

# **DRAFT 2011 BASE YEAR EMISSIONS INVENTORY**

## **FOR THE WASHINGTON DC-MD-VA 2008 OZONE NAAQS NONATTAINMENT AREA**

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**on behalf of the  
Metropolitan Washington Air Quality Committee**

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## 1.0 Introduction

### 1.1 Overview and Background

This document contains a detailed explanation of the 2011 base year emissions inventory for stationary, area, nonroad, and mobile anthropogenic sources as well as biogenic sources in the Washington, DC-MD-VA 2008 ozone National Ambient Air Quality Standards (NAAQS) nonattainment area. The inventory will be included as part of the region's State Implementation Plan (SIP) to meet the above NAAQS. Annual anthropogenic emissions were estimated for volatile organic compound (VOC), nitrogen oxide (NO<sub>x</sub>), carbon monoxide (CO), fine particles (PM<sub>2.5</sub>-Pri), sulfur dioxide (SO<sub>2</sub>), and ammonia (NH<sub>3</sub>). Typical ozone season day emissions were developed for VOC, NO<sub>x</sub>, and CO.

The federal Clean Air Act (CAA), 42 U.S.C.A § 7401 *et seq.*, as amended by the Clean Air Act Amendments of 1990, P.L. 101-549, (referred to hereafter as the Act), requires all areas of the nation to attain and maintain compliance with the NAAQS. These federal standards are designed to protect the public health and welfare from six criteria pollutants, one of which is ozone.

The Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area was designated as a marginal nonattainment area by the United State Environmental Protection Agency (EPA) effective July 20, 2012 (Federal Register, Vol. 77, No. 98, May 21, 2012). This base year inventory is required by the Act at §7502(c)(3):

(3) **Inventory** – Such plan provisions shall include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutant or pollutants in such area, including such period revisions as the Administrator may determine necessary to assure that the requirements of this part are met.

The Metropolitan Washington Council of Governments (MWCOG) prepared the nonroad and onroad portions of the inventory. MWCOG used EPA's nonroad mobile emissions model, NONROAD2008a (embedded in NMIM2008) to develop all nonroad emissions except for commercial marine vessels, aircraft, and locomotives. These three sectors were developed separately. MWCOG developed the 2011 onroad mobile inventory using EPA's MOVES2010a model.

Air quality staff of the District Department of the Environment (DDOE), Maryland Department of the Environment (MDE), and Virginia Department of Environmental Quality (VDEQ), herein referred to as "state air agencies," in collaboration with MWCOG, supplied area and point source emissions estimates.

EPA's estimates for biogenic emissions for the NEI2011 effort were accepted for the purposes of submission of the base year 2011 biogenic inventories. Methodology for

developing biogenic inventories is described in detail in the Technical Support Document for the NEI2011 effort.<sup>1</sup>

Emissions inventory data is used in annual trends reports, SIP submittals, compliance demonstrations, emissions trading, emissions fee programs, and in modeling activities designed to evaluate ambient air concentrations encountered by the general public. For the SIP program, the emission inventory is a fundamental building block in developing an air quality control and maintenance strategy. Regulatory agencies rely on emission inventories as indicators of air quality changes and for setting permit requirements.

The end use of emission inventories requires that they be of the highest quality obtainable. These data are the foundation of air quality decisions. Inventory quality is critical to defining realistic regulations and attainment strategies.

## **1.2 2008 Ozone NAAQS Nonattainment Area Geography**

Effective July 20, 2012, EPA designated the following jurisdictions in the Washington, DC-MD-VA area as nonattainment for the 2008 ozone NAAQS.

- District of Columbia
- Calvert County, Maryland
- Charles County, Maryland
- Frederick County, Maryland
- Montgomery County, Maryland
- Prince George's County, Maryland
- Arlington County, Virginia
- Alexandria City, Virginia
- Fairfax County, Virginia (includes the independent cities of Fairfax and Falls Church)
- Loudoun County, Virginia
- Prince William County, Virginia (includes the independent cities of Manassas and Manassas Park)

## **1.3 Temporal Resolution**

Another step of inventory development is the temporal allocation of emissions. The temporal allocation is an accounting of emission variations over time. The simplest temporal allocation is for a steady-state emissions source that continually releases emissions at the same rate throughout the year. Under actual conditions, however, steady-state emission sources are quite rare. Instead, under actual conditions, emissions sources may operate only in the winter, not operate on Sundays, or their activity may peak during certain hours of the day. The temporal allocation of emissions must reflect as accurately as possible the reality of emissions occurring to the atmosphere. Ozone formation depends on the presence of ozone precursors as well as the amount of sunlight and other

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<sup>1</sup> EPA NEI2011 Web-site - <http://www.epa.gov/ttnchie1/net/2011inventory.html>

meteorological impacts. Since ozone is typically a summertime pollutant, emissions during the summer months are more important to air quality than are emissions during other times of the year. For these reasons, ozone precursor base year emissions are represented as typical ozone season daily emissions (ozone season tons per day). The planning period for the 2008 ozone NAAQS emissions inventory covers the ozone season defined as May through September. For the purpose of submitting the base year 2011 SIP inventory to EPA, annual emissions are estimated for VOC, NO<sub>x</sub>, CO, PM<sub>2.5</sub>-Pri, SO<sub>2</sub>, and NH<sub>3</sub>. Ozone season day emissions are estimated for the ozone precursors of VOC, NO<sub>x</sub>, and CO.

#### **1.4 Quality Assurance Policy and Objectives**

In order to provide data of sufficient quality for attainment and maintenance planning needs, quality assurance (QA) and quality control (QC) procedures are part of the inventory process. The procedures address data quality objectives of accuracy, completeness, comparability, and representativeness. The target goals for each objective are listed below.

*Accuracy:* All estimates must be calculated and documented using acceptable methods. Individual source requirements and availability of data and resources will affect the estimation method selection.

*Completeness:* Completeness is addressed by ensuring that all applicable source categories are included in the inventory and that all information required to estimate emissions is present.

*Comparability:* Data will be compared to the most recent base year inventory: 2011 National Emissions Inventory (NEI) for VOC, NO<sub>x</sub>, and CO. Any discrepancies (data outliers) must be verified or corrected.

*Representativeness:* Actual 2011 annual and the typical ozone season day emissions will be calculated for the base year inventory. Local data will be used in inventory calculations wherever possible.

#### **1.5 Plan Information Sources**

This plan draws upon inventory, quality assurance, and emissions projections guidance available from state and federal agencies and partnerships. The effort also draws upon experience gained during previous emission inventory reviews.

A primary source of emissions inventory data is the 2011 NEI, which was submitted to EPA by the state air agencies.

## 1.6 Summary of the Base Year Emissions Inventory

Summaries of the ozone precursor emissions in tons per day (TPD) and tons per year (TPY) for the Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area are shown in Table 1-1. Summaries relating to the individual sections of the inventory, such as point sources, may be found at the beginning of the respective section. Slight differences between the executive summary table and the section tables are due to rounding.

**Table 1-1**  
**2011 Base Year SIP Emission Inventories**  
 Washington, DC-MD-VA 2008 Ozone NAAQS Nonattainment Area

Source Category	VOC (TPD)	NO <sub>x</sub> (TPD)	CO (TPD)	VOC (TPY)	NO <sub>x</sub> (TPY)	CO (TPY)	PM <sub>2.5</sub> -Pri (TPY)	SO <sub>2</sub> (TPY)	NH <sub>3</sub> (TPY)
<b>Point</b>	6.96	152.00	32.21	1,223.23	14,134.09	4,189.84	1,669.61	14,393.80	53.21
<b>Area</b>	134.86	2.39	31.67	46,333.16	8,827.77	42,671.86	11,582.23	3,910.64	3,573.82
<b>Nonroad</b>	70.80	77.08	841.96	18,661.42	24,036.39	215,002.54	2,018.93	961.98	26.57
<b>On-road</b>	82.35	205.48	894.98	28,981.19	71,099.71	355,846.05	2,771.45	420.83	1,625.23
<b>Anthropogenic Subtotal</b>	<b>294.98</b>	<b>436.95</b>	<b>1,800.82</b>	<b>95,199.00</b>	<b>118,097.96</b>	<b>617,710.29</b>	<b>18,042.21</b>	<b>19,687.25</b>	<b>5,278.84</b>

## 1.7 Document Contents

- Chapter 2      Presents the methodology for developing the 2011 ozone precursor emissions from point sources.
- Chapter 3      Presents the methodology for developing the 2011 ozone precursor emissions from area and nonroad sources.
- Chapter 4      Presents the methodology for developing the 2011 ozone precursor emissions from onroad mobile sources.
- Chapter 5      Presents the QA/QC plan for the 2011 ozone precursor emissions inventory.

The point, area, nonroad, and onroad source emissions inventory development documentation; detailed emissions by source classification code (SCC); and nonroad and onroad model input and output files are presented in Appendices A through D of this document.

## **2.0 Point Sources**

### **2.1 Introduction**

This section documents the development of the Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area stationary point source emissions inventory. This section characterizes the point source component of the emissions inventory by describing the 2011 ozone season day and annual emissions estimation techniques. The point source inventory consists of actual emissions for a typical ozone season day and for the entire period in the year 2011. The inventory includes sources located within the Washington DC-MD-VA 2008 ozone NAAQS nonattainment area.

The state air agencies are responsible for developing point source emissions inventories and maintaining the data. MWCOG compiled the ozone season day and annual emissions data provided by the state air agencies for inclusion in this emissions inventory document.

### **2.2 Compilation and Documentation of Point Source Emissions**

The state air agencies maintain substantial databases of both small and large air emission sources. The list of point sources in this inventory was developed by applying the appropriate thresholds to the emission levels in the databases to differentiate between point and area stationary sources. Sources with emission levels greater than the threshold or sources previously included in Periodic Emissions Inventory submittals are by definition point sources while sources with emissions levels less than the thresholds are by definition area sources.

For Virginia units, temporal allocation of emissions from annual to ozone season day was accomplished using EPA's generally accepted emissions calculation techniques for all point sources other than those units reporting emissions and activity data to the Clean Air Markets Division (CAMD) database under 40 CFR Part 75. For units reporting to CAMD, the hourly average NO<sub>x</sub> emission rate for hours operated during the summer months of 2011 (May through September) was multiplied by 24 hours per day to calculate a typical ozone season daily rate in tons per day.

Full documentation on point sources and emissions in individual states are maintained by the respective state air agency responsible for the state in which the facility or source is located.

Appendix A provides a detailed description of the total point source emissions for the Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area.



**Table 2-1**  
**2011 Base Year SIP Point Source Emission Inventories**  
Washington, DC-MD-VA 2008 Ozone NAAQS Nonattainment Area

Point Source Emissions – Base Year 2011 SIP Emission Inventory																	
Metropolitan Washington NAA <sup>1</sup>																	
Pollutant	Calvert County	Charles County	Fredrick County	Montgomery County	Prince George's County	Arlington County	Fairfax County	Fairfax City	Fairs Church City	Loudoun County	Prince William County	Manassas City	Alexandria City	District Of Columbia	MD Total	VA Total	NAA Total
Tons per ozone season day																	
VOC	0.07	0.76	0.49	0.36	1.34	0.07	1.37	0.36	0.00	1.02	0.73	0.14	0.06	0.19	3.02	3.75	6.96
NO <sub>x</sub>	1.28	28.15	0.68	14.53	50.05	0.87	18.83	0.04	0.01	10.02	13.38	1.03	11.74	1.39	94.70	55.91	152.00
CO	0.43	2.41	0.80	3.28	6.88	0.36	12.12	0.05	0.00	2.46	1.61	0.29	0.55	0.98	13.79	17.44	32.21
Tons per year																	
VOC	6	103	125	44	194	9	243	131	-	89	156	41	11	70.84	472.42	679.96	1,223.23
NO <sub>x</sub>	48	1,421	87	2,611	5,020	75	2,149	7	0.07	216	724	21	1,052	702.88	9,187.12	4,244.09	14,134.09
CO	9	698	127	490	942	49	800	16	0.01	207	252	24	136	438.86	2,266.33	1,484.65	4,189.84
PM <sub>2.5</sub> -Pri	4	595	22	146	578	0	28	0.04	-	2	178	10	50	55.44	1,344.75	269.42	1,669.61
SO <sub>2</sub>	0.25	5,715	14	1,275	5,811	16	141	0.04	0.01	13	320	3	515	569.92	12,815.23	1,008.65	14,393.80
NH <sub>3</sub>	-	1	-	2	1	-	-	-	-	-	43	6	0.23	0.00	4.12	49.09	53.21

<sup>1</sup> There are no VOC, NO<sub>x</sub>, CO, PM<sub>2.5</sub>-Pri, SO<sub>2</sub>, and NH<sub>3</sub> emissions for the Virginia Independent City of Manassas Park.

### **3.0 Area and Nonroad Sources**

#### **3.1 Introduction and Scope**

This document contains a detailed explanation of how the 2011 emissions inventory for area and nonroad sources of VOC, NO<sub>x</sub>, CO, PM<sub>2.5</sub>-Pri, SO<sub>2</sub>, and NH<sub>3</sub> was developed. Emissions inventories for area and a few nonroad sources - marine vessels, airport, railroad locomotives (MAR) - for a typical ozone season day and the entire year in 2011 were prepared by the state air agencies. The MWCOG staff developed emissions for remaining nonroad sources using NMIM2008 software. The MWCOG staff also compiled this information for inclusion in this base year inventory document.

Area sources include stationary sources not part of the states' point source inventories, usually because the source type is too small to be tracked individually and is instead tracked as a group or category. Nonroad sources include equipment that draws power from engines for purposes other than movement on the highway system. Examples include lawn and garden equipment, construction equipments, recreational boating, etc.

All questions or comments regarding the area and MAR emissions in this document should be directed to the respective state air agency.

#### **3.2 Area Sources**

##### **3.2.1 Emission Estimation Approach**

The state air agencies provided detailed documentation regarding the development of emissions for area sources. This information is located in Appendix B1, B2, and B3 respectively.

##### **3.2.2 Summary of Emission Results**

Table 3-1 lists emissions for the counties and cities in the Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area. Appendix B4 is an electronic attachment that provides the detail of these emissions data.

**Table 3-1**  
**2011 Base Year SIP Area Source Emission Inventories**  
Washington, DC-MD-VA 2008 Ozone NAAQS Nonattainment Area

<b>Jurisdiction</b>	<b>VOC (TPD)</b>	<b>NO<sub>x</sub> (TPD)</b>	<b>CO (TPD)</b>	<b>VOC (TPY)</b>	<b>NO<sub>x</sub> (TPY)</b>	<b>CO (TPY)</b>	<b>PM<sub>2.5</sub>-Pri (TPY)</b>	<b>SO<sub>2</sub> (TPY)</b>	<b>NH<sub>3</sub> (TPY)</b>
<b>District of Columbia</b>	<b>2.98</b>	<b>0.01</b>	<b>0.25</b>	<b>4,212.49</b>	<b>1,357.18</b>	<b>867.30</b>	<b>381.41</b>	<b>981.52</b>	<b>147.06</b>
Calvert County	2.09	0.06	1.93	679.34	94.11	1,024.79	253.26	91.97	45.79
Charles County	3.78	0.16	5.38	1,248.73	227.22	2,622.87	536.67	183.29	69.93
Frederick County	6.59	0.16	5.46	2,141.56	399.37	3,129.81	1,042.75	284.57	1,489.06
Montgomery County	23.03	0.04	1.94	7,458.41	1,555.02	4,869.65	1,867.42	379.72	344.29
Prince George's County	20.24	0.08	2.57	6,592.32	1,271.14	4,721.60	1,261.01	361.60	296.99
<b>Maryland Total</b>	<b>55.73</b>	<b>0.50</b>	<b>17.29</b>	<b>18,120.37</b>	<b>3,546.87</b>	<b>16,368.72</b>	<b>4,961.11</b>	<b>1,301.15</b>	<b>2,246.06</b>
Arlington County	5.50	0.09	0.35	2,130.12	402.11	2,643.68	567.74	158.45	54.56
Fairfax County	30.55	0.89	3.23	11,102.29	1,955.18	11,216.08	2,657.38	802.35	413.07
Fairfax City	1.20	0.02	0.05	399.62	52.38	243.70	82.71	20.39	15.17
Falls Church City	0.43	0.01	0.02	153.61	26.41	142.47	51.63	10.17	10.94
Loudoun County	9.50	0.37	2.73	3,414.28	532.15	3,653.13	1,273.07	225.16	391.60
Prince William County	13.10	0.32	7.25	4,754.46	585.35	6,107.55	1,245.42	258.13	242.86
Manassas City	1.31	0.05	0.12	467.47	75.62	371.29	105.04	31.79	13.52
Manassas Park City	0.44	0.01	0.04	159.42	19.62	125.14	27.05	8.86	4.44
Alexandria City	4.11	0.12	0.34	1,419.04	274.90	932.79	229.67	112.68	34.55
<b>Virginia Total</b>	<b>66.15</b>	<b>1.88</b>	<b>14.13</b>	<b>24,000.30</b>	<b>3,923.72</b>	<b>25,435.84</b>	<b>6,239.71</b>	<b>1,627.97</b>	<b>1,180.71</b>
<b>Region Total</b>	<b>134.86</b>	<b>2.39</b>	<b>31.67</b>	<b>46,333.16</b>	<b>8,827.77</b>	<b>42,671.86</b>	<b>11,582.23</b>	<b>3,910.64</b>	<b>3,573.82</b>

### 3.3 Nonroad Sources

Emissions for nonroad sources other than MAR were estimated using EPA's NONROAD2008 model embedded in the NMIM2008 software. Emissions estimation approaches for both categories of nonroad sources are described below.

#### 3.3.1 Marine Vessels, Airport, Railroad Locomotives

##### 3.3.1.1 Emission Estimation Approach

Detailed documentation for the development of MAR emissions were provided by the state air agencies. The state-specific documentation may be found in Appendix B1, B2, and B3, respectively.

##### 3.3.1.2 Summary of Emission Results

Table 3-2 lists emissions for counties and cities in the Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area. Detailed emissions breakdowns may be found in electronic format in Appendix B4 of this document.

**Table 3-2**  
**2011 Base Year SIP MAR Emission Inventories**  
Washington, DC-MD-VA 2008 Ozone NAAQS Nonattainment Area

Jurisdiction	VOC (TPD)	NO <sub>x</sub> (TPD)	CO (TPD)	VOC (TPY)	NO <sub>x</sub> (TPY)	CO (TPY)	PM <sub>2.5</sub> -Pri (TPY)	SO <sub>2</sub> (TPY)	NH <sub>3</sub> (TPY)
<b>District of Columbia</b>	<b>0.23</b>	<b>3.01</b>	<b>2.52</b>	<b>25.64</b>	<b>330.63</b>	<b>62.86</b>	<b>8.67</b>	<b>13.28</b>	<b>0.00</b>
Calvert County	0.09	2.54	0.29	31.94	925.76	105.68	-	500.74	-
Charles County	0.04	0.08	0.66	15.41	30.72	241.69	0.78	2.23	-
Frederick County	0.22	1.25	4.39	80.80	456.17	1,603.02	12.16	10.51	-
Montgomery County	0.09	0.96	1.31	33.00	351.36	478.24	9.95	3.12	-
Prince George's County	0.24	1.17	1.44	86.38	427.36	525.66	8.54	15.68	-
<b>Maryland Total</b>	<b>0.68</b>	<b>6.00</b>	<b>8.09</b>	<b>247.54</b>	<b>2,191.37</b>	<b>2,954.29</b>	<b>31.43</b>	<b>532.27</b>	<b>-</b>
Arlington County	0.57	3.73	6.33	209.40	1360.76	2309.77	34.81	159.3	0.06
Fairfax County	-	0.00	0.26	22.61	359.65	95.43	10.38	6.51	0.43
Loudoun County	0.76	5.20	8.47	279.17	1898.57	3089.74	50.08	194.12	-
Prince William County	0.04	0.80	0.15	15.98	291.55	55.63	8.78	3.67	0.51
Manassas City	0.02	0.04	0.66	8.34	16.21	240.13	5.02	0.95	0.01
Manassas Park City	0.00	0.00	0.00	0.08	1.48	0.24	0.05	0.02	0.04
Alexandria City	0.02	0.39	0.10	8.90	141.97	35.14	4.18	1.78	0.21
<b>Virginia Total</b>	<b>1.49</b>	<b>11.15</b>	<b>15.96</b>	<b>544.48</b>	<b>4,070.20</b>	<b>5,826.08</b>	<b>113.31</b>	<b>366.42</b>	<b>1.26</b>
<b>Region Total</b>	<b>2.40</b>	<b>20.16</b>	<b>26.58</b>	<b>817.65</b>	<b>6,592.20</b>	<b>8,843.22</b>	<b>153.41</b>	<b>911.97</b>	<b>1.26</b>

Note: The cities of Fairfax and Falls Church, located within the Commonwealth of Virginia, did not have any 2011 emissions from the MAR category.

### **3.3.2 Nonroad Model Sources**

Nonroad model sources include a varied collection of equipment using power from engines for purposes other than locomotion on highways. Nonroad emissions result from the use of fuel in this diverse collection, which includes vehicles and equipments in the following categories:

- Recreational vehicles, such as all-terrain vehicles and off-road motorcycles;
- Logging equipment, such as chain saws;
- Agricultural equipment, such as tractors;
- Construction equipment, such as graders and backhoes;
- Industrial equipment, such as fork lifts and sweepers;
- Residential and commercial lawn and garden equipment, such as leaf and snow blowers.

#### **3.3.2.1 Emission Estimation Approach**

Except for equipment in the MAR category, the inventory for nonroad mobile sources was developed using the most current version of EPA's NONROAD model as embedded in the National Mobile Inventory Model (NMIM). The NONROAD model includes more than 80 basic and 260 specific types of nonroad equipment and further stratifies equipment types by horsepower rating. Fuel types include gasoline, diesel, compressed natural gas (CNG), and liquefied petroleum gas (LPG).

EPA's NMIM2008 software (version NMIM20090504), the revised NMIM County Database (NCD20130531\_nei2011v1), and the NONROAD2008a model (July 2009 version) were used to estimate the 2011 annual and average ozone season day emissions for VOC, NO<sub>x</sub>, CO, SO<sub>2</sub>, PM<sub>2.5</sub>-Pri, and NH<sub>3</sub> for the purposes of creating the base year 2011 emissions inventory. The NONROAD2008a model estimates emissions for each specific type of nonroad equipment by multiplying the following input data estimates:

- Equipment population for the base year, distributed by age, power, fuel type, and application;
- Average load factor expressed as average fraction of available power;
- Available power in horsepower;
- Activity in hours of use per year; and
- Emission factors reflecting deterioration and/or new standards.

The emissions are then temporally and geographically allocated using appropriate allocation factors.

Several input files provide necessary information to the model. These input files include information such as: emission factors, base year equipment population, activity, load factors, average lifetime, scrappage function, growth estimates, and geographic and temporal allocations. Default values are provided for all input files. The user may replace the default data files when better information becomes available, either from EPA for national defaults or from local sources for locality-specific data.

The NMIM2008 software was run for all twelve months in 2011 to develop average ozone season day and annual emissions for the cities and counties in the Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area. All emissions sources in the software (except for ground support equipment in Virginia) were included in the run. Ground support equipment emissions were provided by the VDEQ staff separately. Average ozone season day emissions were estimated by dividing total emissions in July by the total number of days (31) in July. Emissions for all twelve months in 2011 were added together to develop annual emissions. Model inputs (temperature, fuel, and other parameters) used in this analysis were included in the NMIM county database mentioned above and were the same as the inputs used in developing the 2011 NEI for the NMIM model sources. The above NMIM county database was acquired from EPA's website (file name '2011nei\_supdata\_nonroad.zip' under "Supporting data and summaries") for the NEI 2011(ver 1) effort.<sup>1</sup> The 2011 NEI Technical Support Document (ver 1) available on the above website provides details of the development of various inputs included in the database.

### 3.3.2.2 Summary of Emission Results

Table 3-3 lists emissions for different counties and cities in the Washington, DC-VA-MD ozone nonattainment region. Detailed NMIM2008 software input and output files are being provided separately in electronic format as Appendix C of this document.

**Table 3-3**  
**2011 Base Year SIP Nonroad Model Source Emission Inventories**  
Washington, DC-MD-VA 2008 Ozone NAAQS Nonattainment Area

Jurisdiction	VOC (TPD)	NO <sub>x</sub> (TPD)	CO (TPD)	VOC (TPY)	NO <sub>x</sub> (TPY)	CO (TPY)	PM <sub>2.5</sub> -Pri (TPY)	SO <sub>2</sub> (TPY)	NH <sub>3</sub> (TPY)
<b>District of Columbia</b>	<b>5.28</b>	<b>7.52</b>	<b>46.75</b>	<b>1,250.21</b>	<b>2,364.45</b>	<b>11,995.60</b>	<b>203.88</b>	<b>6.21</b>	<b>2.85</b>
Calvert County	2.56	1.51	15.48	494.70	373.37	3,249.72	30.13	0.95	0.50
Charles County	4.22	2.64	24.71	868.47	696.76	5,408.72	62.62	1.81	0.92
Frederick County	4.27	3.57	49.91	1,126.46	1,061.06	12,727.80	115.73	3.03	1.49
Montgomery County	14.37	8.87	184.54	3,858.80	2,733.86	46,762.90	333.43	8.41	4.48
Prince George's County	9.18	7.78	112.16	2,432.58	2,442.06	28,757.50	257.83	7.04	3.53
<b>Maryland Total</b>	<b>34.59</b>	<b>24.37</b>	<b>386.79</b>	<b>8,781.01</b>	<b>7,307.11</b>	<b>96,906.64</b>	<b>799.74</b>	<b>21.23</b>	<b>10.92</b>
Arlington County	1.58	3.41	19.41	437.65	1,084.95	5,081.42	98.33	2.84	1.32
Fairfax County	13.85	9.34	189.70	3,798.92	2,903.94	48,445.20	345.98	8.87	4.72
Fairfax City	0.42	0.16	6.74	110.12	49.70	1,666.93	7.45	0.18	0.11
Falls Church City	0.25	0.09	3.81	70.06	26.32	970.22	4.48	0.10	0.06
Loudoun County	6.05	6.88	84.38	1,705.36	2,104.36	21,346.70	230.58	5.92	2.96
Prince William County	4.81	4.52	54.81	1,259.37	1,390.18	13,726.70	149.29	3.91	1.96
Manassas City	0.23	0.17	3.58	66.83	60.63	1,018.76	4.84	0.19	0.08
Manassas Park City	0.23	0.08	3.56	65.52	25.71	912.24	4.29	0.10	0.06
Alexandria City	1.10	0.39	15.86	298.73	126.84	5,081.42	16.66	0.45	0.26
<b>Virginia Total</b>	<b>28.53</b>	<b>25.03</b>	<b>381.85</b>	<b>7,812.56</b>	<b>7,772.63</b>	<b>97,257.07</b>	<b>861.89</b>	<b>22.57</b>	<b>11.53</b>
<b>Region Total</b>	<b>68.40</b>	<b>56.92</b>	<b>815.39</b>	<b>17,843.77</b>	<b>17,444.19</b>	<b>206,159.31</b>	<b>1,865.52</b>	<b>50.01</b>	<b>25.31</b>

<sup>1</sup> EPA NEI 2011 Website - <http://www.epa.gov/ttn/chief/net/2011inventory.html#inventorydoc>

## **4.0 Onroad Mobile Sources**

### **4.1 Introduction**

The MOVES2010a model was used for developing the onroad mobile annual and average ozone season day base year 2011 emissions for the Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area. Appendix D1 provides more detailed documentation on data sources and methodologies used to develop different inputs. MOVES2010a input files, external input files, and output files are provided separately in electronic format as Appendix D2.

Metropolitan Washington Air Quality Committee (MWAQC) staff developed meteorology inputs and coordinated with the state air agencies to acquire fuel and inspection and maintenance program inputs for the MOVES2010a model. MWAQC staff provided these inputs to the National Capitol Region Transportation Planning Board (TPB) staff who developed other transportation related inputs for the model. TPB staff developed emissions using the above model. MWAQC staff reviewed and approved these emissions, incorporating them into the base year 2011 inventories.

This on-road mobile emissions analysis process is very similar to the process used during the development of previous base year inventories.

### **4.2 Summary of Onroad Mobile Source Emissions**

The table below summarizes the typical ozone season day emissions for VOC, NO<sub>x</sub>, and CO and annual emissions for VOC, NO<sub>x</sub>, CO, PM<sub>2.5</sub>-Pri, SO<sub>2</sub>, and NH<sub>3</sub> in the Washington, DC-MD-VA 2008 ozone NAAQS nonattainment area.

**Table 4-1**  
**2011 Base Year SIP Onroad Source Emission Inventories**  
 Washington, DC-MD-VA 2008 Ozone NAAQS Nonattainment Area

**Washington, DC-MD-VA 2008 Ozone NAAQS Nonattainment Area<sup>1</sup>**

<b>Pollutant</b>	<b>Calvert County</b>	<b>Charles County</b>	<b>Frederick County</b>	<b>Montgomery County</b>	<b>Prince George's County</b>	<b>Arlington County</b>	<b>Fairfax County</b>	<b>Loudoun County</b>	<b>Prince William County</b>	<b>Alexandria City</b>	<b>District Of Columbia</b>	<b>MD Total</b>	<b>VA Total</b>	<b>NAA Total</b>
<b>Tons per ozone season day</b>														
<b>VOC</b>	2.06	3.24	6.05	14.42	16.55	2.54	16.48	4.90	7.34	1.85	<b>6.91</b>	<b>42.33</b>	<b>33.10</b>	<b>82.35</b>
<b>NO<sub>x</sub></b>	4.02	7.15	18.54	34.19	43.75	4.98	40.92	13.57	18.77	3.79	<b>15.79</b>	<b>107.65</b>	<b>82.04</b>	<b>205.48</b>
<b>CO</b>	18.64	29.31	72.54	153.61	188.00	29.27	184.19	52.94	76.55	18.64	<b>71.18</b>	<b>462.11</b>	<b>361.69</b>	<b>894.98</b>
<b>Tons per year</b>														
<b>VOC</b>	709	1,112	2,065	5,085	5,678	922	5,966	1,768	2,629	675	<b>2,374.05</b>	<b>14,647.98</b>	<b>11,959.16</b>	<b>28,981.19</b>
<b>NO<sub>x</sub></b>	1,420	2,531	6,603	11,791	15,217	1,679	14,113	4,743	6,629	1,299	<b>5,073.93</b>	<b>37,562.80</b>	<b>28,462.98</b>	<b>71,099.71</b>
<b>CO</b>	7,335	11,387	25,397	58,166	66,022	13,002	81,863	23,816	34,050	8,919	<b>25,889.76</b>	<b>168,307.25</b>	<b>161,649.04</b>	<b>355,846.05</b>
<b>PM<sub>2.5</sub>-Pri</b>	51	97	256	462	562	63	561	198	265	50	<b>206.09</b>	<b>1,428.37</b>	<b>1,136.99</b>	<b>2,771.45</b>
<b>SO<sub>2</sub></b>	6	10	27	69	73	16	105	30	39	11	<b>33.82</b>	<b>185.77</b>	<b>201.24</b>	<b>420.83</b>
<b>NH<sub>3</sub></b>	26	26	26	26	26	26	26	26	26	26	<b>144.30</b>	<b>829.77</b>	<b>651.15</b>	<b>1,625.23</b>

<sup>1</sup> Fairfax County emissions include onroad emissions from Fairfax City and Falls Church City. Prince William County emissions include emissions from Manassas City and Manassas Park City.

\* Small discrepancies may result due to rounding.



## **5.0 Quality Assurance Procedures**

Several quality assurance checks were employed by the Washington DC-MD-VA state air agencies or, given resource constraints, regionally to address the data quality objectives discussed in Chapter 1.4 related to accuracy, completeness, comparability, and/or representativeness: reality/peer review checks, sample calculations, sensitivity analysis, and range checks. Details on each check are provided below.

### **5.1 Reality Check/Peer Review Check**

Independent review was conducted by knowledgeable staff to ensure that data, assumptions, and procedures are reasonable. The objective of these checks is to ensure accuracy, completeness, comparability, and representativeness.

Reasonableness of methods, assumptions, and emissions estimates was assessed by 1) comparing data sources used in the final inventory to those used for the 2011 NEI; 2) relying on reviewer expertise; and 3) comparing emissions estimates to other inventory efforts, particularly the 2002 base year inventory, 2007 attainment year inventory, and the 2011 NEI (Version 1).

### **5.2 Sample Calculations**

Sample calculations provide verification of values by replicating calculations. The benefit is to ensure that calculations are done correctly. The objective is accuracy.

Emissions calculations were duplicated to spot check the accuracy of the arithmetic and, therefore, the resulting emissions estimates. Priority was given to those categories identified as the largest emissions contributors.

For nonroad and onroad emissions estimates, sample calculations were not used as a quality assurance mechanism. Preparing sample calculations for these sectors was not possible since the emissions estimates were generated using EPA-approved models. Rather, these data, which were generated by MWAQC and TPB modeling staff, were checked by comparing the results of similar modeling runs conducted by other agencies such as state air agencies, state transportation agencies, or MARAMA to ensure the results included herein were reasonable.

### **5.3 Sensitivity Analysis**

Sensitivity analysis is the systematic study of how changes in parameters affect data. The benefit is to identify the parameters that have the greatest effect on data. All data quality objectives are addressed using these checks.

A sensitivity analysis in the form of source category emissions rankings by pollutant was performed. The ranking helped determine where efforts should be concentrated.

#### **5.4 Standard Range Checks**

Standard range checks address the data quality objective of comparability. The benefit is to identify the source categories that have the greatest change in emission levels from previous emission estimates. All data quality objectives are addressed using these checks.

The 2011 base year inventory was compared to the most recent inventories (base year 2002, attainment year 2007 inventory, and the 2011 NEI Version 1). Any discrepancies (data outliers) were verified or corrected.

#### **5.5 Corrective Action Plan**

Corrective and follow-up actions identified during the quality checking process were noted and referred to the appropriate staff.

## **Appendix E**

### **Public Hearing Notices, Comments, and Responses**

## **DDOE Notice**

### **DISTRICT DEPARTMENT OF THE ENVIRONMENT NOTICE OF PUBLIC HEARING AND PUBLIC COMMENT PERIOD ON AIR QUALITY ISSUES**

State Implementation Plan Revision - 40 C.F.R. Part 52, Subpart J

Notice is hereby given that a public hearing will be held on Monday, May 12, 2014, at 5:45 p.m. in Room 555 at 1200 First Street NE, 5<sup>th</sup> Floor, in Washington, D.C. 20002. This hearing provides interested parties an opportunity to comment on the proposed revision to the District of Columbia's (District) State Implementation Plan (SIP), found at 40 C.F.R. Part 52 Subpart J.

The District was designated by the U.S. Environmental Protection Agency (EPA) as being in marginal nonattainment of the 2008 8-hour ozone national ambient air quality standard (NAAQS), effective on July 20, 2012 (77 Fed. Reg. 30088, May 21, 2012). To meet requirements of Clean Air Act § 172(c)(3) for marginal areas, a base year emissions inventory must be submitted to EPA as a SIP revision no later than two years after designation (42 U.S. Code § 7511a(a)(1)). Once the District has completed its procedures, the inventory and supporting documents will be submitted to EPA as a SIP revision.

Copies of the proposed SIP revision are available for public review during normal business hours at the offices of the District Department of the Environment (DDOE), 1200 First Street NE, 5<sup>th</sup> Floor, Washington, DC 20002, and on-line at <http://ddoe.dc.gov/>.

Interested parties wishing to testify at this hearing must submit in writing their names, addresses, telephone numbers and affiliation, if any, to Mr. William Bolden at the DDOE address above or at [william.bolden@dc.gov](mailto:william.bolden@dc.gov) by 4:00 p.m. on May 12, 2014. Interested parties may also submit written comments to Ms. Jessica Daniels, Monitoring and Assessment Branch, Air Quality Division, DDOE, at the same address or by email at [jessica.daniels@dc.gov](mailto:jessica.daniels@dc.gov). Questions about this SIP revision should be directed to Mr. Rama S. Tangirala by phone at 202-535-2989 or email at [rama.tangirala@dc.gov](mailto:rama.tangirala@dc.gov), or Ms. Daniels at 202-741-0862 or [jessica.daniels@dc.gov](mailto:jessica.daniels@dc.gov). No comments will be accepted after May 12, 2014.

## VDEQ Notice

### DEPARTMENT OF ENVIRONMENTAL QUALITY Public Notice – Air Quality Plan

**Notice of action:** The Department of Environmental Quality (DEQ) is seeking comments and announcing a public hearing on a proposed 2011 base year inventory for precursors to the pollutant ozone, which are carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), and volatile organic compounds (VOC) in the Metropolitan Washington, DC-MD-VA 2008 Ozone Nonattainment Area. The Commonwealth intends to submit the inventory as a revision to the Commonwealth of Virginia State Implementation Plan (SIP) in accordance with the federal Clean Air Act. The SIP is the plan developed by the Commonwealth in order to fulfill its responsibilities under the Act to attain and maintain the ambient air quality standards promulgated by the U.S. Environmental Protection Agency (EPA).

**Purpose of notice:** DEQ is seeking comments on the overall 2011 inventory for the Northern Virginia portion of the Metropolitan Washington, DC-MD-VA 2008 Ozone Nonattainment Area, which consists of the counties of Arlington, Fairfax, Loudoun, and Prince William and the cities of Alexandria, Fairfax, Falls Church, Manassas, and Manassas Park.

**Public comment period:** March 24 to April 23, 2014.

**Public hearing:** A public hearing will be conducted in Conference Room 2, DEQ Northern Region Office, 13901 Crown Court, Woodbridge, Virginia, at 10:00 am on April 22, 2014. A map and directions maybe found at <http://www.deq.virginia.gov/Locations/NorthernRegionalOffice.aspx>.

**Description of proposal:** The proposed 2011 base year inventory was prepared by the Metropolitan Washington Air Quality Committee (MWAQC), which consists of elected officials from the affected localities and representatives of state transportation and air quality planning agencies.

The proposal consists of a comprehensive inventory of actual emissions from all sources of relevant pollutants for the base year 2011. This inventory, once finalized, will be the basis for any future planning exercises that have as a goal compliance with the 2008 ozone national ambient air quality standard (NAAQS).

**Federal information:** This notice is being given to satisfy the public participation requirements of federal regulations (40 CFR 51.102). The proposed inventory and supporting technical documents will be submitted as a revision to the Commonwealth of Virginia SIP under § 110(a) of the federal Clean Air Act in accordance with 40 CFR 51.104.

**How to comment:** DEQ accepts written comments by email, fax, and postal mail. In order to be considered, comments must include the full name, address, and telephone number of the person commenting and be received by DEQ no later than the last day of the comment period. Both oral and written comments are accepted at the public hearing. DEQ prefers that comments be provided in writing, along with any supporting documents or exhibits. Comments must be submitted to Doris A. McLeod, Air Quality Planner, Department of Environmental Quality, 629 E. Main St, PO Box 1105, Richmond, Virginia 23218 (phone 804-698-4197, fax 804-698-4510, email [doris.mcleod@deq.virginia.gov](mailto:doris.mcleod@deq.virginia.gov)). All materials received are part of the public record.

**To review the proposal:** The proposal and any supporting documents are available on the DEQ Air Public Notices for Plans web site (<http://www.deq.state.va.us/Programs/Air/PublicNotices/airplansandprograms.aspx>). The documents may also be obtained by contacting the DEQ representative named above. The public may review the documents between 8:30 am and 4:30 pm of each business day until the close of the public comment period at the following DEQ locations: 1) Main Street Office, 8th Floor, 629 E. Main St, Richmond, VA, 804-698-4070 and 2) Northern Regional Office, 13901 Crown Court, Woodbridge, VA, 703-583-3800.

SIP\NONATTN PLANS\2014\NVA-INV-SIP-notice

## MDE Notice

**NEW** A public hearing regarding the “Base Year 2011 Emissions Inventory (Washington DC-MD-VA 2008 Ozone NAAQS Nonattainment Area)” will be held on Thursday, June 12, 2014 at the Montgomery County Planning Department, Regional Office at 8787 Georgia Avenue, Silver Spring, MD 20910 -- First Floor Media Room -- 10:00 A.M.

Copies of the document can be viewed at the links following this notice and at the offices of the Maryland Department of the Environment, Air and Radiation Management Administration, 1800 Washington Boulevard, Suite 730, Baltimore, Maryland. For more information, contact Molly Berger at (410) 537-3234.

Comments may be sent to Molly Berger, Maryland Department of the Environment, Air and Radiation Management Administration, 1800 Washington Boulevard, Suite 730, Baltimore, MD, 21230; emailed [Molly.Berger@Maryland.gov](mailto:Molly.Berger@Maryland.gov).

For more information, contact Molly Berger at (410) 537-3234 (Toll free in Maryland call 1-(800) 633-6101 ext. 3234), or via email at [Molly.Berger@Maryland.gov](mailto:Molly.Berger@Maryland.gov);

**NEW** Document Available for Public Comment: Base Year 2011 Emissions Inventory (Washington DC-MD-VA 2008 Ozone NAAQS Nonattainment Area)

- [Full Inventory Document without Appendices](#)
- [Appendices ZIP File](#). This file contains all the appendices in a 176 MB ZIP file.
  - A. Point Source Inventory Files
  - B1. Area and Nonroad (Marine Vessels, Airport, Railroad Locomotives) Source Inventory Development Document (Maryland)
  - B2. Area and Nonroad (Marine Vessels, Airport, Railroad Locomotives) Source Inventory Development Document (Virginia)
  - B3. Area and Nonroad (Marine Vessels, Airport, Railroad Locomotives) Source Inventory Development Document (District of Columbia)
  - B4. Area and Nonroad (Marine Vessels, Airport, Railroad Locomotives) Source Inventory Files
  - C. NMIM2008 (NONROAD Model) Input and Output Files
  - D1. Onroad Mobile Source Development Document
  - D2. MOVES 2010a (Onroad Mobile Model) Input and Output Files

## **Public Comments & Responses**

### **Public Comments**

No public comments were received by the District Department of the Environment, Maryland Department of the Environment, and the Virginia Department of Environmental Quality on the base year 2011 emissions inventory document as of May 21, 2014.

### **Technical Corrections**

Commenter: Virginia Department of Environmental Quality

Date received: April 23, 2014

Recipient: MWCOG

Comment: The VDEQ would like to request that the following revision be incorporated:

The Virginia Department of Environmental Quality would like submit revised 2011 commuter rail emission inventory estimates for northern Virginia for incorporation into the final 2011 emission inventory to be submitted to the EPA as part of the Base Year 2011 emissions inventory (Washington DC-MD-VA 2008 Ozone NAAQS Nonattainment Area submittal). The commuter rail emission estimates for northern Virginia jurisdictions that were included in the revision of the 2011 inventory that were sent out for public review were based on an ERTAC commuter rail study that was grown to CY 2011. Since that time, VDEQ has obtained actual CY 2011 commuter rail activity data and fuel consumption data from the VRE, along with equipment specific engine emission factors and has developed CY 2011 commuter rail emission estimates for northern Virginia which we feel more accurately represent the emissions associated with this source category.



SCC Code	FIPS Code	Pollutant Code	Annual Emissions (TPY)	Daily Emissions (TPD)
2285002009	51013	VOC	1.3186	0.0036
2285002009	51059	VOC	8.9597	0.0245
2285002009	51153	VOC	3.2008	0.0088
2285002009	51510	VOC	4.1131	0.0113
2285002009	51013	SO2	0.2256	0.0006
2285002009	51059	SO2	1.5329	0.0042
2285002009	51153	SO2	0.5476	0.0015
2285002009	51510	SO2	0.7037	0.0019
2285002009	51013	PM25-PRI	0.4246	0.0012
2285002009	51059	PM25-PRI	2.8854	0.0079
2285002009	51153	PM25-PRI	1.0308	0.0028
2285002009	51510	PM25-PRI	1.3246	0.0036
2285002009	51013	PM10-PRI	0.4379	0.0012
2285002009	51059	PM10-PRI	2.9756	0.0082
2285002009	51153	PM10-PRI	1.0630	0.0029
2285002009	51510	PM10-PRI	1.3660	0.0037
2285002009	51013	Nox	15.2126	0.0417
2285002009	51059	Nox	103.3689	0.2832
2285002009	51153	Nox	36.9282	0.1012
2285002009	51510	Nox	47.4536	0.1300
2285002009	51013	CO	6.5920	0.0181
2285002009	51059	CO	44.7926	0.1227
2285002009	51153	CO	16.0020	0.0438
2285002009	51510	CO	20.5630	0.0563

Response: MWAQC and the states agree. The changes will be reflected in the final document.