Eastern Research Group, Inc.

Development of Texas Statewide 2014 AERR Inventory and Trends Data for NONROAD Model Category Mobile Sources

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Prepared for:

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Prepared by:

Eastern Research Group, Inc.

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DEVELOPMENT OF TEXAS STATEWIDE 2014 AERR INVENTORY AND TRENDS DATA FOR NONROAD MODEL CATEGORY MOBILE SOURCES

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Table of Contents

List of Tables

List of Figures

List of Acronyms

Acronym	Definition
AACOG	Alamo Area Council of Governments
AERR	Air Emissions Reporting Rule
ATVs	All-Terrain Vehicles
BPA	Beaumont-Port Arthur
CAPs	Criteria Air Pollutants
CDB	County Database
CNG	Compressed Natural Gas
DCE	Diesel Construction Equipment
DFW	Dallas Fort Worth
EDA	Equipment Data Associates
EIS	Emissions Inventory System
ELP	El Paso
EPA	Environmental Protection Agency
HAPs	Hazardous Air Pollutants
HARC	Houston Advanced Research Center
HGB	Houston-Galveston-Brazoria
HP	Horsepower
LPG	Liquid Petroleum Gas
MOVES	Mobile Vehicle Emissions Simulator
MTBE	Methyl Tertiary Butyl Ether
NCD	National County Database
NCDC	National Climatic Data Center
NEI	National Emissions Inventory
NMHC	Non-Methane Hydrocarbons
NMIM	National Mobile Inventory Model
NOAA	National Oceanic and Atmospheric Administration
NOX	Nitrogen Oxides
OSD	Ozone Season Day
PRI	Primary
REMI	Regional Economic Models, Inc.
RFG	Reformulated Gasoline
RTFs	Rough-Terrain Forklifts
SAS	Statistical Analysis Software
SCC	Source Classification Code
SIP	State Implementation Plan
TCEQ	Texas Commission on Environmental Quality
TWCs	Two-Way Catalysts
USA	United States of America

Acronym	Definition
VOC	Volatile Organic Compounds
XML	Extensible Markup Language

1.0 Introduction

In December 2008, the EPA promulgated the Air Emissions Reporting Requirements (AERR). For mobile sources, the AERR requires that model inputs be provided for mobile sources, rather than the actual emissions.[1] In addition to activity data, state agencies may also submit emissions inventories for criteria pollutants, and optionally hazardous air pollutants (HAPs), using the EPA's Emissions Inventory System (EIS). The data provided to EPA under the AERR is used to develop the National Emissions Inventory (NEI), which is used by EPA in support of evaluating National Ambient Air Quality Standards (NAAQS), assessing interstate transport of air pollutants, air toxics programs, and for international reporting.[2] In accordance with the AERR, and in support of the NEI development, the Texas Commission on Environmental Quality develops and submits periodic emissions inventories every three years for annual (tons per year) and average summer weekday (tons per day) emissions. This report focuses on the development for the AERR activity data and emissions inventory submission for the NONROAD model category mobile sources. The AERR submission includes annual and summer weekday emissions and activity data for criteria air pollutants (CAPs) and CAP precursors as well as hazardous air pollutants (HAPs) for nonroad mobile categories included within the Texas Nonroad (TexN) model.

The TexN model is a tool for developing emissions estimates for nonroad mobile sources in Texas for the mobile source categories under the United States Environmental Protection Agency's (EPA) NONROAD model. The model allows TCEQ staff to replace EPA default data with local bottom-up data. Currently, the TexN model is used by TCEQ staff, local air quality planning agencies, and other nonroad mobile stakeholders in order to facilitate the use of locally developed activity and population data for nonroad mobile sources, and to standardize the emissions estimation methodologies among the different submitting agencies in Texas. The TCEQ supplies all interested parties with the latest model, which reflects TCEQ updates to specific data, and coordinates the integration of all local changes. The emissions estimates developed using this integrated model are used for state implementation plan modeling efforts, the EPA's reporting requirements, trends analyses, and air quality modeling purposes.

Using the Texas NONROAD (TexN) model version 1.7.1, which incorporates all of the latest available data updates, ERG developed both annual and average summer weekday emissions for CAPs and HAPs for the year 2014. Furthermore, the activity data within TexN was used as the basis for the required activity data submittal for the AERR, which conforms to the National Mobile Inventory Model (NMIM) National County Database

[1] "FACT SHEET – Revisions to the Air Emissions Reporting Requirements: Revisions to Lead (Pb) Reporting Threshold and Clarifications to Technical Reporting Details," U.S. EPA, http://www.epa.gov/ttn/chief/aerr/revisions_fact_sheet_final_ruleV2.pdf

[2] "2014 NEI Plan," U.S. EPA, http://www.epa.gov/ttn/chief/net/2014nei_files/2014_nei_plan.pdf

(NCD) format. According to the "Instructions for Submitting NONROAD Inputs for the 2014 NEI,"[3] EPA plans to use the most current version of the Motor Vehicle Emission Simulator (MOVES) model to estimate nonroad emissions. However, EPA recognizes that the recent release of the newest version of the MOVES model, which is capable of nonroad emissions estimation, is not expected to be widely used in time for most agencies to be familiar with its use for nonroad emission estimation. Therefore, EPA is accepting NMIM NCD inputs for nonroad for the 2014 NEI.

This report presents the summaries of the emissions modeling results and discusses how the emissions and activity data were developed for the AERR submittal.

Appendix A provides a very brief summary from where each of the critical TexN model inputs were derived from. Please note that TCEQ has a number of reports that have been generated over the evolution of the TexN model that go into greater detail about the development of each of the model inputs and subsequent data updates.

In addition to the 2014 AERR submittal, ERG has also developed emissions trend inventories for both controlled and uncontrolled typical summer weekday emissions for the years 2008 through 2040 for TexN model categories.

[3] http://www.epa.gov/ttn/chief/net/2014nei_files/Instructions%20for%20Nonroad%20Inputs%20to%20the%202014%20NEI_20150528.pdf

2.0 TexN Updates

Three key updates were made to TexN under this work order prior to executing the model to produce the 2014 emissions estimates. Once these updates were completed, ERG compiled a new installation package for TexN version 1.7.1, which was used for the completion of the AERR emissions inventory and activity data submission. Several other updates have been completed under separate work orders, which are also included in this version of TexN.

2.1 Fuel Data

In order to maintain a high confidence level in the fuel parameters used in the development of emission inventories, trend analysis and control strategy analysis, the TCEQ has undertaken a program to periodically collect and analyze fuel samples. The data ensures the accuracy of local specific fuel information and also provides the best data available to be used in analyses to support Texas State Implementation Plan (SIP) and control strategy development. The latest fuel sampling data, conducted in the summer of 2014[4], was incorporated into TexN for this modeling effort.

2.2 Meteorological Data

Per instructions from the TCEQ project manager, ERG updated the meteorological data for 2014 using meteorological data workups provided by TCEQ. Prior to this update, the meteorological data within TexN included data up to May 2014. In order to have a complete year of data for 2014, and also to maintain consistency with other emission inventory development efforts (e.g., onroad mobile), ERG updated the TexN meteorological data for 2014 using files developed by TCEQ and downloaded from their ftp site (ftp://amdaftp.tceq.texas.gov/pub/Mobile_EI/Statewide/mvs/2014/). Four files were downloaded from this site, each containing TexN-ready data work-ups:

- mvs-tex-25-txdot-districts-2014-temp-rhum-bprs-fall.zip
- mvs-tex-25-txdot-districts-2014-temp-rhum-bprs-spring.zip
- mvs-tex-25-txdot-districts-2014-temp-rhum-bprs-summer.zip
- mvs-tex-25-txdot-districts-2014-temp-rhum-bprs-winter.zip

2.3 Update Reporting Utility for Mercury Emissions

The EPA consolidated the emissions outputs for mercury, requiring a single output for mercury emissions instead of the three previously allowed. Prior to this update, and in accordance with the way NMIM operates, the TexN model produced emissions for elemental gaseous mercury, gaseous divalent mercury, and particulate divalent mercury

[4] Eastern Research Group, 2014 Summer Fuel Field Study (Revised), prepared for Texas Commission on Environmental Health (TCEQ), Revised January 2015.

as three distinct outputs. The AERR requires that the emissions for these three pollutants be combined and reported only as mercury, having the pollutant code of 7439976. Based on this requirement, ERG updated the TexN reporting utility to combine the emission factors for the three discrete mercury pollutants to produce a single emissions output for mercury.

2.4 Other Updates

A few other studies have been incorporated into TexN since the last NEI submissions, most notably, work done for the Capital Area Council of Governments, which is described here.

2.4.1 Heavy-Highway Emission Inventory Update[5]

This study developed site-specific emission inventory estimates for heavy-highway construction projects performed in the 5-county Austin-Round Rock-San Marcos Metropolitan Statistical Area (MSA) during 2006 and 2008. These counties include Bastrop, Caldwell, Hays, Travis, and Williamson. ERG obtained historical highway project information from Daily Work Reports obtained from the Texas Department of Transportation (TxDOT) and used this information to develop equipment use profiles for diesel construction equipment having greater than 25 horsepower used in heavy-highway construction. Profiles were created for five project types: bridgework, new/rebuild, repair/resurface, turn lane addition, and miscellaneous.

This same methodology was used to develop profiles for 2012[6] and 2018.[7]

2.4.2 Construction Equipment Update[8]

Under this work order, Diesel Construction Equipment (DCE) profiles for population and activity were updated for some key DCE subsectors in TexN for the Capital Area Council of Governments (CAPCOG) region. These subsectors included: commercial construction, residential construction, utility construction, city and county road construction, Texas Department of Transportation-owned equipment, and cranes. The counties included in the update were: Bastrop, Caldwell, Hays, Travis, Williamson, Blanco, Burnet, Fayette, Lee, Llano, and Milam.

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[5] "Heavy-Highway Emission Inventory Update." Prepared for Capital Area Council of Governments by ERG. April 9, 2013.
[6] "Heavy-Highway Emission Inventory Update - 2012." Prepared for Capital Area Council of Governments by ERG. May 31, 2013.
[7] "Heavy-Highway Emission Inventory Update - 2018." Prepared for Capital Area Council of Governments by ERG. December 13, 2013.
[8] "Construction Equipment Update." Prepared for Capital Area Council of Governments by ERG. December 30, 2014.

3.0 Emission Inventory Development

Having completed the required TexN model updates, the TexN version 1.7.1 was used to create the CAPs and HAPs annual and typical summer weekday emissions estimates for the 2014 AERR for all counties within Texas and for all sources included within the TexN model.

3.1 Inventory Development

In order to expedite processing times and to control file sizes, the state was subdivided into several county groupings, each requiring its own TexN run. For each county grouping, the model was executed twice: once to estimate annual emissions and another to estimate typical summer weekday emissions. Each model run created an output file which was then imported into the TexN reporting utility. Then, using the NIF3.0 and XML export feature of the reporting utility, each run was exported, automatically creating properly formatted NIF3.0 and XML files for each data set.

For the XML reporting required by the Emissions Inventory System (EIS), all time periods (annual and OSD) and pollutants for a given county must be included in a single file for submission. While the XML files created by TexN included both CAPs and HAPs, it resulted in a separate XML file for each time period. In order to facilitate the accurate and timely combining of multiple XML files, ERG used the MS Access application built by ERG for TCEQ for the 2008 NEI. The name of the application is *XMLCombiner.app* and has been provided to TCEQ again along with this report.

To use the XML combiner application, the XML files being combined must be in the same directory. Once the XML file combiner application is installed, all that is required of the user is to browse to the directory where the XML files you wish to combine are located and select one of the XML files. Next, simply click the Combine button. The application combines the multiple XML files, creating a new file in that same directory. Each combined XML file represents all time periods and all pollutants for one set of counties. Once the combined XML files for each county group were created, they were submitted by TCEQ up to the EPA EIS QA environment and passed the initial quality assurance checks, generating only some warnings for out-of-range emissions, which has been typical for past TCEQ submissions.

While the XML files were successfully submitted to and passed the EPA's EIS XML submission QA, these same files were apparently too large for successful submission to TCEQ's legacy data repository, TexAER. In order to overcome this challenge, the XML files were imported into EPA's MS Access© bridge tool, subdivided into even smaller county groupings using queries executed against the emissions table, then exported to a new, smaller XML file.

3.2 Emissions Estimates

Tables 3-1 through 3-15 present the summaries of the emissions for the 2014 AERR.

Table 3-1. 2014 OSD Criteria Emissions by Equipment Classification (Tons/Day)

Classification	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Agricultural Equipment	21.54	187.38	192.89	17.19	16.67	0.18	0.49
Commercial Equipment	25.50	22.47	645.26	2.22	2.12	0.06	0.57
Construction and Mining Equipment	21.54	121.69	177.01	13.19	12.76	0.09	0.08
Industrial Equipment	7.37	38.67	157.72	1.76	1.72	0.10	0.96
Lawn and Garden Equipment (Com)	19.45	4.00	176.21	2.35	2.17	0.01	0.02
Lawn and Garden Equipment (Res)	27.90	3.63	399.27	0.85	0.78	0.03	0.03
Logging Equipment	1.10	0.86	9.26	0.19	0.18	0.00	0.00
Pleasure Craft	44.36	6.93	132.94	0.56	0.51	0.02	0.01
Railroad Equipment	0.12	0.75	0.55	0.09	0.09	0.00	0.00
Recreational Equipment	65.65	2.53	239.49	2.01	1.85	0.02	0.02
Grand Total	**234.56**	**388.92**	**2,130.59**	**40.40**	**38.85**	**0.52**	**2.18**

Table 3-2. 2014 Annual Criteria Emissions by Equipment Classification (Tons/Year)

Classification	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Agricultural Equipment	5,062	48,014	44,895	4,070	3,947	61	100
Commercial Equipment	8,376	7,409	220,811	699	668	21	179
Construction and Mining Equipment	5,947	35,649	50,829	3,604	3,487	41	22
Industrial Equipment	2,163	12,349	45,103	570	556	32	277
Lawn and Garden Equipment (Com)	5,677	1,063	51,635	678	627	4	5
Lawn and Garden Equipment (Res)	9,985	1,319	158,643	331	304	10	10
Logging Equipment	353	296	3,234	62	58	1	0
Pleasure Craft	18,385	3,180	68,867	271	250	10	6
Railroad Equipment	36	219	160	26	25	0	0
Recreational Equipment	21,516	807	85,541	662	610	7	7
Grand Total	**77,500**	**110,305**	**729,718**	**10,973**	**10,531**	**188**	**608**

Table 3-3. 2014 OSD Criteria Emissions by Selected Area (Tons/Day)

Group	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Alamo Area Council of Governments	20.27	20.69	159.99	2.54	2.43	0.03	0.11
Beaumont-Port Arthur Area	2.18	3.22	27.83	0.42	0.41	0.01	0.03
Capital Area Planning Council	15.50	21.65	134.19	2.38	2.28	0.03	0.12
Corpus Christi Area	6.29	6.18	42.06	0.70	0.67	0.01	0.04
Dallas–Fort Worth Area (10-county)	36.96	58.19	497.36	5.98	5.73	0.09	0.52
East Texas Council of Governments	4.28	8.31	43.64	0.83	0.80	0.01	0.05
El Paso	2.81	5.83	42.90	0.55	0.53	0.01	0.05
Houston-Galveston-Brazoria Area	33.27	45.67	413.88	4.69	4.50	0.08	0.48
Victoria	0.75	1.51	8.05	0.17	0.16	0.00	0.01
Grand Total	**121.58**	**169.64**	**1,364.68**	**18.10**	**17.35**	**0.27**	**1.40**

Table 3-4. 2014 Annual Criteria Emissions by Selected Area (Tons/Year)

Group	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Alamo Area Council of Governments	6,450	5,889	53,589	698	667	11	33
Beaumont-Port Arthur Area	682	948	9,217	117	112	2	9
Capital Area Planning Council	4,926	6,095	44,739	650	622	12	34
Corpus Christi Area	2,159	1,769	14,830	193	185	3	10
Dallas–Fort Worth Area (10-county)	11,675	17,465	163,532	1,699	1,626	33	154
East Texas Council of Governments	1,371	2,394	14,635	225	216	4	13
El Paso	897	1,633	14,313	150	145	3	14
Houston-Galveston-Brazoria Area	12,979	15,055	158,922	1,507	1,441	31	144
Victoria	231	418	2,598	44	43	1	2
Grand Total	**41,126**	**51,226**	**474,602**	**5,243**	**5,017**	**99**	**412**

Table 3-5. 2014 OSD Criteria Emissions by County (Tons/Day)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Anderson	0.482	1.027	3.905	0.115	0.110	0.001	0.002
Andrews	0.099	0.463	1.172	0.046	0.044	0.000	0.001
Angelina	1.252	0.920	8.701	0.113	0.108	0.002	0.008
Aransas	2.791	0.455	10.019	0.077	0.072	0.001	0.001
Archer	0.229	1.089	1.976	0.104	0.100	0.001	0.003
Armstrong	0.103	0.787	0.964	0.074	0.072	0.001	0.002
Atascosa	0.439	1.148	3.419	0.114	0.109	0.001	0.003
Austin	0.454	1.225	3.666	0.137	0.133	0.001	0.004
Bailey	0.159	1.089	1.688	0.099	0.096	0.001	0.004
Bandera	1.837	0.265	6.543	0.078	0.072	0.001	0.001
Bastrop	0.331	1.366	4.028	0.143	0.138	0.001	0.003
Baylor	0.329	1.136	2.396	0.104	0.100	0.001	0.004
Bee	0.196	1.124	2.158	0.114	0.110	0.001	0.003
Bell	2.509	3.384	19.045	0.366	0.351	0.005	0.018
Bexar	8.358	9.149	95.286	1.123	1.074	0.015	0.072
Blanco	0.256	0.325	1.317	0.039	0.037	0.000	0.001
Borden	0.073	0.333	0.399	0.032	0.031	0.000	0.000
Bosque	0.812	1.261	3.912	0.131	0.126	0.001	0.002
Bowie	1.026	1.452	8.749	0.157	0.151	0.003	0.008
Brazoria	2.269	2.851	19.303	0.303	0.290	0.004	0.020
Brazos	1.107	1.435	11.042	0.182	0.174	0.002	0.008
Brewster	0.248	0.275	1.365	0.034	0.032	0.000	0.000
Briscoe	0.118	0.758	1.020	0.072	0.070	0.001	0.002
Brooks	0.661	0.380	2.439	0.072	0.069	0.000	0.000
Brown	0.772	1.909	5.389	0.203	0.196	0.002	0.006
Burleson	0.548	0.997	3.198	0.106	0.103	0.001	0.003
Burnet	2.519	0.791	10.128	0.142	0.134	0.002	0.003
Caldwell	0.557	0.806	3.288	0.091	0.087	0.001	0.002
Calhoun	3.280	1.188	11.934	0.117	0.111	0.002	0.007
Callahan	0.349	0.892	2.247	0.092	0.088	0.001	0.002
Cameron	6.278	3.168	34.787	0.423	0.402	0.004	0.025
Camp	0.580	0.314	2.412	0.044	0.042	0.001	0.001
Carson	0.169	1.194	1.754	0.108	0.104	0.001	0.005
Cass	0.587	0.696	3.703	0.078	0.075	0.001	0.002

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Castro	0.280	2.170	2.912	0.190	0.184	0.002	0.010
Chambers	0.737	0.626	3.899	0.058	0.056	0.001	0.005
Cherokee	0.344	1.141	3.845	0.120	0.115	0.002	0.005
Childress	0.104	0.633	1.136	0.061	0.059	0.001	0.002
Clay	0.326	1.046	1.982	0.100	0.097	0.001	0.002
Cochran	0.119	0.987	1.081	0.088	0.085	0.001	0.003
Coke	0.115	0.282	0.789	0.027	0.026	0.000	0.000
Coleman	0.363	0.948	2.273	0.099	0.095	0.001	0.002
Collin	4.548	7.185	54.020	0.787	0.752	0.010	0.041
Collingsworth	0.122	0.914	1.186	0.086	0.083	0.001	0.002
Colorado	0.667	1.667	4.273	0.170	0.164	0.002	0.005
Comal	2.894	1.979	14.985	0.257	0.244	0.003	0.008
Comanche	0.252	1.149	2.323	0.112	0.109	0.001	0.002
Concho	0.286	0.691	1.501	0.070	0.067	0.001	0.002
Cooke	1.134	1.815	6.580	0.181	0.174	0.002	0.007
Coryell	0.274	1.264	3.047	0.127	0.122	0.001	0.003
Cottle	0.067	0.480	0.624	0.048	0.047	0.000	0.001
Crane	0.022	0.076	0.217	0.010	0.010	0.000	0.000
Crockett	0.259	0.388	1.299	0.047	0.045	0.000	0.001
Crosby	0.180	1.319	1.523	0.113	0.110	0.001	0.002
Culberson	0.035	0.233	0.303	0.024	0.024	0.000	0.000
Dallam	0.344	2.502	3.519	0.230	0.223	0.003	0.011
Dallas	15.517	22.471	234.870	2.349	2.247	0.041	0.256
Dawson	0.217	1.676	2.103	0.144	0.139	0.001	0.003
DeWitt	0.206	1.204	2.295	0.122	0.118	0.001	0.003
Deaf Smith	0.204	1.209	2.281	0.117	0.114	0.001	0.003
Delta	0.550	2.198	3.430	0.191	0.185	0.003	0.007
Denton	3.285	4.560	36.479	0.465	0.446	0.007	0.030
Dickens	0.063	0.434	0.539	0.045	0.043	0.000	0.001
Dimmit	0.460	0.308	1.883	0.043	0.041	0.000	0.000
Donley	0.283	0.489	1.386	0.055	0.053	0.000	0.001
Duval	0.092	0.479	0.946	0.049	0.047	0.000	0.001
Eastland	0.409	1.144	3.139	0.117	0.113	0.001	0.002
Ector	0.774	1.087	11.768	0.119	0.114	0.002	0.011
Edwards	0.039	0.258	0.353	0.028	0.027	0.000	0.000
El Paso	2.815	5.834	42.897	0.546	0.525	0.007	0.048
Ellis	1.188	2.457	12.414	0.219	0.211	0.004	0.021
Erath	0.308	1.559	3.720	0.156	0.151	0.001	0.004
Falls	0.242	1.719	2.544	0.159	0.155	0.002	0.007
Fannin	0.328	1.857	3.478	0.179	0.173	0.002	0.005
Fayette	1.076	1.602	5.652	0.173	0.167	0.002	0.004
Fisher	0.111	0.839	0.967	0.077	0.074	0.001	0.001
Floyd	0.248	1.901	2.543	0.165	0.160	0.002	0.007
Foard	0.109	0.697	1.184	0.065	0.063	0.001	0.003
Fort Bend	1.815	3.623	25.519	0.398	0.382	0.005	0.026
Franklin	0.139	0.462	1.089	0.047	0.045	0.001	0.001
Freestone	0.350	2.099	2.508	0.174	0.169	0.002	0.002
Frio	0.305	0.651	1.995	0.069	0.067	0.001	0.003
Gaines	0.314	2.520	2.934	0.218	0.212	0.002	0.006
Galveston	2.601	2.104	17.896	0.225	0.215	0.003	0.012
Garza	0.107	0.515	0.729	0.050	0.049	0.000	0.001
Gillespie	0.380	0.711	2.964	0.080	0.077	0.001	0.002
Glasscock	0.082	0.670	0.681	0.061	0.059	0.001	0.001

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Goliad	0.145	0.707	1.225	0.074	0.071	0.000	0.001
Gonzales	0.391	1.168	2.974	0.128	0.123	0.001	0.003
Gray	0.217	1.042	2.720	0.098	0.095	0.001	0.005
Grayson	2.953	2.590	16.347	0.279	0.267	0.005	0.014
Gregg	0.651	1.094	11.523	0.120	0.115	0.002	0.016
Grimes	0.451	1.133	3.223	0.123	0.119	0.001	0.004
Guadalupe	1.108	1.746	9.405	0.197	0.189	0.002	0.011
Hale	0.399	2.486	4.548	0.218	0.211	0.003	0.011
Hall	0.098	0.682	0.899	0.066	0.064	0.001	0.001
Hamilton	0.148	1.015	1.580	0.099	0.096	0.001	0.002
Hansford	0.217	1.351	2.357	0.121	0.117	0.001	0.006
Hardeman	0.297	0.669	1.673	0.066	0.064	0.001	0.002
Hardin	0.306	0.702	3.412	0.100	0.097	0.001	0.002
Harris	21.925	32.252	312.725	3.194	3.063	0.059	0.393
Harrison	1.096	2.481	7.070	0.214	0.207	0.003	0.006
Hartley	0.253	2.034	2.508	0.180	0.175	0.002	0.009
Haskell	0.281	1.570	2.609	0.139	0.134	0.002	0.006
Hays	1.045	1.154	8.255	0.143	0.137	0.002	0.006
Hemphill	0.092	0.557	0.888	0.057	0.055	0.000	0.001
Henderson	2.328	1.556	11.622	0.192	0.183	0.003	0.005
Hidalgo	6.743	4.621	46.255	0.621	0.592	0.006	0.033
Hill	1.265	2.347	6.778	0.238	0.229	0.003	0.009
Hockley	0.258	1.686	2.653	0.150	0.145	0.001	0.004
Hood	0.419	1.032	3.663	0.092	0.089	0.001	0.002
Hopkins	0.390	2.497	3.980	0.211	0.204	0.003	0.004
Houston	0.411	1.135	2.910	0.122	0.118	0.001	0.002
Howard	0.393	0.876	2.964	0.089	0.085	0.001	0.003
Hudspeth	0.253	0.526	1.109	0.054	0.052	0.000	0.001
Hunt	1.033	1.831	7.535	0.190	0.183	0.003	0.006
Hutchinson	0.224	0.948	2.441	0.091	0.088	0.001	0.005
Irion	0.030	0.183	0.292	0.020	0.019	0.000	0.000
Jack	0.172	0.766	1.329	0.073	0.071	0.001	0.001
Jackson	0.534	1.463	3.504	0.142	0.138	0.002	0.009
Jasper	0.301	0.442	3.290	0.053	0.051	0.001	0.003
Jeff Davis	0.217	0.197	0.819	0.027	0.026	0.000	0.000
Jefferson	1.174	2.013	18.305	0.250	0.240	0.004	0.020
Jim Hogg	0.073	0.331	0.576	0.051	0.050	0.000	0.000
Jim Wells	0.223	0.977	2.999	0.100	0.097	0.001	0.005
Johnson	0.675	2.287	8.542	0.230	0.222	0.003	0.009
Jones	0.502	1.807	3.803	0.160	0.155	0.002	0.005
Karnes	0.150	0.934	1.648	0.096	0.093	0.001	0.002
Kaufman	0.807	2.105	8.486	0.221	0.213	0.002	0.009
Kendall	1.139	0.494	5.583	0.080	0.076	0.001	0.002
Kenedy	0.190	0.308	0.729	0.033	0.032	0.000	0.000
Kent	0.042	0.289	0.442	0.030	0.029	0.000	0.000
Kerr	2.897	0.628	11.441	0.143	0.134	0.002	0.003
Kimble	0.242	0.258	1.123	0.032	0.031	0.000	0.001
King	0.050	0.394	0.375	0.041	0.040	0.000	0.000
Kinney	0.030	0.150	0.279	0.017	0.017	0.000	0.000
Kleberg	0.984	1.055	4.553	0.117	0.112	0.001	0.004
Knox	0.181	1.171	2.132	0.105	0.102	0.001	0.004
LaSalle	0.246	0.277	1.026	0.034	0.033	0.000	0.000
Lamar	0.497	2.157	5.562	0.209	0.202	0.003	0.009

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Lamb	0.291	2.240	2.984	0.194	0.189	0.002	0.010
Lampasas	0.324	0.705	1.949	0.069	0.066	0.001	0.001
Lavaca	0.222	1.250	2.575	0.130	0.126	0.001	0.004
Lee	0.493	2.486	3.116	0.186	0.180	0.002	0.003
Leon	0.457	3.234	3.332	0.255	0.247	0.002	0.003
Liberty	0.440	0.908	4.232	0.098	0.095	0.001	0.004
Limestone	0.612	1.626	3.487	0.149	0.144	0.002	0.003
Lipscomb	0.090	0.635	0.839	0.062	0.060	0.001	0.001
Live Oak	0.690	0.601	2.994	0.067	0.065	0.001	0.002
Llano	0.895	0.385	4.162	0.053	0.050	0.001	0.001
Loving	0.466	0.108	1.230	0.013	0.012	0.000	0.000
Lubbock	2.555	3.201	24.672	0.364	0.348	0.004	0.019
Lynn	0.190	1.608	1.574	0.140	0.135	0.001	0.002
Madison	0.115	0.650	1.195	0.069	0.067	0.001	0.001
Marion	0.431	0.299	2.102	0.033	0.031	0.001	0.001
Martin	0.109	0.902	0.953	0.079	0.076	0.001	0.001
Mason	0.235	0.268	1.099	0.033	0.032	0.000	0.000
Matagorda	3.887	1.814	14.679	0.187	0.178	0.003	0.007
Maverick	0.159	0.383	2.189	0.040	0.039	0.000	0.001
McCulloch	0.218	1.427	1.531	0.109	0.106	0.002	0.002
McLennan	1.741	3.192	19.099	0.349	0.336	0.005	0.024
McMullen	0.175	0.319	0.683	0.031	0.030	0.000	0.000
Medina	0.541	1.682	4.227	0.172	0.166	0.002	0.005
Menard	0.038	0.200	0.405	0.023	0.022	0.000	0.000
Midland	0.912	1.196	10.734	0.132	0.127	0.002	0.007
Milam	0.292	1.796	3.228	0.177	0.171	0.002	0.007
Mills	0.090	0.608	0.965	0.059	0.057	0.001	0.001
Mitchell	0.137	0.751	1.091	0.069	0.067	0.001	0.001
Montague	0.228	1.064	2.138	0.104	0.100	0.001	0.002
Montgomery	3.157	2.635	27.121	0.338	0.323	0.004	0.018
Moore	0.301	1.667	3.181	0.149	0.145	0.002	0.010
Morris	0.334	0.408	2.031	0.040	0.039	0.001	0.003
Motley	0.057	0.419	0.483	0.042	0.041	0.000	0.000
Nacogdoches	0.794	0.972	6.075	0.113	0.108	0.001	0.005
Navarro	1.484	2.103	7.849	0.214	0.206	0.003	0.007
Newton	0.483	0.193	2.387	0.037	0.035	0.000	0.001
Nolan	0.202	0.878	2.233	0.089	0.086	0.001	0.003
Nueces	4.053	4.265	31.698	0.494	0.473	0.006	0.030
Ochiltree	0.298	1.899	3.449	0.168	0.163	0.002	0.009
Oldham	0.110	0.841	0.959	0.078	0.076	0.001	0.001
Orange	0.702	0.501	6.116	0.072	0.069	0.001	0.007
Palo Pinto	0.472	1.004	3.186	0.095	0.092	0.001	0.003
Panola	0.746	2.138	4.123	0.180	0.173	0.003	0.003
Parker	0.876	1.736	7.265	0.188	0.181	0.002	0.004
Parmer	0.272	1.937	3.093	0.169	0.164	0.002	0.010
Pecos	0.711	0.512	2.807	0.070	0.067	0.001	0.001
Polk	1.271	0.643	6.231	0.083	0.079	0.001	0.003
Potter	1.875	1.450	13.047	0.185	0.177	0.002	0.010
Presidio	0.230	0.218	1.072	0.029	0.028	0.000	0.000
Rains	0.417	0.457	1.930	0.051	0.049	0.001	0.001
Randall	0.694	1.459	8.117	0.167	0.160	0.002	0.006
Reagan	0.057	0.375	0.619	0.037	0.035	0.000	0.001
Real	0.485	0.877	1.833	0.092	0.089	0.001	0.001

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Red River	0.180	1.143	1.753	0.113	0.109	0.001	0.002
Reeves	0.522	0.339	1.851	0.033	0.031	0.000	0.001
Refugio	0.302	0.733	1.826	0.079	0.077	0.001	0.003
Roberts	0.054	0.388	0.431	0.041	0.039	0.000	0.000
Robertson	0.302	1.785	2.514	0.161	0.156	0.002	0.003
Rockwall	0.880	0.783	6.518	0.094	0.090	0.001	0.003
Runnels	0.463	1.583	3.245	0.142	0.138	0.002	0.006
Rusk	0.660	1.906	4.718	0.165	0.160	0.003	0.003
Sabine	2.404	0.537	8.032	0.054	0.051	0.001	0.001
San Augustine	0.754	0.311	2.894	0.032	0.031	0.001	0.001
San Jacinto	0.588	0.377	2.777	0.039	0.038	0.001	0.001
San Patricio	2.239	1.916	10.366	0.208	0.200	0.002	0.010
San Saba	0.085	0.481	1.005	0.046	0.045	0.001	0.001
Schleicher	0.047	0.318	0.464	0.033	0.032	0.000	0.000
Scurry	0.383	0.807	2.582	0.082	0.079	0.001	0.002
Shackelford	0.102	0.703	0.837	0.063	0.061	0.001	0.001
Shelby	0.189	0.662	2.128	0.071	0.069	0.001	0.002
Sherman	0.226	1.699	2.427	0.150	0.145	0.002	0.008
Smith	1.682	2.180	18.048	0.262	0.251	0.004	0.018
Somervell	0.876	0.348	3.224	0.055	0.052	0.001	0.001
Starr	0.289	1.329	2.724	0.154	0.149	0.001	0.004
Stephens	0.202	0.586	1.511	0.058	0.056	0.001	0.001
Sterling	0.026	0.143	0.262	0.017	0.016	0.000	0.000
Stonewall	0.067	0.475	0.658	0.046	0.044	0.000	0.001
Sutton	0.058	0.245	0.687	0.028	0.027	0.000	0.000
Swisher	0.225	1.538	2.301	0.143	0.139	0.002	0.006
Tarrant	8.441	12.991	123.538	1.269	1.216	0.023	0.144
Taylor	1.133	1.820	11.783	0.192	0.185	0.002	0.010
Terrell	0.027	0.160	0.204	0.019	0.019	0.000	0.000
Terry	0.251	1.885	2.490	0.163	0.158	0.002	0.005
Throckmorton	0.102	0.663	0.961	0.064	0.062	0.001	0.001
Titus	0.686	1.643	4.351	0.137	0.132	0.002	0.005
Tom Green	1.135	1.912	9.630	0.200	0.192	0.003	0.010
Travis	6.173	7.400	72.071	0.891	0.852	0.015	0.073
Trinity	1.358	0.428	4.985	0.071	0.067	0.001	0.001
Tyler	0.406	0.275	2.488	0.041	0.039	0.000	0.001
Upshur	0.193	0.644	2.283	0.069	0.066	0.001	0.002
Upton	0.051	0.279	0.587	0.028	0.027	0.000	0.000
Uvalde	1.497	0.869	6.253	0.123	0.117	0.001	0.004
Val Verde	1.237	0.614	5.408	0.082	0.078	0.001	0.002
Van Zandt	0.763	1.636	5.196	0.178	0.172	0.002	0.003
Victoria	0.748	1.513	8.046	0.171	0.164	0.002	0.010
Walker	0.979	0.710	5.448	0.095	0.090	0.001	0.002
Waller	0.328	0.676	3.185	0.078	0.075	0.001	0.003
Ward	0.056	0.151	0.638	0.016	0.016	0.000	0.000
Washington	0.632	1.171	4.388	0.127	0.122	0.001	0.004
Webb	1.320	2.503	14.690	0.306	0.295	0.003	0.010
Wharton	0.584	2.162	5.486	0.220	0.212	0.003	0.012
Wheeler	0.110	0.706	1.095	0.070	0.068	0.001	0.001
Wichita	1.088	2.003	11.638	0.202	0.194	0.003	0.015
Wilbarger	0.227	1.267	2.478	0.118	0.114	0.001	0.005
Willacy	0.390	1.314	2.552	0.127	0.123	0.001	0.007
Williamson	2.156	5.333	22.174	0.519	0.499	0.007	0.023

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Wilson	0.228	1.301	2.498	0.129	0.125	0.001	0.003
Winkler	0.035	0.091	0.417	0.012	0.011	0.000	0.000
Wise	0.743	1.617	5.229	0.159	0.153	0.002	0.004
Wood	1.351	0.967	6.822	0.121	0.116	0.002	0.003
Yoakum	0.184	1.298	1.853	0.116	0.113	0.001	0.004
Young	0.609	0.961	3.711	0.103	0.099	0.001	0.003
Zapata	1.336	0.463	4.586	0.085	0.081	0.000	0.001
Zavala	0.072	0.395	0.729	0.040	0.039	0.000	0.001
Grand Total	**234.556**	**388.920**	**2,130.587**	**40.403**	**38.849**	**0.517**	**2.180**

Table 3-6. 2014 Annual Criteria Emissions by County (Tons/Year)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Anderson	150	277	1,286	29	28	0	1
Andrews	27	121	369	11	11	0	0
Angelina	448	284	3,183	33	31	1	2
Aransas	1,020	167	4,120	26	25	0	1
Archer	64	278	554	25	24	0	1
Armstrong	24	199	226	18	17	0	0
Atascosa	132	313	1,084	29	28	0	1
Austin	134	333	1,129	35	33	0	1
Bailey	40	278	457	24	23	0	1
Bandera	586	75	2,246	23	22	0	0
Bastrop	96	366	1,266	36	35	1	1
Baylor	101	290	694	25	24	0	1
Bee	53	295	629	28	27	0	1
Bell	824	952	6,445	99	95	2	5
Bexar	2,717	2,738	32,363	321	306	6	22
Blanco	79	87	430	10	10	0	0
Borden	22	87	123	8	8	0	0
Bosque	268	338	1,347	33	32	1	1
Bowie	353	415	3,070	42	40	1	2
Brazoria	905	972	7,845	99	95	2	6
Brazos	346	408	3,635	49	47	1	2
Brewster	78	74	455	9	9	0	0
Briscoe	31	194	264	17	17	0	0
Brooks	205	103	812	20	19	0	0
Brown	240	527	1,751	53	51	1	2
Burleson	182	269	1,088	27	26	0	1
Burnet	799	221	3,434	42	39	1	1
Caldwell	172	211	1,059	23	22	0	1
Calhoun	1,281	398	5,301	38	36	1	2
Callahan	101	232	675	23	22	0	0
Cameron	2,071	926	12,394	123	116	2	7
Camp	196	89	872	12	11	0	0
Carson	41	301	432	26	25	0	1
Cass	215	202	1,404	21	20	0	1
Castro	67	547	720	45	44	1	2
Chambers	389	244	2,101	22	21	1	1
Cherokee	105	312	1,244	30	29	1	1
Childress	27	164	314	15	14	0	0
Clay	104	273	637	24	24	0	0
Cochran	30	254	282	22	21	0	1

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Coke	39	76	277	7	7	0	0
Coleman	109	244	681	24	23	0	1
Collin	1,428	2,128	17,636	220	210	4	12
Collingsworth	30	235	301	21	20	0	1
Colorado	200	455	1,328	43	42	1	1
Comal	928	574	5,046	73	69	1	2
Comanche	75	298	729	27	26	0	0
Concho	83	175	422	17	17	0	0
Cooke	371	488	2,250	46	44	1	2
Coryell	77	333	929	31	30	0	1
Cottle	16	124	161	12	11	0	0
Crane	6	21	71	3	3	0	0
Crockett	78	101	413	12	11	0	0
Crosby	47	343	430	28	27	0	0
Culberson	9	61	87	6	6	0	0
Dallam	83	636	871	56	54	1	2
Dallas	4,867	6,906	77,090	682	652	14	76
Dawson	55	433	593	35	34	1	1
DeWitt	55	320	664	29	28	0	1
Deaf Smith	54	312	691	28	28	0	1
Delta	177	586	1,037	47	46	1	1
Denton	1,076	1,441	12,288	136	130	3	9
Dickens	16	113	145	11	11	0	0
Dimmit	141	83	624	12	11	0	0
Donley	85	127	431	14	13	0	0
Duval	25	126	289	12	12	0	0
Eastland	123	300	996	29	28	0	1
Ector	226	323	3,978	34	33	1	3
Edwards	10	66	99	7	6	0	0
El Paso	897	1,633	14,313	150	145	3	14
Ellis	368	710	3,925	61	59	1	6
Erath	85	411	1,134	38	37	1	1
Falls	62	445	685	38	37	1	1
Fannin	89	484	1,009	43	42	1	1
Fayette	365	439	1,981	44	42	1	1
Fisher	27	215	243	18	18	0	0
Floyd	60	484	647	40	39	1	1
Foard	25	175	275	15	15	0	1
Fort Bend	639	1,201	9,571	126	120	2	8
Franklin	45	123	359	12	11	0	0
Freestone	104	587	772	44	43	1	1
Frio	92	171	614	17	17	0	1
Gaines	78	646	769	53	52	1	1
Galveston	1,438	811	9,642	83	78	2	4
Garza	32	135	226	13	12	0	0
Gillespie	115	190	948	21	20	0	1
Glasscock	20	173	169	15	14	0	0
Goliad	43	184	365	18	17	0	0
Gonzales	115	308	914	31	30	0	1
Gray	58	270	819	24	23	0	1
Grayson	1,044	745	6,039	77	73	2	4
Gregg	207	331	3,860	34	33	1	5
Grimes	138	303	1,017	30	29	0	1

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Guadalupe	341	478	3,022	52	50	1	3
Hale	103	639	1,295	53	52	1	2
Hall	25	178	250	16	16	0	0
Hamilton	38	262	447	23	23	0	0
Hansford	54	339	602	29	28	0	1
Hardeman	86	171	473	16	16	0	0
Hardin	92	206	1,110	27	26	0	1
Harris	7,897	10,333	115,092	1,003	961	22	117
Harrison	362	722	2,439	58	56	1	2
Hartley	60	513	593	43	42	1	2
Haskell	73	395	648	33	32	1	1
Hays	327	324	2,726	39	38	1	2
Hemphill	24	143	249	14	13	0	0
Henderson	815	451	4,309	53	51	1	1
Hidalgo	2,091	1,306	15,577	175	167	2	9
Hill	410	624	2,221	60	58	1	2
Hockley	68	439	784	37	36	1	1
Hood	140	289	1,266	24	23	0	1
Hopkins	109	678	1,212	52	51	1	1
Houston	124	304	910	30	29	0	1
Howard	116	234	942	23	22	0	1
Hudspeth	77	135	342	14	13	0	0
Hunt	346	499	2,590	49	47	1	2
Hutchinson	63	249	741	23	22	0	1
Irion	8	47	83	5	5	0	0
Jack	53	203	419	18	17	0	0
Jackson	184	394	1,164	35	34	1	2
Jasper	101	130	1,140	15	14	0	1
Jeff Davis	68	53	269	7	7	0	0
Jefferson	366	593	6,067	69	66	1	6
Jim Hogg	20	90	167	13	13	0	0
Jim Wells	64	262	931	25	24	0	1
Johnson	203	633	2,734	60	58	1	3
Jones	141	466	1,072	39	38	1	1
Karnes	40	245	477	23	22	0	0
Kaufman	241	576	2,653	57	55	1	2
Kendall	359	140	1,862	23	22	0	1
Kenedy	67	83	285	8	8	0	0
Kent	11	74	118	7	7	0	0
Kerr	919	180	3,888	43	40	1	1
Kimble	74	68	367	8	8	0	0
King	12	104	92	10	10	0	0
Kinney	8	39	83	4	4	0	0
Kleberg	339	291	1,650	31	30	0	1
Knox	42	294	522	25	24	0	1
LaSalle	75	73	330	9	9	0	0
Lamar	147	570	1,723	51	50	1	2
Lamb	72	570	775	47	46	1	2
Lampasas	98	191	622	18	17	0	0
Lavaca	60	332	765	31	30	0	1
Lee	143	684	946	48	46	1	1
Leon	130	904	986	64	62	1	1
Liberty	167	317	1,665	33	31	1	1

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Limestone	212	440	1,231	37	36	1	1
Lipscomb	22	161	217	15	14	0	0
Live Oak	249	170	1,155	18	17	0	0
Llano	313	114	1,572	15	15	0	0
Loving	165	40	589	4	4	0	0
Lubbock	765	887	8,197	100	95	1	5
Lynn	48	415	421	34	33	0	1
Madison	31	171	351	17	16	0	0
Marion	166	94	874	10	9	0	0
Martin	28	233	263	19	19	0	0
Mason	73	70	359	9	8	0	0
Matagorda	1,495	565	6,318	55	52	1	2
Maverick	47	106	736	11	10	0	0
McCulloch	61	391	437	28	27	1	1
McLennan	546	885	6,240	93	89	2	7
McMullen	64	90	273	8	8	0	0
Medina	160	444	1,297	43	41	1	1
Menard	10	53	124	6	6	0	0
Midland	267	340	3,609	37	35	1	2
Milam	78	476	922	43	42	1	2
Mills	23	156	275	14	14	0	0
Mitchell	38	194	314	17	16	0	0
Montague	65	280	667	25	25	0	0
Montgomery	1,415	933	11,734	115	109	2	6
Moore	80	427	878	36	35	1	2
Morris	125	119	775	11	10	0	1
Motley	15	110	132	10	10	0	0
Nacogdoches	272	280	2,135	30	29	1	2
Navarro	516	580	2,816	56	54	1	2
Newton	155	57	819	11	10	0	0
Nolan	55	232	655	22	22	0	1
Nueces	1,364	1,226	10,954	137	131	2	8
Ochiltree	71	476	865	40	39	1	2
Oldham	27	218	250	19	18	0	0
Orange	223	150	2,040	21	20	0	2
Palo Pinto	164	278	1,147	25	24	0	1
Panola	232	614	1,348	48	46	1	1
Parker	271	477	2,371	49	47	1	1
Parmer	66	489	793	41	39	1	2
Pecos	215	136	935	19	18	0	0
Polk	460	200	2,412	25	23	0	1
Potter	574	412	4,421	52	50	1	3
Presidio	73	58	355	8	7	0	0
Rains	142	124	697	13	13	0	0
Randall	199	394	2,603	44	42	1	2
Reagan	15	96	175	9	9	0	0
Real	149	246	594	25	24	0	0
Red River	48	298	504	27	26	0	1
Reeves	181	101	791	9	9	0	0
Refugio	90	192	547	20	19	0	1
Roberts	13	99	108	10	9	0	0
Robertson	87	484	746	40	38	1	1
Rockwall	313	236	2,326	27	26	0	1

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Runnels	146	407	994	35	33	1	1
Rusk	210	539	1,576	43	42	1	1
Sabine	949	205	3,723	20	19	1	0
San Augustine	298	104	1,294	10	10	0	0
San Jacinto	228	116	1,168	11	11	0	0
San Patricio	795	542	3,876	57	54	1	2
San Saba	23	125	296	11	11	0	0
Schleicher	12	83	131	8	8	0	0
Scurry	115	213	822	21	20	0	0
Shackelford	26	183	223	15	15	0	0
Shelby	58	183	693	18	17	0	1
Sherman	53	426	574	36	35	1	2
Smith	533	627	6,013	72	69	1	5
Somervell	284	98	1,116	16	15	0	0
Starr	80	357	831	39	38	0	1
Stephens	68	158	520	15	14	0	0
Sterling	7	37	77	4	4	0	0
Stonewall	16	120	159	11	11	0	0
Sutton	16	64	210	7	7	0	0
Swisher	56	393	600	35	34	1	1
Tarrant	2,663	3,917	40,735	366	350	8	42
Taylor	336	494	3,772	51	49	1	3
Terrell	7	43	58	5	5	0	0
Terry	63	482	665	40	39	1	1
Throckmorton	25	168	242	15	15	0	0
Titus	216	470	1,427	36	35	1	1
Tom Green	354	520	3,193	53	51	1	3
Travis	1,970	2,173	24,162	254	242	5	22
Trinity	462	126	1,847	21	20	0	0
Tyler	136	81	886	12	11	0	0
Upshur	59	175	748	17	17	0	0
Upton	13	73	176	7	7	0	0
Uvalde	471	233	2,071	34	32	0	1
Val Verde	406	179	1,998	23	22	0	1
Van Zandt	237	437	1,682	44	43	1	1
Victoria	231	418	2,598	44	43	1	2
Walker	323	201	1,901	26	25	0	1
Waller	129	243	1,272	26	25	0	1
Ward	16	42	215	4	4	0	0
Washington	207	319	1,476	32	31	0	1
Webb	400	721	4,931	83	80	1	3
Wharton	168	573	1,623	54	52	1	3
Wheeler	28	183	306	17	16	0	0
Wichita	345	559	3,860	54	52	1	4
Wilbarger	58	322	649	28	27	0	1
Willacy	124	342	794	31	30	0	1
Williamson	663	1,476	7,163	138	133	3	6
Wilson	62	342	743	31	30	0	1
Winkler	10	25	139	3	3	0	0
Wise	244	440	1,774	41	39	1	1
Wood	456	271	2,441	33	31	1	1
Yoakum	46	333	498	29	28	0	1
Young	185	250	1,176	26	25	0	1

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Zapata	449	139	1,744	25	23	0	0
Zavala	19	102	208	10	9	0	0
Grand Total	**77,500**	**110,305**	**729,718**	**10,973**	**10,531**	**188**	**608**

Table 3-7. 2014 Austin Area OSD Criteria Emissions (Tons/Day)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Bastrop	0.33	1.37	4.03	0.14	0.14	0.00	0.00
Blanco	0.26	0.32	1.32	0.04	0.04	0.00	0.00
Burnet	2.52	0.79	10.13	0.14	0.13	0.00	0.00
Caldwell	0.56	0.81	3.29	0.09	0.09	0.00	0.00
Fayette	1.08	1.60	5.65	0.17	0.17	0.00	0.00
Hays	1.05	1.15	8.25	0.14	0.14	0.00	0.01
Lee	0.49	2.49	3.12	0.19	0.18	0.00	0.00
Llano	0.90	0.38	4.16	0.05	0.05	0.00	0.00
Travis	6.17	7.40	72.07	0.89	0.85	0.01	0.07
Williamson	2.16	5.33	22.17	0.52	0.50	0.01	0.02
Grand Total	**15.50**	**21.65**	**134.19**	**2.38**	**2.28**	**0.03**	**0.12**

Table 3-8. 2014 Beaumont-Port Arthur Area OSD Criteria Emissions (Tons/Day)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Hardin	0.31	0.70	3.41	0.10	0.10	0.00	0.00
Jefferson	1.17	2.01	18.31	0.25	0.24	0.00	0.02
Orange	0.70	0.50	6.12	0.07	0.07	0.00	0.01
Grand Total	**2.18**	**3.22**	**27.83**	**0.42**	**0.41**	**0.01**	**0.03**

Table 3-9. 2014 Dallas-Fort Worth Area OSD Criteria Emissions (Tons/Day)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Collin	4.55	7.19	54.02	0.79	0.75	0.01	0.04
Dallas	15.52	22.47	234.87	2.35	2.25	0.04	0.26
Denton	3.29	4.56	36.48	0.47	0.45	0.01	0.03
Ellis	1.19	2.46	12.41	0.22	0.21	0.00	0.02
Johnson	0.68	2.29	8.54	0.23	0.22	0.00	0.01
Kaufman	0.81	2.11	8.49	0.22	0.21	0.00	0.01
Parker	0.88	1.74	7.27	0.19	0.18	0.00	0.00
Rockwall	0.88	0.78	6.52	0.09	0.09	0.00	0.00
Tarrant	8.44	12.99	123.54	1.27	1.22	0.02	0.14
Wise	0.74	1.62	5.23	0.16	0.15	0.00	0.00
Grand Total	**36.96**	**58.19**	**497.36**	**5.98**	**5.73**	**0.09**	**0.52**

Table 3-10. 2014 El Paso OSD Criteria Emissions (Tons/Day)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
El Paso	2.81	5.83	42.90	0.55	0.53	0.01	0.05

Table 3-11. 2014 Houston-Galveston-Brazoria Area OSD Criteria Emissions (Tons/Day)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Brazoria	2.27	2.85	19.30	0.30	0.29	0.00	0.02
Chambers	0.74	0.63	3.90	0.06	0.06	0.00	0.00
Fort Bend	1.81	3.62	25.52	0.40	0.38	0.00	0.03
Galveston	2.60	2.10	17.90	0.22	0.21	0.00	0.01
Harris	21.93	32.25	312.73	3.19	3.06	0.06	0.39
Liberty	0.44	0.91	4.23	0.10	0.09	0.00	0.00
Montgomery	3.16	2.64	27.12	0.34	0.32	0.00	0.02
Waller	0.33	0.68	3.18	0.08	0.07	0.00	0.00
Grand Total	**33.27**	**45.67**	**413.88**	**4.69**	**4.50**	**0.08**	**0.48**

Table 3-12. 2014 San Antonio Area OSD Criteria Emissions (Tons/Day)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Atascosa	0.44	1.15	3.42	0.11	0.11	0.00	0.00
Bandera	1.84	0.26	6.54	0.08	0.07	0.00	0.00
Bexar	8.36	9.15	95.29	1.12	1.07	0.01	0.07
Comal	2.89	1.98	14.99	0.26	0.24	0.00	0.01
Frio	0.31	0.65	1.99	0.07	0.07	0.00	0.00
Gillespie	0.38	0.71	2.96	0.08	0.08	0.00	0.00
Guadalupe	1.11	1.75	9.41	0.20	0.19	0.00	0.01
Karnes	0.15	0.93	1.65	0.10	0.09	0.00	0.00
Kendall	1.14	0.49	5.58	0.08	0.08	0.00	0.00
Kerr	2.90	0.63	11.44	0.14	0.13	0.00	0.00
Medina	0.54	1.68	4.23	0.17	0.17	0.00	0.00
Wilson	0.23	1.30	2.50	0.13	0.12	0.00	0.00
Grand Total	**20.27**	**20.69**	**159.99**	**2.54**	**2.43**	**0.03**	**0.11**

Table 3-13. 2014 Tyler-Longview Area OSD Criteria Emissions (Tons/Day)

County	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	NH3
Gregg	0.65	1.09	11.52	0.12	0.12	0.00	0.02
Harrison	1.10	2.48	7.07	0.21	0.21	0.00	0.01
Rusk	0.66	1.91	4.72	0.17	0.16	0.00	0.00
Smith	1.68	2.18	18.05	0.26	0.25	0.00	0.02
Upshur	0.19	0.64	2.28	0.07	0.07	0.00	0.00
Grand Total	**4.28**	**8.31**	**43.64**	**0.83**	**0.80**	**0.01**	**0.05**

Table 3-14. 2014 Statewide OSD Hazardous Air Pollutant Emissions (Pounds/Day)

Pollutant Code	Pollutant Name	Emissions Total (lbs/day)
108883	Toluene	27,222
1330207	Xylene	27,097
1634044	MTBE	13,616
540841	2,2,4-Trimethylpentane	11,336
71432	Benzene	10,472
50000	Formaldehyde	10,111
100414	Ethyl Benzene	6,456

Pollutant Code	Pollutant Name	Emissions Total (lbs/day)
110543	Hexane	5,630
75070	Acetaldehyde	4,413
106990	1,3-Butadiene	1,100
123386	Propionaldehyde	1,046
100425	Styrene	331
107028	Acrolein	327
91203	Naphthalene	277
85018	Phenanthrene	25.4382
208968	Acenaphthylene	16.1305
86737	Fluorene	12.9535
83329	Acenaphthene	8.2460
129000	Pyrene	6.9584
206440	Fluoranthene	6.4779
7440382	Arsenic & compounds	3.1208
120127	Anthracene	2.8433
191242	Benzo(g,h,i)perylene	2.0214
7440020	Nickel	0.7227
56553	Benz(a)anthracene	0.6838
193395	Indeno(1,2,3,c,d)pyrene	0.6089
218019	Chrysene	0.6046
50328	Benzo(a)pyrene	0.6008
205992	Benzo(b)fluoranthene	0.5030
207089	Benzo(k)fluoranthene	0.4696
7439965	Manganese	0.4502
16065831	Chromium (Cr3+)	0.1593
18540299	Chromium (Cr6+)	0.0821
53703	Dibenzo(a,h)anthracene	0.0103
7439976	Mercury	7.29268E-03
3268879	Octachlorodibenzo-p-dioxin	6.98700E-04
35822469	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	1.40780E-04
39001020	Octachlorodibenzofuran	3.81000E-05
67562394	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.27000E-05
19408743	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	1.62200E-05
70648269	1,2,3,4,7,8-Hexachlorodibenzofuran	1.39800E-05
51207319	2,3,7,8-Tetrachlorodibenzofuran	8.62000E-06
60851345	2,3,4,6,7,8-Hexachlorodibenzofuran	8.48000E-06
57653857	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	7.90000E-06
57117314	2,3,4,7,8-Pentachlorodibenzofuran	7.32000E-06
57117449	1,2,3,6,7,8-Hexachlorodibenzofuran	5.54000E-06
39227286	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	3.28000E-06
57117416	1,2,3,7,8-Pentachlorodibenzofuran	2.76000E-06
1746016	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2.74000E-06
72918219	1,2,3,7,8,9-Hexachlorodibenzofuran	2.70000E-06
55673897	1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.28000E-06
40321764	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	2.02000E-06

Table 3-15. 2014 Statewide Annual Hazardous Air Pollutant Emissions (Tons/Year)

Pollutant Code	Pollutant Name	Emissions Total (tons/year)
1330207	Xylene	4,835
108883	Toluene	4,760
1634044	MTBE	2,446
540841	2,2,4-Trimethylpentane	2,083
71432	Benzene	1,757
50000	Formaldehyde	1,391
100414	Ethyl Benzene	1,113
110543	Hexane	942
75070	Acetaldehyde	606
106990	1,3-Butadiene	194
123386	Propionaldehyde	145
100425	Styrene	58.6003
107028	Acrolein	47.6481
91203	Naphthalene	41.3897
85018	Phenanthrene	3.5385
208968	Acenaphthylene	2.3652
86737	Fluorene	1.8728
83329	Acenaphthene	1.1152
129000	Pyrene	1.1118
206440	Fluoranthene	1.0085
120127	Anthracene	0.4480
7440382	Arsenic & compounds	0.4248
191242	Benzo(g,h,i)perylene	0.3279
56553	Benz(a)anthracene	0.1103
7440020	Nickel	0.1001
193395	Indeno(1,2,3,c,d)pyrene	0.0997
50328	Benzo(a)pyrene	0.0973
218019	Chrysene	0.0944
205992	Benzo(b)fluoranthene	0.0799
207089	Benzo(k)fluoranthene	0.0747
7439965	Manganese	0.0616
16065831	Chromium (Cr3+)	0.0253
18540299	Chromium (Cr6+)	0.0131
53703	Dibenzo(a,h)anthracene	2.0075E-03
7439976	Mercury	1.0851E-03
3268879	Octachlorodibenzo-p-dioxin	9.4185E-05
35822469	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	2.0350E-05
39001020	Octachlorodibenzofuran	6.5418E-06
67562394	1,2,3,4,6,7,8-Heptachlorodibenzofuran	5.7322E-06
19408743	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	3.1084E-06
70648269	1,2,3,4,7,8-Hexachlorodibenzofuran	2.7305E-06
51207319	2,3,7,8-Tetrachlorodibenzofuran	1.8412E-06
60851345	2,3,4,6,7,8-Hexachlorodibenzofuran	1.8055E-06
57653857	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1.6918E-06
57117314	2,3,4,7,8-Pentachlorodibenzofuran	1.6164E-06
57117449	1,2,3,6,7,8-Hexachlorodibenzofuran	1.2448E-06
39227286	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	8.5940E-07
57117416	1,2,3,7,8-Pentachlorodibenzofuran	7.3168E-07
1746016	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	7.2438E-07

Pollutant Code	Pollutant Name	Emissions Total (tons/year)
72918219	1,2,3,7,8,9-Hexachlorodibenzofuran	7.1941E-07
55673897	1,2,3,4,7,8,9-Heptachlorodibenzofuran	6.3849E-07
40321764	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	6.0891E-07

4.0 Activity Data

TexN currently houses the most detailed and disaggregated data available for calculating emissions for many non-road sources in Texas. However, the EPA prefers to receive activity data for updating county-level activity data according to either the MOVES County Database (CDB) or the NMIM National County Database (NCD) instead of emissions data. The data within TexN are more disaggregated than the structure for NMIM can accommodate, requiring the data within TexN to be aggregated and formatted to match the NMIM data structures as much as possible in order to comply with the EPA's requirement that activity data be submitted for the 2014 AERR.

Submitting activity data to the EPA for the EIS AERR consists of two parts. The first part involves updating some data tables within the NMIM MySQL National County Database (NCD). The second part involves updating the external files that will be used by EPA's emission model.

As part of the 2014 activity data submission, EPA is requiring a spreadsheet checklist that indicates where county-specific data has been provided. Table 4-1 shows a summary of this checklist for the Texas submittal.

Table 4-1. 2014 AERR NCD Checklist (Statewide)

Accept EPA Default Values	
NMIM County	
NMIM CountyYearMonth	X
NMIM CountyNRFile	X
NMIM CountyYear	X
NMIM CountyYearMonth	X
NMIM Diesel	X
NMIM Gasoline	X
NMIM NaturalGas	
Yearly activity rates (yy.act)	X
Seasonal allocations (sea)	X
Source populations (pop)	X
Growth rates (grw)	X
Residential snowblower allocations (sbr.alo)	X
Commercial snowblower allocations (sbc.alo)	X
Snowmobile allocations (snm.alo)	X
Farming equipment allocations (frm.alo)	X
Construction equipment allocations (con.alo)	X
Outboard watercraft allocations (wob.alo)	X
Inboard watercraft allocations (wib.alo)	X
Golf equipment allocations (gc.alo)	X
Airport equipment allocations (air.alo)	X
Mining equipment allocations (min.alo)	X
Wholesale establishment allocations (com.alo)	X
Logging equipment allocations (log.alo)	X
Commercial landscaping allocations (lsc.alo)	X
Manufacturing equipment allocations (mfg.alo)	X
Oil production equipment allocations (oil.alo)	X
Recreational vehicle park allocations (rvp.alo)	X
Human population allocations (pop.alo)	X
Household allocations (hou.alo)	X
Railway maintenance equipment allocations (rr.alo)	X

4.1 NCD Tables

According to the EPA documentation, there are eleven key tables within the NCD that states may update for the activity data submittal. While it is understood that EPA will not use any meteorological updates provided, the tables relating to meteorological data were updated and provided as a matter of record. Table 4-2 shows the updates made for each of the NCD tables.

Table 4-2. NCD Table Updates

Table Name	Update Description
County	No change
CountyYearMonthHour*	This table contains updated 2014 meteorological data, providing hourly average temperatures and hourly relative humidity values for each month of the year. These values were updated based on the meteorological data provided by TCEQ, as a matter of record.
CountyNRFile	This table was updated to reference the external files required for the NONROAD model to execute. The development of the external files are described in more detail in the next section.
CountyYear	This table was updated for the year 2014 to reference the external data file for nonroad activity. The development of the external activity data file is described in more detail in the next section. Within this table, the field for the HasNRStateInputs was changed to indicate "Y". The datasource field was updated to reflect TCEQ's TexN model, as referenced in the datasource table.
CountyYearMonth	This table references the data provided in the fuel-related tables. New ID numbers were assigned for the following fields: NRGasolineID, NRDieselID, RMDieselID, and NRFuelDataSource.
Diesel	The fuel data within the Texas Nonroad Model (TexN) contains fuel properties specific to Texas obtained through multiple fuel sampling surveys conducted by the State. Using the data from the l_fuels table TexN version 1.7.1, the following fields were updated: DieselID and DieselSulfur.
Gasoline	The fuel data within the Texas Nonroad Model (TexN) contains fuel properties specific to Texas obtained through multiple fuel sampling surveys conducted by the State. Using the data from the l_fuels table TexN version 1.7.1, the following fields were updated: RVP, GasSulfur, ETOHVolume, ETOHMktShare, MTBEVolume, MTBEMktShare, ETBEVolume, ETBEMktShare, TAMEVolume, TAMEMktShare, and Gasolineid. All remaining fields were left as default.
Natural Gas	No change
State	No change
BaseYearVMT	Not Applicable to NONROAD sources.
CountyVMTMonthAllocation	Not Applicable to NONROAD sources.
DataSource**	Added ID 48000 as a datasource to reference data updated based on TexN v.1.7.1
CountyMonthHour*	This table contains updated 2014 meteorological data, providing hourly average temperatures and hourly relative humidity values for each month of the year. These values were updated based on the meteorological data provided by TCEQ, as a matter of record.
CountyMonthHourNCD*	This table contains updated 2014 meteorological data, providing hourly average temperatures and hourly relative humidity values for each month of the year. These values were updated based on the meteorological data provided by TCEQ, as a matter of record.

*Not required for the NCD submittal (meteorological data)
**While the datasource table within the NCD was not identified by the EPA as a table that may require updating, there wasn't an existing entry within the table to accurately reflect the information for this data submission. Therefore, the datasource table has also been updated has been included in the NCD activity data submittal.

4.2 External Data Files

As part of the EIS AERR activity data submission, the EPA requires the external files read by the NONROAD model to be updated and submitted. In accordance with this

requirement, the external files in Table 4-3 have been updated to reflect the data within TexN as closely as possible.

Table 4-3. External File Updates

External File(s)	Update Description
Activity	The activity data within TexN were processed using a statistical analysis software program (SAS©). A weighted average activity value was calculated for each equipment SCC using horsepower-hours as the weighting factor.
Emission Factor Files	No change.
Deterioration Files	No change.
Season	Through various TCEQ Work Orders, the seasonality profile within TexN has been updated for certain nonroad equipment.
Growth	The growth file was updated using population profiles from TexN. Using a statistical analysis software program (SAS©), population data from TexN was summed by year and SCC and assigned the appropriate indicator code, according to the default NONROAD indicator code mapping. This file also reflects an update made to the scrap curve for skid steer loaders, as developed under a previous TCEQ Work Order.
Daily	No change.
Allocation Files	Geographic allocation files were updated using TexN population data, summed by SCC for each county and equipment type.
Technology Types	No change.
Population	Population data for the year 2014 were exported from TexN. Using a statistical analysis software program (SAS©), population data were summed by SCC and horsepower bin. Average horsepower and useful life, weighted by equipment population, were calculated by SCC and horsepower bin. The scrappage flag for diesel skid steer loaders was updated to reflect the alternative scrappage curve in the growth file.

5.0 2008 – 2040 Emissions Trends

Using TexN version 1.7.1, ERG created statewide controlled and uncontrolled emissions inventories for typical summer weekday emissions for the years 2008 through 2014. The following sections illustrate the trends analysis results for statewide totals and totals for selected areas, for specified pollutants.

5.1 Controlled Emissions

5.1.1 Federal Rules

The individual federal rules impacting nonroad sources within the TexN model are:

- Rule #1: Emission Standards for New Nonroad Spark-ignition Engines at or below 19 Kilowatts - "Phase I Small SI Rule"
- Rule #2: Federal Emission Standards for Heavy-Duty and Nonroad Engines - "1998 HD and Nonroad Rule"
- Rule #3: Tier 1, 2 and Tier 3 Emission Standards: Control of Emissions of Air Pollution from Nonroad Diesel Engines - "Tier 1, 2 and 3 Rule"
- Rule #4: Final Phase II Standards for Small Nonroad SI Handheld Engines - "Phase II Small SI Rule"
- Rule #5: Emission Standards for New Nonroad Engines: Large Industrial SI Engines, Recreational Vehicles, and Diesel Recreational Marine Engines - "Large SI Rule"
- Rule #6: Clean Air Nonroad Diesel - Tier 4 Final Rule – "Tier 4 Rule"

Table 5-1 shows the phase-in dates, equipment types and hp ranges for each rule. Each of these rules is discussed in more detail below.

Table 5-1. Rule Phase-In Schedule and Applicable Equipment

Rule Reference #	Rule	Sub-categories	Spark Ignition (Gasoline, LPG, CNG)				Compression Ignition (Diesel)			
			< 25 hp	> 25 hp	MARINE < 25 hp	MARINE > 25 hp	< 50 hp	> 50 hp	MARINE < 50 hp	MARINE > 50 hp
1	Phase I Small SI		1997-							
2	1998 HD and Nonroad				1998-2006			1998-2000		
3	Tier 1, Tier 2 and Tier 3	Tier 1					1999-2000			
		Tier 2					2001-2006	2001-2006	2001-2006	
		Tier 3						2006-2008	2006-2008	
4	Phase II Small SI		2002-2007							
5	Large SI	Large Industrial Spark-Ignition Engines (Tier 1)		2004		2004				
		Large Industrial Spark-Ignition Engines (Tier 2)		2007		2007				
		Recreational Vehicles		2006						
		Diesel Recreational Marine Engines								2006
6	Tier 4						2008	2008-2013		

Rule #1: Emission Standards for New Nonroad Spark-ignition (SI) Engines At or Below 19 kW (~25 hp)

This rule is applicable to non-road SI engines at or below 19 kW (~ 25 hp) and manufactured during or after the 1997 model year, including farm and construction equipment, lawnmowers, string trimmers, edgers, chainsaws, commercial turf equipment, small construction equipment, and lawn and garden tractors. Exempt vehicles and equipment include competition or combat vehicles, research, training, investigations, demonstrations, and national security vehicles and equipment, engines used to propel marine vessels, engines used in underground mining equip, motorcycles, aircraft, and recreational vehicles. The standards for this rule are presented in Table 5-2.

Table 5-2. Phase I Small SI Rule Standards (g/bhp-hr)

Class	Year	CO	HC	HC + NOx	NOx	Class Description
I	1997+	387	N/A	12	N/A	Nonhandheld < 225 cc
II	1997+	387	N/A	10	N/A	Nonhandheld > ~225 cc
III	1997+	600	220	N/A	4	Handheld < 20 cc
IV	1997+	600	180	N/A	4	Handheld > ~20 < 50 cc
V	1997+	450	120	N/A	4	Handheld > ~50 cc

Rule #2: Federal Emission Standards for Heavy-Duty and Nonroad Engines

This rule is applicable to non-road compression ignition (CI – diesel) engines greater than 50 hp, and marine SI outboard manufactured as early as 1998, and personal watercraft and jet boat engines manufactured as early as 1999. This rule does not include standards for non-road SI engines greater than 25 hp or marine CI engines. The standards are presented below in Tables 5-3 and 5-4.

Table 5-3. 1998 Nonroad CI Engine Standards in g/bhp-hr

Rated Power	Year	CO	HC	NOx	PM10	Smoke (%) acceleration/lug/peak modes
50 ≤hp< 100	1998+	N/A	N/A	6.9	N/A	20/15/50
100 ≤hp< 175	1997+	N/A	N/A	6.9	N/A	20/15/50
175 ≤hp< 750	1996+	8.5	1	6.9	0.4	20/15/50
hp = 750+	2000+	8.5	1	6.9	0.4	20/15/50

Table 5-4. 1998 Marine SI Engine Standards

Year	HC+NOx			
	P* < 4.3		P* ≥ 4.3	
	g/kW-hr	g/hp-hr	g/kW-hr	g/hp-hr
1998	278	207.3	(0.917 x (151+ 557/P^0.9)) + 2.44	[(0.917 x (151+ 557/P^0.9)) + 2.44] x 0.7457
1999	253	188.7	(0.833 x (151+ 557/P^0.9)) + 2.89	[(0.833 x (151+ 557/P^0.9)) + 2.89] x 0.7457
2000	208	155.1	(0.750 x (151+ 557/P^0.9)) + 3.33	[(0.750 x (151+ 557/P^0.9)) + 3.33] x 0.7457
2001	204	152.1	(0.667 x (151+ 557/P^0.9)) + 3.78	[(0.667 x (151+ 557/P^0.9)) + 3.78] x 0.7457
2002	179	133.5	(0.583 x (151+ 557/P^0.9)) + 4.22	[(0.583 x (151+ 557/P^0.9)) + 4.22] x 0.7457
2003	155	115.6	(0.500 x (151+ 557/P^0.9)) + 4.67	[(0.500 x (151+ 557/P^0.9)) + 4.67] x 0.7457
2004	130	96.9	(0.417 x (151+ 557/P^0.9)) + 5.11	[(0.417 x (151+ 557/P^0.9)) + 5.11] x 0.7457
2005	105	78.3	(0.333 x (151+ 557/P^0.9)) + 5.56	[(0.333 x (151+ 557/P^0.9)) + 5.56] x 0.7457
2006+	81	60.4	(0.250 x (151+ 557/P^0.9)) + 6.00	[(0.250 x (151+ 557/P^0.9)) + 6.00] x 0.7457

*P = power rating in kilowatts

Rule #3: Tier 1, 2 and 3 Diesel Engine Emission Standards

These emission standards apply to all nonroad mobile diesel engines and equipment of all sizes, except for locomotives, marine engines above 50 hp, underground mining equipment, and engines with less than 50 cc that are typically used in model airplanes. The standards are presented in Table 5-5.

Table 5-5. Tier 1, 2 and 3 Diesel Engine Standards in g/kW-hr (g/hp-hr)

Engine Size	Tier	Model year	NMHC + NOx	CO	PM10
kW < 8 (hp < 11)	Tier 1	2000	10.5 (7.8)	8.0 (6.0)	1.0 (0.75)
	Tier 2	2005	7.5 (5.6)	8.0 (6.0)	0.8 (0.6)
8 ≤ kW < 19 (11≤hp< 25)	Tier 1	2000	9.5 (7.1)	6.6 (4.9)	0.8 (0.6)
	Tier 2	2005	7.5 (5.6)	6.6 (4.9)	0.8 (0.6)
19 ≤kW< 37 (25 ≤hp< 50)	Tier 1	1999	9.5 (7.1)	5.5 (4.1)	0.8 (0.6)
	Tier 2	2004	7.5 (5.6)	5.5 (4.1)	0.6 (0.45)
37≤kW< 75 (50 ≤hp< 100)	Tier 2	2004	7.5 (5.6)	5.0 (3.7)	0.4 (0.3)
	Tier 3	2008	4.7 (3.5)	5.0 (3.7)	
75 ≤kW< 130 (100 ≤hp< 175)	Tier 2	2003	6.6 (4.9)	5.0 (3.7)	0.3 (0.22)
	Tier 3	2007	4 (3.0)	5.0 (3.7)	
130 ≤kW< 225 (175 ≤hp< 300)	Tier 2	2003	6.6 (4.9)	3.5 (2.6)	0.2 (0.15)
	Tier 3	2006	4 (3.0)	3.5 (2.6)	
225 ≤kW < 450 (300 ≤hp < 600)	Tier 2	2001	6.4 (4.8)	3.5 (2.6)	0.2 (0.15)
	Tier 3	2006	4 (3.0)	3.5 (2.6)	
450 ≤kW < 560 (600 ≤hp< 750)	Tier 2	2002	6.4 (4.8)	3.5 (2.6)	0.2 (0.15)
	Tier 3	2006	4 (3.0)	3.5 (2.6)	
kW ≥ 560 (hp ≥ 750)	Tier 2	2006	6.4 (4.8)	3.5 (2.6)	0.2 (0.15)

Rule #4: Phase II Standards for Small Nonroad SI Handheld Engines

The Phase II Standards for small handheld non-road spark-ignition engines apply to the following classes of engines shown in Table 5-6. Phase II standards are presented in Table 5-7.

Table 5-6. Phase II Small Nonroad SI Engine Categories

Class	Type	cc*
I-A	Nonhandheld	cc < 66
I-B	Nonhandheld	66 to 100 cc
I	Nonhandheld	100 to 225 c
II	Nonhandheld	> ~225 cc
III	Handheld	< 20 cc
IV	Handheld	20 to 50 cc
V	Handheld	> ~50 cc

* displacement in cubic centimeters

Table 5-7. Phase II HC+NOx Standards for Handheld Engines in g/kW-hr (g/hp-hr)

Model Year	Class III	Class IV	Class V
2002	238 (177)	196 (146)	N/A
2003	175 (130)	148 (110)	N/A
2004	113 (84)	99 (74)	143 (107)
2005	50 (37)	50 (37)	119 (89)
2006	50 (37)	50 (37)	96 (72)
2007+	50 (37)	50 (37)	72 (54)

Rule #5: Large Industrial SI Engines, Recreational Vehicles, and Diesel Recreational Marine Engines

This rule applies to large industrial spark-ignition engines powered by gasoline, natural gas, or propane gas, rated over 19 kW (25 hp). The rule also applies to diesel marine engines over 37 kW (50 hp) used in recreational boats, such as yachts and cruisers. This rule does not apply to spark-ignition recreational marine vessels. The standards are presented in Tables 5-8 through 5-11.

Table 5-8. Large SI Engine Standards in g/kW-hr (g/hp-hr)

Tier/Year	HC+NOx	CO
Tier I Starting in 2004	4 (3.0)	50 (37.3)
Tier 2 Starting in 2007	2.7 (2.0)	4.4 (3.3)

Table 5-9. Recreational Vehicles Standards in g/kW-hr (g/hp-hr)

Vehicle	Model Year	HC	CO	Phase-in %
Snowmobiles	2006	100 (74.6)	275 (205.1)	50
	2007 - 2009	100 (74.6)	275 (205.1)	100
	2010	75 (55.9)	275 (205.1)	
	2012	75 (55.9)	200 (149.1)	
Off-highway Motorcycles	2006	2 (1.5)	25 (18.6)	50
	2007+	2 (1.5)	25 (18.6)	100
ATVs	2006	1.5 (1.1)	35 (26.1)	50
	2007+	1.5 (1.1)	35 (26.1)	100

Table 5-10. Permeation Standards for Recreational Vehicles

Emission Component	Implementation Date	Standard	Test Temperature
Fuel Tank Permeation	2008	1.5 g/sq meters/day	28 Degrees C (82 degrees F)
Fuel Hose Permeation	2008	15 g/sq meters/day	23 Degrees C (73 degrees F)

Table 5-11. Recreational Diesel Marine Standards in g/kW-hr (g/hp-hr)

Engine size	Implementation Date	HC + NOx	PM10	CO
0.5 L/cyl ≤Displacement< 0.9 L/cyl	2007	7.5 (5.59)	0.4 (0.30)	5 (3.73)
0.9 L/cyl ≤Displacement< 1.2 L/cyl	2006	7.2 (5.37)	0.3 (0.22)	5 (3.73)
1.2 L/cyl ≤Displacement< 2.5 L/cyl	2006	7.2 (5.37)	0.2 (0.15)	5 (3.73)
Displacement ≥ 2.5 L/cyl	2009	7.2 (5.37)	0.2 (0.15)	5 (3.73)

Rule #6: Tier 4 Diesel Rule

This rule establishes emission standards for non-road diesel engines and sulfur reductions for non-road diesel fuel. This rule reduces PM emissions by 95% and NOx emissions by 90% and virtually eliminates sulfur oxides. The sulfur level in nonroad diesel fuel is reduced from 3,000 ppm to 500 ppm starting in 2007, and then to 15 ppm starting in 2010. The sulfur reductions made it possible for manufacturers to use clean engine technologies to reduce pollution, similar to those introduced in onroad vehicles. These engine standards took effect, based on engine hp, beginning in 2008. This rule applies to diesel engines used primarily in most construction, agricultural, industrial, and airport support equipment. The standards were fully phased in by 2014, though engines greater than 750 hp will have an additional year (2015) to comply. The Tier 4 standards are presented in Table 5-12.

Table 5-12. Tier 4 Emissions Standards (g/bhp-hr)

Rated Power	First year the standards apply	PM10	NOx
hp < 25	2008	0.3	-
25 ≤hp < 75	2013	0.02	3.5
75 ≤hp < 175	2012 - 2013	0.01	0.3
175 ≤hp <750	2011 - 2013	0.01	0.3
hp ≥750	2011 - 2014	0.075	0.5 (gensets greater than 1,200 hp); 2.6 (all other)
	2015	0.02 (gensets); 0.03 (all other engines)	0.5 (gensets only)

5.1.2 Other Rules

In addition to the federal rules, TexN also accounts for Texas Low Emission Diesel (TxLED) and Reformulated Gasoline (RFG) gasoline for the appropriate counties and years. The Clean Air Act Amendments of 1990 required RFG to be used in areas with high ozone air pollution and encouraged states to expand the RFG requirement to other areas with ozone challenges voluntarily. Texas counties required to use RFG include the eight-county HGB area; while the four-county DFW voluntarily opted into the program. RFG used in these counties in the summer months may not exceed a Reid vapor pressure (RVP) of 6.8 pounds per square inch (psi). Conventional gasoline in other

parts of the state may have gasoline with a RVP as high as 7.8 psi. During the winter months, the areas using RFG may have a RVP as high as 11.5 psi, equal to that of conventional gasoline. The TxLED program applies to diesel fuel sold in a 110-county area in central and eastern Texas. The TxLED program requires diesel fuel to have less than 10 percent aromatic hydrocarbons by volume and a cetane number of 48 or greater. Alternative formulation may be acceptable, if meeting the standards and approved by TCEQ.

5.1.3 Emissions Trends

The sections below present the current results for both the controlled and uncontrolled emissions, population, and activity data for the 2008 through 2040 trends. The plots illustrate statewide controlled versus uncontrolled emissions, population, and activity. The plots clearly show the effectiveness of the collective controls on targeted emissions: VOC, NO_X, PM_{10}, and $PM_{2.5}$. Although the population and activity for the controlled and uncontrolled scenarios are exactly the same and increase over time, as expected, the plots clearly illustrate the associated emissions for these targeted pollutants decrease.

5.1.3.1 Controlled Emissions Trends

The resulting trends data for selected areas and for specified pollutants can be seen below.

Table 5-13. 2008 – 2040 Statewide OSD Controlled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	360	578	3,017	57.22	55.14	13.41	9,226,898	6,624,893
2009	340	542	2,864	55.30	53.28	13.44	9,410,594	6,839,345
2010	308	493	2,751	51.71	49.80	0.92	9,584,465	6,991,021
2011	299	484	2,370	48.79	46.97	0.49	9,765,464	7,181,921
2012	269	443	2,266	45.54	43.82	0.49	9,951,249	7,373,417
2013	251	425	2,203	43.16	41.52	0.49	10,150,974	7,587,522
2014	231	389	2,131	40.40	38.85	0.52	10,345,070	7,785,189
2015	223	355	2,089	36.99	35.55	0.52	10,529,802	7,944,288
2016	212	325	2,057	33.54	32.20	0.52	10,711,458	8,092,901
2017	201	296	2,031	30.01	28.79	0.53	10,882,942	8,215,086
2018	192	269	2,012	26.55	25.44	0.53	11,046,124	8,312,420
2019	185	247	2,004	23.60	22.58	0.53	11,205,480	8,397,824
2020	180	229	2,005	21.36	20.40	0.53	11,364,770	8,480,610
2021	176	214	2,010	19.56	18.66	0.54	11,526,010	8,564,903
2022	174	203	2,021	18.27	17.41	0.54	11,686,891	8,646,862
2023	172	194	2,034	17.20	16.38	0.55	11,846,010	8,723,784
2024	170	187	2,054	16.28	15.48	0.56	12,005,677	8,798,731
2025	169	181	2,065	15.49	14.71	0.56	12,160,507	8,864,835
2026	168	176	2,084	14.82	14.06	0.57	12,316,902	8,931,448
2027	168	172	2,103	14.23	13.49	0.57	12,472,662	8,995,902
2028	168	169	2,123	13.77	13.04	0.58	12,628,567	9,060,517
2029	168	166	2,145	13.37	12.65	0.58	12,784,058	9,124,017
2030	168	164	2,167	13.03	12.31	0.59	12,939,224	9,186,828
2031	169	162	2,190	12.73	12.02	0.60	13,095,587	9,251,573
2032	170	162	2,214	12.47	11.76	0.60	13,254,196	9,321,598
2033	171	161	2,238	12.24	11.54	0.61	13,411,780	9,390,773
2034	172	161	2,263	12.06	11.36	0.62	13,566,733	9,454,317
2035	174	160	2,287	11.91	11.21	0.62	13,722,002	9,517,794
2036	175	161	2,313	11.86	11.16	0.63	13,877,529	9,581,683
2037	177	161	2,339	11.87	11.16	0.64	14,032,859	9,644,983
2038	178	161	2,365	11.88	11.17	0.64	14,187,590	9,707,182
2039	180	162	2,391	11.92	11.20	0.65	14,342,593	9,769,991
2040	181	163	2,417	11.96	11.24	0.66	14,498,841	9,835,841

Table 5-14. 2008 – 2040 Beaumont-Port Arthur Area OSD Controlled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	3.36	5.06	41.19	0.57	0.55	0.14	142,630	63,216
2009	3.20	4.79	39.21	0.57	0.55	0.14	145,630	65,374
2010	3.01	4.36	37.82	0.53	0.51	0.01	148,282	66,554
2011	2.80	4.18	31.21	0.52	0.50	0.01	151,040	68,139
2012	2.51	3.89	29.69	0.49	0.47	0.01	153,934	70,149
2013	2.36	3.59	28.64	0.45	0.43	0.01	156,557	71,267
2014	2.17	3.22	27.83	0.42	0.41	0.01	159,353	72,729
2015	2.12	2.92	27.20	0.39	0.37	0.01	162,077	73,953
2016	2.04	2.69	26.95	0.36	0.35	0.01	164,844	75,273
2017	1.98	2.49	26.85	0.34	0.32	0.01	167,646	76,646
2018	1.92	2.25	26.80	0.30	0.29	0.01	170,052	76,942
2019	1.89	2.09	26.88	0.28	0.26	0.01	172,623	77,649
2020	1.87	1.96	27.03	0.26	0.25	0.01	175,244	78,476
2021	1.86	1.85	27.23	0.24	0.23	0.01	177,847	79,249
2022	1.86	1.77	27.50	0.23	0.22	0.01	180,489	80,115
2023	1.87	1.71	27.80	0.22	0.21	0.01	183,120	80,944
2024	1.88	1.65	28.23	0.21	0.20	0.01	185,716	81,619
2025	1.88	1.60	28.42	0.20	0.19	0.01	188,189	82,070
2026	1.89	1.55	28.77	0.20	0.19	0.01	190,714	82,588
2027	1.91	1.51	29.11	0.19	0.18	0.01	193,233	83,088
2028	1.92	1.48	29.47	0.19	0.17	0.01	195,756	83,599
2029	1.93	1.45	29.83	0.18	0.17	0.01	198,275	84,098
2030	1.95	1.43	30.19	0.18	0.17	0.01	200,796	84,600
2031	1.97	1.41	30.56	0.18	0.17	0.01	203,329	85,132
2032	1.99	1.40	30.93	0.17	0.16	0.01	205,877	85,712
2033	2.01	1.39	31.31	0.17	0.16	0.01	208,424	86,287
2034	2.03	1.38	31.69	0.17	0.16	0.01	210,946	86,793
2035	2.05	1.37	32.07	0.17	0.16	0.01	213,463	87,283
2036	2.07	1.36	32.46	0.17	0.16	0.01	215,985	87,787
2037	2.09	1.36	32.85	0.17	0.16	0.01	218,512	88,300
2038	2.11	1.36	33.24	0.17	0.16	0.01	221,048	88,840
2039	2.14	1.37	33.64	0.17	0.16	0.01	223,588	89,393
2040	2.16	1.37	34.04	0.17	0.16	0.01	226,144	89,991

Table 5-15. 2008 – 2040 Dallas-Fort Worth Area OSD Controlled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	57.39	90.46	670.50	8.42	8.10	1.90	2,067,090	975,380
2009	53.70	83.73	636.87	8.09	7.78	1.87	2,106,495	999,774
2010	51.24	76.58	616.99	7.55	7.25	0.14	2,144,463	1,016,891
2011	49.83	74.75	558.95	7.18	6.89	0.09	2,184,327	1,039,090
2012	44.26	70.59	533.47	6.92	6.64	0.09	2,227,948	1,068,714
2013	40.74	67.89	517.91	6.66	6.39	0.09	2,274,077	1,101,337
2014	37.55	62.22	508.33	6.36	6.10	0.10	2,318,588	1,132,891
2015	36.58	57.38	501.10	5.99	5.74	0.10	2,362,110	1,159,948
2016	35.09	53.37	494.31	5.59	5.35	0.10	2,405,256	1,185,577
2017	33.91	49.31	489.08	5.16	4.93	0.10	2,446,171	1,207,130
2018	33.02	45.62	485.42	4.74	4.52	0.10	2,485,701	1,225,136
2019	32.36	42.36	485.34	4.35	4.14	0.11	2,524,119	1,240,749
2020	31.93	39.58	486.94	4.02	3.83	0.11	2,562,475	1,256,078
2021	31.70	37.39	489.80	3.77	3.58	0.11	2,601,456	1,272,324
2022	31.62	35.67	493.65	3.59	3.41	0.11	2,640,362	1,288,542
2023	31.61	34.21	498.08	3.44	3.26	0.11	2,678,920	1,304,071
2024	31.71	33.03	504.65	3.30	3.13	0.11	2,717,924	1,320,081
2025	31.74	32.01	508.00	3.18	3.01	0.11	2,755,416	1,333,605
2026	31.88	31.18	513.65	3.08	2.91	0.11	2,793,590	1,347,922
2027	32.05	30.51	519.60	3.00	2.83	0.12	2,831,719	1,362,063
2028	32.26	30.01	525.79	2.93	2.76	0.12	2,870,014	1,376,537
2029	32.50	29.60	532.23	2.88	2.71	0.12	2,908,285	1,390,956
2030	32.76	29.28	538.88	2.83	2.67	0.12	2,946,546	1,405,301
2031	33.06	29.08	545.71	2.80	2.63	0.12	2,985,218	1,420,288
2032	33.39	29.02	552.66	2.77	2.60	0.12	3,024,399	1,436,220
2033	33.73	28.97	559.66	2.74	2.57	0.12	3,063,173	1,451,752
2034	34.07	28.88	566.67	2.71	2.55	0.13	3,101,006	1,465,656
2035	34.43	28.87	573.73	2.70	2.53	0.13	3,139,209	1,480,047
2036	34.80	28.94	580.91	2.70	2.53	0.13	3,177,559	1,494,733
2037	35.18	29.04	588.16	2.71	2.54	0.13	3,215,912	1,509,341
2038	35.55	29.17	595.43	2.72	2.55	0.13	3,254,113	1,523,678
2039	35.93	29.34	602.73	2.73	2.56	0.13	3,292,356	1,538,103
2040	36.32	29.56	610.05	2.75	2.58	0.14	3,330,849	1,553,113

Table 5-16. 2008 – 2040 Houston-Galveston-Brazoria Area OSD Controlled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	49.00	68.87	555.42	6.08	5.85	1.36	1,905,655	727,798
2009	47.59	62.95	531.89	5.83	5.61	1.32	1,941,983	746,548
2010	44.42	58.19	512.22	5.47	5.26	0.11	1,977,266	760,771
2011	43.05	55.57	453.40	5.23	5.02	0.08	2,012,749	777,270
2012	37.67	51.96	433.71	5.04	4.83	0.08	2,051,311	799,623
2013	35.62	49.80	422.69	4.89	4.69	0.08	2,092,356	824,625
2014	31.98	45.67	413.88	4.69	4.50	0.08	2,132,219	848,432
2015	31.36	42.20	405.16	4.45	4.26	0.08	2,171,493	869,497
2016	29.90	39.20	398.44	4.18	4.01	0.08	2,210,193	889,388
2017	28.70	36.07	392.84	3.88	3.71	0.08	2,246,423	905,251
2018	27.71	33.10	388.33	3.56	3.40	0.08	2,281,123	917,584
2019	26.92	30.55	387.39	3.26	3.11	0.08	2,315,064	928,127
2020	26.35	28.41	388.00	3.01	2.87	0.08	2,349,166	938,778
2021	25.98	26.74	389.70	2.81	2.67	0.08	2,383,931	950,454
2022	25.73	25.43	392.28	2.67	2.54	0.09	2,418,758	962,316
2023	25.56	24.34	395.39	2.56	2.43	0.09	2,453,251	973,550
2024	25.48	23.45	400.08	2.46	2.33	0.09	2,488,003	985,048
2025	25.38	22.69	402.71	2.37	2.24	0.09	2,521,741	994,883
2026	25.37	22.09	406.94	2.29	2.17	0.09	2,555,978	1,005,279
2027	25.39	21.61	411.48	2.23	2.10	0.09	2,590,127	1,015,441
2028	25.46	21.25	416.24	2.18	2.06	0.09	2,624,321	1,025,711
2029	25.56	20.95	421.25	2.14	2.02	0.09	2,658,435	1,035,833
2030	25.69	20.71	426.48	2.10	1.98	0.09	2,692,427	1,045,724
2031	25.85	20.56	431.90	2.08	1.96	0.10	2,726,717	1,056,103
2032	26.05	20.52	437.44	2.05	1.93	0.10	2,761,541	1,067,541
2033	26.27	20.49	443.02	2.03	1.91	0.10	2,796,126	1,078,755
2034	26.50	20.46	448.62	2.02	1.90	0.10	2,830,209	1,089,088
2035	26.75	20.45	454.26	2.00	1.88	0.10	2,864,369	1,099,358
2036	27.01	20.50	460.00	2.00	1.88	0.10	2,898,628	1,109,774
2037	27.27	20.57	465.80	2.01	1.89	0.10	2,932,819	1,120,051
2038	27.54	20.66	471.61	2.02	1.90	0.10	2,966,832	1,130,034
2039	27.81	20.78	477.45	2.04	1.91	0.11	3,000,913	1,140,122
2040	28.10	20.93	483.31	2.05	1.92	0.11	3,035,284	1,150,795

Table 5-17. 2008 – 2040 Alamo Area OSD Controlled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	28.54	30.25	227.68	3.50	3.36	0.86	757,733	726,645
2009	28.15	28.62	220.52	3.39	3.25	0.86	774,891	758,367
2010	25.93	25.88	213.26	3.18	3.05	0.05	791,408	785,844
2011	24.87	24.98	170.79	2.99	2.86	0.03	807,918	812,027
2012	22.80	22.96	165.07	2.81	2.69	0.03	824,331	836,376
2013	21.61	22.35	161.56	2.69	2.58	0.03	840,808	859,319
2014	20.23	20.69	159.99	2.54	2.43	0.03	856,531	878,827
2015	19.22	18.95	157.47	2.34	2.24	0.03	871,662	894,889
2016	18.22	17.39	156.34	2.14	2.05	0.03	886,349	908,937
2017	17.28	15.92	155.70	1.94	1.85	0.03	900,247	920,530
2018	16.46	14.58	155.49	1.74	1.66	0.03	913,573	930,086
2019	15.82	13.41	155.71	1.57	1.50	0.03	926,568	938,338
2020	15.36	12.44	156.32	1.44	1.37	0.03	939,468	945,939
2021	15.06	11.67	157.24	1.34	1.27	0.03	952,416	953,280
2022	14.86	11.11	158.41	1.26	1.19	0.03	965,250	959,985
2023	14.71	10.64	159.74	1.20	1.13	0.03	977,923	966,155
2024	14.61	10.25	161.43	1.14	1.08	0.03	990,542	971,787
2025	14.53	9.92	162.58	1.09	1.03	0.03	1,002,899	976,890
2026	14.48	9.66	164.13	1.05	0.99	0.03	1,015,324	981,887
2027	14.47	9.44	165.72	1.02	0.96	0.03	1,027,686	986,634
2028	14.48	9.27	167.36	0.99	0.93	0.03	1,040,055	991,433
2029	14.52	9.12	169.02	0.97	0.91	0.03	1,052,387	996,126
2030	14.58	9.00	170.73	0.95	0.89	0.03	1,064,696	1,000,763
2031	14.66	8.91	172.47	0.93	0.87	0.03	1,077,071	1,005,531
2032	14.76	8.86	174.25	0.92	0.86	0.03	1,089,546	1,010,521
2033	14.87	8.82	176.06	0.90	0.85	0.04	1,101,950	1,015,446
2034	14.98	8.78	177.88	0.89	0.84	0.04	1,114,201	1,020,031
2035	15.10	8.76	179.71	0.89	0.83	0.04	1,126,453	1,024,581
2036	15.22	8.76	181.59	0.88	0.83	0.04	1,138,716	1,029,148
2037	15.35	8.77	183.48	0.89	0.83	0.04	1,150,934	1,033,618
2038	15.47	8.78	185.38	0.89	0.83	0.04	1,163,095	1,037,979
2039	15.59	8.81	187.29	0.89	0.83	0.04	1,175,257	1,042,342
2040	15.72	8.85	189.21	0.89	0.83	0.04	1,187,474	1,046,836

Table 5-18. 2008 – 2040 CAPCOG Area OSD Controlled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	22.72	32.08	197.88	3.36	3.23	0.80	614,128	508,833
2009	21.87	30.41	189.95	3.23	3.11	0.79	627,055	527,604
2010	20.18	27.05	183.50	3.05	2.94	0.05	639,610	544,325
2011	19.35	25.10	147.10	2.79	2.68	0.03	651,891	558,626
2012	17.45	23.03	139.97	2.62	2.52	0.03	665,125	575,406
2013	16.57	22.91	136.44	2.52	2.42	0.03	678,906	592,920
2014	15.43	21.65	134.19	2.38	2.28	0.03	692,141	608,710
2015	14.91	19.23	131.86	2.17	2.08	0.03	704,407	620,426
2016	14.16	17.36	130.45	1.97	1.88	0.03	716,314	630,607
2017	13.49	15.69	129.58	1.77	1.69	0.03	727,698	639,120
2018	12.90	14.20	129.11	1.58	1.51	0.03	738,563	645,907
2019	12.45	12.98	129.05	1.42	1.35	0.03	749,123	651,647
2020	12.12	11.99	129.36	1.29	1.23	0.03	759,641	657,057
2021	11.90	11.20	129.98	1.19	1.13	0.03	770,268	662,555
2022	11.76	10.64	130.87	1.12	1.06	0.03	780,839	667,755
2023	11.66	10.18	131.93	1.06	1.00	0.03	791,278	672,562
2024	11.60	9.80	133.43	1.01	0.95	0.04	801,749	677,142
2025	11.54	9.49	134.24	0.97	0.91	0.04	811,904	681,146
2026	11.52	9.24	135.53	0.93	0.88	0.04	822,181	685,186
2027	11.52	9.03	136.86	0.90	0.85	0.04	832,426	689,078
2028	11.53	8.87	138.22	0.88	0.83	0.04	842,713	693,086
2029	11.57	8.74	139.62	0.86	0.81	0.04	852,999	697,074
2030	11.62	8.64	141.05	0.84	0.79	0.04	863,293	701,062
2031	11.69	8.58	142.52	0.83	0.78	0.04	873,740	705,379
2032	11.78	8.57	144.04	0.81	0.77	0.04	884,440	710,247
2033	11.87	8.57	145.57	0.81	0.76	0.04	895,118	715,117
2034	11.97	8.58	147.12	0.80	0.75	0.04	905,753	719,846
2035	12.08	8.61	148.68	0.79	0.74	0.04	916,393	724,576
2036	12.18	8.65	150.28	0.79	0.74	0.04	927,074	729,399
2037	12.30	8.71	151.89	0.80	0.74	0.04	937,753	734,207
2038	12.41	8.77	153.52	0.80	0.75	0.04	948,351	738,815
2039	12.52	8.85	155.15	0.80	0.75	0.04	958,960	743,441
2040	12.63	8.93	156.78	0.81	0.76	0.04	969,631	748,220

Table 5-19. 2008 – 2040 El Paso OSD Controlled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	4.59	8.37	63.68	0.75	0.72	0.19	207,654	78,895
2009	4.38	8.39	60.94	0.76	0.73	0.20	212,012	81,822
2010	4.14	7.86	58.63	0.72	0.70	0.03	216,007	83,334
2011	3.95	7.37	55.19	0.67	0.65	0.01	220,030	84,806
2012	3.51	6.83	52.91	0.63	0.61	0.01	224,247	86,877
2013	3.22	6.43	51.30	0.60	0.57	0.01	228,498	89,476
2014	2.82	5.83	42.90	0.55	0.53	0.01	232,725	91,322
2015	2.71	5.44	42.09	0.51	0.49	0.01	237,057	93,985
2016	2.69	5.69	42.02	0.49	0.47	0.01	241,899	100,129
2017	2.65	5.31	41.97	0.45	0.43	0.01	246,273	103,522
2018	2.61	4.83	42.03	0.40	0.39	0.01	250,442	105,898
2019	2.58	4.46	42.24	0.36	0.35	0.01	254,520	107,834
2020	2.57	4.17	42.56	0.33	0.32	0.01	258,614	109,851
2021	2.58	3.92	42.97	0.30	0.29	0.01	262,684	111,589
2022	2.59	3.76	43.46	0.29	0.27	0.01	266,757	113,326
2023	2.60	3.61	43.99	0.27	0.26	0.01	270,755	114,664
2024	2.62	3.51	44.70	0.26	0.25	0.01	274,819	116,220
2025	2.63	3.42	45.13	0.25	0.23	0.01	278,727	117,379
2026	2.65	3.35	45.74	0.24	0.23	0.01	282,702	118,676
2027	2.68	3.30	46.37	0.23	0.22	0.01	286,667	119,975
2028	2.69	3.24	46.99	0.22	0.21	0.01	290,568	120,849
2029	2.71	3.19	47.62	0.22	0.21	0.01	294,465	121,707
2030	2.73	3.16	48.26	0.21	0.20	0.01	298,390	122,757
2031	2.75	3.12	48.89	0.21	0.20	0.01	302,268	123,485
2032	2.78	3.11	49.55	0.20	0.19	0.01	306,237	124,748
2033	2.82	3.12	50.22	0.20	0.19	0.01	310,216	126,103
2034	2.85	3.11	50.88	0.20	0.19	0.01	314,141	127,236
2035	2.88	3.12	51.55	0.20	0.19	0.01	318,076	128,411
2036	2.91	3.13	52.23	0.20	0.19	0.01	322,006	129,540
2037	2.94	3.14	52.91	0.20	0.19	0.01	325,928	130,626
2038	2.97	3.15	53.59	0.20	0.19	0.01	329,848	131,704
2039	3.00	3.17	54.28	0.20	0.19	0.01	333,779	132,860
2040	3.04	3.19	54.97	0.20	0.19	0.01	337,732	134,112

5.1.3.2 Uncontrolled Emissions

To create the uncontrolled emissions, the adjustments for TxLED and RFG gasoline were turned off (not applied) and alternative technology type files for both exhaust emissions and evaporative emissions were created, setting the technology phase-ins to the year 1900 for all cases, which is the oldest available year in the technology type file, thus modeling an uncontrolled scenario. The results of the uncontrolled emissions for specific areas and pollutants are presented below.

Table 5-20. 2008 – 2040 Statewide OSD Uncontrolled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	869	1,289	5,764	200.39	193.95	13.65	9,226,898	6,624,893
2009	850	1,288	5,828	202.13	195.62	13.68	9,410,594	6,839,345
2010	749	1,226	5,786	201.78	195.26	1.01	9,584,465	6,991,021
2011	754	1,297	5,106	202.66	196.11	0.55	9,765,464	7,181,921
2012	753	1,295	5,143	206.55	199.87	0.55	9,951,249	7,373,417
2013	769	1,358	5,251	215.73	208.76	0.57	10,150,974	7,587,522
2014	777	1,395	5,292	223.52	216.31	0.61	10,345,070	7,785,189
2015	798	1,429	5,397	229.21	221.82	0.62	10,529,802	7,944,288
2016	812	1,468	5,495	235.26	227.69	0.63	10,711,458	8,092,901
2017	825	1,495	5,586	239.74	232.02	0.64	10,882,942	8,215,086
2018	837	1,516	5,672	243.20	235.37	0.65	11,046,124	8,312,420
2019	848	1,534	5,755	246.27	238.35	0.66	11,205,479	8,397,824
2020	859	1,553	5,839	249.51	241.48	0.67	11,364,770	8,480,610
2021	870	1,575	5,925	253.12	244.97	0.68	11,526,009	8,564,903
2022	881	1,597	6,011	256.78	248.52	0.69	11,686,891	8,646,862
2023	892	1,617	6,096	260.23	251.86	0.70	11,846,010	8,723,784
2024	904	1,638	6,195	263.64	255.17	0.71	12,005,677	8,798,731
2025	913	1,657	6,263	266.96	258.38	0.71	12,160,507	8,864,835
2026	924	1,676	6,348	270.23	261.54	0.72	12,316,902	8,931,448
2027	935	1,696	6,433	273.50	264.71	0.73	12,472,662	8,995,902
2028	945	1,715	6,517	276.74	267.85	0.74	12,628,567	9,060,517
2029	956	1,733	6,602	279.94	270.95	0.75	12,784,058	9,124,017
2030	966	1,753	6,686	283.16	274.06	0.76	12,939,224	9,186,828
2031	977	1,773	6,772	286.52	277.32	0.77	13,095,587	9,251,572
2032	988	1,796	6,859	290.30	280.98	0.77	13,254,196	9,321,598
2033	999	1,817	6,945	293.90	284.47	0.78	13,411,780	9,390,773
2034	1,010	1,837	7,030	297.19	287.65	0.79	13,566,732	9,454,317
2035	1,020	1,858	7,115	300.55	290.91	0.80	13,722,002	9,517,794
2036	1,031	1,878	7,200	303.92	294.18	0.81	13,877,529	9,581,683
2037	1,042	1,899	7,285	307.27	297.41	0.82	14,032,859	9,644,983
2038	1,052	1,918	7,369	310.50	300.55	0.83	14,187,589	9,707,182
2039	1,063	1,938	7,454	313.83	303.77	0.84	14,342,593	9,769,991
2040	1,074	1,960	7,540	317.37	307.20	0.85	14,498,841	9,835,841

Table 5-21. 2008 – 2040 Beaumont-Port Arthur Area OSD Uncontrolled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	8.10	10.45	71.18	1.56	1.51	0.14	142,630	63,216
2009	8.22	10.68	72.49	1.59	1.54	0.14	145,630	65,374
2010	8.13	10.45	73.71	1.58	1.53	0.01	148,282	66,554
2011	8.05	10.87	64.50	1.61	1.56	0.01	151,040	68,139
2012	8.08	11.15	65.08	1.65	1.59	0.01	153,934	70,149
2013	8.24	11.28	66.18	1.66	1.60	0.01	156,557	71,267
2014	8.33	11.31	67.25	1.68	1.63	0.01	159,353	72,729
2015	8.53	11.48	68.34	1.71	1.65	0.01	162,077	73,953
2016	8.68	11.69	69.53	1.74	1.69	0.01	164,844	75,273
2017	8.84	11.95	70.74	1.78	1.72	0.01	167,646	76,646
2018	8.93	11.86	71.66	1.77	1.71	0.01	170,052	76,942
2019	9.05	11.94	72.71	1.78	1.72	0.01	172,623	77,649
2020	9.18	12.08	73.81	1.80	1.74	0.01	175,244	78,476
2021	9.30	12.20	74.90	1.82	1.75	0.01	177,847	79,249
2022	9.43	12.36	76.02	1.84	1.78	0.01	180,489	80,115
2023	9.56	12.51	77.14	1.86	1.80	0.01	183,120	80,944
2024	9.70	12.59	78.50	1.87	1.81	0.01	185,716	81,619
2025	9.79	12.63	79.17	1.88	1.81	0.01	188,189	82,070
2026	9.90	12.68	80.24	1.88	1.82	0.01	190,714	82,588
2027	10.02	12.74	81.30	1.89	1.83	0.01	193,233	83,088
2028	10.13	12.79	82.36	1.90	1.83	0.01	195,756	83,599
2029	10.25	12.85	83.42	1.90	1.84	0.01	198,275	84,098
2030	10.36	12.91	84.48	1.91	1.84	0.01	200,796	84,600
2031	10.48	12.98	85.56	1.92	1.85	0.01	203,329	85,132
2032	10.60	13.06	86.64	1.93	1.86	0.01	205,877	85,712
2033	10.72	13.14	87.72	1.94	1.87	0.01	208,424	86,287
2034	10.83	13.20	88.78	1.95	1.88	0.01	210,946	86,793
2035	10.95	13.25	89.84	1.95	1.89	0.01	213,463	87,283
2036	11.06	13.31	90.90	1.96	1.89	0.01	215,985	87,787
2037	11.18	13.38	91.97	1.97	1.90	0.01	218,512	88,300
2038	11.29	13.46	93.04	1.98	1.91	0.01	221,048	88,840
2039	11.41	13.54	94.12	1.99	1.92	0.01	223,588	89,393
2040	11.53	13.65	95.21	2.00	1.93	0.01	226,144	89,991

Table 5-22. 2008 – 2040 Dallas-Fort Worth Area OSD Uncontrolled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	140.67	175.45	1,267.04	23.13	22.35	1.97	2,067,090	975,380
2009	141.95	172.52	1,289.80	22.89	22.12	1.94	2,106,495	999,774
2010	139.28	166.65	1,307.50	22.49	21.73	0.20	2,144,463	1,016,891
2011	138.49	176.11	1,133.85	22.49	21.73	0.11	2,184,327	1,039,090
2012	138.17	181.26	1,140.21	23.54	22.74	0.11	2,227,948	1,068,714
2013	141.24	190.07	1,165.53	24.71	23.88	0.11	2,274,077	1,101,337
2014	142.91	194.95	1,185.36	25.81	24.94	0.12	2,318,588	1,132,891
2015	147.17	201.32	1,214.30	26.79	25.89	0.12	2,362,110	1,159,948
2016	150.09	208.02	1,237.86	27.72	26.80	0.13	2,405,256	1,185,577
2017	152.71	212.76	1,259.91	28.37	27.42	0.13	2,446,171	1,207,130
2018	155.13	216.66	1,281.12	28.87	27.90	0.13	2,485,701	1,225,136
2019	157.39	219.66	1,301.62	29.22	28.25	0.13	2,524,119	1,240,749
2020	159.64	222.60	1,322.10	29.58	28.59	0.13	2,562,475	1,256,078
2021	161.98	226.13	1,343.06	30.02	29.01	0.14	2,601,456	1,272,324
2022	164.32	229.57	1,364.05	30.46	29.44	0.14	2,640,362	1,288,542
2023	166.62	232.80	1,384.95	30.86	29.83	0.14	2,678,920	1,304,071
2024	169.23	235.98	1,410.39	31.25	30.20	0.14	2,717,924	1,320,081
2025	171.11	238.97	1,425.62	31.62	30.57	0.14	2,755,416	1,333,605
2026	173.41	242.01	1,446.67	32.00	30.93	0.15	2,793,589	1,347,922
2027	175.70	245.14	1,467.74	32.39	31.30	0.15	2,831,719	1,362,063
2028	178.01	248.49	1,488.96	32.80	31.70	0.15	2,870,014	1,376,537
2029	180.33	251.88	1,510.18	33.22	32.11	0.15	2,908,285	1,390,956
2030	182.65	255.31	1,531.41	33.64	32.51	0.15	2,946,546	1,405,301
2031	185.02	259.18	1,552.95	34.12	32.98	0.16	2,985,218	1,420,288
2032	187.45	263.47	1,574.81	34.67	33.51	0.16	3,024,399	1,436,220
2033	189.85	267.30	1,596.39	35.15	33.98	0.16	3,063,173	1,451,752
2034	192.12	270.43	1,617.37	35.53	34.34	0.16	3,101,006	1,465,656
2035	194.45	274.00	1,638.63	35.96	34.76	0.17	3,139,209	1,480,047
2036	196.79	277.74	1,660.02	36.42	35.21	0.17	3,177,559	1,494,733
2037	199.13	281.46	1,681.40	36.88	35.65	0.17	3,215,912	1,509,341
2038	201.45	284.97	1,702.65	37.31	36.06	0.17	3,254,112	1,523,677
2039	203.77	288.61	1,723.96	37.75	36.49	0.17	3,292,356	1,538,103
2040	206.14	292.50	1,745.47	38.23	36.96	0.18	3,330,849	1,553,113

Table 5-23. 2008 – 2040 Houston-Galveston-Brazoria Area OSD Uncontrolled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	107.70	129.89	974.29	15.84	15.30	1.58	1,905,655	727,798
2009	109.97	126.96	991.00	15.54	15.01	1.53	1,941,983	746,548
2010	110.67	125.78	1,013.05	15.40	14.87	0.11	1,977,266	760,771
2011	109.92	131.26	888.23	15.52	14.98	0.09	2,012,749	777,270
2012	109.31	134.97	898.09	16.24	15.68	0.09	2,051,311	799,623
2013	112.19	142.75	917.93	17.19	16.60	0.09	2,092,356	824,625
2014	112.85	146.83	936.43	17.88	17.27	0.10	2,132,219	848,432
2015	116.53	152.51	954.49	18.61	17.98	0.10	2,171,493	869,497
2016	118.83	157.77	973.50	19.31	18.65	0.10	2,210,193	889,388
2017	120.84	161.07	991.05	19.72	19.06	0.10	2,246,423	905,251
2018	122.62	163.44	1,007.76	19.98	19.30	0.11	2,281,123	917,584
2019	124.29	165.16	1,024.05	20.13	19.45	0.11	2,315,064	928,127
2020	125.98	166.99	1,040.47	20.31	19.62	0.11	2,349,165	938,778
2021	127.76	169.43	1,057.36	20.58	19.88	0.11	2,383,931	950,454
2022	129.55	171.84	1,074.34	20.85	20.15	0.11	2,418,758	962,316
2023	131.30	174.06	1,091.23	21.10	20.38	0.11	2,453,251	973,550
2024	133.27	176.26	1,111.16	21.33	20.61	0.12	2,488,003	985,048
2025	134.74	178.35	1,124.29	21.56	20.83	0.12	2,521,741	994,883
2026	136.50	180.52	1,141.23	21.80	21.06	0.12	2,555,978	1,005,279
2027	138.24	182.71	1,158.14	22.03	21.29	0.12	2,590,127	1,015,441
2028	140.00	184.98	1,175.10	22.28	21.53	0.12	2,624,321	1,025,711
2029	141.75	187.21	1,192.02	22.52	21.76	0.12	2,658,435	1,035,833
2030	143.48	189.38	1,208.87	22.75	21.98	0.13	2,692,427	1,045,724
2031	145.26	191.91	1,225.92	23.02	22.24	0.13	2,726,717	1,056,103
2032	147.11	194.97	1,243.32	23.38	22.59	0.13	2,761,541	1,067,541
2033	148.94	197.66	1,260.56	23.69	22.89	0.13	2,796,126	1,078,755
2034	150.71	200.17	1,277.54	23.96	23.15	0.13	2,830,209	1,089,088
2035	152.48	202.70	1,294.56	24.23	23.41	0.13	2,864,369	1,099,358
2036	154.26	205.30	1,311.63	24.51	23.69	0.14	2,898,628	1,109,774
2037	156.03	207.83	1,328.67	24.79	23.95	0.14	2,932,819	1,120,051
2038	157.77	210.15	1,345.59	25.03	24.19	0.14	2,966,832	1,130,034
2039	159.52	212.59	1,362.58	25.29	24.44	0.14	3,000,913	1,140,122
2040	161.32	215.27	1,379.76	25.59	24.73	0.14	3,035,284	1,150,795

Table 5-24. 2008 – 2040 AACOG Area OSD Uncontrolled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	56.05	65.23	386.60	10.62	10.26	0.85	757,733	726,645
2009	57.50	66.00	396.35	10.70	10.34	0.85	774,891	758,367
2010	55.12	63.08	397.97	10.65	10.28	0.05	791,408	785,844
2011	55.15	65.03	335.59	10.59	10.22	0.03	807,918	812,027
2012	55.46	65.17	339.70	10.79	10.42	0.03	824,331	836,376
2013	56.82	69.53	347.09	11.37	10.98	0.03	840,808	859,319
2014	57.86	72.21	356.10	11.81	11.40	0.03	856,531	878,827
2015	58.93	73.84	361.79	12.11	11.70	0.03	871,662	894,889
2016	59.95	75.40	368.17	12.38	11.96	0.03	886,349	908,937
2017	60.85	76.59	374.13	12.59	12.16	0.04	900,247	920,530
2018	61.67	77.50	379.78	12.75	12.32	0.04	913,573	930,086
2019	62.44	78.26	385.28	12.89	12.45	0.04	926,568	938,338
2020	63.19	79.09	390.79	13.04	12.59	0.04	939,468	945,939
2021	63.96	80.14	396.43	13.21	12.76	0.04	952,416	953,280
2022	64.71	81.21	402.07	13.40	12.94	0.04	965,250	959,985
2023	65.45	82.20	407.64	13.57	13.11	0.04	977,923	966,155
2024	66.21	83.15	413.91	13.73	13.26	0.04	990,542	971,787
2025	66.86	84.12	418.51	13.90	13.42	0.04	1,002,899	976,890
2026	67.57	85.09	424.07	14.06	13.59	0.04	1,015,324	981,887
2027	68.27	86.08	429.61	14.23	13.75	0.04	1,027,686	986,634
2028	68.97	87.09	435.16	14.40	13.91	0.04	1,040,055	991,433
2029	69.67	88.09	440.70	14.57	14.07	0.04	1,052,387	996,126
2030	70.37	89.09	446.22	14.73	14.23	0.04	1,064,696	1,000,763
2031	71.07	90.17	451.80	14.91	14.40	0.04	1,077,071	1,005,531
2032	71.79	91.32	457.45	15.10	14.58	0.04	1,089,546	1,010,521
2033	72.50	92.37	463.03	15.27	14.75	0.04	1,101,950	1,015,446
2034	73.19	93.33	468.52	15.43	14.91	0.04	1,114,201	1,020,031
2035	73.88	94.30	474.01	15.59	15.06	0.04	1,126,453	1,024,581
2036	74.57	95.26	479.51	15.75	15.22	0.04	1,138,715	1,029,148
2037	75.26	96.18	484.96	15.90	15.36	0.05	1,150,934	1,033,618
2038	75.93	97.01	490.37	16.04	15.50	0.05	1,163,095	1,037,979
2039	76.60	97.86	495.78	16.19	15.64	0.05	1,175,257	1,042,342
2040	77.29	98.73	501.22	16.33	15.78	0.05	1,187,474	1,046,836

Table 5-25. 2008 – 2040 CAPCOG Area OSD Uncontrolled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	47.78	72.06	343.98	10.88	10.52	0.80	614,128	508,833
2009	48.27	73.54	350.35	10.85	10.49	0.79	627,055	527,604
2010	46.33	69.78	352.77	10.87	10.51	0.06	639,610	544,325
2011	46.22	68.97	299.30	10.49	10.14	0.03	651,891	558,626
2012	46.16	69.44	300.37	10.79	10.43	0.03	665,125	575,406
2013	47.50	75.65	307.74	11.55	11.16	0.04	678,906	592,920
2014	48.36	81.19	315.93	12.21	11.81	0.04	692,141	608,710
2015	49.62	81.61	322.14	12.49	12.08	0.04	704,407	620,426
2016	50.43	82.73	327.48	12.71	12.29	0.04	716,314	630,607
2017	51.17	83.63	332.54	12.88	12.45	0.04	727,698	639,120
2018	51.82	84.22	337.27	13.00	12.57	0.04	738,563	645,907
2019	52.42	84.62	341.82	13.08	12.65	0.04	749,123	651,647
2020	53.03	85.13	346.42	13.18	12.74	0.04	759,641	657,057
2021	53.66	85.94	351.20	13.32	12.88	0.04	770,268	662,555
2022	54.29	86.83	356.02	13.48	13.03	0.04	780,839	667,755
2023	54.91	87.69	360.79	13.62	13.17	0.04	791,278	672,562
2024	55.58	88.53	366.49	13.76	13.31	0.04	801,749	677,142
2025	56.11	89.35	370.06	13.90	13.44	0.04	811,904	681,146
2026	56.71	90.15	374.85	14.04	13.58	0.04	822,181	685,186
2027	57.31	90.97	379.63	14.18	13.71	0.04	832,426	689,078
2028	57.92	91.88	384.46	14.33	13.85	0.05	842,713	693,086
2029	58.52	92.82	389.30	14.48	14.00	0.05	852,999	697,074
2030	59.14	93.77	394.16	14.63	14.15	0.05	863,293	701,062
2031	59.77	94.94	399.16	14.82	14.33	0.05	873,740	705,379
2032	60.45	96.35	404.37	15.04	14.55	0.05	884,440	710,247
2033	61.13	97.71	409.56	15.26	14.76	0.05	895,118	715,117
2034	61.80	99.09	414.73	15.48	14.97	0.05	905,753	719,846
2035	62.47	100.53	419.92	15.70	15.18	0.05	916,393	724,576
2036	63.15	102.00	425.15	15.93	15.41	0.05	927,074	729,399
2037	63.83	103.48	430.38	16.16	15.63	0.05	937,753	734,207
2038	64.49	104.83	435.53	16.37	15.83	0.05	948,351	738,815
2039	65.15	106.19	440.71	16.59	16.04	0.05	958,960	743,441
2040	65.83	107.61	445.93	16.81	16.26	0.05	969,631	748,220

Table 5-25. 2008 – 2040 El Paso OSD Uncontrolled Emissions (tons/day), Activity, and Population

Year	VOC	NOX	CO	PM10-PRI	PM25-PRI	SO2	Population	Activity(hrs/yr)
2008	11.95	18.19	113.95	2.43	2.35	0.19	207,654	78,895
2009	12.04	19.80	117.33	2.59	2.50	0.20	212,012	81,822
2010	11.39	19.78	118.41	2.62	2.54	0.03	216,007	83,334
2011	11.58	20.08	117.37	2.59	2.51	0.01	220,030	84,806
2012	11.69	20.41	118.91	2.65	2.57	0.01	224,247	86,877
2013	11.94	21.41	121.21	2.82	2.73	0.01	228,498	89,476
2014	11.58	21.41	106.75	2.81	2.72	0.01	232,725	91,322
2015	11.92	22.94	108.98	3.00	2.90	0.01	237,057	93,985
2016	12.67	31.04	113.85	3.87	3.75	0.01	241,899	100,129
2017	13.09	34.51	116.97	4.25	4.12	0.01	246,273	103,522
2018	13.41	36.59	119.55	4.48	4.34	0.01	250,442	105,898
2019	13.69	38.10	121.90	4.65	4.50	0.01	254,520	107,834
2020	13.98	39.77	124.31	4.83	4.68	0.01	258,614	109,851
2021	14.23	40.86	126.53	4.96	4.80	0.01	262,684	111,589
2022	14.48	41.94	128.75	5.08	4.92	0.01	266,757	113,326
2023	14.69	42.39	130.73	5.14	4.98	0.01	270,755	114,664
2024	14.94	43.18	133.21	5.23	5.06	0.01	274,819	116,220
2025	15.12	43.62	134.73	5.28	5.12	0.01	278,727	117,379
2026	15.33	44.19	136.77	5.35	5.18	0.01	282,702	118,676
2027	15.55	44.83	138.83	5.42	5.25	0.01	286,667	119,975
2028	15.71	44.70	140.61	5.42	5.25	0.01	290,568	120,849
2029	15.88	44.56	142.38	5.41	5.24	0.01	294,465	121,707
2030	16.07	44.78	144.29	5.44	5.27	0.01	298,390	122,757
2031	16.22	44.42	145.98	5.41	5.24	0.01	302,268	123,485
2032	16.43	44.94	148.01	5.47	5.30	0.01	306,237	124,748
2033	16.65	45.63	150.09	5.55	5.37	0.01	310,216	126,103
2034	16.85	46.05	152.06	5.60	5.42	0.01	314,141	127,236
2035	17.06	46.55	154.06	5.66	5.48	0.01	318,076	128,411
2036	17.26	46.96	156.03	5.71	5.53	0.01	322,006	129,540
2037	17.45	47.30	157.97	5.75	5.57	0.01	325,928	130,626
2038	17.65	47.63	159.90	5.79	5.61	0.01	329,847	131,704
2039	17.85	48.11	161.89	5.84	5.66	0.01	333,779	132,860
2040	18.06	48.70	163.93	5.91	5.73	0.01	337,732	134,112

5.1.3.3 Controlled vs. Uncontrolled Emissions, Population, and Activity

The following plots illustrate controlled versus uncontrolled emissions, population, and activity. The plots clearly show the effectiveness of the collective controls on targeted emissions: VOC, NO_X, PM_{10}, and $PM_{2.5}$. Although the population and activity for the controlled and uncontrolled scenarios are exactly the same and increase over time, as expected, the plots clearly illustrate the associated emissions for these targeted pollutants decrease.

A slight dip in the trend line for VOC (Figure 5-4) and CO (Figure 5-6) is observed in 2011, which reflects an overall increase in fuel oxygen weight percent. As fuel oxygen weight percent goes up, emissions go down.[9] The statewide average oxygen weight percent in 2010 was 0.44, and in 2011 went up to 2.94.

Conversely, for NOX, changes in fuel oxygen weight percent, as seen in 2011, result in an increase in NOX emissions. This explains the slight increase in NOX emissions, as seen in Figure 5-5.

Figure 5-9 shows a relatively sharp drop in SO_2 emissions in 2010. This drop is indicative of the significant changes in diesel sulfur that occurred in 2010. The statewide average diesel sulfur in 2009 was 322 ppm. In 2010, this dropped to a statewide average of 15 ppm. This also explains why the controlled and uncontrolled emissions for SO_2 track almost exactly. One of the key variables when calculating emissions for SO_2 is fuel sulfur level. Fuel sulfur inputs were not changed between the controlled and uncontrolled scenarios.

[9] "Exhaust Emission Effects of Fuel Sulfur and Oxygen on Gasoline Engines." US EPA. December 2005. http://www3.epa.gov/otaq/models/nonrdmdl/nonrdmdl2005/420r05016.pdf

Figure 5-1. 2008 – 2040 Statewide Population and Activity Trends

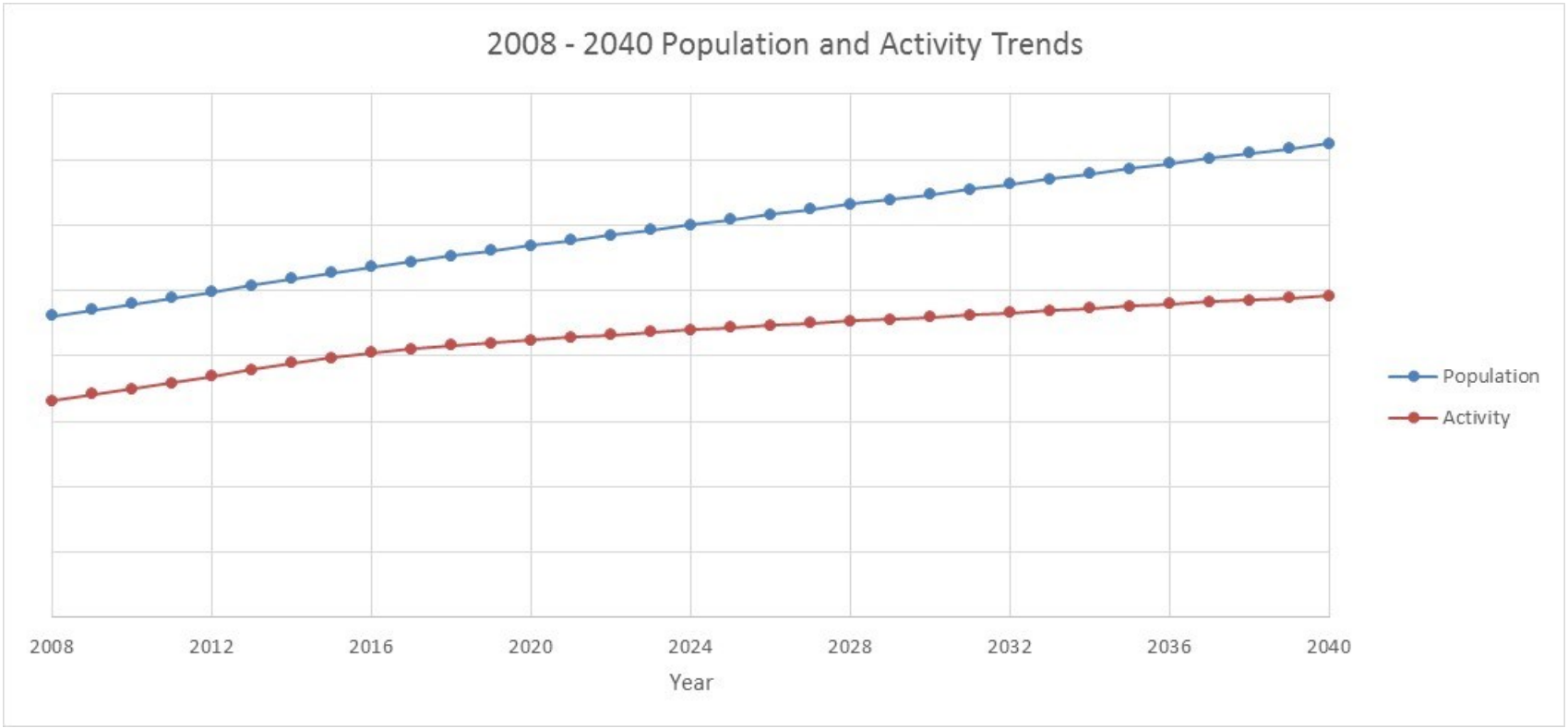


Figure 5-2. 2008 – 2040 Statewide OSD Controlled VOC and NO_X Emissions (tons/day)

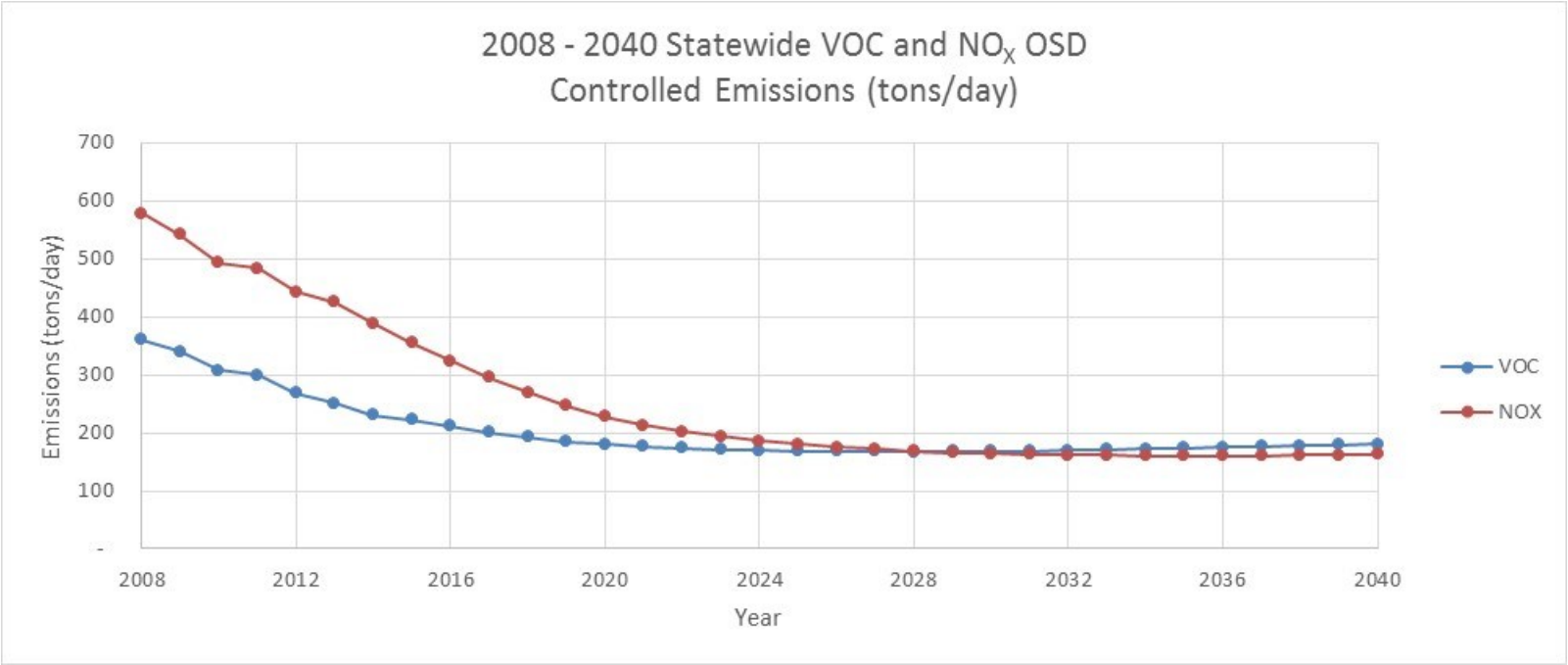


Figure 5-3. 2008 – 2040 Statewide OSD Controlled PM_{10}, $PM_{2.5}$, and SO_2 Emissions (tons/day)

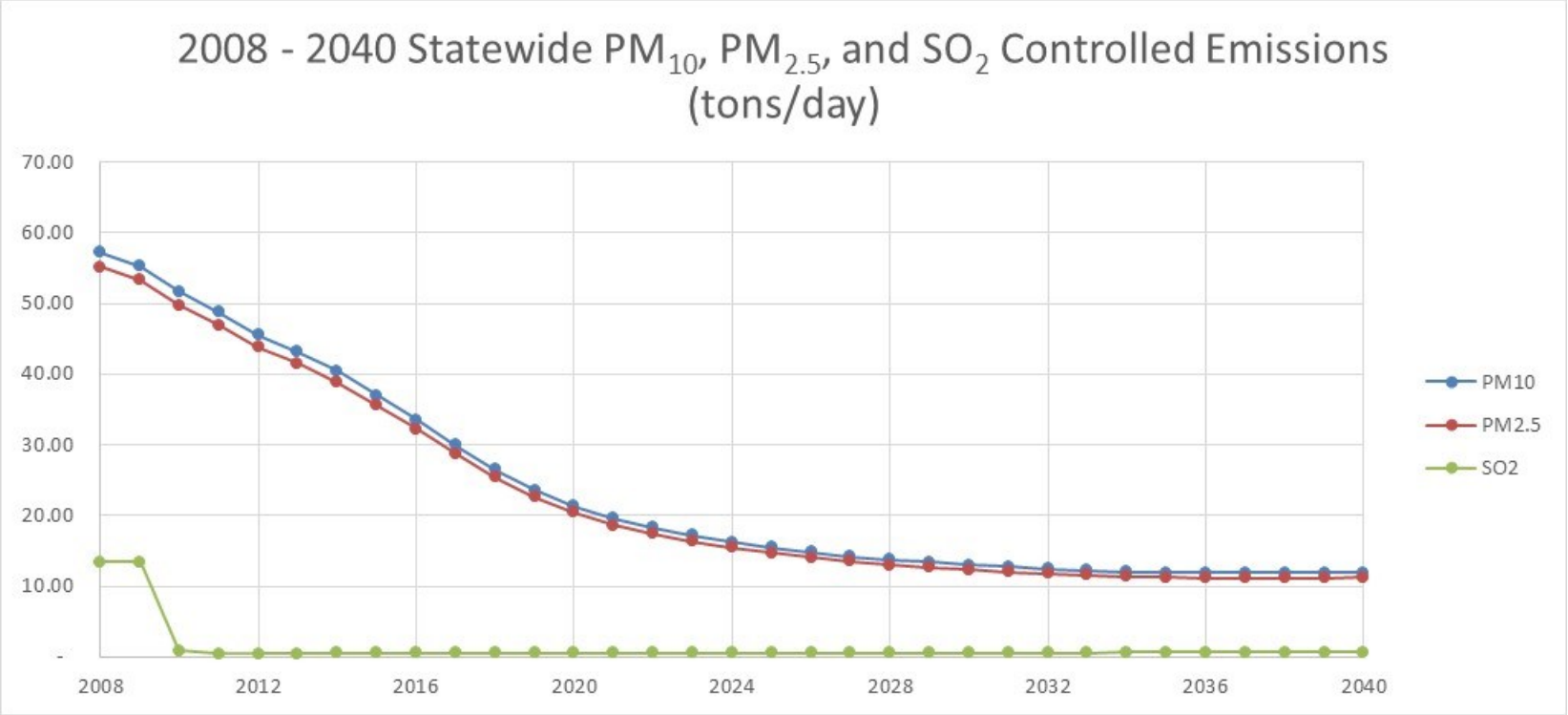


Figure 5-4. 2008 – 2040 Statewide OSD Controlled vs. Uncontrolled Emissions (tons/day) – VOC

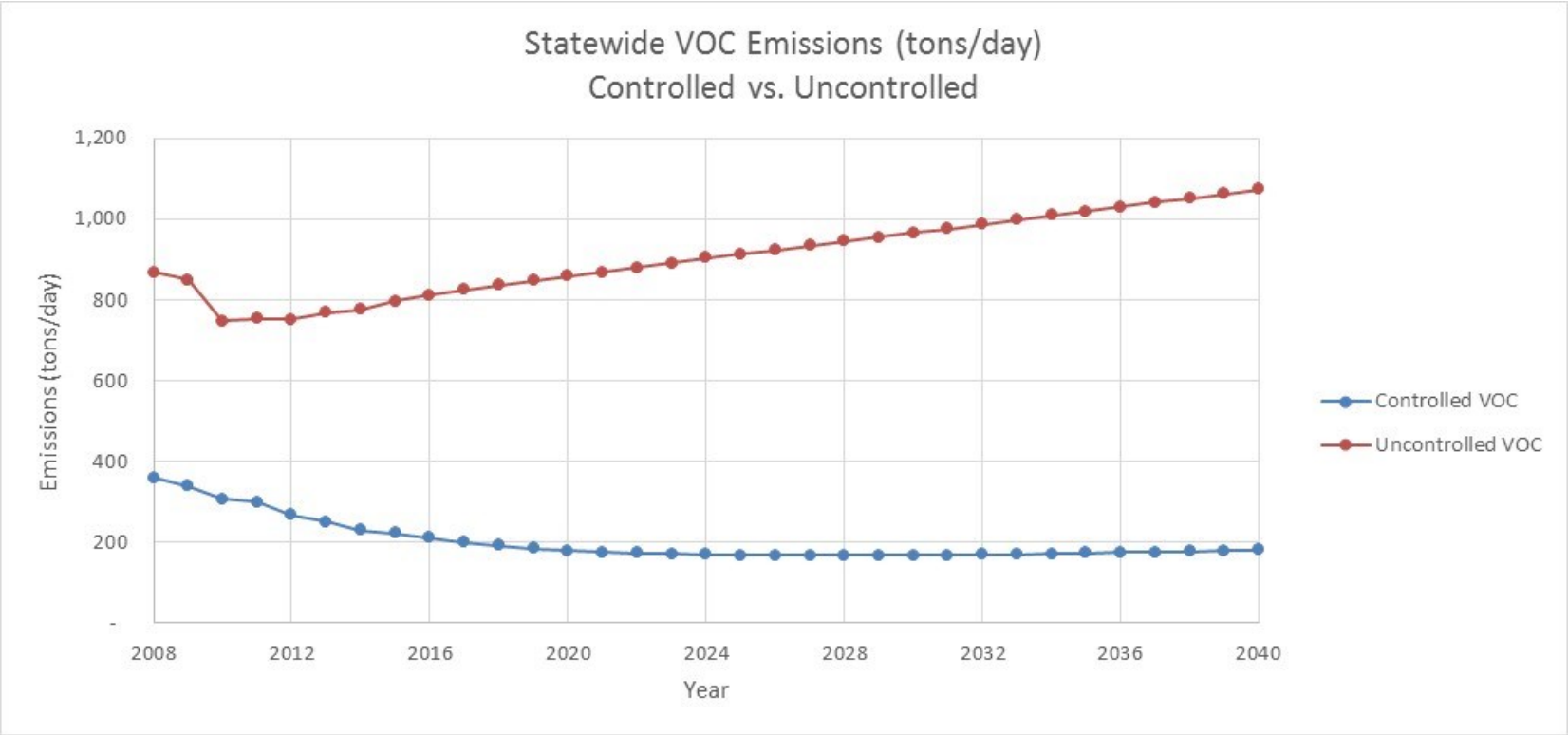


Figure 5-5. 2008 – 2040 Statewide OSD Controlled vs. Uncontrolled Emissions (tons/day) – NO_X

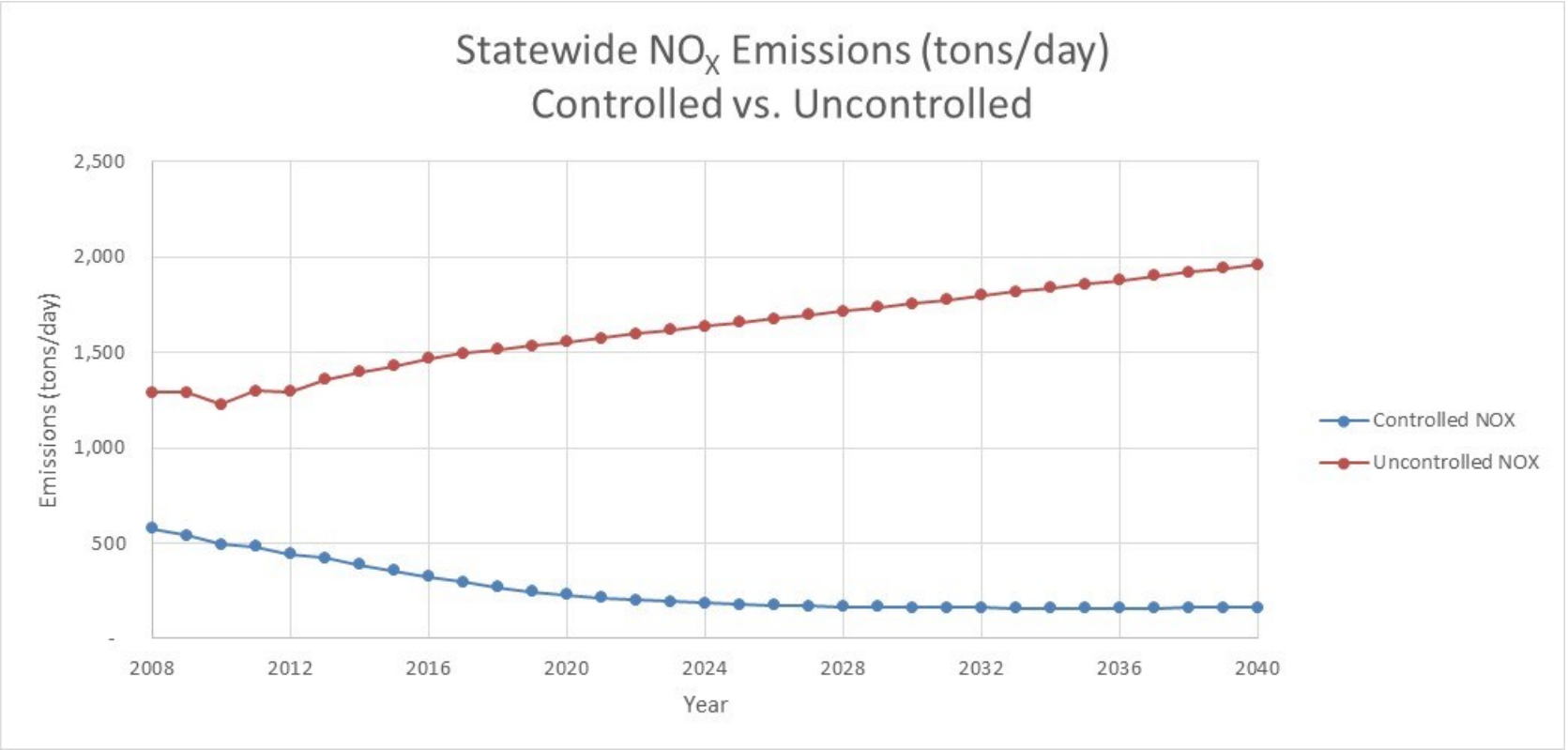


Figure 5-6. 2008 – 2040 Statewide OSD Controlled vs. Uncontrolled Emissions (tons/day) – CO

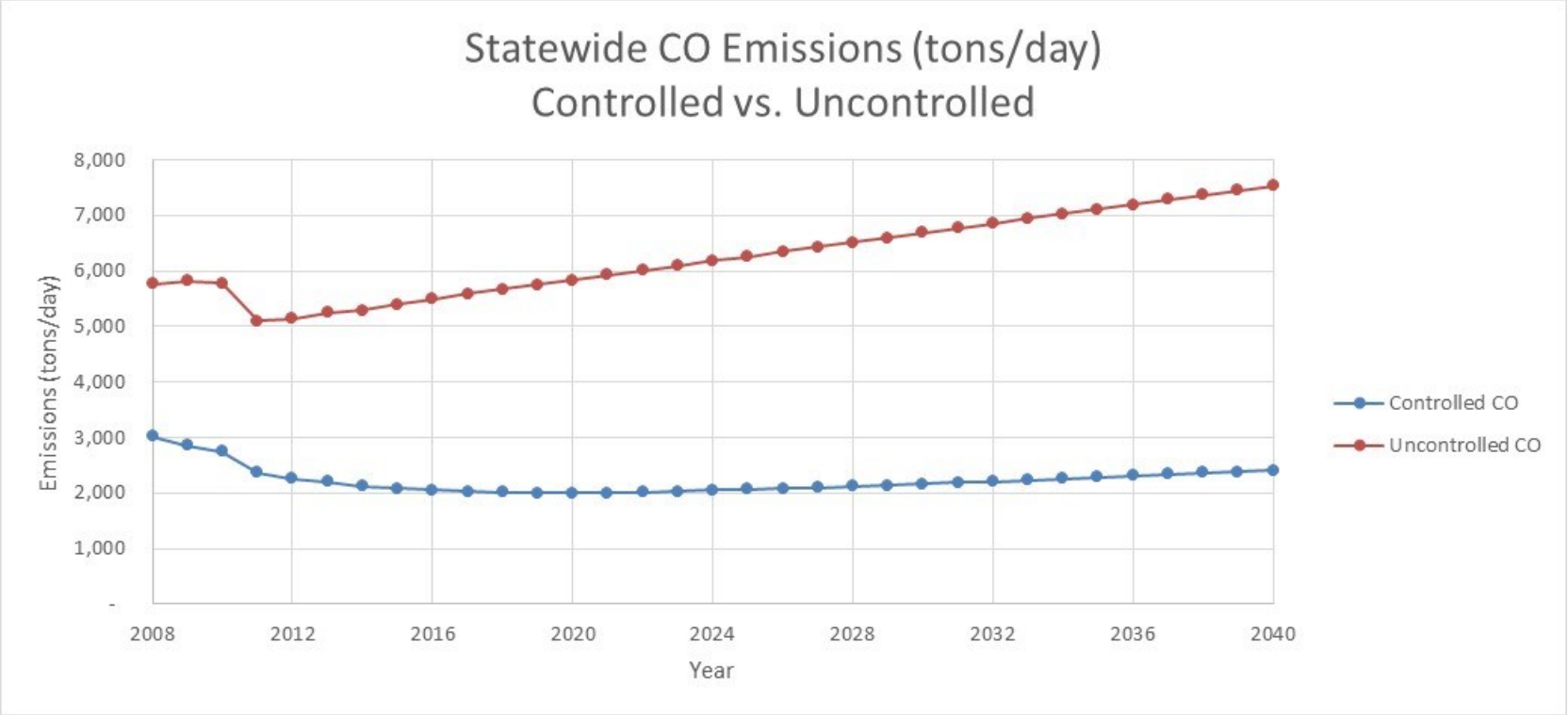


Figure 5-7. 2008 – 2040 Statewide OSD Controlled vs. Uncontrolled Emissions (tons/day) – PM_{10}

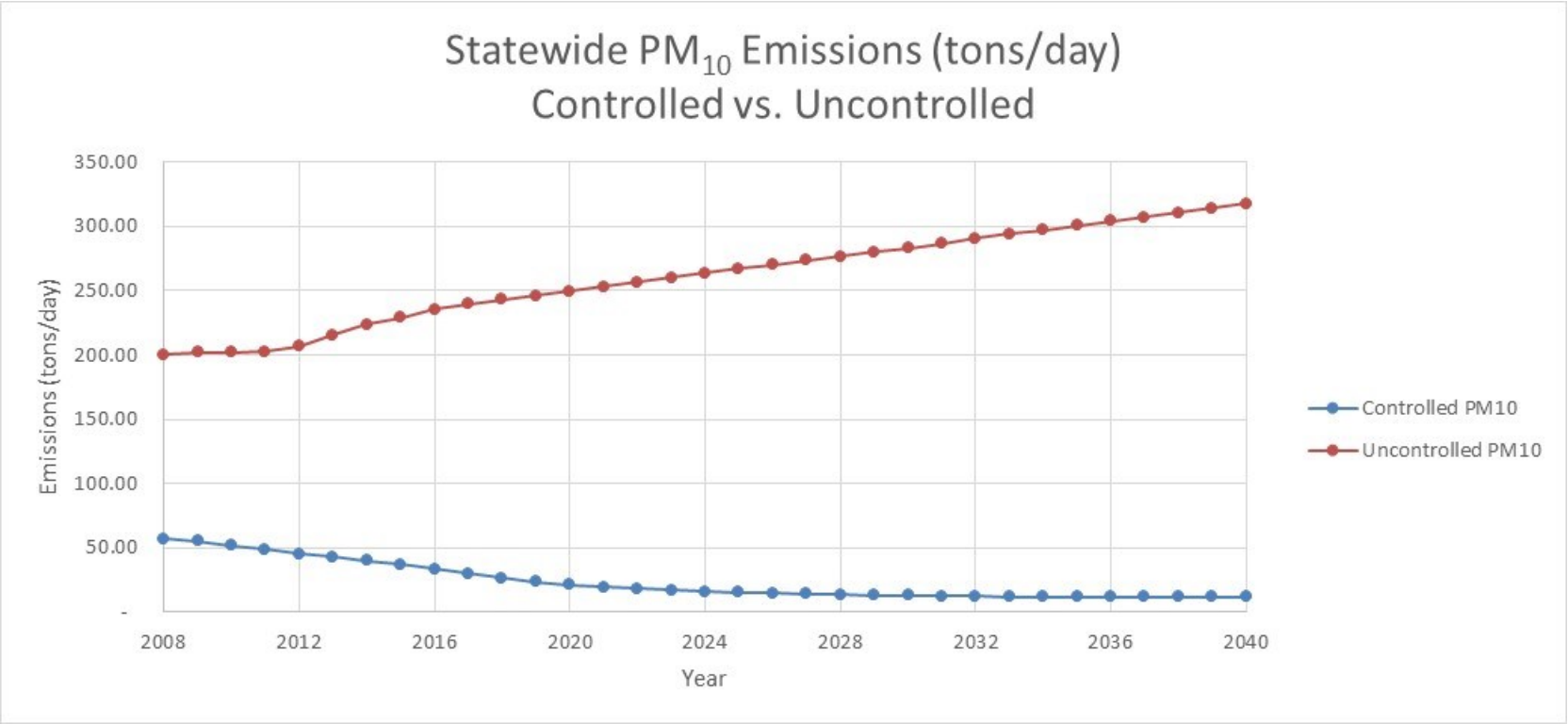


Figure 5-8. 2008 – 2040 Statewide OSD Controlled vs. Uncontrolled Emissions (tons/day) – $PM_{2.5}$

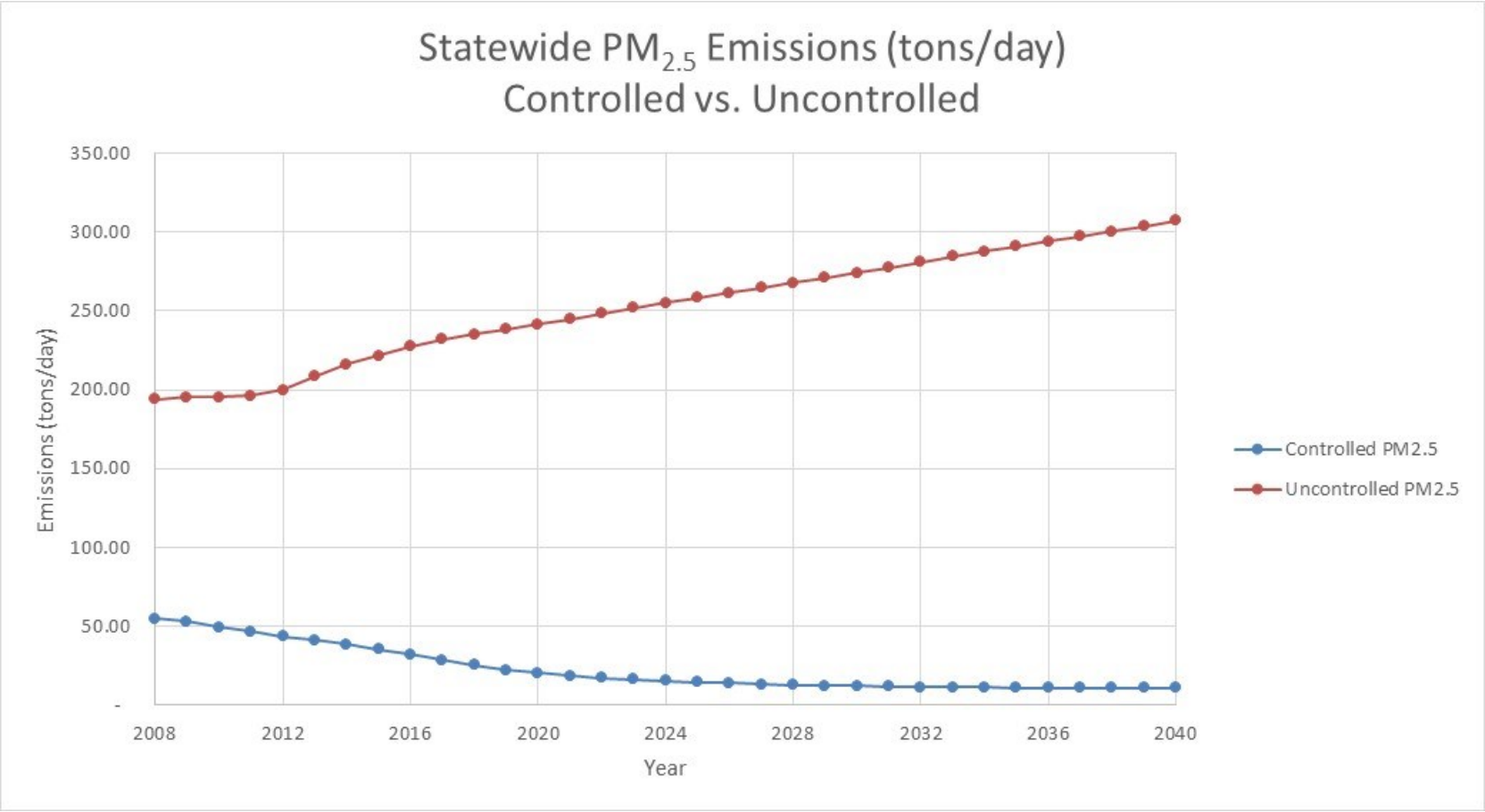
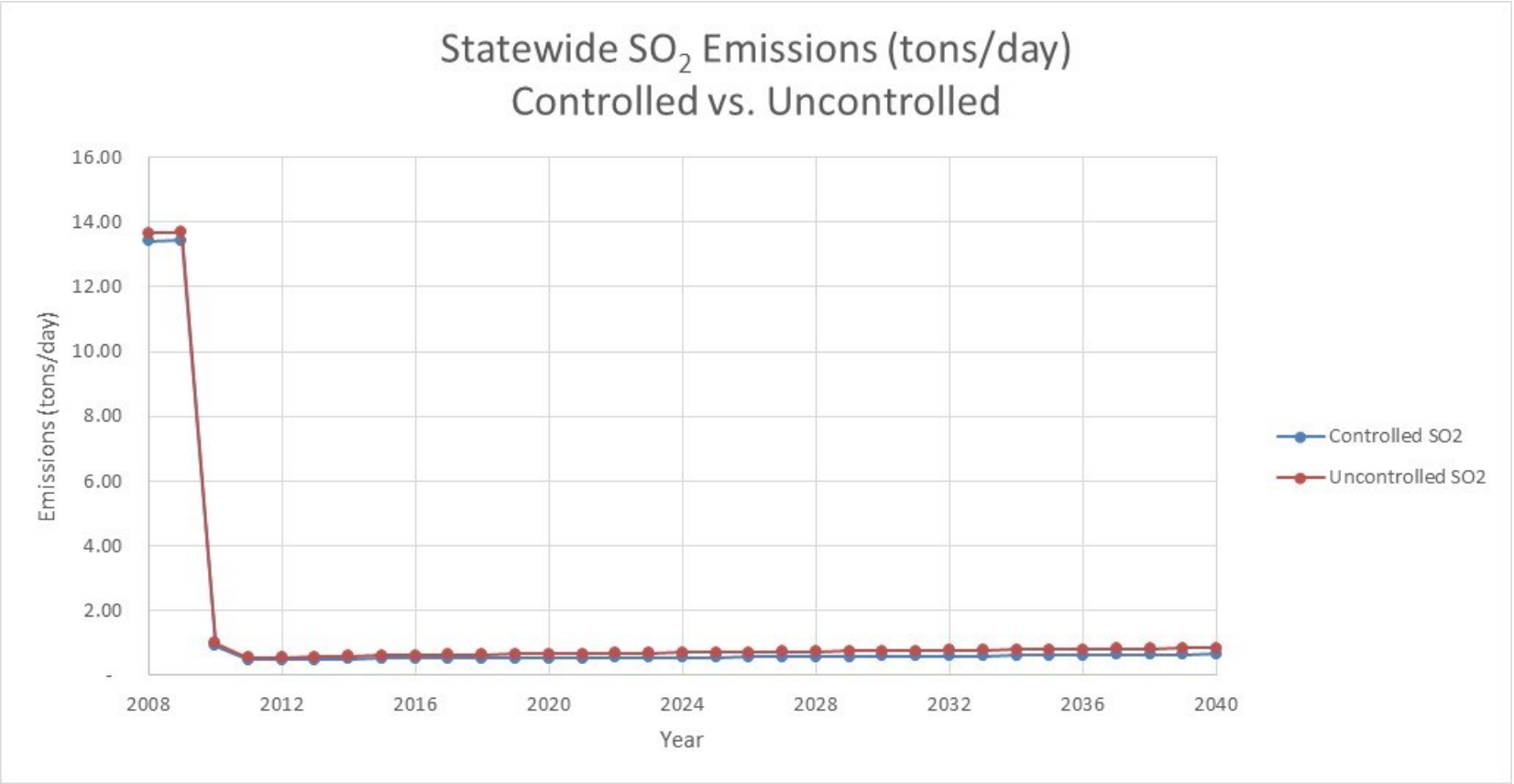


Figure 5-9. 2008 – 2040 Statewide OSD Controlled vs. Uncontrolled Emissions (tons/day) – SO_2



Appendix A
TexN Data Sources

A. Input Data Sources

The following sections are meant only to provide a very brief summary of where the TexN inputs were derived from. Additional detail may be found in the numerous reports for studies conducted by TCEQ throughout the life of TexN.

A.1 Equipment Population, Allocation, and Activity Data[10]

The TCEQ and others have conducted several studies over the years to collect region specific population and activity data for selected non-road engine categories, in order to improve upon NONROAD default estimates. Working with TCEQ staff, ERG compiled a comprehensive list of the most recent data developed for different equipment types and regions of the State for inclusion in the TexN model. The sources of the data for each equipment type and region are presented in Tables A-1 through A-6 below. The methods used to estimate equipment populations and activity levels can be quite complex; in depth discussions of the various methodologies used are provided in the referenced studies.

Table A-1. Sources of Equipment Population Data

Equipment Types	Region	Data Source
Diesel Construction Equipment > 25 hp	Dallas-Fort Worth (DFW) 9-county nonattainment area [11]	Eastern Research Group, Ozone Science and Air Modeling Research Project H43T163: Diesel Construction Equipment Activity and Emissions Estimates for the Dallas/Ft. Worth Region, prepared for The Houston Advanced Research Center, August 31, 2005
Diesel Construction Equipment > 25 hp, except HGB[12] cranes	Statewide excluding 9-county DFW area	Eastern Research Group, Nonroad Ammonia Emissions Inventory Development, prepared for Texas Commission on Environmental Quality, November 24, 2006
Mining and Quarry, Special Trades, Scrap and Recycling, Utility, Rough Terrain Forklifts (RTFs), and Skid Steer Loaders Diesel Construction Equipment	Statewide	Eastern Research Group, Update of Diesel Construction Equipment Emissions Estimates for the State of Texas, Prepared for TCEQ, August 31, 2008.
Mining and Quarry Diesel Construction Equipment	Alamo Area Council of Governments area	AACOG Chapter 2, Table 2-27, 2005 Non-road Emissions Inventory

[10] Information taken from TexN User's Guide unless otherwise noted. *Eastern Research Group, Texas NONROAD (TexN) Model Version 1.0 User's Guide, Work Order No. 582-7-84003-FY-08-09, August 18, 2008.*

[11] Includes Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, and Tarrant Counties.

[12] Includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties.

Equipment Types	Region	Data Source
Heavy Highway Diesel Construction Equipment	Statewide	Eastern Research Group, Update of DCE Emission Estimates for the State of Texas Phase I and Phase II, July 31,2009 and Eastern Research Group, Update of Heavy-Highway Portion of Diesel Construction Equipment Inventory Using New Data Sources, prepared for TCEQ, July 15, 2014.
Diesel Cranes	Houston-Galveston-Brazoria (HGB) nonattainment area	Eastern Research Group, Nonroad Mobile Source Emissions Inventory Development for the Houston-Galveston-Brazoria Area, submitted to the Houston-Galveston Area Council, July 28, 2006
LPG Forklifts	DFW 9-county area and HGB nonattainment areas	Eastern Research Group, Data Collection, Sampling and Emissions Inventory Preparation Plan for Selected Commercial and Industrial Equipment: Phase II, Final Report, prepared for the Texas Commission on Environmental Quality, August 31, 2005
Terminal Tractors and Transportation Refrigeration Units	DFW 9-county nonattainment area	Eastern Research Group, Data Collection, Sampling and Emissions Inventory Preparation Plan for Selected Commercial and Industrial Equipment: Phase II, Final Report, prepared for the Texas Commission on Environmental Quality, August 31, 2005
Transportation Refrigeration Units	HGB nonattainment area	Eastern Research Group, Nonroad Mobile Source Emissions Inventory Development for the Houston-Galveston-Brazoria Area, submitted to the Houston-Galveston Area Council, July 28, 2006
Commercial Lawn and Garden	Statewide	Eastern Research Group, Development of Commercial Lawn and Garden Emissions Estimates for the State of Texas and Selected Metropolitan Areas, prepared for Texas Commission on Environmental Quality, November 24, 2003
Recreational Marine	Statewide (except HGB area)	Eastern Research Group, Recreational Marine Emissions Inventory, prepared for the Texas Commission on Environmental Quality, August 28, 2002
Recreational Marine	HGB nonattainment area	E.H. Pechan & Associates, Development of 2007 Recreational Marine Emissions Inventory: Spatial and Temporal Allocation In the Houston-Galveston-Brazoria 8-County Area, 2008[13]
Agricultural Equipment	Statewide	E.H. Pechan & Associates, Inc.
All remaining equipment –see below	See below	NONROAD defaults - User's Guide for the Final NONROAD2005 Model, EPA420-R-05-013, December 2005

[13] E.H. Pechan & Associates, Development of 2007 Recreational Marine Emissions Inventory: Spatial and Temporal Allocation in the Houston-Galveston-Brazoria 8-County Area, 2008.

Equipment population estimates were taken from NONROAD defaults for the following equipment categories.

- Commercial – all equipment/fuel types
- Logging – all equipment/fuel types
- Railroad – all equipment/fuel types
- Recreational vehicles – all equipment/fuel types
- Residential lawn and garden – all equipment/fuel types
- Industrial – all equipment/fuel types excluding LPG forklifts in DFW and HGB, Transportation Refrigeration Units and Terminal Tractors in DFW
- Construction and Mining – all gasoline, LPG, CNG
- Construction and Mining – diesel < 25 hp
- Construction and Mining – diesel > 25 hp:

— Tampers/Rammers
— Plate Compactors
— Signal Boards/Light Plants
— Concrete/Industrial Saws
— Crushing/Processing Equipment
— Cement/Mortar Mixers
— Dumpers/Tenders
— Off-Highway Tractors
— Other Construction Equipment

Table A-2. Spatial Allocation Surrogates for Diesel Construction Equipment

Sector	Surrogate
Agricultural	Dollar value outputs from Texas Regional Economic Models, Inc. (REMI) model*
Boring and Drilling Equipment	EDA data and dollar value outputs from TX REMI model*
Brick and Stone Operations	Dollar value outputs from TX REMI model*
City and County Road Construction	Project Dollar Value from Reed Construction Data
Commercial Construction	Building footprint data from McGraw Hill Corporation (MHC)
Concrete Operations	Dollar value outputs from TX REMI model*
County-Owned Construction Equipment	County level census projections
Cranes	EDA data and dollar value outputs from TX REMI model*
Heavy Highway Construction	Project lane-mile data by county from TxDOT
Landfill Operations	Landfill disposal volumes from TCEQ
Landscaping Activities	Dollar value outputs from TX REMI model*
Manufacturing Operations	Dollar value outputs from TX REMI model*
Mining and Quarry Operations	Million Tons of Coal Production and Annual non-office employee hours respectively (2007)[14]
Municipal-Owned Construction Equipment	County level census projections

[14] Eastern Research Group, Update of Diesel Construction Equipment Emissions Estimates for the State of Texas, Prepared for TCEQ, August 31, 2008.

Sector	Surrogate
Transportation Sales/Services	Dollar value outputs from TX REMI model*
Residential Construction	County-level housing permit data from the Texas A&M Real Estate Center for 1980 through 2013; County-level census projections from the Texas State Data Center for 2014 through 2050; Housing start for the southern region of the country from the U.S. Census Bureau prior to 1980
Rough Terrain Forklifts, Special Trades Construction, and Trenchers	2007 Economy.com[6]
Scrap/Recycling Operations	USA Data© (2007)[6]
Skid Steer Loaders	EDA data and dollar value outputs from TX REMI model*
TxDOT Construction Equipment	None – TxDOT provided complete county-level population data
Utility Construction	Project Dollar value from Reed Construction Data and MHC

* State level extrapolation and county allocation using 9-county DFW population as basis.

Table A-3. Sources of Geographic Allocation Data (Non-DCE)

Equipment Types	Region	Data Source
LPG Forklifts	9-county DFW area and HGB nonattainment areas	Eastern Research Group, Data Collection, Sampling and Emissions Inventory Preparation Plan for Selected Commercial and Industrial Equipment: Phase II, Final Report, prepared for the Texas Commission on Environmental Quality, August 31, 2005
Terminal Tractors and Transportation Refrigeration Units	9-county DFW nonattainment area	Eastern Research Group, Data Collection, Sampling and Emissions Inventory Preparation Plan for Selected Commercial and Industrial Equipment: Phase II, Final Report, prepared for the Texas Commission on Environmental Quality, August 31, 2005
Transportation Refrigeration Units	HGB nonattainment area	Eastern Research Group, Nonroad Mobile Source Emissions Inventory Development for the Houston-Galveston-Brazoria Area, submitted to the Houston-Galveston Area Council, July 28, 2006
Commercial Lawn and Garden	Statewide	Eastern Research Group, Development of Commercial Lawn and Garden Emissions Estimates for the State of Texas and Selected Metropolitan Areas, prepared for Texas Commission on Environmental Quality, November 24, 2003
Recreational Marine	Statewide	Eastern Research Group, Recreational Marine Emissions Inventory, prepared for the Texas Commission on Environmental Quality, August 28, 2002
All remaining equipment – see below	See below	NONROAD defaults - User's Guide for the Final NONROAD2005 Model, EPA420-R-05-013, December 2005

Geographic allocation surrogates were taken from NONROAD defaults for the following equipment categories.

- Agricultural – all equipment
- Commercial – all equipment
- Logging – all equipment
- Railroad – all equipment
- Recreational vehicles – all equipment
- Residential lawn and garden – all equipment
- Industrial – all equipment/fuel types excluding LPG forklifts in DFW and HGB, TRUs and Terminal Tractors in DFW

Table A-4. Sources of Equipment Activity Data

Equipment Types	Region	Data Source
Diesel Cranes	HGB nonattainment area	Eastern Research Group, Nonroad Mobile Source Emissions Inventory Development for the Houston-Galveston-Brazoria Area, submitted to the Houston-Galveston Area Council, July 28, 2006
Diesel Construction Equipment > 25 hp	9-county DFW nonattainment area	Eastern Research Group, Ozone Science and Air Modeling Research Project H43T163: Diesel Construction Equipment Activity and Emissions Estimates for the Dallas/Ft. Worth Region, prepared for The Houston Advanced Research Center, August 31, 2005
Diesel Construction Equipment > 25 hp	Remainder of State, except HGB cranes	Eastern Research Group, Nonroad Ammonia Emissions Inventory Development, prepared for Texas Commission on Environmental Quality, November 24, 2006
LPG Forklifts	9-county DFW and HGB nonattainment areas	Eastern Research Group, Data Collection, Sampling and Emissions Inventory Preparation Plan for Selected Commercial and Industrial Equipment: Phase II, Final Report, prepared for the Texas Commission on Environmental Quality, August 31, 2005
Terminal Tractors and Transportation Refrigeration Units	9-county DFW nonattainment area	Eastern Research Group, Data Collection, Sampling and Emissions Inventory Preparation Plan for Selected Commercial and Industrial Equipment: Phase II, Final Report, prepared for the Texas Commission on Environmental Quality, August 31, 2005
Transportation Refrigeration Units	HGB nonattainment area	Eastern Research Group, Nonroad Mobile Source Emissions Inventory Development for the Houston-Galveston-Brazoria Area, submitted to the Houston-Galveston Area Council, July 28, 2006
Commercial Lawn and Garden	Statewide	Eastern Research Group, Development of Commercial Lawn and Garden Emissions Estimates for the State of Texas and Selected Metropolitan Areas, prepared for Texas Commission on Environmental Quality, November 24, 2003
All remaining equipment – see equipment population list above	See equipment population list above	NONROAD defaults - User's Guide for the Final NONROAD2005 Model, EPA420-R-05-013, December 2005

Table A-5. Activity Surrogates for Construction Equipment

Sector	Primary Estimation Method
Agricultural	Industry expert profiles
Boring and Drilling Equipment	Industry expert profiles
Brick and Stone Operations	Industry expert profiles
City and County Road Construction	Reed Construction profile
Commercial Construction	Square feet of installed building space from MHC
Concrete Operations	Industry expert profiles
County-Owned Construction Equipment	Survey findings from HARC study
Cranes	Industry expert profiles
Heavy Highway Construction	Survey findings from H-GAC study
Landfill Operations	Survey profile from TCEQ study
Landscaping Activities	Industry expert profiles
Manufacturing Operations	Industry expert profiles
Municipal-Owned Construction Equipment	Survey findings from HARC study
Transportation Sales/Services	Industry expert profiles
Residential Construction	Single family housing construction profile
Rough Terrain Forklifts	Industry expert profiles
Scrap/Recycling Operations	Industry expert profiles
Skid Steer Loaders	Industry expert profiles
Special Trades Construction	Industry expert profiles
Trenchers	Industry expert profiles
TxDOT Construction Equipment	Engine clock hours provided by TxDOT
Utility Construction	Linear feet installed from Reed Construction Data

Table A-6. Sources of Temporal Allocation Factors

Equipment Types	Region	Data Source
Diesel Construction Equipment > 25 hp	9-county DFW nonattainment area	Eastern Research Group, Ozone Science and Air Modeling Research Project H43T163: Diesel Construction Equipment Activity and Emissions Estimates for the Dallas/Ft. Worth Region, prepared for The Houston Advanced Research Center, August 31, 2005
Diesel Construction Equipment > 25 hp	Statewide excluding 9-county DFW area	Eastern Research Group, Nonroad Ammonia Emissions Inventory Development, prepared for Texas Commission on Environmental Quality, November 24, 2006
LPG Forklifts	9-county DFW and HGB nonattainment areas	Eastern Research Group, Data Collection, Sampling and Emissions Inventory Preparation Plan for Selected Commercial and Industrial Equipment: Phase II, Final Report, prepared for the Texas Commission on Environmental Quality, August 31, 2005
All remaining equipment – see equipment population list above	See equipment population list above	NONROAD defaults - User's Guide for the Final NONROAD2005 Model, EPA420-R-05-013, December 2005

A.2 Diesel Construction Equipment Population Growth Surrogates[15]

The TexN model contains 25 distinct "sectors" with distinct equipment population and activity profiles. Diesel construction equipment (DCE) comprises most of these "sectors". Two "sectors" within TexN, being miscellaneous equipment having less than 25 horsepower and all non-DCE, use the default profiles from EPA's NONROAD model. The remaining 23 of these sectors represent independent DCE profiles developed specifically for the TCEQ and the TexN model under numerous projects funded by the TCEQ. The TCEQ has focused on DCE specifically, as DCE has the single largest impact on total NOx emissions from all nonroad mobile equipment represented within the model, which is a driving precursor to ozone formation. Table A-7 presents a summary of the growth surrogates applied to a 2012 base-year population to forecast equipment population for each of the DCE subsectors.

Table A-7. DCE Growth Surrogates

Non-DCE*	**NONROAD default**
DCE - Agricultural Activities	2012 Texas Agricultural Census
DCE – Boring & Drilling Equipment	Economy.com
DCE – Brick & Stone Operations	Economy.com
DCE – City and County Road Construction	Texas State Data Center county-level census population
DCE – Commercial Construction	Economy.com
DCE – Concrete Operations	Economy.com
DCE – County-Owned Construction Equipment	Texas State Data Center county-level census population
DCE – Cranes	Economy.com
DCE – Heavy-Highway Construction	Annual highway expenditures from the Texas Comptroller's Office, for the period 2007 – 2013, appended the data to the 1998-2006 dataset normalized to 1998 dollars using the Consumer Price Index (CPI); Economy.com data prior to 1998 and after 2013
DCE – Landfill Operations	Texas State Data Center county-level census population
DCE – Landscaping Activities	Tx REMI model outputs up to 2013; Texas State Data Center census population data for 2014-2050
DCE – Manufacturing Operations	Economy.com
DCE – Municipal-Owned Construction Equipment	Texas State Data Center county-level census population
DCE – Transportation/Sales/Services	Economy.com
DCE – Residential Construction	County-level housing permit data from the Texas A&M Real Estate Center for 1980 through 2013; County-level census projections from the Texas State Data Center for 2014 through 2050; Housing start for the southern region of the country from the U.S. Census Bureau prior to 1980
DCE – Rough Terrain Forklifts	Economy.com
DCE – Scrap Recycling Operations	Tx REMI model outputs up to 2013; Texas State Data Center census population data for 2014-2050

[15] Eastern Research Group, Texas NONROAD Model Update and Enhancement, Work Order No. 582-11-99776-FY14-25, July 30, 2014.

Non-DCE*	NONROAD default
DCE – Skid Steer Loaders	Equipment Data Associates Sales
DCE – Special Trades Construction	Economy.com
DCE – Trenchers	Economy.com
DCE – TxDOT Construction Equipment*	Zero growth per TxDOT Equipment Replacement Policy
DCE – Utility Construction	Economy.com
DCE – Mining & Quarry Operations	Economy.com
Off-road tractors, Miscellaneous , and all Equipment < 25 hp*	NONROAD default

A.3 Meteorological Data[16]

TexN utilizes high, low and average temperature data, primarily to calculate evaporative emissions from gasoline engines. These data are required as part of TexN's primary input file. In addition, related data on relative humidity and atmospheric pressure are used during post-processing of the TexN model outputs to adjust diesel NOx emissions for ambient effects. The TexN meteorological data is based on historical climate data from December 1996 through June 2014 from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) (http://cdo.ncdc.noaa.gov/qclcd_ascii/).

A.4 Fuel Property Data

In order to maintain a high confidence level in the fuel parameters used in the development of emission inventories, trend analysis and control strategy analysis, the TCEQ has undertaken a program to periodically collect and analyze fuel samples. The data ensures the accuracy of local specific fuel information and also provides the best data available to be used in analyses to support Texas State Implementation Plan (SIP) and control strategy development. The latest fuel sampling data, conducted in the summer of 2014[17], was incorporated into TexN for this modeling effort.

A.5 Emission Factors and Control Phase-In[18]

The TexN model uses the default emission factor and technology type files provided with US EPA NONROAD model, thus using the same phase-in schedule and emission factors for Federal controls. However, unlike the NONROAD model which does not estimate ammonia emissions, there are four ammonia emission factors in TexN: one for diesel engines, one for spark ignition engines (gasoline and gaseous fuel) without three-way catalysts (TWCs), one for gasoline engines with TWCs, and one for natural gas/LPG

[16] Eastern Research Group, Texas NONROAD Model Update and Enhancement, Work Order No. 582-11-99776-FY14-25, July 30, 2014.
[17] Eastern Research Group, 2014 Summer Fuel Field Study (Revised), prepared for Texas Commission on Environmental Health (TCEQ), Revised January 2015.
[18] Information taken from TexN User's Guide unless otherwise noted. *Eastern Research Group, Texas NONROAD (TexN) Model Version 1.0 User's Guide, Work Order No. 582-7-84003-FY-08-09, August 18, 2008.*

engines with TWCs. For more information on how these emission factors were derived, please refer to the TexN User's Guide (2008) and the Addendum (2009)[19].

A.6 Post Processing Adjustments and Additional Controls[20]

TexN applies adjustment factors to the emissions estimates in the output files to generate the final criteria pollutant and ammonia emissions values. Post-processing applies county specific adjustments to emissions estimates for the appropriate SCCs. Depending upon the SCC and county, the following adjustments may be applied within the database:

- County and year specific temperature and humidity adjustments for NOx emissions;
- Adjustments for Texas Low Emission Diesel (TxLED) impacts;
- Altitude, correcting for decreased engine efficiency at increasing elevation;
- Soil compaction, reflecting relative ease or difficulty digging;
- Ground cover, reflecting relative ease or difficulty in land-clearing activity; and
- Reformulated gasoline.

[19] Eastern Research Group, Deliverable 6 – Update of TexN User's Guide Addendum, Work Order No. 582-7-84003-FY09-19, July 31, 2009.

[20] Information taken from TexN User's Guide unless otherwise noted. *Eastern Research Group, Texas NONROAD (TexN) Model Version 1.0 User's Guide, Work Order No. 582-7-84003-FY-08-09, August 18, 2008.*