

Commonwealth of Pennsylvania



pennsylvania

**DEPARTMENT OF ENVIRONMENTAL
PROTECTION**

FINAL

**VOLUME II: Technical Support Document
State Implementation Plan Revision: NO_x and VOC
Motor Vehicle Emission Budget Revisions Based on
the MOVES2010a Model**

Lancaster Eight-Hour Ozone Maintenance Area

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Introduction

This Technical Support Document provides detailed information on the categories of point, area, nonroad, and highway sources of oxides of nitrogen (NO_x) and volatile organic compounds (VOC) emission estimates and assumptions. Data shown in this document were used in the *State Implementation Plan Revision: Maintenance Plan and Base Year Inventory – Lancaster Eight-Hour Ozone Nonattainment Area*, which is hereafter referred to as the Lancaster Ozone Maintenance Plan. Other data and assumptions outlined in the Technical Support Document are also used in this State Implementation Plan (SIP) revision to the Lancaster Ozone Maintenance Plan that is entitled, “*State Implementation Plan Revision: NO_x and VOC Motor Vehicle Emission Budget Revisions Based on the MOVES2010a Model – Lancaster Eight-Hour Ozone Maintenance Area*”, which is hereafter referred to as the Lancaster Ozone Maintenance Plan revision. The Lancaster Ozone Maintenance Plan revision demonstrates that replacing highway emissions estimates using the MOVES Model instead of the Mobile6 Model to generate emissions estimates will not cause emissions from all sources in the maintenance years to exceed all emissions in the attainment year. This Technical Support Document will describe how emission estimates and emission growth rates that were used in both the Lancaster Ozone Maintenance Plan and the Lancaster Ozone Maintenance Plan revision were developed for all source categories (point, area, nonroad, and highway).

Point Source Category Emissions

Point sources included emissions from large commercial, institutional, and industrial facilities, such as chemical manufacturing facilities, large waste disposal sites, and large heating and electric generating units (EGUs). Emission projections used in the Lancaster Ozone Maintenance Plan were prepared for the point source sector for 11 states, including Pennsylvania, and the District of Columbia, for the Mid-Atlantic Regional Air Management Association (MARAMA) by MACTEC Federal Programs, Inc. Future year projections were developed by MACTEC so that states could use the projections as inventories in their SIPs. Estimates were prepared for years 2009 and 2018, and took into consideration growth in economic activity and additional controls.

For the purpose of projecting emissions into the future for all of the states’ ozone maintenance plans, the point source inventory of emissions is divided into two subsectors – the EGU sector and the non-EGU sector. Different projection methods are used for those two sectors. The Lancaster Area has no EGU emission sources. The Lancaster Area contains many non-EGU point sources. For the non-EGU sector, growth factors were developed by using The United States Environmental Protection Agency’s (EPA) Economic Growth Analysis System (EGAS) Version 5.0. U.S. Department of Energy fuel consumption forecasts were used to replace default values for combustion sources in EGAS 5.0. Also, state-supplied population, employment, and other emission projection data were used if either EGAS 5.0 values did not exist or if the state-supplied data was deemed better than values given by EGAS 5.0.

Point Source Emissions for 2009

Table 1 gives totals of NO_x and VOC emissions for both 2009 projected emissions in the Lancaster Ozone Maintenance Plan and the actual 2009 Lancaster Area emissions reported to the Department after the Lancaster Ozone Maintenance Plan was developed.¹ Table 1 demonstrates that the assumptions that point source emissions in the Lancaster Ozone Maintenance Plan for 2009 were overestimated for both NO_x and VOC. Table 2 lists the actual 2009 NO_x and VOC emissions from the individual facilities in the Lancaster Area. The annual emissions were divided by 365 days in a year to obtain daily emissions.

Actual Emissions for 2009

Table 1: Point Source Emissions for 2009 - SIP Estimated Versus Actual

Emissions for 2009	NO_x (tons/day)	VOC (tons/day)
Emissions in Maintenance Plan	4.1	8.7
Actual Emissions (actual reported annual emissions in Table 2 divided by 365 days)	3.2	5.5

Table 2: Actual 2009 Annual NO_x and VOC Point Source Inventory for the Lancaster Ozone Maintenance Area by Facility Source

EPA AFS Number	Facility Name	NO_x (tons per year)	VOC (tons per year)
420710071	ALUMAX MILL PROD INC/MILL	119.8	182.2
420710093	AMER LAFRANCE LLC/EPHRATA	---	4.1
420710066	ANVIL INTL/COLUMBIA FKA GRINNELL	12.4	27.2
420710082	AQUATIC CO/W DONEGAL TWP	1.0	7.3

¹ Air Information Management System Submittal, Pennsylvania Department of Environmental Protection, 2009

EPA AFS Number	Facility Name	NO_x (tons per year)	VOC (tons per year)
420710035	ARMSTRONG WORLD IND /FLOOR PLT	9.4	67.9
420710036	ARMSTRONG WORLD IND /MARIETTA CEILING PLT	67.0	157.4
420710509	B & S WOODCRAFTS/QUARRYVILLE	----	22.5
420710123	BIGBEE STEEL & TANK CO/RAPHO	----	12.0
420710104	BIRD IN HAND WOODWORKS/E HEMPFIELD	----	2.6
420710084	BOLLMAN HAT CO/MAIN ST FACILITY	1.3	4.4
420710306	BUCK CO INC/QUARRYVILLE	1.4	72.7
420710113	CADMUS JOURNAL SVC/CJS LANCASTER PLT	2.1	14.1
420710837	CHESTER CNTY SOLID W/LANCHESTER LANDFILL	0.5	4.9
420710063	CLARK FILTER/HEMPFIELD DIVISION PLT	1.3	7.5
420710073	CNH AMERICA/NEW HOLLAND	7.0	74.0
420710283	COLUMBIA GAS TRANS CORP/MARIETTA	14.1	0.5
420710106	CONESTOGA WOOD SPECIALTIES/EAST EARL	2.6	70.5
420710468	DART CONTAINER CORP/E	2.7	83.9

EPA AFS Number	Facility Name	NO _x (tons per year)	VOC (tons per year)
	LAMPETER WHSE		
420710087	DART CONTAINER CORP/LEOLA	12.2	416.8
420712096	DONSCO INC/MT JOY	----	11.3
420710109	FENNER INC/FENNER DRIVES	----	11.1
420710508	GRANGER ENERGY OF HONEY BROOK LLC/CAERNARVON TWP LANCASTER C	16.4	32.8
420712109	GREINER IND INC/MT JOY TWP PLT	----	19.3
420710502	GUYON IND INC/MANHEIM	----	3.8
420710086	HIGH STEEL STRUCTURES INC/LANCASTER FACILITY	1.6	29.0
420710111	INTELLIGENCER PRINTING/INTELL PRINTING LANCASTER CNTY	0.6	16.2
420710094	JL CLARK INC/LANCASTER	2.5	29.3
420710294	KELLOGG USA INC/EAST HEMPFIELD	30.7	13.0
420710499	KEYSTONE QUALITY PROD/LEOLA	----	12.2
420710463	KEYSTONE WOOD SPECIA/EAST LAMPETER	----	7.8
420710145	LANCASTER CNTY RRF/ LANCASTER	569.8	1.6

EPA AFS Number	Facility Name	NO_x (tons per year)	VOC (tons per year)
420710890	LANCASTER CNTY SWMA/FREY FARM CRESWELL LDFL	0.2	4.2
420710680	LANCASTER HEALTH ALL/LANCASTER GEN HOSP	9.7	0.2
420710610	LANCASTER LAB/LANCASTER	1.7	10.8
420710099	LANCASTER TERM CORP/LANCASTER TERM	----	8.2
420710486	LIPPERT COMPONENTS I/DENVER	----	4.0
420710437	MANHEIM AUTO AUCTION/MANHEIM	13.5	12.4
420710470	MARK LINE IND OF PA /EPHRATA	----	1.0
420710014	MARS SNACKFOOD US LLC/ELIZABETHTOWN CANDY PLT	10.2	66.9
420710723	MCNEIL PPC INC/LITITZ	7.4	4.5
420710494	MGS INC/CONST DENVER	----	5.8
420710456	MORGAN CORP/EPHRATA PLT	0.2	2.4
420710307	MT JOY WIRE CORP/MT JOY	5.1	4.6
420710115	NESSCO ENT LLC DBA MERIDIAN PROD/EAST EARL	----	15.8
420710270	NEW HOLLAND CUSTOM WOODWORK LTD/NEW	----	13.5

EPA AFS Number	Facility Name	NO _x (tons per year)	VOC (tons per year)
	HOLLAND		
420710103	NEXANS INC DBA BERK TEK/NEW HOLLAND	----	22.7
420710469	PARADISE CUSTOM KITCHENS/PARADISE	----	2.2
420712119	PEPPERIDGE FARM INC/EAST COCALICO TWP PLT	8.5	31.1
420710350	PPL RENEWABLE ENERGY/FREY FARM CRESWELL LDFL	17.6	3.5
420710331	PREMIER CUSTOM BUILT INC/E EARL TWP	----	18.8
420710092	QUALITY CUSTOM CABIN/EARL	0.4	17.1
420710122	RR DONNELLEY & SONS /NE DIV LANCASTER WEST	8.4	75.3
420710080	RR DONNELLEY & SONS CO/NE DIV LANCASTER EAST	26.3	165.8
420710317	RR DONNELLEY FINANCIAL INC/LANCASTER FINANCIAL PRINTING DIV	4.6	24.2
420710348	SIGNATURE CUSTOM CABINETRY/EPHRATA	0.1	11.4
420710510	STYLECRAFT CORP/TERRE HILL	----	4.6
420710077	TEXAS EASTERN TRANS/MARIETTA	127.1	11.2

EPA AFS Number	Facility Name	NO _x (tons per year)	VOC (tons per year)
420710121	THE HERSHEY CO/Y & S CANDIES	9.2	17.9
420710772	VALLEY PROTEINS INC/TERRE HILL PLT	38.0	2.2
420710091	VERSATEK ENT LLC/LITITZ	----	2.4
420710089	WELLBORN HOLDINGS INC/LUXURY CUSTOM CABINETS NEW HOLLAND	0.4	10.6
	Total Actual Annual Emissions	1164.9	1995.0

Point Source Category 2018 Emissions

Ideally, emissions growth could be compared between what was assumed in the Lancaster Ozone Maintenance Plan and recently revised assumptions for emissions growth. Both sets of assumptions are valid because the EPA requires that assumptions in growth be updated with each revision to the maintenance plan. If the revised assumptions for growth are less than what was assumed in the original maintenance plan, then it can be easily shown that emissions in the maintenance years are still below the emissions in the attainment year. However, when revised growth in some types of point source are higher, and in some types, the growth is lower, emissions growth cannot be compared to show the new assumptions still maintain the ozone standard. Then, a projected emissions inventory needs to be developed and compared. For the Lancaster Area, a projected inventory for the maintenance year 2018 needed to be developed to show maintenance with the standard.

The 2018 point source inventory for the Lancaster Ozone Maintenance Plan was developed for MARAMA by MACTEC. More recently, an emissions inventory of all emission source categories (point, area, nonroad, and highway) was developed by MARAMA and MACTEC for a regional modeling effort. Table 3 and Table 4 compare total emissions of NO_x and VOC produced by non-EGU sources in the Lancaster Area with the recently developed inventories. During the last year, MARAMA developed inventories for the baseline year of 2007 and projected years of 2013, 2017, 2020, and 2025.² The difference in the inventory years for the

² MARAMA 2007, 2017, and 2020 Baseline and Projected Inventories, Version 3, Julie McDill, Mid-Atlantic Regional Management Association, Towson, MD, January 2012.

inventory used in the Lancaster Ozone Maintenance Plan and new MARAMA/MACTEC inventory development efforts did not allow for easy comparison of growth factors used for projecting emissions. Projected emissions in 2018 were estimated for the maintenance plan revisions using straight-line interpolation between the 2007 MARAMA baseline inventory and the 2020 MARAMA projected year inventory using the following equation:

$$\mathbf{2018\ emissions = 2007\ Emissions + ((2020\ Emissions - 2007\ emissions) * (2018-2007) \div (2020 - 2007))}$$

Emission projections of non-EGU point sources in the Lancaster Ozone Maintenance Plan were overestimated for the year 2018 when compared to newer emissions data derived by MARAMA. See Tables 3 and 4.

Table 3: Lancaster Ozone Maintenance Plan Emission Estimates for 2018

Year	NO_x Emissions (tons/year)	NO_x Emissions (tons/day)	VOC Emissions (tons/year)	VOC Emissions (tons/day)
2018	1719.7	4.6	4097.2	11.0

Table 4: Revised Lancaster Ozone Maintenance Plan Emissions Estimates of Non-EGU Point Sources for 2018 (MARAMA 2007 Baseline and 2020 Projected Inventories)

Year	NO_x Emissions (tons/year)	NO_x Emissions (tons/day)	VOC Emissions (tons/year)	VOC Emissions (tons/day)
2007 (Baseline)	1147.3	3.1	2691.8	7.4
2020 (Projected)	1346.2	3.7	2850.7	7.8
2018 (Interpolated)	1315.6	3.6	2826.3	7.7

Table 5 and Table 6 show actual 2007 and projected 2020 facility emissions of NO_x and VOC for non-EGU point source in the Lancaster area.

Table 5: MARAMA 2018 Annual Baseline and Projected NO_x Point Source Inventories for the Lancaster Ozone Maintenance Area by Facility Source

EPA AFS Number	Facility Name	2007 Baseline NO_x Emissions	2020 Projected NO_x Emissions
420710071	ALUMAX MILL PROD INC/MILL PROD	133.9	186.0
420710093	AMER LAFRANCE LLC/EPHRATA	0.0	0.0
420710066	ANVIL INTL/COLUMBIA FKA GRINNELL	16.1	19.6
420710035	ARMSTRONG WORLD IND /FLOOR PLT	13.2	18.7
420710036	ARMSTRONG WORLD IND /MARIETTA CEILING PLT	65.3	92.7
420710509	B & S WOODCRAFTS/QUARRYVILLE	0.0	0.0
420710123	BIGBEE STEEL & TANK CO/RAPHO	0.0	0.0
420710306	BUCK CO INC/QUARRYVILLE	2.2	2.2
420710113	CADMUS JOURNAL SVC/CJS LANCASTER PLT	1.9	1.9
420710063	CLARK FILTER/HEMPFIELD DIVISION PLT	2.1	2.1
420710073	CNH AMERICA/NEW HOLLAND	13.7	14.8
420710106	CONESTOGA WOOD SPECIALTIES/EAST EARL	3.3	3.3

EPA AFS Number	Facility Name	2007 Baseline NO_x Emissions	2020 Projected NO_x Emissions
420710468	DART CONTAINER CORP/E LAMPETER WHSE	1.8	2.6
420710087	DART CONTAINER CORP/LEOLA	26.0	36.0
420712096	DONSCO INC/MT JOY	0.4	0.4
420710109	FENNER INC/FENNER DRIVES	0.0	0.0
420712109	GREINER IND INC/MT JOY TWP PLT	0.0	0.0
420710086	HIGH STEEL STRUCTURES/LANCASTER	1.5	1.7
420710111	INTELLIGENCER PRINTING/INTELL PRINTING LANCASTER C	1.4	1.5
420710094	JL CLARK INC/LANCASTER	2.3	3.2
420710294	KELLOGG USA INC/EAST HEMPFIELD	30.6	43.1
420710499	KEYSTONE QUALITY PROD/LEOLA	0.0	0.0
420710463	KEYSTONE WOOD SPECIA/EAST LAMPETER	0.0	0.0
420710145	LANCASTER CNTY RRF/ LANCASTER	569.7	601.7
420710890	LANCASTER CNTY SWMA/FREY FARM CRESWELL LDFL	0.3	0.3
420710610	LANCASTER	1.6	1.8

EPA AFS Number	Facility Name	2007 Baseline NO_x Emissions	2020 Projected NO_x Emissions
	LAB/LANCASTER		
420710082	LASCO BATHWARE INC/W DONEGAL TWP	1.2	1.2
420710437	MANHEIM AUTO AUCTION/MANHEIM	0.1	0.1
420710014	MARS SNACKFOOD LLC/ELIZABETHTOWN CANDY PLT	15.2	18.9
420710115	NESSCO ENT LLC DBA MERIDIAN PROD/EAST EARL	0.0	0.0
420710270	NEW HOLLAND CUSTOM WOODWORK LTD/NEW HOLLAND	0.0	0.0
420710103	NEXANS INC DBA BERK TEK/NEW HOLLAND	0.0	0.0
420712119	PEPPERIDGE FARM INC/EAST COCALICO TWP PLT	7.4	8.2
420710099	PGH TERM CORP/LANCASTER TERMINAL	0.0	0.0
420710350	PPL RENEWABLE ENERGY/FREY FARM CRESWELL LDFL	18.2	19.2
420710331	PREMIER CUSTOM BUILT INC/E EARL TWP	0.1	0.1
420710092	QUALITY CUSTOM CABIN/EARL	1.2	1.8
420710122	RR DONNELLEY & SONS /NE		11.9

EPA AFS Number	Facility Name	2007 Baseline NO_x Emissions	2020 Projected NO_x Emissions
	DIV LANCASTER WEST		
420710080	RR DONNELLEY & SONS CO/NE DIV LANCASTER EAST	25.6	30.5
420710317	RR DONNELLEY & SONS/LANCASTER FINANCIAL PRINTING D	4.0	4.1
420710348	SIGNATURE CUSTOM CABINETRY/EPHRATA	0.0	0.0
420710510	STYLECRAFT CORP/TERRE HILL	0.0	0.0
420710077	TEXAS EASTERN TRANS/MARIETTA	130.0	164.7
420710121	THE HERSHEY CO/Y & S CANDIES	11.8	12.0
420710772	VALLEY PROTEINS INC/TERRE HILL PLT	36.1	39.2
420710071	ALUMAX MILL PROD INC/MILL PROD	133.9	186.0
	Total Annual NO_x Emissions	1147.3	1346.2

Table 6: MARAMA 2018 Annual Baseline and Projected VOC Point Source Inventories for the Lancaster Ozone Maintenance Area by Facility Source

EPA AFS Number	Facility Name	2007 Baseline VOC Emissions	2020 Projected VOC Emissions
420710071	ALUMAX MILL PROD INC/MILL PROD	252.5	257.8
420710093	AMER LAFRANCE LLC/EPHRATA	17.3	17.3
420710066	ANVIL INTL/COLUMBIA FKA GRINNELL	44.6	44.8
420710035	ARMSTRONG WORLD IND /FLOOR PLT	72.3	79.8
420710036	ARMSTRONG WORLD IND /MARIETTA CEILING PLT	164.8	233.1
420710509	B & S WOODCRAFTS/QUARRYVILLE	20.0	20.0
420710123	BIGBEE STEEL & TANK CO/RAPHO	17.9	19.5
420710306	BUCK CO INC/QUARRYVILLE	55.1	55.1
420710113	CADMUS JOURNAL SVC/CJS LANCASTER PLT	23.7	23.7
420710063	CLARK FILTER/HEMPFIELD DIVISION PLT	21.9	21.9
420710073	CNH AMERICA/NEW HOLLAND	150.7	149.4
420710106	CONESTOGA WOOD SPECIALTIES/EAST EARL	102.0	102.0
420710468	DART CONTAINER CORP/E	95.1	143.1

EPA AFS Number	Facility Name	2007 Baseline VOC Emissions	2020 Projected VOC Emissions
	LAMPETER WHSE		
420710087	DART CONTAINER CORP/LEOLA	706	706.5
420712096	DONSCO INC/MT JOY	11.3	11.3
420710109	FENNER INC/FENNER DRIVES	18.8	18.8
420712109	GREINER IND INC/MT JOY TWP PLT	17.6	18.3
420710086	HIGH STEEL STRUCTURES/LANCASTER	33.3	36.2
420710094	JL CLARK INC/LANCASTER	33.1	36.1
420710294	KELLOGG USA INC/EAST HEMPFIELD	26.3	26.9
420710499	KEYSTONE QUALITY PROD/LEOLA	16.1	16.4
420710463	KEYSTONE WOOD SPECIA/EAST LAMPETER	10.6	10.6
420710145	LANCASTER CNTY RRF/ LANCASTER	1.9	2.0
420710890	LANCASTER CNTY SWMA/FREY FARM CRESWELL LDFL	4.0	4.2
420710610	LANCASTER LAB/LANCASTER	10.6	12.3
420710082	LASCO BATHWARE INC/W DONEGAL TWP	21.2	21.2
420710437	MANHEIM AUTO	11.5	12.1

EPA AFS Number	Facility Name	2007 Baseline VOC Emissions	2020 Projected VOC Emissions
	AUCTION/MANHEIM		
420710014	MARS SNACKFOOD LLC/ELIZABETHTOWN CANDY PLT	75.8	76.0
420710270	NEW HOLLAND CUSTOM WOODWORK LTD/NEW HOLLAND	12.8	12.8
420710103	NEXANS INC DBA BERK TEK/NEW HOLLAND	32.6	32.6
420712119	PEPPERIDGE FARM INC/EAST COCALICO TWP PLT	24.4	24.4
420710099	PGH TERM CORP/LANCASTER TERMINAL	11.1	12
420710350	PPL RENEWABLE ENERGY/FREY FARM CRESWELL LDFL	3.7	3.9
420710331	PREMIER CUSTOM BUILT INC/E EARL TWP	21.2	21.2
420710092	QUALITY CUSTOM CABIN/EARL	50.2	50.2
420710122	RR DONNELLEY & SONS /NE DIV LANCASTER WEST	95.8	95.8
420710080	RR DONNELLEY & SONS CO/NE DIV LANCASTER EAST	246	246.4
420710317	RR DONNELLEY & SONS/LANCASTER FINANCIAL PRINTING D	29.1	29.1

EPA AFS Number	Facility Name	2007 Baseline VOC Emissions	2020 Projected VOC Emissions
Emission Reduction Credits	RR DONNELLEY & SONS CO	0.0	16.0
420710348	SIGNATURE CUSTOM CABINETS/EPHRATA	25.4	25.4
420710510	STYLECRAFT CORP/TERRE HILL	11.1	11.1
420710077	TEXAS EASTERN TRANS/MARIETTA	6.9	7.6
420710121	THE HERSHEY CO/Y & S CANDIES	15.7	15.9
420710772	VALLEY PROTEINS INC/TERRE HILL PLT	1.8	1.9
420710089	WELLBORN HOLDINGS INC/LUXURY CUSTOM CABINETS NEW	21.9	21.9
420710071	ALUMAX MILL PROD INC/MILL PROD	252.5	257.8
420710093	AMER LAFRANCE LLC/EPHRATA	17.3	17.3
	Total Annual VOC Emissions	2691.8	2850.7

Area Source Category Emissions

The area source category include emissions from sources such as surface coating, solvent use, residential and commercial heating, and other sources that emit small amounts of emissions on a per use basis but have a large number of users. The Lancaster Ozone Maintenance Plan relied on a number of socioeconomic indicators to estimate emissions, and projections of emissions, such as: population, industrial employment, employment, and industry specific growth factors. In the maintenance plan, a baseline area source inventory of 2002 was grown using socioeconomic factors of expected population and employment growth. For some sources, such as coal-, distillate-, or natural gas-fired boilers, data from the 2005 Annual Energy Outlook or the EGAS model was used to predict future growth and emissions. For other area source categories, state-specific industry growth estimates supplied by the Department were used.

Area Source Category 2009 Emissions

Table 7 shows a recent estimate of actual socioeconomic indicators. Actual growth that occurred from 2002 to 2009 was derived from data published by the U.S. Department of Commerce, Bureau of Census^{3,4,5} and the Energy Information Administration, U.S. Department of Energy⁶. The actual growth is compared side-by-side with the predicted growth from the Lancaster Ozone Maintenance Plan. The Lancaster Ozone Maintenance Plan over-predicted growth for most area sources for the 2002 to 2009 timeframe. In one category in the maintenance plan, actual growth was slightly higher than predicted growth: total natural gas consumption compared to natural gas consumption in boilers.

³ U.S. Department of Commerce, Bureau of the Census, "Population Estimates Program," T1. Population Estimates [10] data Set: 2008 Population Estimates, available from <http://www.census.gov/popest/counties/CO-EST2009-01.html>, accessed October 2011.

⁴ U.S. Department of Commerce, Bureau of the Census, Housing Unit Estimates, Data Set 2002 and 2009 Population Estimates, Note: For information on errors stemming from model error, sampling error, and non-sampling error, see: <http://www.census.gov/popest/topics/methodology>, accessed October 2011.

⁵ Employee and establishment numbers: U.S. Census Bureau, County Business Patterns, <http://factfinder.census.gov/econ/cbp/index.html>

⁶ Energy Information Administration, U.S. Department of Energy, State Energy Data System - Consumption, Physical Units, 1960-2006, available from: http://www.eia.gov/state/seds/seds-states.cfm?q_state_a=PA&q_state=Pennsylvania

Table 7: Revised Socioeconomic Data for the Lancaster Ozone Maintenance Area Relative to Projected Growth in the Lancaster Area Maintenance Plan (2002-2009)

Surrogate Indicator for Growth	Actual Use 2002	Actual Use 2009	Actual Growth 2002-2009	Maintenance Plan Growth (2002-2009)
Population	478,078	507,766	1.062	1.0918
Total Employees	214,288	211,461	1.011	1.1321
Total Coal Consumption (short tons)	403,596	261,637	0.648	0.7488
Total Natural Gas Consumption (million cubic ft.)	23,522	25,022	1.064	---
Natural Gas Boilers	---	---	---	1.0105
Natural Gas, Residential	---	---	---	1.0841
Total Heating Oil Consumption (barrels)	2,560,787	2,493,497	0.974	0.9807

Area Source Category 2018 Emissions

The Lancaster Ozone Maintenance Plan estimated area source sector growth using a baseline inventory from 2002 and growing emissions to the maintenance years of 2009 and 2018, based on the growth of socioeconomic activity.⁷ Data used to revise growth estimates was obtained from the same MARAMA inventory effort described in the point source section above. The effort used a baseline inventory of 2007 and maintenance year inventories of 2017, 2020, and 2025.⁸ Just as in the point source emissions, these inventory years made a direct comparison of emissions and growth rates difficult because the MARAMA baseline years and projected inventory years were too dissimilar from what was included in the Lancaster Ozone Maintenance Plan. Therefore, the emissions growth predicted to occur from 2009 to 2018 was determined through linear interpolation by using emission estimates for 2007 and 2020 from the new MARAMA inventory. Projected growth between 2009 and 2018 in the Lancaster Ozone Maintenance Plan was estimated using the 2009 and 2018 emission estimates. In Table 8, the revised growth projections are given.

⁷ State Implementation Plan Revision: Maintenance Plan and Base Year Inventory Lancaster Eight-Hour Ozone Nonattainment Area, September 2006, Appendix B-1, Area Source Methodology, p.2.

⁸ Mid-Atlantic Regional Air Management Association,

The growth rate predicted in the maintenance plan from 2009 to 2018 is derived by the following formula:

$$\text{Growth Factor}_{(2009-2018)} = \left(\frac{\text{Growth Factor}_{(2002-2018)} - \text{Growth Factor}_{(2002-2009)}}{\text{Growth Factor}_{(2002-2009)}} \right) + 1$$

A straight line interpolation between the 2007 MARAMA baseline emissions and the 2020 MARAMA projected emissions was used to calculate emissions for the years 2009 and 2018. From these interpolated emissions (see equations 1 and 2 below), the projected growth between 2009 and 2018 was calculated (see equation 3 below). Fossil fuel combustion surrogates in Table 8 represent most emissions of NO_x, while ‘population’ and ‘employees’ represent the best surrogates for many source categories that produce VOC emissions. The surrogates for growth shown in Table 8 are used to predict revised growth for a large majority of emissions from area source categories in the Lancaster Ozone Maintenance Plan revision.

$$(1) \text{ 2009 Emissions} = 2007 \text{ Emissions} + (2020 \text{ Emissions} - 2007 \text{ Emissions}) * \left(\frac{2009 - 2007}{2020 - 2007} \right)$$

$$(2) \text{ 2018 Emissions} = 2007 \text{ Emissions} + (2020 \text{ Emissions} - 2007 \text{ Emissions}) * \left(\frac{2018 - 2007}{2020 - 2007} \right)$$

$$(3) \text{ Emissions Growth}_{(2009-2018)} = \left(\frac{2018 \text{ Emission} - 2009 \text{ Emissions}}{2009 \text{ Emissions}} \right) + 1$$

Table 8: Revised Socioeconomic Data for the Lancaster Ozone Maintenance Area Relative to the Projected Growth in the Lancaster Area Maintenance Plan (2009-2018)

Indicator for Growth	Revised Growth In MARAMA Inventory (2009-2018)	Maintenance Plan Growth (2009-2018)
Population	1.0509	1.1081
Employees	1.0113*	1.1499
Anthracite Coal, Industrial	0.9799	0.9988
Anthracite Coal, Commercial	1.0055	0.9865
All Combuster Types, Distillate Oil, Residential	0.9615	0.9598
Boilers and Internal Combustion Engines, Natural Gas, Commercial	1.0154	1.0521
Combuster Types, Natural Gas, Residential	1.0034	1.0181

*The MARAMA inventory estimated growth in employment based on statewide North American Industry Classification System codes. NAICS codes proved too cumbersome to establish employment growth on the county level. Employment growth in Table 8 was derived from U.S. Census Bureau industrial employment data and was not developed by MARAMA.

Table 8 shows that, for the most part, growth in the Lancaster Ozone Maintenance Plan is comparable to new assumptions developed by the MARAMA inventory effort. It deserves mentioning that the two sets of employee growth that are compared in Table 8 were estimated using two different methods. It is safe to assume that, due to the severe economic downturn experienced from 2007 to 2009, employee growth does not approach what was predicted in the Lancaster Ozone Maintenance Plan. Most types of VOC emissions relied on population and employment data to grow emissions. Population and employment show clearly that current projections are well below what was projected in the Lancaster Ozone Maintenance Plan. Emissions of NO_x from area sources are dominated by fossil fuel combustion. While two categories, commercial anthracite coal consumption and residential distillate consumption, show that the maintenance plan predicts less fossil fuel growth than current growth assumptions in the MARAMA inventory, the difference in these two categories is small enough to demonstrate that the emissions growth for 2018 is over-predicted in the maintenance plan.

Nonroad Source Category Emissions

Emissions from the nonroad category are produced by many different types of vehicles and equipment. The EPA's NONROAD Model estimates emissions for over 200 types of equipment, engines and vehicles. Nonroad engines and vehicles can be used for such applications as construction, lawn and garden care, farming, and commercial and industrial applications. In addition, emissions from three types of activities including aircraft, locomotives, and commercial marine vessels are not estimated in the NONROAD Model but are still included in the nonroad category. The aircraft, rail, and commercial marine emissions are estimated outside of the NONROAD Model. In the approved Lancaster Ozone Maintenance Plan, the NONROAD2005 model was used to estimate nonroad emissions. The model went through one major revision since it was used for the maintenance plan. NONROAD2008a is the latest version of this model. This new version of the model incorporated two reduction strategies that affect engines and vehicles in the nonroad sector:

- Diesel recreational marine standards in the 2008 final rule on locomotive and marine engines (73 FR 25098); and
- The October 2008 small spark ignition and spark ignition and recreational marine rule (73 FR 59034).

For the Lancaster Ozone Maintenance Plan, the Department modified files in the NONROAD Model, when state specific data was available for emission categories such as residential lawn and garden.

Emissions from nonroad sources have decreased since the submittal of the Lancaster Ozone Maintenance Plan, as a result of the additional controls mentioned and other tier level controls that have been phased in with fleet turnover since 2004. The fleet turnover that occurs as older, more polluting nonroad equipment and vehicles are replaced by newer equipment and vehicles

that meet more stringent emission standards has continued to lower emissions in the nonroad sector since the late 1990s and will continue to do so for the next 10 years. Emission reductions occurred across all segments of the nonroad category, including construction equipment, farming equipment, locomotives, and lawn and garden equipment. Modeling runs were not completed for the nonroad emission source categories. The Department will treat nonroad emissions in the Lancaster Area as non-changing from their 2004 levels for the purpose of this SIP revision, even though full scale modeling runs using the NONROAD2008a would show nonroad emissions in a decline.

Highway Source Category Emissions

Highway emissions were estimated by Michael Baker, Jr., Inc., who is a consultant to the Pennsylvania Department of Transportation. The methodology for estimating emissions of highway vehicles is greatly different than what was used in the Lancaster Ozone Maintenance Plan because an entirely new highway emissions model is being used. Highway emissions are being estimated using the MOVES Model instead of the Mobile6 Model. With this change, a new set of inputs were used in the MOVES Model. The method for how traffic growth or vehicle miles travelled was forecasted remains the same as what was used in the Lancaster Ozone Maintenance Plan. Both the revised maintenance plan and the original maintenance plan used the *Statistical Evaluation of Projected Traffic Growth*. A revised Appendix C, Maintenance Plan Update for the Lancaster (Lancaster County) Eight-Hour Ozone Maintenance Area: Motor Vehicle Emission Budget Revisions Using MOVES2010a, is attached. Also attached, please find Appendix C-1, Mobile Source Highway Emissions Inventory – An Explanation of Methodology.

The MOVES Model estimates that highway vehicle emissions increase greatly for VOC and NO_x for the 2009 and 2018 attainment years when compared to the highway vehicle emission estimates included in the Lancaster Ozone Maintenance Plan for those same years. (See Table 9). MOVES also increases the emission estimates of the 2004 attainment year. Since the emissions increase in both the attainment and maintenance years, MOVES modeled emissions, like Mobile modeled emissions, of highway vehicles still show a large decrease in emissions between 2004 and 2009 and between 2004 and 2018.

Table 9: Revised Motor Vehicle Emissions Using MOVES2010a

Pollutant	Original MOBILE6.2 Emissions			Revised MOVES2010a Emissions		
	2004	2009	2018	2004	2009	2018
VOC (tons/day)	19.75	14.33	7.77	16.41	14.29	8.14
NO _x (tons/day)	32.33	22.32	8.99	42.10	33.18	18.57