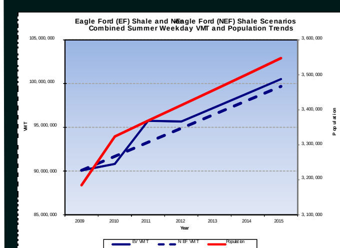
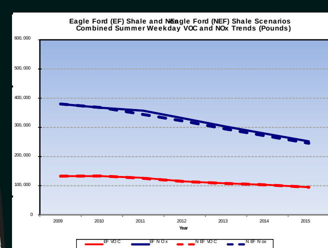
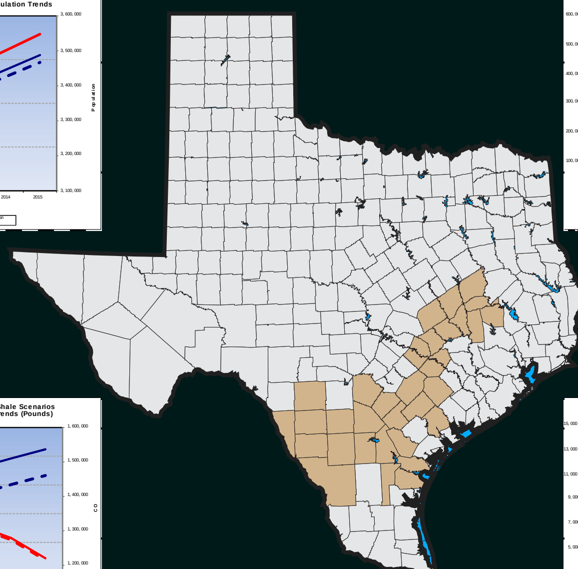
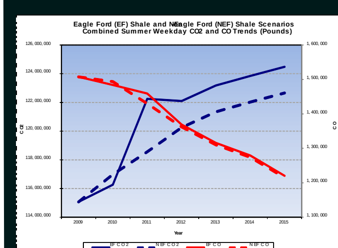
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

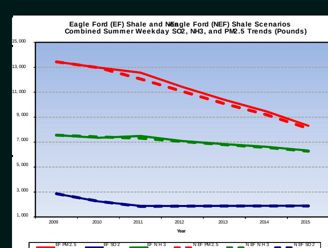
On-Road Mobile Source Emissions Associated With Eagle Ford Shale Area Oil and Gas Development











Prepared by the Texas Transportation Institute

August 2015

ESTIMATION OF ON-ROAD MOBILE SOURCE EMISSIONS ASSOCIATED WITH OIL AND GAS DEVELOPMENT IN THE EAGLE FORD SHALE AREA

FINAL

Prepared for the
Texas Commission on Environmental Quality
Air Quality Planning and Implementation Division

Prepared by the
Transportation Modeling Program
Texas Transportation Institute
TTI Study Number: 605301-0001
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TEXAS TRANSPORTATION INSTITUTE
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College Station, Texas 77843-3135

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EXECUTIVE SUMMARY

This project estimates the aggregate level of on-road mobile source emissions associated with the oil and gas development of the Eagle Ford Shale formation. The result of this project is county-level estimates of aggregate on-road mobile source emissions associated with development of the Eagle Ford Shale Formation in the 32 affected counties for the years 2009 through 2015 (Table 1).

Eagle Ford Shale emissions impacts are estimated by comparing historical activity and the associated emissions for the affected counties, with similar emissions based on hypothetical forecasts of activity without Eagle Ford Shale development. Activity for the hypothetical scenario (no Eagle Ford Shale activity) is analogous to a forecast made before the most recent period of Eagle Ford Shale development. An adjustment was also made to compensate for the concomitant economic downturn.

Full data sets of summer weekday and annual emissions are provided. In addition, individual county graphs are provided for summer weekday trends, along with composite graphs of all 32 counties for each scenario (historical – with Eagle Ford Shale development and hypothetical – without Eagle Ford Shale development). These results are summarized in a graph which combines the two scenarios (Figures 1-4).

There is a clear VMT and emissions impact associated with Eagle Ford Shale activity, in that, for the combined 32-county area, both VMT and emissions are higher for the Eagle Ford Shale activity scenario, though the increases vary in magnitude by individual county (Table 2).

INTRODUCTION

When oil and gas drilling activities increase in an area such as the Eagle Ford Shale formation, the drilling rigs are not the only source of new emissions. Heavy-duty diesel trucks drive to and from the drill sites delivering equipment, water, drilling mud, and other supplies. Similarly, economic activity associated with the housing, food, transportation, and entertainment needs of oil field workers and their families significantly increases. The purpose of this project is to estimate this aggregate level of on-road mobile source emissions associated (directly and indirectly) with the oil and gas development of the Eagle Ford Shale formation. The result of this project is county-level estimates of aggregate on-road mobile source emissions associated with development of the Eagle Ford Shale Formation for the years 2009 through 2015. This project will help state and local officials understand the contribution, if any, made by the Eagle Ford Shale area to downwind ozone. It will also complement the results of monitoring currently being done at Floresville and other air scientific research projects in the region.

BACKGROUND

The Eagle Ford Shale is a hydrocarbon-producing geological formation extending over 26 counties. It stretches from the Mexican border between Laredo and Eagle Pass up through counties east of Temple and Waco. Its recent development began in 2008 when a horizontal well in the formation was drilled with 10 fracking stages along a 3,200 ft. lateral.

Beginning with an on-road emissions inventory trends project currently underway for the Texas Commission on Environmental Quality (TCEQ) (TTI, 2015), the Texas Transportation Institute (TTI) created alternative on-road emissions inventory trends using assumptions and inputs that do not take development of the Eagle Ford Shale formation into account. With the exception of the hypothetical alternative case assumptions (no-Eagle Ford Shale development), this analysis was consistent with methods and parameters used in the previously mentioned trends study being performed concurrently with this study (TTI, 2015). In other words, the generation of the alternative model inputs and emissions trends followed the methods used in the TTI 2015 document, except when necessary to accommodate the alternative scenario where oil and gas related development in the Eagle Ford Shale area does not occur. This approach is cost effective and avoids the need to collect new data or create additional uncertainty when making predictions or forecasts for specific industries.

Table 1 shows the Eagle Ford Shale counties. The analysis years are the period of recent Eagle Ford Shale activity (2009-2015). The pollutants estimated are carbon monoxide (CO), carbon dioxide (CO_2), sulfur dioxide (SO_2), particulate matter less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOC), oxides of nitrogen (NO_x), and ammonia (NH_3).

ACKNOWLEDGMENTS

L. D. White, Stacy Schrank, and Martin Boardman, of TTI, contributed to the development of the MOVES emissions factors input data parameter values, the off-network vehicle activity estimates, and the MOVES based emissions estimates. Gary Lobaugh, of TTI, was responsible for editing, design, and production of this Technical Note. Each member of the assigned TTI staff contributed to the quality assurance of the emissions analysis. Dennis Perkinson, Ph.D. produced the vehicle miles traveled (VMT) mixes used to divide fleet VMT activity into MOVES source use type (SUT) categories, and county VMT control totals for both scenarios, as well as being the principle investigator for the project. This work was performed by TTI under contract to TCEQ. Erik Gribbin was the TCEQ project technical manager.

Table 1. Eagle Ford Shale Counties.

County	FIPS Code	TxDOT District
Atascosa	13	San Antonio
Bastrop	21	Austin
Bee	25	Corpus Christi
Bexar	29	San Antonio
Brazos	41	Bryan
Burleson	51	Bryan
De Witt	123	Yoakum
Dimmit	127	Laredo
Fayette	149	Yoakum
Frio	163	San Antonio
Gonzales	177	Yoakum
Grimes	185	Bryan
Jim Wells	249	Corpus Christi
Karnes	255	Corpus Christi
La Salle	283	Laredo
Lavaca	285	Yoakum
Lee	287	Austin
Leon	289	Bryan
Live Oak	297	Corpus Christi
Madison	313	Bryan
Maverick	323	Laredo
McMullen	311	San Antonio
Milam	331	Bryan
Nueces	355	Corpus Christi
Robertson	395	Bryan
San Patricio	409	Corpus Christi
Uvalde	463	San Antonio
Victoria	469	Yoakum
Walker	471	Bryan
Webb	479	Laredo
Wilson	493	San Antonio
Zavala	507	Laredo

PREVIOUS RESEARCH

There is limited previous research into the vehicle emissions produced by Eagle Ford Shale activities in Texas. These several studies can be characterized as either attempts by junior researchers unfamiliar with emissions estimation and the oil and gas industry (e.g., CTR, 2011), advocacy papers driven with the sponsoring agencies' or authors' predisposition (e.g., Armendariz & Alvarez, 2009) or regurgitations of a few existing studies, without informed commentary (TTI, 2014). All are largely incomplete attempts to address Eagle Ford Shale activities from the bottom up. These traits, as well as the poor quality of the report documents themselves, make these studies unreliable and therefore of little value as credible estimates of the impact of Eagle Ford Shale activities on area VMT and on-road mobile source emissions.

The well thought out and admirably executed Alamo Area Council of Governments (AACOG) and Institute for Economic Development at the University of Texas at San Antonio (IED/UTSA) documents attempt to examine the entire emissions profile are outstanding exceptions (AACOG, 2014 and IED/USTA, 2014, respectively). However, the breadth of these comprehensive efforts precludes their use as estimations of on-road mobile source activity or emissions. Another example of a laudable attempt at assessing the impact of oil and gas operations is the North Central Texas Council of Governments (NCTCOG) examination of the Barnett Shale play in the Dallas/Ft. Worth (DFW) area (NCTCOG, 2012). There are also recent credible and thorough studies addressing the more general transportation / right of way and highway safety impacts of oil and gas development activities (e.g., TTI, 2012 and TTI, 2013).

The current effort addresses the issue of observed impacts associated with Eagle Ford Shale activity through existing official VMT data using a robust empirical approach to compare observed post Eagle Ford Shale development VMT against hypothetical VMT for the same period without Eagle Ford Shale activity. The two scenarios use the same proven robust forecasting methods, holding all significant parameters constant, except for the inclusion of the period of Eagle Ford Shale development. All parameters are empirically derived official data, yielding an aggregate measure of the historical Eagle Ford Shale impact and a pre-Eagle Ford Shale development forecast. In this robust error minimizing empirically based aggregate approach, the only difference between the two scenarios is the Eagle Ford Shale activity. Therefore the difference in VMT and estimated emissions is logically attributable to the Eagle Ford Shale activity.

OVERVIEW OF METHODOLOGY

TTI incorporated previously developed Highway Performance Monitoring System (HPMS)-based, 24-hour, ozone season (average June through August), Weekday (average Monday through Friday) emissions estimates and annual emissions estimates for each of the 32 Eagle Ford Shales counties, for each year inclusive from 2009 through 2015. The level of detail in the final emissions estimates is aggregate emissions by county and SUT/fuel type (vehicle categories). An alternative scenario was also developed without Eagle Ford Shale activity. The following activities were completed for each scenario.

- Estimate 24-hour, typical ozone season (June, July, August), daily (Monday through Friday) emissions for each Texas county, for 2009 through 2015.
- Estimate seasonal and annualized emissions for each Eagle Ford Shale county, for 2009 through 2015.
- Summarize VMT and totals for VOC, CO, NO_x, SO_2, NH_3, CO_2, PM_{10}, $PM_{2.5}$, benzene, ethanol, methyl tertiary butyl ether (MTBE), napthalene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein by county for each analysis year.

- Summarize human population for each analysis year and county.
- Graph vehicle activity, human population and emissions trends for key pollutants (VOC, CO, NO_x, SO_2, NH_3, CO_2, $PM_{2.5}$).

Emissions from all MOVES gasoline-fueled and diesel-fueled SUTs (vehicle categories) were estimated for each analysis year and county using a 24-hour aggregate methodology for the ozone season Weekday emissions and an annual aggregate methodology for the annual emissions. These aggregate methodologies were based on the hourly, virtual-link method developed by TTI to produce detailed emissions estimates for ozone modeling (generally for non-core counties, or those without travel demand models). The hourly, virtual-link method emissions estimates are county level, for each hour of the day, by vehicle type, at the HPMS roadway and area type combination (virtual link) level. This temporal (hourly) and spatial (virtual link) level of detail required for ozone modeling, however, was not needed for the emissions trends analyses, thus, the 24-hour and annual aggregate methods were used for this analysis. These aggregate methods have four main components: VMT mix, VMT, off-network activity, and emissions factors in terms of grams per activity.

The 24-hour, MOVES road type-level VMT mix estimates were developed in five year increments by TxDOT district. TxDOT vehicle classification count data and TxDOT vehicle registration data were used in combination with MOVES default gasoline/diesel fractions by year to estimate VMT mixes. (The reader is referred to the Trends study technical report (TTI, 2015) for a more detailed description of the technical aspects of the analysis.)

Eagle Ford Shale county base case (i.e., with Eagle Ford Shale development) VMT estimates consist of an historical year data set series (2009 through 2012) and a forecast year data set series (2013 through 2015). Historical year HPMS annual average daily traffic (AADT, i.e., Monday through Sunday, January through December) VMT estimates were taken from the TxDOT Roadway Inventory Functional Classification Record (RIFCREC) reports for each historical year. Forecast year AADT VMT estimates were developed using a bimodal forecast procedure, based on the linear regression of historical HPMS AADT VMT estimates and VMT per capita estimates with Texas State Data Center (TSDC) population projections.

For the hypothetical case (i.e., no Eagle Ford Shale development), VMT estimates were based on historical conditions prior to the most recent period of Eagle Ford Shale activity (i.e., before 2009). Hypothetical case VMT estimates consist of a forecast year data set series (2009 through 2015). As with the base case, forecast year AADT VMT estimates were developed using a bimodal forecast procedure, based on the linear regression of historical HPMS AADT VMT estimates and VMT per capita estimates with TSDC population projections. In other words, the hypothetical case VMT forecast is analogous to a forecast made before the most recent period of Eagle Ford Shale development. An adjustment was also made to compensate for the concomitant economic downturn (i.e., consistent 2009 VMT between scenarios).

In both cases, the full series of county total AADT VMT estimates are annualized or converted to summer Weekday using TxDOT district-level AADT factors based on TxDOT automatic traffic recorder (ATR) data. To maintain consistency with the other inputs required to estimate the emissions using the aggregate methods, county totals for all years were disaggregated by MOVES road type using county HPMS data.

DISCUSSION

The VMT trends for all counties show a difference between the historical and hypothetical scenarios. The magnitude of the impact varies between counties, as shown in the individual county graphs (Appendix A and Appendix B). The aggregate impact is shown in the composite graphs and associated tables provided for each scenario (Figures 1-4 and Table 2). For a few individual counties there are slight drops in VMT for the Eagle Ford scenarios (Appendix A, Appendix B, and Appendix C). This counter intuitive result is a function of the methodology, which compares a totally forecast VMT stream (the non-Eagle Ford scenario) with a composite VMT forecast stream (the Eagle Ford scenario). Forecasts are by their nature smooth, whereas historical data are not (individual year-to-year variation is captured). The counter intuitive drops in total VMT for the Eagle Ford scenario for these counties are the result of these historical perturbations, and make the aggregate change in VMT attributed to Eagle Ford Shale activity very conservative.

Regarding the interpretation of the individual parameters, population generally follows VMT, though the relationship changes between scenarios as expected. The difference between these two curves is the ratio of external/pass-through VMT to locally-generated VMT. (Direct interpretation of the area under the curves is not possible due to the difference scales for VMT and population.)

In general, CO_2 closely follows VMT. Declining trends in criteria pollutants (VOC, CO, and NO_x,) reflect emissions control regulations and technologies, as do declines in $PM_{2.5}$. VMT growth and the proportion of heavy-duty diesel vehicles for a given county will impact the magnitude of declines and/or differences. While these patterns are real and warrant comment and explanation, their absolute magnitude is exaggerated by the variable scale used to capture detail in the overall trends.

Similar effects can be seen for CO, especially in counties with high VMT growth during the period of implementation of emissions controls and reduction strategies. (See the technical note for the parent trends study for a full discussion of the details and assumptions used in the analyses.)

The overall impact of Eagle Ford Shale activity is clearly shown in the scenario composite graphs and associated data tables (Figures 1-4 and Table 2). While it is not possible to assign a confidence interval to these estimates since they are generated from secondary statistical data, it is clear that compared with historical activity data and emissions estimates based on that data, there is a regional VMT and emissions impact associated with the Eagle Ford Shale activity, though the increases vary in magnitude by individual county.

Table 2. Eagle Ford Shale VMT and Emissions (Tons) Summer Weekday Summary (All Counties, 2009-2015).

Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
Eagle Ford Shale	668,988,873	406.9	4,817.8	1,133.2	423,596.8	7.3	24.6	39.3
Non-Eagle Ford Shale	664,228,428	405.7	4,064.0	943.1	366,060.8	5.9	20.9	32.6
Difference	4,760,445	1.2	753.8	190.1	57,536.0	1.4	3.8	6.7

Individual county data graphs and data tables are provided for reference as appendices (Appendix A, Appendix B, and Appendix C) as is the proforma Quality Assurance statement in Appendix D.

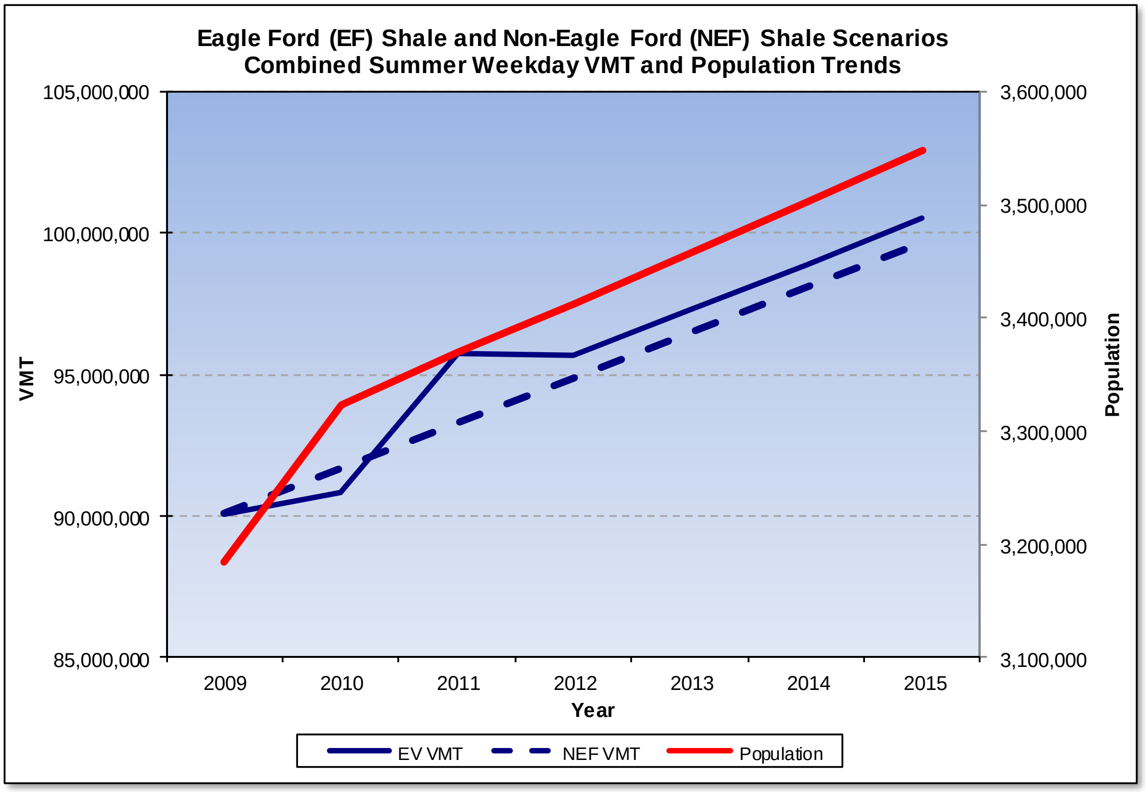

Figure 1. Combined Summer Weekday VMT and Population Trends.

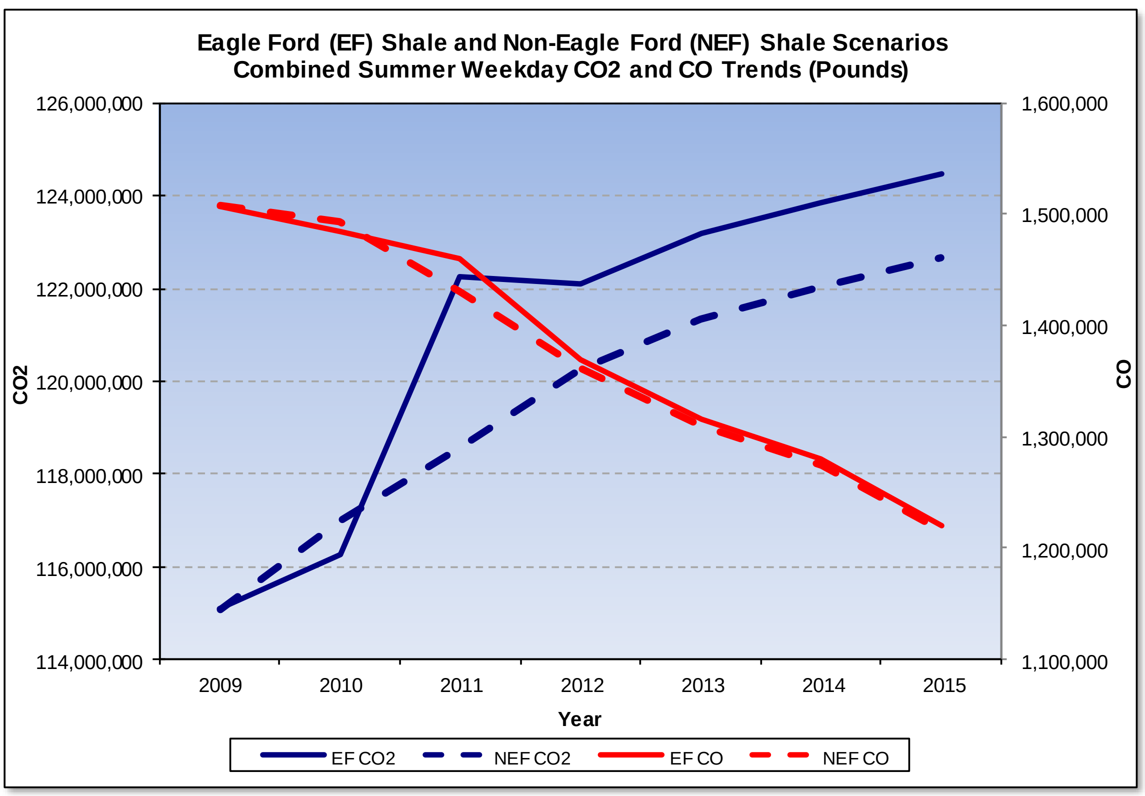

Figure 2. Combined Summer Weekday CO_2 and CO Trends.

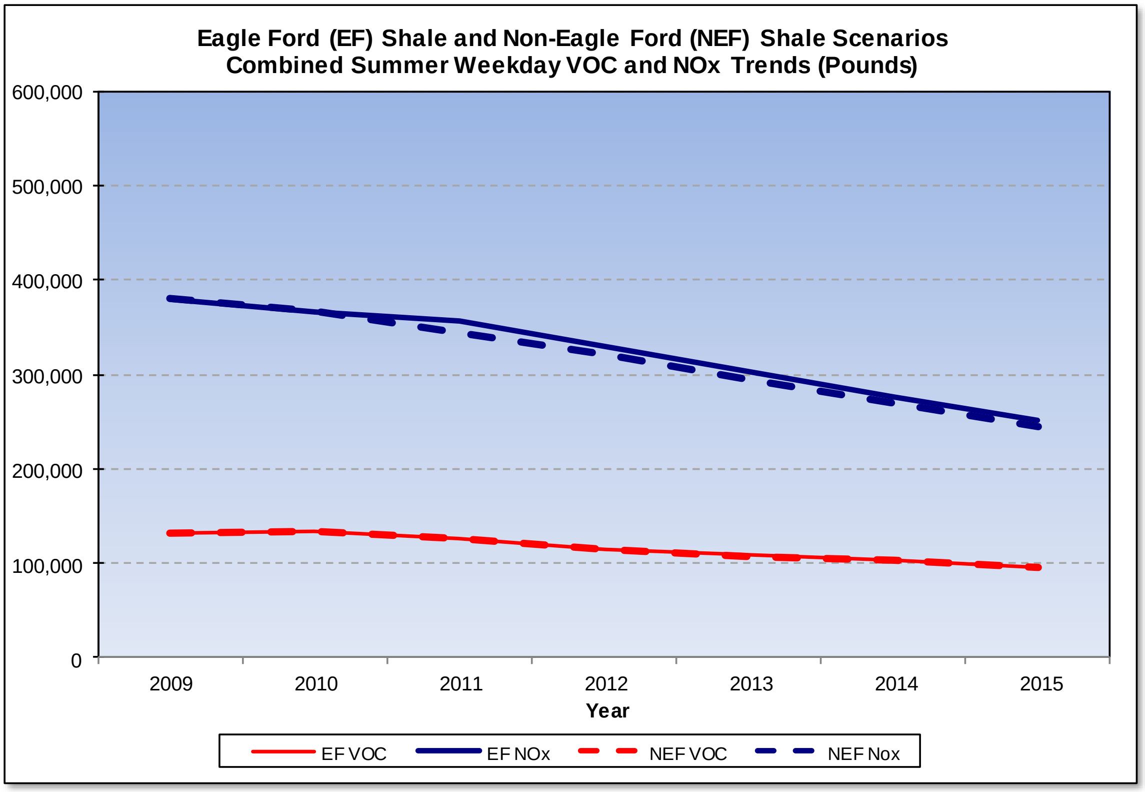

Figure 3. Combined Summer Weekday VOC and NO_x Trends.

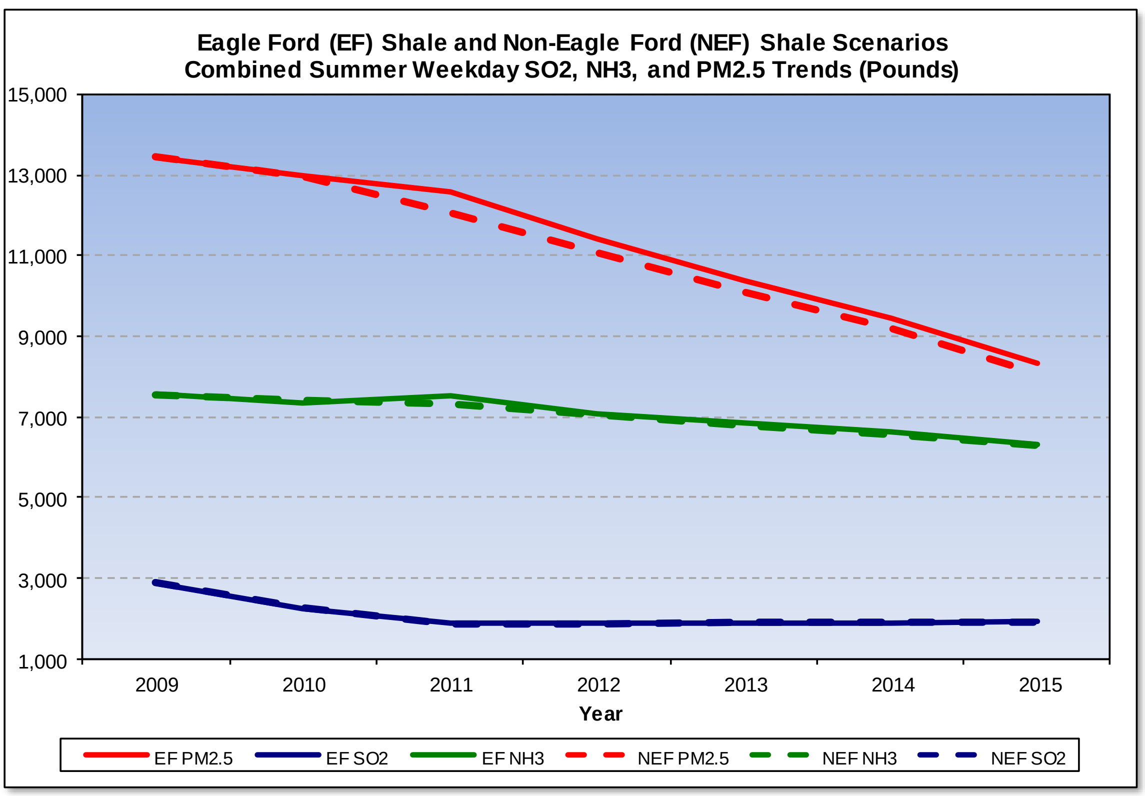

Figure 4. Combined Summer Weekday SO_2, NH_3, and $PM_{2.5}$ Trends.

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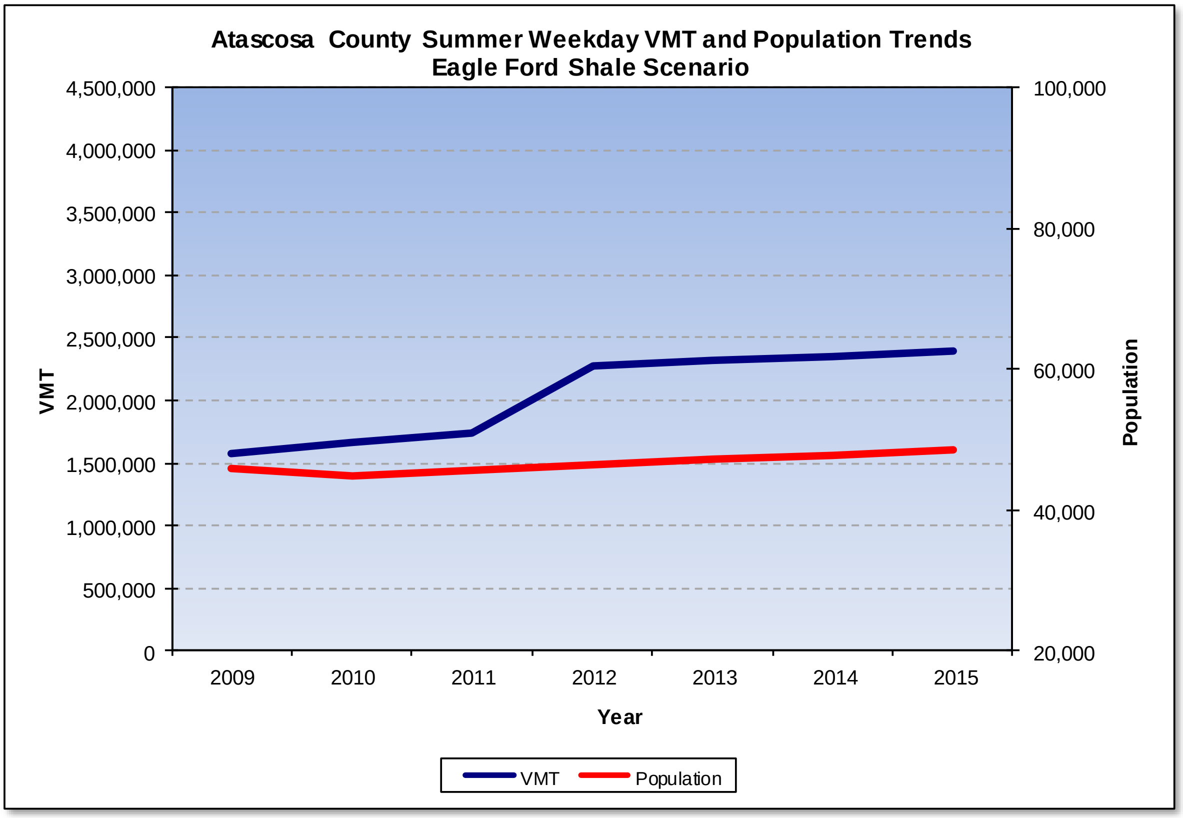
APPENDIX A:
EAGLE FORD SHALE SCENARIO PLOTS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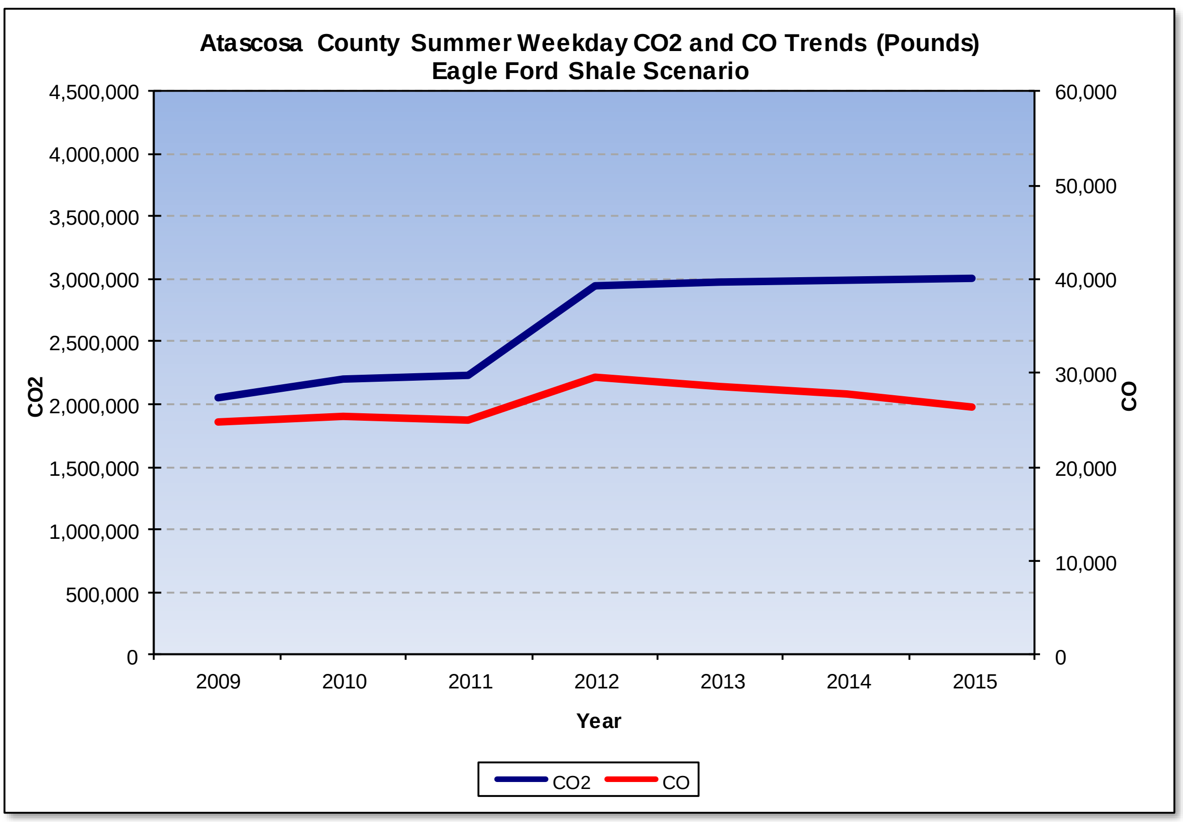
Year
VMT
Population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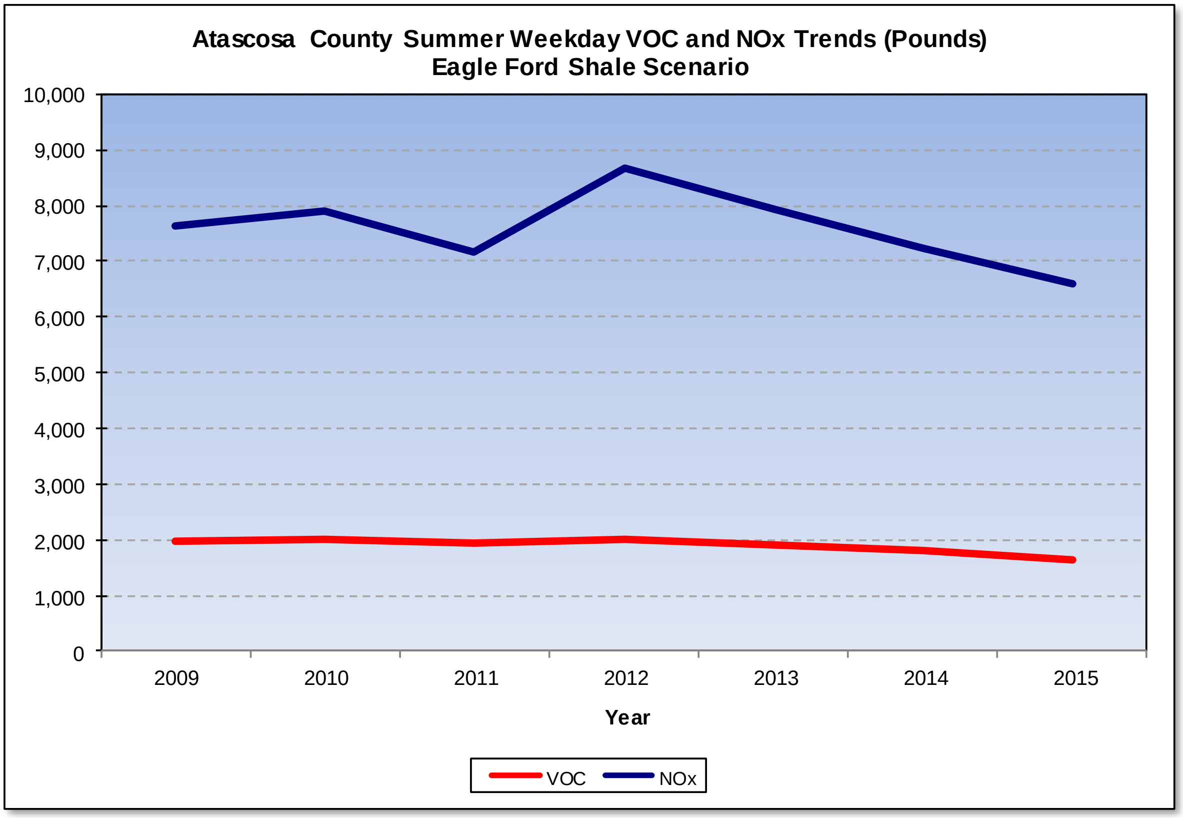
Year
CO2
CO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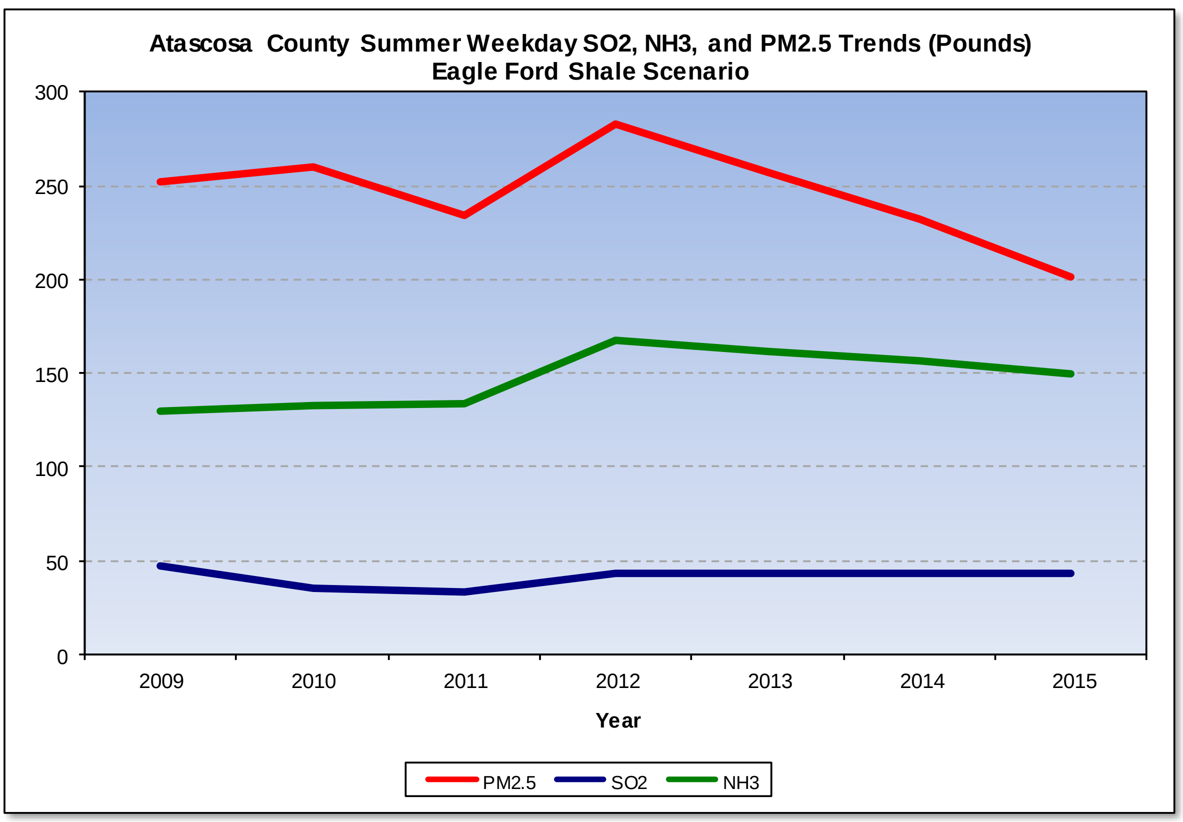
NOx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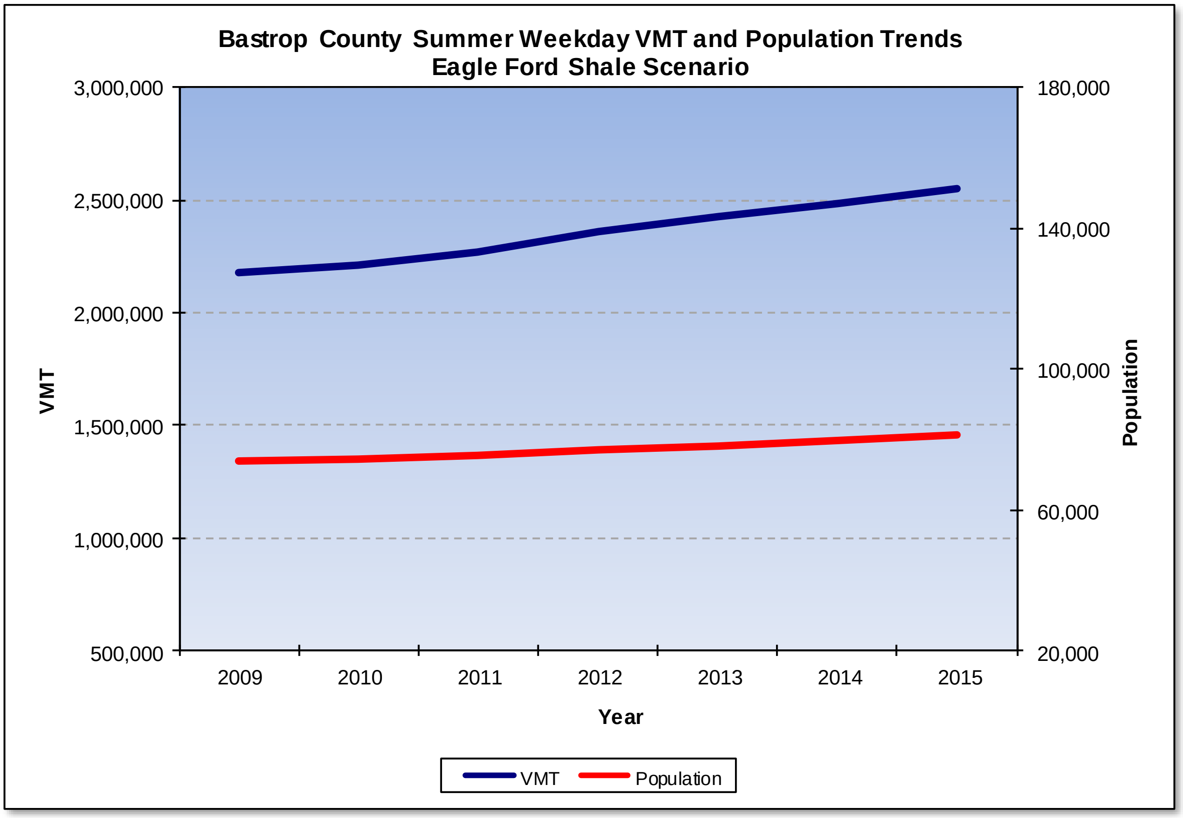
2014
2015
Year
PM2.5
SO2
NH3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2014
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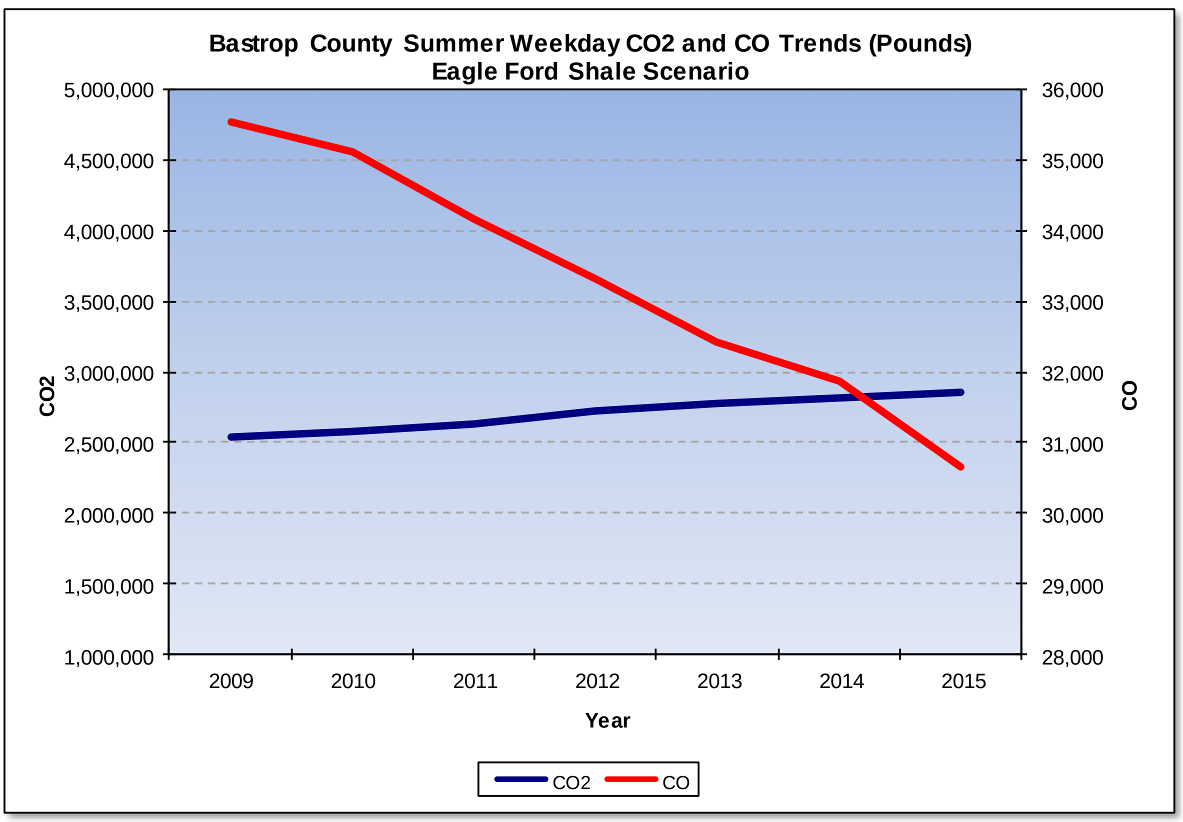
VMT
Population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CO
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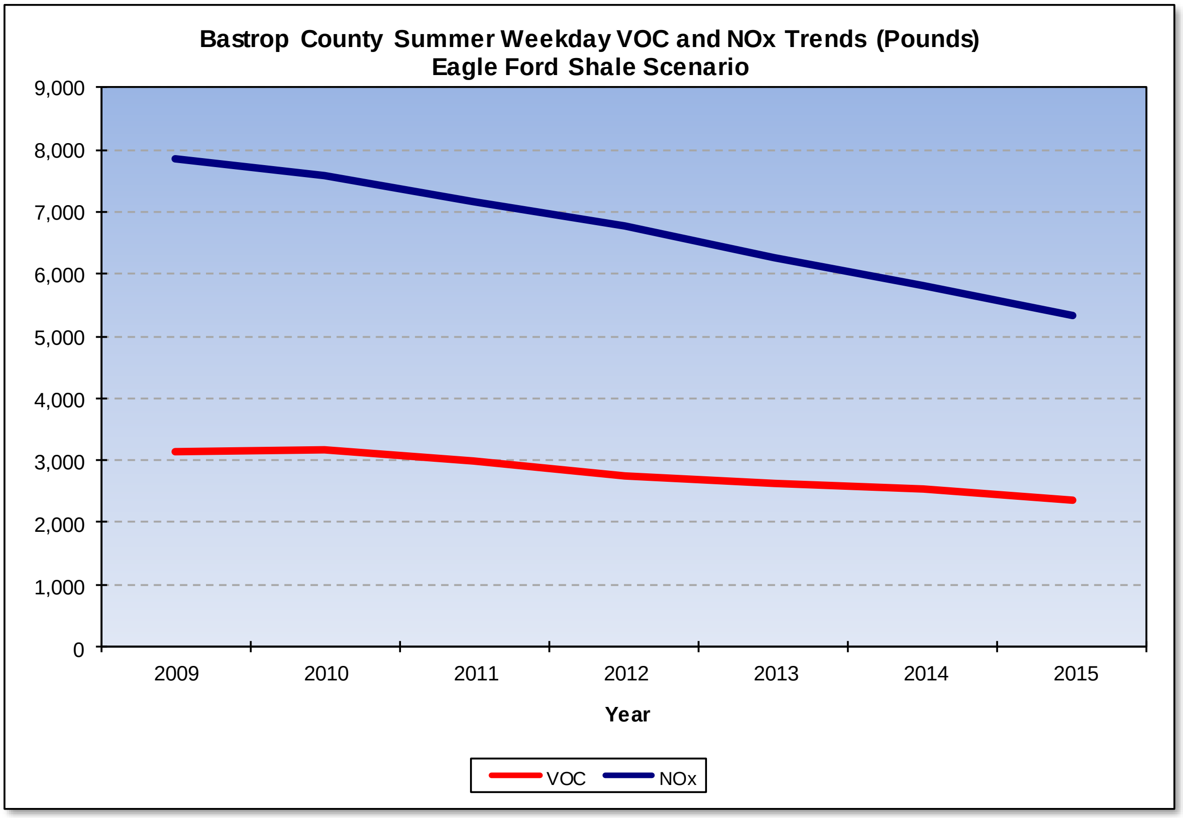
CO2
CO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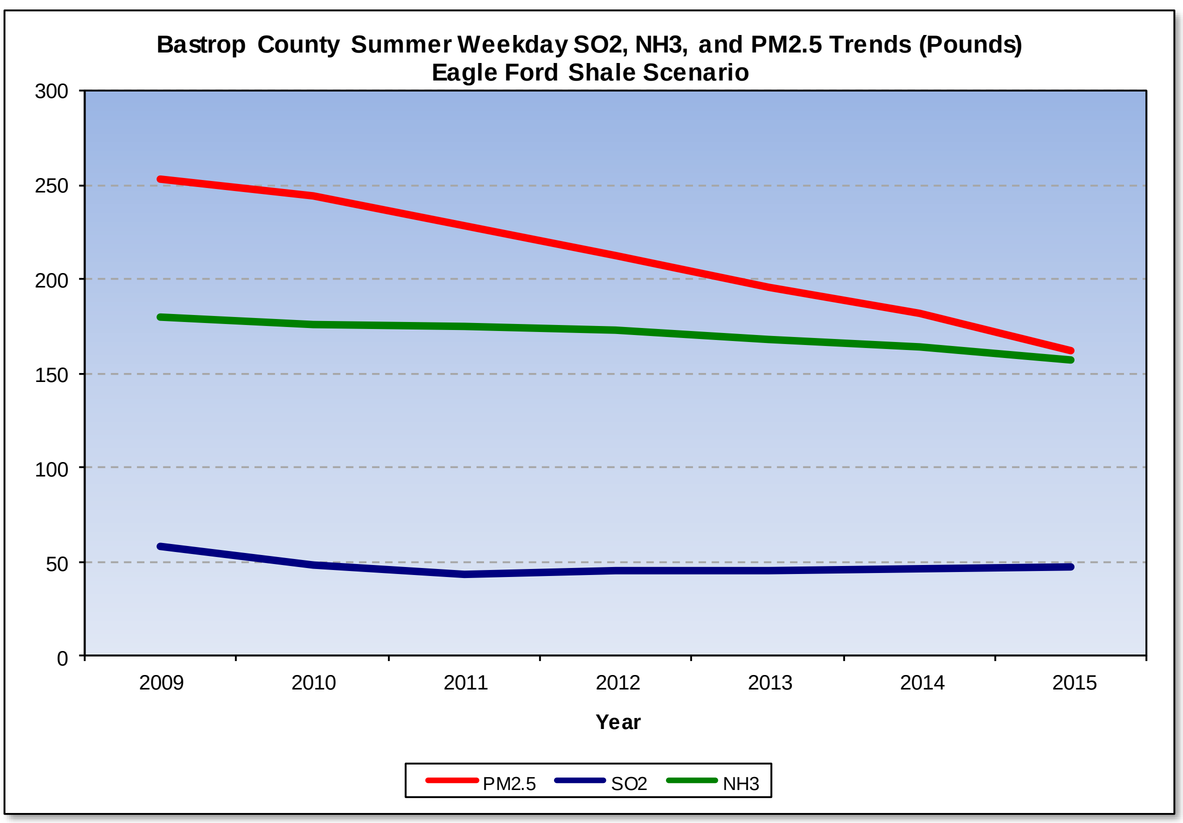
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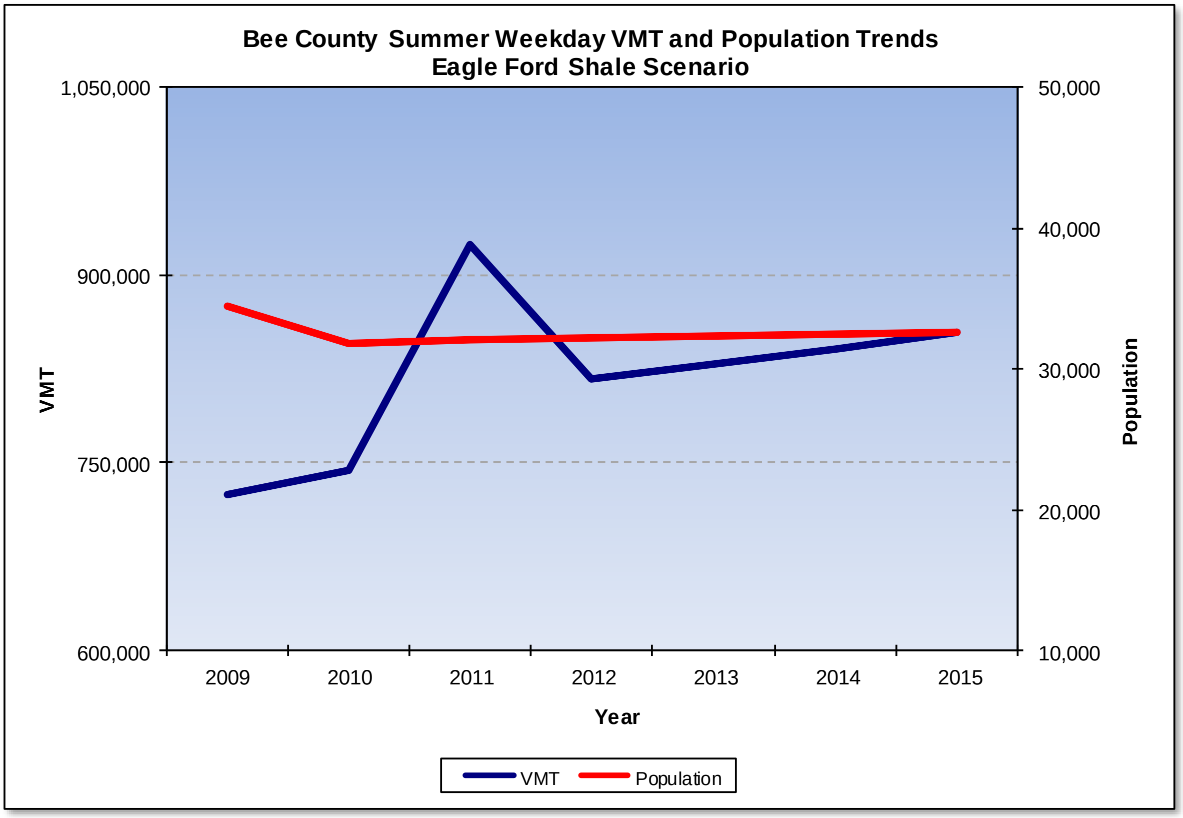
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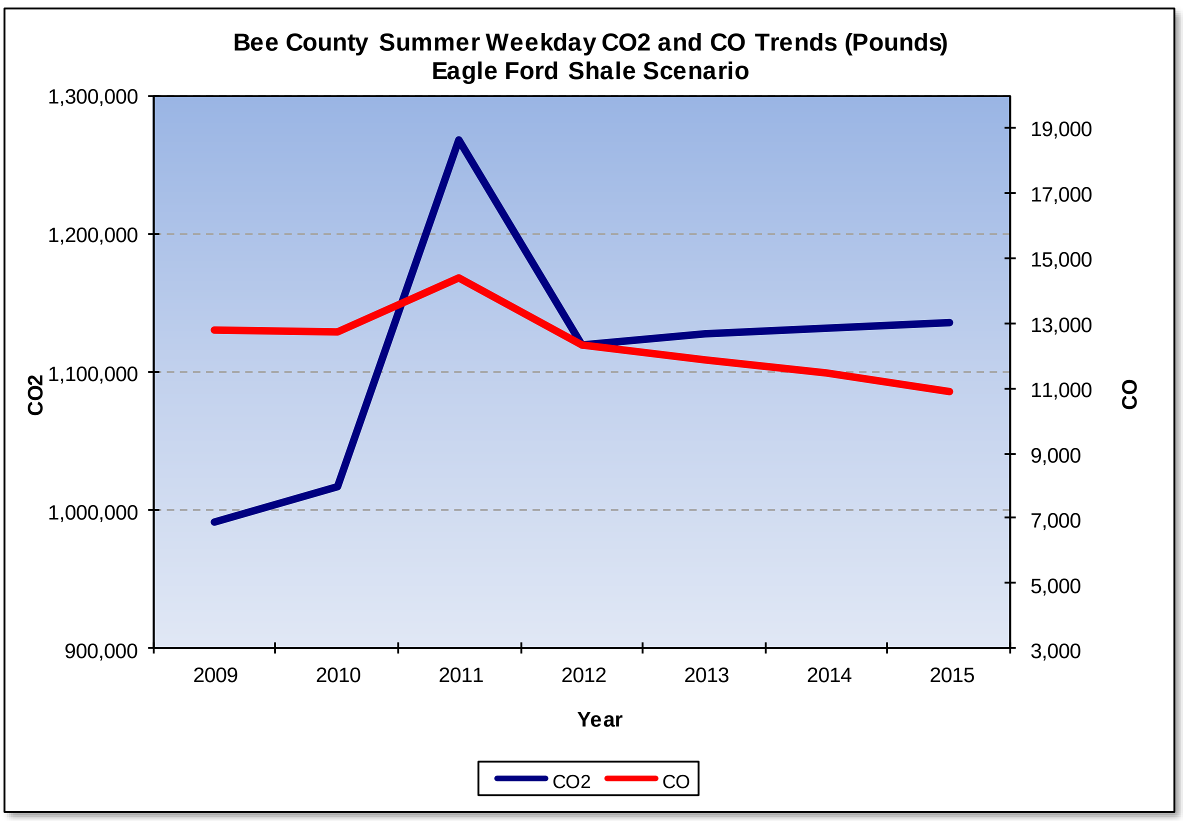
VMT
Population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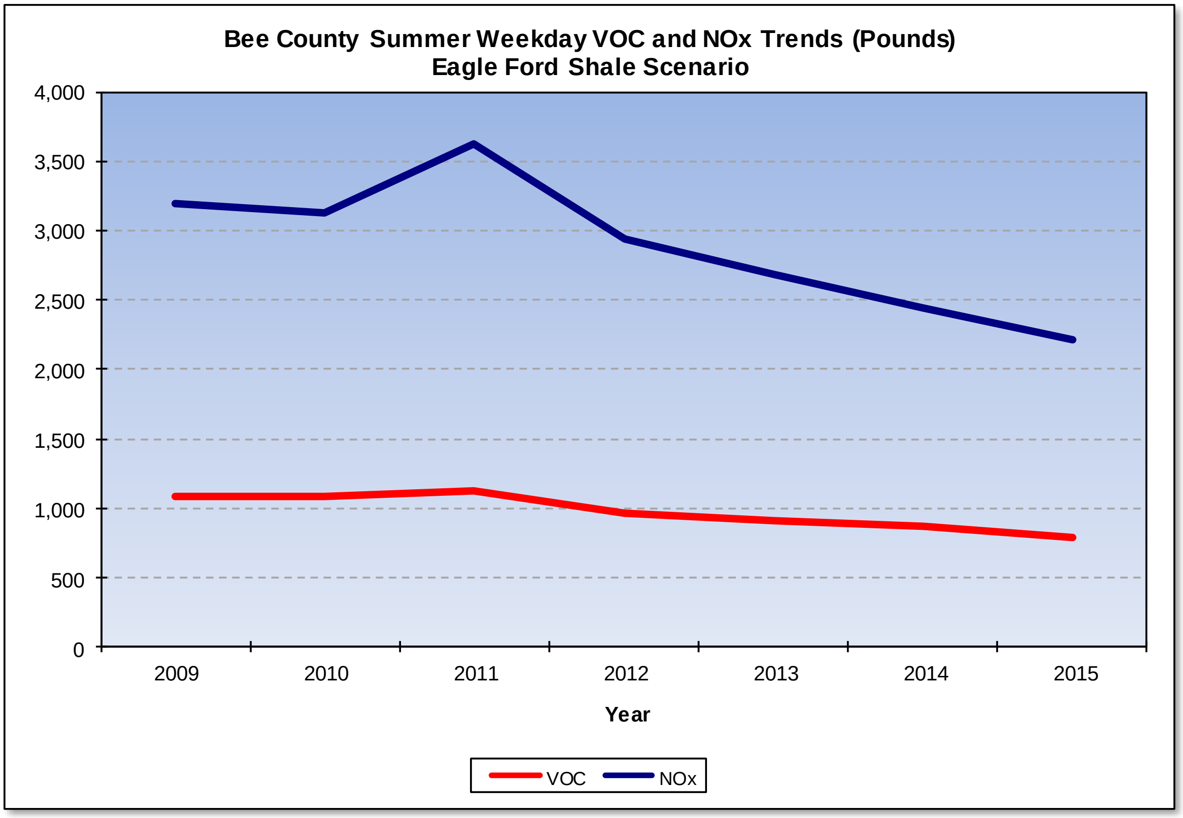
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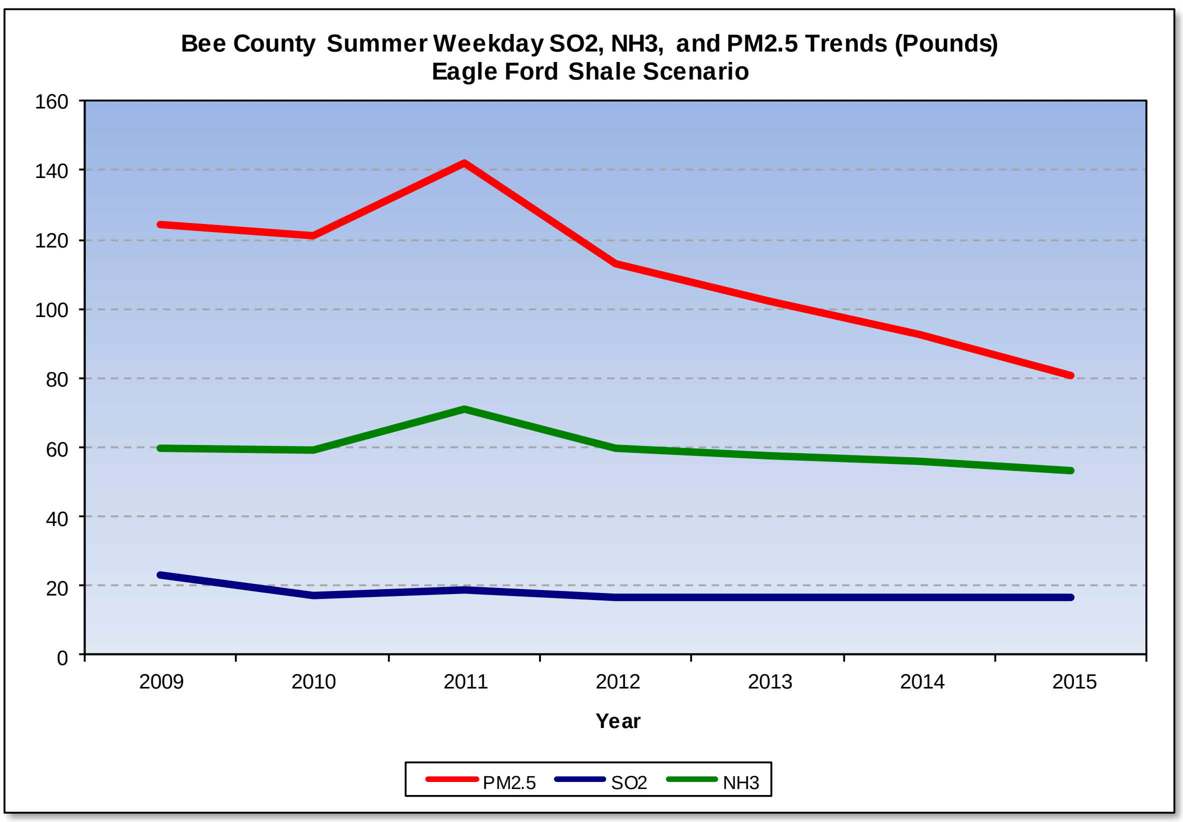
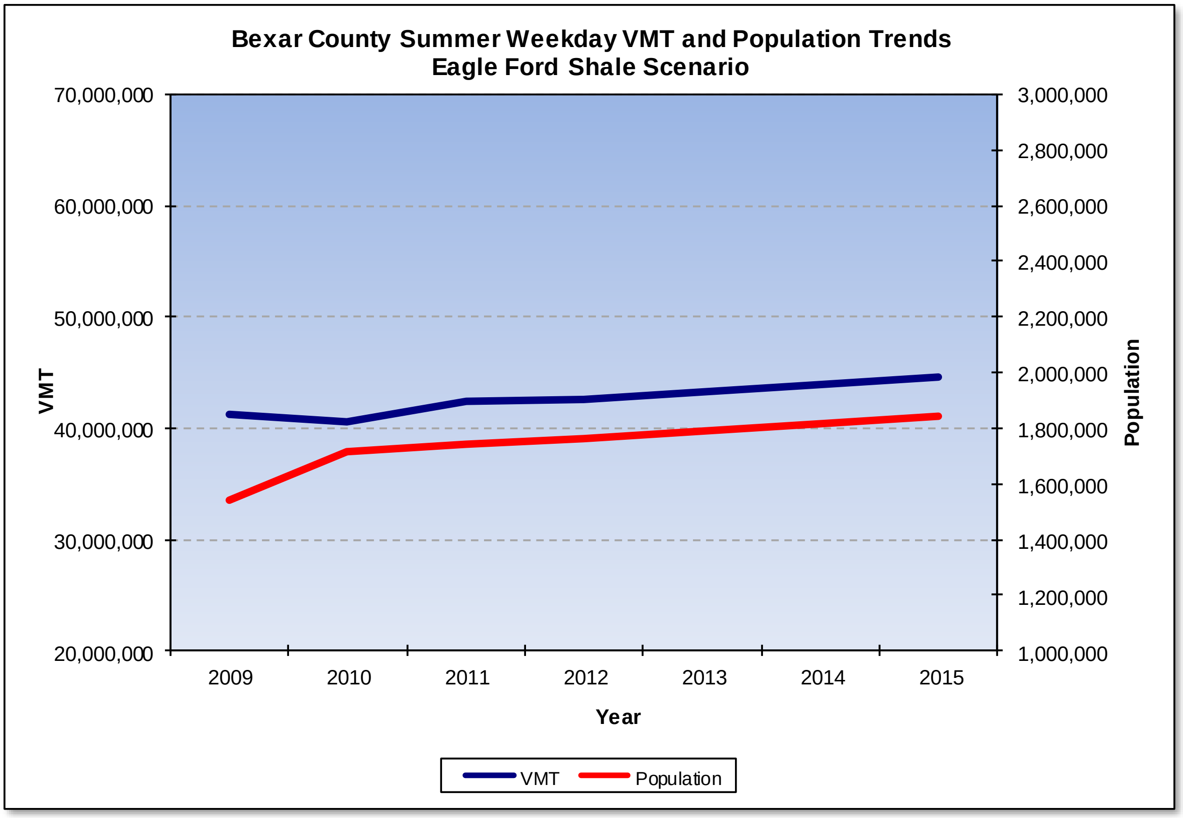
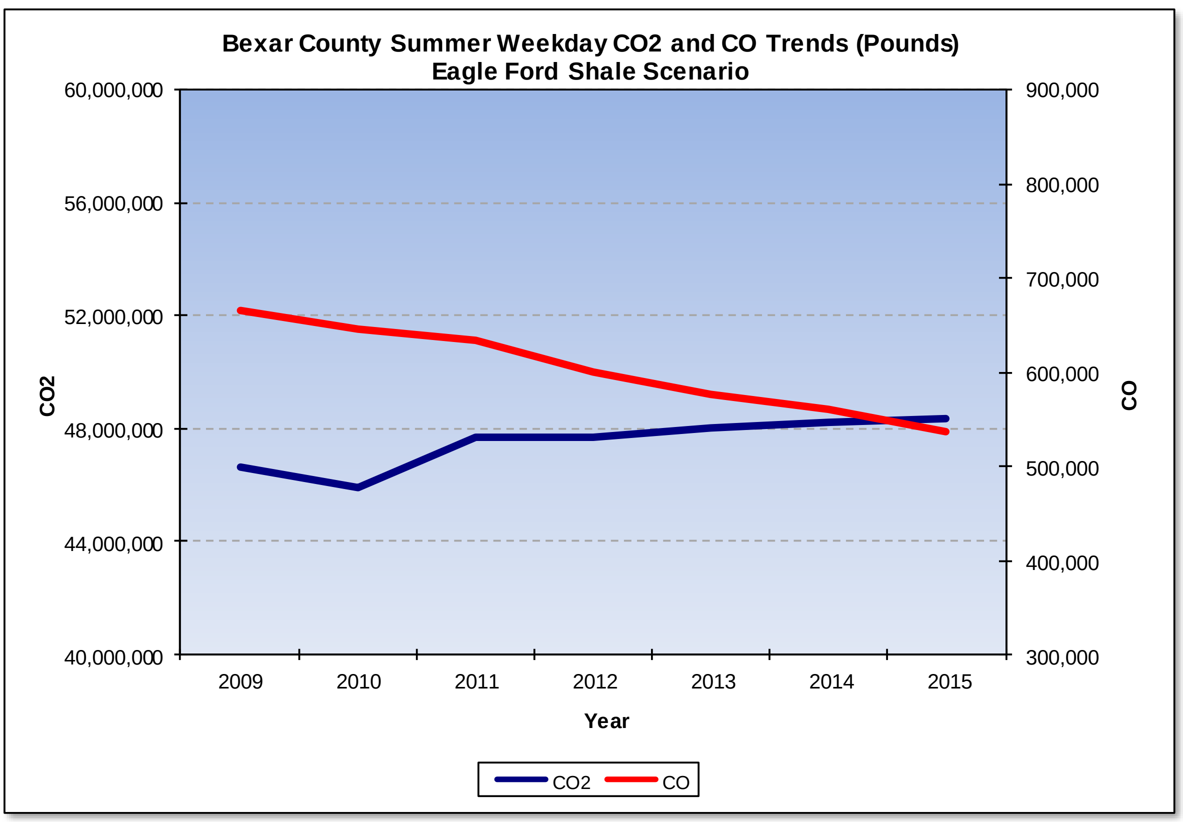
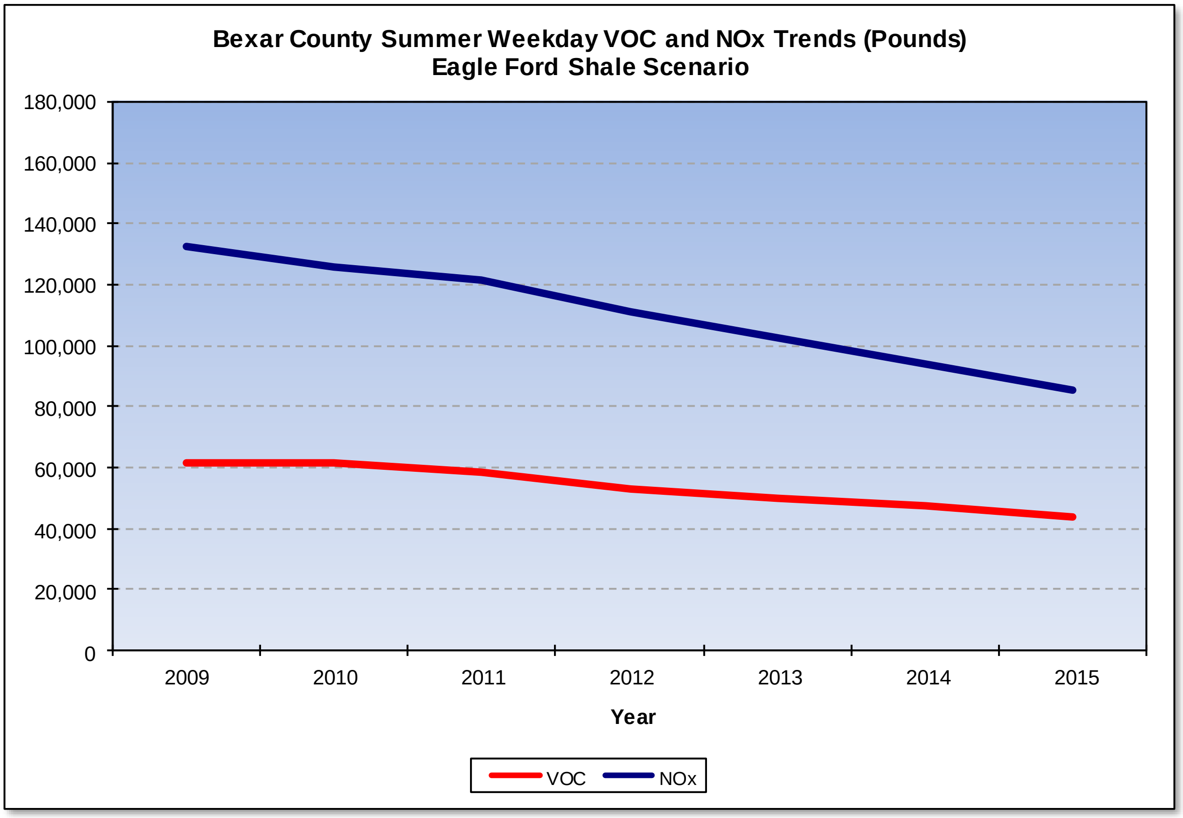
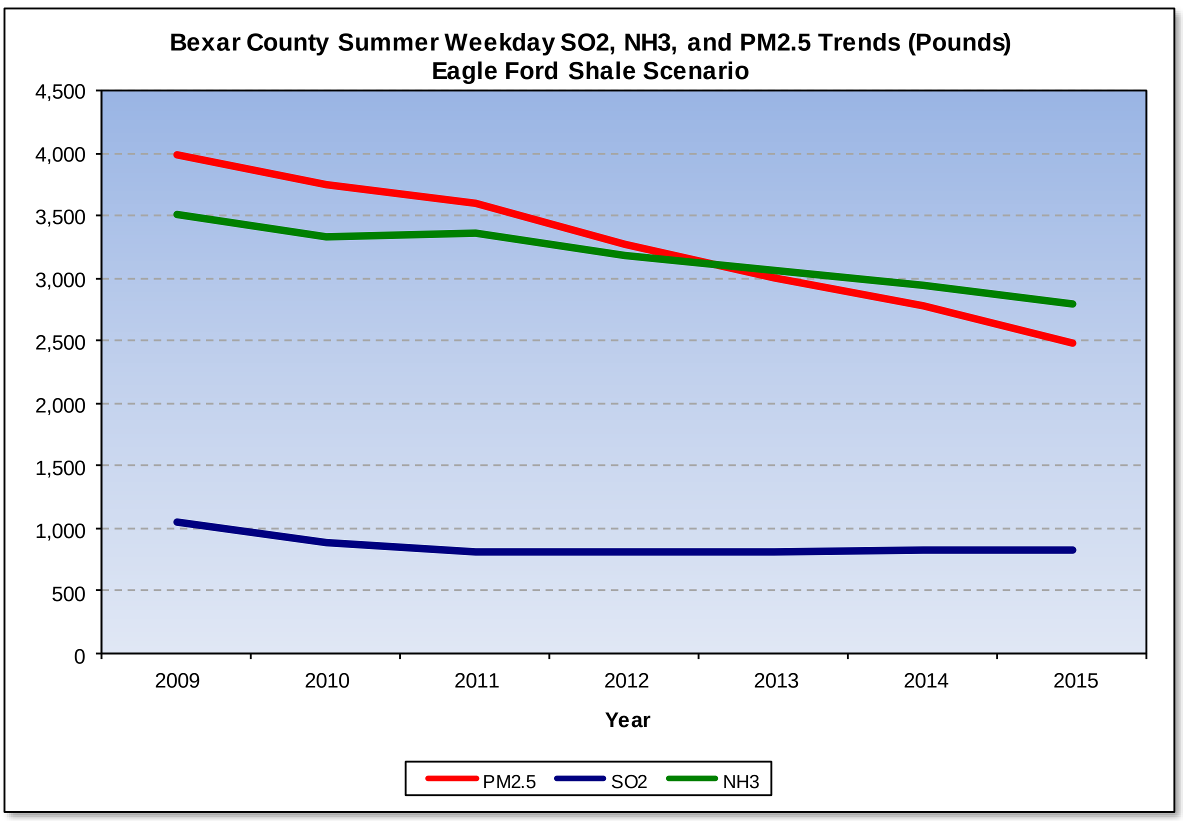
Year
VOC
NOx

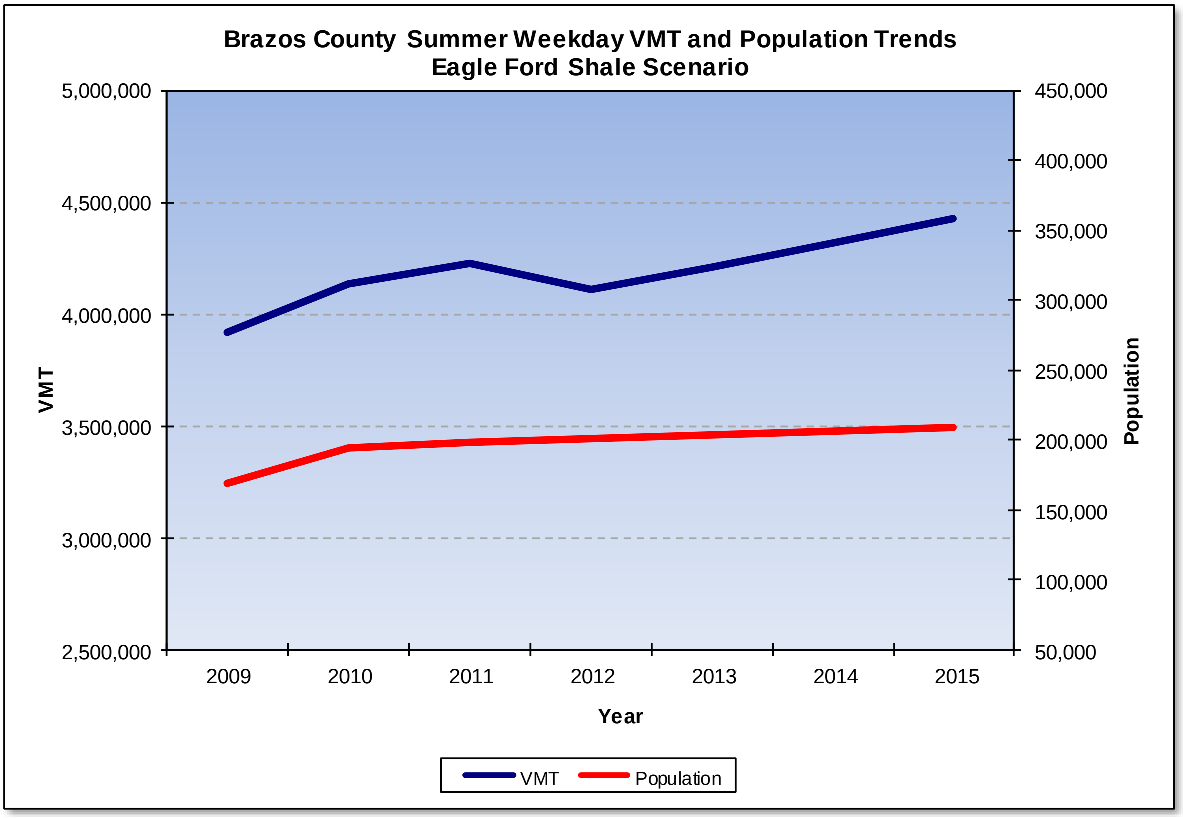

Bee County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

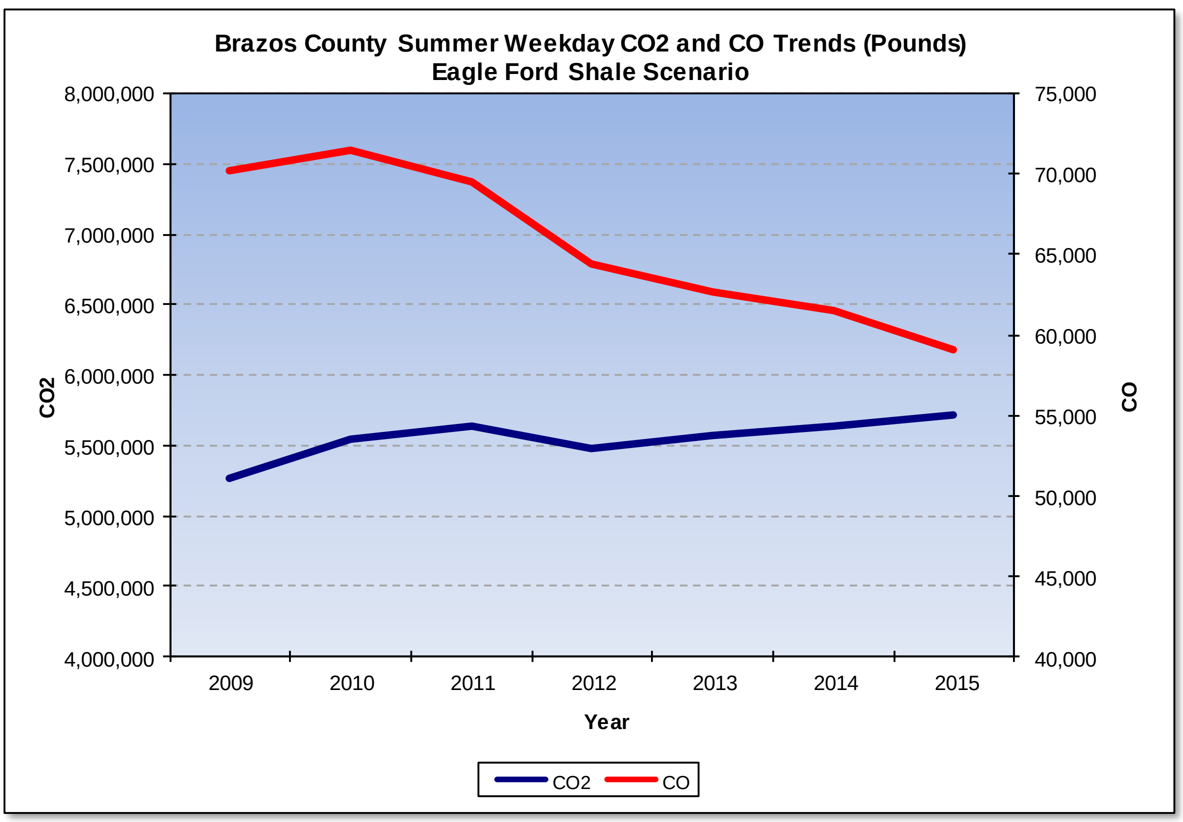

Bexar County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
70,000,000
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
VMT
3,000,000
2,800,000
2,600,000
2,400,000
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

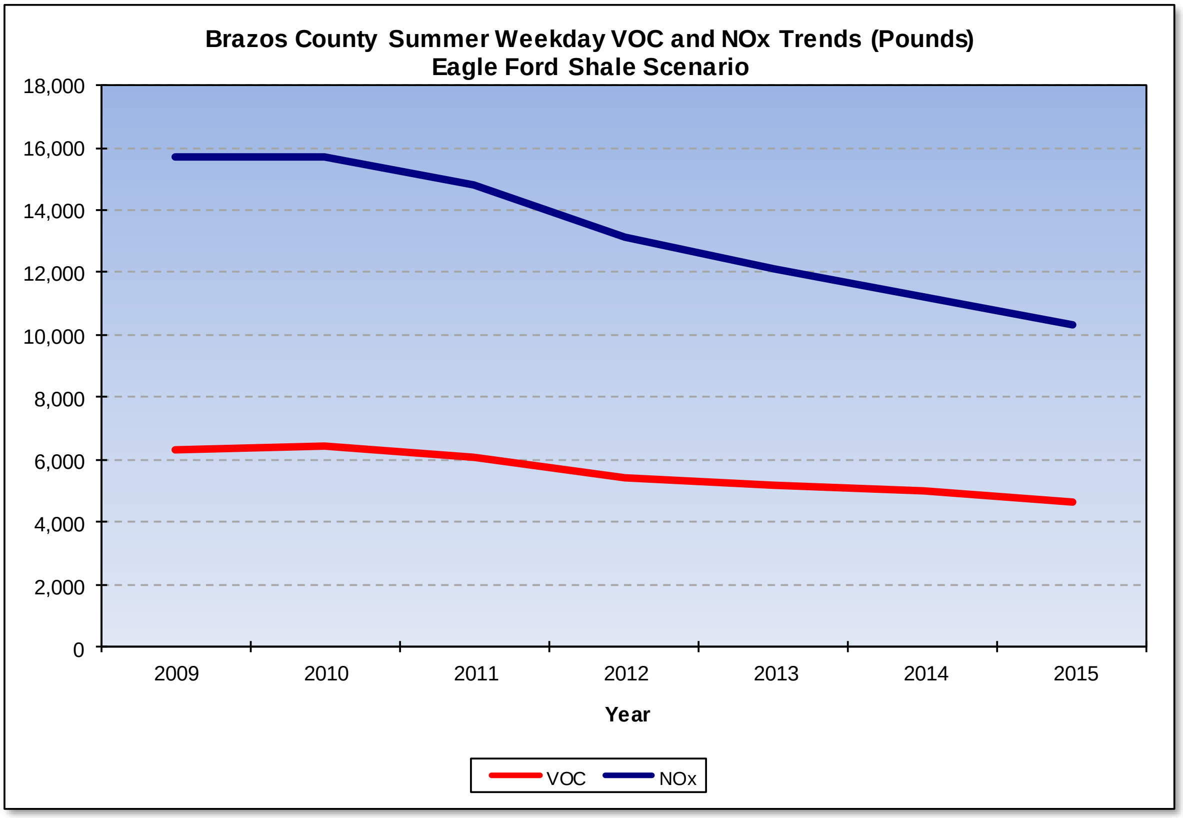

Bexar County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
60,000,000
56,000,000
52,000,000
48,000,000
44,000,000
40,000,000
CO2
900,000
800,000
700,000
600,000
500,000
400,000
300,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

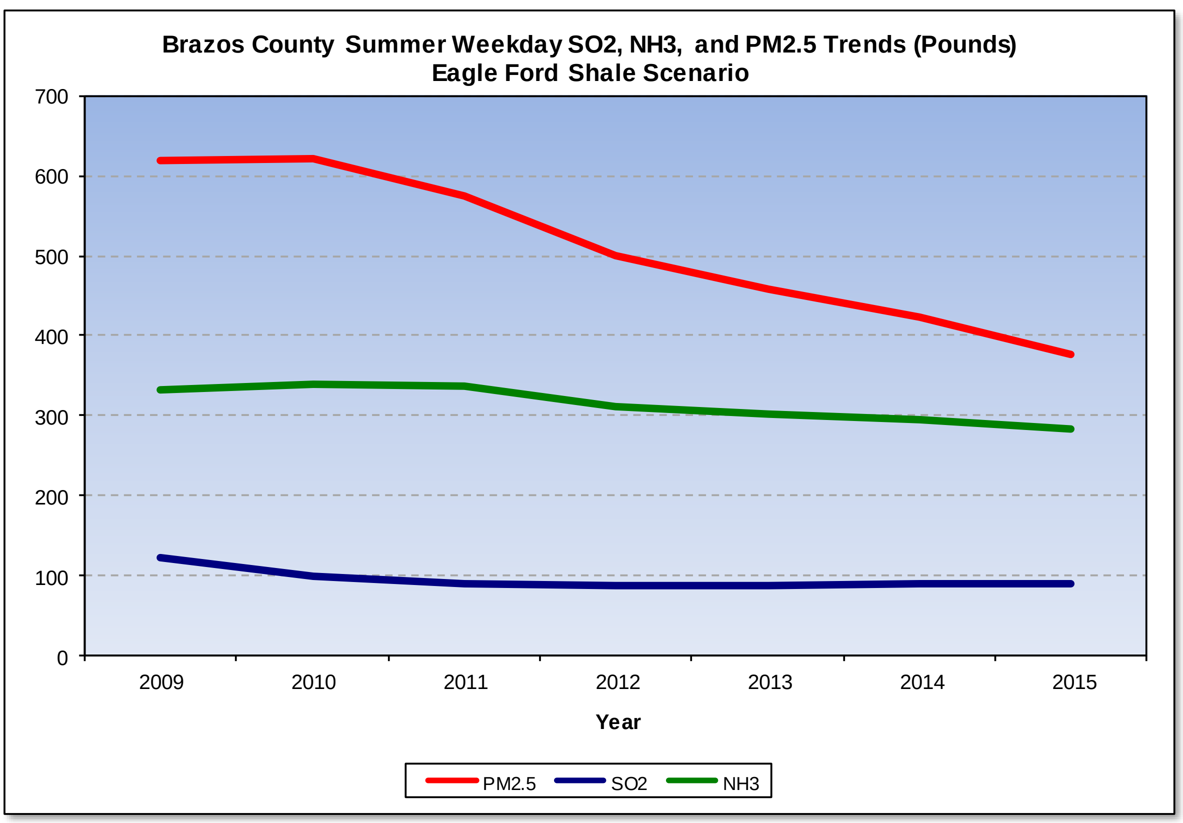

Bexar County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

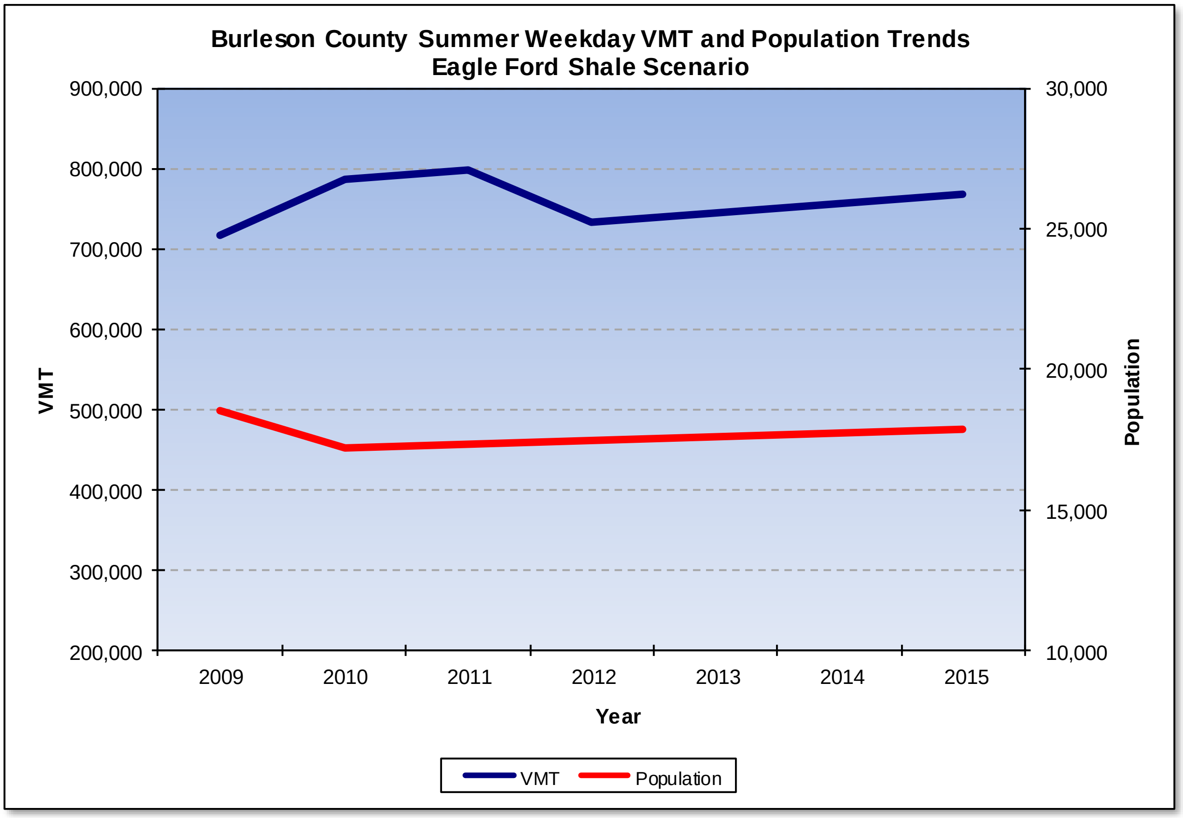

Bexar County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

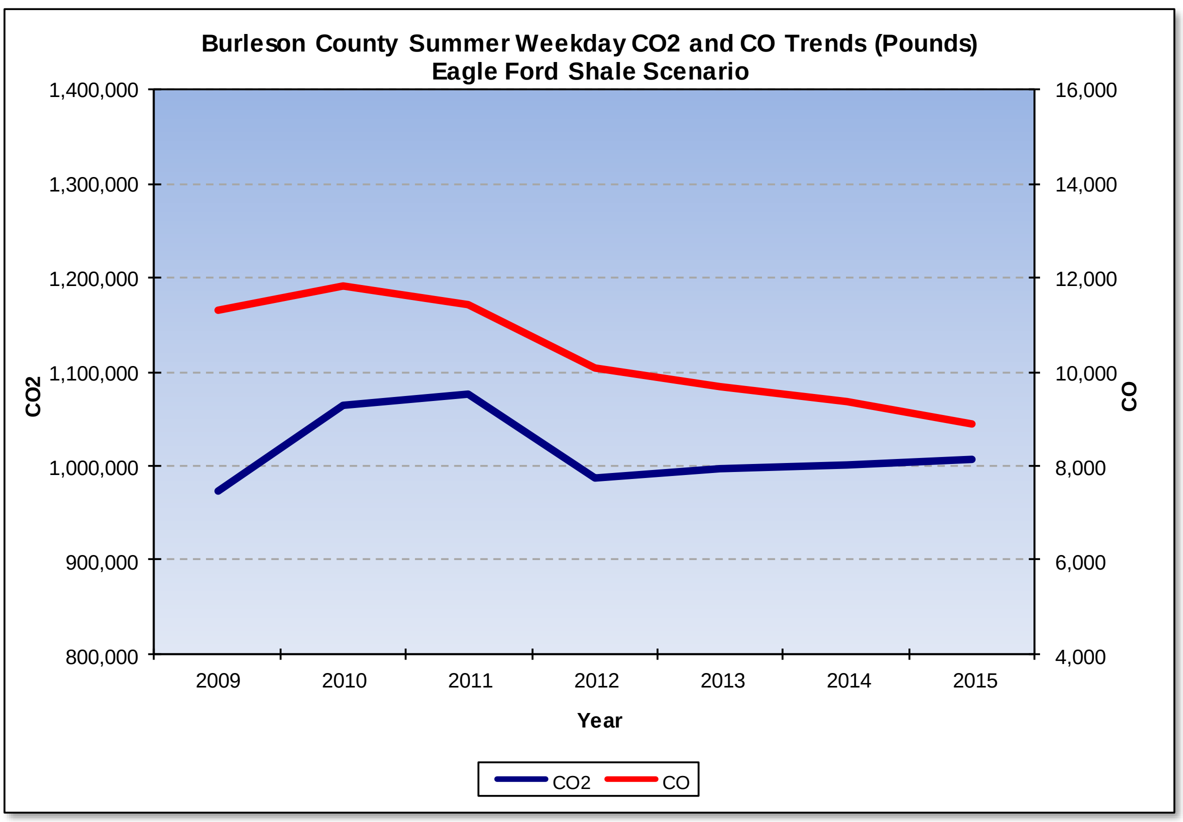

Brazos County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
Population
Year
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
2009
2010
2011
2012
2013
2014
2015
VMT
Population

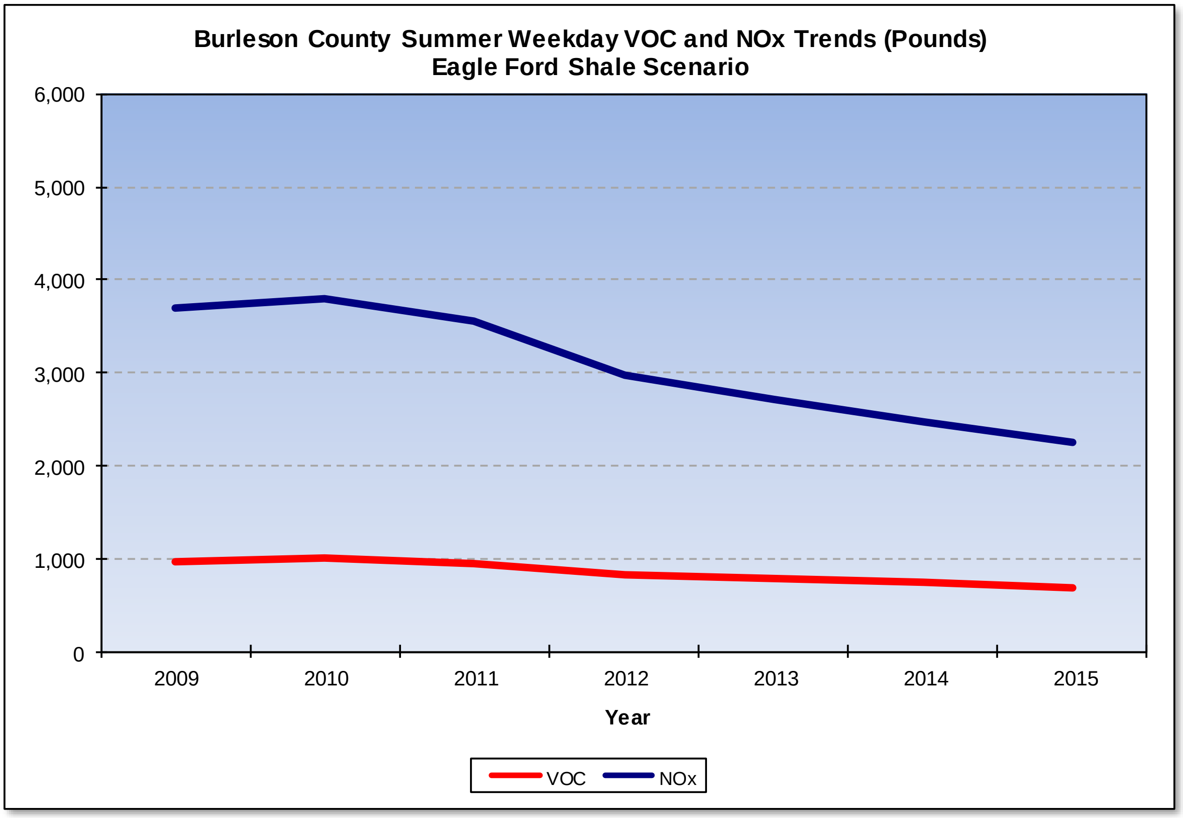

Brazos County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
CO
Year
8,000,000
7,500,000
7,000,000
6,500,000
6,000,000
5,500,000
5,000,000
4,500,000
4,000,000
75,000
70,000
65,000
60,000
55,000
50,000
45,000
40,000
2009
2010
2011
2012
2013
2014
2015
CO2
CO

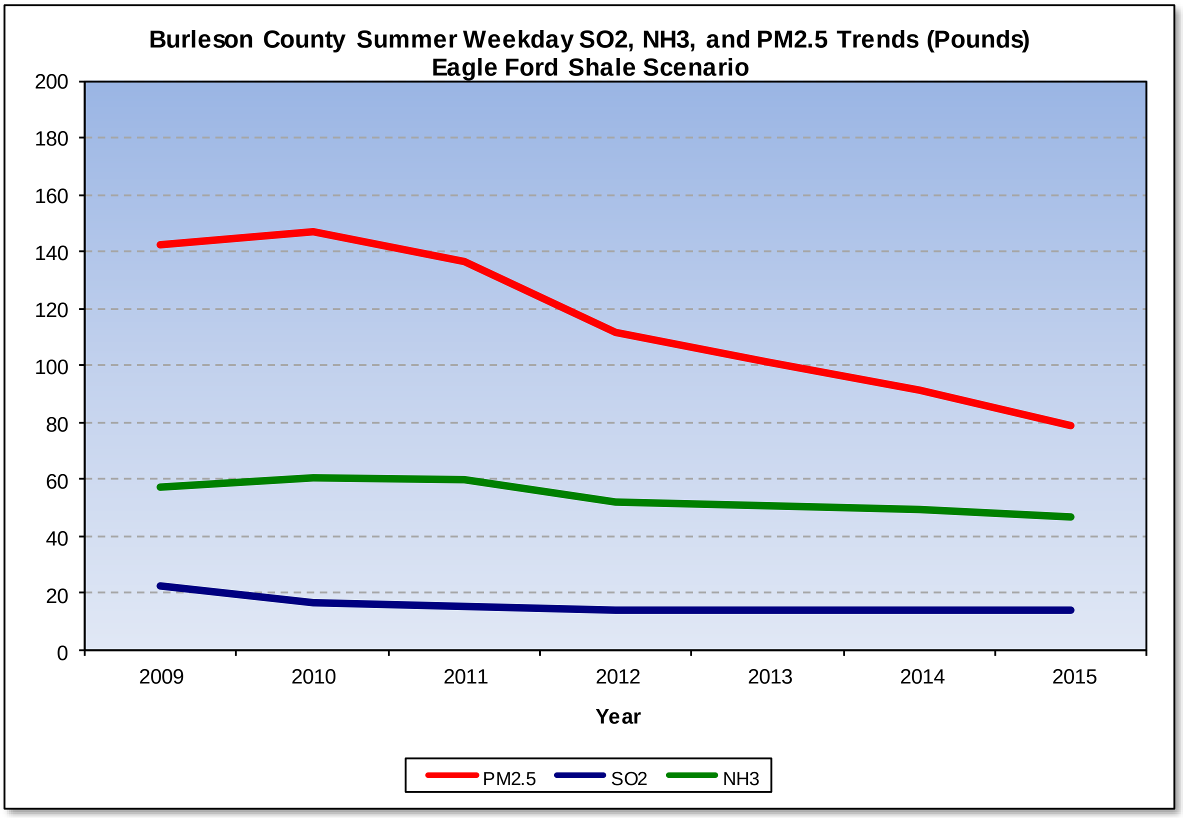

Brazos County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

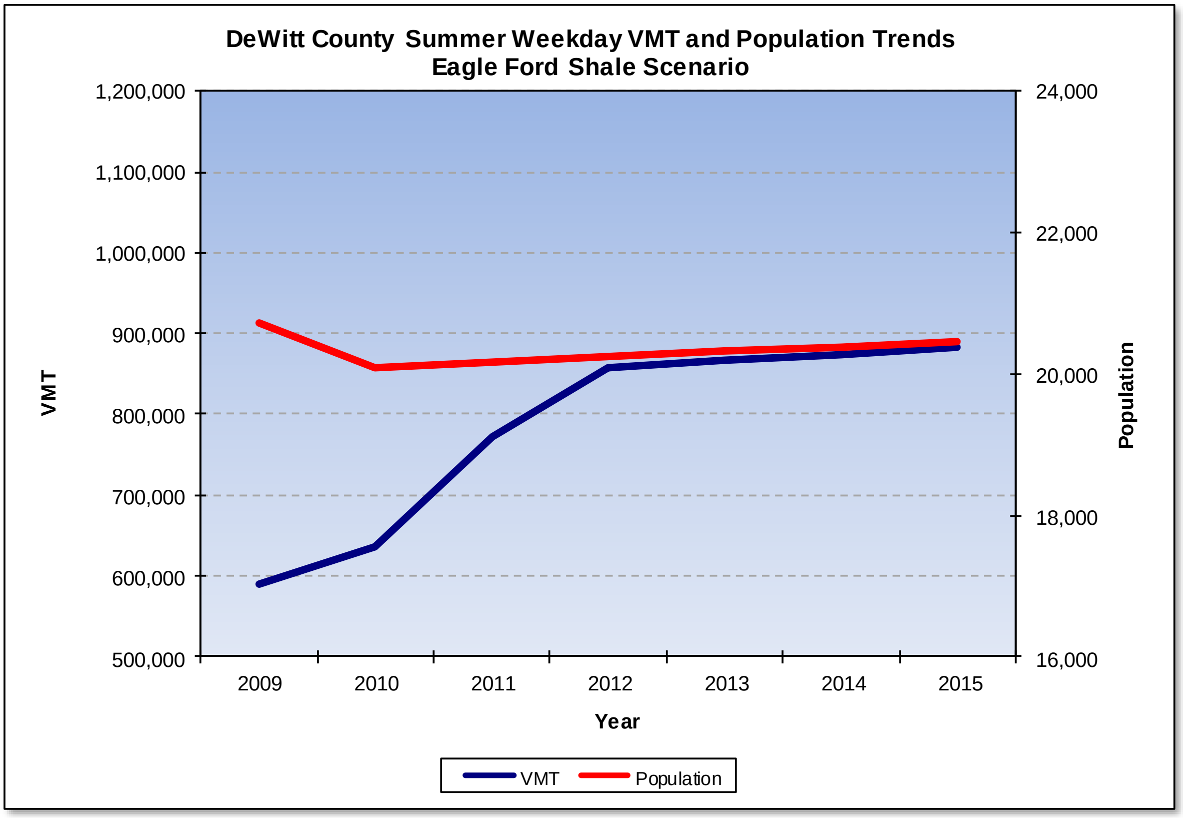

Brazos County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
700
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

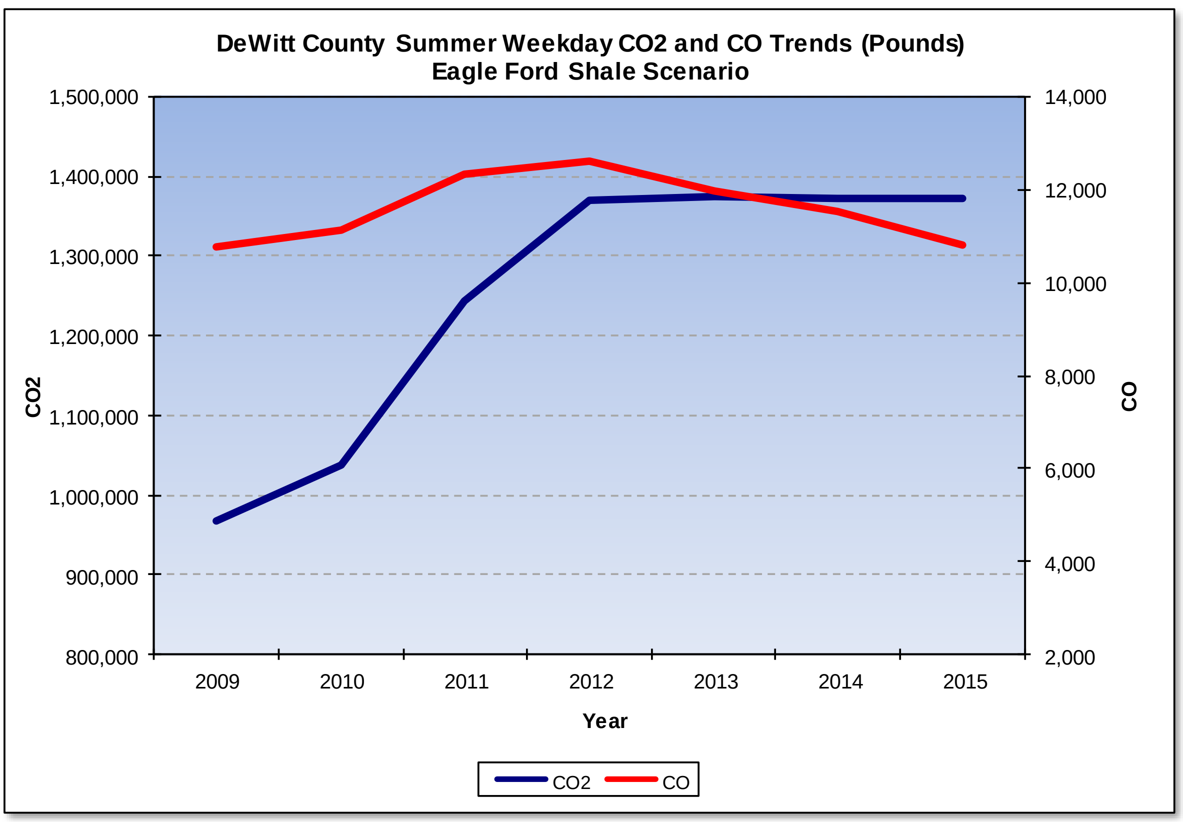

Burleson County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
VMT
30,000
25,000
20,000
15,000
10,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

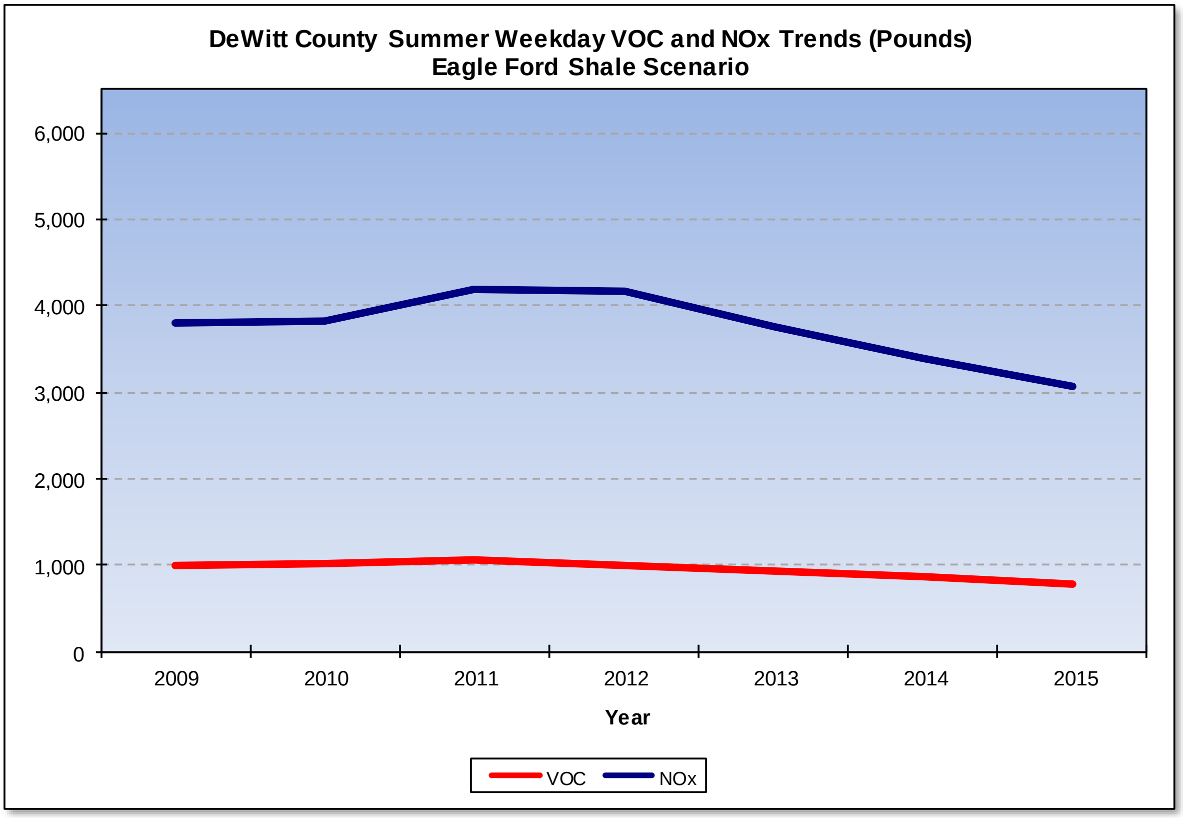

Burleson County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
CO2
16,000
14,000
12,000
10,000
8,000
6,000
4,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

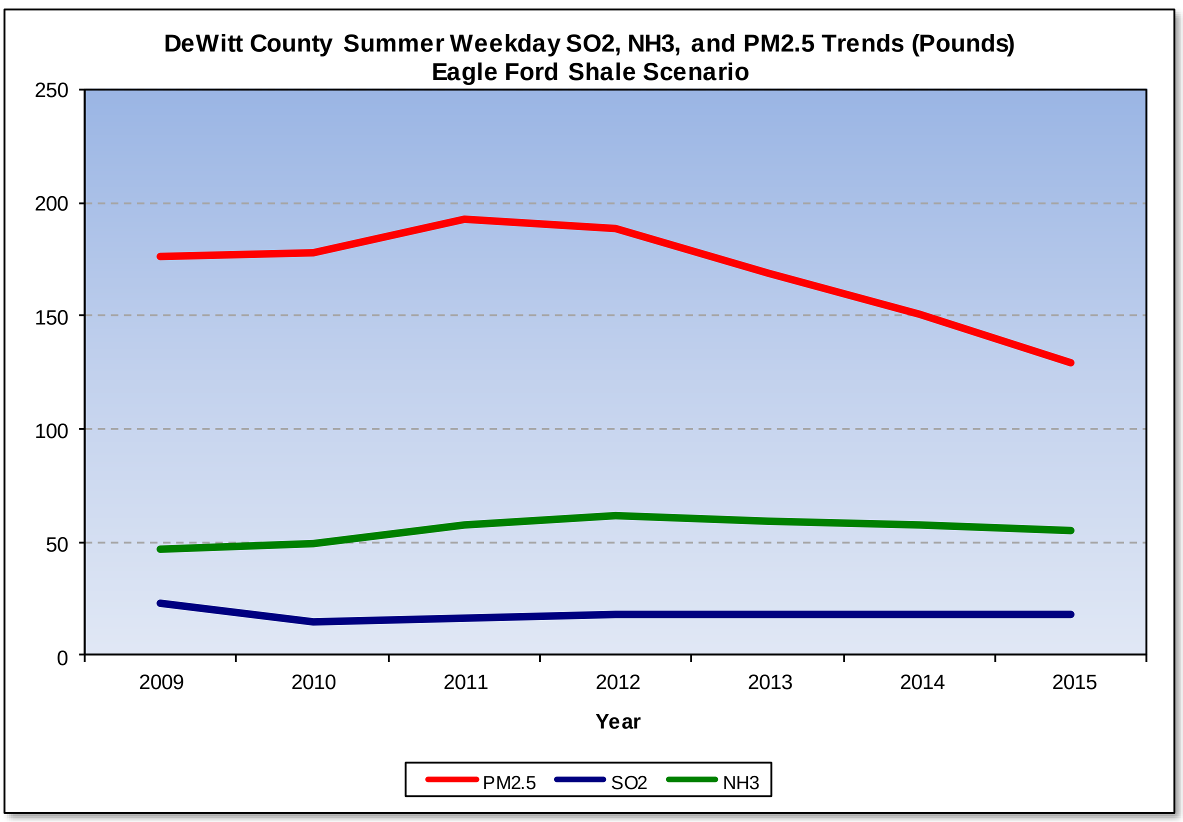

Burleson County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

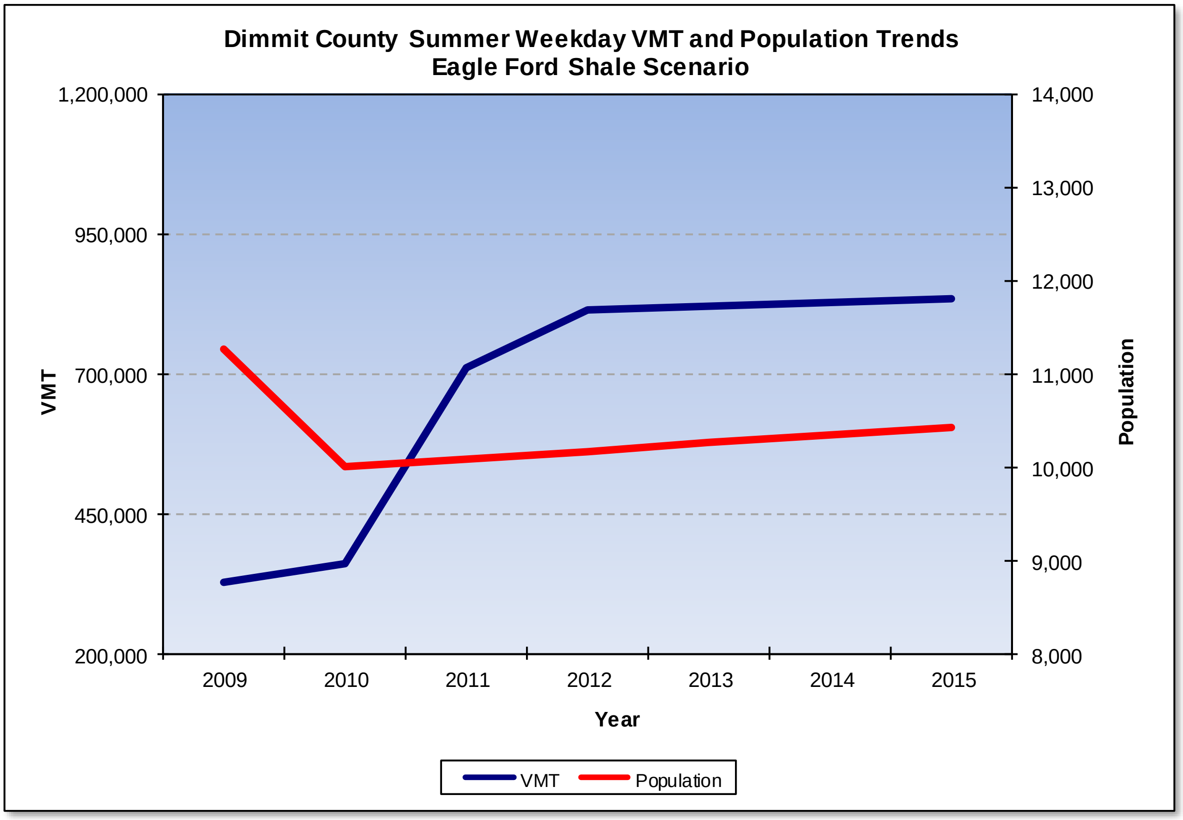

Burleson County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
200
180
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

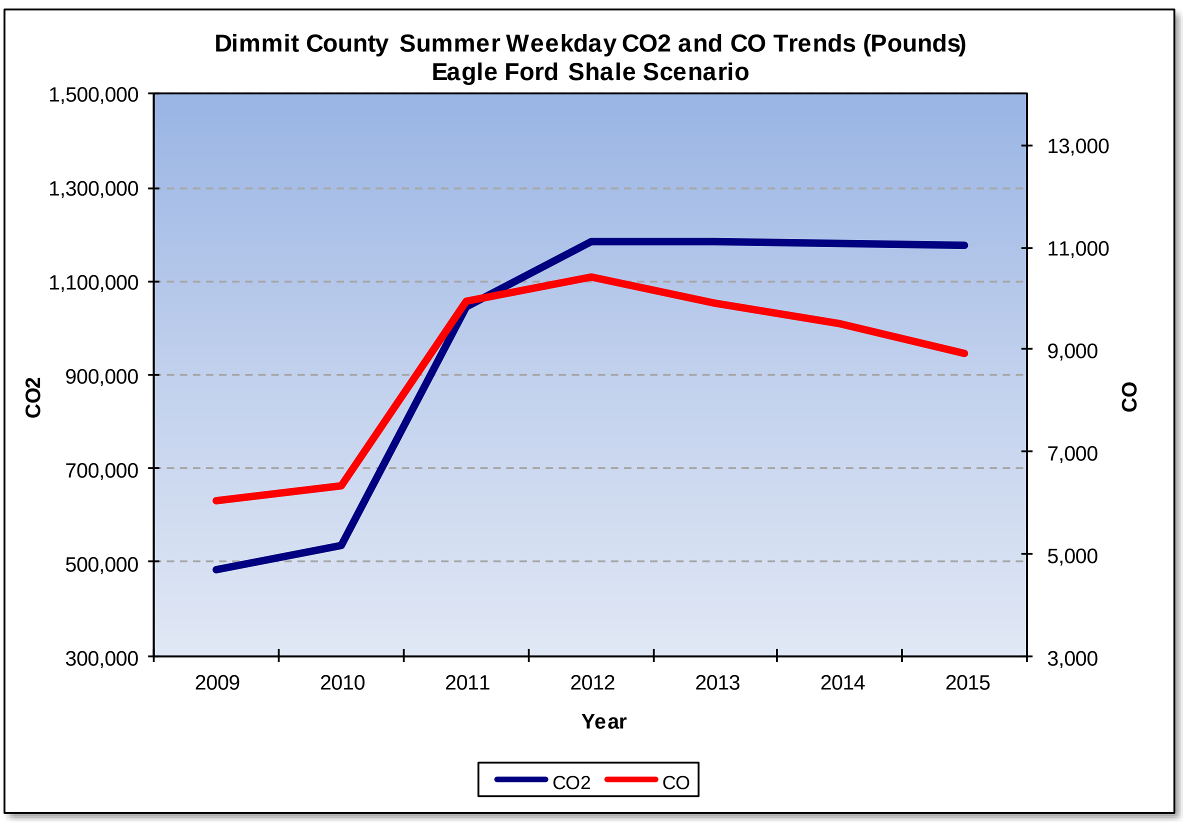

DeWitt County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
Population
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
24,000
22,000
20,000
18,000
16,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

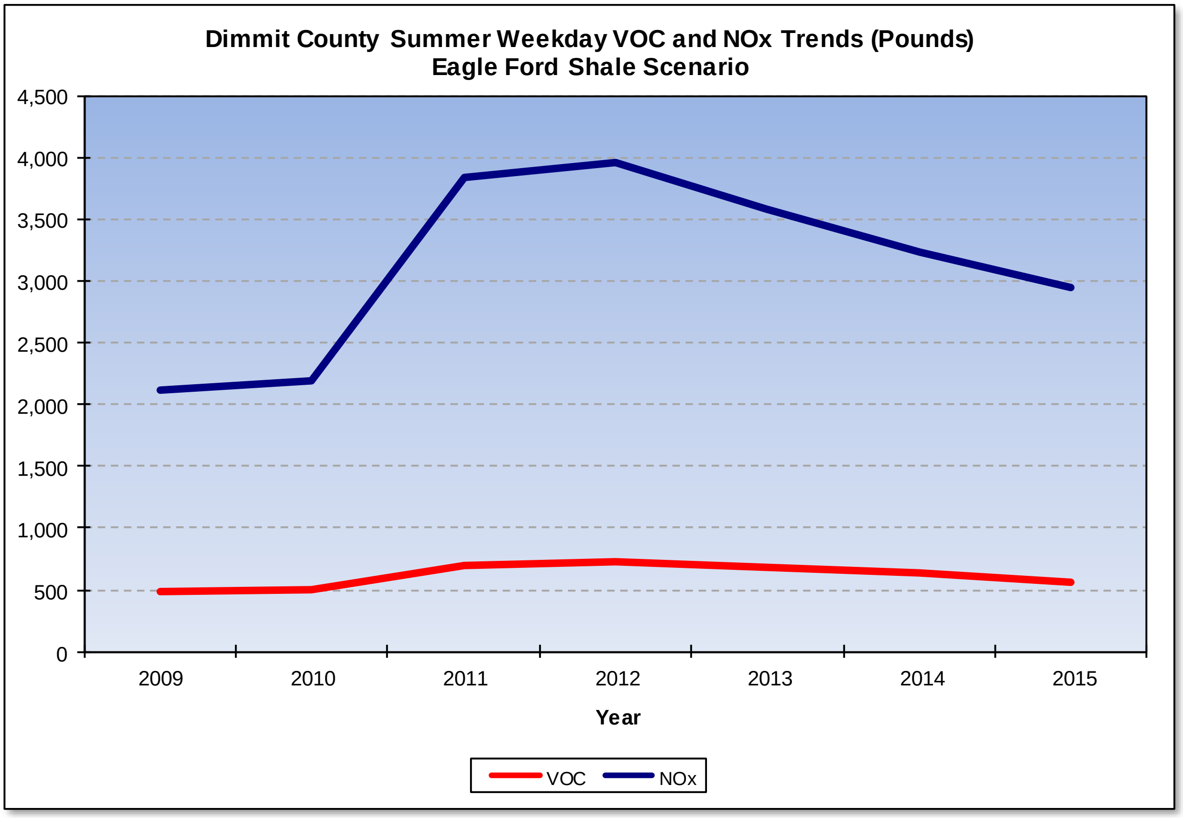

DeWitt County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
CO
1,500,000
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


DeWitt County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

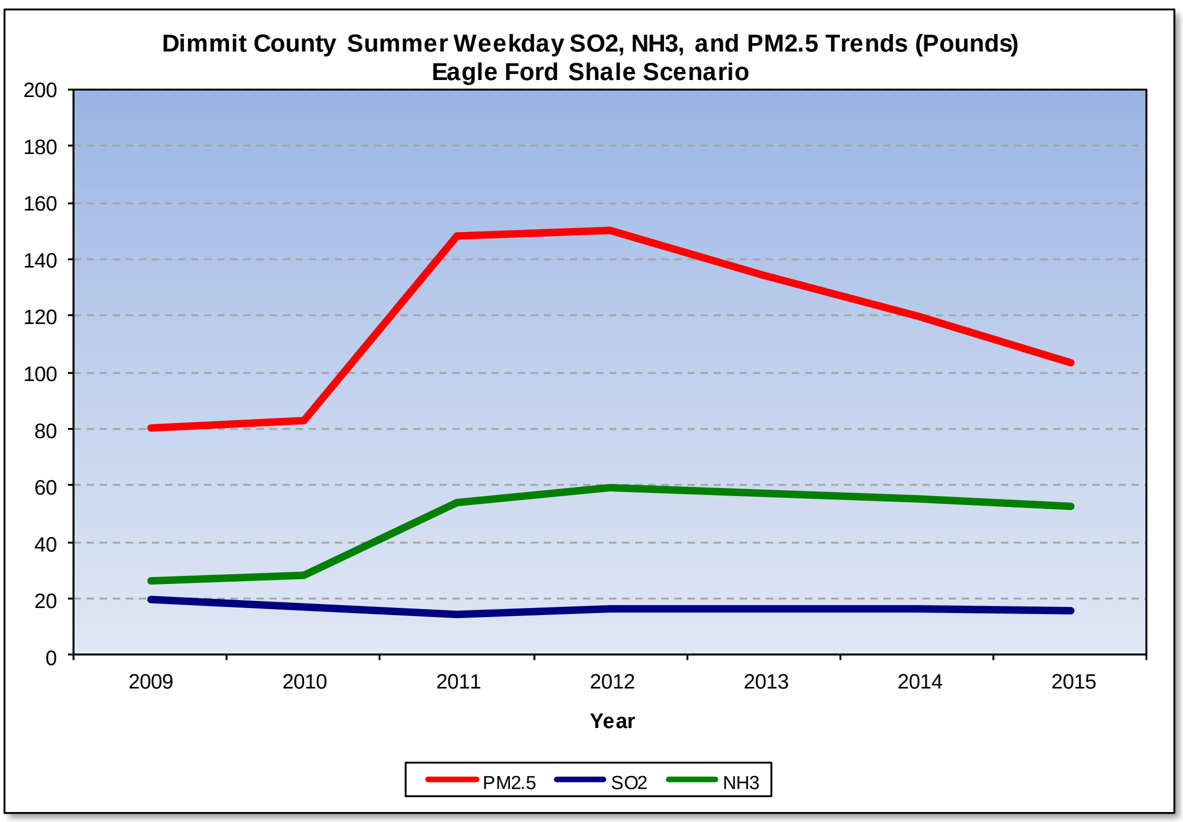

DeWitt County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Dimmit County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
1,200,000
950,000
700,000
450,000
200,000
VMT
14,000
13,000
12,000
11,000
10,000
9,000
8,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

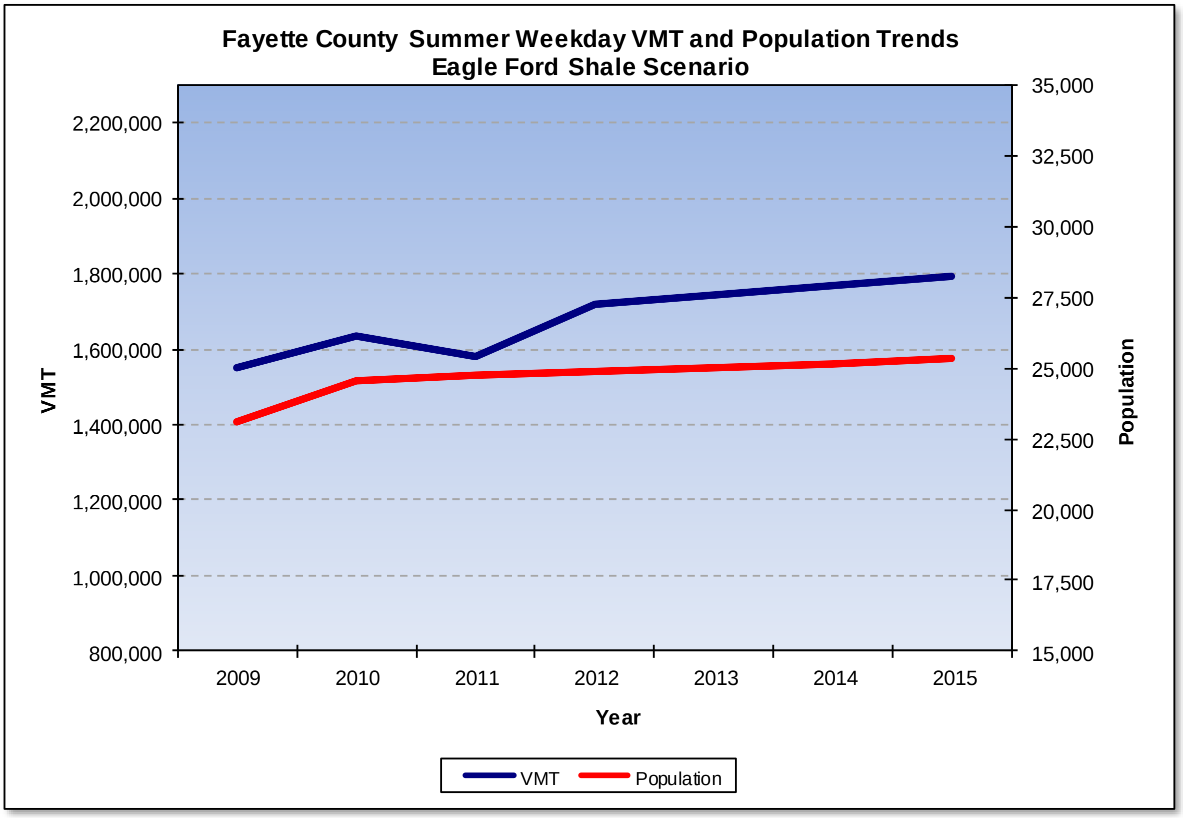

Dimmit County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
1,500,000
1,300,000
1,100,000
900,000
700,000
500,000
300,000
CO2
13,000
11,000
9,000
7,000
5,000
3,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

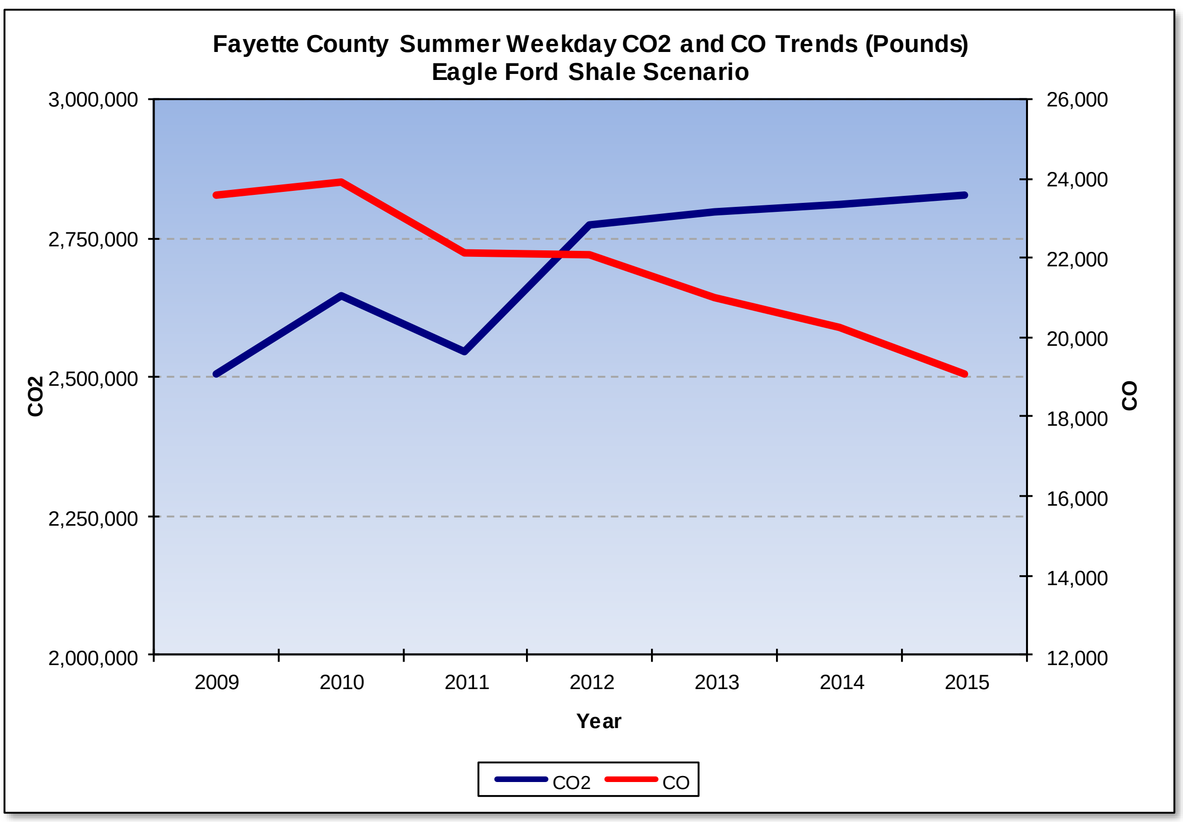


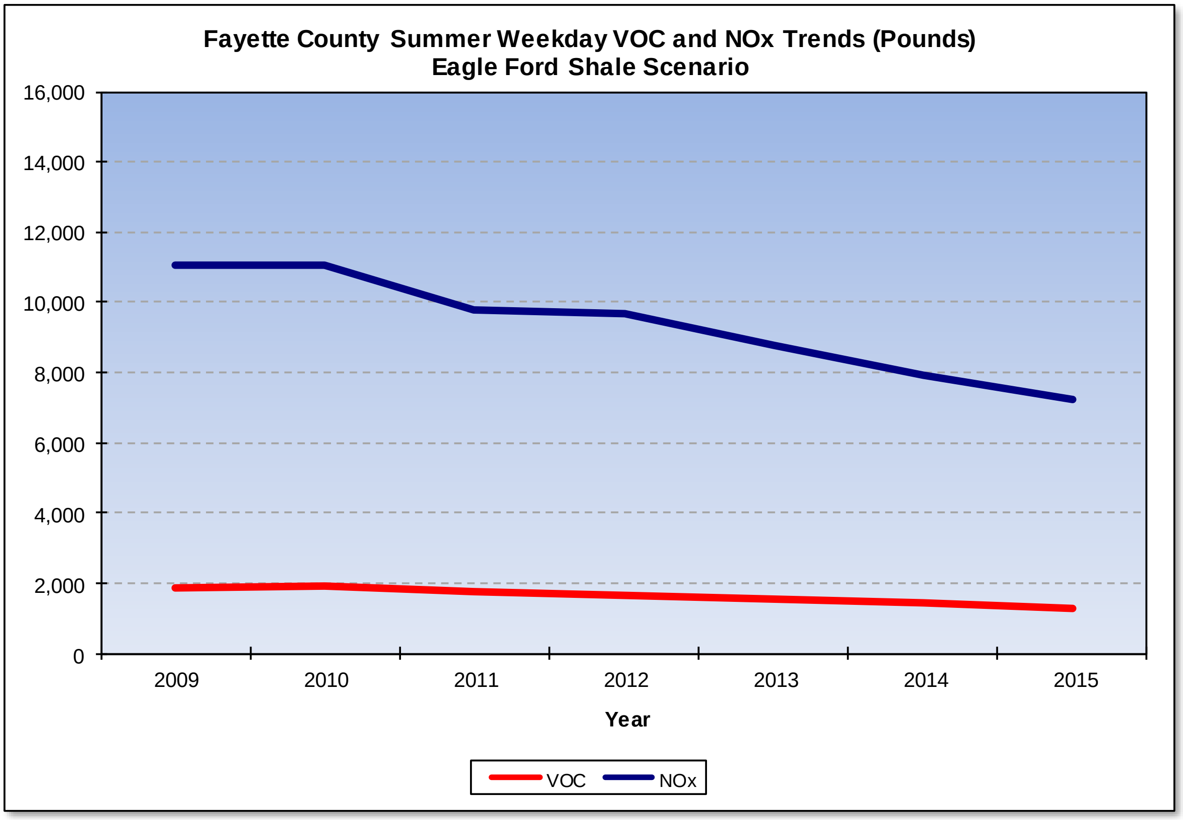
Dimmit County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx



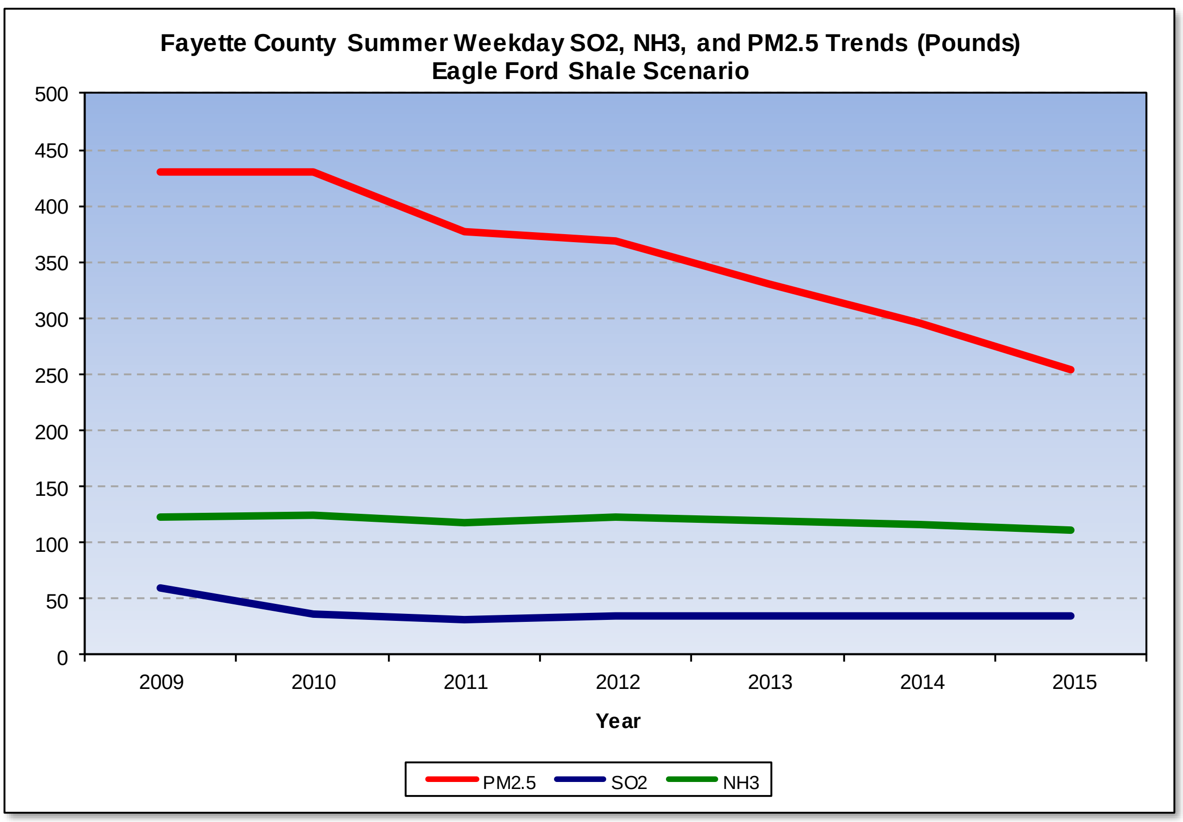
Dimmit County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
200
180
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Fayette County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
35,000
32,500
30,000
27,500
25,000
22,500
20,000
17,500
15,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

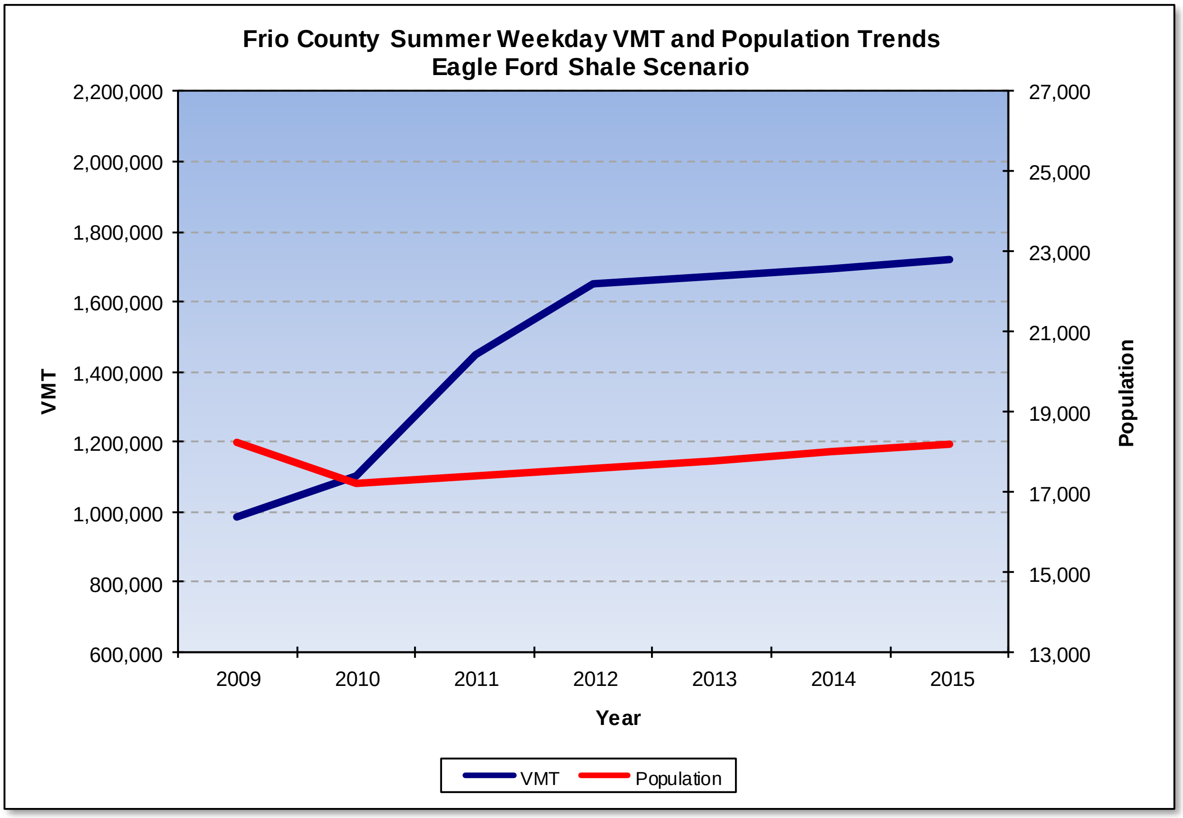

Fayette County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
3,000,000
2,750,000
2,500,000
2,250,000
2,000,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

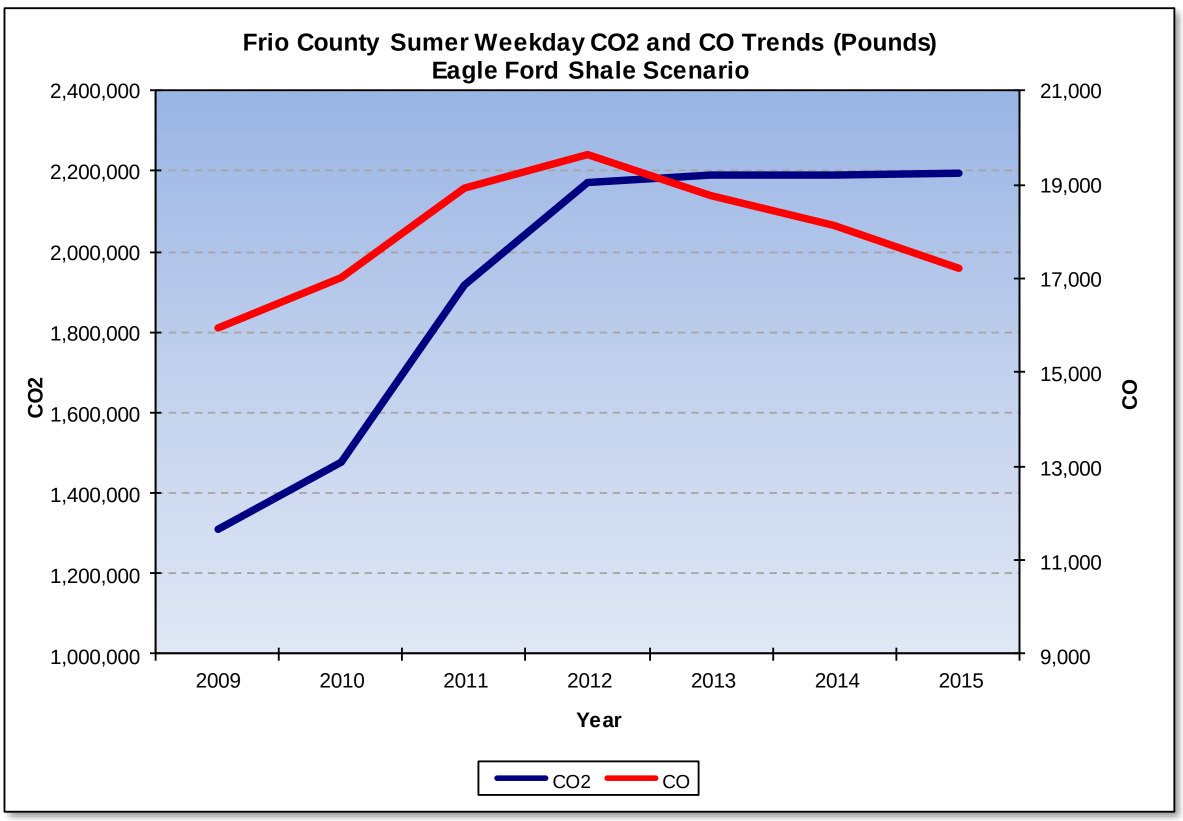


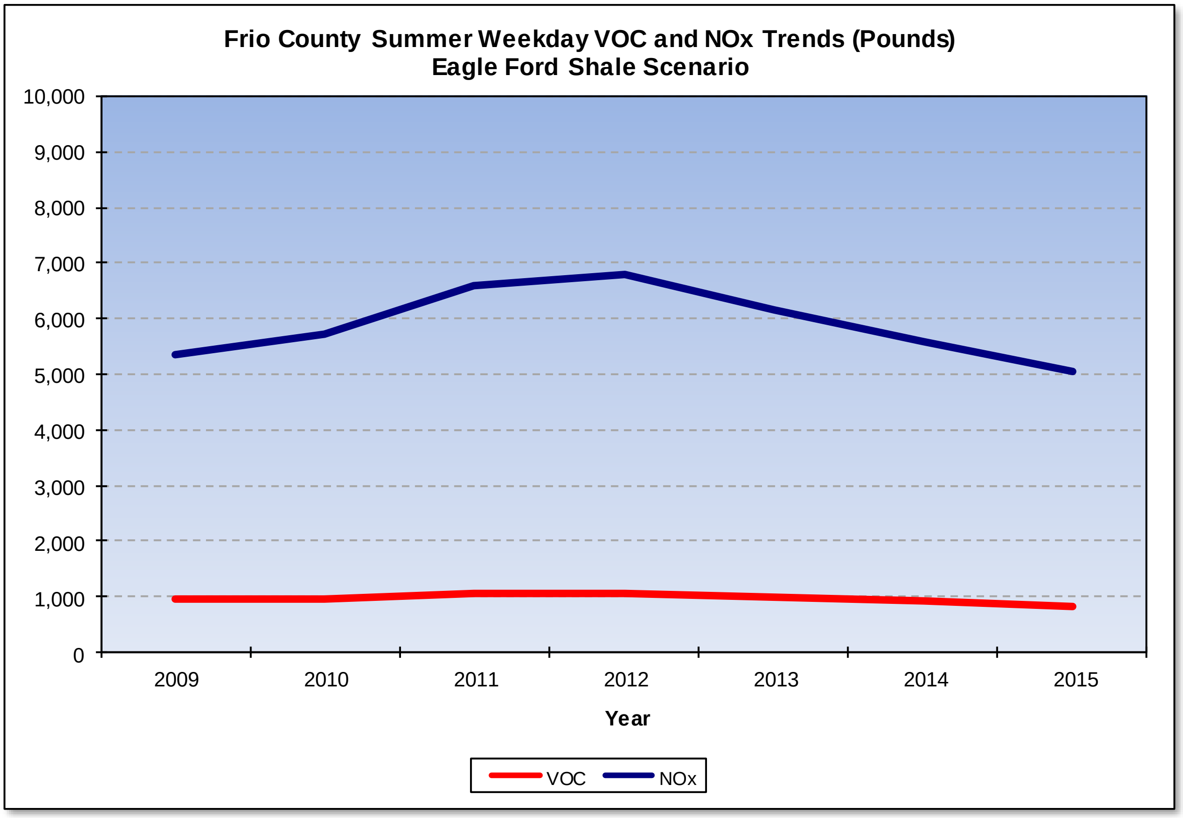
Fayette County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

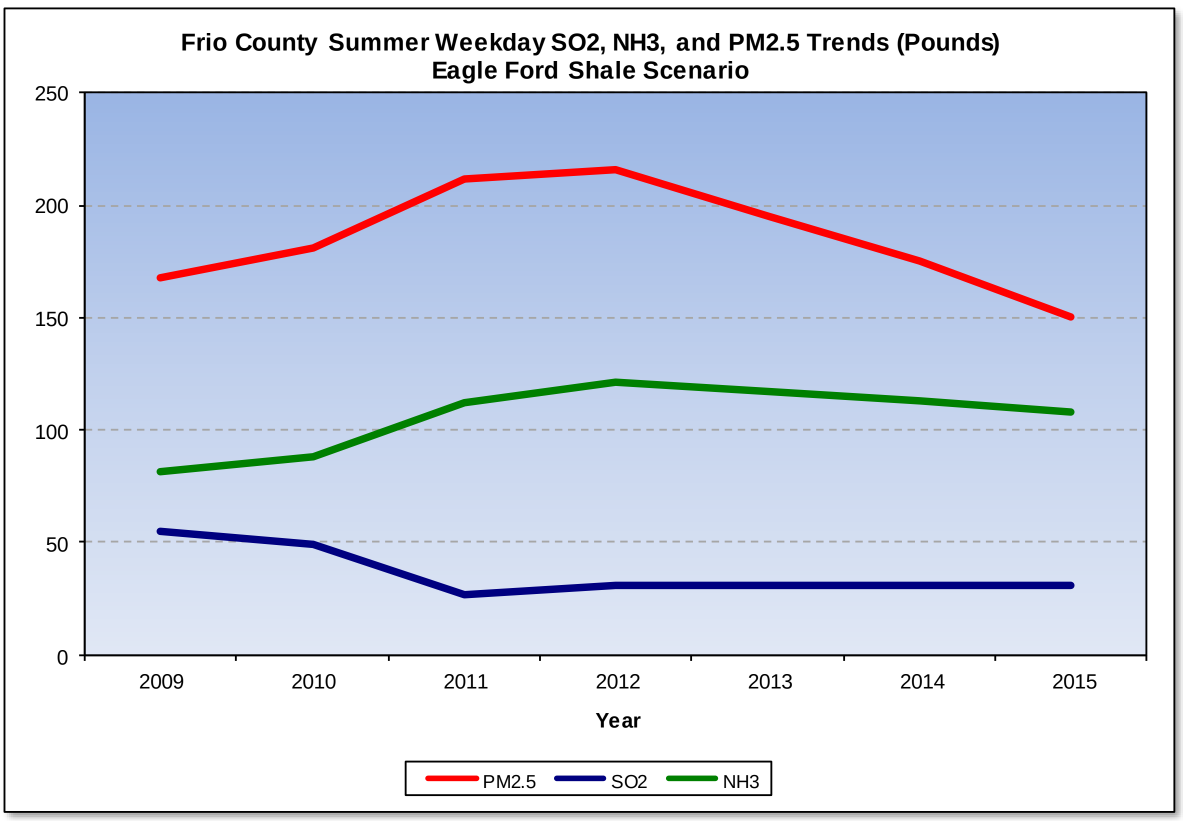


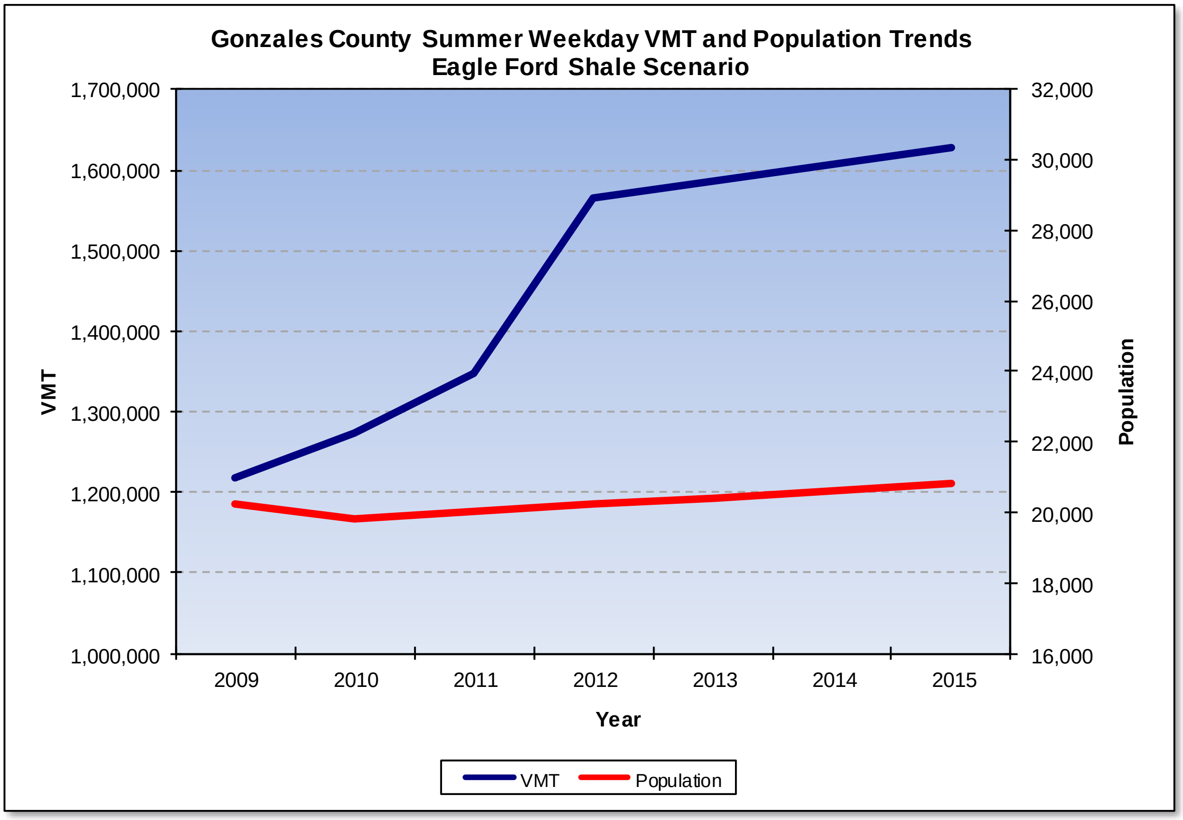
Fayette County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
500
450
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

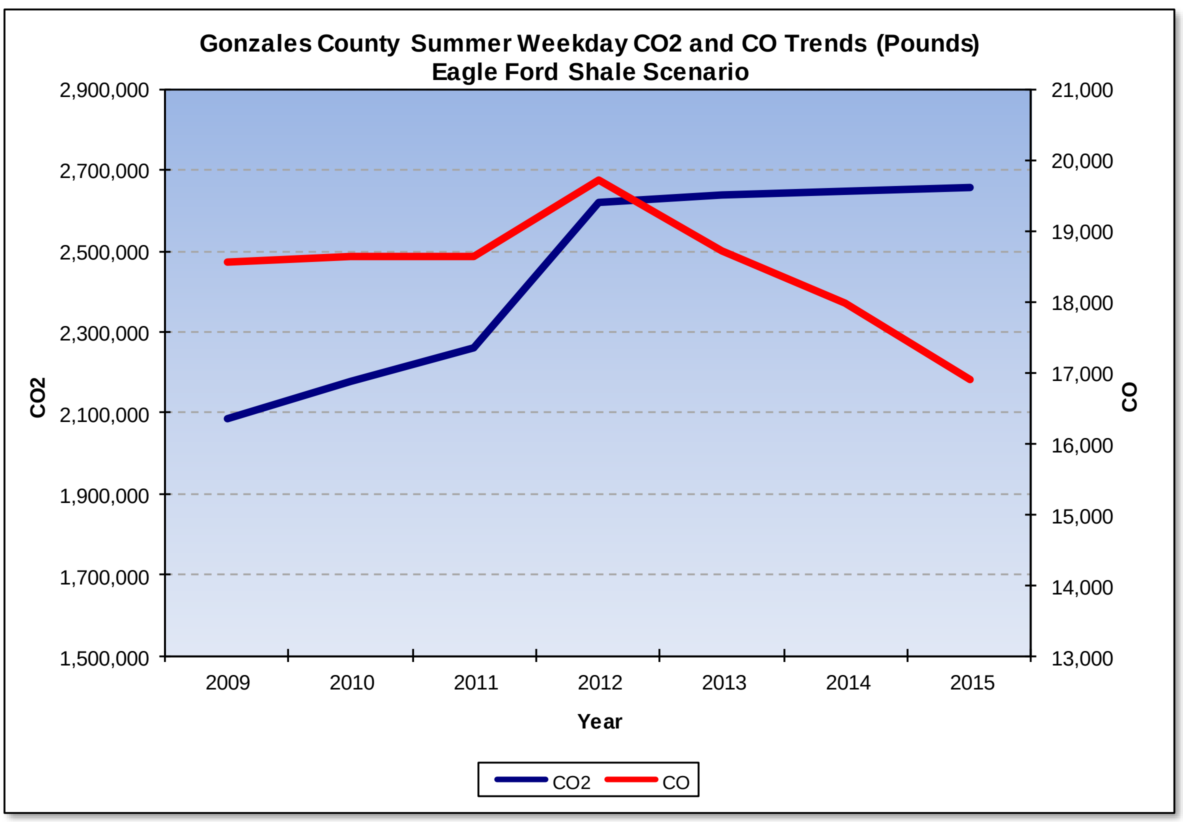

Frio County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
Population
27,000
25,000
23,000
21,000
19,000
17,000
15,000
13,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

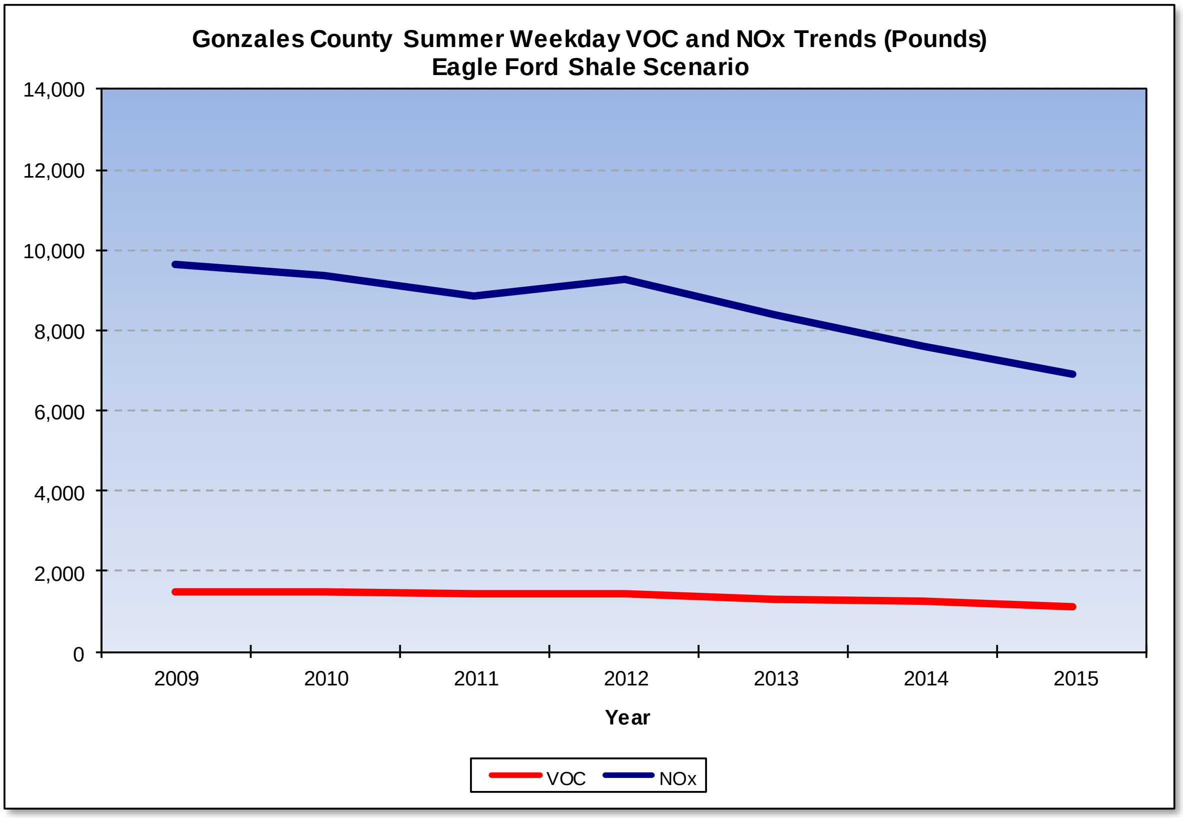

Frio County Sumer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
2,400,000
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
CO
21,000
19,000
17,000
15,000
13,000
11,000
9,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

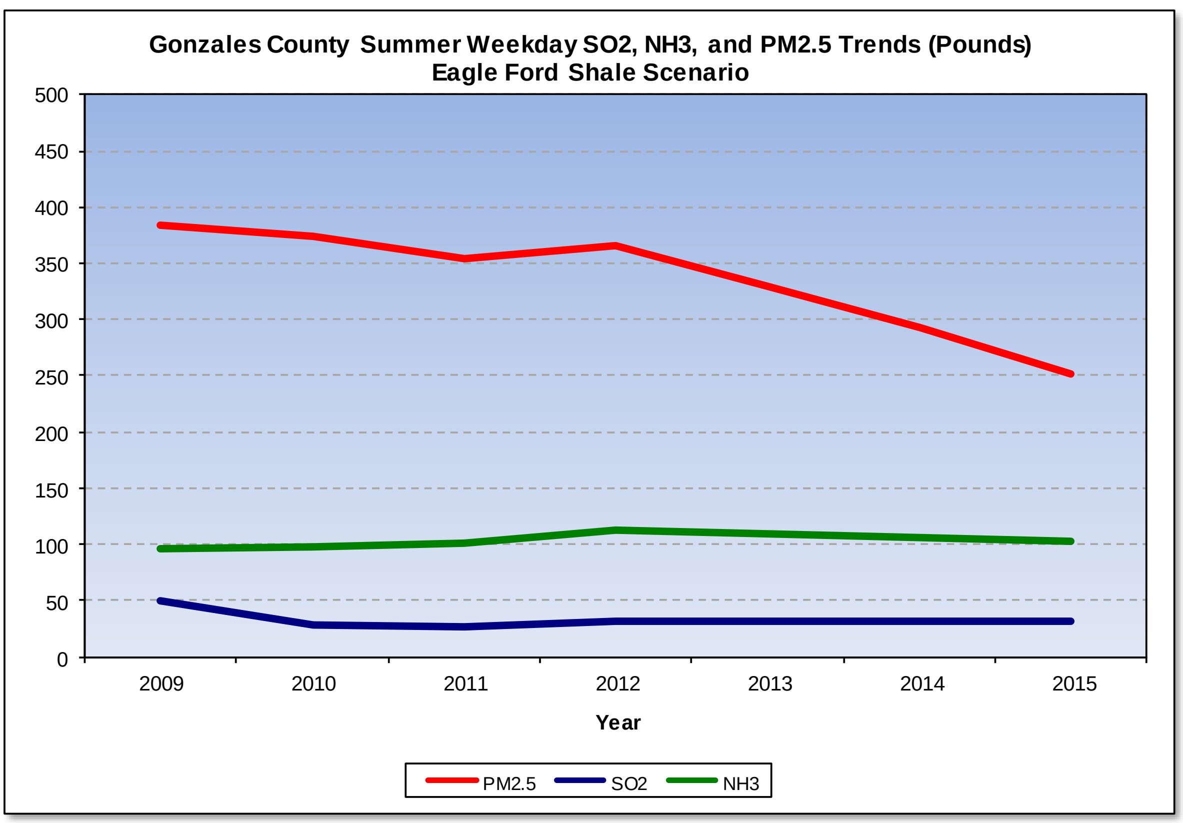

Frio County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

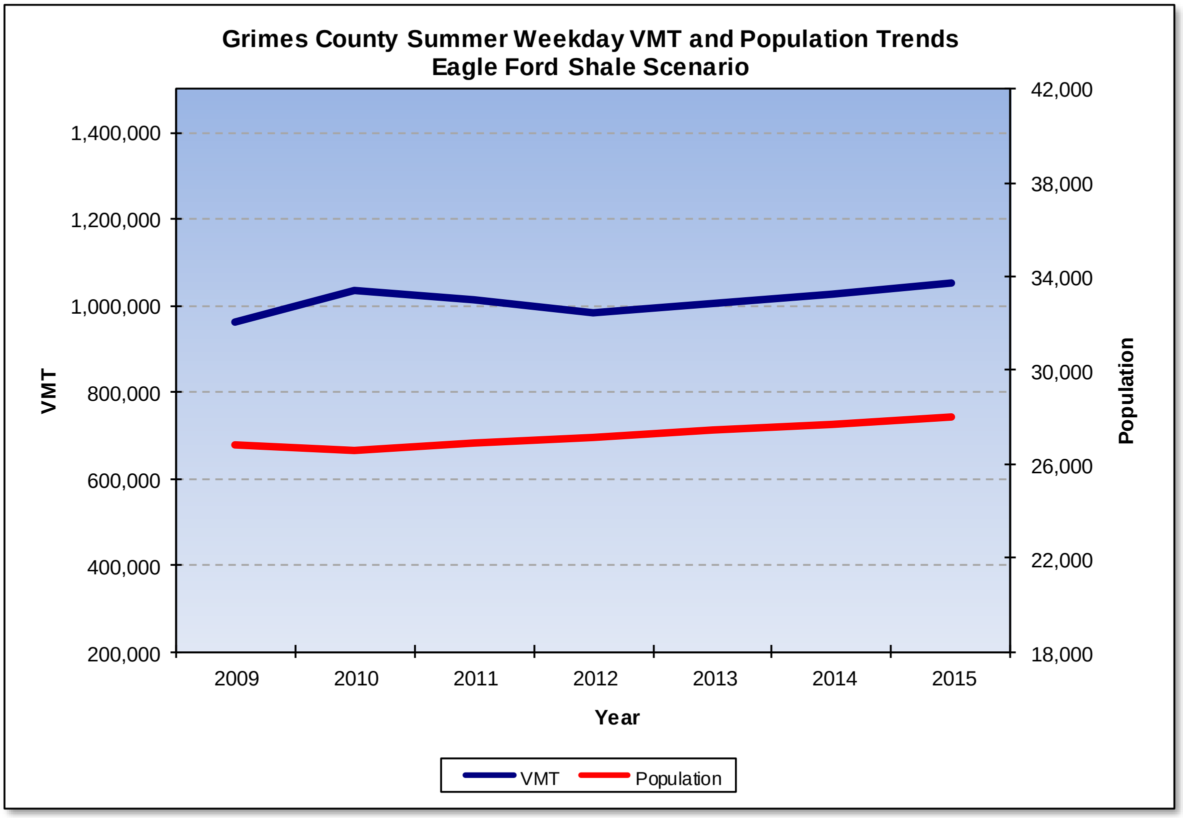

Frio County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

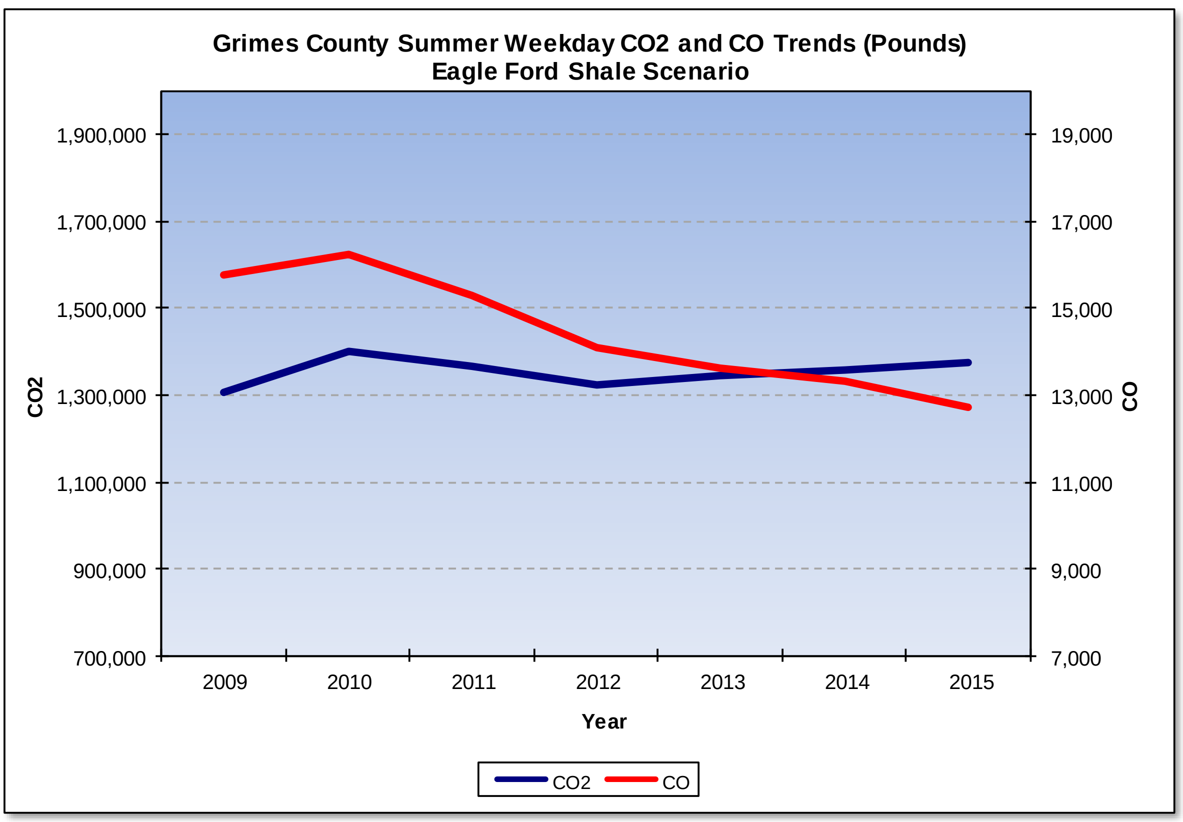

Gonzales County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
1,700,000
1,600,000
1,500,000
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
Population
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

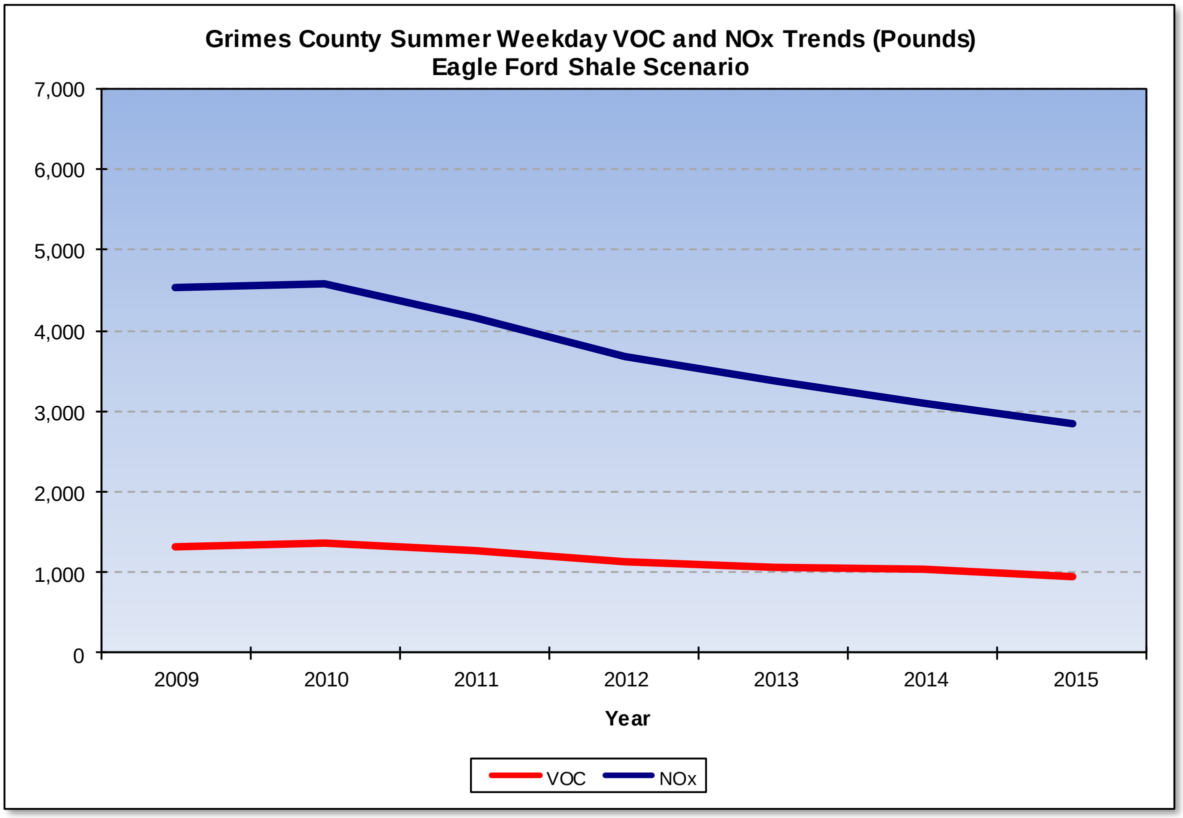

Gonzales County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
2,900,000
2,700,000
2,500,000
2,300,000
2,100,000
1,900,000
1,700,000
1,500,000
CO
21,000
20,000
19,000
18,000
17,000
16,000
15,000
14,000
13,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

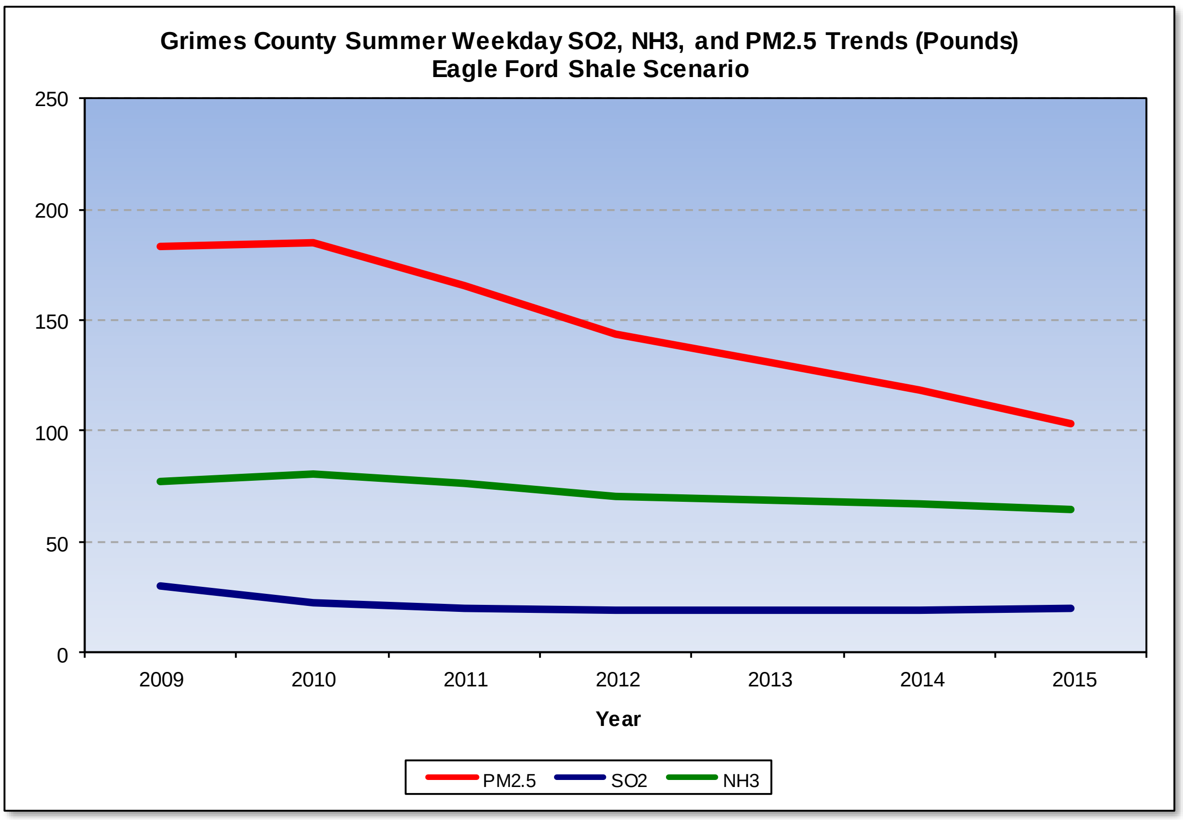

Gonzales County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

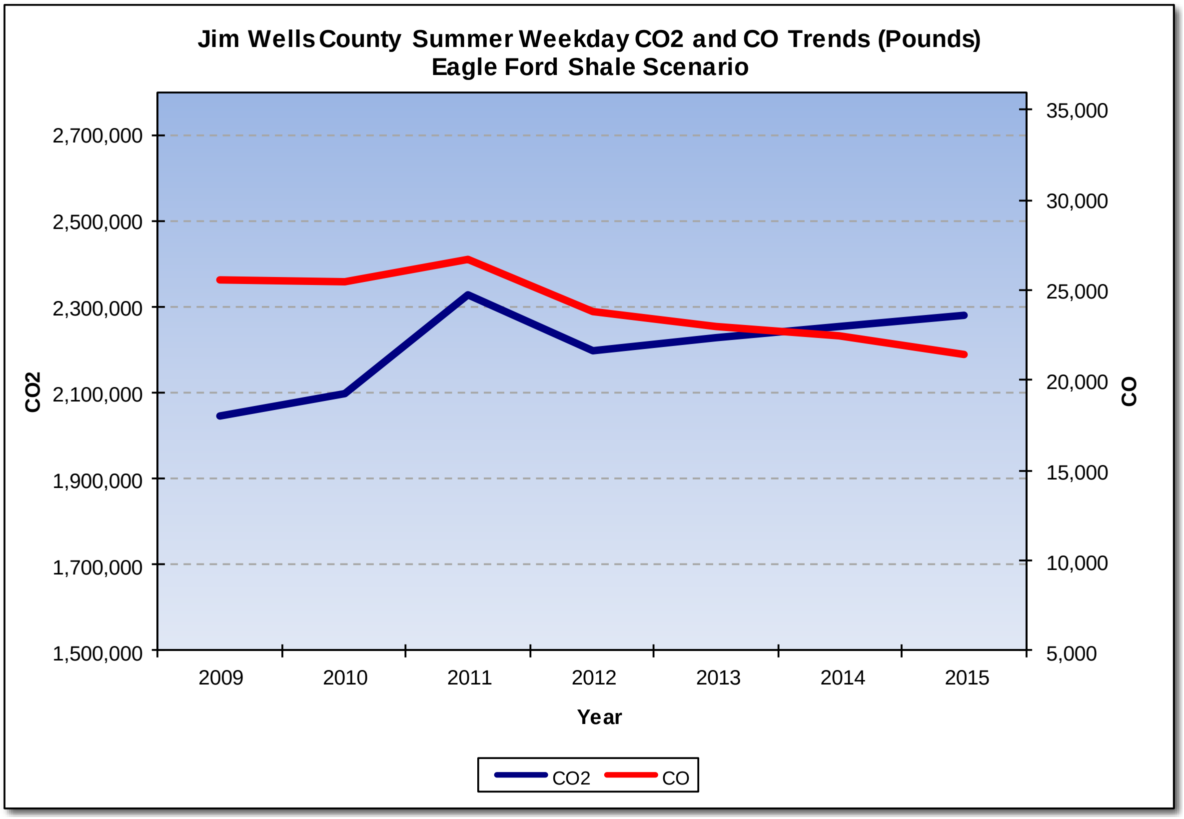

Gonzales County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
500
450
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Grimes County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
42,000
38,000
34,000
30,000
26,000
22,000
18,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

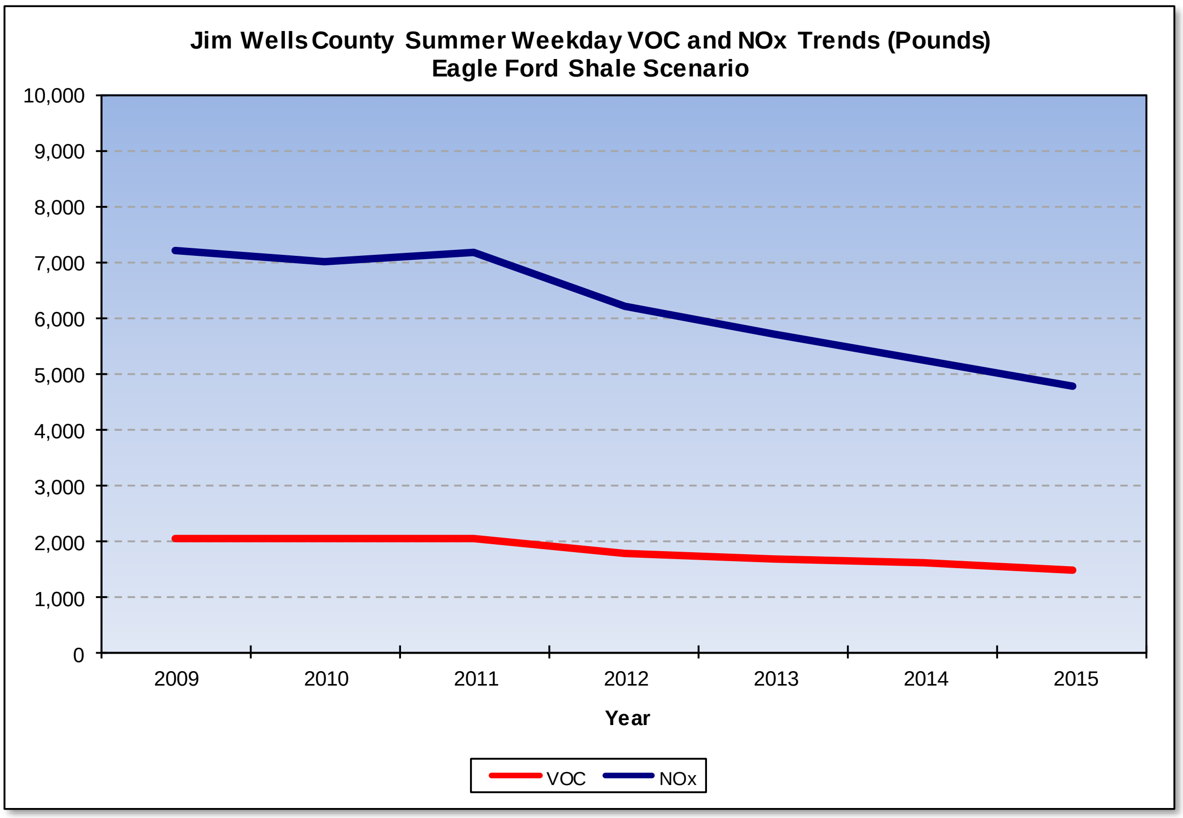

Grimes County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
1,900,000
1,700,000
1,500,000
1,300,000
1,100,000
900,000
700,000
19,000
17,000
15,000
13,000
11,000
9,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


Grimes County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

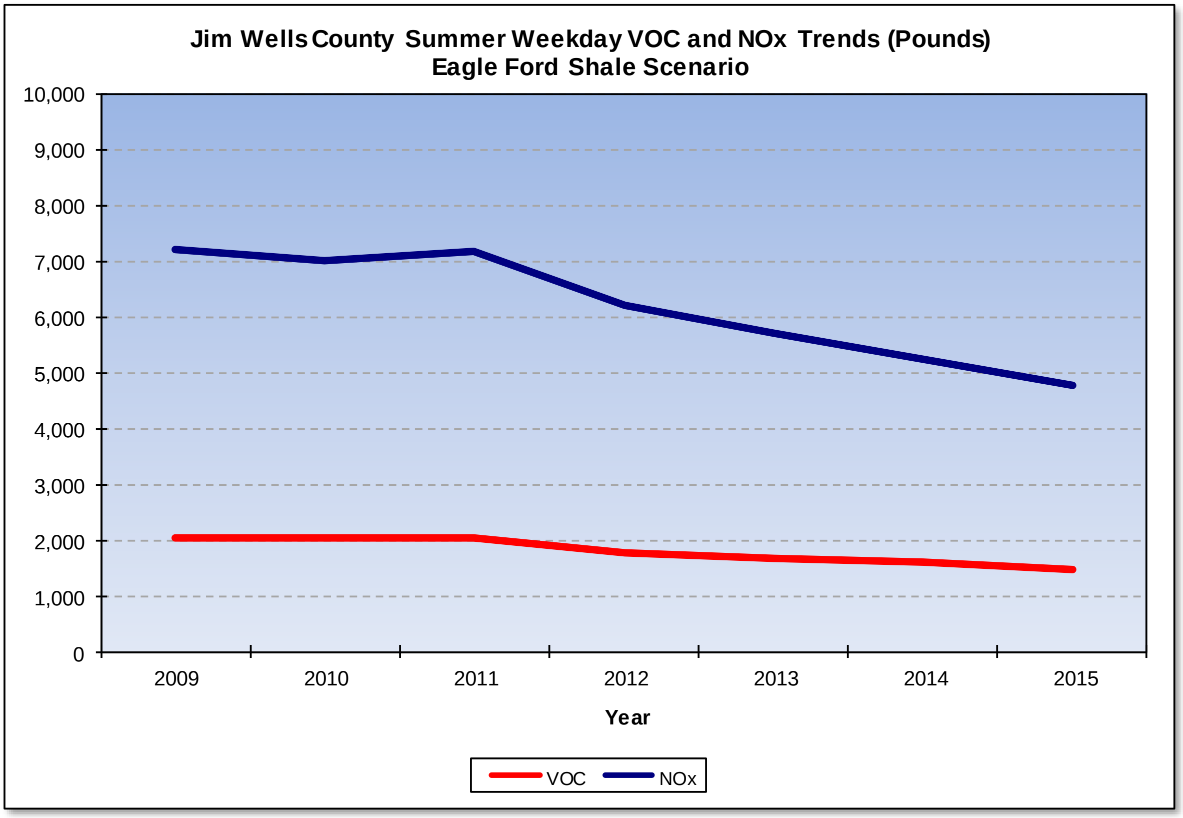

Grimes County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

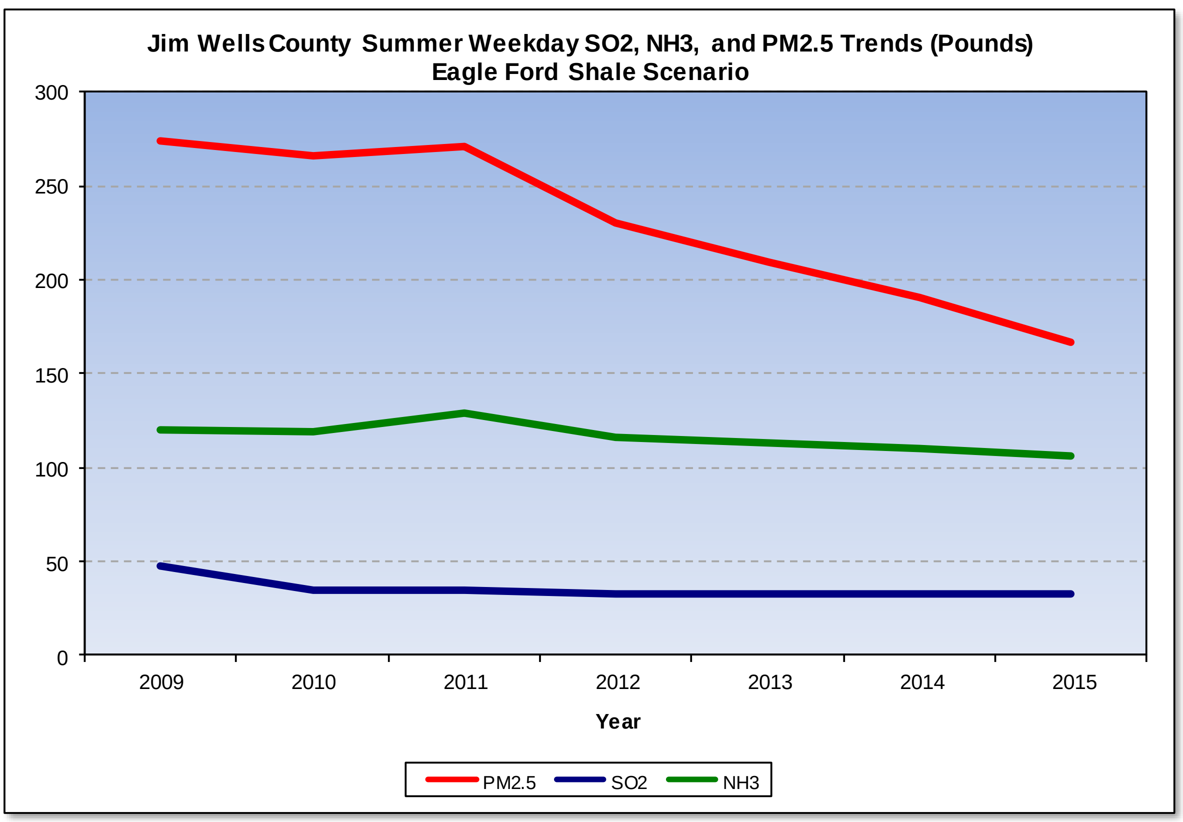


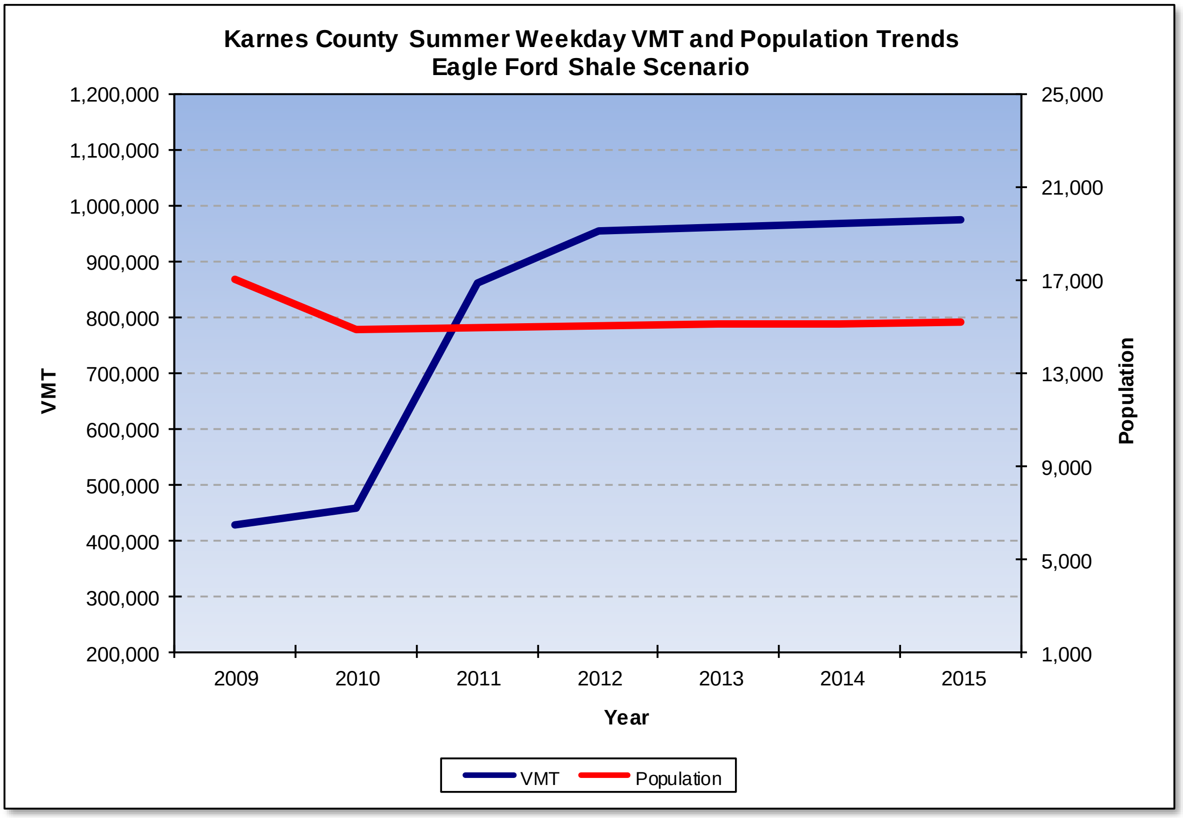
Jim Wells County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
2,700,000
2,500,000
2,300,000
2,100,000
1,900,000
1,700,000
1,500,000
CO2
35,000
30,000
25,000
20,000
15,000
10,000
5,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

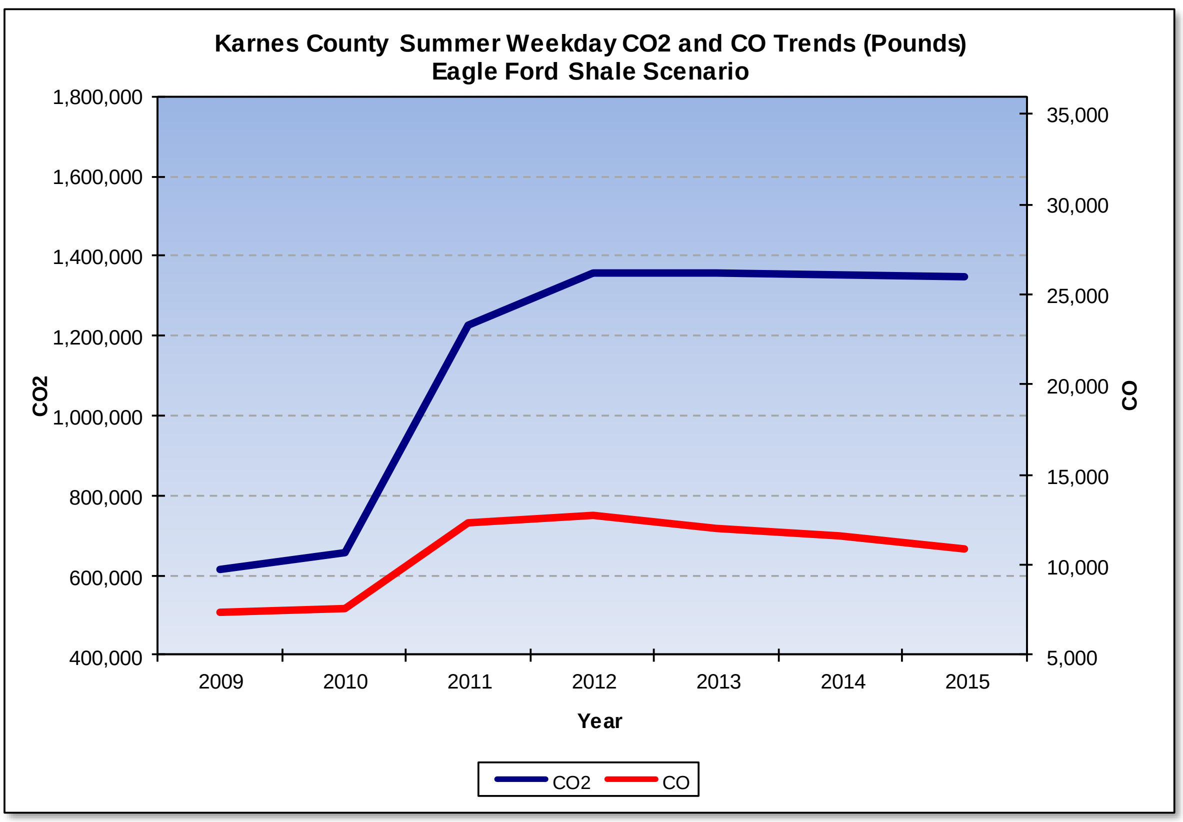


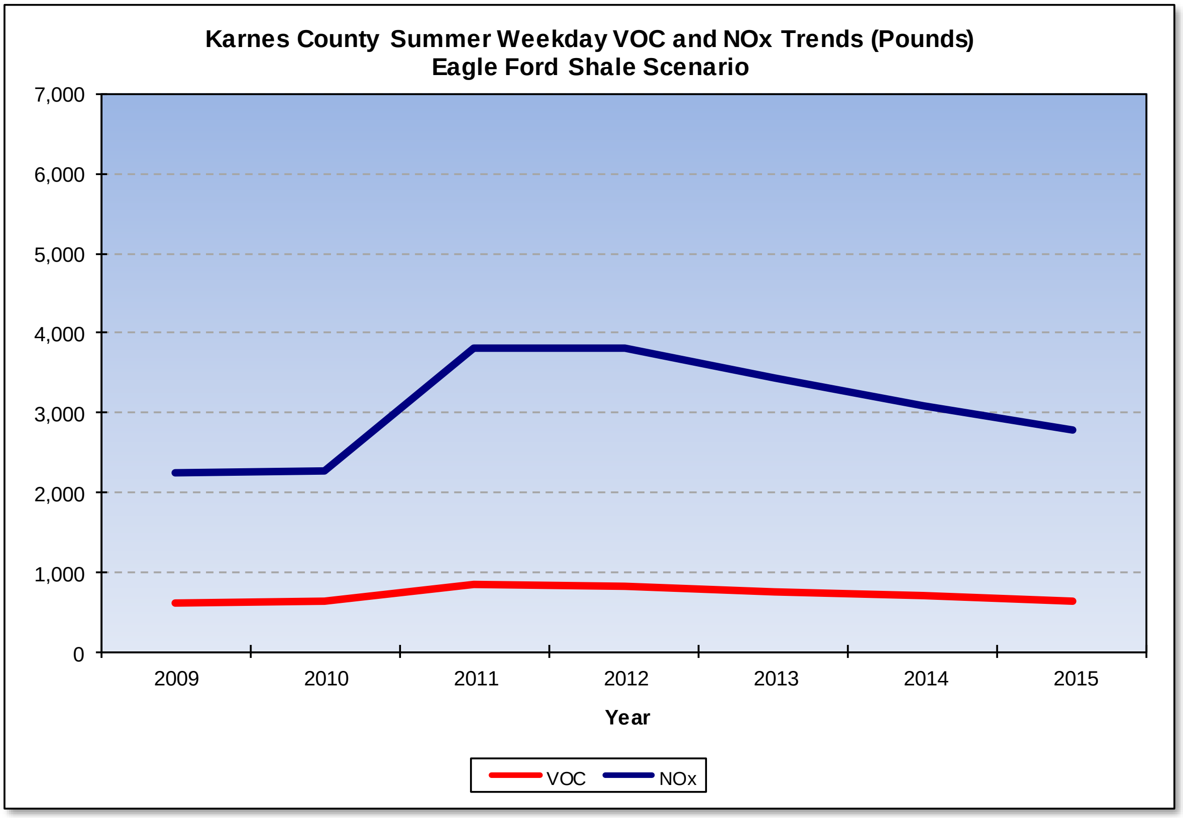
Jim Wells County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

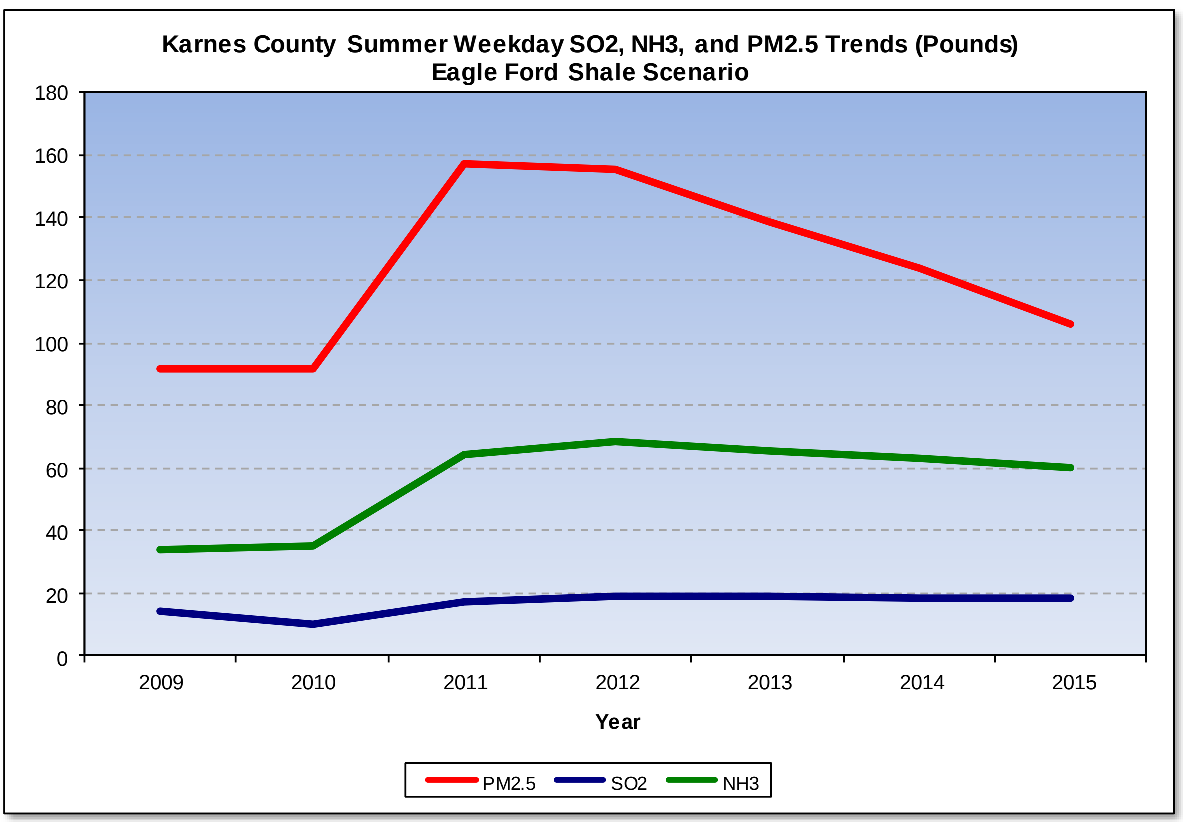

Jim Wells County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

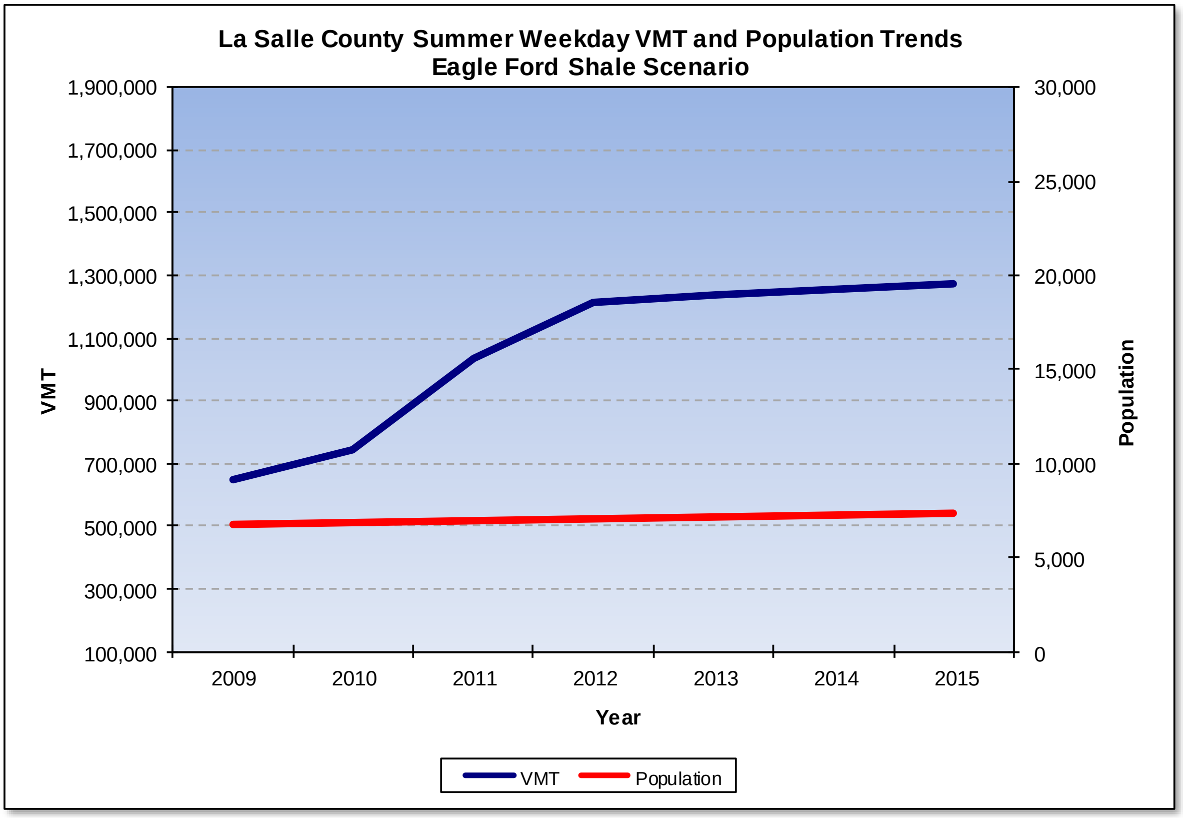

Jim Wells County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

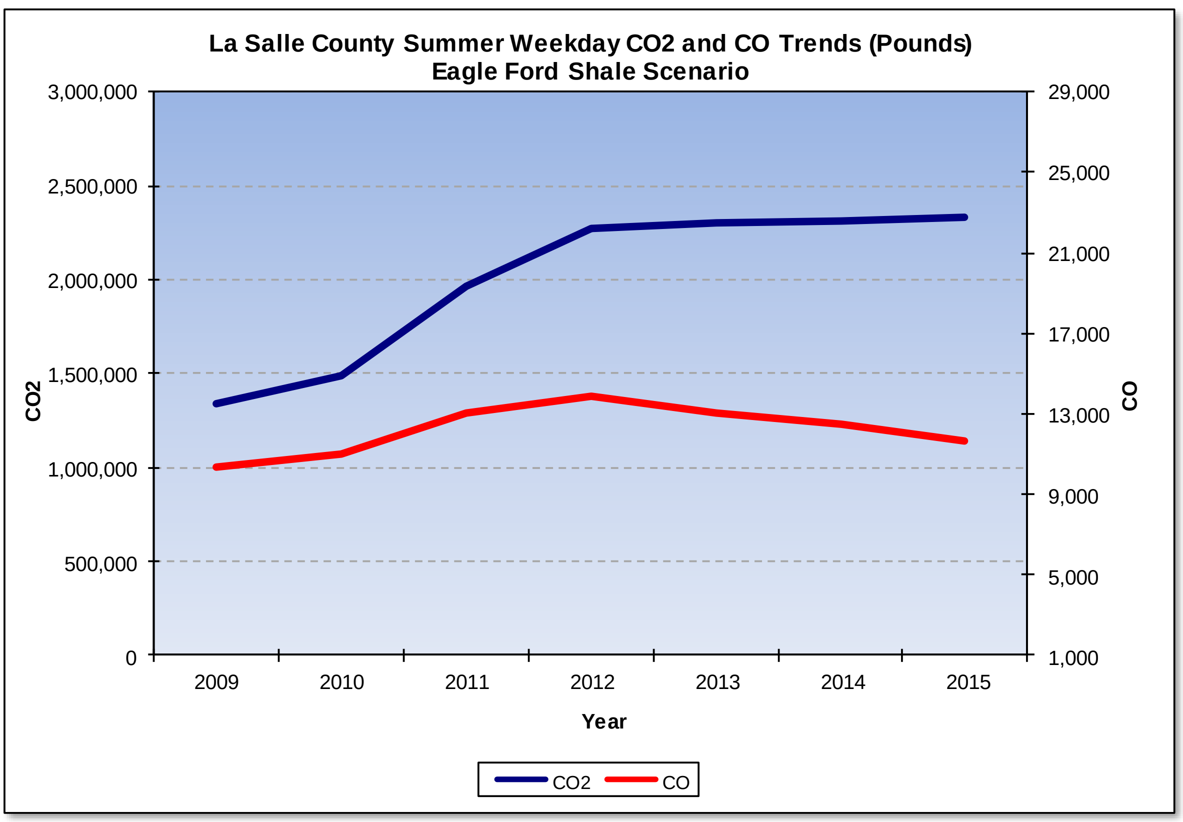

Karnes County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
25,000
21,000
17,000
13,000
9,000
5,000
1,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

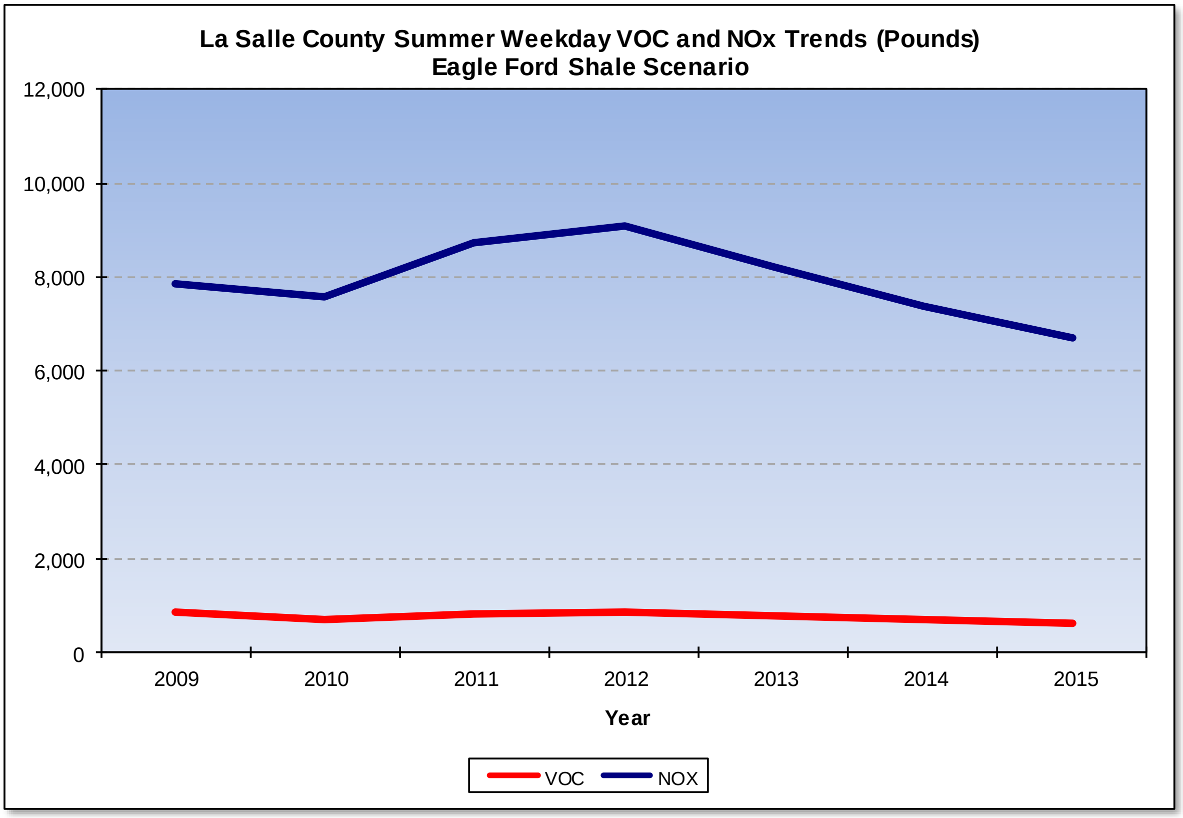

Karnes County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

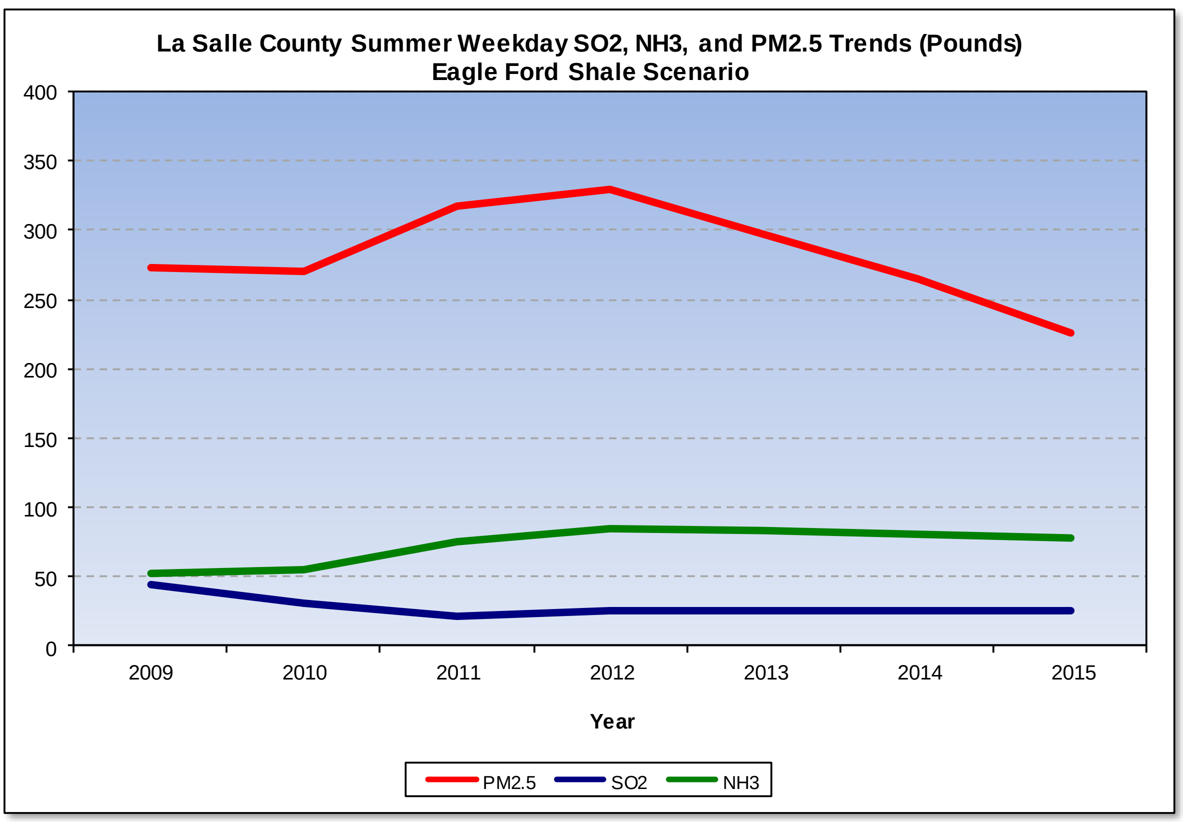

Karnes County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

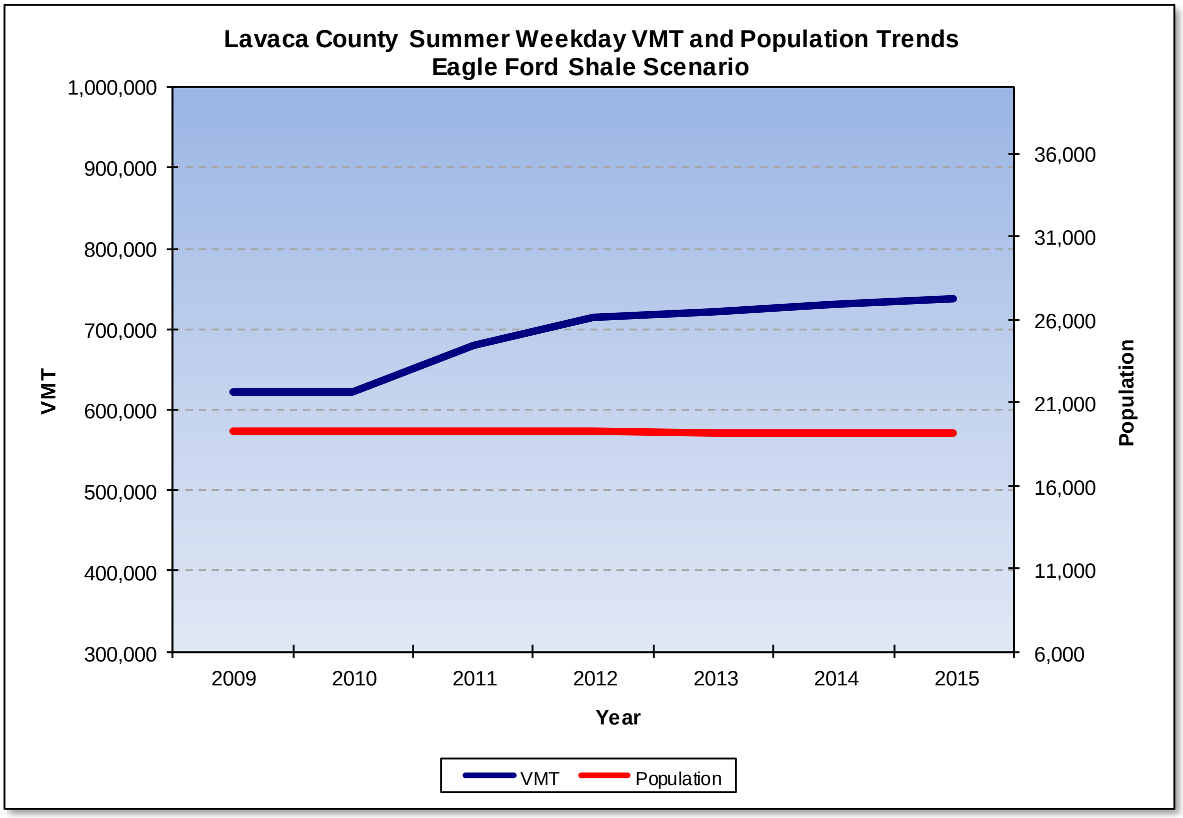

Karnes County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
180
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

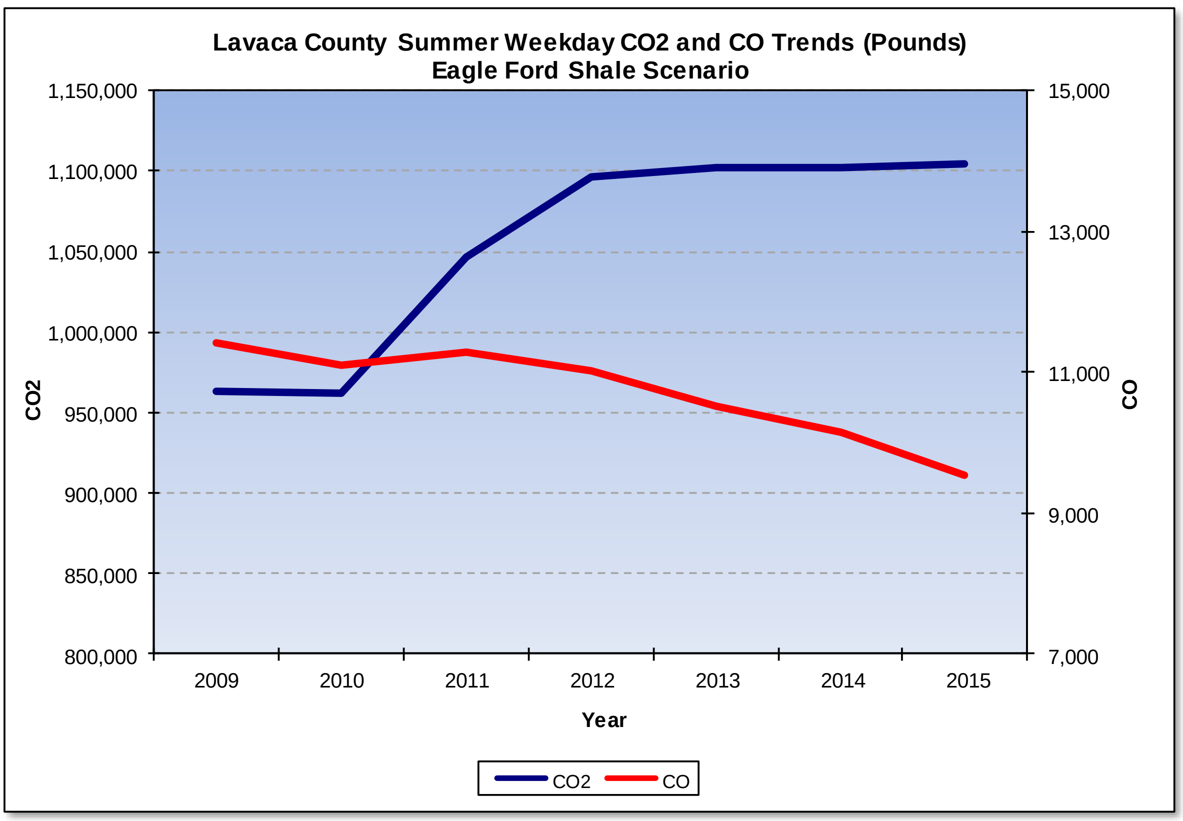

La Salle County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
1,900,000
1,700,000
1,500,000
1,300,000
1,100,000
900,000
700,000
500,000
300,000
100,000
Population
30,000
25,000
20,000
15,000
10,000
5,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

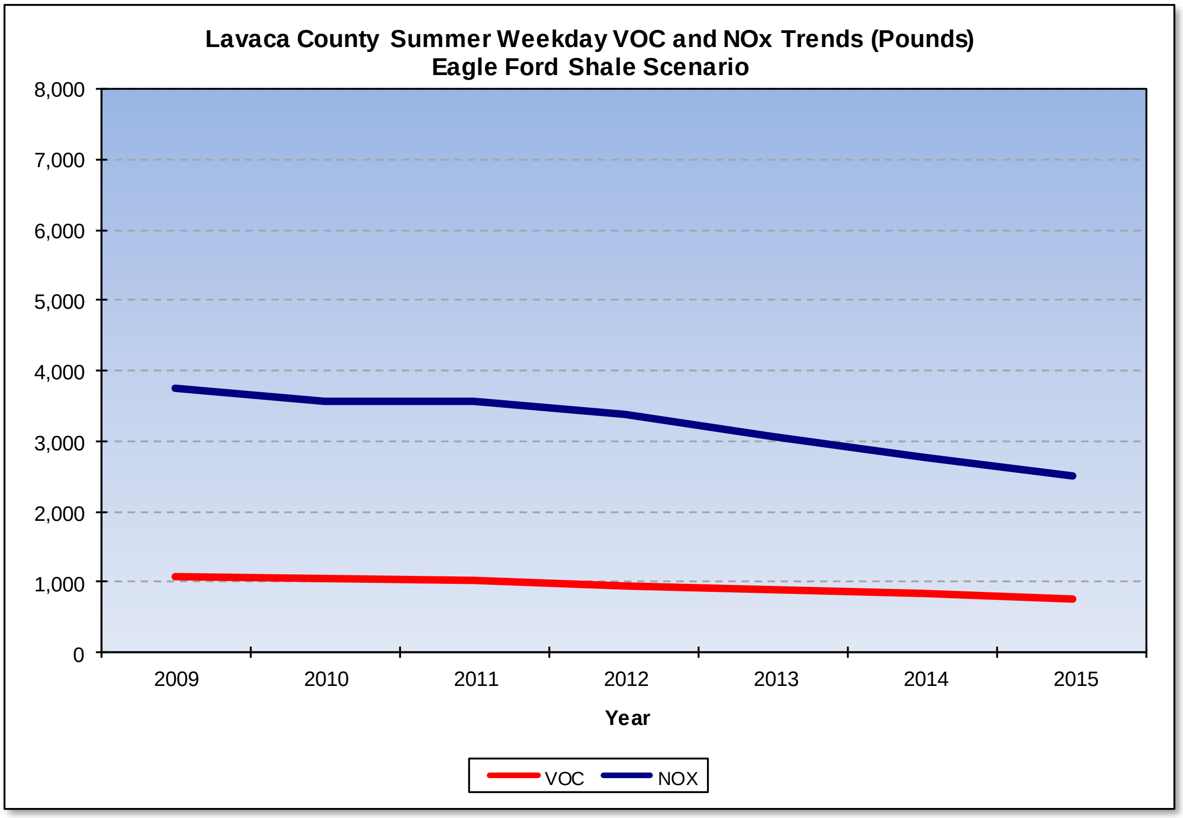

La Salle County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
CO
29,000
25,000
21,000
17,000
13,000
9,000
5,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

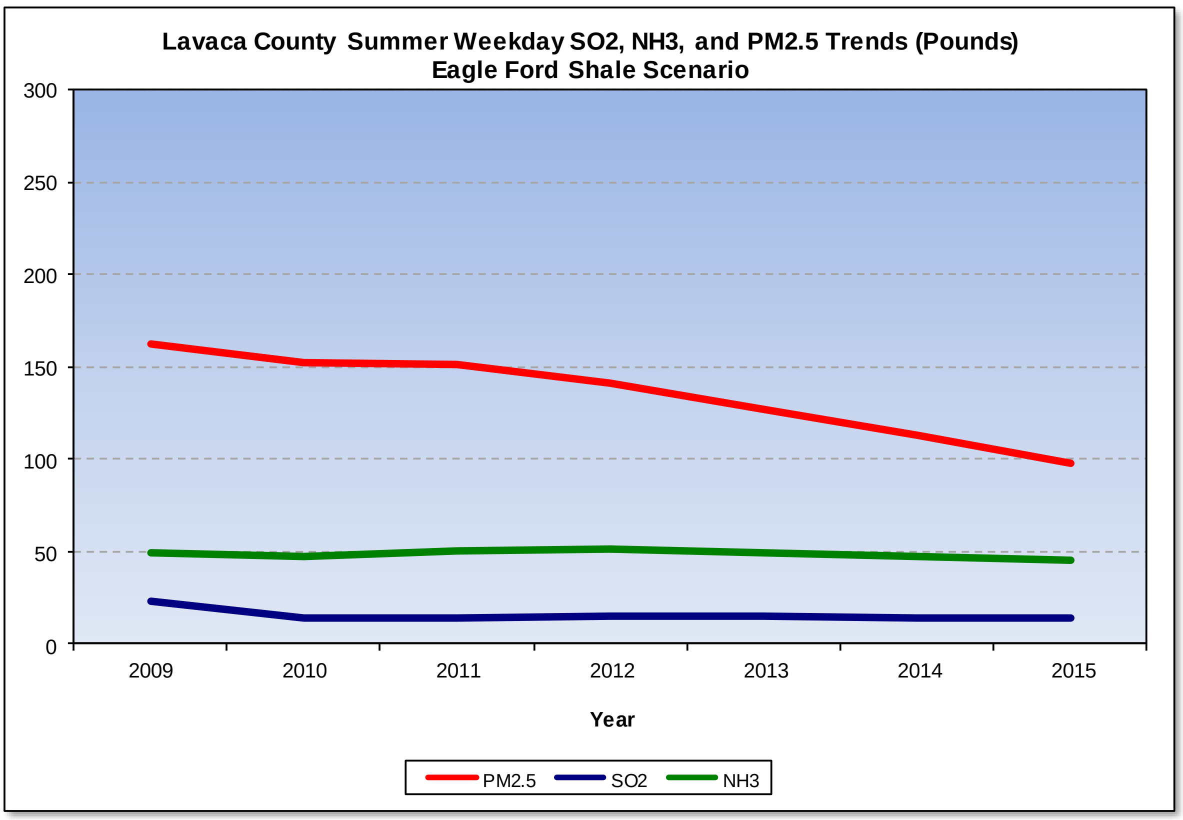

La Salle County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

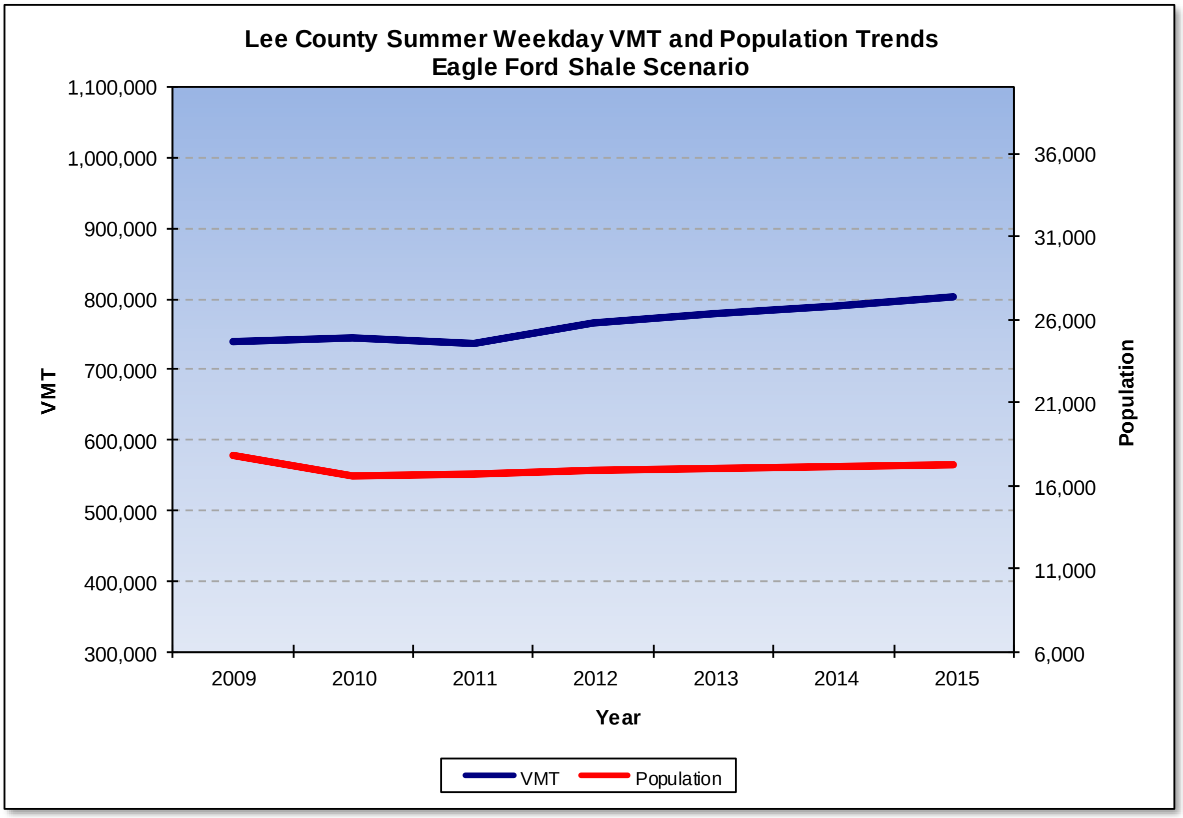

La Salle County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

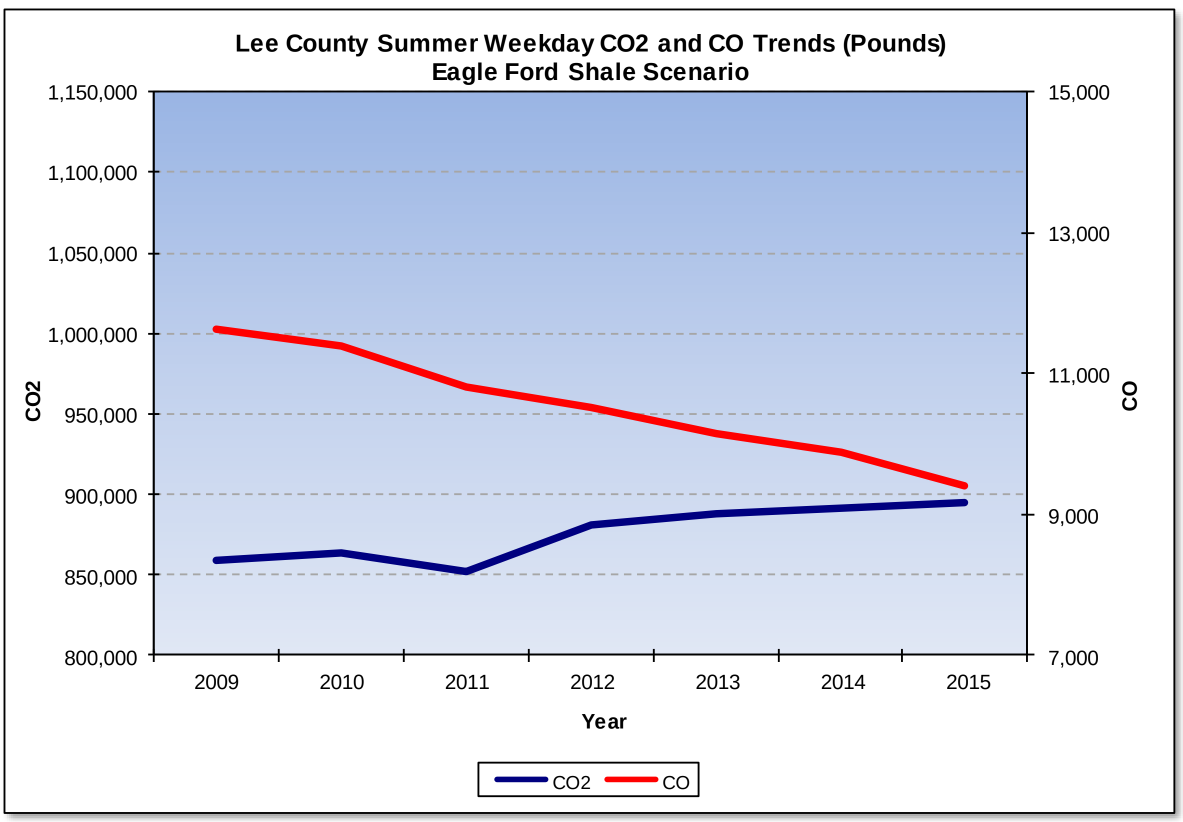

Lavaca County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
VMT
36,000
31,000
26,000
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

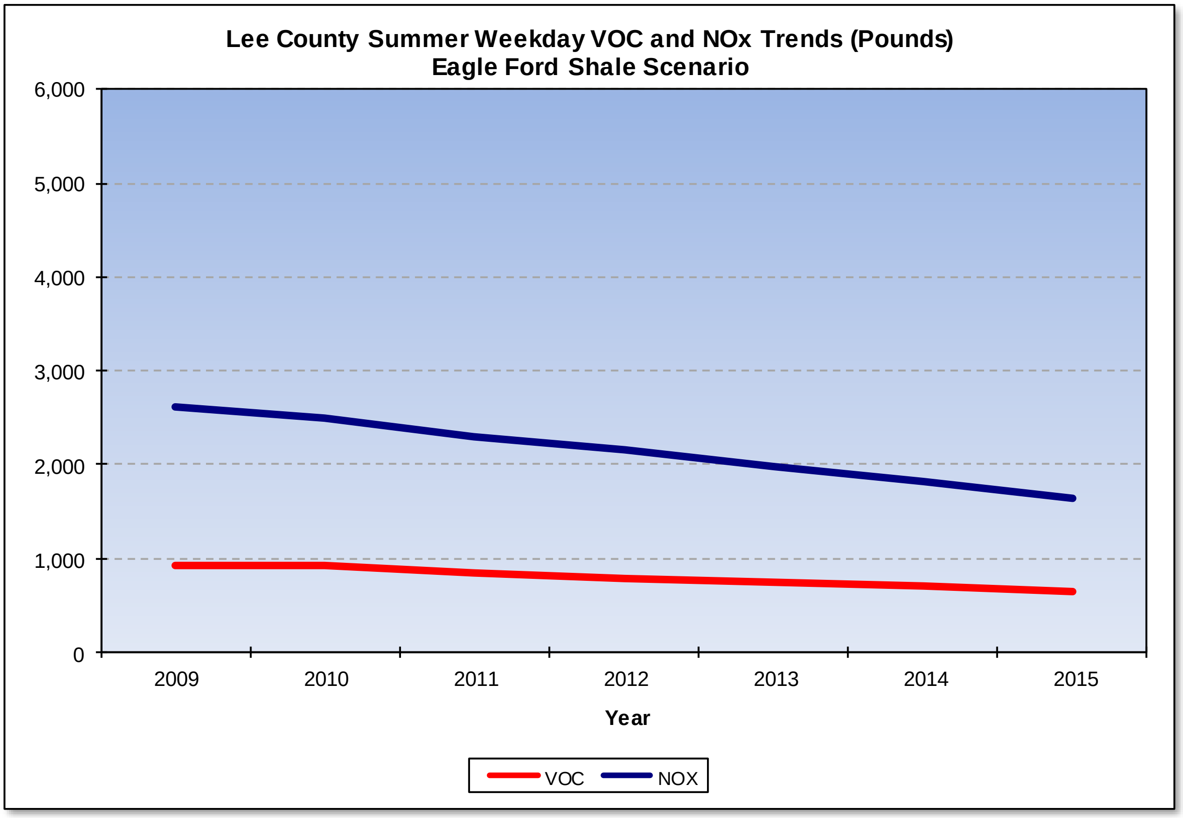

Lavaca County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
1,150,000
1,100,000
1,050,000
1,000,000
950,000
900,000
850,000
800,000
CO2
15,000
13,000
11,000
9,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

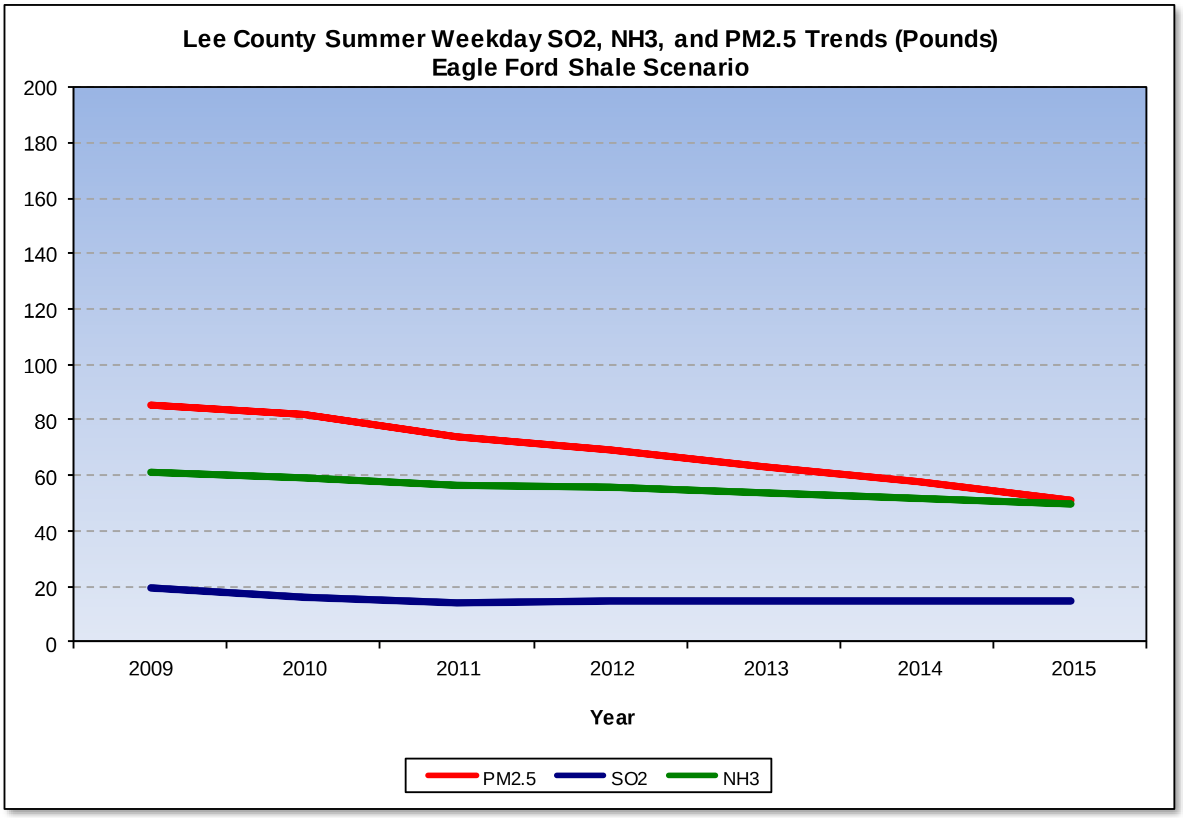

Lavaca County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

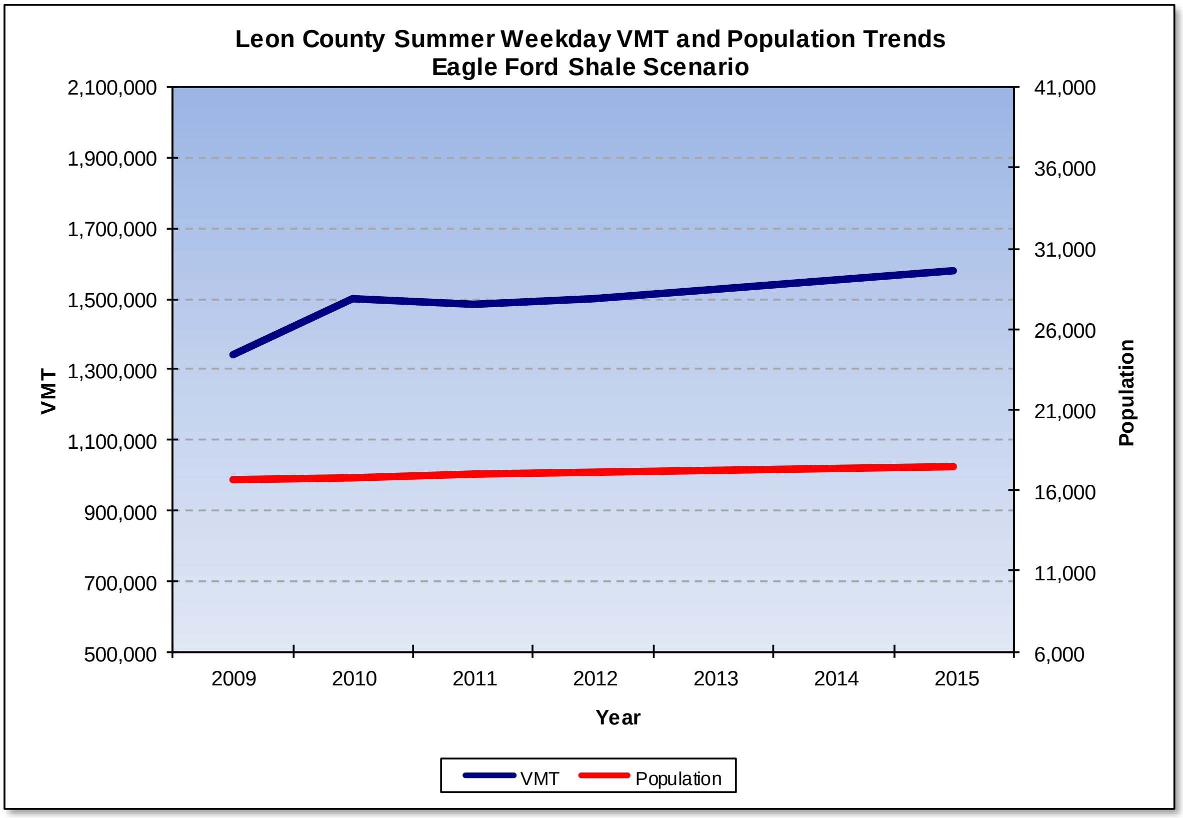

Lavaca County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

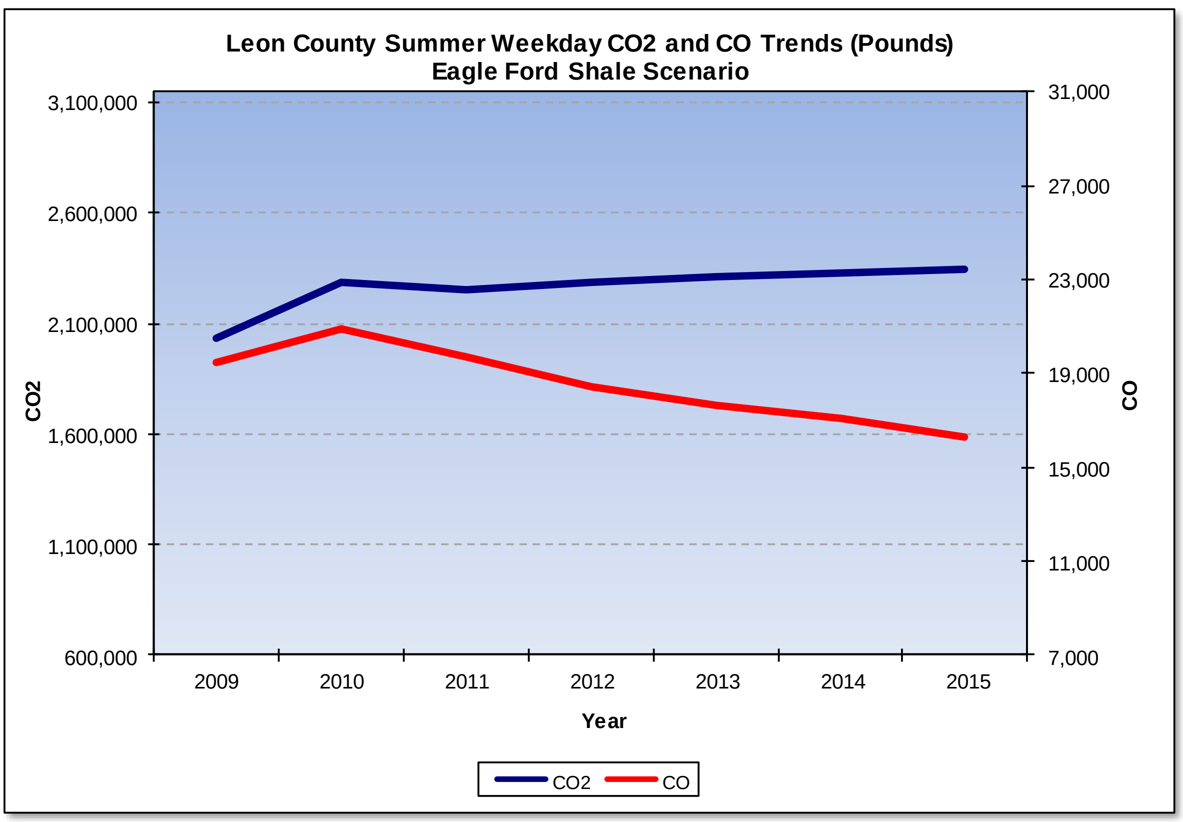

Lee County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
VMT
36,000
31,000
26,000
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

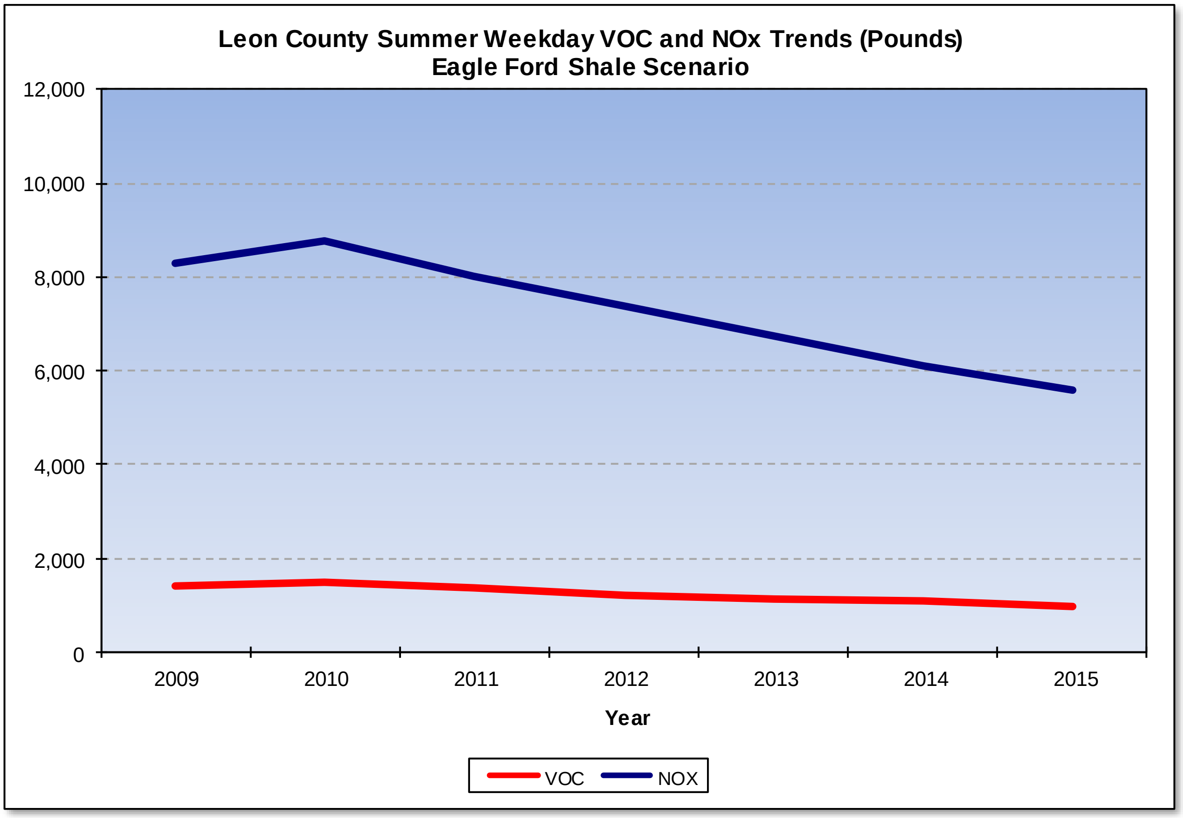

Lee County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
1,150,000
1,100,000
1,050,000
1,000,000
950,000
900,000
850,000
800,000
CO2
15,000
13,000
11,000
9,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


Lee County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

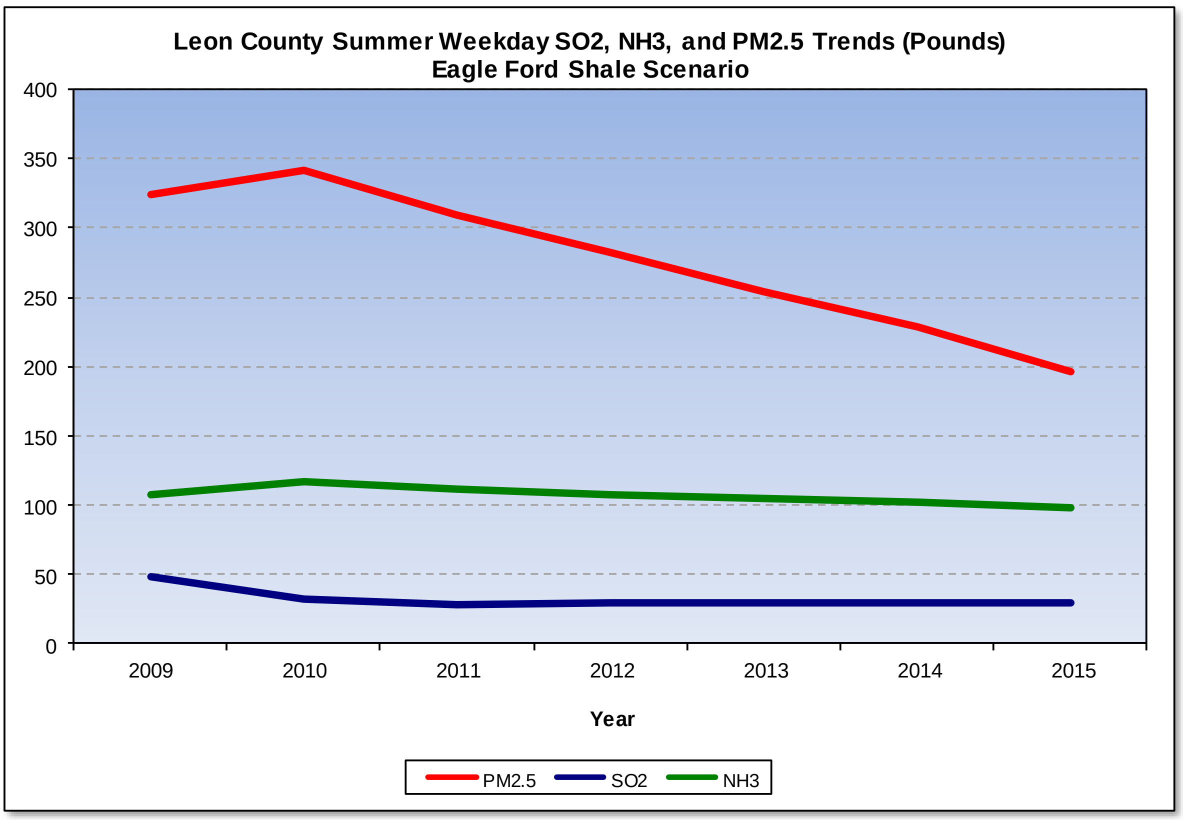

Lee County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
200
180
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Leon County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
2,100,000
1,900,000
1,700,000
1,500,000
1,300,000
1,100,000
900,000
700,000
500,000
VMT
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

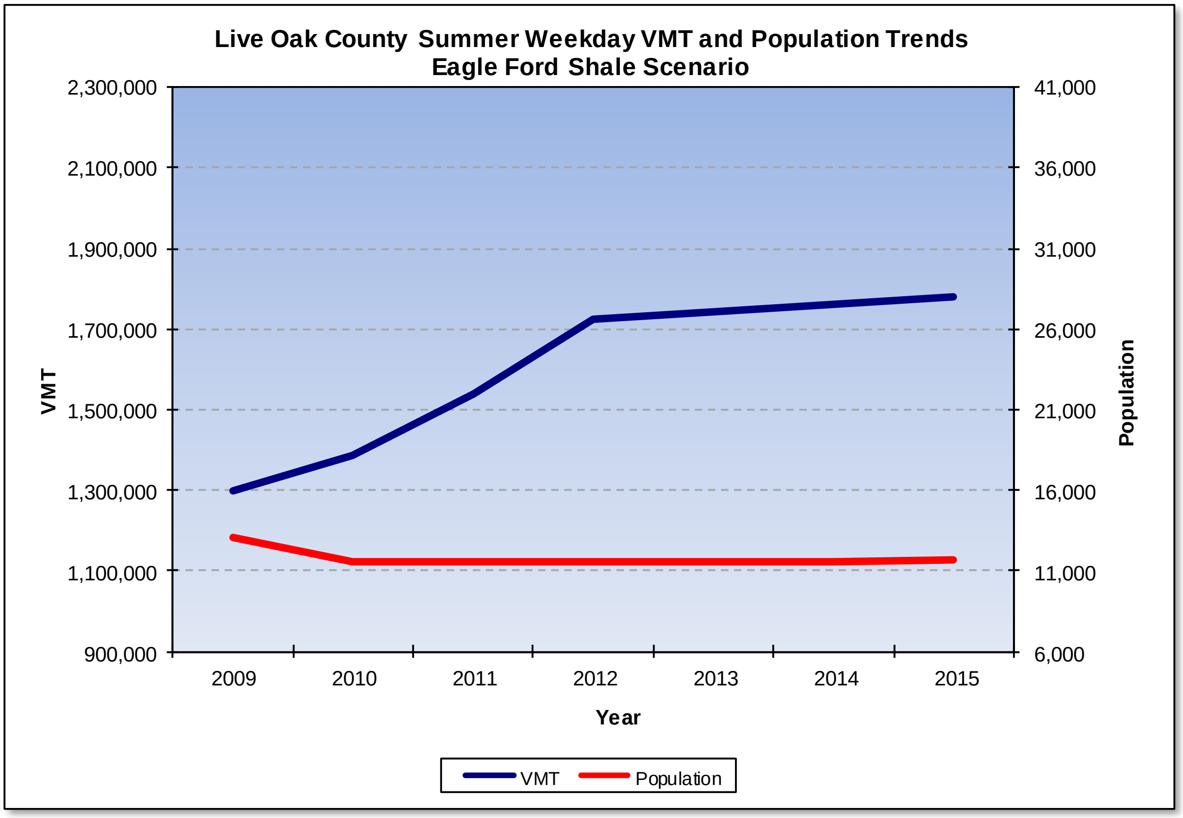

Leon County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
3,100,000
2,600,000
2,100,000
1,600,000
1,100,000
600,000
CO2
31,000
27,000
23,000
19,000
15,000
11,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

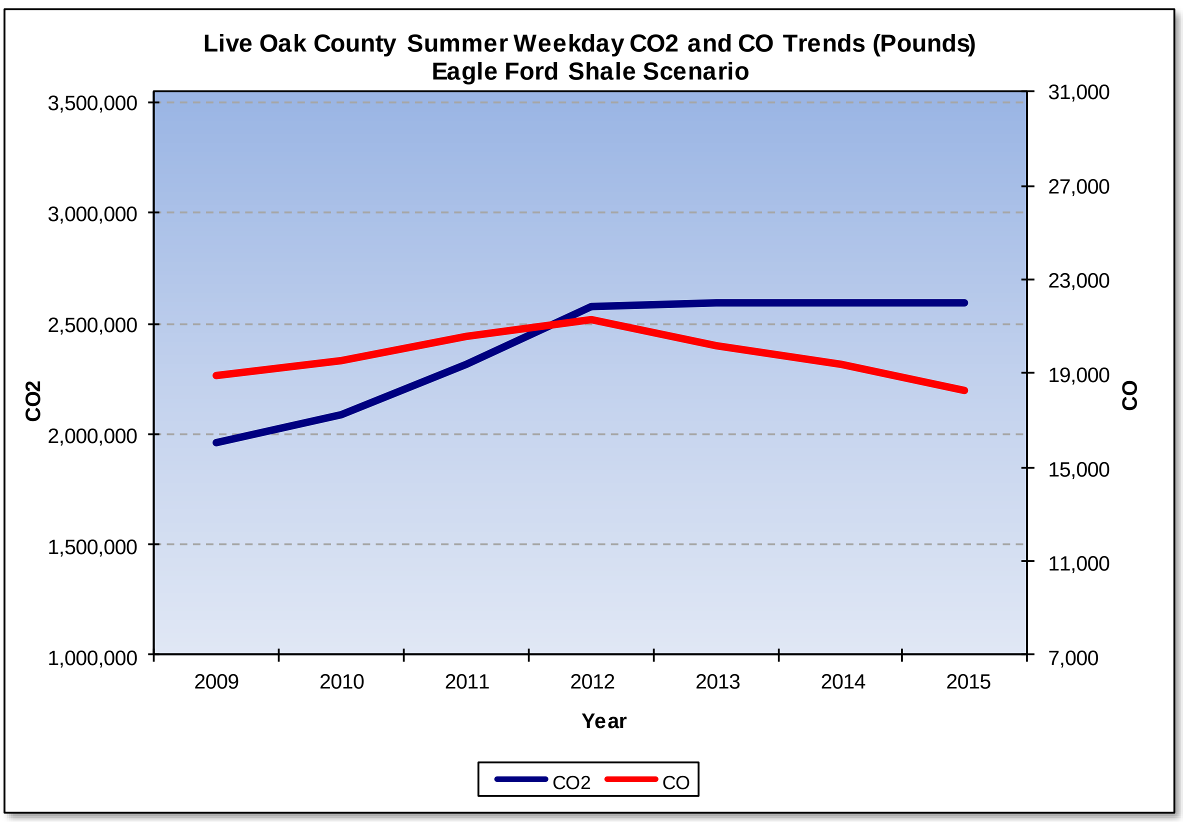


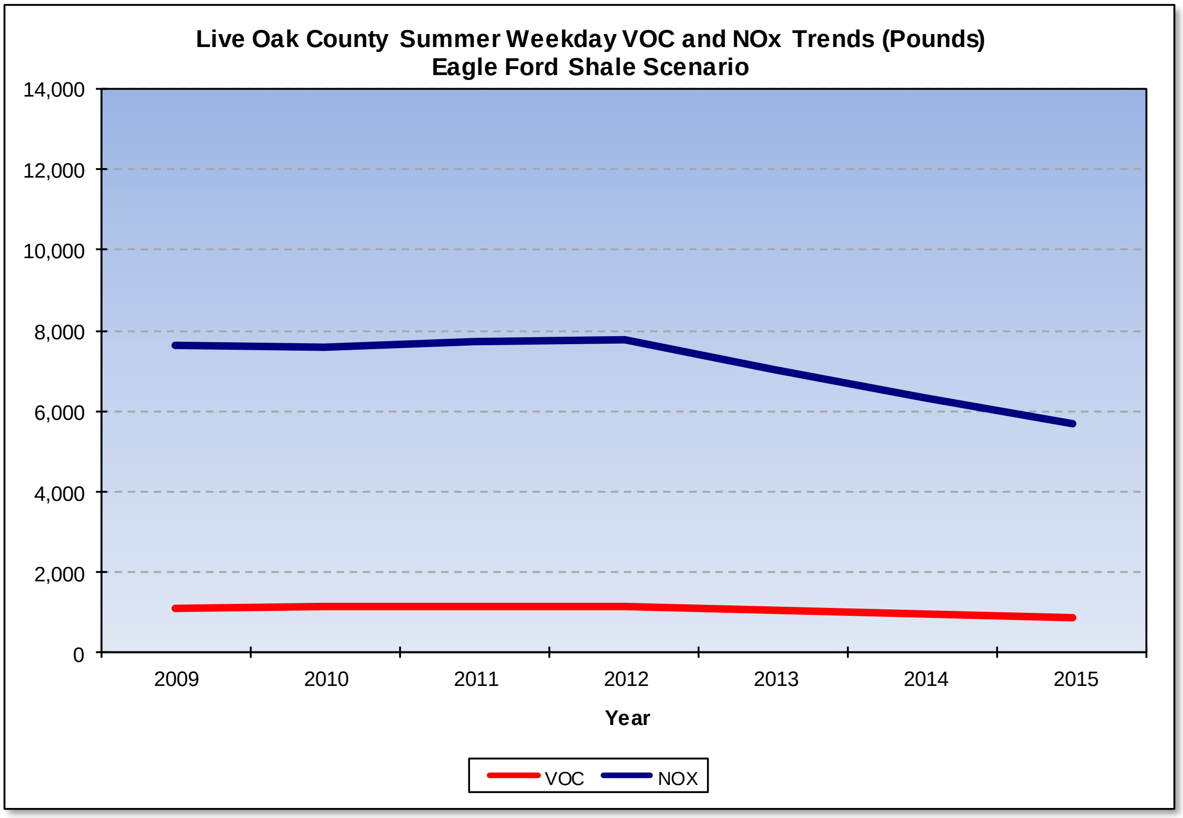
Leon County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

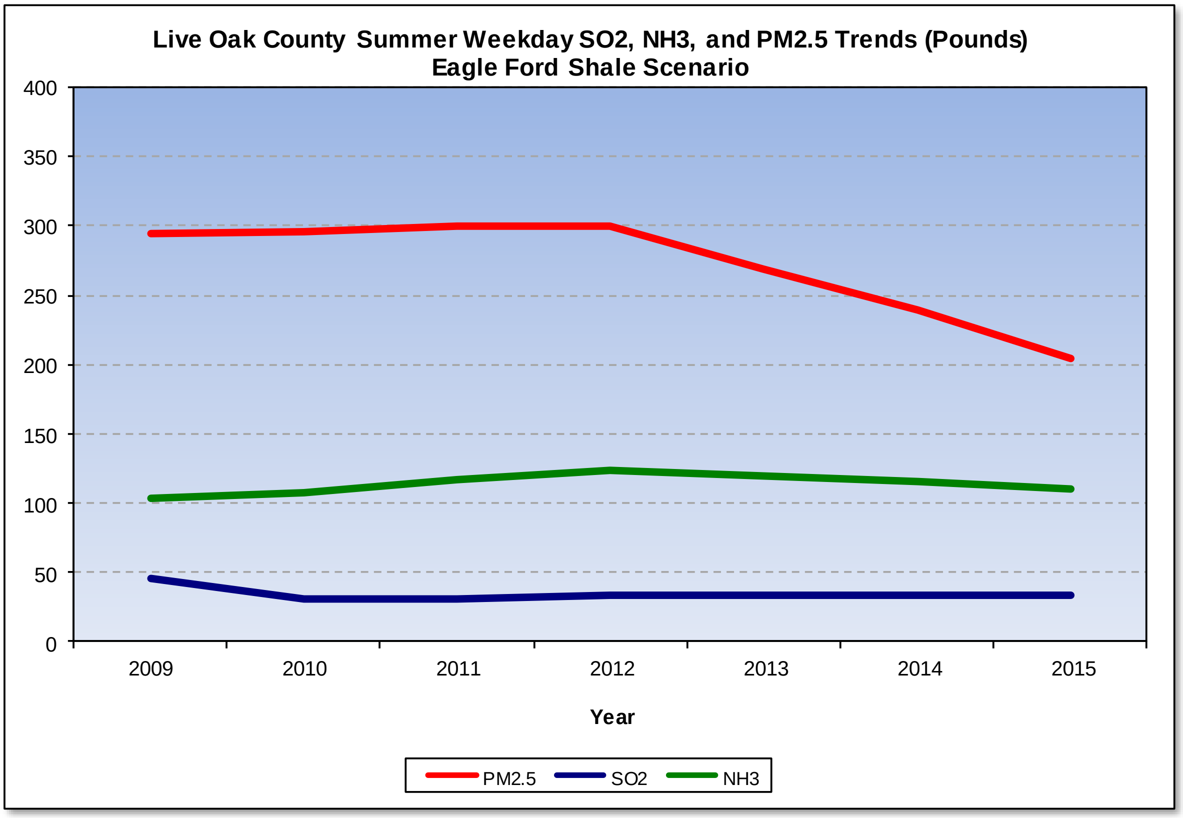


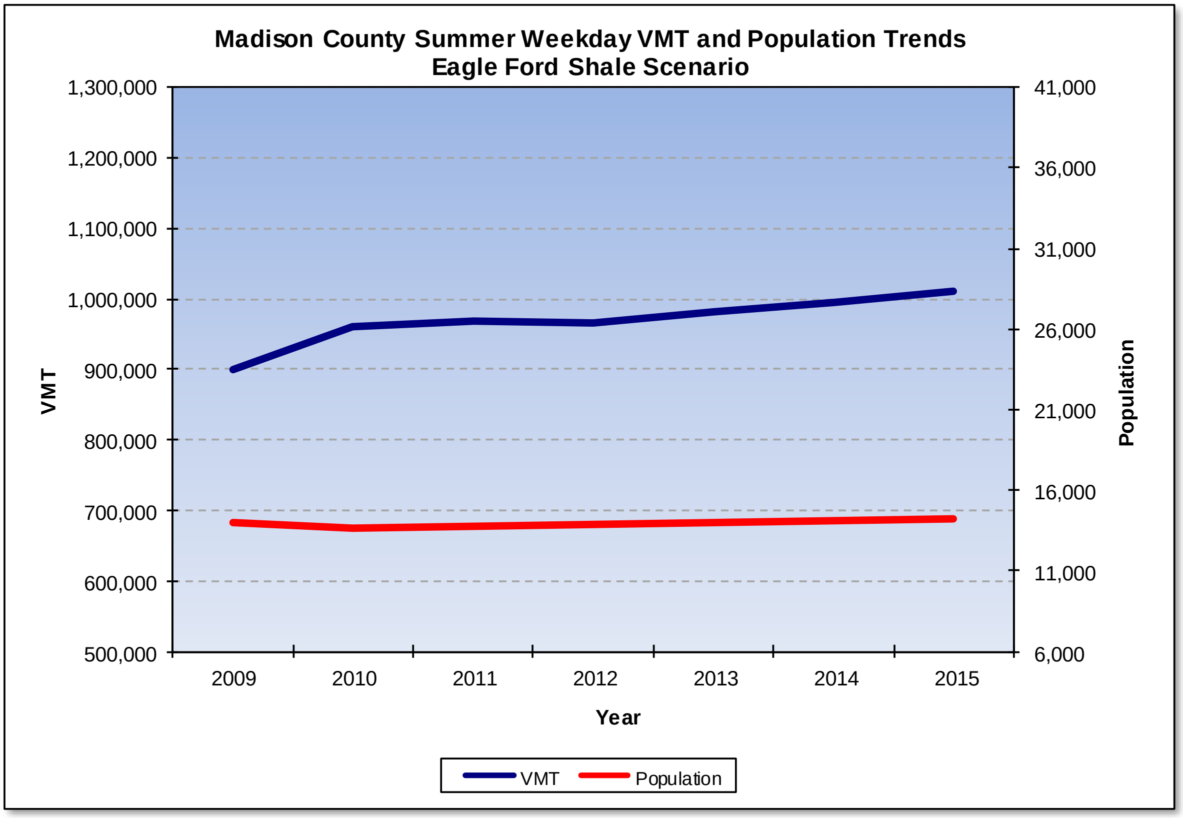
Leon County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Live Oak County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
2,300,000
2,100,000
1,900,000
1,700,000
1,500,000
1,300,000
1,100,000
900,000
VMT
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

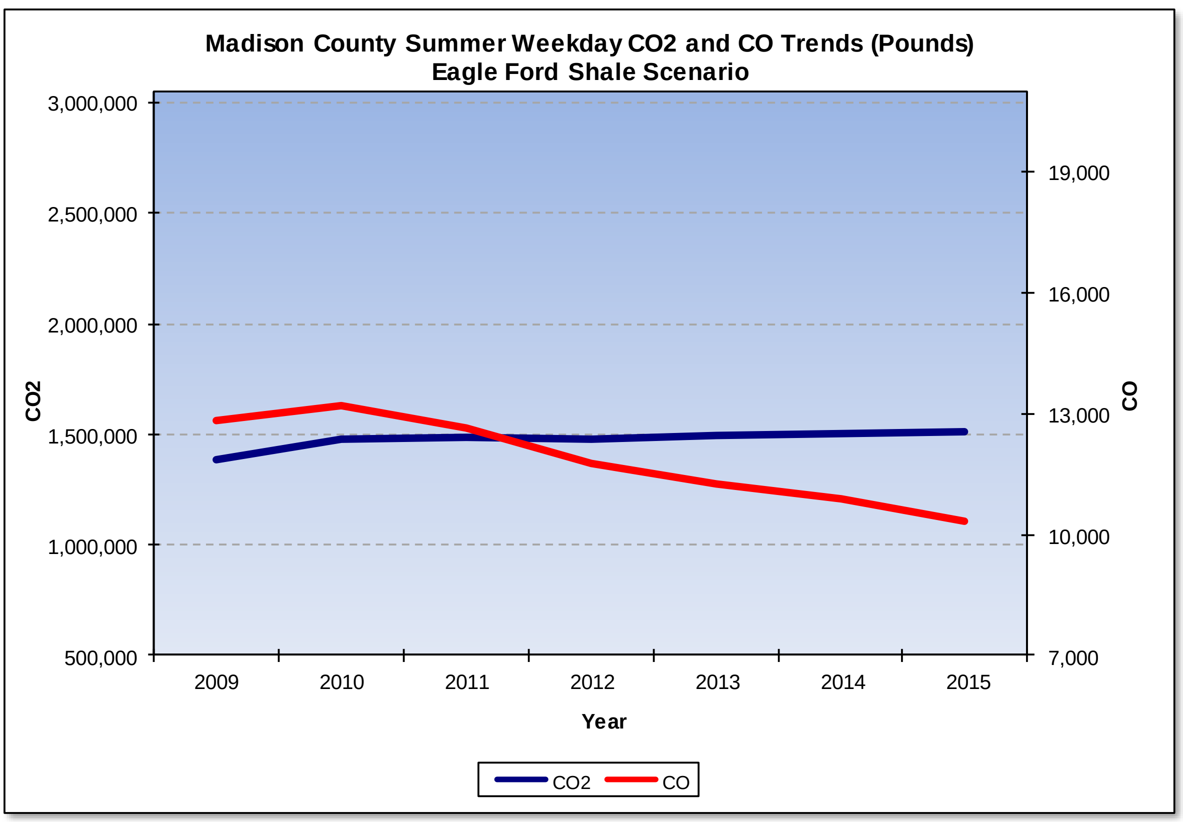

Live Oak County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
CO2
31,000
27,000
23,000
19,000
15,000
11,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


Live Oak County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

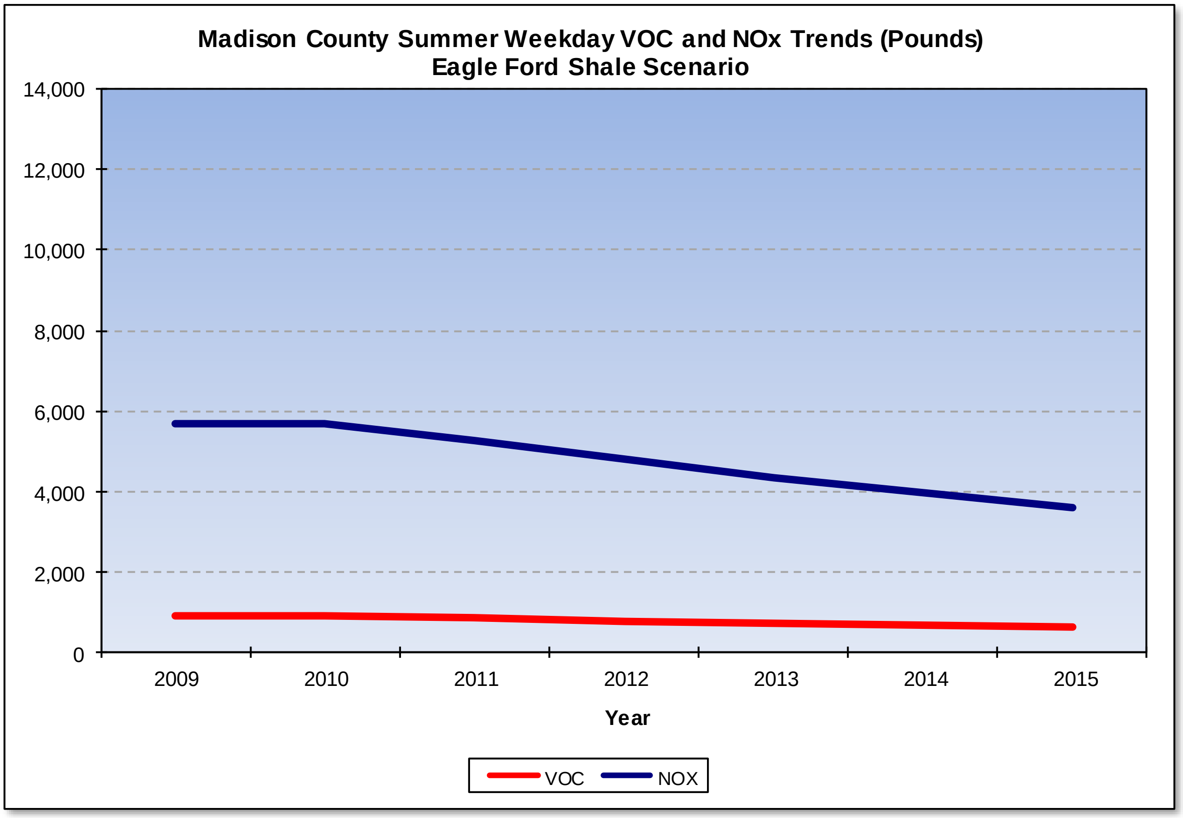

Live Oak County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

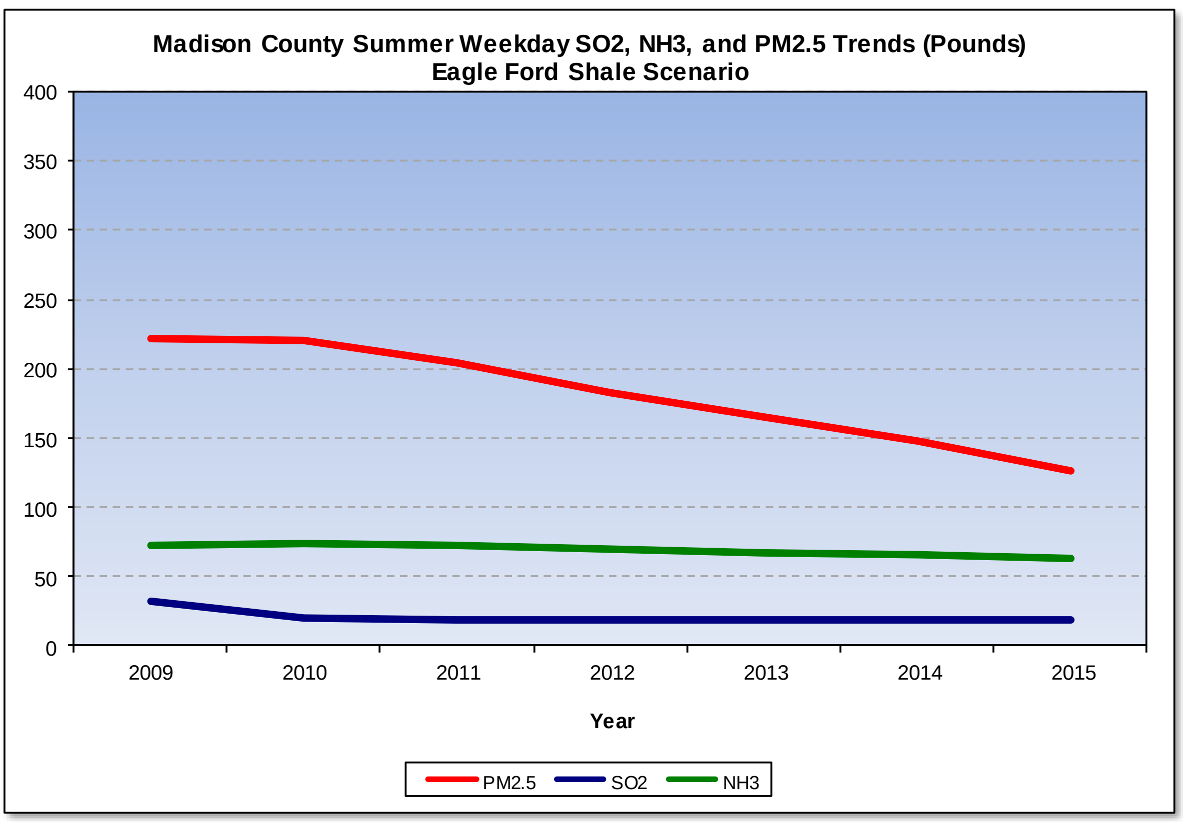


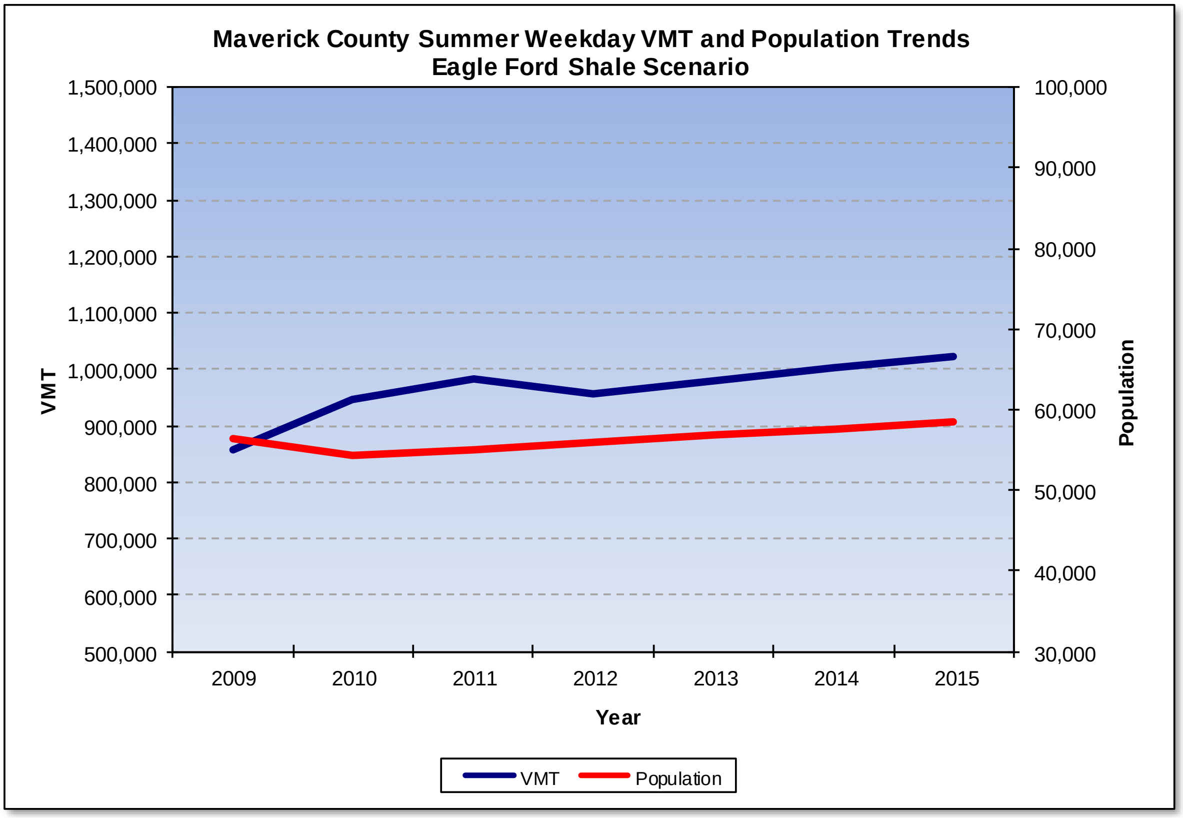
Madison County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
VMT
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

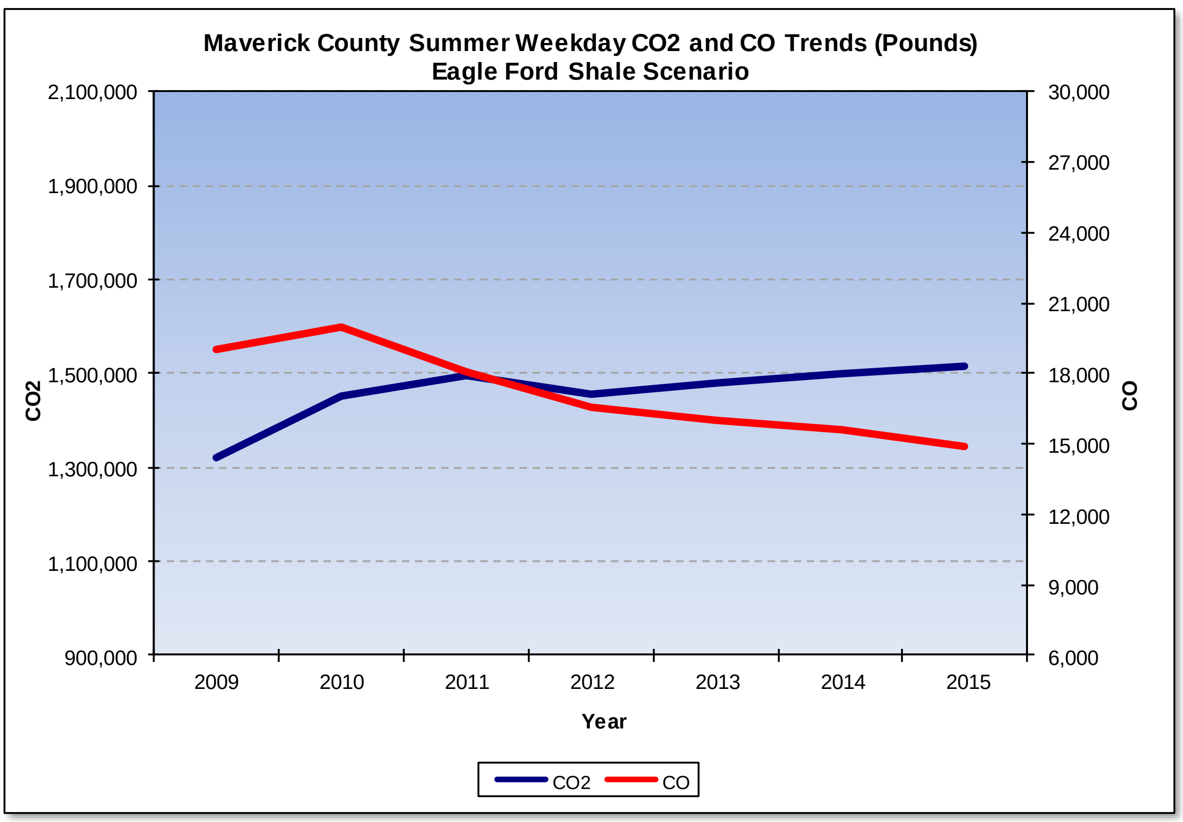


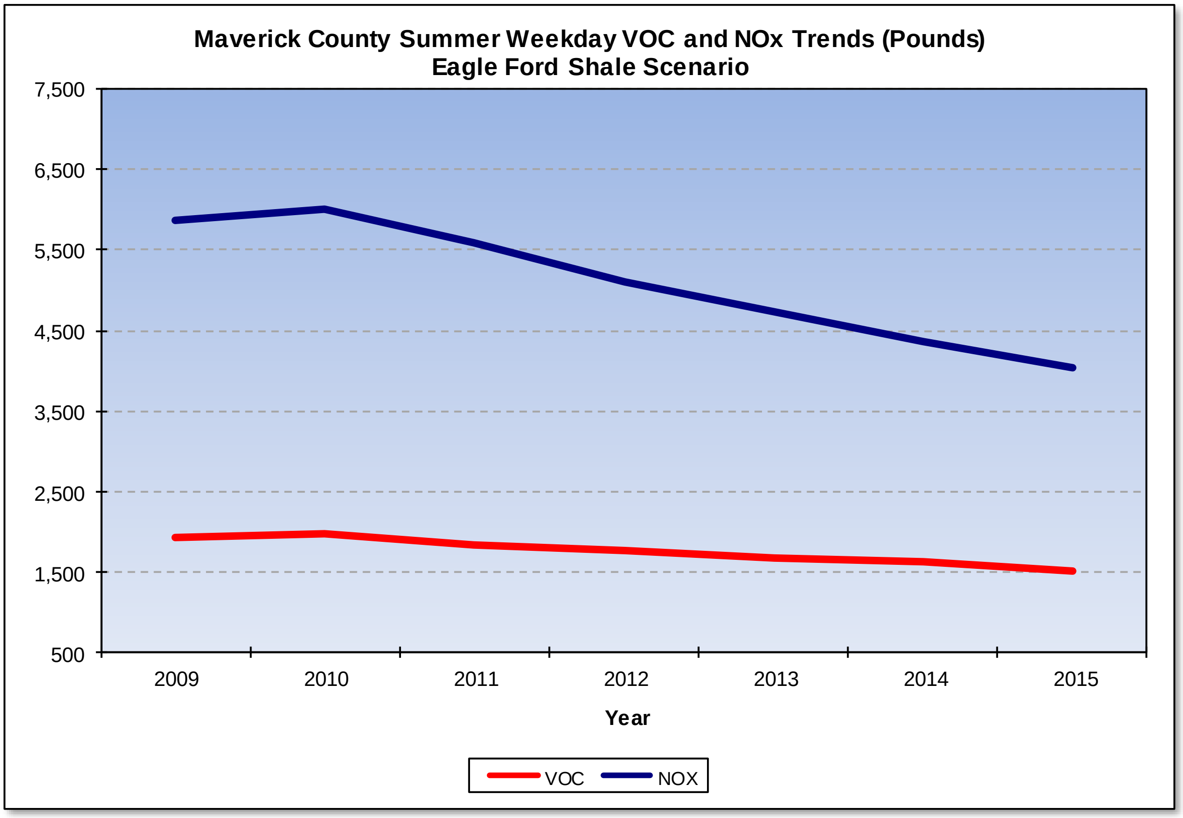
Madison County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
CO2
19,000
16,000
13,000
10,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

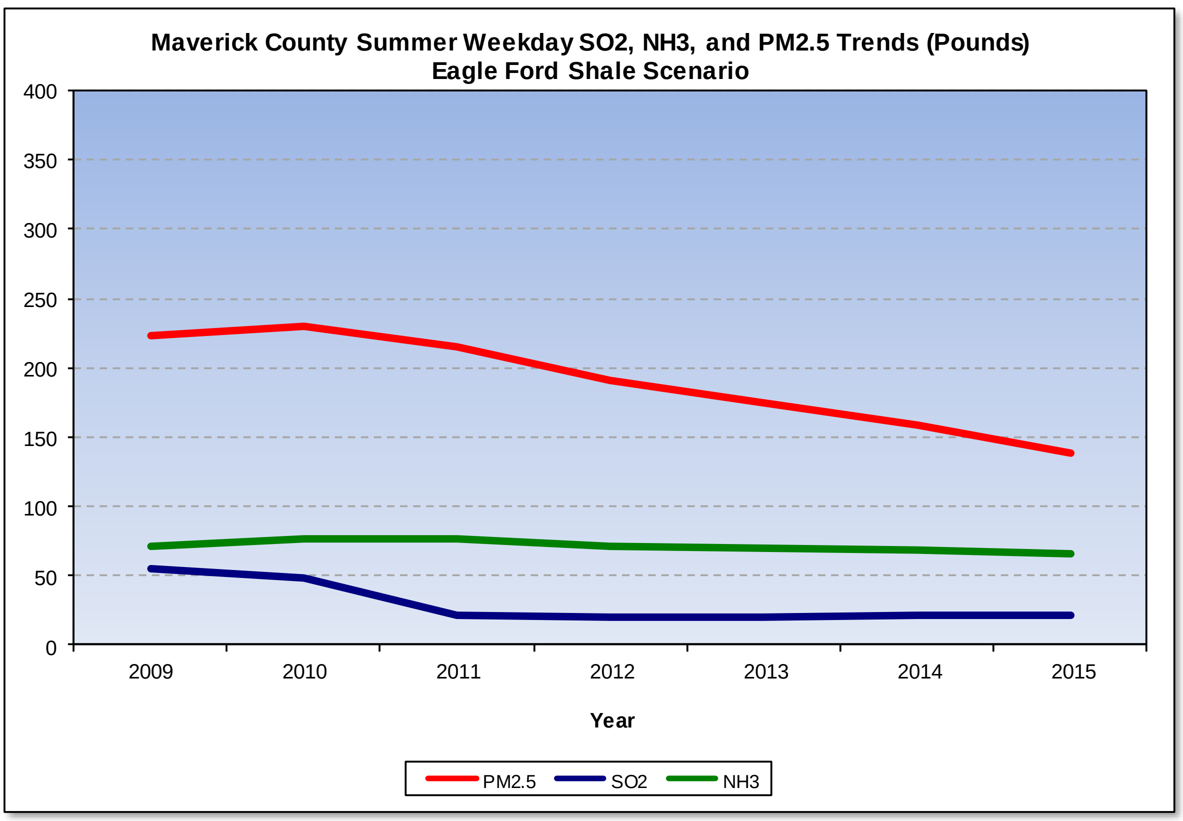

Madison County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

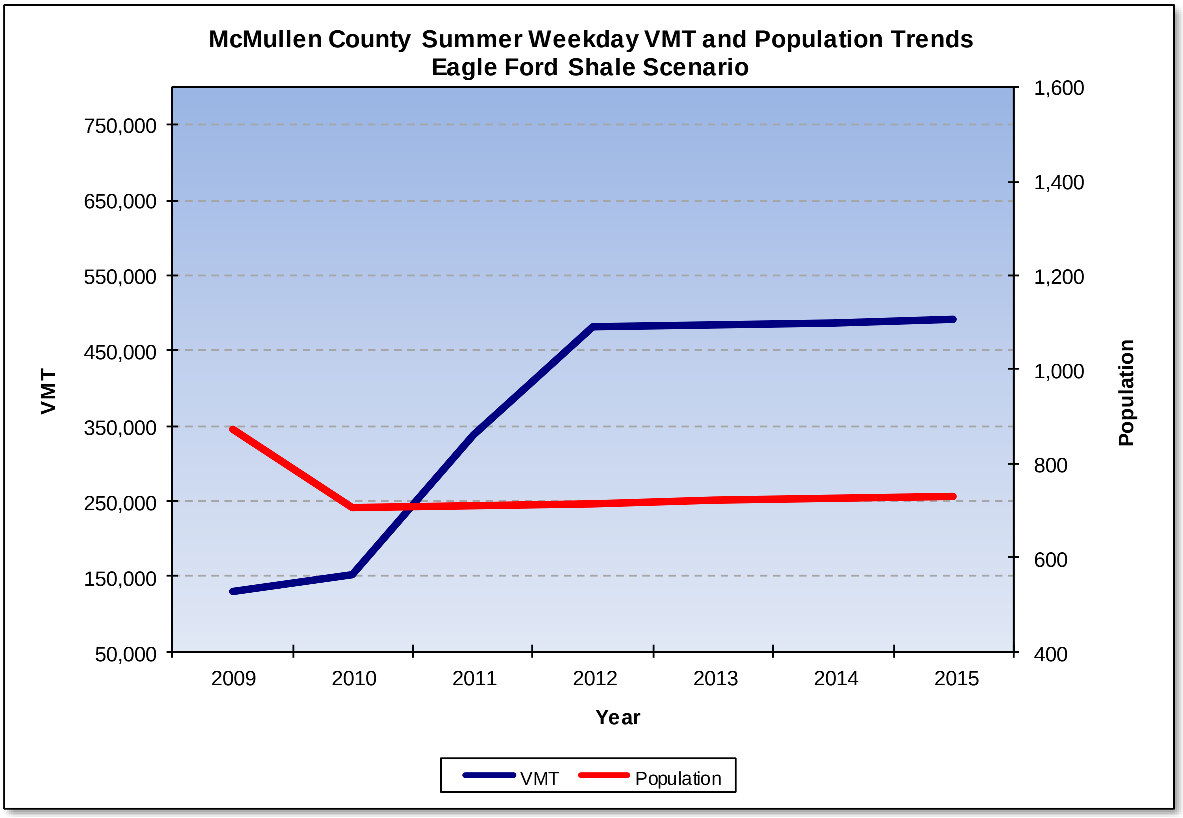

Madison County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

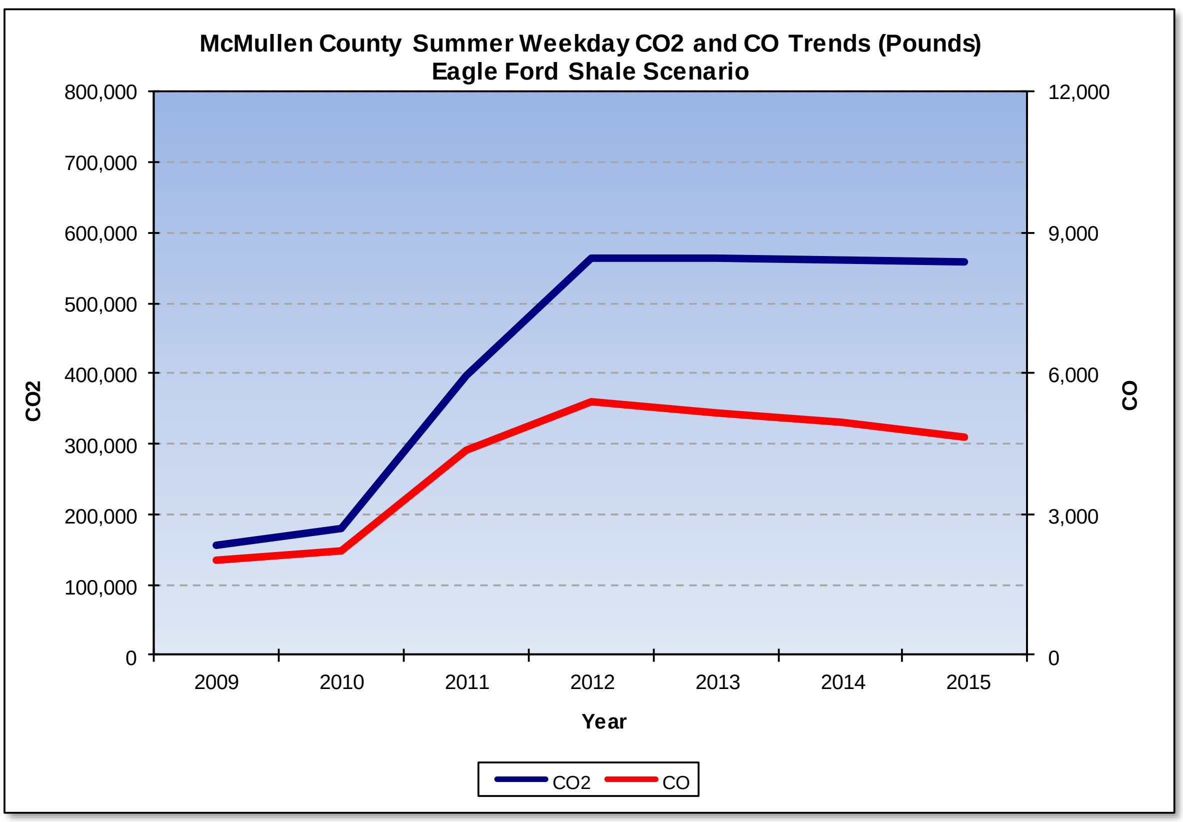

Maverick County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
1,500,000
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
VMT
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

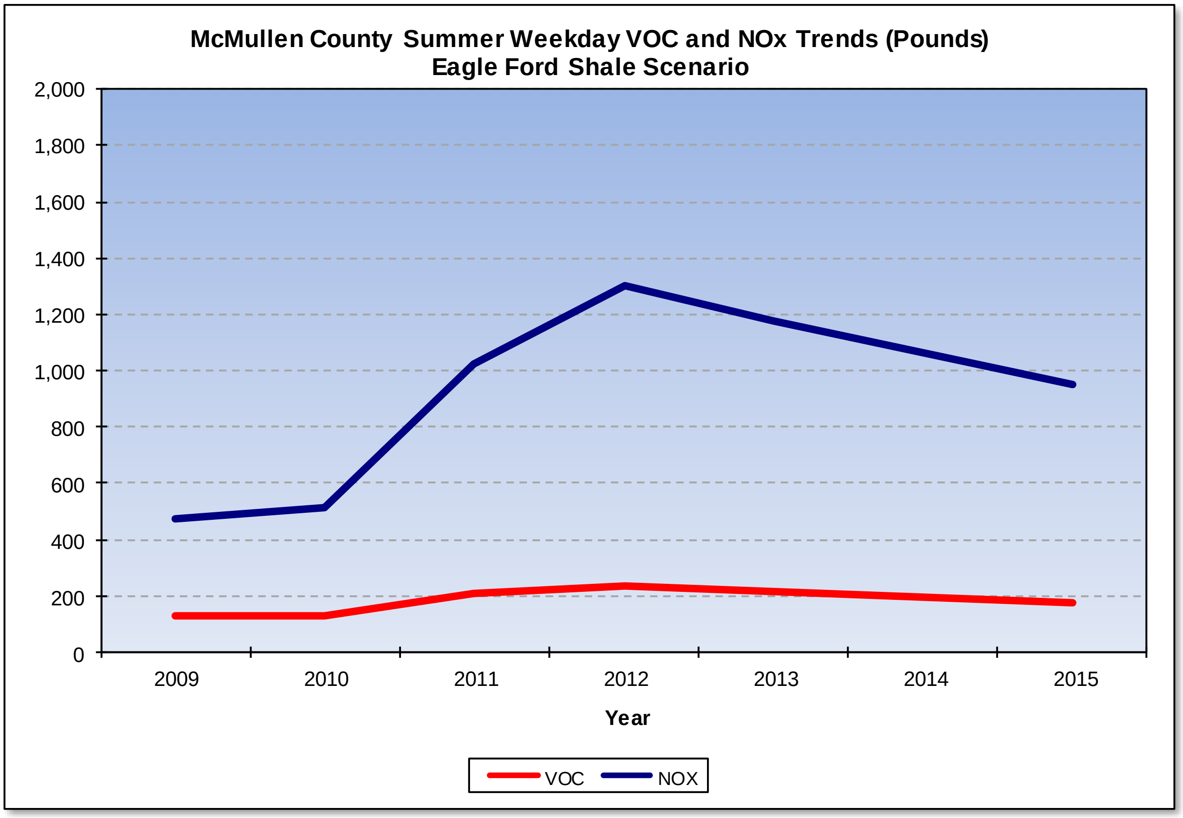

Maverick County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
2,100,000
1,900,000
1,700,000
1,500,000
1,300,000
1,100,000
900,000
CO2
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
6,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

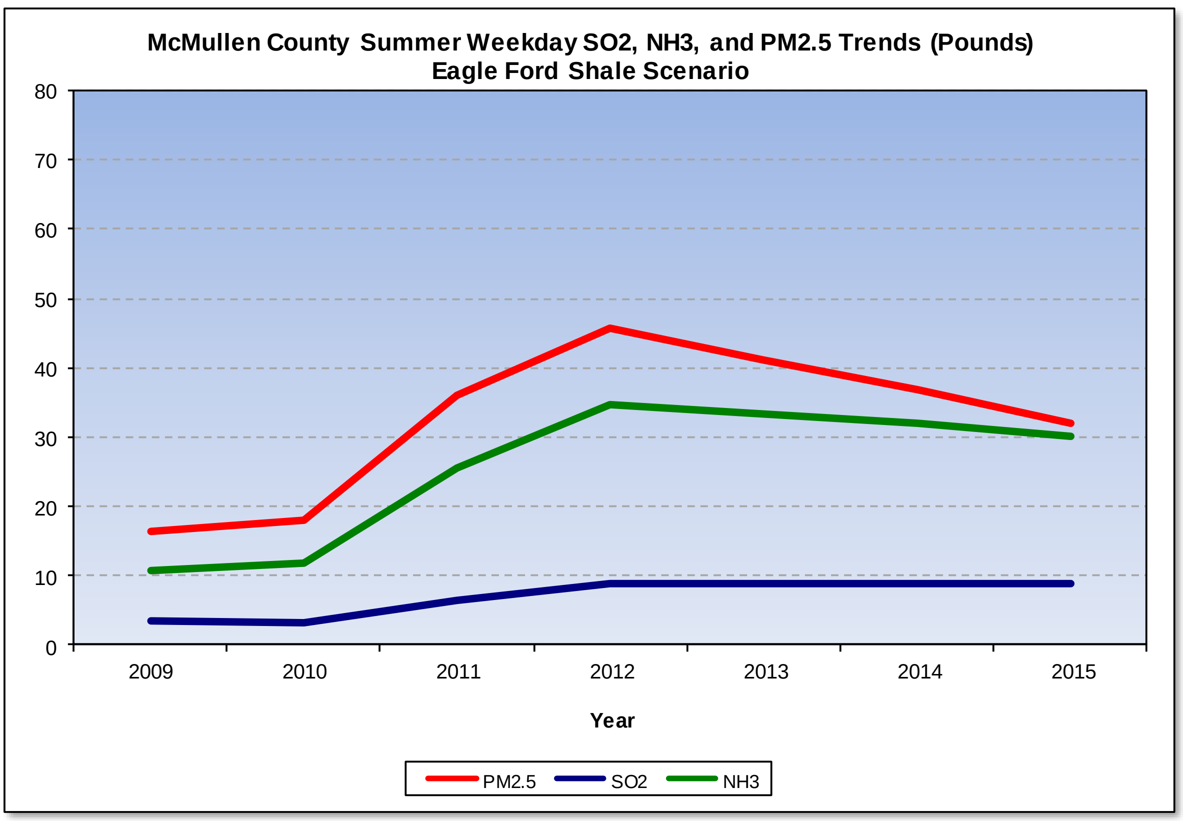

Maverick County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
7,500
6,500
5,500
4,500
3,500
2,500
1,500
500
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

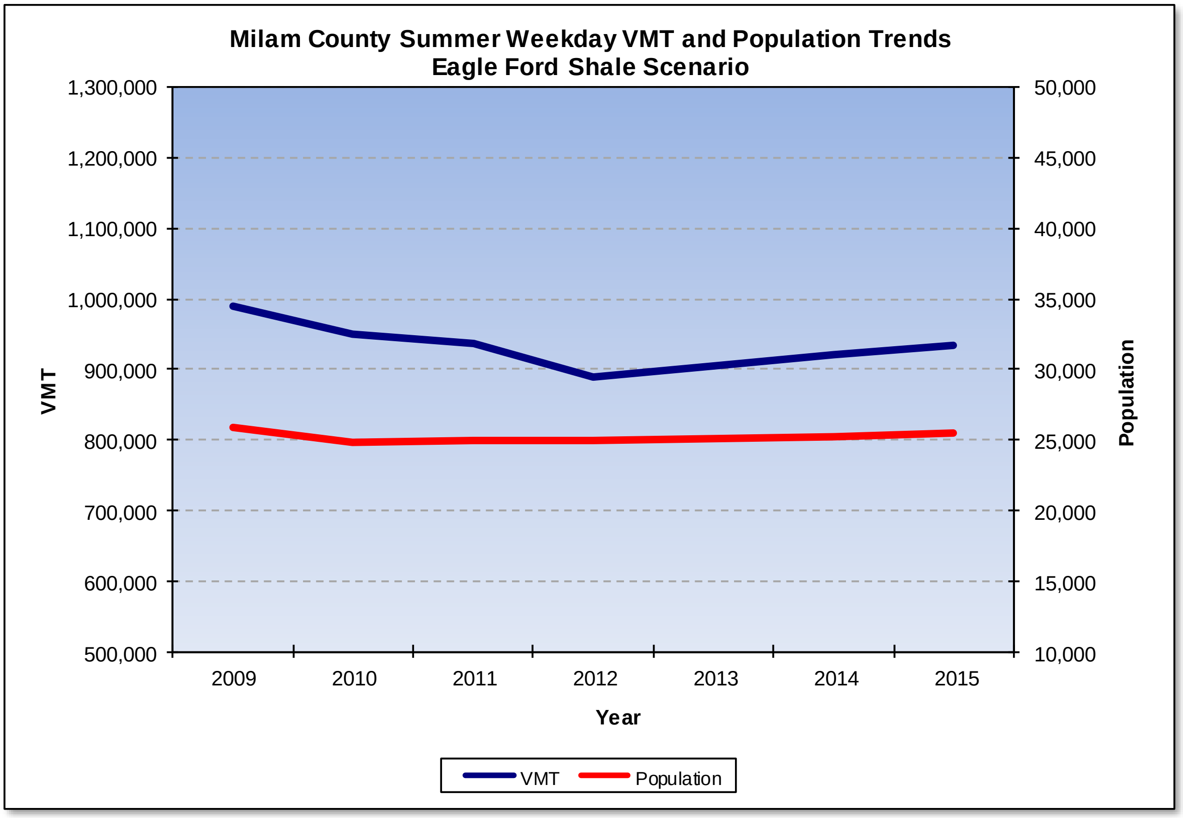

Maverick County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

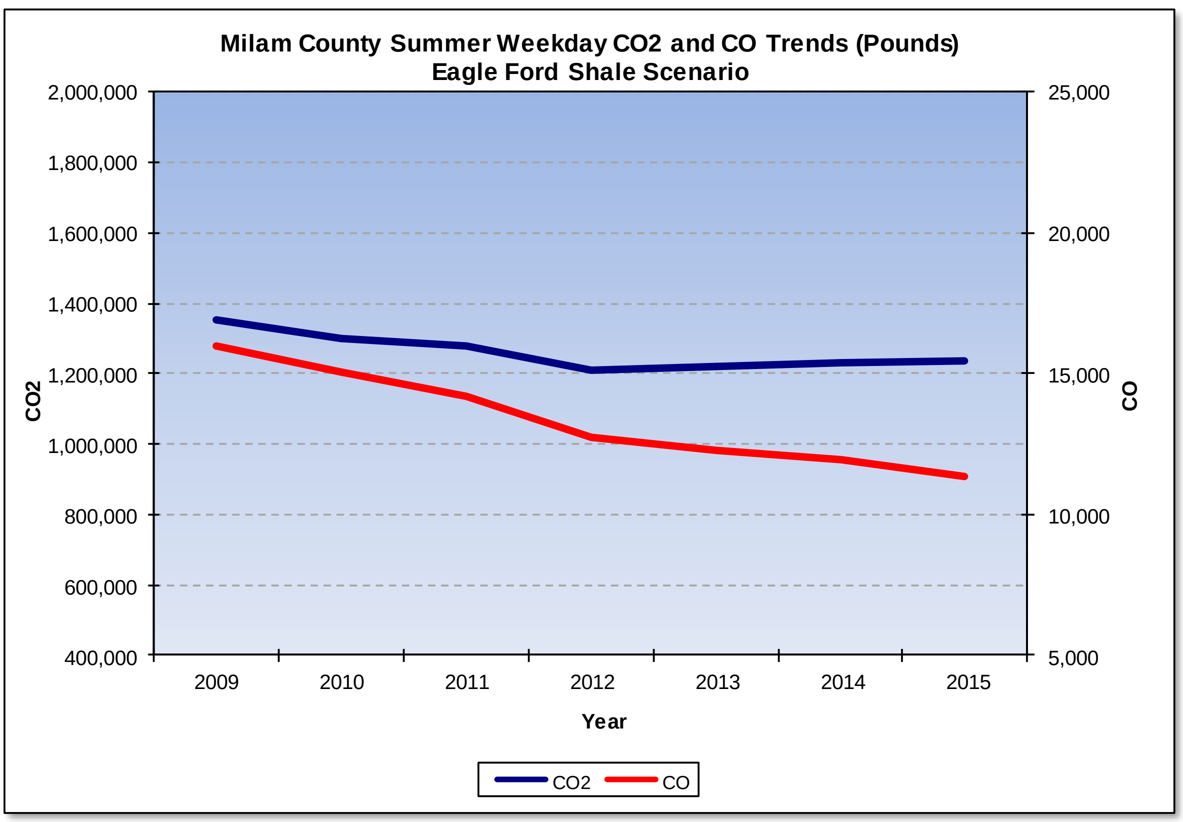

McMullen County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
750,000
650,000
550,000
450,000
350,000
250,000
150,000
50,000
Population
1,600
1,400
1,200
1,000
800
600
400
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

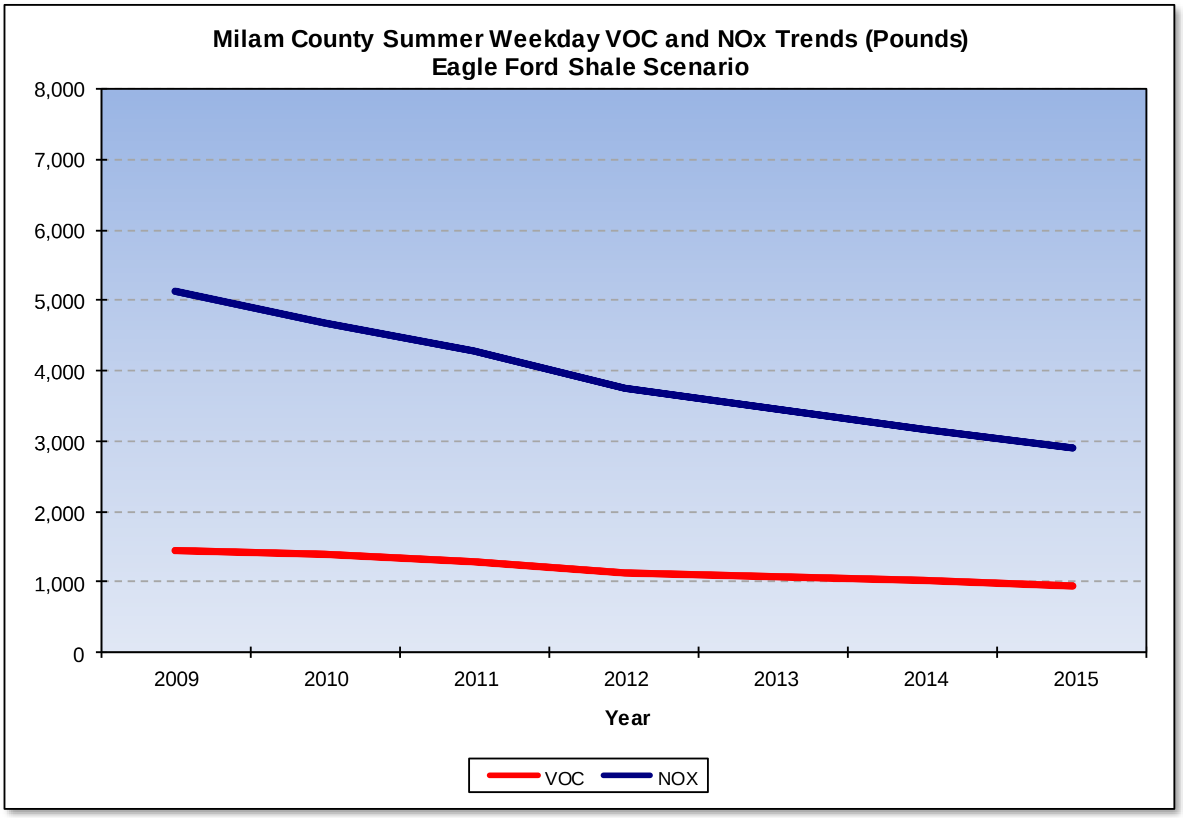

McMullen County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
CO
12,000
9,000
6,000
3,000
0
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

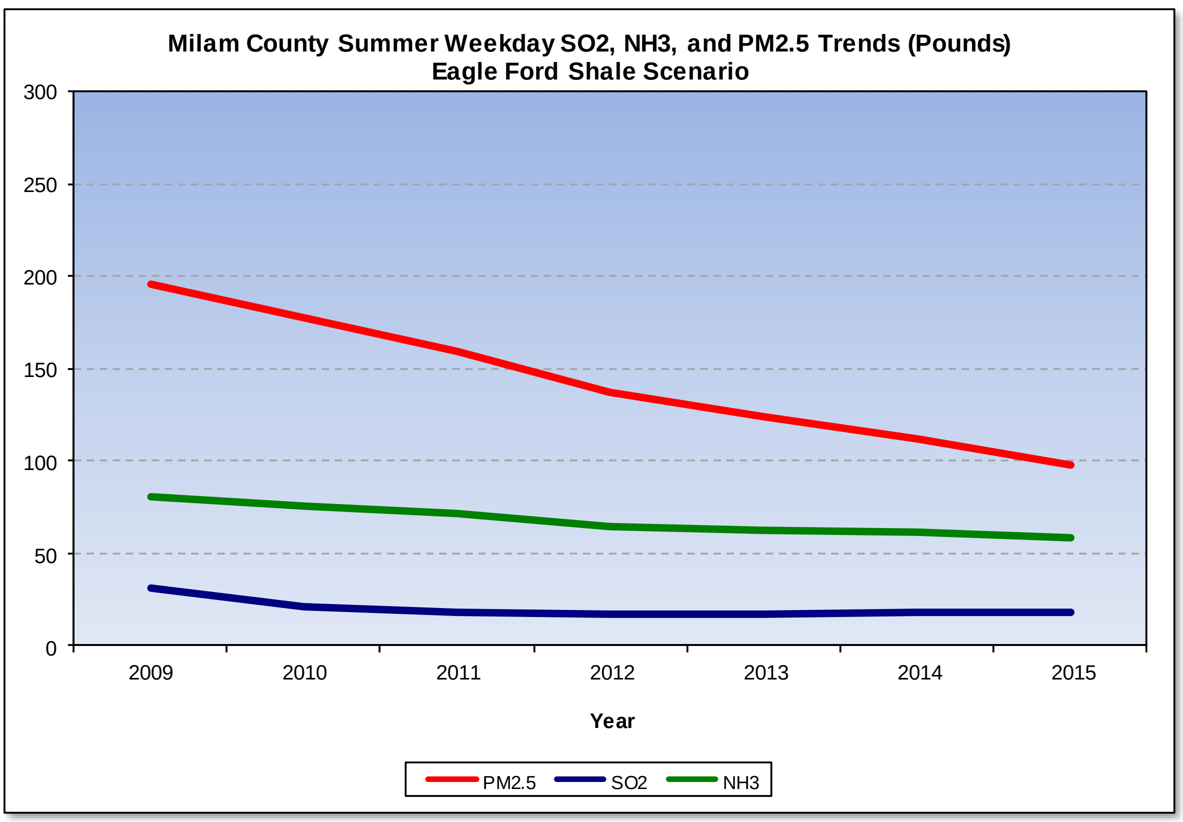

McMullen County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

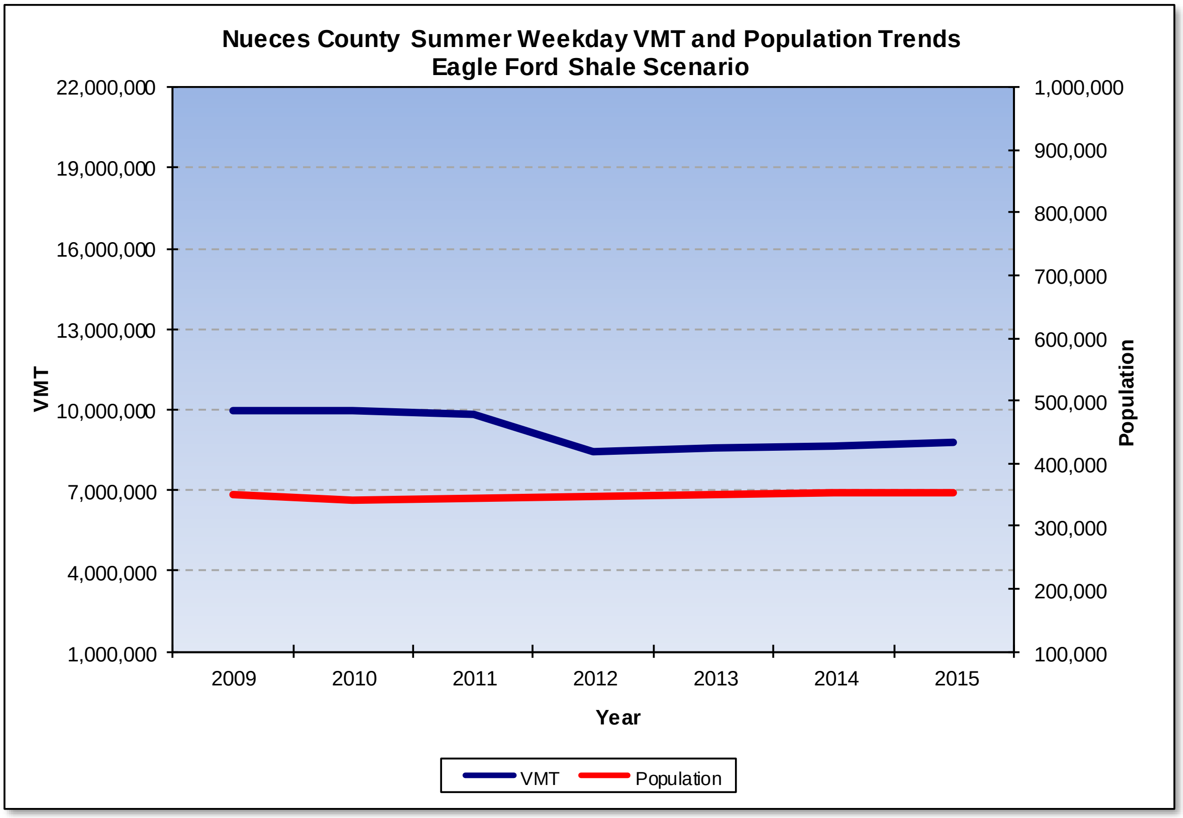

McMullen County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
80
70
60
50
40
30
20
10
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

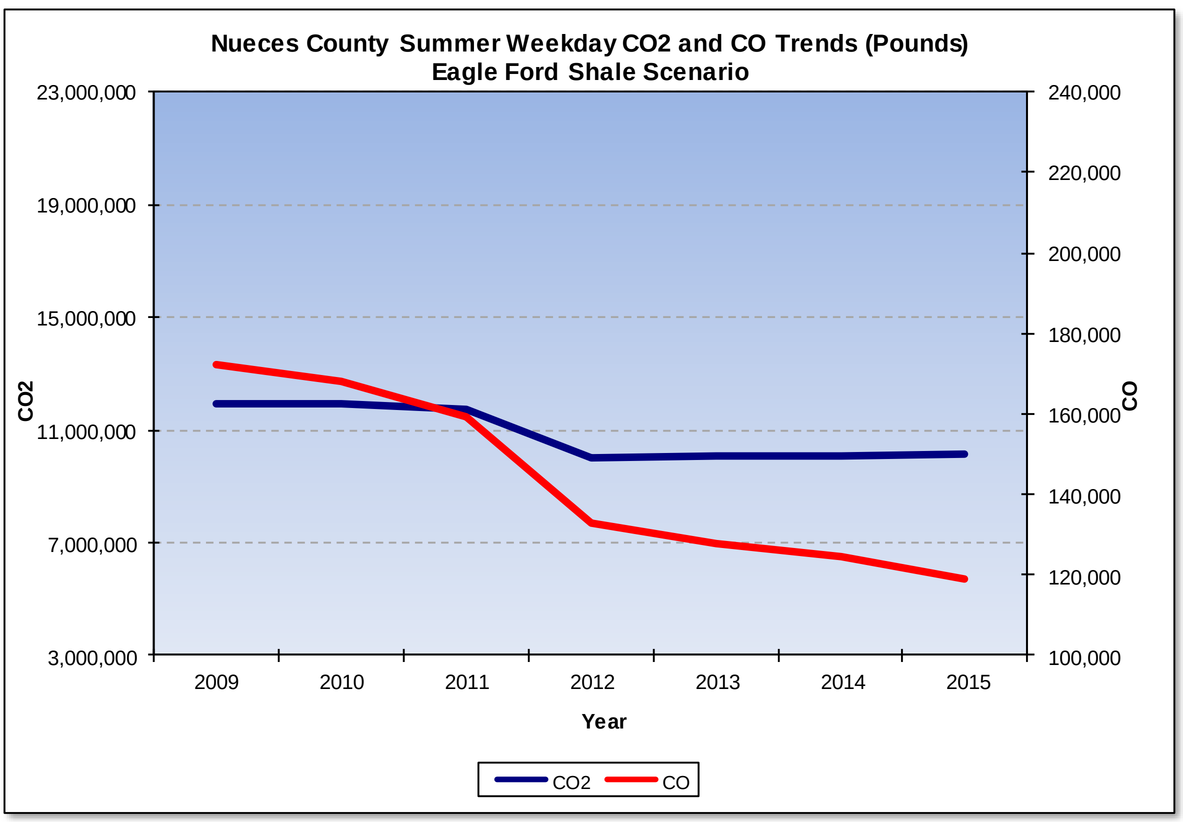

Milam County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
Population
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

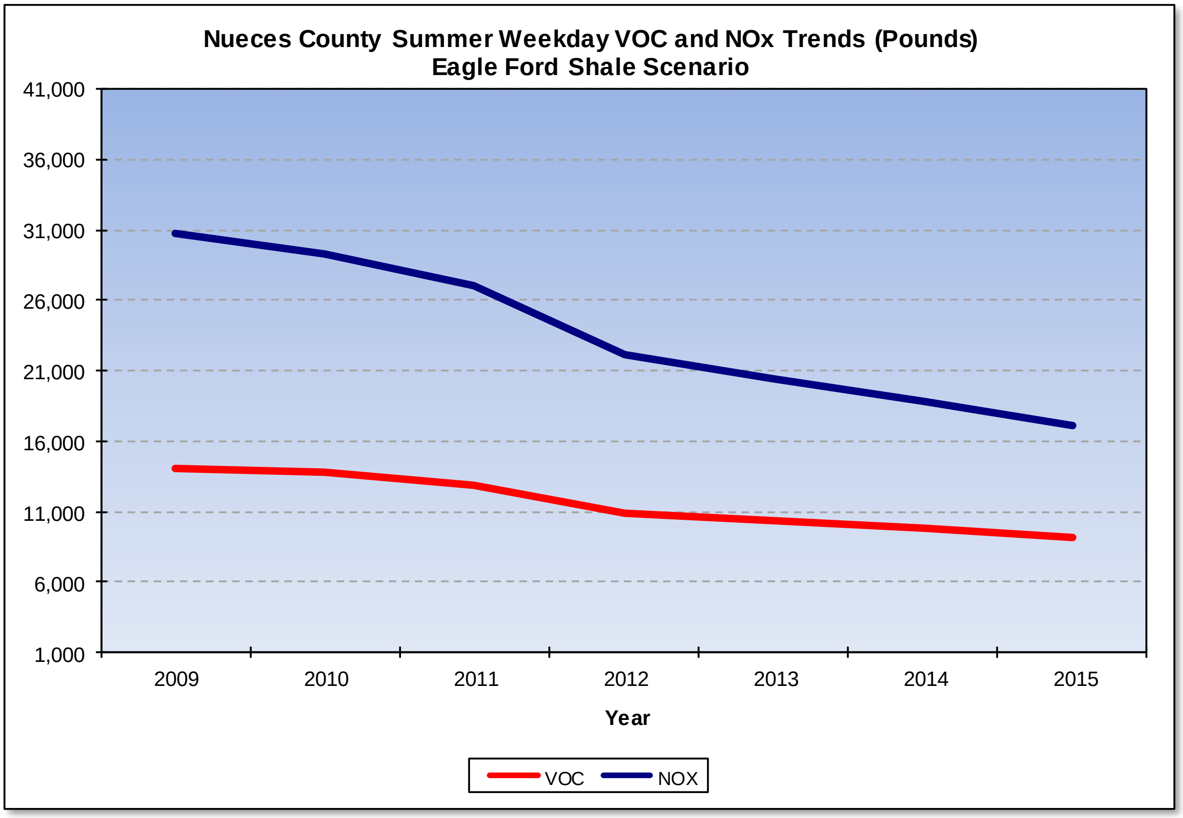

Milam County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
CO
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
25,000
20,000
15,000
10,000
5,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

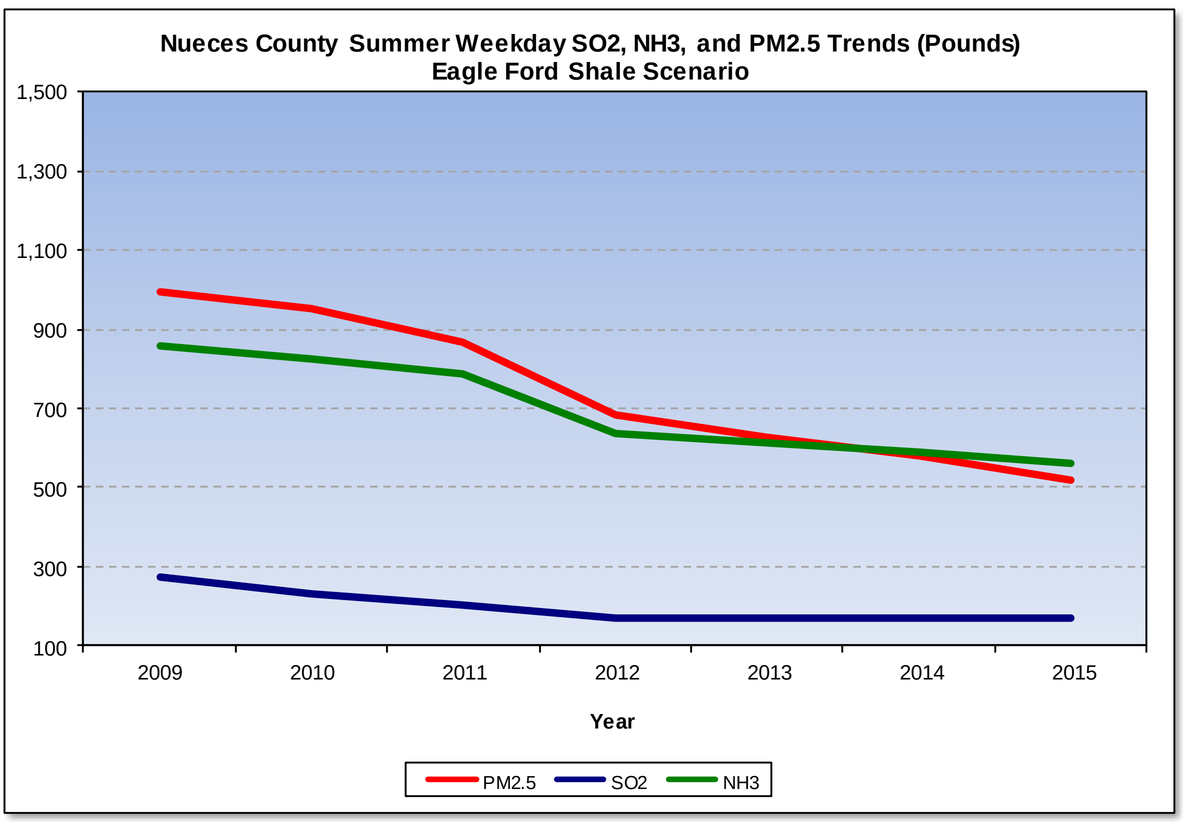

Milam County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

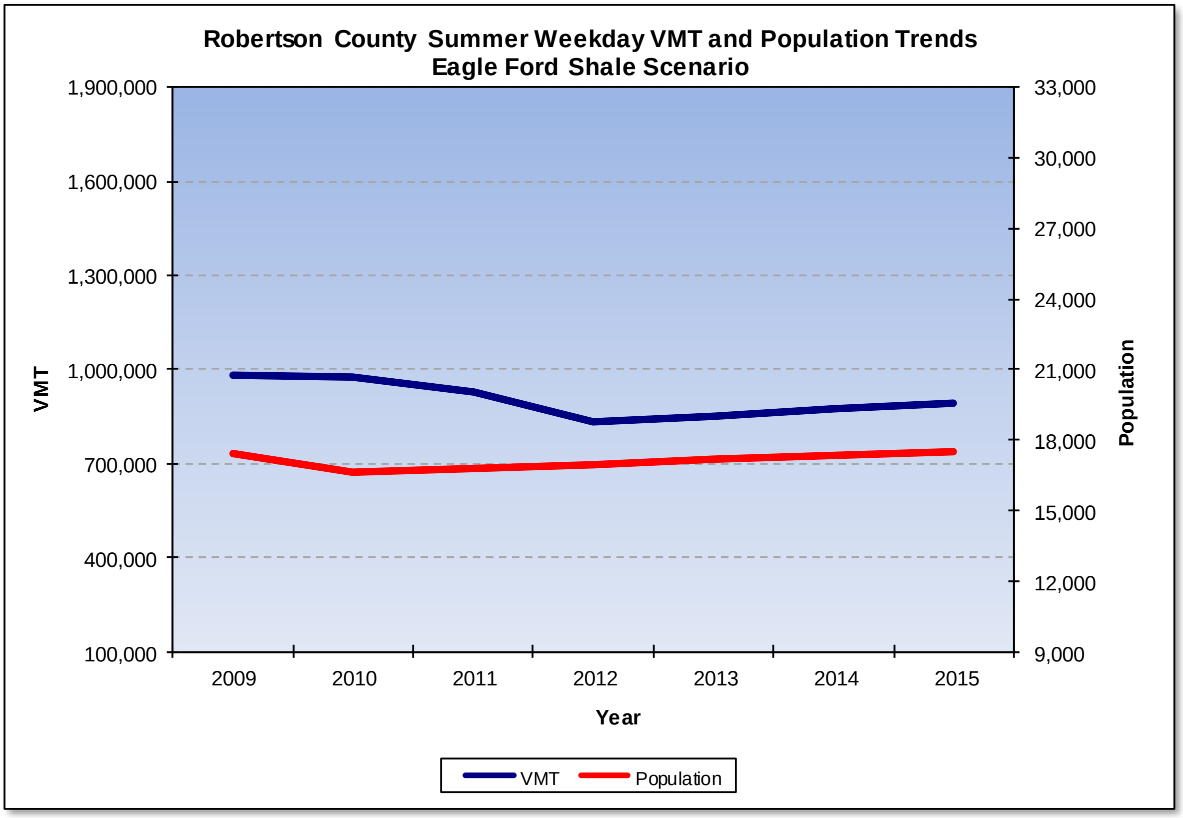

Milam County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

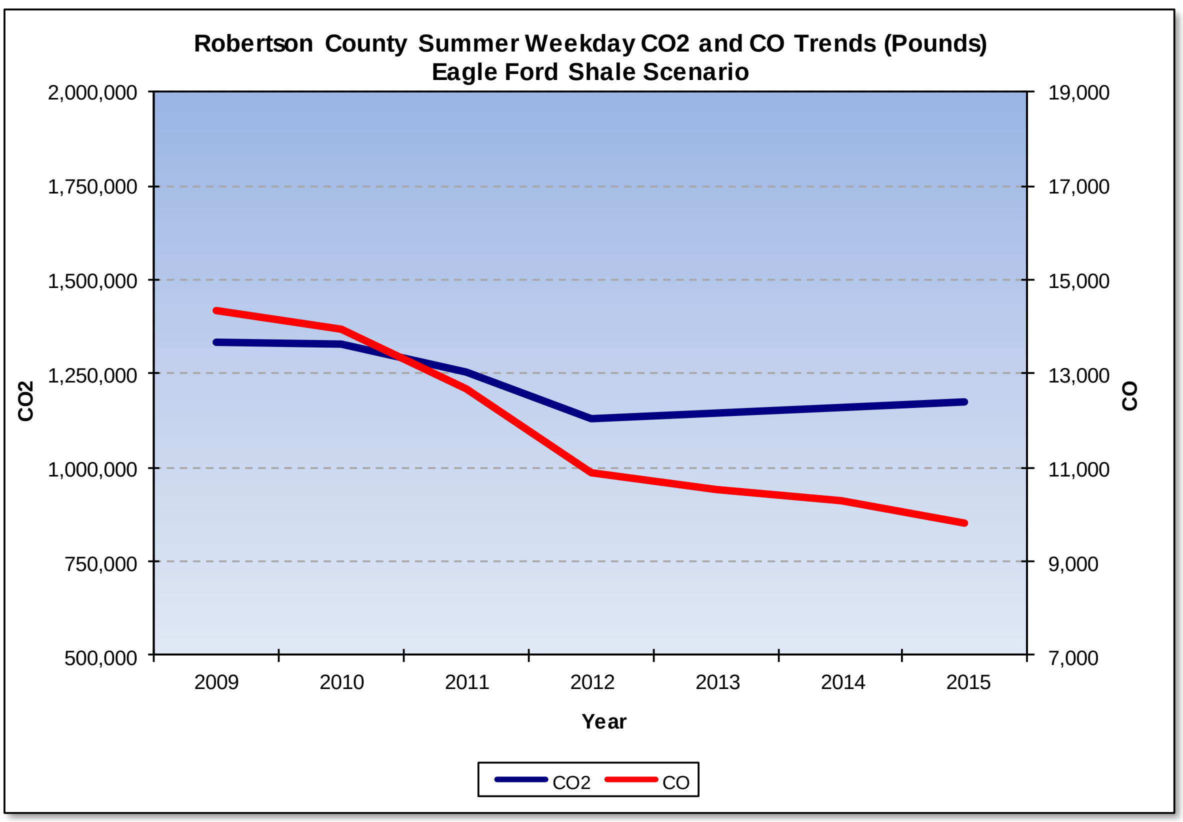

Nueces County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
22,000,000
19,000,000
16,000,000
13,000,000
10,000,000
7,000,000
4,000,000
1,000,000
VMT
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

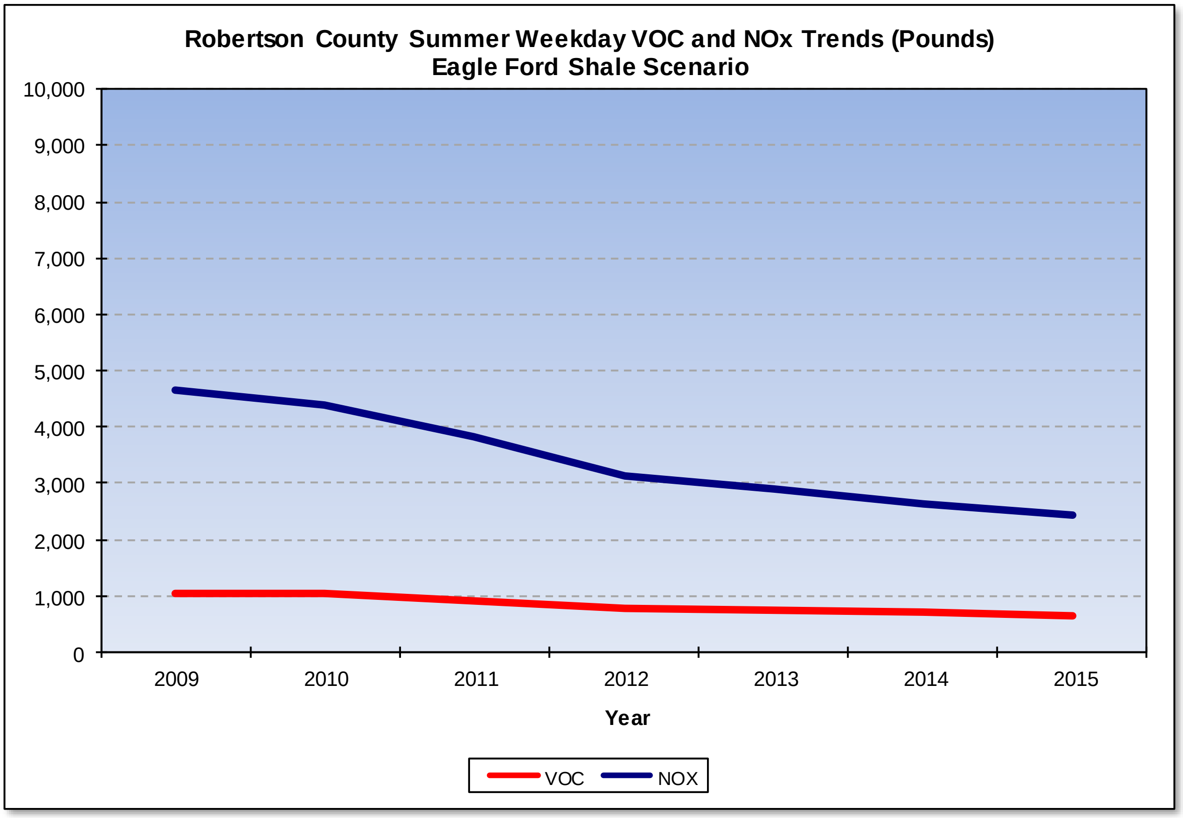

Nueces County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
23,000,000
19,000,000
15,000,000
11,000,000
7,000,000
3,000,000
CO2
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

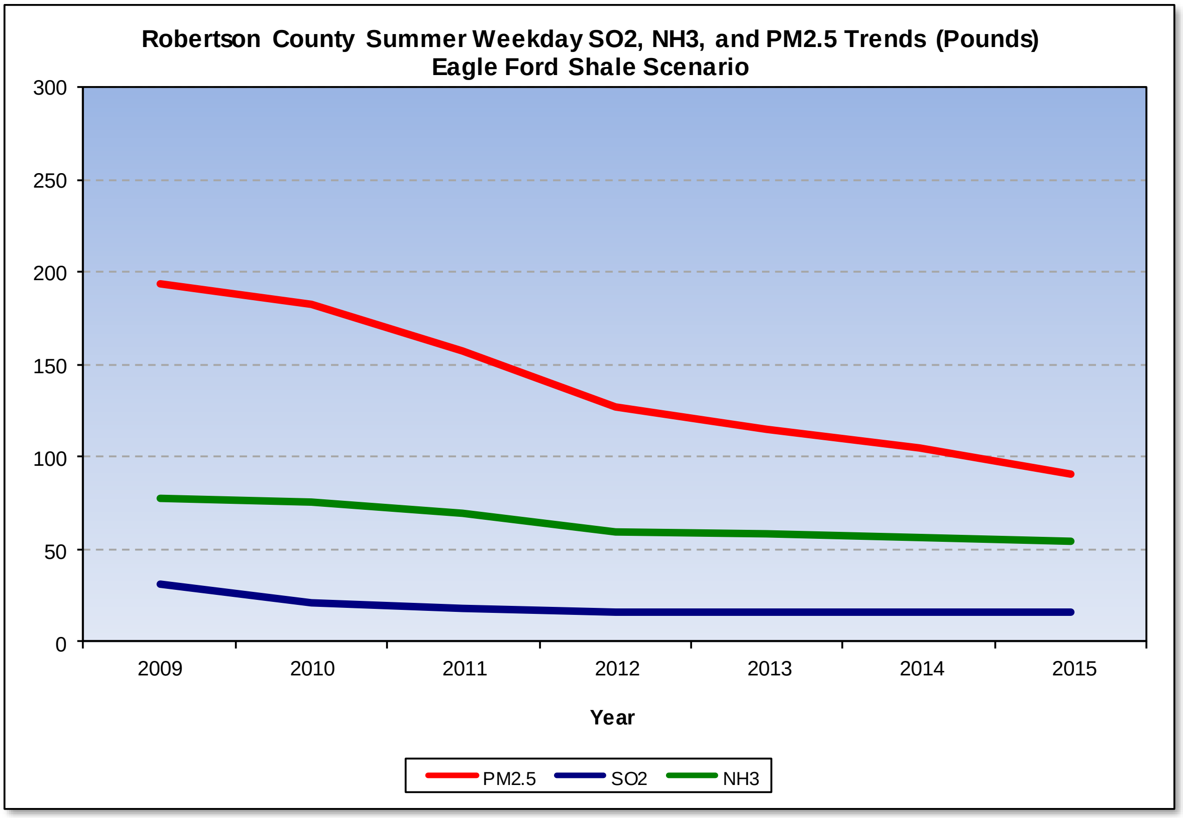

Nueces County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

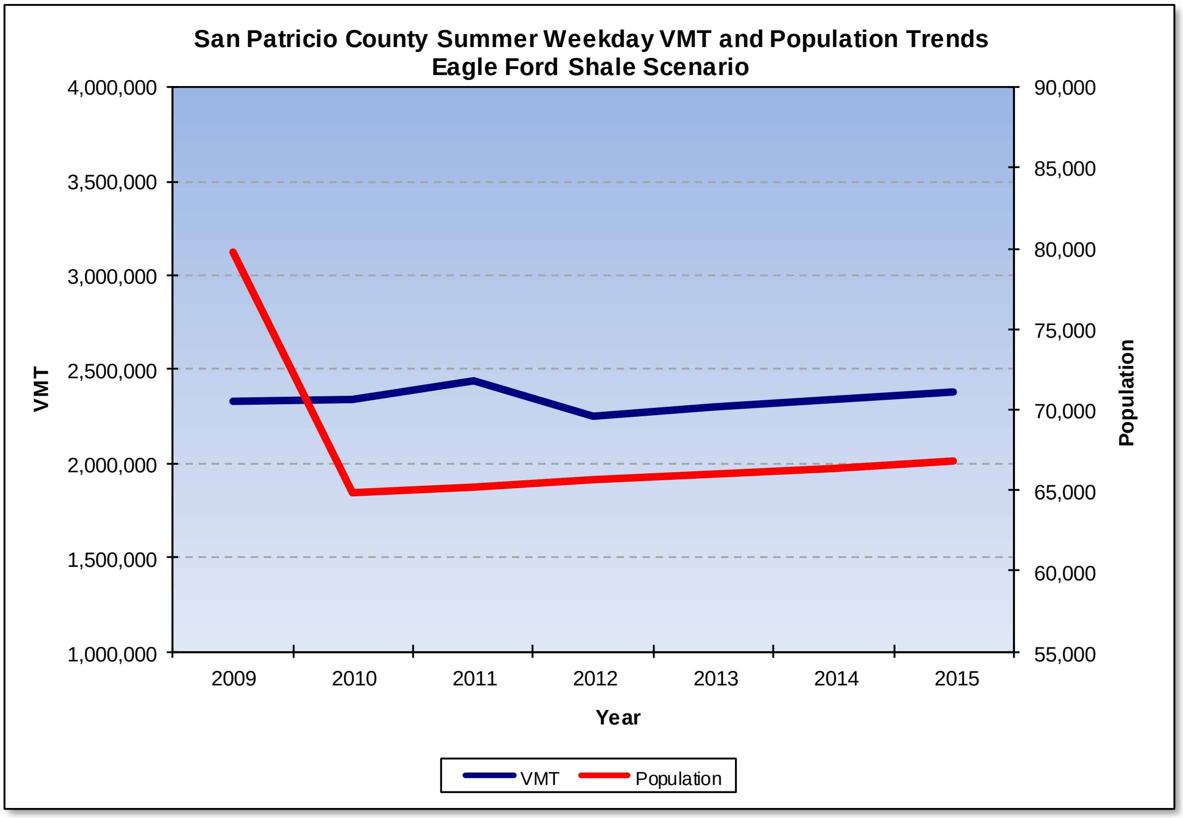

Nueces County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
1,500
1,300
1,100
900
700
500
300
100
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

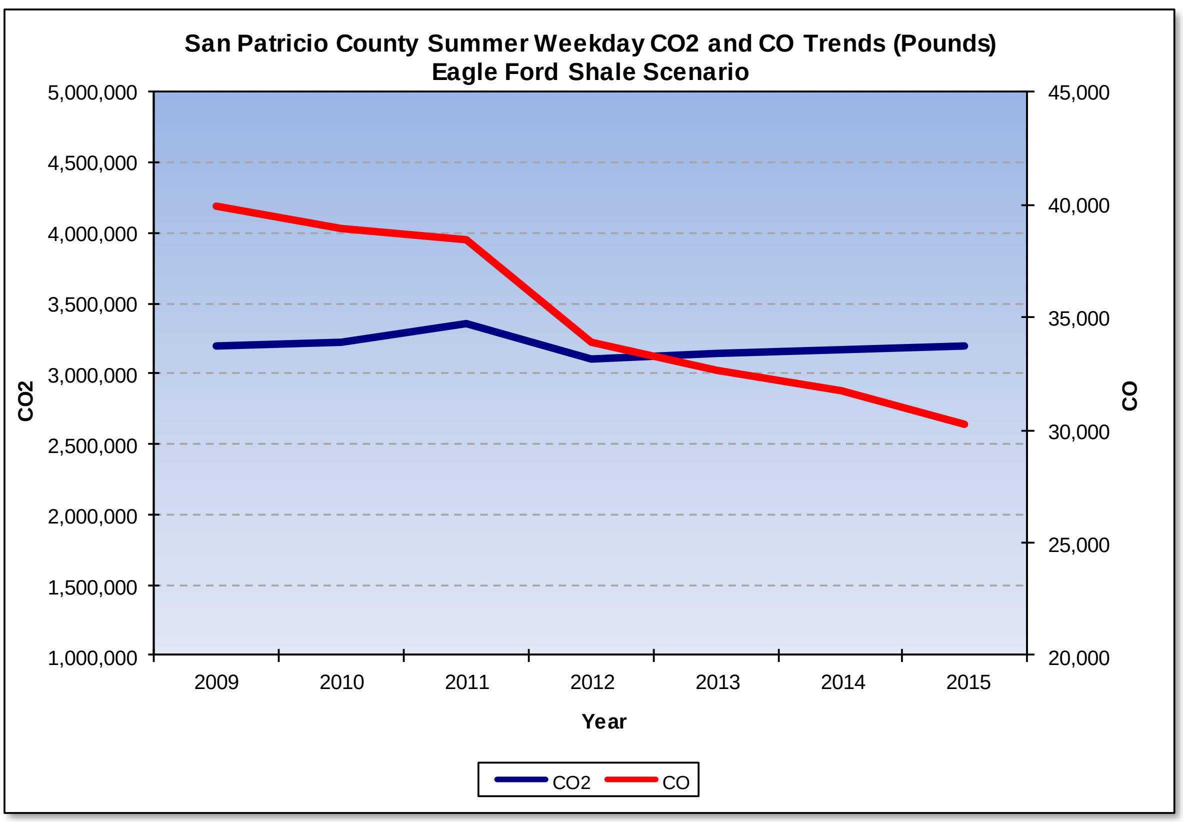

Robertson County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
1,900,000
1,600,000
1,300,000
1,000,000
700,000
400,000
100,000
VMT
33,000
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

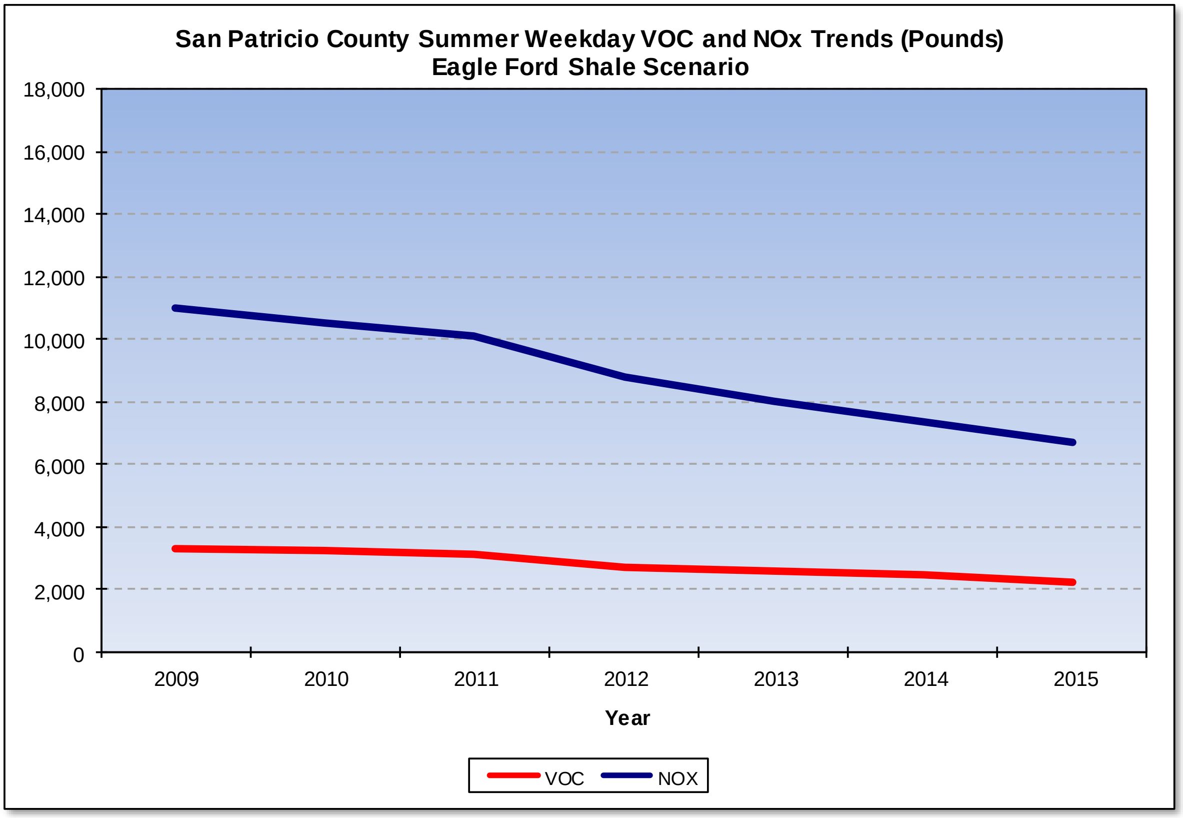

Robertson County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
2,000,000
1,750,000
1,500,000
1,250,000
1,000,000
750,000
500,000
CO2
19,000
17,000
15,000
13,000
11,000
9,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


Robertson County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

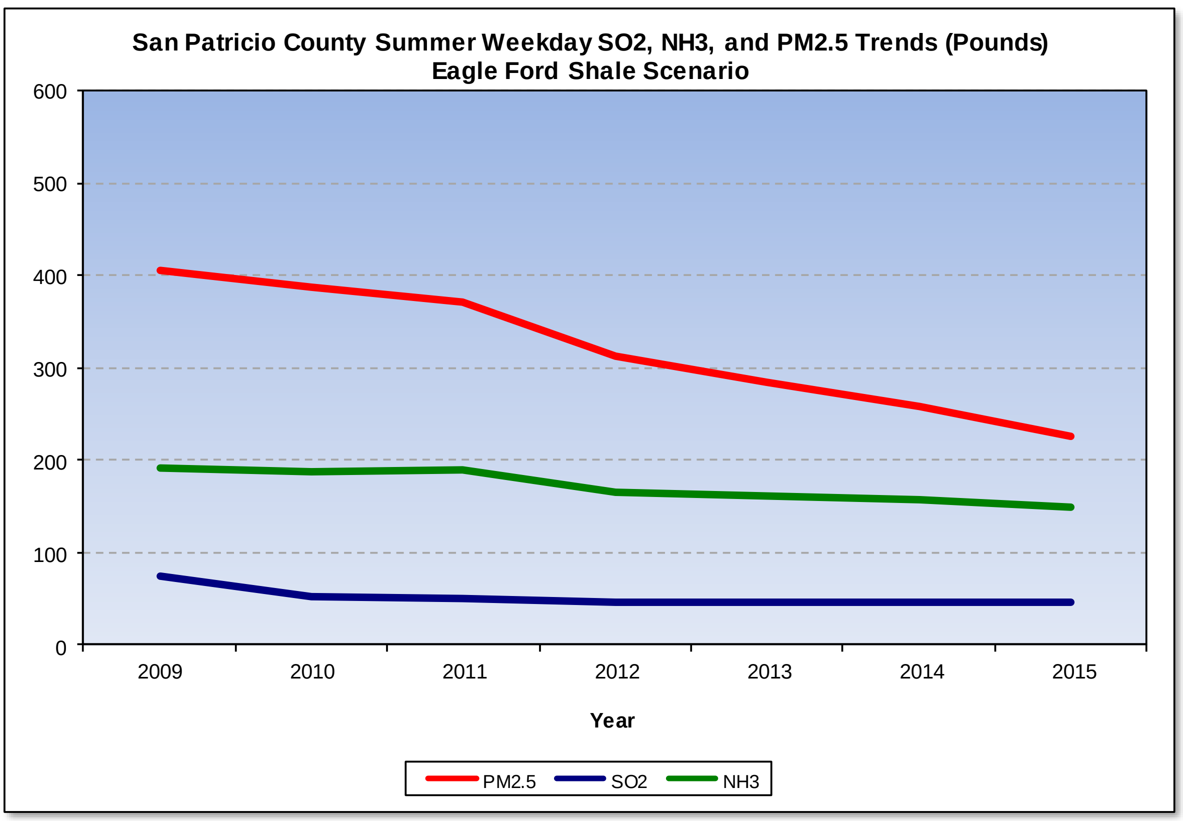

Robertson County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


San Patricio County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
Population
90,000
85,000
80,000
75,000
70,000
65,000
60,000
55,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

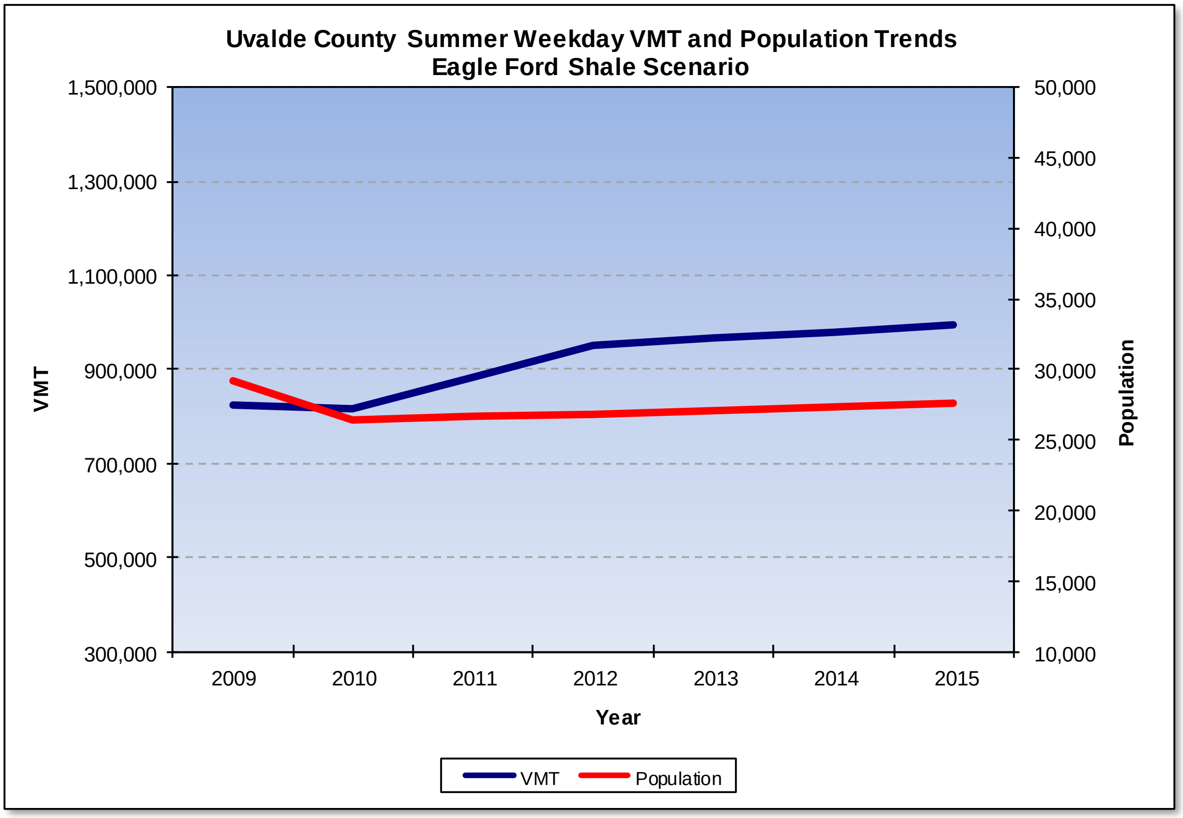

San Patricio County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
CO
45,000
40,000
35,000
30,000
25,000
20,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

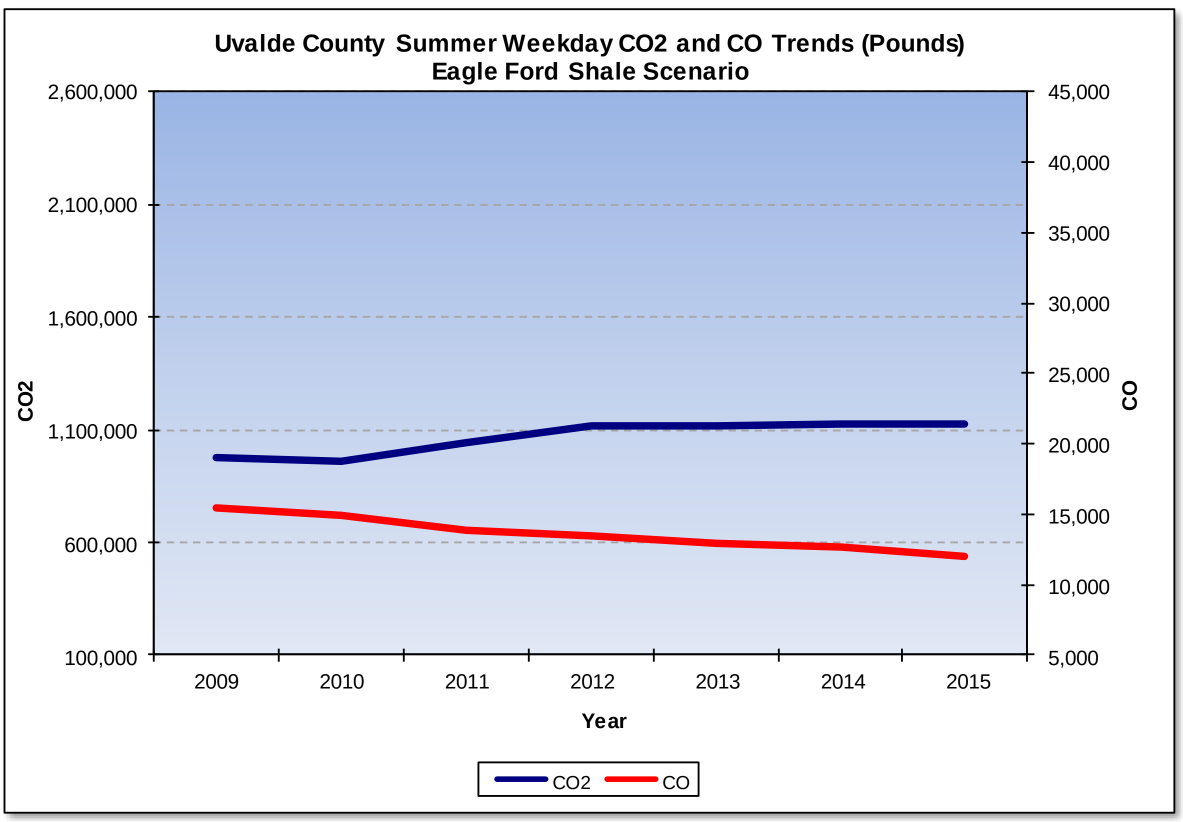


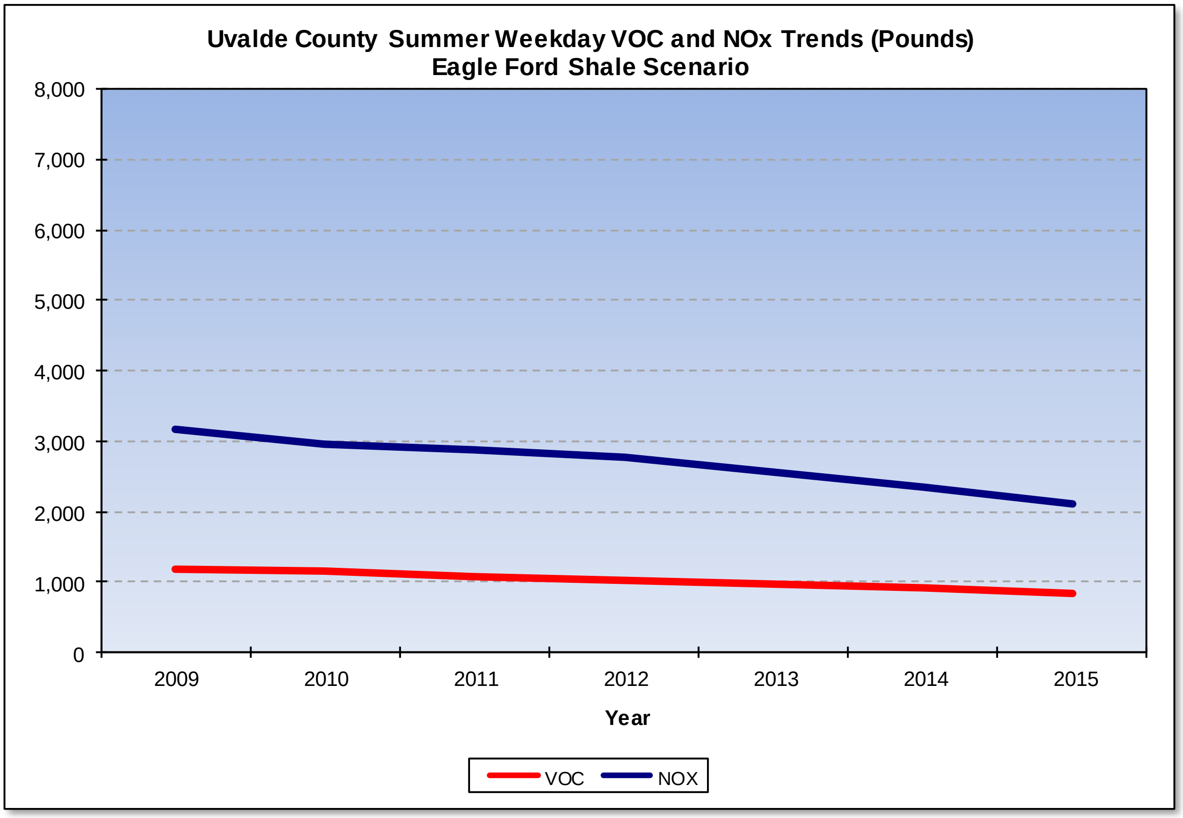
San Patricio County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

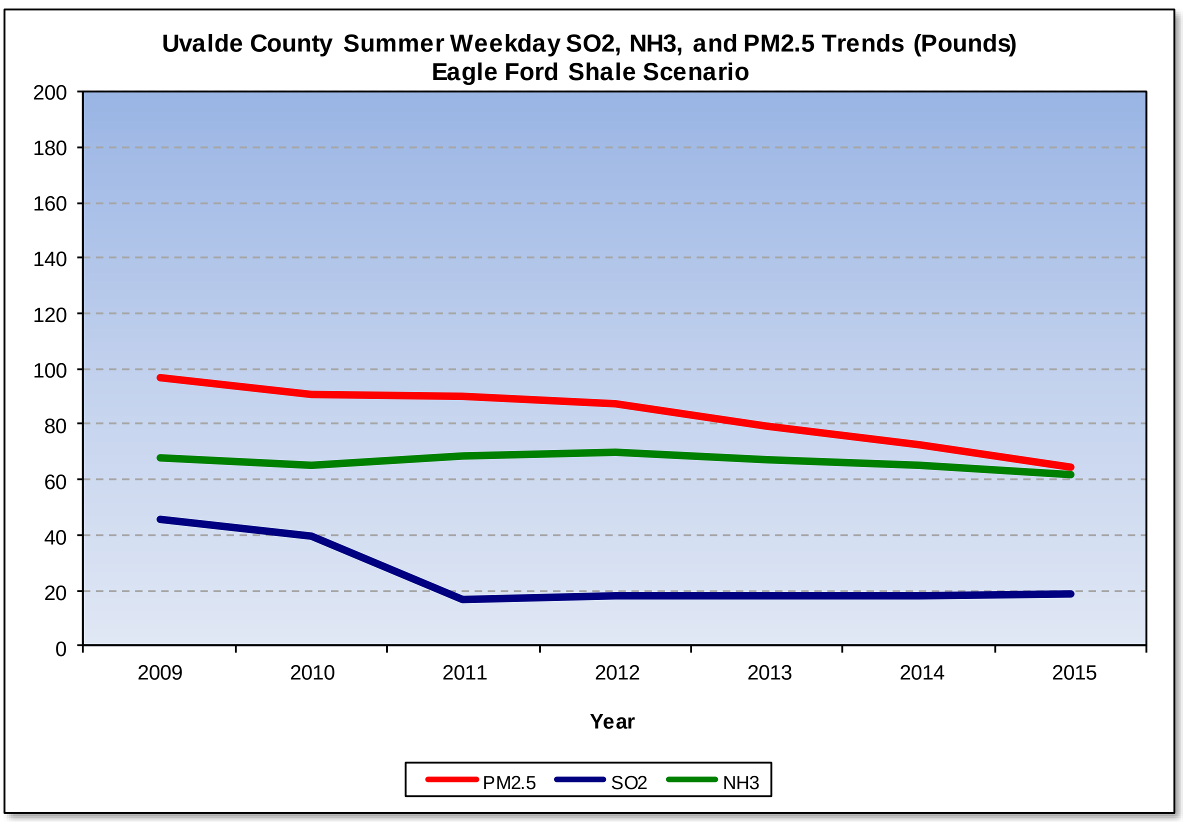


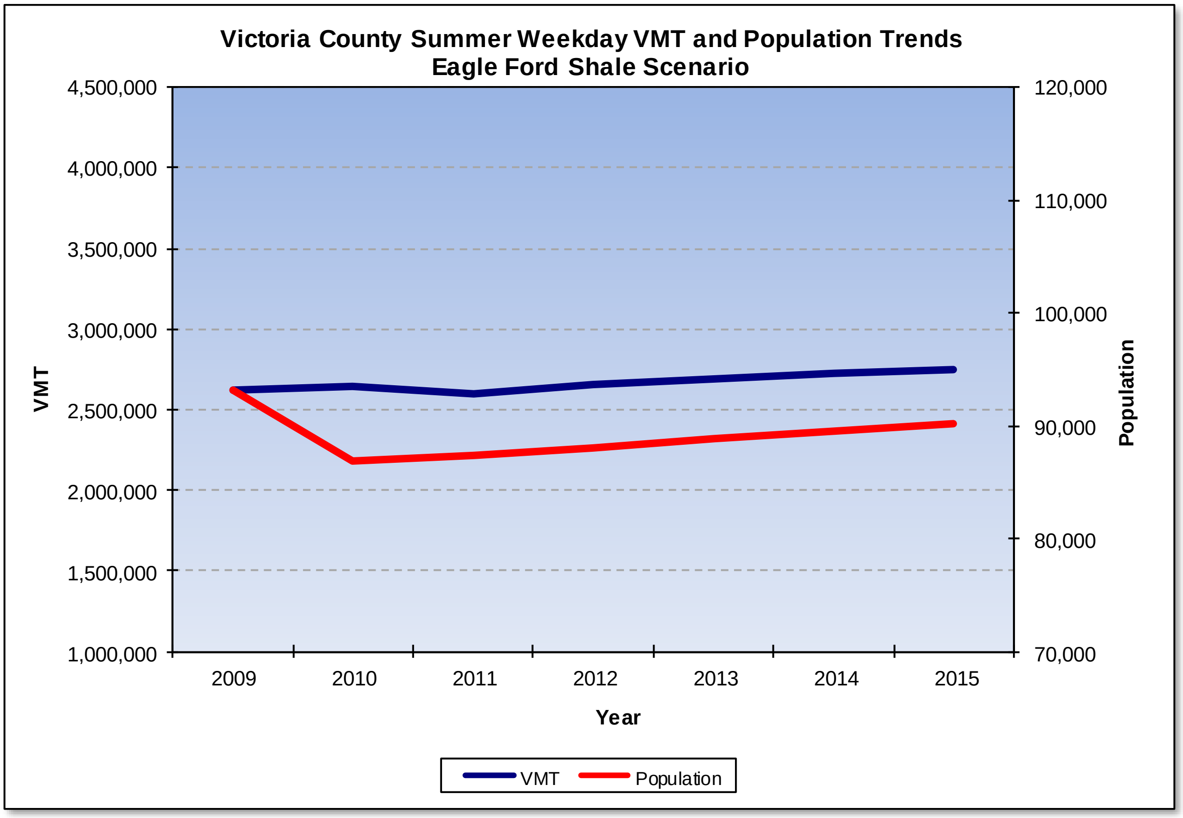
San Patricio County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

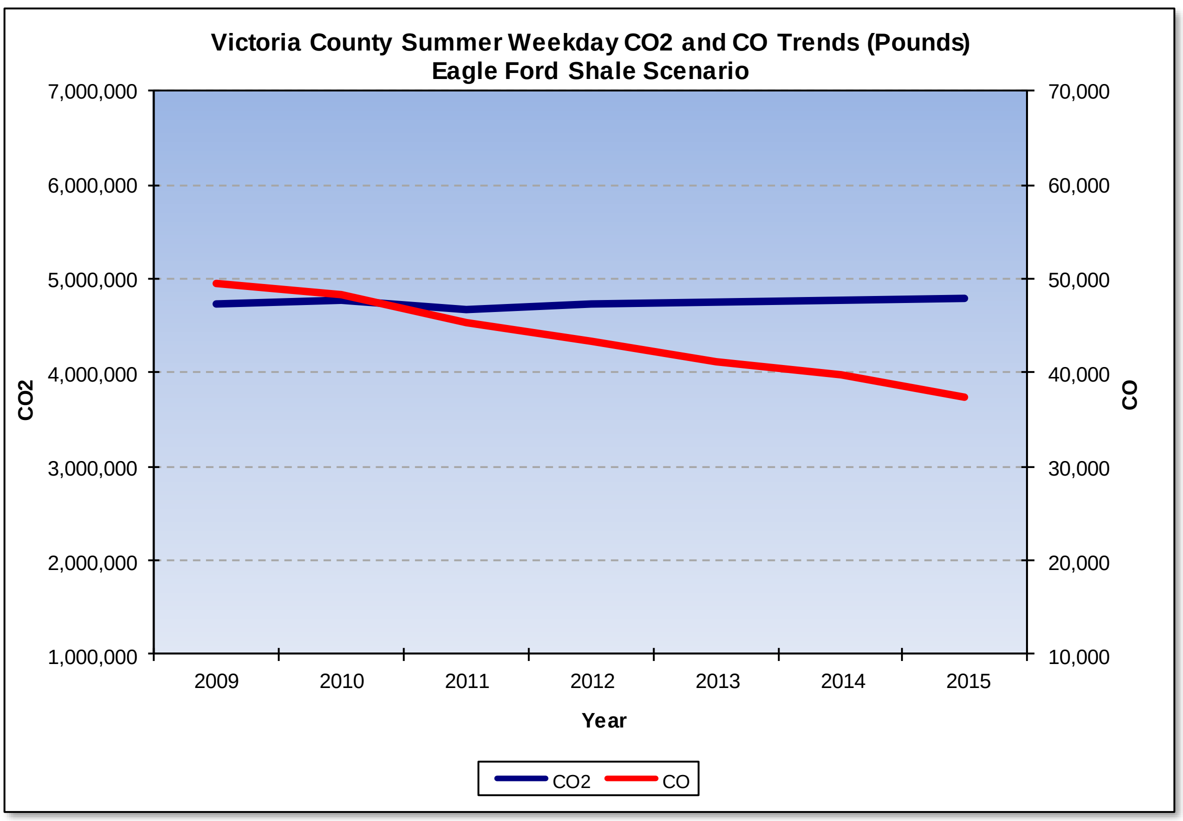

Uvalde County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
1,500,000
1,300,000
1,100,000
900,000
700,000
500,000
300,000
VMT
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

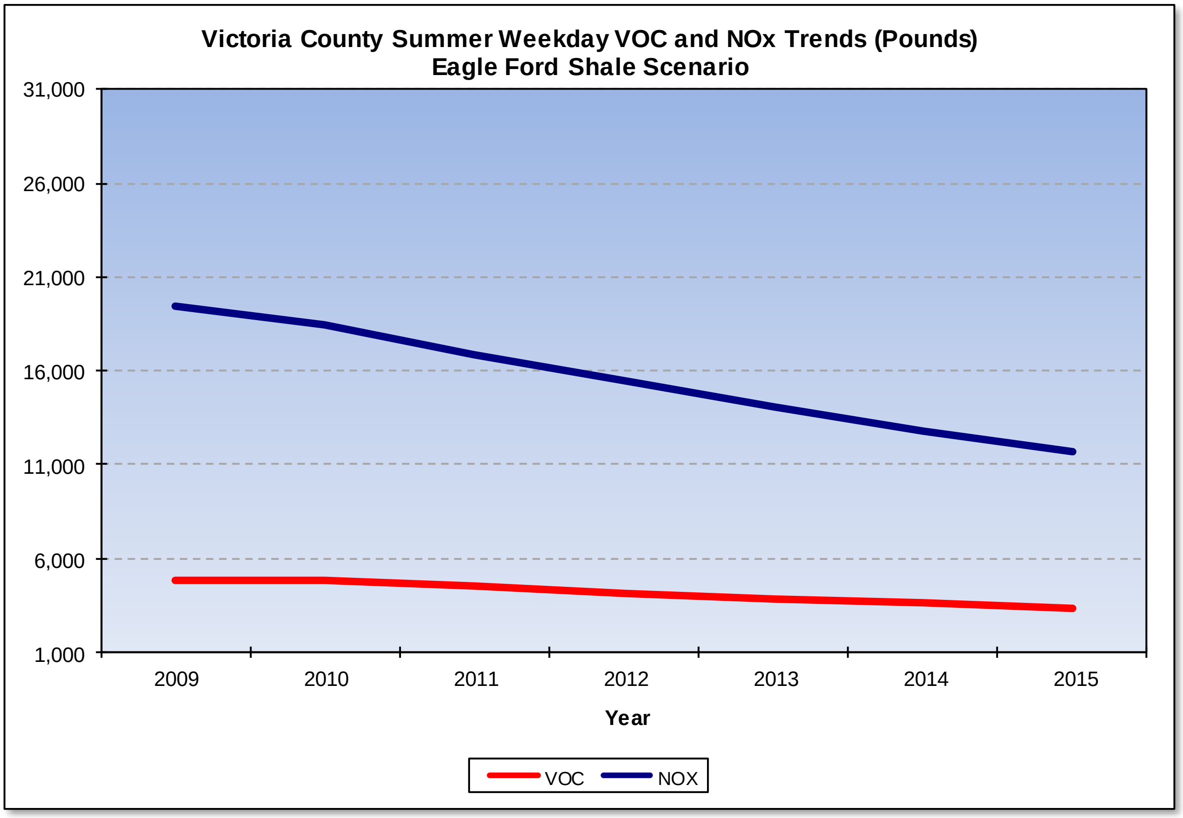

Uvalde County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
2,600,000
2,100,000
1,600,000
1,100,000
600,000
100,000
CO2
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

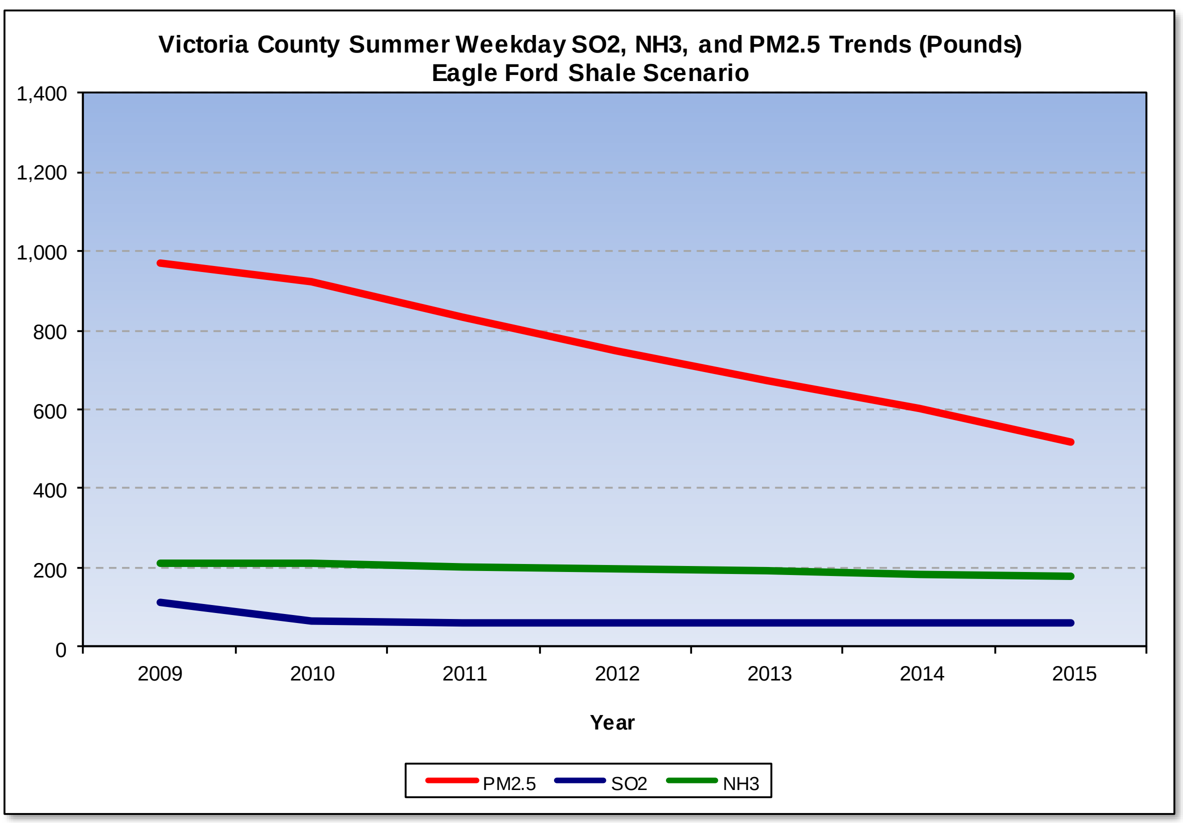

Uvalde County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

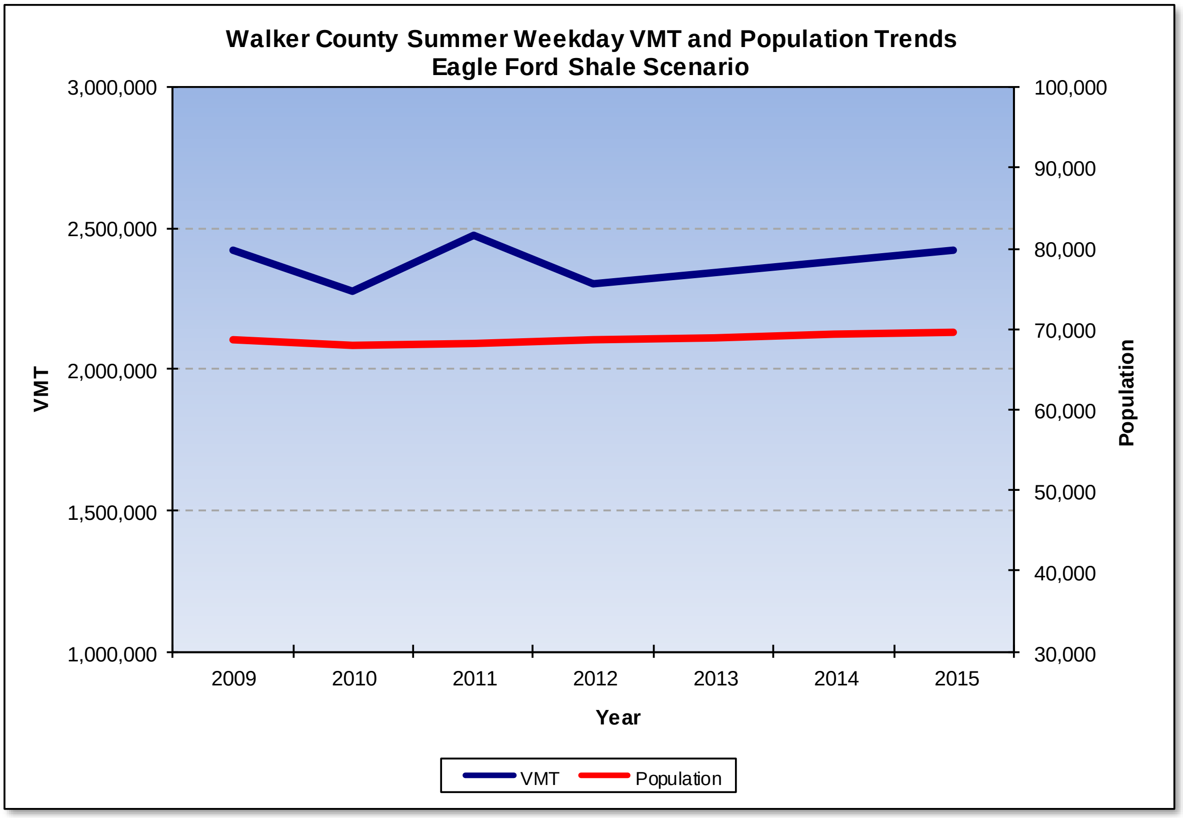

Uvalde County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
200
180
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

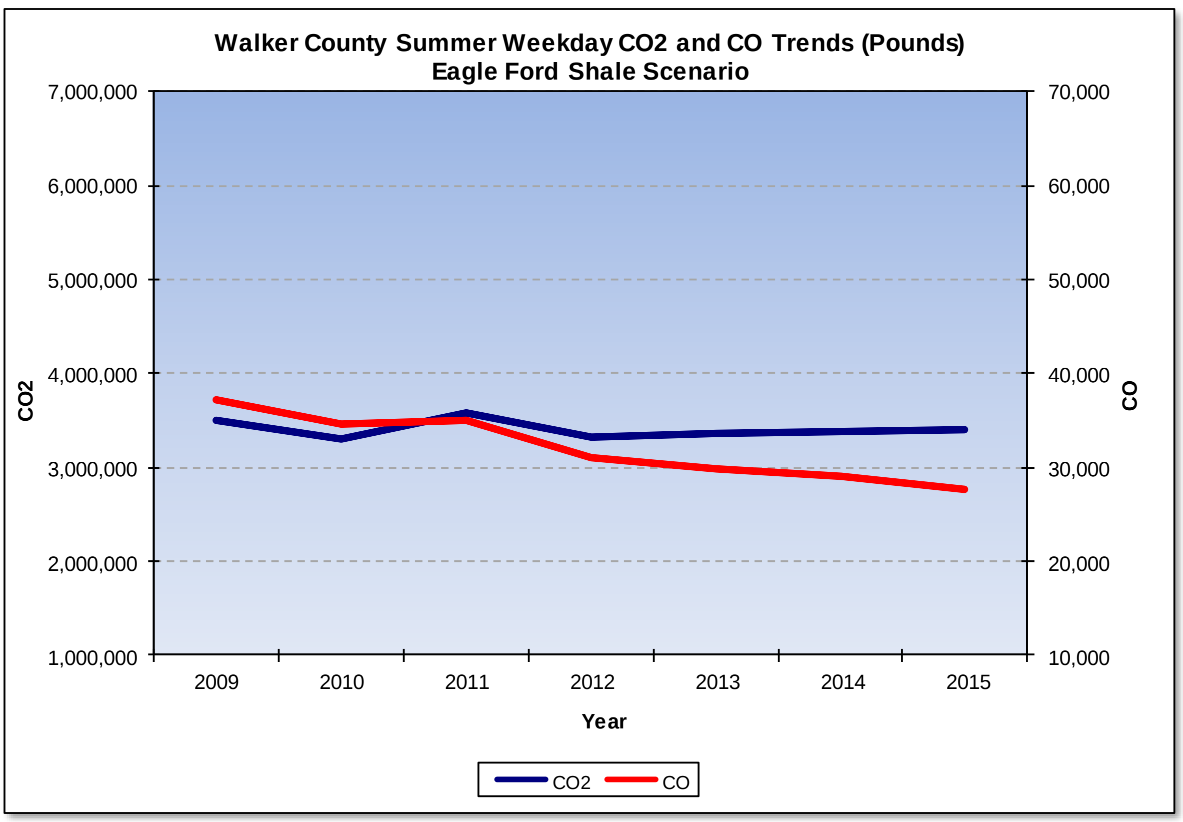

Victoria County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
VMT
120,000
110,000
100,000
90,000
80,000
70,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

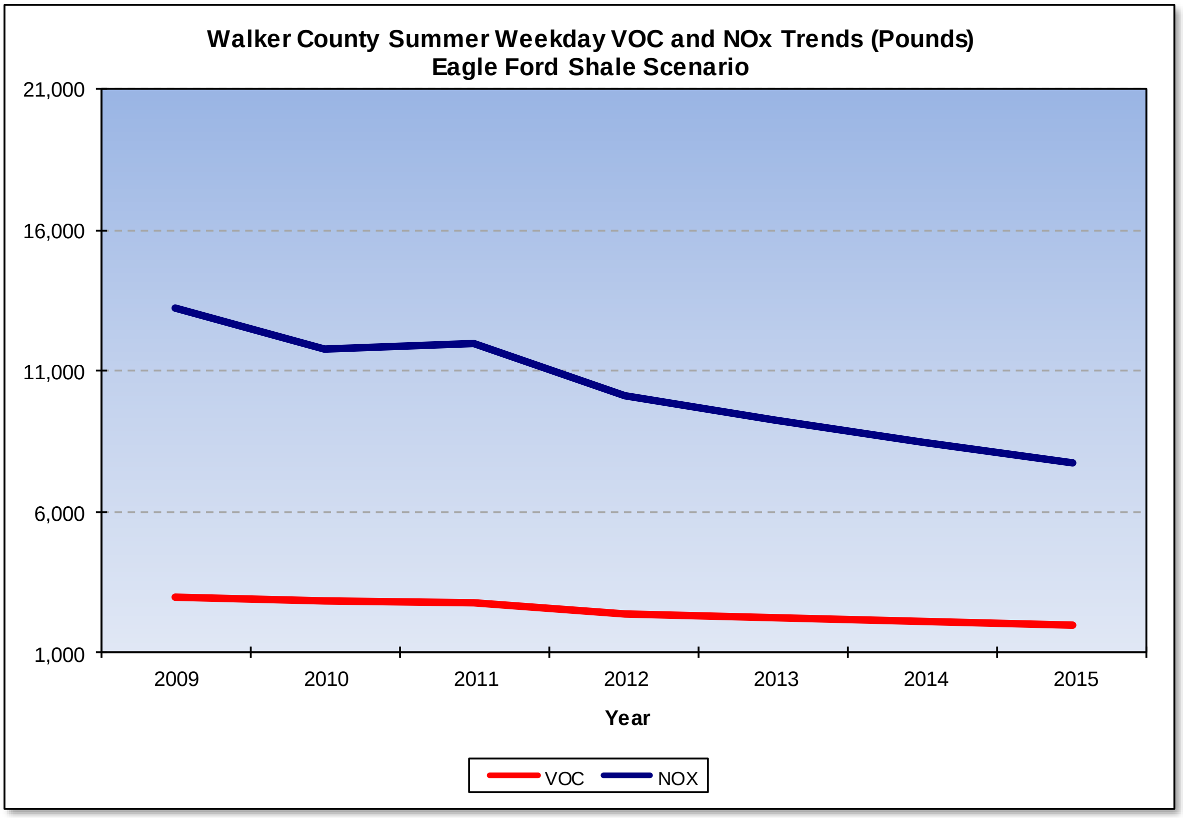

Victoria County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
CO2
70,000
60,000
50,000
40,000
30,000
20,000
10,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

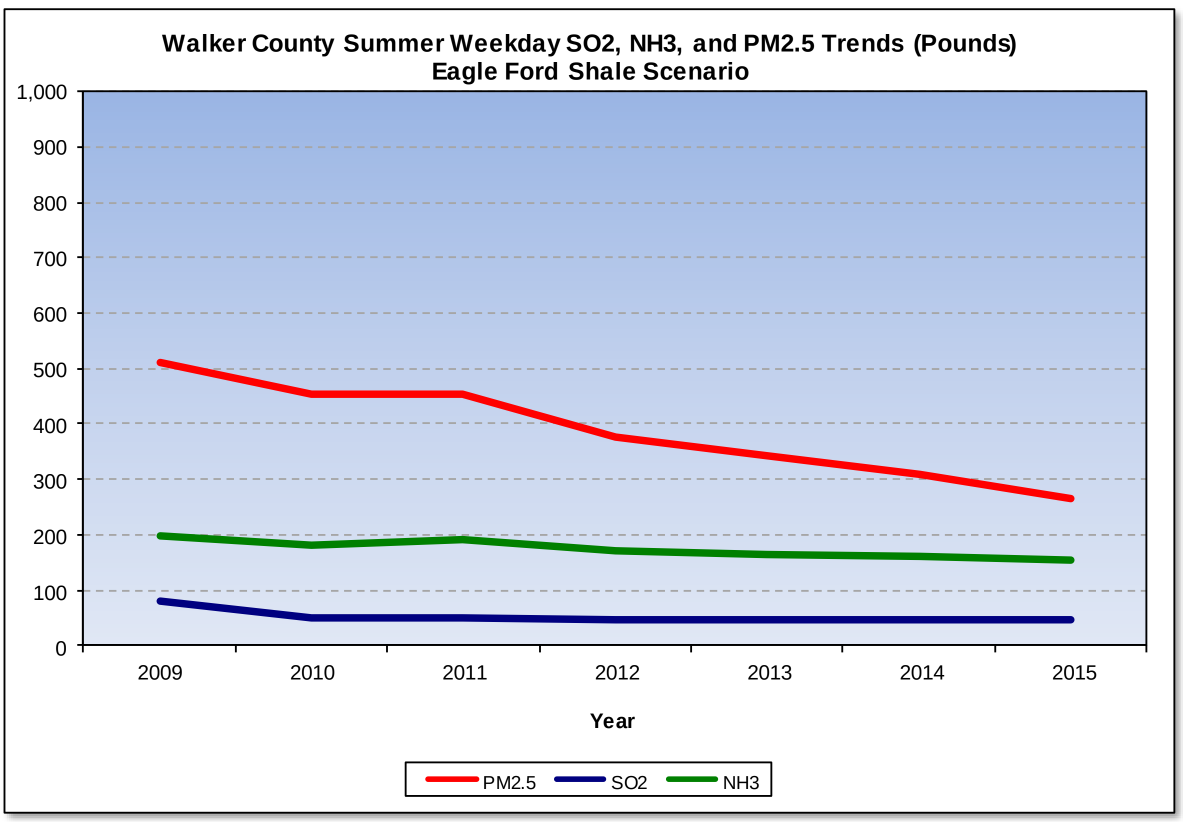

Victoria County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
31,000
26,000
21,000
16,000
11,000
6,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

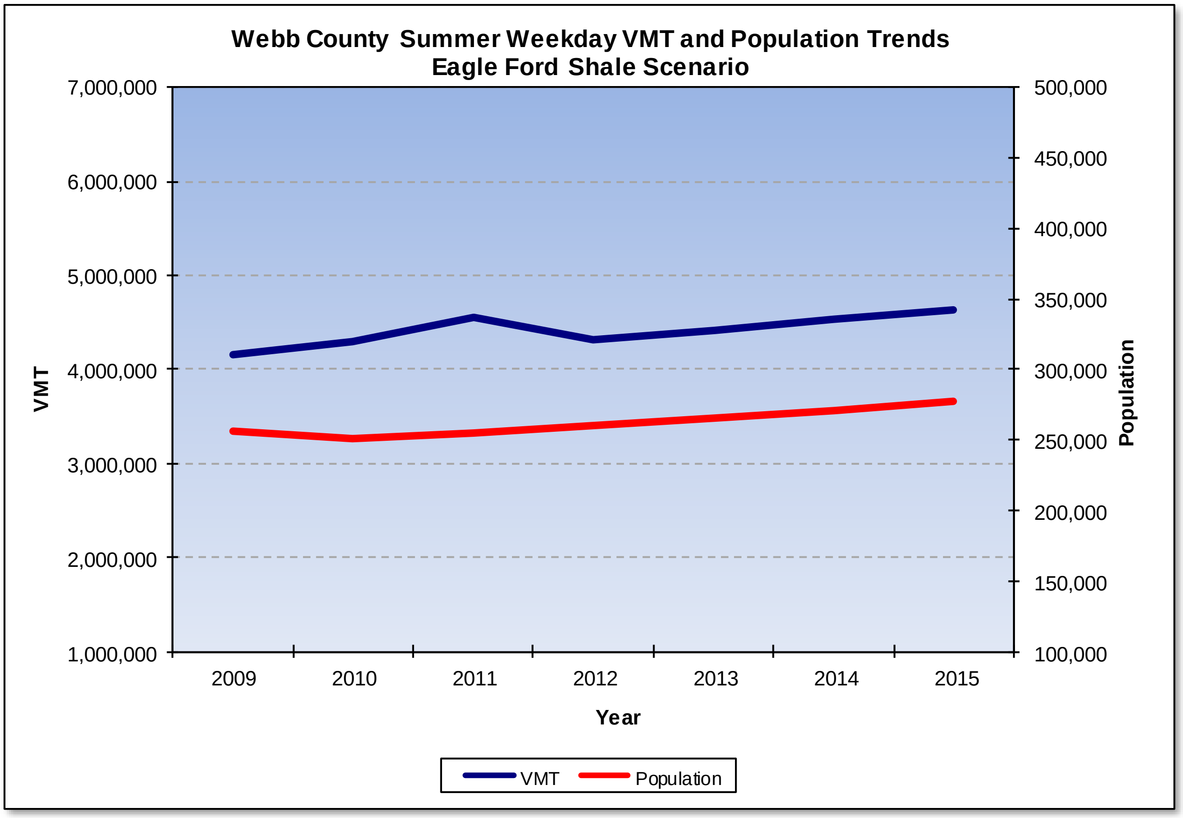

Victoria County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
1,400
1,200
1,000
800
600
400
200
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

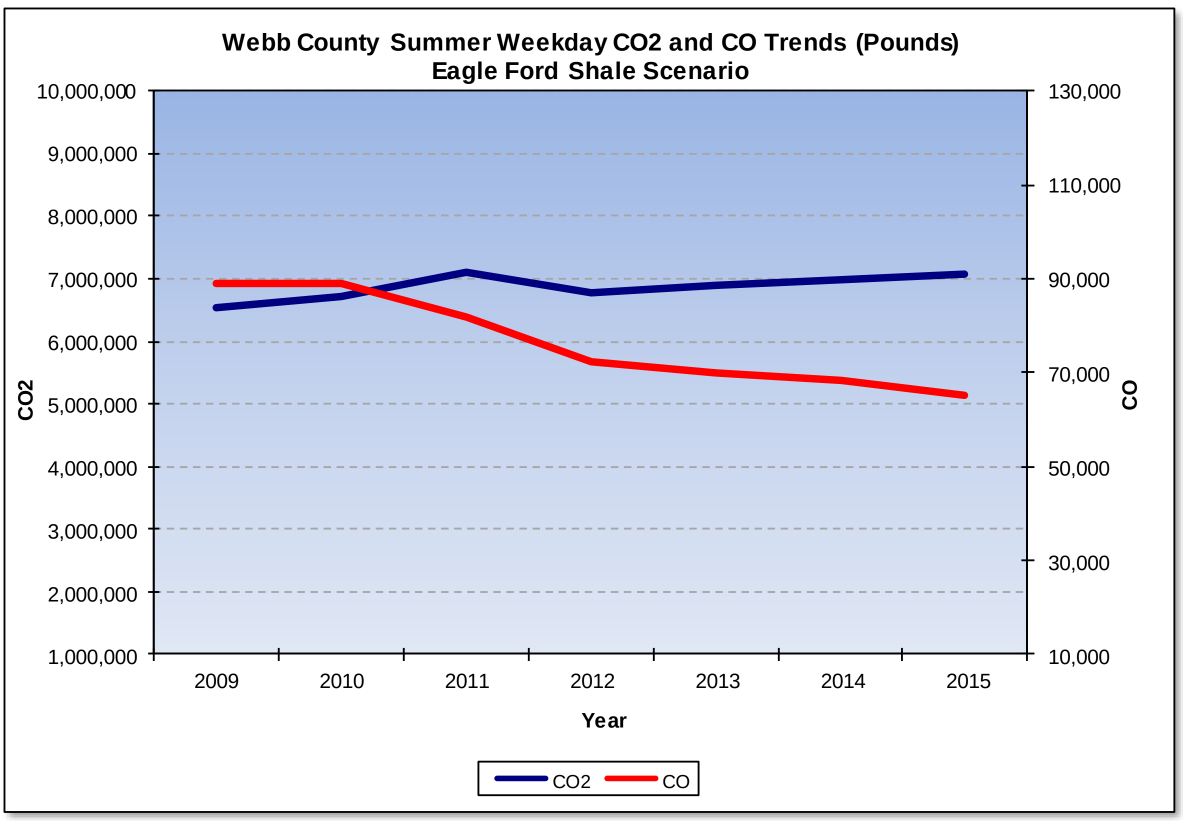

Walker County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
Population
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

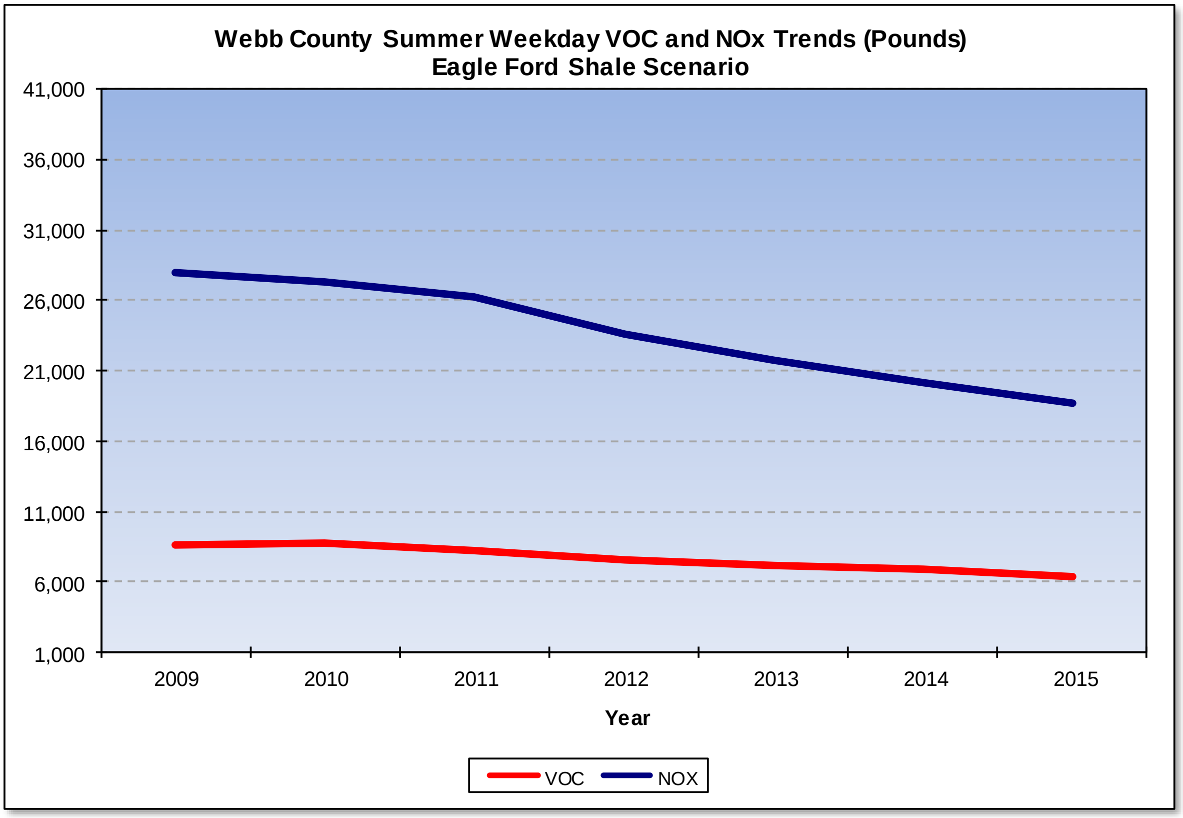

Walker County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
CO
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

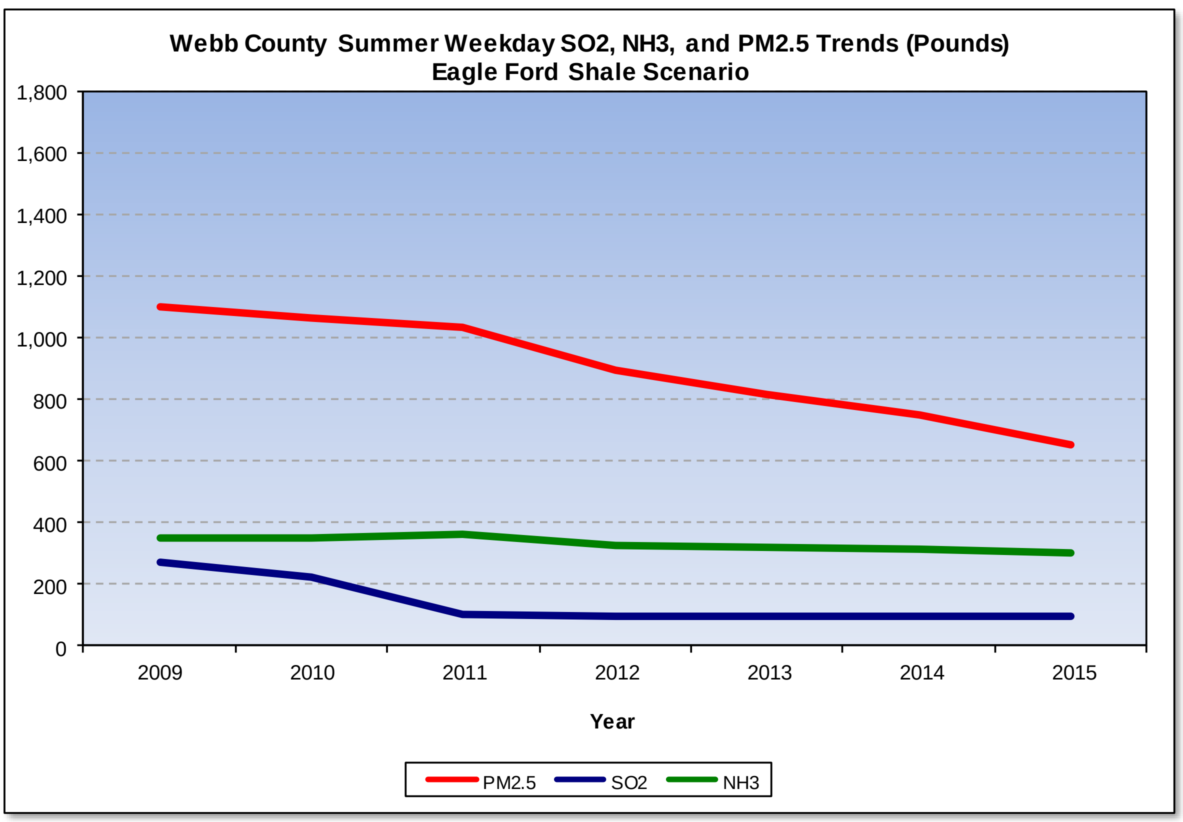

Walker County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
21,000
16,000
11,000
6,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

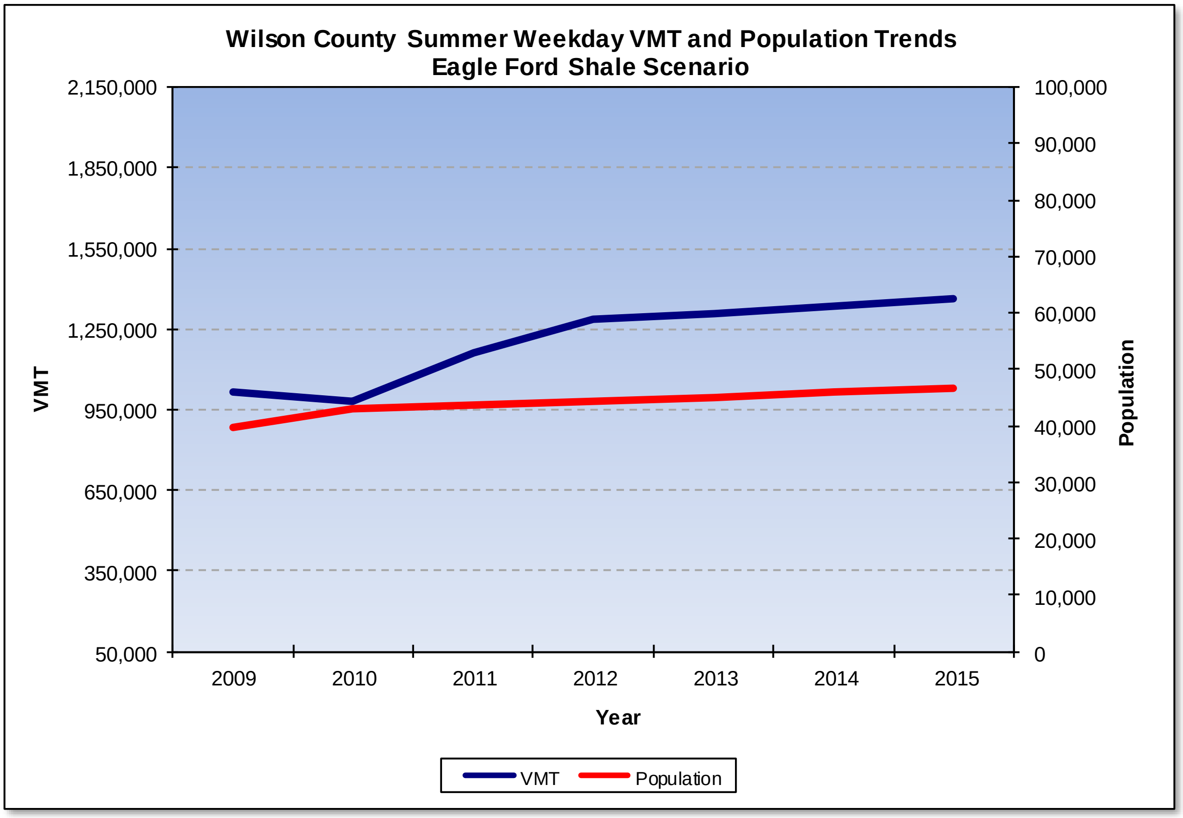

Walker County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
1,000
900
800
700
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Webb County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
Population
Year
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
2009
2010
2011
2012
2013
2014
2015
VMT
Population


Webb County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
CO
Year
10,000,000
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
130,000
110,000
90,000
70,000
50,000
30,000
10,000
2009
2010
2011
2012
2013
2014
2015
CO2
CO


Webb County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX


Webb County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Wilson County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
Population
Year
2,150,000
1,850,000
1,550,000
1,250,000
950,000
650,000
350,000
50,000
100,000
90,000
80,000
70,000
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50,000
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30,000
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10,000
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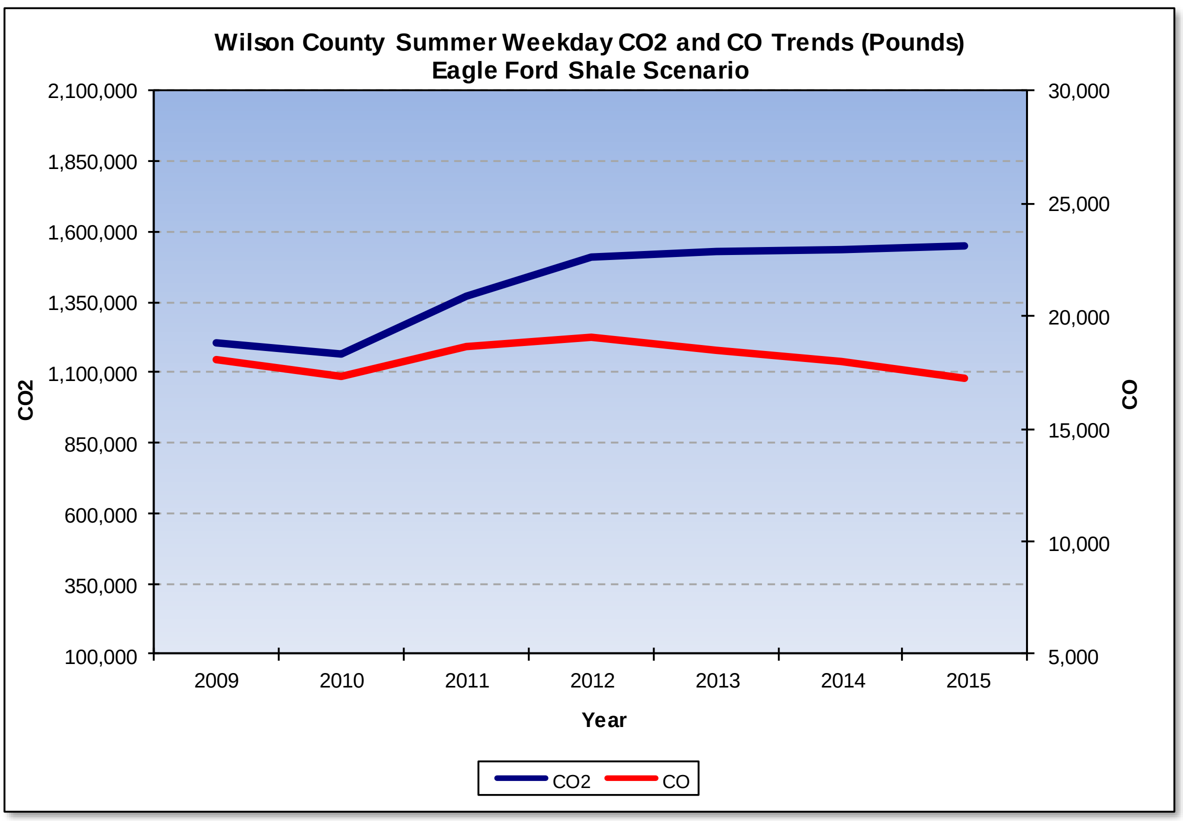
2009
2010
2011
2012
2013
2014
2015
VMT
Population


Wilson County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
CO
Year
2,100,000
1,850,000
1,600,000
1,350,000
1,100,000
850,000
600,000
350,000
100,000
30,000
25,000
20,000
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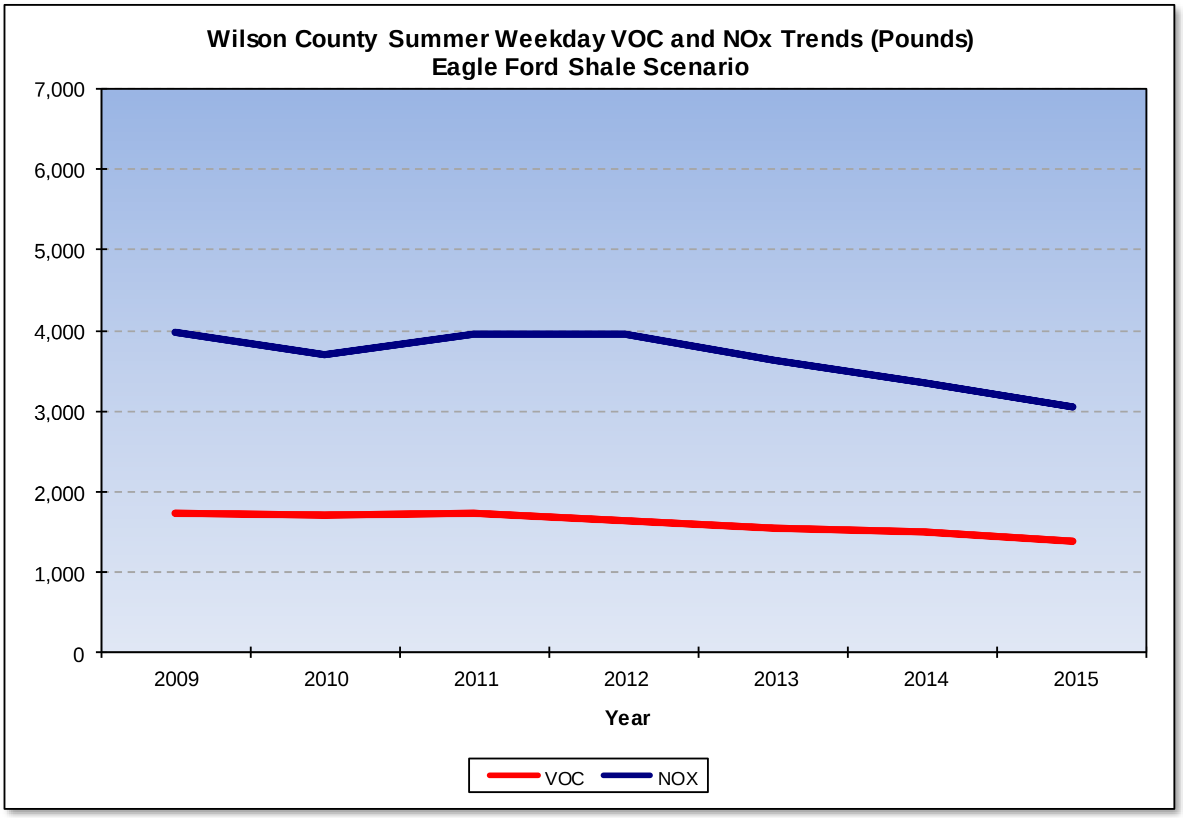
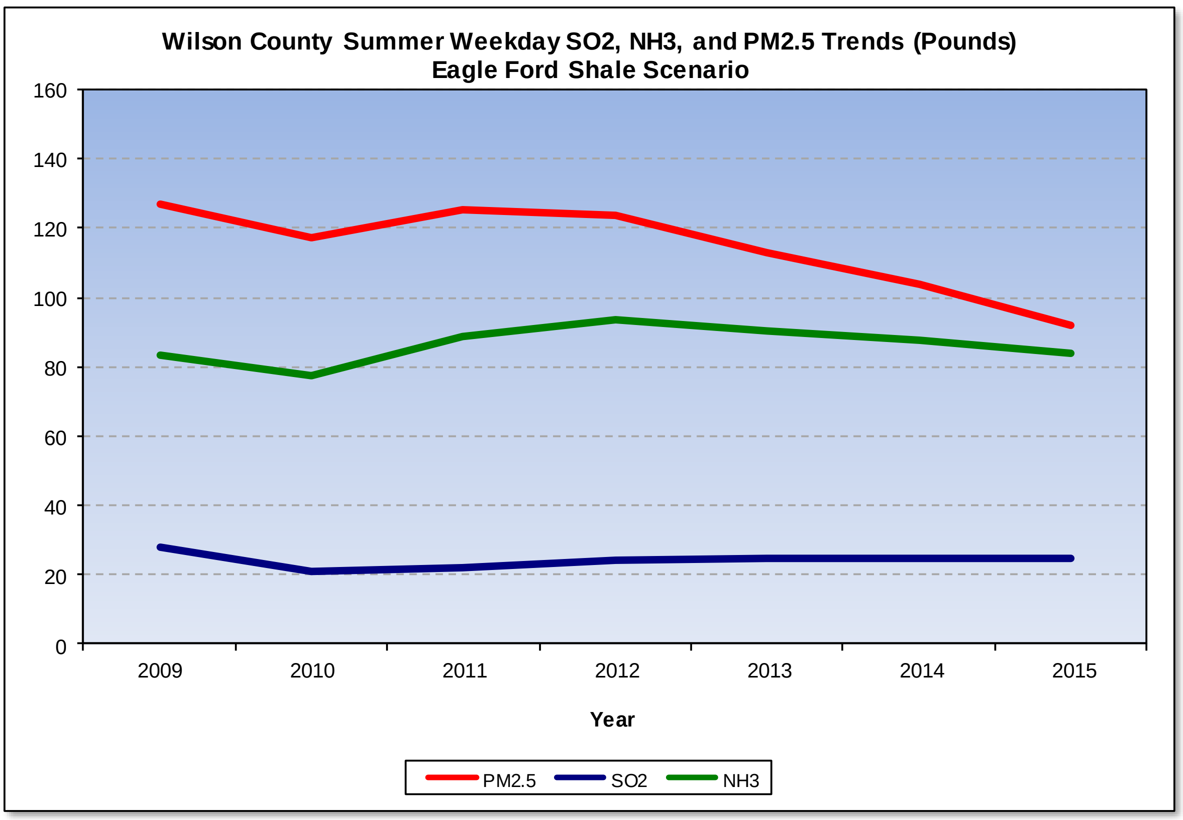
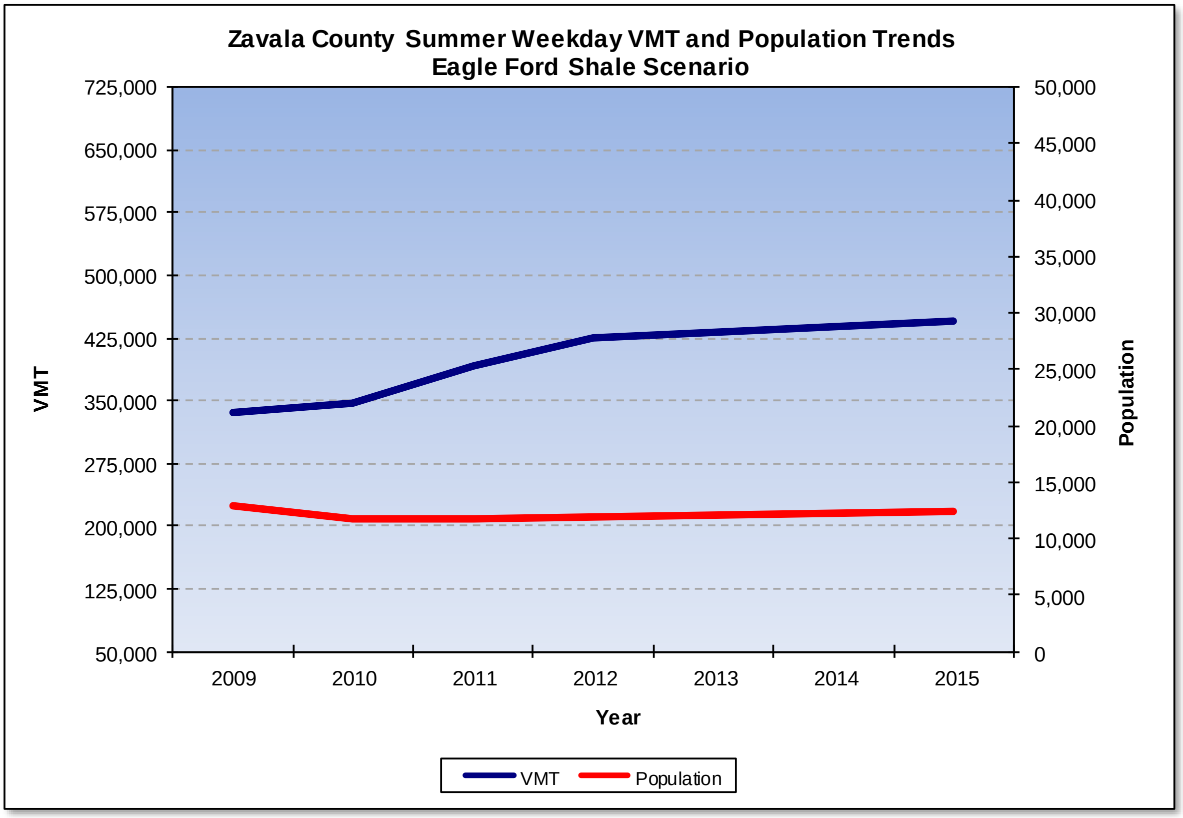
10,000
5,000
2009
2010
2011
2012
2013
2014
2015
CO2
CO

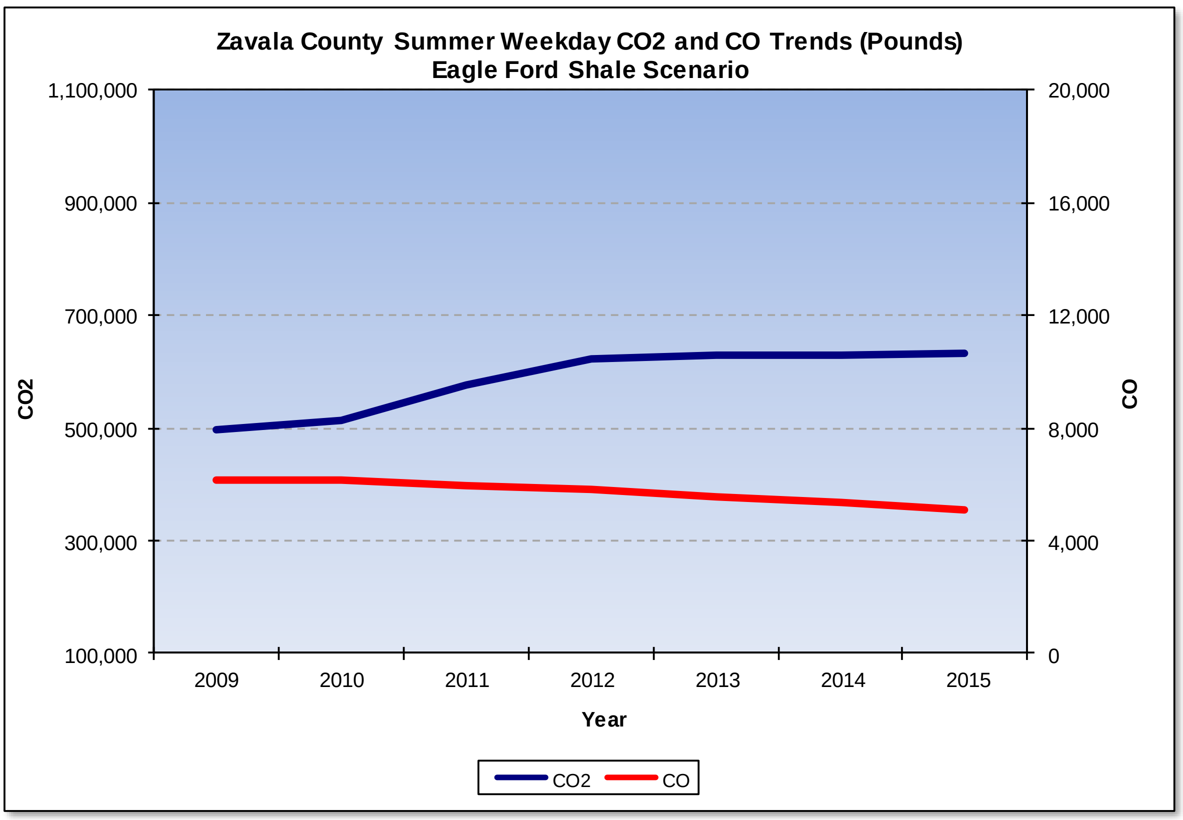


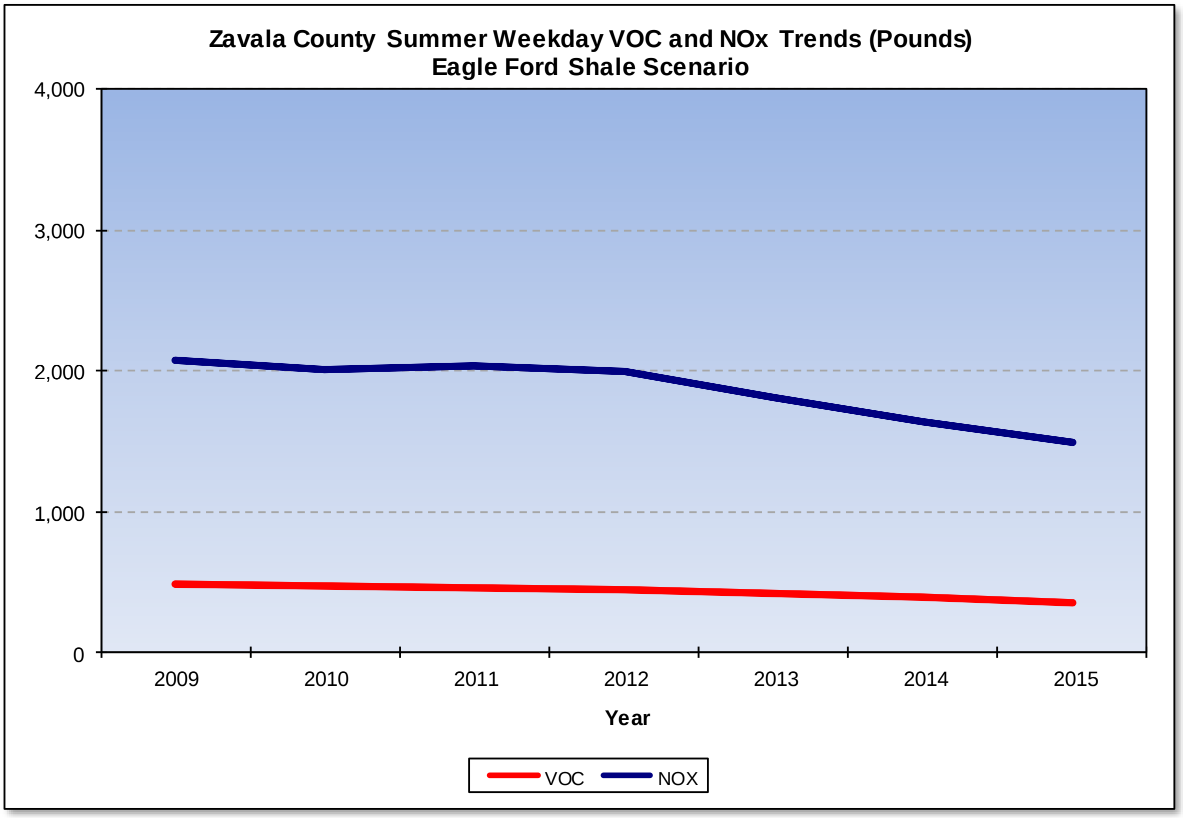
Wilson County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

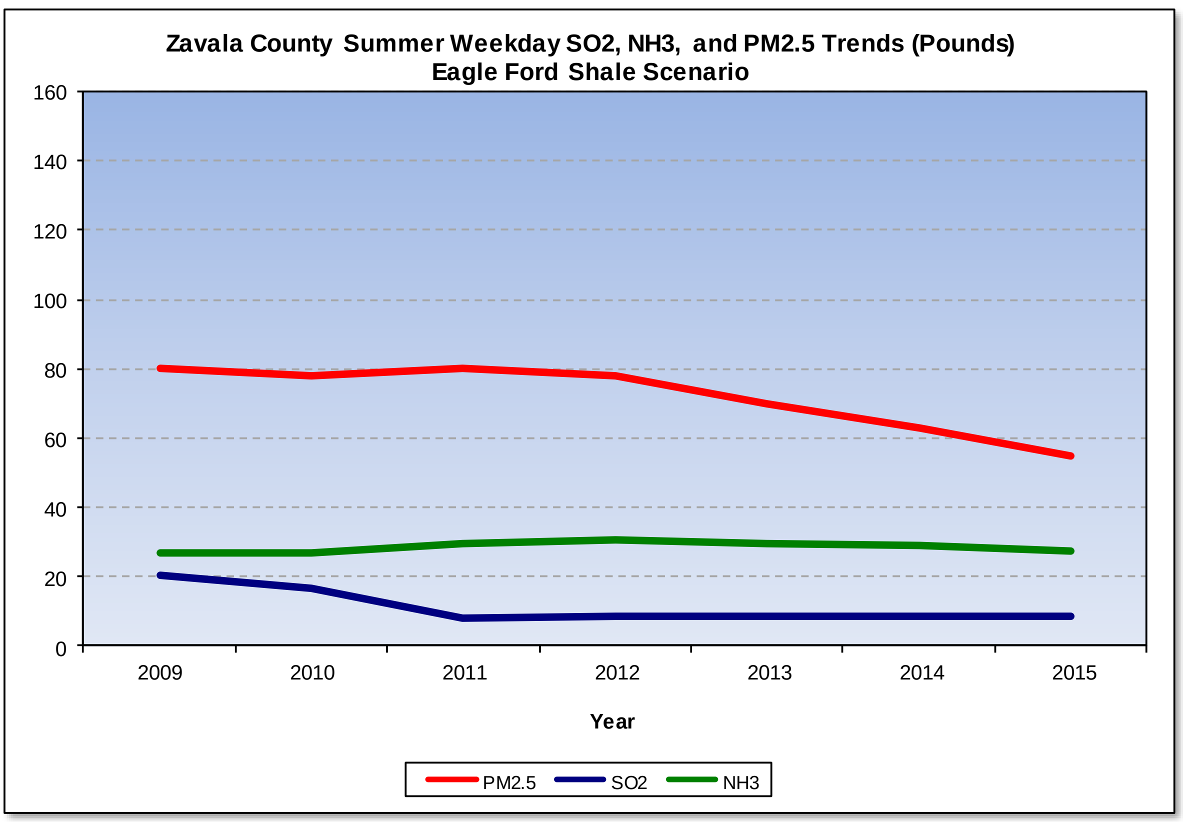


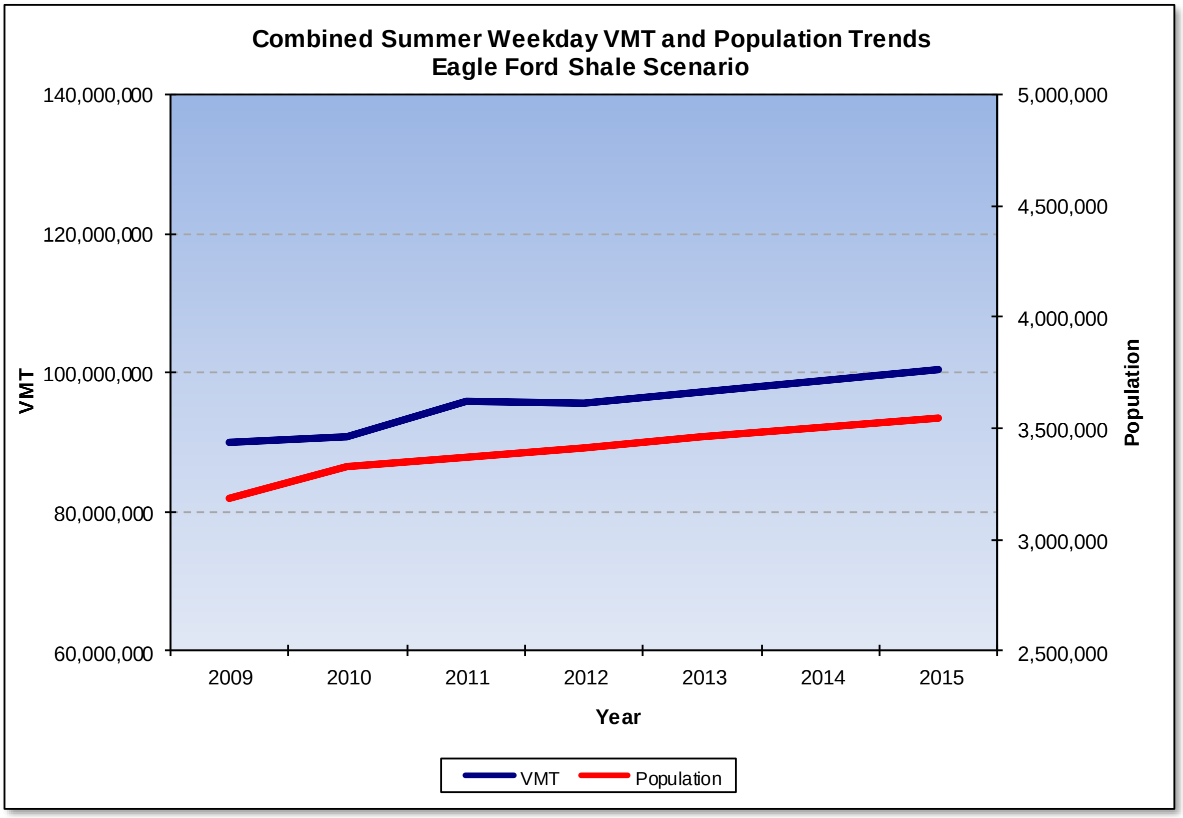
Wilson County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

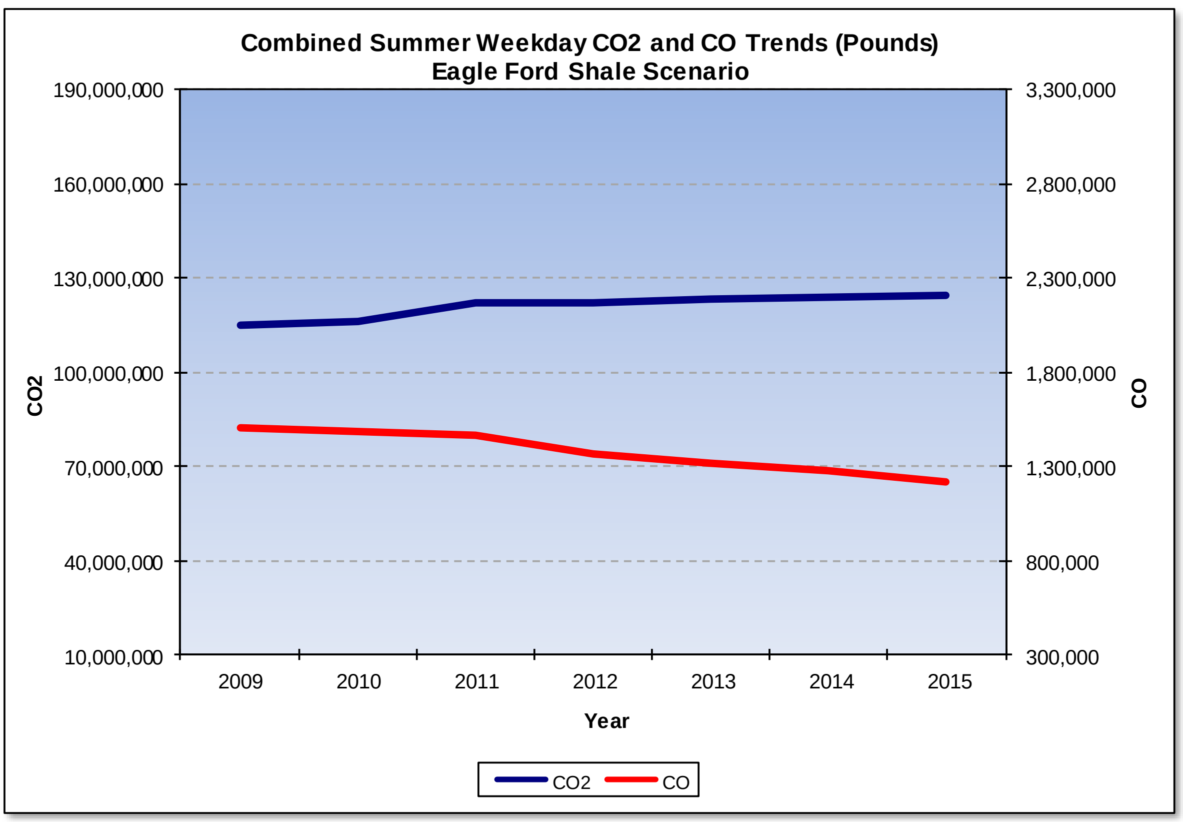

Zavala County Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
VMT
Population
Year
725,000
650,000
575,000
500,000
425,000
350,000
275,000
200,000
125,000
50,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2009
2010
2011
2012
2013
2014
2015
VMT
Population

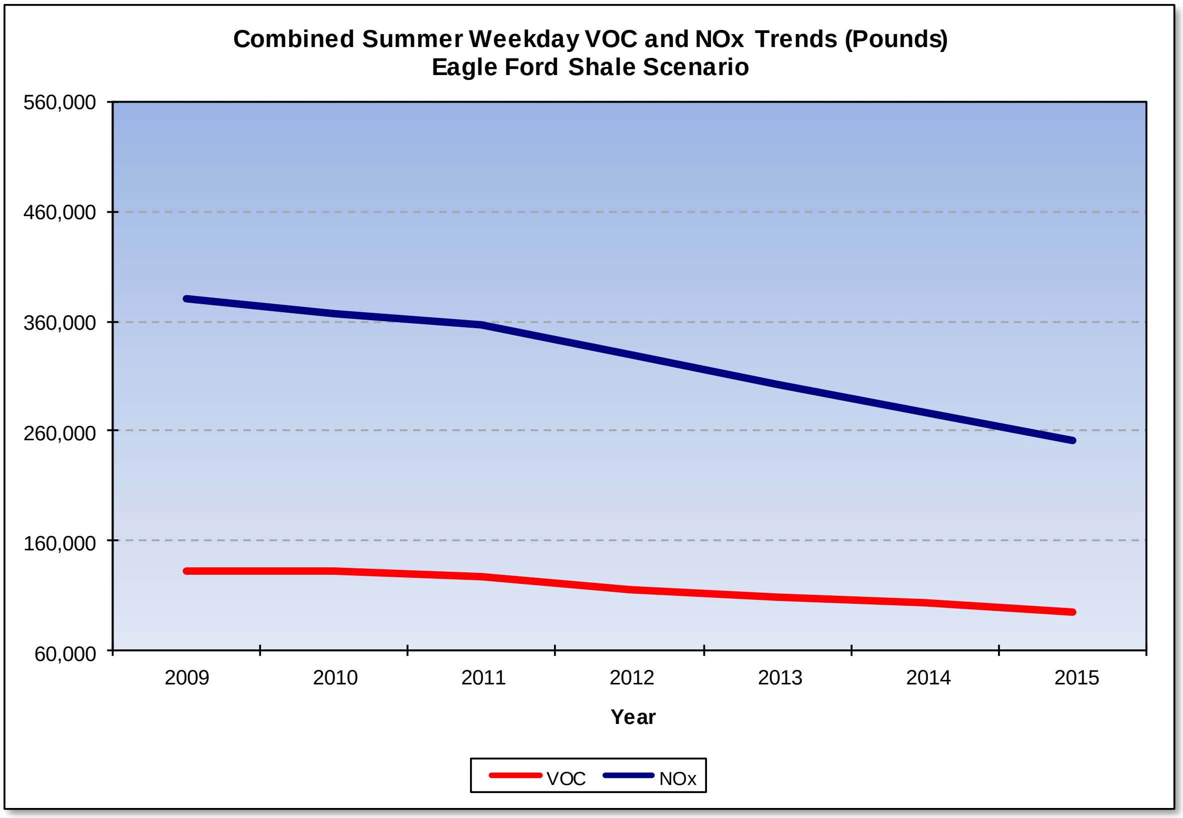

Zavala County Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
CO2
CO
Year
1,100,000
900,000
700,000
500,000
300,000
100,000
20,000
16,000
12,000
8,000
4,000
0
2009
2010
2011
2012
2013
2014
2015
CO2
CO

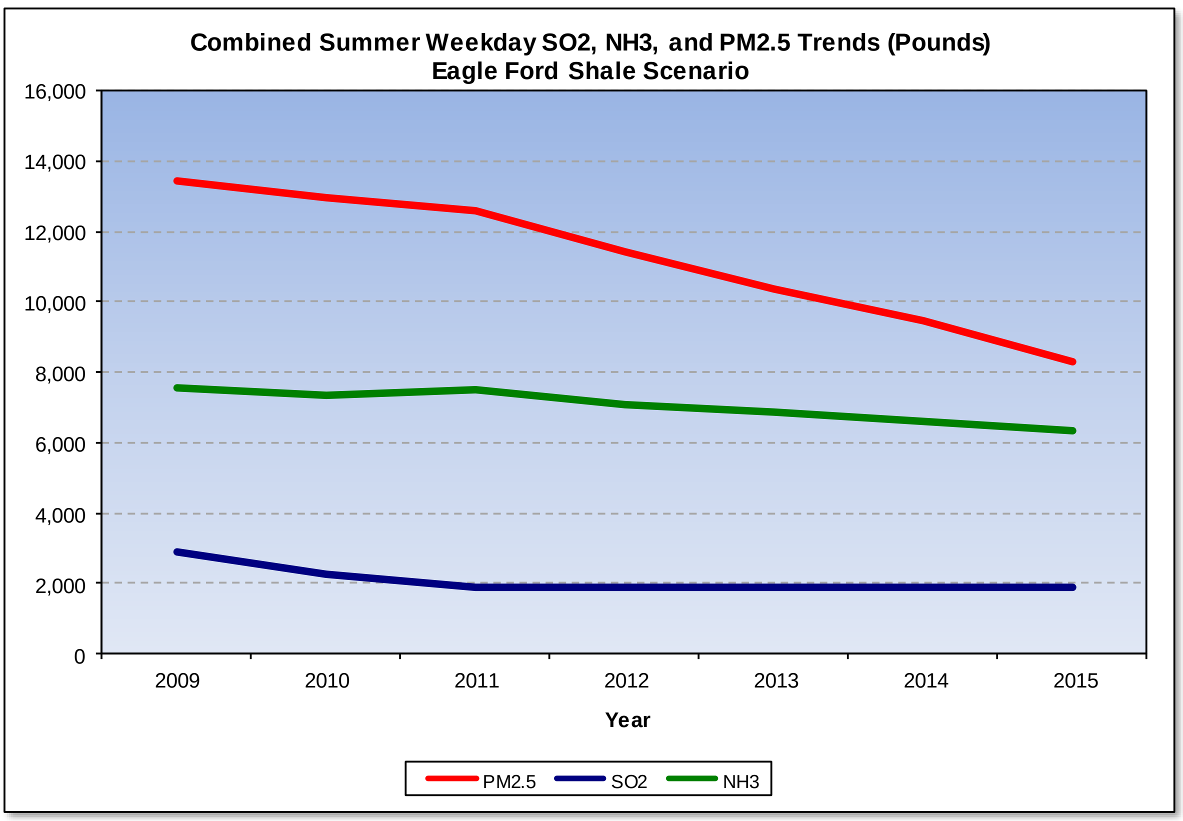

Zavala County Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX


Zavala County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

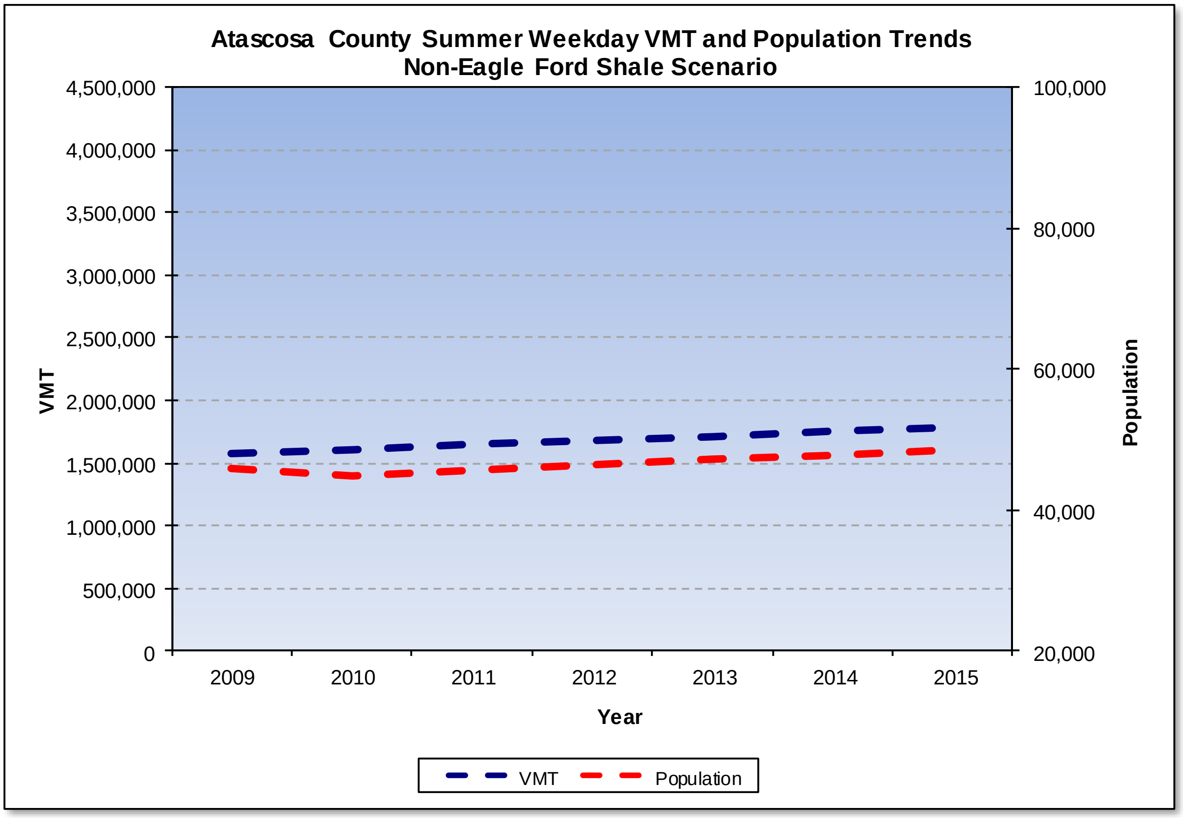

Combined Summer Weekday VMT and Population Trends
Eagle Ford Shale Scenario
140,000,000
120,000,000
100,000,000
80,000,000
60,000,000
VMT
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population


Combined Summer Weekday CO2 and CO Trends (Pounds)
Eagle Ford Shale Scenario
190,000,000
160,000,000
130,000,000
100,000,000
70,000,000
40,000,000
10,000,000
CO2
3,300,000
2,800,000
2,300,000
1,800,000
1,300,000
800,000
300,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

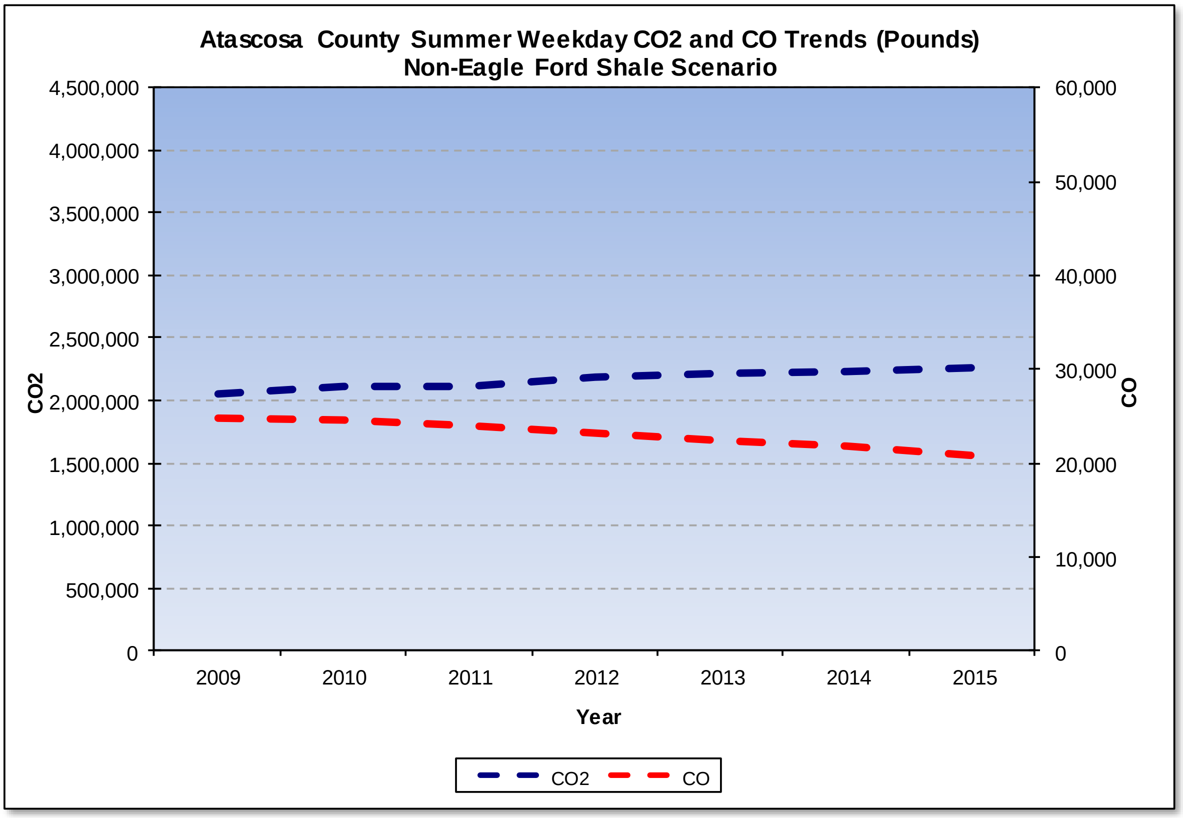

Combined Summer Weekday VOC and NOx Trends (Pounds)
Eagle Ford Shale Scenario
560,000
460,000
360,000
260,000
160,000
60,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx


Combined Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Eagle Ford Shale Scenario
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

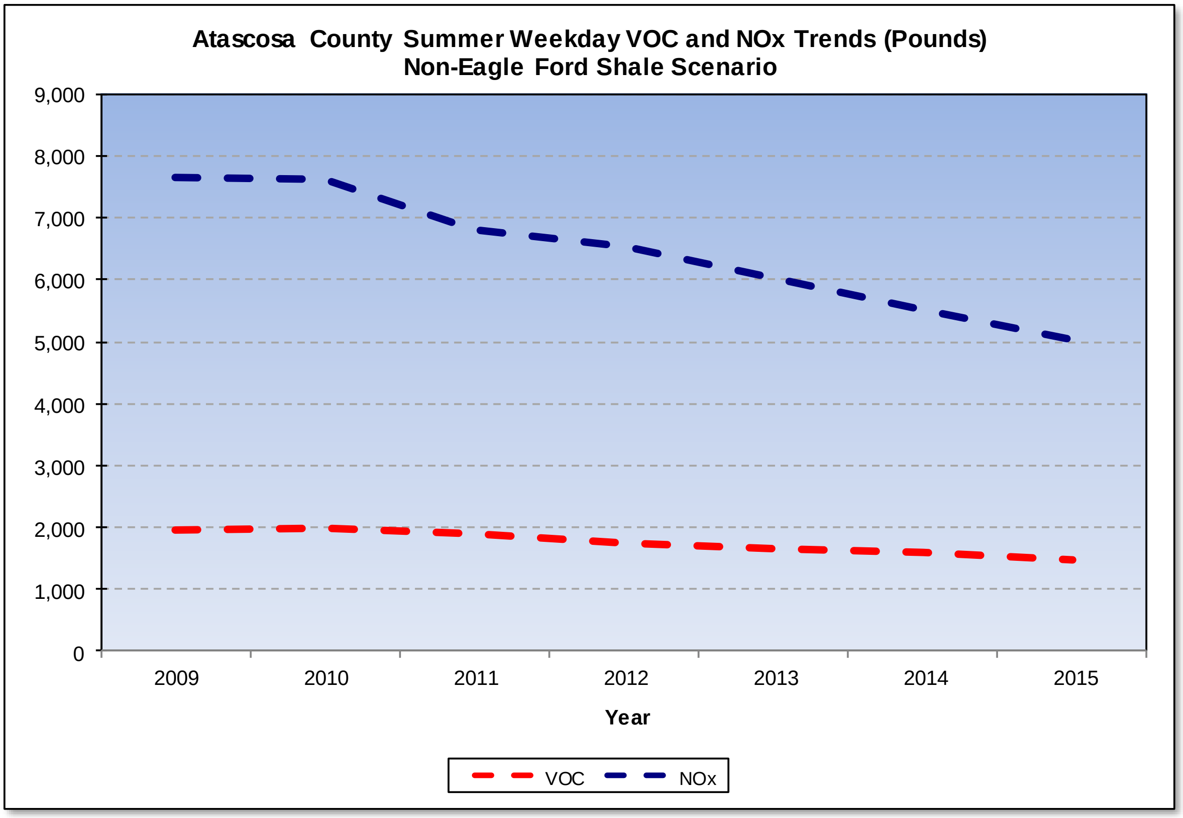
APPENDIX B:
NON EAGLE FORD SHALE SCENARIO PLOTS

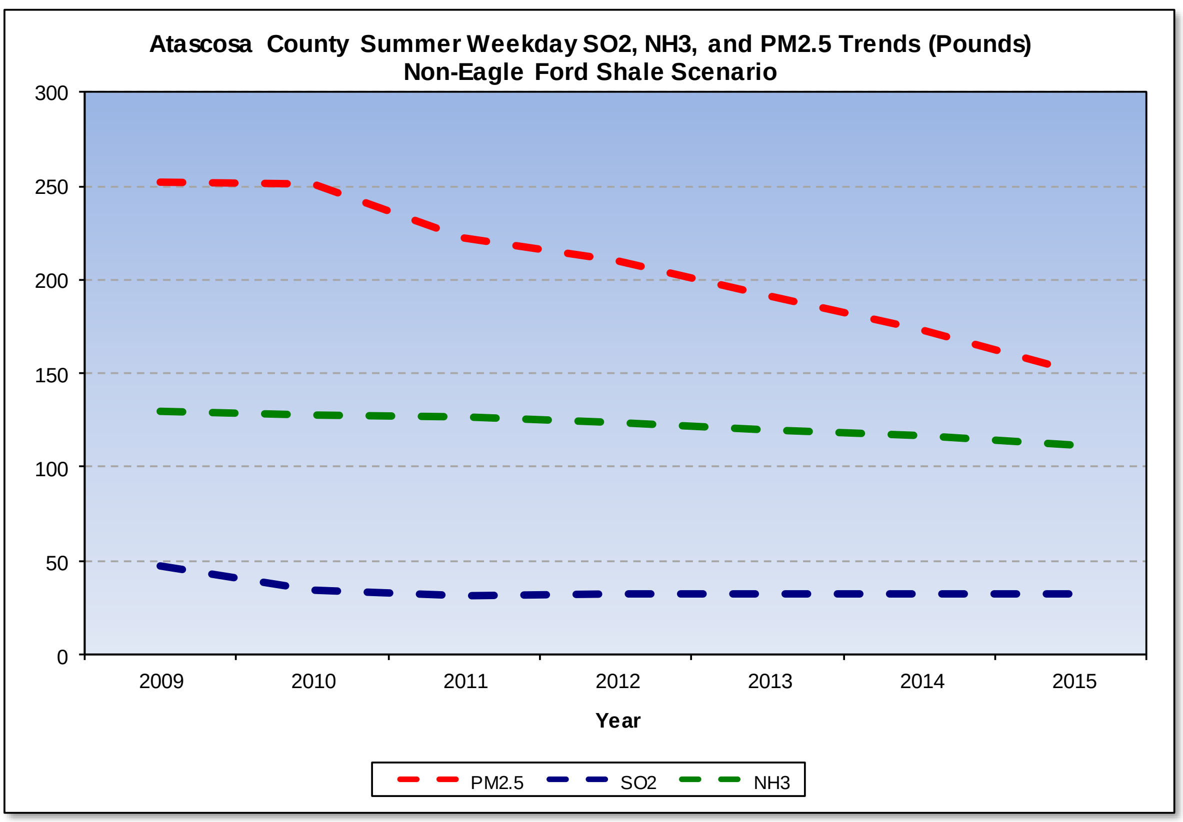


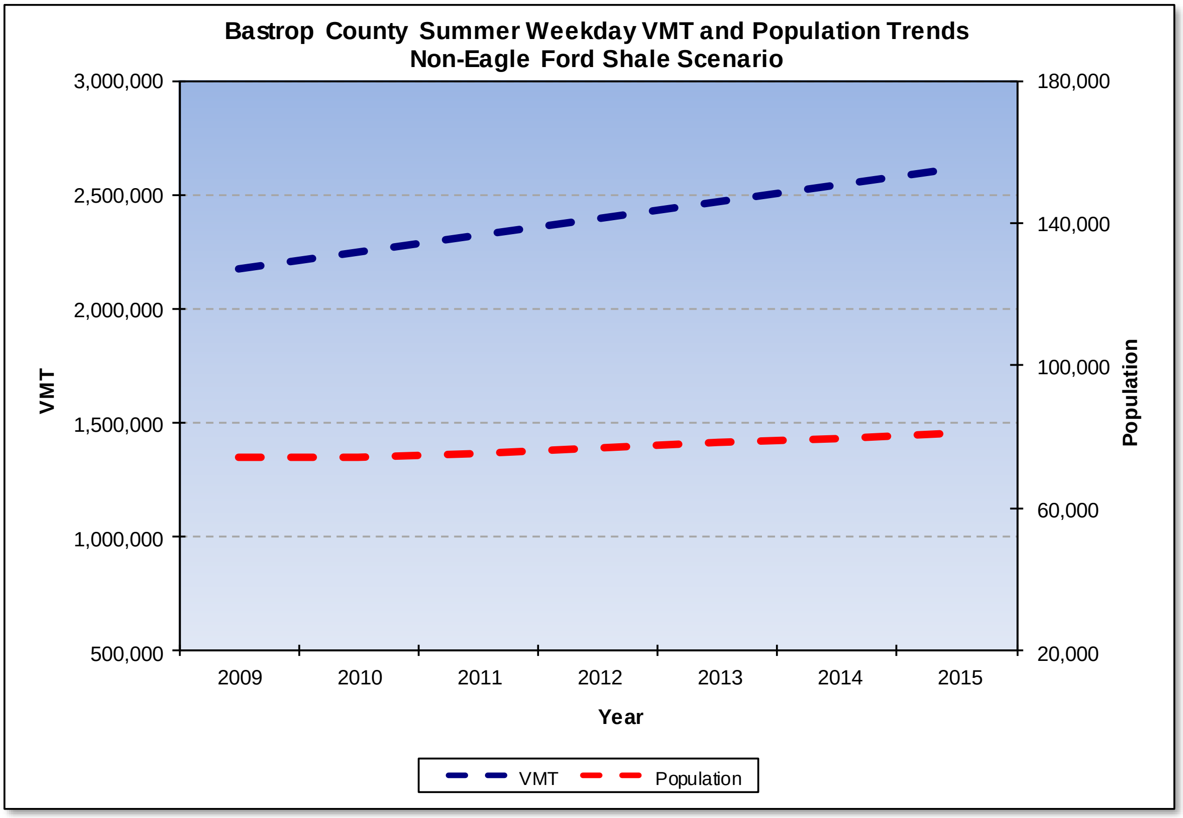
Atascosa County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
Population
Year
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
100,000
80,000
60,000
40,000
20,000
2009
2010
2011
2012
2013
2014
2015
VMT
Population

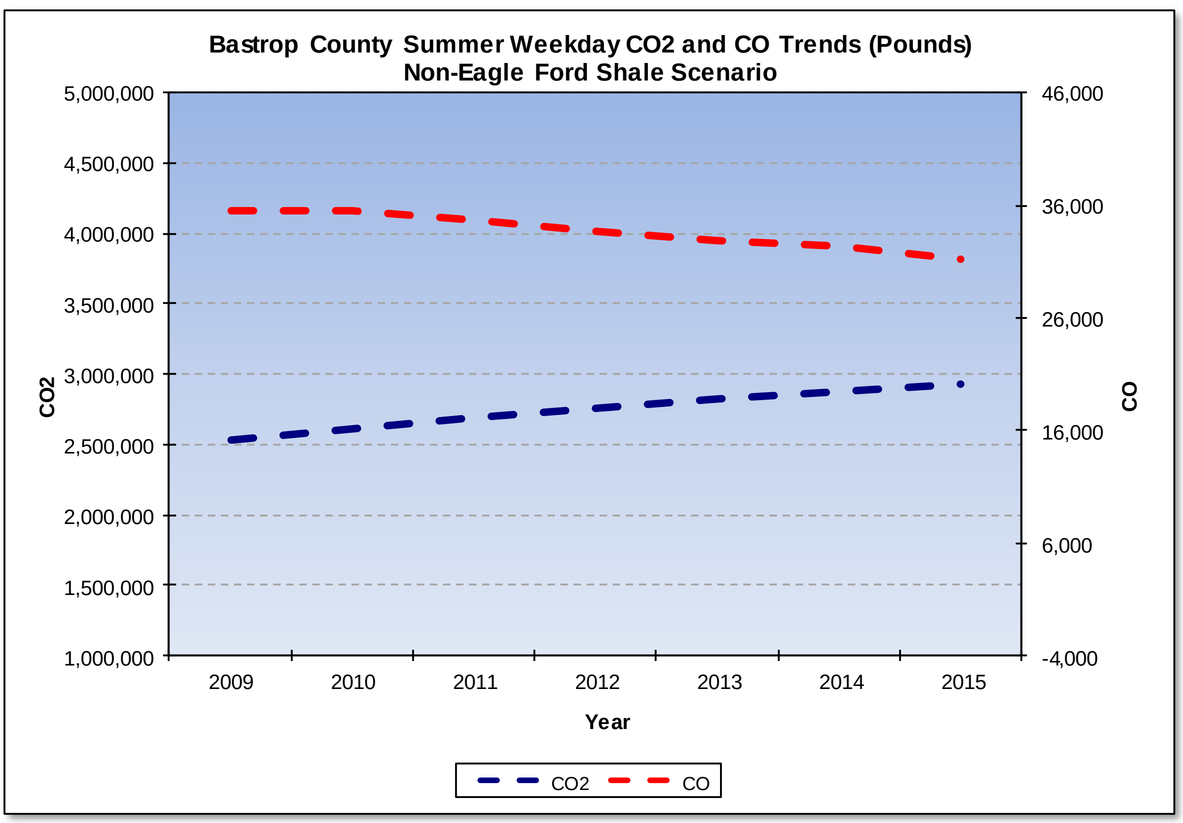


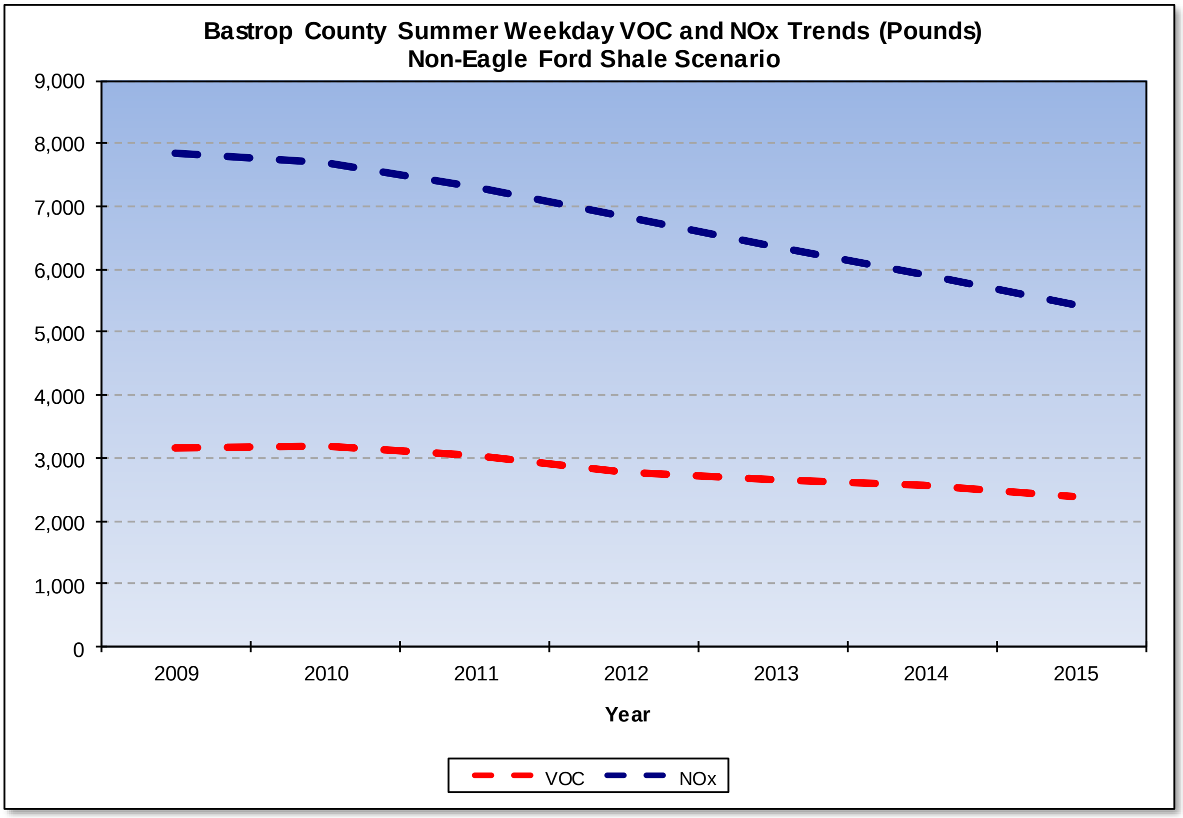
Atascosa County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
CO
Year
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
60,000
50,000
40,000
30,000
20,000
10,000
0
2009
2010
2011
2012
2013
2014
2015
CO2
CO

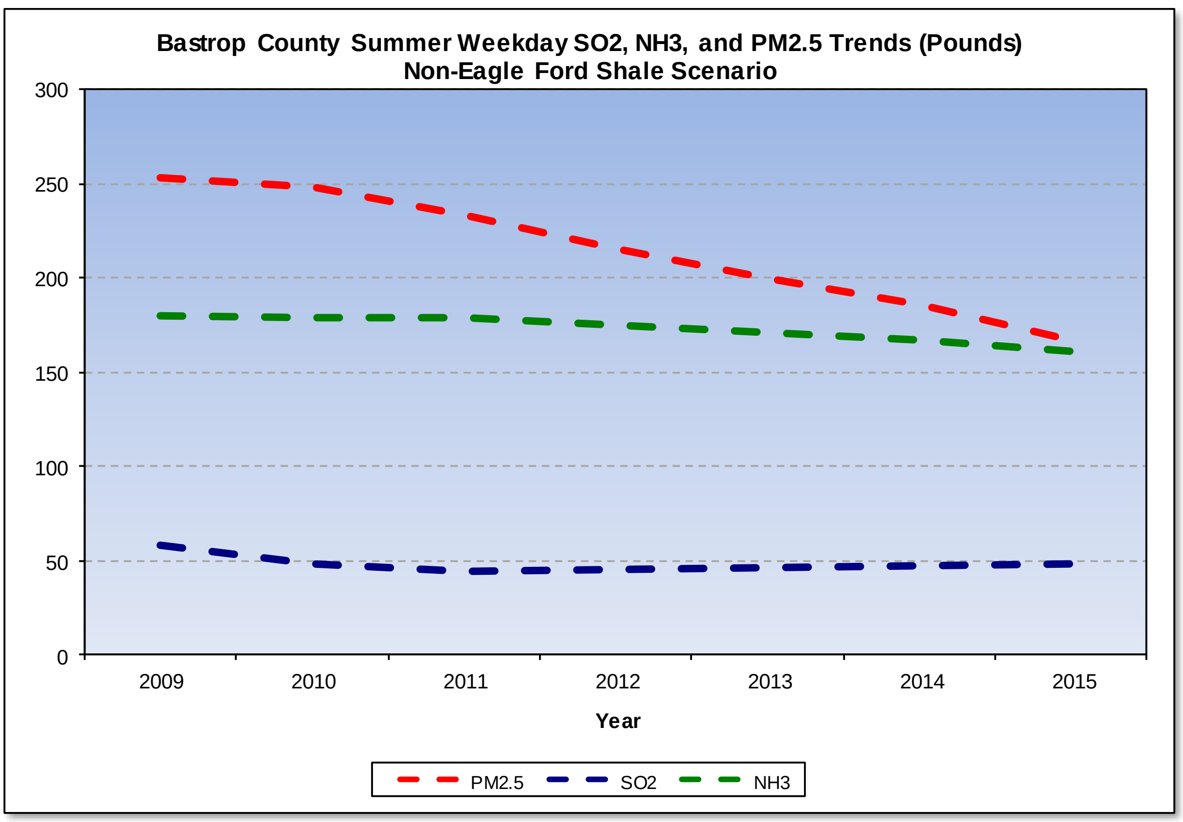

Atascosa County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

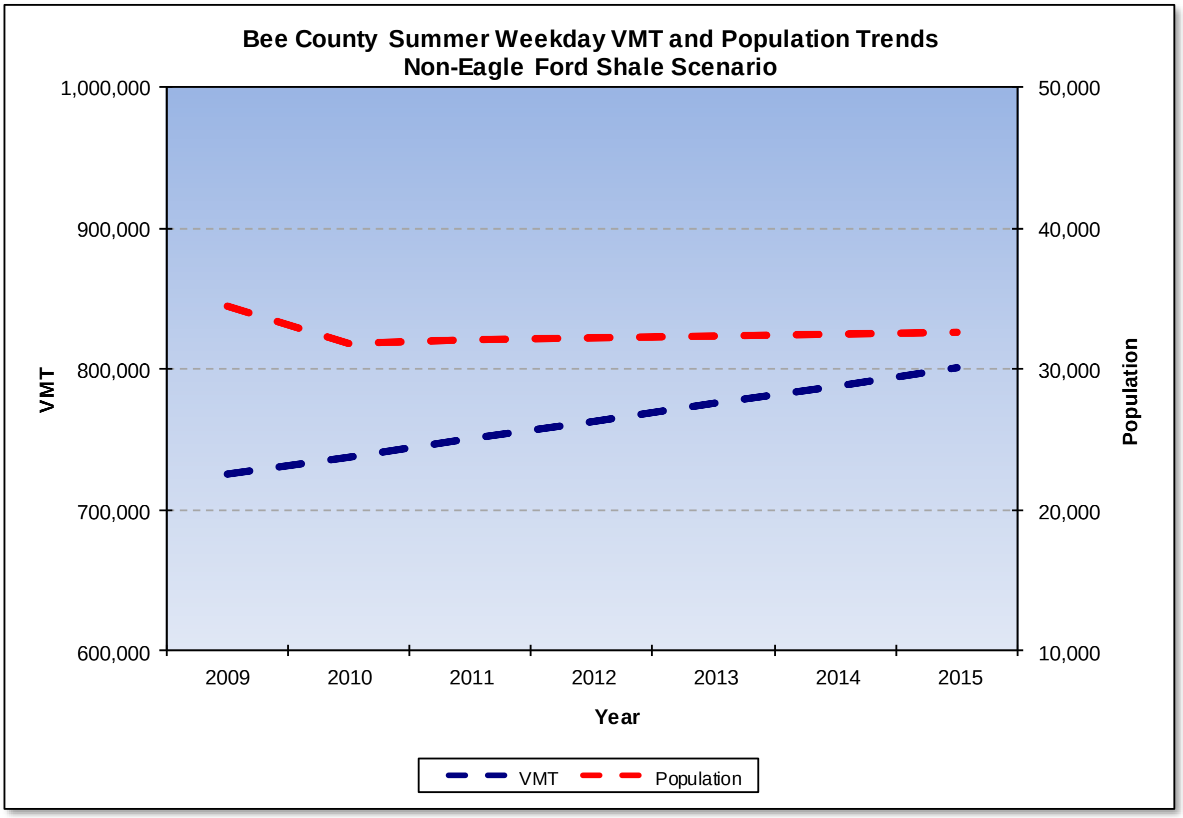

Atascosa County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

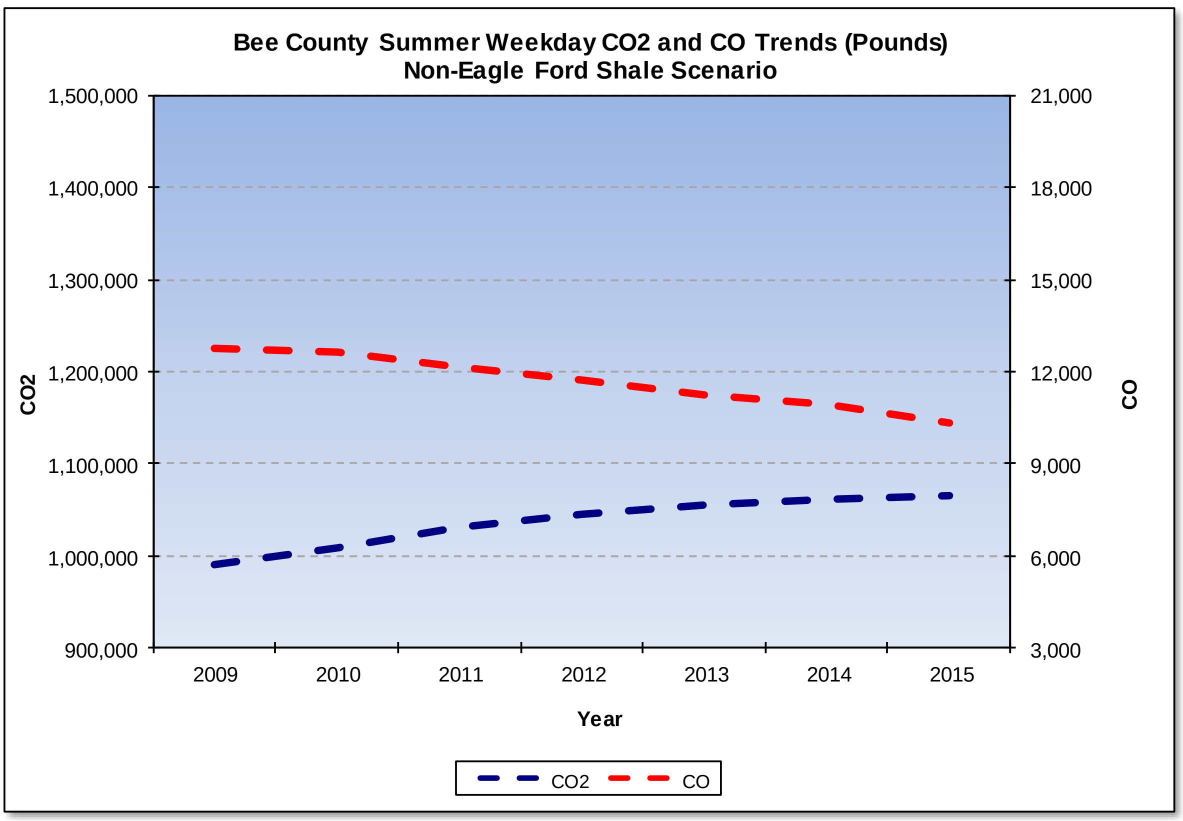

Bastrop County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
VMT
180,000
140,000
100,000
60,000
20,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

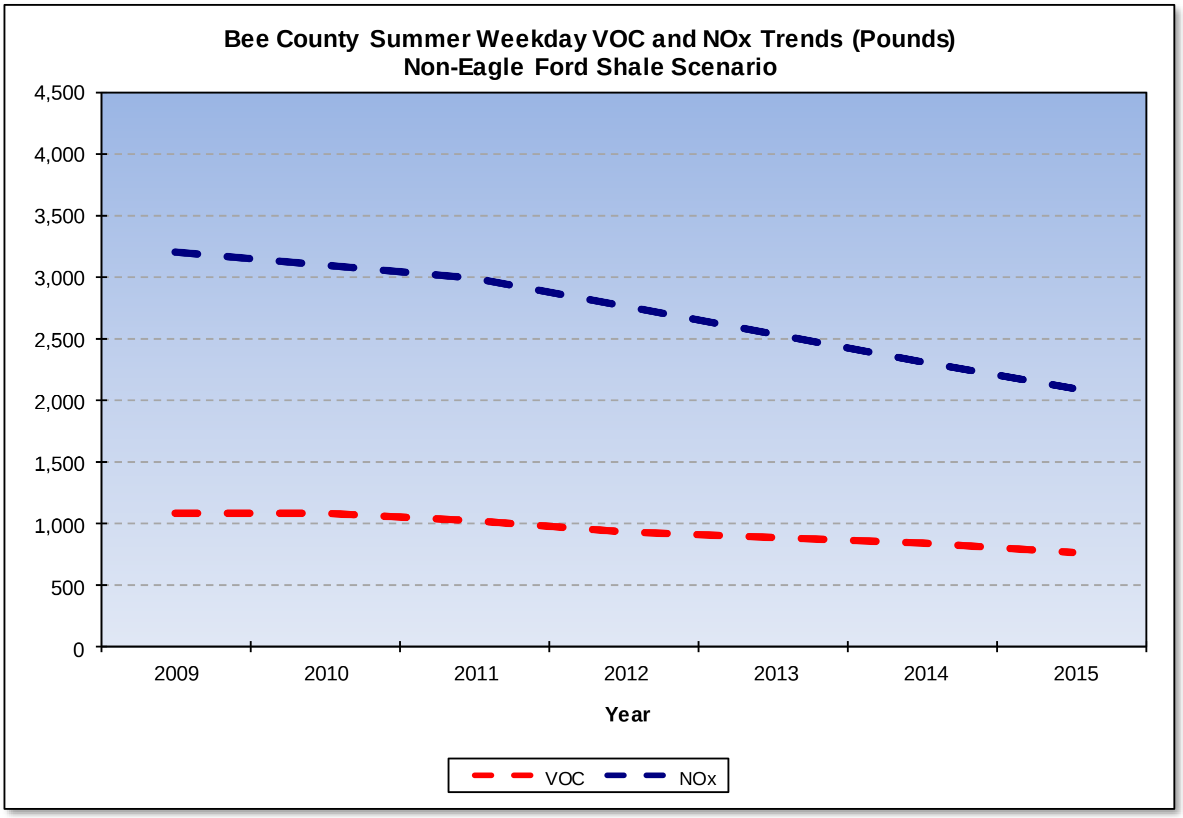

Bastrop County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
CO2
46,000
36,000
26,000
16,000
6,000
-4,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

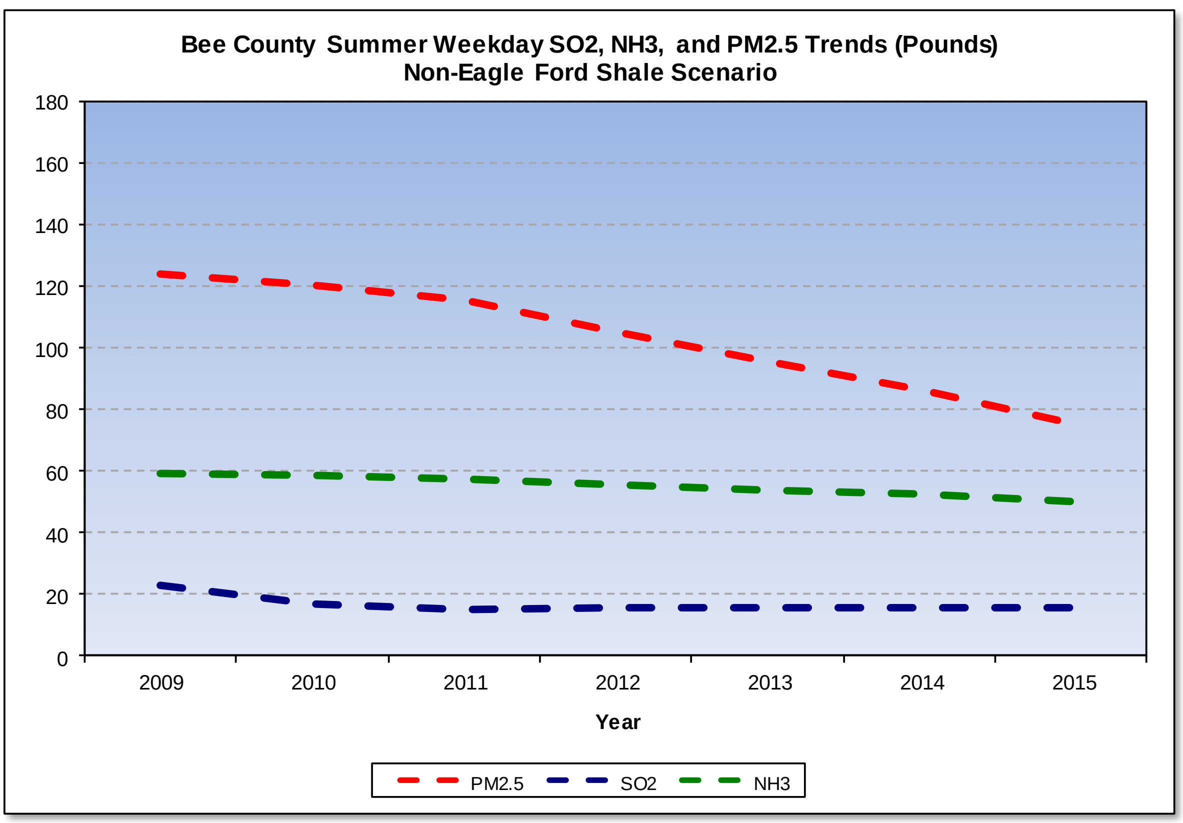

Bastrop County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

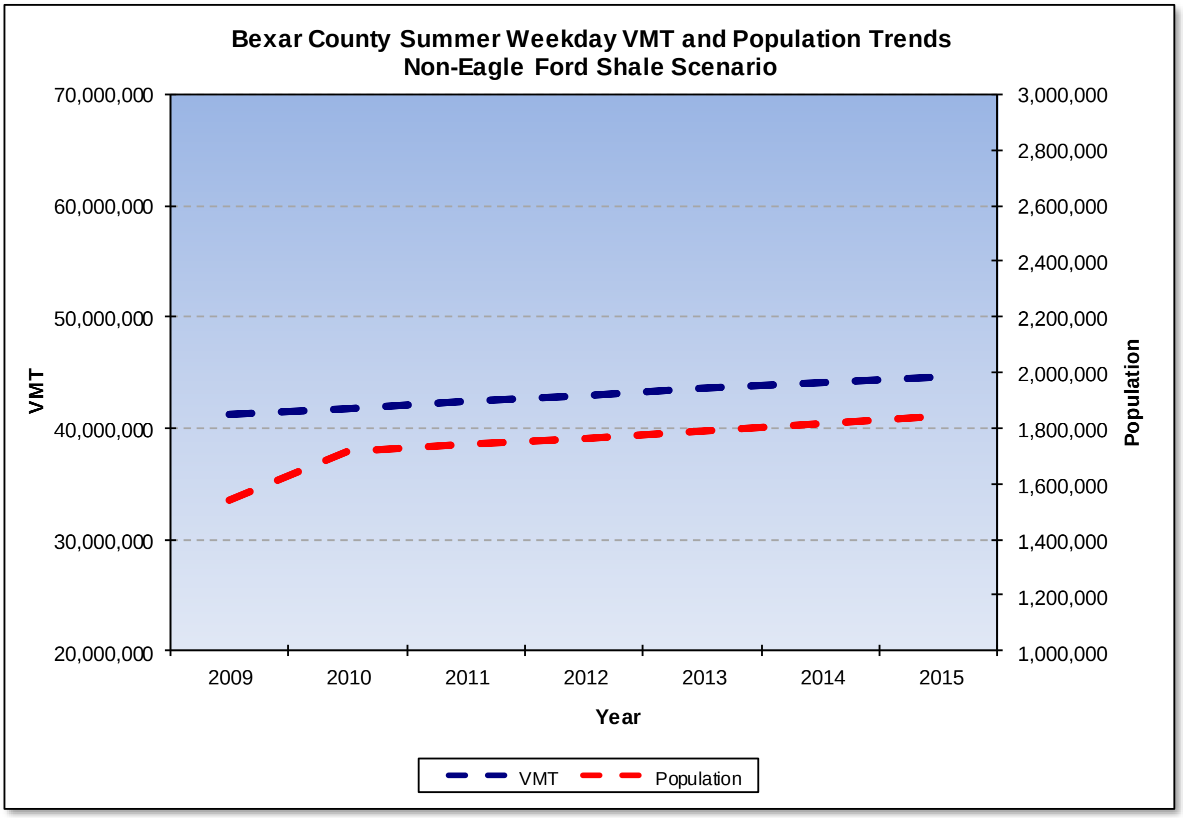

Bastrop County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

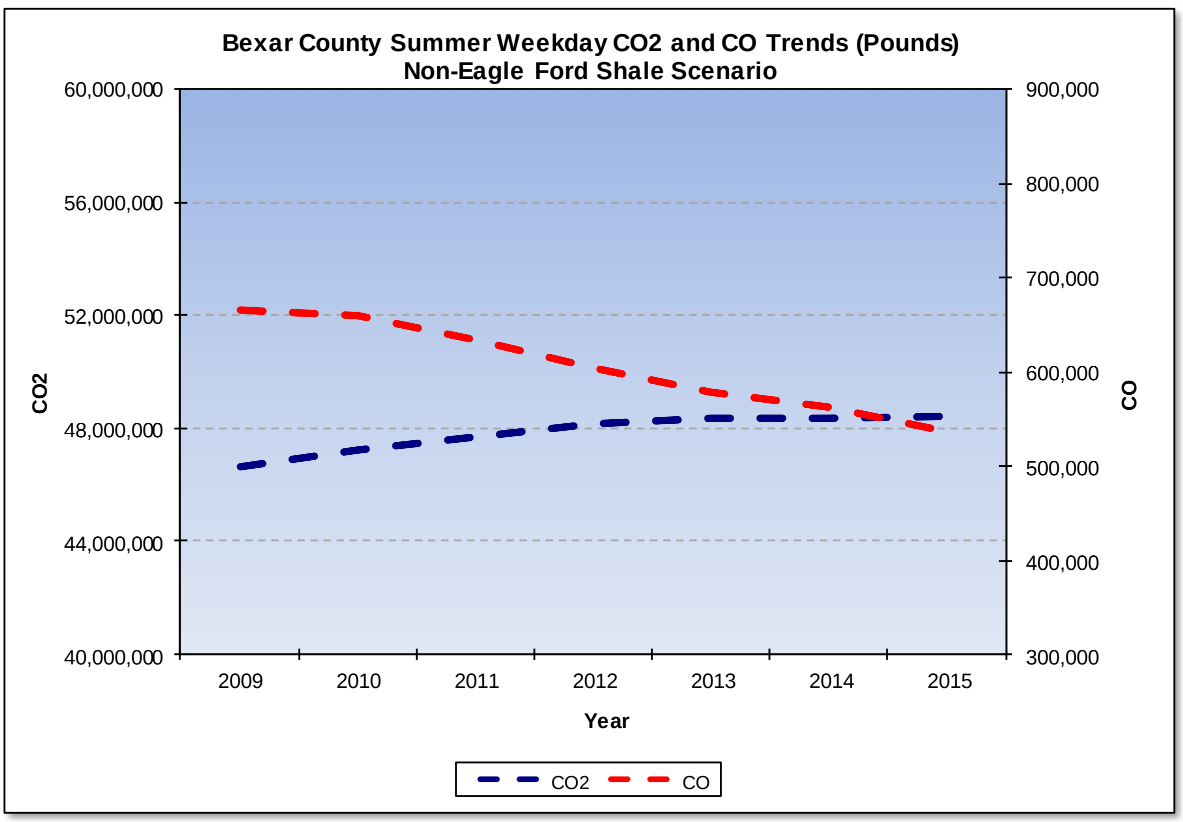

Bee County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,000,000
900,000
800,000
700,000
600,000
50,000
40,000
30,000
20,000
10,000
VMT
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

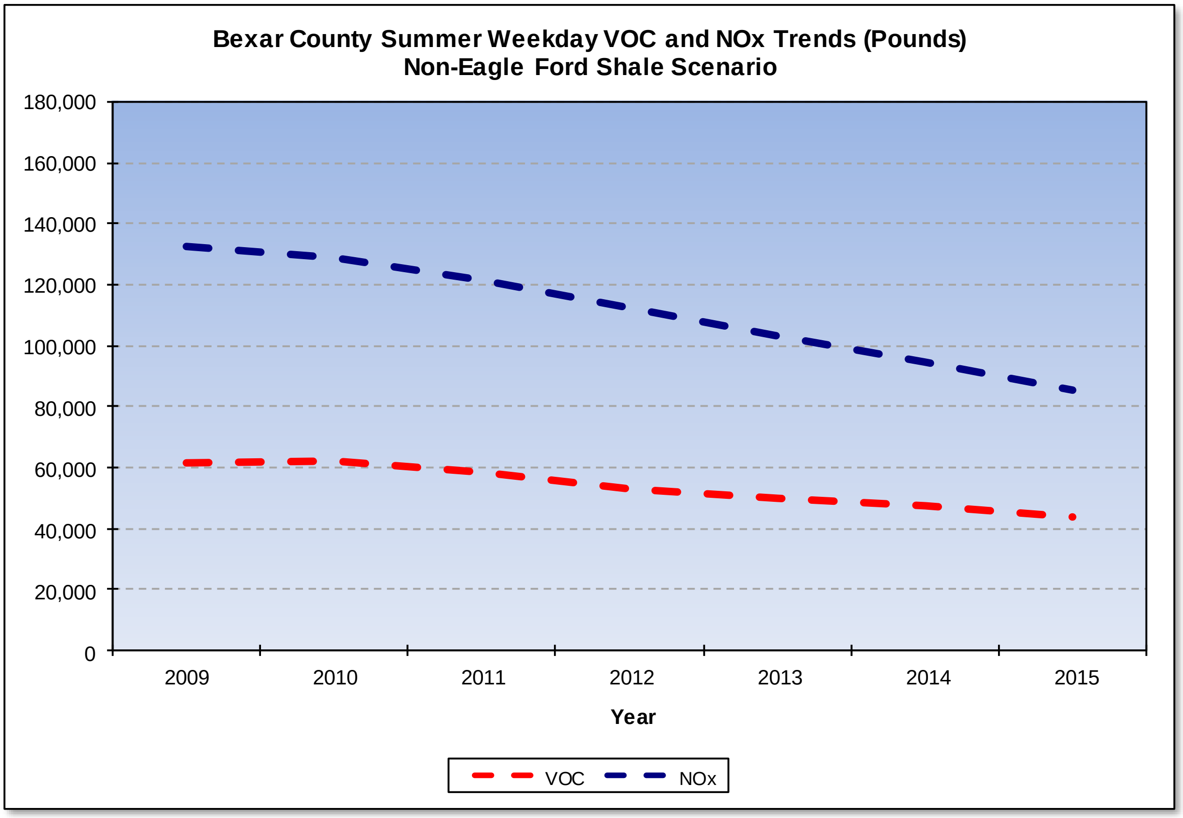

Bee County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,500,000
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
21,000
18,000
15,000
12,000
9,000
6,000
3,000
CO2
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

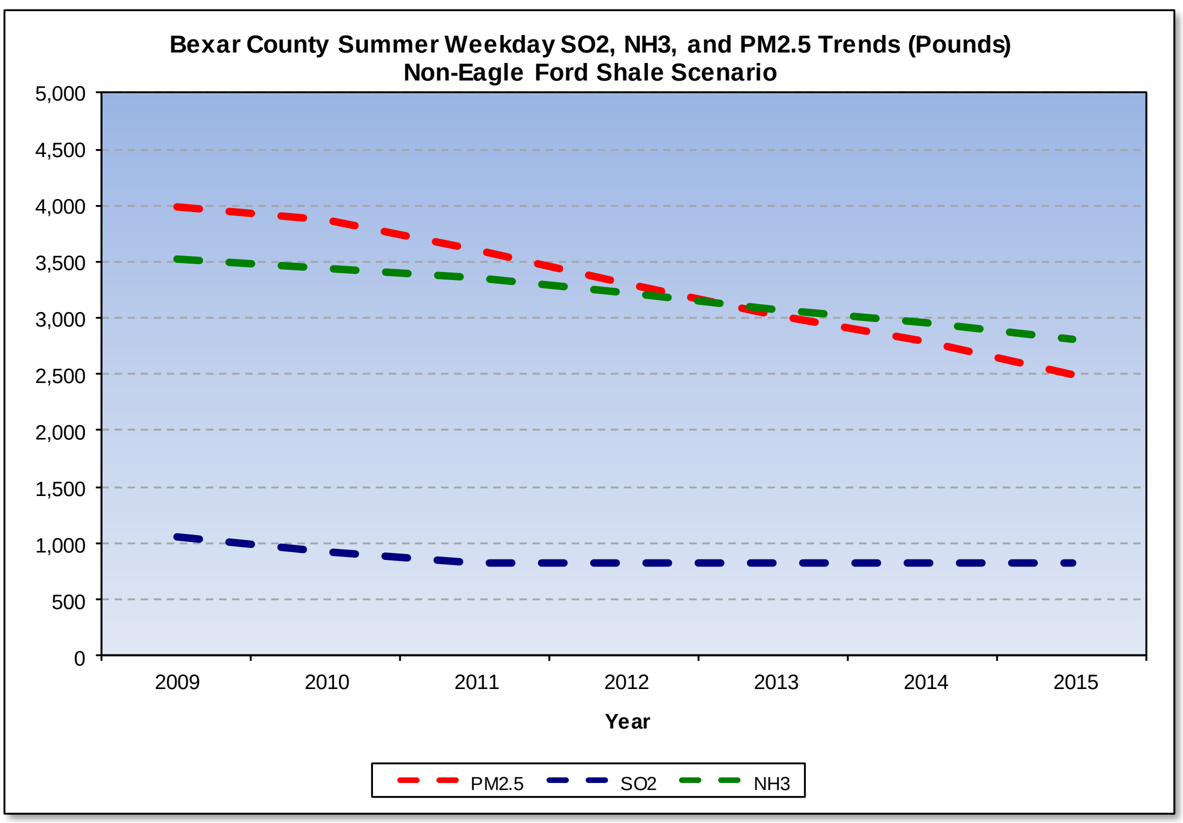

Bee County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

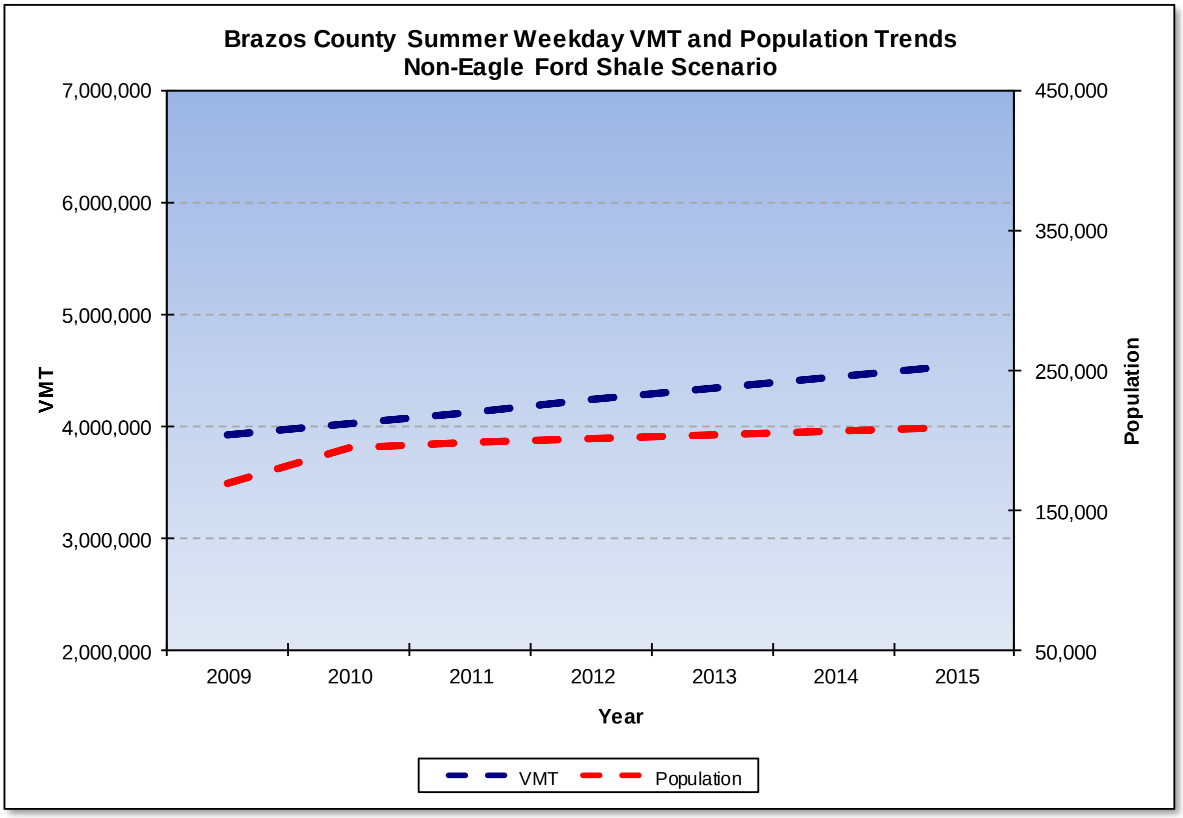

Bee County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
180
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

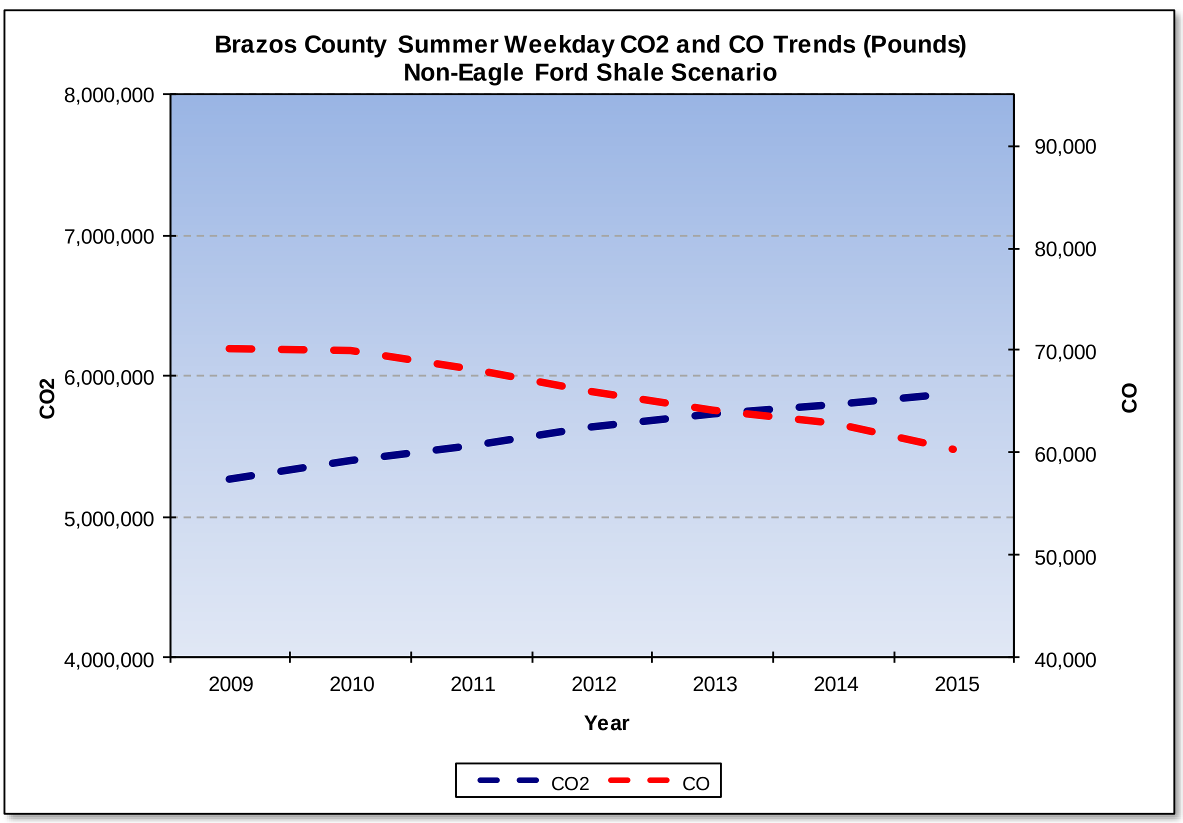

Bexar County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
70,000,000
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
VMT
3,000,000
2,800,000
2,600,000
2,400,000
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

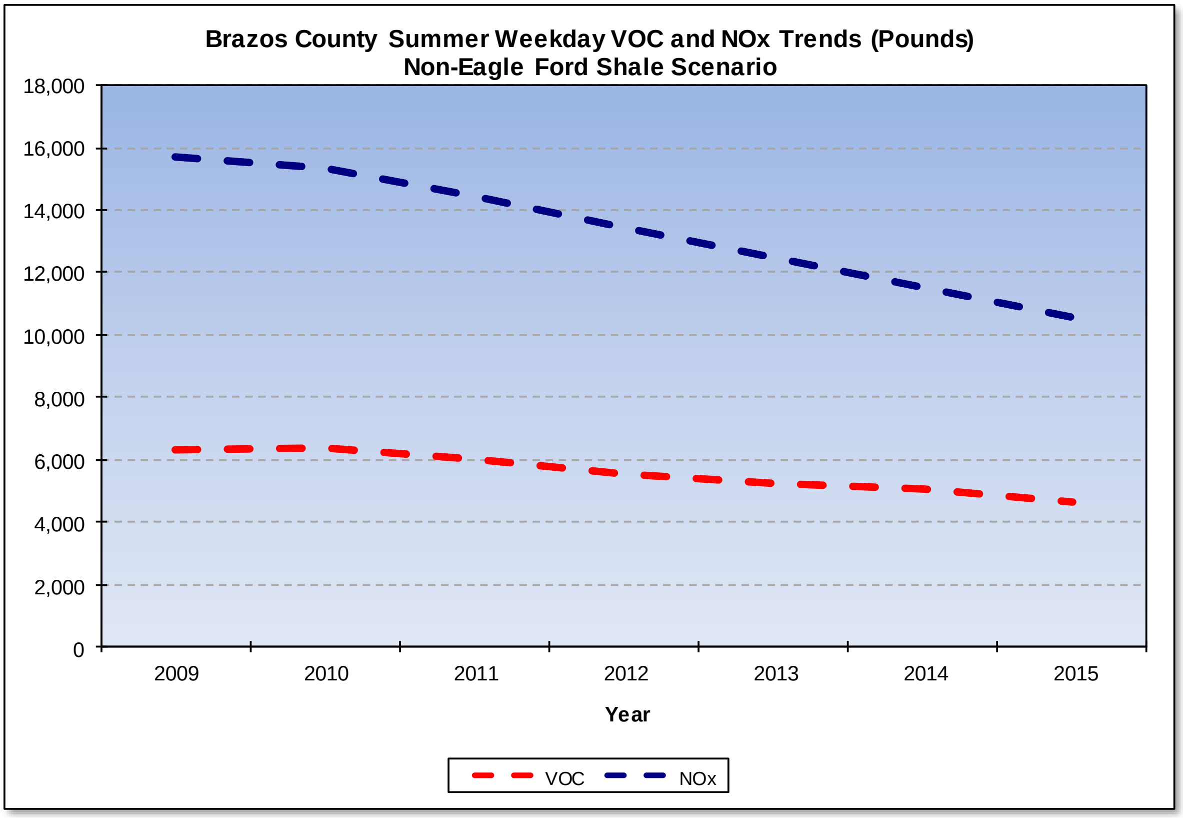

Bexar County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
60,000,000
56,000,000
52,000,000
48,000,000
44,000,000
40,000,000
CO2
900,000
800,000
700,000
600,000
500,000
400,000
300,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


Bexar County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx


Bexar County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Brazos County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
VMT
450,000
350,000
250,000
150,000
50,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population


Brazos County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
CO2
90,000
80,000
70,000
60,000
50,000
40,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


Brazos County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
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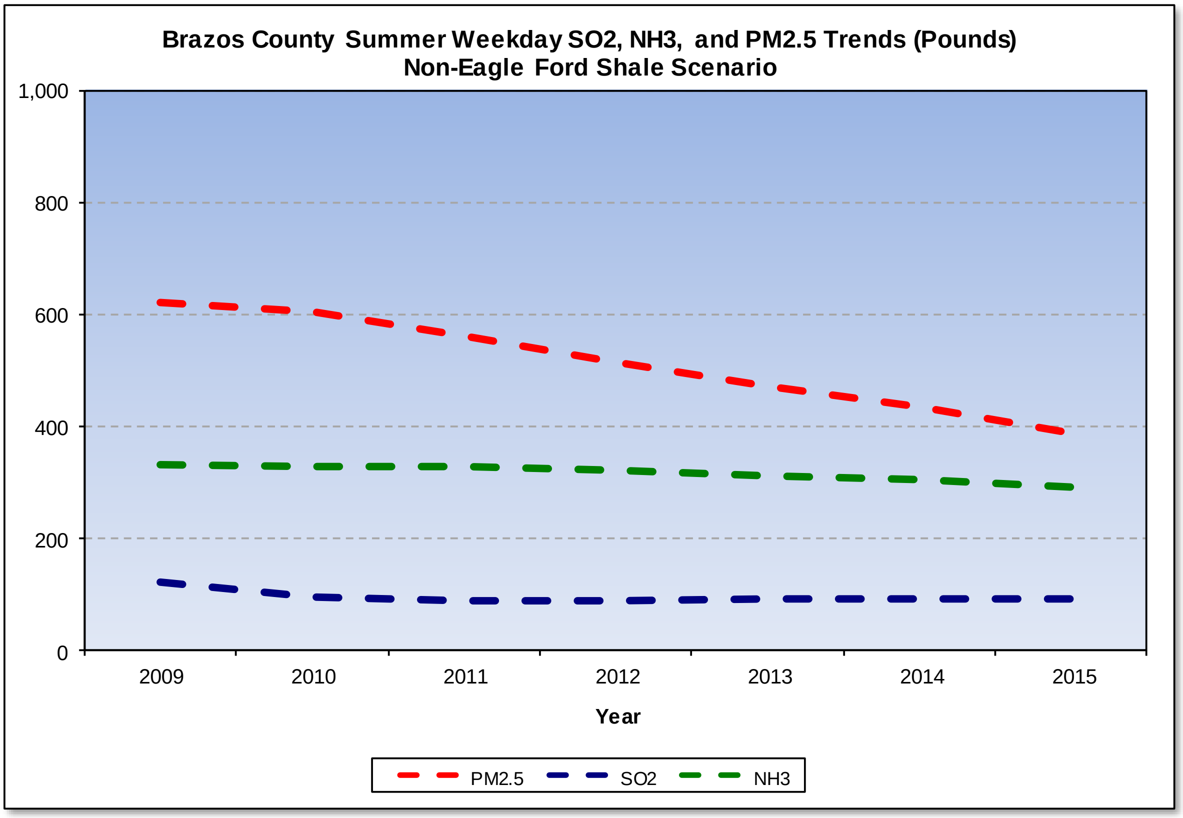
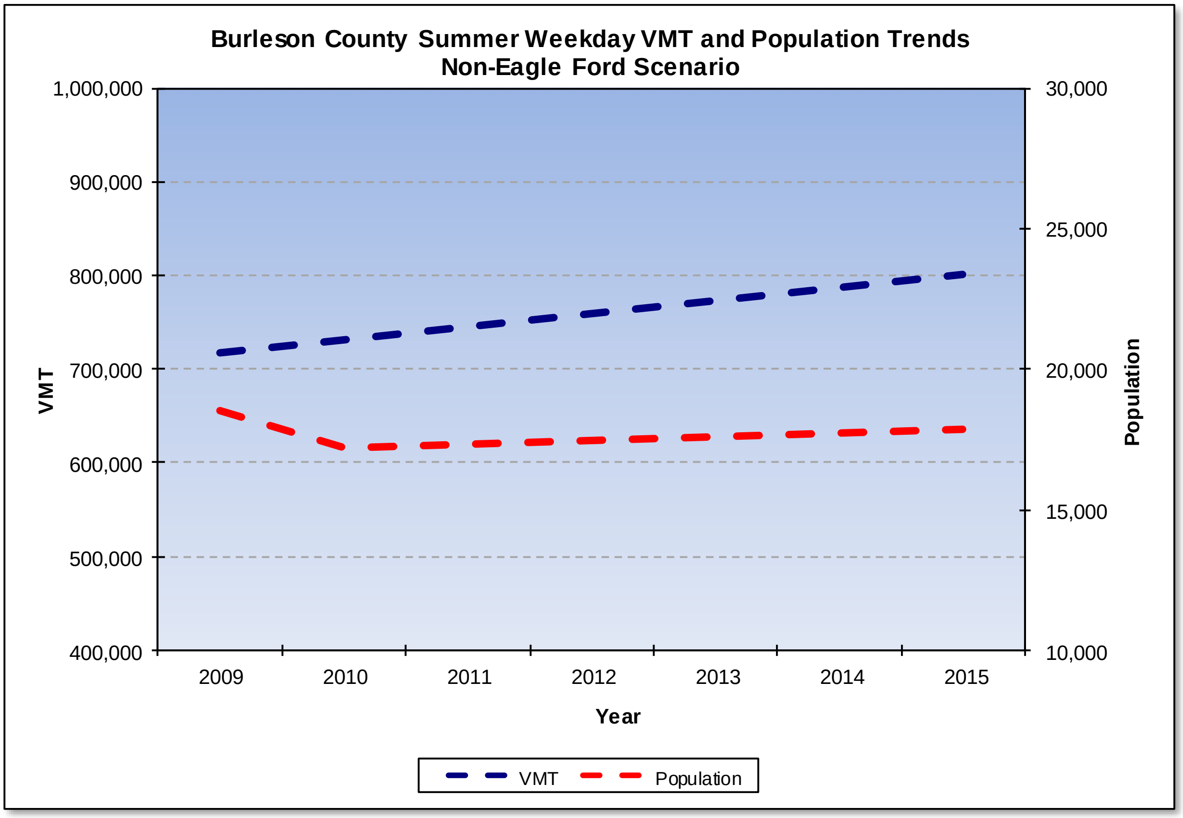
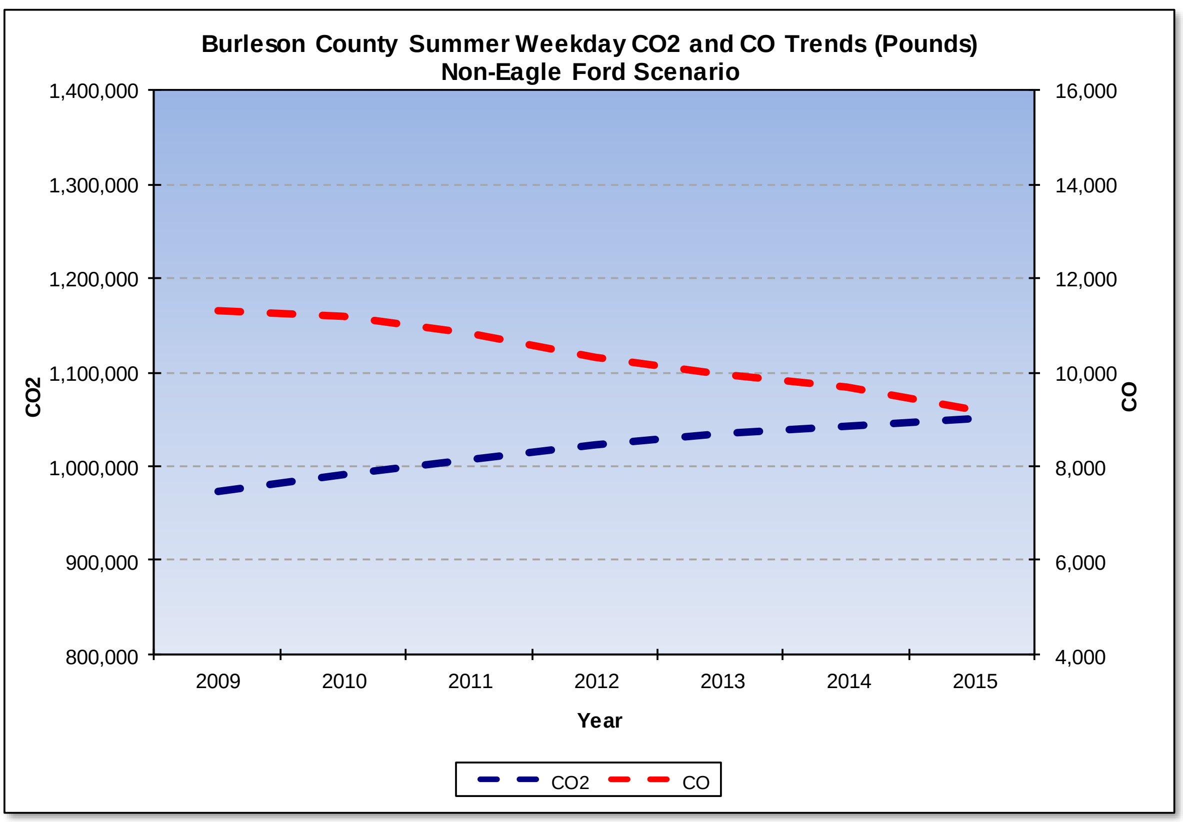
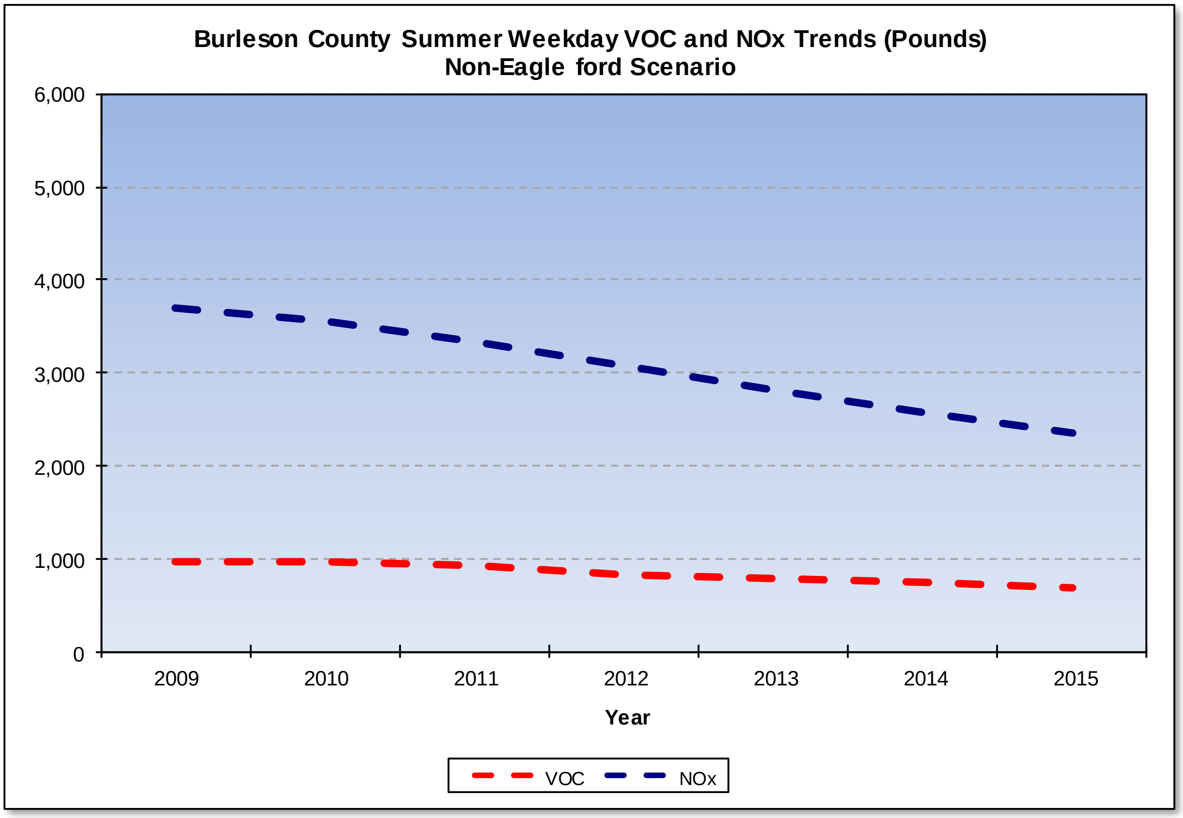
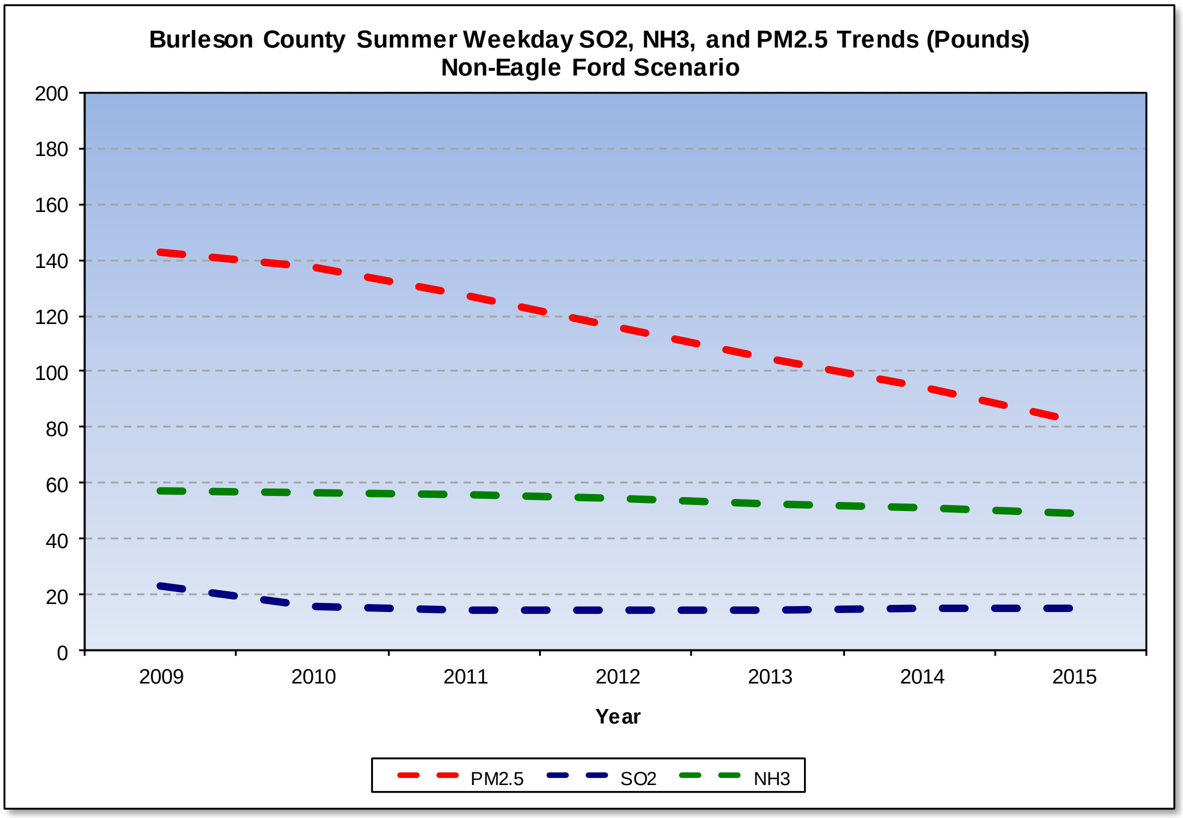
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

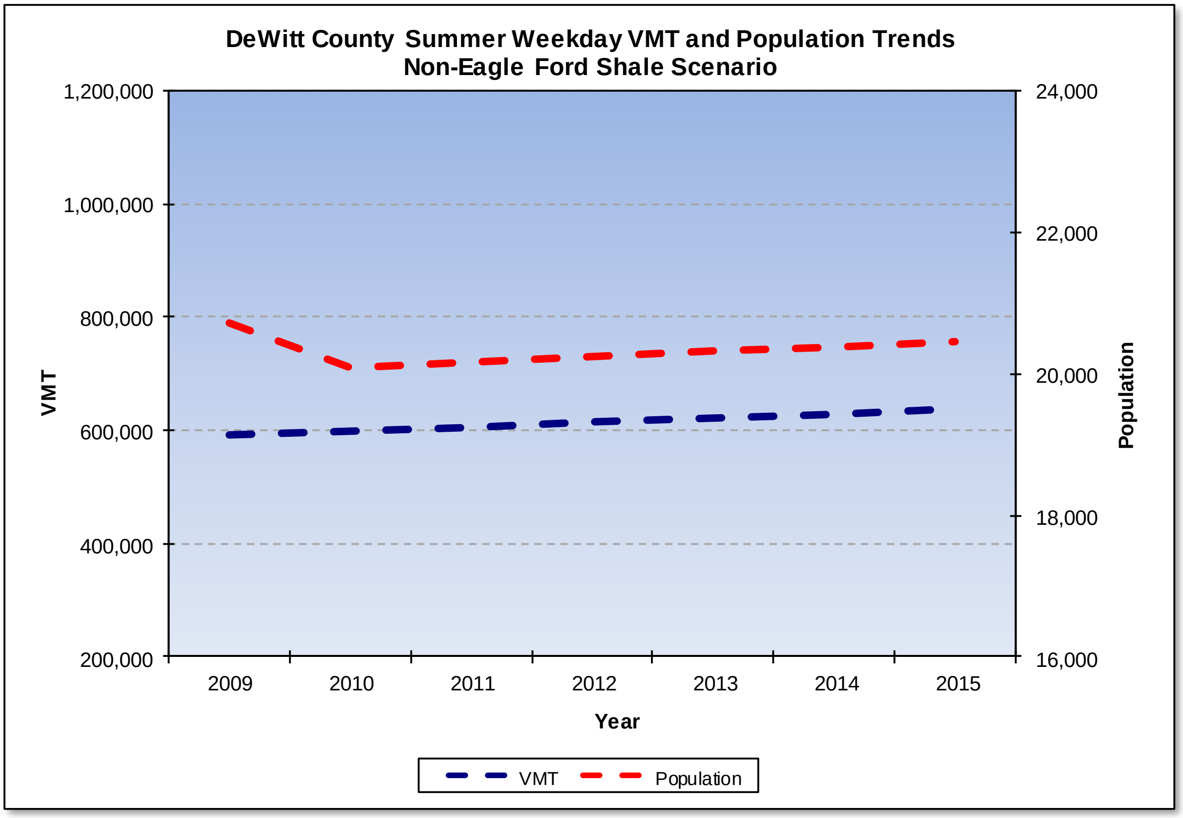

Brazos County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,000
800
600
400
200
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

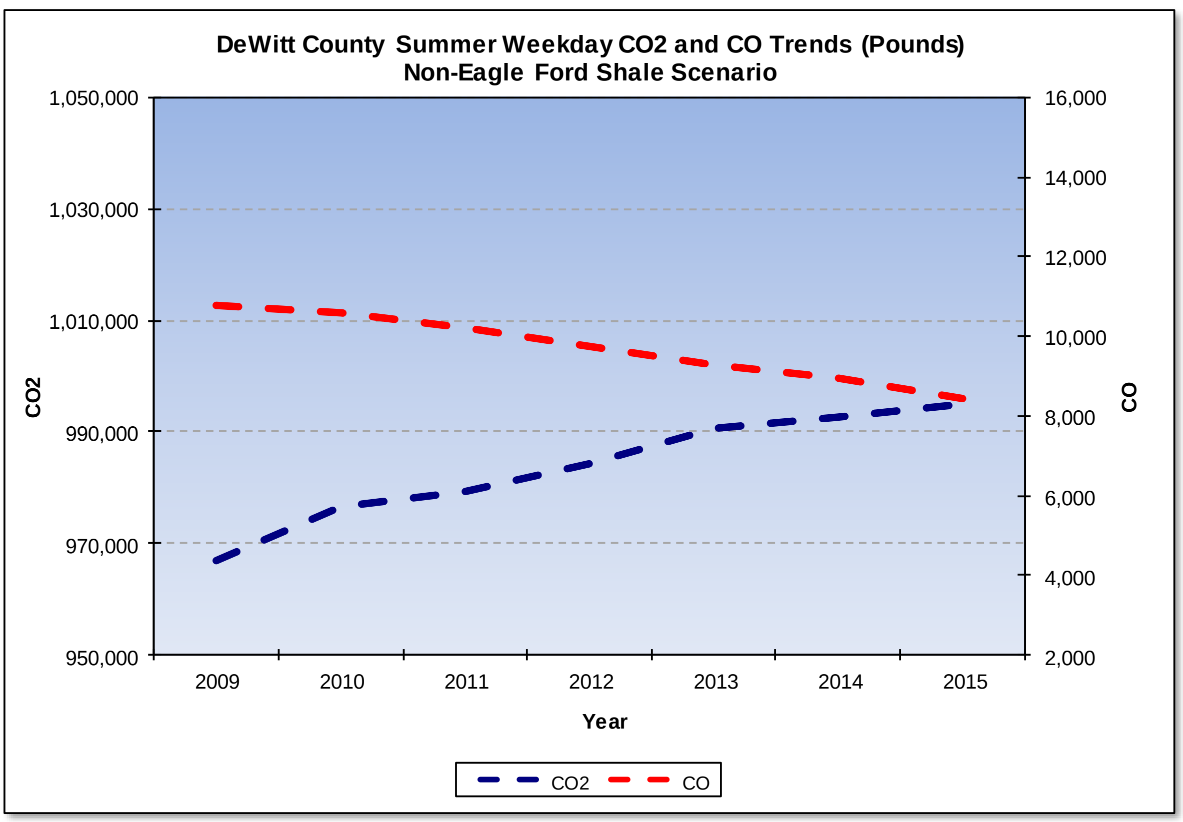

Burleson County Summer Weekday VMT and Population Trends
Non-Eagle Ford Scenario
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
VMT
30,000
25,000
20,000
15,000
10,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

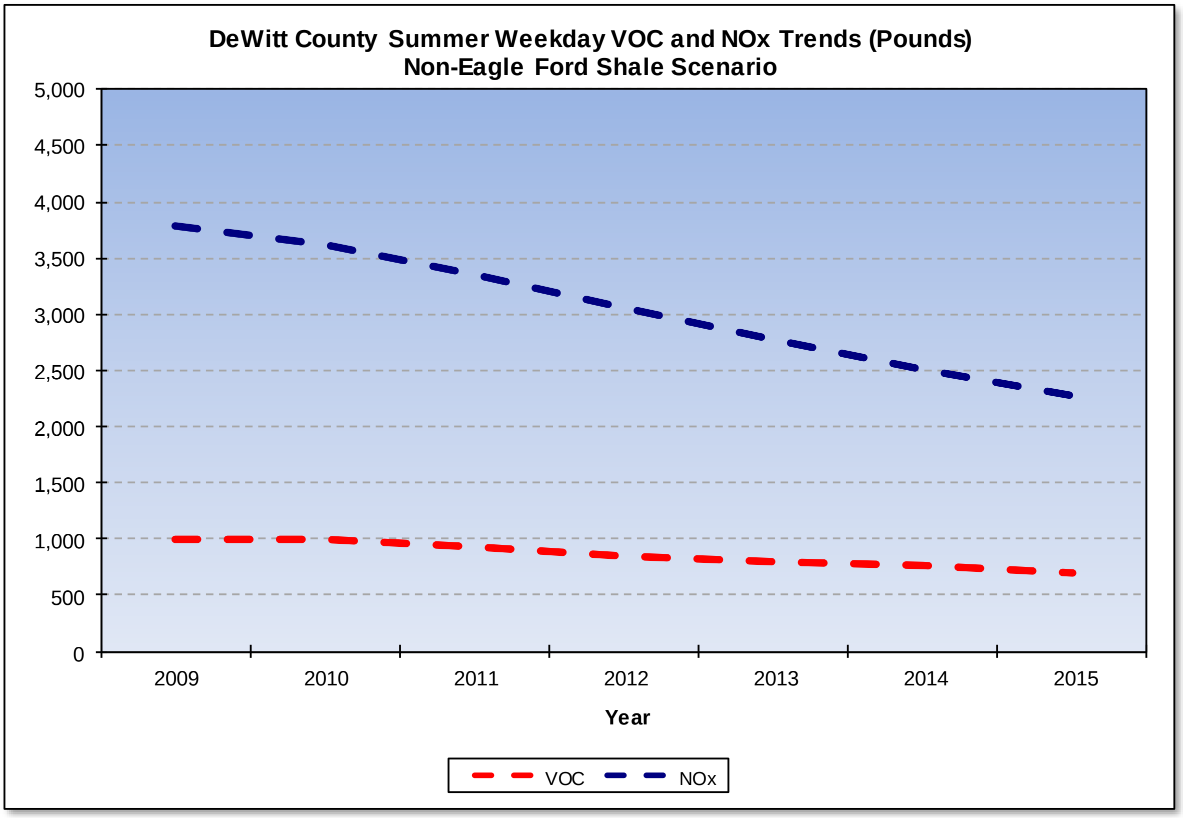

Burleson County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Scenario
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
CO2
16,000
14,000
12,000
10,000
8,000
6,000
4,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

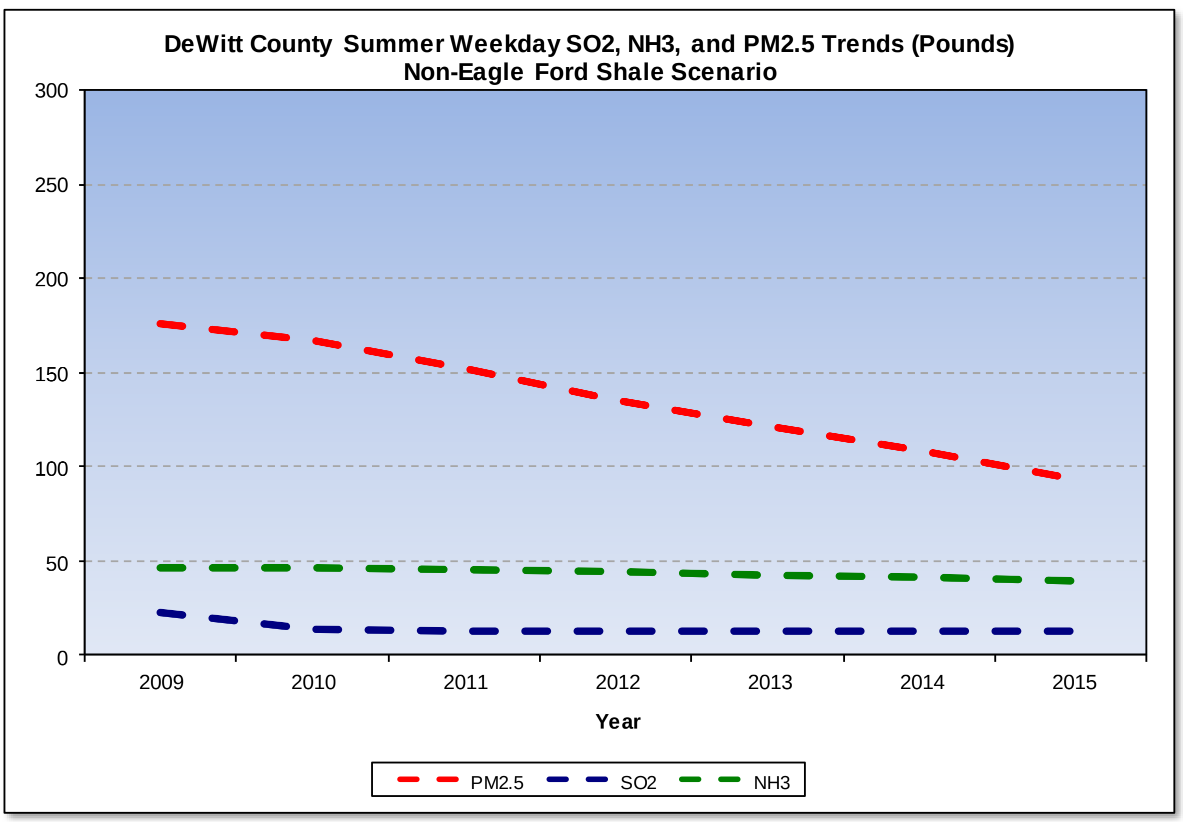

Burleson County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle ford Scenario
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

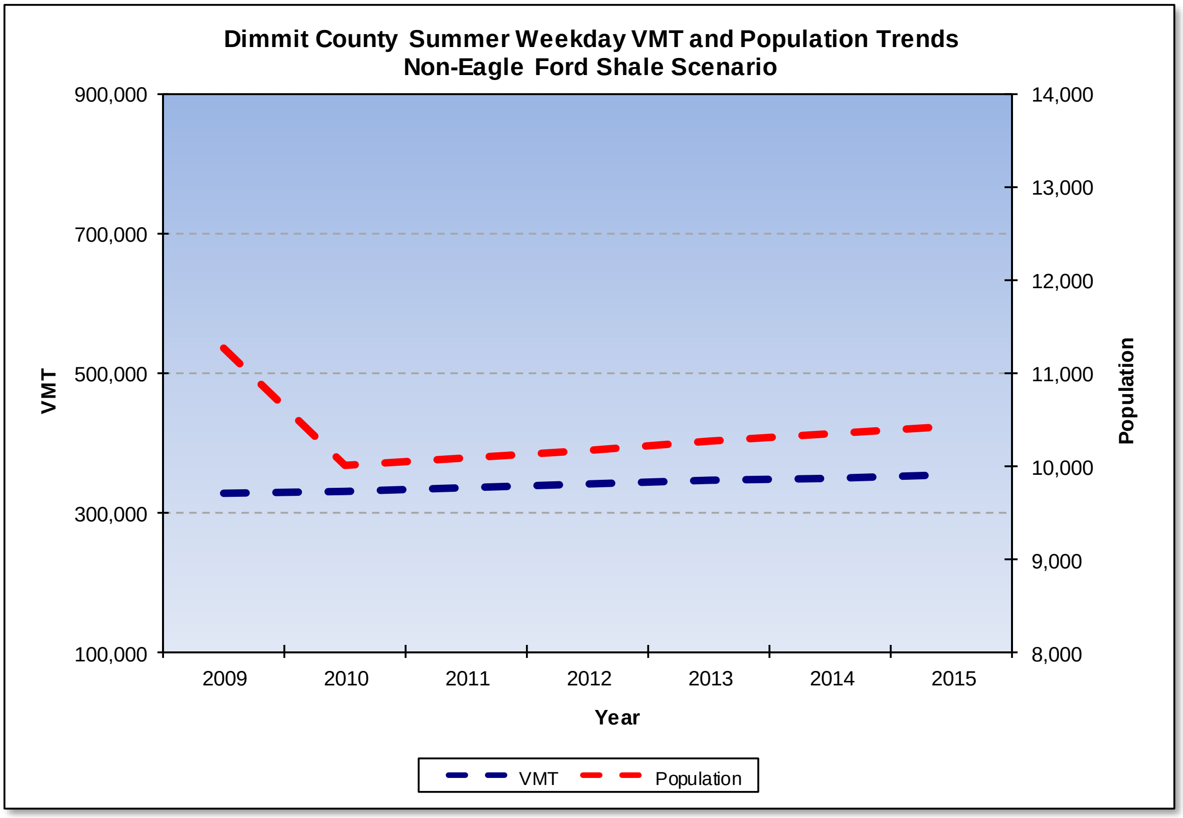

Burleson County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Scenario
200
180
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

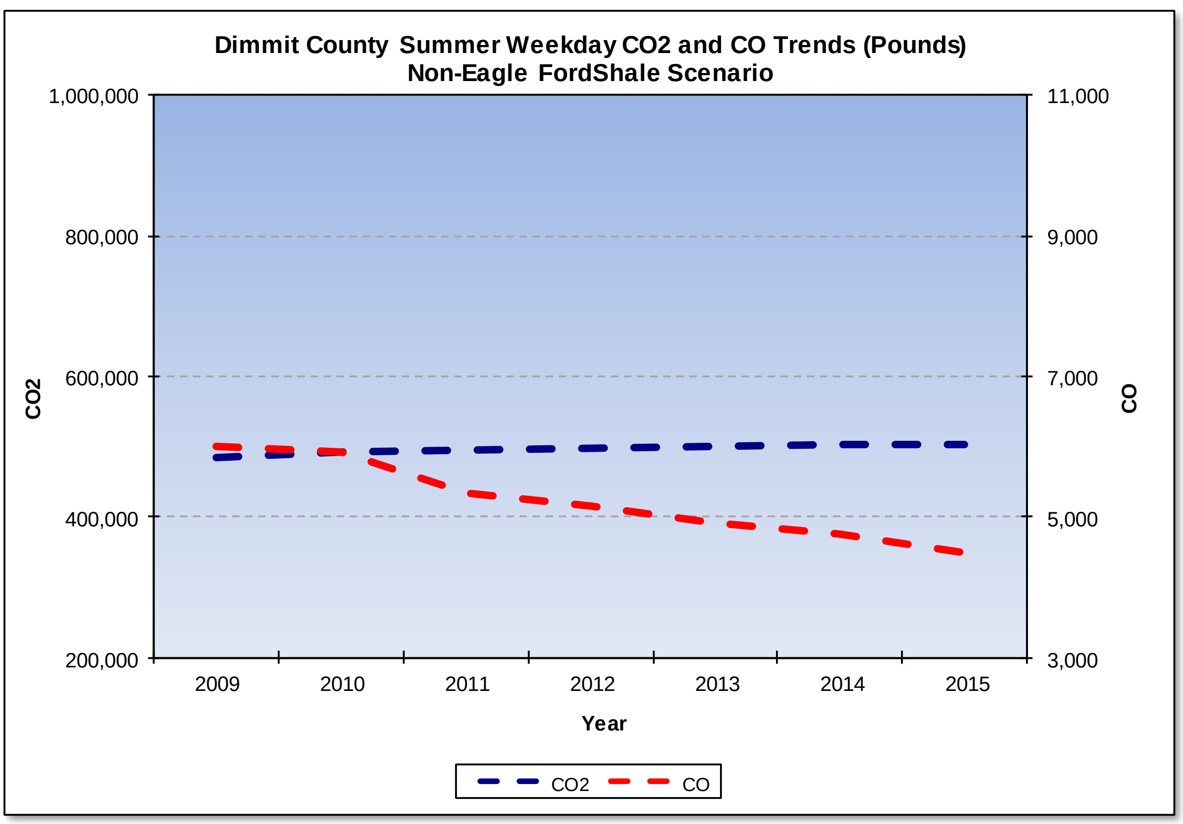

DeWitt County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,200,000
1,000,000
800,000
600,000
400,000
200,000
VMT
24,000
22,000
20,000
18,000
16,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

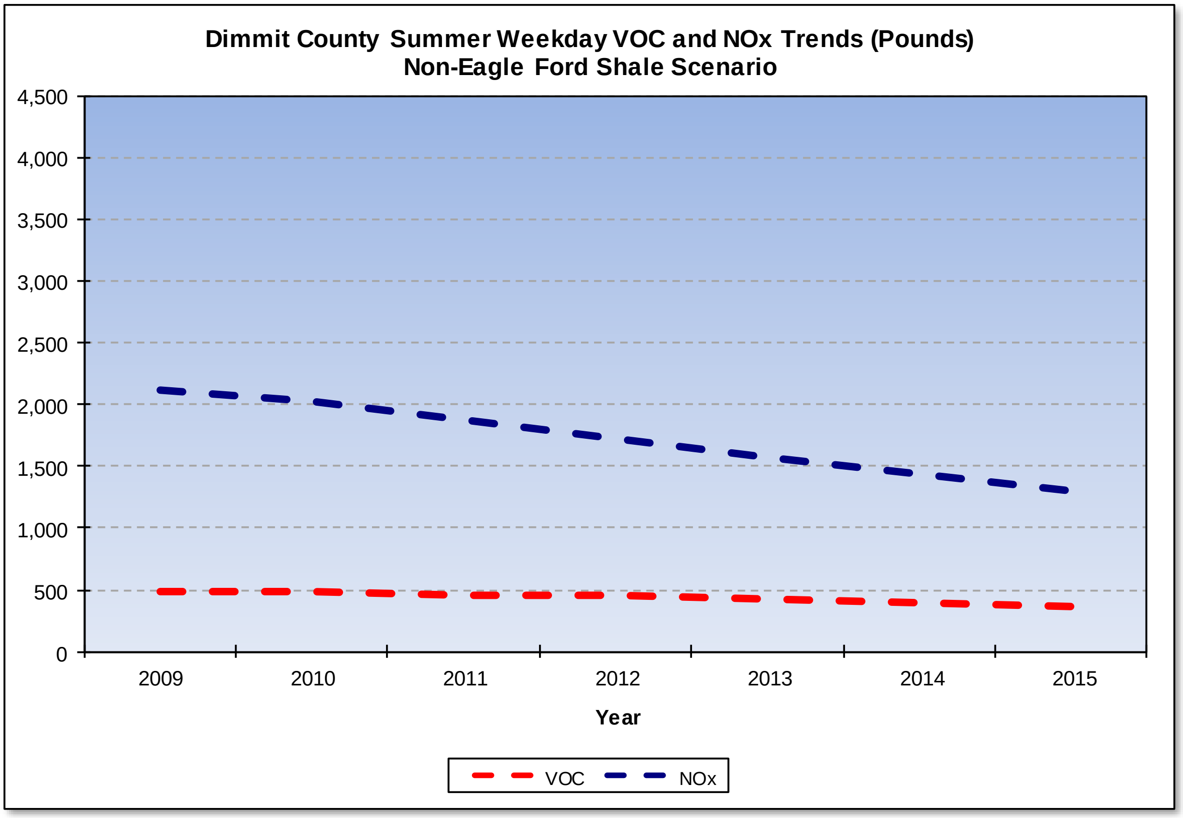

DeWitt County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,050,000
1,030,000
1,010,000
990,000
970,000
950,000
CO2
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

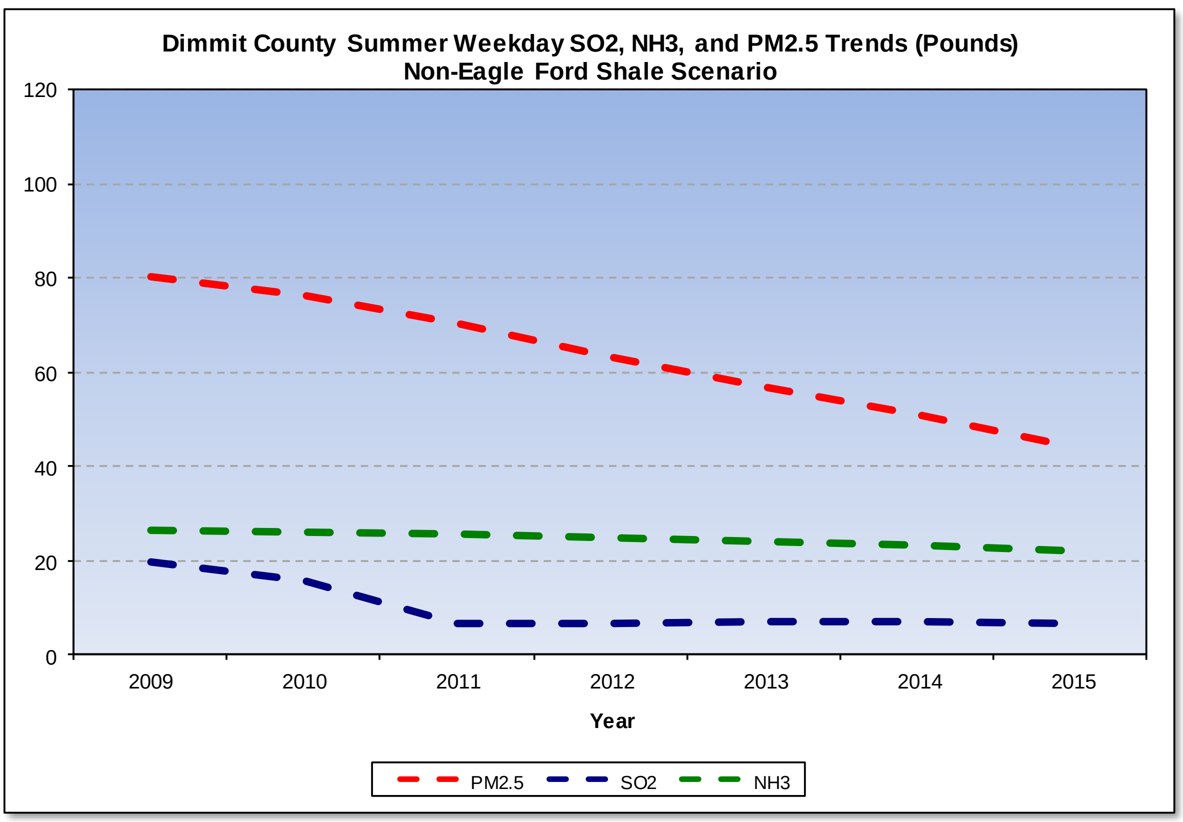

DeWitt County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

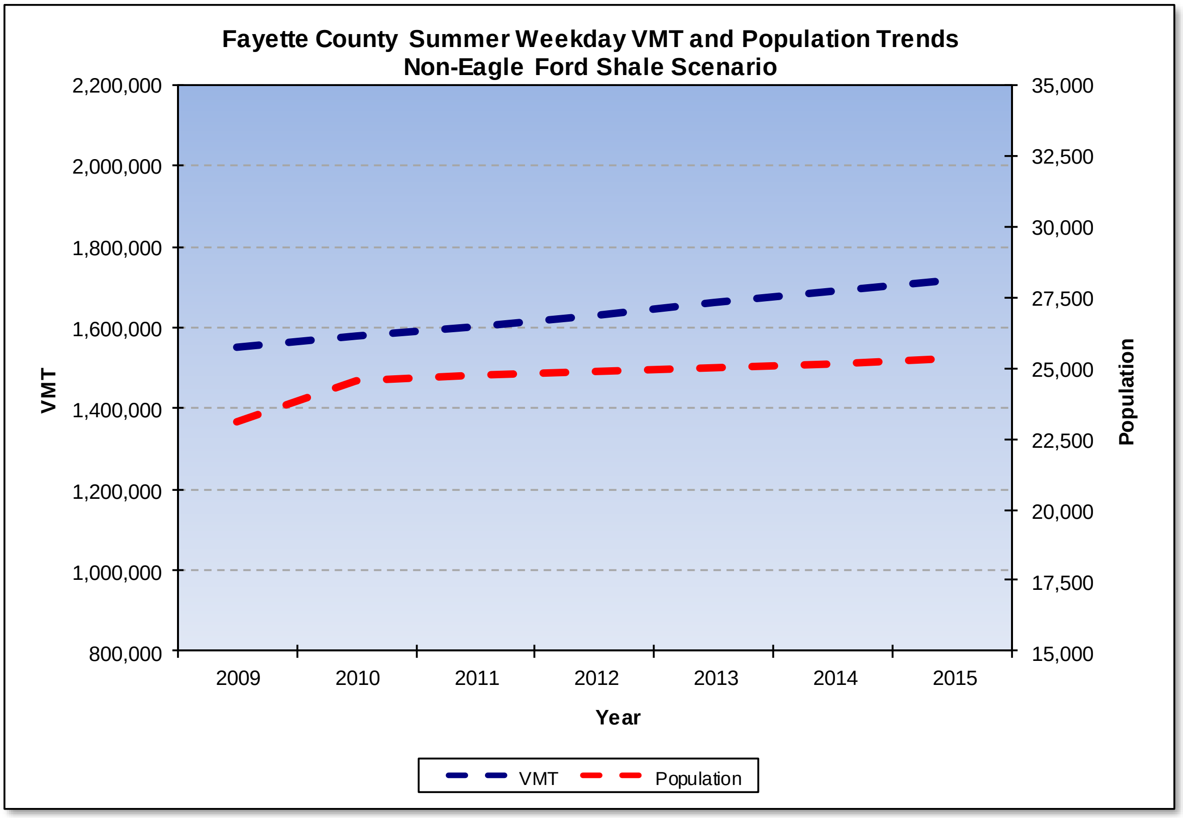

DeWitt County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

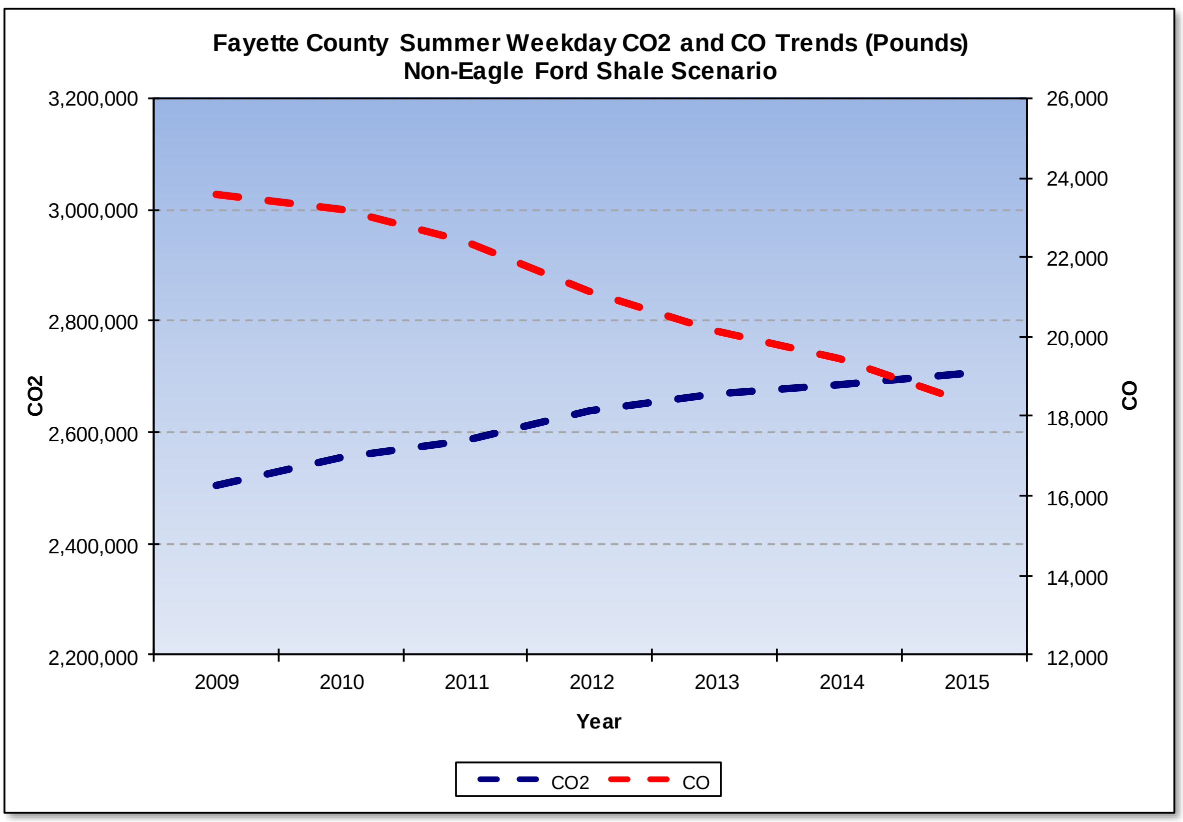

Dimmit County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
Population
900,000
700,000
500,000
300,000
100,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

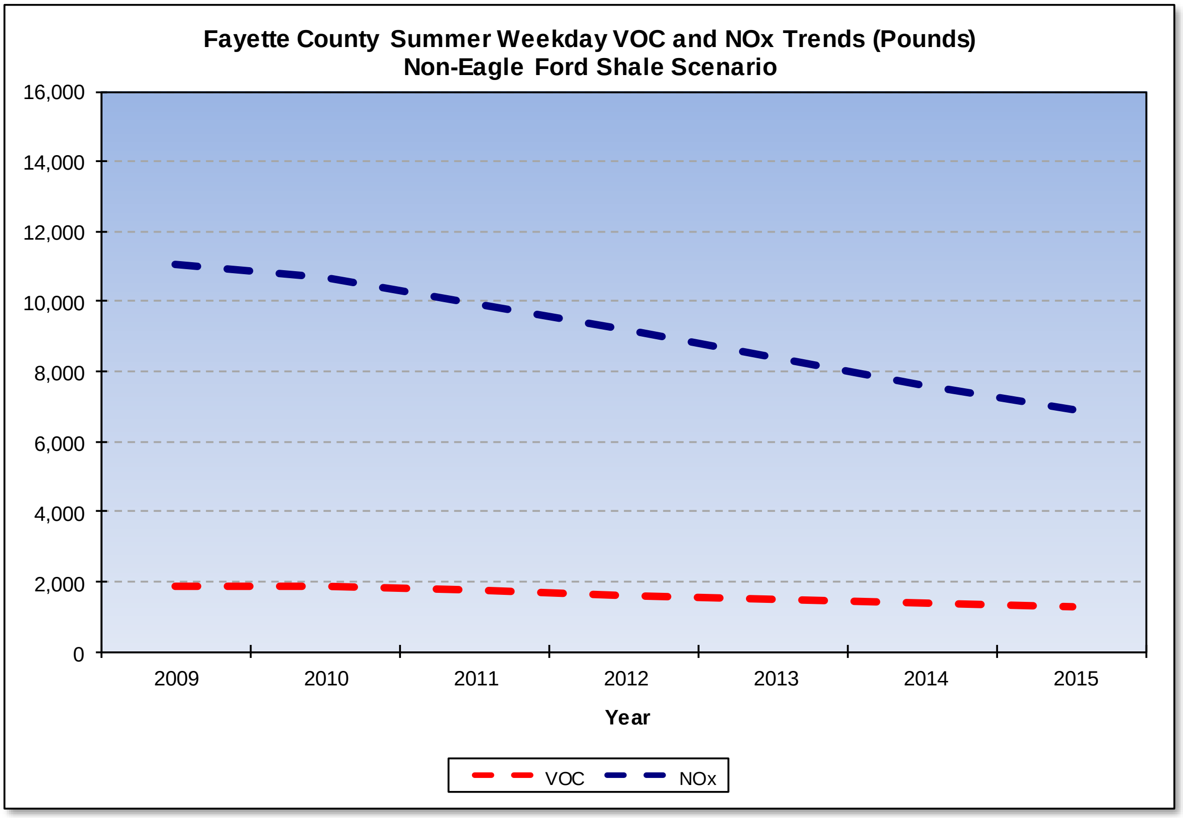

Dimmit County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle FordShale Scenario
CO2
CO
1,000,000
800,000
600,000
400,000
200,000
11,000
9,000
7,000
5,000
3,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

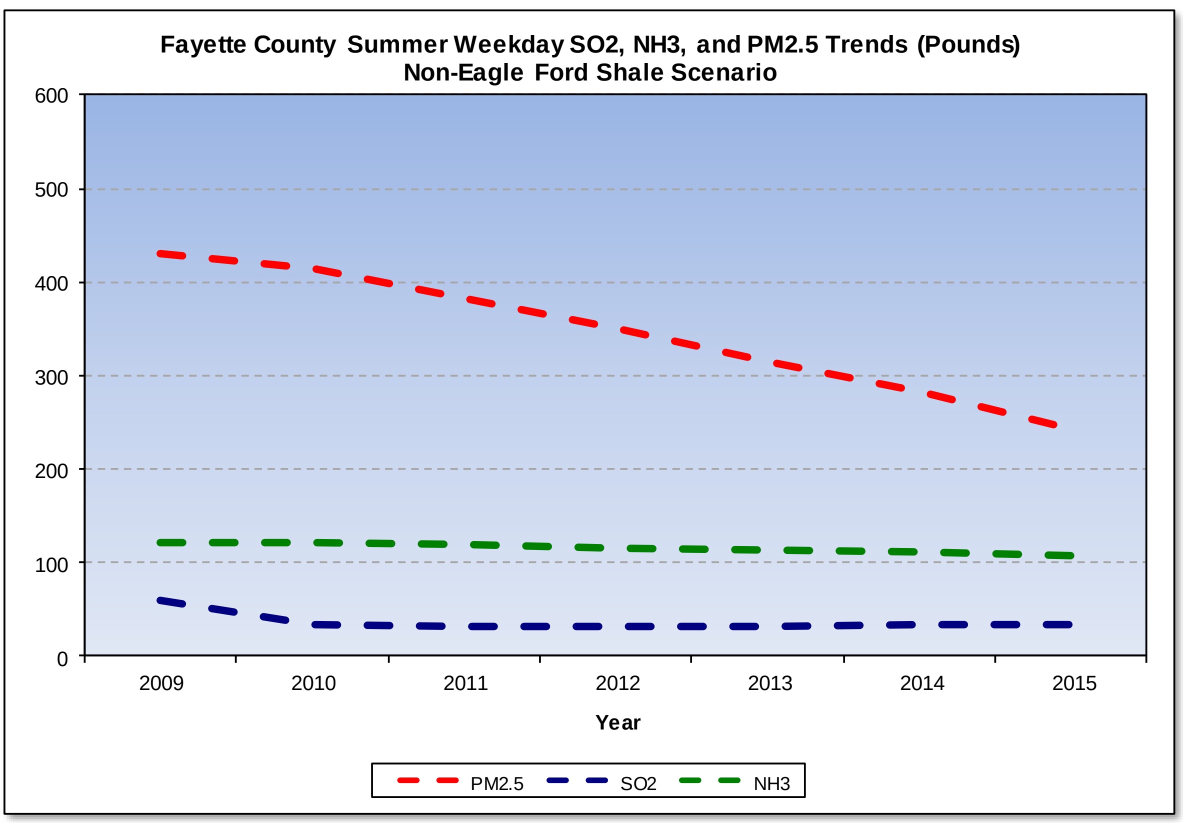

Dimmit County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

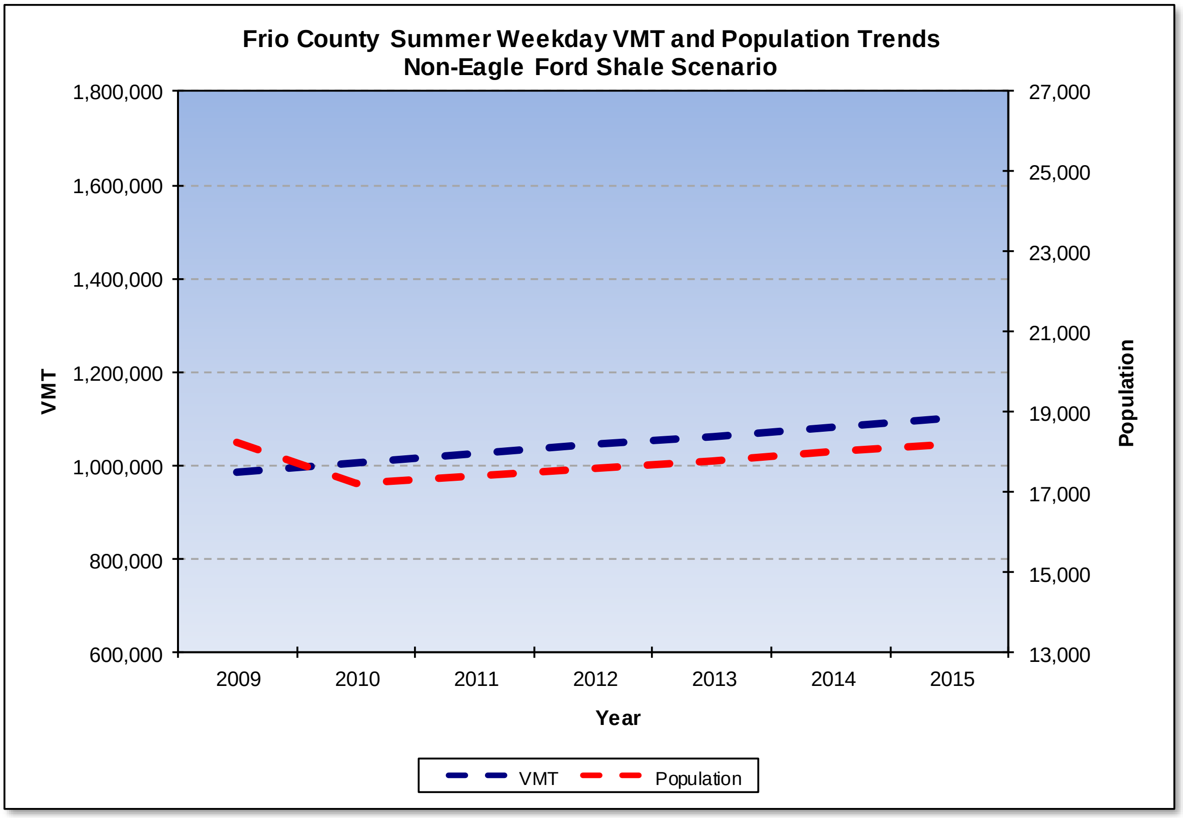

Dimmit County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Fayette County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
Population
Year
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
35,000
32,500
30,000
27,500
25,000
22,500
20,000
17,500
15,000
2009
2010
2011
2012
2013
2014
2015
VMT
Population

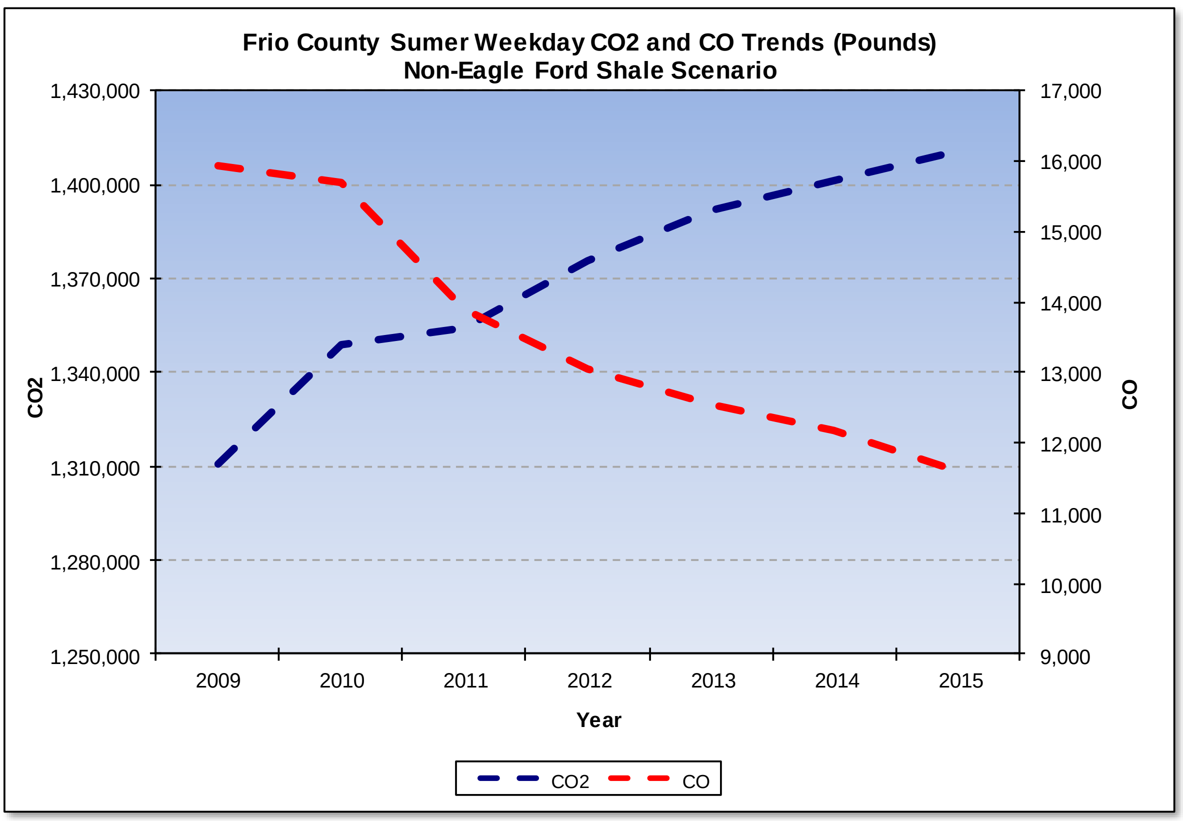

Fayette County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
CO
Year
3,200,000
3,000,000
2,800,000
2,600,000
2,400,000
2,200,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
2009
2010
2011
2012
2013
2014
2015
CO2
CO


Fayette County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

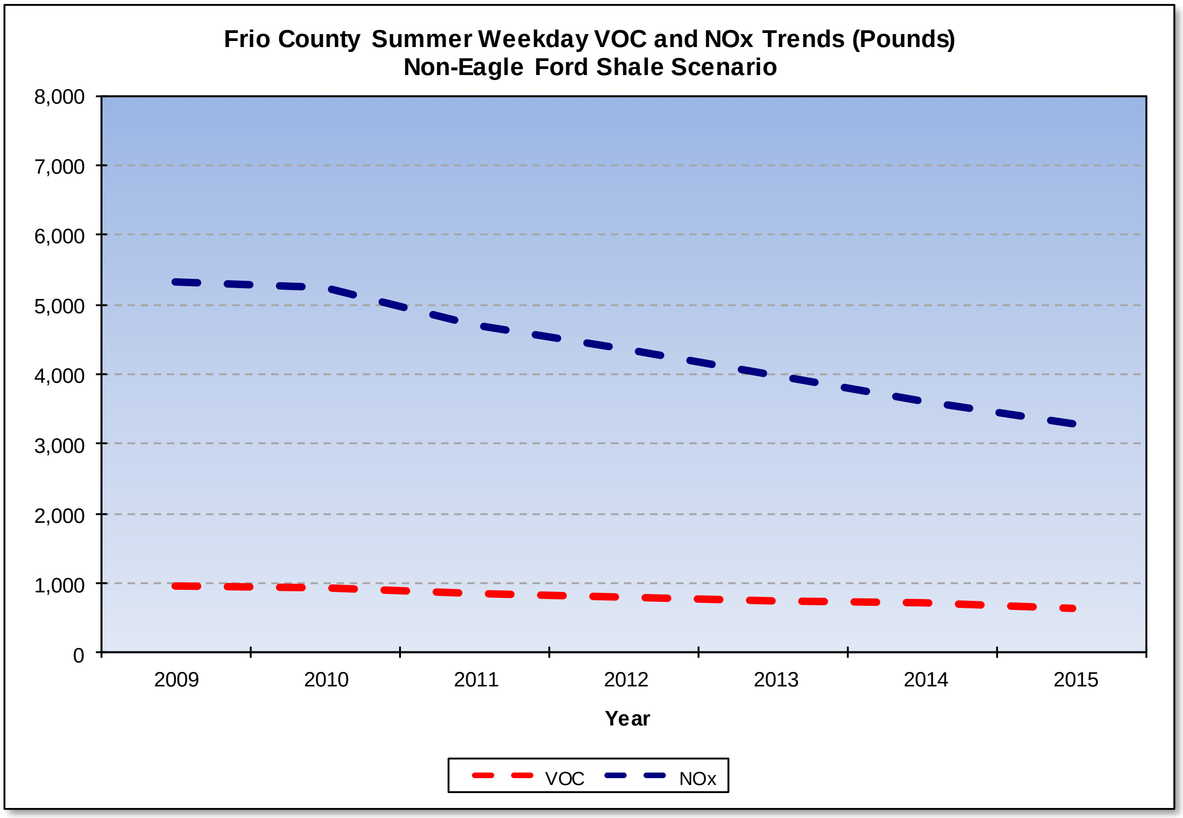

Fayette County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

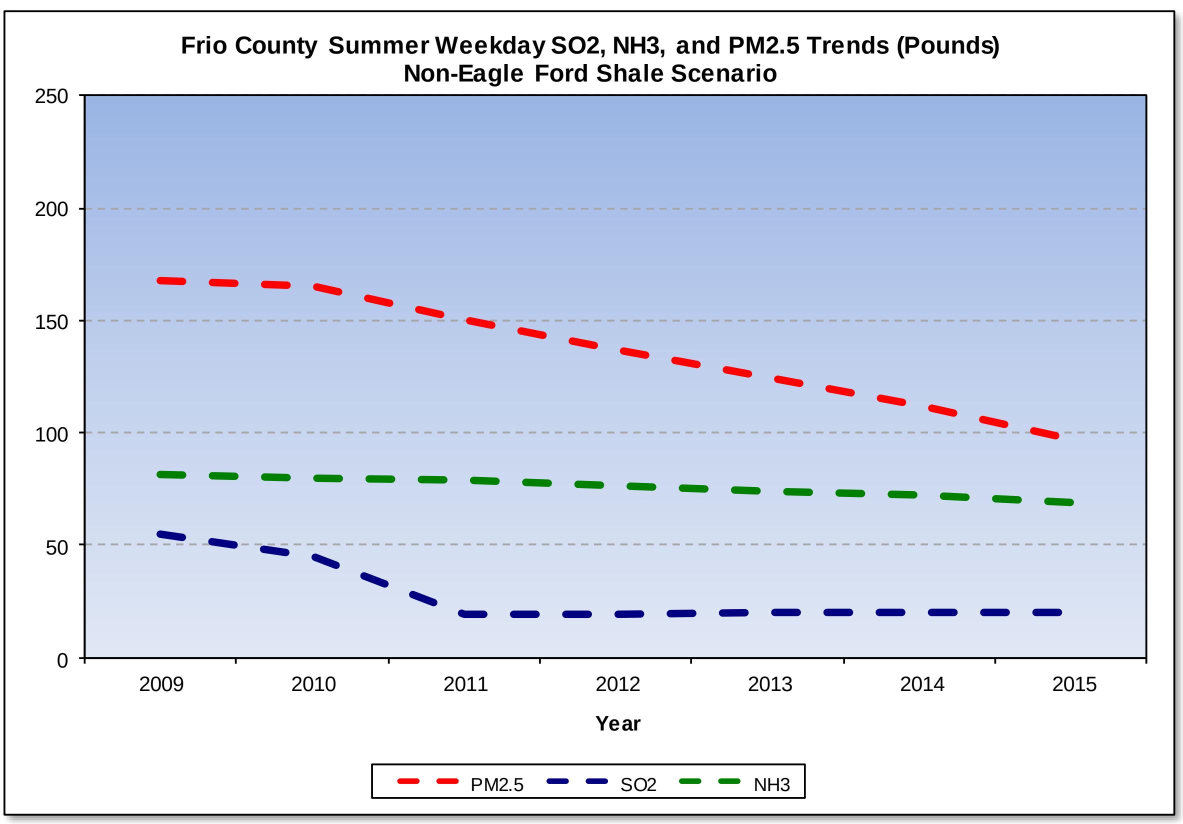


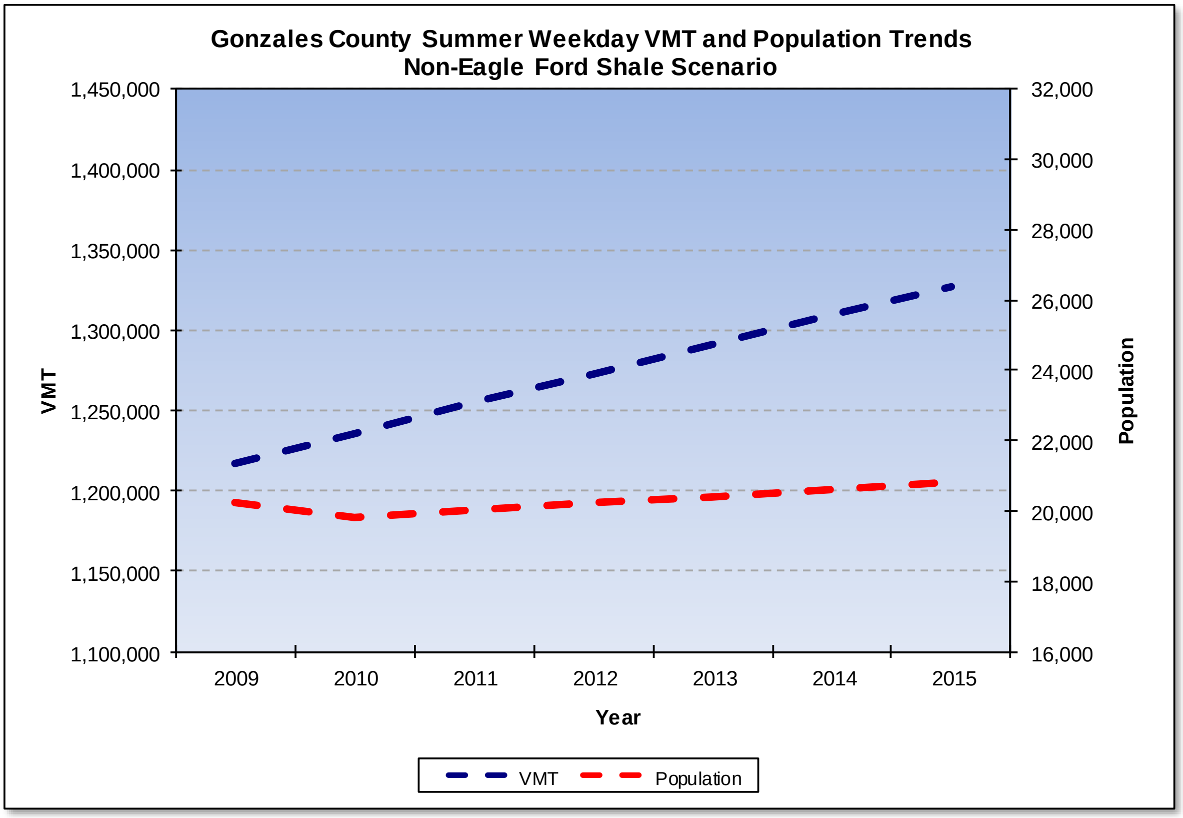
Frio County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
Population
27,000
25,000
23,000
21,000
19,000
17,000
15,000
13,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

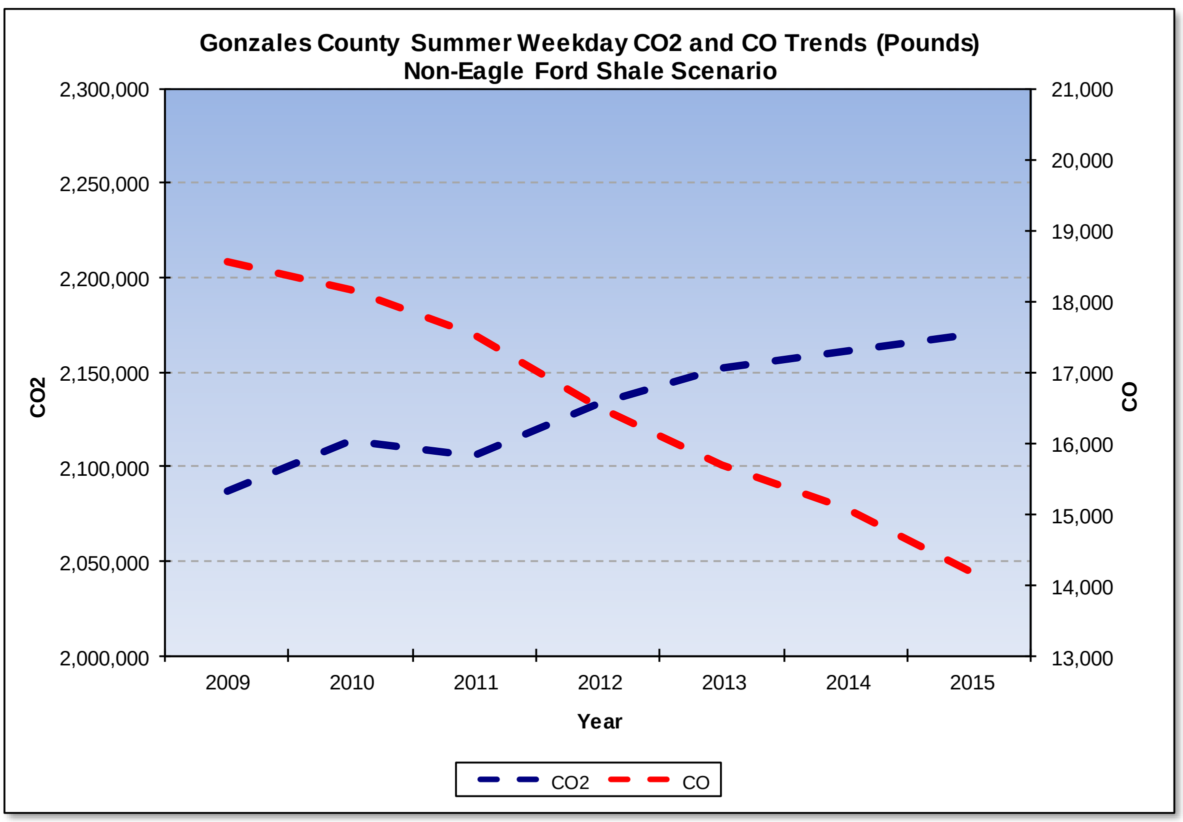


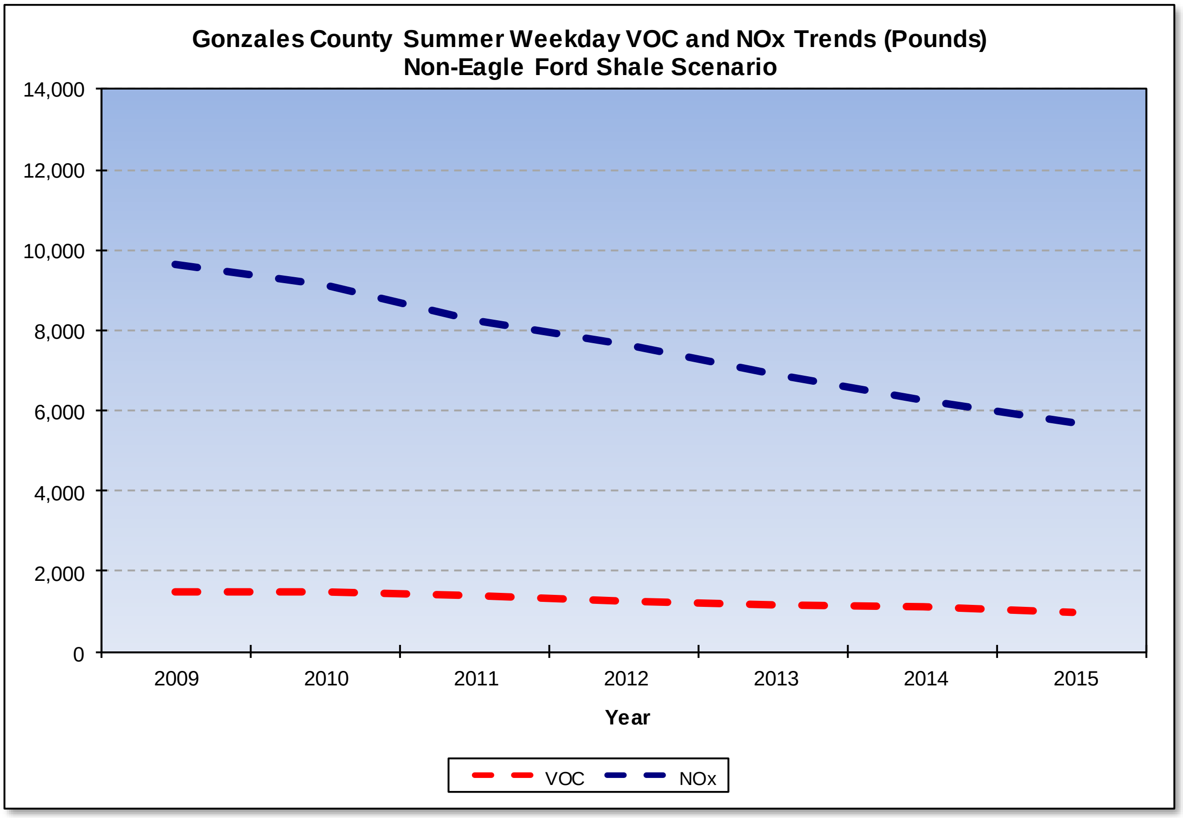
Frio County Sumer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
1,430,000
1,400,000
1,370,000
1,340,000
1,310,000
1,280,000
1,250,000
CO
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

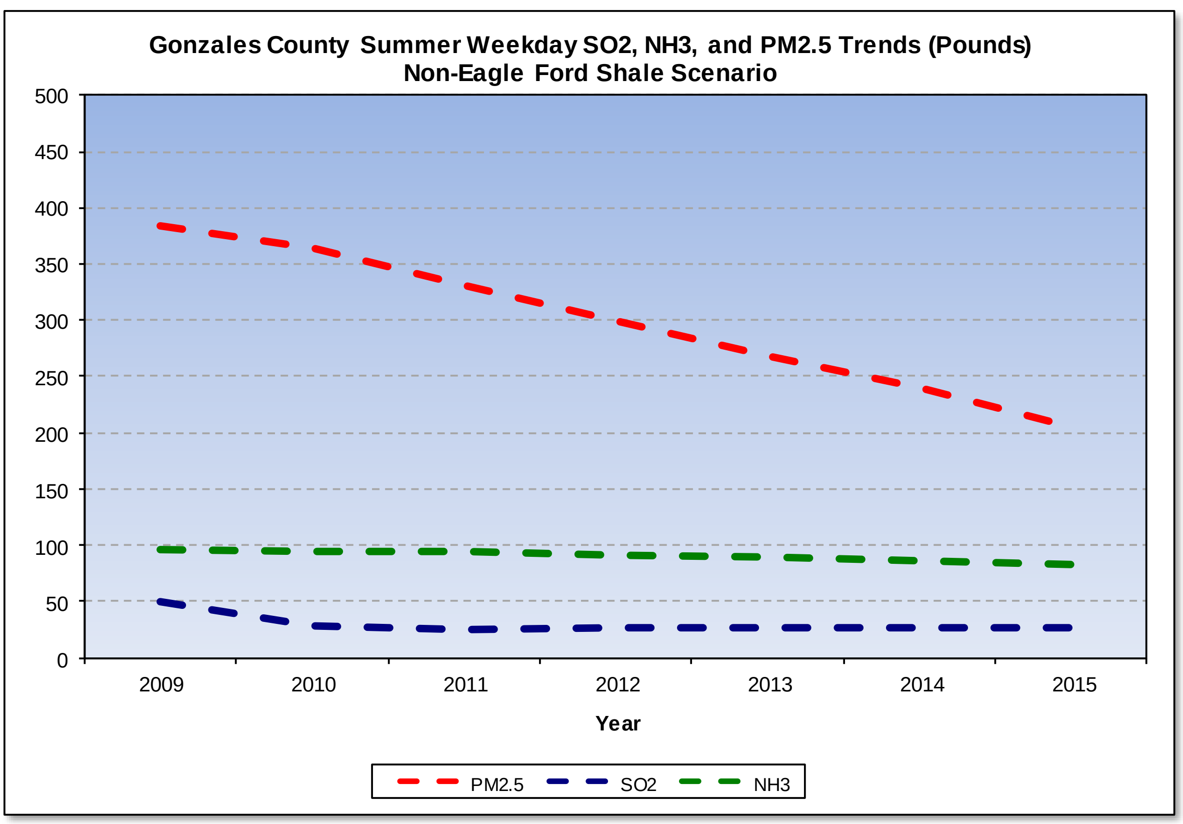

Frio County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

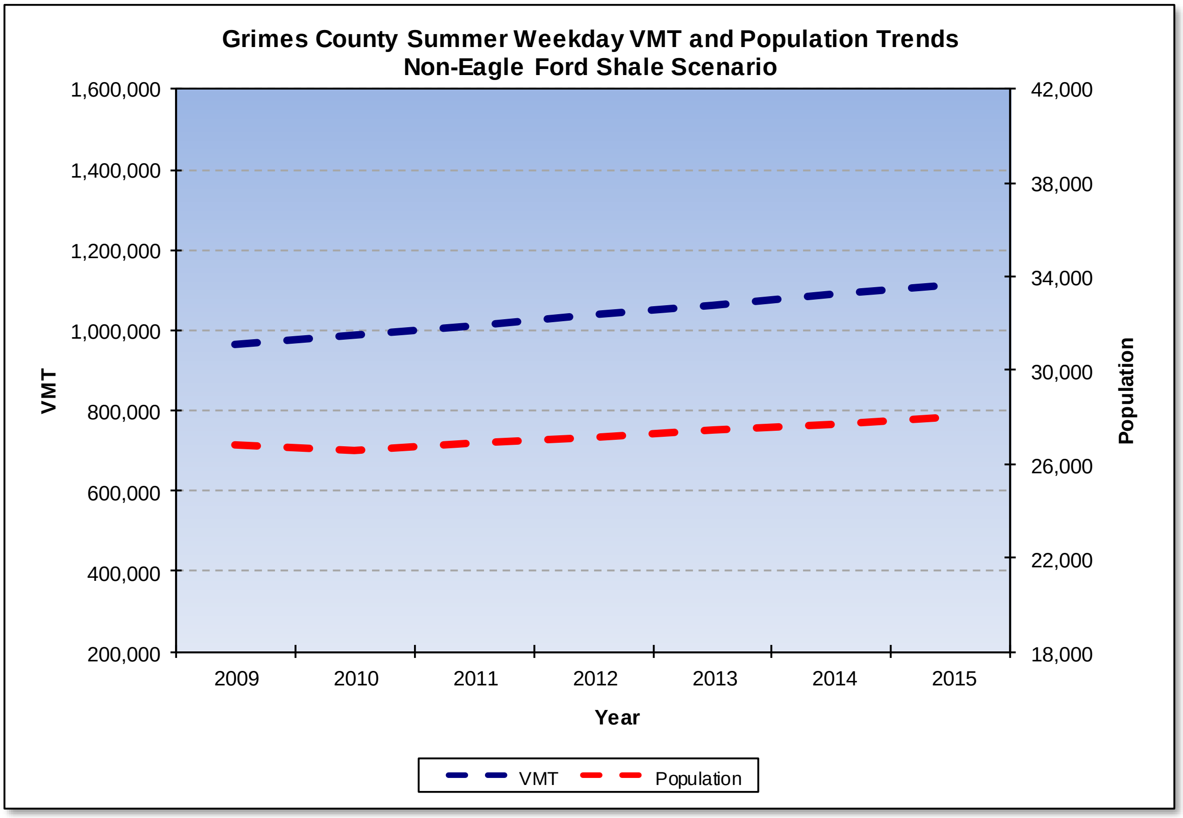

Frio County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

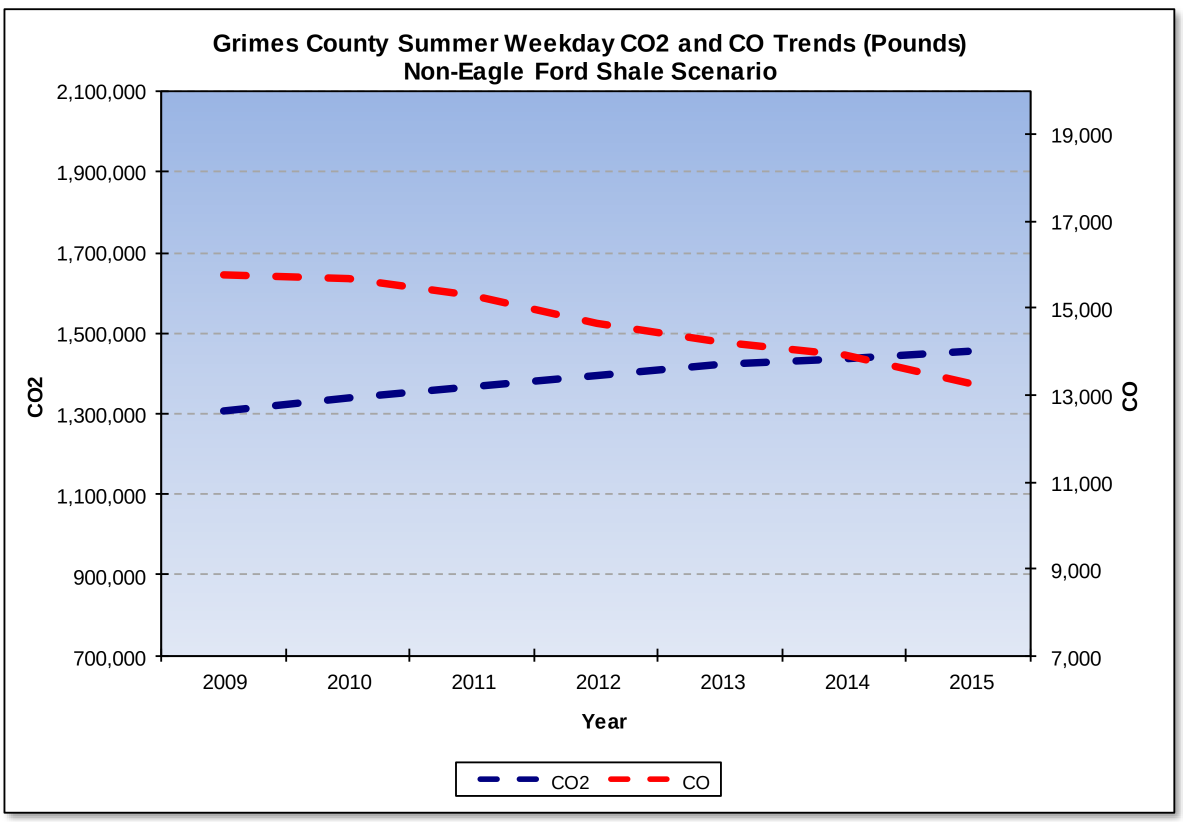

Gonzales County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
1,450,000
1,400,000
1,350,000
1,300,000
1,250,000
1,200,000
1,150,000
1,100,000
Population
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

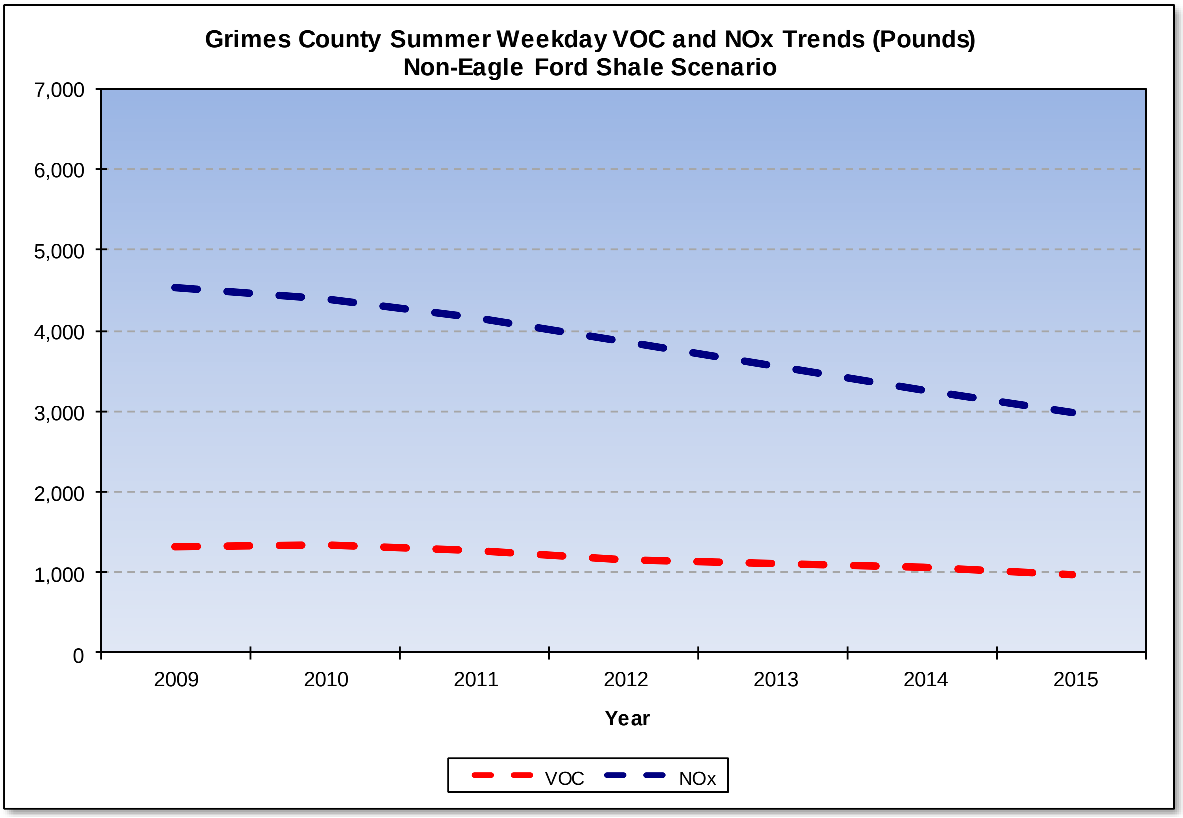

Gonzales County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
2,300,000
2,250,000
2,200,000
2,150,000
2,100,000
2,050,000
2,000,000
CO
21,000
20,000
19,000
18,000
17,000
16,000
15,000
14,000
13,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

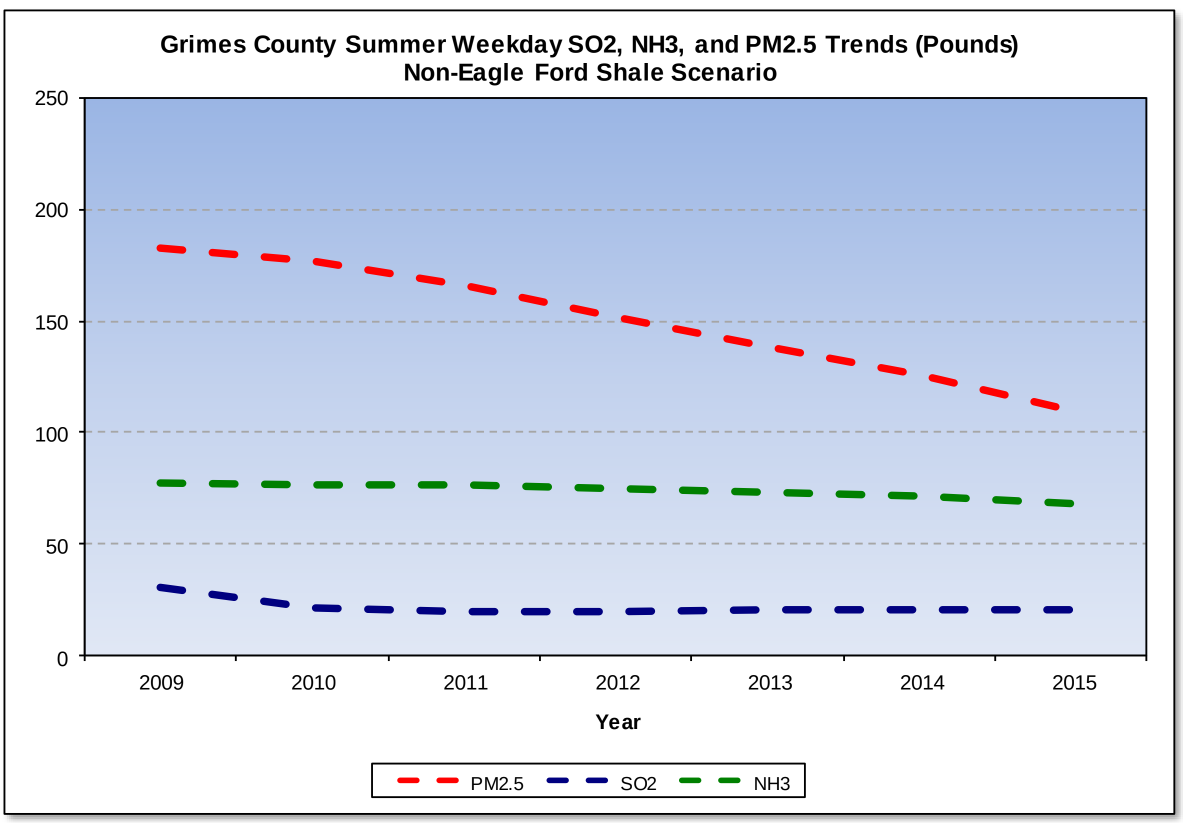

Gonzales County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

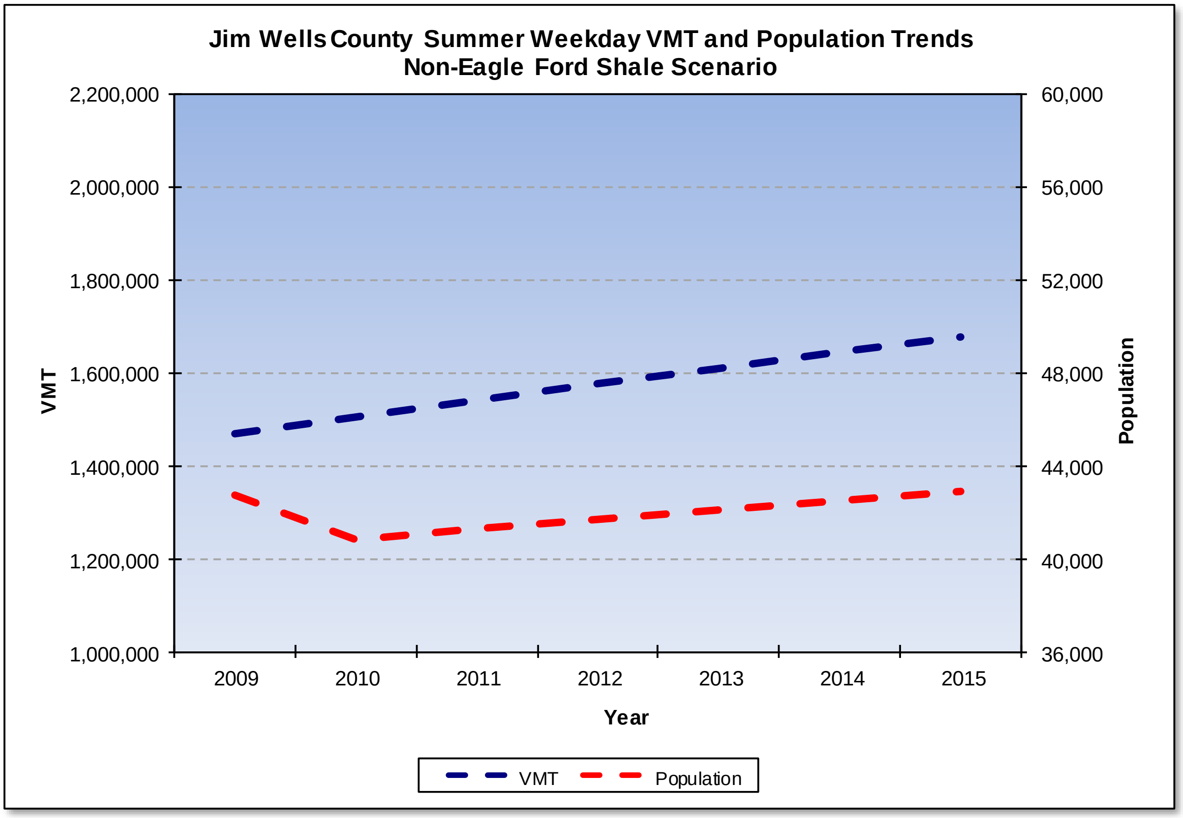

Gonzales County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
500
450
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

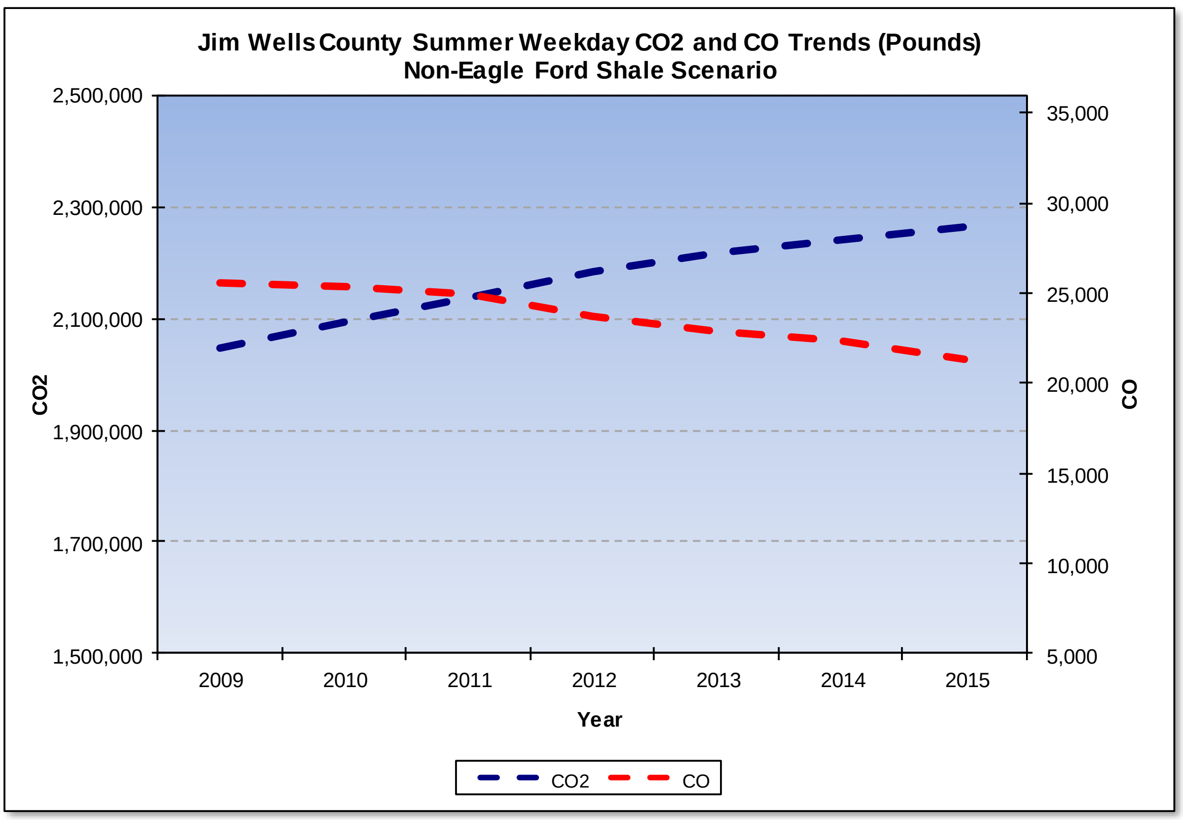

Grimes County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
VMT
42,000
38,000
34,000
30,000
26,000
22,000
18,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

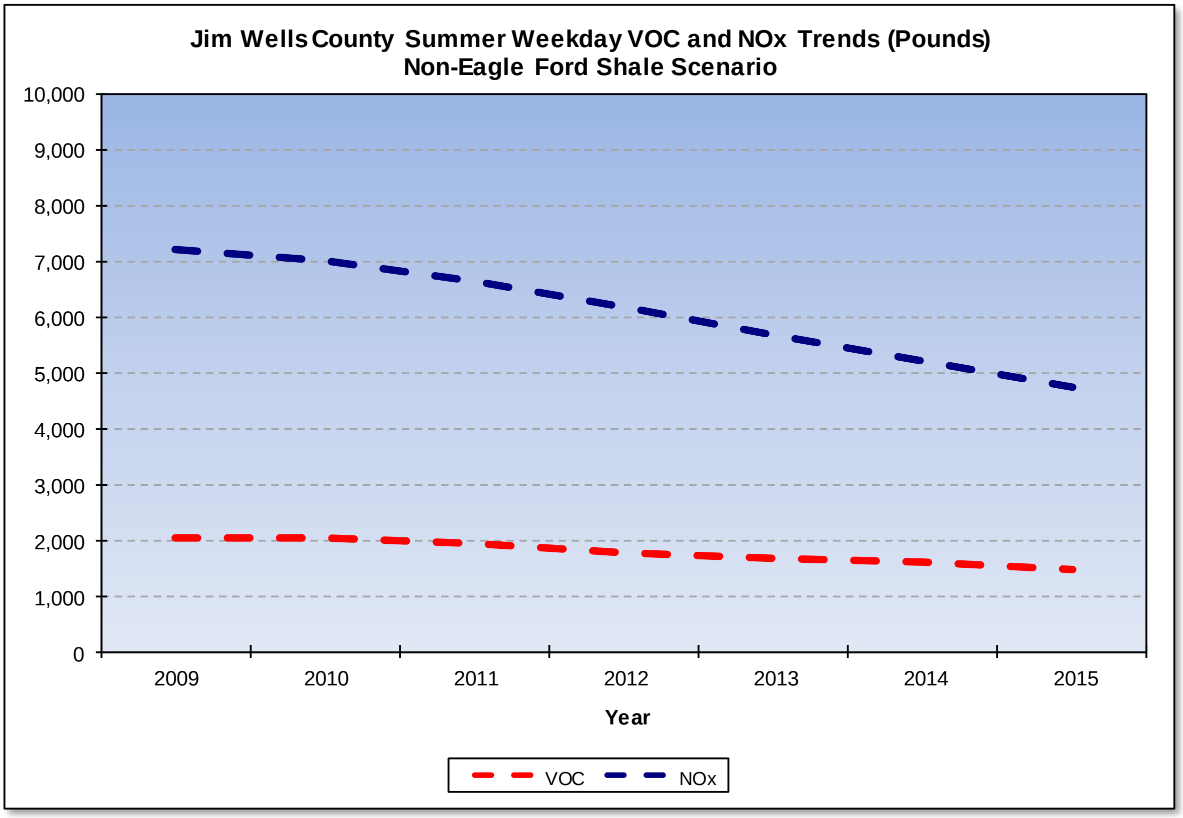

Grimes County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
2,100,000
1,900,000
1,700,000
1,500,000
1,300,000
1,100,000
900,000
700,000
CO2
19,000
17,000
15,000
13,000
11,000
9,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

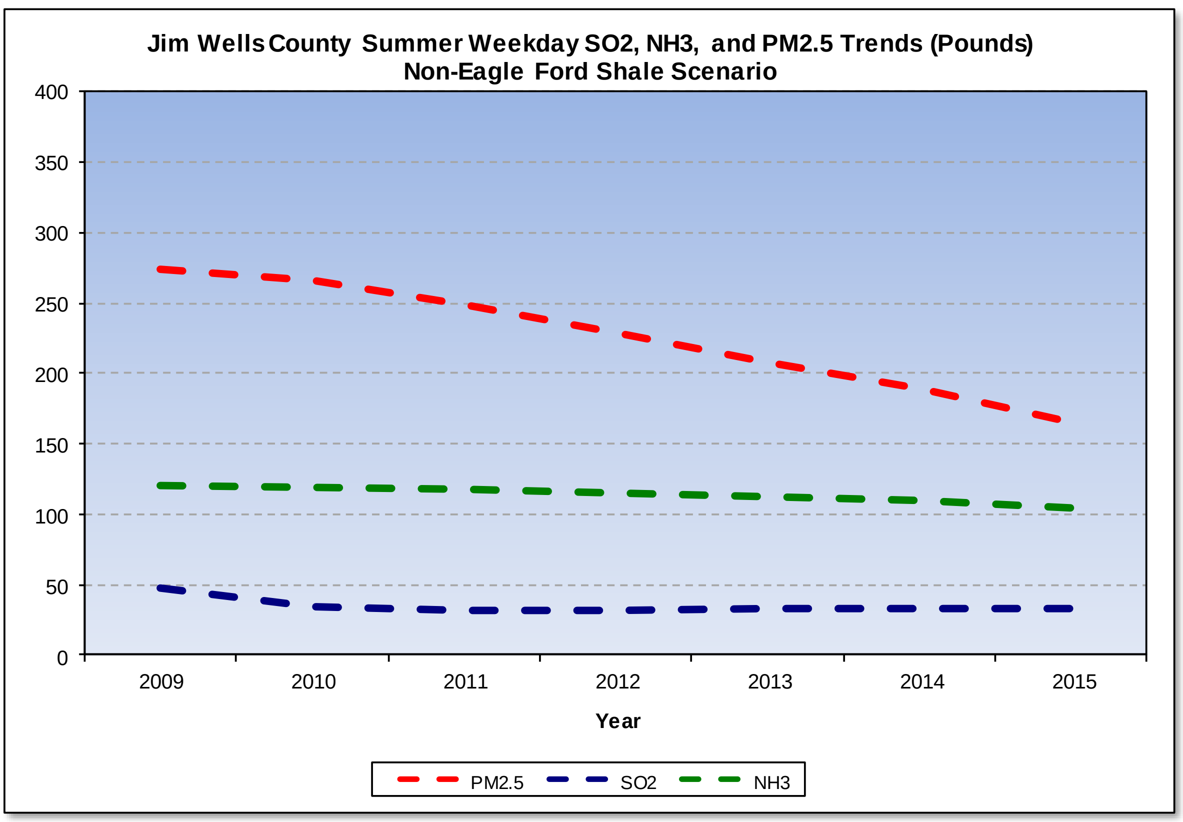

Grimes County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

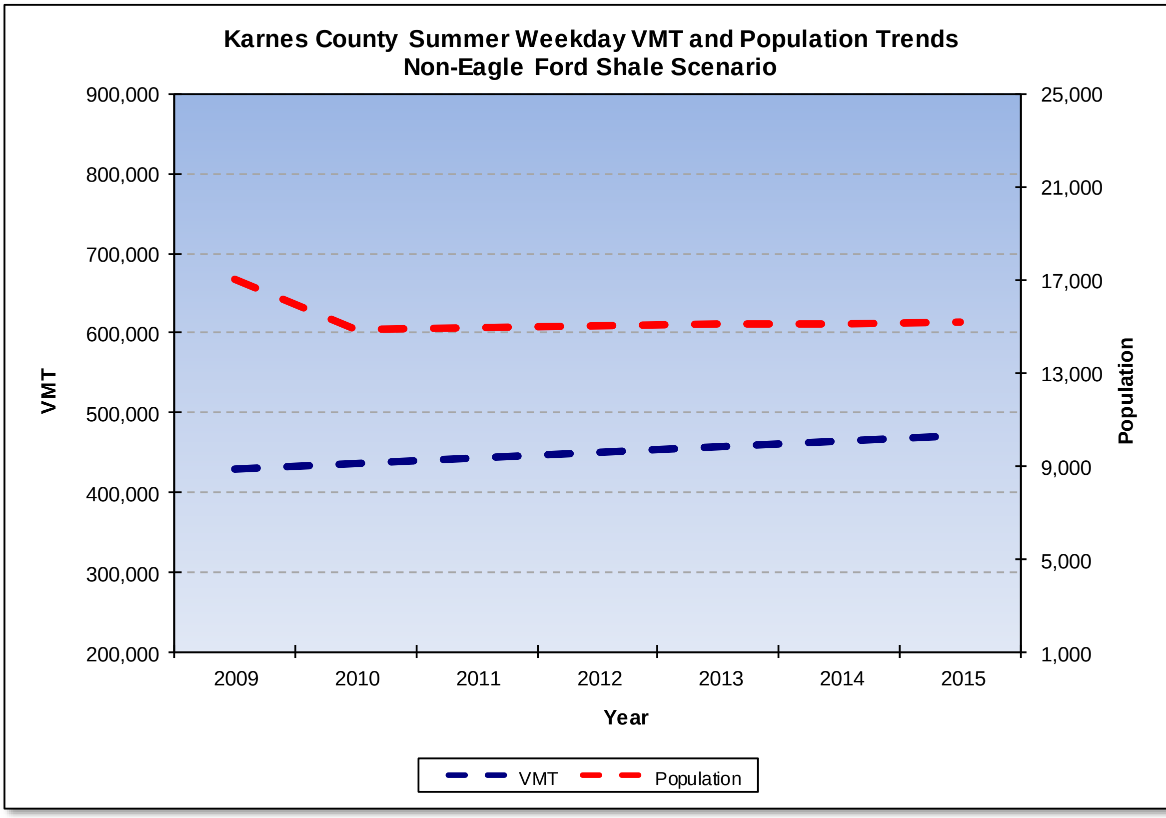

Grimes County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

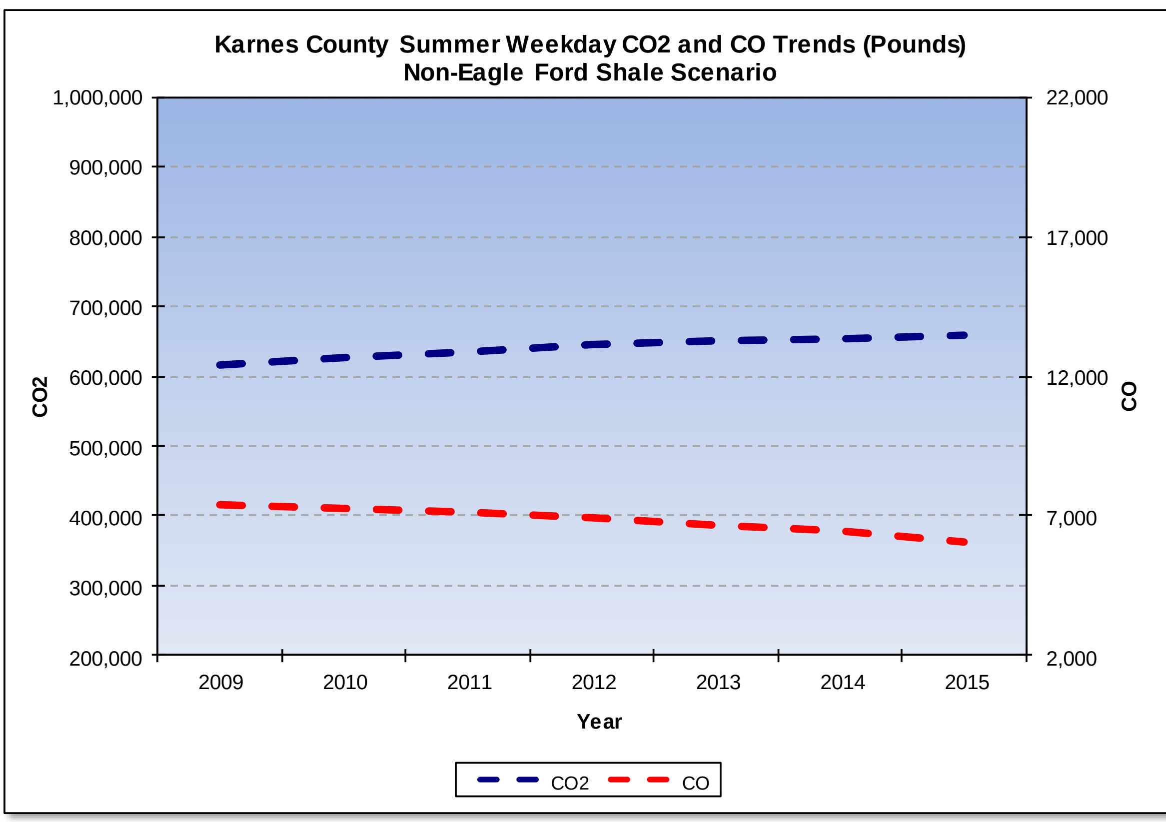

Jim Wells County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
Population
60,000
56,000
52,000
48,000
44,000
40,000
36,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

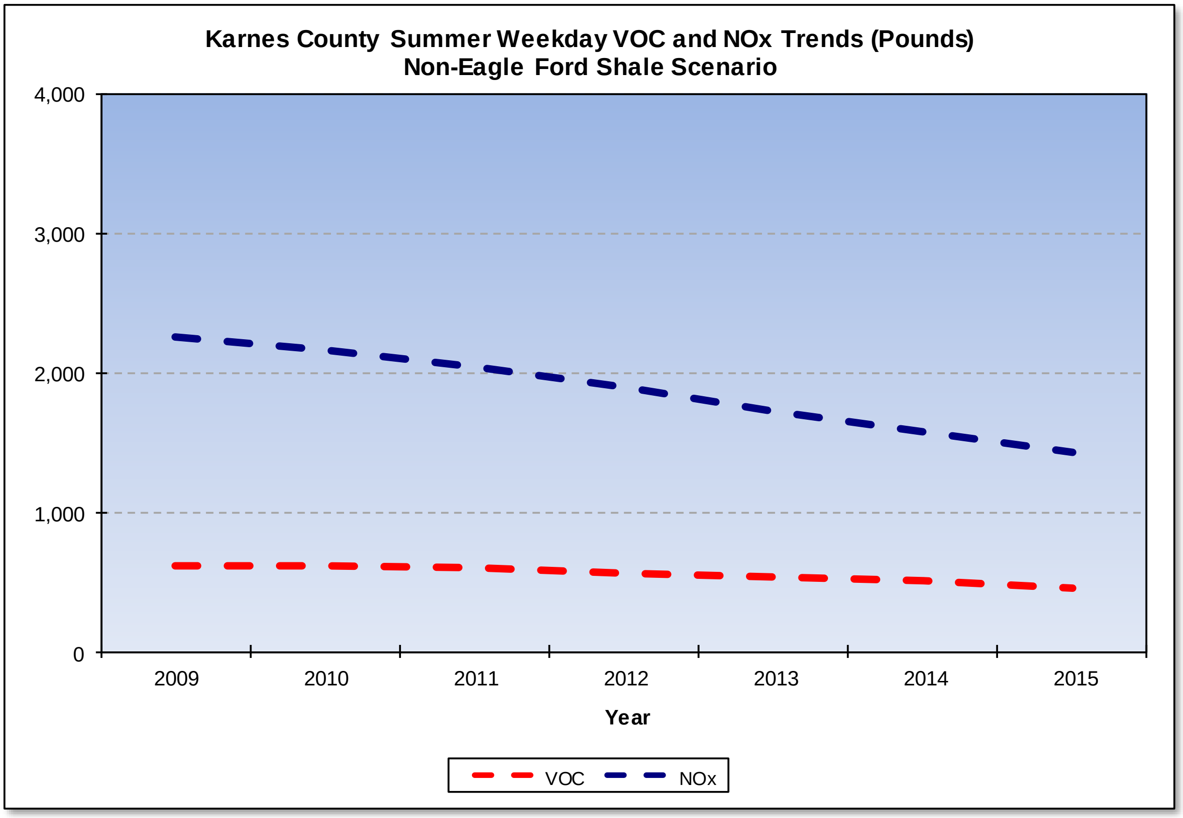

Jim Wells County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
2,500,000
2,300,000
2,100,000
1,900,000
1,700,000
1,500,000
CO
35,000
30,000
25,000
20,000
15,000
10,000
5,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

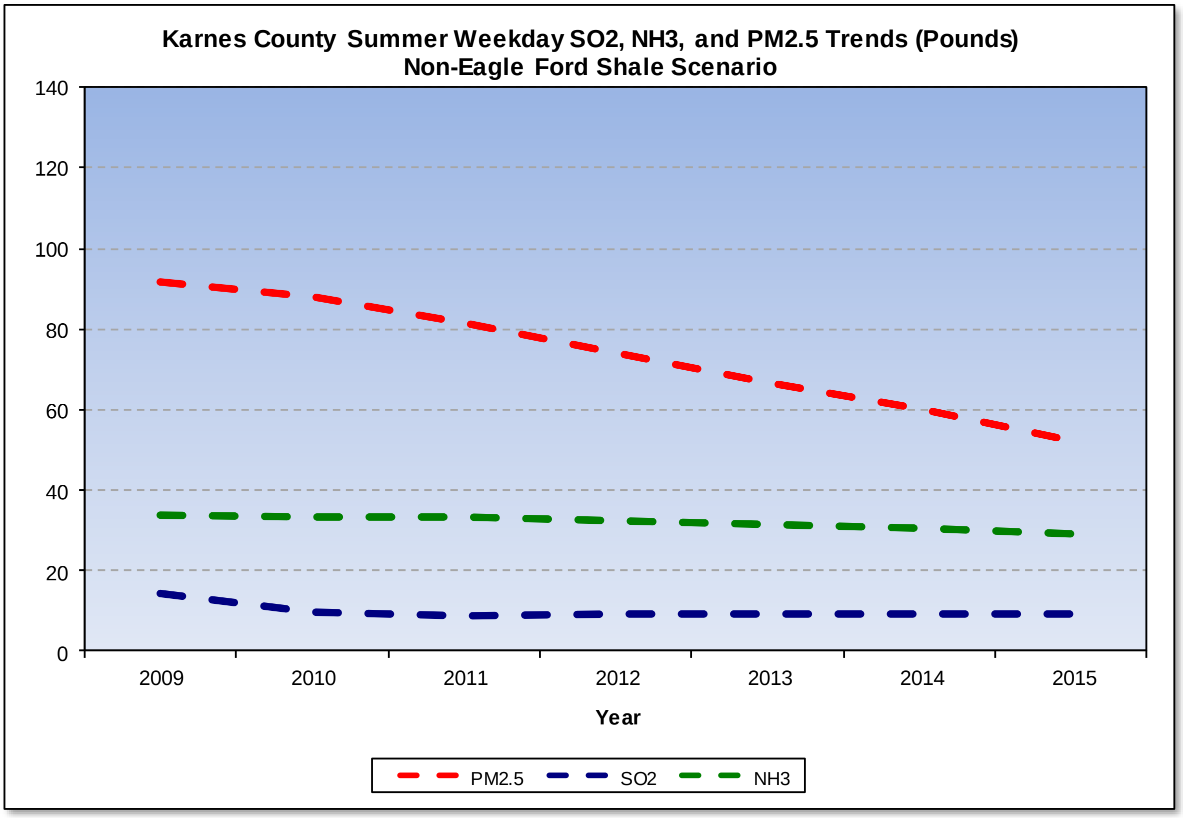

Jim Wells County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

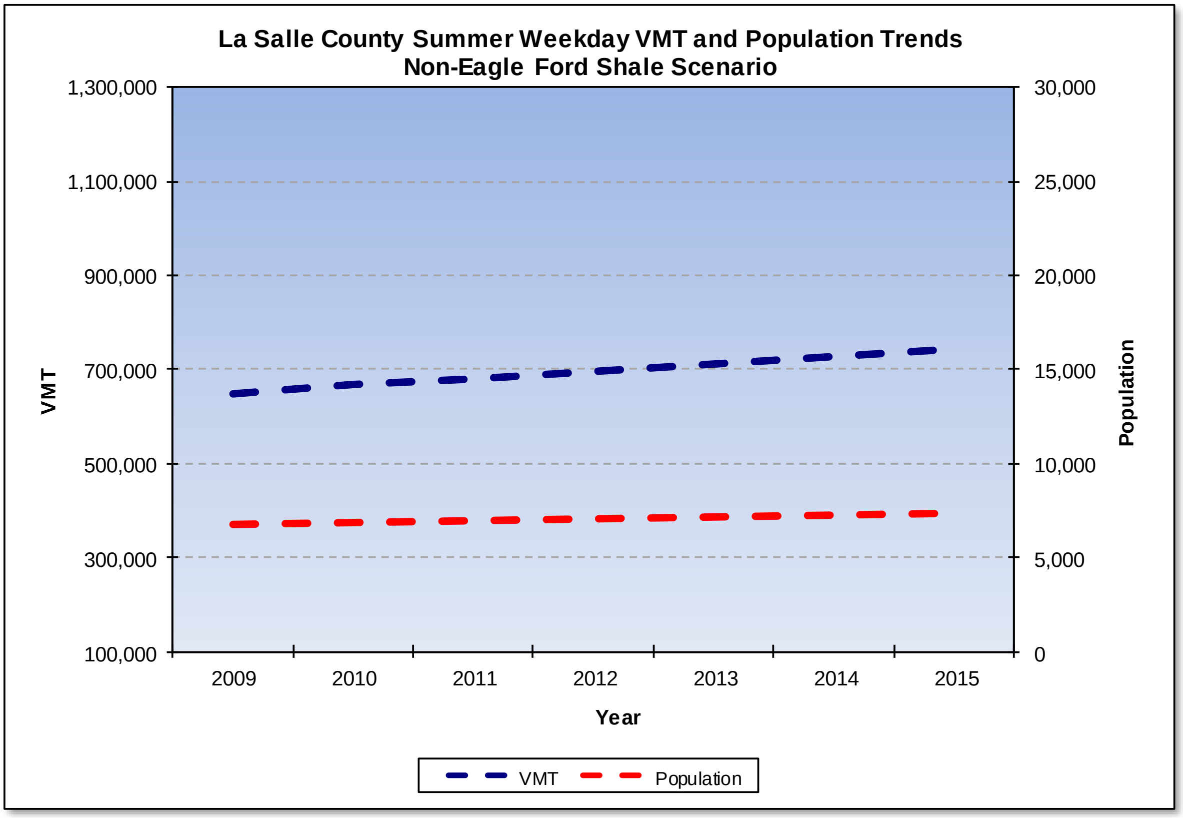

Jim Wells County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

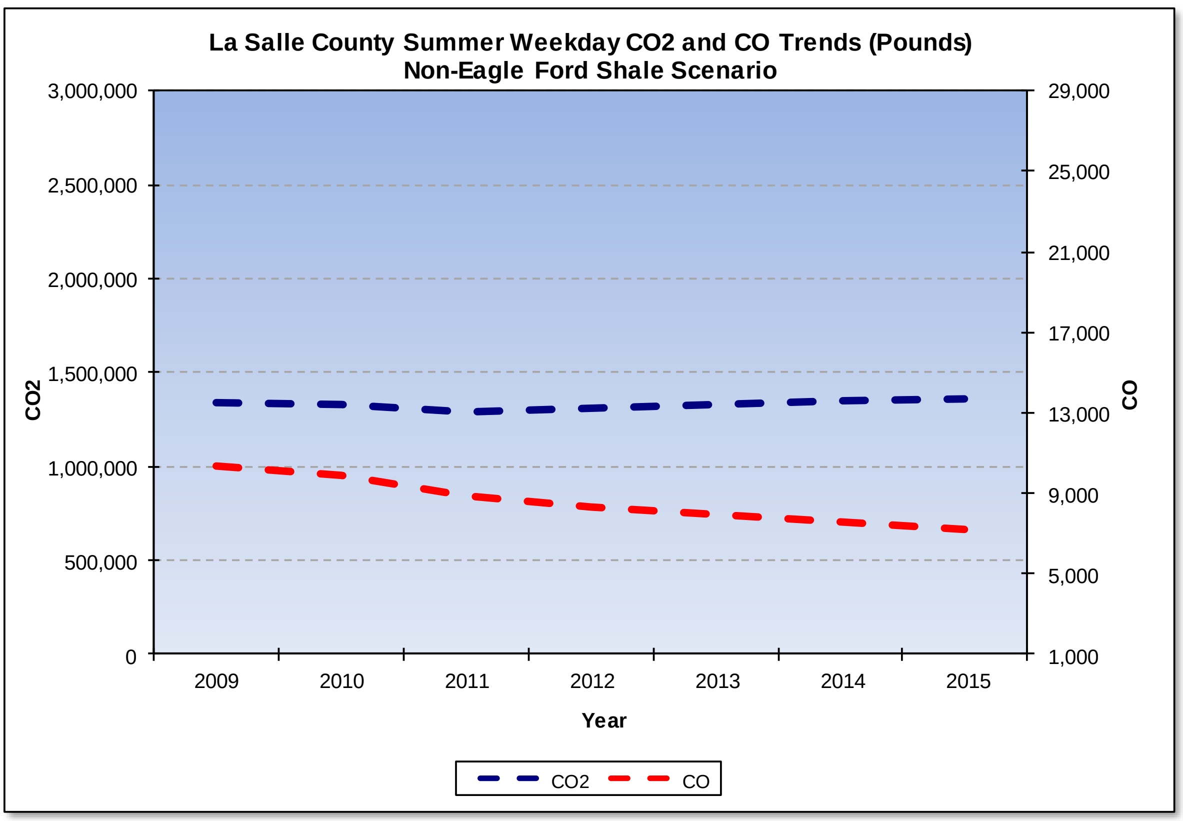

Karnes County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
VMT
25,000
21,000
17,000
13,000
9,000
5,000
1,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

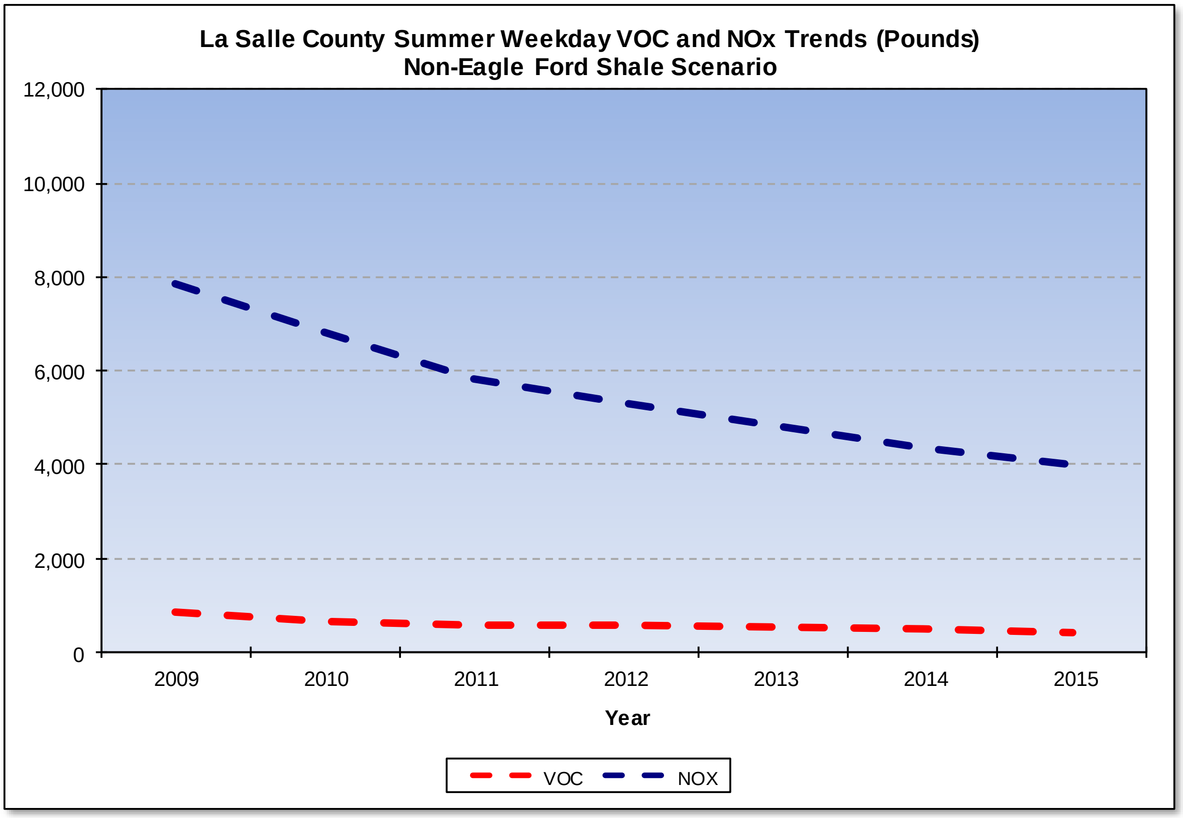

Karnes County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
CO2
22,000
17,000
12,000
7,000
2,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

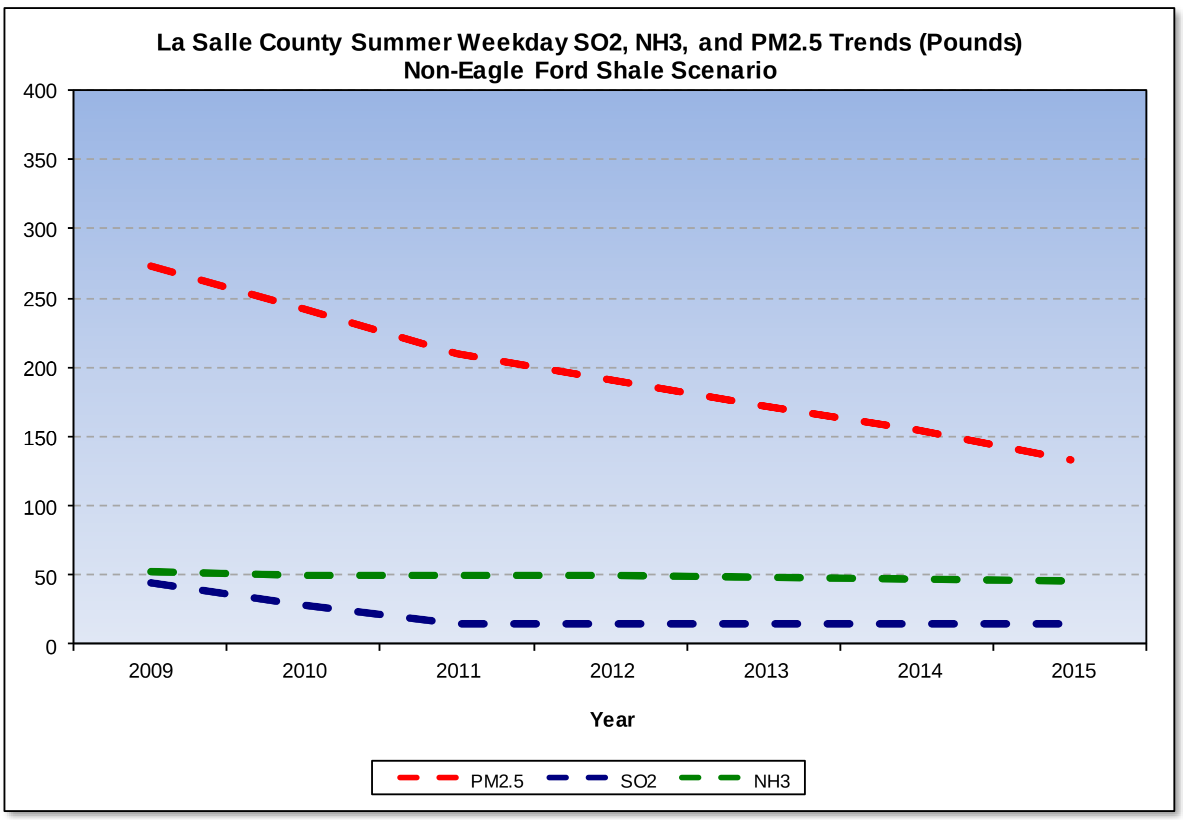

Karnes County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx

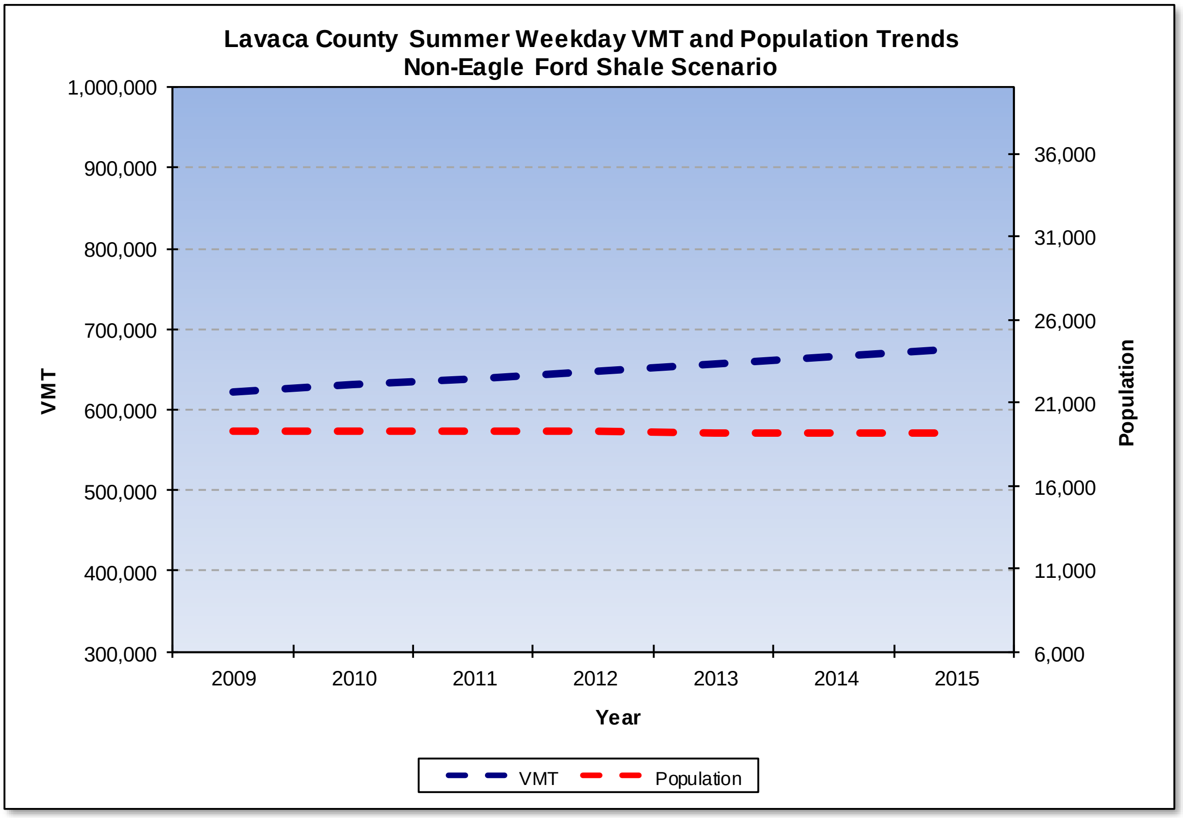

Karnes County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

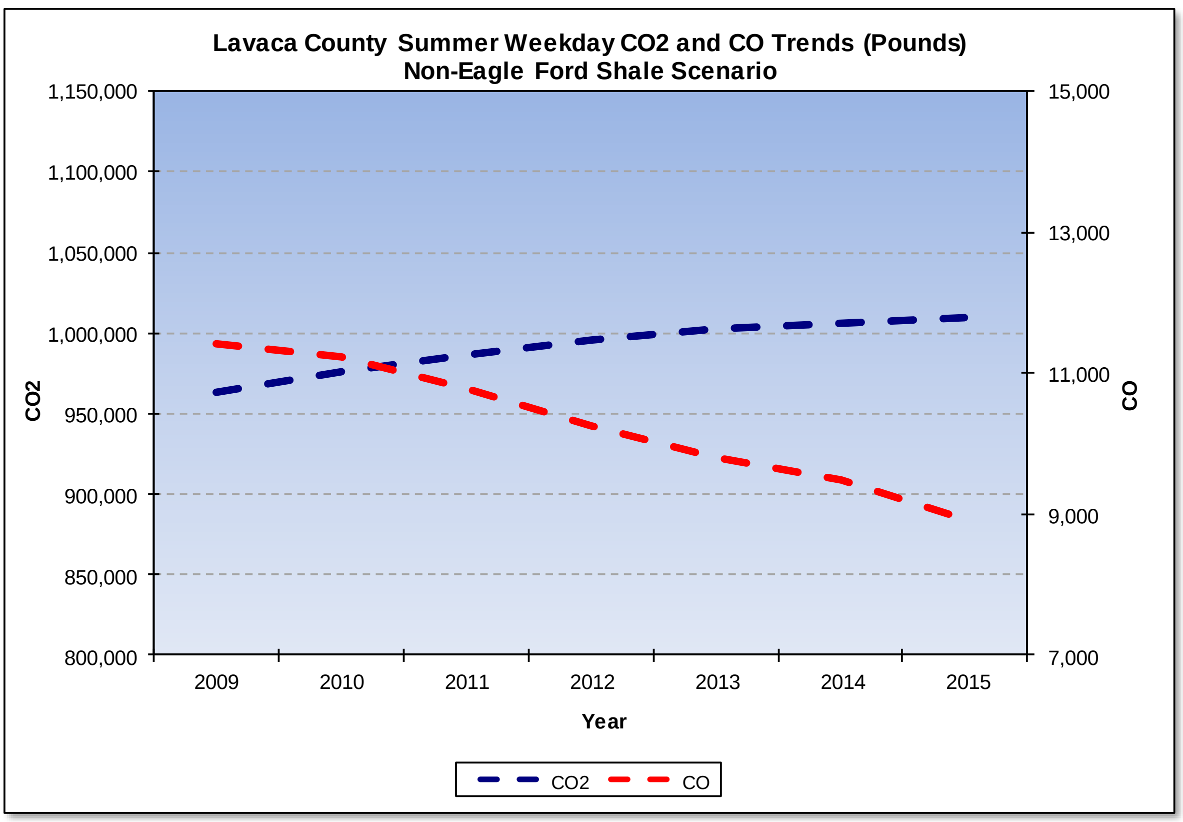

La Salle County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,300,000
1,100,000
900,000
700,000
500,000
300,000
100,000
VMT
30,000
25,000
20,000
15,000
10,000
5,000
0
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

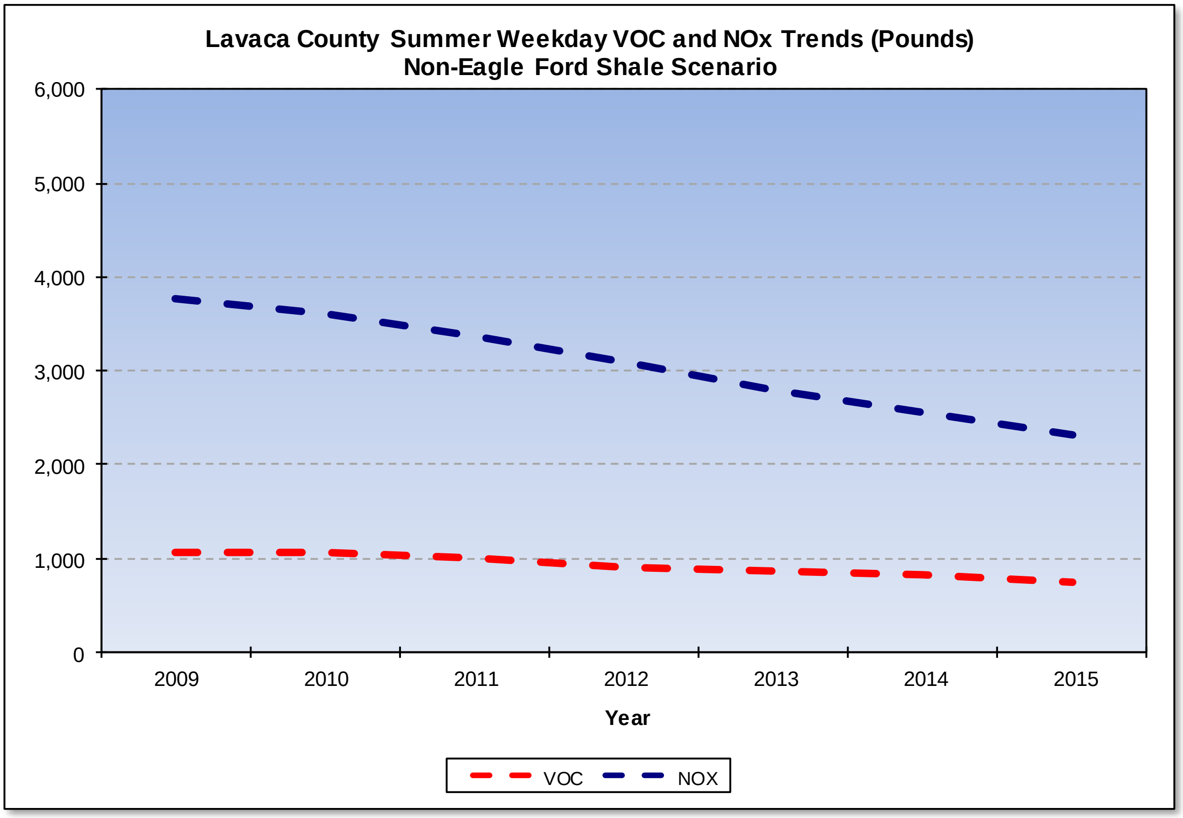

La Salle County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
CO2
29,000
25,000
21,000
17,000
13,000
9,000
5,000
1,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

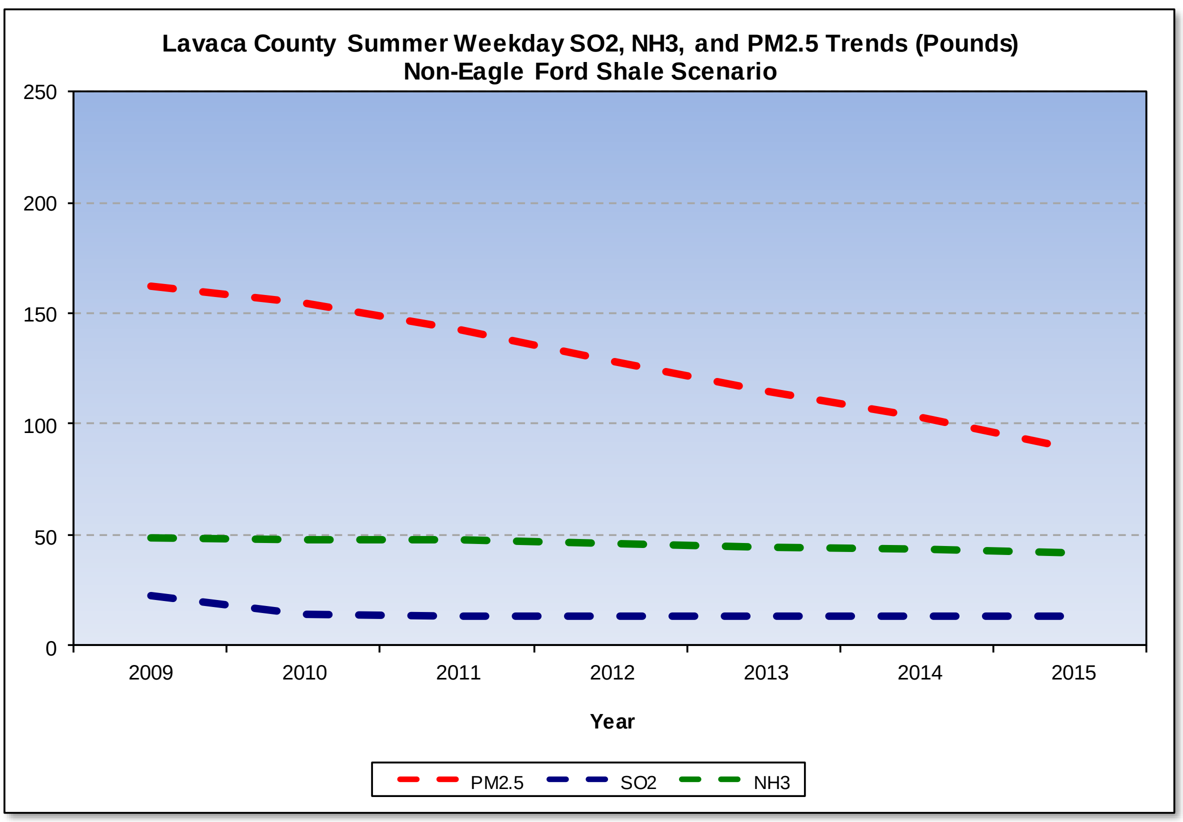

La Salle County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

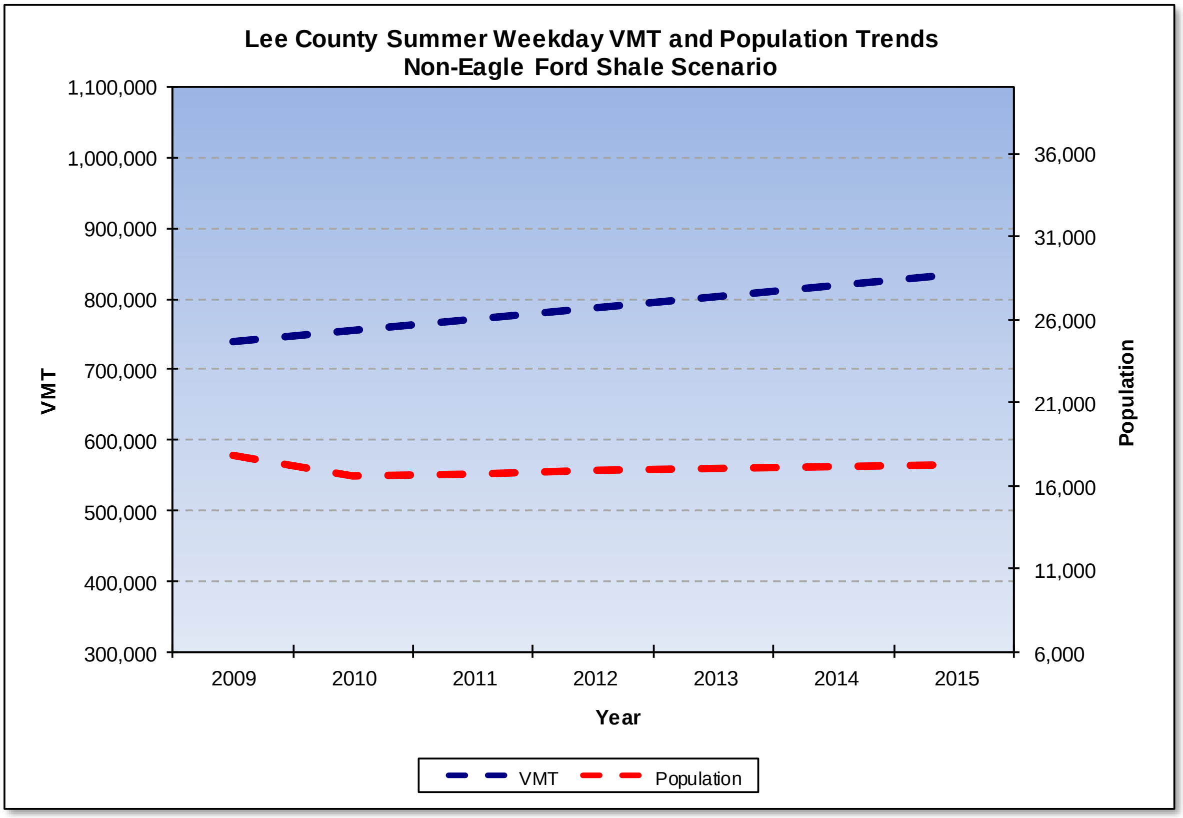

La Salle County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

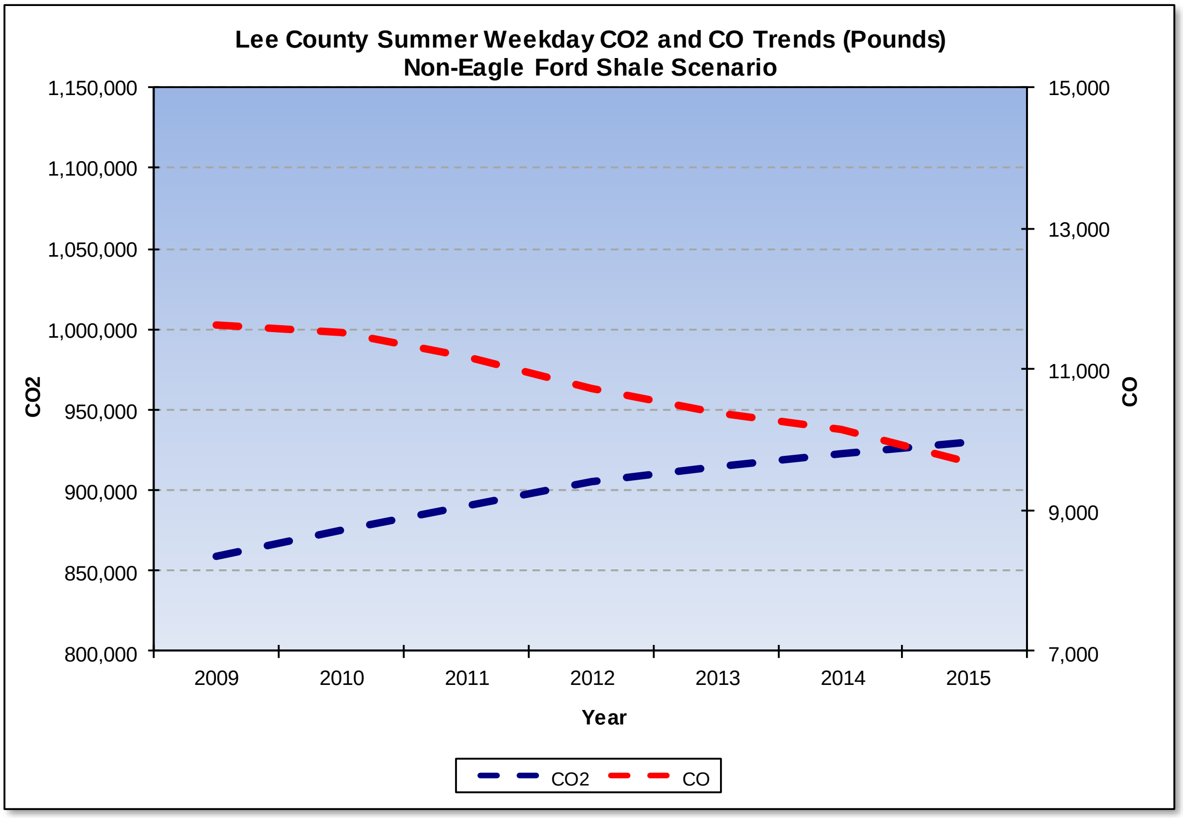

Lavaca County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
Population
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

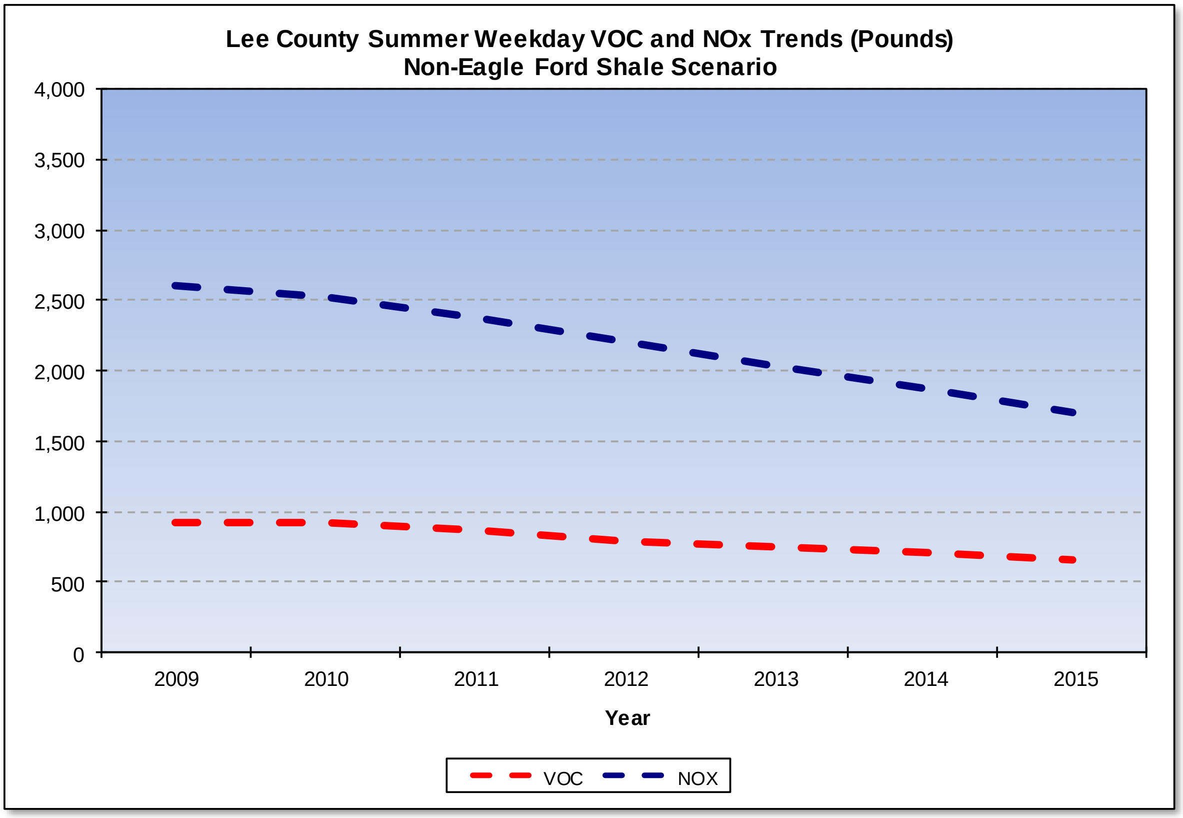

Lavaca County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
CO
1,150,000
1,100,000
1,050,000
1,000,000
950,000
900,000
850,000
800,000
15,000
13,000
11,000
9,000
7,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

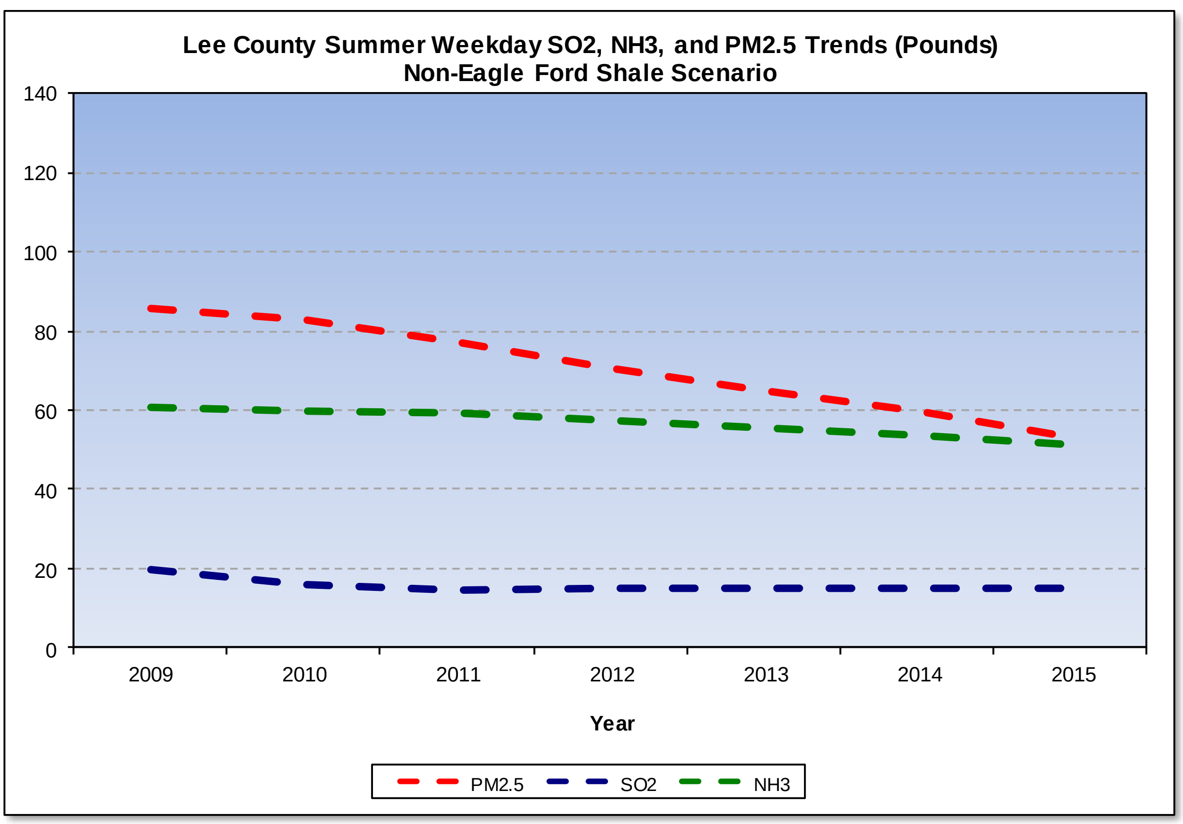

Lavaca County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

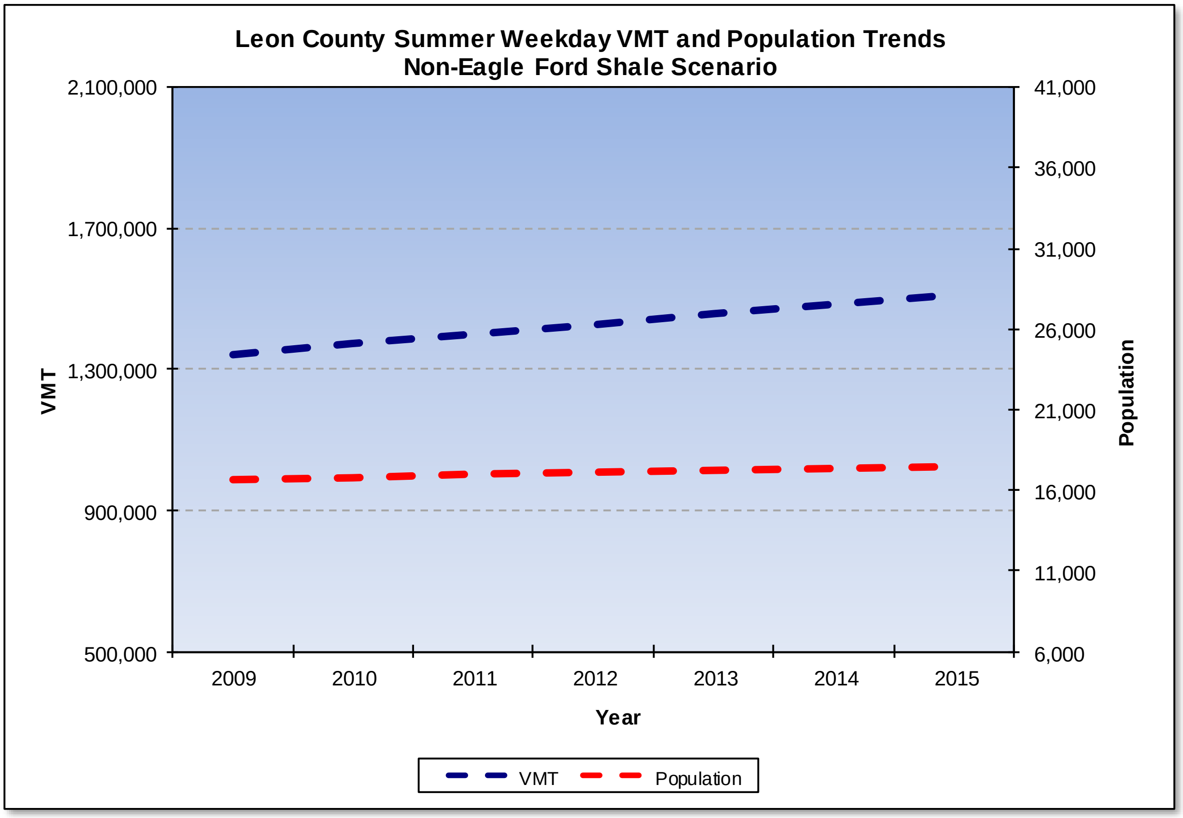

Lavaca County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

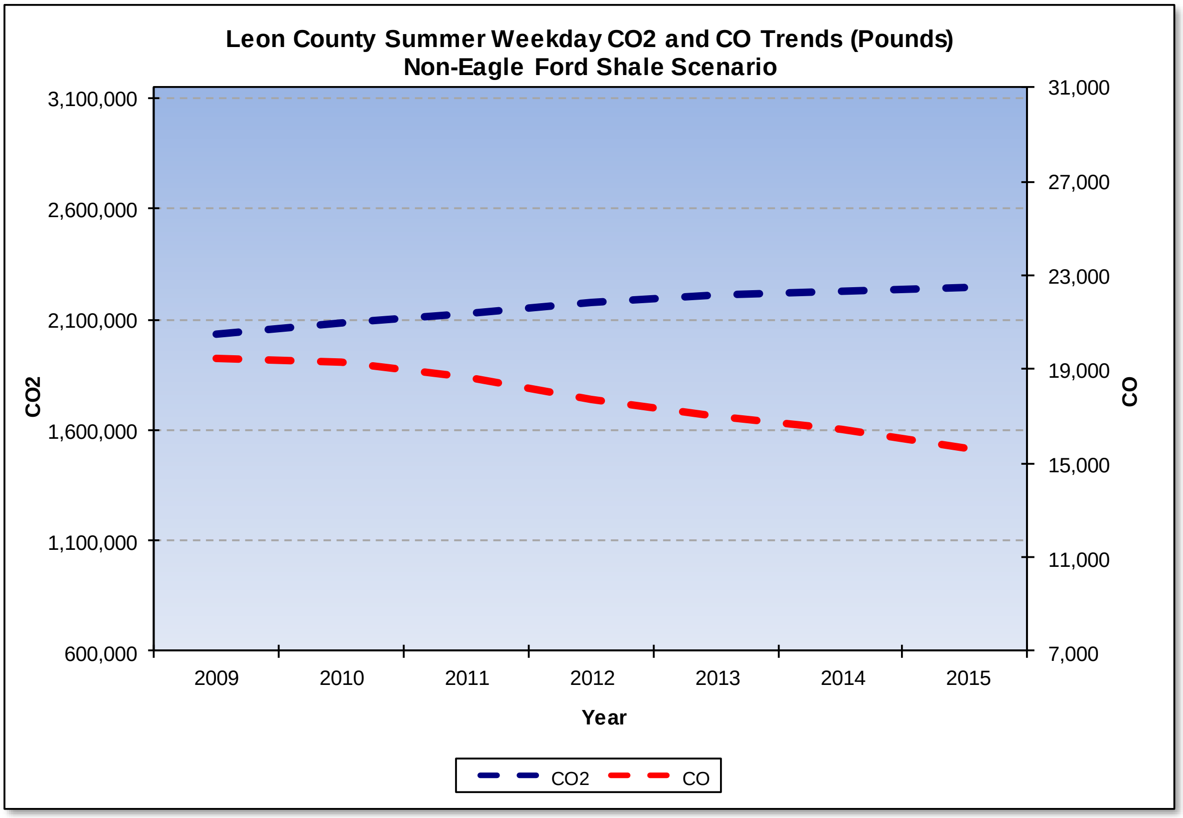

Lee County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
VMT
36,000
31,000
26,000
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

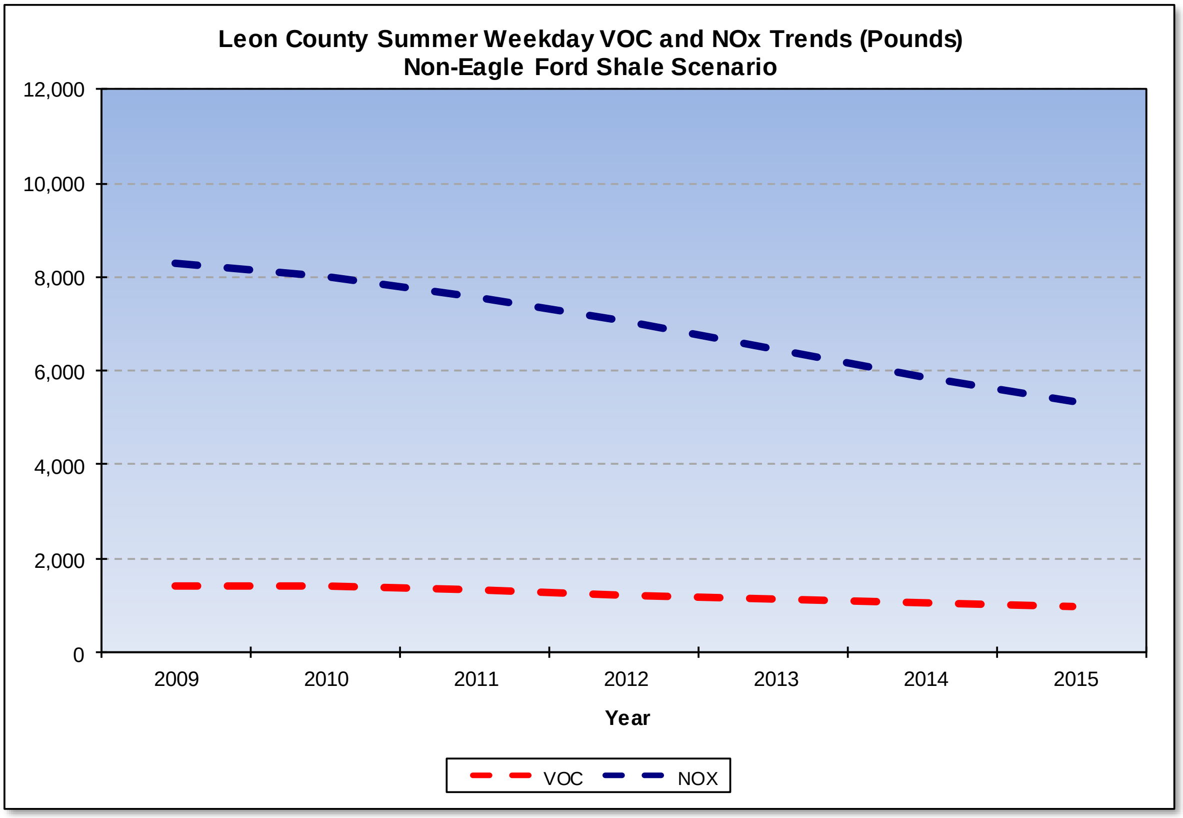

Lee County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,150,000
1,100,000
1,050,000
1,000,000
950,000
900,000
850,000
800,000
CO2
15,000
13,000
11,000
9,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

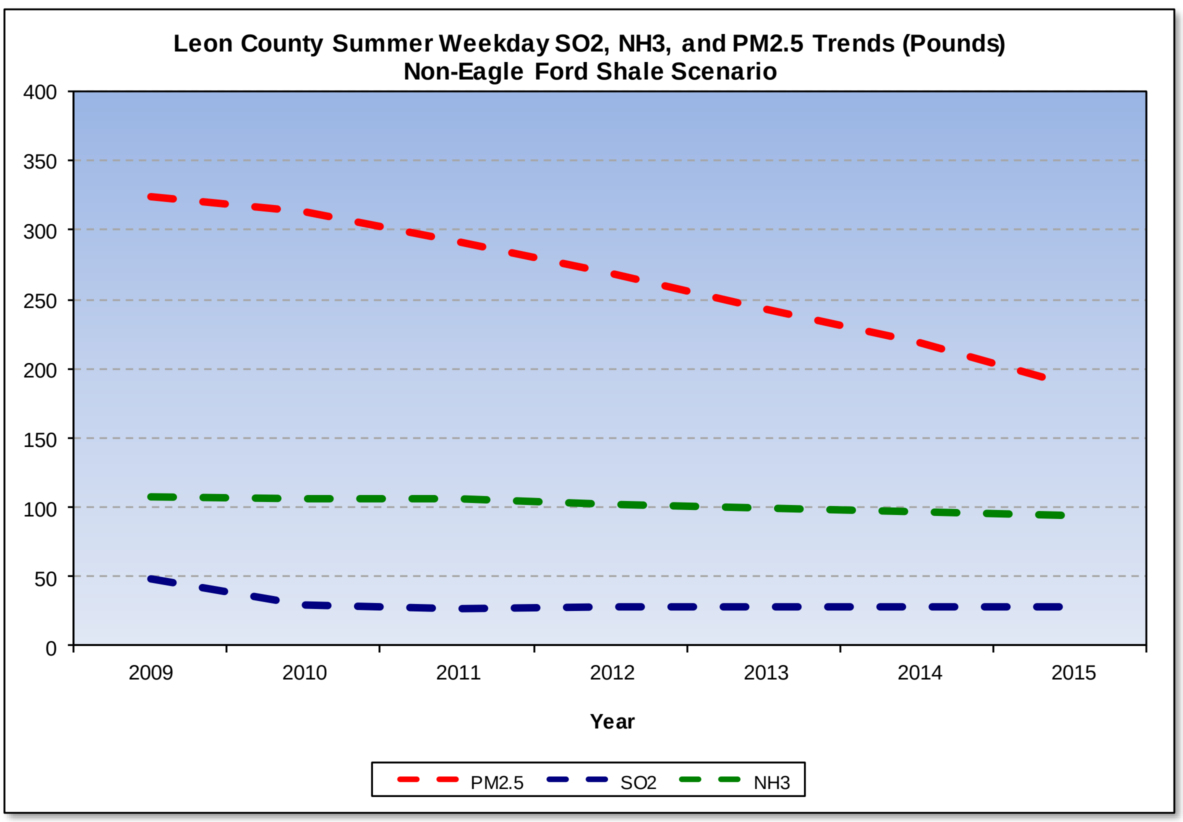

Lee County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

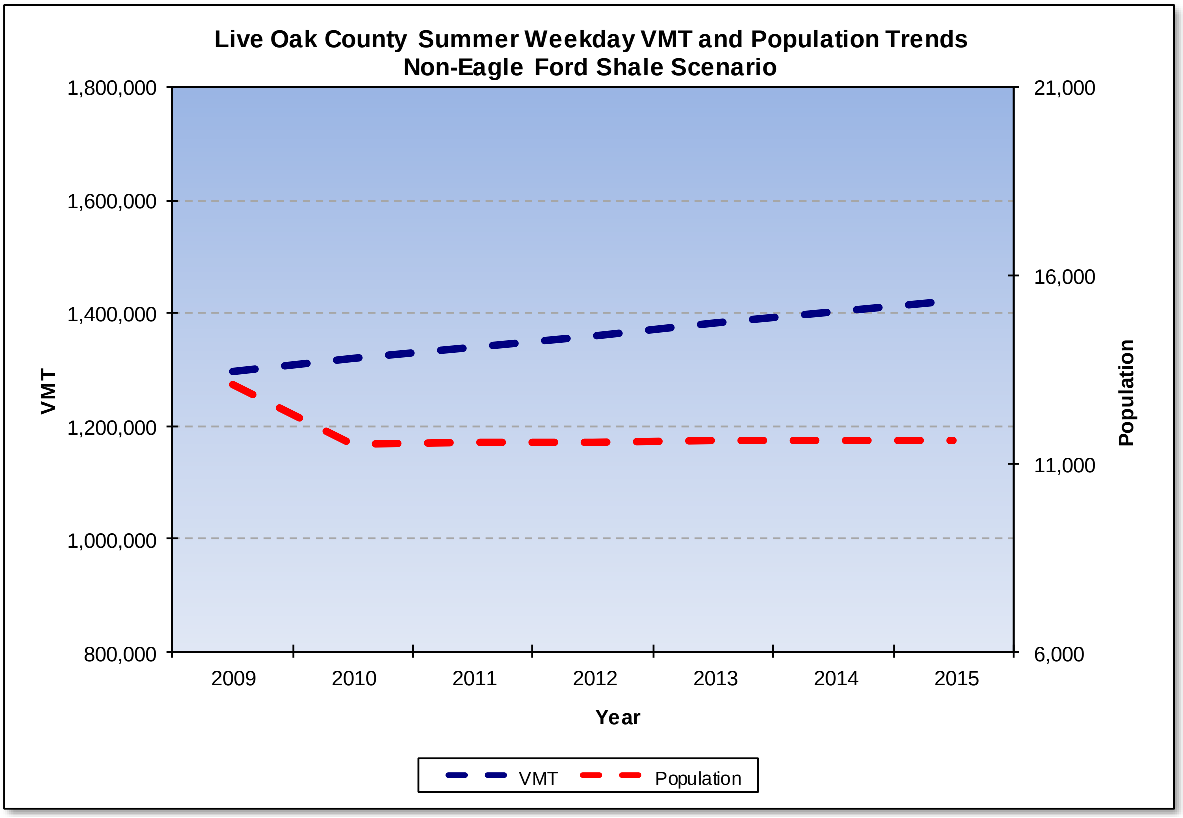

Lee County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

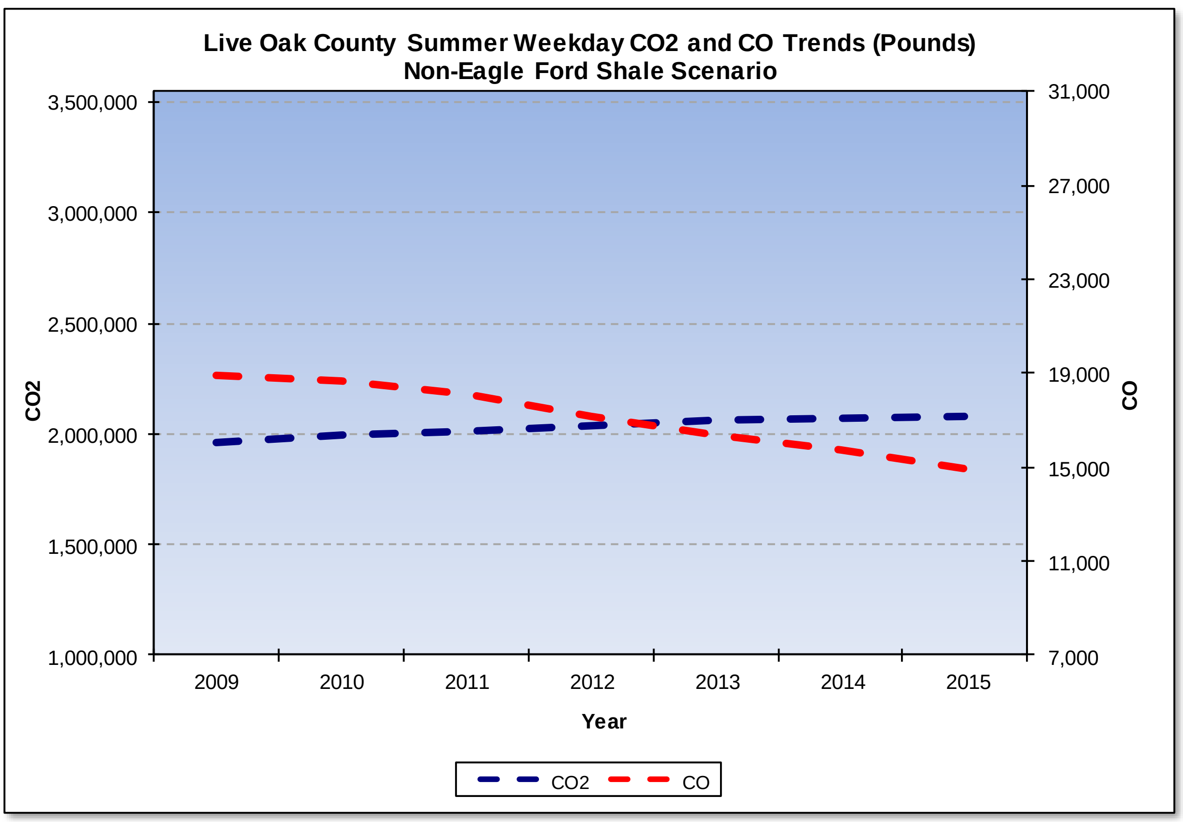

Leon County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
2,100,000
1,700,000
1,300,000
900,000
500,000
VMT
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

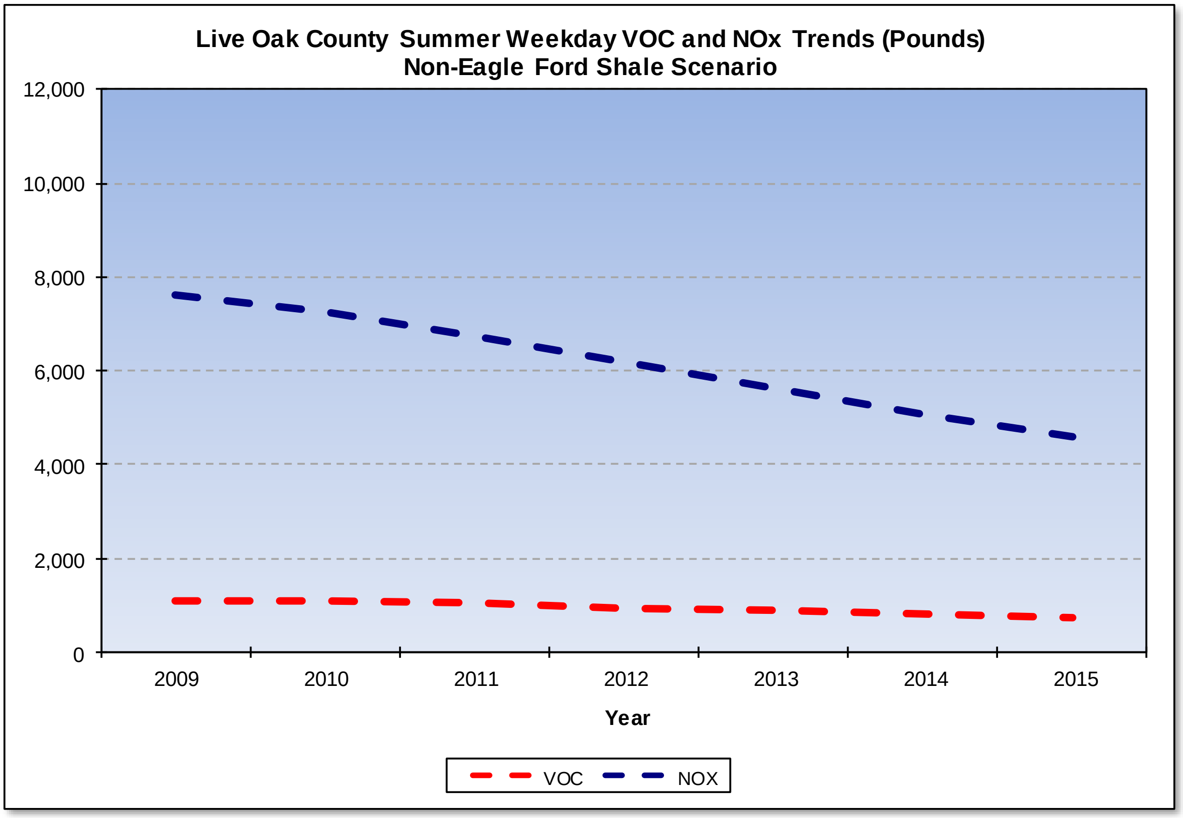

Leon County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
3,100,000
2,600,000
2,100,000
1,600,000
1,100,000
600,000
CO2
31,000
27,000
23,000
19,000
15,000
11,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

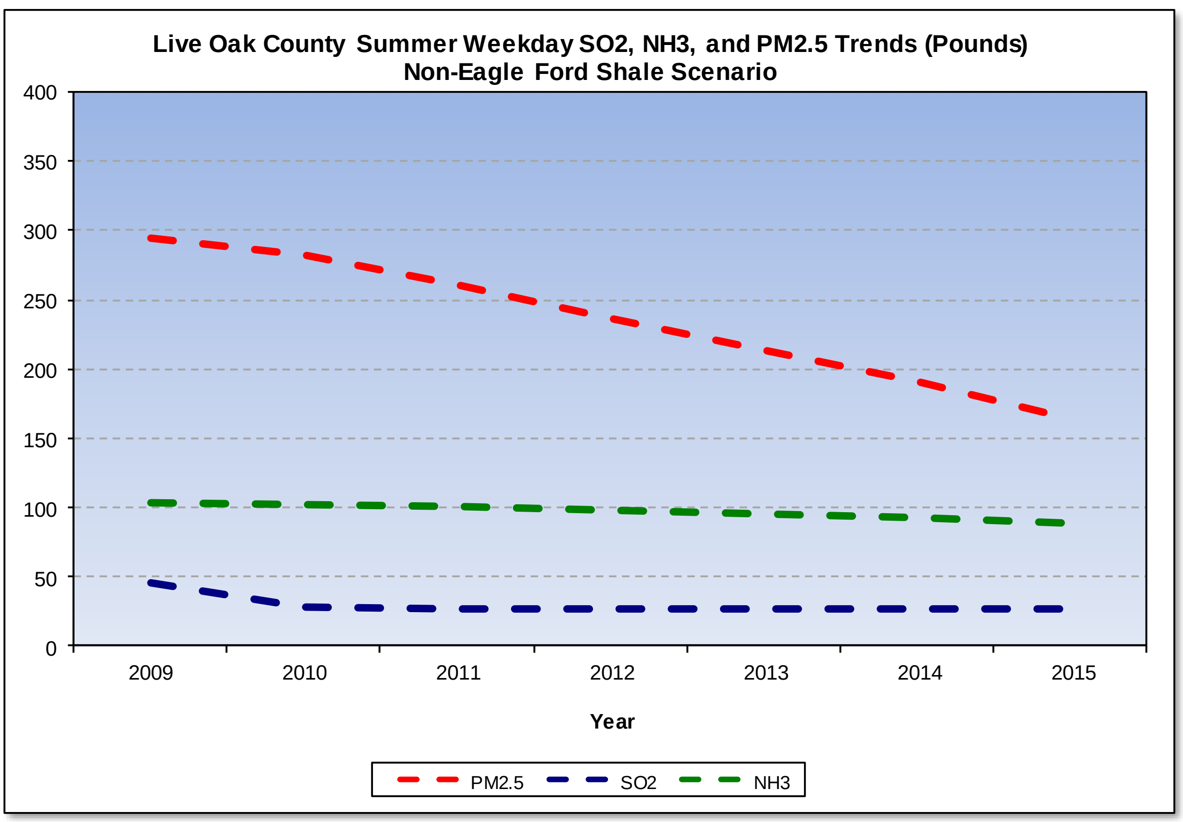

Leon County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

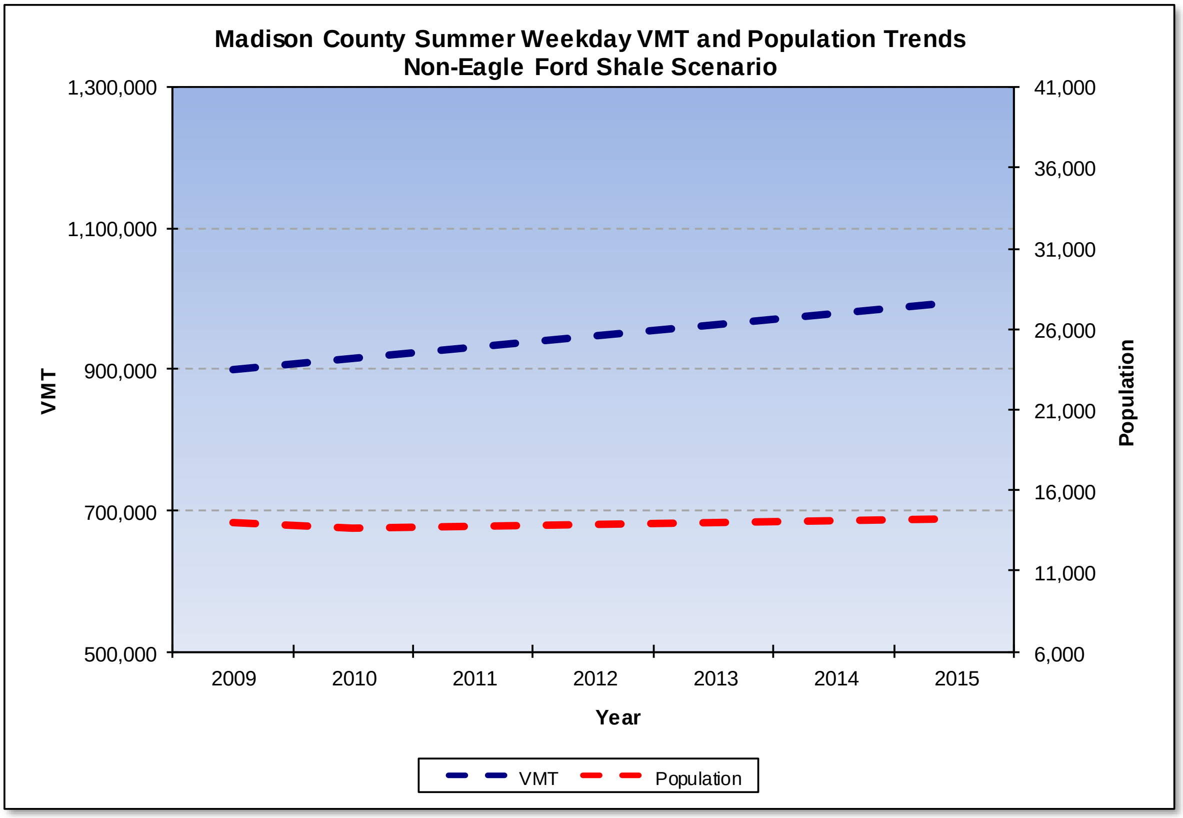

Leon County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

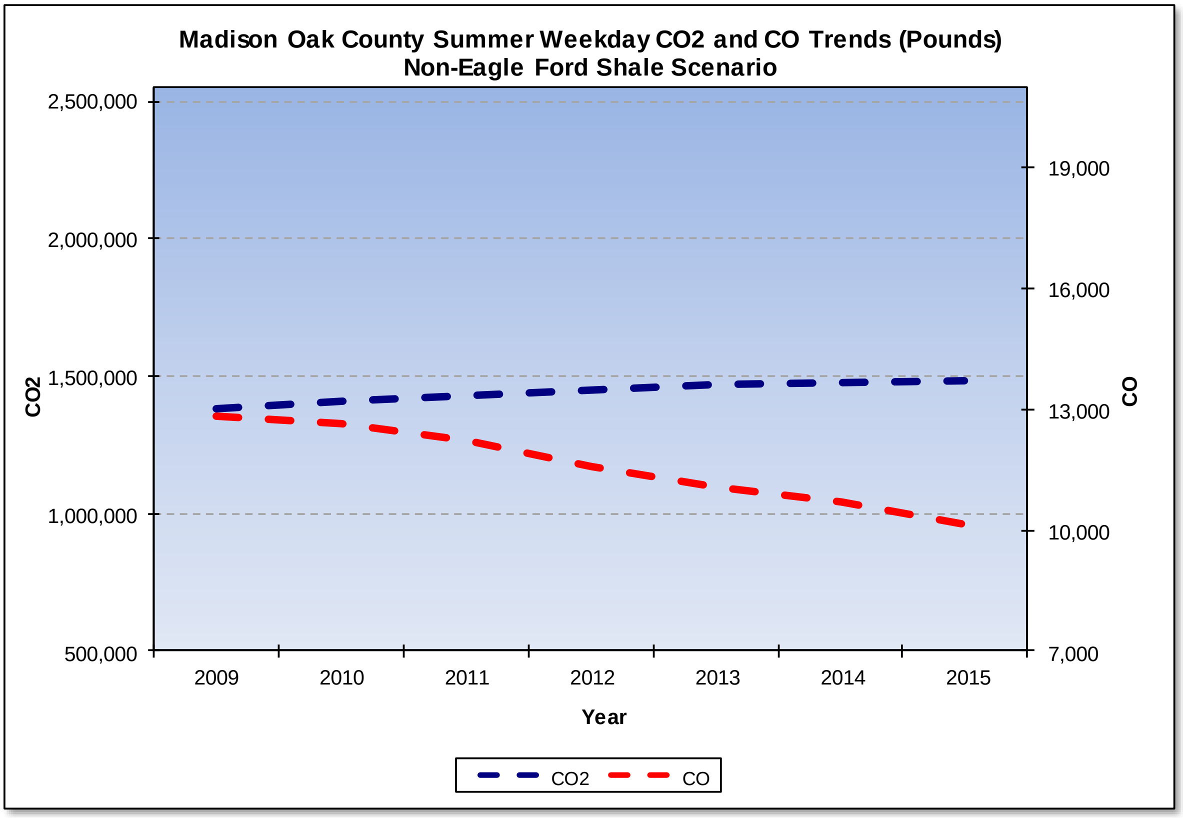

Live Oak County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
VMT
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

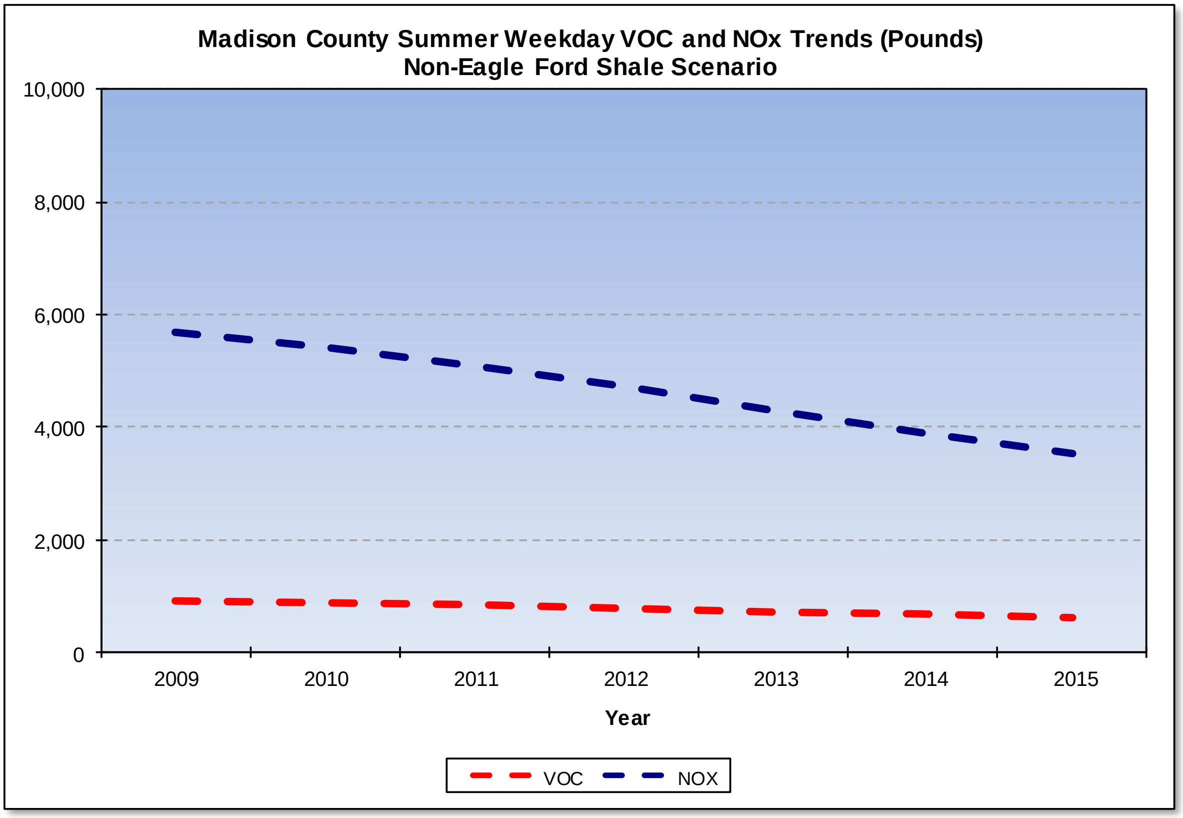

Live Oak County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
CO2
31,000
27,000
23,000
19,000
15,000
11,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

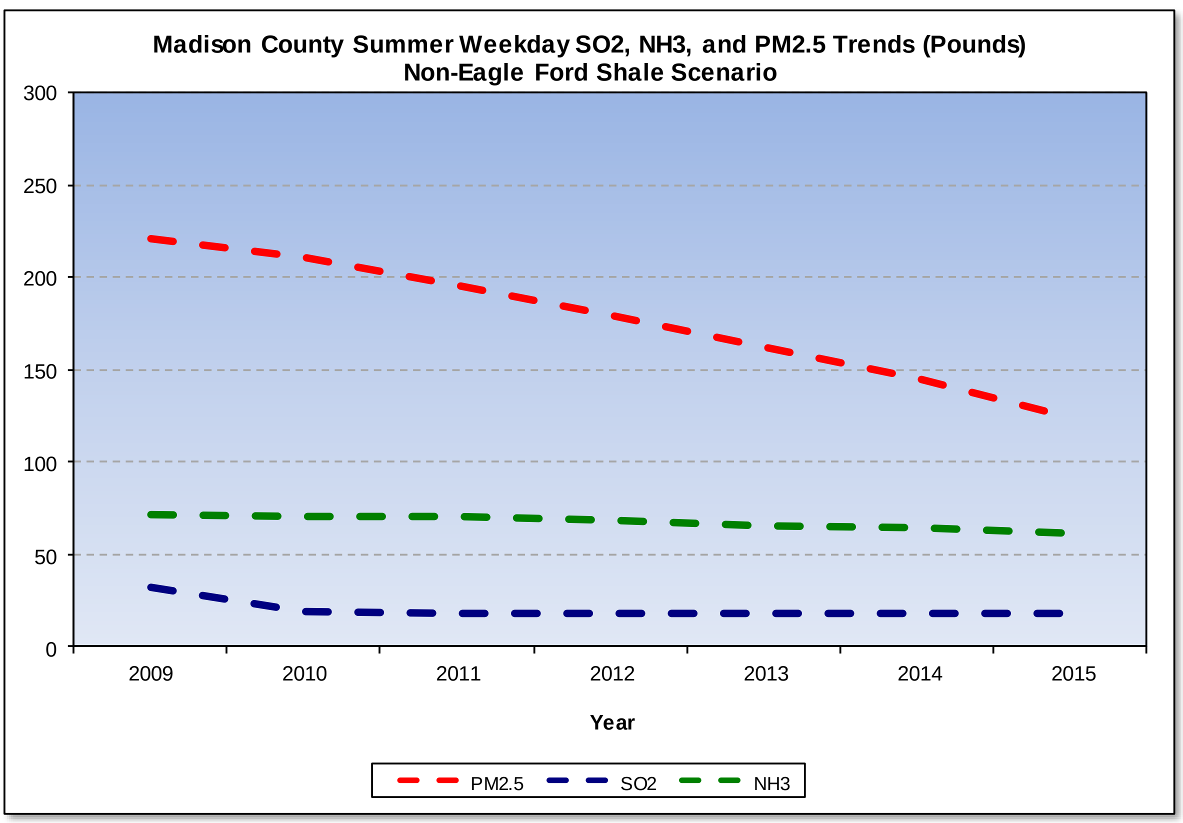

Live Oak County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
12,000
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

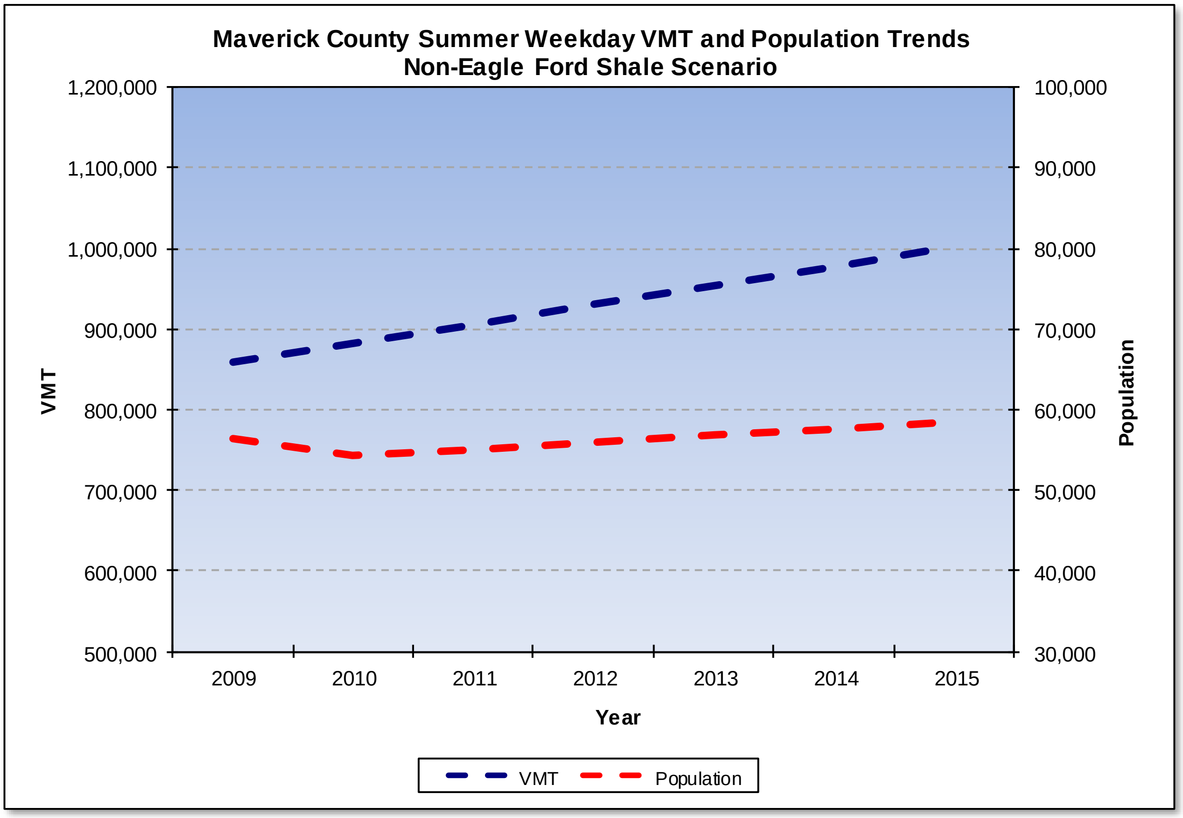

Live Oak County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
400
350
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

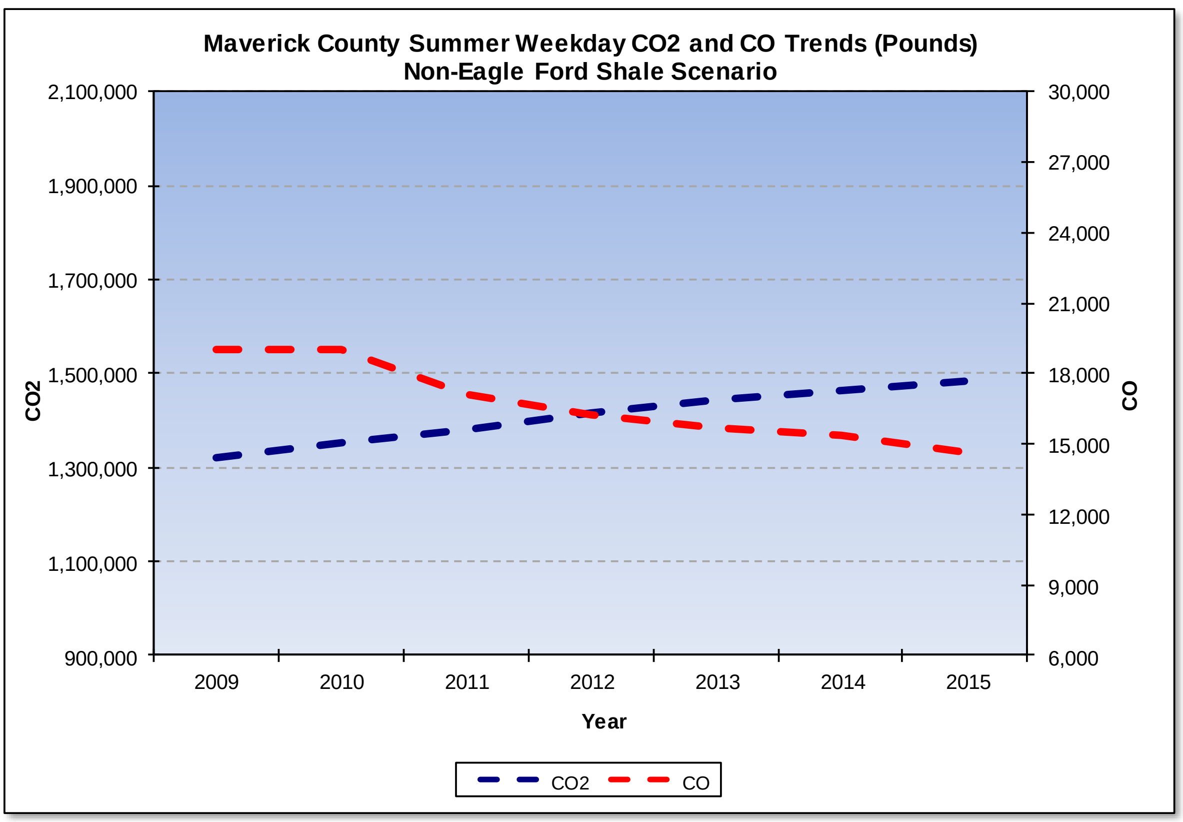

Madison County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,300,000
1,100,000
900,000
700,000
500,000
VMT
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

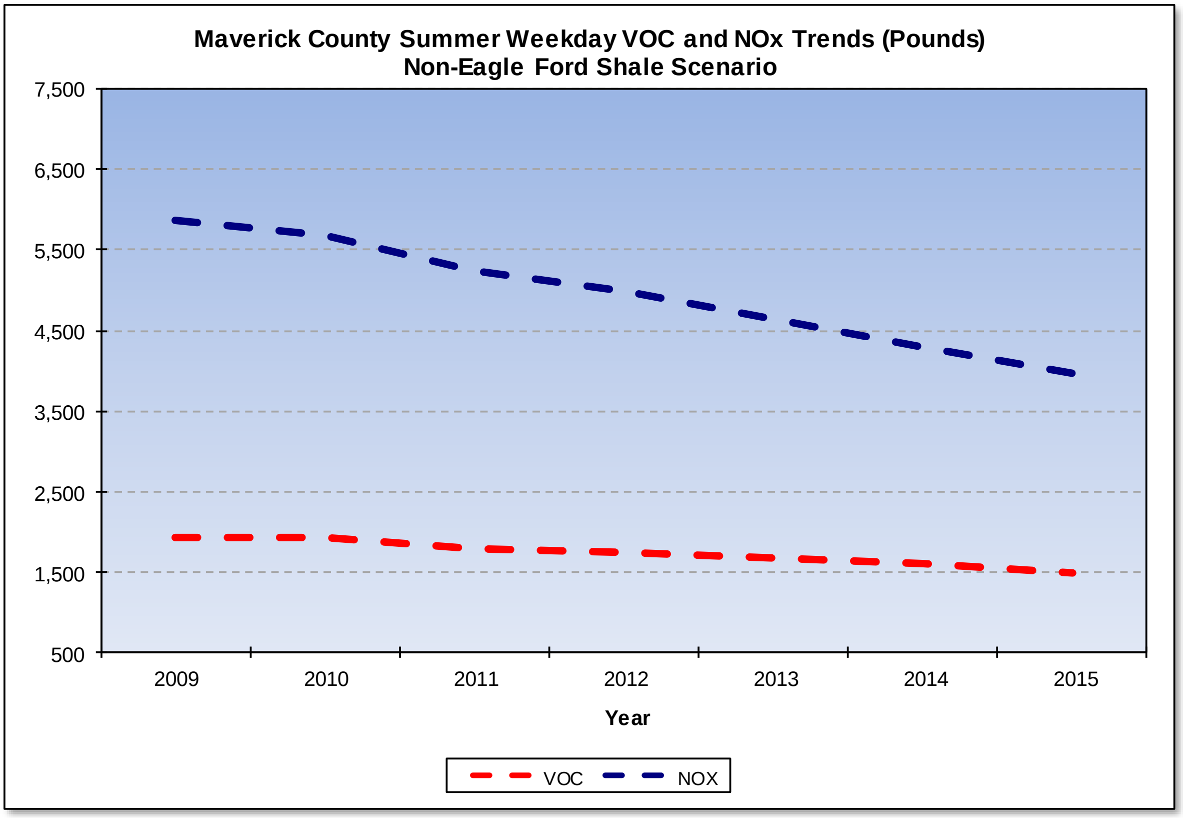

Madison Oak County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
2,500,000
2,000,000
1,500,000
1,000,000
500,000
CO2
19,000
16,000
13,000
10,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

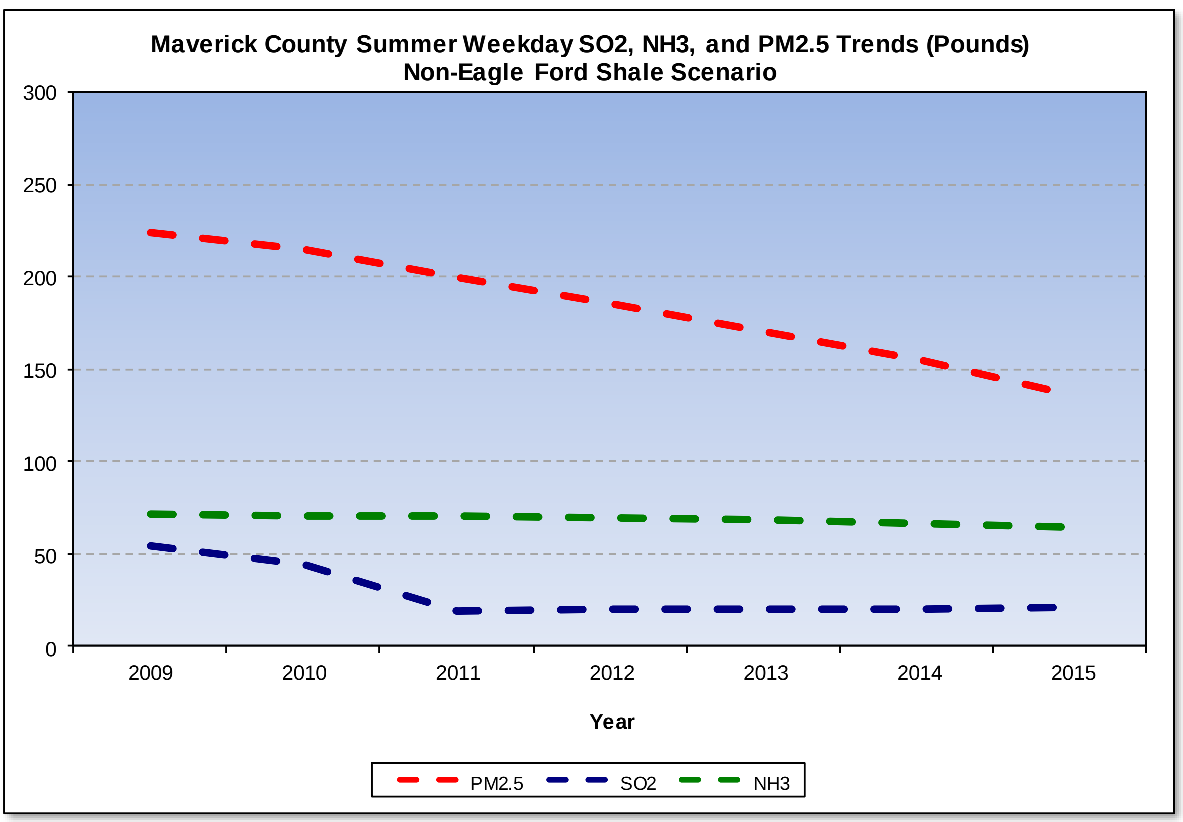

Madison County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
10,000
8,000
6,000
4,000
2,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

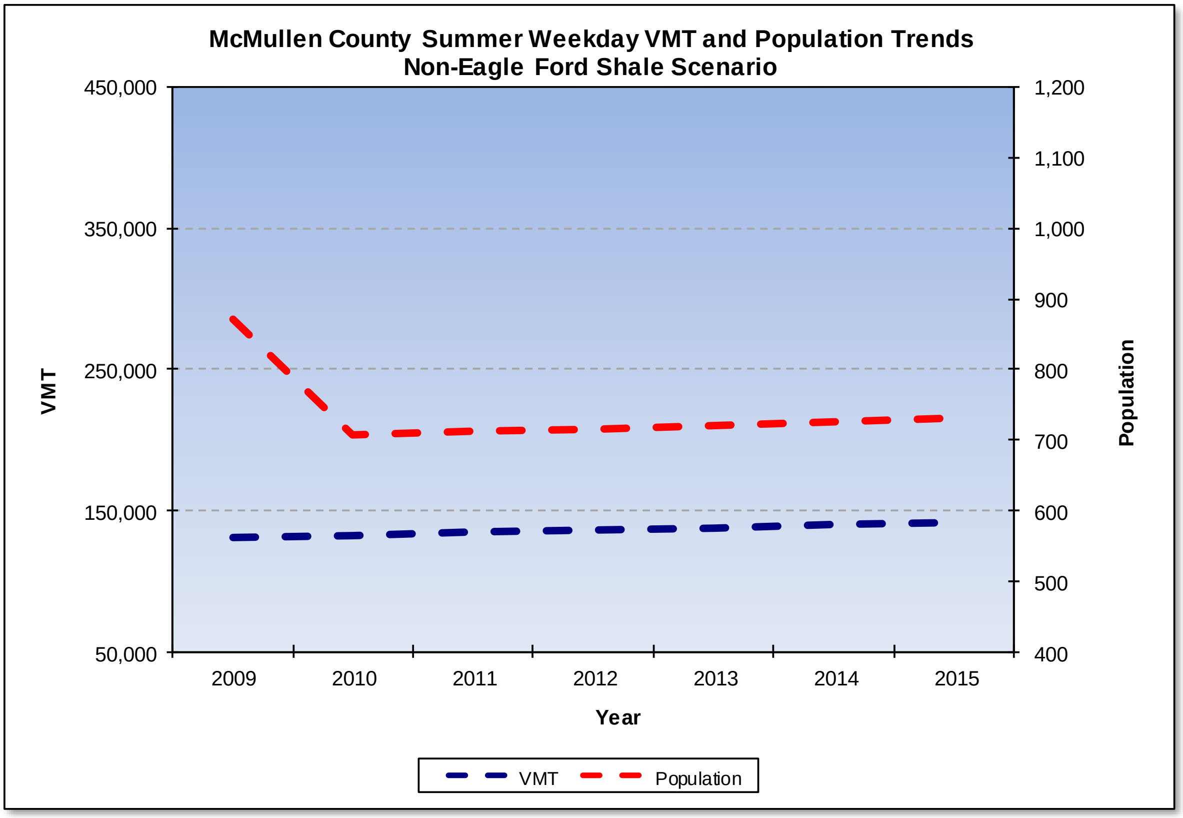

Madison County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

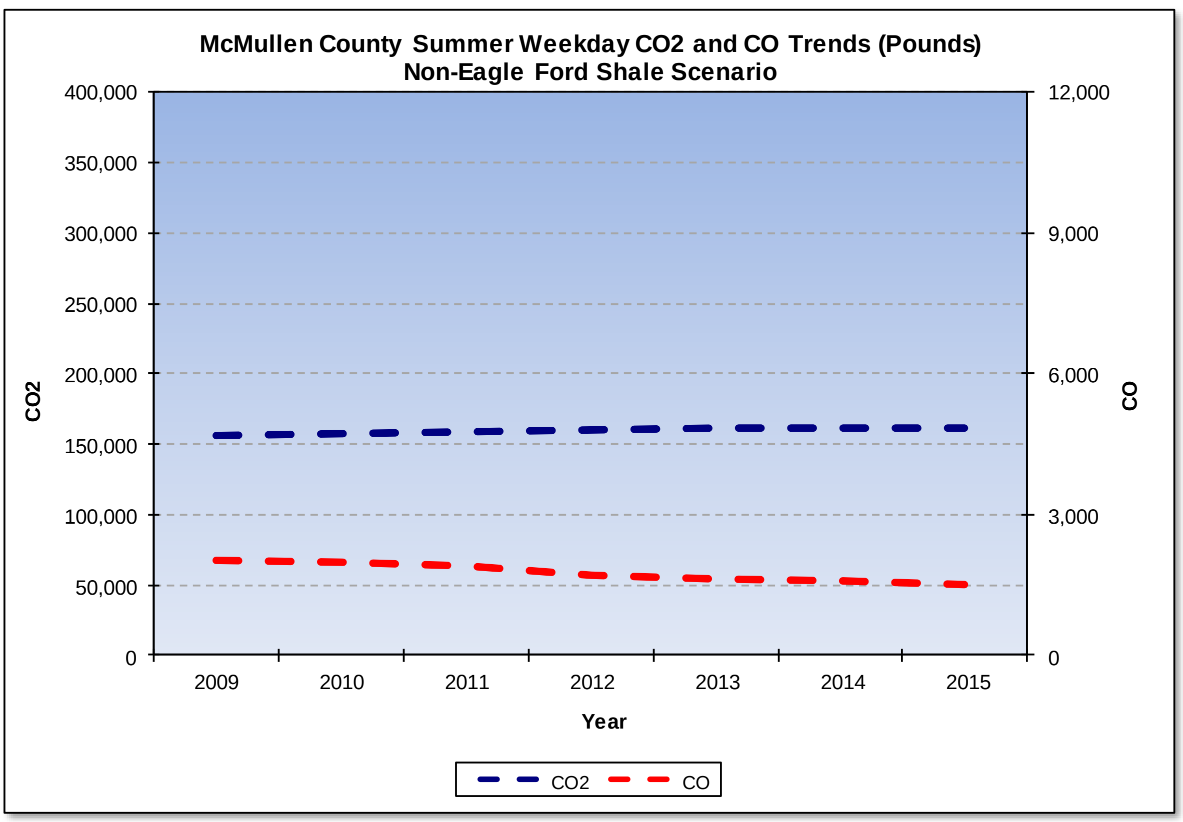

Maverick County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
Population
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

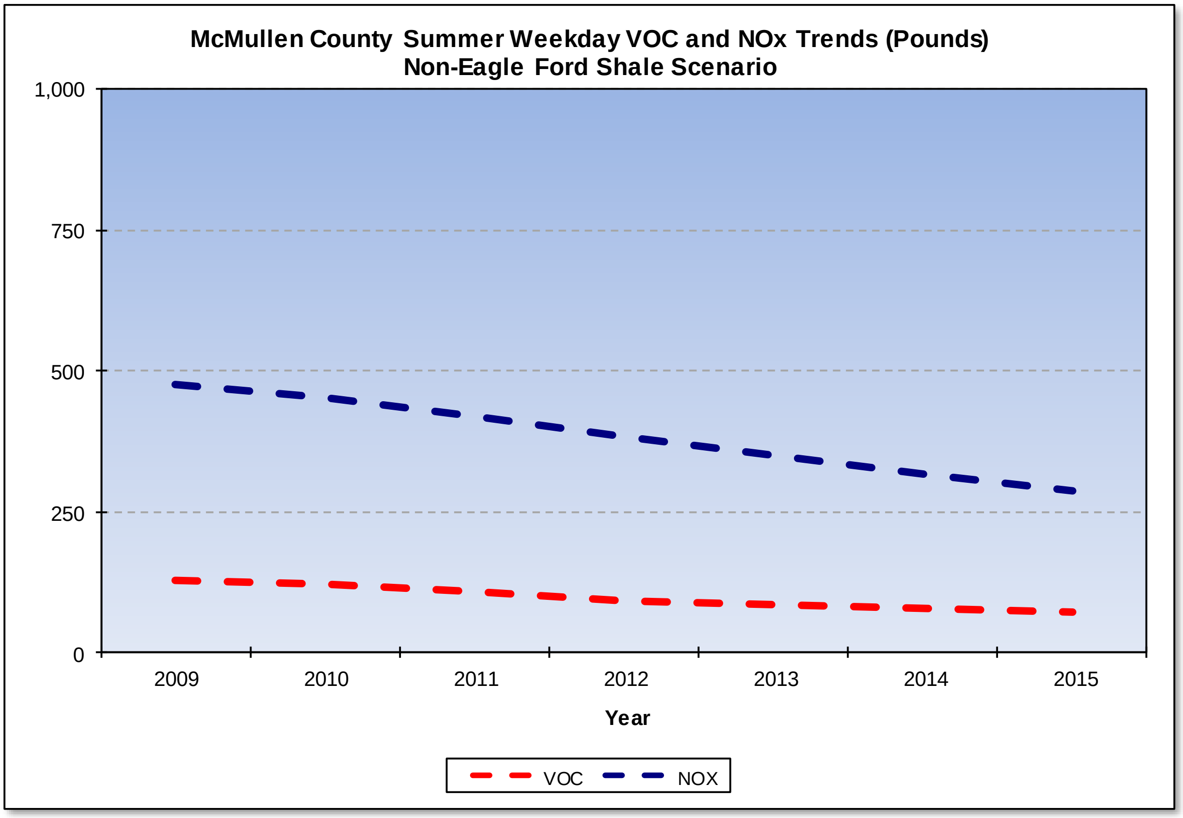

Maverick County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
CO
2,100,000
1,900,000
1,700,000
1,500,000
1,300,000
1,100,000
900,000
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
6,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

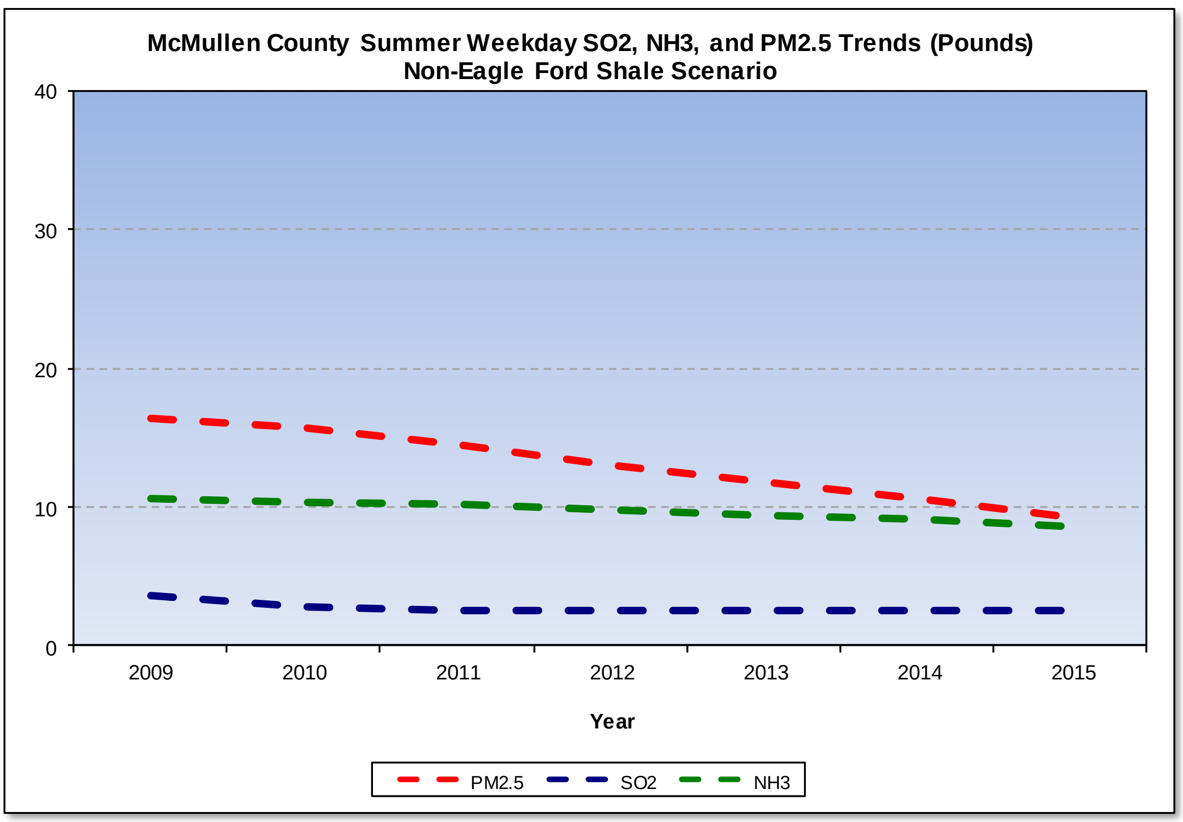

Maverick County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
7,500
6,500
5,500
4,500
3,500
2,500
1,500
500
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

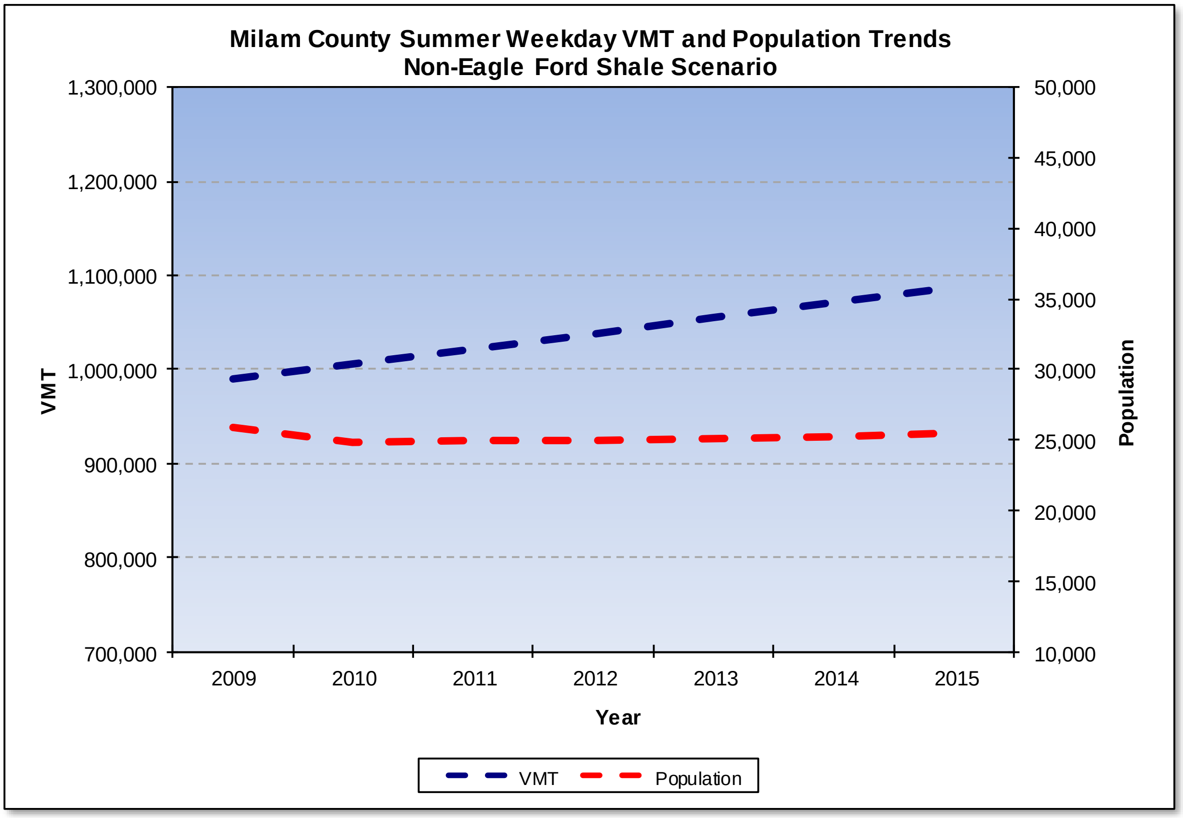

Maverick County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

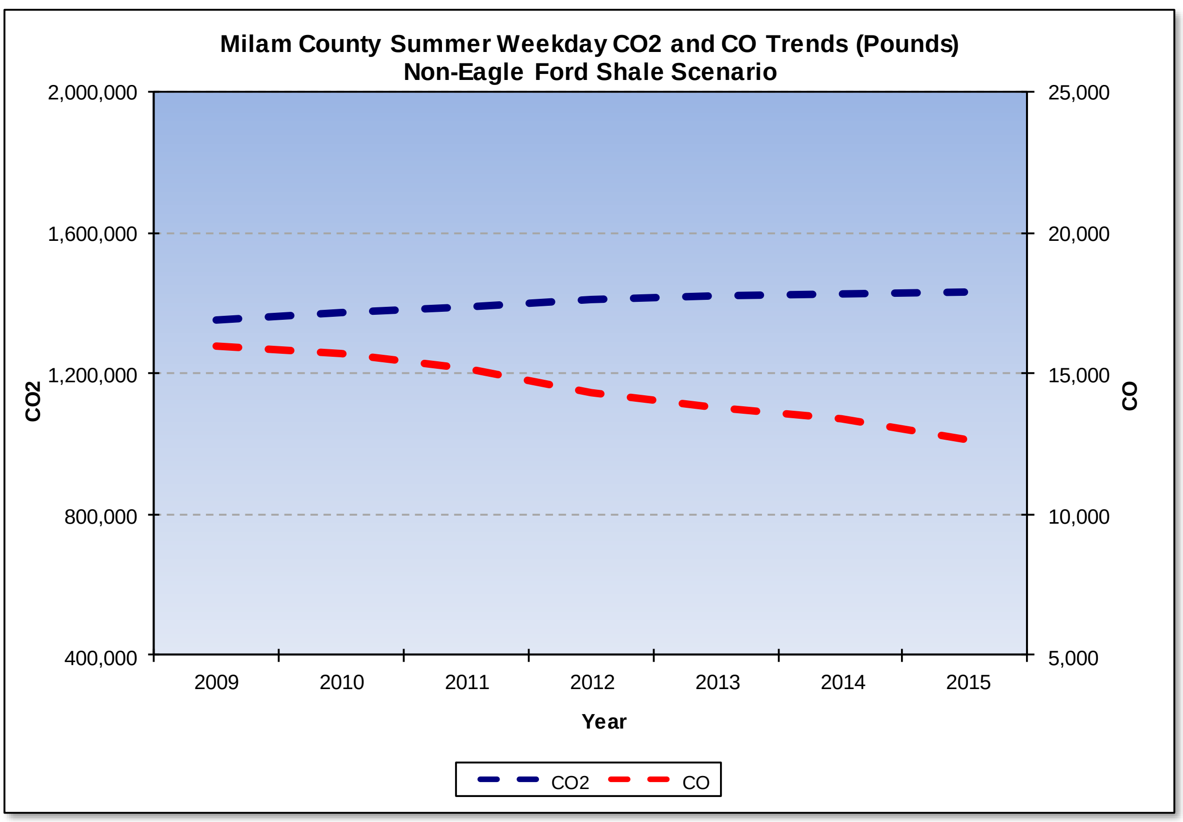

McMullen County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
450,000
350,000
250,000
150,000
50,000
VMT
1,200
1,100
1,000
900
800
700
600
500
400
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

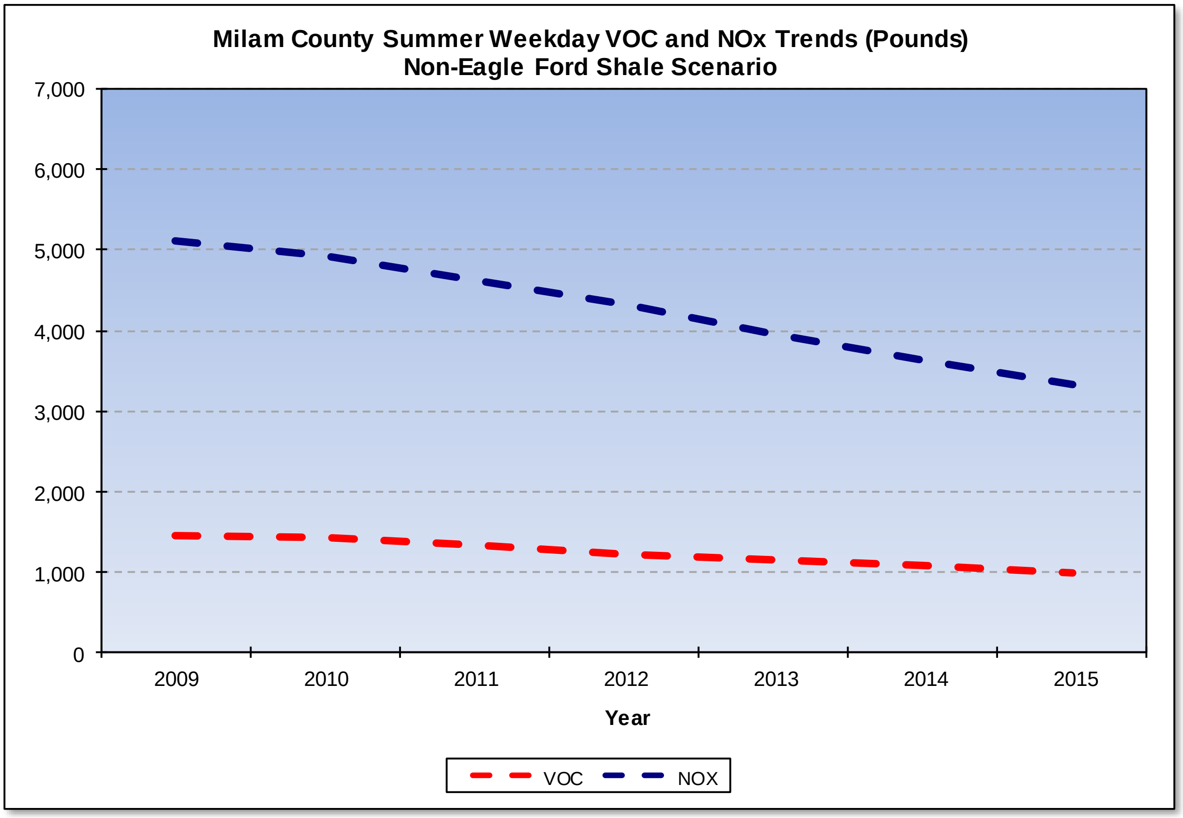

McMullen County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
CO2
12,000
9,000
6,000
3,000
0
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

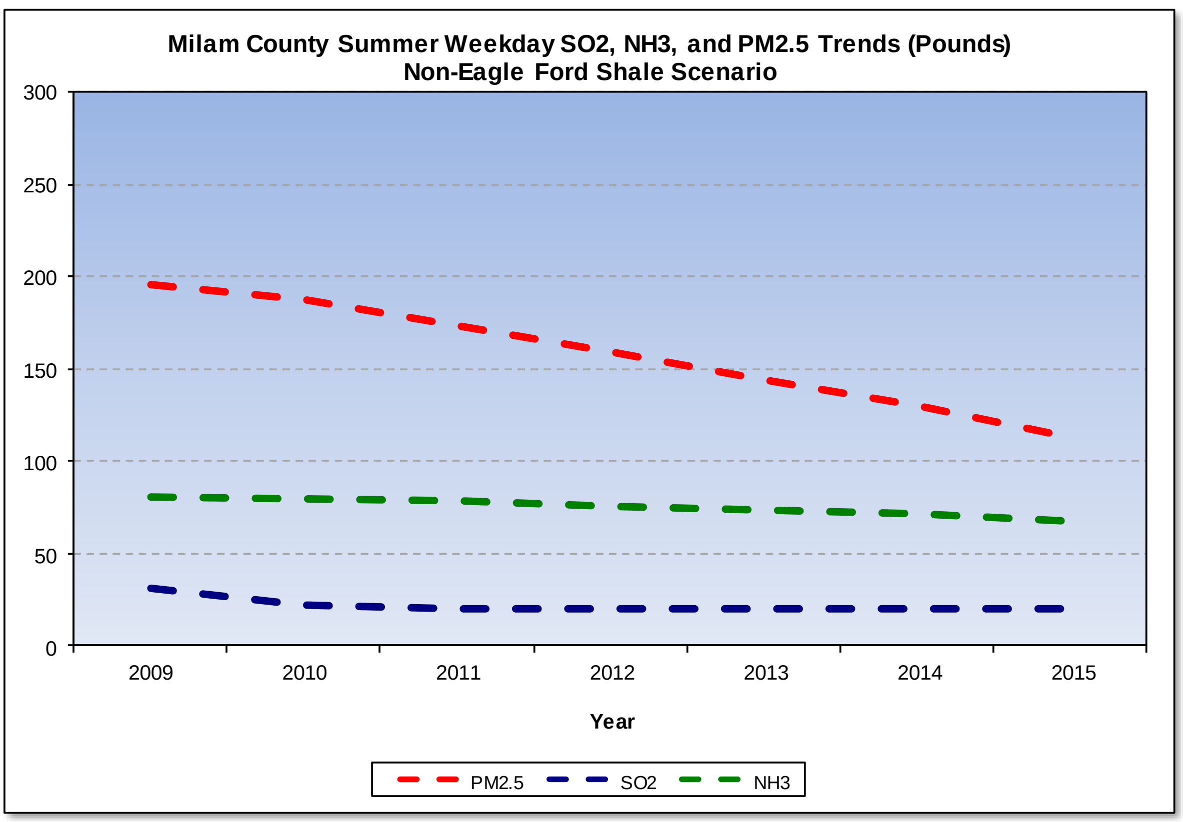

McMullen County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,000
750
500
250
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

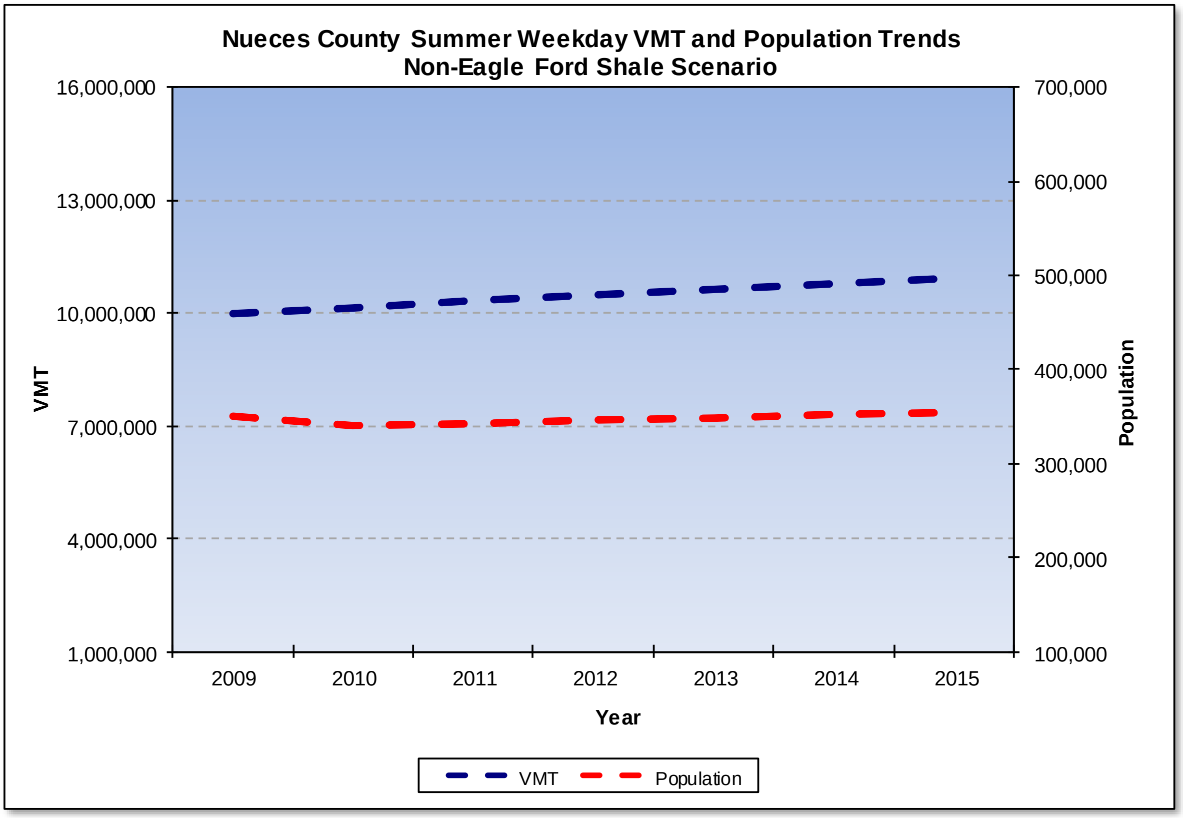

McMullen County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
40
30
20
10
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

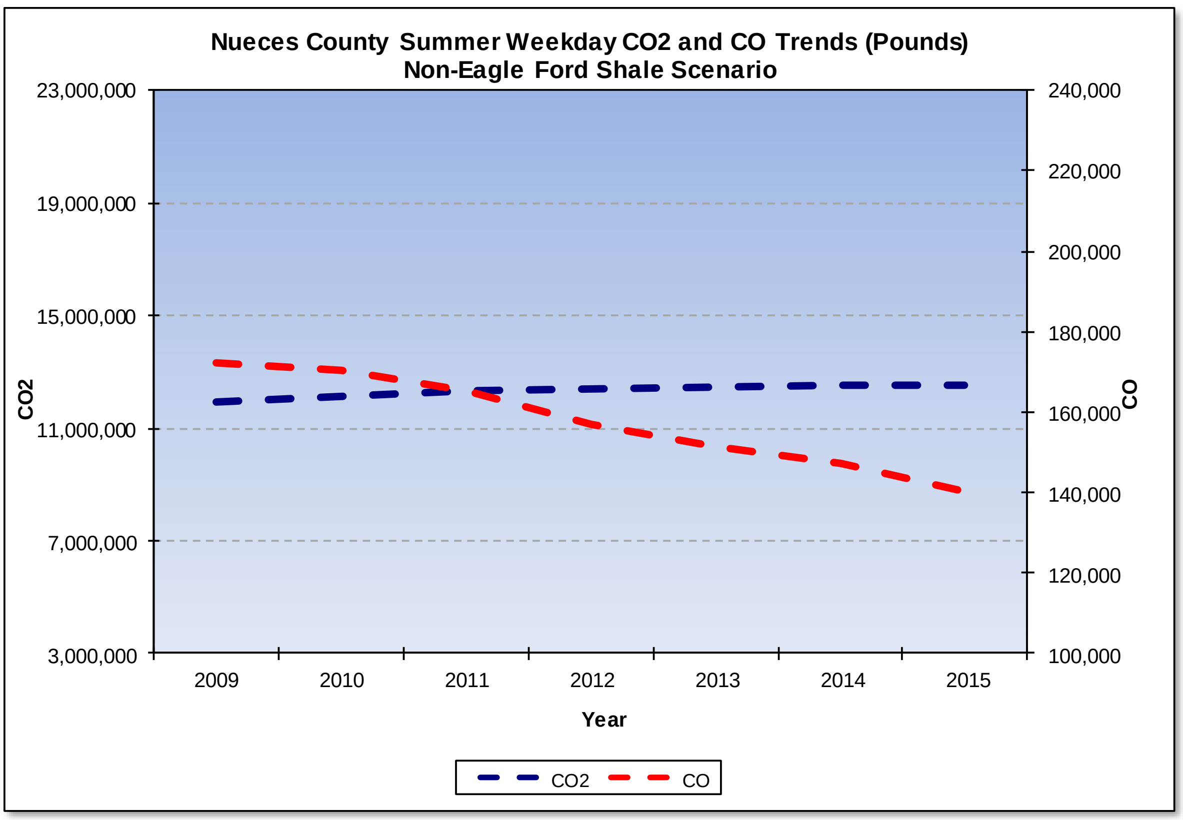

Milam County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
VMT
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

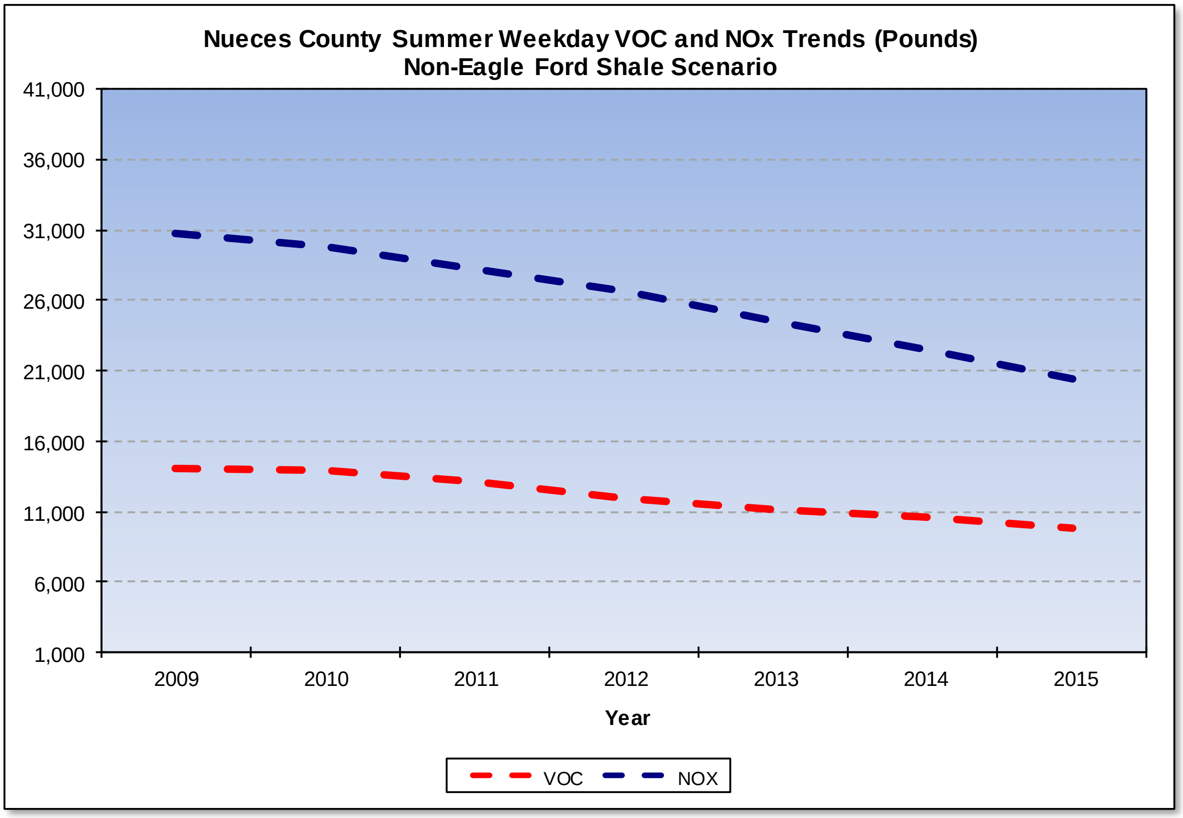

Milam County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
2,000,000
1,600,000
1,200,000
800,000
400,000
CO2
25,000
20,000
15,000
10,000
5,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

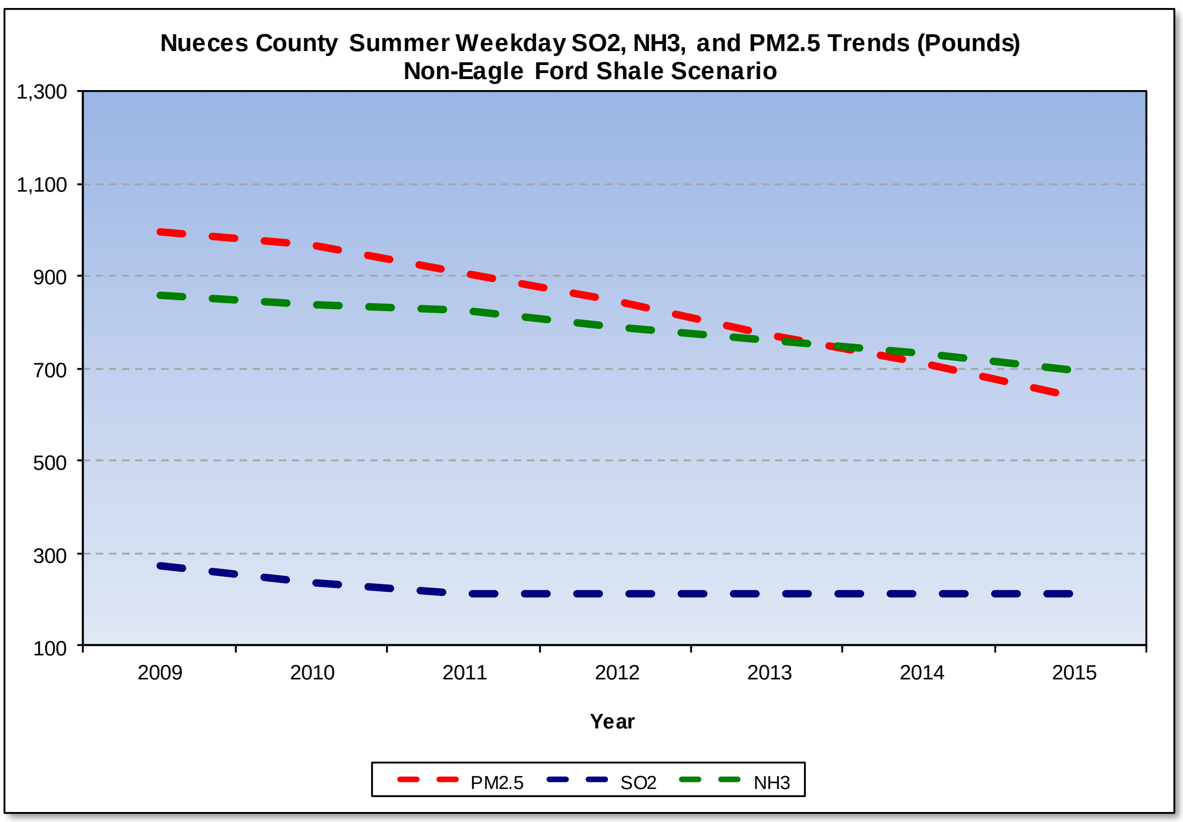

Milam County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

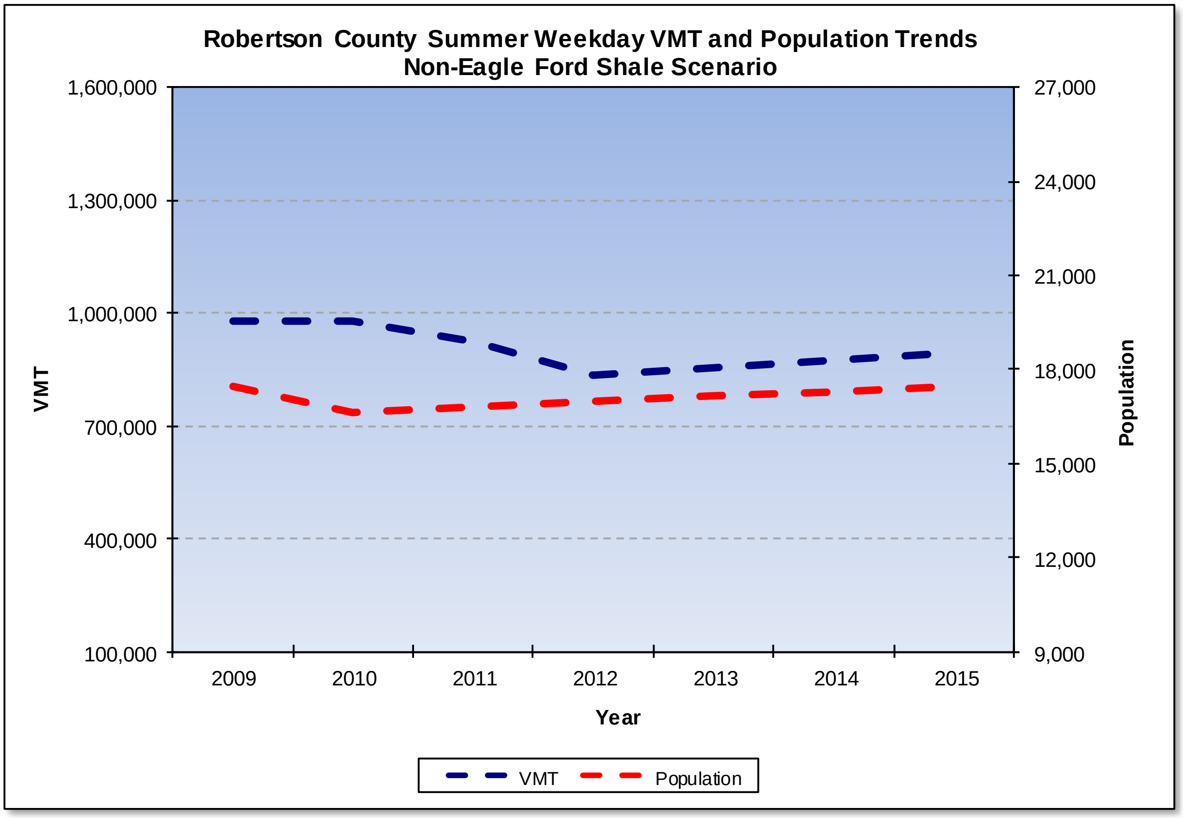

Milam County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

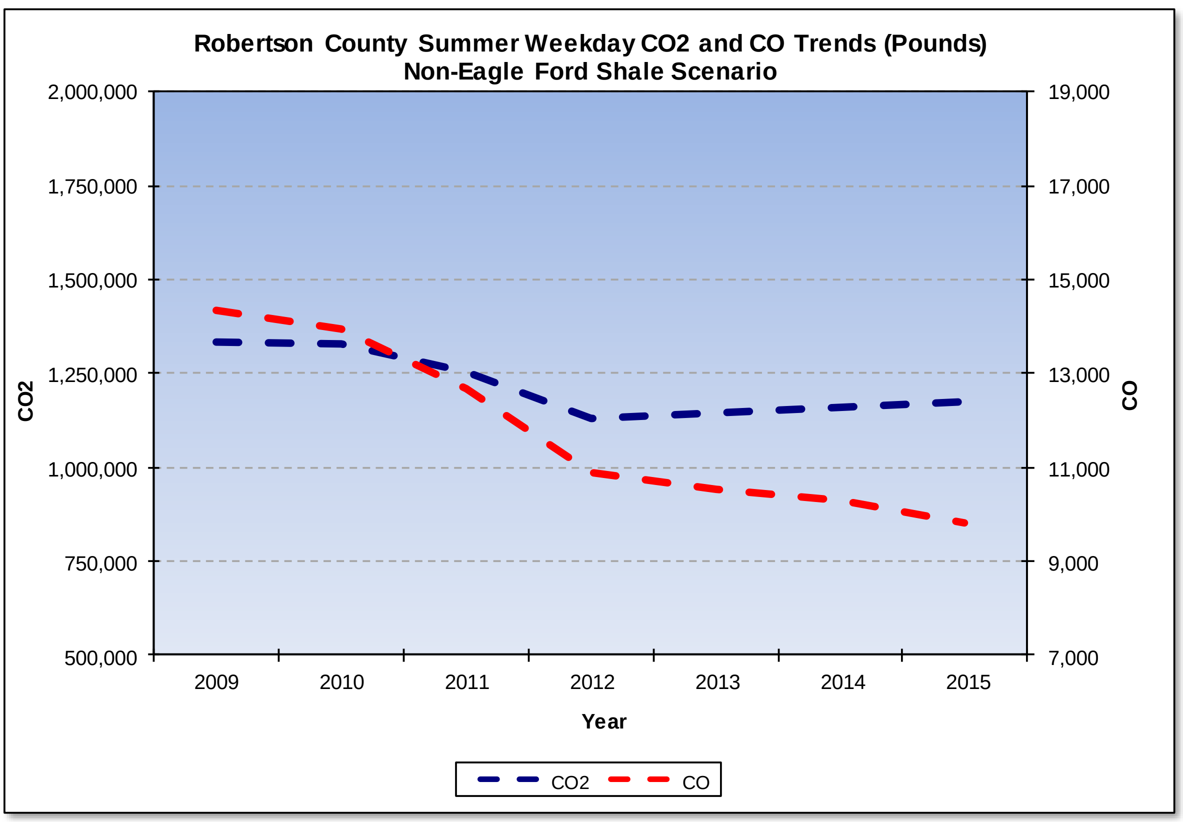

Nueces County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
16,000,000
13,000,000
10,000,000
7,000,000
4,000,000
1,000,000
VMT
700,000
600,000
500,000
400,000
300,000
200,000
100,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

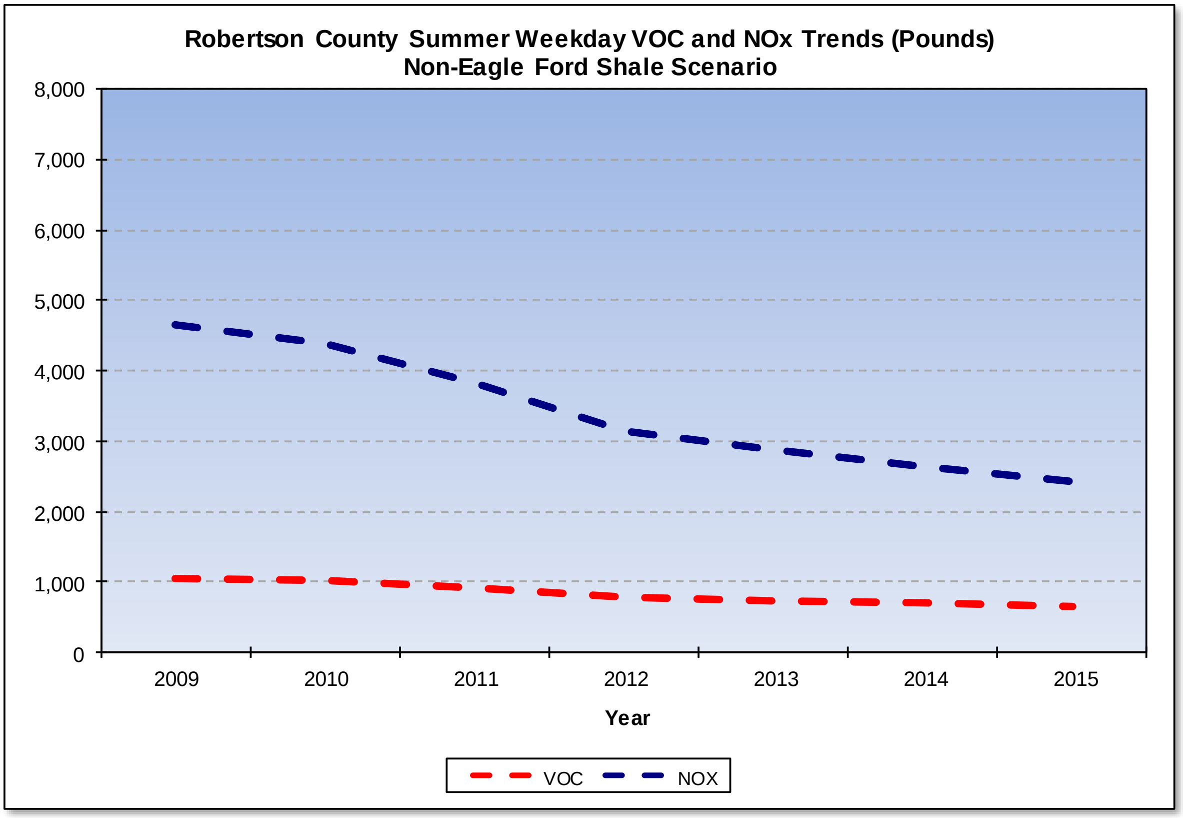

Nueces County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
23,000,000
19,000,000
15,000,000
11,000,000
7,000,000
3,000,000
CO2
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

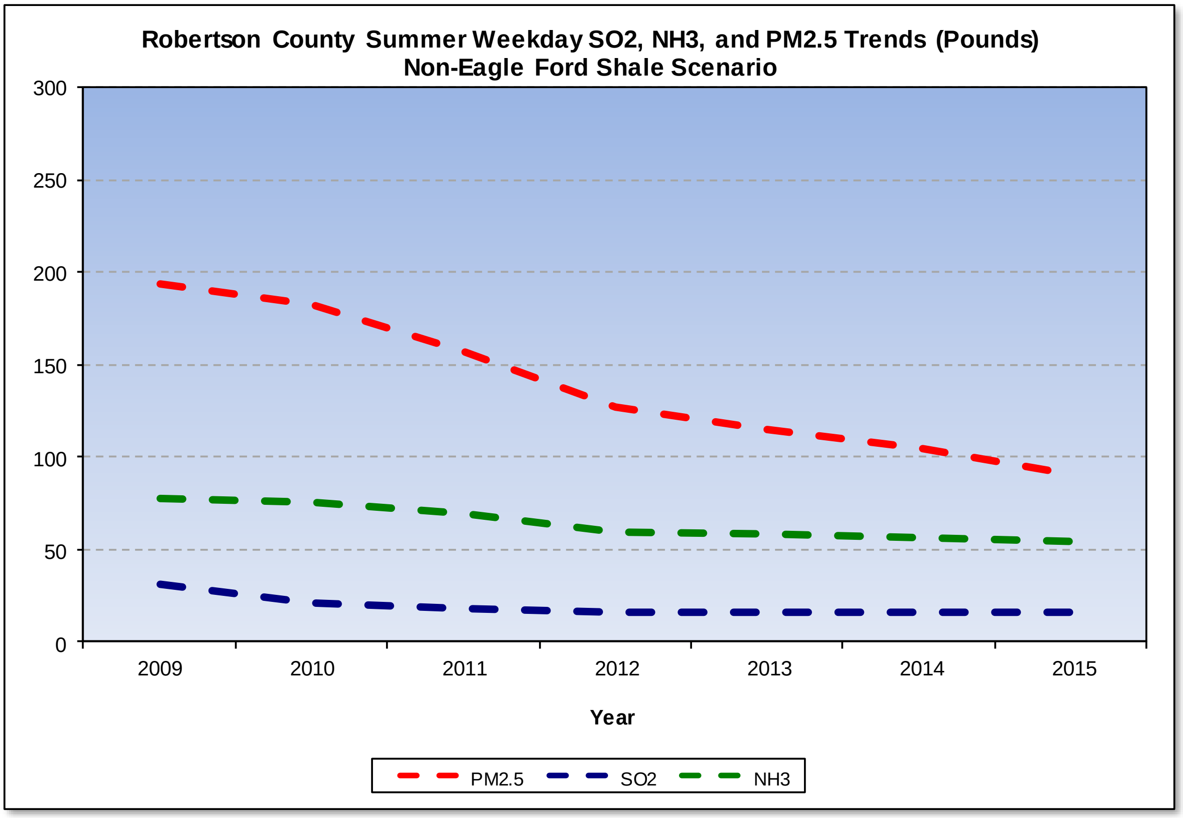

Nueces County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

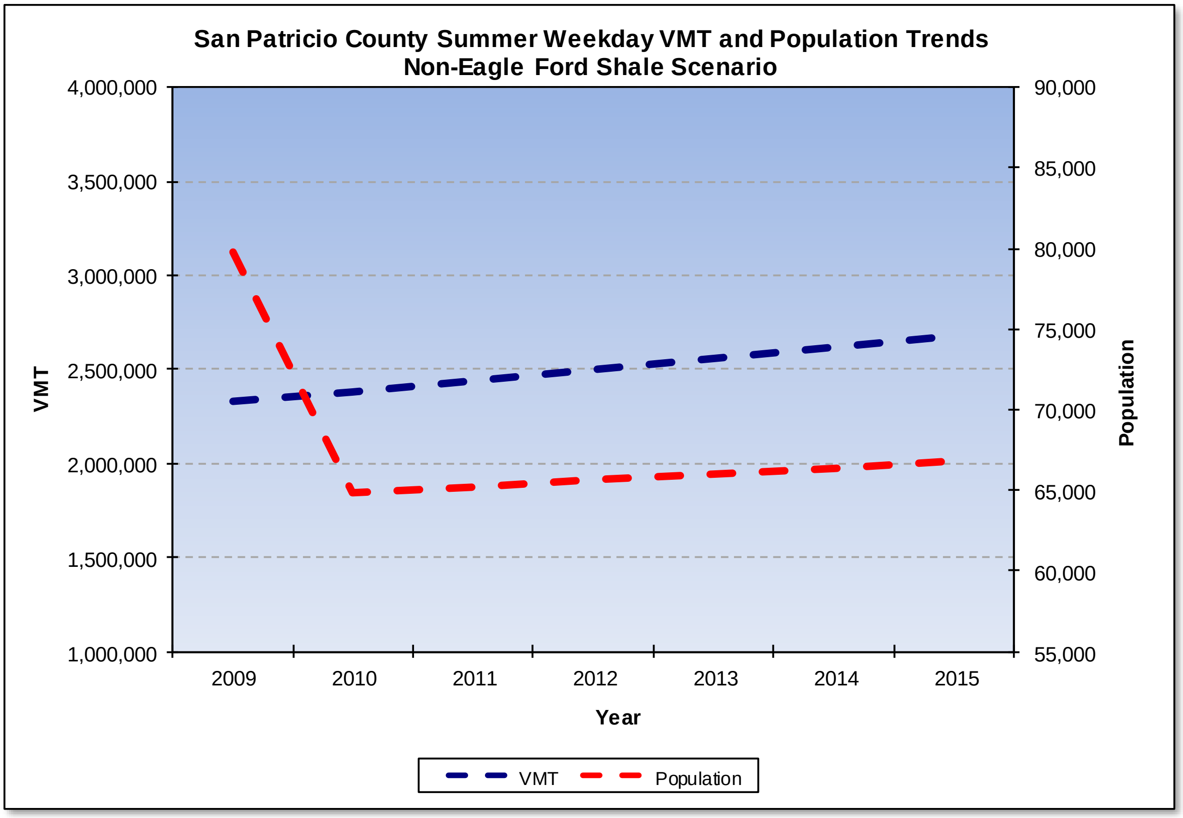

Nueces County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,300
1,100
900
700
500
300
100
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

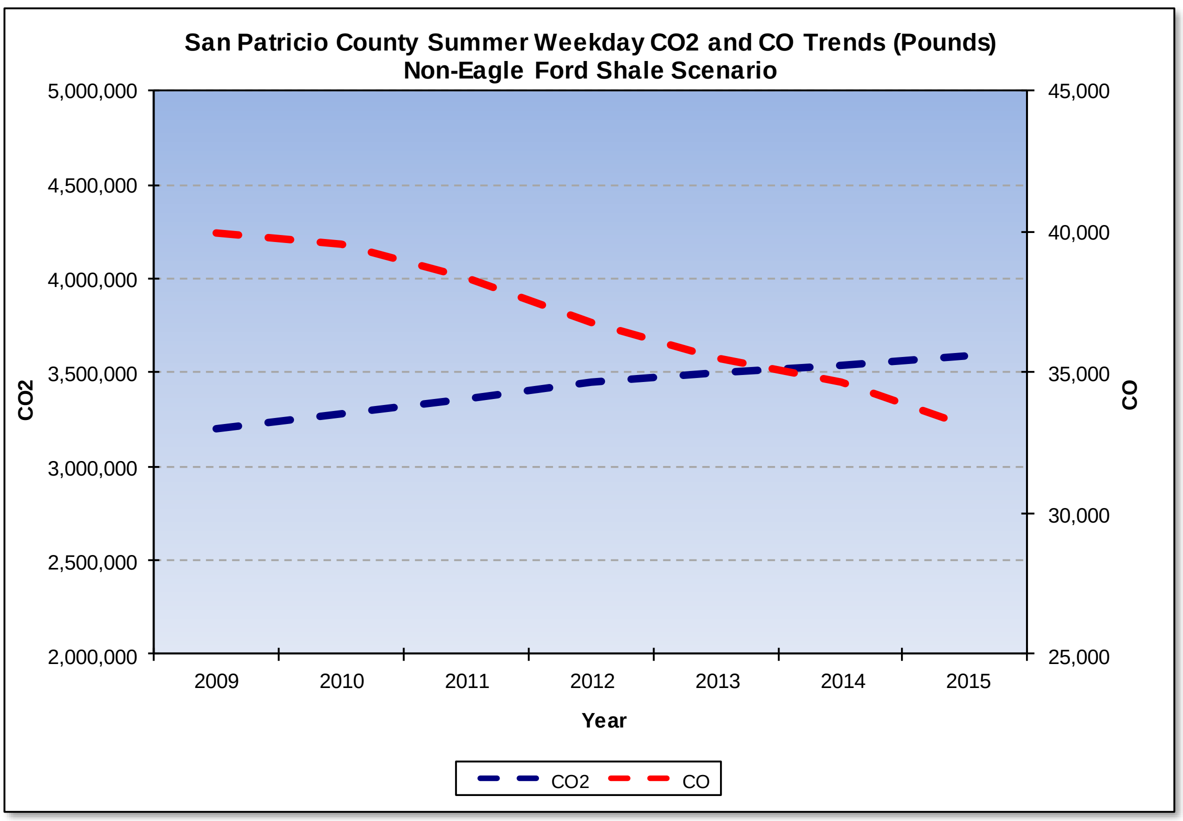

Robertson County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,600,000
1,300,000
1,000,000
700,000
400,000
100,000
VMT
27,000
24,000
21,000
18,000
15,000
12,000
9,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

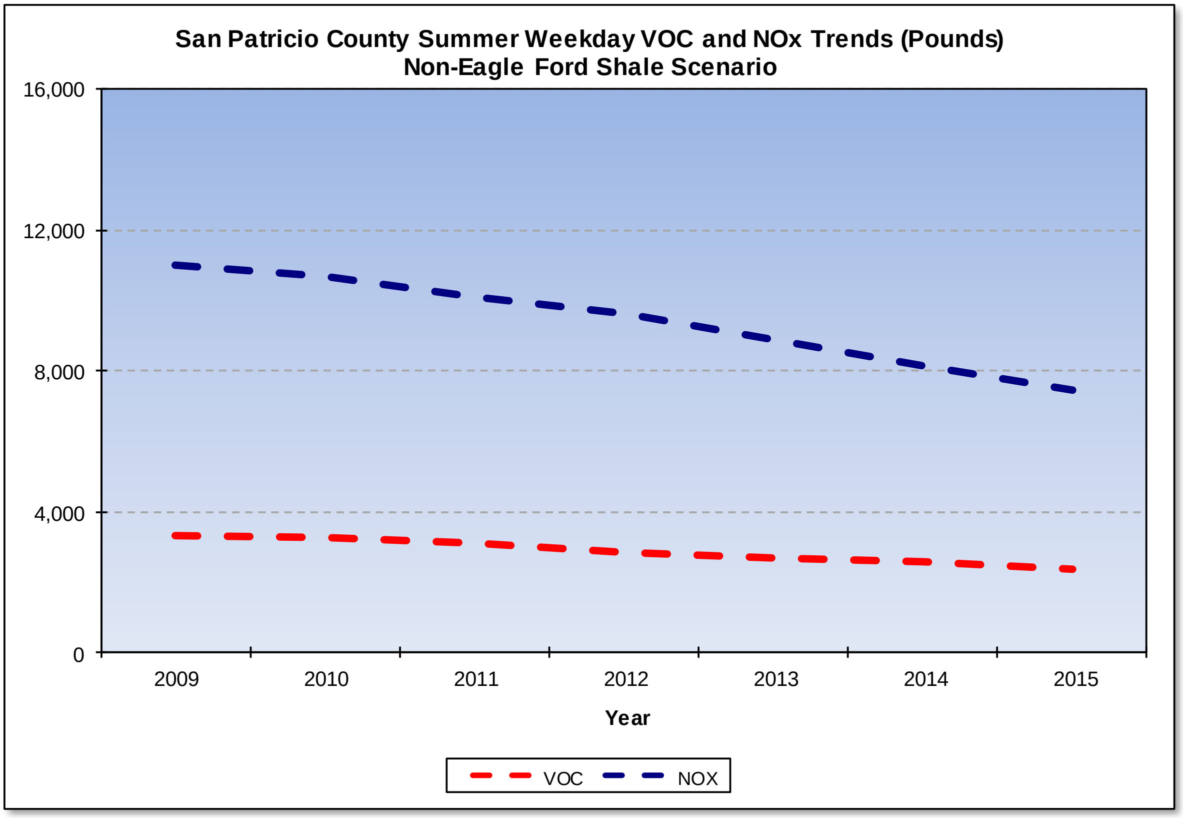

Robertson County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
2,000,000
1,750,000
1,500,000
1,250,000
1,000,000
750,000
500,000
CO2
19,000
17,000
15,000
13,000
11,000
9,000
7,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

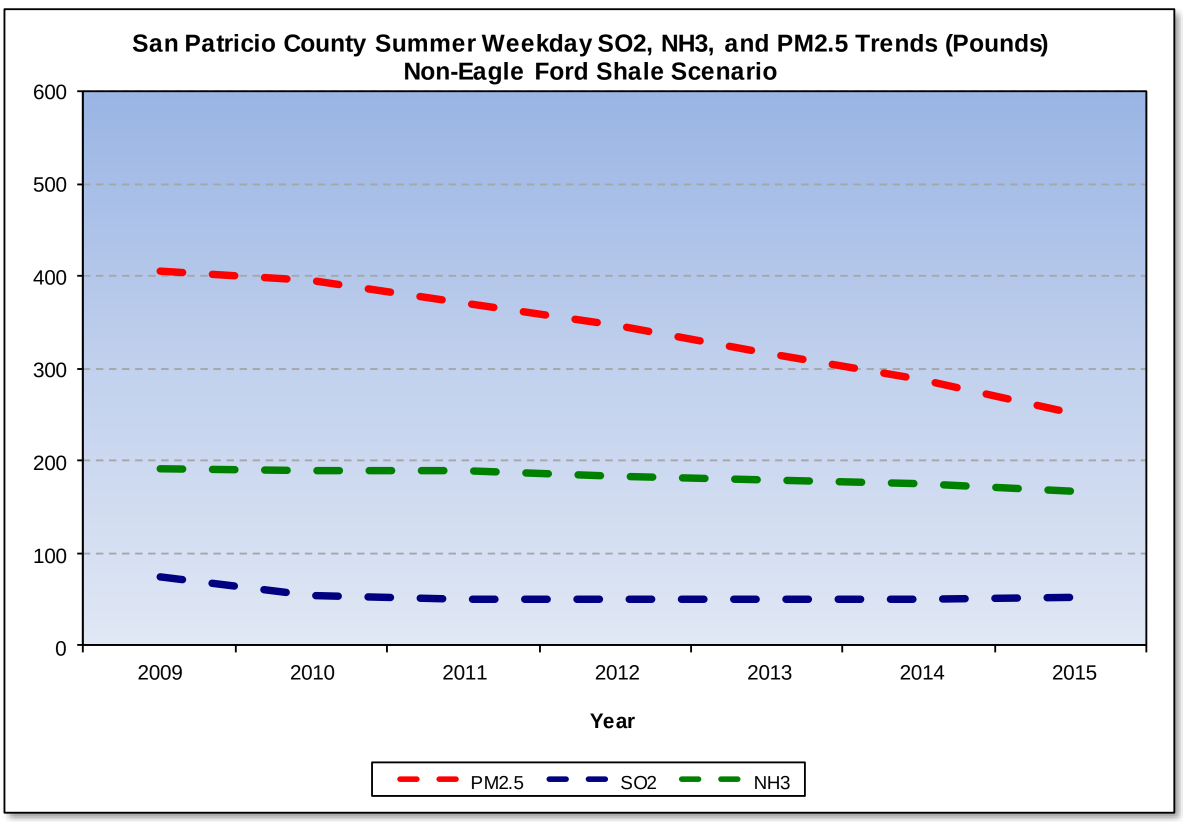

Robertson County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

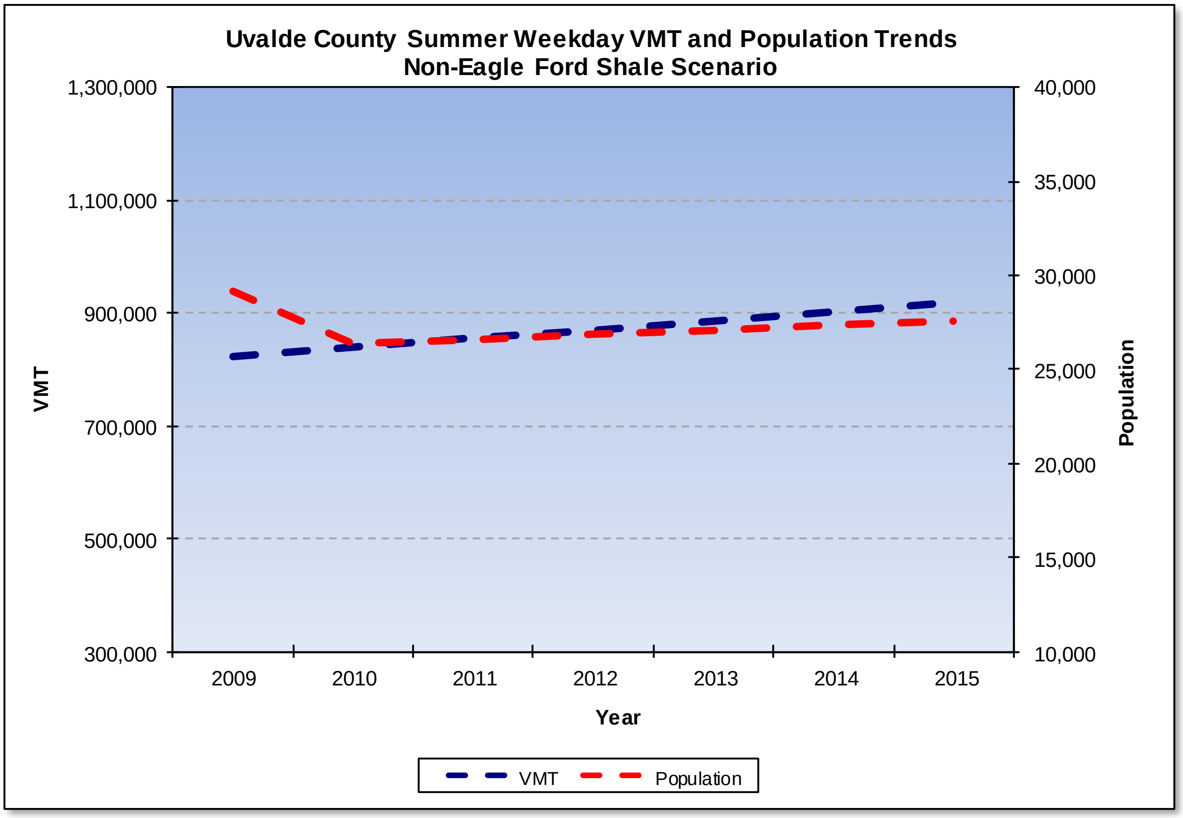

Robertson County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
300
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

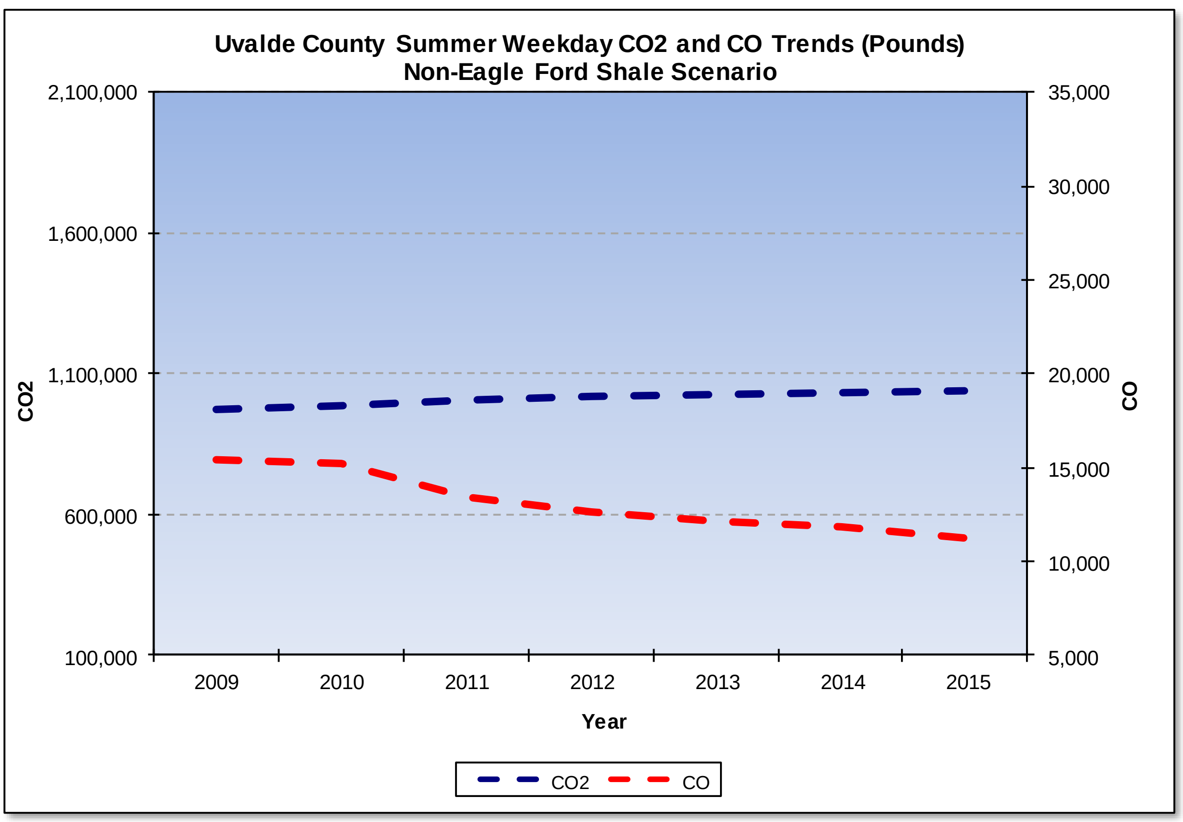

San Patricio County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
Population
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
90,000
85,000
80,000
75,000
70,000
65,000
60,000
55,000
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

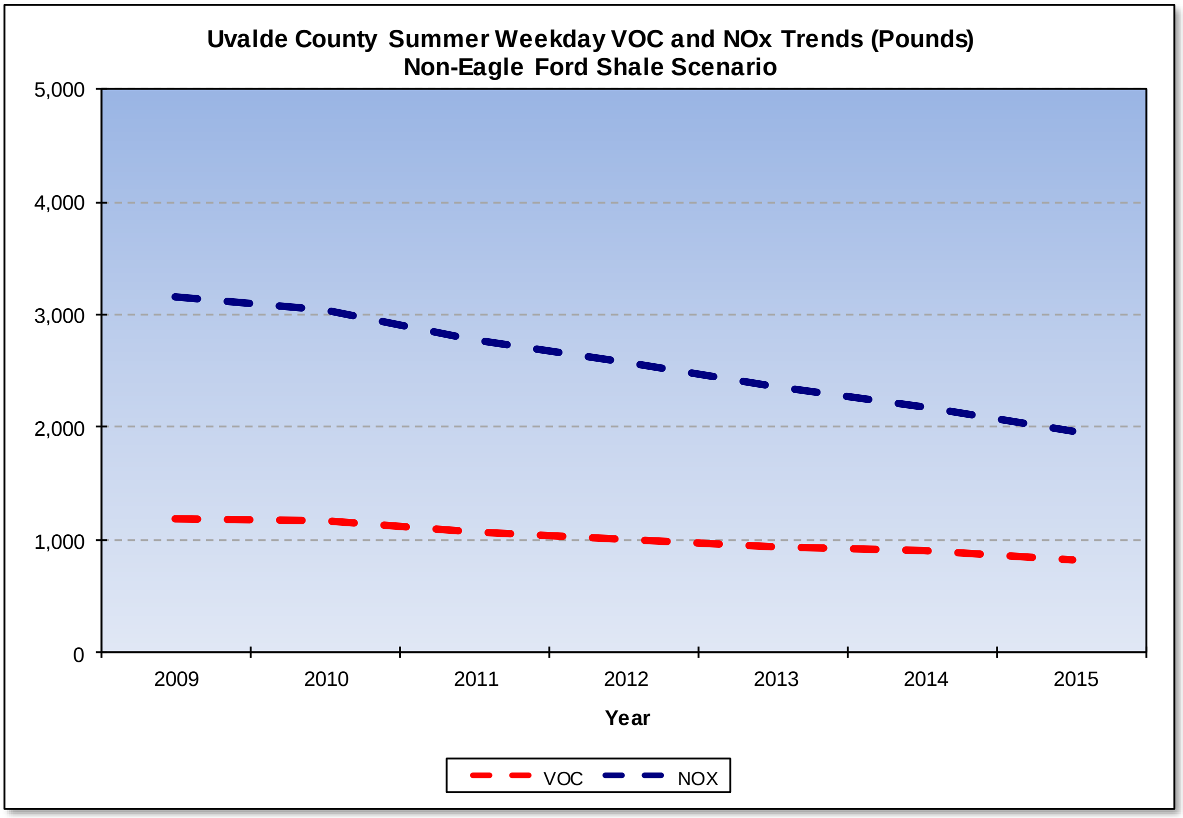

San Patricio County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
CO
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
45,000
40,000
35,000
30,000
25,000
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

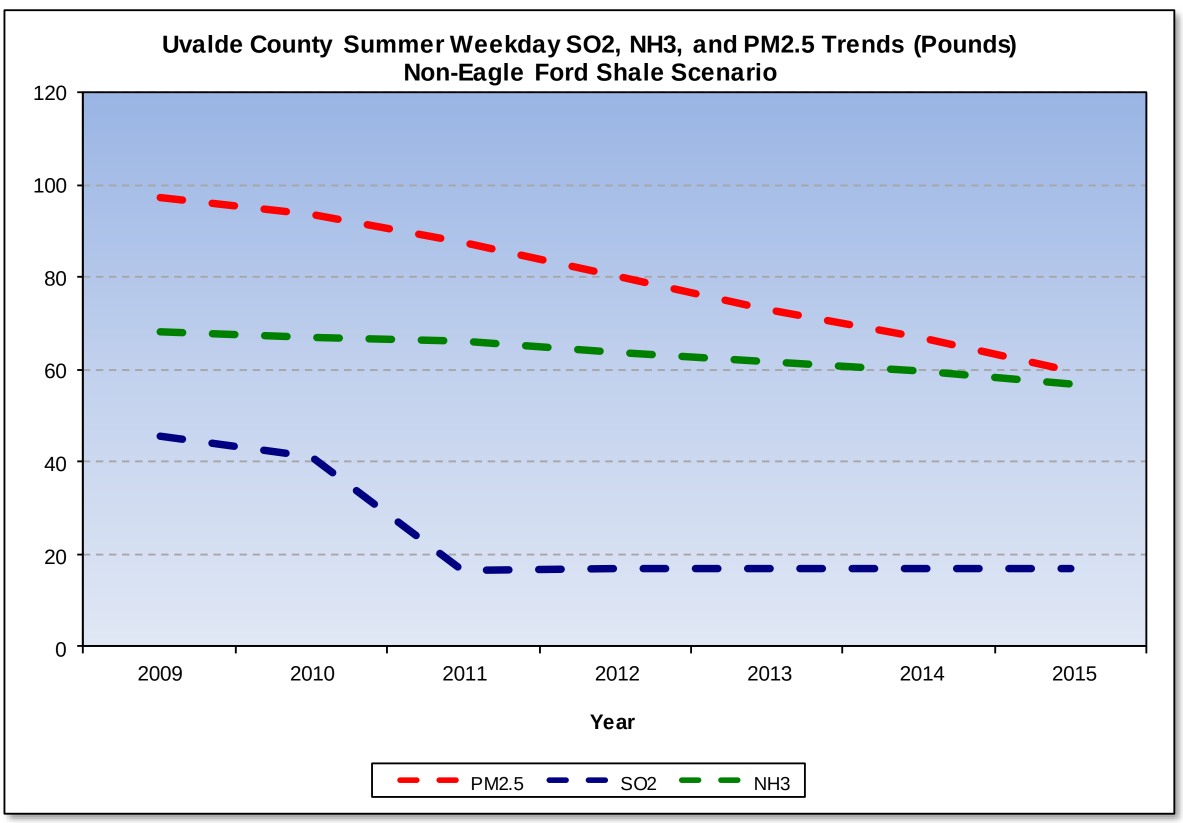

San Patricio County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
16,000
12,000
8,000
4,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

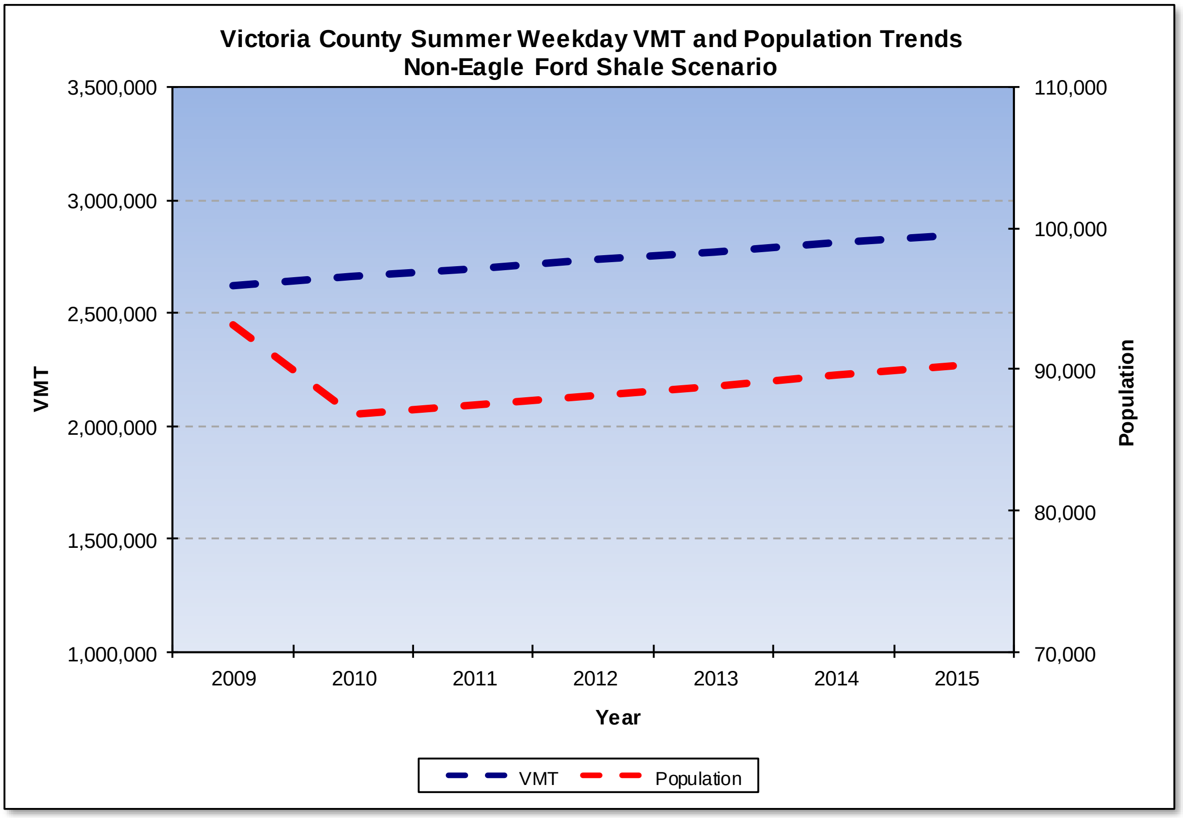

San Patricio County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

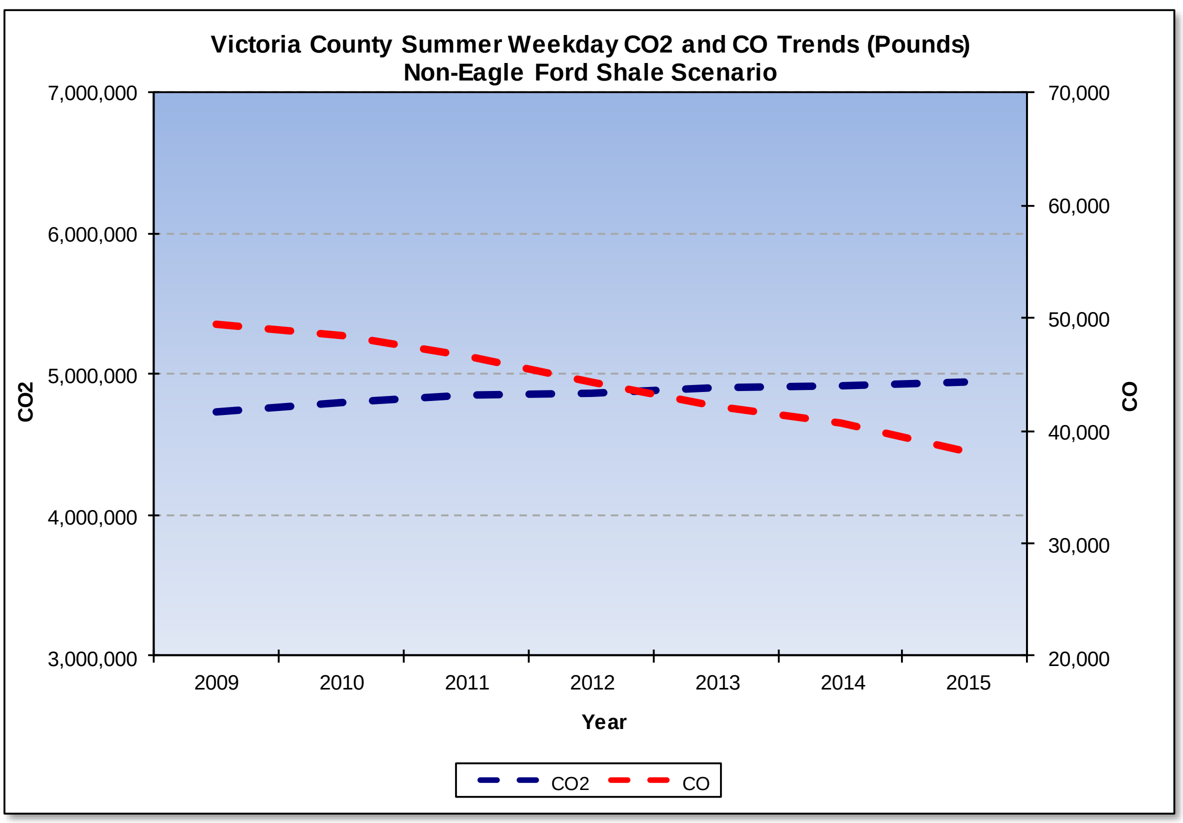

Uvalde County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
1,300,000
1,100,000
900,000
700,000
500,000
300,000
VMT
40,000
35,000
30,000
25,000
20,000
15,000
10,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

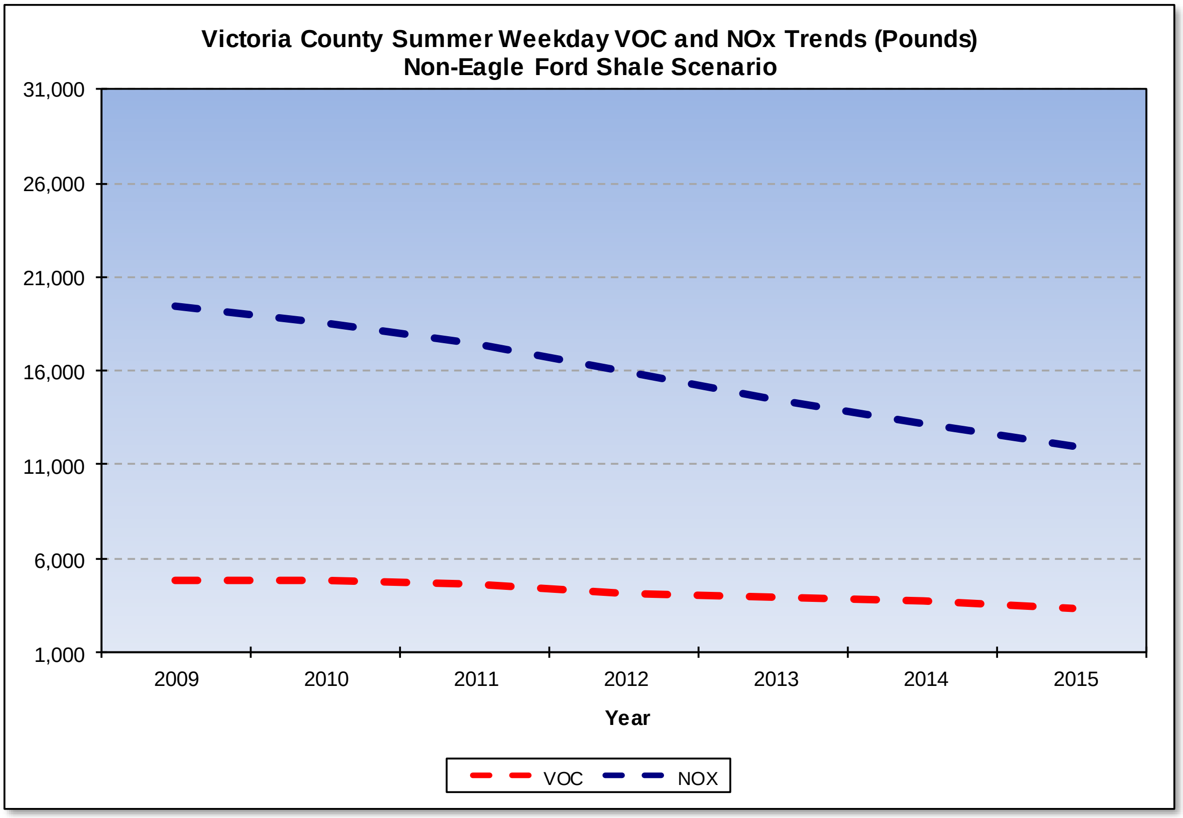

Uvalde County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
2,100,000
1,600,000
1,100,000
600,000
100,000
CO2
35,000
30,000
25,000
20,000
15,000
10,000
5,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

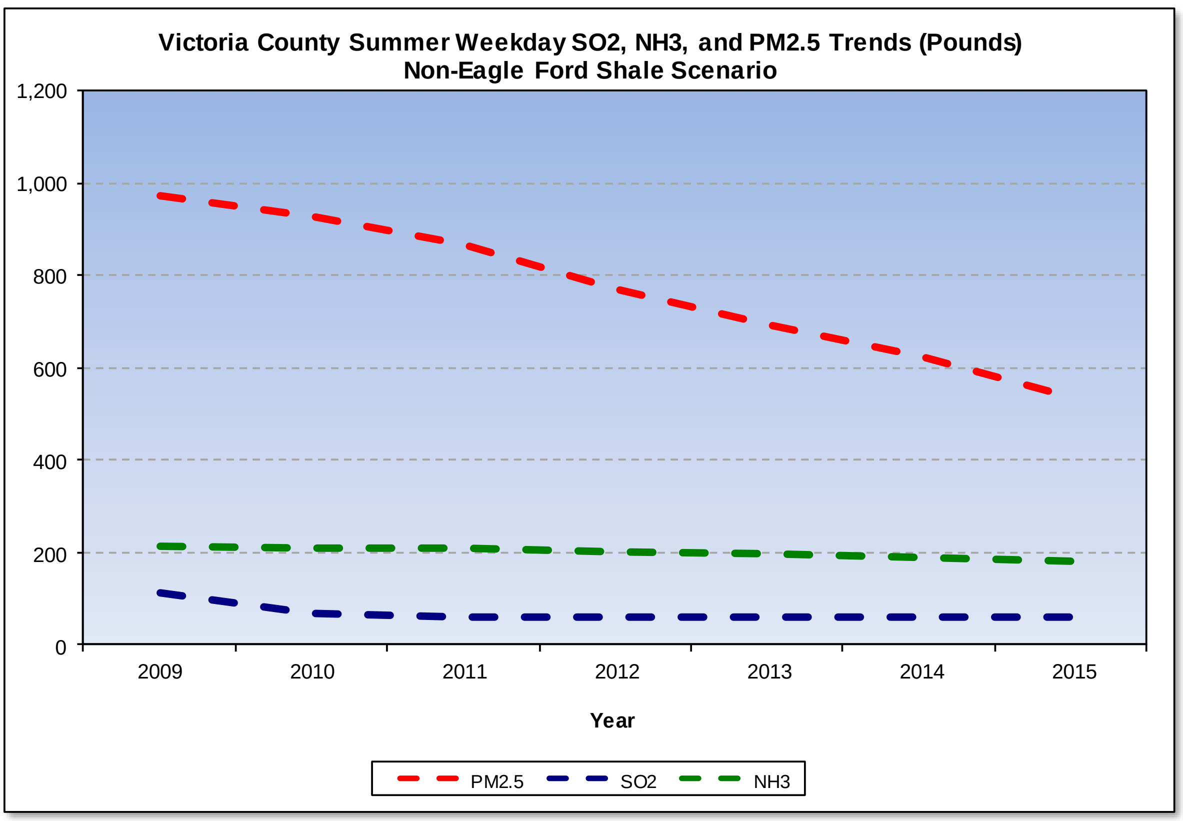

Uvalde County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

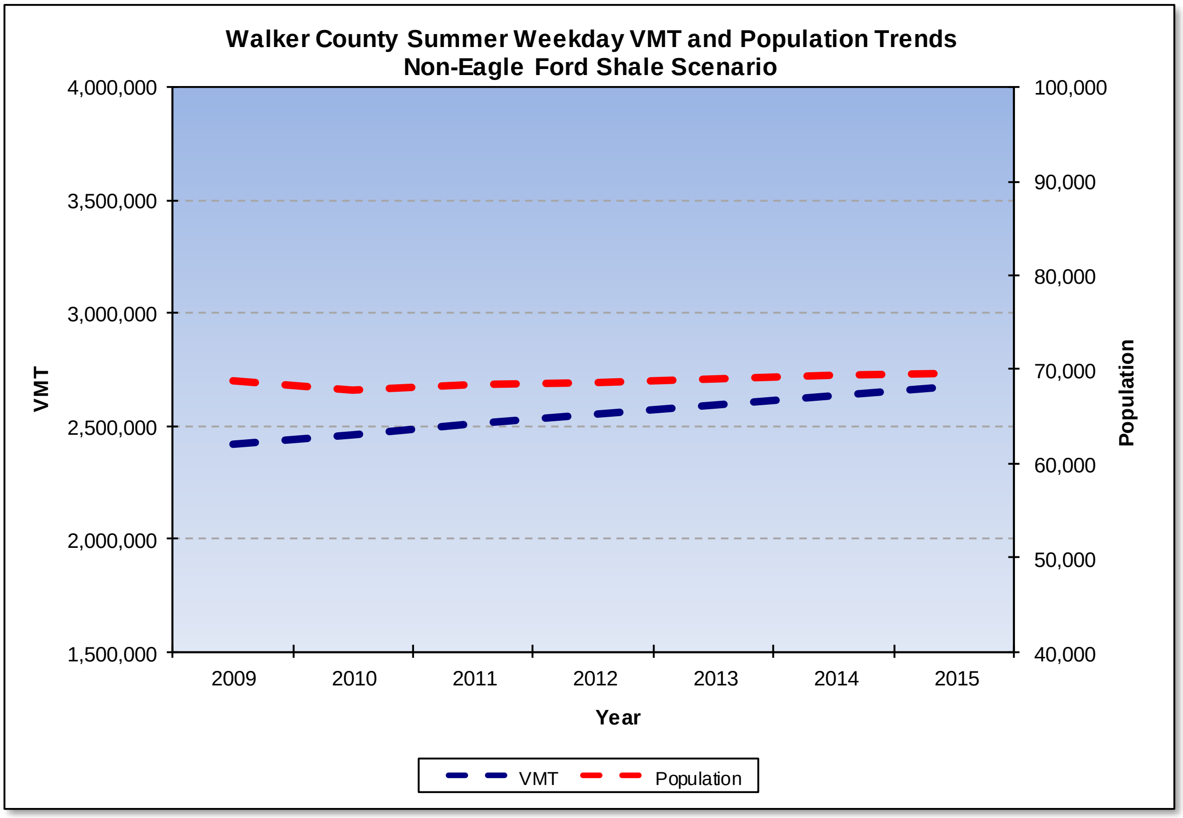

Uvalde County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Victoria County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
110,000
100,000
90,000
80,000
70,000
VMT
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

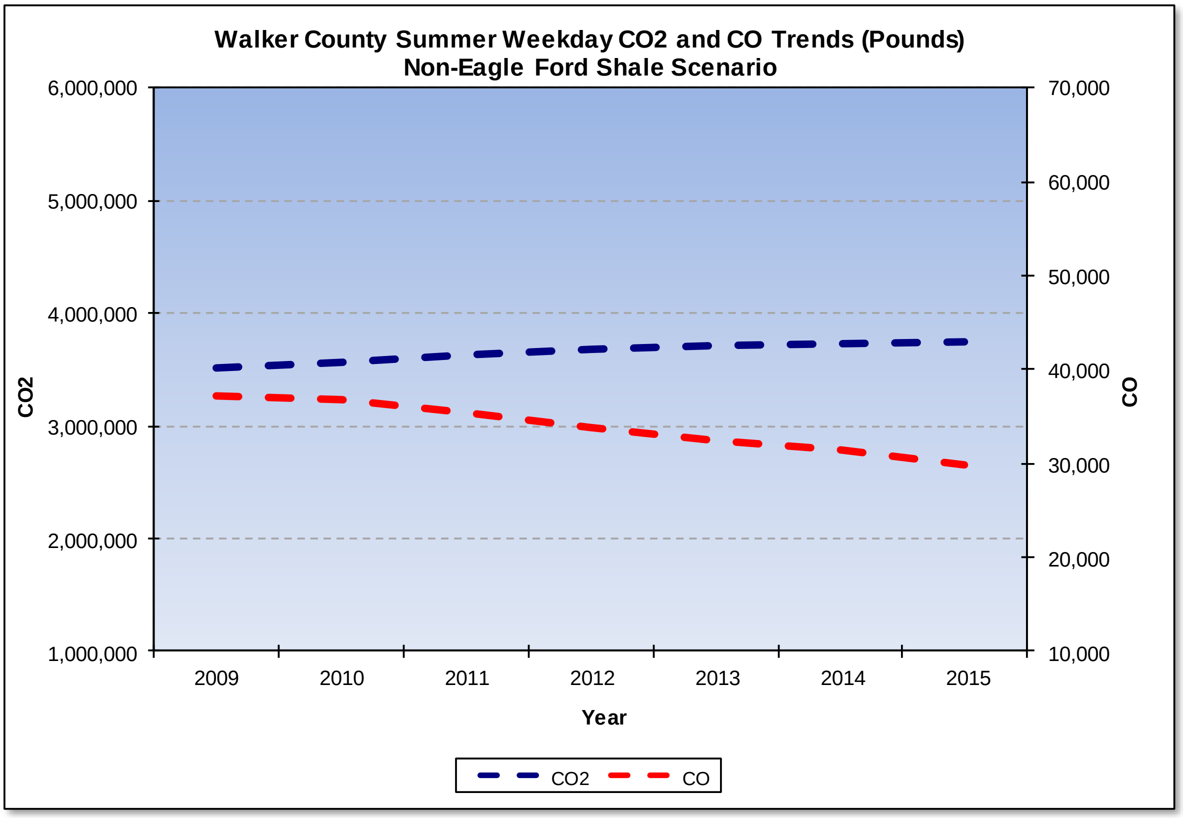

Victoria County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
70,000
60,000
50,000
40,000
30,000
20,000
CO2
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


Victoria County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
31,000
26,000
21,000
16,000
11,000
6,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

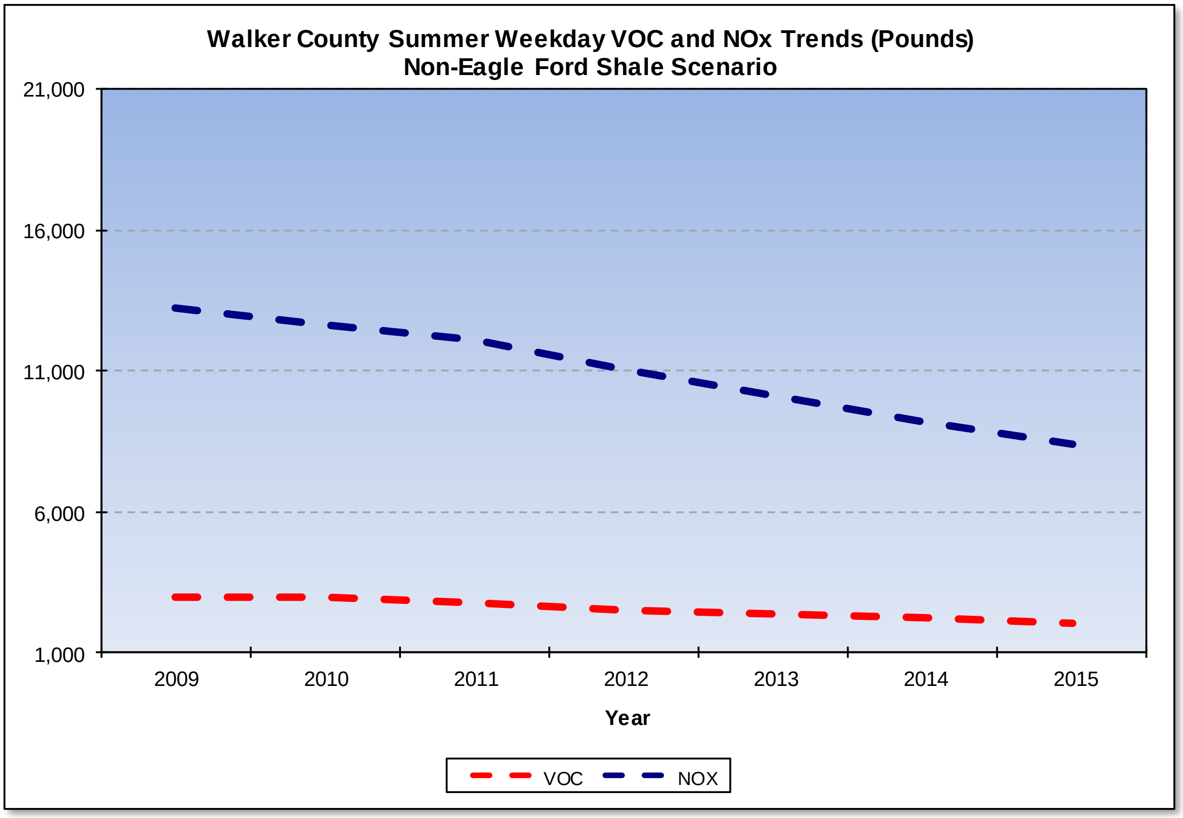

Victoria County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,200
1,000
800
600
400
200
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

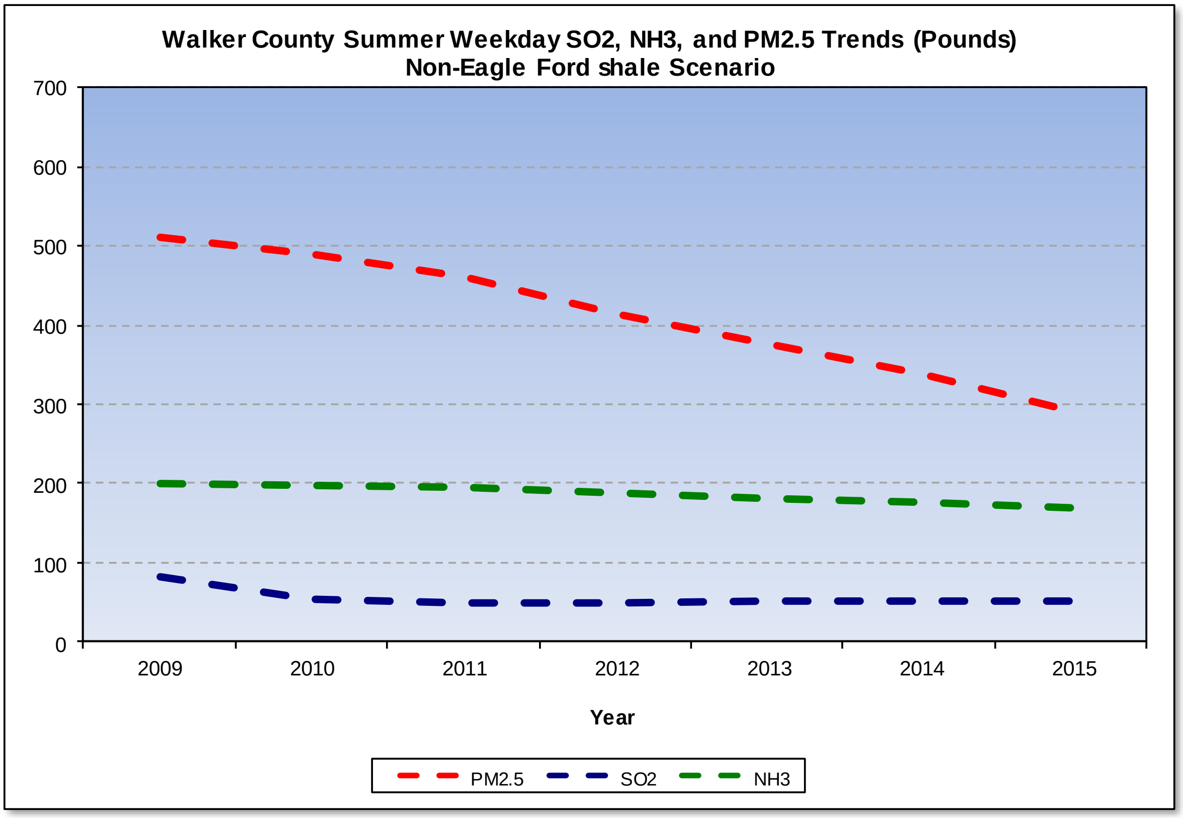


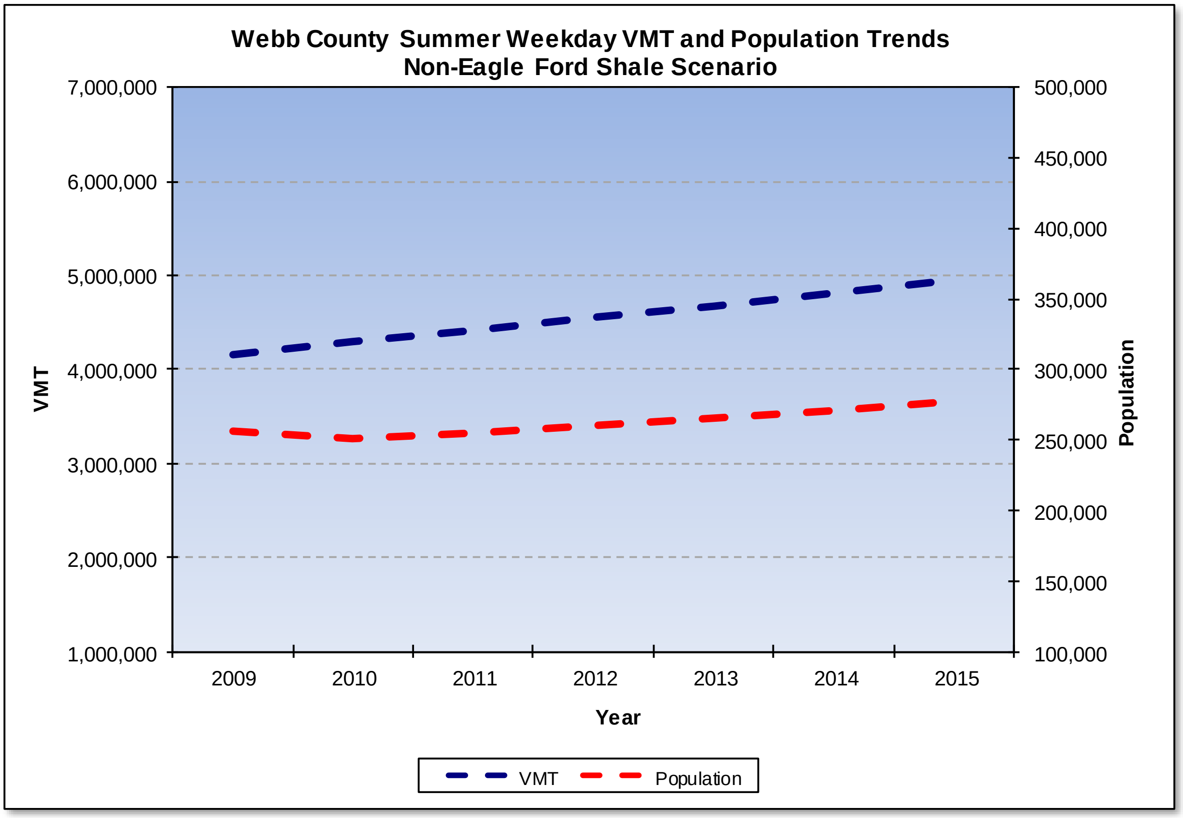
Walker County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
VMT
100,000
90,000
80,000
70,000
60,000
50,000
40,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

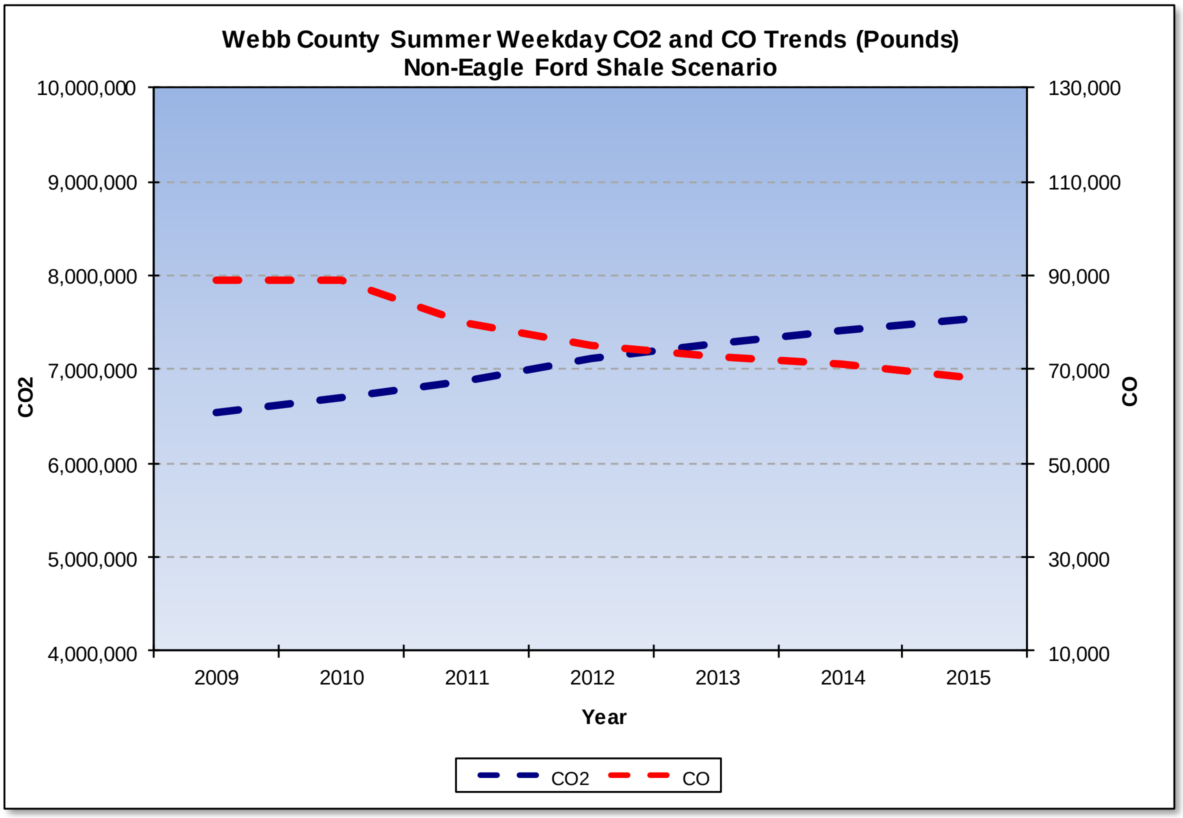


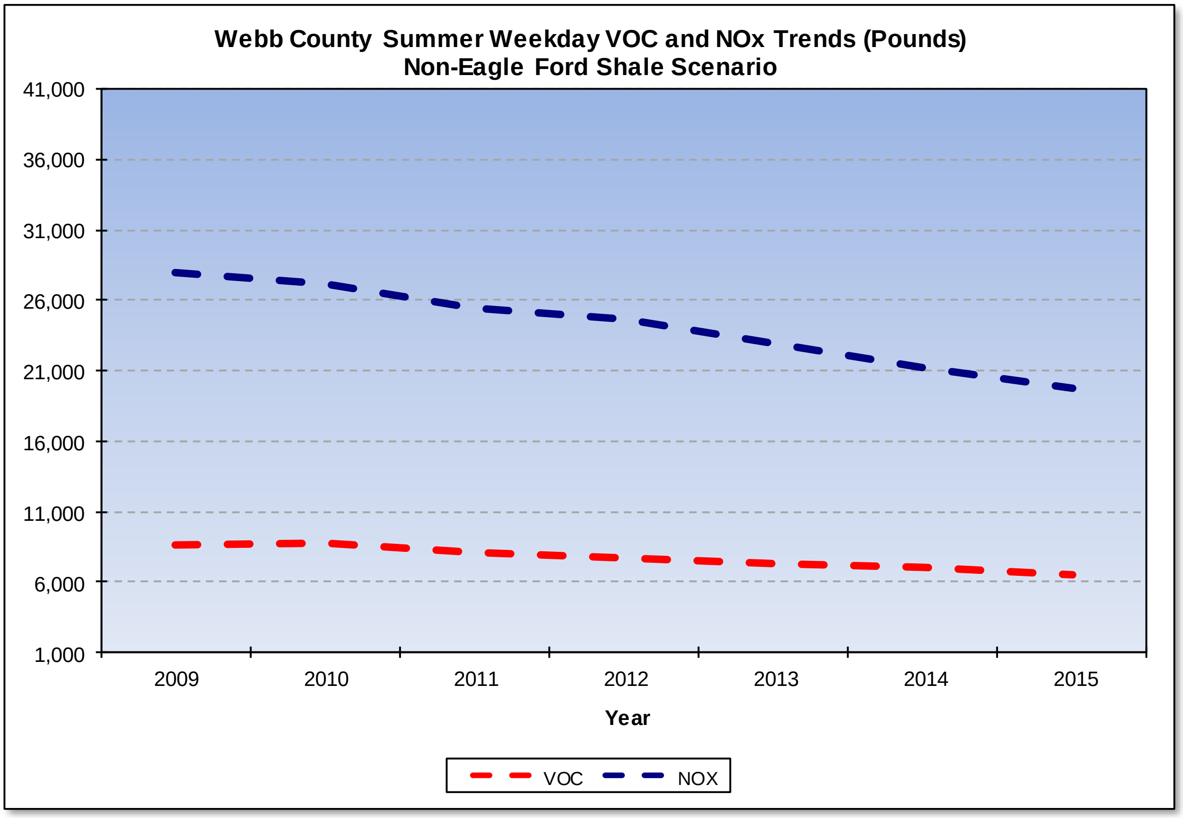
Walker County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
CO2
70,000
60,000
50,000
40,000
30,000
20,000
10,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

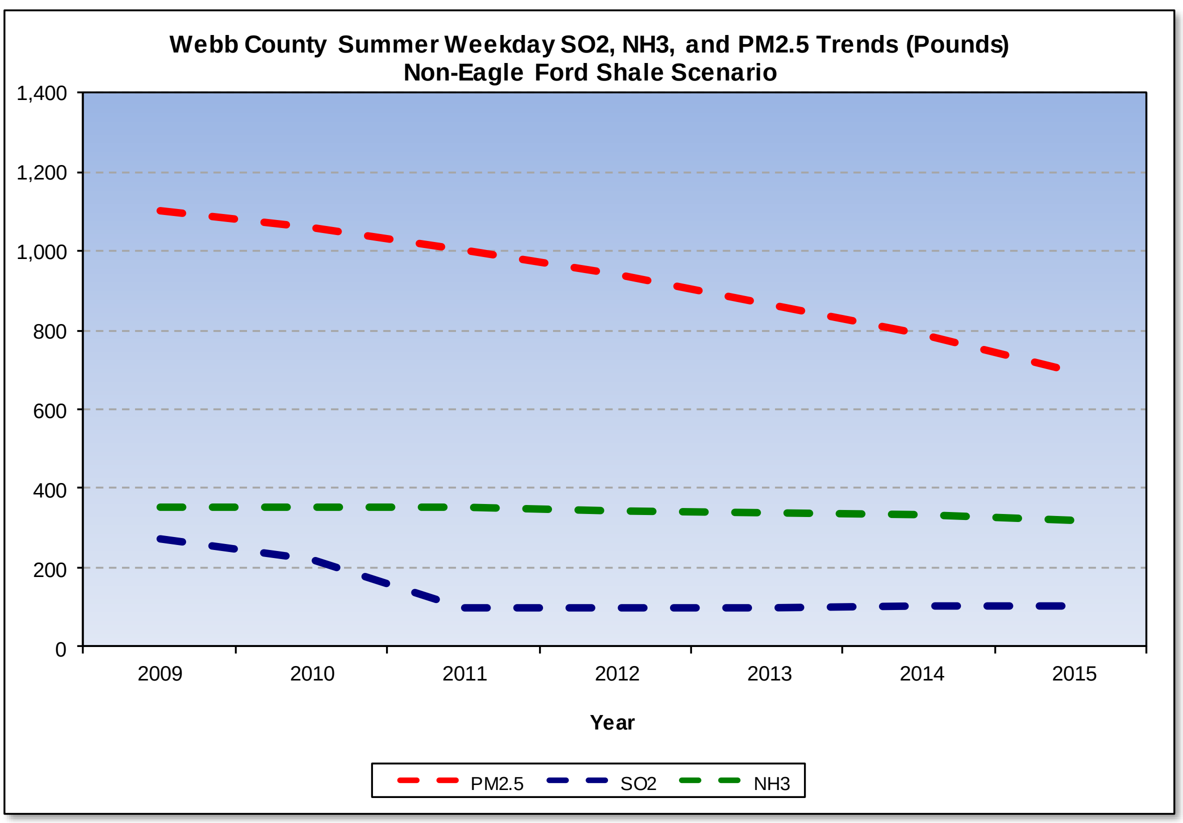

Walker County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
21,000
16,000
11,000
6,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

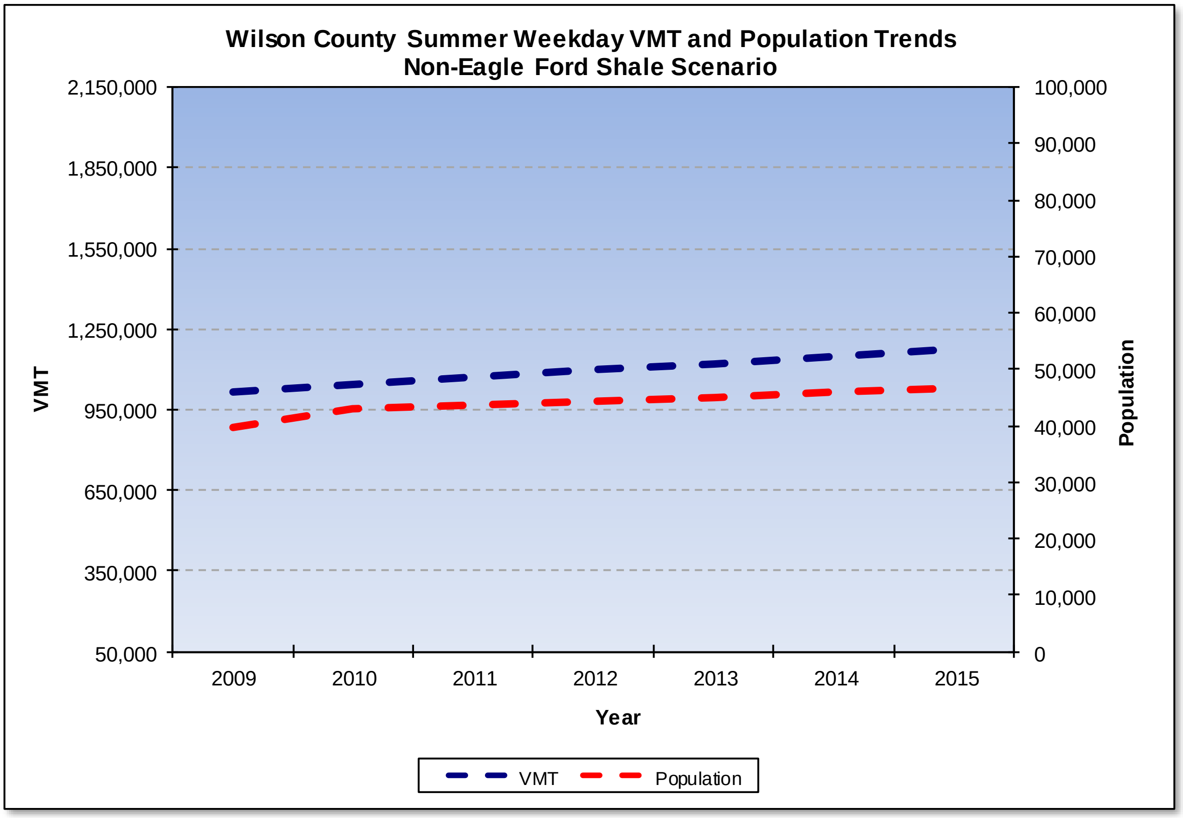

Walker County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford shale Scenario
700
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

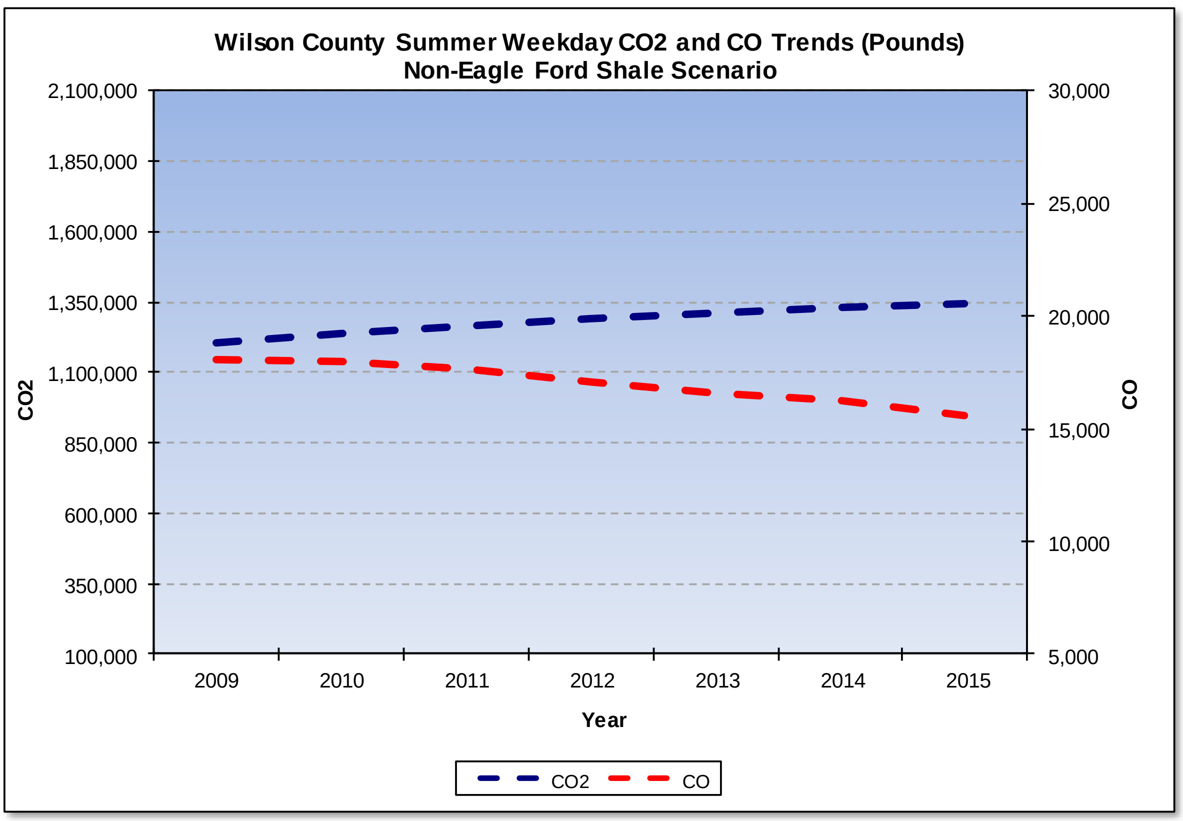

Webb County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
Population
Year
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
2009
2010
2011
2012
2013
2014
2015
VMT
Population

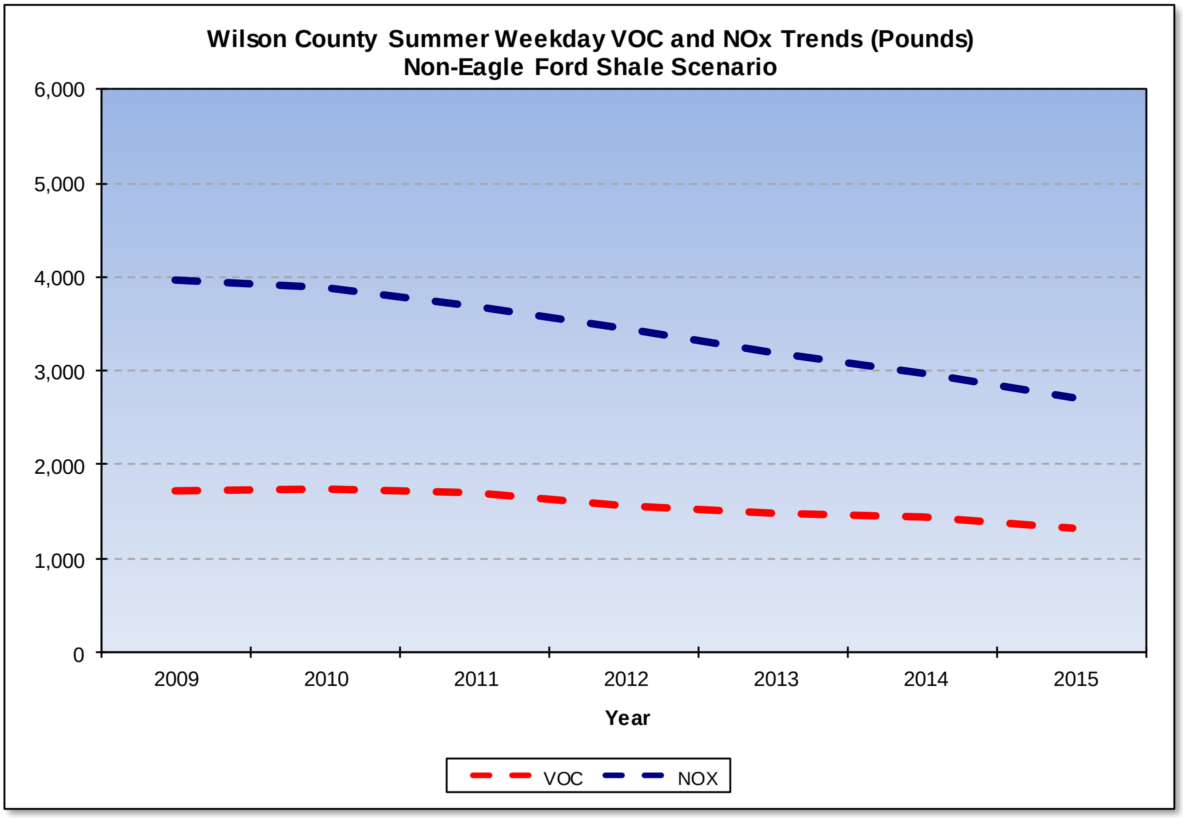

Webb County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
CO
Year
10,000,000
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
130,000
110,000
90,000
70,000
50,000
30,000
10,000
2009
2010
2011
2012
2013
2014
2015
CO2
CO

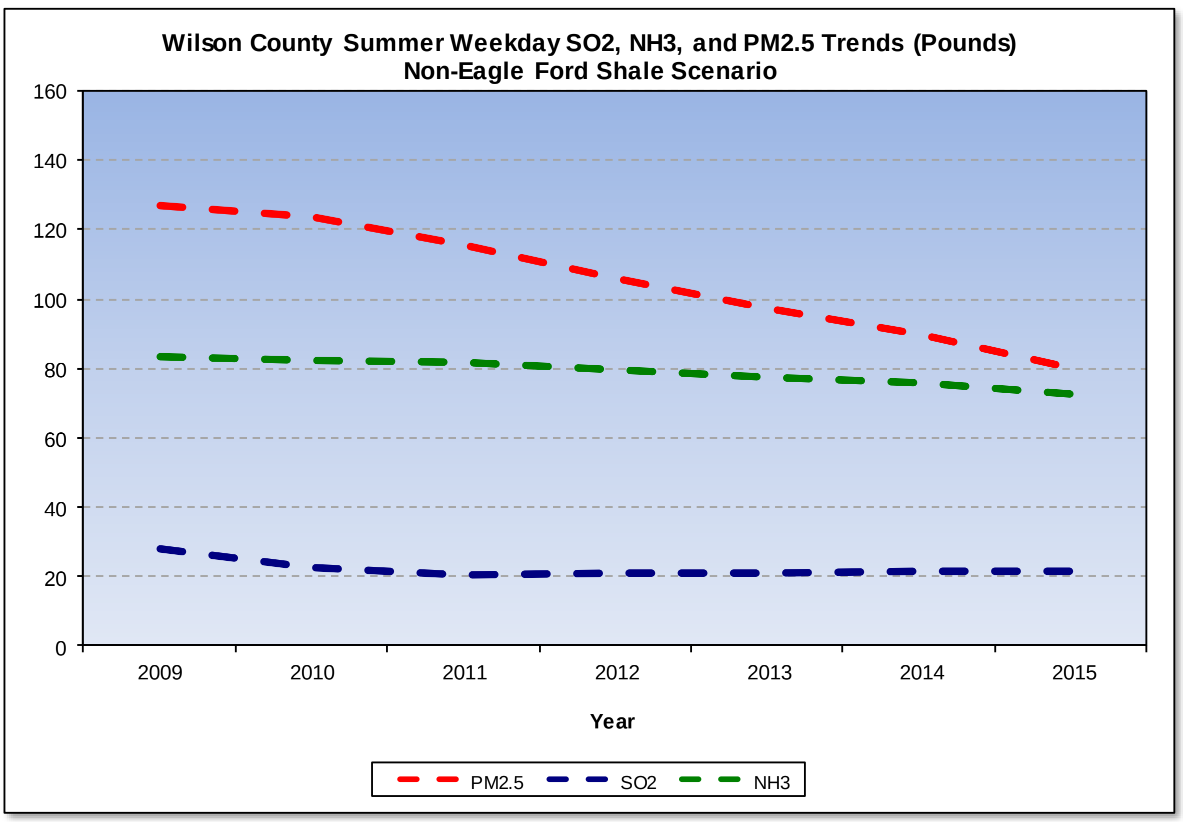

Webb County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
41,000
36,000
31,000
26,000
21,000
16,000
11,000
6,000
1,000
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

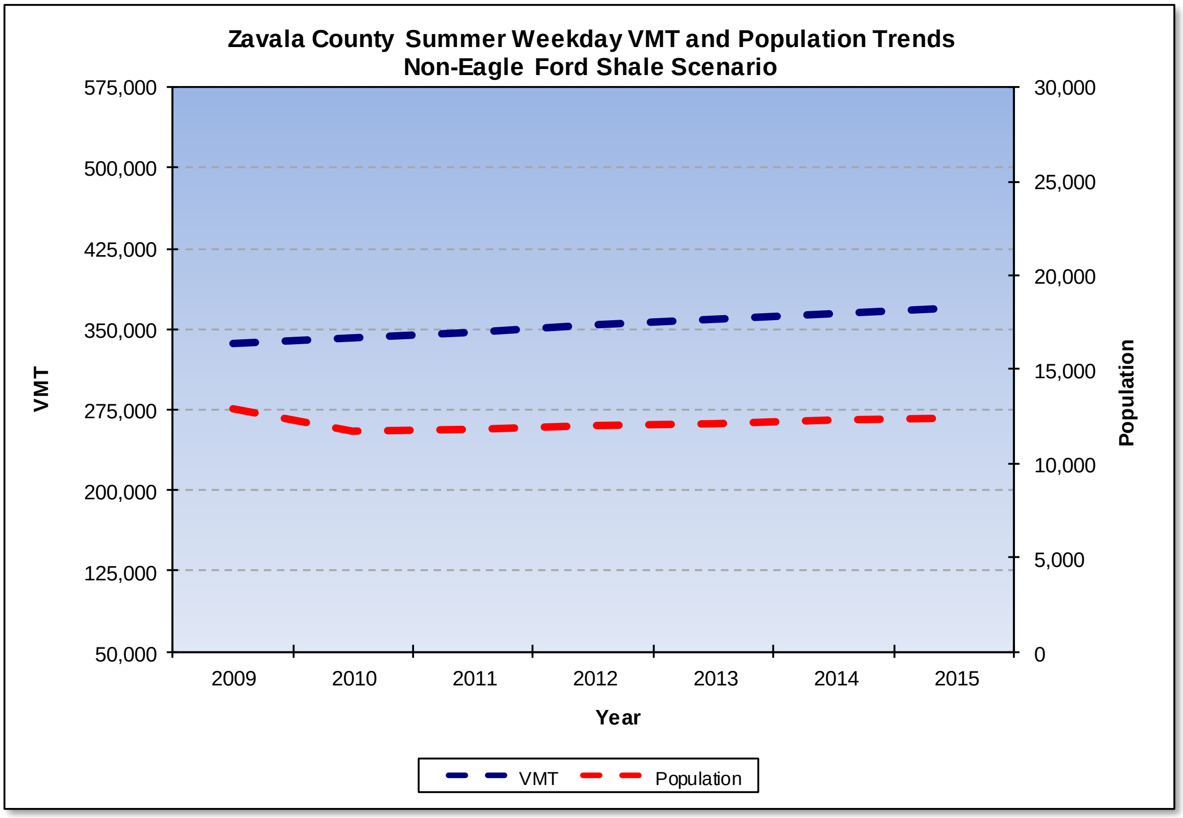

Webb County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
1,400
1,200
1,000
800
600
400
200
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

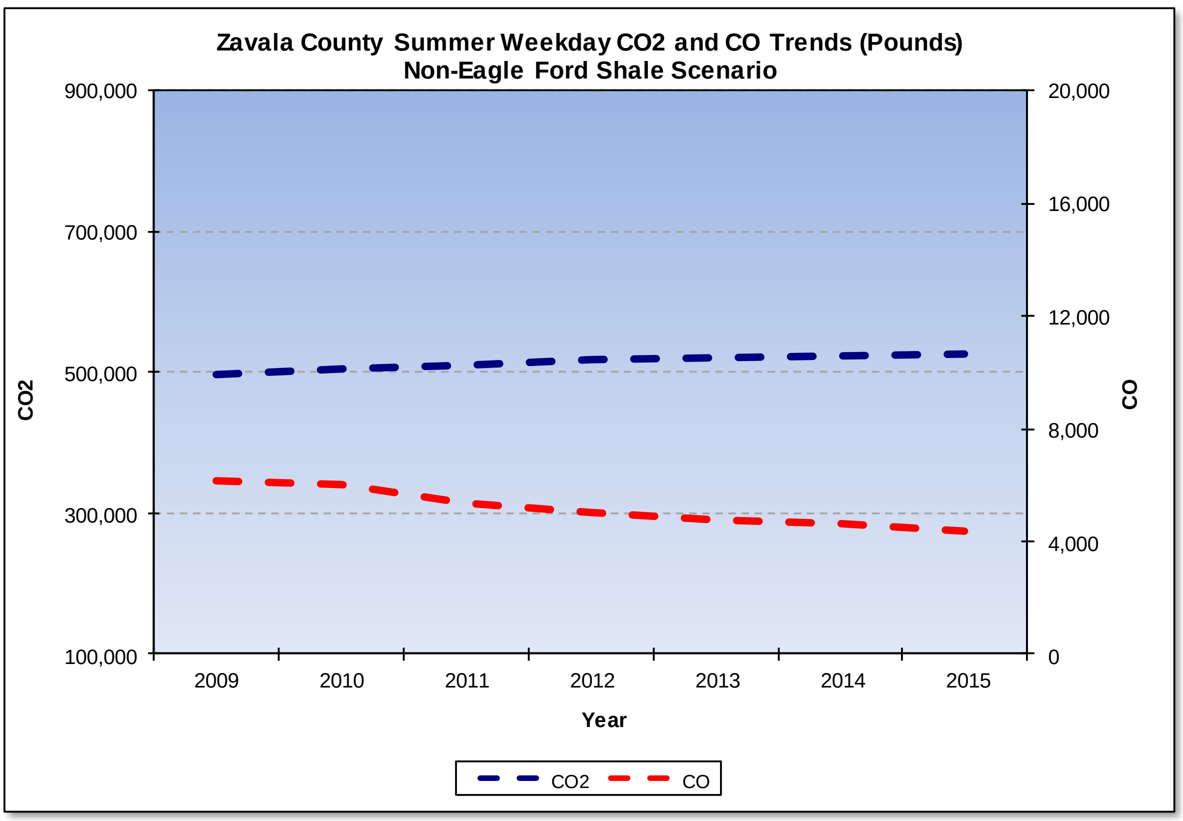

Wilson County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
2,150,000
1,850,000
1,550,000
1,250,000
950,000
650,000
350,000
50,000
VMT
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

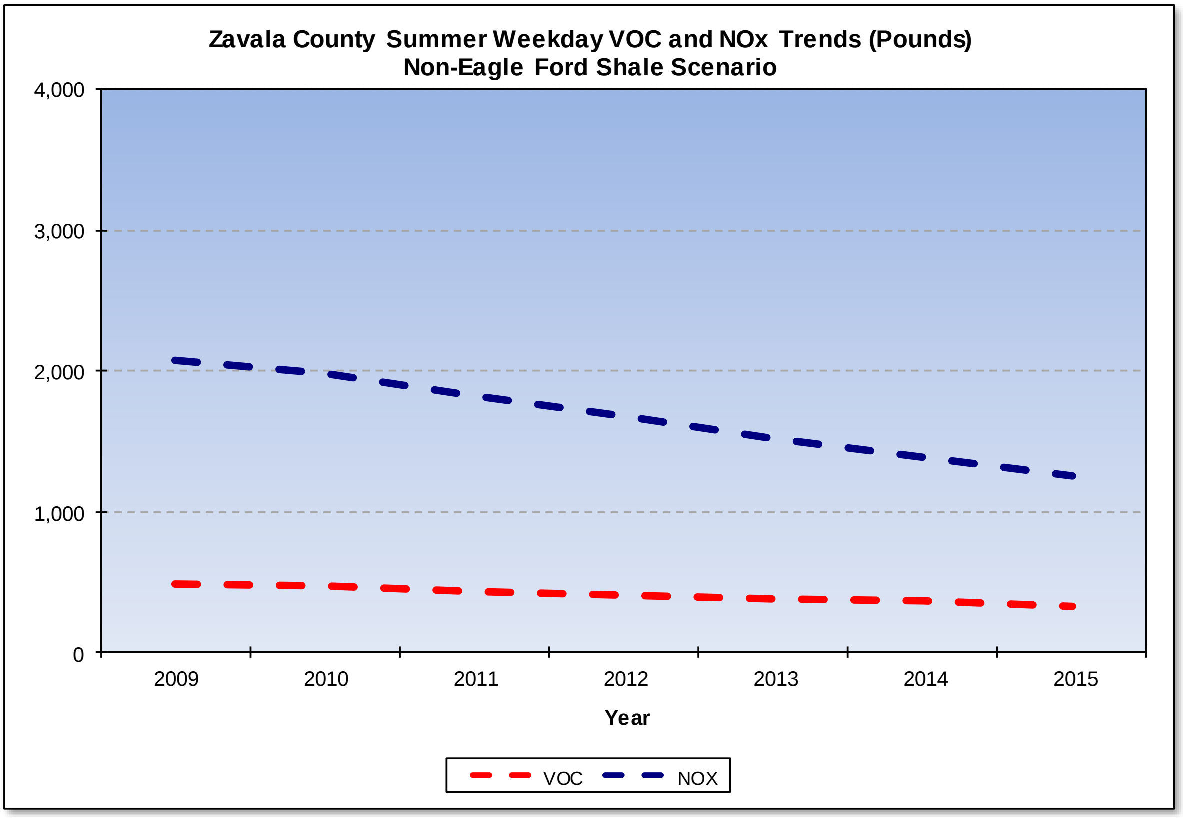

Wilson County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
2,100,000
1,850,000
1,600,000
1,350,000
1,100,000
850,000
600,000
350,000
100,000
CO2
30,000
25,000
20,000
15,000
10,000
5,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

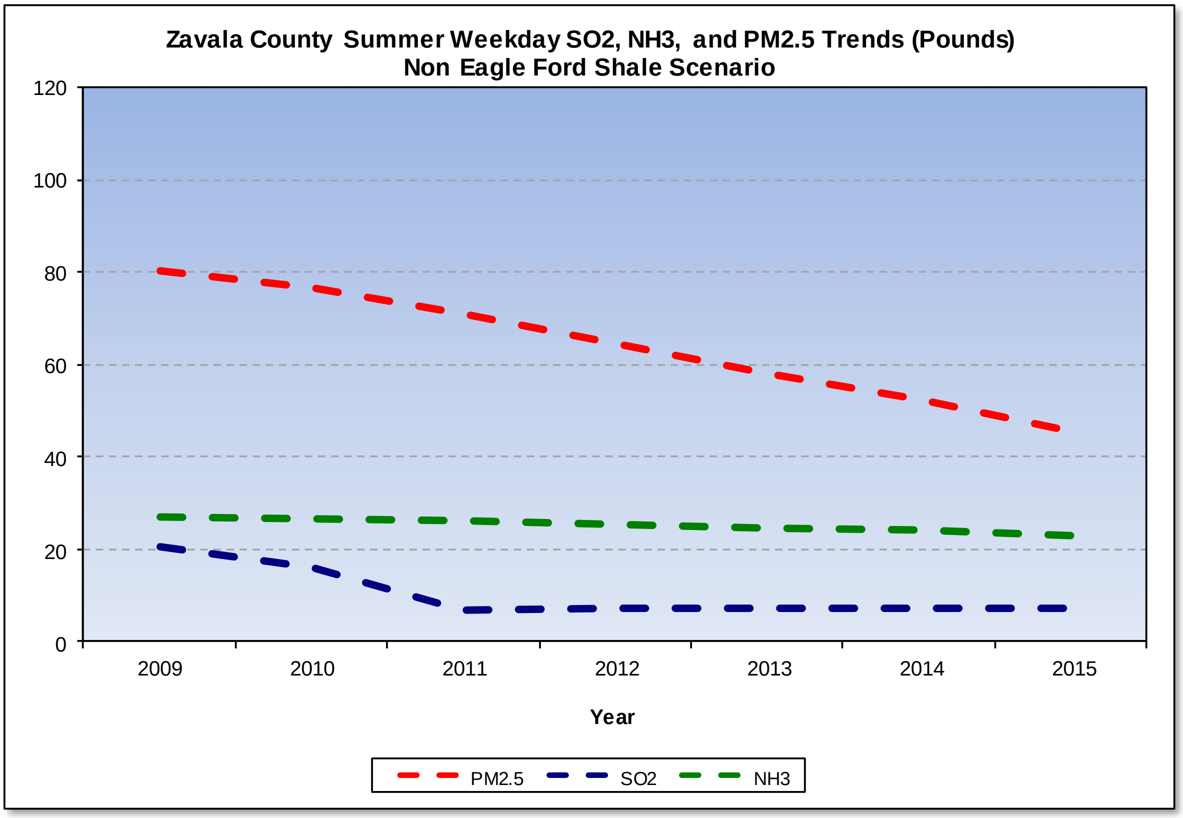

Wilson County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
6,000
5,000
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX

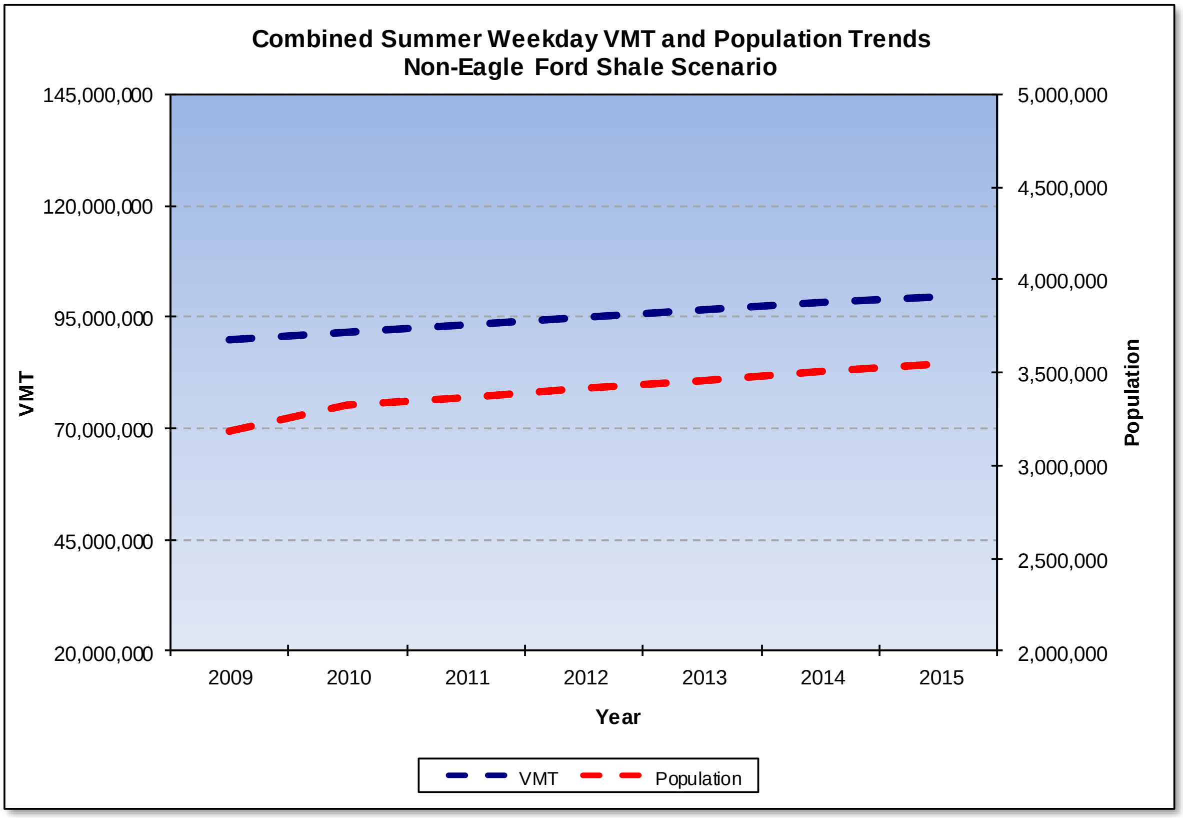

Wilson County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
160
140
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

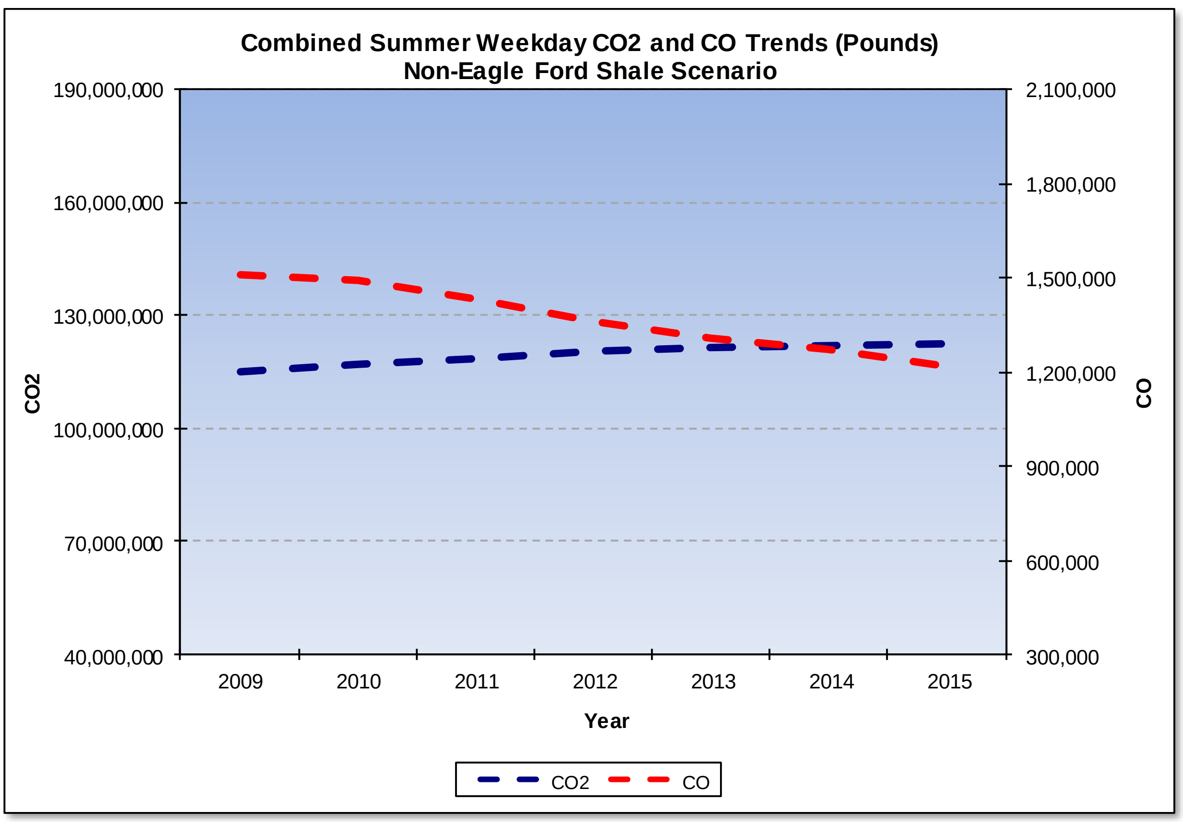

Zavala County Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
VMT
575,000
500,000
425,000
350,000
275,000
200,000
125,000
50,000
Population
30,000
25,000
20,000
15,000
10,000
5,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population

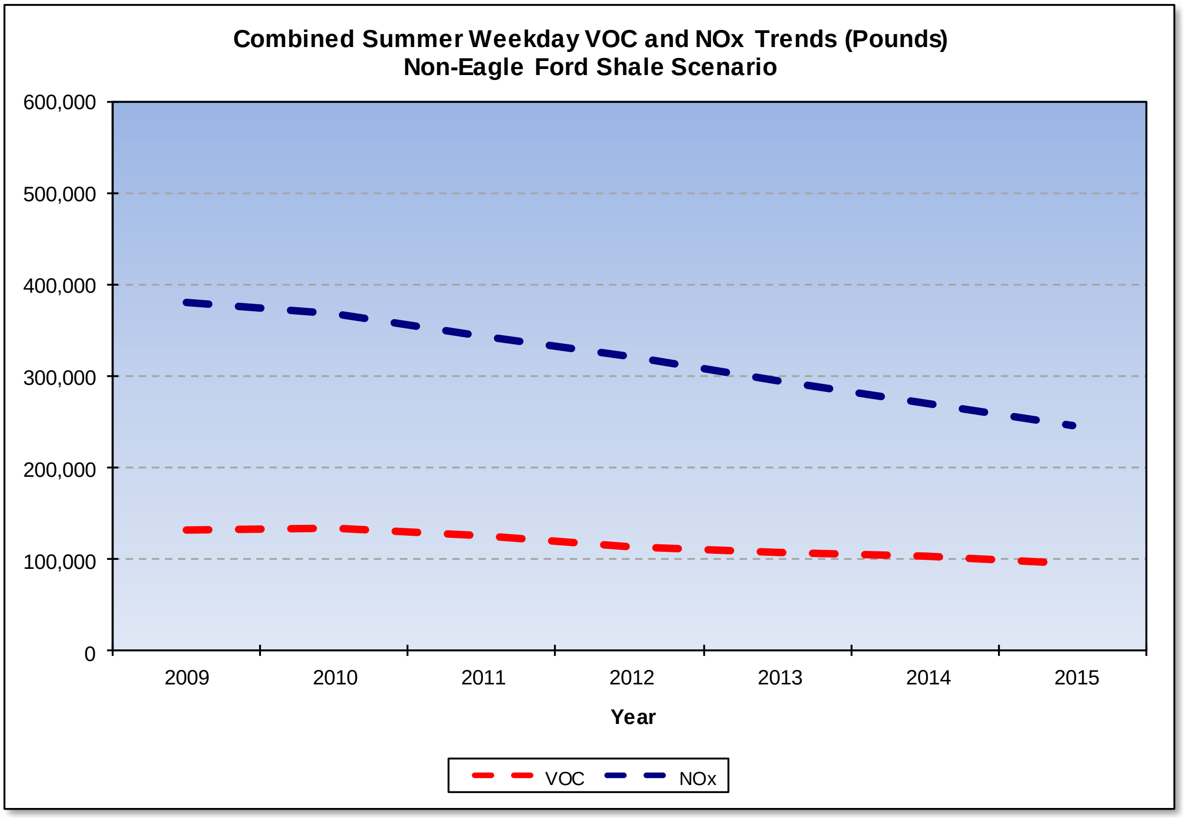

Zavala County Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
CO2
900,000
700,000
500,000
300,000
100,000
CO
20,000
16,000
12,000
8,000
4,000
0
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO

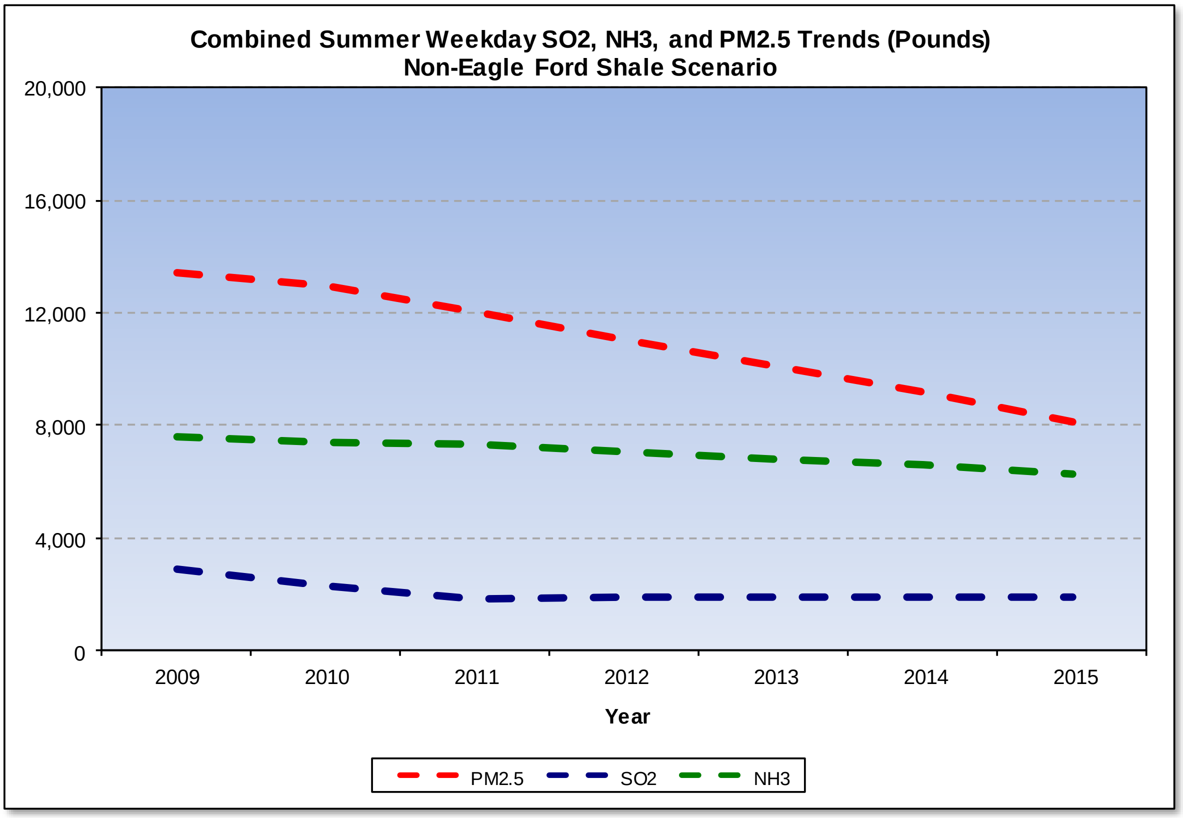

Zavala County Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
4,000
3,000
2,000
1,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOX


Zavala County Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non Eagle Ford Shale Scenario
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3


Combined Summer Weekday VMT and Population Trends
Non-Eagle Ford Shale Scenario
145,000,000
120,000,000
95,000,000
70,000,000
45,000,000
20,000,000
VMT
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
Population
2009
2010
2011
2012
2013
2014
2015
Year
VMT
Population


Combined Summer Weekday CO2 and CO Trends (Pounds)
Non-Eagle Ford Shale Scenario
190,000,000
160,000,000
130,000,000
100,000,000
70,000,000
40,000,000
CO2
2,100,000
1,800,000
1,500,000
1,200,000
900,000
600,000
300,000
CO
2009
2010
2011
2012
2013
2014
2015
Year
CO2
CO


Combined Summer Weekday VOC and NOx Trends (Pounds)
Non-Eagle Ford Shale Scenario
600,000
500,000
400,000
300,000
200,000
100,000
0
2009
2010
2011
2012
2013
2014
2015
Year
VOC
NOx


Combined Summer Weekday SO2, NH3, and PM2.5 Trends (Pounds)
Non-Eagle Ford Shale Scenario
20,000
16,000
12,000
8,000
4,000
0
2009
2010
2011
2012
2013
2014
2015
Year
PM2.5
SO2
NH3

APPENDIX C:
EAGLE FORD SHALE SUMMER WEEKDAY AND ANNUAL VMT AND EMISSIONS SUMMARIES

Eagle Ford Shale Summer Weekday VMT and Emissions (Tons)
Summary - 2009 through 2015

County	Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
Total	Eagle Ford Shale	668,988,873	406.9	4,817.8	1,133.2	423,596.8	7.3	24.6	39.3
	Non-Eagle Ford Shale	664,228,428	405.7	4,064.0	943.1	366,060.8	5.9	20.9	32.6
	Difference	4,760,445	1.2	753.8	190.1	57,536.0	1.4	3.8	6.7
Atascosa	Eagle Ford Shale	14,327,998	6.6	93.7	26.6	9,204.9	0.1	0.5	0.9
	Non-Eagle Ford Shale	11,757,747	6.1	80.9	22.6	7,579.4	0.1	0.4	0.7
	Difference	2,570,251	0.5	12.9	4.0	1,625.5	0.0	0.1	0.1
Bastrop	Eagle Ford Shale	16,491,634	9.8	116.6	23.4	9,454.4	0.2	0.6	0.7
	Non-Eagle Ford Shale	16,778,142	9.9	118.0	23.7	9,615.2	0.2	0.6	0.8
	Difference	-286,508	-0.1	-1.5	-0.3	-160.8	0.0	0.0	0.0
Bee	Eagle Ford Shale	5,736,228	3.4	43.2	10.1	3,895.5	0.1	0.2	0.4
	Non-Eagle Ford Shale	5,338,364	3.3	40.9	9.5	3,628.0	0.1	0.2	0.4
	Difference	397,864	0.1	2.3	0.6	267.4	0.0	0.0	0.0
Bexar	Eagle Ford Shale	298,725,823	188.1	2,109.4	386.4	166,232.4	3.0	11.1	11.4
	Non-Eagle Ford Shale	300,829,901	188.6	2,120.9	388.8	167,388.6	3.0	11.2	11.5
	Difference	-2,104,078	-0.5	-11.6	-2.5	-1,156.3	0.0	-0.1	-0.1
Brazos	Eagle Ford Shale	29,342,191	19.5	229.4	46.5	19,428.5	0.3	1.1	1.8
	Non-Eagle Ford Shale	29,620,144	19.6	230.7	46.8	19,605.6	0.3	1.1	1.8
	Difference	-277,953	0.0	-1.3	-0.2	-177.1	0.0	0.0	0.0
Burleson	Eagle Ford Shale	5,298,604	3.0	36.3	10.7	3,553.1	0.1	0.2	0.4
	Non-Eagle Ford Shale	5,310,505	3.0	36.2	10.7	3,559.6	0.1	0.2	0.4
	Difference	-11,901	0.0	0.1	0.0	-6.5	0.0	0.0	0.0
De Witt	Eagle Ford Shale	5,480,574	3.3	40.5	13.1	4,368.7	0.1	0.2	0.6
	Non-Eagle Ford Shale	4,300,264	3.0	34.0	10.7	3,442.8	0.1	0.2	0.5
	Difference	1,180,310	0.3	6.5	2.4	925.8	0.0	0.0	0.1
Dimmit	Eagle Ford Shale	4,698,214	2.2	30.5	10.9	3,396.4	0.1	0.2	0.4
	Non-Eagle Ford Shale	2,379,900	1.5	18.3	6.0	1,737.2	0.0	0.1	0.2
	Difference	2,318,314	0.6	12.2	4.9	1,659.2	0.0	0.1	0.2
Fayette	Eagle Ford Shale	11,788,076	5.7	76.0	32.8	9,454.6	0.1	0.4	1.2
	Non-Eagle Ford Shale	11,430,788	5.6	74.2	31.9	9,171.0	0.1	0.4	1.2
	Difference	357,288	0.1	1.8	0.9	283.6	0.0	0.0	0.0
Frio	Eagle Ford Shale	10,280,800	3.4	62.8	20.6	6,726.8	0.1	0.4	0.6
	Non-Eagle Ford Shale	7,303,939	2.8	47.4	15.3	4,796.6	0.1	0.3	0.5
	Difference	2,976,861	0.6	15.4	5.3	1,930.2	0.0	0.1	0.2

County	Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
Gonzales	Eagle Ford Shale	10,224,890	4.8	64.6	30.0	8,543.2	0.1	0.4	1.2
	Non-Eagle Ford Shale	8,908,353	4.4	57.9	26.7	7,462.0	0.1	0.3	1.0
	Difference	1,316,537	0.3	6.7	3.2	1,081.2	0.0	0.0	0.1
Grimes	Eagle Ford Shale	7,077,894	4.1	50.5	13.1	4,737.9	0.1	0.3	0.5
	Non-Eagle Ford Shale	7,267,200	4.1	51.4	13.4	4,861.4	0.1	0.3	0.5
	Difference	-189,306	0.0	-0.9	-0.2	-123.4	0.0	0.0	0.0
Jim Wells	Eagle Ford Shale	11,205,737	6.3	84.3	21.7	7,716.1	0.1	0.4	0.8
	Non-Eagle Ford Shale	11,022,607	6.3	83.1	21.3	7,590.9	0.1	0.4	0.8
	Difference	183,130	0.1	1.1	0.3	125.2	0.0	0.0	0.0
Karnes	Eagle Ford Shale	5,602,125	2.5	37.2	10.7	3,957.5	0.1	0.2	0.4
	Non-Eagle Ford Shale	3,151,076	1.9	24.0	6.5	2,242.5	0.0	0.1	0.3
	Difference	2,451,049	0.6	13.3	4.2	1,715.1	0.0	0.1	0.2
La Salle	Eagle Ford Shale	7,401,320	2.7	42.7	27.8	7,001.9	0.1	0.3	1.0
	Non-Eagle Ford Shale	4,874,106	2.1	30.1	19.5	4,656.7	0.1	0.2	0.7
	Difference	2,527,214	0.6	12.6	8.3	2,345.3	0.0	0.1	0.3
Lavaca	Eagle Ford Shale	4,826,955	3.3	37.5	11.3	3,689.1	0.1	0.2	0.5
	Non-Eagle Ford Shale	4,534,868	3.2	36.0	10.7	3,470.1	0.1	0.2	0.4
	Difference	292,087	0.1	1.6	0.6	219.1	0.0	0.0	0.0
Lee	Eagle Ford Shale	5,356,434	2.8	36.9	7.5	3,064.2	0.1	0.2	0.2
	Non-Eagle Ford Shale	5,503,958	2.8	37.6	7.7	3,147.1	0.1	0.2	0.2
	Difference	-147,524	0.0	-0.8	-0.2	-82.9	0.0	0.0	0.0
Leon	Eagle Ford Shale	10,483,032	4.3	64.8	25.4	7,927.1	0.1	0.4	1.0
	Non-Eagle Ford Shale	9,992,707	4.2	62.1	24.3	7,559.1	0.1	0.4	0.9
	Difference	490,325	0.1	2.6	1.1	368.0	0.0	0.0	0.0
Live Oak	Eagle Ford Shale	11,225,547	3.7	69.1	24.9	8,363.1	0.1	0.4	1.0
	Non-Eagle Ford Shale	9,520,670	3.3	59.9	21.5	7,104.4	0.1	0.3	0.8
	Difference	1,704,877	0.4	9.2	3.3	1,258.7	0.0	0.1	0.1
McMullen	Eagle Ford Shale	2,561,477	0.6	14.4	3.3	1,487.4	0.0	0.1	0.1
	Non-Eagle Ford Shale	951,672	0.3	6.1	1.3	557.0	0.0	0.0	0.0
	Difference	1,609,805	0.3	8.2	1.9	930.4	0.0	0.1	0.1
Madison	Eagle Ford Shale	6,782,588	2.7	41.5	16.7	5,165.1	0.1	0.2	0.6
	Non-Eagle Ford Shale	6,626,909	2.7	40.6	16.3	5,047.6	0.1	0.2	0.6
	Difference	155,679	0.0	0.8	0.4	117.5	0.0	0.0	0.0
Maverick	Eagle Ford Shale	6,748,538	6.2	60.0	17.9	5,107.5	0.1	0.2	0.7
	Non-Eagle Ford Shale	6,509,248	6.1	58.6	17.3	4,931.9	0.1	0.2	0.6
	Difference	239,290	0.1	1.5	0.5	175.6	0.0	0.0	0.0

County	Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
Milam	Eagle Ford Shale	6,524,748	4.1	46.7	13.7	4,413.4	0.1	0.2	0.5
	Non-Eagle Ford Shale	7,266,073	4.3	50.6	14.9	4,905.4	0.1	0.3	0.6
	Difference	-741,325	-0.2	-3.8	-1.3	-492.0	0.0	0.0	0.0
Nueces	Eagle Ford Shale	64,197,998	40.5	501.7	82.8	37,973.7	0.7	2.4	2.6
	Non-Eagle Ford Shale	73,225,635	42.3	552.1	91.6	43,177.0	0.8	2.8	2.9
	Difference	-9,027,637	-1.8	-50.4	-8.7	-5,203.4	-0.1	-0.3	-0.3
Robertson	Eagle Ford Shale	6,330,086	2.9	41.3	12.0	4,260.1	0.1	0.2	0.5
	Non-Eagle Ford Shale	7,296,619	3.1	46.1	13.5	4,901.1	0.1	0.3	0.5
	Difference	-966,533	-0.2	-4.9	-1.5	-641.0	0.0	0.0	-0.1
San Patricio	Eagle Ford Shale	16,381,316	9.8	122.9	31.2	11,199.2	0.2	0.6	1.1
	Non-Eagle Ford Shale	17,504,625	10.1	129.0	32.9	11,954.0	0.2	0.6	1.2
	Difference	-1,123,309	-0.2	-6.0	-1.7	-754.8	0.0	0.0	-0.1
Uvalde	Eagle Ford Shale	6,409,991	3.6	47.6	9.4	3,727.5	0.1	0.2	0.3
	Non-Eagle Ford Shale	6,089,409	3.5	46.0	9.0	3,545.3	0.1	0.2	0.3
	Difference	320,582	0.1	1.6	0.4	182.2	0.0	0.0	0.0
Victoria	Eagle Ford Shale	18,680,575	14.5	152.2	54.3	16,599.3	0.2	0.7	2.6
	Non-Eagle Ford Shale	19,139,371	14.7	154.9	55.5	17,000.4	0.2	0.7	2.7
	Difference	-458,796	-0.2	-2.7	-1.1	-401.2	0.0	0.0	-0.1
Walker	Eagle Ford Shale	16,634,406	8.6	112.1	36.2	11,939.4	0.2	0.6	1.4
	Non-Eagle Ford Shale	17,828,197	8.9	118.4	38.4	12,780.0	0.2	0.7	1.4
	Difference	-1,193,791	-0.3	-6.3	-2.2	-840.7	0.0	0.0	-0.1
Webb	Eagle Ford Shale	30,894,692	26.8	267.9	82.8	24,027.6	0.5	1.2	3.2
	Non-Eagle Ford Shale	31,819,802	27.0	272.7	84.7	24,729.9	0.5	1.2	3.2
	Difference	-925,110	-0.3	-4.7	-1.9	-702.4	0.0	0.0	-0.1
Wilson	Eagle Ford Shale	8,450,148	5.6	63.4	12.8	4,931.6	0.1	0.3	0.4
	Non-Eagle Ford Shale	7,674,895	5.5	59.6	11.9	4,491.0	0.1	0.3	0.4
	Difference	775,253	0.1	3.8	0.9	440.6	0.0	0.0	0.0
Zavala	Eagle Ford Shale	2,818,234	1.5	20.0	6.5	2,049.6	0.0	0.1	0.3
	Non-Eagle Ford Shale	2,470,734	1.4	18.2	5.8	1,800.5	0.0	0.1	0.2
	Difference	347,500	0.1	1.8	0.7	249.1	0.0	0.0	0.0

Eagle Ford Shale Annual VMT and Emissions (Tons) Summary - 2009 through 2015

County	Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
Total	Eagle Ford Shale	236,644,160,329	278,115,244.3	3,147,688,093.9	854,801,601.2	286,986,742,716.4	4,947,143.5	17,407,186.5	28,239,896.0
	Non-Eagle Ford Shale	234,959,995,859	277,307,857.7	2,654,565,391.2	711,314,895.6	248,011,758,822.2	3,976,100.2	14,737,527.0	23,418,133.1
	Difference	1,684,164,470	807,386.6	493,122,702.7	143,486,705.6	38,974,983,894.2	971,043.3	2,669,659.5	4,821,762.9
Atascosa	Eagle Ford Shale	5,058,472,744	4,538,245.9	60,682,953.2	20,003,179.6	6,232,487,332.1	97,888.0	363,960.9	614,736.9
	Non-Eagle Ford Shale	4,151,050,463	4,204,214.4	52,756,446.8	17,018,147.1	5,136,125,099.2	81,974.3	301,875.5	519,659.3
	Difference	907,422,281	334,031.4	7,926,506.4	2,985,032.5	1,096,362,232.9	15,913.7	62,085.4	95,077.5
Bastrop	Eagle Ford Shale	5,876,647,549	6,716,037.0	76,996,604.9	17,529,841.9	6,439,686,239.6	113,061.6	423,208.8	539,678.8
	Non-Eagle Ford Shale	5,978,742,135	6,754,775.8	77,897,900.9	17,777,877.0	6,548,454,765.8	114,866.9	430,326.5	548,002.8
	Difference	-102,094,585	-38,738.8	-901,295.9	-248,035.1	-108,768,526.2	-1,805.3	-7,117.7	-8,324.0
Bee	Eagle Ford Shale	1,970,389,006	2,275,442.6	27,019,182.6	7,402,395.2	2,533,736,809.0	41,050.9	142,524.2	267,246.6
	Non-Eagle Ford Shale	1,833,723,090	2,210,512.0	25,655,258.8	6,942,915.4	2,360,661,210.9	38,479.1	132,715.6	249,404.6
	Difference	136,665,916	64,930.6	1,363,923.8	459,479.7	173,075,598.2	2,571.8	9,808.6	17,842.1
Bexar	Eagle Ford Shale	105,464,589,929	128,617,597.1	1,391,604,893.3	288,065,767.5	112,979,621,586.8	2,054,195.0	7,836,701.6	8,350,395.9
	Non-Eagle Ford Shale	106,207,430,709	128,949,802.7	1,398,662,980.8	289,924,999.3	113,758,889,796.9	2,068,481.7	7,894,202.4	8,410,111.8
	Difference	-742,840,780	-332,205.6	-7,058,087.5	-1,859,231.8	-779,268,210.0	-14,286.7	-57,500.9	-59,715.9
Brazos	Eagle Ford Shale	10,836,177,039	13,641,042.1	153,971,413.7	36,755,393.5	13,670,316,142.8	232,402.1	810,155.1	1,337,207.8
	Non-Eagle Ford Shale	10,938,826,085	13,671,166.1	154,798,463.4	36,945,389.0	13,794,202,129.6	234,234.5	816,481.6	1,344,484.8
	Difference	-102,649,046	-30,124.0	-827,049.8	-189,995.5	-123,885,986.7	-1,832.4	-6,326.5	-7,277.0
Burleson	Eagle Ford Shale	1,956,793,581	2,072,143.0	24,571,260.3	8,396,953.5	2,502,959,401.8	39,054.5	138,416.6	300,842.1
	Non-Eagle Ford Shale	1,961,188,663	2,067,117.4	24,536,133.3	8,361,136.2	2,507,524,437.9	39,073.0	138,310.5	299,301.7
	Difference	-4,395,082	5,025.6	35,126.9	35,817.3	-4,565,036.2	-18.5	106.1	1,540.4

County	Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
De Witt	Eagle Ford Shale	1,953,776,555	2,261,826.9	26,233,569.8	9,978,256.4	2,946,060,167.6	42,117.9	137,535.9	419,873.8
	Non-Eagle Ford Shale	1,533,006,394	2,048,949.6	22,215,739.9	8,134,416.5	2,323,828,283.8	34,072.3	108,810.3	339,203.1
	Difference	420,770,161	212,877.2	4,017,829.9	1,843,839.9	622,231,883.8	8,045.6	28,725.6	80,670.7
Dimmit	Eagle Ford Shale	1,646,636,666	1,468,085.6	19,476,160.7	8,187,117.6	2,268,875,862.0	38,424.2	116,228.7	287,278.5
	Non-Eagle Ford Shale	834,110,707	1,044,156.6	11,982,219.6	4,512,070.3	1,163,274,679.1	23,227.1	60,060.9	155,589.8
	Difference	812,525,959	423,928.9	7,493,941.1	3,675,047.3	1,105,601,182.9	15,197.2	56,167.8	131,688.8
Fayette	Eagle Ford Shale	4,202,345,689	3,921,613.2	49,984,054.2	25,054,594.2	6,452,074,671.3	89,826.6	296,536.8	886,576.5
	Non-Eagle Ford Shale	4,074,975,651	3,862,316.8	48,839,880.2	24,398,305.8	6,258,990,195.2	87,439.6	287,921.1	862,955.6
	Difference	127,370,038	59,296.4	1,144,173.9	656,288.4	193,084,476.1	2,387.0	8,615.7	23,621.0
Frio	Eagle Ford Shale	3,629,617,103	2,324,544.4	39,646,866.9	15,578,490.4	4,554,011,630.0	85,923.3	261,116.8	460,395.2
	Non-Eagle Ford Shale	2,578,641,926	1,919,300.0	30,221,464.1	11,539,121.6	3,249,667,973.1	66,776.4	187,874.8	338,876.9
	Difference	1,050,975,177	405,244.4	9,425,402.8	4,039,368.8	1,304,343,656.9	19,146.8	73,242.0	121,518.4
Gonzales	Eagle Ford Shale	3,645,083,592	3,298,528.8	42,300,865.3	22,948,175.2	5,830,347,993.5	79,284.6	258,449.4	837,609.4
	Non-Eagle Ford Shale	3,175,749,700	3,073,411.2	38,063,139.6	20,465,564.8	5,094,216,621.2	70,429.1	226,717.4	745,077.0
	Difference	469,333,892	225,117.6	4,237,725.7	2,482,610.4	736,131,372.3	8,855.6	31,732.0	92,532.4
Grimes	Eagle Ford Shale	2,613,891,800	2,837,903.3	33,908,246.7	10,442,015.1	3,328,786,186.7	52,765.2	186,640.7	383,115.1
	Non-Eagle Ford Shale	2,683,803,189	2,861,552.3	34,472,602.7	10,636,313.1	3,415,124,579.5	53,959.1	191,105.2	390,479.6
	Difference	-69,911,389	-23,648.9	-564,356.0	-194,298.1	-86,338,392.8	-1,194.0	-4,464.5	-7,364.5
Jim Wells	Eagle Ford Shale	3,849,160,282	4,279,436.9	52,577,478.2	15,907,062.9	5,017,012,796.7	80,301.0	278,062.4	555,218.7
	Non-Eagle Ford Shale	3,786,255,297	4,244,933.2	51,903,419.2	15,654,956.9	4,935,971,057.1	79,114.5	273,385.2	545,839.8
	Difference	62,904,985	34,503.6	674,059.0	252,106.0	81,041,739.6	1,186.5	4,677.2	9,378.9

County	Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
Karnes	Eagle Ford Shale	1,924,324,750	1,660,832.2	22,966,743.2	7,870,247.6	2,569,470,787.9	37,871.3	133,763.4	296,821.5
	Non-Eagle Ford Shale	1,082,391,688	1,295,837.3	15,131,533.9	4,796,381.3	1,459,071,263.4	22,514.0	76,544.8	176,755.7
	Difference	841,933,062	364,995.0	7,835,209.3	3,073,866.2	1,110,399,524.4	15,357.2	57,218.6	120,065.9
La Salle	Eagle Ford Shale	2,594,025,067	1,816,729.8	27,224,636.6	21,011,072.7	4,709,552,318.9	66,055.2	178,871.2	690,609.8
	Non-Eagle Ford Shale	1,708,283,542	1,405,884.6	19,353,211.3	14,738,784.9	3,134,074,277.4	48,513.1	119,730.4	480,784.3
	Difference	885,741,525	410,845.3	7,871,425.3	6,272,287.9	1,575,478,041.5	17,542.1	59,140.7	209,825.6
Lavaca	Eagle Ford Shale	1,720,767,115	2,237,798.3	24,529,974.0	8,585,187.3	2,490,399,353.1	36,658.9	120,994.0	336,298.9
	Non-Eagle Ford Shale	1,616,640,662	2,189,977.9	23,571,046.7	8,164,282.2	2,343,174,651.5	34,740.3	113,991.5	318,919.8
	Difference	104,126,453	47,820.4	958,927.3	420,905.1	147,224,701.6	1,918.6	7,002.4	17,379.1
Lee	Eagle Ford Shale	1,908,717,762	1,900,508.3	24,055,064.2	5,612,122.6	2,083,529,765.4	36,596.4	137,771.8	175,378.0
	Non-Eagle Ford Shale	1,961,286,631	1,920,483.9	24,518,796.4	5,740,508.7	2,139,607,029.1	37,518.9	141,437.8	179,679.7
	Difference	-52,568,869	-19,975.5	-463,732.2	-128,386.0	-56,077,263.6	-922.5	-3,666.0	-4,301.7
Leon	Eagle Ford Shale	3,871,421,553	3,067,300.9	42,872,183.0	20,498,978.0	5,591,194,738.1	79,195.9	275,865.2	715,625.7
	Non-Eagle Ford Shale	3,690,342,761	2,981,640.9	41,185,427.9	19,586,835.0	5,332,090,117.6	75,850.8	263,027.4	682,861.7
	Difference	181,078,792	85,660.0	1,686,755.1	912,143.0	259,104,620.5	3,345.1	12,837.8	32,764.0
Live Oak	Eagle Ford Shale	3,855,964,999	2,452,824.1	41,896,081.2	18,396,553.4	5,456,817,607.8	78,583.8	273,746.6	651,487.5
	Non-Eagle Ford Shale	3,270,341,328	2,214,200.3	36,454,995.4	15,932,660.7	4,636,636,202.0	67,892.2	233,723.2	563,055.6
	Difference	585,623,671	238,623.8	5,441,085.8	2,463,892.7	820,181,405.8	10,691.6	40,023.3	88,431.9
McMullen	Eagle Ford Shale	904,324,637	437,831.3	8,834,512.7	2,430,027.5	989,793,830.4	16,163.1	62,666.2	80,394.3
	Non-Eagle Ford Shale	335,986,010	233,589.2	3,820,876.2	1,001,170.6	371,144,839.5	6,356.2	24,027.8	32,572.7
	Difference	568,338,627	204,242.2	5,013,636.6	1,428,856.9	618,648,990.9	9,806.9	38,638.4	47,821.6

County	Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
Madison	Eagle Ford Shale	2,504,834,228	1,919,904.7	27,434,810.8	13,438,274.7	3,644,207,785.2	51,587.8	178,455.7	468,467.1
	Non-Eagle Ford Shale	2,447,341,412	1,893,717.9	26,892,419.8	13,142,139.1	3,561,497,024.1	50,522.5	174,350.2	457,769.6
	Difference	57,492,817	26,186.8	542,390.9	296,135.6	82,710,761.1	1,065.3	4,105.5	10,697.5
Maverick	Eagle Ford Shale	2,365,237,111	4,218,479.7	40,587,901.0	13,354,414.2	3,431,701,115.8	69,397.4	174,452.2	470,556.5
	Non-Eagle Ford Shale	2,281,370,415	4,171,966.8	39,695,752.2	12,960,356.2	3,314,802,781.3	67,160.9	168,281.7	454,596.3
	Difference	83,866,697	46,512.9	892,148.7	394,058.0	116,898,334.5	2,236.5	6,170.5	15,960.2
Milam	Eagle Ford Shale	2,409,612,986	2,888,007.7	31,717,054.6	10,679,061.8	3,111,243,462.1	49,686.3	174,970.6	373,097.4
	Non-Eagle Ford Shale	2,683,386,984	3,021,340.7	34,182,979.2	11,688,735.0	3,456,495,656.8	54,653.9	193,964.6	409,986.9
	Difference	-273,773,998	-133,333.0	-2,465,924.7	-1,009,673.2	-345,252,194.7	-4,967.6	-18,994.1	-36,889.5
Nueces	Eagle Ford Shale	22,051,952,861	27,000,288.7	312,061,158.4	60,094,280.1	24,817,787,512.3	454,123.1	1,670,123.1	1,822,929.1
	Non-Eagle Ford Shale	25,152,937,810	28,211,927.4	341,225,952.4	66,443,808.6	28,196,505,262.9	511,546.9	1,888,628.4	2,036,401.8
	Difference	-3,100,984,949	-1,211,638.8	-29,164,794.0	-6,349,528.5	-3,378,717,750.5	-57,423.8	-218,505.3	-213,472.7
Robertson	Eagle Ford Shale	2,337,723,607	2,054,155.4	27,351,664.1	9,550,396.7	2,986,305,603.1	47,099.3	165,987.6	359,963.8
	Non-Eagle Ford Shale	2,694,667,732	2,198,192.5	30,451,162.9	10,757,127.3	3,434,329,325.4	53,392.7	189,973.0	406,732.8
	Difference	-356,944,125	-144,037.1	-3,099,498.7	-1,206,730.6	-448,023,722.2	-6,293.4	-23,985.4	-46,769.0
San Patricio	Eagle Ford Shale	5,626,966,876	6,563,996.8	77,035,135.0	22,956,171.3	7,317,200,347.8	117,293.0	411,411.4	774,898.5
	Non-Eagle Ford Shale	6,012,822,477	6,721,416.6	80,581,362.8	24,207,552.8	7,808,000,503.2	124,386.4	437,782.6	819,267.9
	Difference	-385,855,601	-157,419.8	-3,546,227.9	-1,251,381.6	-490,800,155.4	-7,093.5	-26,371.2	-44,369.4
Uvalde	Eagle Ford Shale	2,263,035,266	2,455,152.0	31,016,242.8	6,970,058.0	2,513,158,999.5	59,353.0	163,748.3	210,062.4
	Non-Eagle Ford Shale	2,149,854,394	2,415,426.5	30,056,081.4	6,706,970.5	2,391,048,273.0	57,584.1	156,083.0	201,368.7
	Difference	113,180,872	39,725.5	960,161.5	263,087.5	122,110,726.5	1,768.9	7,665.2	8,693.7

County	Scenario	VMT	VOC	CO	NO_x	CO_2	SO_2	NH_3	$PM_{2.5}$
Victoria	Eagle Ford Shale	6,659,461,121	9,917,921.9	99,761,315.2	41,552,901.6	11,224,141,289.1	160,113.5	487,321.3	1,872,099.7
	Non-Eagle Ford Shale	6,823,017,871	10,025,604.3	101,443,046.7	42,426,967.3	11,494,321,240.7	163,475.2	498,920.7	1,913,319.6
	Difference	-163,556,749	-107,682.4	-1,681,731.5	-874,065.7	-270,179,951.6	-3,361.8	-11,599.4	-41,220.0
Walker	Eagle Ford Shale	6,143,146,173	6,047,279.5	74,621,310.5	29,081,295.9	8,424,435,940.4	128,713.4	450,950.9	1,005,425.3
	Non-Eagle Ford Shale	6,584,017,498	6,246,180.5	78,652,831.7	30,815,518.1	9,015,686,011.5	136,908.1	481,788.4	1,068,021.5
	Difference	-440,871,325	-198,901.0	-4,031,521.2	-1,734,222.2	-591,250,071.0	-8,194.7	-30,837.5	-62,596.2
Webb	Eagle Ford Shale	10,828,015,202	18,361,486.0	179,727,494.4	62,081,445.2	16,167,829,986.6	328,574.8	813,528.6	2,228,209.4
	Non-Eagle Ford Shale	11,152,249,059	18,536,661.1	182,626,679.4	63,473,332.7	16,637,131,573.5	334,842.5	835,682.0	2,279,911.4
	Difference	-324,233,857	-175,175.1	-2,899,185.0	-1,391,887.4	-469,301,586.9	-6,267.7	-22,153.4	-51,702.0
Wilson	Eagle Ford Shale	2,983,308,857	3,832,199.8	42,032,306.8	9,516,486.0	3,331,632,270.4	57,296.7	213,003.1	290,388.5
	Non-Eagle Ford Shale	2,709,607,244	3,736,621.8	39,697,444.6	8,862,963.5	3,036,338,828.9	52,610.0	194,583.3	268,526.6
	Difference	273,701,613	95,578.0	2,334,862.2	653,522.5	295,293,441.5	4,686.8	18,419.9	21,861.9
Zavala	Eagle Ford Shale	987,738,625	1,030,100.3	12,988,955.7	4,873,383.7	1,370,363,182.5	26,485.8	70,017.7	177,007.2
	Non-Eagle Ford Shale	865,946,335	974,979.3	11,877,849.6	4,364,717.0	1,204,483,568.0	24,179.8	61,716.0	157,765.1
	Difference	121,792,290	55,121.1	1,111,106.1	508,666.7	165,879,614.4	2,306.1	8,301.6	19,242.0

APPENDIX D:
YEARLY SUMMARY DATA

Appendix D is being transmitted electronically.

APPENDIX E:
QUALITY ASSURANCE

QUALITY ASSURANCE

Analyses and results were subjected to appropriate internal review and QA/QC procedures, including independent verification and reasonableness checks. All work was completed consistent with applicable elements of ANSI/ASQ E4-2004: *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Technology Programs* and the TCEQ Quality Management Plan.

Quality Assurance Project Plan (QAPP) Category II (Modeling for NAAQS Compliance) is the QAPP category that most closely matches these objectives and establishes QAPP requirements for projects involving applied research or technology evaluations. Internal review and quality control measures consistent with applicable NRML QAPP requirements, along with appropriate audits or assessments of data and reporting of findings, were employed. These include, but are not limited to, the elements outlined in the following description.

A. Project Management

The project management was as listed previously in the Acknowledgments section.

The definition and background of the problem addressed by this project, the project/task description, and project documents and records produced are as described previously in the Purpose and Background sections. No special training or certifications were required. The TTI project manager assured that the appropriate project personnel had and used the most current, approved version of the QAPP.

After receiving the Notice to Commence (NTC) from TCEQ, the TTI project manager provided a detailed pre-analysis plan to the TCEQ project manager for review and concurrence. Upon concurrence of the pre-analysis plan, the TTI project manager distributed the pre-analysis plan to the TTI inventory developers for use in both the inventory development and QA review process. TTI maintains records of the project QA checks as a part of the project archive, for at least five years.

The objective was to produce the emissions inventory product of the quality suited to its purpose as specified (i.e., inventories emissions trends analysis purposes), in accordance with the appropriate guidance and methods documents as referenced, as detailed in the pre-analysis plan, and in consultation with the TCEQ project manager.

Basic criteria were used to assure that the acceptable quality of the product was met – product developers verified that the process and product as specified, to include:

- The product met the purpose of the emissions analysis (i.e., for use in on-road emissions inventory trends analyses);
- The full extent of the modeling domain (i.e., analysis years, geographic coverage, seasonal periods, days, sources, pollutants) was included;
- Agreed methods, models, tools, and data were used (i.e., as listed in the Grant Activities Description, and as listed in the more detailed pre-analysis plan;

- The required output data sets were produced in the appropriate formats in accordance with the pre-analysis plan;
- Any deficiencies found during development and end-product quality checks (as discussed in QAPP Part D) were corrected; and
- Aggregate emissions estimate results were comparable with available, similarly produced emissions estimates.

B. Data Generation and Acquisition

Note that no sampling of data was involved in the emissions inventory development, thus only existing data (non-direct measurements) were used for this project.

The data needed for project implementation were in the categories needed for development of emissions rate model inputs and adjustment factors, and development of the activity inputs for external emissions calculations. These emissions factor model inputs and activity inputs were developed using data sources as outlined previously and/or methods and procedures as detailed in the references listed, and as provided in the pre-analysis plan.

All data used either as direct input or to produce inputs (e.g., to the MOVES model or to TTI's emissions inventory development utilities used, which were listed in the pre-analysis plan) were reviewed by TTI for suitability before use. The data sets for the project were provided by the Texas Department of Transportation (TxDOT), a Metropolitan Planning Organization (MPO) or Council of Governments (COG), TCEQ, and/or the EPA, and in most cases were QA'd by the providing agency. The data needed may include: Highway Performance Monitoring System (HPMS) data (from TxDOT's Roadway Inventory Functional Classification Record [RIFCREC] report); regional travel demand model data; speed model data; vehicle registration data; automatic traffic recorder data; vehicle classification count data; meteorological data; fuels data; MOVES emissions model data; extended idling activity data; and vehicle inspection and maintenance program design data.

Any significant problems found during data review, verification, and/or validation (see QA criteria and methods discussion in Section D) were to be corrected, and the QA procedure was repeated until satisfied. No significant problems were found.

Data Management: TTI emissions inventory data developers work as a closely coordinated team. The assigned staff used the same electronic project folder structure on their individual workstations. As various scripts, inputs, and outputs were developed in the emissions inventory development process, data were shared within the team for crosschecking via an intra-net, flash drive, or external hard drive. To perform the MOVES model runs, a computer cluster (multiple computer) configuration or individual workstation configuration was used. After input data were QA'd, depending on the size of the data set, the data sets were backed up and stored in compressed files. These activities were performed throughout the process until the final products were produced.

For MOVES model runs to produce emissions factor look-up tables for the emissions inventories, all run files (MOVES model inputs and batch files) were produced on an individual workstation. After the MOVES input data and batch files (i.e., Run Files) were QA'd, they were either executed on an individual workstation, or they were copied (via external hard drive) to the cluster's Master computer and executed. Upon execution, completion, and error checking, the MOVES output databases and run log text files were (for cluster runs first copied to an individual workstation) archived and processed further in preparation for input to the emissions calculations.

After the final product was completed, all the project data archives were compiled on a set of optical data discs (CD-ROM or DVD, depending on size), or on an external drive for very large project data sets. A complete archive of the project data is kept by TTI (the computer models and emissions inventory development utilities used in the process are included). An electronic data submittal package (containing the project deliverables as listed in Appendix A) was produced along with data description (on CD-ROM, DVDs, or external hard drive, depending on needed storage space) and delivered to TCEQ.

C. Assessment and Oversight

The following assessments were performed.

- Verified that the overall scope was met (consistent with the intended purpose, for specified temporal resolution and geographic coverage, for specified sources, pollutants, and emissions processes).
- Checked input data preparation, and model or utility execution instructions (e.g., run specifications, scripts, JCFs, command files) were prepared according to the plan; and
- Checked that correct output data were produced (includes interim output [output that becomes input to a subsequent step in the inventory development process], as well as the final product). Records were kept of the checks performed.

In the case that any inconsistencies or deficiencies were found, the issue was directly communicated to the responsible staff for corrections (or the outside agency staff involved, if provided from outside of TTI, if needed). After a correction was made, the QA checks were performed again to ensure that the additional work resulted in the intended quality assured result, and the correction was noted in the QA record (process was performed until QA check was satisfied).

Any major problem was reported to the project manager and communicated to the project team as needed, as well as when the various data elements in the process passed QA checks and were ready for further processing according to the project pre-analysis plan. The project manager ensured that all of the QA checks performed were compiled, and maintained in the project archives.

In addition, technical systems audits were performed as appropriate. Audits of data quality at the requisite 25 percent level were performed for any data collected or produced as part of this study. QA findings were reported in both the draft and the final reports.

D. Data Validation and Usability

Development of the detailed on-road mobile source emissions estimates is a multi-staged process that involves many data sets and data processing steps. In the interest of product quality and process efficiency, thorough quality assurance checks were performed during emissions inventory development.

Data for the project, whether provided for direct use or processed by TTI, were reviewed, verified, and validated to ensure conformance to their particular specifications and TCEQ's requirements for the intended use. The data specifications and requirements where not stated specifically, are included in the documents listed in the References section, or are outlined or referenced in the detailed pre-analysis plan.

The criteria for passing quality checks and the checks typically performed on each major inventory input component (i.e., estimates of source activity, activity distributions, and emissions factors) as well as on the resulting emissions estimates, are summarized in the following lists. These QA guidelines were used to ensure the development of emissions inventory estimates that are as accurate as possible and meet the requirements of TCEQ's intended use.

TTI verified that the overall scope of the emissions analysis has been met as prescribed in the pre-analysis plan, to include:

- Purpose of the emissions analysis (i.e., for on-road emissions trends analyses);
- Extent of the modeling domain (e.g., analysis years, geographic coverage, seasonal periods, days, sources, pollutants);
- Methods, models, and data used (e.g., default versus local input data sources); and
- Procedures and tools used and all required emissions output data sets were produced.

TTI performed checks on input data preparation, model or utility execution instructions (e.g., run specifications, scripts, JCFs, command files), and output, as appropriate to the component:

- Input data preparation checks:
  - Verified the basis of input data sets against the pre-analysis plan: Actual historical or latest available data, validated model, expected values or regulated limits, regulatory program design, model defaults, surrogates, professional judgment; check aggregation levels.
  - Data development: Depending on the procedure and particular input data set, calculations were verified (e.g., re-calculated independently and compared with originally prepared values – if spot-checking a series of results, included extremes and intermediate values).
  - Completeness: Verified that input data sets were within the required dimensions, and all required fields were populated and properly coded or labeled.
  - Format: Verified that formats were within required specifications (e.g., field positions, data types and formats, and file formats), if any.

    - Reasonability checks: (discussed in the next section).
    - Ensured that any inputs provided from external sources were quality assured, as listed previously.
- Checked the model or utility execution instructions:
    - Verified that the correct number of utility or model run specifications were prepared for each application (e.g., by year, county, season, day type).
    - Verified that each utility or model run script included the correct modeling specifications (e.g., commands, input values, input and output file paths, output options) for the application per applicable user guide.
- Checked for the successful completion of model and utility executions:
    - Verified that the correct number of each type of output file was produced by the particular model or utility.
    - Checked for any unusual output file sizes.
    - Searched output (e.g., utility listing files or model execution logs that contain error and warning records) for warnings/errors.
    - Checked the summary information provided in output listing files for any unusual results.

TTI performed further checks for consistency, completeness, and reasonability of data output from model or utility applications:

- Verified that the data distributions and allocation factors produced or used sum to 1.0, as appropriate (e.g., hourly travel factors within a time period, proportion of travel by vehicle categories on a particular roadway category).
- Verified that the required data fields were present, populated, and properly coded or labeled; verified that data and file formats were within specifications.
- Verified that any activity, emissions rate, or emissions adjustments were performed as intended (e.g., seasonal activity factor, emissions control program adjustment).
- For data sets prepared with temporal or geographic variation (e.g., activity distributions between weekends/weekdays, vehicle mix by day type, or average speeds between road types or time periods), compared and noted whether directional differences were as expected.
- Checked for consistency between data sets (e.g., compared detailed spatially and temporally disaggregated activity estimates [e.g., hourly VMT] to original aggregate totals, activity total summaries between utility applications [e.g., VMT producer and emissions calculator], and input hourly distributions versus hourly summaries from the link activity output data).

- Calculated county, 24-hour, aggregate emissions rates (from aggregate VMT and emissions output) and compared the rates between counties examining the results for outliers while assessing the reasonability of any relative and directional differences (e.g., qualify based on activity distributions by road type and speed, mix of vehicles by road type, meteorological variation, control program coverage). Compared the results to results from previous emissions analyses if available.
- Calculated county, 24-hour aggregate rates by vehicle class and compared between vehicle classes. Examined the results for consistent patterns, e.g., between gasoline versus diesel, heavy versus light.
- Verified summed link emissions output against tabular emissions output summaries – differences should be within rounding error –N/A.

Any additional data products required for the emissions analysis were subjected to the appropriate QA checks previously listed. Any issues found needing resolution were corrected and appropriate QA checks were performed until satisfied.