Eastern Research Group, Inc.

2014 Texas Statewide Locomotive Emissions Inventory and 2008 through 2040 Trend Inventories

FINAL

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Prepared by:

Eastern Research Group, Inc.

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1.0 Introduction

The objective of this Texas Commission on Environmental Quality (TCEQ) project is to develop the 2014 Air Emissions Reporting Requirements (AERR) locomotive emissions inventory (EI) for actual annual and average summer weekday emissions as well as 2008 through 2040 locomotive statewide actual annual and average summer weekday trend emission inventories. Data developed was for all criteria pollutants, ozone precursors, and hazardous air pollutants (HAPs). Eastern Research Group (ERG) developed these inventories and relevant activity data by SCC for all Texas counties, summing emissions to the county level. During project development, activity data for 2014 were not available. Therefore, ERG obtained activity data from 2013 as this represented the most recent available data at the time the project began. ERG collected activity data for calendar year 2013, updated activity factors for future years, and used those factors to develop an actual annual and ozone season weekday locomotive emission inventory for the 2014 AERR submission to the United States Environmental Protection Agency's (EPA) Emissions Inventory System (EIS). ERG also developed trend emissions inventory data for both controlled and uncontrolled criteria emissions for years 2008 to 2040.

These Texas Locomotive Emissions Inventories include Class I, II, and III railroad activity and emissions by rail segment for all counties in the state. This report describes the inventory approach, including initial collection of local data, emission calculations, and spatial allocations used to develop the statewide locomotive inventories.

2.0 Data Collection

A primary objective of the Texas Locomotive Statewide Emissions Inventory was to include rail companies operating in the state of Texas in the inventory effort. To meet this objective, ERG solicited line-haul and yard data from all Class I, II, and III railroad companies operating in Texas. All railroad members listed in the American Short Line and Regional Railroad Association (ASLRRA) as operating in Texas were included, as well as Class I rail companies Union Pacific (UP), Burlington Northern – Santa Fe (BNSF), and Kansas City Southern (KCS). Additional input was requested from the Texas Department of Transportation and the Texas Transportation Institute (ASLRRA 2011). Approximately 47 different contacts were identified and ERG contacted the organizations via phone and email to solicit quantitative and/or qualitative data.

Table 2-1 identifies the contacts and summarizes the responses received from this outreach effort. The remainder of this section describes the data received.

Table 2-1. Summary of Data Solicitation Effort

Agency/Company Name	Contact Name	Contact Phone	Response
Alamo Gulf Coast Railroad	---	(210) 208-4417	No Response
Alliance Terminal Railroad	Tine Nelson, General Manager, Operations	(817) 224-7152	No Response
Angelina & Neches River Railroad Co.	Laura Ricks, Information Systems	(936) 634-4403	No Response
Austin Western Railroad	---	(512) 246-0738	Received
Blacklands Railroad	Walt Defebaugh, President	(903) 439-0738	No Response
Border Pacific Railroad Co.	---	(956) 487-5606	No Response
Brownsville & Rio Grande Int'l Railroad	Norma Porres	(956) 831-7731	No Response
Burlington Northern Santa Fe	Mike Clift, and Laura Fiffick	(800) 795-2673	No Response
Corpus Christi Terminal Railroad	Brent Azzo	(904) 223-1110	No Response
Dallas, Garland & Northeastern Railroad	---	(972) 808-9800	No Response
Fort Worth & Western Railroad	Bill Parker	(817) 222-9798, x 102	No Response
Galveston Railroad, L. P.	Brent Azzo	(904) 223-1110	No Response
Gardendale Railroad, Inc.	Greg Wheeler	(618) 632-4400	No Response
Georgetown Railroad Company	---	(512) 869-1542	No Response
Kansas City Southern	Kevin McIntosh (Government Relations)	(816) 983-1987	Received

Table 2-1. Summary of Data Solicitation Effort

Agency/Company Name	Contact Name	Contact Phone	Response
	Janet Sommerhauser (Environment)	(816) 983-1603	No Response
Kiamichi Railroad Co.	Seth Rutz, GM	(580) 916-7601	No Response
Moscow, Camden & San Augustine Railroad	---	(404) 652-4000	No Response
Panhandle Northern Railroad, LLC	---	(806) 273-3513	No Response
Pecos Valley Southern Railway Co.	Billy Edwards, Operations Mgr	(432) 445-2487	Received
Plainsman Switching Co., Inc.	---	(806) 744-0118	No Response
Point Comfort & Northern Railway Co.	Brent Azzo	(912) 964-5337	No Response
Port Terminal Railroad Association	---	(713) 393-6500	No Response
Rio Valley Switching Company	Greg Wheeler	(956) 971-9111 ext. 117	No Response
Rockdale, Sandow & Southern Railroad Co.	Brent Azzo	(912) 964-5337	No Response
Sabine River & Northern Railroad	David Clark	(409) 670-6751	No Response
San Antonio Central Railroad	Larry Jensen	(620) 231-2230	Received
South Plains Lamesa Railroad Ltd.	Shad Wisener	(806) 828-4841	Received
Southern Switching Company	Greg Wheeler	(325) 677-3601	No Response
Temple & Central Texas Railway, Inc.	---	(254) 778-8300	No Response
Texas & Northern Railway Co.	Tracy Larson Edwards	(903) 656-6762	Received
Texas Central Business Lines	---	(972) 775-1853	No Response
Texas DOT – Rail	Jackie Ploch	(512) 416-2621	Received
Texas DOT - Environmental Affairs	Air Quality contact	(512) 416-2691	No Response
Texas Gonzales & Northern Railway Co.	---	(830) 540-3788	No Response
Texas - New Mexico Railroad Co., Inc.	---	(806) 221-3150	No Response
Texas North Western Railway Co.	---	(972) 386-0117	No Response
Texas Northeastern Railroad	Dave Geraci	(817) 527-4913	No Response

Table 2-1. Summary of Data Solicitation Effort

Agency/Company Name	Contact Name	Contact Phone	Response
Texas Pacifico Transportation Company Ltd.	Jorge Gonzalez Chozas, VP Operations	(325) 277-3102	No Response
Texas Rock Crusher Railway Co.	Andy Scheriger	(325) 643-5105	No Response
Texas South-Eastern Railroad Co.	---	(859) 881-6588	No Response
Texas Transportation Institute	Les Olson	(979) 862-2846	No Response
Timber Rock Railroad	---	(409) 385-6611	Received
Union Pacific	Jon Germer	(402) 544-2235	Received
West Texas & Lubbock Railway	---	(806) 785-8668; (806) 221-3150 (operating office)	No Response
Western Rail Road Company	Frank Caballero	(830) 625-8084	No Response
Wichita, Tillman & Jackson Railway Co.	Martin Cicalla	(940) 723-1852	No Response

2.1 Union Pacific

Union Pacific (UP) is one of the largest Class I rail companies operating in Texas with over 6,300 miles of track and more than 7,700 employees in Texas alone. In response to ERG's data solicitation, UP provided a 15-page document that contained line-haul and yard data for all activities in Texas for the year 2013. Line-haul mileage, annual average million gross tons (MGT) per mile, fuel usage, train counts, and emission estimates for hydrocarbon (HC), carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM) were provided by county and track segment. The emission estimates were calculated using current EPA emission factors, and the fuel usage was calculated based on the system-wide average fuel consumption rate for 2013. Yard data were provided by county for 211 "yard job equivalents," which equates to one switch locomotive operating 24 hours a day. The activity data were then provided in terms of estimated annual fuel use in gallons, based on an EPA activity factor of 226 gallons per day (gal/day) of operation.

2.2 Kansas City Southern

KCS provided 2013 fuel usage, gross ton miles, and maps for 13 distinct routes (e.g., Port Arthur to Beaumont, Houston to Beaumont, Corpus Christi to Robstown, etc.) They also provided number of engines and gallons of fuel pumped at each of the seven yard locations in Texas.

2.3 Texas & Northern Railway

Texas & Northern Railway provided information on a single yard location in Lone Star. The data included coordinate locations, annual fuel use, annual hours of operation, and number of engines for 2013.

2.4 South Plains Lamesa Railroad

South Plains Lamesa Railroad provided information on Slaton yard in Lubbock County. Data included coordinates, annual fuel use, annual hours of operation, and number of engines.

2.5 Watco Companies

Watco Companies provided information on Austin Western, Timber Rock, San Antonio Central, and Pecos Valley Railroads. Data included engine counts, average daily hours of use, and headquarter locations.

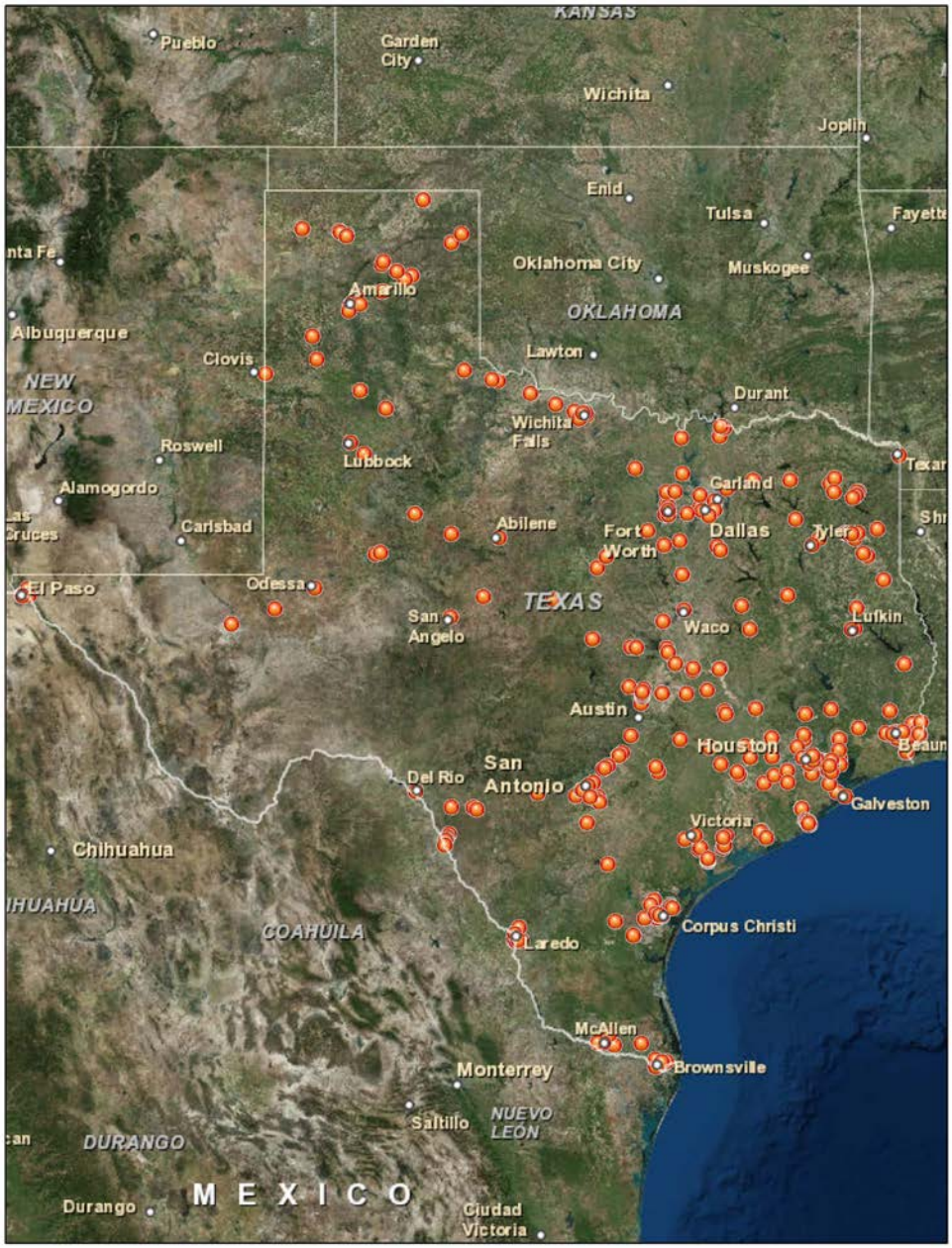
2.6 Switch Yard Locations

Switch yards have historically been under-represented in inventory efforts due to the lack of available data and low response to data requests. Because identifying more yard locations and estimating emissions that were not included in previous inventories was a priority in this project, ERG examined switch yard data carefully.

ERG reviewed previously identified yard locations against rail networks from the Bureau of Transportation Statistics (BTS) and the Texas Natural Resources Information System as well as satellite imagery via Google Earth. Two yards were removed due to lack of substantiation from these related data layers, and some yard coordinates were shifted slightly to better match the network and/or imagery data. The statewide rail networks and satellite imagery were also reviewed systematically to identify potential new yards. Potential new yards were identified as areas with several rail segments parallel to each other and located off of the main tracks according to either rail network. In many cases, these yards also had visible train activity in satellite imagery or collocated support equipment or trucking facilities. These potential yard locations were reviewed by several staff members, and those that seemed questionable were removed.

ERG also researched potential and future yards online via websites from transportation departments, trade associations, railroad company websites, as well as industry trends sites as listed in Appendix A. The 334 switch yards identified in Texas for this inventory are shown in Figure 2-1 and listed in Appendix B. This is approximately triple the number of yards identified in 2011, including many very small switch yards.

Figure 2-1. Class I, II, and III Rail Yard Locations in Texas



3.0 Processing of Local Data

3.1 Line-Haul Data

3.1.1 Union Pacific Railroad Data Processing

ERG converted UP's pdf data to text using Adobe Acrobat and then imported the data into Microsoft Excel. Line-haul fuel use and emissions data were summarized at the county level and hydrocarbon (HC) emissions were converted to VOC using a VOC/HC conversion ratio of 1.053. NO_x emissions were estimated using the fuel-based emission factors and methodology described in Section 4.

3.1.2 Kansas City Southern Railroad

KCS provided 2013 fuel usage, gross ton-miles, and maps for several distinct routes (e.g., Port Arthur to Beaumont, Houston to Beaumont, Corpus Christi to Robstown, etc.). ERG compared these maps against rail segment maps in a geographic information system (GIS) to identify the EIS shapes affiliated with each route. Total route fuel usage was divided among the segments in that route based on segment length, and emissions were calculated using segment-level fuel usage. The route from Ashdown, AR to Shreveport, LA was not processed because it is outside of Texas boundaries.

3.1.3 Burlington Northern Santa Fe

BNSF did not provide updated data for 2013; however, they did respond to a previous data request for the 2011 inventory effort. To maximize use of locally-provided data, this 2011 county-level fuel usage was extrapolated to 2013 using a growth factor derived from their R-1 data as described in Section 6. The 2013 emission factors were used to recalculate 2013 emissions as described in Section 4.

3.1.4 Class II and Class III Line-Haul Data

No Class II or III Railroad companies provided line-haul data. As a result, ERG used other locally-based data sources to estimate 2014 activity levels. The Eastern Regional Technical Advisory Committee (ERTAC) previously collaborated with the Federal Railroad Administration (FRA), the ASLRRA, and members of the Class II and III Railroad communities to develop activity and emissions profiles for Class II and Class III railroads for 2008 (Bergin et. al, 2009). The ASLRRA compiles data from the Class II and III railroads every few years, including total industry fuel use for locomotives and total Class II/III route miles. Unfortunately, at this time there are no newer data, so the 2008 activity data were grown to represent 2013 activity. ERG used the U.S. Energy Information Administration's (EIA) latest Annual Energy Outlook (AEO) to estimate the fuel usage growth by year and applied this growth rate directly to the fuel usage data before applying emission factors as further described in Section 6.

3.2 Switch Yard Data

The final yard list includes 42 UP yards, 42 BNSF yards, 12 KCS yards, 8 Class II/III yards, and an additional 230 small yards identified by ERG for a total of 334 yards. For the 230 yards that did not include fuel use or any other data, ERG developed appropriate surrogates using statewide fuel usage data to fill in the gaps in activity data, which is explained in more detail in Section 6.2. Most respondents provided fuel usage data such that emissions were calculated directly using emission factors in grams/gallon as described in Section 4.0. However, for certain yards, direct fuel usage data were not provided. For these yards, additional steps were required to calculate emissions. For example, BNSF's previous yard work included emissions but not fuel use. Without supporting data on the activity or emission factors used to develop BNSF's 2011 emissions data, ERG projected the emissions to 2013 (using growth factors in Section 5.0) and then divided the emissions by 2013 emission factors in grams per gallon (g/gal) to estimate fuel use in gallons. Watco provided engine count and daily hours of operation. To calculate fuel usage, ERG first calculated an average Class II/III fuel usage rate from data provided by Class II/III railroad companies in Texas to get an average value of 10.05 gallons per hour (gal/hr). ERG also used local Class I data to determine that the average railroad company uses 5.39% of their total fuel for switch operations. Assuming that the engines work 365 days per year, the total fuel use was calculated by yard using the following equation:

$$SG = L * DH * 365 \text{ days per year} * FR * S$$

Where

SG	=	total annual fuel use (gal)
L	=	number of locomotives
DH	=	daily hours of use (hr)
FR	=	fuel usage rate (gal/hr) = 10.05 gal/hr
S	=	portion of total fuel that is used in switch operations

Example:

Austin Western Railroad has 13 locomotives with an average daily use of 12 hours each.

$$SG = 13 * 12 \text{ hr/day} * 365 \text{ days/yr} * 10.05 \text{ gal/hr} * 0.0539$$
$$\text{Switch (gal)} = 30{,}844$$

For yard locations that were identified during our searches but did not match any of the locally-submitted data, a more general approach to activity and emissions estimates was needed. First, because ERG received relatively comprehensive data submittals from the Class I rail lines in the past, we assumed that these other switch yards were likely related

to small Class II and III rail lines. Per the 2011 TCEQ Locomotive inventory and current GIS calculations, there are 2,247.66 miles of Class II and III rail lines in Texas. Using a Class II/III fuel use factor of 2,797.74 gallons per mile obtained from the ASLRR, ERG calculated the total Class II/III fuel use as follows:

$$2{,}247.66 \text{ mi} * 2{,}797.74 \text{ gal/mi} = 6{,}288{,}368 \text{ gallons of fuel}$$

Using the previously defined value of 5.39% of total fuel being consumed by switch operations, ERG estimated a statewide switch fuel use of 338,850 gallons for Class II/III yards. Because we had total fuel estimates from six small line-haul companies, we estimated their switch fuel use as 5.39% of the total and subtracted this "known" fuel use from the statewide total to avoid double-counting. The result was a statewide total of 262,509 gallons for Class II/III switch operations. Given there are 230 Class II/III yards, this fuel usage data equates to roughly 1,141 gallons of fuel per year per yard. This value equates to about 120 operating hours a year or only a couple of hours a week at each of these switching yards.

4.0 Projection Factors

Because activity data were requested for only 2013, projection factors were required to backcast and forecast activity data from 2008 to 2040 using 2013 as the baseline. ERG obtained data for UP, BNSF, and KCS from the Federal Railroad Administration's Complete Class I Railroad Annual Reports (R-1) for years 2008 through 2013. By creating a ratio of annual fuel use in gallons, we calculated company-specific percent change values that we could use to adjust provided 2013 (UP and KCS) and 2011 (BNSF) data to backcasted 2008 activity levels. For clarification, BNSF did not provide new data for 2013. For Class II and III lines and for forecasted years for all companies, actual fuel use is not available, requiring a different approach. ERG used EIA Annual AEO for year 2013 (EIA 2014) as the baseline year to backcast activity to 2008 and to forecast (project) future activity levels through 2040. The AEO provides detailed annual projections in billion ton miles traveled through year 2040. These future projections show little to no growth in rail industry over the time period of interest. ERG verified the trend data in EIA AOE using the historic and projected data published by the Association of American Railroads (AAR 2014) and the U.S. Bureau of Transportation Statistics (BTS 2000).

ERG matched the projected activity to the appropriate future year emission factors provided in Table 4-1. The AEO-based growth factors account for implementation of federal rules that occur relative to the year that the locomotive engine was originally manufactured, such that the full benefit of the rule would occur in the future once fleet turnover was completed. The future year growth factors are listed in Table 4-1.

Table 4-1. AEO-based Growth Factors for Locomotive Activities

Year	Change from Baseline 2013
2008	1.049779
2009	0.865324
2010	0.946688
2011	0.997538
2012	0.976263
2013	1.000000
2014	1.021700
2015	1.024969
2016	0.988173
2017	1.023056
2018	1.048018
2019	1.059861
2020	1.067704
2021	1.080196
2022	1.095967
2023	1.107803
2024	1.116998
2025	1.131407
2026	1.130049
2027	1.137960
2028	1.132725
2029	1.137936
2030	1.142487
2031	1.139860
2032	1.145787
2033	1.141891
2034	1.137895
2035	1.141877
2036	1.149071
2037	1.137236
2038	1.139851
2039	1.138484
2040	1.141102

ERG also investigated whether the recent reduction in gasoline prices would change oil and gas activity in the United States and Texas in future years. However, given that this change in price occurred recently, no studies addressing this issue were found. Final activity estimates can be seen in Table 4-2.

Table 4-2. Statewide Fuel Usage Estimates by Year and SCC

Year	Activity, Fuel Usage (Gal)			
	Class I Line Haul	Class II/III Line Haul	Yard	Total
2008	357,651,785	7,652,815	24,110,683	389,415,283
2009	295,363,674	6,308,149	18,891,328	320,563,151
2010	316,322,957	6,901,293	21,025,872	344,250,122
2011	330,341,464	7,271,985	22,685,182	360,298,630
2012	325,870,637	7,116,888	21,999,022	354,986,546
2013	331,114,086	7,289,931	22,938,782	361,342,800
2014	338,299,262	7,448,123	23,436,554	369,183,938
2015	339,381,820	7,471,956	23,511,551	370,365,327
2016	327,198,012	7,203,713	22,667,486	357,069,212
2017	338,748,102	7,458,004	23,467,649	369,673,755
2018	347,013,556	7,639,980	24,040,259	378,693,795
2019	350,934,809	7,726,311	24,311,914	382,973,034
2020	353,531,726	7,783,486	24,491,822	385,807,035
2021	357,668,048	7,874,553	24,778,377	390,320,977
2022	362,890,001	7,989,521	25,140,141	396,019,663
2023	366,809,213	8,075,808	25,411,654	400,296,676
2024	369,853,730	8,142,837	25,622,571	403,619,138
2025	374,624,843	8,247,880	25,953,102	408,825,825
2026	374,175,293	8,237,983	25,921,959	408,335,234
2027	376,794,520	8,295,648	26,103,412	411,193,581
2028	375,061,265	8,257,488	25,983,337	409,302,090
2029	376,786,547	8,295,473	26,102,860	411,184,880
2030	378,293,693	8,328,655	26,207,271	412,829,619
2031	377,423,618	8,309,499	26,146,995	411,880,111
2032	379,386,221	8,352,708	26,282,959	414,021,888
2033	378,096,307	8,324,309	26,193,597	412,614,213
2034	376,772,970	8,295,174	26,101,919	411,170,064
2035	378,091,676	8,324,207	26,193,276	412,609,159
2036	380,473,653	8,376,650	26,358,294	415,208,597
2037	376,554,775	8,290,370	26,086,803	410,931,948
2038	377,420,851	8,309,438	26,146,803	411,877,092
2039	376,967,946	8,299,467	26,115,427	411,382,839
2040	377,834,972	8,318,555	26,175,492	412,329,020

5.0 Emission Factors

With fuel usage estimates established for all activity data, ERG could apply fuel-based emission factors to estimate emissions. ERG compiled emission factors for Class I and Class II/III line-haul and yard locomotives from various references. This section provides the source documents and calculations involved in identifying emission factors for the listed pollutants.

The EPA Technical Highlights publication, "Emission Factors for Locomotives" (EPA 2009) provides emission factors on a gram per brake horsepower-hour (g/bhp-hr) basis and then converts them to a grams per gallon basis with a factor based on the usable power of the locomotive engine. The conversion requires a factor of 20.8 bhp-hr/gal for large line-haul locomotives, 18.2 bhp-hr/gal for small line-haul locomotives, and 15.2 bhp-hr/gal for yard locomotives. The g/gal emission factors can also be converted to an energy basis for use if the heating value of diesel fuel is known. The conversion to grams emitted per ton-mile of freight hauled (g/ton-mile) is calculated based on data collected by the Association of American Railroads for revenue ton-miles and fuel consumption, which shows approximately one gallon of diesel fuel hauls 400 ton-miles of freight.

5.1 Criteria Pollutants by Locomotive Type

The 2009 EPA Technical Highlights publication includes emission rates for many criteria pollutants including particulate matter ($PM_{2.5}$ and PM_{10}), ammonia, methane, hydrocarbons (HC), and nitrogen oxide (NO_X) among others for line-haul and yard locomotives in g/bhp-hr. ERG converted these emission rates to g/gal by locomotive type. These emission factors were used to develop the uncontrolled emissions inventory. The 2009 EPA Technical Highlights publication also lists expected fleet average emission factors by calendar year and locomotive type, which are listed in Section 4.4.

ERG applied conversion factors to develop the emission factors as needed. Volatile organic compounds (VOC) emissions are estimated to be 1.053 times the HC emissions provided (EPA, 2009). The VOC factor is larger than the HC factor due to slight differences in definitions as well as the fact the VOC factor is actually calculated off of the total organic gas (TOG). Table 4-1 shows the uncontrolled emission factors in g/gal for the criteria pollutants that were used to develop uncontrolled emission estimates for all inventory years.

Table 5-1. Uncontrolled Emission Factors from 2009 EPA Technical Highlights Publication(g/gal)*

Pollutant	Uncontrolled Emission Factors (g/gal)		
	Class I Line Haul	Class II/III Line Haul	Switch
PM_{10}	6.7	5.8	6.7
$PM_{2.5}$	6.5	5.6	6.5
VOC	10.5	9.2	16.2
NO_X	270.4	236.6	264.5
CO	26.6	23.3	27.8
Black Carbon	4.8	4.2	4.9
CH_4	0.8	0.8	0.8
N_2O	0.26	0.26	0.26
NH_3	0.083	0.083	0.083
CO_2	10,217	10,217	10,217
SO_2	0.094	0.094	0.094

* EPA 2009

5.2 Controlled Criteria Emissions by Year

The 2009 EPA Technical Highlights publication (EPA 2009) lists expected fleet average emission factors that account for fleet turnover by calendar year and locomotive type. ERG included these emission factors for large line-haul, small line-haul, and large yard for the various inventories. Tables 5-2 through Table 5-5 list the emission factors by year from 2008 to 2040 for criteria emissions. The emission factors are in g/gal and are desegregated by large Class I line-haul, small Class II/III line-haul, and switch yards. Table 5-2 lists the emission factors that do not change over time. The one minor exception is SO_2 which changed due to transitions to cleaner locomotive diesel fuel. Tables 5-3 to 5-5 lists emission factors by SCC and by year which change based on EPA's expected control technology adoption rate.

The conversion factors listed in Section 5.1 apply for VOC. Additional adjustments were made to future year emission estimates to account for compliance with emission control area sulfur standards and Texas Emissions Reduction Plan (TERP) investments. The TERP program provides grants to eligible businesses to reduce emissions from polluting vehicles and equipment. For rail applications, this typically involves repowering or replacing switch engines. A complete list of control programs addressed in this inventory is presented in Appendix B. As BNSF, KCS, and UP provided data for Texas inventory use, the TERP reductions were already included in their estimates. The remaining TERP projects were for smaller Class II and III rail lines. ERG used the TERP

project data to sum the NO_X reductions over time for each project and then summed by year to get total annual tons of NO_X avoided due to TERP projects. The NO_X tonnage was then added to the uncontrolled inventory to correctly account for the increased emissions that would be present were it not for the TERP projects.

For the controlled emissions, ERG also applied reductions related to the Texas Low Emission Diesel Program (TxLED). The TxLED Program is implemented to reduce emissions of nitrogen oxides from diesel-powered motor vehicles and non-road equipment and involves a 6.2% NO_X reduction in the 110 central and eastern counties that are impacted by this regulation, which include all of the counties in the following ozone nonattainment areas: Houston-Galveston-Brazoria, Beaumont-Port Arthur, and Dallas-Fort Worth.

Once the criteria emissions were finalized, HAP emissions were speciated off of VOC and PM emissions using the fractions from the EPA's 2011 National Emissions Inventory (NEI) (EPA 2013) and listed in Table 5-6

Table 5-2. Controlled Emission Factors for all years by Locomotive Type (g/gal)

Pollutant	Controlled Emission Factors (g/gal)		
	Class I Line Haul SCC 2285002006	Class II/III Line Haul SCC 228502010	Switch SCC 2285002007
CO	26.6	27.8	23.3
CO_2	10,217	10,217	10,217
CH_4	0.8	0.8	0.8
N_2O	0.26	0.26	0.26
NH_3	0.083	0.083	0.083
SO_2 (2008-2011)	1.88	1.88	1.88
SO_2 (2012-2040)	0.094	0.094	0.094

* EPA 2009

Table 5-3. Class I Line Haul Controlled Emission Factors by Year (g/gal)

Calendar Year	Class I Line Haul (SCC 228502006)				
	NO_X	PM_{10}	$PM_{2.5}$	Black Carbon	VOC
2008	169	5.1	4.95	3.71	9.48
2009	165	4.9	4.75	3.56	9.16
2010	157	4.7	4.56	3.42	8.74
2011	149	4.4	4.27	3.20	8.11
2012	144	4.1	3.98	2.98	7.48
2013	139	3.8	3.69	2.76	6.84
2014	135	3.6	3.49	2.62	6.42
2015	129	3.4	3.30	2.47	6.00
2016	121	3.1	3.01	2.26	5.37
2017	114	2.9	2.81	2.11	4.84
2018	108	2.7	2.62	1.96	4.42
2019	103	2.5	2.43	1.82	4.11
2020	99	2.3	2.23	1.67	3.79
2021	94	2.2	2.13	1.60	3.58
2022	89	2.0	1.94	1.46	3.37
2023	84	1.9	1.84	1.38	3.16
2024	79	1.7	1.65	1.24	2.95
2025	74	1.6	1.55	1.16	2.74
2026	69	1.5	1.46	1.09	2.63
2027	65	1.4	1.36	1.02	2.42
2028	61	1.3	1.26	0.95	2.21
2029	57	1.1	1.07	0.80	2.11
2030	53	1.0	0.97	0.73	2.00
2031	49	1.0	0.97	0.73	1.79
2032	46	0.9	0.87	0.65	1.68
2033	43	0.8	0.78	0.58	1.58
2034	40	0.7	0.68	0.51	1.47
2035	37	0.7	0.68	0.51	1.37
2036	35	0.6	0.58	0.44	1.26
2037	33	0.6	0.58	0.44	1.26
2038	31	0.5	0.49	0.36	1.16
2039	29	0.5	0.49	0.36	1.16
2040	28	0.4	0.39	0.29	1.05

* EPA 2009

Table 5-4. Class II/III Line Haul Controlled Emission Factors by Year (g/gal)

Calendar Year	Class II/III Line Haul (SCC 228502010)				
	NO_X	PM_{10}	$PM_{2.5}$	Black Carbon	VOC
2008	242	5.7	5.53	4.15	12.32
2009	242	5.7	5.53	4.15	12.32
2010	242	5.7	5.53	4.15	12.32
2011	242	5.7	5.53	4.15	12.32
2012	242	5.7	5.53	4.15	12.32
2013	242	5.6	5.43	4.07	12.32
2014	242	5.6	5.43	4.07	12.32
2015	240	5.5	5.34	4.00	12.32
2016	239	5.5	5.34	4.00	12.32
2017	237	5.4	5.24	3.93	12.32
2018	236	5.4	5.24	3.93	12.32
2019	233	5.4	5.24	3.93	12.32
2020	231	5.3	5.14	3.86	12.32
2021	228	5.3	5.14	3.86	12.32
2022	225	5.3	5.14	3.86	12.32
2023	223	5.2	5.04	3.78	12.32
2024	220	5.2	5.04	3.78	12.32
2025	217	5.1	4.95	3.71	12.32
2026	215	5.1	4.95	3.71	12.32
2027	212	5.1	4.95	3.71	12.32
2028	209	5.0	4.85	3.64	12.32
2029	206	5.0	4.85	3.64	12.32
2030	203	4.9	4.75	3.56	12.32
2031	200	4.8	4.66	3.49	12.32
2032	197	4.8	4.66	3.49	12.32
2033	193	4.7	4.56	3.42	12.32
2034	190	4.6	4.46	3.35	12.32
2035	187	4.6	4.46	3.35	12.32
2036	184	4.5	4.37	3.27	12.32
2037	180	4.4	4.27	3.20	12.32
2038	177	4.4	4.27	3.20	12.32
2039	174	4.3	4.17	3.13	12.32
2040	171	4.2	4.07	3.06	12.32

* EPA 2009

Table 5-5. Switch Yard Locomotive Controlled Emission Factors by Year (g/gal)

Calendar Year	Switch (SCC 2285002007)				
	NO_X	PM_{10}	$PM_{2.5}$	Black Carbon	VOC
2006	250	6.5	6.31	4.73	15.80
2007	249	6.5	6.31	4.73	15.80
2008	243	5.5	5.34	4.00	15.27
2009	241	5.5	5.34	4.00	15.27
2010	236	5.4	5.24	3.93	14.85
2011	235	5.3	5.14	3.86	14.74
2012	227	5.1	4.95	3.71	14.00
2013	225	5.0	4.85	3.64	14.00
2014	217	4.8	4.66	3.49	13.37
2015	215	4.8	4.66	3.49	13.27
2016	208	4.6	4.46	3.35	12.64
2017	206	4.5	4.37	3.27	12.43
2018	202	4.4	4.27	3.20	12.11
2019	200	4.4	4.27	3.20	12.00
2020	187	4.1	3.98	2.98	11.06
2021	185	4.0	3.88	2.91	10.95
2022	177	3.9	3.78	2.84	10.32
2023	172	3.7	3.59	2.69	10.00
2024	162	3.5	3.40	2.55	9.37
2025	150	3.2	3.10	2.33	8.42
2026	144	3.1	3.01	2.26	8.00
2027	138	3.0	2.91	2.18	7.69
2028	132	2.8	2.72	2.04	7.27
2029	126	2.7	2.62	1.96	6.84
2030	119	2.5	2.43	1.82	6.53
2031	112	2.4	2.33	1.75	6.11
2032	105	2.2	2.13	1.60	5.79
2033	98	2.1	2.04	1.53	5.37
2034	91	1.9	1.84	1.38	4.95
2035	84	1.7	1.65	1.24	4.63
2036	77	1.6	1.55	1.16	4.21
2037	71	1.5	1.46	1.09	3.90
2038	67	1.4	1.36	1.02	3.79
2039	63	1.3	1.26	0.95	3.58
2040	60	1.2	1.16	0.87	3.37

* EPA 2009

Table 5-6. Hazardous Air Pollutant Speciation Profile for Locomotive Activities

Pollutant Code	Pollutant Name	Fraction	Speciation Base
106990	1,3 Butadiene	6.146E-05	PM_{10}
540841	2-2-4 Trimethylpentane	2.243E-03	VOC
83329	Acenaphthene	7.999E-06	PM_{10}
208968	Acenaphthylene	2.182E-04	PM_{10}
75070	Acetaldehyde	4.492E-04	PM_{10}
107028	Acrolein	8.547E-05	PM_{10}
120127	Anthracene	5.350E-05	PM_{10}
7440382	Arsenic	3.570E-07	PM_{10}
71432	Benzene	5.173E-05	PM_{10}
56553	Benzo(a)anthracene	1.211E-05	PM_{10}
50328	Benzo(a)pyrene	4.368E-06	PM_{10}
205992	Benzo(b)fluoranthene	4.368E-06	PM_{10}
191242	Benzo(ghi)perylene	4.368E-06	PM_{10}
207089	Benzo(k)fluoranthene	4.368E-06	PM_{10}
7440417	Beryllium	2.802E-05	PM_{10}
7440439	Cadium	2.802E-05	PM_{10}
18540299	Chromium (VI)	3.400E-08	PM_{10}
218019	Chrysene	9.235E-06	PM_{10}
100414	Ethylbenzene	2.000E-03	VOC
206440	Fluoranthene	6.009E-05	PM_{10}
86737	Fluorene	6.188E-05	PM_{10}
50000	Formaldehyde	9.451E-04	PM_{10}
193395	Indeno(1,2,3-cd)pyrene	3.297E-06	PM_{10}
7439921	Lead	8.405E-05	PM_{10}
7439965	Manganese	2.040E-06	PM_{10}
7439976	Mercury	2.802E-05	PM_{10}
91203	Napthalene	1.851E-03	PM_{10}
110543	n-Hexane	5.500E-03	VOC
7440020	Nickel	6.550E-06	PM_{10}
85018	Phenanthrene	2.822E-04	PM_{10}
123386	Propionaldehyde	6.100E-03	VOC
129000	Pyrene	7.713E-05	PM_{10}
100425	Styrene	2.100E-03	VOC

Table 5-6. Hazardous Air Pollutant Speciation Profile for Locomotive Activities

Pollutant Code	Pollutant Name	Fraction	Speciation Base
108883	Toluene	3.200E-03	VOC
16065831	Trivalent chromium	6.600E-08	PM_{10}
1330207	Xylene	4.800E-03	VOC

6.0 Allocation of Class I Line-Haul Emissions

To facilitate processing and to protect confidential business information (CBI), ERG aggregated line-haul rail activity and emissions to the county level and then reallocated the activity and emissions back to rail segments within each county to meet format requirements of the NEI. This was necessary because railroad track identification information was limited to mile markers and segment IDs that are specific to individual rail lines' networks and do not relate to any publicly available railway networks to allow for accurate spatial mapping of rail activities. ERG allocated Class I line-haul emissions to rail segments based on segment-specific railroad traffic data (ton miles) obtained from the Department of Transportation (BTS, 2009). The BTS dataset categorizes the segments' level of activity into ranges of million gross ton miles (MGTM) and was populated by the Federal Railroad Administration (FRA). ERG divided emissions between all mainline segments using these activity ranges as a proxy to allocate more emissions to segments with higher Class I activity.

ERG reallocated the county emission sums to the segments by multiplying the county emissions by the segment's allocation value divided by the sum of the allocation values for all links within the county as follows:

$$E_{iL} = E_{iC} * \frac{A_L}{\sum_{C=1}^{N} A_{LC}}$$

Where:

E_{iL}	=	emissions of pollutant i per link L (tons/year).
E_{iC}	=	emissions of pollutant i per county C (tons/year).
A_L	=	allocation value for link L per activity category from public BTS dataset.
A_{LC}	=	sum of allocation values for all links in county C from public BTS dataset.

The spatial inventory was developed from confidential data from FRA very similar to the publically-available BTS rail dataset, so segment IDs were generally consistent with those used in EIS, thus facilitating later data processing.

6.1 Class II/III Line-Haul Emissions Allocation

The ERTAC Rail paper (Bergin 2011) extracted links that were identified as owned or operated by specific Shortline or Regional Railroads from the FRA-provided proprietary shapefile to create a shapefile of Class II/III mainline rail segments. Because Class II/III

railroads are less likely to use rail segments that are heavily traveled by Class I railroads, the activity-based approach used for Class I lines is not appropriate for small line-haul rail activities. Instead, Class II/III line-haul emissions were allocated to rail segments using segment length as a proxy.

The county emission sums were reallocated to the segments by multiplying the county emissions by the segment's length divided by the sum of the length for all links within the county as follows:

$$E_{iL} = E_{iC} * \frac{l_L}{\sum_{C=1}^{N} l_{LC}}$$

Where:

E_{iL}	=	emissions of pollutant i per link L (tons/year)
E_{iC}	=	emissions of pollutant i per county C (tons/year)
l_L	=	allocation value for link L per activity category from public BTS dataset
l_{LC}	=	sum of allocation values for all links in county C from public BTS dataset

6.2 Class Yard Emissions Allocation

The yard activity/emissions data received were specific to individual yard locations, therefore, no further spatial allocation was needed. For yards which ERG had no locally provided data, ERG divided the statewide yard fuel use (minus the fuel usage provided by yards to remove double counting) equally among the 230 yard locations as described in Section 3-2.

7.0 Results

Some results of implementing the emission estimation methodology and emission projection procedures are presented in Table 7-1 through Table 7-3. Table 7-1 lists controlled emissions sums for criteria pollutants by county for all counties in which Locomotive activity occurred. Tables 7-2 and 7-3 show uncontrolled and controlled statewide criteria emissions totals for all years, respectively.

The 2014 emissions were comparable to those in the 2011 inventory. The emissions were approximately 15% lower in 2014 compared to the previous 2011 inventory. For example, statewide total VOC emissions were 16.9% lower than the 2011 estimate. This difference could be due to changes in both activity levels and emission factors between the two years. The VOC emission factor decreased approximately 21% from 2011 to 2014 due to compliance with the EPA's engine exhaust standards. Note this standard applies to newly manufactured locomotives or engines that undergo major engine maintenance, so the anticipated emission reductions occur gradually until the current fleet is fully replaced with new engines. Additionally there were differences in activity between the two years. While a direct comparison of industry-submitted activity was not always possible, as activity data were either received from the rail companies in different units of measure or not provided at all, activity increased approximately 2.5% where compatible data existed in 2011 and 2014.

Statewide total NO_X emissions decreased by approximately 7%, mostly as a result of the 9% decrease in EPA's emissions factor change due to engine exhaust standards. Other exceptions included pollutants where the emission factors do not change over time. CH_4, CO, CO_2, N_2O, and NH_3 all increased by approximately 2.5% from 2011 to 2014, which is consistent with the change in activity. One notable difference between the two inventory years was the large decrease in SO_2 emissions; this is due to the introduction of low sulfur fuel, which changed the SO_2 emission factor from 1.88 g/gal in 2011 to 0.094 g/gal in 2014.

Future inventory efforts could be enhanced by additional local input on yard locations and activity. This is an area that has lacked solid data sources and data from local owners and operators in Texas. While this effort garnered a larger than anticipated response rate from Class II/III rail companies, there are a number of smaller rail companies that did not respond; and their input may provide insight on line haul activity levels as well. Additionally, the FRA is currently improving their railway network and developing a Memorandum of Understanding with rail companies to increase industry participation in data development. These improvements could provide better refined data at the rail segment level as well as more accurate activity levels. While much of the data gathered by FRA will be limited to Class I lines and will likely be

considered CBI, this may provide a pathway through which TCEQ could model future data requests and obtain a higher response rate.

Additionally, input from Class II/III rail lines that operate in Texas would be invaluable in improving activity estimates at small rail yards or in areas where smaller railroad companies dominate activity, such as in the Port of Houston.

As oil prices have dropped, crude oil activity may change and affect rail activity. At the time of development of the emissions inventory no studies or reports had been released to quantify these changes. These changes may increase refinery rail yard activity as well as line haul activity. Additional resources could be spent to insure activity from these sources are accurate.

Table 7-1. Controlled Emissions (tons) for Criteria Pollutants by County for 2014

FIPS Code	County Name	Activity (Gal)	Controlled 2014 Annual Emissions (Tons)									
			CH_4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
48001	Anderson	1,543,465	1.361	45.196	17,382.986	0.442	0.141	221.611	6.239	6.052	0.160	11.358
48005	Angelina	555,672	0.490	16.024	6,258.154	0.159	0.051	86.421	2.381	2.309	0.058	4.461
48007	Aransas	7,878	0.007	0.231	88.728	0.002	0.001	1.100	0.031	0.030	0.001	0.056
48011	Armstrong	2,458,468	2.168	72.151	27,688.037	0.705	0.225	343.167	9.756	9.463	0.255	17.407
48013	Atascosa	409,679	0.361	12.025	4,613.931	0.117	0.037	57.284	1.627	1.578	0.042	2.910
48015	Austin	3,711,550	3.273	108.928	41,800.629	1.064	0.340	518.326	14.733	14.291	0.385	26.300
48017	Bailey	563,202	0.497	16.529	6,342.961	0.161	0.052	78.615	2.235	2.168	0.058	3.988
48021	Bastrop	1,259,262	1.110	36.448	14,182.203	0.361	0.115	191.272	5.306	5.146	0.130	9.830
48027	Bell	5,850,427	5.159	174.010	65,889.330	1.677	0.535	972.523	25.658	24.888	0.606	55.442
48029	Bexar	5,983,383	5.276	177.108	67,386.728	1.715	0.547	934.509	25.296	24.537	0.620	51.319
48035	Bosque	3,214,745	2.835	94.346	36,205.455	0.921	0.294	448.732	12.757	12.374	0.333	22.762
48037	Bowie	2,126,288	1.875	61.889	23,946.912	0.609	0.195	312.283	8.746	8.484	0.220	15.965
48039	Brazoria	2,955,362	2.606	86.966	33,284.204	0.847	0.270	427.514	11.962	11.603	0.306	22.280
48041	Brazos	2,331,200	2.056	68.416	26,254.705	0.668	0.213	325.402	9.251	8.973	0.242	16.506
48043	Brewster	2,412,112	2.127	70.450	27,165.957	0.691	0.221	346.977	9.777	9.484	0.250	17.683
48049	Brown	1,035,946	0.914	30.323	11,667.142	0.297	0.095	160.680	4.391	4.259	0.107	8.574
48051	Burleson	4,796,894	4.230	141.213	54,024.114	1.375	0.439	697.596	19.473	18.889	0.497	36.496
48053	Burnet	205,601	0.181	5.280	2,315.539	0.059	0.019	51.445	1.269	1.231	0.021	2.792
48055	Caldwell	1,506,236	1.328	44.205	16,963.700	0.432	0.138	210.249	5.977	5.798	0.156	10.665
48057	Calhoun	35,518	0.031	1.027	400.018	0.010	0.003	6.582	0.170	0.165	0.004	0.372
48059	Callahan	1,782,039	1.571	52.299	20,069.875	0.511	0.163	248.747	7.072	6.860	0.185	12.618
48061	Cameron	387,022	0.341	11.330	4,358.764	0.111	0.035	76.413	1.919	1.861	0.040	4.520
48063	Camp	943,870	0.832	27.632	10,630.162	0.271	0.086	133.962	3.789	3.676	0.098	6.816
48065	Carson	6,259,469	5.520	183.433	70,496.089	1.794	0.573	882.138	25.006	24.256	0.649	44.820
48067	Cass	2,762,516	2.436	81.089	31,112.318	0.792	0.253	386.589	10.978	10.649	0.286	19.649
48069	Castro	695,323	0.613	20.623	7,830.948	0.199	0.064	111.019	2.977	2.888	0.072	6.185

Table 7-1. Controlled Emissions (tons) for Criteria Pollutants by County for 2014

FIPS Code	County Name	Activity (Gal)	Controlled 2014 Annual Emissions (Tons)									
			CH_4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
48071	Chambers	50,423	0.044	1.456	567.881	0.014	0.005	8.325	0.224	0.217	0.005	0.445
48073	Cherokee	1,334,861	1.177	39.025	15,033.625	0.383	0.122	190.852	5.387	5.226	0.138	9.717
48075	Childress	2,229,290	1.966	65.569	25,106.959	0.639	0.204	320.485	8.992	8.722	0.231	16.625
48077	Clay	2,342,377	2.066	68.744	26,380.583	0.671	0.214	326.962	9.295	9.016	0.243	16.585
48079	Cochran	3,616	0.003	0.093	40.720	0.001	0.000	0.905	0.022	0.022	0.000	0.049
48083	Coleman	1,195,434	1.054	34.883	13,463.345	0.343	0.109	172.905	4.864	4.718	0.124	8.819
48085	Collin	864,237	0.762	24.945	9,733.311	0.248	0.079	133.244	3.681	3.570	0.090	6.860
48089	Colorado	1,879,966	1.658	55.030	21,172.768	0.539	0.172	267.668	7.562	7.335	0.195	13.640
48091	Comal	1,722,014	1.519	50.535	19,393.862	0.494	0.158	241.158	6.847	6.642	0.178	12.255
48093	Comanche	165,533	0.146	4.251	1,864.285	0.047	0.015	41.420	1.022	0.991	0.017	2.248
48097	Cooke	1,827,422	1.612	53.775	20,580.994	0.524	0.167	264.390	7.397	7.175	0.189	13.780
48099	Coryell	328,832	0.290	9.652	3,703.412	0.094	0.030	45.999	1.306	1.267	0.034	2.337
48103	Crane	79,227	0.070	2.290	892.278	0.023	0.007	12.109	0.335	0.325	0.008	0.623
48105	Crockett	1,258	0.001	0.032	14.170	0.000	0.000	0.315	0.008	0.008	0.000	0.017
48109	Culberson	2,724,472	2.403	79.958	30,683.856	0.781	0.249	380.297	10.812	10.487	0.282	19.291
48111	Dallam	2,632,898	2.322	77.414	29,652.522	0.755	0.241	376.823	10.593	10.276	0.273	19.483
48113	Dallas	3,484,991	3.073	103.263	39,249.050	0.999	0.319	604.011	15.738	15.266	0.361	34.754
48115	Dawson	43,961	0.039	1.129	495.101	0.013	0.004	11.000	0.271	0.263	0.005	0.597
48117	Deaf Smith	4,814,294	4.245	141.362	54,220.084	1.380	0.440	676.660	19.177	18.602	0.499	34.508
48119	Delta	1,509	0.001	0.039	16.989	0.000	0.000	0.377	0.009	0.009	0.000	0.020
48121	Denton	5,437,996	4.795	159.493	61,244.408	1.559	0.498	762.555	21.648	20.999	0.563	38.718
48123	DeWitt	228,438	0.201	6.704	2,572.738	0.065	0.021	31.887	0.907	0.879	0.024	1.617
48129	Donley	2,844,121	2.508	83.469	32,031.372	0.815	0.260	396.998	11.286	10.948	0.295	20.138
48131	Duval	1,546,099	1.363	45.375	17,412.648	0.443	0.141	215.813	6.135	5.951	0.160	10.947
48133	Eastland	1,806,226	1.593	52.993	20,342.278	0.518	0.165	252.613	7.177	6.962	0.187	12.818
48135	Ector	2,121,361	1.871	63.096	23,891.426	0.608	0.194	350.239	9.263	8.985	0.220	19.911

Table 7-1. Controlled Emissions (tons) for Criteria Pollutants by County for 2014

FIPS Code	County Name	Activity (Gal)	Controlled 2014 Annual Emissions (Tons)									
			CH_4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
48139	Ellis	2,629,671	2.319	77.244	29,616.173	0.754	0.241	371.508	10.505	10.190	0.272	19.021
48141	El Paso	6,018,981	5.308	178.502	67,787.640	1.725	0.551	960.020	25.755	24.983	0.624	53.447
48143	Erath	127,159	0.112	3.277	1,432.106	0.036	0.012	31.758	0.783	0.759	0.013	1.730
48145	Falls	1,665,023	1.468	48.865	18,752.003	0.477	0.152	232.413	6.607	6.409	0.173	11.789
48147	Fannin	101,232	0.089	2.600	1,140.102	0.029	0.009	25.330	0.625	0.606	0.010	1.375
48149	Fayette	2,573,487	2.269	75.528	28,983.415	0.738	0.235	359.320	10.214	9.908	0.267	18.230
48151	Fisher	531,190	0.468	15.589	5,982.426	0.152	0.049	74.146	2.108	2.045	0.055	3.761
48153	Floyd	51,559	0.045	1.330	580.672	0.015	0.005	12.871	0.317	0.308	0.005	0.702
48157	Fort Bend	6,465,570	5.702	189.723	72,817.261	1.853	0.592	913.714	25.850	25.075	0.670	46.661
48159	Franklin	268,207	0.237	7.769	3,020.629	0.077	0.025	40.533	1.126	1.092	0.028	2.081
48161	Freestone	1,290,277	1.138	38.011	14,531.506	0.370	0.118	189.412	5.265	5.107	0.134	9.977
48163	Frio	1,534,626	1.353	45.038	17,283.437	0.440	0.140	214.212	6.090	5.907	0.159	10.866
48165	Gaines	7,422	0.007	0.191	83.590	0.002	0.001	1.857	0.046	0.044	0.001	0.101
48167	Galveston	1,619,696	1.428	47.460	18,241.516	0.464	0.148	247.450	6.797	6.593	0.168	13.135
48169	Garza	1,097,069	0.967	32.197	12,355.535	0.314	0.100	153.135	4.354	4.223	0.114	7.768
48175	Goliad	28,589	0.025	0.839	321.981	0.008	0.003	3.991	0.113	0.110	0.003	0.202
48177	Gonzales	1,531,060	1.350	44.827	17,243.277	0.439	0.140	217.210	6.145	5.960	0.159	11.052
48179	Gray	3,561,798	3.141	104.677	40,114.073	1.021	0.326	506.582	14.281	13.853	0.369	26.069
48181	Grayson	4,730,434	4.172	138.290	53,275.624	1.356	0.433	702.861	19.542	18.956	0.490	36.561
48183	Gregg	1,687,856	1.488	49.835	19,009.161	0.484	0.154	254.974	7.000	6.790	0.175	13.701
48185	Grimes	2,079,009	1.833	61.016	23,414.449	0.596	0.190	290.298	8.252	8.004	0.215	14.729
48187	Guadalupe	2,375,578	2.095	69.718	26,754.501	0.681	0.217	331.597	9.427	9.144	0.246	16.820
48189	Hale	771,689	0.681	22.869	8,691.000	0.221	0.071	128.869	3.402	3.300	0.080	7.306
48191	Hall	1,305,306	1.151	38.308	14,700.765	0.374	0.119	182.202	5.180	5.024	0.135	9.242
48195	Hansford	67,023	0.059	1.721	754.832	0.019	0.006	16.770	0.414	0.401	0.007	0.910
48197	Hardeman	2,507,809	2.212	73.668	28,243.729	0.719	0.229	361.778	10.145	9.840	0.260	18.743

Table 7-1. Controlled Emissions (tons) for Criteria Pollutants by County for 2014

FIPS Code	County Name	Activity (Gal)	Controlled 2014 Annual Emissions (Tons)									
			CH_4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
48199	Hardin	1,743,832	1.538	50.916	19,639.576	0.500	0.160	271.784	7.425	7.202	0.181	14.455
48201	Harris	19,617,526	17.300	580.137	220,938.688	5.622	1.795	3,092.191	83.466	80.962	2.033	170.173
48203	Harrison	605,979	0.534	17.829	6,824.725	0.174	0.055	87.502	2.450	2.377	0.063	4.554
48205	Hartley	2,585,952	2.280	75.892	29,123.802	0.741	0.237	360.962	10.262	9.954	0.268	18.310
48209	Hays	1,389,846	1.226	40.792	15,652.883	0.398	0.127	194.200	5.518	5.353	0.144	9.859
48211	Hemphill	5,473,443	4.827	160.637	61,643.618	1.569	0.501	764.211	21.723	21.072	0.567	38.772
48213	Henderson	897,023	0.791	26.326	10,102.552	0.257	0.082	125.212	3.560	3.453	0.093	6.351
48215	Hidalgo	150,664	0.133	3.892	1,696.829	0.043	0.014	37.579	0.926	0.898	0.016	2.052
48217	Hill	2,612,663	2.304	76.678	29,424.620	0.749	0.239	364.789	10.369	10.058	0.271	18.508
48219	Hockley	401,212	0.354	10.894	4,518.570	0.115	0.037	82.566	2.121	2.058	0.042	4.401
48221	Hood	82,969	0.073	2.136	934.421	0.024	0.008	20.730	0.511	0.496	0.009	1.128
48223	Hopkins	1,152,445	1.016	33.500	12,979.192	0.330	0.105	170.719	4.769	4.626	0.119	8.742
48225	Houston	747,385	0.659	21.934	8,417.280	0.214	0.068	104.324	2.966	2.877	0.077	5.292
48227	Howard	2,034,412	1.794	60.045	22,912.179	0.583	0.186	306.236	8.421	8.168	0.211	16.412
48229	Hudspeth	5,591,629	4.931	164.103	62,974.670	1.603	0.512	780.511	22.189	21.524	0.579	39.591
48231	Hunt	709,285	0.625	20.310	7,988.190	0.203	0.065	114.280	3.119	3.025	0.073	5.919
48233	Hutchinson	10,522	0.009	0.282	118.503	0.003	0.001	2.573	0.063	0.061	0.001	0.146
48235	Irion	110,827	0.098	2.846	1,248.172	0.032	0.010	27.731	0.684	0.664	0.011	1.505
48239	Jackson	1,145,193	1.010	33.301	12,897.520	0.328	0.105	169.564	4.737	4.595	0.119	8.688
48241	Jasper	341,228	0.301	9.310	3,843.015	0.098	0.031	82.544	2.010	1.949	0.035	4.761
48243	Jeff Davis	921,069	0.812	27.031	10,373.362	0.264	0.084	128.568	3.655	3.545	0.095	6.522
48245	Jefferson	4,087,876	3.605	121.463	46,038.937	1.172	0.374	674.569	17.854	17.319	0.424	38.260
48247	Jim Hogg	397,397	0.350	11.663	4,475.610	0.114	0.036	55.471	1.577	1.530	0.041	2.814
48249	Jim Wells	645,631	0.569	18.948	7,271.294	0.185	0.059	90.121	2.562	2.485	0.067	4.571
48251	Johnson	4,009,096	3.535	117.871	45,151.692	1.149	0.367	594.323	16.480	15.985	0.415	31.311
48257	Kaufman	1,301,795	1.148	38.205	14,661.220	0.373	0.119	181.712	5.166	5.011	0.135	9.217

Table 7-1. Controlled Emissions (tons) for Criteria Pollutants by County for 2014

FIPS Code	County Name	Activity (Gal)	Controlled 2014 Annual Emissions (Tons)									
			CH_4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
48261	Kenedy	258,023	0.228	7.572	2,905.937	0.074	0.024	36.016	1.024	0.993	0.027	1.827
48271	Kinney	1,834,259	1.618	53.833	20,657.993	0.526	0.168	256.135	7.280	7.062	0.190	12.996
48273	Kleberg	118,968	0.105	3.491	1,339.852	0.034	0.011	16.606	0.472	0.458	0.012	0.842
48277	Lamar	42,709	0.038	1.097	481.000	0.012	0.004	10.687	0.264	0.256	0.004	0.580
48279	Lamb	684,350	0.603	20.084	7,707.358	0.196	0.063	95.525	2.716	2.634	0.071	4.846
48281	Lampasas	1,364,797	1.204	39.940	15,370.771	0.391	0.125	194.073	5.487	5.322	0.141	9.876
48283	La Salle	1,593,358	1.405	46.742	17,944.894	0.457	0.146	223.011	6.335	6.145	0.165	11.317
48285	Lavaca	212,483	0.187	6.236	2,393.049	0.061	0.019	29.660	0.843	0.818	0.022	1.504
48287	Lee	1,443,601	1.273	42.205	16,258.281	0.414	0.132	206.380	5.826	5.651	0.150	10.508
48289	Leon	1,775,048	1.565	52.096	19,991.148	0.509	0.162	247.870	7.045	6.834	0.184	12.577
48291	Liberty	6,471,800	5.707	191.517	72,887.427	1.855	0.592	1,030.916	27.707	26.876	0.671	57.093
48293	Limestone	2,172,296	1.916	63.752	24,465.070	0.623	0.199	303.221	8.620	8.362	0.225	15.381
48295	Lipscomb	2,073,463	1.828	60.543	23,351.984	0.594	0.190	298.731	8.414	8.161	0.215	15.228
48297	Live Oak	407,366	0.359	11.957	4,587.880	0.117	0.037	56.961	1.618	1.570	0.042	2.893
48299	Llano	103,587	0.091	2.660	1,166.630	0.030	0.009	25.920	0.639	0.620	0.011	1.407
48303	Lubbock	1,578,058	1.392	46.063	17,772.586	0.452	0.144	255.369	6.880	6.674	0.164	13.829
48305	Lynn	144,376	0.127	3.918	1,626.002	0.041	0.013	29.779	0.765	0.742	0.015	1.588
48307	McCulloch	43,022	0.038	1.105	484.529	0.012	0.004	10.765	0.266	0.258	0.004	0.584
48309	McLennan	4,520,869	3.987	132.911	50,915.432	1.296	0.414	646.103	18.175	17.630	0.468	33.370
48313	Madison	256,533	0.226	7.529	2,889.151	0.074	0.023	35.808	1.018	0.987	0.027	1.816
48315	Marion	1,582,659	1.396	46.448	17,824.397	0.454	0.145	220.916	6.280	6.092	0.164	11.206
48317	Martin	604,341	0.533	17.736	6,806.273	0.173	0.055	84.357	2.398	2.326	0.063	4.279
48321	Matagorda	788,187	0.695	23.136	8,876.804	0.226	0.072	110.315	3.132	3.038	0.082	5.607
48323	Maverick	804,483	0.709	23.824	9,060.340	0.231	0.074	126.086	3.408	3.305	0.083	6.942
48325	Medina	2,664,834	2.350	78.209	30,012.195	0.764	0.244	372.071	10.576	10.259	0.276	18.877
48329	Midland	1,245,871	1.099	36.564	14,031.389	0.357	0.114	173.906	4.944	4.796	0.129	8.821

Table 7-1. Controlled Emissions (tons) for Criteria Pollutants by County for 2014

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48331	Milam	5,241,037	4.622	153.762	59,026.192	1.502	0.480	733.558	20.836	20.211	0.543	37.235
48333	Mills	1,074,170	0.947	31.520	12,097.642	0.308	0.098	150.085	4.266	4.138	0.111	7.614
48335	Mitchell	1,813,674	1.599	53.228	20,426.159	0.520	0.166	253.163	7.197	6.981	0.188	12.842
48337	Montague	1,993,573	1.758	58.507	22,452.245	0.571	0.182	278.274	7.911	7.674	0.207	14.115
48339	Montgomery	2,627,016	2.317	76.715	29,586.267	0.753	0.240	378.360	10.657	10.337	0.272	19.289
48341	Moore	5,607,404	4.945	164.485	63,152.330	1.607	0.513	799.227	22.539	21.863	0.581	40.977
48343	Morris	805,877	0.711	23.558	9,076.033	0.231	0.074	116.399	3.273	3.174	0.084	5.959
48347	Nacogdoches	742,737	0.655	21.799	8,364.932	0.213	0.068	103.774	2.949	2.860	0.077	5.268
48349	Navarro	3,106,821	2.740	91.179	34,989.991	0.890	0.284	433.668	12.329	11.959	0.322	21.998
48351	Newton	342,798	0.302	9.900	3,860.701	0.098	0.031	52.678	1.457	1.413	0.036	2.711
48353	Nolan	2,300,943	2.029	67.391	25,913.938	0.659	0.211	332.139	9.329	9.049	0.238	17.083
48355	Nueces	1,639,771	1.446	48.466	18,467.611	0.470	0.150	250.989	6.852	6.646	0.170	13.607
48357	Ochiltree	85,970	0.076	2.213	968.219	0.025	0.008	21.481	0.530	0.514	0.009	1.169
48359	Oldham	436,407	0.385	12.808	4,914.953	0.125	0.040	60.916	1.732	1.680	0.045	3.090
48361	Orange	1,906,970	1.682	55.821	21,476.885	0.547	0.174	272.143	7.681	7.451	0.198	13.886
48363	Palo Pinto	2,065,025	1.821	60.604	23,256.958	0.592	0.189	288.248	8.195	7.949	0.214	14.621
48365	Panola	389,579	0.344	11.472	4,387.563	0.112	0.036	66.866	1.755	1.702	0.040	3.786
48367	Parker	1,980,625	1.747	58.123	22,306.416	0.568	0.181	276.586	7.862	7.626	0.205	14.031
48369	Parmer	8,504,109	7.499	249.579	95,775.919	2.437	0.778	1,187.150	33.749	32.736	0.881	60.222
48371	Pecos	351,112	0.310	9.656	3,954.336	0.101	0.032	68.781	1.787	1.733	0.036	3.652
48373	Polk	801,607	0.707	23.462	9,027.946	0.230	0.073	113.801	3.219	3.122	0.083	5.788
48375	Potter	5,663,561	4.994	167.879	63,784.793	1.623	0.518	897.975	24.151	23.426	0.587	49.807
48377	Presidio	1,418,643	1.251	40.900	15,977.203	0.407	0.130	220.160	6.071	5.889	0.147	11.345
48381	Randall	7,620,940	6.721	224.526	85,829.395	2.184	0.697	1,119.712	31.115	30.182	0.790	59.014
48383	Reagan	79,126	0.070	2.032	891.147	0.023	0.007	19.799	0.488	0.474	0.008	1.075
48389	Reeves	2,120,096	1.870	61.894	23,877.184	0.608	0.194	305.787	8.610	8.351	0.220	15.590

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48391	Refugio	1,498,892	1.322	43.989	16,880.991	0.430	0.137	209.224	5.948	5.770	0.155	10.613
48393	Roberts	3,176,320	2.801	93.218	35,772.702	0.910	0.291	443.369	12.605	12.227	0.329	22.490
48395	Robertson	5,293,575	4.668	155.421	59,617.888	1.517	0.484	743.107	21.072	20.440	0.549	37.861
48397	Rockwall	36,638	0.032	0.941	412.625	0.011	0.003	9.167	0.226	0.219	0.004	0.498
48399	Runnels	90,910	0.080	2.340	1,023.857	0.026	0.008	22.718	0.560	0.543	0.009	1.236
48401	Rusk	456,620	0.403	13.335	5,142.599	0.131	0.042	65.864	1.854	1.798	0.047	3.361
48403	Sabine	51,185	0.045	1.314	576.458	0.015	0.005	12.807	0.316	0.306	0.005	0.695
48405	San Augustine	46,811	0.041	1.202	527.200	0.013	0.004	11.713	0.289	0.280	0.005	0.636
48407	San Jacinto	251,654	0.222	7.386	2,834.205	0.072	0.023	35.127	0.999	0.969	0.026	1.782
48409	San Patricio	1,182,606	1.043	34.713	13,318.873	0.339	0.108	165.469	4.699	4.558	0.123	8.409
48411	San Saba	88,941	0.078	2.284	1,001.679	0.025	0.008	22.255	0.549	0.533	0.009	1.208
48415	Scurry	1,003,186	0.885	29.443	11,298.198	0.288	0.092	140.129	3.983	3.863	0.104	7.112
48419	Shelby	879,214	0.775	25.703	9,901.977	0.252	0.080	139.396	3.781	3.668	0.091	7.499
48421	Sherman	3,405,092	3.003	99.932	38,349.204	0.976	0.312	475.302	13.512	13.107	0.353	24.110
48423	Smith	1,333,020	1.176	39.179	15,012.884	0.382	0.122	189.795	5.348	5.188	0.138	9.775
48427	Starr	42,511	0.037	1.092	478.776	0.012	0.004	10.637	0.262	0.255	0.004	0.577
48429	Stephens	307,942	0.272	9.037	3,468.143	0.088	0.028	42.984	1.222	1.185	0.032	2.180
48437	Swisher	443,775	0.391	13.024	4,997.934	0.127	0.041	61.945	1.761	1.708	0.046	3.142
48439	Tarrant	13,609,290	12.001	403.245	153,272.065	3.900	1.245	2,213.399	58.992	57.222	1.410	124.044
48441	Taylor	2,728,221	2.406	80.069	30,726.072	0.782	0.250	380.919	10.828	10.503	0.283	19.326
48443	Terrell	1,618,440	1.427	47.498	18,227.378	0.464	0.148	225.911	6.422	6.230	0.168	11.459
48445	Terry	192,181	0.169	4.935	2,164.399	0.055	0.018	48.088	1.186	1.151	0.020	2.610
48449	Titus	732,020	0.646	21.367	8,244.238	0.210	0.067	105.988	2.980	2.891	0.076	5.413
48451	Tom Green	90,712	0.080	2.335	1,021.627	0.026	0.008	22.668	0.559	0.542	0.009	1.233
48453	Travis	1,143,812	1.009	32.869	12,881.971	0.328	0.105	184.672	5.026	4.875	0.119	9.653

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48455	Trinity	325,209	0.287	9.544	3,662.607	0.093	0.030	45.395	1.291	1.252	0.034	2.303
48459	Upshur	1,605,073	1.415	47.106	18,076.836	0.460	0.147	224.045	6.369	6.178	0.166	11.365
48461	Upton	86,115	0.076	2.211	969.858	0.025	0.008	21.548	0.532	0.516	0.009	1.169
48463	Uvalde	2,378,068	2.097	69.794	26,782.547	0.682	0.218	332.141	9.440	9.157	0.246	16.856
48465	Val Verde	2,552,202	2.251	74.903	28,743.696	0.731	0.234	356.349	10.129	9.826	0.264	18.080
48467	Van Zandt	1,385,055	1.221	40.649	15,598.925	0.397	0.127	193.334	5.496	5.331	0.144	9.807
48469	Victoria	1,853,396	1.634	54.252	20,873.521	0.531	0.170	263.553	7.450	7.226	0.192	13.420
48471	Walker	546,463	0.482	16.038	6,154.441	0.157	0.050	76.278	2.169	2.103	0.057	3.869
48473	Waller	487,370	0.430	14.305	5,488.912	0.140	0.045	68.128	1.936	1.878	0.050	3.460
48475	Ward	2,048,709	1.807	60.061	23,073.204	0.587	0.187	288.048	8.171	7.926	0.212	14.631
48477	Washington	1,615,936	1.425	47.426	18,199.176	0.463	0.148	225.660	6.414	6.222	0.167	11.450
48479	Webb	3,228,273	2.847	94.885	36,357.821	0.925	0.295	460.507	12.966	12.577	0.335	23.744
48481	Wharton	1,694,576	1.494	49.194	19,084.840	0.486	0.155	252.779	7.048	6.837	0.176	12.953
48485	Wichita	2,129,135	1.878	62.293	23,978.979	0.610	0.195	310.545	8.693	8.432	0.221	16.022
48487	Wilbarger	2,528,285	2.230	74.201	28,474.337	0.725	0.231	353.011	10.035	9.734	0.262	17.910
48489	Willacy	101,106	0.089	2.967	1,138.692	0.029	0.009	14.113	0.401	0.389	0.010	0.716
48491	Williamson	1,457,992	1.286	42.024	16,420.365	0.418	0.133	227.743	6.265	6.077	0.151	11.772
48495	Winkler	70,875	0.063	1.820	798.221	0.020	0.006	17.734	0.438	0.424	0.007	0.963
48497	Wise	3,567,087	3.146	104.831	40,173.647	1.022	0.326	507.222	14.301	13.872	0.370	26.098
48499	Wood	1,412,304	1.245	41.450	15,905.813	0.405	0.129	197.236	5.606	5.438	0.146	10.009
	Total	369,183,938	325.56	10,838	4,157,864	105.81	33.78	54,344	1,512	1,467	38.25	2,842

Table 7-2. Texas Statewide Annual Uncontrolled Criteria Emissions Estimates by Year (tons)

Year	CH_4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
2008	343.41	11,422.28	4,385,716.19	111.61	35.63	120,123.86	2,868.43	2,782.58	807.00	4,647.72
2009	282.69	9,401.43	3,610,282.04	91.87	29.33	99,571.47	2,361.26	2,290.58	664.32	3,819.94
2010	303.58	10,096.63	3,877,052.09	98.66	31.50	106,713.93	2,535.61	2,459.71	713.40	4,106.66
2011	317.73	10,568.04	4,057,795.39	103.26	32.96	111,288.20	2,653.77	2,574.33	746.66	4,302.31
2012	313.04	10,411.94	3,997,969.04	101.74	32.48	108,612.77	2,614.69	2,536.43	735.65	4,236.73
2013	318.65	10,598.93	4,069,555.14	103.56	33.06	110,621.54	2,661.46	2,581.80	748.83	4,315.96
2014	325.56	10,828.92	4,157,864.49	105.81	33.78	112,949.58	2,719.21	2,637.82	765.08	4,409.62
2015	326.61	10,863.58	4,171,169.66	106.15	33.89	111,443.59	2,727.91	2,646.26	767.52	4,423.73
2016	314.88	10,473.57	4,021,424.67	102.34	32.67	106,672.30	2,629.98	2,551.26	739.97	4,264.91
2017	326.00	10,843.29	4,163,380.96	105.95	33.82	110,402.90	2,722.82	2,641.32	766.09	4,415.47
2018	333.95	11,107.87	4,264,967.45	108.53	34.65	113,050.59	2,789.26	2,705.77	784.78	4,523.20
2019	337.72	11,233.39	4,313,161.58	109.76	35.04	114,321.09	2,820.78	2,736.34	793.65	4,574.32
2020	340.22	11,316.51	4,345,078.98	110.57	35.30	115,162.51	2,841.65	2,756.59	799.53	4,608.17
2021	344.20	11,448.92	4,395,916.40	111.87	35.71	116,502.70	2,874.90	2,788.85	808.88	4,662.08
2022	349.23	11,616.07	4,460,096.78	113.50	36.23	118,194.64	2,916.87	2,829.56	820.69	4,730.15
2023	353.00	11,741.53	4,508,265.83	114.73	36.62	119,464.49	2,948.37	2,860.12	829.55	4,781.23
2024	355.93	11,838.98	4,545,684.44	115.68	36.93	120,450.93	2,972.84	2,883.86	836.44	4,820.92
2025	360.52	11,991.70	4,604,323.77	117.17	37.40	121,986.68	3,011.19	2,921.06	847.23	4,883.11
2026	360.09	11,977.31	4,598,798.58	117.03	37.36	121,777.13	3,007.58	2,917.56	846.21	4,877.25
2027	362.61	12,061.15	4,630,990.17	117.85	37.62	122,574.20	3,028.63	2,937.98	852.13	4,911.39
2028	360.94	12,005.67	4,609,687.61	117.31	37.45	122,012.62	3,014.70	2,924.47	848.22	4,888.80
2029	362.60	12,060.90	4,630,892.17	117.85	37.62	122,410.29	3,028.57	2,937.92	852.12	4,911.28
2030	364.05	12,109.14	4,649,415.74	118.32	37.77	122,720.92	3,040.68	2,949.67	855.53	4,930.93
2031	363.22	12,081.29	4,638,722.09	118.05	37.68	122,439.01	3,033.69	2,942.89	853.56	4,919.59
2032	365.10	12,144.11	4,662,843.44	118.66	37.88	123,074.91	3,049.47	2,958.19	858.00	4,945.17
2033	363.86	12,102.82	4,646,989.77	118.26	37.75	122,505.31	3,039.10	2,948.13	855.08	4,928.36
2034	362.59	12,060.46	4,630,725.31	117.84	37.62	122,076.54	3,028.46	2,937.81	852.09	4,911.11

Table 7-2. Texas Statewide Annual Uncontrolled Criteria Emissions Estimates by Year (tons)

Year	CH_4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
2035	363.86	12,102.68	4,646,932.85	118.25	37.75	122,503.81	3,039.06	2,948.10	855.07	4,928.30
2036	366.15	12,178.92	4,676,208.53	119.00	37.99	123,275.58	3,058.21	2,966.67	860.46	4,959.34
2037	362.38	12,053.48	4,628,043.58	117.77	37.60	122,005.84	3,026.71	2,936.11	851.59	4,908.26
2038	363.21	12,081.20	4,638,688.08	118.04	37.68	122,286.46	3,033.67	2,942.86	853.55	4,919.55
2039	362.78	12,066.71	4,633,121.65	117.90	37.64	122,139.71	3,030.03	2,939.33	852.53	4,913.65
2040	363.61	12,094.46	4,643,777.83	118.17	37.72	122,420.64	3,037.00	2,946.09	854.49	4,924.95

Table 7-3. Texas Statewide Annual Controlled Criteria Emissions Estimates by Year(tons)

Year	CH4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
2008	343.41	11,432.14	4,385,716.19	111.61	35.63	70,469.07	2,204.90	2,138.75	807.00	4,245.97
2009	282.69	9,409.55	3,610,282.04	91.87	29.33	56,676.31	1,749.52	1,697.04	664.32	3,386.32
2010	303.58	10,105.34	3,877,052.09	98.66	31.50	58,207.13	1,807.34	1,753.12	713.40	3,485.32
2011	317.73	10,577.15	4,057,795.39	103.26	32.96	58,224.50	1,780.44	1,727.02	746.66	3,419.87
2012	313.04	10,420.92	3,997,969.04	101.74	32.48	55,463.51	1,641.15	1,591.92	36.78	3,121.83
2013	318.65	10,608.06	4,069,555.14	103.56	33.06	54,748.85	1,558.39	1,511.64	37.44	2,951.30
2014	325.56	10,838.25	4,157,864.49	105.81	33.78	54,343.87	1,512.46	1,467.09	38.25	2,841.95
2015	326.61	10,872.94	4,171,169.66	106.15	33.89	52,348.24	1,441.66	1,398.41	38.38	2,690.75
2016	314.88	10,482.60	4,021,424.67	102.34	32.67	47,590.93	1,276.70	1,238.40	37.00	2,350.49
2017	326.00	10,852.63	4,163,380.96	105.95	33.82	46,755.16	1,243.68	1,206.37	38.30	2,231.42
2018	333.95	11,117.44	4,264,967.45	108.53	34.65	45,635.85	1,194.87	1,159.03	39.24	2,116.37
2019	337.72	11,243.07	4,313,161.58	109.76	35.04	44,263.02	1,131.01	1,097.08	39.68	2,015.26
2020	340.22	11,326.26	4,345,078.98	110.57	35.30	42,783.10	1,052.48	1,020.90	39.98	1,881.49
2021	344.20	11,458.78	4,395,916.40	111.87	35.71	41,358.91	1,022.63	991.96	40.44	1,817.59
2022	349.23	11,626.08	4,460,096.78	113.50	36.23	39,853.93	954.79	926.15	41.03	1,742.38
2023	353.00	11,751.64	4,508,265.83	114.73	36.62	38,239.93	918.18	890.63	41.48	1,667.19
2024	355.93	11,849.18	4,545,684.44	115.68	36.93	36,355.05	838.61	813.45	41.82	1,577.32
2025	360.52	12,002.03	4,604,323.77	117.17	37.40	34,539.68	798.64	774.68	42.36	1,483.59
2026	360.09	11,987.63	4,598,798.58	117.03	37.36	32,385.96	753.58	730.97	42.31	1,426.34
2027	362.61	12,071.55	4,630,990.17	117.85	37.62	30,866.62	714.44	693.01	42.61	1,339.77
2028	360.94	12,016.02	4,609,687.61	117.31	37.45	28,986.62	663.17	643.28	42.41	1,234.47
2029	362.60	12,071.29	4,630,892.17	117.85	37.62	27,373.94	580.28	562.87	42.61	1,184.29
2030	364.05	12,119.58	4,649,415.74	118.32	37.77	25,703.35	534.20	518.18	42.78	1,136.00
2031	363.22	12,091.70	4,638,722.09	118.05	37.68	23,868.24	529.18	513.30	42.68	1,033.63
2032	365.10	12,154.58	4,662,843.44	118.66	37.88	22,599.39	484.31	469.79	42.90	985.81
2033	363.86	12,113.25	4,646,989.77	118.26	37.75	21,125.72	437.19	424.07	42.75	926.41
2034	362.59	12,070.86	4,630,725.31	117.84	37.62	19,668.42	387.45	375.83	42.60	867.32

Table 7-3. Texas Statewide Annual Controlled Criteria Emissions Estimates by Year(tons)

Year	CH4	CO	CO_2	N_2O	NH_3	NO_X	$PM_{10\text{-}PRI}$	$PM_{25\text{-}PRI}$	SO_2	VOC
2035	363.86	12,113.10	4,646,932.85	118.25	37.75	18,349.05	383.04	371.54	42.75	817.35
2036	366.15	12,189.42	4,676,208.53	119.00	37.99	17,461.10	339.68	329.49	43.02	766.09
2037	362.38	12,063.86	4,628,043.58	117.77	37.60	16,306.43	332.39	322.42	42.58	749.12
2038	363.21	12,091.61	4,638,688.08	118.04	37.68	15,429.54	288.67	280.01	42.68	704.00
2039	362.78	12,077.10	4,633,121.65	117.90	37.64	14,497.73	284.53	275.99	42.63	697.09
2040	363.61	12,104.88	4,643,777.83	118.17	37.72	14,033.40	239.73	232.54	42.72	648.76

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Appendix A. Internet Research for Existing and Potential Yard Locations

Location	Yard Name	Railroad	Status	Links
Beaumont	Beaumont Yard	UP	Existing	http://en.wikipedia.org/wiki/List_of_rail_yards
Fort Worth	Davidson Yard	UP	Existing	http://en.wikipedia.org/wiki/List_of_rail_yards
Houston	Englewood Yard	UP	Existing	http://en.wikipedia.org/wiki/List_of_rail_yards
Kendleton	Kendleton Yard	KCS	Existing	http://en.wikipedia.org/wiki/List_of_rail_yards
Slaton	Slaton Yard	BNSF/South Plains Lamesa Railroad	Existing	http://en.wikipedia.org/wiki/List_of_rail_yards
La Porte	Strang Yard	UP	Existing	http://iaspub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110035015079
Dallas	Miller Yard	UP	Existing	http://iaspub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110035273398
Eagle Ford	San Antonio	UP	New	http://missionrailpark.com/
San Antonio	Southton Rail Yard	UP & BNSF	Existing	http://southtonrailyard.com/about.html
Dallas	KCS Rail Yard	KCS	Existing	http://wikimapia.org/10547329/Kansas-City-Southern-Rail-Yard
San Antonio	Alamo Junction Rail Park	UP & BNSF	Proposed	http://www.alamojunction.com/
Big Spring		UP	Proposed	http://www.bigspringherald.com/content/rail-yard-could-be-possibility
Port Corpus Christi Commission (PCCA)		BNSF/KCS/UP	Proposed	http://www.progressiverailroading.com/intermodal/news/Texas-port-awards-rail-yard-contract--36514
between Hearne and Mumford, Texas		UP	Proposed	http://www.progressiverailroading.com/union_pacific/news/Union-Pacific-Railroad-proposes-to-build-one-of-Texas-largest-classification-yards-Hearne-mayor-says--31785
Houston	Port Terminal Railroad (PTRA) North Yard	KCS, NS, BNSF	Existing	http://www.ptra.com/index.php/about-us/ptra-yards.html http://www.usa.com/frs/union-pacific-railroad-settegast-yard.html
Houston	PTRA Manchester Yard	UP/BNSF	Existing	http://www.ptra.com/index.php/about-us/ptra-yards.html

Appendix A. Internet Research for Existing and Potential Yard Locations

Location	Yard Name	Railroad	Status	Links
Houston	PTRA Pasadena Yard	UP/BNSF	Existing	http://www.ptra.com/index.php/about-us/ptra-yards.html
Houston	PTRA Storage Yard	UP	Existing	http://www.ptra.com/index.php/about-us/ptra-yards.html
Houston	Settsgast Yard	UP	Existing	http://www.railfanguides.us/tx/houston/map1/index.htm
Dallas	KCS Dallas Yard	KCS	Existing	http://www.railroadforums.com/forum/showthread.php?12220-KCS-yard-near-dallas-or-fort-worth
Wylie	KCS Wylie Yard	KCS, NS, BNSF	Existing	http://www.railroadforums.com/forum/showthread.php?12220-KCS-yard-near-dallas-or-fort-worth
Dallas	Dallas Garland & Northeastern (DGNO) at Mockingbird yard	BNSF, KCS, TNER, and UP	Existing	http://www.railroadforums.com/photos/showphoto.php/photo/23775/title/dgno-at-mockingbird-yarddallas-tx/cat/562
Dallas	Mockingbird yard	DGNO	Existing	http://www.railroadforums.com/photos/showphoto.php/photo/23775/title/dgno-at-mockingbird-yarddallas-tx/cat/562
Galveston	Texas International Terminals	UP	Existing	http://www.up.com/customers/coal/ports-docks/tx-terminals/index.htm
Robertson County		UP	Proposed	http://www.uprr.com/newsinfo/releases/capital_investment/2014/1002_tx-railyard.shtml
Blue Mound	Alliance Railyard	BNSF	Existing	http://www.waymarking.com/waymarks/WM73KD_BNSF_Alliance_Railyard_Blue_Mound_Texas

Appendix B. Texas Switch Yard Locations

FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48001	Anderson	Palestine	RY739	14461911	31.757692	-95.635833
48005	Angelina	Herty	RY1025	16912511	31.355473	-94.678973
48005	Angelina	Lufkin	RY1171	16923311	31.344356	-94.728319
48013	Atascosa	Pleasanton	RY1191	16924611	28.97427	-98.481283
48015	Austin	Bellville	RY1053	16914411	29.922351	-96.240637
48015	Austin	Sealy1	RY1108	16918211	29.781802	-96.16711
48021	Bastrop	Smithville	RY1104	16917811	30.003586	-97.157494
48027	Bell	Corpus Christi3 (Agnes St Yard)	RY953	15528711	27.785797	-97.477569
48027	Bell	Fort Hood	RY988	16933211	31.125511	-97.78053
48027	Bell	Rogers	RY1102	16917611	30.931574	-97.225284
48027	Bell	Temple 1	RY740	14462111	31.11474	-97.348822
48027	Bell	Temple 2	RY982	16929111	31.068564	-97.329459
48029	Bexar	Calaveras Lake	RY1057	16914711	29.29981	-98.322104
48029	Bexar	East 3	RY741	14462211	29.434091	-98.467212
48029	Bexar	Kirby	RY963	16927511	29.471846	-98.38799
48029	Bexar	Mitchell Lake	RY1163	16922611	29.308866	-98.640641
48029	Bexar	San Antonio Central	RY975	16928511	29.37842	-98.541273
48029	Bexar	San Antonio2	RY1109	16918311	29.376954	-98.556942
48029	Bexar	So San Antonio	RY974	16928411	29.295394	-98.432169
48037	Bowie	Texarkana	RY743	14462311	33.399495	-94.05799
48039	Brazoria	Angleton 1	RY744	14462411	29.157184	-95.433799
48039	Brazoria	Angleton 2	RY1300	16930111	29.152062	-95.433486
48039	Brazoria	Brazosport	RY1047	16913911	28.949548	-95.321535
48039	Brazoria	Clute1	RY1092	16916911	29.010993	-95.387195
48039	Brazoria	Clute2	RY1091	16931511	28.996955	-95.375762
48039	Brazoria	Clute3	RY1090	16916811	28.998359	-95.359885
48039	Brazoria	Freeport1	RY1028	16912811	28.964256	-95.348806
48039	Brazoria	Freeport2	RY1041	16933311	28.952796	-95.338393
48039	Brazoria	Oyster Creek1	RY1173	16934211	28.98326	-95.34286
48039	Brazoria	Oyster Creek2	RY1158	16922211	28.972508	-95.340582
48039	Brazoria	Pearland	RY1197	16925111	29.577526	-95.291657
48049	Brown	Brownwood	RY745	14462511	31.712634	-98.966355
48051	Burleson	Chriesman	RY1093	16917011	30.606182	-96.775294
48051	Burleson	Somerville	RY977	16928711	30.35103	-96.531718
48057	Calhoun	Long Mott1	RY1177	16933411	28.49311	-96.767357
48057	Calhoun	Long Mott2	RY1176	16933811	28.500873	-96.772772

Appendix B. Texas Switch Yard Locations

FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48057	Calhoun	Long Mott3	RY1160	16922411	28.512421	-96.771912
48057	Calhoun	Long Mott4	RY1174	16933511	28.521817	-96.769775
48057	Calhoun	Long Mott5	RY1188	16933911	28.534027	-96.764061
48057	Calhoun	Point Comfort1	RY1146	16921011	28.661036	-96.553703
48057	Calhoun	Point Comfort2	RY1103	16917711	28.687419	-96.543028
48057	Calhoun	Point Comfort3	RY1161	16934611	28.697426	-96.534372
48061	Cameron	Alamo Junction	RY1311	16926311	29.261258	-98.346338
48061	Cameron	Brownsville	RY747	14462611	25.912592	-97.489694
48061	Cameron	Cameron Park1	RY1059	16914911	25.941462	-97.439003
48061	Cameron	Harlingen	RY748	14462711	26.204216	-97.706849
48061	Cameron	Olmito 0	RY749	14462811	25.90313	-97.50719
48061	Cameron	Olmito 1	RY1201	16934011	25.999663	-97.507797
48061	Cameron	Reid Hope King1	RY1124	16934911	25.953804	-97.41116
48061	Cameron	Reid Hope King2	RY1123	16934511	25.958507	-97.386164
48061	Cameron	Reid Hope King3	RY1122	16935011	25.954362	-97.381916
48061	Cameron	Reid Hope King4	RY1121	16919211	25.975434	-97.352218
48061	Cameron	Reid Hope King5	RY1120	16919111	25.969089	-97.417659
48063	Camp	Pittsburg	RY1194	16924811	32.99762	-94.978054
48065	Carson	Panhandle	RY1200	16925311	35.34161	-101.37594
48065	Carson	Skellytown 1	RY1106	16918011	35.580678	-101.17095
48067	Cass	Hughes Springs	RY954	15528811	32.998464	-94.634842
48069	Castro	Dimmitt	RY1307	16926011	34.556851	-102.31117
48071	Chambers	Baytown2	RY1061	16915011	29.758596	-94.89949
48071	Chambers	Baytown3	RY1060	16930611	29.772596	-94.894913
48071	Chambers	Beach City	RY1044	16913711	29.696948	-94.89278
48071	Chambers	Mont Belvieu	RY1067	16915611	29.871641	-94.909055
48075	Childress	Childress	RY752	14463011	34.422742	-100.21081
48085	Collin	Wylie	RY955	15528911	33.032174	-96.499084
48089	Colorado	Eagle Lake1	RY1002	16910311	29.563454	-96.328963
48089	Colorado	Eagle Lake2	RY986	16932911	29.601906	-96.347254
48089	Colorado	Glidden	RY753	14463111	29.703364	-96.580978
48091	Comal	Garden Ridge	RY1001	16910211	29.636199	-98.258133
48091	Comal	Hunter	RY1020	16912011	29.803357	-98.036609
48091	Comal	Jama1	RY754	14463211	29.806695	-98.02403
48091	Comal	New Braunfels3	RY1147	16921111	29.678635	-98.181673
48091	Comal	Northcliff	RY1131	16919911	29.653876	-98.227899
48097	Cooke	Gainesville	RY755	14463311	33.641692	-97.145132

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FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48099	Coryell	Copperas Cove	RY1089	16916711	31.127656	-97.860036
48111	Dallam	Dalhart	RY1305	16925811	36.070668	-102.5148
48113	Dallas	Cadiaz	RY756	14463411	32.776399	-96.827491
48113	Dallas	Carrollton 2	RY1096	16917211	32.959155	-96.878801
48113	Dallas	Dallas	RY956	15529011	32.8577	-96.674332
48113	Dallas	Garland 2	RY1042	16913611	32.888027	-96.673711
48113	Dallas	Irving	RY959	16927111	32.81345	-96.881208
48113	Dallas	Mesquite	RY964	16927611	32.78078	-96.670368
48113	Dallas	Miller Yard	RY962	16927411	32.710739	-96.74846
48117	Deaf Smith	Hereford 2	RY1316	16926611	34.825079	-102.36994
48121	Denton	Denton	RY1006	16910711	33.21336	-97.12698
48121	Denton	Justin	RY1017	16911711	32.996909	-97.354136
48121	Denton	Roanoke	RY1119	16919011	33.00007	-97.230422
48135	Ector	Odessa	RY757	14488911	31.841812	-102.37186
48141	El Paso	Alfalfa	RY759	14463611	31.764201	-106.39349
48141	El Paso	Dallas Street	RY760	14487811	31.758912	-106.47871
48141	El Paso	El Paso 0	RY965	16935211	31.74995	-106.47871
48141	El Paso	El Paso 1	RY1308	16926111	31.753308	-106.49313
48141	El Paso	El Paso 2	RY1309	16930911	31.765651	-106.47961
48141	El Paso	Fort Bliss	RY989	16929411	31.836356	-106.41454
48139	Ellis	Ennis	RY1312	16926411	32.300988	-96.589346
48139	Ellis	Garrett	RY758	14463511	32.343809	-96.636944
48143	Erath	Dublin	RY1003	16910411	32.087055	-98.337189
48143	Erath	Stephenville	RY1156	16922011	32.223114	-98.209424
48149	Fayette	Halsted	RY1029	16912911	29.90784	-96.749174
48153	Floyd	Floydada	RY990	16929511	33.980715	-101.32867
48157	Fort Bend	Kendleton_Intermodal	RY967	16927811	29.463533	-95.974282
48157	Fort Bend	Rosenberg	RY1130	16919811	29.560409	-95.828585
48157	Fort Bend	Sugar Land	RY1155	16921911	29.620307	-95.640544
48157	Fort Bend	Thompsons	RY1145	16920911	29.472938	-95.634893
48161	Freestone	Teague	RY981	16929011	31.63	-96.287795
48167	Galveston	Dickinson	RY1005	16910611	29.459966	-95.044592
48167	Galveston	East 2	RY761	14488011	29.3489	-94.941395
48167	Galveston	Galveston	RY762	14463711	29.30052	-94.823747
48167	Galveston	Texas City	RY763	14463811	29.35393	-94.934279
48177	Gonzales	Harwood1	RY1027	16912711	29.605124	-97.468063
48177	Gonzales	Harwood2	RY1026	16912611	29.666476	-97.501541

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FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48179	Gray	Pampa 1	RY1054	16914511	35.482466	-101.05536
48179	Gray	Pampa 2	RY968	16927911	35.529388	-100.96277
48181	Grayson	Denison 1	RY1007	16910811	33.7537	-96.534072
48181	Grayson	Ray Yard	RY1306	16925911	33.771553	-96.584119
48181	Grayson	Sherman	RY764	14463911	33.654137	-96.599046
48183	Gregg	Greggton 1	RY1314	16926511	32.503945	-94.811731
48183	Gregg	Greggton 2	RY1034	16933611	32.501706	-94.788586
48183	Gregg	Greggton 3	RY1033	16913111	32.496285	-94.770163
48183	Gregg	Longview	RY765	14464011	32.493149	-94.727315
48185	Grimes	Navasot	RY1151	16921511	30.381244	-96.086452
48189	Hale	Plainview	RY971	16928111	34.192689	-101.69697
48197	Hardeman	Goodlett 2	RY1037	16913311	34.317627	-99.824209
48197	Hardeman	Quanah	RY972	16928211	34.30422	-99.738047
48199	Hardin	Silsbee	RY766	14464111	30.358535	-94.189046
48201	Harris	Basin	RY767	14464211	29.767723	-95.293528
48201	Harris	Bayport North Industrial Park	RY1062	16915111	29.639855	-95.089988
48201	Harris	Booth	RY769	14464311	29.735778	-95.281514
48201	Harris	Coady	RY770	14464511	29.751592	-95.020386
48201	Harris	Congress	RY771	14487711	29.765943	-95.355992
48201	Harris	Deer Park1	RY1079	16931811	29.725726	-95.153921
48201	Harris	Deer Park10	RY1078	16932011	29.704988	-95.085304
48201	Harris	Deer Park11	RY1077	16932111	29.705392	-95.062476
48201	Harris	Deer Park12	RY1076	16932211	29.699268	-95.062862
48201	Harris	Deer Park2	RY1075	16932411	29.724306	-95.143419
48201	Harris	Deer Park3	RY1074	16932311	29.720538	-95.124579
48201	Harris	Deer Park4	RY1030	16932511	29.721127	-95.099948
48201	Harris	Deer Park5	RY987	16932611	29.73898	-95.093049
48201	Harris	Deer Park6	RY1045	16932711	29.733578	-95.080292
48201	Harris	Deer Park7	RY1012	16911211	29.727554	-95.084177
48201	Harris	Deer Park8	RY1011	16932811	29.715635	-95.082191
48201	Harris	Deer Park9	RY1010	16911111	29.713203	-95.111229
48201	Harris	East 1	RY772	14487911	29.797557	-95.292164
48201	Harris	Englewood	RY773	14464611	29.787702	-95.315257
48201	Harris	Erinwilde	RY993	16929811	30.010395	-95.40042
48201	Harris	Eureka	RY774	14488111	29.782728	-95.421667
48201	Harris	Galena Park	RY1313	16935811	29.748052	-95.218042

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FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48201	Harris	Greens Port	RY1036	16913211	29.75234	-95.196799
48201	Harris	Hardy Street	RY775	14488311	29.771328	-95.356215
48201	Harris	Hockley	RY1023	16912311	30.023641	-95.863606
48201	Harris	Houston1	RY1318	16926811	29.744724	-95.276491
48201	Harris	Houston2	RY1319	16926911	29.715129	-95.262293
48201	Harris	Houston3	RY1021	16912111	29.70115	-95.252357
48201	Harris	La Porte1	RY1187	16924411	29.67599	-95.012984
48201	Harris	La Porte2	RY1186	16924311	29.624278	-95.056247
48201	Harris	Market Street	RY777	14488511	29.717766	-95.286374
48201	Harris	Mykawa	RY778	14464711	29.614838	-95.302751
48201	Harris	New South	RY779	14488611	29.70433	-95.329046
48201	Harris	North Yard	RY780	14488811	29.754853	-95.290042
48201	Harris	Old South	RY781	14464811	29.721474	-95.335379
48201	Harris	Pasadena1	RY969	16931011	29.722678	-95.199411
48201	Harris	Pasadena2	RY1199	16925211	29.727417	-95.174135
48201	Harris	Settegast	RY783	14489111	29.82028	-95.289579
48201	Harris	South	RY784	14489211	29.750607	-95.345575
48201	Harris	Spring	RY1157	16922111	30.05954	-95.409357
48201	Harris	Strang	RY785	14464911	29.680663	-95.039661
48201	Harris	Taylor Lake Village	RY1150	16921411	29.60348	-95.0108
48201	Harris	Woodgate	RY1132	16920011	29.913467	-95.502106
48203	Harrison	Ferguson Creek Reservoir	RY991	16929611	32.440928	-94.68728
48203	Harrison	Longview Heights	RY1172	16923411	32.503887	-94.639639
48203	Harrison	Marshall	RY786	14465011	32.55855	-94.367461
48209	Hays	Jama2	RY787	14488411	29.844798	-97.975179
48209	Hays	Mountain City	RY1175	16923511	30.050715	-97.860152
48211	Hemphill	Canadian	RY1098	16917411	35.906492	-100.4007
48211	Hemphill	Glazier	RY1039	16913411	36.011836	-100.2578
48215	Hidalgo	Alamo	RY1071	16915911	26.177803	-98.088345
48215	Hidalgo	Edinburg1	RY1000	16910111	26.318662	-98.163969
48215	Hidalgo	Kane	RY1129	16919711	26.207663	-98.247463
48215	Hidalgo	Mission	RY1165	16922811	26.214564	-98.329242
48217	Hill	Hillsboro	RY1024	16912411	32.009497	-97.133451
48221	Hood	Cresson	RY1082	16916311	32.535098	-97.621812
48223	Hopkins	Sulphur Springs	RY957	15529111	33.1339	-95.599774
48227	Howard	Big Spring	RY789	14465111	32.25336	-101.48547

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FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48227	Howard	Ziler	RY973	16928311	32.272861	-101.40899
48231	Hunt	Greenville	RY790	14465211	33.137239	-96.133632
48233	Hutchinson	Borger 1	RY1048	16914011	35.656805	-101.39016
48233	Hutchinson	Phillips	RY1195	16924911	35.689992	-101.36805
48239	Jackson	La Ward1	RY1185	16924211	28.816099	-96.504261
48239	Jackson	Point Comfort4	RY1190	16934711	28.709149	-96.543012
48239	Jackson	Redfish Lake	RY1125	16919311	28.78962	-96.548613
48241	Jasper	Jasper	RY960	16927211	30.925756	-93.984383
48245	Jefferson	Amelia	RY791	14465311	30.06967	-94.222215
48245	Jefferson	Beaumont0	RY792	14465411	30.084803	-94.112368
48245	Jefferson	Beaumont1	RY1072	16930711	30.068821	-94.07643
48245	Jefferson	Beaumont2	RY1056	16914611	30.075981	-94.090309
48245	Jefferson	Beaumont3	RY1055	16930811	30.083773	-94.095049
48245	Jefferson	Central Gardens1	RY1095	16931411	29.986176	-93.991318
48245	Jefferson	Central Gardens2	RY1094	16917111	29.999693	-93.983808
48245	Jefferson	Chaison	RY793	14465511	30.054845	-94.074835
48245	Jefferson	Guffy	RY794	14465611	30.019666	-94.082543
48245	Jefferson	Jefferson County1	RY961	16927311	30.078028	-94.242501
48245	Jefferson	Port Neches	RY1128	16919611	29.984083	-93.946568
48245	Jefferson	Port_Neeches	RY966	16927711	29.937528	-93.945796
48245	Jefferson	Portarthur	RY795	14465711	29.879483	-93.952974
48245	Jefferson	Smith Island	RY1105	16917911	30.061217	-94.042518
48245	Jefferson	Sunnyside	RY796	14465811	30.079539	-94.128833
48245	Jefferson	West Port Arthur1	RY1137	16935411	29.842258	-93.957541
48245	Jefferson	West Port Arthur2	RY1136	16920311	29.853767	-93.948576
48249	Jim Wells	Alice	RY1183	16924011	27.74792	-98.081037
48251	Johnson	Alvarado	RY1069	16915711	32.410154	-97.162628
48251	Johnson	Cleburne	RY797	14465911	32.3539	-97.383291
48271	Kinney	Spofford	RY799	14466011	29.168379	-100.4024
48281	Lampasas	Lometa	RY800	14466311	31.235143	-98.403714
48289	Leon	Newby	RY1144	16920811	31.349208	-96.169407
48291	Liberty	Hightower	RY1317	16926711	30.372323	-95.016209
48291	Liberty	Hull	RY958	16927011	30.141691	-94.631271
48291	Liberty	Stilson	RY978	16928811	30.005911	-94.904853
48297	Live Oak	Three Rivers	RY1159	16922311	28.460253	-98.186677
48303	Lubbock	Lubbock	RY801	14466411	33.580156	-101.83688
48303	Lubbock	Slaton	RY802	14466511	33.444147	-101.64069

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FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48321	Matagorda	Matagorda County1	RY1170	16934111	28.871153	-96.00391
48321	Matagorda	Matagorda County2	RY1169	16923211	28.862906	-96.023213
48321	Matagorda	Wadsworth	RY1140	16920511	28.789652	-95.941567
48323	Maverick	Eagle Pass	RY803	14466611	28.702588	-100.49848
48323	Maverick	Elm Creek1	RY1018	16911811	28.835211	-100.4351
48323	Maverick	Elm Creek2	RY1035	16933011	28.799258	-100.46372
48323	Maverick	Elm Creek3	RY1038	16933111	28.772273	-100.47349
48323	Maverick	Elm Creek4	RY1009	16911011	28.75816	-100.48703
48309	McLennan	Bellmead	RY1302	16925611	31.58012	-97.101521
48309	McLennan	Mcgregor	RY1168	16923111	31.442749	-97.405413
48325	Medina	Hondo	RY1022	16912211	29.344583	-99.176201
48331	Milam	Alcoa Lake	RY1070	16915811	30.561095	-97.070274
48331	Milam	Cameron1	RY1100	16931311	30.846703	-96.981575
48331	Milam	Cameron2	RY1099	16917511	30.874457	-96.978211
48339	Montgomery	Beach2	RY1058	16914811	30.315312	-95.384943
48341	Moore	Cactus 1	RY1046	16913811	36.041154	-101.9948
48341	Moore	Cactus 2	RY1086	16931211	36.028971	-101.97537
48341	Moore	Sunray 1	RY979	16931111	36.007858	-101.8911
48341	Moore	Sunray 2	RY1152	16921611	35.982023	-101.89081
48343	Morris	Daingerfield	RY1080	16916111	32.995427	-94.659246
48343	Morris	Lone Star	RY1178	16923611	32.95318	-94.663554
48343	Morris	Tn	RY1310	16926211	32.924907	-94.712187
48347	Nacogdoches	Nacogdoches	RY1153	16921711	31.60338	-94.659177
48353	Nolan	Sweetwater	RY980	16928911	32.494157	-100.4041
48355	Nueces	Agnesstreetyard	RY804	14487511	27.78563	-97.4848
48355	Nueces	Bishop1	RY1051	16914211	27.566487	-97.8229
48355	Nueces	Corpus Christi1	RY1304	16934811	27.823998	-97.451767
48355	Nueces	Corpus Christi2	RY1073	16916011	27.808592	-97.414636
48355	Nueces	Corpus Christi4	RY1087	16916511	27.821131	-97.426548
48355	Nueces	Corpus Christi6	RY1101	16931611	27.818226	-97.46178
48355	Nueces	Corpus Christi7	RY1085	16931711	27.817454	-97.480121
48355	Nueces	Corpus Christi8	RY1084	16931911	27.830165	-97.504066
48355	Nueces	Corpus Christi9	RY1083	16916411	27.841698	-97.522759
48355	Nueces	Nueces River Rail Yard/Proposed	RY1198	16934311	27.84218	-97.510594
48355	Nueces	Robstown	RY1118	16918911	27.785912	-97.663499
48357	Ochiltree	Perryton Yard	RY1196	16925011	36.401251	-100.80165

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FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48361	Orange	Lemonville	RY1181	16923811	30.20868	-93.843601
48361	Orange	Mauriceville	RY805	14466711	30.201928	-93.868283
48361	Orange	Mule Island	RY1154	16921811	30.045574	-93.779374
48361	Orange	Orange	RY806	14489011	30.088921	-93.766165
48361	Orange	Orangefield	RY1179	16935711	30.093865	-93.808438
48361	Orange	Owens-Illinois Reservoir	RY1189	16924511	30.214838	-93.748731
48361	Orange	Plant Reservoir1	RY1193	16934411	30.049283	-93.758592
48361	Orange	Plant Reservoir2	RY1192	16924711	30.056401	-93.762297
48361	Orange	Rose City	RY1116	16918711	30.084554	-94.07519
48361	Orange	Vidor	RY1141	16930211	30.099047	-94.005519
48361	Orange	West Orange	RY1138	16930411	30.068852	-93.768584
48365	Panola	Beckville	RY1301	16925511	32.231131	-94.50244
48369	Parmer	Farwell	RY992	16929711	34.390702	-103.03883
48371	Pecos	Pecos	RY970	16928011	31.409243	-103.51915
48375	Potter	Amarillo 1	RY1068	16930511	35.286018	-101.74415
48375	Potter	Amarillo 2	RY808	14466811	35.192681	-101.83187
48375	Potter	Amarillo 3	RY1066	16915511	35.217033	-101.79963
48375	Potter	Amarillo 4	RY1065	16915411	35.204283	-101.746
48375	Potter	Amarillo 5	RY1064	16915311	35.197775	-101.69289
48381	Randall	Amarillo 0	RY809	14487611	35.175463	-101.83828
48381	Randall	Canyon	RY1097	16917311	35.121278	-101.85741
48395	Robertson	Hearne 1	RY810	14466911	30.874762	-96.589704
48395	Robertson	Hearne 2	RY1315	16930311	30.864016	-96.603899
48399	Runnels	Ballinger	RY1063	16915211	31.738243	-99.950347
48401	Rusk	Dirgin	RY1004	16910511	32.260767	-94.566016
48409	San Patricio	Del Sol-Loma Linda	RY1008	16910911	28.010168	-97.529368
48409	San Patricio	Gregory1	RY1032	16933711	27.925216	-97.296283
48409	San Patricio	Gregory2	RY1031	16913011	27.910357	-97.267706
48409	San Patricio	Odem	RY1107	16918111	27.952409	-97.579317
48415	Scurry	Snyder	RY811	14467011	32.734416	-100.92016
48419	Shelby	Tenaha 2	RY983	16929211	31.940529	-94.278078
48423	Smith	Tyler	RY812	14489411	32.360122	-95.288832
48423	Smith	Winona	RY1133	16920111	32.441579	-95.187055
48439	Tarrant	Berkeley Place	RY1052	16914311	32.718943	-97.344553
48439	Tarrant	Centennial	RY813	14467111	32.725212	-97.376769
48439	Tarrant	Ft Worth	RY814	14467211	32.745423	-97.322403

Appendix B. Texas Switch Yard Locations

FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48439	Tarrant	Great Southwest	RY815	14488211	32.742351	-97.062948
48439	Tarrant	Hodge	RY816	14467311	32.826229	-97.332881
48439	Tarrant	North	RY817	14488711	32.783278	-97.335054
48439	Tarrant	Saginaw	RY818	14467411	32.842821	-97.358468
48439	Tarrant	Tower 55	RY819	14489311	32.743856	-97.323574
48441	Taylor	Abilene	RY1016	16911611	32.448959	-99.728013
48449	Titus	Lake Monticello	RY1184	16924111	33.091947	-95.033686
48449	Titus	Mount Pleasant	RY820	14467611	33.159441	-94.966074
48451	Tom Green	San Angelo 2	RY1110	16918411	31.496793	-100.41152
48453	Travis	Northtech Business Center	RY1117	16918811	30.444777	-97.711953
48463	Uvalde	Dabney	RY1081	16916211	29.163283	-100.09063
48463	Uvalde	Mine	RY1166	16922911	29.14162	-100.03964
48465	Val Verde	Del Rio	RY821	14467711	29.362357	-100.90551
48469	Victoria	Bloomington1	RY822	14467811	28.644604	-96.89578
48469	Victoria	Bloomington2	RY1049	16914111	28.661921	-96.871432
48469	Victoria	Raisin	RY1126	16919411	28.771198	-97.090286
48469	Victoria	Victoria2	RY1142	16920611	28.821866	-96.946411
48473	Waller	Katy	RY1013	16911311	29.792335	-95.856356
48475	Ward	Monahans	RY1162	16922511	31.591845	-102.90593
48477	Washington	Quarry	RY1127	16919511	30.315691	-96.511282
48479	Webb	El Cuatro	RY1014	16911411	27.506138	-99.516703
48479	Webb	Laredo	RY823	14467911	27.522694	-99.516579
48479	Webb	Laredo_Yard	RY1202	16925411	27.501126	-99.402717
48479	Webb	Lax	RY1182	16923911	27.498554	-99.490273
48479	Webb	Milo Distribution Center	RY1167	16923011	27.613699	-99.484956
48479	Webb	Missouri Pacific Railyards	RY1164	16922711	27.666101	-99.445618
48479	Webb	Tejas Industrial Park	RY1149	16921311	27.587831	-99.502833
48479	Webb	Tex-Mex Industrial Park	RY1148	16921211	27.511634	-99.452059
48485	Wichita	Electra	RY1015	16911511	34.029564	-98.921597
48485	Wichita	Iowa Park	RY1019	16911911	33.949852	-98.663938
48485	Wichita	Kay-Bub	RY1088	16916611	33.862578	-98.590921
48485	Wichita	Wichita Falls 1	RY1135	16935611	33.929796	-98.502339
48485	Wichita	Wichita Falls 2	RY984	16929311	33.908664	-98.483341
48485	Wichita	Wichita Falls 3	RY1134	16920211	33.931061	-98.541143

Appendix B. Texas Switch Yard Locations

FIPS Code	County Name	Facility Name	Alternative ID	EIS ID	Latitude	Longitude
48487	Wilbarger	Vernon	RY1143	16920711	34.161473	-99.283779
48491	Williamson	Georgetown	RY1040	16913511	30.620467	-97.680647
48491	Williamson	Liberty Hill	RY1180	16923711	30.64779	-97.885799
48491	Williamson	Round Rock1	RY1114	16935311	30.523004	-97.696295
48491	Williamson	Round Rock2	RY1113	16935111	30.53806	-97.699185
48491	Williamson	Round Rock3	RY1112	16935511	30.554088	-97.698567
48491	Williamson	Round Rock4	RY1111	16918511	30.570614	-97.698318
48491	Williamson	Soil Conservation Service Site 10A	RY1115	16918611	30.588143	-97.696639
48491	Williamson	Taylor	RY826	14468011	30.567394	-97.414481
48493	Wilson	Mission Rail Elmendorf	RY976	16928611	29.232801	-98.302306
48497	Wise	Chico	RY1303	16925711	33.274931	-97.795768
48499	Wood	West Mineola	RY1139	16920411	32.669933	-95.522961

Appendix C. Locomotive Emission Control Programs in Texas, 2008-2040

Rail 2008 to 2040 Control Programs				
Year	**Programs**	**Application**	**Notes**	**Source**
2008 to 2040	TxLED	110 Counties	6.2% Reduction in NO_x	https://www.tceq.texas.gov/assets/public/legal/rules/rule_lib/adoptions/09001114_aex.pdf
2008	TERP	Statewide	NO_x reduced by 4507 tons this year to various counties (listed in detail in the TERP table)	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
	Control of Emissions of Air Pollution for Locomotive Engines and Marine Compression-ignition Engines Less than 30 Liters per Cylinder	Nationwide, Incorporated into EPA's EF's already	More stringent PM and NO_x standards for remanufactured locomotives starting in 2008. - Full implementation of the rule will result in PM reductions of 90% and NO_x reductions of 80% compared to current 2008 standards.	http://www.epa.gov/nonroad/420f08004.pdf
2008 to 2011	Control of Emissions of Air Pollution for Locomotive Engines and Marine Compression-ignition Engines Less than 30 Liters per Cylinder	Nationwide, Incorporated into EPA's EF's already	More stringent PM and NO_x standards for new locomotives starting in 2008.	http://www.epa.gov/nonroad/420f08004.pdf
2009	TERP	Statewide	NO_x reduced by 4392 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2010	TERP	Statewide	NO_x reduced by 4509 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2011	TERP	Statewide	NO_x reduced by 4327 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2012	Fuel Sulfur limit	Nationwide, Incorporated into EPA's EF's already	Sulfur content of diesel fuel limited to 15 ppm starting in June. Included in EPA's Diesel fuel emission factors for locomotives.	http://www.epa.gov/OTAQ/fuels/dieselfuels/index.htm
	TERP	Statewide	NO_x reduced by 3,225	https://www.tceq.texas.gov/a

Appendix C. Locomotive Emission Control Programs in Texas, 2008-2040

Rail 2008 to 2040 Control Programs				
Year	**Programs**	**Application**	**Notes**	**Source**
			tons	ssets/public/comm_exec/pubs/sfr/079_08.pdf
2012 to 2014	Control of Emissions of Air Pollution for Locomotive Engines and Marine Compression-ignition Engines Less than 30 Liters per Cylinder	Nationwide, Incorporated into EPA's EF's already	New locomotives required to apply Tier 3 standards to remanufactured and new locomotives to reduce PM and NO_x emissions. Also creates new idle reduction requirement for new and remanufactured locomotives.	http://www.epa.gov/nonroad/420f08004.pdf
2013	TERP	Statewide	NO_x reduced by 3,349 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2014	TERP	Statewide	NO_x reduced by 3,349 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2015 to 2040	Control of Emissions of Air Pollution for Locomotive Engines and Marine Compression-ignition Engines Less than 30 Liters per Cylinder	Nationwide, Incorporated into EPA's EF's already	New locomotives required to use Tier 4 high-efficiency catalytic after treatment technology.	http://www.epa.gov/nonroad/420f08004.pdf
2015	TERP	Statewide	NO_x reduced by 1,473 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2016	TERP	Statewide	NO_x reduced by 649 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2017	TERP	Statewide	NO_x reduced by 638 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2018	TERP	Statewide	NO_x reduced by 608 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2019	TERP	Statewide	NO_x reduced by 608 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2020	TERP	Statewide	NO_x reduced by 608 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pub

Appendix C. Locomotive Emission Control Programs in Texas, 2008-2040

Rail 2008 to 2040 Control Programs				
Year	**Programs**	**Application**	**Notes**	**Source**
				s/sfr/079_08.pdf
2021	TERP	Statewide	NO_x reduced by 608 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2022	TERP	Statewide	NO_x reduced by 608 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2023	TERP	Statewide	NO_x reduced by 608 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2024	TERP	Statewide	NO_x reduced by 608 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2025	TERP	Statewide	NO_x reduced by 598 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2026	TERP	Statewide	NO_x reduced by 534 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2027	TERP	Statewide	NO_x reduced by 482 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2028	TERP	Statewide	NO_x reduced by 482 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2029	TERP	Statewide	NO_x reduced by 324 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2030	TERP	Statewide	NO_x reduced by 149 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2031	TERP	Statewide	NO_x reduced by 149 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf
2032	TERP	Statewide	NO_x reduced by 149 tons	https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079_08.pdf