.4	306.6	305.4	302.5	300.1	299.1	298.3	297.7
Smith	307.5	306.8	305.7	303.1	300.9	299.9	299.0	298.4
Upshur	307.0	306.5	305.3	302.7	300.6	299.6	298.7	298.1

Cloud cover was characterized from Geostationary Operational Environmental Satellite (GOES) data analyzed and archived by the University of Maryland (UMD). UMD provided average cloud cover fraction for the months of June, July, August and September 1999 on a half-degree grid covering the continental US. These data are shown for Texas in Figure 1. The cloud cover fraction over Texas in 1999 varied from month to month according to the passage of stormy and clear weather systems. Overall, a cloud cover fraction of two tenths appears representative for summer conditions in East Texas, and so this was used as the basis for calculating the biogenic emissions. The UMD satellite data were also used in the preparation of the biogenic emission inventories for ozone modeling as described further in (Yarwood et al., 2001).

Figure 1. Cloud Fraction Plot for Summer 99.



GloBEIS2 Emissions

Comparison to Previous Inventory

The differences in methodology used for the previous biogenic emissions inventory (Yarwood et al., 1999a) are summarized below and the previous emission totals for the five county area are shown in Table 3.

- Older version of the TNRCC LULC data. The main changes (Yarwood et al., 1999b) were an updated methodology for crop lands.
- Older version of the GloBEIS model. The main update for GloBEIS2 was the inclusion of updated isoprene emission factor algorithms (called BEIS99) in place of the older BEIS2 algorithms.
- Different temperatures. The previous inventory assumed slightly warmer temperatures, on average.
- Previous inventory was derived from a gridded inventory (as used for photochemical modeling). Consequently, the previous emission totals were only available for the total 5 county area and were calculated by adding up the emissions for all grid squares covering the 5 county region.

Table 3. Total biogenic emissions (tons/day) for the five county region from the previous study.

	Total
VOC	1350.2
NOx	2.00

Comparing the emissions totals in Tables 1 and 3 shows:

- Decrease in the total VOC emissions for the five county area of 30 percent for the new inventory. This is consistent with the changes between the BEIS99 and BEIS2 algorithms.
- No change in NOx emissions.

The latest biogenic emission totals lead to the following conclusions regarding the role of biogenic sources in ozone formation in East Texas.

- Biogenic VOC emissions are still large relative to anthropogenic VOC emissions for the five county area and will play an important role in local ozone formation.
- Biogenic NOx emissions are small and will make negligible contribution to local ozone formation.

References

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APPENDIX

TECHNICAL NOTE

Transportation Air Quality Technical Support Interagency Contract with Texas Natural Resource Conservation Commission

TO: Mary McGarry-Barber, Project Manager — DATE: 22 May, 2001
Texas Natural Resource Conservation Commission

FROM: Dennis G. Perkinson, Ph.D.
TTI STUDY NO: 402011-24
Texas Transportation Institute

SUBJECT: Near Nonattainment Support - Rider 13 / 1999 Analysis
(Umbrella Contract 9880077500-06: Task 2) - **Final**

BACKGROUND

The Texas Natural Resource Conservation Commission (TNRCC) has agreed to provide CAM-x model-ready emissions for on-road mobile source to Rider 13 participants that include: Austin, San Antonio, Tyler-Longview, Victoria, and Corpus Christi. The spatial extent shall be all counties east of San Angelo, Texas and north of Laredo, Texas, but will not include the core counties in the Dallas-Fort Worth and Houston-Galveston ozone nonattainment areas. The temporal extent defined by the TNRCC, is a two-week regional ozone episode that occurred in August-September, 1999. A 24-hour output format is used based on hourly profiles within these daily estimates. Using travel demand model data where available and a "rural" HPMS method elsewhere, the Texas Transportation Institute (TTI) will provide the following:

- Reference coordinates for selected (primarily link based) counties.
- Model output for each specified day by roadway link, which includes intrazonals, centroid connectors, and/or HPMS "virtual links".
- Model output summary files which summarize each day's vehicle miles of travel, average speed weighted by vehicle miles of travel, and totals for volatile organic compounds, carbon monoxide, and oxides of nitrogen.
- Documentation including MOBILE model inputs and all relevant data to be able to replicate the results.

Deliverables

Interim deliverables are a Technical Note provided to the Project Manager in WordPerfect 6/7/8 format which is supported by electronic document files. All pertinent data have been submitted in specified electronic format. CD-ROM media has been used to record the final data and supporting documentation. TTI has provided five copies of the final report. One of the copies was an unbound original suitable for copying. Electronic copies of all materials related to the task report, to document results and conclusions (e.g., data, work files, text files, etc.), or developed as work products under this contract have also been supplied either with this final report or earlier, as requested by the TNRCC staff.

INTRODUCTION

The TNRCC's episodic on-road mobile source emissions inventories to support photochemical modeling for Texas Rider 13 participants requires emissions estimates for August - September weekday, Friday, Saturday, and Sunday for 1999 (see Appendix 1 for Rider 13 participants). Conversion of 1999 annual average daily traffic (AADT) (i.e., Monday through Sunday, January through December volumes) to August - September weekday, Friday, Saturday, and Sunday is required. This conversion is based on automatic traffic recorder (ATR) data collected by the Texas Department of Transportation (TxDOT) on a continuous basis throughout Texas.

In addition, 1999 vehicle miles traveled (VMT) are required for each county. Highway performance monitoring system (HPMS) data for each county for 1999 is used for this purpose. These AADT VMT estimates are adjusted to August - September weekday, Friday, Saturday, and Sunday VMT using the factors developed from ATR data.

Finally, the proportion of VMT attributable to each of the eight U.S. Environmental Protection Agency (EPA) vehicle types is estimated for each county. These estimates are based on the most recent official TxDOT vehicle classification counts (1997, 1998, and 1999) which are complied on a regular basis throughout Texas.

DATA SOURCES

There are three sources of traffic data are used for developing the adjustment factors and forecasts reported here. These are ATR counts, HPMS VMT estimates, and vehicle classification counts (used to estimate VMT mix). All are collected by TxDOT on a formal and on-going basis as part of the larger HPMS data collection program.

HPMS VMT estimates are available for all counties. ATR and vehicle classification (VMT mix) data are available for most but not all counties. Vehicle classification data is also available for most but not all counties. Consequently, these last two data sources are aggregated to TxDOT Districts to provide adequate data for this analysis. (TxDOT Districts are defined in Appendix 2.)

ATR vehicle counts are collected by TxDOT at selected locations on a continuous basis in Texas. These counts are available by season, month, and weekday, as well as on an annual average daily basis (i.e., AADT). Since they are continuous, they are especially well-suited for making seasonal and day-of-week comparisons (i.e., adjustment factors), although there may be relatively few ATR data collection locations in any given area.

HPMS VMT estimates are based on traffic count data collected according to a statistical sampling procedure specified by the Federal Highway Administration (FHWA) designed to estimate VMT (as well as lane miles and center line miles). A wide range of traffic data is collected under the HPMS program. The focus for this analysis is specifically with the VMT estimates made as part of the HPMS program.

Vehicle classification counts are collected at representative locations throughout Texas on a regular but periodic basis. Roadway functional classification is included as part of the data collected, however this parameter is not used for this analysis, due to the aggregation of counties into TxDOT Districts. Vehicle classification counts are used to estimate the relative proportion of VMT to be assigned to each type of vehicle. (This is critical for estimating the emissions associated with any subset of the roadway system.)

SEASONAL ADJUSTMENT FACTORS

Emissions estimates are required for August - September weekday, Friday, Saturday, and Sunday. Since the VMT data and forecasts are for Monday through Sunday, January through December, a conversion factor is required to convert AADT to August - September weekday, Friday, Saturday, and Sunday.

Vehicle counts are collected by TxDOT on a continuous basis throughout Texas. These ATR counts are available by season, month, and weekday, as well as on an annual average daily basis (i.e., AADT). These data are aggregated by TxDOT District for this analysis. The year of interest for this analysis is 1999, consequently 1999 ATR data were used.

County ATR counts are used to develop August - September weekday, Friday, Saturday, and Sunday factors. These factors are simply the ratio of August - September weekday, Friday, Saturday, and Sunday volume to total volume (AADT, 365 day, Monday through Sunday, January through December traffic) calculated for each TxDOT District. These factors, when applied to AADT, produce seasonally adjusted day of week volumes.

These procedures produced adjustment factors for each of the counties for each TxDOT District. These factors are then applied to the VMT for each county in each TxDOT District. These August - September weekday, Friday, Saturday, and Sunday adjustment factors are shown by District and county for 1999 in Appendices 3 and 4 respectively.

NEAR NONATTAINMENT COUNTY VMT CONTROL TOTALS

Seasonally adjusted day-of-week VMT control totals for 1999 are required for each county. HPMS data for 1999 are used for this purpose, along with the ATR based adjustment factors described above. Seasonal adjustments are applied to the official TxDOT HPMS VMT estimates to produce VMT control totals for August - September weekday, Friday, Saturday, and Sunday. These VMT control totals for each county are shown in Appendix 5.

VMT MIX

VMT mix was estimated using TxDOT weekday vehicle classification data for 1997, 1998 and 1999. As was the case with the seasonal adjustment factor procedure, these data are aggregated into TxDOT Districts and used for all the counties in the respective Districts. TxDOT classification counts classify vehicles into the standard FHWA vehicle classifications shown.

C	Motorcycles and passenger vehicles
P	Two axle, four tire single unit trucks
B	Buses
SU2	Six tire, two axle single unit vehicles
SU3	Three axle single unit vehicles
SU4	Four or more axle single unit vehicles
SE3	Three axle single trailer vehicle
SE4	Four axle single trailer vehicle
SE5	Five axle single trailer vehicle
SE6	Six or more axle single trailer vehicle
SD5	Five or less axle multi trailer vehicle
SD6	Six axle multi trailer vehicle
SD7	Seven or more axle multi trailer vehicle

A brief summary of the allocation and conversion procedure follows. The eight EPA vehicle categories are as follows:

LDGV	light-duty gasoline vehicles
LDGT1	light-duty gasoline trucks up to 6,000 pounds (GVWR)
LDGT2	light-duty gasoline trucks from 6,001 to 8,500 pounds (GVWR)
HDGV	heavy-duty gasoline vehicles over 8,500 pounds (GVWR)
LDDT	light-duty diesel trucks
LDDV	light-duty diesel vehicles
HDDV	heavy-duty diesel vehicles over 8,500 pounds (GVWR)
MC	motorcycles

VMT mix is estimated using TxDOT weekday vehicle classification data for each county for the most recent three years (1997, 1998 and 1999). Vehicle classification data can be aggregated for counties which do not have data, which it was for this analysis (into TxDOT Districts, as previously noted). TxDOT classification counts classify vehicles into the standard FHWA vehicle classifications. Note that motorcycles are not counted separately and are included as a default (subtracted from LDGV).

Vehicle classification counts are first aggregated into two intermediate groups as follows:

PV	C + P
FLT	C + P + B + SU3 + SU4 + SE3 + SE4 + SE5 + SE6 + SD5 + SD6 + SD7

This is followed by a second intermediate allocation which separates light-duty vehicles into passenger cars and light trucks based on county registration data:

LDV	0.712 * PV (Harris County 2000 registration data)
LDT	0.288 * PV (Harris County 2000 registration data shown)

A third intermediate allocation allocates light-duty trucks into LDT1 and LDGT2 based on county registration data. Note that LDT1 is itself intermediate and will be furter divided into LDGT1 and LDDT.

LDT1	0.842 * LDT (Harris County 2000 registration data shown)
LDGT2	0.158 * LDT (Harris County 2000 registration data shown)

Next, the remaining FHWA categories and this intermediate group are disaggregated into the eight EPA vehicle groups, as shown below. Note that TxDOT vehicle classification count procedures do not distinguish between gasoline and diesel light-duty trucks, consequently, MOBILE5ah defaults for the year of interest are used. As before, actual Texas county vehicle registration data are used to separate gasoline from diesel heavy-duty trucks.

LDGV	0.997 * LDV (MOBILE5ah default for 1999 shown)
LDDV	0.003 * LDV (MOBILE5ah default for 1999 shown)
LDGT1	0.994 * LDT1 (MOBILE5ah default for 1999 shown)
LDDT	0.006 * LDT1 (MOBILE5ah default for 1999 shown)
LDGT2	0.158 * LDT (Harris County 2000 registration data, as shown above)
HDGV	0.369 * HDV (Harris County 2000 registration data shown)
HDDV	0.631 * HDV (Harris County 2000 registration data shown)
MC	0.001 of total (subtracted from LDGV)

The resulting vehicle classification distributions for weekdays for each TxDOT District are shown in Appendix 6. TxDOT vehicle classification data are only collected for weekdays (Monday through Thrusday), consequently other data is used to estimate the vehicle classification distribution for Fridays, Saturdays, and Sundays. (No seasonal changes in vehicle classification distribution are assumed.) The procedure used to estimate Friday, Saturday, and Sunday vehicle classification distribution relies on extensive vehicle classification data collected in the Houston area over several years. The ratio of weekday VMT mix to Friday, Saturday, and Sunday VMT mix is applied to the individual TxDOT District weekday VMT mix to produce District specific Friday, Saturday and Sunday VMT mix for each county. The resulting Friday, Saturday, and Sunday VMT mixes for each TxDOT District are shown in Appendices 7, 8 and 9.

SPEED MODEL

Emissions are a function of vehicle type, VMT, and speed. Speed itself is a function of roadway classification (capacity) and congestion (volume). Speed estimates are developed using the hourly volumes and capacities by roadway functional classification, along with freeflow speeds derived from the Highway Capacity Manual (HCM). Volume/delay relationships are based on the speed model originally developed by the North Central Texas Council of Governments (NCTCOG) for the Dallas/Fort Worth area and used for El Paso County (TTI Research Report 1375-5) and the Jefferson-Orange-Hardin Regional Transportatlion Study (JOHRTS) (TTI Research Report 1375-6). Speed estimates are developed using total VMT separated into peak and off-peak directions. VMT mix is based on actual counts and registration data for each county, as described previously. Speeds and capacities fit the combined area types and roadway functional classifications of HPMS.

HPMS data is separated into four area types and seven roadway functional classifications. Area type is defined by population. Areas with a population of 4,999 or less are defined as rural. Areas with a population between 5,000 and 49,999 are designated small urban. Areas with a population of 50,000 or more are defined as urban. (Recent HPMS area types of urban and large urban are grouped for this analysis.) HPMS area type and roadway functional classifications are summarized in Table 1.

TABLE 1
HPMS Area Types and Roadway Functional Classifications

Area Type	Roadway Functional Classification						
Rural	Interstate	Freeway	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local
Small Urban							
Urban							

Total HPMS VMT is allocated into 24 one-hour time periods using the parameters contained in the speed model. Time periods are aggregated to produce a single emissions estimate for a typical day (HPMS VMT is AADT) which is produced to represent a summer day by the temperature inputs to MOBILE5ah and the adjustment of VMT using the ATR-based seasonal and day-of-week adjustment factors described above. Directional split (60/40) is based on aggregate observed values for areas for which data are available. (In link-based applications values are calculated by day or week, time-of-day, and roadway functional classification, and are typically between 70/30 and 50/50. Such data are not available for the rural counties.) The directional delay due to congestion (in minutes per mile) is computed using the speed model.

As noted above, the directional delay due to congestion (in minutes per mile) is computed using a model originally developed for the Dallas/Fort Worth area and applied throughout Texas. The model uses the following volume/delay equation:

$$Delay = Min\ [A\ e^{B(\frac{V}{C})}\ ,\ M]$$

Where:

Delay = congestion delay (in minutes/mile);
A & B = volume/delay equation coefficients;
M = maximum minutes of delay per mile; and
V/C = time-of-day directional V/C ratio.

The delay model parameters (A, B, and M) were developed for the Dallas/Fort Worth area and verified by application to JOHRTS and El Paso. These are shown in Table 2.

TABLE 2
Volume/Delay Equation Parameters

Facility Category	A	B	M
High Capacity Facilities (> 3,400 vehicles per hour [vph], e.g., Interstates and Freeways)	0.015	3.5	5.0
Low Capacity Facilities (≤ 3,400 vph, e.g., Arterials, Collectors and Locals)	0.050	3.0	10.0

Given the estimated directional delay (in minutes/mile) and the estimated freeflow speed, the directional congested speed is computed as follows:

$$Congested\ speed = \frac{60}{\frac{60}{Freeflow\ speed} + Delay}$$

This model is applied to each cell of the area type/functional classification matrix (i.e., the HPMS scheme of 21 cells) for each of 24 one-hour time periods and for each direction. Emissions rates and emissions are estimated for each of the time periods using MOBILE5ah.

Capacity and Freeflow Speed

Capacity and freeflow speed are critical parameters for any speed model. Capacity is the maximum flow past a given point on a roadway. It varies by the type of roadway (i.e., by functional classification). Freeflow speed is the maximum speed at which traffic will move along a given roadway if there are no impediments (e.g., congestion, bad weather, etc.). The capacities and freeflow speeds used for this analysis are taken from the HCM. For HPMS functional classifications 1 and 2 (interstate and freeway), both capacities and freeflow speeds are taken directly from the HCM (3-3). The capacity (2,200 passenger cars per hour per lane [pcphpl]) and freeflow speed (70 mph) for four-lane freeways was used for all interstates, regardless of area type. Similarly, a freeflow speed of 65 mph and capacity of 2,100 pcphpl was used for all freeways (HCM figure 3-2a).

HPMS functional classifications 3, 4, 5, 6, and 7 (principal arterial, minor arterial, major collector, minor collector, and local) have traffic control devices (i.e., signals or stop signs) which determine their capacities. The capacities of these signalized roadways were calculated based on signalized intersection capacity defined as shown (HCM 1994: 9-5, equation 9-3):

$$Ci = Si * (gi/C)$$

Where:

- Ci = capacity of lane group i, vehicles per hour (vph);
- Si = saturation flow rate of lane group i, vehicles per hour of effective green time (vphg); and
- gi/c = effective green ratio for lane group i.

The saturation flow rate (Si) is the flow in vph that could be accommodated by the lane group assuming that the green phase was always available to the lane group (i.e., green ratio = 1.0). Computation of the adjusted saturation flow rate begins with the ideal saturation flow rate of 1,900, which is adjusted to reflect variance from ideal conditions. The saturation flow rate was adjusted for area type using the following assumptions (HCM 1994: 9-14, equation 9-12):

$$S = N*fw*fhv*fg*fp*fbb*fa*frt*flt$$

Where:

- S = saturation flow rate adjustment factor (rounded to 2 decimal places);
- N = number of lanes in the lane group;
- fw = lane width adjustment factor (12-foot lane for all area types assumed);
- fhv = heavy vehicle adjustment factor (5% heavy vehicles for all area types to adjust for passenger vehicle equivalents, not to be confused with VMT mix);
- fg = approach grade factor (level terrain assumed for all area types);
- fp = parking lane adjustment (none for rural areas, 1 maneuver per hour for urban areas);
- fbb = bus blocking factor (none for rural areas, 10 per hour for urban areas, mid-point for small urban areas);
- fa = area type adjustment (0.9 for urban area, 1.0 for all other areas);
- frt = right turn adjustment factor (shared lane for right turns for all area types, high

pedestrians crossing for urban areas, moderate for small urban areas, and low for rural); and

flt = left turn adjustment factor (exclusive left turn lanes and protected phasing for rural areas, shared left turn lanes and protected plus permitted phasing for urban areas, mid-point for small urban areas).

The saturation flow rate adjustment factors used for the three different area types are shown in Table 3.

TABLE 3
Saturation Flow Rate Adjustment Factors
by Area Type

Area Type	fw	fhv	fg	fp	fbb	fa	frt	flt
Rural	1	0.95	1	1	1	1	0.98	0.95
Small Urban	1	0.95	1	0.98	0.98	1	0.94	0.90
Urban	1	0.95	1	0.95	0.96	0.90	0.90	0.85

The effective green ratios used for different roadway functional classifications are shown in Table 4. The same ratios were used for all area types. (Interstates and freeways are unsignalized and do not require green ratios.)

TABLE 4
Effective Green Ratios (gi/C)
by HPMS Roadway Functional Classification

Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local
0.60	0.55	0.50	0.40	0.30

The adjusted saturation flow rate (expressed in pcphpl) for all signalized streets (i.e., not interstate or freeway) for the three area types is shown in Table 5.

TABLE 5
Adjusted Saturation Flow Rate (pcphpl)
by Area Type

HPMS Area Type	Ideal Flow	Adjustment Factor	Adjusted Saturation Flow
Rural	1,900	0.88	1,672
Small Urban		0.77	1,463
Urban		0.59	1,121

The freeflow speed for rural and urban arterials (HPMS functional classifications 3 and 4) were taken directly from HCM (HMC 1994: 7-10 and 11-6 respectively). The freeflow speed for other roadway functional classifications decreases from arterial freeflow speed by 5 mph increments. No freeflow speed is below 30 mph. The hourly lane capacities for all functional classifications and area types are shown in Table 6.

TABLE 6
Hourly Lane Capacities (vehicles per hour per lane [vphpl])

HPMS Area Type	HPMS Roadway Functional Classification						
	Interstate	Freeway	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local
Rural	2,200	2,100	1,003	920	836	669	502
Small Urban	2,200	2,100	878	805	732	585	439
Urban	2,200	2,100	673	617	561	448	336

Similarly, freeflow speeds are provided for each of the three area types and seven roadway functional classifications (the 21-cell matrix representing the HPMS typology). Freeflow speeds do not vary by direction or time of day. These are shown in Table 7.

TABLE 7
Freeflow Speeds (mph)

HPMS Area Type	HPMS Roadway Functional Classification						
	Interstate	Freeway	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local
Rural	70	65	55	50	40	35	30
Small Urban	70	65	45	40	35	30	30
Urban	70	65	40	35	30	30	30

Volume-to-capacity (V/C) ratios are generated for each combination of time period, roadway functional classification, area type, and direction using the following capacities and VMT:

- Volume: VMT is multiplied by each of the twenty-four time period factors yielding VMT for each hour. VMT per hour is divided by centerline miles, yielding hourly volume. This procedure is performed for each combination of time period, roadway functional classification, area type, and direction.

- Capacity: Lane miles are divided by centerline miles to produce lanes. Lanes are multiplied by the lane capacities (i.e., adjusted saturation flows) generated by the process described above, producing hourly lane capacities. This procedure is performed for each combination of roadway functional classification and area type. (Capacity is the same for each direction and time period.)

- V/C ratios: The speed model is applied to the resulting volumes and capacities for each functional classification and area type combination. This yields volumes adjusted for the impact of congestion related delay for each combination of time period, functional classification, area type, and direction.

ESTIMATION OF EMISSIONS USING MOBILE5ah

EPA's MOBILE5ah program is used to compute the mobile source emissions rates. MOBILE5ah is used directly to compute 24-hour diurnal emissions rates. It is applied using a TTI program (POLFAC5hb) to estimate the emissions factors by speed for each time period and direction.

POLFAC5hb is one of a series of programs developed by TTI to facilitate the estimation of mobile source emissions. It is used to in conjunction with MOBILE5ah to obtain emissions rates for three pollutants (volatile organic compounds [VOC], carbon monoxide [CO], and oxides fo nitrogen [NOx]) for a range of speeds (i.e., 3 mph through 65 mph) for each of eight vehicle types. This procedure is used for the twenty-four one-hour time periods, as well as for diurnal emissions. (Diurnal emissions are produced by parked vehicles due to the expansion of the air in the gasoline tank caused by the rise in temperature during the day.) LDGV, LDGT1, LDGT2, HDGV, and MC vehicle types produce diurnal emissions. Diesel vehicle types do not. Diurnal emissions rates are calculated separately for each year and vehicle type and applied to the VMT associated with that year and vehicle type.

Estimation of Temperatures by Time-of-Day

Temperatures for the 24-hour periods and Reid Vapor Pressure (RVP) data for the 210 Texas Rider 13 participating counties were provided by TNRCC for the episode period (August-September 1999). The ambient temperatures for the 24-hour period and the 24 time-of-day time period temperatures are shown in Appendix 10, along with hourly VMT. Appendix 11 shows RVP for each of the 210 counties.

MOBILE5ah Setups

Emissions rates for each of the eight EPA vehicle types for a range of speeds are prepared using MOBILE5ah 24-hour diurnal and 24 time period setups for each county. The only difference between the 24-hour diurnal setups and the individual time periods is the temperature. Vehicle age distribution data for 1999 is used. No inspection and maintenance (I/M) or anti-tampering program (ATP) credits are assumed, except for specific counties in the Dallas area (Dallas and Tarrant) and Houston area (Harris).

Emissions Estimates

For each county the mobile source emissions for each of the twenty-four time periods are computed and combined, along with diurnal emissions estimates, into a 24-hour emissions estimate. MOBILE5ah emissions rates are applied to HPMS and speed model data. HPMS data includes centerline miles, lane miles, and VMT for each county. VMT, speed and distance (lane miles) are combined with average V/C ratio for each HPMS area type, functional classification, and direction, for each time period. In this way, area type, functional classification, and direction constitute virtual links with distinct speeds, capacities, V/C ratios, and VMT.

APPENDIX 1
Texas Counties Participating in Rider 13
(* Link based model available)

Anderson
Angelina
Aransas
Archer
Armstrong
Atascosa
Austin
Bandera
Bastrop
Baylor
Bee
Bell
Bexar*
Blanco
Bosque
Bowie
Brazoria
Brazos
Briscoe
Brooks
Brown
Burleson
Burnet
Caldwell
Calhoun
Callahan
Cameron
Camp
Carson
Cass
Chambers
Cherokee
Childress
Clay
Coke
Coleman
Collin
Collingsworth
Colorado
Comal
Comanche
Concho
Cooke

Coryell
Cottle
Crockett
Crosby
Dallas
Delta
Denton
DeWitt
Dickens
Dimmit
Donley
Duval
Eastland
Edwards
Ellis
Erath
Falls
Fannin
Fayette
Fisher
Floyd
Foard
Fort Bend
Franklin
Freestone
Frio
Galveston
Garza
Gillespie
Goliad
Gonzales
Gray
Grayson
Gregg*
Grimes
Guadalupe
Hall
Hamilton
Hansford
Hardeman
Hardin
Harris
Harrison
Haskell
Hays*
Hemphill
Henderson

Hidalgo
Hill
Hood
Hopkins
Houston
Hunt
Hutchinson
Irion
Jack
Jackson
Jasper
Jefferson
Jim Hogg
Jim Wells
Johnson
Jones
Karnes
Kaufman
Kendall
Kenedy
Kent
Kerr
Kimble
King
Kinney
Kleberg
Knox
La Salle
Lamar
Lampasas
Lavaca
Lee
Leon
Liberty
Limestone
Lipscomb
Live Oak
Llano
Madison
Marion
Mason
Matagorda
Maverick
McCulloch
McLennan
McMullen
Medina

Menard
Milam
Mills
Mitchell
Montague
Montgomery
Morris
Motley
Nacogdoches
Navarro
Newton
Nolan
Nueces*
Ochiltree
Orange
Palo Pinto
Panola
Parker
Polk
Rains
Real
Red River
Refugio
Roberts
Robertson
Rockwall
Runnels
Rusk
Sabine
San Augustine
San Jacinto
San Patricio
San Saba
Schleicher
Scurry
Shackelford
Shelby
Smith*
Somervell
Starr
Stephens
Sterling
Stonewall
Sutton
Tarrant
Taylor
Throckmorton

Titus
Tom Green
Travis*
Trinity
Tyler
Upshur
Uvalde
Val Verde
Van Zandt
Victoria*
Walker
Waller
Washington
Webb
Wharton
Wheeler
Wichita
Wilbarger
Willacy
Williamson*
Wilson
Wise
Wood
Young
Zapata
Zavala

APPENDIX 2
TxDOT District - County Key

Abilene
Borden
Callahan
Fisher
Haskell
Howard
Jones
Kent
Mitchell
Nolan
Scurry
Shackelford
Stonewall
Taylor

Amarillo District
Armstrong
Carson
Dallam
Deaf Smith
Gray
Hansford
Hartley
Hemphill
Hutchinson
Lipscomb
Moore
Ochiltree
Oldham
Potter
Randall
Roberts
Sherman

Atlanta
Bowie
Camp
Cass
Harrison
Marion
Morris
Panola
Titus
Upshur

Austin
Bastrop
Blanco
Burnet
Caldwell
Gillespie
Hays
Lee
Llano
Mason
Travis
Williamson

Beaumont
Chambers
Hardin
Jasper
Jefferson
Liberty
Newton
Orange
Tyler

Brownwood
Brown
Coleman
Comanche
Eastland
Lampasas
McCulloch
Mills
San Saba
Stephens

Bryan
Brazos
Burleson
Freestone
Grimes
Leon
Madison
Milam
Robertson
Walker
Washington

Childress
Briscoe
Childress
Collingsworth
Cottle
Dickens
Donley
Foard
Hall
Hardeman
King
Knox
Motley
Wheeler

Corpus Christi
Aransas
Bee
Goliad
Jim Wells
Karnes
Kleberg
Live Oak
Nueces
Refugio
San Patricio

Dallas
Collin
Dallas
Denton
Ellis
Kaufman
Navarro
Rockwell

El Paso
Brewster
Culberson
El Paso
Hudspeth
Jeff Davis
Presidio

Fort Worth
Erath
Hood
Jack
Johnson
Palo Pinto
Parker
Somervell
Tarrant
Wise

Houston
Brazoria
Fort Bend
Galveston
Harris
Montgomery
Waller

Laredo
Dimmit
Duval
Kinney
La Salle
Maverick
Val Verde
Webb
Zavala

Lubbock
Bailey
Castro
Cochran
Crosby
Dawson
Floyd
Gaines
Garza
Hale
Hockley
Lamb
Lubbock
Lynn
Parmer
Swisher
Terry
Yoakum

Lufkin
Angelina
Houston
Nacogdoches
Polk
Sabine
San Augustine
San Jacinto
Shelby
Trinity

Odessa
Andrews
Crane
Ector
Loving
Martin
Midland
Pecos
Reeves
Terrell
Upton
Ward
Winkler

Paris
Delta
Fannin
Franklin
Grayson
Hopkins
Hunt
Lamar
Rains
Red River

Pharr
Brooks
Cameron
Hidalgo
Jim Hogg
Kenedy
Starr
Willacy
Zapata

San Angelo
Coke
Concho
Crockett
Edwards
Glasscock
Irion
Kimble
Menard
Reagan
Real
Runnels
Schleicher
Sterling
Sutton
Tom Green

San Antonio
Atascosa
Bandera
Bexar
Comal
Frio
Guadalupe
Kendall
Kerr
McMullen
Medina
Uvaldi
Wilson

Tyler
Anderson
Cherokee
Gregg
Henderson
Rusk
Smith
Van Zandt
Wood

Waco
Bell
Bosque
Coryell
Falls
Hamilton
Hill
Limestone
McLennan

Wichita Falls
Archer
Baylor
Clay
Cooke
Montague
Throckmorton
Wichita
Wilbarger
Young

Yoakum
Austin
Calhoun
Colorado
DeWitt
Fayette
Gonzales
Jackson
Lavaca
Matagorda
Victoria
Wharton

APPENDIX 3
TxDistrict Day of Week Adjustment Factors

OBS	DISTRICT	WEEK_FAC	FRI_FAC	SAT_FAC	SUN_FAC
1	Abilene	0.97697	1.24694	1.09300	1.02586
2	Amarillo	1.04222	1.15875	1.11522	0.99869
3	Atlanta	0.99860	1.18856	1.06660	0.92574
4	Austin	1.02868	1.15016	0.97843	0.82830
5	Beaumont	0.99005	1.16482	0.98166	0.82272
6	Brownwood	0.94206	1.26278	1.05453	0.97035
7	Bryan	0.98408	1.26273	1.13302	1.01637
8	Childress	1.00303	1.15034	1.18483	1.18731
9	Corpus_Christi	0.98757	1.18784	1.01834	0.85603
10	Dallas	1.08122	1.22074	0.97345	0.80700
11	El_Paso	1.03938	1.12980	0.92354	0.72924
12	Fort_Worth	1.10639	1.25510	1.00067	0.80257
13	Houston	1.13225	1.24339	1.01721	0.83094
14	Laredo	0.90923	1.09495	1.06462	0.94571
15	Lubbock	1.04730	1.18787	1.03986	0.84837
16	Lufkin	0.99198	1.17966	0.99443	0.86030
17	Odessa	1.06056	1.17998	0.94433	0.73247
18	Paris	0.95367	1.17490	1.06028	0.98926
19	Pharr	0.95111	1.13297	1.01928	0.85249
20	San_Angelo	0.92900	1.12829	1.01617	0.99342
21	San_Antonio	1.08858	1.23397	0.97615	0.77927
22	Tyler	1.01981	1.17610	1.03676	0.79727
23	Waco	0.88831	1.25990	1.09167	1.11760
24	Wichita_Falls	0.98848	1.23524	1.12194	0.97744
25	Yoakum	0.88733	1.23014	1.04964	1.11772

APPENDIX 4
County Day of Week Adjustment Factors by TxDOT District

OBS	DISTRICT	COUNTY	VMT	WEEK_FAC	FRI_FAC	SAT_FAC	SUN_FAC
1	Abilene	BORDEN	53,692	0.97697	1.24694	1.09300	1.02586
2	Abilene	CALLAHAN	842,642	0.97697	1.24694	1.09300	1.02586
3	Abilene	FISHER	177,460	0.97697	1.24694	1.09300	1.02586
4	Abilene	HASKELL	247,594	0.97697	1.24694	1.09300	1.02586
5	Abilene	HOWARD	1,103,802	0.97697	1.24694	1.09300	1.02586
6	Abilene	JONES	581,130	0.97697	1.24694	1.09300	1.02586
7	Abilene	KENT	59,176	0.97697	1.24694	1.09300	1.02586
8	Abilene	MITCHELL	500,351	0.97697	1.24694	1.09300	1.02586
9	Abilene	NOLAN	862,816	0.97697	1.24694	1.09300	1.02586
10	Abilene	SCURRY	609,772	0.97697	1.24694	1.09300	1.02586
11	Abilene	SHACKELFORD	182,126	0.97697	1.24694	1.09300	1.02586
12	Abilene	STONEWALL	104,621	0.97697	1.24694	1.09300	1.02586
13	Abilene	TAYLOR	3,588,229	0.97697	1.24694	1.09300	1.02586
14	Amarillo	ARMSTRONG	296,351	1.04222	1.15875	1.11522	0.99869
15	Amarillo	CARSON	716,266	1.04222	1.15875	1.11522	0.99869
16	Amarillo	DALLAM	343,252	1.04222	1.15875	1.11522	0.99869
17	Amarillo	DEAF_SMITH	509,373	1.04222	1.15875	1.11522	0.99869
18	Amarillo	GRAY	796,306	1.04222	1.15875	1.11522	0.99869
19	Amarillo	HANSFORD	164,676	1.04222	1.15875	1.11522	0.99869
20	Amarillo	HARTLEY	334,698	1.04222			

					1.15875	1.11522	0.99869
21	Amarillo	HEMPHILL	139,023	1.04222	1.15875	1.11522	0.99869
22	Amarillo	HUTCHINSON	508,001	1.04222	1.15875	1.11522	0.99869
23	Amarillo	LIPSCOMB	88,427	1.04222	1.15875	1.11522	0.99869
24	Amarillo	MOORE	548,233	1.04222	1.15875	1.11522	0.99869
25	Amarillo	OCHILTREE	237,817	1.04222	1.15875	1.11522	0.99869
26	Amarillo	OLDHAM	687,378	1.04222	1.15875	1.11522	0.99869
27	Amarillo	POTTER	4,115,322	1.04222	1.15875	1.11522	0.99869
28	Amarillo	RANDALL	2,243,515	1.04222	1.15875	1.11522	0.99869
29	Amarillo	ROBERTS	67,548	1.04222	1.15875	1.11522	0.99869
30	Amarillo	SHERMAN	237,279	1.04222	1.15875	1.11522	0.99869
31	Atlanta	BOWIE	3,058,745	0.99860	1.18856	1.06660	0.92574
32	Atlanta	CAMP	298,624	0.99860	1.18856	1.06660	0.92574
33	Atlanta	CASS	1,046,683	0.99860	1.18856	1.06660	0.92574
34	Atlanta	HARRISON	2,756,142	0.99860	1.18856	1.06660	0.92574
35	Atlanta	MARION	340,890	0.99860	1.18856	1.06660	0.92574
36	Atlanta	MORRIS	484,165	0.99860	1.18856	1.06660	0.92574
37	Atlanta	PANOLA	1,007,868	0.99860	1.18856	1.06660	0.92574
38	Atlanta	TITUS	1,063,926	0.99860	1.18856	1.06660	0.92574
39	Atlanta	UPSHUR	957,945	0.99860	1.18856	1.06660	0.92574
40	Austin	BASTROP	1,636,903	1.02868	1.15016	0.97843	0.82830
41	Austin	BLANCO	452,204	1.02868	1.15016	0.97843	0.82830
42	Austin	BURNET	1,075,441	1.02868	1.15016	0.97843	0.82830

43	Austin	CALDWELL	840,822	1.02868	1.15016	0.97843	0.82830
44	Austin	GILLESPIE	663,720	1.02868	1.15016	0.97843	0.82830
45	Austin	HAYS	3,237,933	1.02868	1.15016	0.97843	0.82830
46	Austin	LEE	625,445	1.02868	1.15016	0.97843	0.82830
47	Austin	LLANO	446,309	1.02868	1.15016	0.97843	0.82830
48	Austin	MASON	173,222	1.02868	1.15016	0.97843	0.82830
49	Austin	TRAVIS	20,078,602	1.02868	1.15016	0.97843	0.82830
50	Austin	WILLIAMSON	5,572,048	1.02868	1.15016	0.97843	0.82830
51	Beaumont	CHAMBERS	2,095,238	0.99005	1.16482	0.98166	0.82272
52	Beaumont	HARDIN	1,404,062	0.99005	1.16482	0.98166	0.82272
53	Beaumont	JASPER	1,304,518	0.99005	1.16482	0.98166	0.82272
54	Beaumont	JEFFERSON	7,106,556	0.99005	1.16482	0.98166	0.82272
55	Beaumont	LIBERTY	1,965,364	0.99005	1.16482	0.98166	0.82272
56	Beaumont	NEWTON	486,535	0.99005	1.16482	0.98166	0.82272
57	Beaumont	ORANGE	2,763,522	0.99005	1.16482	0.98166	0.82272
58	Beaumont	TYLER	602,800	0.99005	1.16482	0.98166	0.82272
59	Brownwood	BROWN	985,784	0.94206	1.26278	1.05453	0.97035
60	Brownwood	COLEMAN	382,760	0.94206	1.26278	1.05453	0.97035
61	Brownwood	COMANCHE	519,112	0.94206	1.26278	1.05453	0.97035
62	Brownwood	EASTLAND	1,016,591	0.94206	1.26278	1.05453	0.97035
63	Brownwood	LAMPASAS	470,643	0.94206	1.26278	1.05453	0.97035
64	Brownwood	MCCULLOCH	334,926	0.94206	1.26278	1.05453	0.97035
65	Brownwood	MILLS	269,523	0.94206			

					1.26278	1.05453	0.97035
66	Brownwood	SAN_SABA	184,121	0.94206	1.26278	1.05453	0.97035
67	Brownwood	STEPHENS	286,787	0.94206	1.26278	1.05453	0.97035
68	Bryan	BRAZOS	3,467,976	0.98408	1.26273	1.13302	1.01637
69	Bryan	BURLESON	663,601	0.98408	1.26273	1.13302	1.01637
70	Bryan	FREESTONE	1,304,853	0.98408	1.26273	1.13302	1.01637
71	Bryan	GRIMES	743,708	0.98408	1.26273	1.13302	1.01637
72	Bryan	LEON	1,170,718	0.98408	1.26273	1.13302	1.01637
73	Bryan	MADISON	756,481	0.98408	1.26273	1.13302	1.01637
74	Bryan	MILAM	898,517	0.98408	1.26273	1.13302	1.01637
75	Bryan	ROBERTSON	705,969	0.98408	1.26273	1.13302	1.01637
76	Bryan	WALKER	2,085,569	0.98408	1.26273	1.13302	1.01637
77	Bryan	WASHINGTON	1,140,918	0.98408	1.26273	1.13302	1.01637
78	Childress	BRISCOE	68,123	1.00303	1.15034	1.18483	1.18731
79	Childress	CHILDRESS	364,741	1.00303	1.15034	1.18483	1.18731
80	Childress	COLLINGSWORTH	110,971	1.00303	1.15034	1.18483	1.18731
81	Childress	COTTLE	93,471	1.00303	1.15034	1.18483	1.18731
82	Childress	DICKENS	110,953	1.00303	1.15034	1.18483	1.18731
83	Childress	DONLEY	429,586	1.00303	1.15034	1.18483	1.18731
84	Childress	FOARD	74,864	1.00303	1.15034	1.18483	1.18731
85	Childress	HALL	221,103	1.00303	1.15034	1.18483	1.18731
86	Childress	HARDEMAN	328,597	1.00303	1.15034	1.18483	1.18731
87	Childress	KING	76,501	1.00303	1.15034	1.18483	1.18731

88	Childress	KNOX	159,866	1.00303	1.15034	1.18483	1.18731
89	Childress	MOTLEY	78,950	1.00303	1.15034	1.18483	1.18731
90	Childress	WHEELER	535,170	1.00303	1.15034	1.18483	1.18731
91	Corpus_Christi	ARANSAS	427,979	0.98757	1.18784	1.01834	0.85603
92	Corpus_Christi	BEE	721,152	0.98757	1.18784	1.01834	0.85603
93	Corpus_Christi	GOLIAD	313,865	0.98757	1.18784	1.01834	0.85603
94	Corpus_Christi	JIM_WELLS	1,361,832	0.98757	1.18784	1.01834	0.85603
95	Corpus_Christi	KARNES	372,161	0.98757	1.18784	1.01834	0.85603
96	Corpus_Christi	KLEBERG	938,651	0.98757	1.18784	1.01834	0.85603
97	Corpus_Christi	LIVE_OAK	1,118,833	0.98757	1.18784	1.01834	0.85603
98	Corpus_Christi	NUECES	8,737,494	0.98757	1.18784	1.01834	0.85603
99	Corpus_Christi	REFUGIO	673,472	0.98757	1.18784	1.01834	0.85603
100	Corpus_Christi	SAN_PATRICIO	1,968,661	0.98757	1.18784	1.01834	0.85603
101	Dallas	COLLIN	10,120,065	1.08122	1.22074	0.97345	0.80700
102	Dallas	DALLAS	64,411,567	1.08122	1.22074	0.97345	0.80700
103	Dallas	DENTON	9,606,949	1.08122	1.22074	0.97345	0.80700
104	Dallas	ELLIS	3,795,222	1.08122	1.22074	0.97345	0.80700
105	Dallas	KAUFMAN	3,355,526	1.08122	1.22074	0.97345	0.80700
106	Dallas	NAVARRO	1,833,095	1.08122	1.22074	0.97345	0.80700
107	Dallas	ROCKWALL	1,271,074	1.08122	1.22074	0.97345	0.80700
108	El_Paso	BREWSTER	299,516	1.03938	1.12980	0.92354	0.72924
109	El_Paso	CULBERSON	608,826	1.03938	1.12980	0.92354	0.72924
110	El_Paso	EL_PASO	13,419,905	1.03938			

					1.12980	0.92354	0.72924
111	El_Paso	HUDSPETH	1,063,092	1.03938	1.12980	0.92354	0.72924
112	El_Paso	JEFF_DAVIS	182,861	1.03938	1.12980	0.92354	0.72924
113	El_Paso	PRESIDIO	221,813	1.03938	1.12980	0.92354	0.72924
114	Fort_Worth	ERATH	976,546	1.10639	1.25510	1.00067	0.80257
115	Fort_Worth	HOOD	860,964	1.10639	1.25510	1.00067	0.80257
116	Fort_Worth	JACK	300,908	1.10639	1.25510	1.00067	0.80257
117	Fort_Worth	JOHNSON	2,761,933	1.10639	1.25510	1.00067	0.80257
118	Fort_Worth	PALO_PINTO	927,485	1.10639	1.25510	1.00067	0.80257
119	Fort_Worth	PARKER	2,709,123	1.10639	1.25510	1.00067	0.80257
120	Fort_Worth	SOMERVELL	215,348	1.10639	1.25510	1.00067	0.80257
121	Fort_Worth	TARRANT	41,073,753	1.10639	1.25510	1.00067	0.80257
122	Fort_Worth	WISE	2,045,278	1.10639	1.25510	1.00067	0.80257
123	Houston	BRAZORIA	5,088,754	1.13225	1.24339	1.01721	0.83094
124	Houston	FORT_BEND	6,284,831	1.13225	1.24339	1.01721	0.83094
125	Houston	GALVESTON	5,862,182	1.13225	1.24339	1.01721	0.83094
126	Houston	HARRIS	83,863,522	1.13225	1.24339	1.01721	0.83094
127	Houston	MONTGOMERY	6,613,134	1.13225	1.24339	1.01721	0.83094
128	Houston	WALLER	1,483,251	1.13225	1.24339	1.01721	0.83094
129	Laredo	DIMMIT	292,254	0.90923	1.09495	1.06462	0.94571
130	Laredo	DUVAL	443,768	0.90923	1.09495	1.06462	0.94571
131	Laredo	KINNEY	195,007	0.90923	1.09495	1.06462	0.94571
132	Laredo	LASALLE	522,390	0.90923	1.09495	1.06462	0.94571

133	Laredo	MAVERICK	735,897	0.90923	1.09495	1.06462	0.94571
134	Laredo	VAL_VERDE	737,913	0.90923	1.09495	1.06462	0.94571
135	Laredo	WEBB	3,349,337	0.90923	1.09495	1.06462	0.94571
136	Laredo	ZAVALA	308,234	0.90923	1.09495	1.06462	0.94571
137	Lubbock	BAILEY	237,832	1.04730	1.18787	1.03986	0.84837
138	Lubbock	CASTRO	312,429	1.04730	1.18787	1.03986	0.84837
139	Lubbock	COCHRAN	114,755	1.04730	1.18787	1.03986	0.84837
140	Lubbock	CROSBY	226,790	1.04730	1.18787	1.03986	0.84837
141	Lubbock	DAWSON	501,744	1.04730	1.18787	1.03986	0.84837
142	Lubbock	FLOYD	241,101	1.04730	1.18787	1.03986	0.84837
143	Lubbock	GAINES	499,987	1.04730	1.18787	1.03986	0.84837
144	Lubbock	GARZA	356,158	1.04730	1.18787	1.03986	0.84837
145	Lubbock	HALE	1,066,096	1.04730	1.18787	1.03986	0.84837
146	Lubbock	HOCKLEY	726,895	1.04730	1.18787	1.03986	0.84837
147	Lubbock	LAMB	511,014	1.04730	1.18787	1.03986	0.84837
148	Lubbock	LUBBOCK	6,270,302	1.04730	1.18787	1.03986	0.84837
149	Lubbock	LYNN	350,169	1.04730	1.18787	1.03986	0.84837
150	Lubbock	PARMER	410,548	1.04730	1.18787	1.03986	0.84837
151	Lubbock	SWISHER	414,882	1.04730	1.18787	1.03986	0.84837
152	Lubbock	TERRY	466,329	1.04730	1.18787	1.03986	0.84837
153	Lubbock	YOAKUM	247,693	1.04730	1.18787	1.03986	0.84837
154	Lufkin	ANGELINA	2,386,639	0.99198	1.17966	0.99443	0.86030
155	Lufkin	HOUSTON	654,533	0.99198			

					1.17966	0.99443	0.86030
156	Lufkin	NACOGDOCHES	1,857,508	0.99198	1.17966	0.99443	0.86030
157	Lufkin	POLK	1,574,345	0.99198	1.17966	0.99443	0.86030
158	Lufkin	SABINE	310,126	0.99198	1.17966	0.99443	0.86030
159	Lufkin	SAN_AUGUSTINE	298,325	0.99198	1.17966	0.99443	0.86030
160	Lufkin	SAN_JACINTO	734,146	0.99198	1.17966	0.99443	0.86030
161	Lufkin	SHELBY	783,361	0.99198	1.17966	0.99443	0.86030
162	Lufkin	TRINITY	358,662	0.99198	1.17966	0.99443	0.86030
163	Odessa	ANDREWS	495,634	1.06056	1.17998	0.94433	0.73247
164	Odessa	CRANE	193,404	1.06056	1.17998	0.94433	0.73247
165	Odessa	ECTOR	2,792,405	1.06056	1.17998	0.94433	0.73247
166	Odessa	LOVING	13,049	1.06056	1.17998	0.94433	0.73247
167	Odessa	MARTIN	370,074	1.06056	1.17998	0.94433	0.73247
168	Odessa	MIDLAND	3,072,958	1.06056	1.17998	0.94433	0.73247
169	Odessa	PECOS	935,266	1.06056	1.17998	0.94433	0.73247
170	Odessa	REEVES	812,506	1.06056	1.17998	0.94433	0.73247
171	Odessa	TERRELL	96,086	1.06056	1.17998	0.94433	0.73247
172	Odessa	UPTON	156,808	1.06056	1.17998	0.94433	0.73247
173	Odessa	WARD	558,770	1.06056	1.17998	0.94433	0.73247
174	Odessa	WINKLER	181,690	1.06056	1.17998	0.94433	0.73247
175	Paris	DELTA	188,573	0.95367	1.17490	1.06028	0.98926
176	Paris	FANNIN	759,605	0.95367	1.17490	1.06028	0.98926
177	Paris	FRANKLIN	404,796	0.95367	1.17490	1.06028	0.98926

178	Paris	GRAYSON	3,314,205	0.95367	1.17490	1.06028	0.98926
179	Paris	HOPKINS	1,467,248	0.95367	1.17490	1.06028	0.98926
180	Paris	HUNT	2,485,651	0.95367	1.17490	1.06028	0.98926
181	Paris	LAMAR	1,322,654	0.95367	1.17490	1.06028	0.98926
182	Paris	RAINS	310,283	0.95367	1.17490	1.06028	0.98926
183	Paris	RED_RIVER	445,538	0.95367	1.17490	1.06028	0.98926
184	Pharr	BROOKS	513,279	0.95111	1.13297	1.01928	0.85249
185	Pharr	CAMERON	5,898,756	0.95111	1.13297	1.01928	0.85249
186	Pharr	HIDALGO	9,959,667	0.95111	1.13297	1.01928	0.85249
187	Pharr	JIM_HOGG	155,065	0.95111	1.13297	1.01928	0.85249
188	Pharr	KENEDY	454,431	0.95111	1.13297	1.01928	0.85249
189	Pharr	STARR	974,904	0.95111	1.13297	1.01928	0.85249
190	Pharr	WILLACY	469,505	0.95111	1.13297	1.01928	0.85249
191	Pharr	ZAPATA	373,932	0.95111	1.13297	1.01928	0.85249
192	San_Angelo	COKE	183,805	0.92900	1.12829	1.01617	0.99342
193	San_Angelo	CONCHO	249,955	0.92900	1.12829	1.01617	0.99342
194	San_Angelo	CROCKETT	449,919	0.92900	1.12829	1.01617	0.99342
195	San_Angelo	EDWARDS	93,872	0.92900	1.12829	1.01617	0.99342
196	San_Angelo	GLASSCOCK	155,756	0.92900	1.12829	1.01617	0.99342
197	San_Angelo	IRION	101,514	0.92900	1.12829	1.01617	0.99342
198	San_Angelo	KIMBLE	450,711	0.92900	1.12829	1.01617	0.99342
199	San_Angelo	MENARD	144,012	0.92900	1.12829	1.01617	0.99342
200	San_Angelo	REAGAN	111,291	0.92900			

					1.12829	1.01617	0.99342
201	San_Angelo	REAL	94,365	0.92900	1.12829	1.01617	0.99342
202	San_Angelo	RUNNELS	364,958	0.92900	1.12829	1.01617	0.99342
203	San_Angelo	SCHLEICHER	140,860	0.92900	1.12829	1.01617	0.99342
204	San_Angelo	STERLING	157,296	0.92900	1.12829	1.01617	0.99342
205	San_Angelo	SUTTON	437,488	0.92900	1.12829	1.01617	0.99342
206	San_Angelo	TOM_GREEN	2,348,322	0.92900	1.12829	1.01617	0.99342
207	San_Antonio	ATASCOSA	1,250,668	1.08858	1.23397	0.97615	0.77927
208	San_Antonio	BANDERA	383,157	1.08858	1.23397	0.97615	0.77927
209	San_Antonio	BEXAR	34,310,313	1.08858	1.23397	0.97615	0.77927
210	San_Antonio	COMAL	2,942,456	1.08858	1.23397	0.97615	0.77927
211	San_Antonio	FRIO	797,433	1.08858	1.23397	0.97615	0.77927
212	San_Antonio	GUADALUPE	2,648,162	1.08858	1.23397	0.97615	0.77927
213	San_Antonio	KENDALL	847,585	1.08858	1.23397	0.97615	0.77927
214	San_Antonio	KERR	1,255,688	1.08858	1.23397	0.97615	0.77927
215	San_Antonio	MCMULLEN	113,013	1.08858	1.23397	0.97615	0.77927
216	San_Antonio	MEDINA	1,116,434	1.08858	1.23397	0.97615	0.77927
217	San_Antonio	UVALDE	807,916	1.08858	1.23397	0.97615	0.77927
218	San_Antonio	WILSON	724,954	1.08858	1.23397	0.97615	0.77927
219	Tyler	ANDERSON	1,352,151	1.01981	1.17610	1.03676	0.79727
220	Tyler	CHEROKEE	1,321,158	1.01981	1.17610	1.03676	0.79727
221	Tyler	GREGG	3,595,986	1.01981	1.17610	1.03676	0.79727
222	Tyler	HENDERSON	1,750,147	1.01981	1.17610	1.03676	0.79727

223	Tyler	RUSK	1,424,111	1.01981	1.17610	1.03676	0.79727
224	Tyler	SMITH	5,707,044	1.01981	1.17610	1.03676	0.79727
225	Tyler	VAN_ZANDT	2,056,178	1.01981	1.17610	1.03676	0.79727
226	Tyler	WOOD	861,712	1.01981	1.17610	1.03676	0.79727
227	Waco	BELL	6,246,405	0.88831	1.25990	1.09167	1.11760
228	Waco	BOSQUE	509,035	0.88831	1.25990	1.09167	1.11760
229	Waco	CORYELL	1,062,381	0.88831	1.25990	1.09167	1.11760
230	Waco	FALLS	702,530	0.88831	1.25990	1.09167	1.11760
231	Waco	HAMILTON	323,042	0.88831	1.25990	1.09167	1.11760
232	Waco	HILL	1,990,703	0.88831	1.25990	1.09167	1.11760
233	Waco	LIMESTONE	676,184	0.88831	1.25990	1.09167	1.11760
234	Waco	MCLENNAN	6,749,203	0.88831	1.25990	1.09167	1.11760
235	Wichita_Falls	ARCHER	372,704	0.98848	1.23524	1.12194	0.97744
236	Wichita_Falls	BAYLOR	185,674	0.98848	1.23524	1.12194	0.97744
237	Wichita_Falls	CLAY	827,185	0.98848	1.23524	1.12194	0.97744
238	Wichita_Falls	COOKE	1,426,561	0.98848	1.23524	1.12194	0.97744
239	Wichita_Falls	MONTAGUE	695,599	0.98848	1.23524	1.12194	0.97744
240	Wichita_Falls	THROCKMORTON	83,897	0.98848	1.23524	1.12194	0.97744
241	Wichita_Falls	WICHITA	3,236,289	0.98848	1.23524	1.12194	0.97744
242	Wichita_Falls	WILBARGER	709,685	0.98848	1.23524	1.12194	0.97744
243	Wichita_Falls	YOUNG	430,325	0.98848	1.23524	1.12194	0.97744
244	Yoakum	AUSTIN	1,108,592	0.88733	1.23014	1.04964	1.11772
245	Yoakum	CALHOUN	560,329	0.88733			

					1.23014	1.04964	1.11772
246	Yoakum	COLORADO	1,508,041	0.88733	1.23014	1.04964	1.11772
247	Yoakum	DEWITT	518,613	0.88733	1.23014	1.04964	1.11772
248	Yoakum	FAYETTE	1,262,694	0.88733	1.23014	1.04964	1.11772
249	Yoakum	GONZALES	1,002,929	0.88733	1.23014	1.04964	1.11772
250	Yoakum	JACKSON	848,500	0.88733	1.23014	1.04964	1.11772
251	Yoakum	LAVACA	574,097	0.88733	1.23014	1.04964	1.11772
252	Yoakum	MATAGORDA	941,921	0.88733	1.23014	1.04964	1.11772
253	Yoakum	VICTORIA	2,555,157	0.88733	1.23014	1.04964	1.11772
254	Yoakum	WHARTON	1,585,521	0.88733	1.23014	1.04964	1.11772

APPENDIX 5
County VMT by Day of Week

OBS	COUNTY	WEEK_VMT	FRI_VMT	SAT_VMT	SUN_VMT
1	ANDERSON	1,378,937	1,590,265	1,401,856	1,078,029
2	ANDREWS	525,650	584,838	468,042	363,037
3	ANGELINA	2,367,498	2,815,422	2,373,345	2,053,225
4	ARANSAS	422,659	508,370	435,828	366,362
5	ARCHER	368,410	460,379	418,151	364,296
6	ARMSTRONG	308,863	343,397	330,496	295,963
7	ATASCOSA	1,361,452	1,543,287	1,220,839	974,608
8	AUSTIN	983,687	1,363,724	1,163,623	1,239,096
9	BAILEY	249,081	282,513	247,312	201,769
10	BANDERA	417,097	472,804	374,018	298,583
11	BASTROP	1,683,849	1,882,700	1,601,595	1,355,846
12	BAYLOR	183,535	229,352	208,315	181,485
13	BEE	712,188	856,613	734,377	617,327
14	BELL	5,548,744	7,869,846	6,819,013	6,980,982
15	BEXAR	37,349,520	42,337,897	33,492,012	26,736,997
16	BLANCO	465,173	520,106	442,450	374,560
17	BORDEN	52,455	66,950	58,685	55,080
18	BOSQUE	452,181	641,333	555,698	568,897
19	BOWIE	3,054,463	3,635,502	3,262,458	2,831,603
20	BRAZORIA	5,761,742	6,327,306		

				5,176,331	4,228,449
21	BRAZOS	3,412,766	4,379,118	3,929,286	3,524,747
22	BREWSTER	311,311	338,393	276,615	218,419
23	BRISCOE	68,329	78,364	80,714	80,883
24	BROOKS	488,185	581,530	523,175	437,565
25	BROWN	928,668	1,244,829	1,039,539	956,556
26	BURLESON	653,037	837,949	751,873	674,464
27	BURNET	1,106,284	1,236,929	1,052,243	890,787
28	CALDWELL	864,936	967,079	822,685	696,453
29	CALHOUN	497,196	689,283	588,143	626,290
30	CALLAHAN	823,236	1,050,725	921,008	864,433
31	CAMERON	5,610,365	6,683,113	6,012,484	5,028,630
32	CAMP	298,206	354,932	318,512	276,448
33	CARSON	746,507	829,973	798,794	715,328
34	CASS	1,045,218	1,244,046	1,116,392	968,957
35	CASTRO	327,207	371,125	324,882	265,055
36	CHAMBERS	2,074,390	2,440,575	2,056,811	1,723,794
37	CHEROKEE	1,347,330	1,553,814	1,369,724	1,053,320
38	CHILDRESS	365,847	419,577	432,157	433,061
39	CLAY	817,656	1,021,772	928,052	808,524
40	COCHRAN	120,183	136,314	119,329	97,355
41	COKE	170,755	207,385	186,777	182,596
42	COLEMAN	360,583	483,342	403,632	371,412

43	COLLIN	10,942,017	12,353,968	9,851,377	8,166,893
44	COLLINGSWORTH	111,307	127,654	131,482	131,757
45	COLORADO	1,338,130	1,855,102	1,582,900	1,685,568
46	COMAL	3,203,099	3,630,902	2,872,278	2,292,968
47	COMANCHE	489,035	655,524	547,419	503,720
48	CONCHO	232,208	282,022	253,997	248,310
49	COOKE	1,410,127	1,762,145	1,600,516	1,394,378
50	CORYELL	943,723	1,338,494	1,159,769	1,187,317
51	COTTLE	93,754	107,523	110,747	110,979
52	CRANE	205,117	228,213	182,637	141,663
53	CROCKETT	417,975	507,640	457,195	446,959
54	CROSBY	237,517	269,397	235,830	192,402
55	CULBERSON	632,802	687,852	562,275	443,980
56	DALLAM	357,744	397,744	382,802	342,803
57	DALLAS	69,643,075	78,629,777	62,701,440	51,980,135
58	DAWSON	525,476	596,007	521,743	425,664
59	DEAF_SMITH	530,879	590,236	568,063	508,706
60	DELTA	179,837	221,555	199,940	186,548
61	DENTON	10,387,225	11,727,586	9,351,884	7,752,807
62	DEWITT	460,181	637,967	544,357	579,665
63	DICKENS	111,290	127,634	131,461	131,736
64	DIMMIT	265,726	320,004	311,140	276,388
65	DONLEY	430,887	494,170		

				508,986	510,052
66	DUVAL	403,488	485,904	472,445	419,676
67	EASTLAND	957,690	1,283,731	1,072,026	986,449
68	ECTOR	2,961,513	3,294,982	2,636,952	2,045,353
69	EDWARDS	87,207	105,915	95,390	93,254
70	ELLIS	4,103,470	4,632,980	3,694,459	3,062,744
71	EL_PASO	13,948,381	15,161,809	12,393,819	9,786,332
72	ERATH	1,080,441	1,225,663	977,201	783,747
73	FALLS	624,065	885,118	766,931	785,148
74	FANNIN	724,413	892,460	805,394	751,447
75	FAYETTE	1,120,426	1,553,290	1,325,374	1,411,338
76	FISHER	173,373	221,282	193,963	182,049
77	FLOYD	252,505	286,397	250,711	204,543
78	FOARD	75,091	86,119	88,701	88,886
79	FORT_BEND	7,116,000	7,814,496	6,392,993	5,222,317
80	FRANKLIN	386,042	475,595	429,197	400,448
81	FREESTONE	1,284,079	1,647,677	1,478,424	1,326,213
82	FRIO	868,070	984,009	778,414	621,416
83	GAINES	523,636	593,919	519,916	424,174
84	GALVESTON	6,637,456	7,288,978	5,963,070	4,871,122
85	GARZA	373,004	423,070	370,355	302,154
86	GILLESPIE	682,756	763,385	649,404	549,760
87	GLASSCOCK	144,697	175,738	158,275	154,731

88	GOLIAD	309,963	372,821	319,621	268,678
89	GONZALES	889,929	1,233,744	1,052,715	1,120,994
90	GRAY	829,927	922,720	888,057	795,263
91	GRAYSON	3,160,658	3,893,859	3,513,985	3,278,610
92	GREGG	3,667,223	4,229,240	3,728,175	2,866,972
93	GRIMES	731,869	939,103	842,637	755,883
94	GUADALUPE	2,882,737	3,267,753	2,585,004	2,063,633
95	HALE	1,116,522	1,266,383	1,108,590	904,444
96	HALL	221,773	254,344	261,970	262,518
97	HAMILTON	286,961	407,001	352,655	361,032
98	HANSFORD	171,628	190,818	183,649	164,460
99	HARDEMAN	329,593	377,998	389,331	390,146
100	HARDIN	1,390,091	1,635,479	1,378,311	1,155,150
101	HARRIS	94,954,473	104,275,064	85,306,813	69,685,555
102	HARRISON	2,752,283	3,275,840	2,939,701	2,551,471
103	HARTLEY	348,828	387,831	373,261	334,259
104	HASKELL	241,892	308,734	270,620	253,996
105	HAYS	3,330,797	3,724,142	3,168,091	2,681,980
106	HEMPHILL	144,893	161,093	155,041	138,841
107	HENDERSON	1,784,817	2,058,348	1,814,482	1,395,340
108	HIDALGO	9,472,739	11,284,004	10,151,689	8,490,517
109	HILL	1,768,361	2,508,087	2,173,191	2,224,810
110	HOCKLEY	761,277	863,457		

				755,869	616,676
111	HOOD	952,562	1,080,596	861,541	690,984
112	HOPKINS	1,399,271	1,723,870	1,555,694	1,451,490
113	HOUSTON	649,284	772,126	650,887	563,095
114	HOWARD	1,078,381	1,376,374	1,206,455	1,132,346
115	HUDSPETH	1,104,956	1,201,081	981,808	775,249
116	HUNT	2,370,491	2,920,391	2,635,486	2,458,955
117	HUTCHINSON	529,449	588,647	566,533	507,336
118	IRION	94,306	114,537	103,155	100,846
119	JACK	332,921	377,669	301,109	241,500
120	JACKSON	752,900	1,043,774	890,620	948,386
121	JASPER	1,291,538	1,519,528	1,280,593	1,073,253
122	JEFFERSON	7,035,845	8,277,858	6,976,221	5,846,705
123	JEFF_DAVIS	190,063	206,597	168,880	133,350
124	JIM_HOGG	147,483	175,683	158,054	132,191
125	JIM_WELLS	1,344,904	1,617,638	1,386,808	1,165,769
126	JOHNSON	3,055,775	3,466,502	2,763,783	2,216,644
127	JONES	567,746	724,634	635,175	596,158
128	KARNES	367,535	442,068	378,987	318,581
129	KAUFMAN	3,628,062	4,096,225	3,266,437	2,707,910
130	KENDALL	922,664	1,045,895	827,370	660,498
131	KENEDY	432,214	514,857	463,193	387,398
132	KENT	57,813	73,789	64,679	60,706

133	KERR	1,366,917	1,549,482	1,225,740	978,520
134	KIMBLE	418,711	508,533	457,999	447,746
135	KING	76,733	88,002	90,641	90,830
136	KINNEY	177,306	213,523	207,608	184,420
137	KLEBERG	926,984	1,114,968	955,866	803,514
138	KNOX	160,351	183,901	189,415	189,811
139	LAMAR	1,261,376	1,553,986	1,402,384	1,308,449
140	LAMB	535,185	607,019	531,383	433,529
141	LAMPASAS	443,374	594,318	496,307	456,688
142	LASALLE	474,972	571,991	556,147	494,029
143	LAVACA	509,413	706,220	602,595	641,680
144	LEE	643,383	719,362	611,954	518,056
145	LEON	1,152,080	1,478,301	1,326,447	1,189,883
146	LIBERTY	1,945,808	2,289,295	1,929,319	1,616,944
147	LIMESTONE	600,661	851,924	738,170	755,703
148	LIPSCOMB	92,160	102,465	98,616	88,311
149	LIVE OAK	1,104,926	1,328,995	1,139,353	957,755
150	LLANO	459,109	513,326	436,682	369,677
151	LOVING	13,839	15,398	12,323	9,558
152	LUBBOCK	6,566,888	7,448,304	6,520,237	5,319,536
153	LYNN	366,732	415,956	364,127	297,073
154	MADISON	744,438	955,232	857,109	768,865
155	MARION	340,413	405,168		

				363,593	315,576
156	MARTIN	392,485	436,679	349,472	271,068
157	MASON	178,190	199,233	169,486	143,480
158	MATAGORDA	835,795	1,158,695	988,678	1,052,804
159	MAVERICK	669,099	805,770	783,450	695,945
160	MCCULLOCH	315,521	422,938	353,190	324,996
161	MCLENNAN	5,995,384	8,503,320	7,367,902	7,542,909
162	MCMULLEN	123,023	139,454	110,317	88,067
163	MEDINA	1,215,328	1,377,646	1,089,807	870,004
164	MENARD	133,787	162,487	146,341	143,064
165	MIDLAND	3,259,057	3,626,029	2,901,887	2,250,850
166	MILAM	884,212	1,134,584	1,018,037	913,225
167	MILLS	253,907	340,348	284,220	261,531
168	MITCHELL	488,828	623,907	546,883	513,290
169	MONTAGUE	687,586	859,232	780,420	679,906
170	MONTGOMERY	7,487,720	8,222,704	6,726,946	5,495,117
171	MOORE	571,379	635,265	611,400	547,515
172	MORRIS	483,487	575,459	516,411	448,211
173	MOTLEY	79,189	90,819	93,542	93,738
174	NACOGDOCHES	1,842,611	2,191,228	1,847,162	1,598,014
175	NAVARRO	1,981,979	2,237,732	1,784,426	1,479,307
176	NEWTON	481,694	566,725	477,612	400,282
177	NOLAN	842,945	1,075,879	943,058	885,128

178	NUECES	8,628,887	10,378,745	8,897,739	7,479,557
179	OCHILTREE	247,858	275,570	265,218	237,505
180	OLDHAM	716,399	796,499	766,578	686,478
181	ORANGE	2,736,025	3,219,005	2,712,839	2,273,605
182	PALO_PINTO	1,026,161	1,164,087	928,107	744,372
183	PANOLA	1,006,457	1,197,911	1,074,992	933,023
184	PARKER	2,997,347	3,400,221	2,710,938	2,174,261
185	PARMER	429,967	487,678	426,913	348,297
186	PECOS	991,905	1,103,595	883,199	685,054
187	POLK	1,561,719	1,857,192	1,565,576	1,354,409
188	POTTER	4,289,071	4,768,629	4,589,489	4,109,931
189	PRESIDIO	230,548	250,605	204,853	161,755
190	RAINS	295,907	364,551	328,987	306,950
191	RANDALL	2,338,236	2,599,673	2,502,013	2,240,576
192	REAGAN	103,389	125,568	113,090	110,558
193	REAL	87,665	106,471	95,891	93,744
194	RED_RIVER	424,896	523,463	472,395	440,753
195	REEVES	861,711	958,740	767,273	595,136
196	REFUGIO	665,101	799,977	685,824	576,512
197	ROBERTS	70,400	78,271	75,331	67,459
198	ROBERTSON	694,730	891,448	799,877	717,525
199	ROCKWALL	1,374,310	1,551,650	1,237,327	1,025,756
200	RUNNELS	339,046	411,778		

				370,859	362,556
201	RUSK	1,452,323	1,674,898	1,476,462	1,135,401
202	SABINE	307,638	365,843	308,398	266,801
203	SAN_AUGUSTINE	295,933	351,922	296,663	256,649
204	SAN_JACINTO	728,258	866,042	730,057	631,586
205	SAN_PATRICIO	1,944,191	2,338,454	2,004,766	1,685,233
206	SAN_SABA	173,453	232,504	194,161	178,661
207	SCHLEICHER	130,859	158,931	143,138	139,933
208	SCURRY	595,729	760,349	666,481	625,541
209	SHACKELFORD	177,931	227,100	199,063	186,836
210	SHELBY	777,078	924,099	778,997	673,925
211	SHERMAN	247,297	274,947	264,619	236,968
212	SMITH	5,820,100	6,712,054	5,916,835	4,550,055
213	SOMERVELL	238,259	270,284	215,493	172,832
214	STARR	927,241	1,104,537	993,700	831,096
215	STEPHENS	270,171	362,150	302,426	278,284
216	STERLING	146,128	177,475	159,839	156,261
217	STONEWALL	102,211	130,456	114,350	107,326
218	SUTTON	406,426	493,614	444,562	434,609
219	SWISHER	434,506	492,826	431,419	351,974
220	TARRANT	45,443,590	51,551,668	41,101,273	32,964,562
221	TAYLOR	3,505,592	4,474,306	3,921,934	3,681,020
222	TERRELL	101,905	113,379	90,737	70,380

223	TERRY	488,387	553,938	484,917	395,620
224	THROCKMORTON	82,931	103,633	94,128	82,004
225	TITUS	1,062,437	1,264,540	1,134,784	984,919
226	TOM_GREEN	2,181,591	2,649,589	2,386,295	2,332,870
227	TRAVIS	20,654,456	23,093,605	19,645,507	16,631,106
228	TRINITY	355,786	423,100	356,664	308,557
229	TYLER	596,802	702,154	591,745	495,936
230	UPSHUR	956,604	1,138,575	1,021,744	886,808
231	UPTON	166,305	185,031	148,079	114,857
232	UVALDE	879,482	996,945	788,648	629,585
233	VAL_VERDE	670,932	807,978	785,597	697,851
234	VAN_ZANDT	2,096,911	2,418,271	2,131,763	1,639,329
235	VICTORIA	2,267,267	3,143,200	2,681,995	2,855,950
236	WALKER	2,052,366	2,633,510	2,362,991	2,119,709
237	WALLER	1,679,411	1,844,260	1,508,778	1,232,493
238	WARD	592,609	659,337	527,663	409,282
239	WASHINGTON	1,122,755	1,440,671	1,292,683	1,159,595
240	WEBB	3,045,318	3,667,357	3,565,772	3,167,502
241	WHARTON	1,406,881	1,950,413	1,664,226	1,772,169
242	WHEELER	536,792	615,628	634,086	635,413
243	WICHITA	3,199,007	3,997,593	3,630,922	3,163,278
244	WILBARGER	701,510	876,632	796,224	693,675
245	WILLACY	446,551	531,935		

				478,557	400,248
246	WILLIAMSON	5,731,854	6,408,747	5,451,859	4,615,327
247	WILSON	789,171	894,572	707,664	564,935
248	WINKLER	192,693	214,391	171,575	133,082
249	WISE	2,262,875	2,567,028	2,046,648	1,641,479
250	WOOD	878,782	1,013,459	893,388	687,017
251	YOAKUM	259,409	294,227	257,566	210,135
252	YOUNG	425,368	531,555	482,799	420,617
253	ZAPATA	355,650	423,653	381,141	318,773
254	ZAVALA	280,255	337,500	328,152	291,500

APPENDIX 6
Weekday VMT Mix by TxDOT District

OBS	DISTRICT	P_LDGV	P_LDGT1	P_LDGT2	P_HDGV	P_LDDV	P_LDDT	P_HDDV	P_MC
1	Abilene	0.4583171	0.1791995	0.0343551	0.1338103	0.0011814	0.0011646	0.1909720	0.0010000
2	Amarillo	0.5167705	0.2020047	0.0387272	0.0984075	0.0013317	0.0013128	0.1404456	0.0010000
3	Atlanta	0.5180767	0.2025144	0.0388249	0.0976163	0.0013351	0.0013161	0.1393165	0.0010000
4	Austin	0.6034359	0.2358167	0.0452094	0.0459177	0.0015546	0.0015325	0.0655331	0.0010000
5	Beaumont	0.5550955	0.2169570	0.0415937	0.0751956	0.0014303	0.0014100	0.1073180	0.0010000
6	Brownwood	0.5690413	0.2223979	0.0426368	0.0667492	0.0014661	0.0014453	0.0952634	0.0010000
7	Bryan	0.5445211	0.2128315	0.0408028	0.0816001	0.0014031	0.0013832	0.1164584	0.0010000
8	Childress	0.5009853	0.1958463	0.0375465	0.1079679	0.0012911	0.0012728	0.1540901	0.0010000
9	Corpus_Christi	0.6008639	0.2348132	0.0450170	0.0474755	0.0015480	0.0015260	0.0677563	0.0010000
10	Dallas	0.5997753	0.2343885	0.0449356	0.0481348	0.0015452	0.0015233	0.0686973	0.0010000
11	El_Paso	0.6202501	0.2423767	0.0464670	0.0357341	0.0015979	0.0015752	0.0509991	0.0010000
12	Fort_Worth	0.6025623	0.2354759	0.0451440	0.0464469	0.0015524	0.0015303	0.0662883	0.0010000
13	Houston	0.6203231	0.2424051	0.0464725	0.0356899	0.0015980	0.0015754	0.0509360	0.0010000
14	Laredo	0.5661731	0.2212789	0.0424223	0.0684863	0.0014588	0.0014381	0.0977426	0.0010000

15	Lubbock	0.5648533	0.2207640	0.0423236	0.0692856	0.0014554	0.0014347	0.0988834	0.0010000
16	Lufkin	0.5230757	0.2044647	0.0391988	0.0945887	0.0013479	0.0013288	0.1349955	0.0010000
17	Odessa	0.5278057	0.2063101	0.0395525	0.0917239	0.0013601	0.0013408	0.1309069	0.0010000
18	Paris	0.5502633	0.2150718	0.0412323	0.0781222	0.0014178	0.0013977	0.1114948	0.0010000
19	Pharr	0.6244394	0.2440111	0.0467804	0.0331968	0.0016086	0.0015858	0.0473779	0.0010000
20	San_Angelo	0.5554696	0.2171030	0.0416217	0.0749690	0.0014312	0.0014109	0.1069946	0.0010000
21	San_Antonio	0.5985125	0.2338959	0.0448411	0.0488997	0.0015419	0.0015201	0.0697889	0.0010000
22	Tyler	0.5995069	0.2342838	0.0449155	0.0482974	0.0015445	0.0015226	0.0689293	0.0010000
23	Waco	0.5635341	0.2202493	0.0422249	0.0700846	0.0014520	0.0014314	0.1000237	0.0010000
24	Wichita_Falls	0.5815504	0.2272782	0.0435724	0.0591729	0.0014983	0.0014770	0.0844507	0.0010000
25	Yoakum	0.5143591	0.2010640	0.0385468	0.0998679	0.0013255	0.0013067	0.1425300	0.0010000

APPENDIX 7
Friday VMT Mix by TxDOT District

OBS	DISTRICT	F_LDGV	F_LDGT1	F_LDGT2	F_HDGV	F_LDDV	F_LDDT	F_HDDV	F_MC
1	Abilene	0.5503803	0.1834656	0.0354558	0.0849768	0.0014140	0.0011942	0.1421133	0.0010000
2	Amarillo	0.5976345	0.1991889	0.0384944	0.0601900	0.0015351	0.0012965	0.1006605	0.0010000
3	Atlanta	0.5986507	0.1995270	0.0385597	0.0596570	0.0015377	0.0012987	0.0997691	0.0010000
4	Austin	0.6616151	0.2204777	0.0426086	0.0266295	0.0016992	0.0014351	0.0445347	0.0010000
5	Beaumont	0.6267702	0.2088835	0.0403679	0.0449072	0.0016099	0.0013597	0.0751018	0.0010000
6	Brownwood	0.6370338	0.2122986	0.0410279	0.0395235	0.0016362	0.0013819	0.0660982	0.0010000
7	Bryan	0.6188695	0.2062546	0.0398599	0.0490514	0.0015896	0.0013425	0.0820325	0.0010000
8	Childress	0.5852205	0.1950583	0.0376961	0.0667017	0.0015033	0.0012697	0.1115504	0.0010000
9	Corpus_Christi	0.6598120	0.2198778	0.0424926	0.0275754	0.0016946	0.0014312	0.0461165	0.0010000
10	Dallas	0.6590471	0.2196233	0.0424434	0.0279766	0.0016926	0.0014296	0.0467874	0.0010000
11	El_Paso	0.6732677	0.2243550	0.0433579	0.0205173	0.0017291	0.0014604	0.0343127	0.0010000
12	Fort_Worth	0.6610033	0.2202742	0.0425692	0.0269505	0.0016976	0.0014338	0.0450714	0.0010000
13	Houston	0.6733177	0.2243717	0.0433611	0.0204910	0.0017292	0.0014605	0.0342688	0.0010000
14	Laredo	0.6349372	0.2116010	0.0408931	0.0406232	0.0016308	0.0013773	0.0679374	0.0010000

15	Lubbock	0.6339700	0.2112791	0.0408309	0.0411306	0.0016283	0.0013752	0.0687858	0.0010000
16	Lufkin	0.6025243	0.2008159	0.0388088	0.0576251	0.0015477	0.0013071	0.0963710	0.0010000
17	Odessa	0.6061671	0.2020280	0.0390431	0.0557143	0.0015570	0.0013150	0.0931754	0.0010000
18	Paris	0.6231726	0.2076864	0.0401366	0.0467942	0.0016006	0.0013519	0.0782576	0.0010000
19	Pharr	0.6761349	0.2253090	0.0435422	0.0190133	0.0017365	0.0014666	0.0317975	0.0010000
20	San_Angelo	0.6270478	0.2089758	0.0403858	0.0447615	0.0016106	0.0013603	0.0748582	0.0010000
21	San_Antonio	0.6581586	0.2193276	0.0423863	0.0284426	0.0016904	0.0014276	0.0475668	0.0010000
22	Tyler	0.6588584	0.2195605	0.0424313	0.0280756	0.0016921	0.0014292	0.0469530	0.0010000
23	Waco	0.6330016	0.2109569	0.0407686	0.0416385	0.0016258	0.0013731	0.0696353	0.0010000
24	Wichita_Falls	0.6460924	0.2153127	0.0416104	0.0347719	0.0016594	0.0014015	0.0581517	0.0010000
25	Yoakum	0.5957541	0.1985632	0.0383735	0.0611764	0.0015303	0.0012925	0.1023100	0.0010000

APPENDIX 8
Saturday VMT Mix by TxDOT District

OBS	DISTRICT	S_LDGV	S_LDGT1	S_LDGT2	S_HDGV	S_LDDV	S_LDDT	S_HDDV	S_MC
1	Abilene	0.6131162	0.1940526	0.0352156	0.0575475	0.0015766	0.0012595	0.0962319	0.0010000
2	Amarillo	0.6477969	0.2050112	0.0372044	0.0396642	0.0016657	0.0013307	0.0663271	0.0010000
3	Atlanta	0.6485222	0.2052404	0.0372459	0.0392902	0.0016675	0.0013321	0.0657017	0.0010000
4	Austin	0.6918822	0.2189416	0.0397324	0.0169312	0.0017788	0.0014211	0.0283127	0.0010000
5	Beaumont	0.6682646	0.2114787	0.0383781	0.0291098	0.0017182	0.0013726	0.0486779	0.0010000
6	Brownwood	0.6753165	0.2137070	0.0387824	0.0254735	0.0017363	0.0013871	0.0425972	0.0010000
7	Bryan	0.6627808	0.2097459	0.0380636	0.0319376	0.0017041	0.0013614	0.0534066	0.0010000
8	Childress	0.6388682	0.2021898	0.0366924	0.0442683	0.0016427	0.0013123	0.0740262	0.0010000
9	Corpus_Christi	0.6906823	0.2185624	0.0396636	0.0175500	0.0017758	0.0014186	0.0293474	0.0010000
10	Dallas	0.6901726	0.2184014	0.0396343	0.0178128	0.0017745	0.0014176	0.0297869	0.0010000
11	El_Paso	0.6995796	0.2213739	0.0401738	0.0129620	0.0017986	0.0014369	0.0216753	0.0010000
12	Fort_Worth	0.6914753	0.2188130	0.0397090	0.0171411	0.0017778	0.0014202	0.0286636	0.0010000
13	Houston	0.6996125	0.2213842	0.0401757	0.0129451	0.0017987	0.0014369	0.0216469	0.0010000
14	Laredo	0.6738825	0.2132539	0.0387002	0.0262129	0.0017326	0.0013842	0.0438336	0.0010000

15	Lubbock	0.6732199	0.2130445	0.0386622	0.0265546	0.0017309	0.0013828	0.0444050	0.0010000
16	Lufkin	0.6512793	0.2061116	0.0374040	0.0378685	0.0016746	0.0013378	0.0633242	0.0010000
17	Odessa	0.6538611	0.2069274	0.0375521	0.0365371	0.0016812	0.0013431	0.0610980	0.0010000
18	Paris	0.6657736	0.2106916	0.0382352	0.0303943	0.0017118	0.0013675	0.0508259	0.0010000
19	Pharr	0.7014587	0.2219676	0.0402815	0.0119931	0.0018034	0.0014407	0.0200550	0.0010000
20	San_Angelo	0.6684564	0.2115393	0.0383890	0.0290109	0.0017187	0.0013730	0.0485125	0.0010000
21	San_Antonio	0.6895799	0.2182141	0.0396003	0.0181184	0.0017729	0.0014163	0.0302979	0.0010000
22	Tyler	0.6900467	0.2183616	0.0396271	0.0178777	0.0017741	0.0014173	0.0298954	0.0010000
23	Waco	0.6725557	0.2128347	0.0386241	0.0268971	0.0017292	0.0013814	0.0449777	0.0010000
24	Wichita_Falls	0.6814737	0.2156526	0.0391355	0.0222984	0.0017521	0.0013997	0.0372878	0.0010000
25	Yoakum	0.6464526	0.2045864	0.0371273	0.0403574	0.0016622	0.0013279	0.0674863	0.0010000

APPENDIX 9
Sunday VMT Mix by TxDOT District

OBS	DISTRICT	S_LDGV	S_LDGT1	S_LDGT2	S_HDGV	S_LDDV	S_LDDT	S_HDDV	S_MC
1	Abilene	0.6039479	0.2414667	0.0420537	0.0405689	0.0015560	0.0015618	0.0678450	0.0010000
2	Amarillo	0.6276379	0.2509226	0.0437006	0.0275036	0.0016170	0.0016230	0.0459954	0.0010000
3	Atlanta	0.6281251	0.2511171	0.0437344	0.0272349	0.0016182	0.0016242	0.0455460	0.0010000
4	Austin	0.6566543	0.2625046	0.0457177	0.0115008	0.0016916	0.0016979	0.0192331	0.0010000
5	Beaumont	0.6412584	0.2563593	0.0446474	0.0199918	0.0016520	0.0016582	0.0334330	0.0010000
6	Brownwood	0.6458909	0.2582084	0.0449695	0.0174369	0.0016639	0.0016701	0.0291604	0.0010000
7	Bryan	0.6376347	0.2549129	0.0443955	0.0219902	0.0016427	0.0016488	0.0367751	0.0010000
8	Childress	0.6216133	0.2485179	0.0432818	0.0308262	0.0016015	0.0016074	0.0515519	0.0010000
9	Corpus_Christi	0.6558802	0.2621956	0.0456639	0.0119277	0.0016896	0.0016959	0.0199471	0.0010000
10	Dallas	0.6555511	0.2620643	0.0456410	0.0121092	0.0016888	0.0016951	0.0202506	0.0010000
11	El_Paso	0.6615996	0.2644785	0.0460615	0.0087734	0.0017043	0.0017107	0.0146720	0.0010000
12	Fort_Worth	0.6563919	0.2623999	0.0456995	0.0116455	0.0016909	0.0016972	0.0194752	0.0010000
13	Houston	0.6616207	0.2644869	0.0460629	0.0087617	0.0017044	0.0017107	0.0146526	0.0010000
14	Laredo	0.6449514	0.2578334	0.0449042	0.0179550	0.0016615	0.0016677	0.0300269	0.0010000

15	Lubbock	0.6445168	0.2576599	0.0448739	0.0181947	0.0016604	0.0016666	0.0304277	0.0010000
16	Lufkin	0.6299738	0.2518550	0.0438630	0.0262153	0.0016230	0.0016290	0.0438409	0.0010000
17	Odessa	0.6317008	0.2525443	0.0439830	0.0252629	0.0016274	0.0016335	0.0422481	0.0010000
18	Paris	0.6396147	0.2557032	0.0445332	0.0208983	0.0016478	0.0016539	0.0349490	0.0010000
19	Pharr	0.6628015	0.2649583	0.0461450	0.0081105	0.0017074	0.0017138	0.0135635	0.0010000
20	San_Angelo	0.6413848	0.2564097	0.0446562	0.0199220	0.0016523	0.0016585	0.0333164	0.0010000
21	San_Antonio	0.6551683	0.2619115	0.0456144	0.0123203	0.0016878	0.0016941	0.0206037	0.0010000
22	Tyler	0.6554698	0.2620318	0.0456354	0.0121540	0.0016885	0.0016948	0.0203256	0.0010000
23	Waco	0.6440809	0.2574859	0.0448436	0.0184351	0.0016593	0.0016654	0.0308297	0.0010000
24	Wichita_Falls	0.6499109	0.2598129	0.0452489	0.0152198	0.0016743	0.0016805	0.0254527	0.0010000
25	Yoakum	0.6267341	0.2505619	0.0436378	0.0280021	0.0016146	0.0016207	0.0468289	0.0010000

APPENDIX 10
Temperature & VMT Fraction by Hour

Hour	Ambient	VMT %
1	76.2	0.8965
2	74.8	0.5558
3	73.7	0.4661
4	72.6	0.3629
5	71.7	0.4975
6	70.8	1.3496
7	70.1	4.3003
8	71.5	7.4029
9	76.0	5.7542
10	80.3	4.6980
11	84.1	4.8427
12	87.2	5.2972
13	89.5	5.7300
14	91.3	5.6740
15	92.6	5.9599
16	93.1	6.9092
17	93.1	7.4638
18	92.2	8.1233
19	90.1	6.6508
20	86.1	4.9923
21	82.5	4.1471
22	80.5	3.5226
23	78.7	2.6780
24	77.3	1.7253

APPENDIX 11
RVP by County

COUNTY	RVP
Anderson	7.0
Andrews	7.8
Angelina	7.0
Aransas	7.0
Archer	7.8
Armstrong	8.4
Atascosa	7.8
Austin	7.0
Bailey	7.8
Bandera	7.8
Bastrop	7.0
Baylor	7.8
Bee	7.0
Bell	7.0
Bexar	7.5
Blanco	7.8
Borden	7.8
Bosque	7.0
Bowie	7.0
Brazoria	6.9
Brazos	7.0
Brewster	7.8
Briscoe	7.8
Brooks	6.9
Brown	7.8
Burleson	7.0
Burnet	7.8
Caldwell	7.5
Calhoun	7.0
Callahan	7.8
Cameron	7.8
Camp	7.0
Carson	8.4
Cass	7.0
Castro	7.8
Chambers	6.9
Cherokee	7.0
Childress	7.8

COUNTY	RVP
Clay	7.8
Cochran	7.8
Coke	7.8
Coleman	7.8
Collin	7.0
Collingsworth	7.8
Colorado	7.0
Comal	7.5
Comanche	7.8
Concho	7.8
Cooke	7.0
Coryell	7.0
Cottle	7.8
Crane	8.2
Crockett	7.8
Crosby	7.8
Culberson	6.5
Dallam	7.8
Dallas	7.0
Dawson	7.8
Deaf Smith	7.8
Delta	7.0
Denton	7.0
DeWitt	7.0
Dickens	7.8
Dimmit	7.8
Donley	8.4
Duval	7.8
Eastland	7.8
Ector	8.2
Edwards	7.8
El Paso	6.5
Ellis	7.0
Erath	7.8
Falls	7.0
Fannin	7.0
Fayette	7.0
Fisher	7.8
Floyd	7.8
Foard	6.9

COUNTY	RVP
Fort Bend	6.9
Franklin	7.0
Freestone	7.0
Frio	7.8
Gaines	7.8
Galveston	6.9
Garza	7.8
Gillespie	7.8
Glasscock	7.8
Goliad	7.0
Gonzales	7.0
Gray	8.4
Grayson	7.0
Gregg	7.0
Grimes	7.0
Guadalupe	7.5
Hale	7.8
Hall	7.8
Hamilton	7.8
Hansford	8.4
Hardeman	7.8
Hardin	7.8
Harris	6.9
Harrison	7.0
Hartley	7.8
Haskell	7.8
Hays	7.5
Hemphill	8.4
Henderson	7.0
Hidalgo	7.8
Hill	7.0
Hockley	7.8
Hood	7.0
Hopkins	7.0
Houston	7.0
Howard	7.8
Hudspeth	6.5
Hunt	7.0
Hutchinson	8.4
Irion	7.8

COUNTY	RVP
Jack	7.4
Jackson	7.0
Jasper	7.8
Jeff Davis	7.8
Jefferson	7.8
Jim Hogg	7.8
Jim Wells	7.8
Johnson	7.0
Jones	7.8
Karnes	7.0
Kaufman	7.0
Kendall	7.8
Kenedy	6.9
Kent	7.8
Kerr	7.8
Kimble	7.8
King	7.8
Kinney	7.8
Kleberg	7.8
Knox	7.8
Lamar	7.8
Lamb	7.0
Lampasas	7.8
LaSalle	7.8
Lavaca	7.0
Lee	7.0
Leon	7.0
Liberty	6.9
Limestone	7.0
Lipscomb	8.4
Live Oak	7.0
Llano	7.8
Loving	6.5
Lubbock	7.8
Lynn	7.8
Madison	7.0
Marion	7.0
Martin	7.8
Mason	7.8
Matagorda	7.0

COUNTY	RVP
Maverick	7.8
McCulloch	7.8
McLennan	7.0
McMullen	7.8
Medina	7.8
Menard	7.8
Midland	8.2
Milam	7.0
Mills	7.8
Mitchell	7.8
Montague	7.0
Montgomery	6.9
Moore	8.4
Morris	7.0
Motley	7.8
Nacogdoches	7.0
Navarro	7.0
Newton	7.8
Nolan	7.8
Nueces	6.9
Ochiltree	8.4
Oldham	7.8
Orange	7.8
Palo Pinto	7.0
Panola	7.0
Parker	7.0
Parmer	7.8
Pecos	7.8
Polk	7.0
Potter	8.4
Presidio	7.8
Rains	7.0
Randall	8.4
Reagan	7.8
Real	7.8
Red River	7.0
Reeves	6.5
Refugio	7.0
Roberts	8.4
Robertson	7.0

COUNTY	RVP
Rockwall	7.0
Runnels	7.8
Rusk	7.0
Sabine	7.0
San Augustine	7.0
San Jacinto	7.0
San Patricio	7.0
San Saba	7.8
Schleicher	7.8
Scurry	7.8
Shackelford	7.8
Shelby	7.0
Sherman	8.4
Smith	7.0
Somervell	7.0
Starr	7.8
Stephens	7.8
Sterling	7.8
Stonewall	7.8
Sutton	7.8
Swisher	7.8
Tarrant	7.0
Taylor	7.8
Terrell	7.8
Terry	7.8
Throckmorton	7.8
Titus	7.0
Tom Green	7.8
Travis	7.5
Trinity	7.0
Tyler	7.0
Upshur	7.0
Upton	7.8
Uvalde	7.8
Val Verde	7.8
Van Zandt	7.0
Victoria	7.0
Walker	7.0
Waller	6.5
Ward	8.2

COUNTY	RVP
Washington	7.0
Webb	7.8
Wharton	6.9
Wheeler	7.8
Wichita	7.8
Wilbarger	7.8
Willacy	7.8
Williamson	7.0
Wilson	7.0
Winkler	8.2
Wise	7.0
Wood	7.0
Yoakum	7.8
Young	7.8
Zapata	7.8
Zavala	7.8