APPENDIX B

Tyler/Longview/Marshall Flexible Attainment Region

Emission Inventory Ozone Precursors, VOC and NO_x Emissions

TYLER/LONGVIEW/MARSHALL

FLEXIBLE ATTAINMENT REGION

EMISSION INVENTORY

OZONE PRECURSORS, VOC AND NO_X

1995 EMISSIONS

MAY 1997

PREPARED BY POLLUTION SOLUTIONS
3000 TAKU RD.
CEDAR PARK, TX 78613
512-259-3277
512-250-1410

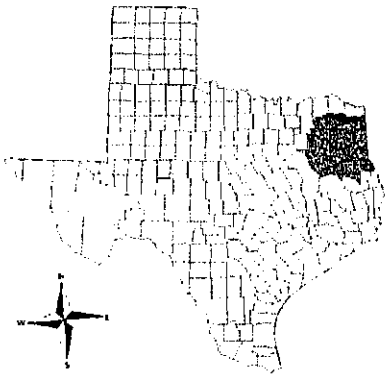
TABLE OF CONTENTS

Section		Tab
1.0	BACKGROUND AND EMISSIONS SUMMARY	1
2.0	POINT SOURCES	2
3.0	AREA SOURCES	3
4.0	NON-ROAD MOBILE SOURCES	4
5.0	ON-ROAD MOBILE SOURCES	5
6.0	BIOGENIC EMISSIONS	6
	APPENDIX	7
	a) QUALITY ASSURANCE PLAN	

96° W 95° W 94° W

Major Sources of of Non-Methane Organic Compound (NMOC) and Nitrogen Oxide (NOx) Emissions

1 TEXAS UTILITIES FUEL CO.
AA0035V, BETHEL COMPRESSOR STATION
2 EXXON PIPELINE CO.
AA0055P, EXXON PIPELINE CO.
3 TEXAS UTILITIES FUEL CO.
AA0059H, BETHEL DOME DEHYDRATION
4 INTERNATIONAL PAPER CO.
CG0010G, TEXARKANA MILL
5 SHELL WESTERN E. & P. INC.
CG0012C, BRYANS MILL PLANT
6 TEXAS UTILITIES GENERATING CO.
CI0026J, STRYKER CREEK STATION SES.
7 UNOCAL PIPELINE CO.
CI0051K, JOHN JORDAN SURVEY A-27
8 TEXACO E. & P. INC.
FH0002M, NEW HOPE GAS PLANT
9 ARCO PERMIAN
GI0003W, LONGVIEW GAS PLANT
10 TRIDENT N.G.L. INC.
GI0005S, EAST TEXAS GAS PLANT
11 STROH BREWERY CO.
GI0026K, LONGVIEW BREWERY
12 AMERICAN NATIONAL CAN CO.
GI0027I, AMERICAN NATIONAL CAN CO.
13 PETROLITE CORPORATION
GI0038D, KILGORE PLANT
14 SOUTHWESTERN ELECTRIC POWER CO.
GI0043K, KNOX LEE POWER PLANT
15 TONKAWA GAS PROCESSING CO.
GI0079M, SUB. OF TEX OIL & GAS CORP.
16 ENSERCH EXPLORATION INC.
GI0139T, WILLOW SPRINGS PLANT
17 WASKOM GAS PROCESSING CO.
HH0005S, WASKOM PLANT
18 NORIT AMERICAS INC.
HH0019H, NORIT AMERICAS INC.
19 MOBIL OIL CORPORATION
HH0029E, WASKOM TERMINAL
20 NATURAL GAS PIPELINE CO.
HI0031R, STATION 304
21 SOUTHWESTERN ELECTRIC POWER CO.
HH0037P, H. W. PIRKEY POWER PLANT
22 STAR ENTERPRISE
HH0041O, TEXACO REFINING & MARKETING
23 EASTMAN CHEMICAL CO.
HH0042M, TEXAS EASTMAN DIVISION
24 ENSERCH EXPLORATION INC.
HH0112Q, WHELAN COMPRESSOR STATION
25 HUNTSMAN POLYPROPYLENE CORP.
HH0171A, HUNTSMAN POLYPROPYLENE
26 ENSERCH EXPLORATION INC.
HM0008I, OPELIKA STATION
27 HUNT OIL CO.
HM0010V, FAIRWAY GAS PLANT
28 ENSERCH PROCESSING CO.
HM0011T, TRINIDAD GAS PLANT
29 LONE STAR PIPELINE CO.
HM0012R, TRI-CITIES STATION
30 TRIDENT N.G.L. INC.
HM0014N, EUSTACE PLANT
31 CHAN WEST OIL CORP.
HM0024K, SMACKOVER PLANT
32 HUNT OIL CORPORATION
HM0160B, WATER STATION 4
33 VALENCE OPERATING CO.
HR0018T, COMO PLANT
34 SOUTHWESTERN ELECTRIC POWER CO.
ME0006A, WILKES POWER PLANT
35 LONE STAR STEEL CO.
MS0008I, LONE STAR STEEL CO.
36 T. & N. LONE STAR WAREHOUSE
MS0012R, T & N LONE STAR WAREHOUSE
37 INTERNATIONAL PAPER CO.
NA0017W, INTERNATIONAL PAPER CO.
38 J. M. CLIPPER CORPORATION
NA0035U, GASKET & SEAL MFG. FACILITY
39 EXXON CORPORATION
NA0076G, TRAWICK EAST STATION
40 EXXON CO. U.S.A.
NA0100L, TRAWICK CTRL. TREATING STN.
41 UNION PACIFIC RESOURCES CO.
PB0002N, EAST TEXAS GAS PLANT
42 UNION PACIFIC RESOURCES CO.
PB0009L, CENTRAL COMPRESSOR STATION
43 KOCH INDUSTRIES INC.
PB0012K, CARTHAGE CO. STATION #2
44 KOCH GATHWAY PIPELINE CO.
PB0013I, LATEX
45 AMOCO PRODUCTION CO.
PB0052V, CHEAIRS FACILITY
46 UNION PACIFIC RESOURCES
PB0067I, GEORGE GRAY PLANT
47 EXXON CORPORATION
RL0007C, EAST TEXAS GAS PLANT
48 INTERNATIONAL PAPER CO.
RL0012J, HENDERSON MILL
49 TEXAS UTILITIES ELECTRIC CO.
RL0020X, MARTIN LAKE STATION
50 SUN PIPE LINE CO.
RL0040E, VIRGIL I. GRISSOM STATION
51 EXXON PIPELINE CO.
RL0041C, EXXON PIPELINE CO.
52 TEXAS EASTERN GAS PIPELINE
SD0034K, JOAQUIN COMPRESSOR STATION
53 KERR MCGEE
SK0014W, CHAPEL HILL PLANT
54 THE TRANE CO.
SK0016S, TRANE C.A.C. INC., TYLER
55 LA GLORIA OIL AND GAS CO.
SK0022A, LA GLORIA OIL & GAS CO.
56 TYLER PIPE CO.
SK0041T, DIV. RANSOM INDUSTRIES INC.
57 BONAR PACKAGING INC.
SK0043P, BONAR PACKAGING INC.
58 SOUTHWESTERN ELECTRIC POWER CO.
TI0012D, WELSH POWER PLANT
59 TEXAS UTILITIES ELECTRIC CO.
TI0013B, MONTICELLO STATION
60 CHEVRON U.S.A.
UA0008J, BIG SANDY CHEVRON INSTLN.
61 WESTERN GAS RESOURCES INC.
VB0001S, EDGEWOOD GAS PLANT
62 UNION OIL CO. OF CALIFORNIA
VB0011P, VAN GASOLINE PLANT #19
63 UNOCAL PIPELINE
VB0024G, VAN TANK FARM
64 EXXON CO. U.S.A.
WO0009I, HAWKINS GAS PLANT
65 EXXON PIPELINE CO.
WO0038B, HAWKINS STATION



LEGEND:

County Boundary
City Boundary
US/State Highway
Interstate Highway
City
Lake/Water Body
Core Study County
Perimeter Study County

NMOC Emissions Source
NOx Emissions Source
Airport
Air Monitoring Station
Total Emissions
Range in Tons Per Year:
<250, 250-500, 500-1000, 1000-5000, >5000 TPY

Texas Natural Resource Conservation Commission
Air Quality Planning Division (Mail Code 164)
P. O. Box 13087
Austin, Texas 78711-3087

This map was generated by the Air Quality Planning and Assessment Division of the Texas Natural Resource Conservation Commission. No claims are made to the accuracy or completeness of the data or to its suitability for a particular use. The scale and compilation of all information shown herein is approximate. Reproduction is not permitted without prior written permission from the Texas Natural Resource Conservation Commission. For more information concerning this map, contact Wendi White, Emissions Inventory Section, Air Quality Planning and Assessment Division, at (512) 239-1938.

WCRF-96110103

1.0 BACKGROUND AND EMISSIONS SUMMARY

This document presents the 1995 emissions inventory for reactive volatile compounds (VOC) and oxides of nitrogen (NO_x) from point, area, non-road mobile, on-road mobile, and biogenic sources for the Tyler/Longview/Marshall Flexible Attainment Region (FAR). Also provided are the major stationary point source data from Caddo, Bossier, and DeSoto Parishes in Louisiana. Emissions are reported on an annual basis.

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 and the FAR agreement.

1.1 BACKGROUND

The geographic area covered in this inventory is shown in the map at the front of this document. This area includes the 5 core counties of Gregg, Harrison, Rusk, Smith, and Upshur as well as those counties 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 jurisdiction 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.

Other State agencies contributed information to this inventory necessary for preparing emission estimates. The state Comptrollers Office provided 1995 population projection data for the planning area counties. The Texas Department of Transportation (TxDOT) supplied highway vehicle registration data and developed vehicle miles of travel (VMT) estimates and vehicle travel parameters input into the MOBILE emissions model. The Texas Natural Resource Conservation Commission's (TNRCC) point source inventory was updated through the results of a mail questionnaire.

1.2 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 sources of 25 tons or greater were

included in the inventory. Within the 25-mile boundary extending from the core counties VOC and No_x point sources with emissions of 100 tons per year or greater were inventoried. Emissions totals are expressed as 1995 values using data for 1995, 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 1996. 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**. In order to meet the criteria an additional survey was conducted to collect data from sources smaller than 100 tons per year.

Area and non-road mobile 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 **Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources** to yield emissions totals.

On-road vehicle emissions were estimated by applying EPA emission factors from the MOBILE5a model to VMT estimates for the Tyler/Longview/Marshall area. Local data were used whenever possible to run the travel models and MOBILE5a. For some parameters, however, sufficient resources were not available to develop site-specific values, so national average defaults contained in the models were used.

Biogenic emissions were developed using EPA's PC-Biogenic Emissions Inventory System model. Activity data necessary to operate this model include TNRCC monitoring information as well as meteorological data from the National Weather Service. Table 1-1 at the end of this section is the Emission Inventory Summary for 1995 by major category for this project.

TABLE 1-1

EMISSIONS INVENTORY SUMMARY FOR TYLER/LONGVIEW/MARSHALL AREA FOR THE YEAR 1995

1995 East Texas Emission Inventory as of 5/20/97														
	Source Category												La. Major sources	
County	Major ton/year		Minor ton/year		Area ton/year		Non-Road Mobile ton/year		On-Road Mobil ton/day*		Biogenic ton/day*		ton/yr	
	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
Gregg	1032.8	2700.6	834.94	4112.99	7440.12	426.62	1897.55	1114.97	10.07	10.77	49.31	0.40		
Harrison	4453.2	14176.7	214.22	1567.40	2710.14	213.47	1784.41	1303.21	7.37	9.87	170.52	0.83		
Rusk	767.4	30542.3	235.12	490.03	2995.16	137.74	1048.90	308.04	3.93	4.60	125.10	1.18		
Smith	2793.7	1373.8	122.23	363.79	3571.61	1677.12	3698.98	1890.83	11.42	14.60	113.36	1.28		
Upshur	299.4	5.3	89.35	33.90	1816.26	173.93	1008.59	767.82	2.36	3.17	97.78	0.62		
Perimeter**	8515.4	43018.7												
TOTAL	17861.8	91817.3	1495.86	6568.11	18533.29	2628.88	9438.43	5384.87	35.15	43.01	556.07	4.31	3882.3	18716.1

Total VOC for Tyler/Longview/Marshall Area, ton/yr***	51,211.71
Total NOx for Tyler/Longview Area/Marshall, ton/yr***	125,115.30

* - Biogenic emissions and On-Road Mobil emissions are in ton/day

** - 16 Perimeter Counties in East Texas

*** - Tyler/Longview/Marshall Area total does not include Biogenic or on-Road mobil emissions since they are reported in Ton/day

Minor source emissions are from about 250 sources that responded to questionares and from 23 sources provided by TNRCC.
If you have any questions please call Jerry Demo at 512-259-3277 or Clayton Smith at 512-250-1410.

2.0 POINT SOURCES

2.1 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. 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. The point source inventory consists of actual emissions for 1995.

2.2 MAJOR SOURCES

2.2.1 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 1995. The same inventory methodology, with minor improvements, created for the 1990 base year inventory was used. In order for the Tyler/Longview/Marshall inventory to be equal in approach and quality to a 1990 base year type ozone Nonattainment inventory an additional survey of smaller stationary point sources was conducted.

2.2.2 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 1995 inventory.

2.2.3 SUMMARY OF POINT SOURCE EMISSIONS

Table 2-1 at the end of this section reflect the major point source emissions for 1995 by source, by category type and total county emissions.

2.3 MINOR SOURCES

2.3.1 METHODOLOGY AND APPROACH

Minor source emissions were obtained by taking currently inventoried minor sources and adding to this,

the emissions from 250 additional sources found by this study. The TNRCC provided a list of minor sources that is part of their PSDB. For additional selection of minor sources as part of this study, a data base of companies was searched for appropriate SIC codes. From this printout, a selection of companies was made and a questionnaire mailed to each potential air emission source. The questionnaire, Figure 2-1, requested fuel consumption, VOC (volatile organic compounds) storage, and consumption of materials containing VOC. Responses were sorted by industry type and a calculation for emissions was made based upon material consumption represented in the response. AP 42 was utilized for estimation of loss from storage of compounds containing VOC, Nitrous Oxides (NOX) and unburned hydrocarbons from combustion. Average VOC content per gallon of coating was utilized to estimate emissions from paint. Average solvent weight of 7.3 pounds per gallon was used to estimate solvent loss. Minor source emissions were calculated excluding evaporative emissions from oil and condensate tankage. These emissions were accounted for in the area source calculations. Corrections were made to eliminate double counting of emissions. The TNRCC supplied information was updated by the more current emissions estimates from this study.

2.3.2 EXAMPLE CALCULATIONS

WATER BASE COATINGS

VOC = 1.5 LB/GAL X 2173 GAL = 3259.5 LBS FOR EXAMPLE SOURCE

OIL BASED COATINGS

VOC = 3.5 LB/GAL X 2683 GAL = 9390.5 LBS FOR EXAMPLE SOURCE

SOLVENT CONSUMPTION

VOC = 7.3 LB/GAL X 2683 GAL = 19585.9 LBS FOR EXAMPLE SOURCE

COMBUSTION OF NATURAL GAS

VOC = 3 LB/MMBTU X 7750 MMBTU = 23250 LBS UNBURNED HYDROCARBON

NOX = 140 LB/MMBTU X 7750 MMBTU = 1085000 LBS NOX

COMBUSTION OF OIL

VOC = 0.76 LB/1000 GAL X 4.15 MGAL = 3.154 LBS

NOX = 55 LB/1000 GAL X 4.15 MGAL = 228.25 LBS

COMPRESSOR (LEAN BURN)

VOC (LBS/HP-HR) = 0.00159 LBS/HP-HR X 8760 HR X 2000 HP = 27856.8 LBS

NOX (LBS/HP-HR) = 0.026 LBS/HP-HR X 8760 HRS X 2000 HP = 455520 LBS

COMPRESSOR (LEAN BURN)

VOC (LBS/MMBTU) = 0.18 LB/MMBTU X 128000 MM BTU = 23040 LBS

NOX (LBS/MM BTU) =3.2 LB/MMBTU X 128000 MMBTU = 409600 LBS

Tank emissions were calculated using EPA "tanks" program. Other VOC or NOX was included where the company provided estimates.

TABLE 2-1

MAJOR SOURCES CORE COUNTIES - EMISSIONS ARE IN TONS/YR			
GREGG			
COMPANY —	NMOC	NOX	SIC_CODE
ARCO PERMIAN	186.7	613.7	1321
WARREN NGL, INC.	79.99	589.09	1321
STROH BREWERY COMPANY, THE	90.9	135.1	2082
AMERICAN NATIONAL CAN COMPANY	156.9	5.55	3411
LE TOURNEAU,INC.	27.1	56	3531
PETROLITE CORPORATION	374.4	32.7	2999
SOUTHWESTERN ELECTRIC POWER COMPANY	6.5	1133.5	4911
MID VALLEY PIPELINE COMPANY	73.7	0	5171
TONKAWA GAS PROCESSING CO.	5.72	97.1	1321
ENSERCH EXPLORATION, INC.	30.9	37.89	1321
TOTAL	1032.81	2700.63	
HARRISON			
COMPANY	NMOC	NOX	SIC_CODE
WASKOM GAS PROCESSING COMPANY	159.4	188	1321
BERWIND RAILWAY SERVICE COMPANY, L.P	32.9	0	4789
WOODLAWN PIPELINE CO. INC.	60.4	94.3	1321
NORIT AMERICAS, INC.	113.9	559.7	2819
MOBIL OIL CORPORATION	155.4	0	5171
NATURAL GAS PIPELINE CO. OF AMERICA	12.27	226.76	4922
SNIDER INDUSTRIES, INCORPORATED	30.5	26.5	2421
SOUTHWESTERN ELECTRIC POWER COMPANY	58.3	7624.9	4911
STAR ENTERPRISE	136.23	1.4	5171
TEXAS EASTMAN DIV., EASTMAN CHEM CO.	3523.12	5436.16	2869
ENSERCH EXPLORATION, INC.	40.91	13.33	1321
HUNTSMAN POLYPROPYLENE CORPORATION	129.84	5.6	2821
TOTAL	4453.17	14176.65	
RUSK			
COMPANY	NMOC	NOX	SIC_CODE
EXXON CORPORATION	82.8	263.5	1321
INTERNATIONAL PAPER COMPANY	143.6	21.8	2421
TEXAS UTILITIES ELECTRIC COMPANY	378.6	30257	4911
EXXON PIPELINE COMPANY	162.4	0	4612
TOTAL	767.4	30542.3	
SMITH			
COMPANY	NMOC	NOX	SIC_CODE
CARRIER CORPORATION	50.6	0.8	3585
MUSTANG FUEL CORP.	27.8	41.9	1321
THE TRANE COMPANY	131.8	24.6	3585
LA GLORIA OIL AND GAS COMPANY	1982.65	1251.76	2911
TYLER PIPE COMPANY	407.9	50	3321
BONAR PACKAGING, INC.	120.5	2.8	2673
ALLIANCE COMPRESSORS	72.4	1.9	3585
TOTAL	2793.65	1373.76	
UPSHUR			
COMPANY	NMOC	NOX	SIC_CODE
NORAM FIELD SERVICES CORPORATION	60.3	5.2	1311
CHEVRON U.S.A.	239.1	0.1	5171
TOTAL	299.4	5.3	

TABLE 2-2

MAJOR SOURCES PERIMETER COUNTIES				
FINAL LIST OF ACCOUNTS				
EMISSIONS ARE IN TONS/YEAR				
ANDERSON				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
EXXON PIPELINE COMPANY	168.4	0	AA0055P	4612
TOTAL	168.4	0		
CASS				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
INTERNATIONAL PAPER COMPANY	3397.37	1925.27	CG0010G	2621
SHELL GAS PROCESSING & PRODUCTS	237	288.7	CG0012C	1321
TOTAL	3634.37	2213.97		
CHEROKEE				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
TEXAS UTILITIES GENERATING COMPANY	8.81	823.29	CJ0026J	4911
UNOCAL PIPELINE	203.1	0	CJ0051K	4612
TOTAL	211.91	823.29		
FRANKLIN				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
WARREN ENERGY RESOURCES, L.P.	101.5	84.3	FH0002M	1311
TOTAL	101.5	84.3		
HENDERSON				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
ENSEARCH EXPLORATION, INC.	51.2	232	HM0008I	1311
HUNT OIL COMPANY	104.5	1972	HM0010V	1321
ENSERCH PROCESSING, INC.	78.3	628.9	HM0011T	1321
LONE STAR PIPELINE COMPANY	37	258.4	HM0012R	4922
WARREN NLG, INC.	88.4	204.4	HM0014N	1321
TOTAL	359.4	3295.7		
HOPKINS				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
VALENCE OPERATING COMPANY	118.7	476.4	HR0018T	1321
TOTAL	118.7	476.4		
MARION				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
SOUTHWESTERN ELECTRIC POWER COMPANY	16.8	1596.8	ME0006A	4911
TOTAL	16.8	1596.8		

TABLE 2-2

MORRIS				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
LONE STAR STEEL COMPANY	323	586.7	MS0008I	3312
TOTAL	323	586.7		
NACOGDOCHES				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
INTERNATIONAL PAPER COMPANY	934.56	142.37	NA0017W	2493
EXXON CORPORATION	19.61	119.62	NA0076G	
EXXON COMPANY	178.5	75.67	NA0100L	
	1132.67	337.66		
PANOLA				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
UNION PACIFIC RESOURCES COMPANY	890.7	1233.3	PB0002N	1321
UNION PACIFIC RESOURCES COMPANY	81.22	1264.3	PB0003L	1321
KOCH INDUSTRIES, INC.	301.6	1461.3	PB0012K	4922
KOCH GATEWAY PIPELINE COMPANY	47.1	288.9	PB0013I	4922
AMOCO PRODUCTION CO.	77.9	931.8	PB0052V	1311
UNION PACIFIC RESOURCES	13.9	176.5	PB0067I	1321
TOTAL	1412.42	5356.1		
SHELBY				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
TEXAS EASTERN GAS PIPELINE	10.1	176.9	SI0034K	4922
TOTAL	10.1	176.9		
TITUS				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
SOUTHWESTERN ELECTRIC POWER COMPANY	143.6	9571.2	TF0012D	4911
TEXAS UTILITIES ELECTRIC COMPANY	261	14915.7	TF0013B	4911
TOTAL	404.6	24486.9		
VAN ZANDT				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
WESTERN GAS RESOURCES, INC.	18	529.5	VB0001S	1321
UNION OIL COMPANY OF CALIFORNIA	59.8	908.2	VB0011P	1321
UNOCAL PIPELINE	237.89	0	VB0024G	4612
TOTAL	315.69	1437.7		
WOOD				
COMPANY	NMOC	NOX	ACCOUNT	SIC_COD
PAN ENERGY FIELD SERVICES, INC.	24.2	180	WO0007M	1321
EXXON COMPANY U.S.A.	167.57	1966.25	WO0009I	1321
EXXON PIPELINE COMPANY	114.1	0	WO0038B	4612
TOTAL	305.87	2146.25		
TOTAL FOR PERIMETER COUNTIES	8515.43	43018.67		

FIGURE 2-1

EAST TEXAS EMISSION INVENTORY QUESTIONNAIRE

Please fill in parts of questionnaire that apply to your facility and return in the enclosed envelope.

Name of Company _____

County _____

Location Description _____

_____

Contact Person _____

Phone Number _____

Fax Number _____

Number of Employees _____

Description of Product _____

_____

Product Production/yearly _____ Units _____

Material Usage/yearly
Coatings water base _____ Units _____
Coatings Solvent base _____ Units _____
Solvent _____ Units _____
Total other organic material _____ Units _____

Combustion sources, fuel usage/yearly
Gas _____ Units _____
Oil _____ Units _____

Storage of Petroleum Products, throughput/yearly
(Gasoline, crude oil, condensate, other)
General type _____ Units _____
General type _____ Units _____
General type _____ Units _____

Gas/Oil Processing, Quantity produced/yearly
Gas _____ Units _____
Oil _____ Units _____
# of Tanks _____ Ave. Size _____ Type _____

Description of air emission controls _____

_____

Any additional information or comments _____

_____

_____

_____

3.0 AREA SOURCES

3.1 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 handled individually in the point source inventory. The base year of the inventory is 1995. Area sources of VOC, and NOx emissions were identified by using lists of sources provided in the EPA's **AP-42** (fourth edition) and **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I**. Emission sources are divided 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, degreasing, surface coating operations, and leaking underground storage tanks. Fuel combustion sources include stationary source fossil fuel combustion, structural fires, and solid waste disposal. 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.

3.2 METHODOLOGY AND APPROACH

Methodologies used for estimating the area source activity levels and emissions came primarily from two EPA sources: **Procedures for the Preparation of Emissions Inventories for Precursors of Carbon Monoxide and Ozone, Volume I**, and **AP-42** (fourth edition). Some area source categories may have been added or omitted to better fit the Tyler/Longview/Marshall area. Some categories were researched to obtain more accurate methods of calculation of emissions. Additional information was provided by Texas state agencies, including the Texas Railroad Commission (TRC), the TDH, the TNRCC, and the Department of Parks and Wildlife (TP&WD). County population numbers used for calculating emissions from specific categories were provided by the U.S. Census on the Internet. These numbers have been updated and reflect the 1995 U.S. Census projected population. For the purposes of this study most calculations were rounded to one-hundredth of a ton/yr and if the source was less than .01 ton/yr they were not included in the inventory.

Table 3-1
Area Source Categories

Evaporative Emission Sources	Combustion Emission Sources
OIL & GAS PRODUCTION	ON-SITE INCINERATION
OIL & GAS PRODUCTION-- OFFSHORE	STATIONARY SOURCE FUEL COMB.
SERVICE STATIONS	FUEL OIL-RESIDENTIAL
VEHICLE REFUELING	FUEL OIL-COMMERCIAL/DISTILLATE
TANK TRUCK UNLOADING	FUEL OIL-COMMERCIAL/RESIDUAL
TANK TRUCKS IN TRANSIT	FUEL OIL-INDUSTRIAL/DISTILLATE
TANK BREATHING LOSSES	FUEL OIL-INDUSTRIAL/RESIDUAL
OTHER	COAL-RESIDENTIAL
AIRCRAFT REFUELING	COAL-COMMERCIAL
MARINE VESSEL LOADING LOSSES	COAL-INDUSTRIAL
SYNTHETIC ORGANIC CHEMICAL STORAGE TANKS	NATURAL GAS-RESIDENTIAL
LEAKING UNDERGROUND TANKS	NATURAL GAS-COMMERCIAL
ARCHITECTURAL COATINGS	NATURAL GAS-INDUSTRIAL
AUTO REFINISHING	LPG-RESIDENTIAL
TRAFFIC MARKINGS	LPG-COMMERCIAL
FURNITURE & FIXTURES	LPG-INDUSTRIAL
METAL CONTAINERS	WOOD-RESIDENTIAL
AUTOMOBILES (NEW)	STRUCTURE FIRES
MACHINERY & EQUIPMENT	FOREST FIRES
APPLIANCES	PRESCRIBED BURNING
OTHER TRANSPORTATION EQUIP	SLASH BURNING
SHEET, STRIP, & COIL	OPEN BURNING
FACTORY FINISHED WOOD	ORCHARD HEATERS
ELECTRICAL INSULATION	AGRICULTURAL BURNING
OTHER PRODUCT COATINGS	
HIGH-PERFORMANCE MAINT.	
MARINE COATINGS	
OTHER SPEC. PURPOSE COATINGS	
BARGE, TANK, TANK TRUCK, RAIL CAR, DRUM CLEAN	
BREWERIES	
WINERIES	
DISTILLERIES	
CATASTROPHIC/ACCIDENTAL RELEASES	
SURFACE CLEANING	
DRY CLEANING	
GRAPHIC ARTS	
CUTBACK ASPHALT	
EMULSIFIED ASPHALT	
CONSUMER/COMMERCIAL SOLVENT USE	

Table 3-1 (continued)

Evaporative Emission Sources

PESTICIDE APPLICATION
MUNICIPAL WASTE LANDFILLS
MUNICIPAL WASTEWATER TREATMENT (POTW)
INDUSTRIAL WASTEWATER TREATMENT
WASTEWATER PACKAGE PLANTS
COMMERCIAL BAKERIES

3.3 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. As reported in the TNRCC's Inventory Preparation Plan (IPP), the QA plan was developed in accordance with EPA's **Guidance for Preparation of Quality Assurance Plans for Ozone/Carbon Monoxide State Implementation Plans Emission Inventories** and **Quality Assurance Project Plans For Environmental Data Operations**. QA procedures are covered in detail in attachments to this document.

3.4 SUMMARY OF AREA SOURCE EMISSIONS

Area sources in the Tyler/Longview/Marshall ozone planning area were responsible for the release of 18939.81 tons of VOC, and 2628.88 tons of NO_x during the 1995 year.

Tables 3-2 through 3-6 show the area source emissions by specific categories for each county in the study area. Point source emissions were subtracted when appropriate to prevent double counting of emissions.

3.5 CORRECTIONS TO AREA SOURCES

The following corrections (reductions) were made to the area source numbers to eliminate double counting of emissions from point source emissions.

For **Gregg County:**

Natural Gas-Industrial Point source emissions are much greater than estimated Area Source. The Area Source estimate has been eliminated based upon Point Source.

Machinery and Equipment The area source VOC emissions were adjusted by 40.25 tons.

Metal Cans The area source VOC emissions were adjusted by 250.8 tons.

For **Harrison County:**

Natural Gas-Industrial Point source emissions are much greater than estimated Area Source. The Area Source estimate has been eliminated based upon Point Source.

Machinery and Equipment For area source emissions, zero out the VOC and use point source estimate.

For **Rusk County:**

Natural Gas-Industrial Point source emissions are much greater than estimated Area Source. The Area Source estimate has been eliminated based upon Point Source.

For **Smith County:**

Natural Gas-Industrial Point source emissions are much greater than estimated Area Source. The Area Source estimate has been eliminated based upon Point Source.

Machinery and Equipment The area source VOC emissions were adjusted by 208.41 tons.

For **Upshur County:**

There are no changes.

Table 3-2		
Summary of Emissions from Area Sources		
GREGG COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
OIL & GAS PRODUCTION	4413.51	
SERVICE STATIONS - VEHICLE REFUELING	300.04	
SERVICE STATIONS - TANK TRUCK UNLOADING	193.66	
SERVICE STATIONS - TANK TRUCKS IN TRANSIT	3.27	
SERVICE STATIONS - TANK BREATHING LOSSES	27.28	
SERVICE STATIONS - OTHER	19.09	
AIRCRAFT REFUELING	0.01	
SYNTHETIC ORGANIC CHEMICAL STORAGE TANKS	N/A	
LEAKING UNDERGROUND TANKS	0.21	
ARCHITECTURAL COATINGS	248.98	
AUTO REFINISHING	124.49	
TRAFFIC MARKINGS	27.06	
FURNITURE & FIXTURES	28.32	
METAL CANS(adjusted by point sources)	804.27	
AUTOMOBILES (NEW)	0.00	
MACHINERY & EQUIPMENT(adjusted by point sources)	54.07	
APPLIANCES	0.00	
OTHER TRANSPORTATION EQUIP.	28.52	
SHEET, STRIP, & COIL	0.00	
FACTORY FINISHED WOOD	15.65	
ELECTRICAL INSULATION	0.00	
OTHER PRODUCT COATINGS	N/A	
HIGH-PERFORMANCE MAINT.	N/A	
MARINE COATINGS	53.90	
OTHER SPEC. PURPOSE COATINGS	N/A	
BARGE,TANK,TANK TRUCK,RAIL CAR,DRUM CLEAN.	N/A	
BREWERIES	POINT SOURCE	
WINERIES	N/A	
DISTILLERIES	N/A	
CATASTROPHIC/ACCIDENTAL RELEASES	1.49	
SURFACE CLEANING	232.74	
DRY CLEANING	97.43	
GRAPHIC ARTS	70.36	
CUTBACK ASPHALT	10.81	
EMULSIFIED ASPHALT	6.14	
CONSUMER/COMMERCIAL SOLVENT USE	340.99	
PESTICIDE APPLICATION	0.82	
MUNICIPAL WASTE LANDFILLS	45.27	
MUNICIPAL WASTEWATER TREATMENT (POTW)	52.33	
INDUSTRIAL WASTEWATER TREATMENT	0.00	
WASTEWATER PACKAGE PLANTS	N/A	
COMMERCIAL BAKERIES	41.46	
ON SITE INCINERATION	0.00	
STATIONARY SOURCE FUEL COMBUSTION:		
FUEL OIL-RESIDENTIAL	0.00	0.00
FUEL OIL-COMMERCIAL/DISTILLATE	1.02	59.81

Table 3-2		
Summary of Emissions from Area Sources		
GREGG COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
FUEL OIL-COMMERCIAL/RESIDUAL	0.00	0.00
FUEL OIL-INDUSTRIAL/DISTILLATE	0.00	0.00
FUEL OIL-INDUSTRIAL/RESIDUAL	0.00	0.00
COAL-RESIDENTIAL	0.00	0.00
COAL-COMMERCIAL	N/A	
COAL-INDUSTRIAL	N/A	
NATURAL GAS-RESIDENTIAL	5.90	111.39
NATURAL GAS-COMMERCIAL	4.28	80.78
NATURAL GAS-INDUSTRIAL	Point Source	Point Source
LPG-RESIDENTIAL	0.05	0.91
LPG-COMMERCIAL	0.06	1.12
LPG-INDUSTRIAL	0.30	15.39
WOOD-RESIDENTIAL	114.53	11.45
STRUCTURE FIRES	3.14	134.23
FOREST FIRES	24.77	4.13
PRESCRIBED BURNING	3.38	0.56
SLASH BURNING	40.50	6.75
OPEN BURNING	0.00	0.00
ORCHARD HEATERS	N/A	
AGRICULTURAL BURNING	N/A	
TOTAL	7440.12	426.52

Table 3-3		
Summary of Emissions from Area Sources		
HARRISON COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
OIL & GAS PRODUCTION	520.34	
SERVICE STATIONS - VEHICLE REFUELING	300.04	
SERVICE STATIONS - TANK TRUCK UNLOADING	193.66	
SERVICE STATIONS - TANK TRUCKS IN TRANSIT	3.27	
SERVICE STATIONS - TANK BREATHING LOSSES	27.28	
SERVICE STATIONS - OTHER	19.09	
AIRCRAFT REFUELING	0.07	
SYNTHETIC ORGANIC CHEMICAL STORAGE TANKS	N/A	
LEAKING UNDERGROUND TANKS	0.07	
ARCHITECTURAL COATINGS	137.03	
AUTO REFINISHING	68.52	
TRAFFIC MARKINGS	14.89	
FURNITURE & FIXTURES	28.32	
METAL CANS	0.00	
AUTOMOBILES (NEW)	0.00	
MACHINERY & EQUIPMENT	Point Source	
APPLIANCES	0.00	
OTHER TRANSPORTATION EQUIP.	19.68	
SHEET, STRIP, & COIL	14.38	
FACTORY FINISHED WOOD	16.00	
ELECTRICAL INSULATION	54.30	
OTHER PRODUCT COATINGS	N/A	
HIGH-PERFORMANCE MAINT.	N/A	
MARINE COATINGS	0.00	
OTHER SPEC. PURPOSE COATINGS	N/A	
BARGE,TANK,TANK TRUCK,RAIL CAR,DRUM CLEAN.	N/A	
BREWERIES	N/A	
WINERIES	N/A	
DISTILLERIES	N/A	
CATASTROPHIC/ACCIDENTAL RELEASES	0.03	
SURFACE CLEANING	128.09	
DRY CLEANING	53.62	
GRAPHIC ARTS	38.73	
CUTBACK ASPHALT	10.81	
EMULSIFIED ASPHALT	6.14	
CONSUMER/COMMERCIAL SOLVENT USE	187.67	
PESTICIDE APPLICATION	0.82	
MUNICIPAL WASTE LANDFILLS	0.00	
MUNICIPAL WASTEWATER TREATMENT (POTW)	16.31	
INDUSTRIAL WASTEWATER TREATMENT	541.39	
WASTEWATER PACKAGE PLANTS	N/A	
COMMERCIAL BAKERIES	22.82	
ON SITE INCINERATION	0.00	
STATIONARY SOURCE FUEL COMBUSTION:		
FUEL OIL-RESIDENTIAL	0.00	0.00
FUEL OIL-COMMERCIAL/DISTILLATE	0.02	14.13

Table 3-3		
Summary of Emissions from Area Sources		
HARRISON COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
FUEL OIL-COMMERCIAL/RESIDUAL	0.00	0.00
FUEL OIL-INDUSTRIAL/DISTILLATE	0.00	0.00
FUEL OIL-INDUSTRIAL/RESIDUAL	0.00	0.00
COAL-RESIDENTIAL	0.00	0.00
COAL-COMMERCIAL	N/A	
COAL-INDUSTRIAL	N/A	
NATURAL GAS-RESIDENTIAL	3.10	58.53
NATURAL GAS-COMMERCIAL	1.01	19.08
NATURAL GAS-INDUSTRIAL	Point Source	Point Source
LPG-RESIDENTIAL	0.03	0.48
LPG-COMMERCIAL	0.01	0.26
LPG-INDUSTRIAL	0.09	4.32
WOOD-RESIDENTIAL	60.18	6.02
STRUCTURE FIRES	1.73	73.88
FOREST FIRES	18.99	3.17
PRESCRIBED BURNING	12.60	2.1
SLASH BURNING	189.00	31.5
OPEN BURNING		
ORCHARD HEATERS	N/A	
AGRICULTURAL BURNING	N/A	
TOTAL	2710.14	213.47

Table 3-4		
Summary of Emissions from Area Sources		
RUSK COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
OIL & GAS PRODUCTION	1247.85	
SERVICE STATIONS - VEHICLE REFUELING	300.04	
SERVICE STATIONS - TANK TRUCK UNLOADING	193.66	
SERVICE STATIONS - TANK TRUCKS IN TRANSIT	3.27	
SERVICE STATIONS - TANK BREATHING LOSSES	27.28	
SERVICE STATIONS - OTHER	19.09	
AIRCRAFT REFUELING	0.06	
SYNTHETIC ORGANIC CHEMICAL STORAGE TANKS	N/A	
LEAKING UNDERGROUND TANKS	0.00	
ARCHITECTURAL COATINGS	102.81	
AUTO REFINISHING	51.41	
TRAFFIC MARKINGS	11.18	
FURNITURE & FIXTURES	559.30	
METAL CANS	0.00	
AUTOMOBILES (NEW)	0.00	
MACHINERY & EQUIPMENT	11.93	
APPLIANCES	0.00	
OTHER TRANSPORTATION EQUIP.	1.75	
SHEET, STRIP, & COIL	0.00	
FACTORY FINISHED WOOD	11.79	
ELECTRICAL INSULATION	0.00	
OTHER PRODUCT COATINGS	N/A	
HIGH-PERFORMANCE MAINT.	N/A	
MARINE COATINGS	0.00	
OTHER SPEC. PURPOSE COATINGS	N/A	
BARGE,TANK,TANK TRUCK,RAIL CAR,DRUM CLEAN.	N/A	
BREWERIES	N/A	
WINERIES	N/A	
DISTILLERIES	N/A	
CATASTROPHIC/ACCIDENTAL RELEASES	0.03	
SURFACE CLEANING	96.11	
DRY CLEANING	40.23	
GRAPHIC ARTS	29.06	
CUTBACK ASPHALT	10.81	
EMULSIFIED ASPHALT	6.14	
CONSUMER/COMMERCIAL SOLVENT USE	140.81	
PESTICIDE APPLICATION	0.82	
MUNICIPAL WASTE LANDFILLS	0.00	
MUNICIPAL WASTEWATER TREATMENT (POTW)	7.50	
INDUSTRIAL WASTEWATER TREATMENT	0.04	
WASTEWATER PACKAGE PLANTS	N/A	
COMMERCIAL BAKERIES	17.12	
ON SITE INCINERATION	0.00	
STATIONARY SOURCE FUEL COMBUSTION:		
FUEL OIL-RESIDENTIAL	0.00	0.00
FUEL OIL-COMMERCIAL/DISTILLATE	0.14	8.01

Table 3-4		
Summary of Emissions from Area Sources		
RUSK COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
FUEL OIL-COMMERCIAL/RESIDUAL	0.00	0.00
FUEL OIL-INDUSTRIAL/DISTILLATE	0.00	0.00
FUEL OIL-INDUSTRIAL/RESIDUAL	0.00	0.00
COAL-RESIDENTIAL	0.00	0.00
COAL-COMMERCIAL	N/A	
COAL-INDUSTRIAL	N/A	
NATURAL GAS-RESIDENTIAL	2.52	47.59
NATURAL GAS-COMMERCIAL	0.57	10.82
NATURAL GAS-INDUSTRIAL	Point Source	Point Source
LPG-RESIDENTIAL	0.02	0.39
LPG-COMMERCIAL	0.01	0.15
LPG-INDUSTRIAL	0.04	1.87
WOOD-RESIDENTIAL	48.93	4.89
STRUCTURE FIRES	1.30	55.43
FOREST FIRES	46.17	7.69
PRESCRIBED BURNING	0.90	0.15
SLASH BURNING	4.50	0.75
OPEN BURNING	0.00	0.00
ORCHARD HEATERS	N/A	
AGRICULTURAL BURNING	N/A	
TOTAL	2995.16	137.74

Table 3-5		
Summary of Emissions from Area Sources		
SMITH COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
OIL & GAS PRODUCTION	622.38	
SERVICE STATIONS - VEHICLE REFUELING	300.04	
SERVICE STATIONS - TANK TRUCK UNLOADING	193.66	
SERVICE STATIONS - TANK TRUCKS IN TRANSIT	3.27	
SERVICE STATIONS - TANK BREATHING LOSSES	27.28	
SERVICE STATIONS - OTHER	19.09	
AIRCRAFT REFUELING	0.02	
SYNTHETIC ORGANIC CHEMICAL STORAGE TANKS	N/A	
LEAKING UNDERGROUND TANKS	0.21	
ARCHITECTURAL COATINGS	364.59	
AUTO REFINISHING	182.30	
TRAFFIC MARKINGS	39.63	
FURNITURE & FIXTURES	23.60	
METAL CANS	0.00	
AUTOMOBILES (NEW)	3.97	
MACHINERY & EQUIPMENT(adjusted by point sources)	253.13	
APPLIANCES	0.00	
OTHER TRANSPORTATION EQUIP.	10.83	
SHEET, STRIP, & COIL	14.38	
FACTORY FINISHED WOOD	20.50	
ELECTRICAL INSULATION	0.00	
OTHER PRODUCT COATINGS	N/A	
HIGH-PERFORMANCE MAINT.	N/A	
MARINE COATINGS	3.08	
OTHER SPEC. PURPOSE COATINGS	N/A	
BARGE,TANK,TANK TRUCK,RAIL CAR,DRUM CLEAN.	N/A	
BREWERIES	N/A	
WINERIES	N/A	
DISTILLERIES	N/A	
CATASTROPHIC/ACCIDENTAL RELEASES	7.16	
SURFACE CLEANING	340.82	
DRY CLEANING	142.67	
GRAPHIC ARTS	103.04	
CUTBACK ASPHALT	10.81	
EMULSIFIED ASPHALT	6.14	
CONSUMER/COMMERCIAL SOLVENT USE	499.33	
PESTICIDE APPLICATION	1.44	
MUNICIPAL WASTE LANDFILLS	3.10	
MUNICIPAL WASTEWATER TREATMENT (POTW)	44.69	
INDUSTRIAL WASTEWATER TREATMENT	41.82	
WASTEWATER PACKAGE PLANTS	N/A	
COMMERCIAL BAKERIES	60.71	
ON SITE INCINERATION	0.00	
STATIONARY SOURCE FUEL COMBUSTION:		
FUEL OIL-RESIDENTIAL	0.00	0.00
FUEL OIL-COMMERCIAL/DISTILLATE	1.32	77.49

Table 3-5		
Summary of Emissions from Area Sources		
SMITH COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
FUEL OIL-COMMERCIAL/RESIDUAL	0.00	0.00
FUEL OIL-INDUSTRIAL/DISTILLATE	0.00	0.00
FUEL OIL-INDUSTRIAL/RESIDUAL	0.00	0.00
COAL-RESIDENTIAL	0.00	0.00
COAL-COMMERCIAL	N/A	
COAL-INDUSTRIAL	N/A	
NATURAL GAS-RESIDENTIAL	8.50	160.44
NATURAL GAS-COMMERCIAL	5.55	104.65
NATURAL GAS-INDUSTRIAL	22.00	1099.99
LPG-RESIDENTIAL	0.07	1.31
LPG-COMMERCIAL	0.08	1.45
LPG-INDUSTRIAL	0.30	15.31
WOOD-RESIDENTIAL	164.97	16.50
STRUCTURE FIRES	4.60	196.56
FOREST FIRES	16.04	2.67
PRESCRIBED BURNING	0.00	0
SLASH BURNING	4.50	0.75
OPEN BURNING	0.00	0.00
ORCHARD HEATERS	N/A	
AGRICULTURAL BURNING	N/A	
TOTAL	3571.61	1677.12

Table 3-6		
Summary of Emissions from Area Sources		
UPSHUR COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
OIL & GAS PRODUCTION	757.75	
SERVICE STATIONS - VEHICLE REFUELING	300.04	
SERVICE STATIONS - TANK TRUCK UNLOADING	193.66	
SERVICE STATIONS - TANK TRUCKS IN TRANSIT	3.27	
SERVICE STATIONS - TANK BREATHING LOSSES	27.28	
SERVICE STATIONS - OTHER	19.09	
AIRCRAFT REFUELING	0.04	
SYNTHETIC ORGANIC CHEMICAL STORAGE TANKS	N/A	
LEAKING UNDERGROUND TANKS	0.00	
ARCHITECTURAL COATINGS	74.54	
AUTO REFINISHING	37.27	
TRAFFIC MARKINGS	8.10	
FURNITURE & FIXTURES	18.88	
METAL CANS	0.00	
AUTOMOBILES (NEW)	0.00	
MACHINERY & EQUIPMENT	10.78	
APPLIANCES	0.00	
OTHER TRANSPORTATION EQUIP.	0.00	
SHEET, STRIP, & COIL	0.00	
FACTORY FINISHED WOOD	0.65	
ELECTRICAL INSULATION	0.00	
OTHER PRODUCT COATINGS	N/A	
HIGH-PERFORMANCE MAINT.	N/A	
MARINE COATINGS	0.00	
OTHER SPEC. PURPOSE COATINGS	N/A	
BARGE,TANK,TANK TRUCK,RAIL CAR,DRUM CLEAN.	N/A	
BREWERIES	N/A	
WINERIES	N/A	
DISTILLERIES	N/A	
CATASTROPHIC/ACCIDENTAL RELEASES	0.00	
SURFACE CLEANING	69.68	
DRY CLEANING	29.17	
GRAPHIC ARTS	21.06	
CUTBACK ASPHALT	10.81	
EMULSIFIED ASPHALT	6.14	
CONSUMER/COMMERCIAL SOLVENT USE	102.08	
PESTICIDE APPLICATION	0.92	
MUNICIPAL WASTE LANDFILLS	0.05	
MUNICIPAL WASTEWATER TREATMENT (POTW)	3.80	
INDUSTRIAL WASTEWATER TREATMENT	0.39	
WASTEWATER PACKAGE PLANTS	N/A	N/A
COMMERCIAL BAKERIES	12.41	
ON SITE INCINERATION	0.00	
STATIONARY SOURCE FUEL COMBUSTION:		
FUEL OIL-RESIDENTIAL	0.00	0.00
FUEL OIL-COMMERCIAL/DISTILLATE	0.11	6.28

Table 3-6		
Summary of Emissions from Area Sources		
UPSHUR COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
FUEL OIL-COMMERCIAL/RESIDUAL	0.00	0.00
FUEL OIL-INDUSTRIAL/DISTILLATE	0.00	0.00
FUEL OIL-INDUSTRIAL/RESIDUAL	0.00	0.00
COAL-RESIDENTIAL	0.00	0.00
COAL-COMMERCIAL	N/A	N/A
COAL-INDUSTRIAL	N/A	N/A
NATURAL GAS-RESIDENTIAL	1.70	32.12
NATURAL GAS-COMMERCIAL	0.45	8.48
NATURAL GAS-INDUSTRIAL	1.41	70.41
LPG-RESIDENTIAL	0.01	0.26
LPG-COMMERCIAL	0.01	0.12
LPG-INDUSTRIAL	0.02	0.98
WOOD-RESIDENTIAL	33.03	3.30
STRUCTURE FIRES	0.94	40.18
FOREST FIRES	27.53	4.59
PRESCRIBED BURNING	2.70	0.45
SLASH BURNING	40.50	6.75
OPEN BURNING	0.00	0.00
ORCHARD HEATERS	N/A	N/A
AGRICULTURAL BURNING	N/A	N/A
TOTAL	1816.26	173.93

3.6 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.

3.7 OIL AND GAS PRODUCTION

3.7.1 Introduction

Emissions considered in this category come from crude oil and natural gas production in each County in 1995. The production information was obtained from the Oil & Gas Division of the Railroad Commission of Texas.

3.7.2 Methodology

It was assumed that the crude oil and natural gas condensate that was produced was stored in a tank at the production site before it was transported off site to a processing plant. A survay was conducted and it was ascertained that the averave size storage tank was approximately 10,665 gallons. The production in each county was divided by the net throughput of the average tank. This would provide the number of average tanks in that county. The number of tanks was multiplied by the emissions per tank to obtain the tons of VOC emissions for crude oil and condensate. The emissions per tank was obtained by using the EPA Tanks3 program for oil and condensate for 1995 in the affected counties. This is in lieu of surveying each tank at every production site.

3.7.3 Example Calculation

The following were the input parameters for the crude oil Tanks3 calculations: Vertical fixed roof, shell height 16 ft, diameter 11 ft, liquid height 15 ft, avg. liquid height 8 ft, volume 10,665 gallons, turnovers per year 12, net throughput 127,980 gal/yr, shell color/shade gray/light, shell condition good, roof color/shade gray/light, roof condition good, roof height 1 ft, roof radius 11 ft, met data used Dallas Fort Worth, mixture/component crude oil

Example for Harrison County
total VOC emissions from Tanks3 = 1121 lb/yr per tank
1121/2000 = 0.5605 tons/yr per tank(ave. ton/tank for the 5 counties)

Harrison county produced 28,324,128 gallons of oil
28,324,128 gal/127,980 gal per tank/yr = 221 tanks/yr
221 tanks/yr x 0.5605 tons/tank = 124 tons of VOC emissions

3.7.4 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. **TANKS3 program, U.S. Environmental Protection Agency**

3.8 GASOLINE DISTRIBUTION

3.8.1 Introduction

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

3.8.2 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).

VOC emissions from the unloading of diesel fuel was calculated using the same criteria as in gasoline unloading: using an emission factor of .014 lb./1000 gal. The resulting emissions were determined to be insignificant. The total for all five counties was less than 0.01 tons per year.

3.8.3 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. Emissions from diesel refueling were determined to be insignificant (per guidance from TNRCC).

3.8.4 Tank Breathing Losses

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

3.8.5 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.

3.8.6 Other Losses

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

3.8.7 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 1995. The emission factors used are as follows:

Tank Truck Unloading	7.1 lb/1000 gal
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 used came from AP-42 and were applied to 1995 gasoline sales for each ozone county obtained from the Texas Department of Transportation.

The emissions for tank trucks in transit were multiplied by 1.25 to account for gasoline transferred to bulk plants. Tank truck unloading is based on RVP of 8.0 for gasoline in the Tyler/Longview/Marshall area, the emission factor for tank truck unloading was recalculated using AP-42. RVP 8.0 is a true vapor pressure (P) of 4.5 psig.

3.8.8 Example Calculation

Calculating the tank truck unloading (all categories are calculated in the same manner) factor:

LL = 12.46 SPM / T
LL = Loading loss in lb/1000 gal.
S = Saturation factor (1)
P = True vapor pressure (4.5)

M = Molecular weight (67)
T = Temperature (68 deg. F + 460)
LL = 12.46 x 1 x 4.5 x 67/(460 + 68) = 7.1 lb/1000 gal

Calculating tank truck unloading:
Gasoline sales for one county =
54,553,424 gal. in 1995
54,553 x 7.1 = 387,326 lbs.
387,326 / 2000 = 193.66 tons per year

3.8.9 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.

3.9 AIRCRAFT REFUELING

3.9.1 Introduction

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

3.9.2 Methodology

The amount of fuel transferred into the aircraft at each major commercial airport was obtained from the referenced data sources. 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*)

$$T = \text{Temp. Degrees R} = 460° + 60° = 520°$$

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

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

Fuel data was obtained for the five commercial airports in Texas. General 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.

In addition to the methodology described above, another method was employed in order 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 VOC emissions due to refueling of the reciprocating type of engines. An example calculation of this method is given immediately after the example calculations for the first method discussed.

3.9.3 Example Calculation

A Texas airport:

Jet-A = 587,967 gals/yr
+
100-No lead = 157,208 gals/yr
Total = 745,175gals/yr

$$VOC = 745{,}175 \times \frac{0.038 \text{ lb}}{\text{1000 gal}} \times \frac{\text{Ton}}{\text{2000 lb}} = 0.01 \text{ TPY}$$

<u>Small Airport Example Calculation:</u>

Rusk Co. = 9,400 LTO

$$VOC = \frac{1.75 \text{ gal}}{\text{LTO}} \times \frac{9{,}400 \text{ LTO}}{\text{Yr}} \times \frac{7.1 \text{ lb}}{10^3 \text{ gal}} \times \frac{\text{Ton}}{\text{2000 lb}} = 0.06 \text{ TPY}$$

3.9.4 References

1. TNRCC data for emission factors.

3.10 MARINE VESSEL LOADING LOSSES

3.10.1 Introduction

This category does not apply to this area.

3.11 SYNTHETIC ORGANIC CHEMICAL STORAGE

No emissions will be calculated for this area source category. Any emissions will be reported as point sources and will be found in that section of the 1995 Base Year Emissions Inventory.

3.12 LEAKING UNDERGROUND STORAGE TANKS

3.12.1 Introduction

This is a category for the 1995 Emissions Inventory dealing with old underground VOC storage tanks that have been unearthed for removal.

3.12.2 Methodology

The number of underground storage tank removals for each county was obtained from the Petroleum Storage Tank Division of the TNRCC.

The emission factor of 28 lbs/day of VOC emissions per event was supplied by Radian Corporation under contract to the EPA Office of Air Quality Planning and Standards.

3.12.3 Example Calculation

Tanks removed in Gregg county in 1995 = 3
Activity Days per event = 5
3 x 28 lbs per day = 84 lbs.
(84 / 2000) x 5 = 0.21 TPY

3.12.4 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**, Texas Natural Resource Conservation Commission, Austin, Texas, November, 1996.

3.13 SURFACE COATINGS

3.13.1 Automobile Refinishing

3.13.1.1 Introduction

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

3.13.1.2 Methodology

A per capita emission factor of 2.3 lb/capita was used to calculate VOC emissions from automobile refinishing.

The emission factor and activity days were based on information from EPA's **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I**. County populations came from the U.S. CENSUS ON THE INTERNET.

3.13.1.3 Example Calculations

One county 1995 population = 59,579
59,579 x 2.3 lb. VOC per person = 137,031.7 lbs.
137,031.7 / 2000 = 68.5 TPY

3.13.1.4 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.

3.13.2 Architectural Coatings

3.13.2.1 Introduction

Architectural surface coatings, or trade 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.

3.13.2.2 Methodology

A per capita emission factor of 4.6 lb/capita was used to calculate VOC emissions from architectural surface coatings.

The emission factor was based on information from EPA's **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone. Volume I**. County populations came from the U.S. Census.

3.13.2.3 Example Calculation

One county 1995 population = 59,579
59,579 x 4.6 lb. VOC per person = 274,063 lbs.
274,063 / 2000 = 137.0 TPY

3.13.2.4 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.

3.13.3 Traffic Markings

3.13.3.1 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, crosswalks, and so on.

3.13.3.2 Methodology

These VOC emissions will be estimated by multiplying the county population by an EPA supplied emission factor of 0.5 lbs. per year per capita as seen in Table 4.3-6, p. 4.24 of the **Procedures for the Preparation of Emission Inventories for Carbon**

Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources. County populations came from the U.S. Census.

3.13.3.3 Example Calculations

One county is located in the Tyler/Longview/Marshall area has a population of 59,579.
59,579 x .5 = 29,789.5 lbs. per year
29,789.5/2000 = 14.9 TPY

3.13.3.4 References

1. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources**, No. EPA-450/4-91-016, U.S. Environmental Protection Agency, May 1991.
2. **Projections for County Populations**, data provided by TNRCC Emission Inventory staff.

3.13.4 Industrial Surface Coatings

3.13.4.1 Introduction

Surface coatings are applied to a wide variety of products, such as the categories listed below, and are almost entirely considered point sources, and their emissions are 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.

3.13.4.2 Methodology

Per employee emission factors were used, for the most part, in calculating the emissions from these categories. However, in three of the categories SIC codes were not available and the per capita emission factors were resorted to. These categories were: Other Product Coatings, High-performance Maint. and Other Special Purpose Coatings. The emission factors for each category are from EPA's **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I**. County populations came from the Texas Water Development Board. In order to prevent double-counting, point

source emissions were subtracted from these area source categories. The categories and their lbs/year per employee emission factors are:

Category	SIC Code(s)	Lbs./Yr. Per Employee
Furniture and Fixtures	25	944
Metal Containers	341	6,029
Automobiles (New)	3711	794
Machinery and Equipment	35	77
Appliances	363	463
Other Trans. Equipment	37, except 3711 & 373	35
Sheet, Strip and Coil	3479	2,877
Factory Finished Wood	2426-9, 243-245, 2492, 2499	131
Electrical Insulation	3357, 3612	290
Other Product Coatings	N/A	N/A
High-Performance Maintenance	N/A	N/A
Marine Coatings	373	308
Other Spec. Purpose Coatings	N/A	N/A

3.13.4.3 Example Calculation

One county's 1995 employment in SIC code 35 = 167
Machinery and Equipment emission factor = 77 lb. per employee
167 x 77 lb. VOC per person = 12,859 lbs.
12,859 / 2000 = 6.43 tons per year

3.13.4.4 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. **County Business Patterns, 1995, Texas**, Internet, U. S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census.

3.14 BARGE, TANK, TANK TRUCK, RAIL CAR, AND DRUM CLEANING

Information collected in this category proved to be extremely difficult for several reasons: (1.) The guidance provided by the text in **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources** was insufficient to explain precisely to other agencies and agency personnel what it was that was needed. For example, if a list of companies/manufacturers that used certain chemicals was required it might have been possible to obtain some of the information from the TNRCC. However, without such a specific list and without either EPA codes or other codes for these chemicals, no headway could be made in obtaining information from the resident data bases. (2) Since these obstacles were encountered, assistance was requested from the TNRCC. At the time of this writing no assistance has been given in this category other than having been told that other states were experiencing similar difficulty. (3) A further difficulty was anticipated. Had a list of companies been provided by the TNRCC, it would have been so extensive that it would have been an arduous task to make all of the necessary contacts to obtain any useful information.

3.14.1 References

1. Charlie Rubick, telephone contact, TNRCC, Austin, Texas (512) 239-1478

3.15 BREWERIES

3.15.1 Introduction

Breweries are emitters of VOC's (including ethanol, ethyl acetate, myrcene and some other higher alcohols) due to the various process steps that they utilize in the manufacture of beer. Quantities of emissions depend on brewery size and process steps. Although the convention in the brewing industry is to classify according to production (Large = 60,000 barrels, or more, per year; Small = 1000 to 60,000-barrels per year; Micro = less than 1000 barrels per year; Home breweries) these classifications are not particularly

relevant to Texas breweries considered as area sources in study area. According to the Texas Alcoholic Beverages Commission (TABC), there are eight active breweries in Texas. Of these eight, one of the breweries is in the study area. Emissions from the Strohs' brewery is included in the point source summary.

3.16 WINERIES

3.16.1 Introduction

Emissions from wineries are a consequence of the biological process of fermentation of grapes, the filtration process of grape solids from grape juice and the fugitive emissions from the wine bottling process. The primary emission is ethanol. The wineries in Texas seem to fall in the traditional pattern of being located in rural areas, and since they are not large establishments, they do not report as point sources. The Wine Marketing Research Institute confirmed that no wineries are located in the Tyler/Longview/Marshall area.

3.16.2 Methodology

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

3.16.3 References

1. **Texas Wine & Wine Grape Industry Fact Sheet**, Texas Wine Marketing Research Institute, Texas Tech University, P. O. Box 41162, Lubbock, Texas 79409.

3.17 DISTILLERIES

According to Jim Rush, with the TABC, there are no active distilleries in Texas. Mr. Rush may be contacted at the TABC, 5806 Mesa Drive, Austin, Texas 78731 Phone: (512) 458-2500.

3.18 BAKERIES

3.18.1 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. Small bakeries are also important because although small

in, individual emissions, there are a large number per capita.

3.18.2 Methodology

The starting point of the calculation of emissions in this category was the American Institute of Baking estimate of per capita consumption of bread and related products. The per capita consumption is 76.67 lbs. per person per year. Based on this consumption rate, calculations of emissions were made as suggested in the April 24, 1992 Radian memo, "VOC Emissions from Bakeries" by Lucy Adams. A per capita emission rate of .383 tpy/1000 people was derived. That figure is multiplied by per 1000 people of county population. Research for minor source inventory indicates there is a large number of small bakeries. Because of this the lbs/capita factor was used.

3.18.3 Example Calculations

One county that is located in the Tyler/Longview/Marshall area has a population of 59,579.

$$59{,}579 \times .383 \text{ TPY} / 1000 = 22.8 \text{ TPY}$$

3.18.4 References

1. Adams, Lucy; "VOC Emissions from Bakeries", Radian Corporation, April 24, 1992.

TABLE

Per Capita Consumption of Bread and Related Products	
Product	Pounds Per Person
Breads	**49.87**
White Pan	27.92
Variety Types	21.95
Rolls	**22.81**
Hamburger and hot dog	13.30
Bagels, all types	2.99
Brown and serve	1.35
Hearth	1.38
English muffins	1.68
Croissants	.48
Other bread type rolls	1.63
Sweet Yeast Goods	**3.99**
Doughnuts	1.50
All other	2.49
Total	**76.67**

Note: Estimates and forecasts by U.S. Department of Commerce, International Trade Administration (ITA)
Source: U.S. Industrial Outlook 1992--Food and Beverages

3.19 CATASTROPHIC/ACCIDENTAL RELEASES

3.19.1 Oil Spills

3.19.1.1 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, though, from the TNRCC simply lists the category of oil (crude or gas well liquid), where it was spilled, when, how, and net losses. Given the information, our calculations of emissions will, of necessity, be simple and direct also.

3.19.1.2 Methodology

We have the net amounts lost from each spill. A TNRCC chemist has estimated that 10% of the weight of crude lost will evaporate; 20% of gas well liquid (condensate) will evaporate. The number of gallons lost (after conversion from barrels) will be multiplied by 7.1 lbs./gal (density of crude) or by 6.5 lbs./gal. (approximate density of condensate). The pounds will then be converted to TPY.

3.19.1.3 Example Calculation

In 1995, 4208 Gallons of condensate was the net loss from spills in Gregg County. Employing the methodology described above, the emissions would be estimated this way:
4208 gallons x .2 = 841.6 gallons evaporated
841.6 gallons x 7.1 lbs./gal density of crude /2000 = 0.3 TYP of VOC emissions

3.19.1.4 Summary

The Longview/Tyler area had 313,612 gallons of oil/condensate spilled. This calculated to 22.27 ton/yr of VOC emissions.

3.19.1.5 References

1. Phil Winsborough, TNRCC, Emergency Response Unit MC 142, 12124 Park 35 Circle, Austin, Texas 78753; (512) 239-2524. TNRCC print-out of Losses or Spills for a site by date

3.19.2 Rail Car, Tank Truck And Industrial Accidents

This category was investigated using information provided by the Emergency Response unit of the TNRCC. Using the criteria established by TNRCC Air staff of only reporting those accidents involving an amount greater than or equal to .10 tons per year of emissions, it was determined that there were no reportable accidents in the Tyler/Longview/Marshall area.

3.19.3 Natural Gas Well Blow-Outs

Radian Corporation in Austin, Texas has done research on amounts of natural gas lost from well-head to ultimate distribution and has concluded that the amounts lost at the well due to blow-outs are relatively insignificant.

3.19.3.1 References

1. "Draft Report: Venting and Flaring Emissions from Production, Processing, and Storage in the Natural Gas Industry", Radian Corporation, June 1992, p. 6-12. Information supplied by Mr. Matt Harrison, Radian Corporation, Austin, Texas (512) 454-4797.

3.20 SURFACE CLEANING OPERATIONS

3.20.1 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.

3.20.2 Methodology

EPA's **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I** separate this degreasing category into two major and two minor subcategories. However, since the "per capita" method of calculating emissions was used, the total factor of 4.3 was applied.

Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I was the source of the emission factor and county populations came from the U.S. Census.

3.20.3 Example Calculation

One county 1995 population = 59,579
59,579 x 4.3 lb. VOC per person = 256,189.7 lbs.
256,189.7 / 2000 = 128 TPY

3.20.4 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.

3.21 DRY CLEANING

3.21.1 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 Rule Effectiveness Study. The EPA calculated emission is reduced by 73.75% because perchlorethylene a nonVOC has been used as a replacement for naphtha.

3.21.2 Methodology

A per capita emission factor of 1.8 lb/capita was used to calculate VOC emissions. The activity days per week are five. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I** was the source of the emission factor, as well as the activity days, and county populations came from the Texas Water Development Board.

3.21.3 Example Calculation

"X" 1995 population =59,579
59,579 x 1.8 lb. VOC per person = 107,724 lbs.

10,724 / 2000 = 53.6 tons per year
53.6 x (1 - 0.7375) = 14.07 tons per year

3.21.4 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.

3.22 GRAPHIC ARTS

3.22.1 Introduction

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

3.22.2 Methodology

A per capita emission factor of 1.3 lb/capita was used to calculate VOC emissions from graphic arts facilities. **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I** was the source of the emission factor and county populations came from the U.S. Census.

3.22.3 Example Calculation

One county 1995 population = 59,579
59,579 x 1.3 lb. VOC per person = 77,453 lbs.
77,453 / 2000 = 38.7 tons per year

3.22.4 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.

3.23 ASPHALT

3.23.1 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 liquefied 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.

3.23.2 Methodology

VOC emissions from cutback asphalt were calculated by acquiring the gallons of material used for each county for 1995 and applying an emission factor derived from the evaporation rates of the different types of cutback asphalt: Texas Department of Transportation buys 5 different grades of cutback with 5 different diluent rates. Calculations for emissions are based on 80% loss of diluent when asphalt is cured.

The Texas Department of Transportation supplied the total amount of cutback asphalt used while the EPA's **Procedures for the Preparation of Emissions Inventories for Precursors of Ozone, Volume I** was the source for emission factors.

VOC emissions from emulsified asphalt were calculated by acquiring the gallons of material used for each county for 1995 and applying an emission factor provided by EPA. The composite emission factor of 0.22 lbs. per gallon was provided by EPA's **Procedures for the Preparation of Emissions Inventories for Precursors of Ozone, Volume I**.

3.23.3 Example Calculation

Cutback Asphalt:
—MC30 cutback represents 44.8% of cutback used. Where: (16,695.84 gallons total cutback) times (44.8% percent of total) times (40% distillate) times (80% evaporation during cure) times (5.5 lbs/gallon) divided by 2000 lbs per ton equals 6.7 tons per year.

The above calculation methodology is repeated for the four remaining grades MC800, MC3000, MC2400 and RC250. Cutback emissions are the sum of the evaporative loss from the five grades.

Emulsified asphalt:
One county used 55,857 gallons of asphalt in 1995.
55,857 gal x 0.22 lb. per gal. / 2000 = 6.14 tons of VOC.

3.23.4 References

1. **Cutback Asphalt Usage**, Texas Department of Transportation, Austin, Texas, 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.

3.24 CONSUMER/COMMERCIAL SOLVENT

3.24.1 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.

3.24.2 Methodology

A per capita emission factor of 6.3 lb/capita was used to calculate VOC emissions from consumer/commercial solvent use. EPA's **Procedures for the Preparation of Emissions Inventories for Precursors of Ozone, Volume I** was the

source of the emission factor. County populations came from the U.S. Census.

3.24.3 Example Calculation

One county 1995 population =59,579
59,579 x 6.3 lb. VOC per person = 375,347 lbs.
375,347 / 2000 = 187.6 tons per year

3.24.4 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.

3.25 PESTICIDE APPLICATION

3.25.1 Introduction

Pesticides are defined as any substance used to kill or retard the growth of insects, rodents, fungi, weeds, or microorganisms. Pesticides used in the home and garden are included as part of the consumer/commercial solvent use category.

3.25.2 Methodology

An emission factor of 3.5 lb. (averaged from the recommended 2-5 lbs.) per harvested acre was used to calculate VOC emissions from pesticide application. The factor was applied to each county's total harvested acreage.

EPA's **Procedures for the Preparation of Emission Inventories for Precursors of Ozone. Volume I** provided the emission factor, as well as the seasonal adjustment factor and activity days per week, and harvested acres for each county came from the document **Texas County Statistics**.

3.25.3 Example Calculation

One county 1995 acres in tillage = 468
468 acres x 3.5 lb. VOC per acre = 1638 lbs.
1638 / 2000 = 0.82 TPY

3.25.4 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 County Statistics**, Austin, Texas, 1995.

3.26 MUNICIPAL WASTE LANDFILLS

3.26.1 Introduction

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

3.26.2 Methodology

VOC emissions were calculated using the equation for average annual waste acceptance rate and default values that is in the AP-42 Section 2.4. This equation is also used to calculate emissions in the New Source Performance Standards, 40CFR60, Subpart WWW, which became effective March 12, 1996. The following is an definition of terms in the equation and the default values:

M_{NMOC} = mass emission rate of non methane VOC, Tons per year
L_0 = 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 tonnage.

3.26.3 Example Calculation

Average Annual waste acceptance rate for Gregg County = $70,825 \times 10^6$ grams/yr
Age of landfill = 20 years

$M_{NMOC} = 2L_oR(1-e^{-kt})(C_{NMOC})(3.6 \times 10^{-9})(1.102)$
$M_{NMOC} = 2(125)(70825)(1-e^{-(0.04)(20)})(1170)(3.6X10^{-9})(1.102)$
$M_{NMOC} = 45.27$ TPY

3.26.4 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**

3.27 WASTE TREATMENT EMISSIONS

3.27.1 Publicly Owned Treatment Works (POTW)

3.27.1.1 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%[1].

3.27.1.2 Methodology

Information was provided by the TNRCC Wastewater Permits Section on the total annual flows (in millions of gallons) of counties in the study area. The annual millions of gallons were multiplied by .16 (industry's contribution to the total flow). This number, in turn, was multiplied by an emission factor from Procedures Volume I of 1.1×10^{-4} lbs. of VOC per gallon of wastewater. The product of this multiplication was divided by 2000 to convert to tons per year of VOC.

POTW Influent By County in the Tyler/Longview/Marshall Area		
County	Gallons (Millions)	VOC Tons/Yr
Gregg	5946.46	52.328
Harrison	1852.95	16.306
Rusk	851.98	7.497
Smith	5112.93	44.994
Upshur	431.78	3.800
	Total:	**124.926**

Notes:
VOC Tons/Yr = Default value of 16% (Industrial Discharge) times emission factor of 1.1 x 10 to the -4 times Gallons (Millions) divided by 2000

3.27.1.3 Example Calculation

Harrison County had 1852.95 million gallons of annual wastewater flow

$1852,950,000 \times .16 \times 1.1 \times 10^{-4}$ (or .00011)/2000 = 16.306 Tons/Yr

3.27.1.4 Summary

Total VOC emissions from POTW's in the Tyler/Longview/Marshall area were 124.926 Tons/Yr.

3.27.1.5 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. TNRCC Waste Water Permits Section

3.27.2 Package Plants

Package plants are permitted operations in Texas and emissions from these types of facilities have been reported along with other permitted wastewater treatment facilities in the POTW section of this document.

3.27.3 Industrial Wastewater Treatment Facilities

The emissions from Industrial Wastewater Treatment Facilities were calculated the same way as the POTW facilities.

3.27.3.1 References

1. Mike Veazey, Office of Administrative Services, Texas Natural Resource Conservation Commission, "Municipal and industrial self-reporting flow data for wastewater discharge for 1995".

3.28 SOLID WASTE INCINERATION

3.28.1 On-Site Incineration

On-site incineration of solid waste includes the burning of leaves, landscape refuse, or other refuse or rubbish by residential, commercial/institutional and industrial sources. The TNRCC Regulation I 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 in the "Open Burning" category.

3.28.2 Open Burning

3.28.2.1 Introduction and Methodology

As is noted in the EPA document **Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone Volume I: General Guidance for Stationary Sources**, there is little information available concerning open burning. Therefore, the suggested method is to calculate emissions by assuming a quantity burned per capita, per 1000 people, or per employee. These factors are provided in Table 4.6-2, p. 4-38 and are reproduced below in Table 1. Emission factors were obtained from AP-42 (VOC = 30 lbs./ton of municipal refuse; NO_x = 6 lbs./ton; CO = 85 lbs./ton).

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 a population of 30,000 or more. The practice in Texas, however, is that even in the exempt counties trash pick-up is available. Therefore, it is concluded that a worst-case analysis of open burning is that it would be confined to those counties with populations of 30,000, or less, and that it would be practiced by a small number of people in a category called Rural Farm by the U.S. Census. That the number of open burners is no larger (and, in fact, this may inflate the actual number) is substantiated by the TNRCC Municipal Solid Waste Division. A list of those counties in the area and perimeter counties with populations less than 30,000 and their respective rural farm populations follows:

County	Population	Rural Farm Population
Gregg	107,538	10,284
Harrison	59,530	29,926
Rusk	45,947	29,180
Smith	158,002	68,023
Upshur	32,357	24,169

3.28.2.2 Summary

None of the actual Tyler/Longview/Marshall counties are below the threshold population of 30,000 and all have both municipal and county (rural) trash pick-up mandated by Texas law. No emissions were reported for open burning pending a study of compliance with open-burning regulations.

3.28.2.3 References

1. **Vernon's Texas Code, Annotated**, Health and Safety Code, Part I, Chapter 3, Section 363.113, 1992.
2. **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-450/4-91-016, p. 4-38, May 1991 edition.

3. **U.S. Census**

3.29 SMALL STATIONARY SOURCE FOSSIL FUEL USE

3.29.1 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.

3.29.1.1 Residential Distillate Consumption

3.29.1.1.1 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.

3.29.1.1.2 Methodology

The formula for estimating residential distillate fuel oil use was obtained from an EPA publication, "Development of a Methodology to Allocate Liquid Fossil Fuel Consumption by County". The formula allocates a level amount to each county based primarily on heating degree days (an index of the severity of the winter and, thus, the likelihood of using more, or less, fuel). As was said above, the primary difference in the formula is the number of heating degree days. The number for Tyler/Longview/Marshall is 2055. After calculating the gallons of fuel used, the next step will be to multiply that number by a lbs./gal. emission factor from AP-42.

factors are: VOC .713 lb/1000 gal, and NO_x 18 lbs/1000 gal.

3.29.1.1.3 Summary

The 1990 consumption statewide was 3000 barrels. EIA information indicates similar patterns for 1995. Emissions were calculated to be less than 0.01 ton/yr and were not reported.

3.29.1.2 Commercial Distillate Consumption

3.29.1.2.1 Introduction

The total amount of distillate fuel oil consumed by commercial operations in Texas in 1995 is estimated to be 826,068,000 gallons.

3.29.1.2.2 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 is for SIC codes 50-87, and 89. Numbers of employees by SIC code per county are available from Census publications. The number of barrels is multiplied by 42 to yield number of gallons then multiplied by the number of employees per county to come up with a total consumption in gallons per county figure. 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 gallons per county are then multiplied by the emission factors from AP-42 which are: VOC = .34 lb/1000 gal.; NO_x = 20 lbs/1000 gal. The number of pounds is converted to TPY by dividing by 2000.

3.29.1.2.3 Example Calculation

"Z" County has 7480 employees in SIC codes 50-87 and 89.

826,068 thousand gallons x 7480 employees/4,371,116 statewide employees = 1413 gallons
1413 x .34 lb/thousand gal VOC = 480 lbs.
480/2000 = 0.24 TPY

3.29.1.2.4 Summary

See the tables starting with Table 3-2 for complete, county by county, breakdowns of emissions.

3.29.1.3 Commercial Residual Consumption

3.29.1.3.1 Introduction

Use of residual quality fuel by commercial operations in Texas is even smaller in numbers of barrels than in use of distillate. Energy Information Administration (EIA) estimates indicate that 71,000 barrels were used statewide in 1990.

Similar consumption trends are shown for residual fuel as it is for distillate in 1995. No area source emissions are reported. Residual consumption emissions are reported in point source data.

3.29.1.4 Industrial Distillate Consumption

3.29.1.4.1 Introduction

This was reported as point source emissions only. Distillate reported by the EIA was for commercial category emissions.

3.29.1.5 Industrial Residual Consumption

3.29.1.5.1 Introduction

This was reported as part of the point source emissions.

3.29.2 Coal Consumption

3.29.2.1 Residential Coal Consumption

3.29.2.1.1 Introduction

No reported usage of coal for home heating in 5 county area. Coal (lignite) is used for power plants and is reported for point source category.

3.29.2.2 Commercial Coal Consumption

3.29.2.2.1 Introduction

Commercial coal use is insignificant and has not been calculated for each area. The reason for this conclusion is that the annual usage for 1990 reported by EIA was only 7,000 tons. This amount spread over county proportions of 3,730,328 statewide employees in SIC codes 50-87 and 89 results in emissions less than 0.01 TPY for the 5 county area. This same usage trend was seen in 1995. Emissions reported are zero.

3.29.2.3 Industrial Coal Consumption

3.29.2.3.1 Introduction

There will be no coal usage reported for this area. Point source usage of coal in counties more than accounts for the total usage shown by EIA

3.29.3 Natural Gas Consumption

3.29.3.1 Residential Natural Gas Consumption

3.29.3.1.1 Introduction

There were 206,125 million cubic feet of natural gas consumed in Texas during 1995 by residential users.

3.29.3.1.2 Methodology

There is a formula provided in Procedure, Vol. I for calculating residential natural gas consumption. That formula will be used to make the emissions estimate. Values that will need to be provided to generate an emissions estimate are:
A = total number of natural gas customers

B = annual heating degree days, 2055 for Tyler/Longview/Marshall

C = number of dwelling units using natural gas for space heating The assumption is that this is the same as A.

D = the larger of the number of dwelling units *using natural gas for cooking or hot water* heating. The assumption is that this is the same as A

E = median number of rooms per dwelling unit

Since the formula is expressed in therms, it will need to be converted. The first conversion is into British Thermal Units (BTU's) by multiplying the number of therms by 100,000. Then, BTU's are converted to Standard Cubic Feet by dividing the number of BTU's by 1015. Lastly, in order to take care of the fact that the emissions factors are expressed in pounds per million cubic feet, divide through by 1,000,000 to obtain the number of cubic feet. The cubic feet are then multiplied by an emission factor and converted to TPY by dividing the product by 2000. Emission factors are: VOC = 5.3 lb/10^6 cubic feet; NO_x = 100 lb/10^6 cubic feet.

3.29.3.1.3 Example Calculation

The formula for calculating residential natural gas consumption is:

$47.5 \times A \times B^{.367} \times (C/D)^{.588} \times E^{.125}$ = Therms of Natural Gas

Inserting some actual values, then, County "X" has 12,445 natural gas customers:

$47.5 \times 12{,}445 \times 2055^{.367} \times (12445/12455)^{.588} \times 5^{.125}$ = 11,849,115 Therms x 100,000/1015/1000000 standard cubic ft. x 5.3 lb/cu ft VOC)/2000 = 3.1 TPY

3.29.3.1.4 Summary

See the tables starting with Table 3-2 for complete, county by county, breakdowns of emissions.

3.29.3.2 Commercial Natural Gas Consumption

3.29.3.2.1 Introduction

Statewide consumption of natural gas by commercial establishments was estimated by EIA at 223,144 million cubic feet.

3.29.3.2.2 Methodology

The statewide consumption is to be allocated to each county based on the number of employees in the commercial SIC codes (50-87 and 89). The statewide number of employees in these SIC codes was 4,371,116 in 1995. The number of billions of cubic feet of gas will by multiplied by the county number of employees[1] then divided by the state number of employees. Then, that number will be divided by one million in order to bring the emission factor down from its express in pounds per million cubic feet to pounds per cubic feet. The number of cubic feet will by multiplied by an emission factor then divided by 2000 to convert it to TPY. The emission factors are: VOC = 5.3 lb/10^6 cubic feet; NO_x = 100 lbs/10^6 cubic feet.

3.29.3.2.3 Example Calculation

County "C" has 7480 employees in the commercial SIC codes.
[(7480 x 23,144)/4,371,116]/1,000,000 cu. ft. x 5.3 lb/10^6 cubic ft. VOC/2000 = 1.01 TPY

3.29.3.2.4 Summary

See the tables starting with Table 3-2 for complete, county by county, breakdowns of emissions.

3.29.3.3 INDUSTRIAL NATURAL GAS CONSUMPTION

3.29.3.3.1 Introduction

Industrial natural gas consumption was estimated by EIA at 1,812,437 million cubic feet in 1995.

3.29.3.3.2 Methodology

The first step is to collect employee numbers for SIC codes 1-39 (Industrial employees) because the statewide gas consumption figure is for that entire group. The total number of Industrial employees in the state was 4,371,116.

However, the guidance requests that in this category the usage only for SIC codes 20 through 39 (Manufacturing) be reported. Allocation was by ratio of by county in SIC 1-39 to state total for employees in SIC 1-39.

A further refinement to the allocation is that the SIC code range for the EIA Industrial Natural Gas total is 1-39 whereas the EPA describes the Industrial category as equivalent to Manufacturing employment (SIC codes 20-39). Thus, the cubic feet of gas per county has been adjusted (multiplied) by each county's percentage of county Manufacturing in SIC 20-39 to total Manufacturing employees in SIC 1-39.

Emission factors are from **AP-42**, Table 1.4-1, p. 1.4-2: VOC = 2.8 lb/10^6 cubic feet; NO_x = 140 lb/10^6 cubic feet. The cubic feet of gas will be converted to tons per year by dividing by 2000.

3.29.3.3.3 Example Calculation

(1,812,437 x 10^6 ft^3)(4232 emp. 1-39/1,367,663 state emp. 1-39)(3354 sic 20-39/4232 sic 1-39)(2.8 lb/10^6 ft^3)/2000 lb/ton) = 6.2 TPY

3.29.3.3.4 Summary

See the tables starting with Table 3-2 for complete, county by county, breakdowns of emissions.

3.29.4 Liquid Petroleum Gas Consumption

3.29.4.1 Residential LPG Consumption

3.29.4.1.1 Introduction

The EIA estimates that 30,403 thousand gallons of liquid petroleum gas (LPG) were consumed by residential users in Texas during 1995.

3.29.4.1.2 Methodology

The procedure in this subcategory will be a very direct apportionment to the counties of the total statewide usage based on numbers of households using LPG for home heating. The gallons will be multiplied times the number of households using LPG then divided by the statewide number of households using LPG (per Census information). Next, the gallons will be multiplied by an emission factor then divided by 2000 to convert pounds to TPY. Emission factors are: VOC = .5 lb/1000 gal.; NO_x = 9.4 lbs/1000 gal. Please note that 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.

3.29.4.1.3 Example Calculation

Harrison County has 1586 households that use LPG for home heating. The 30,403 thousand gallons of LPG that were consumed statewide will be allocated this way:
(1586 Harrison/473,527 TX)(30,403 thousand gal.)(0.5 lb/1000 gal)/2000 lb/ton = 0.03 TPY

3.29.4.1.4 Summary

See the tables starting with Table 3-2 for a complete, county by county, breakdown of emissions.

3.29.4.2 Commercial LPG Consumption

3.29.4.2.1 Introduction

The statewide consumption by commercial businesses in Texas of LPG during 1995 was 32,913 x 10^3 gallons according to the EIA.

3.29.4.2.2 Methodology

Statewide consumption of LPG will be allocated according to county numbers of employees in Commercial SIC codes (50-87 and 89). The total number of employees in Commercial SIC codes statewide was 4,371,116. The number of gallons will be multiplied by the county's number of Commercial employees then divided by the statewide number of Commercial employees. The number of gallons will then be multiplied by an emission factor then divided by 2000 in order to convert from pounds to tons. Emission factors are: VOC = .5 lb/1000 gal; NO_x = 9.4 lb/1000 gal. Please note that 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.

3.29.4.2.3 Example Calculation

Harrison County had 7480 employees in commercial SIC codes 5-87 and 89 in 1995. Statewide consumption of 32,913 x 10^3 gallons will be apportioned to the county this way:
(32,913 x 10^3 gal)(7480 SIC 5-87+89/4,371,116 State SIC 50-87-89)(0.5 lb/10^3 gal)/2000 lb/ton = 0.01 TPY

3.29.4.2.4 Summary

See the tables starting with Table 3-2 for complete, county by county, breakdowns of emissions.

3.29.4.3 Industrial LPG Consumption

3.29.4.3.1 Introduction

According to the EIA, the statewide consumption of LPG in Texas for Industrial uses during 1995 was 267,336 x 10^3 gallons.

3.29.4.3.2 Methodology

The total LPG to be allocated, again, is 267,336 x 10^3 gallons.

The next step is to collect employment by SIC code for all SIC codes 1-39 (since the total

state consumption figure is for all those SIC codes). Next, only manufacturing employees, by county, are collected for SIC's 20-39. A percentage of (1.) manufacturing employees to (2.) total industrial employees is derived by dividing (1.) by (2.). This percentage will later be multiplied by the total county allocation for gallons of LPG. Gallons are then multiplied by county employment in SIC codes 1-39, divided by statewide employment, then multiplied by the percentage of manufacturing employees. In this manner, the number of gallons per county for total manufacturing employees is obtained. Emission factors for VOC are .26 lb/1000 gal, and 13.2 lb/1000 gal for NO_x.

3.29.4.3.3 Example Calculation

Harrison County has 4232 employees in SIC codes 1-39 and 3354 in the Manufacturing SIC codes (20-39). The percentage of Manufacturing employees of total Industrial employees is 73.12%. The allocation of the state's consumption of LPG is done this way:

(3354 Co. SIC 20-39/ 4232 Co. SIC 1-39)(267,336 X 10^3)(4232 Co. SIC 1-39/1,367,663 St SIC 1-39)(0.26 lb/10^3 gal)/2000 lb/ton = 0.09 TPY

3.29.4.3.4 Summary

See the tables starting with Table 3-2 for complete, county by county, breakdowns for emissions.

3.29.4.3.5 References

1. **DOE/EIA**
2. **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, p. 4-38.
3. **AP-42, Volume I**, U. S. Environmental Protection Agency.

4. **Procedures...Vol. I**, May 1991, p. 5-18.
3.28.4.3.5.1 Industrial LPG Consumption

3.29.5 Wood Consumption

3.29.5.1 Residential Wood Consumption

3.29.5.1.1 Introduction and Methodology

The burning of wood for home heating is calculated by a formula available from Procedures, Vol. I, pp. 4-42. The formula requires the following information:

NHUHW = number of housing units heating with wood

HDG = heating degree days (2055 for Tyler/Longview/Marshall)

ARPH = average room per housing unit (five rooms)

The formula is:

Residential wood use (TPY) = .0017 x NUHW x HDG x ARPH/5.0

Residential Wood Use in the Tyler/Longview/Marshall Area

County	Households Using Wood
Gregg	2341
Harrison	1230
Rusk	1000
Smith	3372
Upshur	675

Source: Census of Population and Housing, U.S. Department of Commerce, Economic Statistics Administration, Bureau of the Census.

After obtaining TPY of wood used, that number will be multiplied by an emission factor, then converted to tons from pounds (since the factors are expressed in pounds per ton). The emission factors are: VOC = 28 lbs/ton; NO_x

2.8 lb/ton. The factors used are for Conventional Stoves since no information is available on specific types of stoves used.

3.29.5.1.2 Example Calculation

Harrison County has 1230 households using wood for home heating and the county is in a region where there are 2055 heating degree days a year. The average number of rooms per housing unit in the area is five.

.0017 x 1230 x 2055 x 5/5 x 28 lb/ton VOC)/2000 = 60.18 TPY

3.29.5.1.3 Summary

See the tables starting with Table 3-2 for complete, county by county, breakdowns of emissions.

3.29.5.2 Commercial Wood Consumption

According to **Procedures, Volume I**, this category is usually ignored due to its insignificant impact on emissions, in most areas.

3.29.5.3 Industrial Wood Consumption

According to **Procedures, Volume I**, this category is usually ignored due to its insignificant impact on emissions, in most areas.

3.30 STRUCTURE FIRES

3.30.1 Introduction

Building fires can produce large amounts of emissions over a short period of time.

3.30.2 Methodology

Emissions were derived from an assumption of SIX fires per 1000 people with a fuel loading factor of 6.8 tons per fire. The derived factors of 0.000224 tons/capita for VOC, and 0.000029 tons/capita for NO_x, was used.

EPA's **Procedures for the Preparation of Emission Inventories for Precursors of Ozone, Volume I** provided the emission factor, and county populations came from the U.S. CENSUS ON THE INTERNET.

3.30.3 Example Calculation

One county 1995 population = 59,579
59,579 x 0.000224 tons VOC per capita = 13.34 tons

3.30.4 References

1. **Projections for County** Populations, U.S. Census.
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.

3.31 FOREST FIRES

3.31.1 Introduction

Forest fires, or wildfires, in Texas consumed a large number of acres in 1995. A significant portion of that burning occurred in East Texas, where the major forests in Texas are located. Three thousand and four hundred nine acres were reported burned by the Texas Forest Service in the study area's 5 counties.

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 Texas Forest Service supplied information on acreage burned by type of vegetation for each county. They also supplied an estimated tons per acre of vegetation burned per vegetation type. There were three types of vegetation, Nonforest, Natural Forest and Planted Forest.

3.31.2 Methodology

The procedure will be to multiply that acreage by county by type times the fuel loading factor then multiply that product by an emission factor, obtained from AP-42. The fuel loading factors supplied by the Texas Forest Service

are: 3 tons/acre for Nonforest, 15 tons/acre for Natural Forest and 25 tons/acre for Planted Forest. The emission factors are: VOC's: 6 lbs./ton, NO_x: 1 lb./ton

3.31.3 Example Calculation

The Texas Forest Service reports that 84 fires consumed 132 acres of Nonforest, 364 acres of Natural Forest and 19 acres of Planted Forest in Harrison County. Using the factors provided by AP-42:
[(132 acres x Fuel Loading (3 tons per acre)) + (364 x 15) + (19 x 25)] x 6 lb./ton emission factor = 37,986 lbs. or
37,986/2000 = 19 TPY VOC
[(132 acres x 3 tons per acre) + (364 x 15) + (19 x 25) x 1 lb./ton NO_x emission factor = 6331 lbs./2000 = 3.17 TPY

3.31.4 References

1. AP-42 U.S. Environmental Protection Agency, Section 13.1
2. Emission factors are default values from the AMS PC program.
3. Mahlon Hammetter, Texas Forest Service, (409) 639-8120.

3.32 ORCHARD HEATERS

Orchard heaters are used in Texas to a limited extent. The estimate is that 2,000 to 3000 orchard heaters in the entire State are used for a period of perhaps 12 hours per year. There is very limited use of orchard heaters in the Tyler/Longview/Marshall area.

However, this use occurs primarily in March, during the spring frost, in order to protect deciduous fruit orchards. This use does not coincide with the peak ozone season for the Texas areas. The peak ozone season for Tyler/Longview/Marshall area has been determined to be June through August. No emissions were calculated for this source.

This information was provided by Dr. Calvin Lyons of the Texas Agricultural Extension Service, 225 Horticultural Forest Science Bldg., College Station, Texas 77843-2134, Phone: (409) 845-7341.

3.33 AGRICULTURAL BURNING

Agricultural burning is extremely limited in Texas, consisting of the burning of perhaps 34 to 35,000 acres per year only (of sugarcane). In addition, this burning is confined to three Texas counties: Cameron, Willacy, and Hidalgo; none of which is in (or in the perimeter of) the Tyler/Longview/Marshall area.

This information was provided by Dr. Miller, Agronomist, with the Texas Agricultural Extension Service, 350 Crop Science Bldg., College Station, Texas 77843-2474, Phone: (409) 845-0603.

3.34 SLASH BURNING AND PRESCRIBED BURNING

3.34.1 Slash Burning

3.34.1.1 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. Six thousand and two hundred ninety acres were reported burned by the Texas Forest Service in the study area's 5 counties. The Texas Forest Service also supplied an estimated tons per acre of vegetation.

3.34.1.2 Methodology

The county acreage will be multiplied first by a fuel loading factor for slash burning of 15 tons per acre. The "loaded acres" will then be multiplied by emission factors from AP-42,. The emission factors used are: VOCs 6 lbs/ton, NO_x 1 lb/ton.

3.34.1.3 Example Calculation

The Texas Forest Service reports the 4200 acres of slash burning occurred in Harrison County in 1995.
[4200acres x fuel loading(15 tons per acre)] x 6 lb/ton = 378,000 lbs or
378,000/2000 = 189 TPY VOC
[4200acres x fuel loading(15 tons per acre)] x 1 lb/ton = 63,000 lbs or
63,000/2000 = 31.5 TPY No_x

3.34.2 Prescribed Burning

3.34.2.1 Introduction

Prescribed burning is also a forest management tool, but its primary purpose is to clear not only waste logs, but also underbrush that may serve as a host for destructive insects. Since the source of fuel is obviously not as dense as logs the Fuel Loading Factor for material that is burned is far lower: three tons per acre. The Texas Forest Service reported that 2175 acres were involved in prescribed burning.

3.34.2.2 Methodology

The methods employed to calculate emissions from prescribed burning will be identical with those described above. The only difference is the Fuel Loading Factor of three tons per acre.

3.34.2.3 Example Calculation

Please refer to the Example Calculation in the Slash Burning section above. As has been said, the only difference in the calculations is in the Fuel Loading Factor employed.

3.34.2.4 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, No. EPA-450/4-91-016, May 1991.
2. Mahlon Hammetter, Texas Forest Service, College Station, Texas (409) 639-8120.
3. **AP-42**, U.S. Environmental Protection Agency, Section 13.1

4.0 NON-ROAD MOBILE SOURCES

4.1 INTRODUCTION AND SCOPE

The base year for non-road mobile sources is 1995. Four categories were considered in Non-Road Mobile Sources. They are aircraft, marine vessels, locomotives, and small engines. Aircraft emissions were based on activity data from the Texas department of Transportation, Aviation Division. Locomotive emissions relied upon data from the Railroad Commission of Texas (RCT). Small Engines emissions were extrapolated from previous TNRCC work.

4.2 METHODOLOGY AND APPROACH

Methodologies used for estimating the non-road mobile source activity levels and emissions came from EPA's **Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources**, 1992. Aircraft emissions were calculated using landing/takeoff cycles provided by the Federal Aviation Administration (FAA) and the FAA "**Engine Emissions Data Base**" was used for calculating emissions from commercial aircraft. The RCT, as well as individual railroad companies, was contacted for data on locomotives.

4.3 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. A copy of the Quality Assurance Plan is attached.

4.4 SUMMARY OF NON-ROAD MOBILE SOURCE EMISSIONS

Total non-road mobile emissions from the five Tyler/Longview/Marshall area counties were 9438.43 tons of VOC, and 5384.87 tons of NO_x, per year during the 1995 study year.

Table 4-1 through 4-5 show the non-road mobile source emissions by specific categories for each county in the area.

TABLE 4-1		
Summary of Emissions from Non-Road Mobil Sources		
GREGG COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
LOCOMOTIVES	16.60	386.08
AIRCRAFT-COMMERCIAL	84.53	112.41
AIRCRAFT-MILITARY	75.12	32.19
AIRCRAFT-GENERAL	14.57	2.40
MARINE VESSELS	N/A	N/A
SMALL ENGINES	1706.73	581.88
TOTAL of Non-Road Mobil	**1897.56**	**1114.97**
SMALL ENGINE EMISSIONS 4cycle , 2cycle &diesel		
EQUIPMENT TYPES	**VOC**	**NOX**
	TPY	**TPY**
Trimmers/Edgers/Brush Cutters	104.93	0.19
Lawn Mowers	642.20	3.57
Leaf Blowers/Vacuums	34.95	0.07
Rear Engine Riding Mowers	10.69	0.34
Front Mowers	3.84	0.09
Chainsaws <4 HP	266.73	0.39
Shredders <5 HP	0.90	0.01
Tillers <5 HP	14.64	0.12
Lawn & Garden Tractors	59.87	5.56
Wood Splitters	3.95	0.04
Snowblowers	0.00	0.00
Chippers/Stump Grinders	25.82	4.96
Commercial Turf Equipment	105.74	4.10
Other Lawn & Garden Equipment	3.12	0.01
Subtotal	**1277.37**	**19.44**
Aircraft Support Equipment	0.00	0.00
Terminal Tractors	0.00	0.00
Subtotal	**0.00**	**0.00**
All Terrain Vehicles (ATVs)	48.96	0.09
Minibikes	0.61	0.34
Off-Road Motorcycles	21.66	0.00
Golf Carts	84.03	0.10
Snowmobiles	0.00	0.00
Specialty Vehicles Carts	23.23	0.07
Subtotal	**178.49**	**0.60**
Vessels w/Inboard Engines	0.93	0.24
Vessels w/Outboard Engines	26.19	0.27
Vessels w/Sterndrive Engines	2.07	0.64
Sailboat Auxiliary Inboard Engines	0.00	0.00
Sailboat Auxiliary Outboard Engines	0.01	0.00
Subtotal	**29.20**	**1.15**

TABLE 4-1		
Summary of Emissions from Non-Road Mobil Sources		
GREGG COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Generator Sets <50 HP	61.64	5.53
Pumps <50 HP	10.79	2.29
Air Compressors <50 HP	6.07	1.16
Gas Compressors <50 HP	0.00	0.00
Welders <50 HP	10.15	4.70
Pressure Washers <50 HP	3.14	0.11
Subtotal	**91.78**	**13.79**
Aerial Lifts	1.32	1.41
Forklifts	11.47	22.59
Sweepers/Scrubbers	1.71	8.67
Other General Industrial Equipment	1.68	2.89
Other Material Handling Equipment	0.14	0.32
Subtotal	**16.32**	**35.89**
Asphalt Pavers	0.17	1.61
Tampers/Rammers	1.60	0.00
Plate Compactors	3.32	0.06
Concrete Pavers	0.10	0.83
Rollers	0.97	3.48
Scrapers	1.10	13.27
Paving Equipment	3.86	7.24
Surfacing Equipment	0.48	0.05
Signal Boards	0.07	0.30
Trenchers	1.07	3.60
Bore/Drill Rigs	0.77	3.19
Excavators	1.17	17.50
Concrete/Industrial Saws	1.68	0.18
Cement and Mortar Mixers	0.74	0.10
Cranes	3.46	26.64
Graders	2.48	15.03
Off-Highway Trucks	2.05	22.64
Crushing/Proc. Equipment	0.57	3.39
Rough Terrain Forklifts	1.45	6.18
Rubber Tired Loaders	3.88	44.14
Rubber Tired Dozers	0.62	6.82
Tractors/Loaders/Backhoes	4.71	32.19
Crawler Tractors	8.78	69.36
Skid Steer Loaders	1.84	6.48
Off-Highway Tractors	5.28	24.78
Dumpers/Tenders	0.11	0.01
Other Construction Equipment	0.67	3.23
Subtotal	**52.98**	**312.30**
2-Wheel Tractors	0.05	0.01

TABLE 4-1		
Summary of Emissions from Non-Road Mobil Sources		
GREGG COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Agricultural Tractors	31.34	152.23
Agricultural Mowers	0.05	0.01
Combines	1.06	9.41
Sprayers	0.20	0.12
Balers	0.02	0.07
Tillers >5 HP	1.99	0.02
Swathers	0.91	3.61
Hydro Power Units	0.16	0.09
Other Agricultural Equipment	0.33	1.68
Subtotal	**36.12**	**167.22**
Chainsaws >4 HP	21.04	0.06
Shredders >5 HP	1.00	0.03
Skidders	1.34	17.35
Fellers/Bunchers	1.08	14.06
Subtotal	**24.46**	**31.50**
==========	==========	==========
Grand Total of Small Engines	**1706.73**	**581.88**

TABLE 4-2		
Summary of Emissions from Non-Road Mobil Sources		
HARRISON COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
LOCOMOTIVES	40.89	950.93
AIRCRAFT-COMMERCIAL	N/A	N/A
AIRCRAFT-MILITARY	N/A	N/A
AIRCRAFT-GENERAL	2.25	0.3705
MARINE VESSELS	N/A	N/A
SMALL ENGINES	1741.28	351.91
TOTAL of Non-Road Mobil	**1784.41**	**1303.21**
SMALL ENGINE EMISSIONS 4cycle , 2cycle &diesel		
EQUIPMENT TYPES	**VOC**	**NOX**
	TPY	**TPY**
Trimmers/Edgers/Brush Cutters	57.75	0.10
Lawn Mowers	353.45	1.97
Leaf Blowers/Vacuums	19.24	0.04
Rear Engine Riding Mowers	5.88	0.19
Front Mowers	2.11	0.05
Chainsaws <4 HP	146.80	0.21
Shredders <5 HP	0.49	0.00
Tillers <5 HP	8.06	0.07
Lawn & Garden Tractors	32.95	3.06
Wood Splitters	2.17	0.02
Snowblowers	0.00	0.00
Chippers/Stump Grinders	14.21	2.73
Commercial Turf Equipment	58.20	2.26
Other Lawn & Garden Equipment	1.72	0.01
Subtotal	**703.03**	**10.70**
Aircraft Support Equipment	0.00	0.00
Terminal Tractors	0.00	0.00
Subtotal	**0.00**	**0.00**
All Terrain Vehicles (ATVs)	26.94	0.05
Minibikes	0.34	0.19
Off-Road Motorcycles	11.92	0.00
Golf Carts	46.25	0.05
Snowmobiles	0.00	0.00
Specialty Vehicles Carts	12.79	0.04
Subtotal	**98.24**	**0.33**
Vessels w/Inboard Engines	25.96	6.65
Vessels w/Outboard Engines	733.62	7.51
Vessels w/Sterndrive Engines	58	18.04
Sailboat Auxiliary Inboard Engines	0.07	0.09
Sailboat Auxiliary Outboard Engines	0.36	0.00
Subtotal	**818.01**	**32.29**

TABLE 4-2		
Summary of Emissions from Non-Road Mobil Sources		
HARRISON COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Generator Sets <50 HP	33.93	3.04
Pumps <50 HP	5.94	1.26
Air Compressors <50 HP	3.34	0.64
Gas Compressors <50 HP	0.00	0.00
Welders <50 HP	5.59	2.59
Pressure Washers <50 HP	1.73	0.06
Subtotal	**50.51**	**7.59**
Aerial Lifts	0.73	0.77
Forklifts	6.31	12.44
Sweepers/Scrubbers	0.94	4.77
Other General Industrial Equipment	0.93	1.59
Other Material Handling Equipment	0.08	0.18
Subtotal	**8.98**	**19.75**
Asphalt Pavers	0.09	0.89
Tampers/Rammers	0.88	0.00
Plate Compactors	1.82	0.03
Concrete Pavers	0.05	0.46
Rollers	0.54	1.91
Scrapers	0.60	7.31
Paving Equipment	2.13	3.99
Surfacing Equipment	0.26	0.03
Signal Boards	0.04	0.17
Trenchers	0.59	1.98
Bore/Drill Rigs	0.43	1.76
Excavators	0.64	9.63
Concrete/Industrial Saws	0.92	0.10
Cement and Mortar Mixers	0.41	0.05
Cranes	1.90	14.66
Graders	1.37	8.27
Off-Highway Trucks	1.13	12.46
Crushing/Proc. Equipment	0.31	1.87
Rough Terrain Forklifts	0.80	3.40
Rubber Tired Loaders	2.14	24.29
Rubber Tired Dozers	0.34	3.75
Tractors/Loaders/Backhoes	2.59	17.72
Crawler Tractors	4.83	38.17
Skid Steer Loaders	1.01	3.56
Off-Highway Tractors	2.90	13.64
Dumpers/Tenders	0.06	0.01
Other Construction Equipment	0.37	1.78
Subtotal	**29.16**	**171.88**
2-Wheel Tractors	0.03	0.00

TABLE 4-2		
Summary of Emissions from Non-Road Mobil Sources		
HARRISON COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Agricultural Tractors	17.25	83.78
Agricultural Mowers	0.03	0.00
Combines	0.59	5.18
Sprayers	0.11	0.07
Balers	0.01	0.04
Tillers >5 HP	1.10	0.01
Swathers	0.50	1.98
Hydro Power Units	0.09	0.05
Other Agricultural Equipment	0.18	0.92
Subtotal	**19.88**	**92.03**
Chainsaws >4 HP	11.58	0.03
Shredders >5 HP	0.55	0.02
Skidders	0.74	9.55
Fellers/Bunchers	0.60	7.74
Subtotal	**13.46**	**17.34**
==========	==========	==========
Grand Total of Small Engines	**1741.28**	**351.91**

TABLE 4-3		
Summary of Emissions from Non-Road Mobil Sources		
RUSK COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
LOCOMOTIVES	2.25	52.2
AIRCRAFT-COMMERCIAL	N/A	N/A
AIRCRAFT-MILITARY	4.73	2.028
AIRCRAFT-GENERAL	1.77	0.2925
MARINE VESSELS	N/A	N/A
SMALL ENGINES	1040.14	253.52
TOTAL of Non-Road Mobil	**1048.90**	**308.04**
SMALL ENGINE EMISSIONS 4cycle , 2cycle &diesel		
EQUIPMENT TYPES	**VOC**	**NOX**
	TPY	**TPY**
Trimmers/Edgers/Brush Cutters	43.33	0.08
Lawn Mowers	265.18	1.47
Leaf Blowers/Vacuums	14.43	0.03
Rear Engine Riding Mowers	4.41	0.14
Front Mowers	1.58	0.04
Chainsaws <4 HP	110.14	0.16
Shredders <5 HP	0.37	0.00
Tillers <5 HP	6.05	0.05
Lawn & Garden Tractors	24.72	2.29
Wood Splitters	1.63	0.01
Snowblowers	0.00	0.00
Chippers/Stump Grinders	10.66	2.05
Commercial Turf Equipment	43.66	1.69
Other Lawn & Garden Equipment	1.29	0.00
Subtotal	**527.46**	**8.03**
Aircraft Support Equipment	0.00	0.00
Terminal Tractors	0.00	0.00
Subtotal	**0.00**	**0.00**
All Terrain Vehicles (ATVs)	20.22	0.04
Minibikes	0.25	0.14
Off-Road Motorcycles	8.94	0.00
Golf Carts	34.70	0.04
Snowmobiles	0.00	0.00
Specialty Vehicles Carts	9.59	0.03
Subtotal	**73.70**	**0.25**
Vessels w/Inboard Engines	11.03	2.83
Vessels w/Outboard Engines	311.6	3.19
Vessels w/Sterndrive Engines	24.64	7.66
Sailboat Auxiliary Inboard Engines	0.03	0.04
Sailboat Auxiliary Outboard Engines	0.15	0.00
Subtotal	**347.45**	**13.72**

TABLE 4-3		
Summary of Emissions from Non-Road Mobil Sources		
RUSK COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Generator Sets <50 HP	25.45	2.28
Pumps <50 HP	4.46	0.95
Air Compressors <50 HP	2.50	0.48
Gas Compressors <50 HP	0.00	0.00
Welders <50 HP	4.19	1.94
Pressure Washers <50 HP	1.30	0.04
Subtotal	**37.90**	**5.69**
Aerial Lifts	0.54	0.58
Forklifts	4.74	9.33
Sweepers/Scrubbers	0.71	3.58
Other General Industrial Equipment	0.69	1.19
Other Material Handling Equipment	0.06	0.13
Subtotal	**6.74**	**14.82**
Asphalt Pavers	0.07	0.66
Tampers/Rammers	0.66	0.00
Plate Compactors	1.37	0.02
Concrete Pavers	0.04	0.34
Rollers	0.40	1.44
Scrapers	0.45	5.48
Paving Equipment	1.59	2.99
Surfacing Equipment	0.20	0.02
Signal Boards	0.03	0.13
Trenchers	0.44	1.49
Bore/Drill Rigs	0.32	1.32
Excavators	0.48	7.23
Concrete/Industrial Saws	0.69	0.07
Cement and Mortar Mixers	0.31	0.04
Cranes	1.43	11.00
Graders	1.03	6.20
Off-Highway Trucks	0.85	9.35
Crushing/Proc. Equipment	0.24	1.40
Rough Terrain Forklifts	0.60	2.55
Rubber Tired Loaders	1.60	18.23
Rubber Tired Dozers	0.26	2.82
Tractors/Loaders/Backhoes	1.95	13.29
Crawler Tractors	3.62	28.64
Skid Steer Loaders	0.76	2.67
Off-Highway Tractors	2.18	10.23
Dumpers/Tenders	0.04	0.00
Other Construction Equipment	0.27	1.33
Subtotal	**21.88**	**128.95**
2-Wheel Tractors	0.02	0.00

TABLE 4-3		
Summary of Emissions from Non-Road Mobil Sources		
RUSK COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Agricultural Tractors	12.94	62.86
Agricultural Mowers	0.02	0.00
Combines	0.44	3.88
Sprayers	0.08	0.05
Balers	0.01	0.03
Tillers >5 HP	0.82	0.01
Swathers	0.38	1.49
Hydro Power Units	0.07	0.04
Other Agricultural Equipment	0.14	0.69
Subtotal	**14.92**	**69.05**
Chainsaws >4 HP	8.69	0.02
Shredders >5 HP	0.41	0.01
Skidders	0.55	7.17
Fellers/Bunchers	0.45	5.80
Subtotal	**10.10**	**13.01**
==========	==========	==========
Grand Total of Small Engines	**1040.14**	**253.52**

TABLE 4-4		
Summary of Emissions from Non-Road Mobil Sources		
SMITH COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
LOCOMOTIVES	25.80	600.3
AIRCRAFT-COMMERCIAL	300.21	399.24
AIRCRAFT-MILITARY	8.27	3.54393
AIRCRAFT-GENERAL	12.69	2.093845
MARINE VESSELS	N/A	N/A
SMALL ENGINES	3352.00	885.65
TOTAL of Non-Road Mobil	**3698.98**	**1890.83**
SMALL ENGINE EMISSIONS 4cycle , 2cycle &diesel		
EQUIPMENT TYPES	**VOC**	**NOX**
	TPY	**TPY**
Trimmers/Edgers/Brush Cutters	153.65	0.28
Lawn Mowers	940.41	5.23
Leaf Blowers/Vacuums	51.18	0.10
Rear Engine Riding Mowers	15.65	0.50
Front Mowers	5.62	0.13
Chainsaws <4 HP	390.59	0.57
Shredders <5 HP	1.31	0.01
Tillers <5 HP	21.44	0.17
Lawn & Garden Tractors	87.67	8.13
Wood Splitters	5.78	0.05
Snowblowers	0.00	0.00
Chippers/Stump Grinders	37.81	7.26
Commercial Turf Equipment	154.84	6.00
Other Lawn & Garden Equipment	4.57	0.02
Subtotal	**1870.52**	**28.47**
Aircraft Support Equipment	0.00	0.00
Terminal Tractors	0.00	0.00
Subtotal	**0.00**	**0.00**
All Terrain Vehicles (ATVs)	71.69	0.13
Minibikes	0.90	0.50
Off-Road Motorcycles	31.71	0.00
Golf Carts	123.06	0.14
Snowmobiles	0.00	0.00
Specialty Vehicles Carts	34.02	0.10
Subtotal	**261.37**	**0.88**
Vessels w/Inboard Engines	28.42	7.28
Vessels w/Outboard Engines	803.12	8.22
Vessels w/Sterndrive Engines	63.5	19.75
Sailboat Auxiliary Inboard Engines	0.07	0.01
Sailboat Auxiliary Outboard Engines	0.40	0.00
Subtotal	**895.51**	**35.26**

TABLE 4-4		
Summary of Emissions from Non-Road Mobil Sources		
SMITH COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Generator Sets <50 HP	90.26	8.10
Pumps <50 HP	15.80	3.36
Air Compressors <50 HP	8.88	1.70
Gas Compressors <50 HP	0.00	0.00
Welders <50 HP	14.86	6.88
Pressure Washers <50 HP	4.59	0.16
Subtotal	**134.40**	**20.19**
Aerial Lifts	1.93	2.06
Forklifts	16.60	33.09
Sweepers/Scrubbers	2.51	12.69
Other General Industrial Equipment	2.46	4.24
Other Material Handling Equipment	0.20	0.47
Subtotal	**23.90**	**52.55**
Asphalt Pavers	0.24	2.36
Tampers/Rammers	2.34	0.00
Plate Compactors	4.85	0.09
Concrete Pavers	0.14	1.22
Rollers	1.43	5.09
Scrapers	1.61	19.44
Paving Equipment	5.66	10.61
Surfacing Equipment	0.70	0.07
Signal Boards	0.10	0.44
Trenchers	1.57	5.27
Bore/Drill Rigs	1.13	4.67
Excavators	1.71	25.63
Concrete/Industrial Saws	2.45	0.26
Cement and Mortar Mixers	1.09	0.14
Cranes	5.06	39.01
Graders	3.64	22.00
Off-Highway Trucks	3.00	33.15
Crushing/Proc. Equipment	0.84	4.97
Rough Terrain Forklifts	2.12	9.05
Rubber Tired Loaders	5.68	64.63
Rubber Tired Dozers	0.90	9.99
Tractors/Loaders/Backhoes	6.90	47.14
Crawler Tractors	12.85	101.57
Skid Steer Loaders	2.70	9.48
Off-Highway Tractors	7.73	36.29
Dumpers/Tenders	0.16	0.02
Other Construction Equipment	0.97	4.73
Subtotal	**77.58**	**457.31**
2-Wheel Tractors	0.07	0.01

TABLE 4-4		
Summary of Emissions from Non-Road Mobil Sources		
SMITH COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Agricultural Tractors	45.89	222.92
Agricultural Mowers	0.08	0.01
Combines	1.56	13.77
Sprayers	0.30	0.17
Balers	0.03	0.10
Tillers >5 HP	2.91	0.03
Swathers	1.34	5.28
Hydro Power Units	0.23	0.13
Other Agricultural Equipment	0.49	2.45
Subtotal	**52.90**	**244.87**
Chainsaws >4 HP	30.81	0.09
Shredders >5 HP	1.47	0.04
Skidders	1.96	25.41
Fellers/Bunchers	1.58	20.58
Subtotal	**35.82**	**46.13**
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Grand Total of Small Engines	**3352.00**	**885.65**

TABLE 4-5		
Summary of Emissions from Non-Road Mobil Sources		
UPSHUR COUNTY		
CATEGORY	**VOC EMISSIONS**	**NOx EMISSIONS**
	TONS/YEAR	**TONS/YEAR**
LOCOMOTIVES	24.70	574.8
AIRCRAFT-COMMERCIAL	N/A	N/A
AIRCRAFT-MILITARY	N/A	N/A
AIRCRAFT-GENERAL	1.24	0.20475
MARINE VESSELS	N/A	N/A
SMALL ENGINES	982.65	192.82
TOTAL of Non-Road Mobil	***1008.59***	***767.82***
SMALL ENGINE EMISSIONS 4cycle , 2cycle &diesel		
EQUIPMENT TYPES	**VOC**	**NOX**
	TPY	**TPY**
Trimmers/Edgers/Brush Cutters	31.41	0.06
Lawn Mowers	192.25	1.07
Leaf Blowers/Vacuums	10.46	0.02
Rear Engine Riding Mowers	3.20	0.10
Front Mowers	1.15	0.03
Chainsaws <4 HP	79.85	0.12
Shredders <5 HP	0.27	0.00
Tillers <5 HP	4.38	0.04
Lawn & Garden Tractors	17.92	1.66
Wood Splitters	1.18	0.01
Snowblowers	0.00	0.00
Chippers/Stump Grinders	7.73	1.49
Commercial Turf Equipment	31.65	1.23
Other Lawn & Garden Equipment	0.93	0.00
Subtotal	**382.40**	**5.82**
Aircraft Support Equipment	0.00	0.00
Terminal Tractors	0.00	0.00
Subtotal	**0.00**	**0.00**
All Terrain Vehicles (ATVs)	14.66	0.03
Minibikes	0.18	0.10
Off-Road Motorcycles	6.48	0.00
Golf Carts	25.16	0.03
Snowmobiles	0.00	0.00
Specialty Vehicles Carts	6.95	0.02
Subtotal	**53.43**	**0.18**
Vessels w/Inboard Engines	15.25	3.91
Vessels w/Outboard Engines	430.88	4.41
Vessels w/Sterndrive Engines	34.07	10.59
Sailboat Auxiliary Inboard Engines	0.04	0.05
Sailboat Auxiliary Outboard Engines	0.21	0.00
Subtotal	**480.45**	**18.97**

TABLE 4-5		
Summary of Emissions from Non-Road Mobil Sources		
UPSHUR COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Generator Sets <50 HP	18.45	1.66
Pumps <50 HP	3.23	0.69
Air Compressors <50 HP	1.82	0.35
Gas Compressors <50 HP	0.00	0.00
Welders <50 HP	3.04	1.41
Pressure Washers <50 HP	0.94	0.03
Subtotal	**27.48**	**4.13**
Aerial Lifts	0.39	0.42
Forklifts	3.43	6.76
Sweepers/Scrubbers	0.51	2.60
Other General Industrial Equipment	0.50	0.87
Other Material Handling Equipment	0.04	0.10
Subtotal	**4.89**	**10.74**
Asphalt Pavers	0.05	0.48
Tampers/Rammers	0.48	0.00
Plate Compactors	0.99	0.02
Concrete Pavers	0.03	0.25
Rollers	0.29	1.04
Scrapers	0.33	3.97
Paving Equipment	1.16	2.17
Surfacing Equipment	0.14	0.01
Signal Boards	0.02	0.09
Trenchers	0.32	1.08
Bore/Drill Rigs	0.23	0.96
Excavators	0.35	5.24
Concrete/Industrial Saws	0.50	0.05
Cement and Mortar Mixers	0.22	0.03
Cranes	1.04	7.98
Graders	0.74	4.50
Off-Highway Trucks	0.61	6.78
Crushing/Proc. Equipment	0.17	1.02
Rough Terrain Forklifts	0.43	1.85
Rubber Tired Loaders	1.16	13.21
Rubber Tired Dozers	0.18	2.04
Tractors/Loaders/Backhoes	1.41	9.64
Crawler Tractors	2.63	20.76
Skid Steer Loaders	0.55	1.94
Off-Highway Tractors	1.58	7.42
Dumpers/Tenders	0.03	0.00
Other Construction Equipment	0.20	0.97
Subtotal	**15.86**	**93.49**
2-Wheel Tractors	0.01	0.00

TABLE 4-5		
Summary of Emissions from Non-Road Mobil Sources		
UPSHUR COUNTY		
CATEGORY	VOC EMISSIONS	NOx EMISSIONS
	TONS/YEAR	TONS/YEAR
Agricultural Tractors	9.38	45.57
Agricultural Mowers	0.02	0.00
Combines	0.32	2.82
Sprayers	0.06	0.04
Balers	0.01	0.02
Tillers >5 HP	0.60	0.01
Swathers	0.27	1.08
Hydro Power Units	0.05	0.03
Other Agricultural Equipment	0.10	0.50
Subtotal	**10.81**	**50.06**
Chainsaws >4 HP	6.30	0.02
Shredders >5 HP	0.30	0.01
Skidders	0.40	5.20
Fellers/Bunchers	0.32	4.21
Subtotal	**7.32**	**9.43**
==========	==========	==========
Grand Total of Small Engines	**982.65**	**192.82**

4.5 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.

4.5.1 AIRCRAFT EMISSIONS

4.5.1.1 Introduction

Aircraft may be divided into three categories: commercial, general, and military. Activity data as well as methodology for calculating emissions have been well-defined for commercial aircraft. For military and general aircraft more basic techniques have been applied.

4.5.1.2 Methodology

TNRCC composite emission factors were used. The following is the TNRCC staff's derivation of these factors. Emissions from commercial aircraft were calculated from the engine data provided in the FAA's Engine Emissions Data Base (FAEED). Engine information from commercial airports in the FAEED computer program along with input landing/takeoff (LTOs) cycles were used to calculate emissions. LTO's per aircraft type are input into the FAEED, and emissions are generated by precoded aircraft engine emission information,, including aircraft time-in-mode, fuel flow rate, number of engines, and emission indices for each mode of operation. As an example, the data below is for the Boeing 727-100 with JT8D-7B engines.

Mode	Number of Engines	Time in Mode (min.)	Fuel Flow (lb/min)	Emission Indexes (lb/1000 lb)		Pollutant Emissions (lb./LTO)	
				HC	NO_x	HC	NO_x
Takeoff	3	0.7	130.85	.4	17.1	.11	4.70
Climbout	3	2.2	107.32	.5	13.5	.35	9.56
Approach	3	4.0	37.84	1.6	5.5	.73	2.50
Idle	3	26.0	17.08	10.6	2.7	14.12	3.60
					Total	15.31	20.36

Commercial:
Methodology
Emission factors were derived from data provided above by the following method:

Engine No. x Time in Mode x Fuel Flow x Emission Index = Emission Factor

The factors for four scenarios were totaled to provide factors of 15.31 lb/LTO for VOC, 20.36 and 53.88 lb/LTO for CO.

One commercial airport had 950 LTO's during 1990.

950 x 15.31 lb./LTO / 2000 = 7.27 tons per year

727 / 35 = .11 tons per day of VOC

Emissions from general aircraft and air taxis were calculated from the number of LTOs at each airport applied to emission factors for VOC, NO_x, and CO provided by EPA's **Procedures for Emission Inventory Preparation. Volume IV: Mobile Sources**.

Military Aircraft:
Methodology
Emissions from military aircraft were calculated using the methodology described in Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources. Since military aircraft types were not included in the FAA's Airport Master Records, it was assumed all military aircraft landing at general airports would be of the C-130 type. The tables in the referenced document provided time in mode, engine model, and modal emissions. These parameters are summarized as follows:

Mode	Number of Engines	Time in Mode (min)	Fuel Flow (lb/min)	Emission Indexes (lb/1000 lb)		Pollutant Emissions (lb./LTO)	
				HC	NO_x	HC	NO_x
Takeoff	4	0.7	39.87	.18	11.71	.02	1.31
Climbout	4	1.6	36.45	.18	10.18	.04	2.37
Approach	4	5.2	19.10	.28	6.38	.11	2.53
Idle	4	47.7	8.23	14.96	2.50	23.49	3.93
					Total	23.66	10.14

4.5.1.3 Example Calculations

Military:
Emission factors were derived from data provided above by the following method:

Engine No. x Time in Mode x Fuel Flow x Emission Index = Emission Factor

The factors for four scenarios were totaled to provide factors of 23.66 lb./LTO for VOC, 10.14 lb/LTO for NO_x, and 13.82 lb./LTO for CO.
One county had 681 military LTO's during 1990.

681 x 23.66 lb./LTO / 2000 = 8.1 tons per year
8.1 / 365 = .222 tons per day of VOC

General Aviation:
A county has one airport that had 87,600 LTOs during 1990. The EPA emission factors for general aviation are: VOC = 0.394 lb. per LTO, NO_x = 0.065 lb. per LTO, and CO = 12.014 lb. per LTO.
Seasonal Adjustment Factor = Uniform
Activity Days = 7
87600 x 0.394 / 2000 = 17.3 tons of VOC per year
17.3 / 365 = 0.0473 tons per day of VOC
87600 x 0.065 / 2000 = 2.8 tons of NO_x per year
2.8 / 365 = 0.0076 tons per day of NO_x
87600 x 12.014 / 2000 = 526 tons of CO per year
526 tons / 365 = 1.441 tons per day of CO

The following is a list of airports in the Tyler/Longview/Marshall area.

City	Airport
Longview	Gregg County Airport
Marshall	Harrison County Airport
Henderson	Rusk County Airport
Tyler	Tyler Pounds Field
Gilmer	Upshur County Airport

4.5.1.4 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.

4.5.2 MARINE VESSELS

4.5.2.1 Introduction

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

4.5.3 LOCOMOTIVE EMISSIONS

4.5.3.1 Introduction

There were three Class I railroads operating in East Texas in 1995. The three railroads are: (1) Union Pacific Company, (2) Burlington Northern Santa Fe Railway Company, (3) Kansas City Southern Railway Company.

Complete information concerning railroad operations in Texas proved to be difficult to receive. 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 (and this information is not required by the RCT either). Needless to say, in some cases this lack of hard 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 that gave the miles of track of a rail line segment in each county, the trains per day on that rail line segment, and the average number train engines for the rail line segment. The Union Pacific Co. provided the average number of gallons of fuel per mile per engine. There are 6 rail line segments that run through the 5 county study area.

4.5.3.2 Methodology

The method was to simply calculate the number of miles traveled per engine and multiply that time the average number of gallons per mile per engine to arrive at the gallons used in each county. Calculation, then, just amounted to multiplying the gallons by emission factors from Table 6-1, p. 204 of the **Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources**[1]. These factors are: HC = .0211 lbs/gal; and NO_x = .4931 lbs/gal. Hydrocarbon numbers are converted to VOC numbers by multiplying by 1.005, as suggested by the Procedures, Vol. IV manual.

4.5.3.3 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 x 16 trains x 3.5 engines/train x 3.5 gallons/mile/engine x 312 = 1,169,532 gals of fuel
1,169,532 x .0211 x 1.005/2000 = 10.92 ton/yr VOC
1,169,532 x .4931/2000 = 256.31 ton/yr NOx
There are three rail line segments in Gregg County for a total of 16.60 ton/yr of VOC and 386.08 ton/yr of NOx

4.5.3.4 Summary

See Tables starting with Table 4-1 for complete, county by county, breakdowns of emissions.

4.5.3.5 References

1. **Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources**, 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.

4.5.4 Non-Road Mobil Sources "Small Engines"

4.5.4.1 Introduction

Emissions were extrapolated from previous TNRCC work. Montgomery County was determined to be similar to the study area of Gregg, Smith, Rusk, Harrison, and Upshur Counties. Emission estimates were calculated based upon population ratios between the example county and the five counties referenced above. Out board engines were an exception. Data was obtained on area lake size in acres from the Texas Parks and Wildlife. Each counties lake area was divided by Montgomery County lake area. Emission estimates were calculated based upon lake size ratios between the example county and the five counties referenced above.

5.0 ON-ROAD MOBILE

5.1 INTRODUCTION AND EMISSIONS SUMMARY

The 1995 Tyler/Longview/Marshall area On-road Mobile source emissions inventory was developed based on general procedures for the 1990 base year emissions inventory for ozone nonattainment areas as required by the 1990 Federal Clean Air Act Amendments. The geographical area covered included Gregg, Harrison, Smith, and Upshur counties.

This section presents emissions for VOC and NOX, and the emissions sources are the eight EPA regulated vehicle types: light-duty gasoline vehicles; light-duty gasoline trucks up to 6000 pounds gross vehicle weight (GVW); light-duty gasoline trucks from 6001 to 8500 pounds GVW; heavy-duty gasoline vehicles over 8500 pounds GVW; light-duty diesel vehicles; heavy-duty diesel vehicles over 8500 pounds; and motorcycles.

Emissions estimates are provided in tons per day and were produced using emission factors developed with EPA's MOBILE5a emission factor model in conjunction with vehicle miles of travel (VMT) developed for the inventory area. The model differentiates vehicle speeds and delegates VMT by vehicle type, rural and urban split, and by roadway type. The mobile model parameter inputs used internal program national average data where modeler-input locality-specific information was not available. The Texas Department of Transportation and the TNRCC worked in conjunction to develop the Tyler/Longview/Marshall area On-road Mobile section of this emissions inventory. A summary of ozone season emissions for each county is presented below in Table 5-1.

TABLE 5-1
1995 ON-ROAD MOBILE SOURCE EMISSIONS
(tons per ozone season day)

County	VOC	NO_x
Gregg	10.07	10.77
Harrison	7.37	9.87
Rusk	3.93	4.60
Smith	11.42	14.60
Upshur	2.36	3.17

6.0 BIOGENIC EMISSIONS

6.1 INTRODUCTION

The biogenic sources of emissions for the Tyler/Longview/Marshall area were arrived at through the use of the EPA provided PC-Biogenic Emissions Inventory System (PCBEIS2). Results, or outputs, from the model will be indicative of a "typical operating day" in the ozone season, in Texas.

6.2 METHODOLOGY

The approach, or methodology, used to obtain emissions results from the PCBEIS2 model was taken from Publication No. EPA-450/491-017 that accompanied the software to run the model. A data base of information from TNRCC monitoring stations was queried for the ten highest ozone concentration level occurrence days in the last three years. The next step in the procedure was to rank order the ten highest days by the maximum temperature that occurred on the day. The fourth highest temperature day was then selected as the target date for the input into the model. Twenty-four hour surface weather observation data was obtained for a target date for each county in the attainment area. For the selected day some meteorological data for some hours were missing for Gregg and Smith counties. This data was supplied using the hourly data from the next closest station in Shreveport, Louisiana. Also, in the absence of any meteorological data available for Harrison, Rusk and Upshur counties, the data for Smith County was used.

6.3 SUMMARY OF BIOGENIC EMISSIONS

Biogenic sources of emissions in the study area are represented in the Table 6-1 the end of this section.

6.4 REFERENCES

1. **User's Guide to the Personal Computer Version of the Biogenic Emissions Inventory System (PC-BEIS2)**, EPA-450/4-91-017, Pierce, Thomas E. and Baugues, Keith A., U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, July 1991.

TABLE 6-1
PCBEIS2.2 EMISSION RATES CORRECTED FOR MET INPUTS
TONS FOR 24 HOURS

COUNTY	SIMULATION DATE	LAT.	LONG.	TIME ZONE	ISOPRENE TON/DAY	MONOTERP TON/DAY	OVOC TON/DAY	TOTAL VOC TON/DAY	TOTAL NO TON/DAY
GREGG	9/1/93	32.50	94.80	6	37.92	5.39	6.00	49.31	0.40
HARRISON	9/28/94	32.50	94.30	6	99.65	38.71	32.17	170.52	0.83
RUSK	9/28/94	32.10	94.70	6	72.54	28.14	24.42	125.10	1.18
SMITH	9/28/94	32.40	95.30	6	71.59	21.42	20.36	113.36	1.28
UPSHUR	9/28/94	32.70	94.90	6	57.17	22.26	18.34	97.78	0.62

APPENDIX

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July 1996

Quality Assurance Project Plan to Compile an Emissions Inventory of VOC and NO_X Emissions for the Area Served by East Texas Council of Governments

The "**Quality Assurance Project Plan to Compile an Emissions Inventory of VOC and NO_x Emissions for the Area Served by East Texas Council of Governments**" has ben reviewed and approved by the following TNRCC staff.

Charles Rubick

Charlie Rubick, Emission Inventory Coordinator

7-22-96

Date

Jim Thomas, Director Air Quality Planning & Assessment Division

7/22/96

Date

Doyle Pendleton, Director Monitoring Operations Division

7/22/96

Date

QUALITY ASSURANCE PROJECT PLAN FOR OZONE EMISSION INVENTORIES

The requirements of the Emissions Inventory procedures for the East Texas Council of Government (ETCOG) include the development of a Quality Assurance Project Plan (QAPP) plan to provide guidelines and instructions for the QAPP process that will be applied to the new inventory. *This QAPP plan was developed in accordance with the* Environmental Protection Agency's Guidance for the Preparation of Quality Assurance Plans for Ozone/CO SIP Emission Inventories and Quality Assurance Project Plans For Environmental Data Operations.

Program Summary

Briefly, the main components of the QAPP plan will include: defining and scheduling tasks and resources; recognizing constraints on resources; identifying and contacting appropriate sources; checking, validating, and correcting submitted data; recording and coding data into the correct reporting format; and performing audits as necessary to correct errors in the QAPP procedures.

Resource Allocation

In accordance with the Emissions Inventory Requirements for Ozone. As shown in the work plan the Emission Inventory can be prepared for U.T.'s submittal to the East Texas

Council of Governments in a time period of four months. Pollution Solutions will prepare an Emissions Inventory of NOX and VOC to satisfy items 19 through 28 of the East Texas Council of Governments Request for Proposal. Allocation of resources is as follows:

Item 19	Louisiana Sources	2%
Item 20	Minor Sources	30%
Item 21	Area Sources	27%
Item 22	Non-Road Mobile Sources	18%
Item 23	EI Tabulation	4%
Item 24	Alternate Methods of Source ID	2%
Item 25	Emission Estimates	5%
Item 26	Surveys	9%
Item 27	Modeling Compatibility	4%
Item 28	Transport Estimates	2%

Due to the number of inventories that will be processed and the variety of the industries being asked to submit Emission Inventory Questionnaires (EIQs), the entire Emissions Inventory staff will be involved in some way with the QAPP process. In order to coordinate the emissions inventory task Pollution Solutions has organized the section as shown below. The coordinators and their telephone numbers are:

Clayton Smith 512-250-1410

Jerry Demo 512-259-3277

The responsibilities of the coordinators listed above will include auditing the emissions inventory process to ensure that errors in the inventory preparation are detected and corrected and acting as focal points for addressing significant QAPP problems and corrective actions.

Tasks and Assignment or Responsibility

In order to track the progress of EIQs a system has been established whereby one staff member will act as the Receipts Coordinator, tracking the flow of EIQs from the time they are received at Pollution Solutions until the completed EIQs are received for final quality assurance. All activities for each EIQ will be maintained on a data base in order to document the activity flow and to trouble-shoot any bottle-necks or problem areas.

Quality Assurance staff will process all EIQs according to procedures discussed in this report. The Quality Control staff will check each EIQ to ensure it is prepared for entry into the computer. Additionally, quality assurance takes place by the data entry staff after entry of the data into the data base. Following these procedures new printouts reflecting the additions, deletions, and changes in the EIQs are verified. Any subsequent changes will follow the same activity flow as before.

Personnel Training

Proper training of personnel is vital to the maintenance of a data base with quality data. Routine training of the Emissions Inventory staff is an ongoing procedure. Therefore the training program for our experienced personnel is a review of the following information. Training personnel in the processing of inventories involves three major factions: obtaining background information regarding the industries that receive EIQs, training on specifics of the emission factors and emission estimating techniques for each source type, and instruction on QAPP procedures of the inventories. Training personnel on the background information consists of discussions with experienced staff, use of reading material, and exposure to the information maintained in the Inventory. Once the background knowledge is mastered more specific training is required in areas such as the processes associated with these industries, materials used and produced, and the various methods of calculating emissions. Information on emission points and abatement equipment criteria will also be covered during training.

The second portion of training is more extensive due to the complexity of the Inventory This training consists of supplying personnel with data from sources and requiring review and emission estimation based upon process information. Identification of required data, ranges for industry types, and restrictions on data use are also included in this training.

The third part of training emphasizes quality assurance procedures such as computation methods, error detection, contacting companies for data, and preparing questionnaires.

Instruction on computation methods is accomplished by personnel reviewing documents such as AP-42 and the Post-1987 Emission Inventory Procedures. Other sources include computer programs, TNRCC procedures, and various EPA manuals. The skills needed for error detection are developed mainly through experience with the actual questionnaires submitted by companies. An extensive amount of time is spent reviewing these questionnaires with personnel being encouraged to ask questions. This "on-the-job- training" is likewise used to educate staff on proper methods for contacting companies, and periodic meetings are held with emissions inventory and data entry staff to coordinate training of preparation of data. These discussions include a wide range of topics from the definitions of required data entry codes to the legibility of the questionnaires.

Schedule and Project Planning

Meetings were held to discuss resources and procedures for the new inventory. Resource requirements discussed included the number of personnel (for both QAPP and data entry) that would be required to process EIQs. Closely associated with this was the need to determine the approximate time required for the project. Also discussed were the new EPA requirements for inventories which affect data collection as well as data entry. A strategy has been developed for inventorying minor sources, area sources, off-road mobile sources.

The following scheduled activities are listed in order of occurrence. Asterisks indicate potential logical check points for problem detection:

Establish resource allocation

Schedule events

* Identify emissions sources

* Check emission estimation methods

* Perform calculations on emissions

* Validate data

* Record and code data

Perform audits

Company Contacts

In order to instruct the companies on the purpose and extent of the inventory a mailout briefly introducing and discussing the need for a minor source inventory will be mailed to potential minor source companies. Immediately following this initial mailing a questionnaire requesting process information and/or emissions of NOX and VOC will be mailed to the same companies.

Identification of Emission Sources

The procedure for creating a final mailing list for the inventory consisted of collecting information from the TNRCC and private organizations. The TNRCC was contacted to

obtain addresses and contact persons for minor sources. Data from the TNRCC, East Texas Council of Governments and demographic information from a Dun and Bradstreet publication and a manufacturers guide will be used to complete the mailing list.

The Questionnaire

Pollution Solutions believes the questionnaire format supplemented by regional manufacturing data to be the most efficient means of collecting emissions information from minor individual sources. The questionnaire to be used for this inventory will incorporate process information, use of VOC containing products and fuel consumption. It will accommodate EPA requirements, to provide more data to QAPP emissions calculations, and to facilitate evaluation of possible control strategy techniques. All forms will be organized to provide a format that would expedite data collection and data use.

The questionnaire is just one part of the data collection procedure. Information from sources such as off road mobile and area sources will be obtained from other government agencies, census information and on site data collection .

Data Quality

The QAPP staff will thoroughly review all data submitted by companies on the EIQs. Emissions data, however, is of primary concern. QAPP of emissions data is accomplished by reviewing the data submitted . Material use pages should include the information required to calculate emission rates.

Quality assurance of inventory data once it has been entered into the Inventory is also performed by staff other than Pollution Solutions. All participants in this study who have reason and opportunity to use the data base can notify Pollution solutions of any errors and changes they find while pursuing their own tasks. Input from UT staff and ETCOG staff is anticipated.

Emission Estimation Methods

Companies sent questionnaires are provided with options as to the response They may respond with material usage, fuel consumption, products produced and industry specific information. If the company does not respond, Pollution Solutions will estimate their emissions based upon their knowledge and experience of similar facilities and processes.

Calculations

Due to the number of EIQs involved in this inventory the QAPP staff may not have time to assess all information submitted by the companies. Therefore, randomized checks will be conducted to ensure data quality. The EIQ will include requests for sources to submit material usage data, unit production, fuel consumption , products produced and number of employees. Pollution Solutions is requesting information to check the submitted information and to ensure consistency of units and unit conversions as well as the proper use of emission factors. Emission estimates will be cross-checked for similar facilities based on production. Any process data having obvious or suspicious information will be checked against typical information submitted for that type of industry. Inventory staff

experienced in emissions calculations will conduct meetings with all personnel and TNRCC staff concerning methods for determining emission rates. These methods include the use of AP-42 and other approved means of calculating emission rates for all types of facilities. These as well as other topics of discussion were important in ensuring consistency in all inventory procedures. To ensure consistency in documenting data, all the QAPP staff will use established procedures for checking emissions calculations. This may include the use of notebooks and/or worksheets as necessary to make sure all are using the same methods and calculations. Each staff member will have access to a PC for use in standardizing QAPP procedures. Following the QAPP review procedures each EIQ is double-checked by another member of the QAPP staff. This will ensure consistency with the QAPP procedures and will help prevent typographical errors such as the transposition of numbers. Site investigation of a randomized set of companies and telephone calls to a randomized set of companies will be made to directly validate data.

Validation Procedures

Checks for data consistency will be accomplished by use of computer systems as well as by manual procedures. Pollution solutions will assess whether emission estimates fall within acceptable ranges and to screen out nonreactive VOCs. The QAPP and tracking procedures will also promote consistency and prevent omission of data. Adequate training to ensure consistency among the QAPP staff is important. Checklists may be used during the QAPP process and quality control screening will document incorrect and

missing data and reroute EIQs for corrections. To ensure that double counting of sources does not occur in the inventory, efforts will be taken to separate minor sources included in the point source inventory from area sources in the same categories by subtracting those point source emissions from the area source emissions where appropriate.

Data Coding and Recording

All inventory data submitted will be entered into a spreadsheet. This helps ensure the data will be consistently submitted and stored correctly. A routine part of the QAPP process is an initial check of all inventories for completeness of data. If data are found to be omitted or wrongly submitted, the company will be contacted for corrections. All data must be complete and accurate before it will be entered into the Inventory.

Data Tracking

Tracking data will be the responsibility of all staff handling EIQs. The receipt verification will use a database and forms with dates and initials to indicate where a particular EIQ is located at any given time. As additions and changes to EIQs are submitted they will be included with the original documents. All the staff, however, will be responsible for the EIQs they are processing.

Correcting/Missing Data

When erroneous or missing data is discovered the QAPP coordinator must decide if the significance of the data warrants expending the time to obtain corrections. When the determination has been made that the data is necessary a telephone call to the company representative is the most expeditious method of clarifying problems. The QAPP staff also have the option of correcting data without contacting the companies. This method is implemented if the changes are insignificant or if the data required to document the calculations are unavailable from the companies. Where no information is available, estimates will be made based on industry type, number of employees, production, or best information available. Applicable data checks will be implemented to ensure data is consistent and complete before being entered into the Inventory. Due to the mechanics of the EIQ ensuring that all required data fields are complete and is similarly reported and entered is a major aspect of the QAPP process. One of the essential methods for accomplishing this is the establishment of communications among the QAPP staff to ensure the same methodology is being used. Issues concerning reasonableness of data are likewise communicated among the staff. Proofing data will be accomplished by individuals checking one anothers work.

Audit Responsibility and Schedules

Internal type audits will occur when problems arise that indicate the QAPP process is not functioning as efficiently as it should or when new ideas or procedures are discovered that will streamline the process. The Receipt Coordinator and the Quality Control Staff will make determinations for changes that need making to the QAPP procedures. Audits

will be documented and results will be recorded. Pollution Solutions will welcome an external audit of its QAPP plan to be performed by the TNRCC.

Area Sources

Since the questionnaire is not a method used to develop an area source inventory, similar QAPP procedures cannot be implemented for collecting area source emissions. Emissions data for area sources are collected from a variety of sources. Area sources are generally calculated using approved EPA procedures and categories. Sources of data include gasoline sales figures, the port authorities, and federal and state government agencies. QAPP procedures are based mainly upon reliance on the sources of area emissions data. As new sources are located determinations are made as to their reliability.

Conclusion

In order to ensure the emissions inventory meets developed specifications for completeness, consistency, reasonableness of emissions values, and overall documentation requirements, the checklist approach as recommended in EPA's Quality Review Guidelines for 1990 Base Year Emission Inventories will be implemented.

Policy Statement

The objective of this emissions inventory is to compile an accurate and comprehensive inventory of emissions and facility data from point, area, and off-road mobile sources for the base year (1995) per ETCOG request for proposal. The inventory will be developed for volatile organic compounds (VOC), oxides of nitrogen (NOX).

To ensure that the inventory is of the highest quality, Pollution Solutions will implement certain quality assurance (QAPP) procedures at various points in the inventory process. Resources, including trained QAPP personnel, have been allocated for this purpose. This company will follow the procedures outlined in the EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QAPP/R-5) July 1993.

This document identifies four elements to be addressed. The are:

PROJECT MANAGEMENT

MEASUREMENT/DATA ACQUISITION

ASSESSMENT/OVERSIGHT

DATA VALIDATION AND USABILITY

The above document covers all of these elements to the extent that they apply. The emission inventory project has a well defined set of objectives listed on page 2 of this document and clear definition of the responsibility of Pollution Solutions to deliver information required to satisfy each objective. Measurement is not a part of estimating

emissions. This portion does not apply. Activites for assessment are outlined and defined in pages 6 through 12. The validation of data is discussed in pages 9 and 10.

Please review this document with the above four objectives in mind. Suggestions or questions should be addressed to either Clayton Smith at 250-1410 or Jerry Demo at 259-3277.

ADDENDUM

In response to Pollution Solutions letter of agreement dated July 22, 1996, the following additional information is offered. As discussed in the meeting of 7/22/96 an emission inventory will be prepared per the East Texas Council of Government proposal. This will include tabulation of all sources and quantification of Minor sources, Area Sources, and Non Road Mobile Sources. Quality assurance in the case of Area Sources and Non Road Mobile Sources will be the application of best engineering judgement to a limited data set supplied by other government agencies. In the case of the minor sources a questionnaire (draft copy attached) will be mailed to a list of potential sources. The list of sources will be developed by merging and sorting lists supplied by the TNRCC Emission Inventory(E.I.) section, TNRCC Fee Section, and State of Texas Comptroller. Supplemental information will also be sought from the Railroad Commission for natural gas processing and crude oil production.

The development of the inventory for Minor sources, Area Sources, and Non Road Mobile Sources is to supplement an inventory that currently only includes 100 tpy and larger sources. The purpose of this effort is to identify as many sources as possible and make an initial estimate of their size. If the responses from the questionnaire or field work indicate that a source or industry type previously uninventoried or underinventoried is a major contributor of VOC or NOX emissions, then it may be

appropriate to spend more resources in a follow up effort to refine this initial inventory. A simple, easy to respond to, questionnaire was assembled to try to influence the number of industry responses. Based on the information from this questionnaire an estimate of emissions will be prepared. The quality of the estimates depends upon the number and quality of response. It is initially hoped that 80% or more of those industries mailed a questionnaire will respond. Estimates of emissions will still be prepared for the nonrespondents, but this would be limited to a secondary indicator such as number of employees. Lower responses will yield lower quality estimates, but the primary goal may still be achieved, which is to identify which sources or types of industry are significant contributors of VOC and NOX. Even though there are specific measures that can be made such as % return of questionnaires, correlation of material usage to amount of product produced, and correlation of material usage to number of employees, the only real determinant of quality resides in best engineering judgement. During the course of this effort we will develop a rating criteria for the emission estimates(engineering judgement) that will be made based on the information that was received and group(s) of emission sources. This rating criteria will be developed in coordination with the TNRCC E.I. Section and incorporated into the final report.

The computer platform utilized to store data gathered in this inventory will be an IBM PC or equivalent. Spreadsheet programs utilizing Quattro Pro or equivalent will be utilized for data storage and emission estimation. Cross checking of emission estimates will be 50% or higher.

Random audits of questionnaire responses will be done for 5% of the returned questionnaires. This will be accomplished through telephone calls and for selected companies a visit to the facility. Pollution Solutions staff consists of a small but very experienced group. Principals involved in completing this task are Jerry Demo and Clayton Smith.