APPENDIX A

PROJECTION FACTORS FOR POINT AND AREA SOURCES

Eastern Research Group, Inc.

PROJECTION FACTORS FOR POINT AND AREA SOURCES

Final

Prepared for:

Texas Commission on Environmental Quality
Air Quality Division
MC-164, P.O. Box 13087
Austin, TX 78711-3087

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ACRONYMS

AEO	*Annual Energy Outlook*
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
CO	carbon monoxide
EAC	Early Action Compact
EGAS	Economic Growth Analysis System
EIA	Energy Information Administration
EIIP	Emission Inventory Improvement Program
ERCOT	Electric Reliability Council of Texas
ERG	Eastern Research Group, Inc.
INGAA	Interstate Natural Gas Association of America
NAAQS	National Ambient Air Quality Standard
NAICS	North American Industry Classification System
NGSA	Natural Gas Supply Association
NO_x	nitrogen oxides
PUCT	Public Utility Commission of Texas
RA	Rocky Mountain Power Area
REMI	Regional Economic Growth, Inc.
SCC	Source Classification Code
SERC	Southeastern Electric Reliability Council
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SPP	Southwest Power Pool
TCC	Texas Chemical Council
TCEQ	Texas Commission for Environmental Quality
TIPI	Texas Industrial Production Index
U.S. EPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WDA	Workforce Development Area

ES.0 EXECUTIVE SUMMARY

Eastern Research Group, Inc. (ERG) completed the development of a comprehensive suite of growth factors for point and area sources. The growth factors were based upon a base year of 2005 and were developed for each year between 2006 and 2035. Various demographic and economic data were used to develop the growth factors, including: energy projections from the Energy Information Administration's (EIA) *Annual Energy Outlook*, economy forecasts from Economy.com, Texas-specific population projections, etc. In addition, analysis was conducted to demonstrate growth factor variances.

The developed growth factors were submitted to TCEQ along with the final report. The point source growth factors and associated data were provided in Microsoft Access. The area source growth factors and associated data were provided in a TexAER loadable format, as well as in a Microsoft Access format, where all fields are complete and all mandatory fields have been quality assured. All resulting TexAER loadable files will be entered into TexAER. Any errors or discrepancies identified in the TexAER loadable format or loading process will be corrected by ERG, or otherwise addressed in consultation with the TCEQ.

1.0 INTRODUCTION

Emission inventories are a core component of air quality analyses. Inventories are used to estimate the quantity of emissions generated by a wide range of source types (i.e., point sources, area sources, on-road motor vehicles, and nonroad mobile sources) and pollutants (e.g., criteria air pollutants, hazardous air pollutants, etc.). Inventories are used as inputs to air quality models for simulating air quality concentrations based on "business as usual" and/or control scenarios for determining future-year compliance with federal National Ambient Air Quality Standards (NAAQS) within State Implementation Plans (SIPs).

The Texas Commission on Environmental Quality (TCEQ) uses base year inventories and future year projections to develop SIPs. In general, future year inventory projections are estimated by applying growth and control factors to base year emissions. As part of a project completed in 2005, Eastern Research Group, Inc. (ERG) developed a suite of area source growth factors through 2020 (and backcasting factors for years dating back to 1990) based upon a 2002 base year. For ongoing SIP development, TCEQ now needs to estimate future year emissions out to 2035 for both point and area sources. As a result, the purpose of this project is the

development of growth factors for calendar years 2006 through 2035 based upon a 2005 base year.

The remainder of this report describes in detail the steps involved with developing the Texas county-level point and area source growth factors. The remainder of the report is presented in the following sections:

- Section 2.0 describes the collection of data used to develop the point and area source growth factors;
- Section 3.0 explains the development of the point source growth factors;
- Section 4.0 explains the development of the area source growth factors;
- Section 5.0 briefly describes the data analysis that was conducted following the development of the preliminary growth factors;
- Section 6.0 explains the final growth factor formatting;
- Section 7.0 identifies a number of important caveats associated with the use of growth factors; and
- Section 8.0 lists all references used in the development of the point and area source growth factors.

2.0 DATA COLLECTION

As part of the previous 2005 project, area source growth factors were developed using the U.S. Environmental Protection Agency's (U.S. EPA) Economic Growth Analysis System (EGAS) (U.S. EPA, 2006) using data and model inputs from the following sources:

- *Policy Insight* model from Regional Economic Growth, Inc. (REMI);
- Economy.com economic projections; and
- Energy Information Administration (EIA) *Annual Energy Outlook (AEO)*.

The development of point source and area source category growth factors for calendar years 2006 through 2035 for this project built upon the 2005 project.

The project work plan (ERG, 2010) specifically indicated that the following data sources would be obtained and analyzed:

- Economy.com economic data and projections;
- Texas Industrial Production Index (TIPI);
- *Annual Energy Outlook (AEO)*; and
- Internal data mappings from the EGAS model.

Beyond these identified data sources, ERG also examined and analyzed a number of other supplemental sources of data under Task 2 (Obtain, Analyze, and Compile Growth Factor Data) of the project scope. All data sources reviewed for this project are described below.

2.1 Economy.com Economic Data and Projections

Historical economic data and future year economic projections were obtained from Moody's Economy.com (Economy.com, 2010). Economy.com's future year projections are recalibrated each month based upon the most recent monthly economic indicators. As a result, economic changes are gradually reflected over time in the future year projections. For instance, at the national level, future year projections are currently being adjusted every month to account for the ongoing economic recession and other regional impacts. At the local level, the economic and demographic impacts of Hurricane Katrina in August 2005 first appeared in the future year projections for New Orleans and southern Louisiana, only. Over time, the long-term ripple effects of the resultant economic downturn and population shifts gradually appeared in Texas and the broader region. Likewise, the effects of the ongoing Deepwater Horizon oil spill in the Gulf of Mexico have just started to appear in the future forecasts for metropolitan areas located in Southern Louisiana (i.e., New Orleans, Houma, Lafayette, and Lake Charles) and the Florida Panhandle (i.e., Pensacola, Panama City, and Crestview). It is possible that there may be potential long-term effects on the oil and petrochemical industry in Houston and Louisiana due to reduced drilling and production, more stringent off-shore permitting, and overall higher costs, but these have not been quantified in Economy.com's future year projections (Di Natale, 2010).

The particular Texas data set obtained from Economy.com was county-level gross product expressed in millions of constant 2000 dollars for each 4-digit North American Industry Classification System (NAICS) code. These data were obtained in April 2010 at no cost through TCEQ's existing Data Buffet license with Economy.com. Product output data were obtained because U.S. EPA and the Emission Inventory Improvement Program (EIIP) have indicated that the use of product output as a growth indicator is preferred over the use of employment, earnings, or value added statistics (EIIP, 1999). Although economic data from REMI's Policy Insight model are similar to Economy.com's data, the Policy Insight model was prohibitively expensive and, therefore, not utilized for this project.

2.2 Texas Industrial Production Index

The project work plan identified the Texas Industrial Production Index (TIPI), produced by the Federal Reserve Bank of Dallas, as a potential source of projections data. Research found that the TIPI measures the changes in output levels in the Texas economy for the manufacturing (i.e., durable and nondurable goods), mining, and utility sectors on a monthly basis (FRB, 2010). Historical data

are available from 1969 to the present. The TIPI is not intended to be used for forecasting and, thus, projection data were not available from TIPI. Therefore, the TIPI was not utilized for this project.

2.3 Annual Energy Outlook

The U.S. Department of Energy's Energy Information Administration (EIA) annually publishes the *Annual Energy Outlook (AEO)*; the 2010 version with projections out to 2035 was released in April 2010 (EIA, 2010). The *AEO* provides sector-specific consumption projections, as well as production projections, at the regional level. Information regarding regional petroleum refining capacity projections is also available. U.S. EPA staff working on emission projections have indicated that *AEO* is considered to be reliable source of projections data for combustion sources (Chappell and Bollman, 2008; Chappell, 2010). Therefore, the AEO was used extensively for this project.

2.4 EGAS Model

Although the EGAS model was not directly used to calculate growth factors, the internal data mappings of the EGAS Version 5.0 model were reviewed. These internal data mappings were used as the starting point for the assignment of activity data surrogates to specific Source Classification Codes (SCCs) (Pechan, 2004).

2.5 U.S. EPA Projections-Related Research

The project work plan indicated that any U.S. EPA research into the relationship of energy- and non-energy-based emissions and the potential for growth factor development would be investigated. Since 2007, U.S. EPA has been analyzing a long-held fundamental assumption that economic growth is an appropriate surrogate for emissions growth. In particular, U.S. EPA has been conducting a sector-level analysis of energy (i.e., combustion) emissions versus non-energy (i.e., process) emissions for 10 key industries, which included the following:

- Petroleum refining;
- Pulp and paper;
- Iron and steel;
- Cement;
- Primary aluminum;
- Secondary aluminum;
- Black carbon;
- Copper;
- Sulfuric acid; and
- Glass

At the time when the project work plan was developed, it was expected that the results of U.S. EPA's analysis would be available for use in this project. However, this analysis has been undergoing internal U.S. EPA review for the past six months and is still not available for public use (Chappell, 2010). Although U.S. EPA's analysis could potentially contain some significant findings related to growth factors, these findings could not be incorporated into the Texas growth factors due to the timing of this project.

2.6 Texas State Comptroller Data

The Texas State Comptroller has published historical and projected state product data for the period from 1990 to 2039 (TexasAhead, 2009). Although this time frame corresponds with the required growth factor period (i.e., 2005 to 2035), the data were only provided at the state level. In addition, the product data were only provided at a fairly high level of aggregation (e.g., agriculture, mining, construction, manufacturing, etc.). Therefore, these data were not utilized for this project.

2.7 Texas Workforce Commission

The Texas Workforce Commission published a limited set of employment projections for the 28 Workforce Development Areas (WDAs) located in Texas (TWC, 2010). The employment projections covered a 10-year period of time from 2006-2016 and were disaggregated to the 3-digit NAICS level (with some limited details down to the 4-digit NAICS level). Because of the short projection time frame, these data were not used for this project.

2.8 Federal Reserve Bank of Dallas

The Federal Reserve Bank of Dallas was contacted about long-term industry projections. Specific sector-level projections were not available. However, Federal Reserve Bank staff indicated that over the last 30 years, annual Texas growth has been approximately 1 percent higher than the national average and it is expected that this trend will continue for the next 20 years (Davalos, 2010; Saving, 2009).

2.9 Industry Associations

As part of ERG's research effort, various industry trade associations were contacted to identify potential sources of projections data. In particular, focus was given to five major industry sectors (i.e., electric power generation, transmission, and distribution; oil and gas

extraction; basic chemical manufacturing; petroleum and coal products manufacturing; and natural gas pipeline transportation).

For the electric power generation, transmission, and distribution sector, ERG contacted the Public Utility Commission of Texas (PUCT). However, the PUCT does not address electricity generation and suggested contacting the Electric Reliability Council of Texas (ERCOT). The PUCT is involved with electricity transmission and distribution companies, but does not develop long-term transmission and distribution growth projections (Gilbertson, 2010). The ERCOT was also contacted regarding available long-term projections (Gage, 2010). However, ERCOT's forecast is limited to a 10-year plan that was developed using a set of econometric model utilizing weather, economic, and demographic data to project the trends of historical load data for the past 6 years (ERCOT, 2009).

For the remaining four major industry sectors (i.e., oil and gas extraction; basic chemical manufacturing; petroleum and coal products manufacturing; and natural gas pipeline transportation), ERG contacted the following industry groups:

- Texas Energy Group;
- Texas Alliance of Energy Producers;
- Society of Petroleum Engineers;
- Texas Oil and Gas Association;
- Texas Chemical Council (TCC);
- Clean Coal Technology Foundation of Texas;
- Natural Gas Supply Association (NGSA); and
- Interstate Natural Gas Association of America (INGAA).

No projections information was obtained from any of these industry groups.

3.0 DEVELOPMENT OF POINT SOURCE GROWTH FACTORS

The development of point source growth factors was also conducted under Task 2 - Obtain, Analyze, and Compile Growth Factor Data of the project scope. Because of the large number of industry sectors associated with TCEQ's point source inventory, a prioritized approach was used to assess the importance of individual point source sectors. Since one of the primary uses of future year projected inventories in Texas will be for ozone SIPs, ERG ranked the existing 2005 TCEQ point source inventory by volatile organic compounds (VOC) and nitrogen oxide (NO_x) emissions for each sector (as defined by 4-digit NAICS code). The most

significant sectors contributing up to a cumulative 90 percent of the total VOC and NO_x emissions are shown in Tables 3-1 and 3-2.

Table 3-1. Most Significant VOC Point Source Sectors in TCEQ Point Source Inventory

NAICS	NAICS Description	Annual VOC Emissions	% of Total	Cumulative %
3241	Petroleum and Coal Products Manufacturing	30,455.8	21.14%	21.14%
3251	Basic Chemical Manufacturing	22,451.2	15.58%	36.72%
2111	Oil and Gas Extraction	21,453.9	14.89%	51.61%
4931	Warehousing and Storage	7,775.0	5.40%	57.01%
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	7,567.9	5.25%	62.26%
4862	Pipeline Transportation of Natural Gas	5,542.5	3.85%	66.11%
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	4,787.1	3.32%	69.43%
3221	Pulp, Paper, and Paperboard Mills	4,740.0	3.29%	72.72%
4861	Pipeline Transportation of Crude Oil	4,237.8	2.94%	75.67%
2211	Electric Power Generation, Transmission and Distribution	4,057.1	2.82%	78.48%
4247	Petroleum and Petroleum Products Merchant Wholesalers	3,703.7	2.57%	81.05%
3261	Plastics Product Manufacturing	3,317.2	2.30%	83.35%
4869	Other Pipeline Transportation	2,105.1	1.46%	84.82%
3211	Sawmills and Wood Preservation	1,379.6	0.96%	85.77%
3273	Cement and Concrete Product Manufacturing	1,327.6	0.92%	86.70%
3323	Architectural and Structural Metals Manufacturing	1,149.2	0.80%	87.49%
3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing	1,075.5	0.75%	88.24%
3313	Alumina and Aluminum Production and Processing	1,023.8	0.71%	88.95%
3315	Foundries	926.4	0.64%	89.59%
2213	Water, Sewage and Other Systems	807.4	0.56%	90.15%
	Total	144,069.8		

Table 3-2. Most Significant NO_x Point Source Sectors in TCEQ Point Source Inventory

NAICS	NAICS Description	Annual NO_x Emissions	% of Total	Cumulative %
2211	Electric Power Generation, Transmission and Distribution	178,101.9	38.77%	38.77%
2111	Oil and Gas Extraction	82,216.3	17.90%	56.67%
3251	Basic Chemical Manufacturing	54,531.7	11.87%	68.54%
3241	Petroleum and Coal Products Manufacturing	39,061.7	8.50%	77.05%
4862	Pipeline Transportation of Natural Gas	34,676.1	7.55%	84.59%
3273	Cement and Concrete Product Manufacturing	26,422.7	5.75%	90.35%
	Total	459,356.7		

Comparison of the two tables shows that all six of the significant NO_x source sectors listed in Table 3-2 are also included as significant VOC source sectors in Table 3-1.

3.1 More Significant Point Source Sectors

Based on the rankings presented in Tables 3-1 and 3-2, additional detailed research was conducted for the more significant point source sectors (i.e., top 90 percent of the VOC and NO_x point source inventories). As described above, numerous industry associations were contacted with minimal success.

Besides the Economy.com data, the Texas Workforce Commission's 10-year (2006-2016) employment projections at the 3-digit NAICS level for the 28 Texas Workforce Development Areas (WDAs) were the only data that were reasonably comparable in terms of level of detail. Growth factors derived from the Texas Workforce Commission's 10-year employment projections were compared to similar growth factors derived from Economy.com data (aggregated to the level of the 28 WDAs) for the same period. The 28 WDAs and their associated counties are as follows:

- **Alamo –** Atacosa, Bandera, Bexar, Comal, Frio, Gillespie, Guadalupe, Karnes, Kendall, Kerr, Medina, Wilson
- **Brazos Valley –** Brazos, Burleson, Grimes, Leon, Madison, Robertson, Washington
- **Cameron County –** Cameron
- **Capital Area –** Travis
- **Central Texas –** Bell, Coryell, Hamilton, Lampasas, Milam, Mills, San Saba
- **Coastal Bend –** Aransas, Bee, Brooks, Duval, Jim Wells, Kenedy, Kleberg, Live Oak, McMullen, Nueces, Refugio, San Patricio
- **Concho Valley** – Coke, Concho, Crockett, Irion, Kimble, Mason, McCulloch, Menard, Reagan, Schleicher, Sterling, Sutton, Tom Green
- **Dallas County –** Dallas
- **Deep East Texas –** Angelina, Houston, Jasper, Nacogdoches, Newton, Polk, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Tyler
- **East Texas –** Anderson, Camp, Cherokee, Gregg, Harrison, Henderson, Marion, Panola, Rains, Rusk, Smith, Upshur, Van Zandt, Wood
- **Golden Crescent –** Calhoun, DeWitt, Goliad, Gonzales, Jackson, Lavaca, Victoria
- **Gulf Coast –** Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller, Wharton
- **Heart of Texas –** Bosque, Falls, Freestone, Hill, Limestone, McLennan
- **Lower Rio Grande Valley –** Hidalgo, Starr, Willacy
- **Middle Rio Grande –** Dimmit, Edwards, Kinney, LaSalle, Maverick, Real, Uvalde, Val Verde, Zavala
- **North Central –** Collin, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Wise
- **North East –** Bowie, Cass, Delta, Franklin, Hopkins, Lamar, Morris, Red River, Titus
- **North Texas –** Archer, Baylor, Clay, Cottle, Foard, Hardeman, Jack, Montague, Wichita, Wilbarger, Young
- **Panhandle –** Armstrong, Briscoe, Carson, Castro, Childress, Collingsworth, Dallam, Deaf Smith, Donley, Gray, Hall, Hansford, Hartley, Hemphill, Hutchinson, Lipscomb, Moore, Ochiltree, Oldham, Parmer, Potter, Randall, Roberts, Sherman, Swisher, Wheeler
- **Permian Basin –** Andrews, Borden, Crane, Dawson, Ector, Gaines, Glasscock, Howard, Loving, Martin, Midland, Pecos, Reeves, Terrell, Upton, Ward, Winkler
- **Rural Capital –** Bastrop, Blanco, Burnet, Caldwell, Fayette, Hays, Lee, Llano, Williamson

- **South East Texas –** Hardin, Jefferson, Orange
- **South Plains –** Bailey, Cochran, Crosby, Dickens, Floyd, Garza, Hale, Hockley, King, Lamb, Lubbock, Lynn, Motley, Terry, Yoakum
- **South Texas –** Jim Hogg, Webb, Zapata
- **Tarrant County –** Tarrant
- **Texoma –** Cooke, Fannin, Grayson
- **Upper Rio Grande –** Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio
- **West Central –** Brown, Callahan, Coleman, Comanche, Eastland, Fisher, Haskell, Jones, Kent, Knox, Mitchell, Nolan, Runnels, Scurry, Shackelford, Stephens, Stonewall, Taylor, Throckmorton

The comparison of the Texas Workforce Commission employment-based growth factors with the Economy.com output-based growth factors for the 10-year period between 2006 and 2016 is presented in Table 3-3. The difference between the growth factors was calculated by subtracting the output-based growth factor from the employment-based growth factor. Thus, a positive difference represents a larger employment-based growth factor, while a negative difference represents a larger output-based growth factor. The maximum and minimum differences are shown in Table 3-3.

From Table 3-3, it can be seen that there is a wide disparity between the employment-based growth factors and the output-based growth factors. Since there are both positive and negative differences for most 3-digit NAICS codes, it is not clear whether the employment-based growth factors or output-based growth factors are more accurate. For the positive differences (i.e., larger employment-based growth factors than output-based growth factors), one plausible explanation is an expected increase in administration and other support staff that do not directly impact output production. For negative differences (i.e., larger output-based growth factors than employment-based growth factors), a possible explanation is expected increases in sector efficiency which boost output without requiring additional employment. Based upon the wide variability of differences shown in Table 3-3, and since U.S. EPA and the Emission Inventory Improvement Program have indicated that the use of product output as a growth indicator is preferred over the use of employment, earnings, or value added statistics (EIIP, 1999), the Economy.com output data were used to develop growth factors for 15 of the 20 most significant point source sectors (i.e., all sectors listed in Table 3-1, except for 2211, 3241, 4861, 4862, and 4869).

Table 3-3. Comparison of Economy.com Output-Based and WDA Employment-Based Growth Factors between 2006 and 2016

NAICS	NAICS Description	Maximum Difference	WDA	Minimum Difference	WDA
211	Oil and Gas Extraction	0.5485	Deep East	-0.1916	Capital
212	Mining (excl. Oil and Gas)	1.0982	Deep East	-0.2003	West Central
213	Mining Support Activities	0.6178	Deep East	-0.4663	Tarrant
221	Utilities	0.2103	Texoma	-0.6437	North Central
236	Building Construction	0.2968	Cameron	-0.3349	Heart of Texas
237	Heavy Construction	0.2819	South	-0.5126	Cameron
311	Food Manufacturing	0.4490	Concho Valley	-0.2812	Texoma
312	Beverage Manufacturing	0.7865	Rural Capital	-0.5741	Capital
313	Textile Mills	1.1623	Gulf Coast	0.7281	Dallas
314	Textile Product Mills	1.3504	Rural Capital	-0.9768	South
315	Apparel Manufacturing	1.0917	Brazos Valley	0.2634	Lower Rio Grande
316	Leather Product Manufacturing	0.9324	West Central	0.5593	North Central
321	Wood Product Manufacturing	0.5908	South East	-3.0596	Cameron
322	Paper Manufacturing	0.3917	Panhandle	-0.1142	Alamo
323	Printing and Related Activities	0.3741	South Plains	-3.0058	Cameron
324	Petroleum and Coal Products	0.6629	East	0.2992	Capital
325	Chemical Manufacturing	0.2711	Concho Valley	-0.6927	Rural Capital
326	Plastic and Rubber Products	0.4258	Brazos Valley	-0.5951	Alamo
327	Nonmetallic Mineral Products	0.6700	Middle Rio Grande	-0.5843	Concho Valley
331	Primary Metal Manufacturing	0.5549	Lower Rio Grande	-0.3379	North Central
332	Fabricated Metal Products	0.2715	Golden Crescent	-0.3516	South
333	Machinery Manufacturing	0.8758	Lower Rio Grande	-0.6096	Rural Capital
334	Computer and Electronic Products	0.7610	Brazos Valley	-0.2903	North Central
335	Electrical Manufacturing	0.0797	South East	-1.2328	Tarrant
336	Transportation Equipment	0.7680	South East	-0.6091	Concho Valley
337	Furniture Manufacturing	1.1420	Permian Basin	-0.3561	Heart of Texas
339	Miscellaneous Manufacturing	0.5165	Concho Valley	-0.4122	Rural Capital

Economy.com output based growth factors were not used for NAICS 2211 (Electric Power Generation, Transmission, and Distribution) because of the availability of Texas-specific projections in the *AEO* (EIA, 2010). Fuel-specific generation projections for the ERCOT electricity market module region (or power pool) were obtained from the Main Reference Case Tables of the *AEO* (Table 73: Electric Power Projections for Electricity Market Module Regions – Electric Reliability Council of Texas) (EIA, 2010). The ERCOT region covers the vast majority of Texas; only small portions of the state fall in other regions (i.e., portions of the Panhandle and northeast Texas in the Southwest Power Pool [SPP], portions of east Texas in the Southeastern Electric Reliability Council [SERC], and far west Texas in the Rocky Mountain Power Area [RA]). It was assumed that the ERCOT region was applicable for the entire state. These *AEO* generation projections were previously used by ERG for development of 2018 projected inventories for the Western Regional Air Partnership and are generally assumed to be

of high quality. It should be noted that although the Texas population is expected to grow steadily, there appear to be some slight decreases in the electricity generation projections. Definitive answers cannot be provided without an extensive analysis of the *AEO* modeling, but the decreases in the electricity generation projections may be due to conservation efforts and demand-side management.

Originally, ERG intended to use the Economy.com output data for NAICS 3241 (Petroleum and Coal Products Manufacturing) (i.e., including refineries). However, TCEQ review of the initial projections based on Economy.com output data indicated a decrease, in spite of an increase in output data in a number of related sectors (e.g., organic chemicals, carbon black, plastics, petroleum bulk stations, special warehousing and storage, etc.) (Muldoon, 2010). Thus, instead of Economy.com output data, ERG used *AEO* domestic refining capacity data (Table 102: Domestic Refinery Distillation Base Capacity and Expansion) for Petroleum Administration for Defense (PAD) District III (i.e., Alabama, Arkansas, Louisiana, Mississippi, New Mexico, and Texas) to project NAICS 3241 (EIA, 2010).

ERG also originally intended to use Economy.com output data for NAICS 4861 (Pipeline Transportation of Crude Oil), 4862 (Pipeline Transportation of Natural Gas), and 4869 (Other Pipeline Transportation). However, after compiling the Economy.com output data, it was unexpectedly determined that Economy.com output data were entirely unavailable for these three NAICS codes. Economy.com staff were contacted in an effort to identify the reason for the unavailability of output data for these three NAICS code. The Economy.com staff response was that for specialized industries (i.e., pipeline transportation) that there is typically one of three underlying reasons for data unavailability: a small industry sample size, a poor industry response, or one dominant establishment. If one of these reasons occurs, then the Bureau of Labor Statistics (BLS), whose data Economy.com uses, will not publish employment estimates in order to maintain data quality and to protect the privacy of survey respondents (McGee, 2010a). Another potential reason is that pipelines, unlike most other traditional point sources, stretch across multiple counties. As a result, it is probably very difficult to allocate output, employment, and other economic data associated with pipelines to individual counties. Instead of Economy.com data, *AEO* crude oil and natural gas production data (Table 113: Lower 48 Crude Oil Production and Wellhead Prices by Supply Region; Table 114: Lower 48 Natural Gas Production and Wellhead Prices by Supply Region) for the Gulf Coast and Southwest Oil and

Gas Supply Model Regions were used to project NAICS codes 4861 and 4862, respectively (EIA, 2010). Since the specific definition of NAICS 4869 (Other Pipeline Transportation) is ambiguous, Economy.com data for NAICS 3251 (Basic Chemical Manufacturing) were used as a surrogate.

3.2 Less Significant Point Source Sectors

For the less significant point source sectors (i.e., the bottom 10 percent of the VOC and NO_x point source inventories), the Economy.com output data were used as the starting point for the development of growth factors for all sector/county combinations. The sector-specific growth factor for a particular year was estimated by dividing the sector-specific output for that year by the sector specific output for the 2005 base year. A growth factor greater than 1.0000 indicates (positive) growth, while growth factor less than 1.0000 indicates a contracting sector. A growth factor of exactly 1.0000 represents no growth.

3.3 All Point Source Sectors

One particular area of concern associated with the use of Economy.com output data for both the more and less significant point source sectors was that for certain NAICS/county combinations the derived growth factors may be overly large. In some cases, this may, in fact, represent an industry sector that is growing rapidly. However, in other instances, these growth factors may be the result of insignificant county-level outputs. County-level output estimates are based upon detailed county-level employment estimates and the Bureau of Economic Analysis' (BEA) state- and metropolitan area-level output data. For the larger counties, actual output data exist; however, for the smaller counties, Economy.com gap-fills the output estimates by allocating the state-level output (minus actual output data for the large counties) based upon employment estimates. For some NAICS/county combinations, the output estimates are as small as 1×10^{-8} million dollars (i.e., 1 cent). These small output estimates are not realistic and are simply an artifact of Economy.com's gap-filling process. After consulting with TCEQ staff, it was decided that for any NAICS/county combinations (both more and less significant sectors) with 2005 output values less than $1,000,000 that growth factors would be based on county-level population growth instead of output data from Economy.com. The basis of this decision was that BEA does not report any data less than $1,000,000 (McGee, 2010b). This substitution of county-level population growth instead of Economy.com output data was used for 48,939 point source NAICS/county combinations out of a total of 72,136.

4.0 DEVELOPMENT OF AREA SOURCE GROWTH FACTORS

The development of area source growth factors was also conducted under Task 2 (Obtain, Analyze, and Compile Growth Factor Data) of the project scope. After analyzing all of the collected data, the specific data assignments for each area source category were developed. These data assignments are presented in Table 4-1. Table 4-1 includes a comprehensive listing of all area source categories included in TCEQ's existing area source inventory. At the request of TCEQ, some additional area source categories have been added, including: disaggregated oil and gas categories, gas cans, and various minor point source categories developed by ERG under previous projects (ERG, 2009a; ERG, 2009b).

The project work plan indicated that the EGAS internal data mappings would be used as the starting point for the data assignments of growth factors to specific area source categories (ERG, 2010). Some of the EGAS internal data mappings were followed exactly, but significant adjustments were made to other mappings. These adjustments included adjustment from SIC codes to NAICS codes, expanded use of Economy.com output data (adjusted with population growth data for NAICS/county combinations with less than $1,000,000 output in 2005), expanded use of *AEO* data, use of Texas-specific population projections, and use of flat/no growth factors. These adjustments are described below.

4.1 Adjustment from SIC Codes to NAICS Codes

For many industrial categories, the EGAS model utilized SIC-specific output data from REMI's *Policy Insight* model. However, economic data have transitioned from SIC-based reporting to NAICS-based reporting over the last couple of years. Therefore, the available Economy.com data were all in terms of NAICS. In general, the equivalence between SIC codes and NAICS codes was fairly straightforward, but a few cases required some engineering judgment to assign an appropriate NAICS code.

4.2 Expanded Use of Economy.com Output Data

In some instances, the Economy.com NAICS-based output data were more detailed than the *Policy Insight* SIC-based output data. This allowed output data to be used for additional source categories. Some examples included commercial cooking (SCC 2302xxxxxx), construction (SCC 2311xxxxxx), graphic arts (SCC 2425000000), etc.

Table 4-1. Area Source Category Projection Data Assignments

SCC	SCC Description	Projection Data[a]	Projection Data Description
2102004000	Industrial Fuel Combustion - Distillate Oil (Boilers/IC Engines)	AEO regional consumption data	
2102005000	Industrial Fuel Combustion - Residual Oil	AEO regional consumption data	
2102006000	Industrial Fuel Combustion - Natural Gas (Boilers/IC Engines)	AEO regional consumption data	
2102006001	Industrial Fuel Combustion - Natural Gas (Boilers)	AEO regional consumption data	
2102006002	Industrial Fuel Combustion - Natural Gas (IC Engines)	AEO regional consumption data	
2102007000	Industrial Fuel Combustion - Liquefied Petroleum Gas (LPG)	AEO regional consumption data	
2102011000	Industrial Fuel Combustion – Kerosene	AEO regional consumption data	
2103004000	Commercial/Institutional Fuel Combustion - Distillate Oil	AEO regional consumption data	
2103005000	Commercial/Institutional Fuel Combustion - Residual Oil	AEO regional consumption data	
2103006000	Commercial/Institutional Fuel Combustion - Natural Gas	AEO regional consumption data	
2103007000	Commercial/Institutional Fuel Combustion - Liquefied Petroleum Gas (LPG)	AEO regional consumption data	
2103011000	Commercial/Institutional Fuel Combustion - Kerosene	AEO regional consumption data	
2104004000	Residential Fuel Combustion - Distillate Oil	AEO regional consumption data	
2104005000	Residential Fuel Combustion - Residual Oil	AEO regional consumption data	
2104006000	Residential Fuel Combustion - Natural Gas	AEO regional consumption data	
2104007000	Residential Fuel Combustion - Liquefied Petroleum Gas (LPG)	AEO regional consumption data	
2104008100	Residential Fuel Combustion - Wood - Fireplaces	AEO regional consumption data	
2104008210	Residential Fuel Combustion - Wood - Woodstove Fireplace Inserts (Non-EPA Certified)	AEO regional consumption data	
2104008230	Residential Fuel Combustion - Wood - Woodstove Fireplace Inserts (EPA Certified Catalytic)	AEO regional consumption data	
2104008300	Residential Fuel Combustion - Wood - Woodstoves (Freestanding)	AEO regional consumption data	
2104008320	Residential Fuel Combustion - Wood - Woodstoves (Freestanding - EPA Certified Non-Catalytic)	AEO regional consumption data	
2104008330	Residential Fuel Combustion - Wood - Woodstoves (Freestanding - EPA Certified Catalytic)	AEO regional consumption data	
2104011000	Residential Fuel Combustion - Kerosene	AEO regional consumption data	
2294000000	Paved Road Dust - All Roads	Population	
2302002100	Commercial Cooking - Conveyorized Charbroiling	Economy.com output data (91); population (163)	NAICS 7221, 7222, 7223 (Full-Service Food Places, Limited Service Food Places, Special Food Services)
2302002200	Commercial Cooking - Under-Fired Charbroiling	Economy.com output data (91); population (163)	NAICS 7221, 7222, 7223 (Full-Service Food Places, Limited Service Food Places, Special Food Services)

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2302003000	Commercial Cooking - Deep Fat Frying	Economy.com output data (91); population (163)	NAICS 7221, 7222, 7223 (Full-Service Food Places, Limited Service Food Places, Special Food Services)
2302003100	Commercial Cooking - Flat Griddle Frying	Economy.com output data (91); population (163)	NAICS 7221, 7222, 7223 (Full-Service Food Places, Limited Service Food Places, Special Food Services)
2302003200	Commercial Cooking - Clamshell Griddle Frying	Economy.com output data (91); population (163)	NAICS 7221, 7222, 7223 (Full-Service Food Places, Limited Service Food Places, Special Food Services)
2302010000	Meat Products Manufacturing	Economy.com output data (84); population (170)	NAICS 3116 (Animal Slaughtering and Processing)
2302040000	Grain Mill Products Manufacturing	Economy.com output data (39); population (215)	NAICS 3112 (Grain and Oilseed Milling)
2302050000	Food Manufacturing - Bakery Products	Economy.com output data (64); population (190)	NAICS 3118 (Bakeries and Tortilla Manufacturing)
2302070001	Food Manufacturing – Breweries	Economy.com output data (64); population (190)	NAICS 3121 (Beverage Manufacturing)
2302070005	Food Manufacturing - Wineries	Economy.com output data (64); population (190)	NAICS 3121 (Beverage Manufacturing)
2304050000	Nonferrous Foundries (Castings)	Economy.com output data (43); population (211)	NAICS 3315 (Foundries)
2305070000	Concrete, Gypsum, and Plaster Products Manufacturing	Economy.com output data (40); population (214)	NAICS 3273, 3274 (Cement and Concrete Product Manufacturing, Lime and Gypsum Product Manufacturing)
2306010000	Asphalt Paving/Roofing Materials Manufacturing	Economy.com output data (108); population (146)	NAICS 3241 (Petroleum and Coal Products Manufacturing)
2307020000	Wood Products Manufacturing - Sawmills/Planning Mills	Economy.com output data (35); population (219)	NAICS 3211 (Sawmills and Wood Preservation)
2307060000	Wood Products Manufacturing - Miscellaneous Wood Products	Economy.com output data (79); population (175)	NAICS 3219 (Other Wood Product Manufacturing)
2309000000	Fabricated Metals Manufacturing - All Processes (Total	Economy.com output data (83); population (171)	NAICS 3329 (Other Fabricated Metal Product Manufacturing)
2309100010	Fabricated Metals Manufacturing - Electroplating	Economy.com output data (43); population (211)	NAICS 3328 (Coating, Engraving, Heat Treating, and Allied Activities)
2309100080	Fabricated Metals Manufacturing - Hot Dip Galvanizing (Zinc)	Economy.com output data (43); population (211)	NAICS 3328 (Coating, Engraving, Heat Treating, and Allied Activities)
2310000000	Industrial Processes - Oil and Gas Exploration and Production - All Processes (Total: All Processes)	AEO – natural gas production	
2310000220	Industrial Processes - Oil and Gas Exploration and Production - All Processes (Drill Rigs)	AEO – natural gas production	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2310000330	Industrial Processes - Oil and Gas Exploration and Production - All Processes (Artificial Lift)	AEO – natural gas production	
2310000440	Industrial Processes - Oil and Gas Exploration and Production - All Processes (Saltwater Disposal Engines)	AEO – natural gas production	
2310001000	Industrial Processes - Oil and Gas Exploration and Production - All Processes (On-Shore: Total: All Processes)	AEO – onshore crude oil production	
2310002000	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil And Gas Production (Total: All Processes)	AEO – offshore crude oil production	
2310002301	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil And Gas Production (Flares: Continuous Pilot Light)	AEO – offshore crude oil production	
2310002305	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil And Gas Production (Flares: Flaring) Operations	AEO – offshore crude oil production	
2310002401	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil And Gas Production (Pneumatic Pumps): Gas And Oil Wells	AEO – offshore crude oil production	
2310002411	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil And Gas Production (Pressure/Level Controllers)	AEO – offshore crude oil production	
2310002421	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil And Gas Production (Cold Vents)	AEO – offshore crude oil production	
2310010000	Industrial Processes - Oil and Gas Exploration and Production - Crude Petroleum (Total: All Processes)	AEO – onshore crude oil production	
2310010100	Industrial Processes - Oil and Gas Exploration and Production - Crude Petroleum (Oil Well Heaters)	AEO – onshore crude oil production	
2310010200	Industrial Processes - Oil and Gas Exploration and Production - Crude Petroleum (Oil Well Tanks - Flashing & Standing/Working/Breathing)	AEO – onshore crude oil production	
2310010300	Industrial Processes - Oil and Gas Exploration and Production - Crude Petroleum (Oil Well Pneumatic Devices)	AEO – onshore crude oil production	
2310010700	Industrial Processes - Oil and Gas Exploration and Production - Crude Petroleum (Oil Well Fugitives)	AEO – onshore crude oil production	
2310010800	Industrial Processes - Oil and Gas Exploration and Production - Crude Petroleum (Oil Well Truck Loading)	AEO – onshore crude oil production	
2310011000	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Total: All Processes)	AEO – onshore crude oil production	
2310011020	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Storage Tanks: Crude Oil)	AEO – onshore crude oil production	
2310011100	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Heater Treater)	AEO – onshore crude oil production	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2310011201	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Tank Truck/Railcar Loading: Crude Oil)	AEO – onshore crude oil production	
2310011450	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Wellhead)	AEO – onshore crude oil production	
2310011500	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Fugitives: All Processes)	AEO – onshore crude oil production	
2310011501	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Fugitives: Connectors)	AEO – onshore crude oil production	
2310011502	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Fugitives: Flanges)	AEO – onshore crude oil production	
2310011503	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Fugitives: Open Ended Lines)	AEO – onshore crude oil production	
2310011504	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Fugitives: Pumps)	AEO – onshore crude oil production	
2310011505	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Fugitives: Valves)	AEO – onshore crude oil production	
2310011506	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Production (Fugitives: Other)	AEO – onshore crude oil production	
2310012000	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Total: All Processes)	AEO – offshore crude oil production	
2310012020	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Storage Tanks: Crude Oil)	AEO – offshore crude oil production	
2310012201	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Barge Loading: Crude Oil)	AEO – offshore crude oil production	
2310012511	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Fugitives, Connectors: Oil Streams)	AEO – offshore crude oil production	
2310012512	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Fugitives, Flanges: Oil)	AEO – offshore crude oil production	
2310012515	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Fugitives, Valves: Oil)	AEO – offshore crude oil production	
2310012516	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Fugitives, Other: Oil)	AEO – offshore crude oil production	
2310012521	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Fugitives, Connectors: Oil/Water Streams)	AEO – offshore crude oil production	
2310012522	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Fugitives, Flanges: Oil/Water)	AEO – offshore crude oil production	
2310012525	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Fugitives, Valves: Oil/Water)	AEO – offshore crude oil production	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2310012526	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Production (Fugitives, Other: Oil/Water)	AEO – offshore crude oil production	
2310020000	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas (Total: All Processes)	AEO – natural gas production	
2310020600	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas (Compressor Engines)	AEO – natural gas production	
2310020700	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas (Gas Well Fugitives)	AEO – natural gas production	
2310020800	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas (Gas Well Truck Loading)	AEO – natural gas production	
2310021000	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Total: All Processes)	AEO – natural gas production	
2310021010	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Storage Tanks: Condensate)	AEO – natural gas production	
2310021030	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Tank Truck/Railcar Loading: Condensate)	AEO – natural gas production	
2310021100	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Gas Well Heaters)	AEO – natural gas production	
2310021101	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 2Cycle Lean Burn Compressor Engines < 50 Hp)	AEO – natural gas production	
2310021102	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 2Cycle Lean Burn Compressor Engines 50 To 499 Hp)	AEO – natural gas production	
2310021103	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 2Cycle Lean Burn Compressor Engines 500+ Hp)	AEO – natural gas production	
2310021109	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Total: All Natural Gas Fired 2Cycle Lean Burn Compressor Engines)	AEO – natural gas production	
2310021201	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 4Cycle Lean Burn Compressor Engines <50 Hp)	AEO – natural gas production	
2310021202	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 4Cycle Lean Burn Compressor Engines 50 To 499 Hp)	AEO – natural gas production	
2310021203	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 4Cycle Lean Burn Compressor Engines 500+ Hp)	AEO – natural gas production	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2310021209	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Total: All Natural Gas Fired 4Cycle Lean Burn Compressor Engines)	AEO – natural gas production	
2310021300	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Gas Well Pneumatic Devices)	AEO – natural gas production	
2310021301	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 4Cycle Rich Burn Compressor Engines <50 Hp)	AEO – natural gas production	
2310021302	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 4Cycle Rich Burn Compressor Engines 50 To 499 Hp)	AEO – natural gas production	
2310021303	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Natural Gas Fired 4Cycle Rich Burn Compressor Engines 500+ Hp)	AEO – natural gas production	
2310021309	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Total: All Natural Gas Fired 4Cycle Rich Burn Compressor Engines)	AEO – natural gas production	
2310021400	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Gas Well Dehydrators)	AEO – natural gas production	
2310021401	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Nat Gas Fired 4Cycle Rich Burn Compressor Engines <50 Hp w/ NSCR)	AEO – natural gas production	
2310021402	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Nat Gas Fired 4Cycle Rich Burn Compressor Engines 50 To 499 Hp w/ NSCR)	AEO – natural gas production	
2310021403	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Nat Gas Fired 4Cycle Rich Burn Compressor Engines 500+ Hp w/ NSCR)	AEO – natural gas production	
2310021409	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Total: All Nat Gas Fired 4Cycle Rich Burn Compressor Engines w/ NSCR)	AEO – natural gas production	
2310021450	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Wellhead)	AEO – natural gas production	
2310021500	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Gas Well Completion - Flaring and Venting)	AEO – natural gas production	
2310021501	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Fugitives: Connectors)	AEO – natural gas production	
2310021502	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Fugitives: Flanges)	AEO – natural gas production	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2310021503	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Fugitives: Open Ended Lines)	AEO – natural gas production	
2310021504	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Fugitives: Pumps)	AEO – natural gas production	
2310021505	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Fugitives: Valves)	AEO – natural gas production	
2310021506	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Fugitives: Other)	AEO – natural gas production	
2310021509	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Fugitives: All Processes)	AEO – natural gas production	
2310021600	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Production (Gas Well Venting)	AEO – natural gas production	
2310022000	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas : Off-Shore: Total: All Processes)	AEO – natural gas production	
2310022010	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Storage Tanks: Condensate)	AEO – natural gas production	
2310022051	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Turbines: Natural Gas)	AEO – natural gas production	
2310022090	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Boilers/Heaters: Natural Gas)	AEO – natural gas production	
2310022105	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Diesel Engines)	AEO – natural gas production	
2310022300	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Compressor Engines: 4Cycle Rich)	AEO – natural gas production	
2310022420	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Dehydrator)	AEO – natural gas production	
2310022501	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Fugitives, Connectors: Gas Streams)	AEO – natural gas production	
2310022502	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Fugitives, Flanges: Gas Streams)	AEO – natural gas production	
2310022505	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Fugitives, Valves: Gas)	AEO – natural gas production	
2310022506	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Production (Fugitives, Other: Gas)	AEO – natural gas production	
2310023000	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas (Cbm Gas Well - Dewatering Pump Engines)	AEO – natural gas production	
2310030000	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas Liquids (Total: All Processes)	AEO – natural gas production	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2310030210	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas Liquids (Gas Well Tanks - Flashing & Standing/Working/Breathing, Uncontrolled)	AEO – natural gas production	
2310030220	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas Liquids (Gas Well Tanks - Flashing & Standing/Working/Breathing, Controlled)	AEO – natural gas production	
2310031000	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas Liquids (On-Shore: Total: All Processes)	AEO – natural gas production	
2310032000	Industrial Processes - Oil and Gas Exploration and Production - Natural Gas Liquids (Off-Shore: Total: All Processes)	AEO – natural gas production	
2310111000	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Exploration (All Processes)	AEO – onshore crude oil production	
2310111100	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Exploration (Mud Degassing)	AEO – onshore crude oil production	
2310111401	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Exploration (Oil Well Pneumatic Pumps)	AEO – onshore crude oil production	
2310111700	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Exploration (Oil Well Completion: All Processes)	AEO – onshore crude oil production	
2310111701	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Exploration (Oil Well Completion: Flaring)	AEO – onshore crude oil production	
2310111702	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Oil Exploration (Oil Well Completion: Venting)	AEO – onshore crude oil production	
2310112000	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Exploration (All Processes)	AEO – offshore crude oil production	
2310112100	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Exploration (Mud Degassing Activities)	AEO – offshore crude oil production	
2310112401	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Exploration (Oil Well Pneumatic Pumps)	AEO – offshore crude oil production	
2310112700	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Exploration (Oil Well Completion: All Processes)	AEO – offshore crude oil production	
2310112701	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Exploration (Oil Well Completion: Flaring)	AEO – offshore crude oil production	
2310112702	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Oil Exploration (Oil Well Completion: Venting)	AEO – offshore crude oil production	
2310121000	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Exploration (All Processes)	AEO – natural gas production	
2310121100	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Exploration (Mud Degassing)	AEO – natural gas production	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2310121401	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Exploration (Gas Well Pneumatic Pumps)	AEO – natural gas production	
2310121700	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Exploration (Gas Well Completion: All Processes)	AEO – natural gas production	
2310121701	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Exploration (Gas Well Completion: Flaring)	AEO – natural gas production	
2310121702	Industrial Processes - Oil and Gas Exploration and Production - On-Shore Gas Exploration (Gas Well Completion: Venting)	AEO – natural gas production	
2310122000	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Exploration (All Processes)	AEO – natural gas production	
2310122100	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Exploration (Mud Degassing)	AEO – natural gas production	
2310122401	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Exploration (Gas Well Pneumatic Pumps)	AEO – natural gas production	
2310122700	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Exploration (Gas Well Completion: All Processes)	AEO – natural gas production	
2310122701	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Exploration (Gas Well Completion: Flaring)	AEO – natural gas production	
2310122702	Industrial Processes - Oil and Gas Exploration and Production - Off-Shore Gas Exploration (Gas Well Completion: Venting)	AEO – natural gas production	
2311010000	General Building Construction	Economy.com output data (126); population (128)	NAICS 2361, 2362 (Residential Construction; Nonresidential Construction)
2311020000	Heavy Construction	Economy.com output data (86); population (168)	NAICS 2379 (Other Heavy and Civil Engineering Construction)
2311030000	Road Construction	Economy.com output data (138); population (116)	NAICS 2373 (Highway, Street, and Bridge Construction)
2325000000	Mining & Quarrying - All Processes	Economy.com output data (1); population (253)	NAICS 2121, 2122, 2123 (Coal Mining; Metal Ore Mining; Nonmetallic Mining and Quarrying)
2325020000	Mining & Quarrying - Crushed and Broken Stone	Economy.com output data (69); population (185)	NAICS 3279 (Other Nonmetallic Mineral Product Manufacturing)
2325050000	Mining & Quarrying - Chemical and Fertilizer Materials	Economy.com output data (86); population (168)	NAICS 2123 (Nonmetallic Mineral Mining and Quarrying)
2399000000	Industrial Processes - Not Elsewhere Classified	Economy.com output data (85); population (169)	NAICS 3399 (Other Miscellaneous Manufacturing)
2401001000	Architectural Coatings	Population	
2401005000	Auto Refinishing	Economy.com output data (124); population (130)	NAICS 8111 (Automotive Repair and Maintenance)
2401008000	Traffic Markings	Economy.com output data (138); population (116)	NAICS 2373 (Highway, Street, and Bridge Construction)

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2401015000	Industrial Surface Coating - Factory Finished Wood	Economy.com output data (27); population (227)	NAICS 3211, 3212, 3219 (Sawmills and Wood Preservation; Veneer, Plywood, and Engineered Wood Product Manuf.; Other Wood Product Manf.)
2401020000	Industrial Surface Coating - Wood Furniture	Economy.com output data (22); population (232)	NAICS 3371, 3372, 3379 (Veneer, Plywood, and Engineered Wood Product Manf.; Office Furniture [including Fixtures] Manf.; Other Furniture Related Product Manf.)
2401025000	Industrial Surface Coating - Metal Furniture	Economy.com output data (27); population (227)	NAICS 3211, 3212, 3219 (Veneer, Plywood, and Engineered Wood Product Manf.; Office Furniture [including Fixtures] Manf.; Other Furniture Related Product Manf.)
2401030000	Industrial Surface Coating – Paper	Economy.com output data (53); population (201)	NAICS 3221, 3222 (Pulp, Paper, and Paperboard Mills; Converted Paper Product Manf.)
2401040000	Industrial Surface Coating - Metal Cans	Economy.com output data (83); population (171)	NAICS 3329 (Other Fabricated Metal Product Manufacturing)
2401045000	Industrial Surface Coating - Metal Coils	Economy.com output data (83); population (171)	NAICS 3329 (Other Fabricated Metal Product Manufacturing)
2401050000	Industrial Surface Coating - Misc. Finished Metals	Economy.com output data (3); population (251)	NAICS 3312, 332x (Steel Product Manufacturing from Purchased Steel; Fabricated Metal Product Manf.)
2401055000	Industrial Surface Coating - Machinery & Equipment	Economy.com output data (17); population (237)	NAICS 333x (Machinery Manufacturing)
2401060000	Industrial Surface Coating - Large Appliances	Economy.com output data (29); population (225)	NAICS 3352 (Household Appliance Manufacturing)
2401065000	Industrial Surface Coating - Electronic & Other Electrical	Economy.com output data (7); population (247)	NAICS 334x, 335x (Computer and Electric Product Manf.; Electrical Equipment, Appliance, and Component Manf.)
2401070000	Industrial Surface Coating - Motor Vehicles	Economy.com output data (27); population (227)	NAICS 3361, 3362, 3363 (Motor Vehicle Manf.; Motor Vehicle Body and Trailer Manf.; Motor Vehicle Parts Manf.)
2401075000	Industrial Surface Coating – Aircraft	Economy.com output data (140); population (114)	NAICS 3364 (Aerospace Product and Parts Manufacturing)
2401080000	Industrial Surface Coating – Marine	Economy.com output data (20); population (234)	NAICS 3366 (Ship and Boat Building)
2401085000	Industrial Surface Coating – Railroad	Economy.com output data (34); population (220)	NAICS 3365 (Railroad Rolling Stock Manufacturing)
2401090000	Industrial Surface Coating - Misc. Manufacturing	Economy.com output data (65); population (189)	NAICS 3339, 3399 (Other General Purpose Machinery Manf; Miscellaneous Manf.)
2401100000	Industrial Surface Coating - Industrial Maintenance	Economy.com output data (0); population (254)	NAICS 3xxx (All Manufacturing)

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2401200000	Industrial Surface Coating - Special Purpose	Economy.com output data (0); population (254)	NAICS 3xxx (All Manufacturing)
2401990000	All Surface Coating Categories	Economy.com output data (0); population (254)	NAICS 3xxx (All Manufacturing)
2415000000	Degreasing (All Processes) - All Industries	Economy.com output data (0); population (254)	NAICS 3xxx (All Manufacturing)
2415100000	Degreasing (Open Top) - All Industries	Economy.com output data (0); population (254)	NAICS 3xxx (All Manufacturing)
2415105000	Degreasing (Open Top) - Furniture & Fixtures	Economy.com output data (22); population (232)	NAICS 3371, 3372, 3379 (Veneer, Plywood, and Engineered Wood Product Manf.; Office Furniture [including Fixtures] Manf.; Other Furniture Related Product Manf.)
2415110000	Degreasing (Open Top) - Primary Metal Ind.	Economy.com output data (18); population (236)	NAICS 331x (Primary Metal Manufacturing)
2415120000	Degreasing (Open Top) - Fabricated Metal	Economy.com output data (7); population (247)	NAICS 332x (Fabricated Metal Product Manufacturing)
2415125000	Degreasing (Open Top) - Industrial Machinery & Equipment	Economy.com output data (17); population (237)	NAICS 333x (Machinery Manufacturing)
2415130000	Degreasing (Open Top) - Electronic & Other Electric	Economy.com output data (7); population (247)	NAICS 334x, 335x (Computer and Electric Product Manf.; Electrical Equipment, Appliance, and Component Manf.)
2415135000	Degreasing (Open Top) - Transportation Equipment	Economy.com output data (5); population (249)	NAICS 336x (Transportation Equipment Manufacturing)
2415140000	Degreasing (Open Top) - Instruments & Related Products	Economy.com output data (42); population (212)	NAICS 3333, 3345, 3391 (Commercial and Service Industry Machinery Manf.; Navigational, Measuring, Electromedical, and Control Instruments Manf.; Medical Equipment and Supplies Manf.)
2415145000	Degreasing (Open Top) - Misc. Manufacturing	Economy.com output data (65); population (189)	NAICS 3339, 3399 (Other General Purpose Machinery Manf; Miscellaneous Manf.)
2415300000	Degreasing (Cold Cleaning) - All Industries	Economy.com output data (0); population (254)	NAICS 3xxx (All Manufacturing)
2415305000	Degreasing (Cold Cleaning) - Furniture & Fixtures	Economy.com output data (22); population (232)	NAICS 3371, 3372, 3379 (Veneer, Plywood, and Engineered Wood Product Manf.; Office Furniture [including Fixtures] Manf.; Other Furniture Related Product Manf.)
2415310000	Degreasing (Cold Cleaning) - Primary Metal Ind.	Economy.com output data (18); population (236)	NAICS 331x (Primary Metal Manufacturing)
2415320000	Degreasing (Cold Cleaning) - Fabricated Metal	Economy.com output data (7); population (247)	NAICS 332x (Fabricated Metal Product Manufacturing)

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2415325000	Degreasing (Cold Cleaning) - Industrial Machinery & Equipment	Economy.com output data (17); population (237)	NAICS 333x (Machinery Manufacturing)
2415330000	Degreasing (Cold Cleaning) - Electronic & Other Electric	Economy.com output data (7); population (247)	NAICS 334x, 335x (Computer and Electric Product Manf.; Electrical Equipment, Appliance, and Component Manf.)
2415335000	Degreasing (Cold Cleaning) - Transportation Equipment	Economy.com output data (5); population (249)	NAICS 336x (Transportation Equipment Manufacturing)
2415340000	Degreasing (Cold Cleaning) - Instruments & Related Products	Economy.com output data (42); population (212)	NAICS 3333, 3345, 3391 (Commercial and Service Industry Machinery Manf.; Navigational, Measuring, Electromedical, and Control Instruments Manf.; Medical Equipment and Supplies Manf.)
2415345000	Degreasing (Cold Cleaning) - Misc. Manufacturing	Economy.com output data (65); population (189)	NAICS 3339, 3399 (Other General Purpose Machinery Manf; Miscellaneous Manf.)
2415355000	Degreasing (Cold Cleaning) - Automotive Dealers	Economy.com output data (77); population (177)	NAICS 4411, 4412 (Automobile Dealers; Other Motor Vehicle Dealers)
2415360000	Degreasing (Cold Cleaning) - Auto Repair Services	Economy.com output data (124); population (130)	NAICS 8111 (Automotive Repair and Maintenance)
2415365000	Degreasing (Cold Cleaning) - Misc. Repair Services	Economy.com output data (28); population (226)	NAICS 8112, 8113, 8114 (Electronic and Precision Equipment Repair and Maintenance; Commercial and Industrial Machinery and Equipment [except Automotive and Electronic] Repair and Maintenance; Personal and Household Goods Repair and Maintenance)
2420000000	Dry Cleaning - All Processes (All Solvent Types)	Economy.com output data (60); population (194)	NAICS 8123 (Drycleaning and Laundry Services)
2420010055	Dry Cleaning - Commercial/Industrial (Perchloroethylene)	Economy.com output data (60); population (194)	NAICS 8123 (Drycleaning and Laundry Services)
2420010370	Dry Cleaning - Commercial/Industrial (Special Naphthas)	Economy.com output data (60); population (194)	NAICS 8123 (Drycleaning and Laundry Services)
2420020055	Dry Cleaning - Coin Operated (Perchloroethylene)	Economy.com output data (60); population (194)	NAICS 8123 (Drycleaning and Laundry Services)
2425000000	Graphic Arts	Economy.com output data (83); population (171)	NAICS 3231 (Printing and Related Support Activities)
2430000000	Rubber/Plastics	Economy.com output data (44); population (210)	NAICS 3261, 3262 (Plastics Product Manf.; Rubber Product Manf.)
2440020000	Miscellaneous Industrial Adhesive Application	Economy.com output data (0); population (254)	NAICS 3xxx (All Manufacturing)
2460100000	Consumer/Commercial Solvent Use (Personal Care Products)	Population	
2460200000	Consumer/Commercial Solvent Use (Household Products)	Population	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2460400000	Consumer/Commercial Solvent Use (Automotive Aftermarket Products)	Population	
2460500000	Consumer/Commercial Solvent Use (Coatings And Related Products)	Population	
2460520000	Consumer/Commercial Solvent Use (Coatings Related Products)	Population	
2460600000	Consumer/Commercial Solvent Use (Adhesives and Sealants)	Population	
2460800000	Consumer/Commercial Solvent Use (FIFRA Related Products)	Population	
2460900000	Consumer/Commercial Solvent Use (Miscellaneous Products)	Population	
2461021000	Asphalt Application - Cutback Asphalt	Economy.com output data (138); population (116)	NAICS 2373 (Highway, Street, and Bridge Construction)
2461022000	Asphalt Application - Emulsified Asphalt	Economy.com output data (138); population (116)	NAICS 2373 (Highway, Street, and Bridge Construction)
2461023000	Asphalt Application - Asphalt Roofing	Economy.com output data (142); population (112)	NAICS 2381 (Foundation, Structure, and Building Exterior Contractors)
2461800000	Commercial Solvent Use - Pesticides (All)	Population	
2461850000	Commercial Solvent Use - Pesticides (Herbicides)	Population	
2465000000	Consumer Solvent Use (Total)	Population	
2465100000	Consumer Solvent Use (Personal Care Products)	Population	
2501000090	Petroleum Product Storage and Transport (Breathing) - Distillate Oil	AEO regional data	
2501000120	Petroleum Product Storage and Transport (Breathing) - Gasoline	AEO regional data	
2501000150	Petroleum Product Storage and Transport (Breathing) – Jet Naphtha	AEO regional data	
2501000180	Petroleum Product Storage and Transport (Breathing) - Kerosene	AEO regional data	
2501010030	Petroleum Product Storage and Transport (Breathing) – Crude Oil	AEO regional data	
2501010060	Petroleum Product Storage and Transport (Breathing) - Residual Oil	AEO regional data	
2501010120	Petroleum Product Storage and Transport (Breathing) - Gasoline	AEO regional data	
2501010180	Petroleum Product Storage and Transport (Breathing) - Kerosene	AEO regional data	
2501011011	Portable Fuel Containers – Permeation – Residential	Population	
2501011012	Portable Fuel Containers – Evaporation (Diurnal) – Residential	Population	
2501011013	Portable Fuel Containers – Spillage – Transport – Residential	Population	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2501011014	Portable Fuel Containers – Refilling – Vapor Displacement – Residential	Population	
2501011015	Portable Fuel Containers – Refilling – Spillage – Residential	Population	
2501012011	Portable Fuel Containers – Permeation – Commercial	Population	
2501012012	Portable Fuel Containers – Evaporation (Diurnal) – Commercial	Population	
2501012013	Portable Fuel Containers – Spillage – Transport – Commercial	Population	
2501012014	Portable Fuel Containers – Refilling – Vapor Displacement – Commercial	Population	
2501012015	Portable Fuel Containers – Refilling – Spillage – Commercial	Population	
2501060051	Gasoline Service Stations - Stage 1 (Submerged Filling)	AEO regional data	
2501060053	Gasoline Service Stations - Stage 1 (Balanced Submerged Filling)	AEO regional data	
2501060100	Gasoline Service Stations - Stage 2 (Total)	AEO regional data	
2501060101	Gasoline Service Stations - Stage 2 (Displacement Loss/Uncontrolled)	AEO regional data	
2501060102	Gasoline Service Stations - Stage 2 (Displacement Loss/Controlled)	AEO regional data	
2501060103	Gasoline Service Stations - Stage 2 (Spillage)	AEO regional data	
2501060201	Gasoline Service Stations - Underground Tank Breathing and Emptying	AEO regional data	
2501080050	Petroleum Product Storage and Transport - Aviation Gasoline - Stage 1	AEO regional data	
2501080100	Petroleum Product Storage and Transport - Aviation Gasoline - Stage 2	AEO regional data	
2501995120	Petroleum Product Storage and Transport (Working Loss) - Gasoline	AEO regional data	
2505020000	Petroleum Product Storage and Transport (Marine Vessel Transport) - All Products	AEO regional data	
2505030120	Petroleum Product Storage and Transport (Truck Transport) - Gasoline	AEO regional data	
2601010000	On-Site Incineration – Industrial	Economy.com output data (0); population (254)	NAICS 3xxx (All Manufacturing)
2601020000	On-Site Incineration - Commercial/Institutional	Population	
2610000100	Open Burning (Yard Waste) - Leaf	Population	
2610000400	Open Burning (Yard Waste) – Brush	Population	
2610000500	Open Burning (Land Clearing Debris Except Logging Debris)	Economy.com output data (136); population (118)	NAICS 2361 (Residential Building Construction)
2610030000	Open Burning (Household Waste)	Population	
2620000000	Landfills – All	Population	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2620030000	Landfills – Municipal	Population	
2630000000	Wastewater Treatment – All	Population	
2630020000	Wastewater Treatment - Public Owned	Population	
2660000000	Leaking Underground Storage Tanks	Economy.com output data (67); population (187)	NAICS 5629 (Remediation and Other Waste Management Services)
2801000000	Agriculture Production (Total)	Constant	
2801000003	Agriculture Tilling	Constant	
2801500000	Agriculture - Field Burning (All Crops)	Constant	
2801700001	Fertilizer Application - Anhydrous Ammonia	Constant	
2801700002	Fertilizer Application - Aqua Ammonia	Constant	
2801700003	Fertilizer Application - Nitrogen Solutions	Constant	
2801700004	Fertilizer Application – Urea	Constant	
2801700005	Fertilizer Application - Ammonium Nitrate	Constant	
2801700006	Fertilizer Application - Ammonium Sulfate	Constant	
2801700007	Fertilizer Application - Ammonium Thiosulfate	Constant	
2801700008	Fertilizer Application - Other Straight Nitrogen	Constant	
2801700009	Fertilizer Application - Ammonium Phosphates	Constant	
2801700010	Fertilizer Application - N-P-K	Constant	
2801700011	Fertilizer Application - Calcium Ammonium Nitrate	Constant	
2801700012	Fertilizer Application - Potassium Nitrate	Constant	
2801700013	Fertilizer Application - Diammonium Phosphate	Constant	
2801700014	Fertilizer Application - Monoammonium Phosphate	Constant	
2801700015	Fertilizer Application - Liquid Ammonium Polyphosphate	Constant	
2801700099	Fertilizer Application - Miscellaneous Fertilizers	Constant	
2805001000	Beef Cattle Feedlots – Total	Constant	
2805001100	Beef Cattle Feedlots – Confinement	Constant	
2805001200	Beef Cattle Feedlots - Manure Handling/Storage	Constant	
2805001300	Beef Cattle Feedlots - Land Application of Manure	Constant	
2805002000	Beef Cattle Production – Composite	Constant	
2805003100	Beef Cattle Pasture/Range – Confinement	Constant	
2805007100	Poultry Production - Layers with Dry Manure Management Confinement	Constant	
2805007300	Poultry Production - Land Application of Manure	Constant	
2805008100	Poultry Production - Layers with Wet Manure Confinement	Constant	
2805008200	Poultry Production - Wet Manure Handling and Storage	Constant	
2805008300	Poultry Production - Land Application of Wet Manure	Constant	
2805009100	Poultry – Confinement	Constant	
2805009200	Poultry - Manure Handling/Storage	Constant	
2805009300	Poultry - Land Application of Manure	Constant	
2805010100	Turkey Production – Confinement	Constant	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2805010200	Turkey Production - Manure Handling/Storage	Constant	
2805010300	Turkey Production - Land Application of Manure	Constant	
2805018000	Dairy Cattle - Composite:Nec	Constant	
2805019100	Dairy Cattle - Flush Dairy (Confinement)	Constant	
2805019200	Dairy Cattle - Flush Dairy (Manure Handling/Storage)	Constant	
2805019300	Dairy Cattle - Flush Dairy (Land Application of Manure)	Constant	
2805021100	Dairy Cattle - Scrape Dairy (Confinement)	Constant	
2805021200	Dairy Cattle - Scrape Dairy (Manure Handling/Storage)	Constant	
2805021300	Dairy Cattle - Scrape Dairy (Land Application of Manure)	Constant	
2805022100	Dairy Cattle - Deep Pit Dairy (Confinement)	Constant	
2805022200	Dairy Cattle - Deep Pit Dairy (Manure Handling/Storage)	Constant	
2805022300	Dairy Cattle - Deep Pit Dairy (Land Application of Manure)	Constant	
2805023100	Dairy Cattle - Drylot/Pasture Dairy (Confinement)	Constant	
2805023200	Dairy Cattle - Drylot/Pasture Dairy (Manure Handling/Storage)	Constant	
2805023300	Dairy Cattle - Drylot/Pasture Dairy (Land Application of Manure)	Constant	
2805025000	Hogs & Pigs – Composite	Constant	
2805030000	Poultry & Chickens – Composite	Constant	
2805030007	Poultry & Chickens – Ducks	Constant	
2805030008	Poultry & Chickens – Geese	Constant	
2805035000	Horses & Ponies – Composite	Constant	
2805039100	Swine Production - Lagoons (Confinement)	Constant	
2805039200	Swine Production - Lagoons (Manure Handling & Storage)	Constant	
2805039300	Swine Production - Lagoons (Land Application of Manure)	Constant	
2805040000	Sheep & Lambs – Composite	Constant	
2805045000	Goats - Waste Emissions	Constant	
2805047100	Swine Production - Deep-Pit House (Land Application of Manure - Confinement)	Constant	
2805047300	Swine Production - Deep-Pit House (Land Application of Manure)	Constant	
2805053100	Swine Production - Out Door Operations (Land Application of Manure)	Constant	
2806010000	Domestic Animals - Cats	Population	
2806015000	Domestic Animals - Dogs	Population	
2807025000	Wild Animals - Elk	Constant	
2807030000	Wild Animals - Deer	Constant	
2810001000	Other Combustion - Forest Wildfires	Constant	
2810005000	Other Combustion - Managed Burning Slash (Logging Debris)	Constant	

Table 4-1. Continued

SCC	SCC Description	Projection Data[a]	Projection Data Description
2810015000	Other Combustion - Prescribed Burning For Forest Management	Constant	
2810020000	Other Combustion - Prescribed Burning Of Rangeland	Constant	
2810030000	Other Combustion - Structure Fires	Population	
2810040000	Other Combustion - Aircraft/Rocket Engine Firing And Testing	Constant	
2810050000	Other Combustion - Motor Vehicle Fires	Population	
2830000000	All Catastrophic/Accidental Releases	Constant	

[a] When projection data are indicated as both Economy.com output data and population data, the parenthetical number indicates the number of counties the particular projection data were applied to.

Economy.com output data were obtained for all area source categories indicated in Table 4-1. These include individual 4-digit NAICS (e.g., 3121, etc.) and multiple aggregated NAICS (e.g., 3xxx, etc.). For the multiple aggregated NAICS, output data for all the individual NAICS within the group were aggregated together for each county, by year, before calculating the growth factors.

As discussed in Section 3.3 for point sources, any NAICS/county combinations with 2005 output values less than $1,000,000 used county-level population growth instead of Economy.com output data. The basis for this decision was that one particular area of concern associated with the use of Economy.com output data was that for certain NAICS/county combinations the derived growth factors may be overly large. In some cases, this may, in fact, represent an industry sector that is growing rapidly. However, in other instances, these growth factors may be the result of insignificant county-level outputs. County-level output estimates are based upon detailed county-level employment estimates and the Bureau of Economic Analysis' (BEA) state- and metropolitan area-level output data. For the larger counties, actual output data exist; however, for the smaller counties, Economy.com gap-fills the output estimates by allocating the state-level output (minus actual output data for the large counties) based upon employment estimates. For some NAICS/county combinations, the output estimates are as small as 1×10^{-8} million dollars (i.e., 1 cent). These small output estimates are not realistic and are simply an artifact of Economy.com's gap-filling process. After consulting with TCEQ staff, it was decided that for any NAICS/county combinations with 2005 output values less than $1,000,000 that growth factors would be based on county-level population growth instead of output data from Economy.com. The substitution of Economy.com output data with population is shown in Table 4-1 by indicating the number of counties for which Economy.com output data were maintained and the number of counties for which population data were substituted.

4.3 Expanded Use of Annual Energy Outlook Data

The EGAS model utilized *AEO* consumption data for the industrial, commercial/institutional, and residential fuel combustion area source categories (i.e., SCC 2102xxxxxx, 2103xxxxxx, and 2104xxxxxx). These assignments were maintained in Table 4-1. As part of this project, use of the *AEO* data were expanded to additional area source categories. In particular, total fuel-specific (e.g., gasoline, distillate, residual, kerosene) consumption data were applied to the petroleum storage and transport categories (i.e., SCC 2501xxxxxx and 2505xxxxxx).

In addition, *AEO* oil and gas production data were applied to oil and gas production categories (i.e., SCC 2310xxxxxx). The consumption data were not available at the state-level; instead, consumption data for the West South Central census division (i.e., Arkansas, Louisiana, Oklahoma, and Texas). Given the relative size of Texas consumption activity compared to the other three states the application of the West South Central census division to Texas is a reasonable assumption. Likewise, the *AEO* oil and gas production data were not available at the state-level either. Instead, production data were reported at the oil and gas supply model regions level. The two relevant oil and gas supply model regions that included Texas were the Gulf Coast and Southwest regions.

4.4 Use of Texas-Specific Population Projections

The most recent Texas-specific population projections were obtained from the Texas State Demographer at the Texas State Data Center (TSDC, 2008). Compared to other types of activity data used for area source projections, population projections are considered to typically be more accurate. This accuracy is due to birth and death rates being fairly well understood and quantified. In addition, birth and death rates usually have considerable inertia and do not change significantly from year to year. The uncertainty of population projections is primarily due to immigration and sudden population influxes (e.g., the evacuation of New Orleans in the wake of Hurricane Katrina, etc.). As shown in Figure 4-1, the county-level population projection factors from 2005 to 2035 ranged from a minimum of 0.7812 for Llano County to 1.7110 for Webb County. The population projection factor for Loving County was even lower (i.e., 0.7463), but with a starting 2005 population of 67, it was considered to be an outlier. A total of 43 counties had decreasing population between 2005 and 2035; however, most of these counties were comparatively small with the largest county having a 2005 population of 42,725 (i.e., Kerr County).

The statewide population growth projection factor from 2005 to 2035 was 1.1809, while the growth projection factor for the 10 most populous counties (i.e., Bexar, Collin, Dallas, Denton, El Paso, Fort Bend, Harris, Hidalgo, Tarrant, and Travis counties) was slightly higher at 1.2025. These 10 counties comprised over 57 percent of the state population in 2005. The individual county-level population projections for these 10 most populous counties are shown in Figure 4-2. As shown in Figure 4-2, the population projections for 8 of these 10 counties (i.e., Bexar, Collin, Dallas, Denton, Fort Bend, Harris, Tarrant, and Travis counties) track fairly closely with state and

aggregated 10 county projections with 2035 projection factors ranging from 1.1392 to 1.1922. The two counties that significantly vary from the state and aggregated 10 county projections are Hidalgo and El Paso counties with 2035 projection factors of 1.5579 and 1.3474, respectively.

4.5 Use of Flat/No Growth Factors

For a few source categories, the EGAS model assigned flat or no growth factors (i.e., 1.0000). These source categories included a number of categories that either were not expected to vary significantly from year to year or appropriate activity data could not be reasonably assigned. Some examples included forest wildfires, catastrophic/accidental releases, and ammonia emissions from wild animals. For this effort, the flat factor was also assigned to all of the agricultural source categories (SCC 2801xxxxxx) and livestock ammonia categories (SCC 2805xxxxxx). The agricultural source categories were previously assigned value added data from farms, but since total agricultural acreage does not significantly change over time it was decided that a flat factor would be more appropriate. Various types of livestock vary from year to year, but these variations are often cyclical in nature and are in response to market forces. As a result, a flat factor was assigned to the livestock ammonia categories.

Figure 4-1. Range of Population Growth Factors for Texas

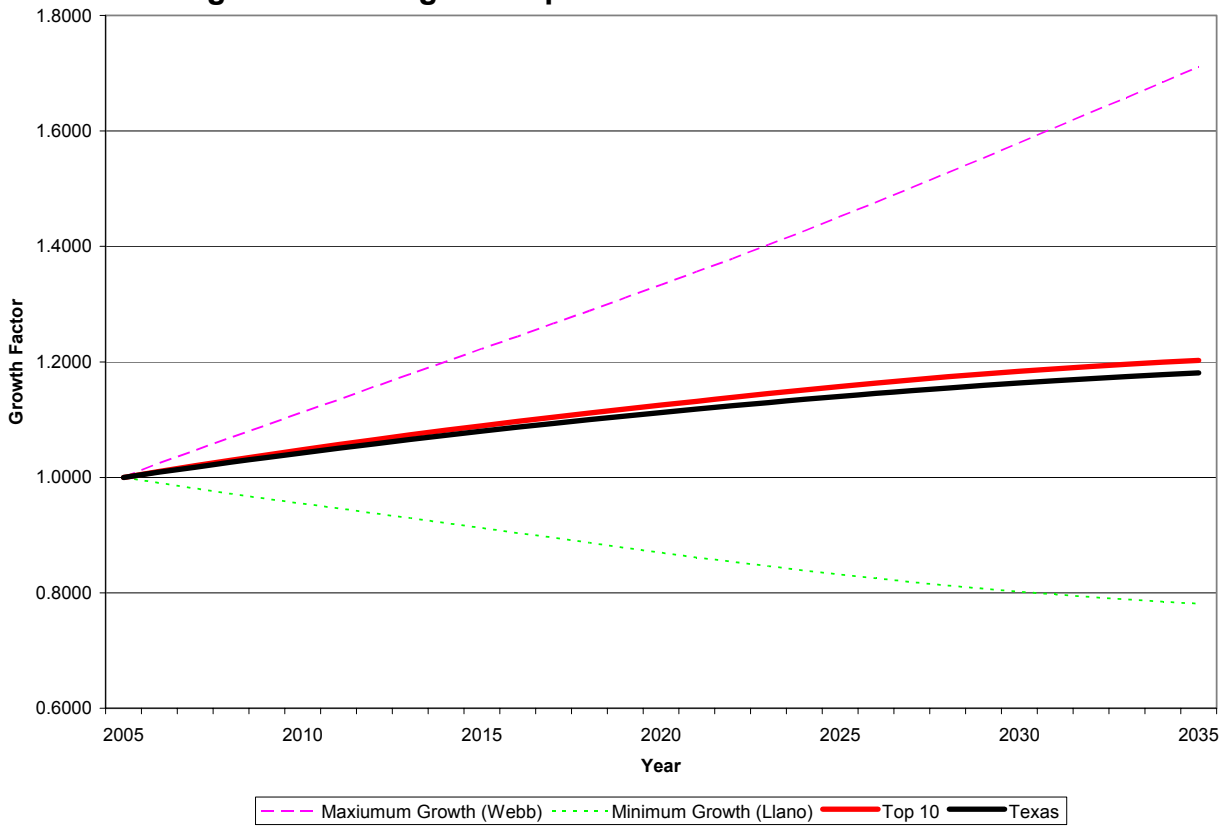
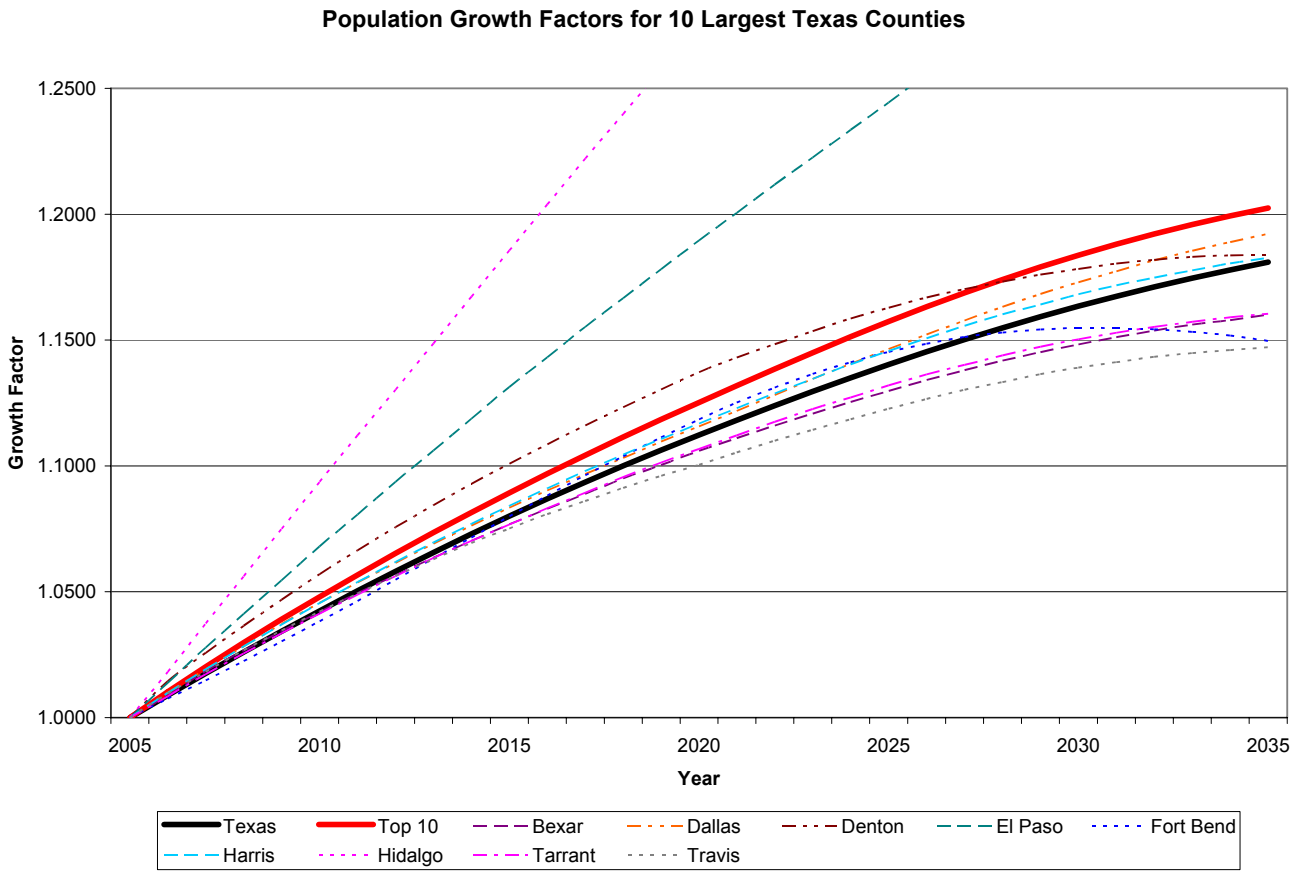


Figure 4-2. Population Growth Factors for 10 Most Populous Counties in Texas



5.0 DATA ANALYSIS

After developing preliminary growth factors for Texas point and area sources as described in Sections 3.0 and 4.0, ERG conducted a data analysis by applying the compiled growth factors to the point source and area source 2005 base year emissions inventories (provided by TCEQ and used "as is" with no changes) and developing future year emissions inventories for 2008, 2017, 2020, 2026, and 2035. This analysis was conducted under Task 3 (Data Analysis) of the project scope. ERG analyzed the future emissions inventories by comparing and contrasting differences between the 2005 base year inventory and the five future year inventories. The data analysis included comparisons at the following levels of disaggregation: county, attainment status area (i.e., including nonattainment, near nonattainment, Early Action Compact [EAC], and attainment), and state. The attainment status areas are as follows:

- Houston-Galveston-Brazoria Ozone Nonattainment Area;
- Dallas-Fort Worth Ozone Nonattainment Area;

- Beaumont/Port Arthur Ozone Nonattainment Area;
- El Paso Nonattainment Area;
- Austin Ozone EAC Area;
- Northeast Texas EAC Area;
- San Antonio EAC Area;
- Corpus Christi Near Nonattainment Area;
- Victoria Near Nonattainment Area; and
- All attainment counties.

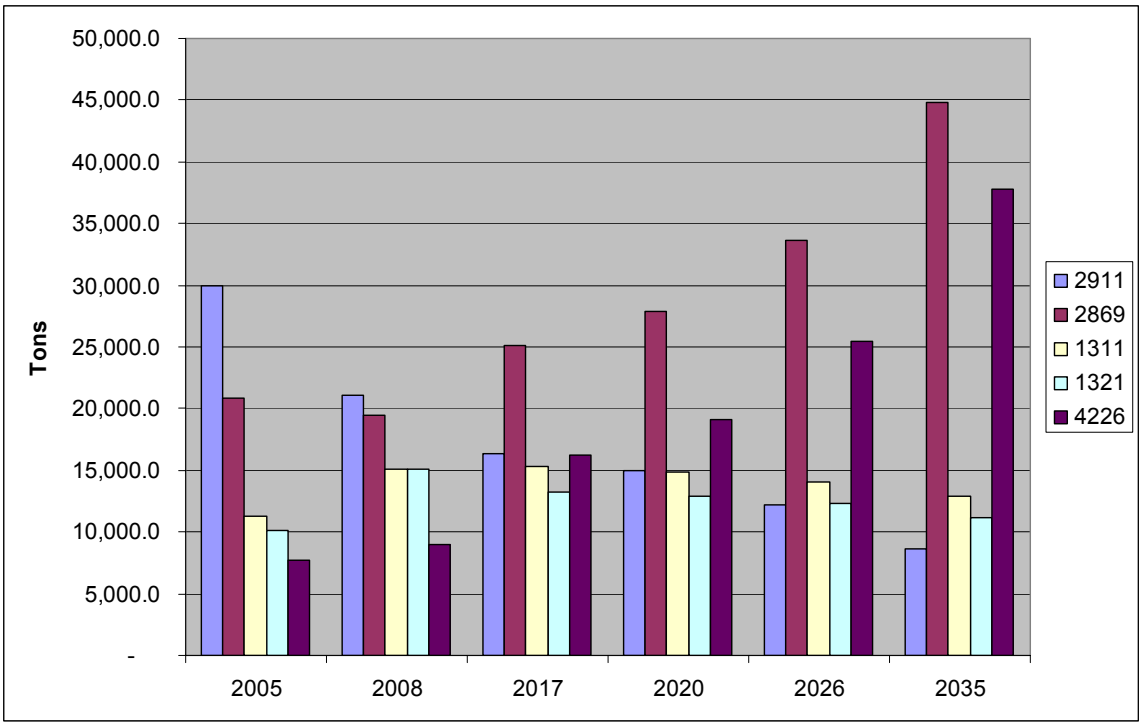
Based on conversation with TCEQ project staff, it was decided to limit further analysis to NO_x, VOC, and carbon monoxide (CO) only. The analysis identified SCCs and Standard Industrial Classification (SIC) codes that had the greatest and least variation of emissions estimates with the degree of variation indicated in units of tons per day and percent change. ERG compiled the differences between the 2005 base year emissions inventory and the five future year inventories in a spreadsheet and submitted these to TCEQ for their review. Figures 5-1 and 5-2 show the top five state-level VOC source categories (based on 2005 emissions) for point and area sources along with their future year emissions. Additional analysis was conducted for oil and gas source category emissions within the point and area source types. Figures 5-3 and 5-4 present the state-level base year and future year VOC emissions for point source and area source oil and gas categories, respectively. Figures 5-5 through 5-12 present a similar set of charts for CO and NO_x emissions.

Based upon TCEQ staff's review of the analysis results, several revisions were made to the projection factors which are listed below:

- For NAICS 3241 (Petroleum and Coal Products Manufacturing) (i.e., including refineries) point sources, replacement of Economy.com output data with *AEO* domestic refining capacity data (described in detail in Section 3.1).
- For NAICS 4861 (Pipeline Transportation of Crude Oil), 4862 (Pipeline Transportation of Natural Gas), and 4869 (Other Pipeline Transportation) point sources, use of alternative data when Economy.com output data were unavailable (i.e., *AEO* crude oil and natural gas production for NAICS 4861 and 4862 and use of Economy.com output data for NAICS 3251 [Basic Chemical Manufacturing] as a surrogate for NAICS 4869) (described in detail in Section 3.1).
- For both point and area sources, replacement of Economy.com output data with county-level population data for those NAICS sector/county combinations with a 2005 output value less than $1,000,000 (described in detail in Section 3.3).

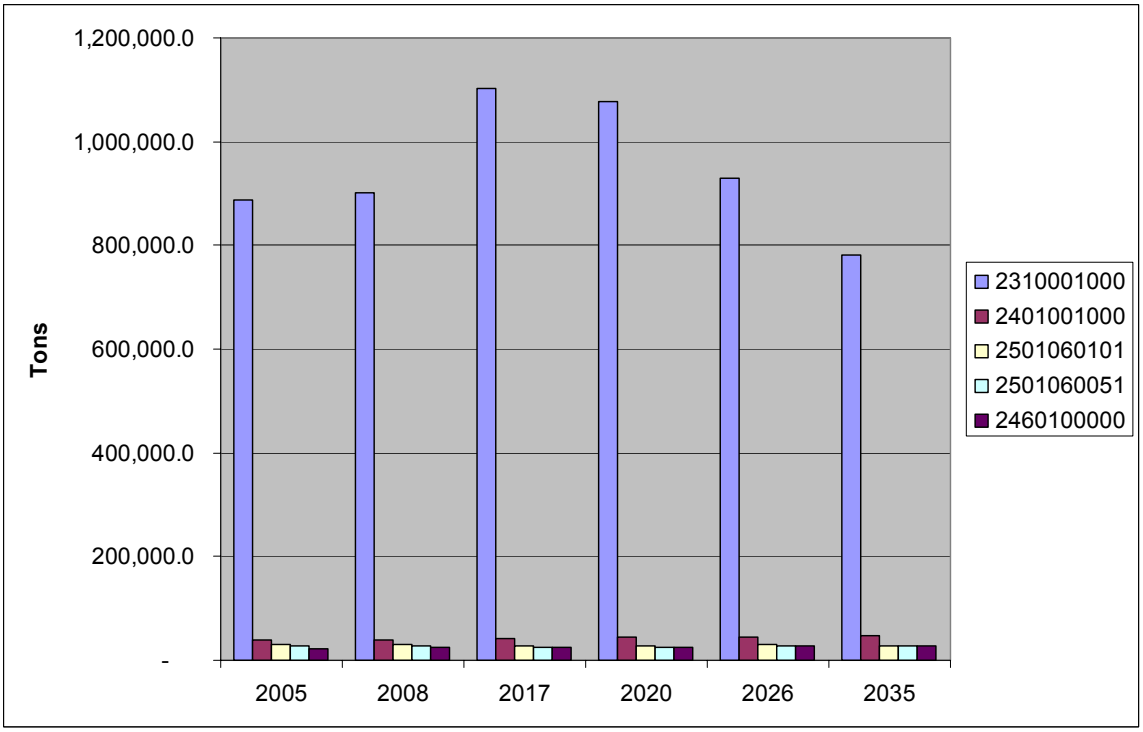
Since these changes were made after TCEQ staff's review of the analysis results, these changes are not reflected in Figures 5-1 through 5-12.

Figure 5-1. Top Five State-Level Point Source VOC Categories



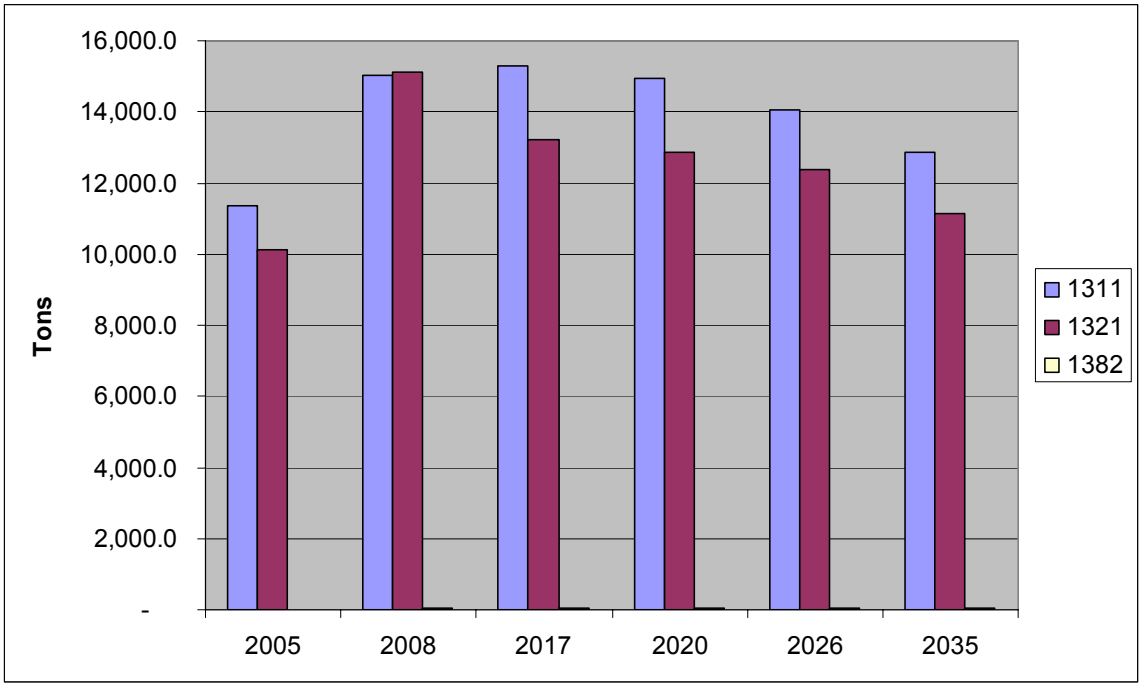
2911 – Petroleum Refining; 2869 – Industrial Organic Chemicals, NEC; 1311 – Crude Petroleum & Natural Gas; 1321 – Natural Gas Liquids; and 4226 – Special Warehousing & Storage, NEC. Note: SIC 4226 includes many "terminals for hire" and a large portion of the reported VOC emissions are from the landing of floating roof tanks, which have subsequently been controlled.

Figure 5-2. Top Five State-Level Area Source VOC Categories



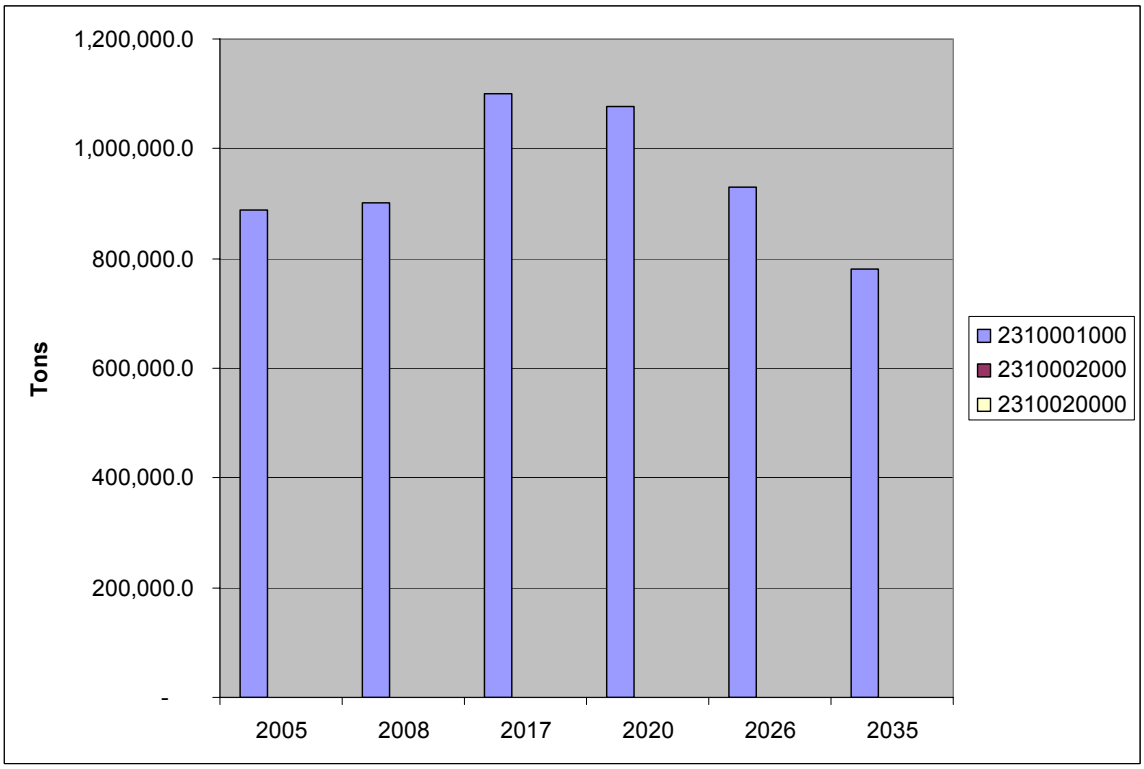
2310001000 – Onshore Oil & Gas Exploration & Production; 2401001000 – Architectural Coatings; 2501060101 – Petroleum Products (Gasoline Service Stations – Stage 2 Displacement Loss, Uncontrolled); 2501060051 – Petroleum Products (Gasoline Service Stations – Stage 1 Submerged Filling); and 2460100000 – Consumer/Commercial (All Personal Care Products).

Figure 5-3. State-Level Oil & Gas Point Source VOC Categories



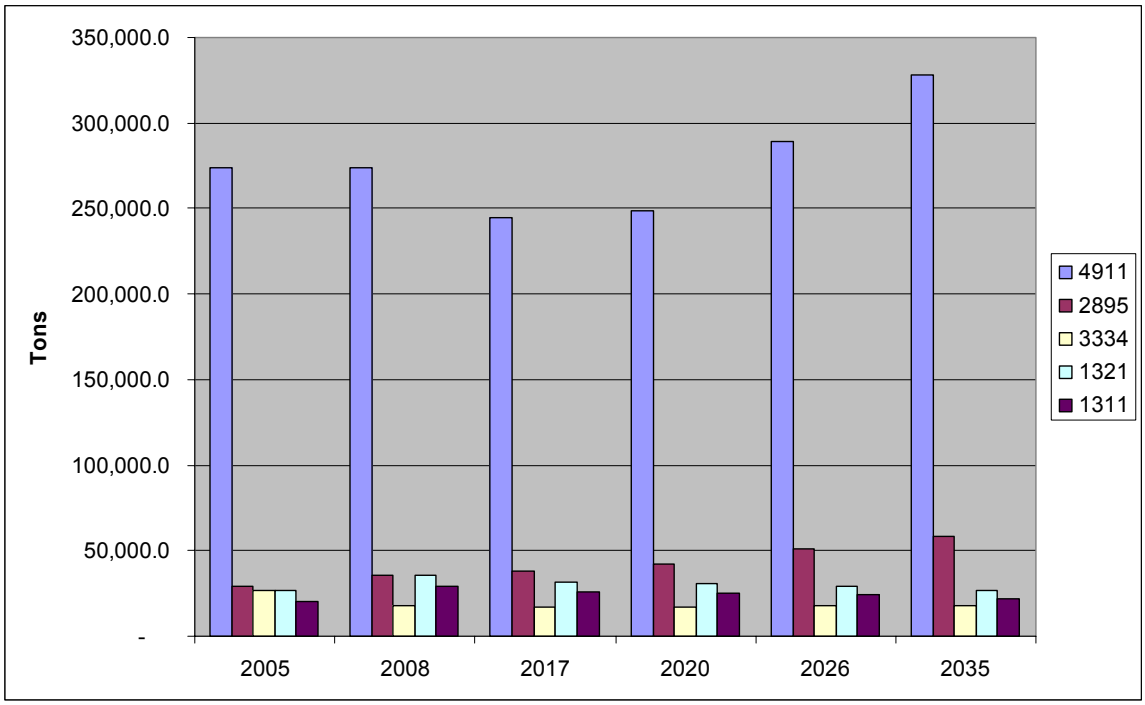
1311 - Crude Petroleum & Natural Gas; 1321 - Natural Gas Liquids; 1382 - Oil and Gas Exploration Services

Figure 5-4. State-Level Oil & Gas Area Source VOC Categories



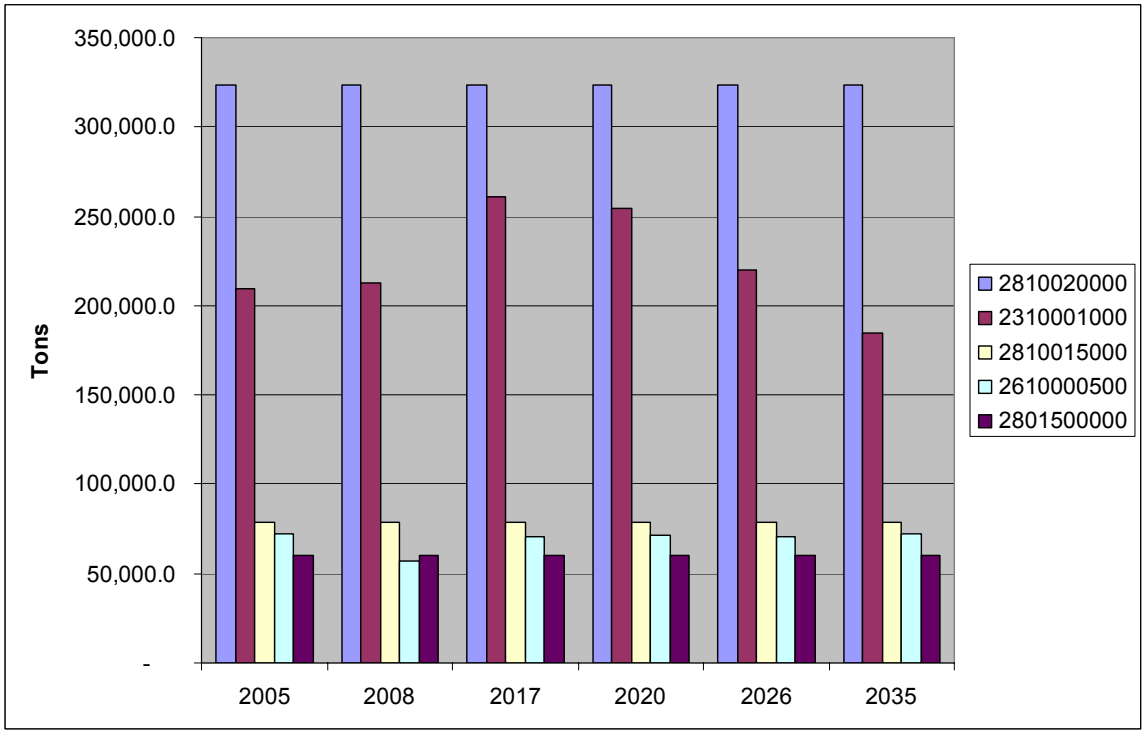
2310001000 – Onshore Oil & Gas Exploration & Production (All Processes); 2310002000 – Offshort Oil & Gas Production (All Processes); and 2310020000 – Natural Gas Exploration and Production (All Processes). Note: VOC emissions from 2310002000 and 2310020000 are below 500 tpy and do not show up on the graphic due to the scale.

Figure 5-5. Top Five State-Level Point Source CO Categories



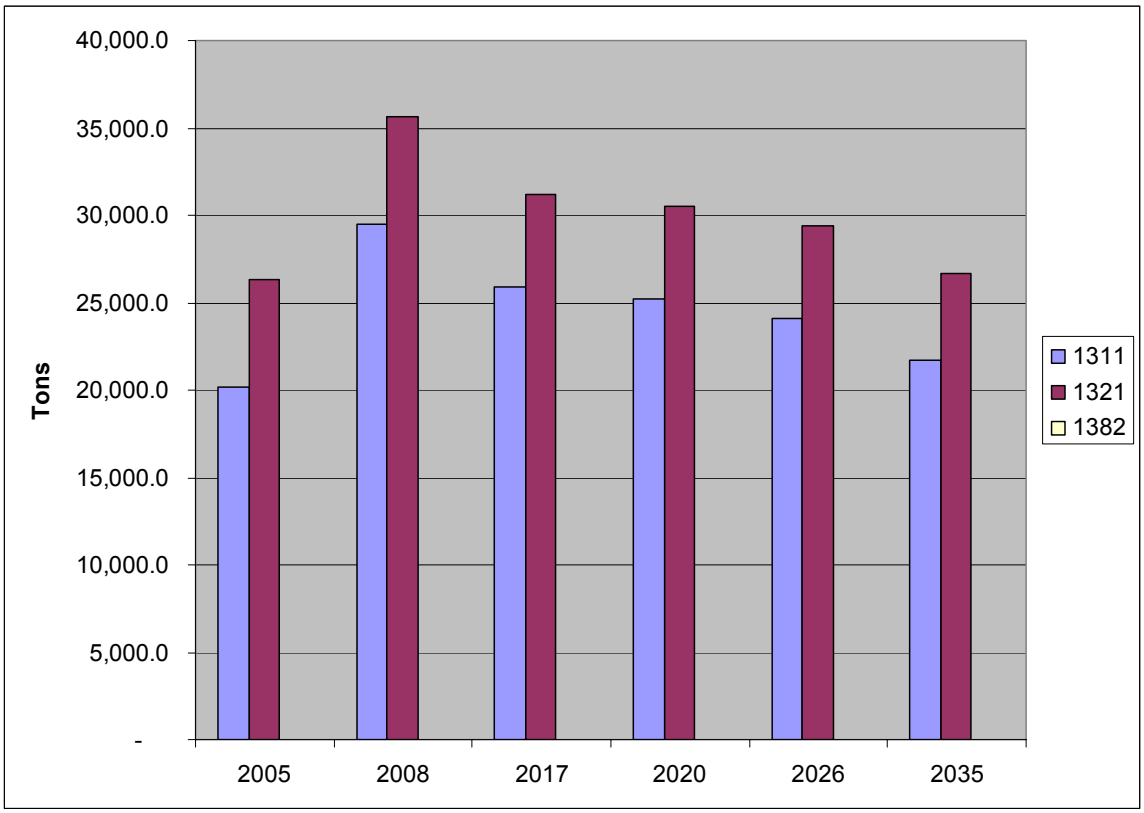
4911 – Electric Services; 2895 – Carbon Black; 3334 – Primary Aluminum; 1321 – Natural Gas Liquids; and 1311 – Crude Petroleum & Natural Gas.

Figure 5-6. Top Five State-Level Area Source CO Categories



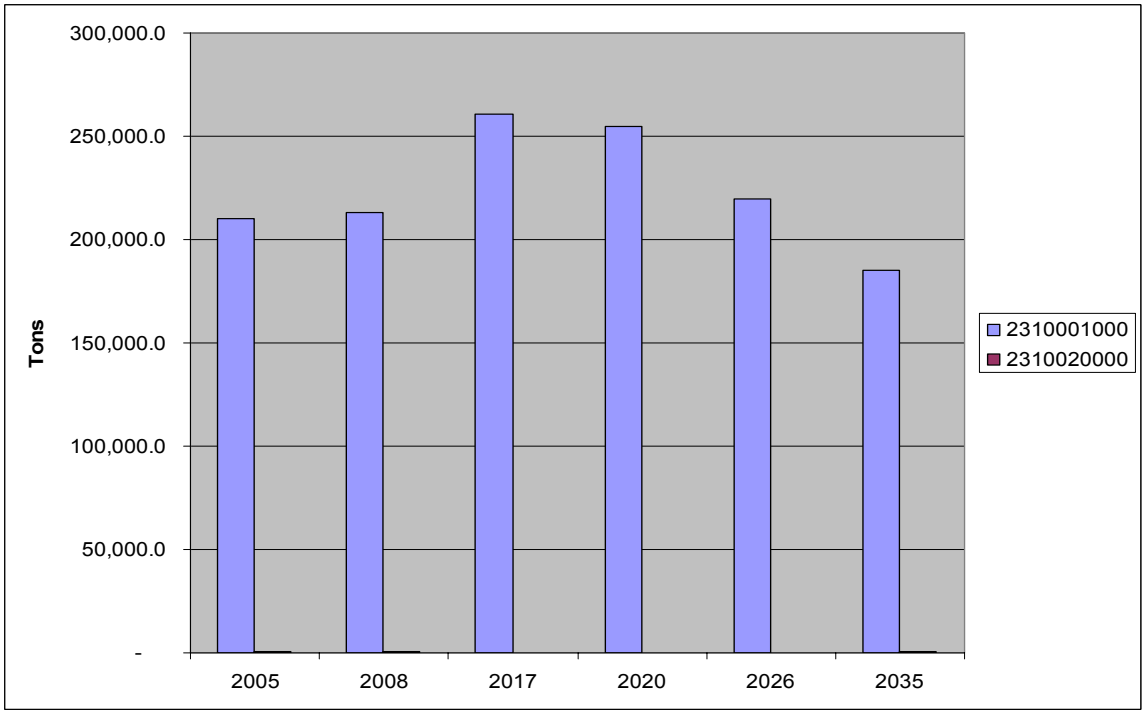
2810020000 - Prescribed Burning Of Rangeland; 2310001000 - On Shore Oil & Gas Exploration & Production; 2810015000 - Prescribed Burning For Forest Management; 2610000500 – Open Burning - Land Clearing Debris; and 2801500000 - Agriculture Field Burning.

Figure 5-7. State-Level Oil & Gas Point Source CO Categories



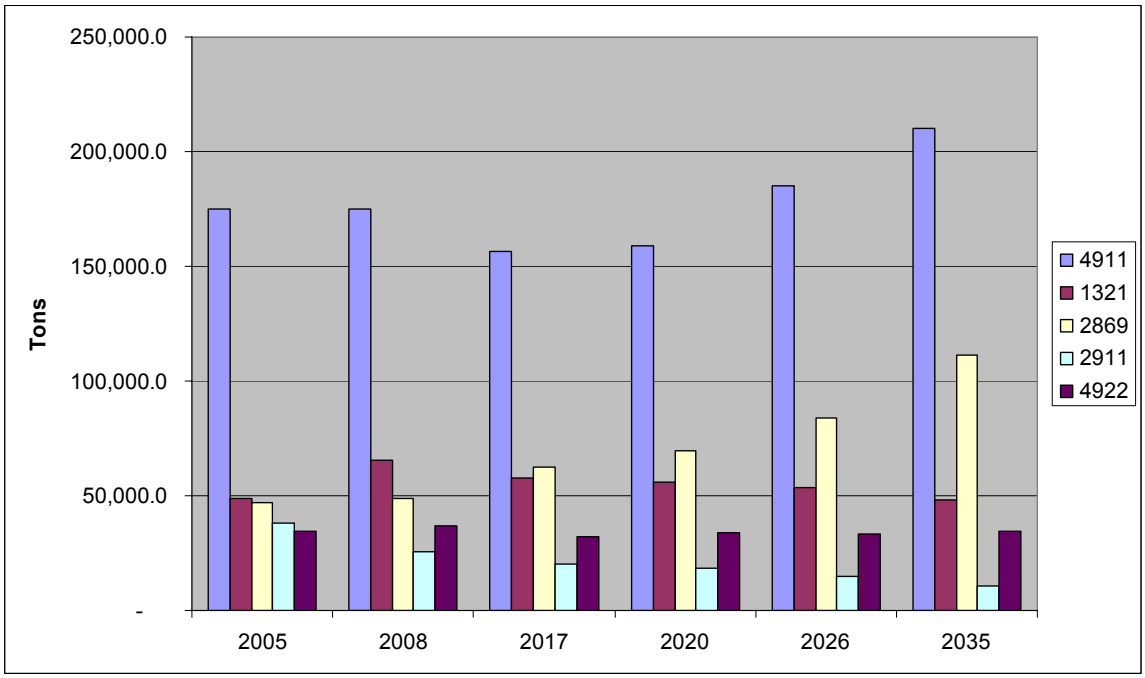
1311 – Crude Petroleum & Natural Gas; 1321 – Natural Gas Liquids; and 1382 – Oil & Gas Exploration Services. Note: CO emissions from 1382 are less than 100 TPY and do not show up on the graphic due to the scale.

Figure 5-8. State-Level Oil & Gas Area Source CO Categories



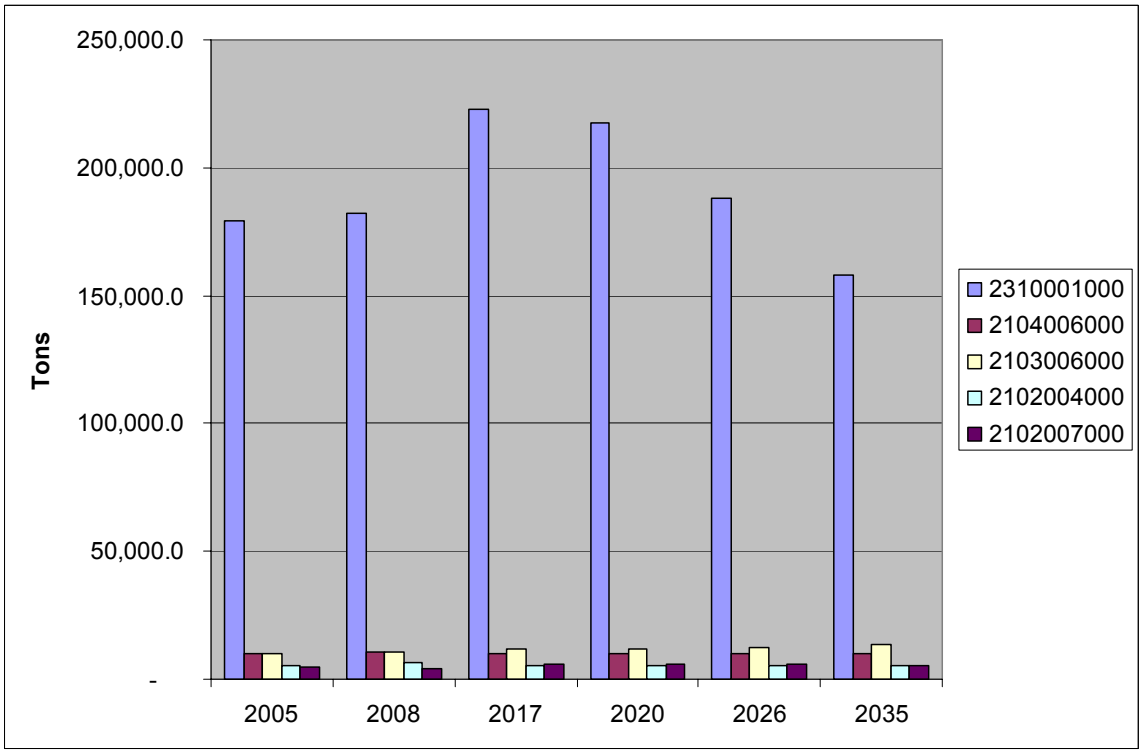
2310001000 - On Shore Oil & Gas Exploration & Production; and 2310020000 - Natural Gas Exploration & Production.

Figure 5-9. Top Five State-Level Point Source NO_x Categories



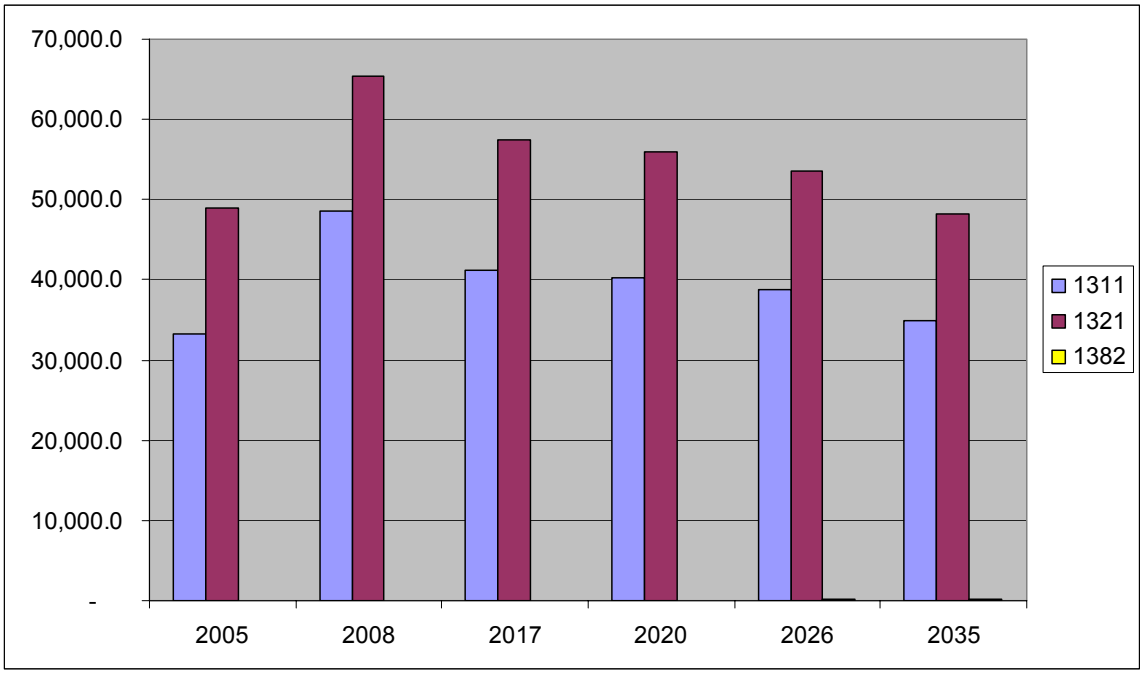
4911 – Electric Services; 1321 – Natural Gas Liquids; 2869 - Industrial Organic Chemicals, NEC; 2911 – Petroleum Refining; and 4922 – Natural Gas Transmission.

Figure 5-10. Top Five State-Level Area Source NO_x Categories



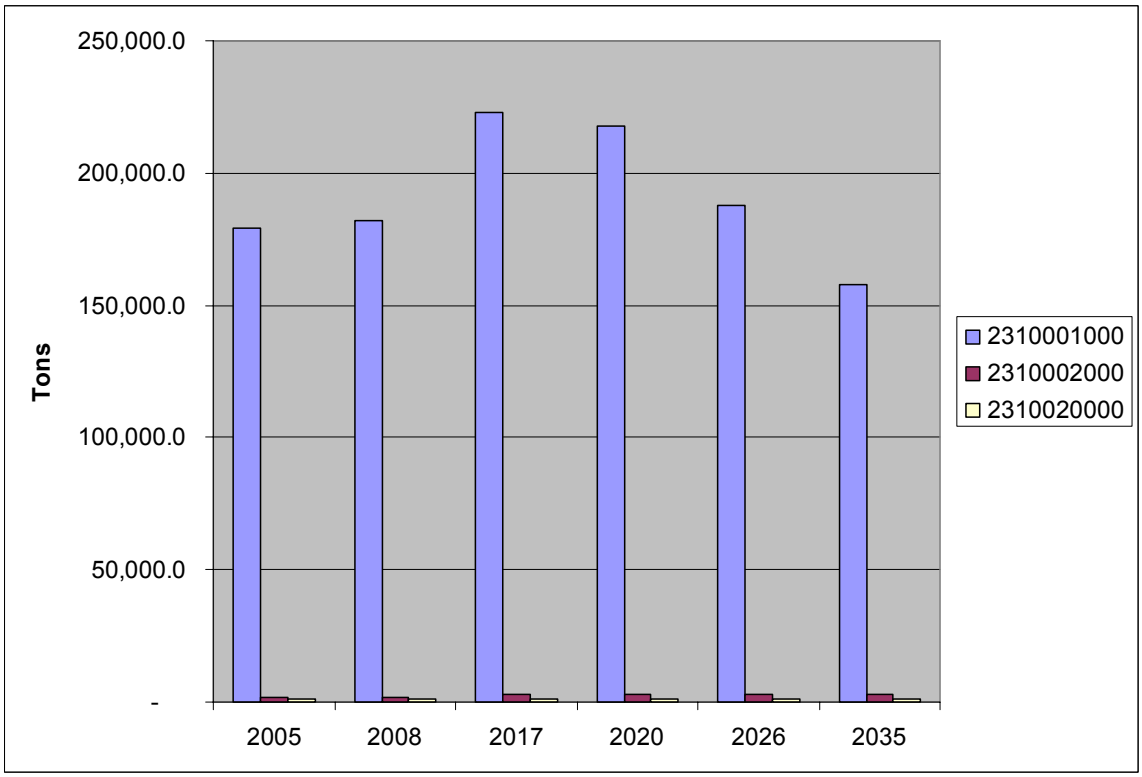
2310001000 - On Shore Oil & Gas Exploration & Production: All Processes; 2104006000 - Residential Fuel Combustion: Natural Gas; 2103006000 - Commercial/Institutional Fuel Combustion: Natural Gas; 2102004000 - Industrial Fuel Combustion: Distillate Oil: Boilers/IC Eng.; and 2102007000 - Industrial Fuel Combustion: Liquefied Petroleum Gas (LPG).

Figure 5-11. State-Level Oil & Gas Point Source NO_x Categories



1311 – Crude Petroleum & Natural Gas; 1321 – Natural Gas Liquids; and 1382 – Oil & Gas Exploration Services. Note: NOx emissions from 1382 are less than 100 TPY and do not show up on the graphic due to the scale.

Figure 5-12. State-Level Oil & Gas Area Source NO_x Categories



2310001000 - On Shore Oil & Gas Exploration & Production; 2310002000 - Off Shore Oil & Gas Production; and 2310020000 - Natural Gas Exploration & Production: All Processes.

6.0 FORMATTED GROWTH FACTORS

The final step of the projects was the development of the formatted growth factors which was conducted under Task 4 (Develop the Formatted Growth Factors) of the project scope. These formatted growth factors were submitted to TCEQ along with the final report. ERG provided the developed growth factors and associated data in Microsoft Access format for point sources. For area sources, ERG provided the developed growth factors and associated data in TexAER loadable format as well as in Microsoft Access format, where all fields are complete and all mandatory fields have been quality assured. All resulting TexAER loadable files will be entered into TexAER. Any errors or discrepancies identified in the TexAER loadable format or loading process will be corrected by ERG, or otherwise addressed in consultation with the TCEQ.

7.0 CAVEATS ASSOCIATED WITH USE OF GROWTH FACTORS

Although a comprehensive suite of point and area source growth factors were developed under this project, there are a number of caveats that should be considered when using these growth factors to develop projected emission inventories. These caveats include the following:

- Growth factors developed under this project do not account for the effects of controls (e.g., regulation control, rule effectiveness, rule penetration, fuel switching, technology improvements, etc.). As part of the development of future emissions, the effects of controls should also be considered.
- Growth factors developed under this project are based upon the most recent data projections available (i.e., spring/summer 2010) from Economy.com, *AEO*, Texas state demographics, etc. In the future, these data projections will be updated based upon newly available data and/or revised projections. Therefore, as these growth factors become dated, increased care and consideration should be exercised when using them.
- Growth factors developed under this project were developed relative to a 2005 base year. Use of these growth factors for a base year other than 2005 requires the use of growth factor ratioing. For instance, the 2013 growth factor for a 2008 base year inventory would be the ratio of the 2013 growth factor (2005 base year) divided by the 2008 growth factor (2005 base year).
- Growth factors developed under this project were based upon national- or regional-level data that were extrapolated down to individual counties. Care should be exercised when applying growth factors to point sectors with a small number of facilities. Local conditions (e.g., new construction, expansion, closings, etc.) may not be accurately represented. Information regarding local "on-the-ground" conditions should take precedence over this project's growth factors.
- Growth factors developed under this project may not fully represent short-term and/or regional disruptions, such as economic recessions, natural disasters, etc. The full effect of these events typically takes time to permeate through all data projections.

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