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DEPARTMENT OF ENVIRONMENTAL PROTECTION

PROPOSED

Volume I
State Implementation Plan Revision: NOx Motor Vehicle Emission Budget Revisions Based on the MOVES2010a Model

Reading Eight-Hour Ozone Maintenance Area for the 1997 Ozone National Ambient Air Quality Standard

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1. Introduction and Overview of Ground-Level Ozone

Maintaining concentrations of ground-level ozone below the health-based 8-hour ozone national ambient air quality standards (NAAQS) is important because ozone is a serious human health threat and can cause damage to important food crops, forests, and wildlife.

Repeated exposure to ozone pollution may cause a variety of adverse health effects for both healthy people and those with existing conditions including: difficulty breathing, chest pains, coughing, nausea, throat irritation, and congestion. Ozone exposure can exacerbate bronchitis, heart disease, emphysema, and asthma, and reduce lung capacity. Asthma is a significant and growing threat to children and adults. Ozone can aggravate asthma, causing more asthma attacks, increased use of medication, more medical treatment and more frequent visits to hospital emergency clinics. Because ozone pollution usually forms in hot weather, anyone who spends time outdoors in the summer may be affected, particularly children, the elderly, outdoor workers and people exercising. Children are most at risk from exposure to ozone because they are active outside during the summertime when ozone levels are highest.

Ozone is one of the most pervasive and detrimental pollutants known to affect vegetation, causing more injury to trees and crops than any other air pollutant in the United States. Ozone interferes with photosynthesis, the process by which plants convert water and sunlight to food. Ozone makes plants more susceptible to disease, insects, other pollutants and harsh weather. It damages the foliage of trees and other plants, ruining the landscapes of cities, parks, forests, and recreation areas. Research has shown that current ozone concentrations result in reductions in wood growth of over 10 percent in forests of the Northeast United States. There is strong scientific evidence showing that current levels of ozone are reducing crop yields, particularly in sensitive species such as soybean, cotton, and peanuts. Annual crop loss alone from ozone-affected soybeans in Illinois, Indiana and Ohio has been calculated to fall between $199 million and $346 million. The U.S. Environmental Protection Agency (EPA) has estimated national crop yield losses due to ozone in excess of $1 billion annually. One of the key components of ozone, oxides of nitrogen, contributes to fish kills and algae blooms in sensitive waterways, such as the Chesapeake Bay.

Ozone is not emitted directly to the atmosphere, but is formed by photochemical reactions between volatile organic compounds (VOCs) and oxides of nitrogen (NO_X) in the presence of sunlight. The long, hot, humid days of summer are particularly conducive to ozone formation, so ozone levels are of concern primarily during the months of May through September. The primary sources of man-made VOCs and NO_X, the ozone precursors, are the evaporation of fuels and solvents (gasoline and consumer products), combustion of fuels (motor vehicles, power plants and non-road engines), and industrial processes.

1.1. 1997 8-Hour Ozone National Ambient Air Quality Standards

In July 1997, the EPA established identical primary and secondary 8-hour ozone NAAQS at a concentration of 0.08 parts per million (ppm), based on the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentrations measured in the ambient air at each monitored location. Implementation of the standards was delayed due to litigation. In April

2004, EPA designated the Reading Area, which consists of all of Berks County, as nonattainment for the 1997 8-hour ozone standard, based on ambient air quality monitoring data collected from 2001-2003. See 69 FR 23858 (April 30, 2004). The Reading Area was one of seventeen areas in Pennsylvania designated as an 8-hour ozone nonattainment area for the 1997 ozone NAAQS.

On March 12, 2008, the EPA revised the NAAQS for ozone to 0.075 ppm averaged over 8 hours to provide even greater protection for children, other at-risk populations and the environment against the array of ozone-induced adverse health and welfare effects. See 73 FR 16436 (March 27, 2008). The EPA had begun a voluntary reconsideration of the 2008 ozone NAAQS in January 2010 to set a more protective 8-hour ozone standard (75 FR 2938), but withdrew that reconsideration at the request of the President of the United States on September 2, 2011, leaving the 2008 ozone standard in place. On May 21, 2012, the EPA published a final rule for the 2008 8-hour ozone NAAQS, implementing the nonattainment area classification approach and attainment deadlines, and revoking the 1997 ozone NAAQS for the purpose of transportation conformity (77 FR 30160). The EPA has stated that it will promulgate an additional implementation rule for the 2008 ozone NAAQS to address State Implementation Plan (SIP) requirements and other issues.

States will need to submit SIP revisions to demonstrate how they will bring the nonattainment areas into attainment of the 2008 ozone NAAQS. Nevertheless, the promulgation of the new ozone standard does not affect the need for this revision to the approved maintenance plan for the Reading Area (Reading Ozone Maintenance Plan) under the 1997 ozone NAAQS.

1.2. Reading Area and Ozone SIP Revisions

On January 25, 2007, the Department submitted a SIP revision to the EPA requesting redesignation of the Reading Area to attainment of the 1997 ozone NAAQS. The Department concurrently submitted a SIP revision (2007 Reading SIP revision) to the EPA that included a maintenance plan based on the attainment and continued long-term attainment of the 1997 ozone NAAQS for the Reading Area (Reading Ozone Maintenance Plan), the 2002 baseline inventory, and motor vehicle emission budgets (MVEBs) to be used for purposes of transportation conformity. The EPA's transportation conformity regulation, found at 40 CFR Part 93, Subpart A, requires that the transportation plan, transportation improvement program (TIP), and projects not from a conforming transportation plan and TIP must be consistent with the MVEBs in the applicable air quality SIP. This criterion is satisfied if the state can demonstrate that emissions of the pollutants or pollutant precursors for which the area is in nonattainment or maintenance, and for which the applicable SIP contains MVEBs approved or deemed adequate by the EPA, are less than or equal to the MVEBs established in the applicable SIP or SIP submission. The metropolitan planning organization for the area, the Berks County Planning Commission, ensures that emissions resulting from its TIP are less than the MVEBs in the SIP by completing periodic conformity determinations, which are subject to public comment. The EPA approved all of the components of the 2007 Reading SIP revision, including the MVEBs, on August 24, 2007 (72 FR 48559), and redesignated the Reading Area to attainment.

The approved MVEBs included in the approved Reading Ozone Maintenance Plan were estimated using the EPA-approved highway emissions model in effect at that time, the Highway

Mobile Source Emission Factor Model version 6.2 (Mobile6.2). The MVEB in the Reading Ozone Maintenance Plan included emission budgets for both NO_X and VOC. On March 2, 2010, the EPA released a new mobile source emissions model called the Motor Vehicle Emission Simulator 2010 (MOVES2010). The EPA provided a two-year grace period to transportation planning organizations, ending March 2, 2012, during which the older Mobile6.2 emissions model could be used to model emissions for transportation projects in order to meet the requirements of transportation conformity (75 FR 9411 (March 2, 2010)). In September 2010, EPA approved a revised version of the MOVES2010 model (MOVES2010a). On October 13, 2011, the EPA proposed a one-year extension to the two-year grace period because states and localities needed more time to transition to using MOVES2010a and to develop the technical capacity to use MOVES2010a (76 FR 63575). The EPA finalized the extension on February 27, 2012 (77 FR 11394). The extension allows states and localities to better evaluate whether SIPs and MVEBs, or transportation plans and TIPs, should be revised for future conformity determinations. The 1-year extension provides additional time that may be critical for nonattainment and maintenance areas to learn and apply MOVES2010a for regional conformity analyses. Any new transportation conformity analysis started after March 2, 2013, must use the most up-to-date version of MOVES.

EPA issued the MOVES2010b version of the model and its associated guidance in April 2012. EPA considers both MOVES2010a and MOVES2010b to be minor revisions to MOVES2010 that do not significantly affect the results of modeling criteria pollutant estimates for highway vehicles. References to "MOVES" in the remainder of this document relate to all of the approved versions of the model. The highway vehicle emissions modeling for this proposed SIP revision was already developed significantly using MOVES2010a. By the time that version 2010b was issued, using MOVES2010b would have been impractical.

Compared to Mobile6.2, the MOVES model estimates higher NO_X emissions and, in some areas, higher VOC emissions being produced by highway vehicles, depending on the model inputs for a specific area. Emissions of NO_X estimated using MOVES will always be greater for transportation planning than the NO_X emissions accounted for in the MVEBs estimated using Mobile6.2. As a result, comparing emissions from the MOVES model to the MVEBs included in the approved maintenance plan would not allow local and regional transportation planning agencies to meet the requirements of transportation conformity; the emissions budget in the maintenance plan would be exceeded and transportation planning could be adversely affected. This is why the Department is updating the MVEBs for the Reading Area using the EPA-approved emissions model, MOVES2010a.

It is important to mention that higher emission estimates calculated by MOVES2010a do not mean that emissions from vehicles dramatically increased. The MOVES model better estimates emissions that are already being produced by vehicles. Consequently, the ability of the area to maintain the standard will not be affected by using estimates produced by the new model.

1.3. EPA Requirements for Developing and Revising Maintenance Plans

The 2007 Reading SIP revision redesignation request is consistent with the September 4, 1992, EPA memorandum written by John Calcagni, Director, Air Quality Management Division, entitled, *Procedures for Processing Requests to Redesignate Areas to Attainment*. For the

Reading Ozone Maintenance Plan, the Department produced an emissions inventory for NO_X, VOC, and carbon monoxide (CO) for 2004, the attainment year, which included ambient air quality monitoring data that showed emissions that met the 1997 ozone NAAQS in the Reading Area. The inventory was based on a "typical summer day," as required by the EPA. The Department developed an emissions inventory for 2018 that demonstrated that the area would meet the 1997 ozone NAAQS for a 10-year period following redesignation of the area to attainment. The emissions inventory for 2018, a maintenance year, showed that emissions of NO_X, VOC, and CO in the Reading Area would not exceed emissions that occurred in 2004. The maintenance year is a year at least 10 years in the future that a state chooses to demonstrate that emissions over a 10-year period of analysis will not lead to an exceedance of the standard. A state does this by showing that emissions in the maintenance year are less than emissions in the attainment year.

An emissions inventory in the 2007 Reading SIP revision showed that emissions in 2009, the interim year, did not exceed emissions in 2004, the attainment year. The 2009 and 2018 inventories both considered future growth projected from a 2002 baseline year, and included emission reductions from permanent and enforceable control measures.

This proposed SIP revision updates highway emissions estimates using the MOVES2010a model. The Department need not update emissions estimates for nonroad sources for several reasons. For one, the growth assumptions for emissions from nonroad sources in the 2007 Reading Ozone Maintenance Plan for the year 2009 were greater than the documented growth that actually occurred from 2002 to 2009. Additionally, newer, updated emission growth projections to 2018 for nonroad sources are less than emission growth projections for these sources in the Reading Ozone Maintenance Plan. A few indicators of growth used to project the area source emissions inventory in the Reading Ozone Maintenance Plan were less than actual area source growth factors used in this proposed SIP revision. Also in this proposed SIP revision, linearly interpolated 2018 point source emission estimates derived from the Mid-Atlantic Regional Air Management Association (MARAMA) recent effort for modeling ambient particulate matter concentrations are used to revise 2018 projected point source emissions in the Reading Ozone Maintenance Plan.

Ambient air quality monitoring results for the Reading Area demonstrate continued attainment of the 1997 ozone NAAQS (0.08 ppm, with rounding, 84 parts per billion (ppb)), as shown in Table 1. Preliminary monitoring results for 2012 indicate a design value of 79 ppb.

Table 1: Reading Area 2011 Design Values

Monitor	2009 4th Highest	2010 4th Highest	2011 4th Highest	3-Year Average or Design Value[1]
Kutztown 42-011-0006	63 ppb	78 ppb	73 ppb	71 ppb
Reading Airport 42-011-0011	72 ppb	84 ppb	75 ppb	77 ppb

[1] A "design value" is the annual fourth highest daily maximum 8-hour ozone concentration, averaged over three years.

The EPA Office of Transportation and Air Quality developed guidance titled, *Policy Guidance on the Use of MOVES2010 and Subsequent Minor Revisions for State Implementation Plan Development, Transportation Conformity, and Other Purposes*, (MOVES2010 guidance) EPA 420-B-12-010, April 2012. This guidance describes requirements for SIP revisions. For maintenance demonstrations, areas can have a revised motor vehicle emissions inventory and budget using MOVES without revising emissions for other sectors included in the applicable SIP or completing additional modeling if:

- The SIP continues to meet applicable requirements when the previous motor vehicle emissions inventories are replaced with inventories generated by MOVES2010a; and,
- The state can document that growth and control strategy assumptions for non-motor vehicle sources continue to be valid and minor updates do not change the overall conclusions of the SIP.

The EPA further states that if both of the criteria are met, the state can simply re-submit the original maintenance plan with the revised motor vehicle emissions inventories, using the most current version of the MOVES model. However, if either criterion is not met, the emissions categories in the maintenance plan that have changed must be brought up to date.

Since the second criterion listed above is not met for point source or area source emissions, this proposed SIP revision includes information addressing the recommendations described in the MOVES2010 guidance, listed here:

- Demonstration that the 1997 ozone NAAQS approved maintenance plans continue to meet applicable requirements with the revised motor vehicle emissions inventories, as calculated by the most recently approved MOVES model, and recalculation of the attainment year, interim year and maintenance year MVEBs with the latest planning assumptions, including documentation of the updated assumptions;
- Review of the point, area, and nonroad emissions inventories for the interim year and maintenance year to determine if growth and control strategy assumptions have changed and, if so, development of an analysis to determine if these changes affect the conclusion

of the maintenance plan that air quality will remain compliant with the 1997 ozone NAAQS; and

- Assessment to confirm excess emissions in the SIP revision exist prior to allocating them to the MVEBs and the quantification of these excess emissions for use in the safety margin applied to the MVEBs.

1.4. Maintenance Plan Demonstration and Motor Vehicle Emissions Budgets

Table 2 shows the revised 2004, 2009 and 2018 NO_X MVEBs calculated using the latest planning assumptions for the Reading Area using MOVES2010a. Only revised NO_X budgets have been included in Table 2 and revised in this proposed maintenance plan revision, as the existing MOBILE6.2-based VOC MVEBs are sufficient for future conformity determinations. Assumptions used in the MOVES2010a modeling, including model inputs, growth assumptions and modeling methodology, are provided in Appendix C. Highway vehicle emissions show a clear, downward trend.

Table 2: Motor Vehicle Emissions Budgets

Year	NO_X Emissions (tons/day) (MOVES2010a)	VOC Emissions (tons/day) (MOBILE6.2)
2004 Attainment Year	34.40	17.0
2009 Modeled Emissions	26.98	12.1
Conformity Portion of Safety Margins[1]	2.00	1.00
2009 Interim Year Budget	28.98	13.1
2018 Modeled Emissions	12.90	6.5
Conformity Portion of Safety Margins	2.00	1.00
2018 Maintenance Year Budgets	14.90	7.5

[1] A "safety margin" is the amount of emissions by which the total projected emissions from all sources of a given pollutant are less than the total emissions that would satisfy the applicable requirement for reasonable further progress, attainment, or maintenance (40 CFR §93.101). The state may designate a portion of these emissions for use by the Metropolitan Planning Organization (MPO) or Department of Transportation (DOT) as a safety margin to be used for transportation projects. See 40 CFR §93.124(a) for application of a safety margin.

1.5. Non-Mobile Inventory Review

As explained above, the EPA states in its MOVES2010 guidance that revisions to existing SIPs and budgets must continue to meet applicable requirements under the Clean Air Act. A maintenance plan revised to take into account new emission estimates due to an update in the highway model must demonstrate that attainment of the standard continues, even with updated control measures and growth estimates. This proposed SIP revision includes increases in the maintenance plan's NO_X emission estimates for the attainment, interim and maintenance years resulting from revising highway emissions using MOVES instead of the Mobile6.2 model. This proposed SIP revision also accounts for emissions of point, area, and nonroad sources using the latest planning assumptions and growth estimates. Total emissions in the years 2009 and 2018 cannot exceed the emissions in the 2004 attainment year inventory. The Department concludes that the Reading Area will continue to demonstrate attainment of the 1997 ozone NAAQS because total emissions of NO_X in the interim year and maintenance year will be less than the 2004 attainment year inventory for NO_X. Developing a revised highway inventory for CO is unnecessary for this proposed SIP revision because CO emissions decrease using MOVES in place of the Mobile6.2 model. VOC emissions are not being updated because VOC emission estimates for the Reading Area do not increase to the point at which the existing budget is exceeded when using the MOVES2010a model.

Growth and control strategy assumptions have changed for all of the emission categories since the Reading Ozone Maintenance Plan was approved. The changes in these assumptions have generally decreased forecasted emissions in future years. A severe economic recession occurred since the maintenance plan was approved and employment was greatly depressed, falling short of the employment projections in the maintenance plan for the year 2009. More controls of source categories have been implemented at both the federal and state level. The nonroad NO_X emission inventory is not being revised for the interim and maintenance years in this proposed SIP revision. The point source NO_X emission inventory is being updated. The Department compared updated growth estimates with growth assumptions and growth estimates in the Reading Ozone Maintenance Plan. That analysis is included below. More detailed information can be found in Volume II: Technical Support Document.

Some SIP revisions for certain areas in the Commonwealth will require the Department to update growth and strategy assumptions of point, area, and non-road sources. A number of areas in the Commonwealth are home to newly built point sources, such as electric generating units (EGUs). Some areas have experienced Marcellus Shale gas development, which has increased area source emissions.

The EPA developed the Clean Air Interstate Rule (CAIR) in 2005 to control emissions from EGUs. See, 70 FR 25162 (May 12, 2005) and later amendments. The U.S. Court of Appeals for the D.C. Circuit remanded CAIR in December 2008, without vacating it, in *North Carolina v. EPA*, 531 F.3d 896, *modified,* 550 F.3d 1176 (D.C. Cir. 2008. EPA developed the Cross-State Air Pollution Rule (CSAPR) in 2011 to limit the transport of NO_X and sulfur dioxide, which could have changed projected emissions of point sources. See, 76 FR 48208 (Aug. 8, 2011), and later revisions. The court vacated CSAPR on August 21, 2012, however, and ordered EPA to continue administering CAIR pending the promulgation of a valid replacement. The court recently denied EPA's requests that the court rehear the case. See, *EME Homer City Generation L.P. v. EPA,* 696 F.3d 7 (D.C. Cir. 2012), *rehearing denied,* 2013 U.S. App. LEXIS 1623 and

1624 (D.C. Cir. Jan. 24, 2013). Following the court's direction, CAIR remains in place. On November 19, 2012, EPA Assistant Administrator Gina McCarthy issued a memorandum stating that it is appropriate for EPA to rely on CAIR reductions as permanent and enforceable until court proceedings are resolved or, if the vacatur of CSAPR remains in place, until EPA promulgates a replacement and state plans for implementation are approved. Some owners and operators of EGUs have responded to new economic and regulatory developments by closing coal-fired electric generation units or by switching fuels (to natural gas) at their facilities. The Department has considered these developments and concluded that some changes apply to EGUs in the Reading Area.

Table 3 shows that NO_X emissions in the interim and maintenance years will not exceed overall emissions from all sources in 2004, the attainment year, even though highway emissions for NO_X are greater in the Reading Area when modeled by MOVES than when the emissions were estimated by Mobile6.2 in the Reading Ozone Maintenance Plan. Actual emissions for the 2009 point sources, area sources grown with updated growth factors to 2009 and updated 2018 projected point source and area source emissions are included in this SIP revision inventory. Projected nonroad category emissions from the Reading Ozone Maintenance Plan are used for 2009 and 2018 in this proposed SIP revision. Projected nonroad sources do not need to be updated because emissions from these categories have not increased appreciably since the Reading Ozone Maintenance Plan was submitted to the EPA. Attainment of the 1997 ozone standard is maintained by showing revised actual and projected growth for 2009 and 2018 does not increase overall future emissions included in the Reading Ozone Maintenance Plan. This proposed SIP revision demonstrates that growth assumptions in the Reading Ozone Maintenance Plan forecast greater growth than what actually occurred or will occur in the major source category segments.

Table 3: Revised Reading Area NO_X Emissions from 2004 to 2018

NO_X in tons/day					
Year	**Point**	**Area**	**Nonroad**	**Highway**	**Total**
2004	16.00	2.12	10.30	36.40	64.82
2009	11.51	2.31	8.40	28.98	51.20
Δ(2004-2009)	-4.49	0.19	-1.90	-7.42	-13.62
2018	12.60	2.11	5.40	14.90	35.01.
Δ(2004-2018)	-3.40	-0.01	-4.90	-21.50	-29.81

2. Source Category Emissions

2.1. Point Source Category Emissions

2.1.1. CONTROL MEASURES

At the time of the development of the Reading Ozone Maintenance Plan, many large sources were affected by the requirements of the federal CAIR. Pennsylvania implemented NO_X control programs, including implementation of CAIR, which control NO_X from large industrial boilers, internal combustion engines, electric generating units, and cement kilns. Another control measure took effect for NO_X emissions for point sources after the Reading Ozone Maintenance Plan was approved. New Source Performance Standards (NSPS) have been promulgated that affect newly manufactured stationary engines installed at facilities after January 1, 2012. The NSPS standards reduce NOx on 50 percent of new engines initially and are phased in to affect 100 percent of engines beginning in 2014. The NOx emission standard is 95 percent cleaner for the affected engines.

2.1.2. GROWTH ESTIMATES IN THE READING OZONE MAINTENANCE PLAN

Annual point source inventories using historical emissions data reported to the Department by point source facilities were included in the Reading Ozone Maintenance Plan. The Department developed an emissions inventory of point sources for calendar years 2002 and 2004. The 2002 point source emissions inventory represents a time when the Reading Area did not meet the 1997 ozone NAAQs. The 2004 point source inventory showed emissions that occurred during 2004, the attainment year for the 1997 ozone NAAQS.

Emission projections for the point source sector for 11 states, including Pennsylvania, and the District of Columbia, were prepared for MARAMA by MACTEC Federal Programs, Inc. (MACTEC). Future year projections were developed by MACTEC so that states could use the point source inventories in their SIPs. Emission projections were prepared for years 2009 and 2018.

For the purpose of projecting emissions into the future, the point source inventory in the Reading Ozone Maintenance Plan was divided into two subsectors – the EGU sector and the non-EGU sector. Different projection methods were used for those two sectors. For the EGU sector, the Mid-Atlantic/Northeast Visibility Union (MANE-VU) effort used the Integrating Planning Model (IPM) to project future electric generation, as well as to calculate the impact of control programs on future emission levels. The Reading Area has two EGU emission facilities. For the non-EGU sector, growth factors were developed by using the EPA's Economic Growth Analysis System Version 5.0 (EGAS 5.0). The U.S. Department of Energy fuel consumption forecasts were used to replace default values in EGAS 5.0. Also, state-supplied population, employment, and other emission projection data were used to update and enhance the EGAS 5.0 default values.

GenOn's Titus Generating Station, which is one of the top two point source producers of NO_X in the Reading Area, is scheduled for shutdown before the 2018 maintenance year. The SIP revision treats Titus Generating Station as if it will be active in 2018. With this in mind, this revision is conservative in its emission estimate of NO_X for point sources.

2.1.3. POINT SOURCE CATEGORY CONCLUSION

Projected NO_X emissions for 2009 in the Reading Ozone Maintenance Plan are being revised with actual emissions for point sources in 2009, because the actual emissions are readily available and allow easy comparison between the projected emissions in the maintenance plan and the actual emissions. The Department assessed point source emissions by comparing the actual emissions inventory data submitted to the Department by owners and operators of point sources for 2009 to the estimated 2009 NO_X emissions from point sources in the Reading Ozone Maintenance Plan. The Reading Ozone Maintenance Plan overestimated point source emissions for 2009. Table 4 shows that the projected point source emissions of NO_X in the maintenance plan were 5.3 tons per day more than actual 2009 point source emissions. Actual emissions of NO_X declined significantly from 2004 to 2009, even when compared to the slow growth in emissions forecasted in the Reading Ozone Maintenance Plan.

Table 4: 2009 Point Source Emissions - Maintenance Plan Estimates Versus Actual

2009 Emissions	**NO_X (tons/day)**
Maintenance Plan Estimate	16.8
Actual Emissions	11.5

In this proposed SIP revision, the Department revises the 2018 inventory in the Reading Ozone Maintenance Plan by using emissions from the inventory developed by MARAMA. Because the updated inventory produced by MARAMA uses different years for the baseline and projected inventories, and different surrogates to estimate growth than those used in the Reading Ozone Maintenance Plan, comparison between growth factors used to produce the two inventories is difficult. The MARAMA projected inventory estimated emissions for the years 2017 and 2020 from a baseline 2007 emissions inventory. In order to obtain emission estimates for the 2018 maintenance year, a straight line interpolation between 2007 and 2020 was used. Projected NO_X emissions in 2018 using the MARAMA estimates are still well below the 2018 projected emissions in the Reading Ozone Maintenance Plan, as shown in Table 5, and thus show that projected emissions in 2018 will fall below the 2004 (attainment year) emission levels.

Table 5: 2018 Point Source Emissions – Maintenance Plan Estimate Versus Revised 2018 Emissions

2018 Emissions	NO_X (tons/day)
2018 Maintenance Plan Estimate	19.2
2018 Revised Estimate (MARAMA Inventory)	12.6

2.2. AREA SOURCE CATEGORY EMISSIONS

2.2.1. CONTROL MEASURES

The area sector includes, but is not limited to, such diverse emissions source categories as: surface coating; commercial and consumer solvent use; residential heating; open burning; traffic line painting; and landfill gases. Emissions are produced from a wide number of sources for which actual emissions or direct indicators of emissions are not available. One control measure took effect for NO_X emissions for area sources after the Reading Ozone Maintenance Plan was approved. New Source Performance Standards (NSPS) have been promulgated that affect newly manufactured stationary engines installed at facilities after January 1, 2012. The NSPS standards reduce NOx on 50 percent of new engines initially and are phased in to affect 100 percent of engines beginning in 2014. The NOx emission standard is 95 percent cleaner for the affected engines.

2.2.2. GROWTH ESTIMATES IN THE READING OZONE MAINTENANCE PLAN

Area source emission growth factors were developed by using the default configuration in EGAS 5.0. EGAS 5.0 used the Department of Energy Annual Energy Outlook 2004 (AEO2004) fuel use projections. In this proposed SIP revision, the AEO2005 fuel consumption forecasts were used to replace AEO2004 forecasts. State-supplied population and employment data were used to replace default data, when the state-specific data was available. Growth estimates were represented by growth factors for each area source classification code (SCC) for each county.

County-level population data for 2000, and projections for 2010 and 2020 from the Pennsylvania State Data Center, http://pasdc.hbg.psu.edu/, were provided to derive growth factors. These data were interpolated to obtain growth factors for projecting emissions from 2002 to 2009 for SCCs that are population based. General employment data for 21 counties or areas for 2000, and projections to 2010 and 2020, were used. These data were also interpolated to estimate growth factors for projecting from 2002 to 2009 and 2018 for nine area source categories. For all other area source categories, AEO2005 forecasts were used for projecting emissions from area source fuel combustion, when available. If AEO2005 forecasts are not available, EGAS 5.0 default factors were used.

The Reading Ozone Maintenance Plan relied upon many different types of socioeconomic indicators that served as surrogates to actual sales data to estimate emissions from the area source sector when actual sales data was not available. Population, employment, fuel use and housing data are some of the surrogates used to estimate emissions. Methodologies for estimating some emissions from some area sources were updated by the EPA in the time since EPA approved the Reading Ozone Maintenance Plan, but, because the emissions change similarly for the attainment, interim and maintenance years, the changes will not result in a significant difference between the attainment year's emissions and the maintenance year's emissions. As can be seen from Table 6, with the exception of the growth surrogates of commercial boilers using natural gas and population, emissions would decrease from area sources, since actual growth rates from 2002 to 2009 are lower or nearly the same when compared to the growth rates used in the Reading Ozone Maintenance Plan. Population is higher than what was in the maintenance plan, but population serves predominately as a growth surrogate for VOC emission growth, which is not considered in this SIP revision. The growth surrogates presented in Table 6 are used to estimate emission growth for most SCCs in the area source category in the maintenance plan and account for a large majority of the emissions in the area source inventory. Growth from 2009 to 2018 presented in Table 7 shows that the growth in the Reading Ozone Maintenance Plan was estimated to be less than projected growth in the MARAMA inventory for commercial anthracite coal, and residential distillate oil.

Table 6: Comparison of Growth Factors Used in Maintenance Plan and Inventory Updates (2002 to 2009)

Growth Surrogates	Actual Growth (Census Data)	Maintenance Plan Surrogate Estimates (2006)
2009 Population *	1.070	1.0381
2009 Total Employment	1.010	1.0645
2009 Commercial Boilers Natural Gas	1.0456	1.0105
2009 Commercial Boilers, Distillate	0.979	0.9807
2009 Commercial Boilers, Coal	0.652	0.7488

***Growth for the year 2009 is computed from 2002 to 2009.**

Table 7: Comparison of Growth Factors Used in Maintenance Plan and Inventory Updates (2009 to 2018)

Growth Surrogates	Revised Growth from MARAMA Inventory (2009-2018)*	Maintenance Plan Growth (2009-2018)*
Population	1.0509	1.0472
Employees	1.0113	1.0779
Anthracite Coal, Industrial	0.9799	0.9983
Anthracite, Commercial	1.0055	0.9865
All Combustor Types, Distillate Oil, Residential	0.9615	0.9598
Boilers and Internal Combustion Engines, Natural Gas, Commercial	1.0154	1.0521
Combustor Types, Natural Gas, Residential	1.0034	1.0181

***Growth for the year 2018 is given as a factor estimating growth from 2009 to 2018. Due to different time ranges used for growth estimates in the maintenance plan and more recent inventory data, growth based on 2002 was impossible to estimate. This method allows for a direct comparison.**

2.2.3. GROWTH ESTIMATES IN MARAMA 2011 REGIONAL MODELING EFFORT

The development of growth factors for the MARAMA 2011 regional modeling effort for area sources used one or a combination of the following as surrogates for growth: AEO2010, population data, or employment data. A direct comparison cannot be made between the growth factors based on AEO2005 or population in the original maintenance plan and this proposed SIP revision which uses growth factors from MARAMA's 2011 regional modeling effort. As years pass, different inventory methodologies are developed. This proposed SIP revision uses the best method to compare emissions inventories that use differing methodologies. (See Volume II: Technical Support Document). The MARAMA 2011 regional modeling effort developed growth factors for most SCCs using AEO2010 or county level population. Employment data was derived from North American Industry Classification System to the state level. Since employment data to the county level was not available from the MARAMA 2011 modeling, state employment data was applied to all SCCs that use employment data and counties in this proposed SIP revision. The recession reduced employment, which fell short of the projections in the maintenance plan for the year 2009. Starting from depressed employment levels in 2009, it is unlikely that employment projections in the maintenance plan will be exceeded in 2018, even if employment growth recovers to normal levels in the near future.

2.2.4. MARCELLUS SHALE EMISSIONS

Significant infrastructure development to extract Marcellus Shale natural gas in some Pennsylvania counties has occurred since the 2007 Reading Area SIP revision was submitted to the EPA by the Department. Area source emissions result from the placement of drilling

equipment, gathering lines and compressor stations. The Reading Area has not experienced any Marcellus Shale development and is not expected to experience any of this development in the future.

2.2.5. AREA SOURCE CATEGORY CONCLUSION

Projected area source NO_X emissions in the Reading Ozone Maintenance Plan are being revised in this proposed SIP revision. Area source emissions are being revised because updated growth factors do not clearly demonstrate that emissions growth in the Reading Ozone Maintenance SIP over-predicted emissions. Revised emission growth estimates for fuel use, which produces NO_X emissions, is sufficiently non-predictive to demonstrate that area source emissions decreased when compared to the Reading Ozone Maintenance Plan. Therefore, area source emissions in the Reading Ozone Maintenance Plan were revised for both 2009 and 2018. Projected emissions of NO_X from area sources were slightly higher in 2009 (see Table 3) and nearly the same in 2018.

2.3. Nonroad Source Category Emissions

2.3.1. CONTROL MEASURES

The nonroad category contains many different types of equipment. The Department used NONROAD2005 for the Reading Ozone Maintenance Plan. All versions of the EPA's NONROAD Model estimate emissions for over 200 types of engines and vehicles. Nonroad engines and vehicles can be used for such applications as construction, lawn and garden care, farming, and industrial applications. In addition, emissions from three types of activities, including aircraft, locomotive, and commercial marine vessel activities, are not estimated in the NONROAD Model but are in the nonroad category. The model went through one major revision since it was used for the Reading Ozone Maintenance Plan. NONROAD2008a is the latest version of this model. This new version of the model incorporates two nonroad sector reduction strategies that were not included in the Reading Ozone Maintenance Plan:

- Diesel recreational marine standards in the 2008 final rule on locomotive and marine engines (See *Control of Emissions of Air Pollution From Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder*, 73 FR 25098, May 6, 2008); and

- The October 2008 small spark ignition and spark ignition and recreational marine rule (See *Control of Emissions From Nonroad Spark-Ignition Engines and Equipment*, 73 FR 59034, October 8, 2008).

For the Reading Ozone Maintenance Plan, the Department modified files in the NONROAD2005 model, when state specific data was available, that affect emission categories such as residential lawn and garden and recreational marine vessels.

2.3.2. GROWTH ESTIMATES

Emissions from nonroad sources have decreased since the submittal of the Reading Ozone Maintenance Plan as a result of additional controls mentioned above, and other tier level controls that have been phased in since 2004 for engines used in the nonroad sector. 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. Furthermore, the recession significantly lowered construction, railroad, aircraft, and industrial activity, and, consequently, lowered emissions. Even if growth returns to pre-recession levels, overall growth will likely remain lower than what was predicted in the maintenance plan up to the 2018 maintenance year.

2.3.3. NONROAD SOURCE CATEGORY CONCLUSION

The Department demonstrated through the analysis above that it is reasonable to assume that emissions growth for nonroad sources that has occurred, and is occurring, is less than the growth forecasted in the Reading Ozone Maintenance Plan for NO_X for both maintenance years, 2009 and 2018. The Department compared growth estimates between those used in NONROAD2005 and NONROAD2008a, and took into account fleet turnover, effects of the recession and the two new standards introduced in 2008. Emissions of NO_X from the nonroad source sector have not increased as a result of any new activity or update in methodology. Therefore, no revisions to the nonroad source sector for NO_X emissions are necessary.

2.4. Highway Source Category Emissions

2.4.1. CONTROL MEASURES

Assumptions for vehicle emissions standards have not been changed significantly in the modeled analysis from when the Reading Ozone Maintenance Plan was submitted to EPA. Pennsylvania began implementation of California emission standards, which are incorporated by reference in Pennsylvania regulations, for model year 2005 for diesel-powered heavy-duty trucks, and model year 2008 for passenger cars and light-duty trucks.

In January 2012, the California Air Resources Board (CARB) approved significant revisions to its regulations for criteria pollutant and greenhouse gas emissions from passenger cars, light-duty trucks and medium-duty vehicles. The amendments, referred to as LEV III, were approved by California's Office of Administrative Law (OAL) on August 7, 2012, and will become effective in model year (MY) 2015 for criteria pollutants and in MY 2017 for greenhouse gases. The requirements were automatically incorporated by reference as part of the Pennsylvania Clean Vehicles Program, to the extent the amendments apply to Pennsylvania's program. *See,* 25 Pa. Code §126.411(b). On August 28, 2012, the EPA and the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) issued a joint Final Rulemaking to extend the National Program of harmonized greenhouse gas and fuel economy standards to MYs 2017-2025 passenger vehicles. Neither the California nor the EPA-NHTSA Final Rulemaking has been analyzed as to its effect on future year emission estimates of NO_X, at the time of the development of this proposed SIP revision. However, it is reasonable to assume that NO_X emissions will decrease as these vehicles replace older vehicles during fleet turnover.

2.4.2. GROWTH ESTIMATES

Overall emissions from highway vehicles will continue to decrease as new vehicles take the place of older vehicles during normal fleet turnover. Fleet turnover is the greatest driver in lowering emissions from highway vehicles. Fleet turnover has been slower than forecast in the Reading Ozone Maintenance Plan. This is, in part, a result of the recent recession. Other factors have some impact on emissions from the highway source category, such as changes in fleet age, vehicle miles traveled, and the fleet mix of vehicles. The fleet age is also increasing as people operate their vehicles for a longer period of time. This will reduce the rate of fleet turnover and the reductions expected in emissions. It is difficult to compare vehicle miles traveled (VMT) in Pennsylvania between the Reading Ozone Maintenance Plan and this proposed SIP revision because the method for estimating VMT has changed. Nationally, there was a slight decline in VMT during the recession. The percentage of vehicles in Pennsylvania that are light-duty trucks is also shrinking. Consumers are purchasing more passenger cars than light-duty trucks. Passenger cars tend to have lower emissions.

Emission estimates of NO_X were developed using MOVES2010a and the latest planning assumptions. Emissions have been estimated for 2004 (attainment year), 2009 and 2018 (maintenance years). The MOBILE6.2 emission estimates from the original maintenance plan have been included in Table 8 to illustrate relative changes in emissions.

Table 8: Revised Motor Vehicle Emissions Using MOVES2010a

Pollutant	Original MOBILE6.2 Emissions			Revised MOVES2010a Emissions		
	2004	2009	2018	2004	2009	2018
NO_X	29.8	21.3	9.0	34.4	27.0	12.9
VOC	17.0	12.1	6.5	N/A*	N/A	N/A

*VOC budgets were not recalculated using MOVES2010a. The VOC MVEBs developed with Mobile6.2 are approved for transportation conformity.

Table 8 shows the MOVES model estimates NO_X emissions in 2009 and 2018 that exceed the MOBILE6.2-derived emissions in the Reading Ozone Maintenance Plan. This would cause transportation planning emissions estimates using MOVES to exceed the MVEBs. The updated NO_X MVEBs provided in Table 9 will help ensure that the Reading Area can demonstrate transportation conformity using MOVES2010a, once the conformity grace period expires, while the emissions estimates still demonstrate that the Reading Area demonstrates attainment with the 1997 ozone NAAQS.

2.4.2. MOBILE SOURCE CATEGORY CONCLUSION

This proposed SIP revision includes revised MVEBs for Berks County using updated highway vehicle emissions estimates derived from MOVES. Appendix C of this proposed SIP revision replaces the corresponding sections of the original Appendix C in the Reading Ozone Maintenance Plan. Appendix C of this proposed SIP revision describes the highway modeling methodology necessary to produce accurate emission estimates from the MOVES model.

3. Safety Margins

Table 3 shows that the emissions in the interim and maintenance years, even when using conservative estimates in the Reading Ozone Maintenance Plan, for point, area and nonroad sectors, provide a significant safety margin for continued maintenance.

Therefore, a portion of those safety margins is being allocated to transportation projects to help ensure that any future planning assumption updates will not negatively impact the area's ability to demonstrate transportation conformity. Adequate safety margins will also defer the need for future SIP revisions, where the purpose of the SIP revision is only to update numbers and not to document any actual emissions reductions to the atmosphere.

To help ensure that the transportation conformity process is not needlessly delayed, a 2.0 ton/day safety margin for NO_X has been applied to the MVEBs in 2009 and 2018 in this proposed SIP revision. All indications are that the 2009 and 2018 emission estimates made for point, area and nonroad sources in the Reading Ozone Maintenance Plan are higher than any actual emissions for 2009 and revised estimates for 2018 in this SIP revision. Table 3 quantitatively shows that these safety margins will continue to allow the area to remain well below the 2004 attainment year emissions inventory cap, thereby ensuring that future air quality will continue to meet the 1997 ozone NAAQS.

4. Motor Vehicle Emission Budgets for Transportation Conformity

The Department proposes to establish budgets for highway emissions in order to ensure that transportation emissions do not impede clean air goals for almost the next decade. The information in Table 9, once EPA approves this proposed SIP revision for the purposes of transportation conformity, will establish MVEBs for Berks County.

Table 9: Motor Vehicle Emissions Budgets

Calendar Year	**Pollutant**
	NO_X
2009 Predicted Safety Margin	24,501 kilograms/summer day (27.0 tons/summer day) 1815 kilograms/summer day (2.0 tons/summer day)
2009 Budget	**26,316 kilograms day** **(29.0 tons/summer day)**
2018 Predicted Safety Margin	11,706 kilograms day (12.9 tons/summer day) 1815 kilogram/summer day (2.0 tons/summer day)
2018 Budget	**13,521 kilograms/summer day** **(14.9 tons summer day)**

5. Conclusion

By examining actual and projected emissions, increased controls for all emissions categories, and evidence that actual emissions growth for point source, area source, and nonroad source categories has been less than the projected emissions growth in the approved Reading Ozone Maintenance Plan, the Department has shown that the conclusion in the Reading Ozone Maintenance Plan that the Reading Area will continue to maintain attainment of the 1997 ozone NAAQS remains valid, even after updating the highway emissions using the new EPA-approved MOVES model. Updating NO_X emissions in the MVEBs will not negatively affect the Reading Area's ability to maintain the 1997 ozone NAAQS. In this proposed SIP revision, the Department has updated emissions of NO_X that were included in the Reading Ozone Maintenance Plan for point, area and highway sources. Emissions of nonroad sources were not updated from the Reading Ozone Maintenance Plan because it was shown that growth in emissions for those sources decreased or was unaffected.