Appendix F

Technical Support Document for the Development of the 2007 Emission Inventory for Regional Air Quality Modeling in the Northeast/Mid-Atlantic Region; ver. 3.3

Technical Support Document for the Development of the 2007 Emission Inventory for Regional Air Quality Modeling in the Northeast / Mid-Atlantic Region

Version 3.3

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About MARAMA

The Mid-Atlantic Regional Air Management Association, Inc. is a voluntary, non-profit association of ten state and local air pollution control agencies. MARAMA's mission is to strengthen the skills and capabilities of member agencies and to help them work together to prevent and reduce air pollution in the Mid-Atlantic Region. MARAMA provides cost-effective approaches to regional collaboration by pooling resources to develop and analyze data, share ideas, and train staff to implement common requirements.

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Acronyms and Abbreviations

Acronym	Description
CAMD	Clean Air Markets Division (USEPA)
CAP	Criteria Air Pollutant
CEM	Continuous Emission Monitoring
CMV	Commercial Marine Vessel
CO	Carbon Monoxide
EGU	Electric Generating Unit
ERTAC	Eastern Regional Technical Advisory Committee
FIPS	Federal Information Processing Standard
GSE	Ground Support Equipment
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MANE-VU+VA	MANE-VU States plus Virginia
MAR	Marine, Airport, Rail
MARAMA	Mid-Atlantic Regional Air Management Association
MOBILE6	USEPA model
MOVES	Motor Vehicle Emissions Simulator
NAICS	North American Industry Classification System code
NCD	National County Database
NEI	National Emission Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
NH3	Ammonia
NIF3.0	National Emission Inventory Input Format Version 3.0
NMIM	National Mobile Input Model
NOF3.0	National Emission Inventory Output Format Version 3.0
NONROAD	USEPA model
NOx	Oxides of nitrogen
OAQPS	Office of Air Quality Planning and Standards (USEPA)
ORL	One-record-per-line (SMOKE Format)
OTAQ	Office of Transportation and Air Quality (USEPA)
PFC	Portable Fuel Container
PM-CON	Primary PM, Condensable portion only (all < 1 micron)
PM-FIL	Primary PM, Filterable portion only
PM-PRI	Primary PM, includes filterables and condensables PM-PRI= PM-FIL + PM-CON
PM10-FIL	Primary PM10, Filterable portion only
PM10-PRI	Primary PM10, includes filterables and condensables, PM10- PRI = PM0-FIL + PM-CON

Acronym	**Description**
PM25-FIL	Primary PM2.5, Filterable portion only
PM25-PRI	Primary PM2.5, includes filterables and condensables PM25-PRI= PM25-FIL + PM-CON
RWC	Residential Wood Combustion
SEMAP	Southeast Modeling, Analysis and Planning
SIC	Standard Industrial Classification code
SIP	State Implementation Plan
SCC	Source Classification Code
S/L	State/local
SMOKE	Sparse Matrix Operator Kernel Emissions
SO2	Sulfur Dioxide
USEPA	U.S Environmental Protection Agency
VISTAS	Visibility Improvement State and Tribal Association of the Southeast
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This technical support document (TSD) explains the data sources, methods, and results for preparing the 2007 criteria air pollutant (CAP) and ammonia (NH3) emission inventory for the Northeast and Mid-Atlantic/Northeast region. The region includes the Mid-Atlantic / Northeast Visibility Union (MANE-VU) area plus Virginia. In this document, this region will be referred to as the MANE-VU+VA region. The MANE-VU+VA region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. Local air planning agencies include Philadelphia and Allegheny County, Pennsylvania.

1.1 INVENTORY PURPOSE

The MANE-VU+VA regional inventory will be used to concurrently address national ambient air quality standard (NAAQS) requirements for the new ozone and fine particle ambient standards and to evaluate progress towards long-term regional haze goals. Similar pollutant emissions and atmospheric processes control chemical formation and transport of ozone, fine particles, and regional haze. Therefore, similar technical analyses are necessary to evaluate air quality benefits of emissions controls. The emissions inventory will support a single integrated, one-atmosphere air quality modeling platform to support State air quality attainment demonstrations.

The U.S. Environmental Protection Agency (USEPA) has provided guidance on developing emission inventories to be used with models and other analyses for demonstrating attainment of air quality goals for ozone, fine particles, and regional haze (USEPA 2007a). According to the USEPA guidance, there are potentially two different base year emissions inventories. One is the <u>base case</u> inventory which represents the actual emissions for the meteorological period that is being modeled. This inventory is generally used for model performance evaluations. The second potential base year inventory is called the <u>baseline</u> inventory, which is generally used as the basis for projecting emissions to the future. The <u>base case</u> inventory may include day specific information (e.g. hourly continuous emission monitoring data for point sources) that USEPA considers inappropriate for using in future year projections. Therefore, the <u>baseline</u> inventory may need to replace the day specific emissions with average or “typical” emissions (for certain types of sources). For the 2007 MANE-VU+VA inventory, the <u>base case</u> and <u>baseline</u> inventories are one in the same.

1.2 POLLUTANTS

The inventory includes annual emissions for carbon monoxide (CO), ammonia (NH3), oxides of nitrogen (NOx), particulate matter (PM), sulfur dioxide (SO2), and volatile organic compounds (VOC). The PM species in the inventory are categorized as: filterable and condensable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM10-PRI and PM25-PRI); filterable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM10-FIL and PM25-FIL); and condensable particles (PM-CON). Note that PM10-PRI equals the sum of PM10-FIL and PM-CON, and PM25-PRI equals the sum of PM25-FIL and PM-CON.

1.3 SOURCE CATEGORIES

Emission inventory data from five general categories are needed to support air quality modeling: stationary point-sources, stationary area-sources, on-road mobile sources, nonroad mobile sources (including aircraft, railroad, and marine vessels), and biogenic/geogenic emissions. These sectors are described as follows:

- **Point Sources** are individual facilities and are further subdivided by stack, emission unit ("point"), and emission process ("segment"). The point source data include source-specific information on the location of sources (e.g., latitude/longitude coordinates); stack parameters (stack diameter and height, exit gas temperature and velocity); type of emission process (Source Classification Code {SCC}); and annual emissions. Point sources were classified as electric generating units (EGUs) and non-electric generating units (nonEGUs). Most point source emissions data is certified by the facility and reported to the State agency or USEPA.

- **Stationary Area Sources** include sources that in and of themselves are small, but in aggregate may comprise significant emissions. Examples include emissions from small industrial/commercial facilities, residential heating furnaces, VOCs volatizing from house painting or consumer products, gasoline service stations, and agricultural fertilizer/pesticide application. Emissions were calculated using emission factors and activity data on a county and source category basis.

- **On-road Mobile Source** emissions include sources of air pollution from internal combustion engines used to propel cars, trucks, buses, and other vehicles on public roadways. Emissions were calculated by the Northeast States for Coordinated Air

Use Management (NESCAUM) using the USEPA Motor Vehicle Emission Simulator (MOVES) model in concert with vehicle miles traveled (VMT) data.

- **Non-road Mobile Sources** include internal combustion engines used to propel marine vessels, airplanes, and locomotives, or to operate equipment such as forklifts, lawn and garden equipment, portable generators, etc. For activities other than marine vessels, airplanes, and locomotives, the inventory was developed using the most current version of USEPA's NONROAD model as embedded in the National Mobile Inventory Model (NMIM). Since the NONROAD model does not include emissions from marine vessels, airplanes, and locomotives, these emissions were estimated using the latest USEPA guidance or by groups such as the Eastern Regional Technical Advisory Committee (ERTAC).

- **Biogenic** emissions are emitted by natural sources, such as plants, trees, and soils. The sharp scent of pine needles, for instance, is caused by monoterpenes, which are VOCs. The USEPA developed estimates of biogenic emissions from vegetation for natural areas, crops, and urban vegetation. The USEPA estimates take into account the geographic variations in vegetation land cover and species composition, as well as seasonal variations in leaf cover.

For all sectors, emissions data were compiled on an annual basis to represent 2007 actual emissions and meteorology. For certain large EGUs and nonEGUs, actual hourly 2007 emissions data were adapted for use in the inventory. For sources with emissions estimated by NONROAD model, emissions were compiled as monthly total emissions. For sources included in the MOVES model, emissions will be compiled on an hourly basis.

1.4 DATA FORMATS

The annual mass emissions inventory files were prepared in the National Emissions Inventory (NEI) Output Format Version 3.0 (NOF 3.0). These annual emission inventories will be converted (through the emissions modeling process) from their original resolution (e.g., annual, county level) to input files for air quality models. These input files generally require emissions to be specified by model grid cell, hour, and model chemical species. The emission modelers in the MANE-VU+VA region are using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system and data formats. Ancillary files (holding spatial, temporal, and speciation profile data) were prepared in SMOKE compatible format. Various spreadsheets summarizing emissions by county, sector, SCC, and pollutant were also prepared.

1.5 SUMMARY OF INVENTORY DEVELOPMENT PROCESS

Work on Version 1 of the 2007 MANE-VU+VA inventory began in April 2009. Preparation of the consolidated inventory for point, area, onroad, and nonroad sources started with the inventories submitted by State and local (S/L) as well as input files needed by the NONROAD and MOVES models. For certain area and nonroad source categories, the S/L submittals were supplemented 2008 NEI data. In addition, the Carnegie Mellon Ammonia model was exercised to calculate agricultural ammonia emissions. Work products developed by ERTAC were used including the USEPA wood smoke tool and the Area Source emission factor harmonization project.

The USEPA's format and content quality assurance (QA) programs (and other QA checks not included in USEPA's QA software) were run to identify format and/or data content issues (EPA, 2004). The Contractor worked with the S/L agencies and the staff of the Mid-Atlantic Regional Air Management Association (MARAMA) to resolve QA issues and augment the inventories to fill data gaps in accordance with the Quality Assurance Project Plan prepared for this project.

Work on Version 2 began with a stakeholder review process. Version 1 inventory and summary files were provided for stakeholder review between October 2009 and August 2010. Stakeholder comments were reviewed by the S/L agencies and revisions to the inventory files were made to incorporate stakeholder comments as approved by each S/L agency. Other corrections, revisions, or updates were supplied by the S/L agencies, which resulted in the publication of Version 2 of the 2007 inventory in February 2011 (MARAMA 2011).

Further revisions to the 2007 inventory were made in late 2011. The most significant changes were to use an improved emission estimation methodology for re-entrained road dust from paved roads, incorporate vehicle refueling emissions as calculated by MOVES, amd correct errors used in the NMIM modeling of nonroad emissions. Other revisions were made to correct minor errors or revisions to selected categories as identified by the S/L agencies. These revisons resulted in the publication of Version 3 of the 2007 inventory in December 2011.

1.6 REPORT ORGANIZATION

This report documents the development of Version 1 of the 2007 inventory, as well as the revisions made during the Version 2 and Version 3 update cycles. Sections 2 and 3 of this TSD present the general and State-specific methods and data sources used to develop the MANE-VU+VA 2007 annual inventory for point sources and hourly emissions for large

point sources, respectively. Sections 4 through 7 present the methods and data used to develop the inventory for area sources, nonroad marine vessel/airport/locomotive sources, nonroad sources included in the NONROAD model, and onroad sources included in the MOVES model. Section 8 documents the inventory, temporal allocation, speciation, and spatial allocation modeling input files used for the MANE-VU+VA 2007 inventory for all sectors. Section 9 identifies the file names for all final deliverable products. References for the TSD are provided in Section 10.

2.0 ANNUAL 2007 INVENTORY FOR POINT SOURCES

2.1 INITIAL DATA SOURCES AND QA REVIEW

The 2007 annual point source inventory was developed using the 2007 inventories that S/L agencies submitted to MARAMA and data from the USEPA's Clean Air Markets Division (CAMD) hourly emissions database.

2.1.1 Initial State NIF Submittals

State and local (S/L) agencies prepared and submitted emission inventory files in the National Emissions Inventory (NEI) Input Format Version 3.0 (NIF 3.0). The NIF format includes eight tables: Transmittal (TR), Site (SI), Emission Unit (EU), Emission Release Point (ER), Emission Process (EP), Emission Period (PE), Emission (EM), and Control Equipment (CE). States were requested to submitted 2007 data for those major sources that they would normally submit to USEPA during the 3-year requirements of the Consolidated Emission Reporting Rule. All 13 MANE-VU+VA agencies submitted point source inventories to MARAMA. In addition, Allegheny and Philadelphia Counties in Pennsylvania each submitted their own point source inventories.

Upon receipt of the NIF submittals, the Contractor performed an initial review of the S/L inventories with the following QA checks:

- EPA's Basic Format and Content Checker tool was used to verify format and check for referential integrity and duplicate record issues. Only very minor issues were identified and were resolved by the Contractor without the need for S/L assistance.

- Facility-level comparisons were made between the MANE-VU/VISTAS Best and Final 2002 inventories and the S/L 2007 submittals to identify facilities included in the 2002 inventory but not in the 2007 inventory. For four S/L agencies (NY, PA, Allegheny and Philadelphia Counties), the number of facilities included in the 2007 were far less than the number of facilities reported in 2002. These S/L agencies provided revised files with a lower facility emission cutoff level to ensure that all major sources were included in the 2007 inventory. S/L agencies were asked to review this list and confirmed that facilities not in the 2007 inventory were either closed or included in the area source inventory.

- Facility-level comparisons were made between the MANE-VU/VISTAS 2002 inventories and the S/L 2007 submittals to identify facilities included in the 2007 inventory but not in the 2002 inventory. S/L agencies verified the reasonableness of this list of sources.

- Facility-level comparisons were made between the MANE-VU/VISTAS 2002 inventories and the S/L 2007 submittals to identify facilities that were included in both the 2002 inventory and 2007 inventory. Facility-level emission changes were calculated, large differences between 2002 and 2007 emissions were flagged, and S/L agencies reviewed and confirmed the reasonableness of the emission changes between 2002 and 2007.

- Facility-level ammonia emissions were obtained from the USEPA 2007 Toxic Release Inventory (USEPA 2009a) and were compared to the ammonia emissions in the S/L agency submittal. S/L agencies reviewed the TRI data to ensure that large (> 100 tons per year) ammonia sources were included in the 2007 MANE-VU+VA inventory.

Following this initial QA review, these individual inventory files were consolidated into a single NIF database. S/L responses and updates to the inventory files resulting from the initial QA review are discussed later in this document.

2.1.2 EPA CAMD Hourly Emissions Data

The second source of data was the hourly emissions data reported to USEPA by facilities to comply with various provisions of the Clean Air Act. MARAMA downloaded the 2007 CAMD annual inventory containing NOx and SO2 emissions, heat input data and other information from the CAMD web site in May 2009.

MARAMA prepared an initial crosswalk file to match facilities and units in the CAMD inventory to facilities and units in the 2002 MANE-VU Version 3 inventory. In the CAMD inventory, the Office of Regulatory Information Systems (ORIS) identification (ID) code identifies unique facilities and the unit ID identifies unique boilers and internal combustion engines (i.e., turbines and reciprocating engines). MARAMA sent an Excel Workbook to each S/L agencies that contained an initial crosswalk with the ORIS ID and unit ID in the CAMD inventory matched to the state and county FIPS, state facility ID, and EU ID in the 2002 MANE-VU Version 3 inventory. The crosswalk contained the annual 2007 NOx, SO2, and heat input (except for those units that are required to report for only 6 months, wherein the data were for the 6 month period). The crosswalk also included other information from the 2002 MANVEU inventory, including stack and location coordinates.

Agencies reviewed and confirmed/corrected/supplemented the information in the crosswalk, provided annual 2007 emissions for the 6-month CAMD reporting units, and provided 2007 annual emissions for other CAPs and NH3.

The crosswalk was provided to the Contractor who updated the crosswalk as follows:

- In most of the S/L inventories, the state and county FIPS and state facility ID together identify unique facilities and the EU ID identifies unique boilers or internal combustion engines. However, in some of the S/L inventories, the emissions for multiple EUs were summed and reported under the same EU ID. To provide a better linkage between the CAMD data and the S/L inventories, the Contractor worked with States to establish the crosswalk at the EU ID / EP ID / ER ID. This effort resulted in a much better linkage between the CAMD and S/L inventories.

- In several cases, the EU ID / EP ID / ER ID identifiers in the 2002 MANVU inventory were changed in the 2007 S/L agency submittals. The Contractor worked with the S/L agencies to correct these broken linkages by updating the EU ID / EP ID /ER ID identifies as necessary.

- The Contractor downloaded the 2007 CAMD hourly inventory containing hourly NOx and SO2 emissions and heat input data from the CAMD website (USEPA 2009b). The Contractor summed the hourly emissions to the annual level (or 6-month level for 6-month reporting units) by emission unit. The summed hourly data was compared to the annual summary data, which matched in virtually all cases. This check was made because MARAMA is considering using the actual 2007 hourly data rather than average temporal profiles in the next round of regional air quality modeling.

- As another QA check, the Contractor compiled a list of sources with EGU SCCs of 1-01-xxx-xx and 2-01-xxx-xx in the State NIF tables that could not be linked to the CAMD table. States reviewed this list and verified that there are no large EGUs missing from the CAMD to NIF crosswalk.

The Contractor prepared a CAMD-to-NIF crosswalk spreadsheet for each State. Aagencies were asked to review this list and verify that (1) the linkages are correct, (2) there are no large sources missing from the CAMD-to-NIF crosswalk, and (3) there are not discrepancies between the emissions reported to CAMD and the emissions reported in the SEMAP database.

There are three types of possible linkages:

- CAMD facility has no match in NIF SI facility table. The emissions from these facilities reported to CAMD are small, and initially accounted for about 0.5% of the NOx and 0.07% of the SO2 emissions in the CAMD database.

- CAMD unit could not be matched in NIF. The emissions from these facilities reported to CAMD were small, accounting for about 0.9% of the NOx and 0.007% of the SO2 emissions in the CAMD database. Most of the units that could not be matched at the unit level are either peaking units or industrial sources such as paper mills or chemical plants. In addition, there were several instances where multiple CAMD units match to a single NIF record (i.e., units are grouped in the NIF tables but reported individually in the CAMD database).

- CAMD unit matches with a single NIF record or CAMD unit matches with multiple NIF records (in many cases, the NIF tables include multiple records for different fuel types). The emissions from these units reported to CAMD account for about 98.6% of the NOx and 99.9% of the SO2 emissions in the CAMD database. In most cases the sum of the emissions from the matching NIF records are generally very close to the CAMD unit level emissions; and S/L agencies verified that linkages were correct.

As another QA check, the Contractor compiled a list of sources with EGU SCCs of 1-01-xxx-xx and 2-01-xxx-xx in the S/L agency NIF tables that could not be linked to the CAMD CEM table to help resolve some of the linkage issues noted above. S/L agencies made significant efforts to improve the crosswalk between the CAMD identifiers and the S/L agency identifiers. Appendix A contains the current version of the crosswalk.

2.2 PM AUGMENTATION

PM compounds may be reported in several forms, as identified in Exhibit 2.1. Exhibit 2.2 provides a count of the number of annual NIF EM table records in each agency's NIF Submittal by type of PM compound. The PM augmentations process was necessary to gap-fill missing PM pollutant complements. For example, if a S/L agency provided only PM10-PRI emissions, the PM augmentation process filled in the PM25-PRI emissions.

A second aspect of the PM augmentation process was to utilize improved condensable emission factors for EGUs. Condensable emissions were not calculated uniformly across all states in the MANE-VU region in the 2002 emissions inventory. Because of the need to model the effect of condensable emissions on regional haze and fine particles, MARAMA instructed the Contractor to use recently updated emission factors for condensable emissions from EGUs.

Exhibit 2.1 – PM Compound Descriptions

Pollutant Code	Pollutant	Pollutant Description
PM-CON	Primary PM Condensable portion only (all < 1 micron)	Material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack.
PM-FIL	Primary PM, Filterable portion only	Particles that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train.
PM-PRI	Primary PM, includes filterables and condensables PM-PRI= PM-FIL + PM-CON	Particles that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM.
PM10-FIL	Primary PM10, Filterable portion only	Particles with an aerodynamic diameter equal to or less than 10 micrometers that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train.
PM10-PRI	Primary PM10, includes filterables and condensables, PM10- PRI = PM0-FIL + PM-CON	Particles with an aerodynamic diameter equal to or less than 10 micrometers that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM. (As specified in § 51.15 (a)(2), These two PM components are the components measured by a stack sampling train such as USEPA Method 5.)
PM25-FIL	Primary PM2.5, Filterable portion only	Particles with an aerodynamic diameter equal to or less than 2.5 micrometers that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train.
PM25-PRI	Primary PM2.5, includes filterables and condensables PM25-PRI= PM25-FIL + PM-CON	Particles with an aerodynamic diameter equal to or less than 2.5 micrometers that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM. (As specified in § 51.15 (a)(2), These two PM components are the components measured by a stack sampling train such as USEPA Method 5.)

Exhibit 2.2 – PM Compounds Reported in State Initial Submittals

	Number of Annual EM Records in Agency's Initial NIF Submittal						
Agency	**PM-CON**	**PM-FIL**	**PM-PRI**	**PM10-FIL**	**PM10-PRI**	**PM25-FIL**	**PM25-PRI**
CT[1]	---	---	---	122	1,300	---	5
DE	449	---	---	886	756	734	699
DC	70	---	---	70	70	70	70
ME	---	9	---	1,150	---	1,053	---
MD	1,265	---	---	3,543	3,750	3,040	2,477
MA	---	---	6	6,614	---	5,930	---
NH	---	463	---	464	---	461	---
NJ	---	---	5,966	---	5,848	---	---
NY	---	---	1,220	---	1,201	---	---
PA	---	---	---	---	5,738	---	3,949
Allegheny[2]	434	881	---	881	---	836	---
Philadelphia	---	---	---	1,178	27	351	21
RI	12	12	105	12	46	12	48
VT	---	64	---	---	---	---	---
VA[3]	---	---	---	5,204	---	3,302	---

After reviewing the initial draft inventory that was posted in October, 2009, three agencies provided the following changes to their initial submittals. These changes are reflected in the record counts in the above table. The PM augmentation routine was re-executed to account for these changes.

1) Connecticut indicated that the PM records in their original submittal for oil and coal-fired boilers should have been submitted as PM10-FIL and not PM10-PRI. All natural gas-fired units and oil-fired turbines were correctly reported as PM10-PRI.
2) Allegheny County provided information on 31 additional facilities that were not included in their original submittal.
3) Virginia indicated that all of the PM records in their original submittal used incorrect pollutant codes. Records in the original submittal designated as PM10-PRI should have been submitted as PM10-FIL, and PM25-PRI should have been PM25-FIL.

The PM augmentation process was divided into two components – the first applying to EGUs and the second to all other point sources. EGUs were identified as those units that supplied hourly data to USEPA's CAMD database. Because of the differences in the augmentation process for EGUs and nonEGUs, each process is discussed separately in the following sections. The EGU process uses the updated condensable emission factors, while the nonEGU process is essentially the same process used in developing the 2002 MANE-VU Version 3 inventory.

2.2.1 EGU PM Augmentation

The EGU PM augmentation process utilized the recently updated condensable emission factors for EGUs developed for MARAMA in 2008. Appendix B contains the technical memorandum describing how the emission factors were developed. The general process is to use the emission factors and heat input to calculate the PM-CON emissions, and then to perform the gap filling for compounds missing from the S/L submittal.

2.2.1.1 EGU Condensable Emission Factors

As described in Appendix B, two sets of emission factors were developed by 6-digit SCC corresponding to equipment type (boiler or IC engine) and fuel type. The first set is based on all available source tests, while the second set includes only source tests where nitrogen purging occurred. As described in more detail in Appendix B, in measuring condensable PM from combustion of fuels containing sulfur, it has been shown by USEPA that SO2 collected in the impingers can be oxidized to sulfate and produce a variable sulfate artifact that results in overestimation of condensable emissions. In this example, if impingers are not purged with nitrogen, errors associated with the sulfate artifact may be inflated resulting in an overestimation of condensable PM emissions.

Exhibit 2.3 shows the emission factors considered for use in estimating EGU condensable PM emissions. It shows the new emission factors developed using all available test data as well as the emission factors based only on those tests that utilized a nitrogen purge. In addition, emission factors are available from USEPA's AP-42 emission factor document. The emission factors actually used in the augmentation process are **highlighted in bold** in Exhibit 2.3. Emission factors based on purged test were used where available; otherwise the emission factors based on all tests were used. Since Appendix B did not provide a condensable PM emission factors for residual oil, we used the AP-42 condensable PM emission factor for residual oil.

Exhibit 2.3 - Emission Factors Used to Estimate EGU Condensable PM Emissions

		Emission Factor (lbs/mmBtu)		
SCC (6-digit)	**SCC (6-digit) Description**	**MARAMA[1] All Tests**	**MARAMA[1] Purged Tests Only**	**AP-42[2]**
1-01-001 *1-02-001*	Boiler / EGU / Anthracite Coal *Boiler / Industrial / Anthracite Coal*	**0.0084**	---	---
1-01-002 *1-02-002* *1-03-002*	Boiler / EGU / Bituminous/Sub-butuminous Coal *Boiler / Industrial / Bituminous/Subbit. Coal* *Boiler / Commercial / Bituminous/Subbit. Coal*	0.022	**0.013**	0.04 to 0.37[3] depending on sulfur content
1-01-003 *1-02-003*	Boiler / EGU / Lignite *Boiler / Industrial / Lignite*	**0.039**	---	0.014
1-01-004 *1-02-004*	Boiler / EGU / #6 Fuel Oil *Boiler / Industrial / #6 Fuel Oil*	---	---	**0.01**
1-01-005 *1-02-005* *1-03-005*	Boiler / Industrial / #2 Fuel Oil *Boiler / Commercial / #2 Fuel Oil* *Boiler / EGU / #2 Fuel Oil*	**0.014**	---	0.00928
1-01-006 *1-02-006* *1-03-006*	Boiler / EGU / Natural Gas *Boiler / Industrial / Natural Gas* *Boiler / Commercial / Natural Gas*	**0.00249**	---	0.00559
1-01-008	Boiler / EGU / Petroleum Coke	**0.05**	---	---
2-01-001 *2-01-009* *2-02-009*	IC Engine / EGU/ Fuel Oil *IC Engine / EGU/ Kerosene* *IC Engine / Industrial / Kerosene*	0.013	**0.01**	0.0072
2-01-002 *2-02-002* *2-03-002*	IC Engine / EGU / Natural Gas *IC Engine / Industrial/ Natural Gas* *IC Engine / Commercial / Natural Gas*	0.005	**0.0015**	0.0047

1) Source: *Emissions Factors for Condensable Particulate Matter Emissions from Electric Generating Units* ; memo dated August 20, 2008, from Arthur Werner (MACTEC) to Julie McDill (MARAMA). In accordance with USEPA guidance, CPM emissions determined from Method 202 tests that apply nitrogen purging are more reliable than results from tests where purging was not used.
2) Source: *AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources*.
3) Based on typical bituminous sulfur content range of 0.7 to 4.0 % by weight.
4) Based on typical lignite sulfur content of 0.4 % by weight.
5) **Bolded** numbers are the emission factors actually used to calculated condensable emissions.

SCCs associated with CAMD units for which condensable emission factors were not available in the MARAMA report:

1-01-009 Boiler / EGU / Wood or Bark Waste
1-01-010 Boiler / EGU / LPG
1-01-012 Boiler / EGU / Solid Waste
1-01-013 Boiler / EGU / Liquid Waste
1-02-009 Boiler / Industrial / Wood or Bark Waste
1-02-010 Boiler / Industrial / LPG
1-02-014 Boiler / CO Boiler / Natural or Process Gas
3-05-007 Cement Manufacturing / Kilns
3-06-002 Petroleum Refining / Catalytic Cracking Units
3-06-012 Petroleum Refining / Fluid Coking Units
3-90-001 In-process Fuel / Anthracite Coal
3-90-012 In-process Fuel / Solid Waste
3-99-999 Misc. Industrial Processes

While Appendix B only provides emission factors for electric generation SCCs (e.g., 1-01-xxx-xx or 2-01-xxx-xx), a review of the S/L agency NIF submittals showed that several other SCCs were used by EGUs. These additional SCCs are *highlighted in italics* in Exhibit 3. Since these SCCs were associated with EGUs, it was assumed that emission factors would apply to these SCCs also.

Note also that there were several other SCCs associated with EGUs for which condensable PM emission factors were not available. These SCCs are listed at the bottom of Exhibit 2.3. No special effort was made to evaluate condensable emissions for these SCCs; rather, the State-supplied PM condensable emissions were used where available.

2.2.1.2 EGU Heat Input

In addition to the emission factors, the annual heat input in mmBtu/year by unit and fuel type is also needed to calculate condensable PM emissions. Heat input was available from two sources. The CAMD hourly database provides heat input, but there are two limitations for each use in this analysis. First, the heat input is reported at the unit level and does not provide a breakout of heat input for units using multiple fuels. Second, only a 6-month heat input value is provided for those units only required to report for six months.

As an alternative to the CAMD heat input, the S/L NIF tables usually provide a fuel process annual throughput which can be used to calculate the heat input using the heating value of the fuel. By calculating the heat input using the NIF annual throughput, the annual heat input is available by fuel type for both 6-month and 12-month reporting units. Where NIF annual throughput was available, it was used to calculate the annual heat input which was then used to calculate condensable PM emissions. In cases where the S/L NIF tables do not provide an annual throughput, the CAMD heat input was assigned to the primary fuel type and used in the condensable PM emission calculations.

2.2.1.3 EGU PM Emission Calculations

In addition to calculating the condensable PM emissions, the EGU PM augmentation also gap-fills missing PM compounds. The gap-filling requires that the data be analyzed and separated into cases. The cases determine which math steps and ratios of PM terms will be applied. Exhibit 2.4 shows the various cases and the augmentation method that was applied.

Exhibit 2.4 – Cases and Required Steps to Augment EGU PM Emissions

Case	PM Reported	Augmentation Methodology
1	---	None required; all PM compounds = 0
2	PM25-PRI	PM-CON = HEAT_USED * EMIS_FACT PM25-PRI = PM-CON (only if PM-CON > PM25-PRI) PM25-FIL = PM25-PRI - PM-CON PM10-FIL = PM25-FIL * F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL
3	PM10-PRI	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON (only if PM-CON > PM10-PRI) PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
4	PM25-PRI PM10-PRI	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON (only if PM-CON > PM10-PRI) PM25-PRI = PM-CON (only if PM-CON > PM25-PRI) PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM25-PRI - PM-CON
5	PM10-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
6	PM10-FIL PM25-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
7	PM10-FIL PM10-PRI PM25-FIL PM25-PRI	PM-CON = HEAT_USED * EMIS_FACT
8	PM-PRI	PM-CON = HEAT_USED * EMIS_FACT PM-PRI = PM-CON (only if PM-CON > PM-PRI) PM-FIL = PM-PRI - PM-CON PM10-FIL = PM-FIL * F10_FIL ratio PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
9	PM-PRI PM10-PRI	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON (only if PM-CON > PM10-PRI) PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
10	PM-PRI PM10-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL

Case	PM Reported	Augmentation Methodology
11	PM-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-FIL = PM-FIL * F10_FIL ratio PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
12	PM-FIL PM10-FIL PM25-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
13	PM-CON PM10-FIL PM25-FIL	PM10-PRI = PM10-FIL + PM-CON PM25-PRI = PM25-FIL + PM-CON
14	PM-CON PM10-FIL PM10-PRI	PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PMCON + PM25-FIL
15	PM-CON PM10-FIL PM10-PRI PM25-FIL PM25-PRI	None required; all PM compounds present
16	PM-CON PM-PRI	None required; only one occurrence and emissions were trivial
17	PM-CON PM-PRI PM10-FIL PM10-PRI PM25-FIL PM25-PRI	None required; all PM compounds present
18	PM-CON PM-FIL PM-PRI PM10-FIL PM10-PRI PM25-FIL PM25-PRI	None required; all PM compounds present

2.2.2 NONEGU PM Augmentation

The nonEGU PM augmentation process utilized the methodology developed for MARAMA for the 2002 MANE-VU Version 3 inventory. The steps in the PM augmentation process were as follows:

- Step 1: Initial QA and remediation of S/L provided PM pollutants;
- Step 2: Updating of PM factor ratios previously developed for MARAMA based on factors from the Factor Information and Retrieval (FIRE) Data System and the USEPA PM Calculator (Appendix C provides the PM ratio table by SCC and control device);
- Step 3: Implementation of the ratios developed in step 2.; and
- Step 4: Presentation of PM augmentation results to S/L agencies for review and comment.

2.2.2.1 Initial QA and Remediation of PM Pollutants

Before we ran the nonEGU PM augmentation process, we reviewed the data for inconsistencies. Inconsistent values were be replaced. The consistency checks and replacement actions were as follows:

1. If PM10-PRI >0 and PM25-PRI > PM10-PRI (and PM10-FIL, PM25-FIL and PM-CON are null or 0), then set PM25-PRI = PM10-PRI.
2. If PM10-FIL > 0 and PM25-FIL > PM10-FIL (and PM10-PRI, PM25-PRI and PM-CON are null or 0), then set PM25-FIL = PM10-FIL.
3. If PM10-PRI >0 and PM10-FIL > PM10-PRI (and PM25-PRI, PM25-FIL and PM-CON are null or 0), then set PM10-FIL = PM10-PRI.
4. If PM25-PRI > 0 and PM25-FIL > PM25-PRI (and PM10-PRI, PM10-FIL and PM-CON are null or 0), then set PM25-FIL = PM25-PRI.

The consistency checks revealed very few occurrences of inconsistencies, and when inconsistencies did occur, the emission values were very small. As a result, S/L agencies were not asked to review this information and provide corrections because the inconsistencies did not involve significant emission sources. The replacement actions above were appropriate for an inventory used for regional air quality modeling.

2.2.2.2 Updating of PM Factor Ratios

The augmentation steps require the use of ratios developed from available emissions and particle size distribution data. These ratios are needed when only one PM term is available,

and two or more terms need to be augmented. Examples of how we used the PM ratios are shown below:

PM-FIL × RatioCON/FIL = PM-CON

PM-PRI × RatioCON/PRI = PM-CON

PM-CON × RatioFIL/CON = PM-FIL

PM-CON × RatioPRI/CON = PM-PRI

For the MANE-VU 2002 inventory, a table of PM compound ratios was developed. The development of this table is documented in the *TSD for the 2002 MANE-VU SIP Modeling Inventories, Version 3*. The primary deliverable of this step of the process was the development of a table keyed by SCC, primary control device, and secondary control device. This table is called the SCC Control Device Ratios table (Reference Tables MANE-VU_PMAugmentation.mdb). We updated this table to include SCC, primary control device, and secondary control device codes found in the 2007 inventory that were not contained in the 2002 MANE-VU inventory. Appendix C provides the PM ratio table by SCC and control device.

2.2.2.3 NonEGU PM Emission Calculations

The gap-filling requires that the data be analyzed and separated into cases. The cases determine which math steps and ratios of PM terms will be applied. Exhibit 2.5 shows the various cases and the augmentation method that was applied.

After completing the calculations, the data was QA checked to ensure that the calculations resulted in consistent values for the PM complement. On a few occasions, the mix of ratio value and the pollutants and values provided by the S/L agency resulted in negative values when FIL was back-calculated. In this case the negative FIL value was set to zero and the PRI value was readjusted. In a few cases the appropriate combination of ratios, SCC, and control efficiencies were not available to calculate the PM10-PRI and PM25-PRI values. In these cases, PM10-PRI and PM25-PRI were set equal.

Exhibit 2.5 – Cases and Required Steps to Augment nonEGU PM Emissions

Case	PM Reported	Augmentation Methodology
1	PM25-PRI	PM-CON = PM25-PRI * CON_P25 ratio PM25-FIL = PM25-PRI - PM-CON PM10-FIL = PM25-FIL * F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL
2	PM10-PRI	PM-CON = PM10-PRI * CON_P10 ratio PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
3	PM25-PRI PM10-PRI	PM-CON = PM10-PRI * CON_P10 ratio PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM25-PRI - PM-CON
4	PM10-FIL	PM-CON = PM-CON * CON_F10 ratio PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
5	PM10-FIL PM25-FIL	PM-CON = PM10-FIL * CON_F10 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
6	PM10-FIL PM10-PRI	PM-CON = PM10-PRI - PM10-FIL PM25-FIL = PM10-FIL * F25_F10 ratio PM25-PRI = PM-CON + PM25-FIL
7	PM25-FIL	PM-CON = PM25-FIL * CON_F25 ratio PM10-FIL = PM25-FIL * F10-F25 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
8	PM10-FIL PM10-PRI PM25-FIL PM25-PRI	PM-CON = PM25-PRI - PM25-FIL
9	PM-PRI	PM-CON = PM-PRI * CON_PRI ratio PM-FIL = PM-PRI - PM-CON PM10-FIL = PM-FIL * F10_FIL ratio PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
10	PM25-FIL PM25-PRI	PMCON = PM25-PRI - PM25-FIL PM10-FIL = PM25-FIL * F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL
11	PM-CON PM10-FIL PM25-FIL	PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL

Case	PM Reported	Augmentation Methodology
12	PM-CON	PM10-FIL = PM-CON * F10_CON ratio PM25-FIL = PM10-FIL * F25_F10 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
13	PM-CON PM10-FIL PM10-PRI	PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PMCON + PM25-FIL
14	PM-CON PM10-FIL PM10-PRI PM25-FIL PM25-PRI	None required; all PM compounds present
15	PM-CON PM-FIL	PM10-FIL = PM-CON / CON_F10 ratio PM25-FIL = PM10-FIL / F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
16	PM-CON PM10-PRI PM25-PRI	PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM25-PRI - PM-CON
17	PM-FIL	PM10-FIL = PM-FIL * F10_FIL ratio PM_CON = PM10-FIL * CON_F10 ratio PM25-FIL = PM10-FIL / F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL

2.3 EMISSION RELEASE POINT QA CHECKS

Stack parameters are an important component of an emission inventory used for regional air quality modeling. Careful QA is required to ensure that the point source emissions are properly located both horizontally and vertically on the modeling grid. This section describes the procedures used to quality assure, augment, and where necessary, revise, stack parameters using standardized procedures to identify and correct stack data errors. These procedures were implemented within the NIF file itself, and are based on the QA procedures built into SMOKE that are designed to catch missing or out-of-range stack parameters.

2.3.1 QA Checks and Gap-Filling for Location Coordinates

Because air quality modeling strives to replicate the actual physical and chemical processes that occur in an inventory domain, it is important that the physical location of emissions be determined as accurately as possible. The emission release (ER) point record is used to report the location and relevant physical attributes of the emission release point. Location

coordinates must be reported to identify where emissions are released to the ambient air, via a stack or non-stack (e.g., fugitive release). For a non-stack, or fugitive release, coordinates may represent the general location where emissions are released.

In the ER record, location data may be reported as x and y coordinates (X – Y) from either of two coordinate systems - Latitude / Longitude (LATLON), or Universal TransMercator (UTM). X - Y coordinates reported as Latitude and Longitude must be reported in the decimal degree format. X - Y coordinates reported as UTM Easting and UTM Northing, must be reported in kilometers.

UTM data received from MARAMA was processed by the Contractor Team and converted to Latitude Measure and Longitude Measure in decimal degrees, as is required by the SMOKE emissions processing system. All conversions of UTM to LATLON were made using a spreadsheet[1] developed by Professor Steven Dutch, School of Natural and Applied Sciences, University of Wisconsin - Green Bay. This spreadsheet tool allowed for batch conversion of UTM data to decimal degree format and was configured for WGS 84 DATUM. While errors using this spreadsheet are typically a few meters, rarely 10 or more, the accuracy of the conversion is limited to the accuracy of the initial UTM data.

Once conversions were made to LATLON decimal degrees, reasonableness checks were conducted on each release point relative to county centroids and min/max coordinates associated with the FIPS codes assigned to each stack. If a stack was located outside the western-, eastern-, northern- or southern-most boundary of the county (based on SMOKE's county lat/lon file), the point was flagged for additional review. Flagged sources were then mapped with GIS software to determine their placement relative to the FIPS County associated with the stack. If a source was found to be outside of the county boundaries, it was identified for further review.

2.3.2 QA Checks and Gap-Filling for Emission Release Parameters

In preparing emissions for grid modeling, valid parameters for the physical characteristics of each release point (stack height, diameter, temperature, velocity, and flow) are necessary to correctly place facility release points and associated emissions into vertical layers for proper air quality modeling. The USEPA's QA guidance for diagnosing stack parameter issues was generally applied to identify QA issues in the S/L point source inventories. The QA guidance involved diagnosing the correct assignment of the ERP type (i.e., stack or

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[1] http://www.uwgb.edu/dutchs/FieldMethods/UTMSystem.htm

fugitive), parameters with zero values, parameters not within the range of values specified in the USEPA's QA procedures, and consistency checks (i.e., comparing calculated values against the values reported in the inventory). In many cases errors were caused by missing or zero values.

The first step of our quality assurance (QA) involves review of the Emission Release Point Type. Using this type code, we used a routine to assess the validity of the stack parameters, to replace values if necessary, and to fill-in missing data points. We employed a routine that compared each emission release point parameter to a minimum and maximum range of values and when that parameter was missing or was found to exist outside of that range, we augmented the parameter. We also checked non-fugitive stack parameters for internal consistency between:

- stack height and diameter, and
- stack diameter, exit gas velocity, and exit gas flow rate.

When internal consistency was not met, we provided replacement values for the parameters.

The following steps summarize the process of finding and replacing missing, out-of-range, or internally inconsistent stack parameters.

Step 1: For fugitive emission release points, replace stack parameters

For fugitive emission release points (ERPTYPE=01), we first compared the existing fugitive emission height against the following range thought to be representative of the minimum and maximum values allowable for most fugitive emission release points.

Fugitive Release Height: 0.1 to 100 ft

In all but one case, the fugitive release height was valid. For that one case, we set the fugitive release height to 100 feet. For all other cases, we kept the fugitive release height and replaced all other stack parameters with the defaulted values listed below. In some cases, the fugitive release height was blank but the S/L agency provided a stack height and we retained the S/L supplied stack height. In other cases, the S/L agency provided a temperature for the fugitive emissions and we retained the S/L supplied temperature. The following summarizes the procedure for filling in stack parameters for fugitive emission release points:

Stack Height: use fugitive release height, if valid; if fugitive release height not present and stack height provided, use the stack height; if neither fugitive release height or stack height not present, use 10 feet as the default.

Stack Temperature: use temperature provided by S/L agency, if valid; otherwise used 72 ^{o}F.

Stack Diameter: use 0.003 feet for fugitive sources

Stack Velocity: 0.0003 feet per second for fugitive sources

Stack Flow: use 0.0 cubic feet per second for fugitive sources

Step 2: For non-fugitive emission release points, find and replace out-of-range or missing stack heights and temperatures

For non-fugitive emission release points, we compared existing stack parameters against a set of the following ranges thought to be representative of the minimum and maximum values allowable for most emission release points.

Stack Height: 0.1 to 1000 feet

Stack Temperature: 50 to 1,800 ^{o}F

Stack Diameter: 0.1 to 50 feet

Missing or out-of range parameters were identified and evaluated. If not realistic, missing or out-of range parameters were replaced using the procedures described below.

Stack Height: All stack heights were less than the maximum value of 1000 feet. Numerous stack heights were zero or missing, in which case the stack height was filled in using national default sets of physical parameter data based on the SCC. The stack parameter national default database is included as Appendix D.

Stack Temperature: There were 30 records where the stack temperature exceeded 1,800 ^{o}F. We reviewed the stack description table for these records, which indicated that most of these stacks were for flares or furnaces. We deemed the S/L supplied temperature data as plausible and retained the S/L provided value. There were 100 records where the stack temperature was less than 50 ^{o}F and not equal to 0 ^{o}F or missing. We reviewed the stack description table for these records. Many of these stacks were for refrigerated tanks or other sources where the S/L supplied temperature data was deemed plausible. For example, a nylon manufacturing facility in Virginia emits thousands of tons of NOx in 2007. Most of the NOx is

emitted from a handful of fairly cold stacks, with exit gas temperatures generally ranging from 40-60 degrees. Rather than replace these S/L supplied values that seemed plausible with national defaults, we retained the S/L supplied data. Where the stack temperature was reported as 0 ^{o}F or missing, we replaced the stack temperature with the national default based on the SCC.

Step 3: For non-fugitive emission release points, find and replace out-of-range or missing stack diameters, velocities, and flow rates

First, we evaluated the stack diameter to determine if it was within the valid range of 0.1 to 50 feet. There were 200 records where the stack diameter exceeded 50 feet. We reviewed the stack description table for these records. Most of these were large storage tanks, cooling towers, wastewater treatment ponds or area-type sources such as process equipment leaks. Based on this review, we deemed the S/L supplied diameter data as plausible and retained the S/L provided value.

There were 66 records with missing stack diameters where both the velocity and flow rate were provided. For these records, the stack diameter was calculated using the following equation:

Stack Diameter [ft] = SQRT (4 * Stack Flow [cu ft/sec] / (Stack Velocity [ft/sec] * π [Pi]))

For the remaining cases where the stack diameter was reported as zero or missing, we replaced the stack diameter with the national default based on the SCC.

Next, the velocity and flow rate were evaluated. If the diameter, velocity and flow rate were all non-zero, we assessed internal consistency between diameter, velocity and flow rate using the following equation:

Stack Flow [cu ft/sec] = (π [Pi] * (Stack Diameter [ft] / 2) ^ 2) * Stack Velocity [ft/sec]

If the calculated and reported flow rates are within 10 % of one another, then internal consistency was assumed and no additional steps were taken. If the internal consistency was not met for velocity and flow rate, Exhibit 2.6 below provides details on the approach taken to correct missing, out-of-range values, or internally inconsistent values for velocity and flow rate based on different scenarios. Velocity and flow rate were augmented either by calculation or the use of national defaults by SCC when necessary.

Exhibit 2.6 - Stack Parameter Data Replacement Matrix

(X = Data value present)

Diameter	Velocity	Flow Rate	Action
-	X	X	1. Calculate diameter using velocity and flow rate. 2. Check that calculated diameter is within range.
-	-	-	1. Replace diameter, velocity, and flow rate with national SCC default values.
-	-	X	1. Replace diameter, velocity, and flow rate with national SCC default values.
-	X	-	1. Replace diameter, velocity, and flow rate with national SCC default values.
X	-	-	1. Default velocity using national default sets. 2. Calculate flow rate using internal consistency formula.
X	-	X	1. Calculate velocity using internal consistency formula. 2. Check that calculated velocity is within range (less than 150 ft/sec). A. If calculated velocity is not within range, then default all 3 parameters using national default sets.
X	X	-	1. Check that velocity is within range (less than 150 ft/sec). A. If velocity is within range, then: > Calculate flow rate using internal consistency formula. B. If velocity is not within range, then: > Default all 3 parameters using national default sets.
X	X	X	1. Check that velocity is within range (less than 150 ft/sec). A. If velocity is within range and flow rate does not meet internal consistency for diameter, velocity and flow rate, then: > Calculate flow rate using internal consistency formula. B. If velocity is not within range, then: > Calculate velocity using internal consistency formula. > Check that calculated velocity is within range. If so, then default to calculated velocity. > If calculated velocity is not within range, then default all 5 parameters using national default set.

2.4 IDENTIFICATION OF EGUs AND NONEGUs

In the past, point sources have been categorized as either EGUs or nonEGUs using a variety of schemes. The SCC, standard industrial classification code (SIC), and North American Industry Classification System (NAICS) code have been used to classify sources as either EGU or nonEGU. Another scheme that has been used is to classify as EGU sources that is required to report emissions to USEPA's CAMD hourly emission database. For consistency in both reporting and projecting emissions to the future, the MANE-VU+VA inventory using the following scheme for classifying point sources:

- CAMD EGU – these are units that report emissions to the USEPA CAMD hourly emission database and have been classified by States as EGUs;
- CAMD nonEGU - these are units that report emissions to the USEPA CAMD hourly emission database and have been classified by States as nonEGUs; and
- OTHER – all other nonEGU point sources and small EGU point sources not included in the above categories.

Data elements were add to the NIF EP table to include the above classification scheme. This classification scheme was reviewed and approved by ERTAC.

2.5 VERSION 2 - STAKEHOLDER COMMENT AND RESPONSE

On October 6, 2009, MARAMA provided a notice to stakeholders of the opportunity to review the initial draft of the 2007 point source inventory data and documentation. Stakeholders were invited to review and comment on the draft 2007 inventory of air emissions from point sources to be used for regional air quality modeling. On October 20, MARAMA hosted a conference call that provided an opportunity for stakeholders to ask questions about the draft 2007 point source modeling inventory. Written comments were reviewed by the State inventory staff and MARAMA, and resulted in several changes to the draft documentation and inventory data. The changes requested by stakeholders and approved by the States are summarized in the following subsections.

2.5.1 Connecticut Response to Stakeholder Comments

Sikorsky Aircraft provided comments on roughly ten sources regarding the SO2, PM, and VOC emissions. The requested changes were very small (under a ton per year). Connecticut accepted Sikorsky Aircraft's comments.

Covanta Energy commented that the annual NOx emissions for the Covanta Bristol Unit #1 (Facility ID 09003-0902, emission unit P0026) were abnormally low because of a temporary pilot test of a NOx emission control technology. Covanta requested that 2005 emissions should be used since the 2007 actual emissions are not representative of previous or subsequent years. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values rather than 2005 values as requested by Covanta. Connecticut will consider this comment again during the development of the future year inventories to ensure that reasonable future year emissions are estimated.

Hamilton Sundstrand commented that three emission units at its facility (Facility ID 09003-8602, emission units P0038, P0079, and R0097) were permanently shut down in 2008. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values. Connecticut will consider this comment again during the development of the future year inventories to ensure that reasonable future year emissions are estimated.

NRG Energy provided very minor revisions to the SO2, NOx, CO, VOC, PM and NH3 emissions data for the Montville (Facility ID 09011-1505) and Norwalk (Facility ID 09001-4214) facilities. Connecticut accepted these changes.

2.5.2 Maryland Response to Stakeholder Comments

NRG Energy requested a change to the VOC emissions for the Vienna Power Generating Station (Facility ID 019-0013, emission unit 4-0065). Maryland agreed to make the change, revising the VOC emissions from 0.9455 to 0.9641 tons per year.

Transcontinental Gas Pipe Line Company commented that the inventory for its facility in Howard County (Facility ID 027-0223) has 12 internal combustion engines represented by one grouped emission unit, which gives the impression that there is one large source when there are actually 12 smaller units. Maryland did not change the inventory based on this comment since the 12 engines are nearly identical and identifying each engine individually is not needed for the 2007 modeling inventory.

Covanta Energy requested changes to the stack parameters for the three units at the Montgomery County Resource Recovery Facility (Facility ID 031-1718). Maryland agreed to make those revisions.

2.5.3 Massachusetts Response to Stakeholder Comments

Saint Gobain Containers requested minor changes to the annual emissions and stack parameters for its facility in Milford (Facility ID 25027-1200856). Massachusetts accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Verallia formerly (Saint Gobain Containers) also provided comments on the 2007 PM2.5 emissions for all sources and stated that they may not contain appropriate condensable emissions. The company did not provide revised estimates or suggestions for improving the estimates of condensable emissions. For facilities that did not report PM2.5 or condensable emissions, the PM2.5 or condensable emissions were calculated using the methodogy described in Section 2.2.2. MARAMA acknowledges that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM2.5 or condensable emissions.

Verallia formerly (Saint Gobain Containers) also indicated that stack flow rate data was missing for their plants in Massachusetts. The facilities facilities did have stack velocity data. This data gap was filled by calculating the flow rate using the stack diameter and the stack exit velocity.

2.5.4 New Jersey Response to Stakeholder Comments

RRI Energy provided updated emissions and stack data for several of its facilities, mostly minor changes to PM emission values and revisions to stack parameters. New Jersey agreed to make the revisions provided by RRI Energy.

BASF identified that its plant in East Newark (Facility ID 34017-10419) was permanently shut down and did not operate in 2007. New Jersey agreed and the 2007 emissions were set to zero.

Merck & Co., Inc indicated that its facility in Rahway, NJ (Facility ID 34039-41712) emitted 3.42 tons/yr of ammonia emissions from their boilers in 2007. New Jersey agreed and the ammonia emissions were added to the inventory.

Georgia Pacific Gypsum LLC submitted updates for its Camden facility (Facility ID 34007-51611) to correct the 2007 emissions based upon recent stack test data for board dryer U7 and process emissions factors from kettles U3, U4 and U5. Total PM2.5 emissions were also updated using current AP-42 factors for the Gypsum industry. In

addition, the ammonia emissions were missing from the inventory. New Jersey agreed to make the requested changes.

E.R. Squibb & Sons, LLC, requested changes to the ammonia and PM2.5 emissions for its facilities in Lawrenceville, NJ (Facility ID 34021-61052), New Brunswick, NJ (Facility ID 34023-17739), and Hopewell (Facility ID 34021-61053). New Jersey agreed to make the requested changes.

Schering Corporation supplied corrections to the ammonia emissions from its Kenilworth facility (Facility ID 34039-41806). New Jersey agreed to make the requested changes.

ConocoPhillips Company provided revisions to ammonia and VOC emissions for the Bayway Refinery (Facility ID 34039-41805). They also provided revisions to selected SCCs for certain heaters, sulfur recovery units, truck loading activities, marine vessel loading activities, and emergency flares. ConocoPhillips also requested that certain parts of the refinery be modeled as area sources rather than point sources, and provided rectangular grid coordinates to define the area sources. While this change would be appropriate for a fence line modeling study, it cannot not be accommodated in a multi-State regional air quality model since the SMOKE emission modeling system is not capable of handling area sources that are smaller than the air quality model grid cell. Therefore, this change was not made.

Covanta Energy requested minor revisions to the ammonia and PM emissions at the Union County Resource Recovery Facility (Facility ID 34039-41814) and Warren Energy Resource Facility (Facility ID 34041-85455). New Jersey agreed to make those revisions.

Air Engineering submitted comments on behalf of EF Kenilworth LLC (Facility ID 34029-41741), requesting minor changes to PM emissions and revisions to stack parameters. New Jersey agreed to make the requested changes.

Air Engineering submitted comments on behalf of Rowan University (Facility ID 34015-55779), requesting adding ammonia emissions for its sources. New Jersey agreed to make the requested changes.

Air Engineering submitted comments on behalf of The College of New Jersey (Facility ID 34021-61008), requesting adding ammonia emissions for its sources and revisions to stack parameters. New Jersey agreed to make the requested changes.

Actavis requested the addition of 0.13 tons per year of ammonia for their facility (Facility ID 34039-40295). New Jersey agreed to make the addition.

PSEG Power LLC requested changes to SCCs and stack parameters, as well as numerous minor changes to emission estimates, for its facilities in New Jersey. New Jersey agreed to make the revisions. PSEG also requested the units classified as "insignificant units" be excluded from the modeling inventory. New Jersey elected to keep the emissions from insignificant units in the inventory because the purpose of the inventory is to model all of the emissions actually emitted in 2007.

MRPC/OEC-LES requested changes SCCs, ammonia and PM emissions, and stack parameters for its facility (Facility ID 34029-78901). New Jersey agreed to make the revisions.

2.5.5 New York Response to Stakeholder Comments

Covanta Energy provided updated PM emissions and stack data for several of its facilities, mostly minor changes to PM emission values and revisions to stack parameters. New York agreed to make the revisions provided by Covanta Energy.

NRG Energy provided updated PM emissions and stack data for its facilities. NRG Energy also provided updated data for the individual turbine units at the Astoria Gas Turbine Power Plant (ORISID=55243). New York agreed to make the revisions provided by NRG Energy. NRG Energy also noted that baghouses are being installed at the Dunkirk and Huntley coal-fired plants. These changes were noted and will be accounted for in the future year inventories.

2.5.6 Pennsylvania Response to Stakeholder Comments

Covanta Energy requested changes to stack parameters at the Delaware Valley (Facility ID 420450059), Lancaster County (Facility ID 420710145), Plymouth (420910295) and Harrisburg (Facility ID 420430017) facilities. Covanta also requested minor changes to the emission estimates at the Plymouth facility. Pennsylvania agreed to make those revisions.

RRI Energy provided updated emissions and stack data for several of its facilities. The most notable change was a significant increase in PM emissions at several coal-fired units. Pennsylvania agreed to make the revisions provided by RRI Energy.

Saint Gobain Containers requested minor changes to the annual emissions and stack parameters for its facility in Port Allegheny (Facility ID 420830006). Pennsylvania accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Verallia formerly (Saint Gobain Containers) also provided comments on the 2007 PM2.5 emissions for all sources and stated that they may not contain appropriate condensable emissions. The company did not provide revised estimates or suggestions for improving the estimates of condensable emissions. For facilities that did not report PM2.5 or condensable emissions, the PM2.5 or condensable emissions were calculated using the methodogy described in Section 2.2.2. MARAMA acknowledges that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM2.5 and condensable emissions.

The National Lime Association requested changes to the PM emissions for four of their member facilities: Mercer Lime & Stone (Facility ID 420190021), Graymont/Pleasant Gap (Facility ID 420270003), Carmeuse Lime/Millard Lime (Facility ID 420750016), and OWB Refractories (Facility ID 421330007). Pennsylvania accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Magnesita Refractories (formerly LWB Refractories) provided minor revisions to stack data and PM emission estimates for the facility. Pennsylvania determined that no changes to the 2007 inventory were needed since the PM2.5 emissions were small (about 20 tons per year) and that PM2.5 emissions of this magnitude should not adversely impact the results of regional air quality modeling analyses using these inventories.

Carmeuse Lime provided minor revisions to stack data and PM emission estimates for the facility. Pennsylvania determined that no changes to the 2007 inventory were needed since the PM2.5 emissions were small (about 10 tons per year) and that PM2.5 emissions of this magnitude should not adversely impact the results of regional air quality modeling analyses using these inventories.

2.5.7 Virginia Response to Stakeholder Comments

Virginia received comments from Covanta Energy and Transco requesting very minor changes to the emissions for their facilities (generally less than 0.1 ton change in emissions). Virginia decided not to make those changes because of the insignificant impact on the regional modeling inventory.

BASF identified that its plant in Virginia is permanently shut down. Since it did operate in 2007, the actual 2007 emissions will be used for the 2007 modeling. Emissions from the plant will be set to zero for future year inventories.

Michigan Cogen Systems requested minor changes to stack parameters for their facility. Virginia approved the requested changes.

Virginia received revised stack parameters for about 20 units at the Chemical Lime Company's Kimbalton Plant. Due to the location of this facility and the size of the emissions in 2007, Virginia determined that the recommended changes should not affect air quality modeling results for 2007.

Virginia received comments from Carmeuse Natural Chemicals regarding the PM2.5 emissions at two of its facilities in Virginia. Since the company did not provide PM2.5 emissions to Virginia, the PM2.5 emissions were calculated using the methodogy described in Section 2.2.2. Virginia acknowledged that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM2.5 emissions. Virginia determined that no changes to the 2007 inventory were needed since the PM2.5 emissions from these two kilns were small (less than 20 tons per year) and that PM2.5 emissions of this magnitude should not adversely impact the results of regional air quality modeling analyses using these inventories.

2.6 VERSION 2 - ADDITIONAL STATE-SPECIFIC UPDATES

Several States and local agencies provided revisions and updates following their review of the initial draft of the point source inventory posted in October, 2009. These changes are summarized in the following subsections.

2.6.1 Connecticut

During the review of the initial draft 2007 inventory, Connecticut identified several emission units with unexpectedly high emission values. Connecticut determined that its original submittal had emissions adjusted for rule effectiveness. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values rather than values that had been artificially adjusted to account for rule effectiveness. The Contractor calculated the actual emissions for all units with a non-zero rule effectiveness value by backing out the rule effectiveness value. These actual emission values were supplied to Connecticut for review and approval. Connecticut recommended that the actual emissions calculated by the Contractor be used instead of the values originally supplied by Connecticut which included rule effectiveness.

Connecticut indicated that some of the PM records in their original submittal used incorrect pollutant codes. Connecticut indicated that the PM records in their original submittal for oil and coal-fired boilers should have been submitted as PM10-FIL and not PM10-PRI. All natural gas-fired units and oil-fired turbines were correctly reported as

PM10-PRI. The PM augmentation routine described in Section 1.3 was re-executed for the coal- and oil-fired units.

2.6.2 Delaware

No revisions to the initial inventory were requested or made.

2.6.3 District of Columbia

The District of Columbia made revisions to the emission inventory for Benning Road (Facility ID 11001-0001). There are four emission units at the facility designated as Units 1, 2, 15, and 16. Units 15 and 16 report emissions to USEPA's CAMD CEM database, while units 1 and 2 do not. Units 1 and 2 were not included in the initial point source inventory. These two units were added to the inventory and increased facility-wide SO2 emissions by about 100 tons per year and NOx emissions by 50 tons per year. Smaller increases were added for the other pollutants.

2.6.4 Maine

Maine provided a small correction to the SO2 emissions for the Maine Independence Station (Facility ID 2301900115).

Maine provided small corrections to the SO2 and NOx emissions for Westbrook Energy Center (Facility ID 2300500193). Also there was an error in the cross-reference between the USEPA CAMD database and the State's NIF database, which was corrected.

2.6.5 Maryland

No additional revisions beyond those requested by stakeholder were requested or made.

2.6.6 Massachusetts

An error in the PM augmentation routine was detected that incorrectly replaced State-reported PM25-FIL values. The Contractor reviewed the PM augmentation routine and identified the error that affected "Case 5" nonEGU PM25-FIL and PM25-PRI values. This error also affected numerous small sources in Massachusetts. The error was corrected and the State-reported PM25-FIL values were retained during the PM augmentation process and that the PM25-PRI values were correctly calculated using the State-reported PM25-FIL value.

Massachusetts identified errors in the ammonia emissions for 2007 for the Stony Brook Energy Center (25013-0420001) and New Bedford Energy (25005-1200634). Massachusetts provided corrected ammonia emission estimates for these two facilities. This change reduced ammonia emissions in Massachusetts by about 2,300 tons.

2.6.7 Maine

Maine identified on error in the PM augmentation routine that incorrectly replaced State-reported PM25-FIL values. The Contractor reviewed the PM augmentation routine and identified the error that affected "Case 5" nonEGU PM25-FIL and PM25-PRI values. The error was corrected and the State-reported PM25-FIL values were retained during the PM augmentation process and that the PM25-PRI values were correctly calculated using the State-reported PM25-FIL value.

2.6.8 New Hampshire

An error in the PM augmentation routine was detected that incorrectly replaced State-reported PM25-FIL values. The Contractor reviewed the PM augmentation routine and identified the error that affected "Case 5" nonEGU PM25-FIL and PM25-PRI values. This error also affected numerous small sources in New Hampshire. The error was corrected and the State-reported PM25-FIL values were retained during the PM augmentation process and that the PM25-PRI values were correctly calculated using the State-reported PM25-FIL value.

2.6.9 New Jersey

New Jersey identified numerous emission units that were inadvertently missing from their initial submittal. Most of these units were flagged as "insignificant units" or "non-source fugitive" sources in New Jersey's data system and were excluded during the initial conversion to NIF tables. New Jersey subsequently identified these "unmatched" units and submitted pertinent data for inclusion in the 2007 modeling inventory. The Contractor added these units and emissions to the NIF database. The emissions added to the inventory from these units were about: 60 tpy of CO, 50 tpy of NOx, 672 tpy of PM10-PRI,257 tpy of PM25-PRI, 5 tpy of SO2, and 1,477 tpy of VOC.

Ammonia emissions were missing from New Jersey's initial submittal. New Jersey supplied the missing ammonia emissions, which added about 845 tpy of NH3 to the point source inventory.

2.6.10 Pennsylvania – Allegheny County

Allegheny County's initial 2007 submittal included only the five "very large" sources that were submitted to USEPA for the 2007 NEI. After the release of the initial version of the point source inventory in October, 2009, the agency provided a second submittal with an addition 31 facilities. The second submittal was subjected to the QA and PM augmentation procedures described previously in Sections 1.2 and 1.3 of this report.

2.6.11 Pennsylvania - Philadelphia

Philadelphia provided the following revisions to the initial draft inventory:

- Boiler #3 at Sunoco Chemical Frankford Plant (Facility ID 4210101551 and emission point 052) was linked to CAMD ORIS ID 880007 and boilerID 52.
- VOC emissions at Cardone Industries (Facility ID 4210103887) were increased from 75.96 to 143.98 tons per year.

2.6.12 Rhode Island

Rhode Island revised the emissions for Providence Metallizing Co. (Facility ID 44007AIR1230 and emission point 2). All emissions for this emission point were changed to zero for 2007.

2.6.13 Vermont

No revisions to the initial inventory posted in October 2009 were requested or made.

2.6.14 Virginia

After the release of the initial version of the point source inventory in October, 2009, the agency provided a second submittal with a number of additional distributed generation units. The second submittal was subjected to the QA and PM augmentation procedures described previously in Sections 1.2 and 1.3 of this report. A flag was added to the EP table to identify the distributed generation units for both the units in Virginia's original submittal as well as the new units.

Virginia indicated that all of the PM records in their original submittal used incorrect pollutant codes. Records in the original submittal designated as PM10-PRI should have been submitted as PM10-FIL, and PM25-PRI should have been PM25-FIL. The PM augmentation routine described in Section 1.3 was re-executed after changing all PM10-PRI to PM10-FIL and all PM25-PRI to PM25-FIL.

Virginia revised the PM data for the Mirant Potomac River Generating Station (SiteID: 51-510-00003) using 2007 condensable test data using the test method with the nitrogen purge to replace the emission factors previously applied by the Contractor.

Virginia requested that the plantID for the Dominion Leesburg Compressor Station be changed from 51-107-71978 to 51-107-01016.

Virginia requested that the plantID for the Transcontinental Gas Pipeline Station 175 be changed from 51-065-40789 to 51-065-00016.

Virginia's review of stack test data Greif Packaging LLC (51-009-00022) showed an incorrect emissions factor applied in 2007. The 2007 emissions factor for CO was 54 lbs CO/ton processed. The test factor was 5.6 lbs CO/ton processed. The 2007 data was corrected using the lower emissions factor.

2.7 VERSION 3 REVISIONS

2.7.1 Emission Offsets

Mulitple states (CT, MA, MD, NH and NJ) added county level records account for account emission reduction credits (ERCs) issued to stationary sources pursuant to state regulation. States provided ERCs on a county-by-county basis. Fictitious facilities with an identifier of "OFFSET99999" were created for each county using SCC 23-99-000-000 (miscellaneous industrial processes: not elsewhere classified) Stack data were developed that assumed that emissions were released at the county centroid with an assumed release height of 10 feet. For the 2007, ERC emissions were set to zero since the banked emissions were not actually emitted in 2007. The ERCs will be included in the future year inventories and air quality modeling analysis.

2.8 ANNUAL 2007 POINT SOURCE EMISSION SUMMARY

Exhibits 2.7 to 2.20 present State-level summaries of 2002 and 2007 annual point source emissions by pollutant and compare 2007 annual emissions from CAMD EGUs, CAMD nonEGUs, and OTHER point sources. The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia.

For most States and pollutants, point source emissions have decreased from 2002 to 2007. Notable exceptions are substantial increases in PM10-PRI and PM25-PRI emissions in Maryland, Pennsylvania, and Virginia. These increases are primarily due to a better representation of condensable emissions in the 2007 inventory, especially for coal-fired power plants. New data provided by these States confirm that condensable emissions were underreported in the 2002 inventory.

In 2007, CAMD EGUs accounted for about 88% of SO2 emissions, 62% of NOx, 51% of PM10-PRI, and 54% of PM25-PRI emissions. Non-CAMD reporting sources accounted for 94% of VOC and 82% of CO emissions in 2007.

Exhibit 2.7 – 2002 and 2007 Point Source CO Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	4,053	3,679	-9%
Delaware	9,766	7,753	-21%
District of Columbia	248	311	25%
Maine	17,005	14,483	-15%
Maryland	99,032	81,770	-17%
Massachusetts	21,641	10,108	-53%
New Hampshire	2,725	3,164	16%
New Jersey	12,300	10,548	-14%
New York	66,427	66,357	0%
Pennsylvania	121,524	101,440	-17%
Rhode Island	2,234	1,653	-26%
Vermont	1,078	2,146	99%
Virginia	70,688	70,353	0%
	428,721	**373,765**	**-13%**

Exhibit 2.8 – EGU and nonEGU 2007 Point Source CO Emissions by State

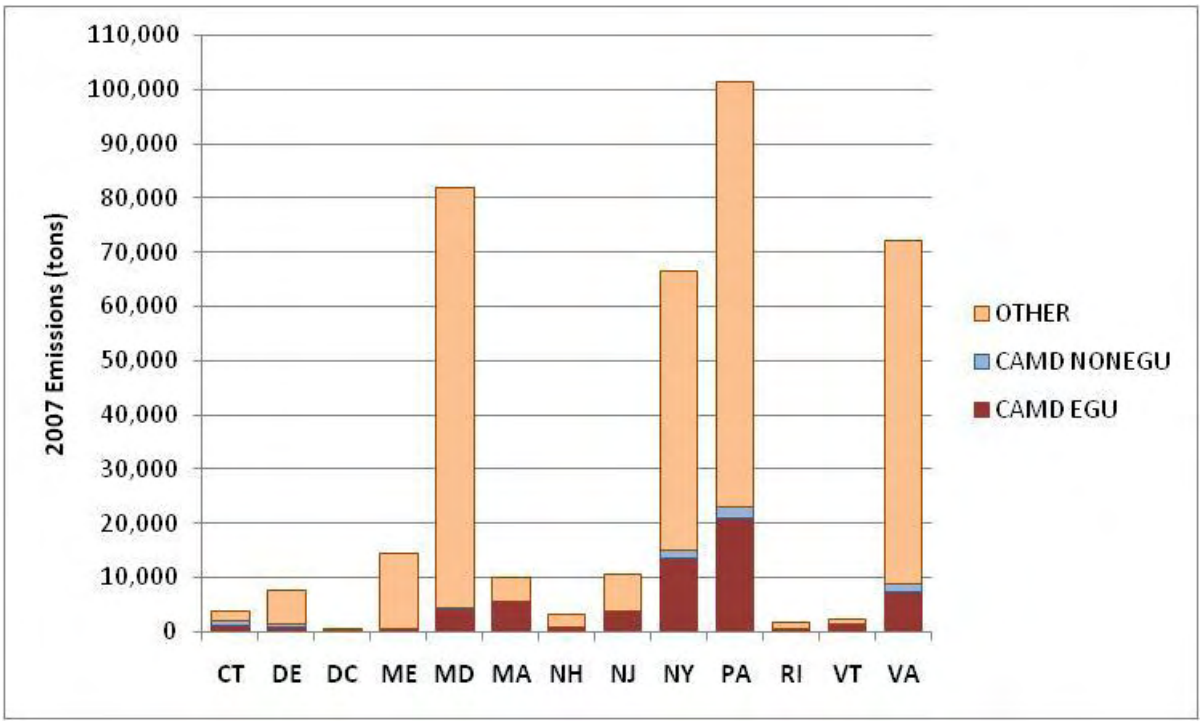


Exhibit 2.9 – 2002 and 2007 Point Source NH3 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	0	0	
Delaware	196	94	-52%
District of Columbia	4	0	-100%
Maine	845	665	-21%
Maryland	305	137	-55%
Massachusetts	1,578	647	-59%
New Hampshire	74	128	73%
New Jersey	0	918	
New York	1,861	2,417	30%
Pennsylvania	1,388	2,379	71%
Rhode Island	58	74	28%
Vermont	0	0	
Virginia	3,230	1,830	-43%
	9,539	**9,289**	**-3%**

Exhibit 2.10 – EGU and nonEGU 2007 Point Source NH3 Emissions by State

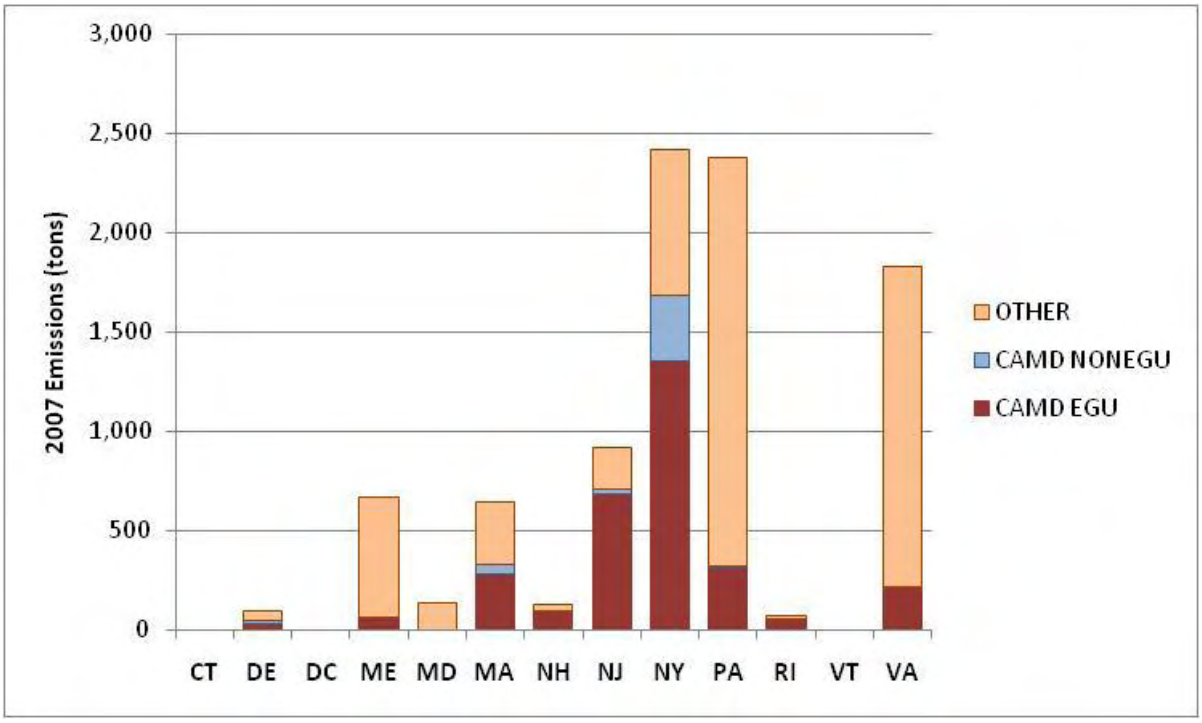


Exhibit 2.11 – 2002 and 2007 Point Source NOx Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	12,923	10,061	-22%
Delaware	16,345	15,628	-4%
District of Columbia	780	789	1%
Maine	19,939	17,746	-11%
Maryland	95,369	74,890	-21%
Massachusetts	48,607	23,628	-51%
New Hampshire	9,759	7,441	-24%
New Jersey	51,593	30,088	-42%
New York	118,978	83,033	-30%
Pennsylvania	297,379	258,379	-13%
Rhode Island	2,764	1,444	-48%
Vermont	787	811	3%
Virginia	147,300	112,938	-23%
	822,523	**636,876**	**-23%**

Exhibit 2.12 – EGU and nonEGU 2007 Point Source NOx Emissions by State

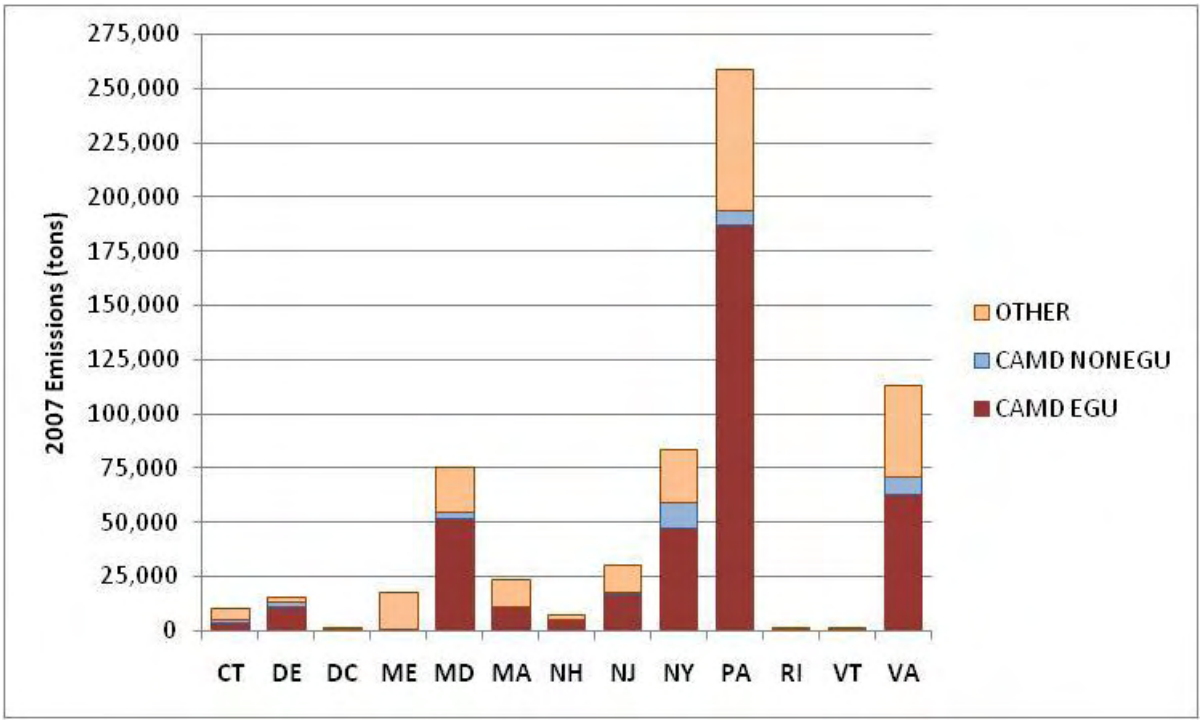


Exhibit 2.13 – 2002 and 2007 Point Source PM10-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,617	1,350	-17%
Delaware	4,217	3,465	-18%
District of Columbia	161	59	-63%
Maine	7,289	4,896	-33%
Maryland	9,046	19,322	114%
Massachusetts	5,852	5,604	-4%
New Hampshire	3,332	1,925	-42%
New Jersey	6,072	7,642	26%
New York	10,392	9,507	-9%
Pennsylvania	40,587	49,745	23%
Rhode Island	300	189	-37%
Vermont	304	146	-52%
Virginia	17,211	19,203	12%
	106,380	**123,053**	**16%**

Exhibit 2.14 – EGU and nonEGU2007 Point Source PM10-PRI Emissions by State

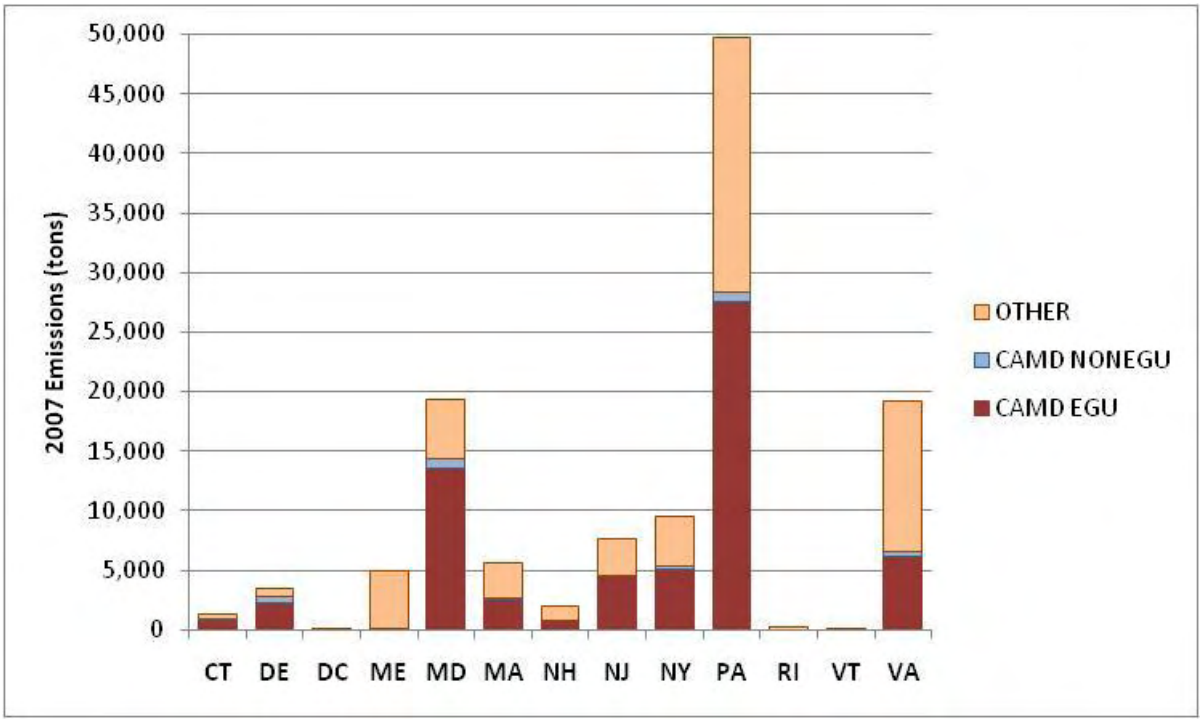


Exhibit 2.15 – 2002 and 2007 Point Source PM25-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,283	1,242	-3%
Delaware	3,666	3,107	-15%
District of Columbia	132	53	-60%
Maine	5,787	3,852	-33%
Maryland	5,054	15,682	210%
Massachusetts	4,161	4,864	17%
New Hampshire	2,938	1,663	-43%
New Jersey	4,779	6,821	43%
New York	7,080	5,999	-15%
Pennsylvania	20,116	32,460	61%
Rhode Island	183	140	-23%
Vermont	267	114	-57%
Virginia	12,771	14,888	17%
	68,217	**90,885**	**33%**

Exhibit 2.16 – EGU and nonEGU 2007 Point Source PM25-PRI Emissions by State

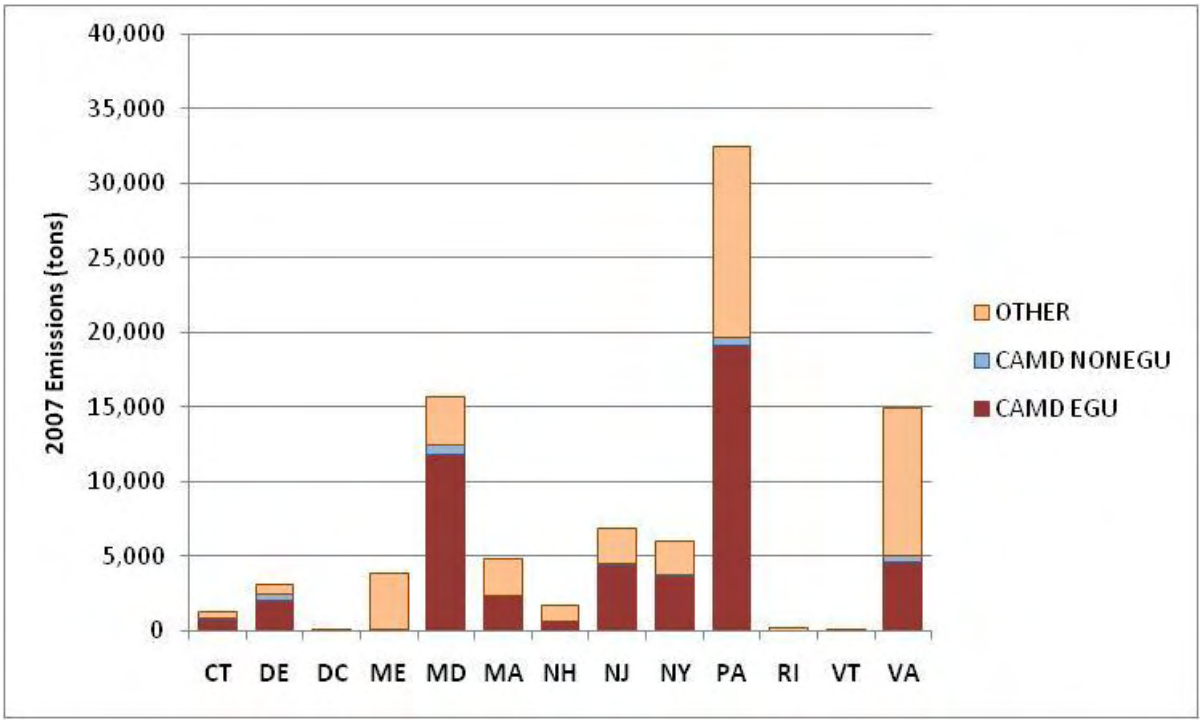


Exhibit 2.17 – 2002 and 2007 Point Source SO2 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	15,988	7,971	-50%
Delaware	73,744	43,088	-42%
District of Columbia	963	612	-36%
Maine	23,711	17,248	-27%
Maryland	290,929	305,383	5%
Massachusetts	106,960	63,229	-41%
New Hampshire	46,560	45,258	-3%
New Jersey	61,217	40,703	-34%
New York	294,729	152,751	-48%
Pennsylvania	995,175	1,028,056	3%
Rhode Island	2,666	1,516	-43%
Vermont	905	322	-64%
Virginia	305,106	243,048	-20%
	2,218,653	**1,949,185**	**-12%**

Exhibit 2.18 – EGU and nonEGU 2007 Point Source SO2 Emissions by State

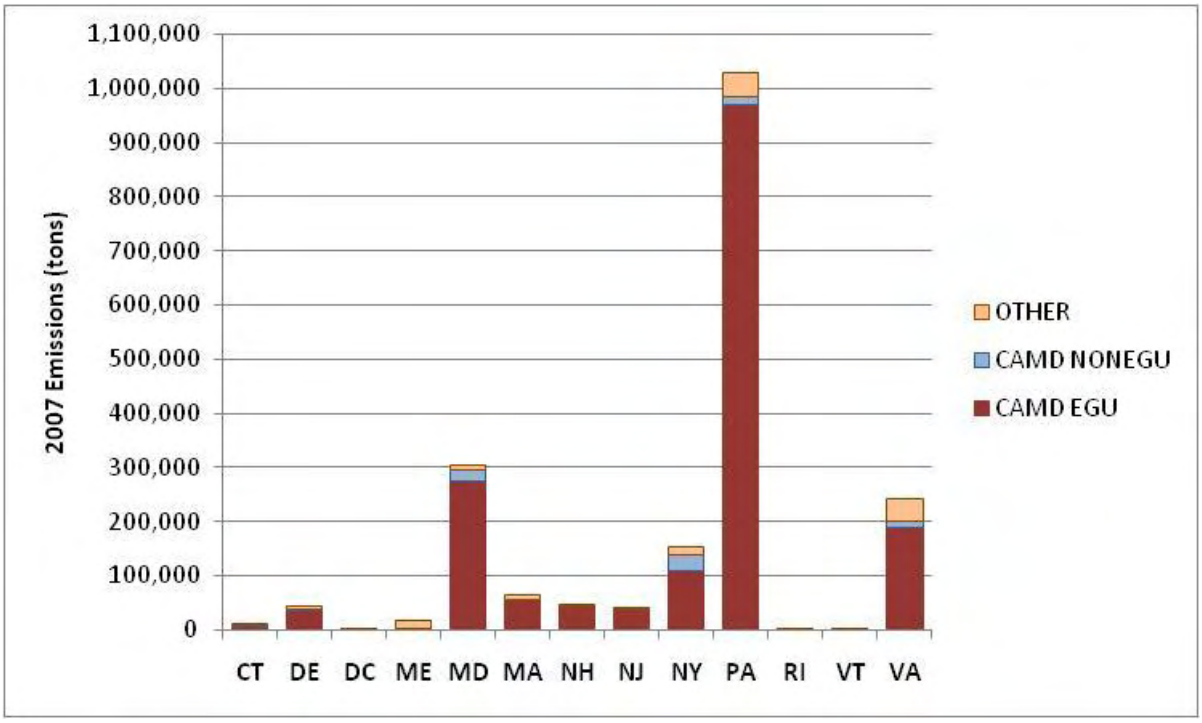
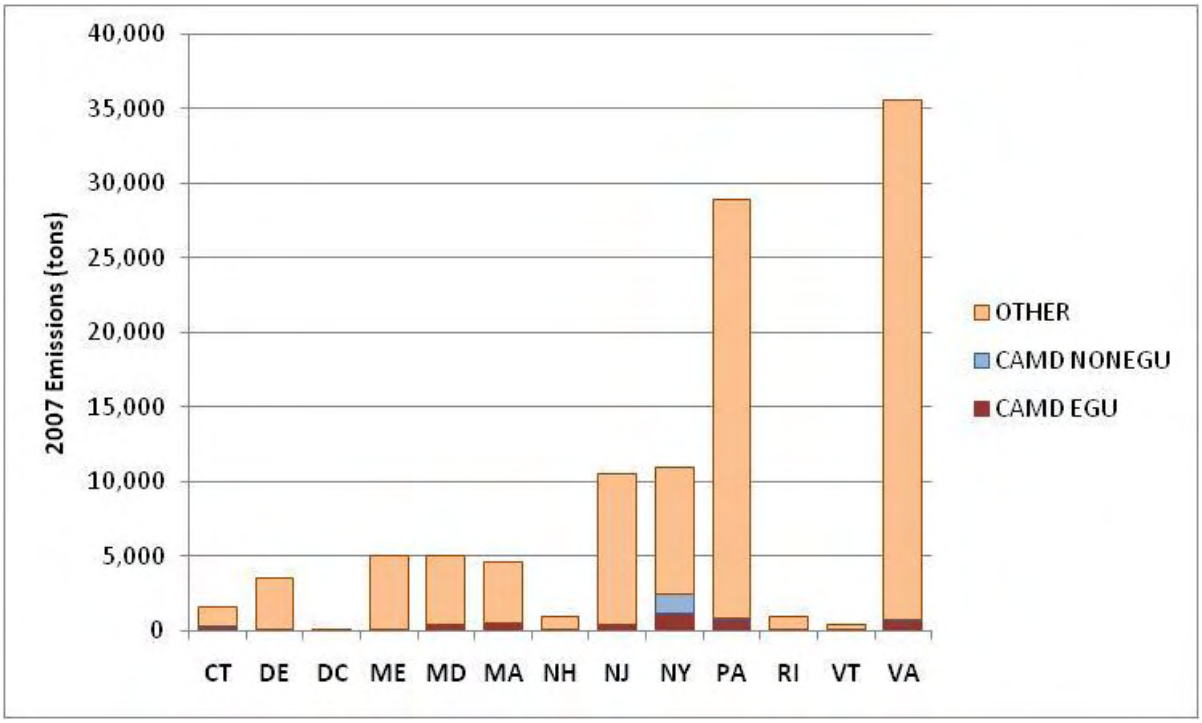


Exhibit 2.19 – 2002 and 2007 Point Source VOC Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	4,907	1,590	-68%
Delaware	4,755	3,489	-27%
District of Columbia	69	59	-14%
Maine	5,319	5,022	-6%
Maryland	6,187	4,986	-19%
Massachusetts	8,350	4,557	-45%
New Hampshire	1,599	916	-43%
New Jersey	16,547	10,526	-36%
New York	11,456	10,891	-5%
Pennsylvania	37,323	28,965	-22%
Rhode Island	1,928	970	-50%
Vermont	1,097	395	-64%
Virginia	43,906	35,618	-19%
	143,443	**107,984**	**-25%**

Exhibit 2.20 – EGU and nonEGU 2007 Point Source VOC Emissions by State



3.0 HOURLY 2007 INVENTORY FOR LARGE POINT SOURCES

The sources included in the hourly inventory include those that report hourly emissions to USEPA's CAMD database as required by market-based regulatory programs including the USEPA Acid Rain and NOx Budget Trading Programs. In Virginia, the hourly inventory also includes distributed generation (DG) units. These Virginia units are mainly internal combustion engines that participate in a demand-response program. The hourly SO2, NOx, and heat input data were used to prepare SMOKE files for modeling that used actual 2007 hourly emissions data.

3.1 DATA SOURCES FOR HOURLY EMISSIONS

The 2007 hourly point source inventory was developed using the 2007 annual emissions inventory developed as discussed in Section 2 of this report, data from the USEPA's CAMD hourly emissions database, hourly emissions data provided by the Virginia Department of Environmental Quality (VDEQ), and hourly emissions data for 6-month reporting units provided by the Maryland Department of the Environment (MDE).

3.1.1 2007 Annual Emission Inventory

As described in Section 2 of this TSD, S/L agencies prepared and submitted emission inventory files in the NIF format. A crosswalk was developed to match facilities and units in the USEPA CAMD hourly database to units in the 2007 Version 1 annual inventory. This process is necessary because the data submitted by the S/L agencies and data submitted by companies to CAMD do not use the same facility or boiler/unit identifiers to identify a particular unit. The crosswalk matched a unit in the NIF annual inventory (using the State, County, PlantID, PointID, StackID and SegmentID) with its counterpart in the USEPA CAMD hourly database (using the ORISID and BoilerID). As previously discussed in Section 2, the final version of the crosswalk is included as Appendix A in this TSD. Complete documentation of the development of the annual inventory and crosswalk table can be found in Section 2 of this report.

3.1.2 EPA CAMD Hourly Database

The second source of data was the hourly emissions data reported to USEPA by facilities to comply with various provisions of the Clean Air Act. Affected facilities are required to report hourly emissions of NOx and SO2, as well as other operational parameters such as hourly emission rate, gross load and heat input. Some units are required to submit hourly emissions data for both NOx and SO2 for the entire 12 month reporting period. Other units are required to submit hourly emissions data only for NOx for the entire 12 month reporting period. Still other units are required to submit hourly emissions data only for

NOx for the 6 month ozone season. Finally, there are a very small number of units that reported hourly emissions for a 9-month period. The USEPA CAMD hourly database is subjected to extensive QA/QC by both USEPA and the reporting facilities.

For this analysis, we used the "Part 75 Prepackaged Data Sets - hourly emissions data formatted for use with the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system". The 2007 hourly data was obtained from the USEPA Clean Air Markets web site (USEPA 2009c).

3.1.3 Virginia Hourly Data for Distributed Generation Units

The third set of data came from VDEQ. Distributed generation units are mainly internal combustion engines that participate in a demand-response program. These are small units, each usually no more than two or three megawatts in capacity, and they generally run on distillate fuel oil. These units are not required to report hourly emissions to USEPA's CAMD. Most are permitted for well below 100 tons of NOx emissions annually and do not run frequently. Annual emissions of NOx are usually not very large from these units. However, ozone season daily emissions estimates from previous ozone SIPs show that facilities that have one or more of these types of units can be quite significant NOx emitters when examined on an ozone season daily basis.

In past modeling efforts, these units were either not included in the emission inventory, or if they were included, were modeled using the SMOKE default temporal profile for the given SCC. To improve the hourly temporal allocation for these units, VADEQ undertook a substantial effort to develop hourly emission profiles using 2007 operations data obtained from utilities for their demand response programs as well as other facility-specific data. These data were used to create a 2007 profile for when these units generally operated. VDEQ used these generic profiles to prepare SMOKE PTHOUR files for each DG unit listed in the annual emissions inventory.

Complete documentation of the data sources and methods used by VDEQ is included as Appendix E - *VDEQ Conceptual Description for DG draft Feb 25, 2010.doc.*

3.1.4 Maryland Hourly Data for Six Month Reporters

The final set of data came from the Maryland Department of the Environment (MDE). MDE filled in the non-ozone season hourly emissions data for certain units that only reported ozone season hourly emissions to USEPA CAMD. MDE identified facilities which reported only 6 months worth of data to CAMD and submitted requests to these facilities for the missing 6 months of data. MDE provided the values in a CAMD-formatted table similar to the Part 75 Prepackaged Data Set format.

3.2 METHODOLOGY FOR DEVELOPING HOURLY SMOKE FILES

SMOKE requires two input files for processing hourly point source emissions:

- PTINV File. This file contains annual emissions data, stack parameters, geographic coordinates, and other information. This file can be in Inventory Data Analyzer (IDA), Emission Modeling System-95 (EMS-95), or one-line-per record (ORL) format. The ORL format from SMOKE Version 2.6 was selected for this project and is shown in Exhibit 3.1.

- PTHOUR File. This file contains the hour-specific data. This file can be in either EMS-95 format or Continuous Emissions Monitoring (CEM) format. The SMOKE Version 2.6 EMS-95 traditional format was selected for this project and is shown in Exhibit 3.2.

The following subsections describe how the PTINV ORL annual emissions file and the PTHOUR EMS-95 hour-specific emission files were created.

3.2.1 Conversion of Annual NIF Inventory to SMOKE ORL Format for PTINV

The 2007 annual inventory was developed in NIF format. Flags were added to the NIF EP table to indicate whether a unit was matched to a CAMD hourly unit or a Virginia DG unit. Matching units in the NIF file were converted to SMOKE PTINV ORL format. To facilitate QA of files and summarization of emissions, six different ORL files were created for the following types of sources:

- Annual emissions for units that reported hourly to USEPA CAMD for the entire 12 months of 2007;
- Ozone season emissions for units that reported to USEPA CAMD for either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Non-ozone season emissions for units that reported to USEPA CAMD for either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Units that reported hourly to USEPA CAMD for the either 6 or 9 months of 2007 in Maryland;
- Units that are classified as distributed generation units by VDEQ; and
- All other units (these are not associated with the hourly PTHOUR files); temporal allocation for these units will be accomplished using the standard SMOKE V2.6 temporal allocation profiles.

The ORL files were quality assured to conform to the SMOKE PTINV ORL format and to prevent double counting of emissions.

Exhibit 3.1 – SMOKE ORL Format for PTINV

Position	Name	Type	Description
A	FIPS	Int	Five digit FIPS code for state and county (required)
B	PLANTID	Char	Plant Identification Code (15 characters maximum) (required; this is the same as the State Facility Identifier in the NIF)
C	POINTID	Char	Point Identification Code (15 characters maximum) (required; this is the same as the Emission Unit ID in the NIF)
D	STACKID	Char	Stack Identification Code (15 characters maximum) (recommended; this is the same as the Emissions Release Point ID in the NIF)
E	SEGMENT	Char	DOE Plant ID (15 characters maximum) (recommended; this is the same as the Process ID in the NIF)
F	PLANT	Char	Plant Name (40 characters maximum) (recommended)
G	SCC	Char	Ten character SCC (required)
H	ERPTYPE	Char	Emissions release point type (2 characters maximum); indicates type of stack (not used by SMOKE) • 01 = fugitive • 02 = vertical stack • 03 = horizontal stack • 04 = goose neck • 05 = vertical with rain cap • 06 = downward-facing vent
I	SRCTYPE	Char	Source type (not used)
J	STKHGT	Real	Stack Height (ft) (required)
K	STKDIAM	Real	Stack Diameter (ft) (required)
L	STKTEMP	Real	Stack Gas Exit Temperature (°F) (required)
M	STKFLOW	Real	Stack Gas Flow Rate (ft^3/sec) (optional; automatically calculated by **Smkinven** from velocity and diameter if not given in file)
N	STKVEL	Real	Stack Gas Exit Velocity (ft/sec) (required)
O	SIC	Int	Standard Industrial Classification Code (recommended)
P	MACT	Char	Maximum Available Control Technology Code (6 characters maximum) (optional)
Q	NAICS	Char	North American Industrial Classification System Code (6 characters maximum) (optional)

Position	Name	Type	Description
R	CTYPE	Char	Coordinate system type (1 character maximum) (required) • L = Latitude/longitude
S	XLOC	Real	X location (required); Longitude (decimal degrees)
T	YLOC	Real	Y location (required); Latitude (decimal degrees)
U	UTMZ	Int	UTM zone (not used)
V	CAS	Char	Pollutant CAS number or other code (16 characters maximum) (required; this is called the pollutant code in the NIF)
W	ANN_EMIS	Real	Annual Emissions (tons/year) (required)
X	AVD_EMIS	Real	Average-day Emissions (tons/average day) (not used)
Y	CEFF	Real	Control Efficiency percentage (give value of 0-100) (recommended, if left blank, SMOKE default is 0)
Z	REFF	Real	Rule Effectiveness percentage (give value of 0-100) (recommended, if left blank, SMOKE default is 100)
AA	CPRI	Int	Primary Control Equipment Code (not used by SMOKE)
BB	CSEC	Int	Secondary Control Equipment Code (not used by SMOKE)
CC	NEI_UNIQUE_ID	Char	For units that report hourly emissions to CAMD, this field contains a code to indicate how frequently the unit operated in 2007 (i.e., <15%, 15-50%, or >50% of available hours) For Virginia DG units, this field contains the descriptor “VA DG”. For units that do not have an association in the PTHOUR file, this field contains the descriptor “NonHourly”.
DD	ORIS_FACILITY_CODE	Char	DOE Plant ID (generally recommended, and required if matching to hour-specific CEM data)
EE	ORIS_BOILER_ID	Char	Boiler Identification Code (recommended)

Fields not currently used by SMOKE Version 2.6 after field position EE have been excluded from the ORL file to reduce file size.

Exhibit 3.2 – SMOKE EMS-95 Traditional Format for Individual Hour-Specific Files

Position	Name	Type	Description
1-2	STID	Int	State FIPS Code (required)
3-5	CYID	Int	County FIPS Code (required)
6-20	FCID	Char	Facility ID (a.k.a. plant ID) (required)
21-32	SKID	Char	Point ID (required)
33-44	DVID	Char	Stack ID (required)
45-56	PRID	Char	Segment ID (required)
57-61	POLID	Char	Pollutant name (required)
62-69	DATE	Char	Date in MM/DD/YY format. Years less than 70 are treated as century 2000 (required)
70-72	TZONNAM	Char	Time zone name associated with emissions data. Valid entries are GMT, ADT, AST, EDT, EST, CDT, CST, MDT, MST, PDT, and PST. (required)
73-79	HRVAL1	Real	Hourly emissions for hour 1 (short tons/hour) (required)
80-86	HRVAL2	Real	Hourly emissions for hour 2 (short tons/hour) (required)
87-93	HRVAL3	Real	Hourly emissions for hour 3 (short tons/hour) (required)
...			
234-240	HRVAL24	Real	Hourly emissions for hour 24 (short tons/hour) (required)
241-248	DAYTOT	Real	Daily emissions total (short tons/day)
249	Blank	Blank	Blank
250-259	SCC	Char	SCC (required).
261-276	DATNAM	Char	Blank

3.2.2 PTHOUR Methodology for 12 Month Reporters

For units that reported hourly data to USEPA CAMD for the entire 12 months of 2007, the annual emissions in the PTINV ORL files were allocated to specific hours using the actual NOx, SO2, and heat input-based hour-specific data in the USEPA CAMD database. This ensured that the annual emission values provided by the S/L agencies were maintained and distributed to specific hours using actual 2007 hourly data.

The methodology for creating the PTHOUR files is as follows. First, hourly SO2 and NOx mass and heat input values in the USEPA CAMD database were summed for each unit to

create annual values. Next, annual emission records in the ORL file were matched to a corresponding hourly CAMD unit using the crosswalk file. The hourly values in the PTHOUR file were calculated using the following equations, depending on the pollutant:

Hourly NOx emissions

$$\text{Hourly PTHOUR NOx emissions} = \frac{\text{annual ORL NOx emissions} * \text{hourly CAMD NOx emissions}}{\text{CAMD summed annual NOx emissions}}$$

Hourly SO2 emissions for units with non-zero SO2 emissions in the CAMD database

$$\text{Hourly PTHOUR SO2 emissions} = \frac{\text{annual ORL SO2 emissions} * \text{hourly CAMD SO2 emissions}}{\text{CAMD summed annual SO2 emissions}}$$

Hourly SO2 emissions for units with zero SO2 emissions in the CAMD database

Hourly PTHOUR SO2 emissions = annual ORL SO2 emissions * annual factor

Where annual factor = hourly CAMD heat input / annual summed CAMD heat input

Hourly emissions for other pollutants (CO, NH3, PM10-PRI, PM25-PRI, VOC)

Hourly PTHOUR POLL emissions = annual ORL POLL emissions * annual factor

Where annual factor = hourly CAMD heat input / annual summed CAMD heat input

If CAMD heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

3.2.3 PTHOUR Methodology for 6 Month Reporters

About 15 percent of the units in the 2007 CAMD hourly database only reported data for the ozone season, i.e., the second and third quarters, as allowed by their reporting requirements. These units are referred to as 6-months units in this document. Two separate PTINV ORL files were created – one for the 6-month ozone season and one for the 6-month non-ozone season. The CAMD hourly data for these units were used to develop ozone season PTINV and PTHOUR files. For the non-ozone season, a PTINV file was created and was used with re-adjusted SMOKE temporal profiles to develop hourly emissions for the non-ozone season.

The CAMD hourly database for 6-month units contains NOx emissions, heat input and other parameters for the 6 month period. The CAMD hourly data for April through September was used directly and was summed to calculate the ozone season NOx emissions. To calculate the non-ozone season NOx emissions, total CAMD NOx emissions for a 6-month unit was subtracted from the annual NOx emissions of the corresponding unit in the S/L supplied NIF database. In some cases, the 6-month NOx

emissions in the CAMD database were greater than the annual emissions in the S/L NIF database. For those cases, non-ozone season emissions were set to zero.

Ozone season emissions of other pollutant are not available from the CAMD database. These emissions were estimated based on a ratio of ozone season NOx emissions to annual NOx emissions. This ratio was applied to the annual emissions from the NIF database. To calculate the non-ozone season emissions for the other pollutants, the total ozone season emissions for the 6-month unit was subtracted from the annual emissions reported for that unit in the S/L supplied NIF database. The PTHOUR files for the ozone season were created as follows. First, hourly NOx mass and heat input values in the USEPA CAMD database were summed for each unit to create ozone season values. Next, ozone season emission records in the ORL file were matched to the hourly CAMD unit using the crosswalk file. Hourly emissions were calculated using the following equations:

Hourly NOx emissions

$$\text{Hourly PTHOUR NOx emissions} = \frac{\text{6-month ORL NOx emissions} * \text{hourly CAMD NOx emissions}}{\text{CAMD summed 6-month NOx emissions}}$$

Hourly emissions for other pollutants (CO, NH3, PM10-PRI, PM25-PRI, SO2, VOC)

$$\text{Hourly PTHOUR POLL emissions} = \text{annual ORL POLL emissions} * \text{annual factor}$$

$$\text{Where annual factor} = \text{hourly CAMD heat input} / \text{6-month summed CAMD heat input}$$

If CAMD heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

Hourly data for the non-ozone season was developed using the methodology discussed in Section 3.4 of this TSD.

3.2.4 PTHOUR Methodology for Maryland 6 Month Reporters

MDE identified facilities that only reported 6 months of data to CAMD and requested data from those facilities for the 6 months outside of the ozone season. MDE manually entered hourly values into a CAMD-formatted table similar to the Part 75 Prepackaged Data Set format for the following units.

Plant Name	ORIS	UNITS
Constellation Perryman	1556	CT1, CT2, CT3, CT4
Constellation Riverside	1559	CT6
Constellation Westport	1560	CT5
Mirant Chalk Point	1571	GT2, SMECO
Mirant Morgantown	1573	GT3, GT4, GT5, GT6

The PTHOUR files for the Maryland 6-month reporters were created as described here. First, hourly SO2 and NOx mass and heat input in the MDE hourly database were summed for each unit to create annual totals. Next, annual emission records for all pollutants in the ORL file were matched to the hourly records using the crosswalk file. Hourly emissions in the PTHOUR file were calculated using the following equations, depending on the pollutant:

Hourly NOx emissions

$$\text{Hourly PTHOUR NOx emissions} = \frac{\text{annual ORL NOx emissions} * \text{hourly MDE NOx emissions}}{\text{MDE summed annual NOx emissions}}$$

Hourly SO2 emissions for units with SO2 emissions in the MDE database

$$\text{Hourly PTHOUR SO2 emissions} = \frac{\text{annual ORL SO2 emissions} * \text{hourly MDE SO2 emissions}}{\text{MDE summed annual SO2 emissions}}$$

Hourly SO2 emissions for units without SO2 emissions in the MDE database

Hourly PTHOUR SO2 emissions = annual ORL SO2 emissions * annual factor

Where annual factor = hourly MDE heat input / annual summed MDE heat input

Hourly emissions for other pollutants (CO, NH3, PM10-PRI, PM25-PRI, VOC)

Hourly PTHOUR POLL emissions = annual ORL POLL emissions * annual factor

Where annual factor = hourly MDE heat input / annual summed MDE heat input

If MDE heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

3.2.5 PTHOUR Methodology for Virginia Distributed Generation Units

Complete documentation of the data sources and methods used by VDEQ is included as Appendix E - *VDEQ Conceptual Description for DG draft Feb 25, 2010.doc.*

3.2.6 QA of PTINV and PTHOUR Files

A number of QA activities were undertaken to ensure that the PTINV and PTHOUR files were complete, consistent with the 2007 NIF annual inventory, and did not double count any emission source. Specific QA steps included:

- The ORL annual emission files were quality assured to conform to the SMOKE PTINV ORL format and match the values reported in the original NIF file.
- The PTHOUR files were quality assured to conform to the SMOKE PTHOUR EMS-95 traditional format, the sum of emissions in the PTHOUR file equals the

ORL annual emissions, the number of hourly data records equals 8760, the number of days equals 365, and that all pollutants were included in the PTHOUR file.

These QA checks verified that the original NIF annual values and the annual sum of the hourly values matched.

3.3 DEVELOPMENT OF HOURLY PROFILES FOR 6-MONTH REPORTING UNITS

Since some CAMD units only report data for the ozone season, there was a need for a set of actual 2007 hourly temporal profiles to be used in simulating hourly emissions for these units in non-ozone season months. The following subsections describe the steps taken by Alpine Geophysics in preparing this file.

3.3.1 Annual Profile Preparation

The 2007 hourly CEM data was obtained from CAMD's "Data and Maps" website for each State in the MANE-VU+VA region. Using these data, we filtered the individual source list within each State to only those units reporting each hour of the year (i.e., 8,760 hours of data). This ensured that the resulting profiles are not influenced by units which only report during summertime months for ozone season programs.

For this filtered source list, we summed three variables: total NOx and SO2 mass and heat input as reported in these hourly files at both a State monthly and a State total basis. For each of the three variables, monthly distribution ratios were calculated by dividing each State's monthly sum by their total annual sum as shown in Equation 1 below.

Equation 1. Monthly ratio calculation.

$$\text{Monthly Ratio}_{\text{State, Var}} = \text{Monthly Sum}_{\text{State, Var}} / \text{Annual Sum}_{\text{State, Var}}$$

Where,

Var = CEM-based variable of SO2, NOx or heat input

Exhibit 3.3 provides an example calculation for this step, both in tabular and graphical format.

The resulting ratios were normalized for each variable to provide SMOKE with the monthly distribution factors necessary to process annual emissions into a monthly result. An example monthly profile using the data from Exhibit 3.3 is shown in Exhibit 3.4.

Exhibit 3.3 – Example Application of Calculated Ratios for Actual 2007 by Month

		Actual Reported Value Sums [2007]			Calculated Ratios		
State	**Month**	**SO2 Mass**	**NOx Mass**	**Heat Input**	**SO2**	**NOx**	**Heat Input**
NY	Jan	22,423,391	10,809,292	60,408,685	0.1046	0.0942	0.0809
NY	Feb	29,299,033	12,448,052	67,590,104	0.1366	0.1084	0.0905
NY	Mar	21,364,883	10,327,432	63,106,554	0.0996	0.0900	0.0845
NY	Apr	16,454,881	9,221,500	55,568,488	0.0767	0.0803	0.0744
NY	May	12,855,963	8,198,597	53,421,346	0.0600	0.0714	0.0715
NY	Jun	14,525,239	9,282,277	65,577,304	0.0677	0.0809	0.0878
NY	Jul	16,311,783	10,372,119	74,182,361	0.0761	0.0904	0.0993
NY	Aug	17,757,143	11,156,733	82,322,615	0.0828	0.0972	0.1102
NY	Sep	15,809,719	8,879,373	63,553,452	0.0737	0.0773	0.0851
NY	Oct	15,055,032	7,390,952	55,149,951	0.0702	0.0644	0.0738
NY	Nov	14,471,865	7,561,984	47,280,729	0.0675	0.0659	0.0633
NY	Dec	18,092,057	9,155,587	58,804,999	0.0844	0.0798	0.0787
NY	**Total**	**214,420,988**	**114,803,899**	**746,966,587**	**1.0000**	**1.0000**	**1.0000**

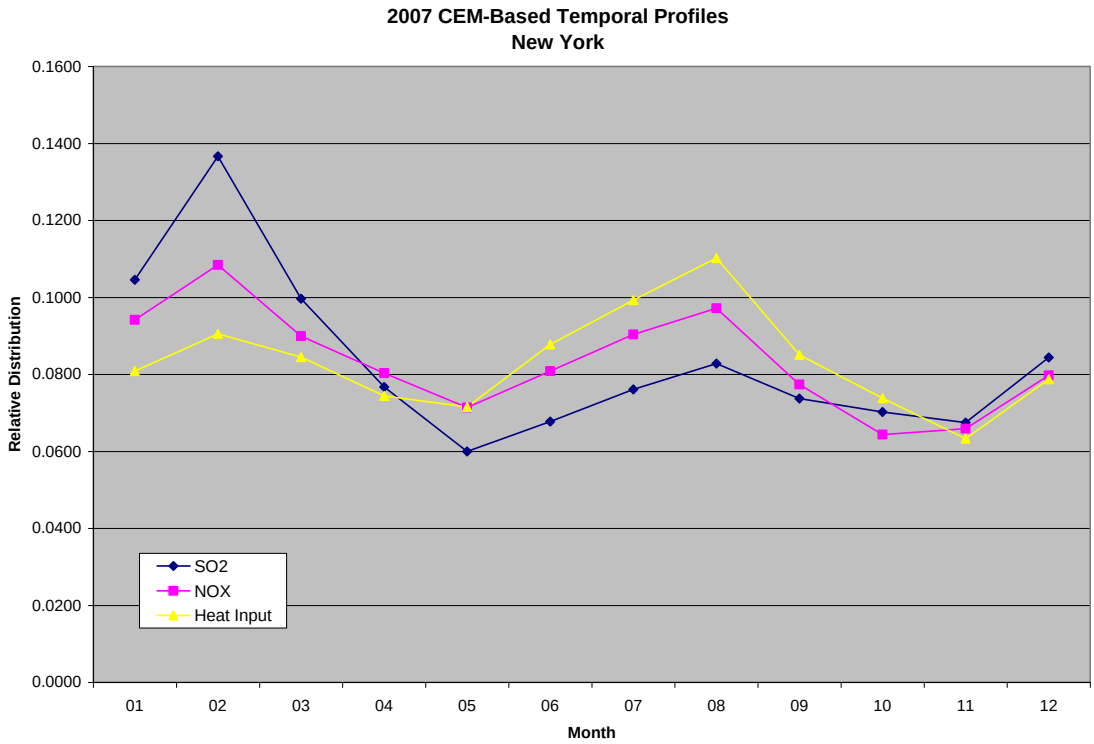


Exhibit 3.4 - Example SMOKE profile for monthly distribution of New York annual emissions using heat input.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly Ratio	0.0809	0.0905	0.0845	0.0744	0.0715	0.0878	0.0993	0.1102	0.0851	0.0738	0.0633	0.0787	1.0000
Monthly Profile	809	905	845	744	716	878	994	1103	851	739	633	788	10005

The profile in the above table can then be associated to the profile cross-reference lookup either by State, State-SCC or some other combination allowing each non-CEM (PTHOUR) reporting unit to have annual emissions allocated. Existing day of week and diurnal profiles from the EPA CHIEF website were used to allocate emissions to finer smaller time periods within each month.

3.3.2 Non-Annual Profile Development

A number of units were identified which require monthly distribution for timeframes outside of the ozone season (when these units are not required to report CEMs). The monthly profiles described in 3.3.1 were modified for use with these units. To account for emissions at these sources not included in prepared hourly (PTHOUR) SMOKE input files, the monthly profiles were zeroed out during the months when hourly CAMD emissions were reported. Concurrently, the TOTAL profile sum was adjusted to accurately reflect the ratio of month to total distribution. An example of this adjustment is shown with highlight in Exhibit 3.5.

Exhibit 3.5 - Example SMOKE profile for adjusted monthly distribution of New York seasonal emissions using heat input.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly Ratio	0.0809	0.0905	0.0845	0.0744	0.0715	0.0878	0.0993	0.1102	0.0851	0.0738	0.0633	0.0787	1.0000
Monthly Profile	809	905	845	744	716	878	994	1103	851	739	633	788	10005
Adjusted Profile	809	905	845	0	0	0	0	0	0	739	633	788	4719

3.3.3 Issue for Consideration

In the USEPA CAMD files only a few CAMD 6-month units reported emissions in April 2007. As a result, the April hourly CAMD data was not used in MARAMA's simulation. Instead, an adjusted profile for five month operation was prepared and used for these sources.

3.4 VERSION 2 - STATE AND STAKEHOLDER REVIEW

On March 15, 2010, MARAMA invited States and stakeholders to review and comment on the draft 2007 hourly inventory of air emissions from point sources. States and stakeholders were provided a 4-week comment period. Written comments were reviewed by the State inventory staff and MARAMA, and resulted in several changes to the draft documentation and inventory data. The changes requested by stakeholders and approved by the States are summarized in the following subsections.

3.4.1 Massachusetts

Massachusetts commented that the majority of the Massachusetts facilities reviewed the CAMD-to-NIF crosswalk and indicated they found no major errors. Some facilities expressed concern that several dual fuel units appeared to have their total NOx emissions doubled, reported separately for both oil and gas. The Contractor reviewed the database and verified that no double counting of emissions occurs. For multiple-fuel units, the Appendix A spreadsheet matches each CAMD record to ALL fuel records in the NIF database, making it appear that the CAMD emissions are counted more than once. MARAMA will use the NIF emissions from State database in regional modeling and the hourly data from the matching CAMD unit to allocate NIF emissions to hourly data for modeling. Emissions will not be double counted for units using multiple fuels.

3.4.2 New York

NRG Energy identified an issue with the hourly emissions for those units in the NIF database when multiple units exhaust from a common stack. In NY's database, multiple units are represented by a single emission unit, whereas in the CAMD database each unit is represented individually. That is why there is a CAMD BLR6ID with no equivalent NIF labels in Appendix A. The Contractor discussed the issue with NRG and devised a solution for the Huntley and Dunkirk Steam Generating Stations by adding emissions units to the NIF tables in cases where there are combined stacks. Annual emissions in the NIF database will be apportioned to each unit based on annual heat input from the USEPA CAMD database. This will allow a proper match to the hourly data for each Unit and

ensure that the proper CAMD hourly emissions were used in developing the PTHOUR files for the units at these two facilities.

New York State also worked to improve the linkages between the NIF annual emissions and the CAMD hourly emissions. Not all cases could be resolved, and New York is continuing to review the data.

3.4.3 Pennsylvania

RRI Energy commented that they agree with the approach for calculating hourly emissions as described in Section 3.3 of this report.

3.4.4 Virginia

Virginia reviewed the data in the hourly files and provided three updates needed for the VA cross reference between NIF and CAMD information. These updates do not affect large emission units, but they were made to make the cross reference as correct as possible, as follows:

- For ORIS CODE 55439, NIF ID 51-065-00021, facility name Tenaska Virginia Generating Station was added to CAMD Boiler ID CTGDB1 with the NIF identifier Stack 1, Point 1, Segment 2. This stack point segment was left out of the cross reference and represents the emissions from the duct burner on this turbine.
- For ORIS CODE 55439, NIF ID 51-065-00021, facility name Tenaska Virginia Generating Station was added to CAMD Boiler ID CTGDB3 with the NIF identifier Stack 3, Point 9, Segment 2. This stack point segment was left out of the cross reference and represents the emissions from the duct burner on this turbine.
- For ORIS CODE 52089, NIF ID 51-071-00062, facility name Duke Energy Generation Services of Narrows was deleted for the NIF identifier Stack 1, Point 1, Segment 3 from CAMD Boiler ID BLR007. This stack point segment represents the emissions from the ash handling system for the boilers, and the emissions would be better represented by generic profiles rather than CAMD profiles.

Virginia also commented that some facilities have empty date stamps (i.e., MM/DD/YY field is listed as “xx/xx/xxEST“ where x is blank space). For example, in 12 month units files, 51-033-00040 and 51-065-00021 combined have either 21 or 39 lines with empty date stamps. Similarly, in 6 month units files, 09-009-6614 (in New Haven, Connecticut) have 6 or 12 lines without date stamps. The Contractor identified errors in the CAMD to NIF crosswalk that caused this situation to occur. Fixing the CAMD to NIF crosswalk resolved all occurrences of this problem.

3.5 VERSION 3 REVISIONS

3.5.1 Massachusetts Stony Brook Energy Center NH3 Emissions

Massachusetts identified errors in the ammonia emissions for 2007 for the Stony Brook Energy Center (25013-0420001) and New Bedford Energy (25005-1200634). Massachusetts provided corrected ammonia emission estimates for these two facilities. This change reduced ammonia emissions in Massachusetts by about 2,300 tons.

New Bedford Energy does not report hourly emissions to CAMD, so no changes to the PTHOUR files were needed for this source.

The Stony Brook Energy Center has three units that are 12-month CAMD reporters and two units that are 5-month CAMD reporters. The PTHOUR monthly files for 5-month and 12-month reporters were revised to provide corrected NH3 emissions for the Stony Brook units.

4.0 ANNUAL 2007 INVENTORY FOR AREA SOURCES

4.1 AREA SOURCE CATEGORIES

Area sources are relatively small sources of air pollutants that are diffused over a wide geographical area. They include sources that individually are insignificant, but in aggregate may comprise significant emissions. Examples are emissions from home heating systems, house painting, consumer products usage, and small industrial or commercial operations that are not permitted as point sources. There are 356 individual area source categories in the MANE-VU+VA inventory, categorized by a 10-digit SCC. Major grouping (categories at the 7-digit SCC) included in the area source inventory are shown in Exhibit 4.1.

The USEPA has develops area source emission estimation methodologies and estimates for the NEI on a three-year cycle, and inventories are available for 2002, 2005, and 2008 (USEPA 2010a).

For many categories, unless specifically instructed otherwise by the States, the Contractor used the most recent data from USEPA. These sources included ammonia emissions from livestock and fertilizers which came from a recent application of the Carnegie Mellon University (CMU) ammonia model to produce 2007 emissions and output from a version of the Residential Wood Combustion (RWC) model developed by USEPA and run with updated 2007 data to produce emission estimates for that source category. In addition, a number of States requested that the Contractor include USEPA data on wildfire emissions developed as part of USEPA's SMARTFIRE system.

In the following sections, we describe the data that was available from USEPA and that was used for categories where States did not submit data. Next we describe the State data submittals that were used to override the USEPA data. We summarize the ultimate source of the area source data that each State decided to use for each source category. Finally, we present a State-level summary of emissions by pollutant.

Exhibit 4.1 – Area Source Category Definitions

7-Digit SCC	7-Digit SCC Description
21-01-001	Stationary Fuel; Electric Utility; Anthracite Coal
21-01-002	Stationary Fuel; Electric Utility; Bituminous/Sub-butuminousSub-butuminous Coal
21-01-004	Stationary Fuel; Electric Utility; Distillate Oil
21-01-005	Stationary Fuel; Electric Utility; Residual Oil
21-01-006	Stationary Fuel; Electric Utility; Natural Gas
21-02-001	Stationary Fuel; Industrial; Anthracite Coal

7-Digit SCC	7-Digit SCC Description
21-02-002	Stationary Fuel; Industrial; Bituminous/Sub-butuminous Coal
21-02-004	Stationary Fuel; Industrial; Distillate Oil
21-02-005	Stationary Fuel; Industrial; Residual Oil
21-02-006	Stationary Fuel; Industrial; Natural Gas
21-02-007	Stationary Fuel; Industrial; Liquified Petroleum Gas (LPG)
21-02-008	Stationary Fuel; Industrial; Wood
21-02-011	Stationary Fuel; Industrial; Kerosene
21-03-001	Stationary Fuel; Commercial/Institutional; Anthracite Coal
21-03-002	Stationary Fuel; Commercial/Institutional; Bituminous/Sub-butuminous Coal
21-03-004	Stationary Fuel; Commercial/Institutional; Distillate Oil
21-03-005	Stationary Fuel; Commercial/Institutional; Residual Oil
21-03-006	Stationary Fuel; Commercial/Institutional; Natural Gas
21-03-007	Stationary Fuel; Commercial/Institutional; Liquified Petroleum Gas (LPG)
21-03-008	Stationary Fuel; Commercial/Institutional; Wood
21-03-011	Stationary Fuel; Commercial/Institutional; Kerosene
21-04-001	Stationary Fuel; Residential; Anthracite Coal
21-04-002	Stationary Fuel; Residential; Bituminous/Sub-butuminous Coal
21-04-004	Stationary Fuel; Residential; Distillate Oil
21-04-006	Stationary Fuel; Residential; Natural Gas
21-04-007	Stationary Fuel; Residential; Liquified Petroleum Gas (LPG)
21-04-008	Stationary Fuel; Residential; Wood
21-04-009	Stationary Fuel; Residential; Firelog
21-04-011	Stationary Fuel; Residential; Kerosene
22-94-000	Mobile Sources; Paved Roads; All Paved Roads
22-96-000	Mobile Sources; Unpaved Roads; All Unpaved Roads
23-01-000	Industrial Processes; Chemical Manufacturing: SIC 28; All Processes
23-01-030	Industrial Processes; Chemical Manufacturing: SIC 28; Process Emissions from Pharmaceutical
23-02-002	Industrial Processes; Food and Kindred Products: SIC 20; Commercial Cooking – Charbroiling
23-02-003	Industrial Processes; Food and Kindred Products: SIC 20; Commercial Cooking – Frying
23-02-040	Industrial Processes; Food and Kindred Products: SIC 20; Grain Mill Products
23-02-050	Industrial Processes; Food and Kindred Products: SIC 20; Bakery Products
23-02-070	Industrial Processes; Food and Kindred Products: SIC 20; Fermentation/Beverages
23-02-080	Industrial Processes; Food and Kindred Products: SIC 20; Miscellaneous Food and Kindred Prods
23-07-030	Industrial Processes; Wood Products: SIC 24; Millwork, Plywood, and Structural Members
23-07-060	Industrial Processes; Wood Products: SIC 24; Miscellaneous Wood Products
23-08-000	Industrial Processes; Rubber/Plastics: SIC 30; All Processes
23-09-100	Industrial Processes; Fabricated Metals: SIC 34; Coating, Engraving, and Allied Services
23-11-010	Industrial Processes; Construction: SIC 15 - 17; Residential
23-11-020	Industrial Processes; Construction: SIC 15 - 17; Industrial/Commercial/Institutional
23-11-030	Industrial Processes; Construction: SIC 15 - 17; Road Construction
23-25-000	Industrial Processes; Mining and Quarrying: SIC 14; All Processes
23-25-020	Industrial Processes; Mining and Quarrying: SIC 14; Crushed and Broken Stone

7-Digit SCC	7-Digit SCC Description
23-25-030	Industrial Processes; Mining and Quarrying: SIC 14; Sand and Gravel
23-90-008	Industrial Processes; In-process Fuel Use; Wood
23-99-000	Industrial Processes; Industrial Processes: NEC; Industrial Processes: NEC
23-99-010	Industrial Processes; Industrial Refrigeration; Refrigerant Losses
24-01-001	Solvent Utilization; Surface Coating; Architectural Coatings
24-01-002	Solvent Utilization; Surface Coating; Architectural Coatings - Solvent-based
24-01-003	Solvent Utilization; Surface Coating; Architectural Coatings - Water-based
24-01-005	Solvent Utilization; Surface Coating; Auto Refinishing: SIC 7532
24-01-008	Solvent Utilization; Surface Coating; Traffic Markings
24-01-015	Solvent Utilization; Surface Coating; Factory Finished Wood: SIC 2426 thru 242
24-01-020	Solvent Utilization; Surface Coating; Wood Furniture: SIC 25
24-01-025	Solvent Utilization; Surface Coating; Metal Furniture: SIC 25
24-01-030	Solvent Utilization; Surface Coating; Paper: SIC 26
24-01-040	Solvent Utilization; Surface Coating; Metal Cans: SIC 341
24-01-045	Solvent Utilization; Surface Coating; Metal Coils: SIC 3498
24-01-050	Solvent Utilization; Surface Coating; Miscellaneous Finished Metals: SIC 34 - (341 + 3498)
24-01-055	Solvent Utilization; Surface Coating; Machinery and Equipment: SIC 35
24-01-060	Solvent Utilization; Surface Coating; Large Appliances: SIC 363
24-01-065	Solvent Utilization; Surface Coating; Electronic and Other Electrical: SIC 36 - 363
24-01-070	Solvent Utilization; Surface Coating; Motor Vehicles: SIC 371
24-01-075	Solvent Utilization; Surface Coating; Aircraft: SIC 372
24-01-080	Solvent Utilization; Surface Coating; Marine: SIC 373
24-01-085	Solvent Utilization; Surface Coating; Railroad: SIC 374
24-01-090	Solvent Utilization; Surface Coating; Miscellaneous Manufacturing
24-01-100	Solvent Utilization; Surface Coating; Industrial Maintenance Coatings
24-01-102	Solvent Utilization; Surface Coating; Industrial Maintenance Coatings
24-01-103	Solvent Utilization; Surface Coating; Industrial Maintenance Coatings
24-01-200	Solvent Utilization; Surface Coating; Other Special Purpose Coatings
24-01-990	Solvent Utilization; Surface Coating; All Surface Coating Categories
24-15-000	Solvent Utilization; Degreasing; All Processes/All Industries
24-15-005	Solvent Utilization; Degreasing; Furniture and Fixtures (SIC 25): All Processes
24-15-010	Solvent Utilization; Degreasing; Primary Metal Industries (SIC 33): All Processes
24-15-020	Solvent Utilization; Degreasing; Fabricated Metal Products (SIC 34): All Processes
24-15-025	Solvent Utilization; Degreasing; Industrial Machinery and Equipment (SIC 35): All Processes
24-15-030	Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): All Processes
24-15-035	Solvent Utilization; Degreasing; Transportation Equipment (SIC 37): All Processes
24-15-040	Solvent Utilization; Degreasing; Instruments and Related Products (SIC 38): All Processes
24-15-045	Solvent Utilization; Degreasing; Miscellaneous Manufacturing (SIC 39): All Processes
24-15-050	Solvent Utilization; Degreasing; Transportation Maintenance Facilities (SIC 40-45): All Processes
24-15-055	Solvent Utilization; Degreasing; Automotive Dealers (SIC 55): All Processes
24-15-060	Solvent Utilization; Degreasing; Miscellaneous Repair Services (SIC 76): All Processes
24-15-065	Solvent Utilization; Degreasing; Auto Repair Services (SIC 75): All Processes

7-Digit SCC	7-Digit SCC Description
24-15-100	Solvent Utilization; Degreasing; All Industries: Open Top Degreasing
24-15-130	Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): Open Top Degreasing
24-15-200	Solvent Utilization; Degreasing; All Industries: Conveyerized Degreasing
24-15-230	Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): Conveyerized Degreasing
24-15-300	Solvent Utilization; Degreasing; All Industries: Cold Cleaning
24-15-360	Solvent Utilization; Degreasing; Auto Repair Services (SIC 75): Cold Cleaning
24-20-000	Solvent Utilization; Dry Cleaning; All Processes
24-20-010	Solvent Utilization; Dry Cleaning; Commercial/Industrial Cleaners
24-25-000	Solvent Utilization; Graphic Arts; All Processes
24-25-010	Solvent Utilization; Graphic Arts; Lithography
24-25-020	Solvent Utilization; Graphic Arts; Letterpress
24-25-030	Solvent Utilization; Graphic Arts; Rotogravure
24-25-040	Solvent Utilization; Graphic Arts; Flexography
24-30-000	Solvent Utilization; Rubber/Plastics; All Processes
24-40-000	Solvent Utilization; Misc. Industrial; All Processes
24-40-020	Solvent Utilization; Misc. Industrial; Adhesive (Industrial) Application
24-60-000	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Processes
24-60-100	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Personal Care Products
24-60-200	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Household Products
24-60-400	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Automotive Aftermarket
24-60-500	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Coatings and Related
24-60-600	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Adhesives and Sealants
24-60-800	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All FIFRA Related Products
24-60-900	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; Miscellaneous Products
24-61-020	Solvent Utilization; Misc. Non-industrial: Commercial; Asphalt Application: All Processes
24-61-021	Solvent Utilization; Misc. Non-industrial: Commercial; Cutback Asphalt
24-61-022	Solvent Utilization; Misc. Non-industrial: Commercial; Emulsified Asphalt
24-61-023	Solvent Utilization; Misc. Non-industrial: Commercial; Asphalt Roofing
24-61-200	Solvent Utilization; Misc. Non-industrial: Commercial; Adhesives and Sealants
24-61-800	Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: All Processes
24-61-850	Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: Agricultural
24-61-870	Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: Non-Agricultural
24-65-000	Solvent Utilization; Misc. Non-industrial: Consumer; All Products/Processes
24-65-800	Solvent Utilization; Misc. Non-industrial: Consumer; Pesticide Application
25-01-011	Storage and Transport; Petroleum and Petroleum Product Storage; Residential PFCs
25-01-012	Storage and Transport; Petroleum and Petroleum Product Storage; Commercial PFCs
25-01-030	Storage and Transport; Petroleum and Petroleum Product Storage;
25-01-050	Storage and Transport; Petroleum and Petroleum Product Storage; Bulk Terminals
25-01-055	Storage and Transport; Petroleum and Petroleum Product Storage; Bulk Plants
25-01-060	Storage and Transport; Petroleum and Petroleum Product Storage; Gasoline Service Stations
25-01-080	Storage and Transport; Petroleum and Petroleum Product Storage; Airports : Aviation Gasoline
25-01-090	Storage and Transport; Petroleum and Petroleum Product Storage;

7-Digit SCC	7-Digit SCC Description
25-01-995	Storage and Transport; Petroleum and Petroleum Product Storage; All Storage Types
25-05-020	Storage and Transport; Petroleum and Petroleum Product Transport; Marine Vessel
25-05-030	Storage and Transport; Petroleum and Petroleum Product Transport; Truck
25-05-040	Storage and Transport; Petroleum and Petroleum Product Transport; Pipeline
25-30-010	Storage and Transport; Bulk Materials Storage; Commercial/Industrial
26-01-000	Waste Disposal; On-site Incineration; All Categories
26-01-010	Waste Disposal; On-site Incineration; Industrial
26-01-020	Waste Disposal; On-site Incineration; Commercial/Institutional
26-01-030	Waste Disposal; On-site Incineration; Residential
26-10-000	Waste Disposal; Open Burning; All Categories
26-10-030	Waste Disposal; Open Burning; Residential
26-10-040	Waste Disposal; Open Burning; Municipal (collected from residences, parks,other for central burn)
26-20-000	Waste Disposal; Landfills; All Categories
26-20-030	Waste Disposal; Landfills; Municipal
26-30-010	Waste Disposal; Wastewater Treatment; Industrial
26-30-020	Waste Disposal; Wastewater Treatment; Public Owned
26-30-050	Waste Disposal; Wastewater Treatment; Public Owned
26-40-000	Waste Disposal; TSDFs; All TSDF Types
26-60-000	Waste Disposal; Leaking Underground Storage Tanks; Leaking Underground Storage Tanks
26-80-001	Waste Disposal; Composting; 100% Biosolids (e.g., sewage sludge, manure, mixtures)
26-80-002	Waste Disposal; Composting; Mixed Waste (e.g., a 50:50 mixture of biosolids and green wastes)
28-01-000	Misc. Area Sources; Agriculture Production - Crops; Agriculture – Crops
28-01-001	Misc. Area Sources; Agriculture Production - Crops;
28-01-002	Misc. Area Sources; Agriculture Production - Crops;
28-01-500	Misc. Area Sources; Agriculture Production - Crops; Agricultural Field Burning - whole field
28-01-700	Misc. Area Sources; Agriculture Production - Crops; Fertilizer Application
28-05-001	Misc. Area Sources; Agriculture Production - Livestock; Beef cattle - finishing / dry-lots
28-05-002	Misc. Area Sources; Agriculture Production - Livestock; Beef cattle production composite
28-05-003	Misc. Area Sources; Agriculture Production - Livestock; Beef cattle - finishing / pasture/range
28-05-007	Misc. Area Sources; Agriculture Production - Livestock; Poultry production - layers with dry mgmt
28-05-008	Misc. Area Sources; Agriculture Production - Livestock; Poultry production - layers with wet mgmt
28-05-009	Misc. Area Sources; Agriculture Production - Livestock; Poultry production – broilers
28-05-010	Misc. Area Sources; Agriculture Production - Livestock; Poultry production – turkeys
28-05-018	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle composite
28-05-019	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - flush dairy
28-05-020	Misc. Area Sources; Agriculture Production - Livestock; Cattle and Calves Waste Emissions
28-05-021	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - scrape dairy
28-05-022	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - deep pit dairy
28-05-023	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - dry-lot/pasture dairy
28-05-024	Misc. Area Sources; Agriculture Production - Livestock;
28-05-025	Misc. Area Sources; Agriculture Production - Livestock; Swine production composite
28-05-026	Misc. Area Sources; Agriculture Production - Livestock;

7-Digit SCC	7-Digit SCC Description
28-05-027	Misc. Area Sources; Agriculture Production - Livestock;
28-05-028	Misc. Area Sources; Agriculture Production - Livestock;
28-05-030	Misc. Area Sources; Agriculture Production - Livestock; Poultry Waste Emissions
28-05-035	Misc. Area Sources; Agriculture Production - Livestock; Horses and Ponies Waste Emissions
28-05-039	Misc. Area Sources; Agriculture Production - Livestock; Swine production - ops with lagoons
28-05-040	Misc. Area Sources; Agriculture Production - Livestock; Sheep and Lambs Waste Emissions
28-05-045	Misc. Area Sources; Agriculture Production - Livestock; Goats Waste Emissions
28-05-047	Misc. Area Sources; Agriculture Production - Livestock; Swine production - deep-pit house
28-05-053	Misc. Area Sources; Agriculture Production - Livestock; Swine production - outdoor
28-06-010	Misc. Area Sources; Domestic Animals Waste Emissions; Cats
28-06-015	Misc. Area Sources; Domestic Animals Waste Emissions; Dogs
28-07-020	Misc. Area Sources; Wild Animals Waste Emissions; Bears
28-07-025	Misc. Area Sources; Wild Animals Waste Emissions; Elk
28-07-030	Misc. Area Sources; Wild Animals Waste Emissions; Deer
28-07-040	Misc. Area Sources; Wild Animals Waste Emissions; Birds
28-10-001	Misc. Area Sources; Other Combustion; Forest Wildfires
28-10-003	Misc. Area Sources; Other Combustion; Cigarette Smoke
28-10-005	Misc. Area Sources; Other Combustion; Managed Burning, Slash (Logging Debris)
28-10-010	Misc. Area Sources; Other Combustion; Human Perspiration and Respiration
28-10-014	Misc. Area Sources; Other Combustion; Prescribed Burning
28-10-015	Misc. Area Sources; Other Combustion; Prescribed Forest Burning
28-10-020	Misc. Area Sources; Other Combustion; Prescribed Rangeland Burning
28-10-025	Misc. Area Sources; Other Combustion; Charcoal Grilling - Residential
28-10-030	Misc. Area Sources; Other Combustion; Structure Fires
28-10-035	Misc. Area Sources; Other Combustion; Firefighting Training
28-10-050	Misc. Area Sources; Other Combustion; Motor Vehicle Fires
28-10-060	Misc. Area Sources; Other Combustion; Cremation
28-10-090	Misc. Area Sources; Other Combustion; Open Fire
28-30-000	Misc. Area Sources; Catastrophic/Accidental Releases; All Catastrophic/Accidental Releases
28-30-010	Misc. Area Sources; Catastrophic/Accidental Releases; Transportation Accidents
28-70-000	Misc. Area Sources; ;

4.2 USEPA AREA SOURCE DATA

USEPA emissions inventories and emission estimation tools were used to create a preliminary version of the 2007 area source inventory. States reviewed the data available from USEPA and made a determination on a category by category basis of whether the USEPA data was acceptable for their State. This section describes the data and tools available from USEPA.

4.2.1 USEPA 2008 National Emission Inventory

Prior to preparation of the 2008 inventory, USEPA, in consultation with ERTAC, revised the recommended emission factors and estimation methods for many area source categories, as listed below. The goal was to provide standardized emission calculations and related documentation across states. These were used by USEPA's contractor to develop 2008 emission estimates for fifteen area source categories to support development of the 2008 National Emission Inventory (NEI). In general, county-level criteria and HAP pollutant emissions were estimated at the SCC level. In most cases, activity data was collected for 2008. In cases where 2008 activity data did not exist, data from the most recent year available was used, as reported in the documentation.

- Agriculture Production - Livestock
- Asphalt Paving
- Aviation Gasoline Distribution
- Commercial Cooking
- Construction Dust
- Commercial/Institutional Fuel Combustion
- Fertilizer Application
- Gasoline Distribution
- Industrial Fuel Combustion
- Open Burning
- Road Dust
- Publicly Owned Treatment Works (POTW)
- Residential Heating
- Solvent Usage - Surface Coatings
- Solvent Usage - Other

The emission factors from the ERTAC process and the resulting 2008 emissions developed by USEPA were available for State use in this 2007 inventory development process (USEPA 2010a).

4.2.2 EPA Residential Wood Combustion (RWC) Tool

EPA worked with a group of State, local, and regional planning organization representatives to develop a new methodology for estimating RWC emissions (USEPA 2010b). USEPA developed a Microsoft Access Tool to allow S/L agencies to calculate annual emissions from RWC sources. The new methodology: 1) accounts for appliances not included in the old methodology (e.g., outdoor hydronic heaters); 2) makes the methodology easier for States to input location-specific knowledge; and 3) updates many of the assumptions made to calculate emissions (for example, the percent conventional versus USEPA certified wood stoves).

EPA updated the RWC tool with 2007 population data and provided it to States to review the input parameters, including county populations, appliance profiles, burn rates, density of cordwood by county, appliance populations, and emission factors by SCC. The only changes that were made to the model itself were for Vermont, which provided updated burn rates and other appliance populations. The Contractor reran the revised 2007 RWC tool for all states. The results of this run are included in the inventory with the exception of New Jersey. New Jersey revised certain model inputs, re-ran the RWC tool on their own, and provided the Contractor with the resulting NIF files.

4.2.3 EPA CMU Agricultural Ammonia Model

In preparation for the 2008 NEI, USEPA used the Carnegie Mellon University (CMU) Ammonia Model to generate an ammonia emission inventory for the continental United States based on 2007 activity levels. No significant change was made to the emission factors in the model. The primary sources of ammonia are two agricultural operations:

- Livestock refers to domesticated animals intentionally reared for the production of food, fiber, or other goods or for the use of their labor. The definition of livestock in this category includes beef cattle, dairy cattle, ducks, geese, goats, horses, poultry, sheep, and swine.
- Fertilizer refers to any nitrogen-based compound, or mixture containing such a compound, that is applied to land to improve plant fitness.

The Contractor obtained from USEPA a recent run of the CMU model for 2007 and provided it to the States for their review (USEPA 2010c). The USEPA data provided to MARAMA included emissions for livestock and fertilizer application. The CMU model is also capable of estimating ammonia emissions from non-domestic animals (deer, bear, etc.) and domesticated pets (dogs and cats) as well as other things such as human perspiration. However, none of these sources were included in the runs of the CMU model that EPA provided to MARAMA. Thus, unless a State supplied emission estimates for those categories, they were not included in the 2007 inventory.

4.2.4 EPA SMARTFIRE Emissions Database

SMARTFIRE is an algorithm and database system developed and built within a geographic information system (GIS) framework that combines multiple sources of fire information and reconciles them into a unified data set (SONOMA 2009). SMARTFIRE data sources include satellite fire detects and ground reports of fire incidents for various wild land management agencies. SMARTFIRE was developed by the USDA Forest Service AirFire Team and Sonoma Technology, Inc. under a grant from NASA.

SMARTFIRE interfaces with the BlueSky framework to estimate daily, location-specific fire emissions.

The Contractor obtained from USEPA a file of 2007 annual, county-level emissions data for wild land fires as calculated using the SMARTFIRE methodology. The Contractor provided the inventory and documentation to States for their review and consideration.

4.3 STATE-SPECIFIC DATA

States reviewed the documentation and resulting emission files for each USEPA estimation methodology. Each State made a decision of whether to accept the USEPA inventory (NEI 2008, RWC tool results, CMU ammonia model results, SMARTFIRE results) or to develop their own emission estimates for these categories. Based on state choices, the Contractor initiated collection of the State supplied data. Generally states provided their data in NIF3.0 format; however some data was provided in spreadsheets in a State-specific format or in the new EIS Emissions format. Where necessary, data was converted to NIF format, filling in as many NIF fields as possible with state-supplied data.

State submitted emission files were augmented using USEPA data as directed by the States. Where 2008 NEI data were used to fill missing categories in the 2007 MANE VU+VA inventory, no growth adjustment was made to the emissions. This is because States felt that activity in 2008 to 2007 was similar due to the economic downturn.

The emissions data is housed in NOF formatted files, which provide additional fields at the end of each table to identify the data source and revision date. Those data elements provide a the data lineage for each source category, thus improving the overall inventory quality assurance (QA). The values in the DATA_SOURCE field in the EM table are shown in Exhibit 4.2. Exhibit 4.3 summarizes the data sources used for each MARAMA State and major source category.

Exhibit 4.2 – Values Contained in the DATA_SOURCE Field of the EM Table

EM Table DATA-SOURCE Value	Description of Data Source
2005NEIv2	All of the records are for CT, which used this value in their submittal to the Contractor – data taken directly by CT from the 2005 NEI version 2
2008NEI	Emissions based on USEPA's 2008 NEI using the USEPA data and methodologies described in Section 4.2.1 of this TSD
EPA	Emissions based on USEPA's 2008 NEI using the USEPA data and methodologies described in Section 4.2.1 of this TSD
EPA NEI05	Emissions based on USEPA's 2005 NEI as a gap-filling measure where 2007 data were not available from State or USEPA
EPA RWC Mo	Emissions based on USEPA's Residential Wood Combustion model
EPA/Ratio	PM emissions were generated using USEPA-supplied emission values and ratios of condensable to PM-PRI or other ratios as necessary to complete the PM spectrum of pollutants
EPA-CMU	Emissions based on USEPA's 2007 run of the CMU ammonia model
MARAMA02BY	Emissions based on MARAMA's 2002 Version 3 area source inventory as a gap-filling measure where 2007 data were not available from the State or USEPA
MARAMA2009	Emissions based on MARAMA's 2009 Version 3 area source inventory as a gap-filling measure where 2007 data not available from State or USEPA
MOVES	Vehicle refueling emissions calculated by NESCAUM using the MOVES model in the inventory mode
NEI0508INT	Emissions were linearly interpolated for 2007 based on values in the 2005 NEI and the 2008 NEI
NEI08CTMOD	All of the records are for CT, which used this value in their submittal to the Contractor – these records were based on the 2008 NEI data modified by CT air quality staff
SEMAP07	Emissions for Virginia are based on SEMAPs 2007 area source inventory
State MOVES	Vehicle refueling emissions calculated by the state using the MOVES model in the inventory mode
State RWC	Emissions for New Jersey based on NJ-specific application of USEPA's Residential Wood Combustion model
State	Emissions were provided directly by the State and represent actual 2007 emissions
StateRatio	PM emissions were generated using State-supplied emission values and ratios of condensable to PM-PRI or other ratios as necessary to complete the PM spectrum of pollutants

Exhibit 4.3 – Data Sources Generally Used by Each State for Each Area Source Category

SCC4 Description	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	VA
2101 Fuel Comb. / Utility	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	State	n/a	n/a	n/a	n/a
2102 Fuel Comb. / Industrial	State	State	State	n/a	n/a	State	State	State	State	State	State	State	State
2103 Fuel Comb. / Commercial	State	State	State	State	State	State	State	State	State	State	State	State	State
2104 Residential Other Fuels	State	State	State	State	State	State	State	State	State	State	EPA	State / USEPA	State
2104 Residential Wood Comb.	EPA RWC	State	EPA RWC	State	State	EPA RWC	State	State RWC	State	State	EPA RWC	EPA RWC	EPA RWC
2294 Paved Road Dust	State	State	State	State	State	State	State	State	State	State	State	State	State
2296 Unpaved Road Dust	EPA	n/a	State	State	State	EPA	EPA	State	EPA	EPA	EPA	State	EPA
2302 Food & Kindred Products	EPA	State	State	State	State	State	EPA	State	State	State	EPA	EPA	State / USEPA
2311 Construction	EPA	State	State	State	State	n/a	State / USEPA	State	EPA	EPA	EPA	EPA	EPA
2325 Mining & Quarrying	State	n/a	n/a	State	n/a	EPA NEI05	EPA NEI05	State	MARAMA 09	EPA NEI05	n/a	EPA NEI05	State
2399 Industrial Refrigeration	State	n/a	n/a	n/a	n/a	n/a	n/a	State	n/a	n/a	n/a	n/a	n/a
2401 Surface Coating	EPA	State	State	State	State	State	State	State	State	State	EPA	EPA	State
2415 Degreasing	EPA	State	State	State	State	State	State	State	State	State	EPA	EPA	State
2420 Dry Cleaning	EPA	State	State	n/a	State	State	EPA	State	n/a	State	EPA	EPA	State
2425 Graphic Arts	EPA	State	State	State	State	State	State	State	State	State	EPA	EPA	State

SCC4 Description	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	VA
2440 Industrial Adhesives	2005NEI	State	n/a	State	State	State	n/a	State	MARAMA 09	n/a	n/a	n/a	n/a
2460 Consumer/Comm Products	EPA	State	State	State	State	State	State	State	n/a	State	EPA	EPA	State
2461 Road Asphalt	2005NEI	State	State	State	State	State	State	State	State	State	State	EPA	State
2465 Consumer Products	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	State	n/a	n/a	n/a	n/a
2501 Portable Fuel Containers	NEI0508 INT	State	State	n/a	State	EPA	EPA	State	State	State	State	EPA	EPA
2501 Gas Stations Stage 1	2008NEI	State	State	State	State	State	State	State	EPA	State	State	State	State
2501 Gas Stations Stage 2	MOVES	MOVES	MOVES	MOVES	MOVES	MOVES	MOVES	MOVES	State MOVES	State MOVES	MOVES	MOVES	State MOVES
2501 Aviation Gas Stage 1/2	EPA	State	State	State	State	State	n/a	State	n/a	n/a	EPA	State	EPA
2505 Tank Truck Transport	2008NEI	State	State	State	State	State	n/a	State	EPA	State	State	State	State
2610 Open Burning	EPA	State	State	State	State	EPA	State	State	EPA	State / USEPA	EPA	EPA	EPA
2620 Landfills	State	State	n/a	State	State	State	State	State	State	n/a	n/a	n/a	n/a
2630 Wastewater Treatment	EPA	State	State	State	State	State	State	State	State	State	EPA	EPA	EPA
2660 Leaking Underground Tanks	State	State	n/a	State	State	State	State	State	n/a	n/a	n/a	n/a	State
2680 Composting	State	n/a	n/a	State	n/a	n/a	State	State	n/a	n/a	n/a	n/a	n/a
2801 Agriculture Tilling	State	State	n/a	State	State	State	State	State	n/a	EPA NEI05	EPA NEI05	State	State

SCC4 Description	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	VA
2801 Agriculture Field Burning	n/a	n/a	n/a	State	n/a	n/a	n/a	State	n/a	n/a	n/a	n/a	n/a
2801 Agriculture Fertilizer	EPA CMU	State	n/a	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU
2805 Agriculture Livestock	EPA CMU	State	n/a	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU
2810 Forest Wildfires	n/a	State	n/a	State	State	State	n/a	State	State	EPA	n/a	State	SEMAP 07
2810 Prescribed Fires	n/a	State	State	State	State	n/a	n/a	State	State	n/a	n/a	n/a	SEMAP 07
2810 Structure Fires	State	State	State	State	State	State	State	State	State	n/a	n/a	State	State

Note: this table provides a general indication of the data source used for each major source category. Refer to the NIF EM table for a comprehensive listing of the Data Source for each individual county/SCC/pollutant.

4.4 VERSION 2: STATE AND STAKEHOLDER REVIEW AND COMMENT

The draft MS Access area source files were provided to States and stakeholders for review and comment. Within the Access database three queries were provided to allow the States to summarize emissions by State, county, SCC and pollutant to assist with the review. States and stakeholders provided comments and changes for incorporation and/or change. The following subsections describe the comments received and other QA activities performed that were ultimately incorporated into the final area source inventory.

4.4.1 National Park Service Comments

The only comments received from outside stakeholders came from the National Park Service (NPS). The NPS requested that the documentation be updated to more clearly identify the data sources used by each State for each category. Exhibits 4.2 and 4.3 were prepared in response to this request. Note that Exhibit 4.2 provides only a general indication of the data source used for each major source category. Reviewers are directed to the NOF EM table for a comprehensive listing of the Data Source used for each individual county/SCC/pollutant record. The NPS also commented on the large differences in emissions from some categories between 2002 and 2007. These differences were evaluated and are addressed in Section 4.4.3 and 4.5 of this TSD.

4.4.2 Checks for Missing Categories, Double Counting, Outliers, and Differences between 2002 and 2007 Inventories

As shown previously in Exhibit 4.3, a variety of data sources and methods are used by States to develop the 2007 inventory. The potential exists for categories to be inadvertently omitted, double counted (for example by including both State-specific and USEPA estimates), or to have a large per-capita or per-employee variation from State-to-State.

To guard against omission or double counting, the Contractor and MARAMA prepared a series of SCC level summary reports and manually reviewed them to determine potentially missing source categories. Among the reports were the following:

- "SCC in both 2002 and 2007" compares emissions by State and SCC for SCCs contained in both the 2002 and 2007 inventories.
- "2002 SCCs NOT in 2007" contains the SCCs that were in the 2002 inventory, but not in the first draft of the 2007 inventory.
- "2007 SCCs NOT in 2002" contains the SCCs that were in the 2007 inventory, but not in the 2002 inventory.

There are both increases and decreases in emissions between 2002 and 2007 depending upon the State and pollutant. In order to better understand these differences, we also prepared charts to graphically depict the major differences between the 2002 and 2007 area source inventories. Finally 4-digit SCC summaries were prepared to identify gaps.

States were asked to review these QA reports and provide responses to fill in gaps or address potentially anomalous emission estimates. Several instances were found where a State did not have emissions for a relatively important source category in the draft 2007 inventory. Examples are several SCCs related to PM emissions from construction, agricultural tilling and mining & quarrying operations. These gaps were brought to the attention of the affected States for resolution. In some cases, States provided data for the missing categories or advised the Contractor to fill in the gap using available data from existing USEPA or MARAMA inventories. In other cases, States indicated that emissions from the missing categories were small and determined that the effort to fill the missing category gap was not justified.

We reviewed SO2 and NOx emissions by State from industrial, commercial/institutional, and residential fuel combustion. Since the OTC is considering additional control measures for the industrial/commercial/institutional fuel combustion category, these values were closely scrutinized. Pennsylvania showed a dramatic increase in emissions from 2002 to 2007 for both SO2 and NOx for the industrial fuel combustion category. New York showed a substantial decrease in both the industrial and commercial/institutional categories from 2002 to 2007. Pennsylvania provided updated estimates for Version 3 of the inventory. New York did not provide an explanation of the possible reason for the differences, and no changes to the 2007 values were made.

A comparison of 2002 and 2007 VOC emissions by State for three types of solvent evaporation categories revealed that two States – Maine and New York – appear to have double-counted VOC emissions for this category using two different SCCs (24-60-xxx-xx and 24-65-xxx-xx). Maine and New York reviewed the issue and provided updates to eliminate the double counting issue.

4.5 VERSION 3 REVISIONS

4.5.1 Use of New USEPA Road Dust Equation

In January 2011, USEPA issued a new methodology (USEPA 2011) for developing emission factors for re-entrained particulate matter from vehicles traveling over a paved surface such as a road or parking lot. The new methodology was not used in Version 2 of the MANE-VU+VA 2007 inventory as it was not finalized in time.

This January 2011 version of the paved road emission factor equation only estimates particulate emissions from suspended road surface material. Particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using USEPA's MOVES model. This approach eliminates possible double counting of emissions resulting from use of the previous version of the equation in this section and MOVES to estimate particulate emissions from vehicle traffic on paved roads.

All states (except Maine) submitted revised paved road emission estimates using the new methodology for Version 3 of the 2007 MANE-VU+VA inventory. Exhibit 4.4 compares the 2007 PM10 and PM2.5 emissions using the new and previous methodology. PM10 emissions are lower using the new methodology, while PM2.5 emissions are higher.

Exhibit 4.4 –2007 Paved Road Dust PM10 and PM2.5 Emission Estimates

State	PM10-PRI		PM25-PRI	
	Version2 (tons/yr)	Version 3 New Method (tons/yr)	Version2 (tons/yr)	Version 3 New Method (tons/yr)
Connecticut	16,085	6,722	688	1,680
Delaware	10,217	4,556	724	1,143
District of Columbia	1,841	819	81	201
Maine*	16,536	16,536	1,665	1,665
Maryland**	12,813	13,798	3,160	3,387
Massachusetts	32,748	27,392	1,622	6,724
New Hampshire	8,821	7,985	524	1,960
New Jersey	38,210	19,914	1,142	4,979
New York	95,075	46,348	5,818	11,376
Pennsylvania	92,927	46,806	6,114	11,489
Rhode Island	4,387	3,833	204	941
Vermont	11,326	5,659	979	1,389
Virginia	50,827	29,637	2,966	7,275
Total	**391,814**	**230,004**	**25,690**	**54,207**

* Maine did not provide paved road emissions using the new method.
** Maryland used a draft version of the new AP-42 method for Version 2.

4.5.2 Use of MOVES Model to Estimate Stage II Emissions

States elected to use the Stage II emissions as calculated by the MOVES model, and to include those emissions in the area source sector emission summaries. Stage II emissions result from the refueling of motor vehicles at gasoline service stations. NESCAUM, PA, NY, and VA each executed the MOVES model in inventory mode to calculate vehicle refueling emissions. The MOVES estimates were used instead of the estimates provided

by states for Version 2 of the inventory. The MOVES estimates are not included in the onroad sector summaries or modeling files so that the emissions will not be double counted. Exhibit 4.5 compares the Stage II VOC emissions in the 2008 NEI to the emissions calculated using the MOVES model. VOC emissions are higher using MOVES in some states, lower in others. Appendix F contains NESCAUM's documentation of the MOVES modeling. Appendix G contains the VOC control efficiencies by county used in the MOVES modeling for displacement losses and for spillage losses.

Exhibit 4.5 –Stage II Refueling VOC Emissions for 2007 Using NMIM and MOVES

State	NEI2008 (tons/yr)	2007 Version 3 Using MOVES (tons/yr)
Connecticut	483	286
Delaware	284	294
District of Columbia	71	52
Maine	809	709
Maryland	1,933	2,132
Massachusetts	980	807
New Hampshire	412	419
New Jersey	2,287	2,500
New York	7,604	8,787
Pennsylvania	5,313	6,581
Rhode Island	178	180
Vermont	128	122
Virginia	4,464	5,569
Total	**24,947**	**28,437**

4.5.3 Connecticut Changes for Fuel Combustion

Connecticut provided updated 2007 emission estimates for non-wood fuel combustion for the residential, commercial/institutional and industrial source categories. Connecticut previously relied on USEPA's 2005 NEI-v2 (commercial/institutional and industrial) and USEPA's 2008 NEI (residential) for these categories. Prompted by reviews provided by MARAMA, Connecticut subsequently discovered that USEPA's inventory assumed a 2.25% sulfur level for residual fuel oil compared to a CT regulatory maximum of 1.0% sulfur. In addition, Connecticut could not verify whether USEPA's 2005 NEI-v2 adjusted its area source estimates to avoid double counting of point sources. As a result, Connecticut has decided to use emission estimates from its draft-2005 periodic emissions inventory (PEI) for the non-wood fuel combustion portions of the three cited categories.

The draft-2005 PEI includes only CO, VOC and NOx emissions, so fuel use values were multiplied by USEPA emission factors obtained from the 2008 NEI to calculate estimates of annual SO2 and PM2.5 emissions. Emissions for 2005 are assumed to be representative of 2007, with no growth adjustments.

Connecticut identified errors in the Version 2 inventory that were corrected in Version 3. The CO emissions for residential distillate oil combustion were incorrectly reported as winter season emissions instead of annual emissions. Version 2 emissions for residential, commercial/institutional, and industrial kerosene combustion were based on NEI 2008 values. Connecticut indicated that kerosene emissions in the state are included under the distillate oil category. Emissions for the kerosene combustion SCCs were set to zero in Version 3 to avoid double counting of emissions. For a few SCCs, the sum of the PM10-FIL and PM-CON emissions did not equal the PM10-PRI emissions, and the sum of the PM25-FIL and PM-CON emissions did not equal the PM25-PRI emissions. Revisions to the PM10-PRI and PM25-PRI emissions were made to correct the error.

4.5.4 Connecticut Revisions for AIM Coatings and Auto Refinishing

Version 2 of the 2007 inventory for AIM coatings was based on USEPA 2008 NEI values, which accounted for the implementation of the OTC model rule for AIM coatings in Connecticut. Since Connecticut's AIM rule did not go into place in time to produce 2007 reductions, the 2008 NEI values for those SCCs were increased for the Version 3 inventory. The emission factor used to calculate emissions was changed from 2.41 to 3.02 lbs/person to reflect the absence of reductions from the CT AIM rule in 2007.

Version 2 of the 2007 inventory for industrial maintenance coatings was based on USEPA 2008 NEI values, which accounted for the implementation of the OTC model rule for AIM coatings in Connecticut. Since Connecticut's AIM rule did not go into place in time to produce 2007 reductions, the 2008 NEI values for those SCCs were increased for the Version 3 inventory. The emission factor used to calculate emissions was changed from 0.15 to 0.96 lbs/person to reflect the absence of reductions from the CT AIM rule in 2007.

Version 2 of the 2007 inventory for auto refinishing coatings was based on USEPA 2008 NEI values, which did not account for the implementation of the OTC model rule for mobile equipment repair and refinishing in Connecticut. A rule similar to the OTC rule was in place in Connecticut in April 2006. Since Connecticut's auto refinishing rule was in place prior to 2007, the 2008 NEI values for those SCCs were reduced for the Version 3 inventory. The emission factor used to calculate emissions was changed from 89 to 55 lbs/employee to reflect the 38 percent reduction in VOC emissions from the Connecticut auto refinishing rule in 2007.

4.5.5 District of Columbia Residential Wood Combustion

Emissions for residential wood combustion in the District of Columbia were missing from Version 2 of the 2007 MANE-VU+VA area source inventory. These emissions were originally estimated using the USEPA RWC tool, but were inadvertently left out of the 2007 inventory. The 2007 emissions calculated by the USEPA RWC tool were added.

4.5.6 Maryland Degreasing VOC Emisions

Maryland provided revised estimates for VOC emissions for the degreasing category.

4.5.7 Massachusetts NH3 Emisions

Massachusetts added NH3 emissions from humans (SCC 28-10-010-000), cats (SCC 28-06-010-000), and dogs (SCC 28-06-015-000) that were missing in Version 2.

4.5.8 New Jersey Bakeries and Auto Refinishing VOC Emisions

New Jersey revised the VOC emissions for bakeries and auto refinishing.

4.5.9 New York VOC Emisions from Residential Wood Combustion

New York revised the CO and VOC emissions for all residential wood combustion SCCs.

4.5.10 Pennsylvania Industrial Coal Combustion

Pennsylvania revised the industrial coal emissions for SCCs 2102001000 and 2102002000. This revision was accomplished using one of the two new preferred methods of point subtraction based on activity throughputs (coal usage). The revised activity method is performed by subtracting the point source coal usage from the state coal usage totals, and then calculating the area source emissions, which is a more accurate calculation estimate.

4.5.11 Pennsylvania Residential Distillate Oil Combustion

Pennsylvania's original submittal for SO2 emissions for residential distillate oil were incorrectly underreported by a factor of 100. This error was corrected in Version 3.

4.5.12 Virginia Industrial Coal Combustion

Virginia identified an error in the Version 2 emissions from industrial coal combustion (SCC=21-02-002-000) resulting from a misinterpretation of activity data from the Energy Information Administration. Virginia now believes that all industrial coal combustion is accounted for in the point source inventory. All emissions for this SCC were zeroed out for all counties in Virginia.

4.5.13 Multiple States Open Burning and Commercial Cooking

USEPA updated their emissions estimates for the 2008 NEI in August, 2011. Several states relied on the USEPA estimates for use in the 2007 MANE-VU+VA inventory. These revisions included:

- For commercial cooking (SCCs 23-02-002-xxx and 23-02-003-xxx), USEPA added emission factors for PM-CON and emissions for PM25-PRI were recalculated.
- For open burning (26-10-000-100, 26-10-000-400, 26-10-000-500, 26-10-030-000), USEPA updated per capita waste generation and recalculated emissions.

Emissions for states using the USEPA estimates were updated to reflect these changes.

4.6 ANNUAL 2007 AREA SOURCE EMISSION SUMMARY

Overall, estimated area source emissions decreased from 2002 to 2007 in the region for all pollutants. Area source emissions are generally a product of both activity and emission factors. Changes in both activity and emission factors occurred between 2002 and 2007 for several categories resulting in changes in emission estimates.

Exhibit 4.6 summarizes 2002 and 2007 area source CO emissions by State. Exhibit 4.7 presents the 2007 CO emissions by State and major source category. Most States show a significant reduction in CO area source emissions between 2002 and 2007. The District of Columbia, Rhode Island and Vermont show increases. Regionwide, area source emissions of CO are estimated to be 33% lower in 2007 than was estimated in 2002. Most of the area source CO emissions result from residential wood combustion and open burning, and the emission estimation methods used for these categories changed between 2002 and 2007. Therefore, the substantial changes in CO emissions from 2002 to 2007 are primarily due to different emission estimation methodologies used for the 2002 and 2007 inventories.

Exhibit 4.8 summarizes 2002 and 2007 area source NH3 emissions by State. Exhibit 4.9 presents the 2007 NH3 emissions by State and major source category. Most States show a reduction in NH3 area source emissions between 2002 and 2007, except for the District of Columbia, which show substantial percentage increase. It should be noted that the magnitude of NH3 emissions in the District are very small in comparison to regional emissions, and the large percentage increase is insignificant in the context of regional air quality modeling. Regionwide, area source emissions of NH3 are estimated to be 15% lower in 2007 than was estimated in 2002. Nearly all area source NH3 emissions result from agricultural livestock and fertilizer categories which were calculated by USEPA using the CMU ammonia model. Reductions in animal populations and fertilizer usage between 2007 and 2002 are the reason for the change.

Exhibit 4.10 summarizes 2002 and 2007 area source NOx emissions by State. Exhibit 4.11 presents the 2007 NOx emissions by State and major source category. Most States show decreases between 2002 and 2007, except for Pennsylvania and Vermont, which show increases. Regionwide, area source emissions of NOx are estimated to be 28% lower in 2007 than was estimated in 2002. Nearly all area source NOx emissions are from the industrial, commercial, and residential (non-wood fuel) categories.

Exhibit 4.12 summarizes 2002 and 2007 area source PM10-PRI emissions by State. Exhibit 4.13 presents the 2007 PM10-PRI emissions by State and major source category. Regionwide, area source emissions of PM10-PRI are estimated to be 29% lower in 2007 than was estimated in 2002. PM10-PRI emissions are attributable to the paved/unpaved road dust, construction activity, mining & quarrying, and agricultural tilling categories. Changes in the emission calculation methodology for road dust from paved roads accounts for a substantial portion of the decrease.

Exhibit 4.14 summarizes 2002 and 2007 area source PM25-PRI emissions. Exhibit 4.15 presents the 2007 PM25-PRI emissions by State and major source category. Regionwide, area source emissions of PM25-PRI are estimated to be 19% lower in 2007 than was estimated in 2002. PM25-PRI emissions result from residential wood combustion, paved/unpaved road dust, construction activity, mining & quarrying, and open burning categories. Changes in the emission calculation methodology for road dust from paved roads and residential wood combustion accounts for a substantial portion of the changes.

Exhibit 4.16 summarizes 2002 and 2007 area source SO2 emissions by State. Exhibit 4.17 presents the 2007 SO2 emissions by State and major source category. Most States show decreases between 2002 and 2007, except for Connecticut and Pennsylvania, which show increases. Regionwide, area source emissions of SO2 are estimated to be 42% lower in 2007 than was estimated in 2002. Nearly all area source SO2 emissions are from the industrial, commercial, and residential (non-wood fuel) categories.

Exhibit 4.18 summarizes 2002 and 2007 area source VOC emissions by State. Exhibit 4.19 presents the 2007 VOC emissions by State and major source category. All States show substantial reductions in VOC emissions from 2002 to 2007. Regionwide, area source emissions of VOC are estimated to be 45% lower in 2007 than was estimated in 2002. Part of the difference can be explained by post-2002 control measures for architectural coatings, consumer products, degreasing and portable fuel containers. But, as was discuss for CO emissions, part of the difference is due to differences in the methodologies used to estimate emissions from residential wood combustion.

Exhibit 4.6 – 2002 and 2007 Area Source CO Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	70,198	41,496	-41%
Delaware	14,052	8,266	-41%
District of Columbia	2,300	5,488	139%
Maine	109,223	50,496	-54%
Maryland	141,179	74,188	-47%
Massachusetts	137,496	79,226	-42%
New Hampshire	79,647	39,677	-50%
New Jersey	97,657	77,687	-20%
New York	356,254	205,055	-42%
Pennsylvania	266,935	217,079	-19%
Rhode Island	8,007	15,419	93%
Vermont	43,849	51,109	17%
Virginia	155,873	132,098	-15%
	1,482,669	**997,285**	**-33%**

Exhibit 4.7 – 2007 Area Source CO Emissions by Category and State (tons/year)

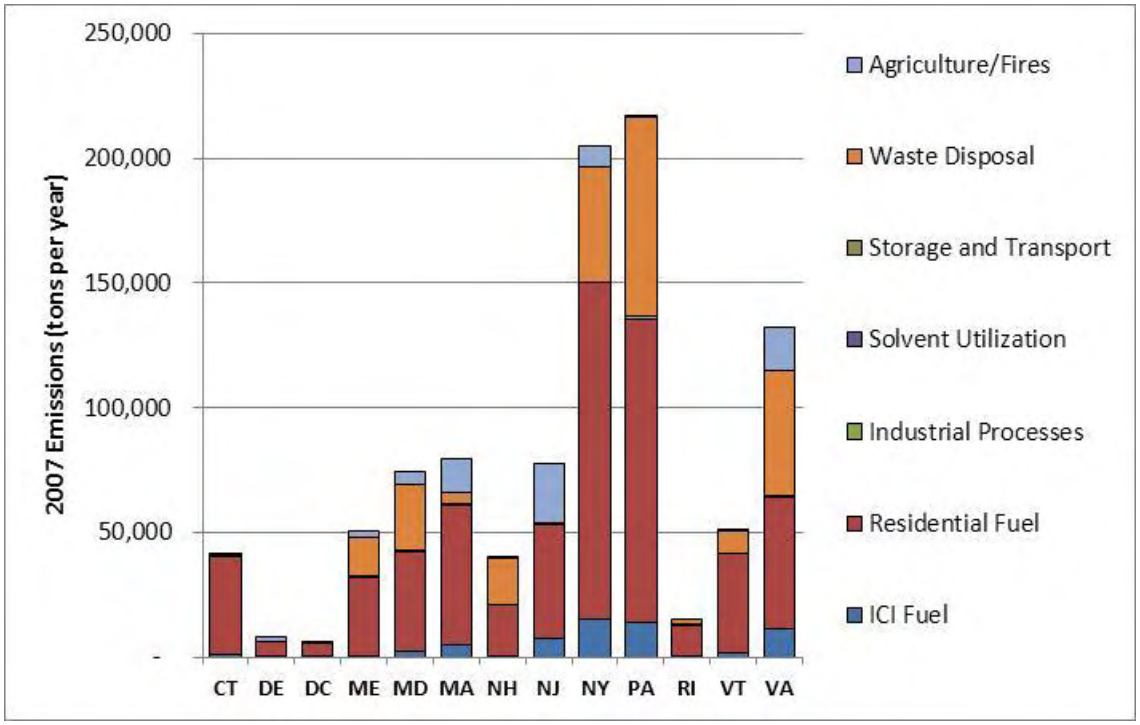


Exhibit 4.8 – 2002 and 2007 Area Source NH3 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	5,318	4,421	-17%
Delaware	13,278	12,382	-7%
District of Columbia	14	183	1188%
Maine	8,747	5,736	-34%
Maryland	25,835	26,006	1%
Massachusetts	18,809	13,791	-27%
New Hampshire	2,158	1,500	-30%
New Jersey	17,572	15,736	-10%
New York	67,422	45,693	-32%
Pennsylvania	79,911	72,569	-9%
Rhode Island	883	625	-29%
Vermont	9,848	8,013	-19%
Virginia	43,905	43,394	-1%
	293,699	**250,049**	**-15%**

Exhibit 4.9 – 2007 Area Source NH3 Emissions by Category and State (tons/year)

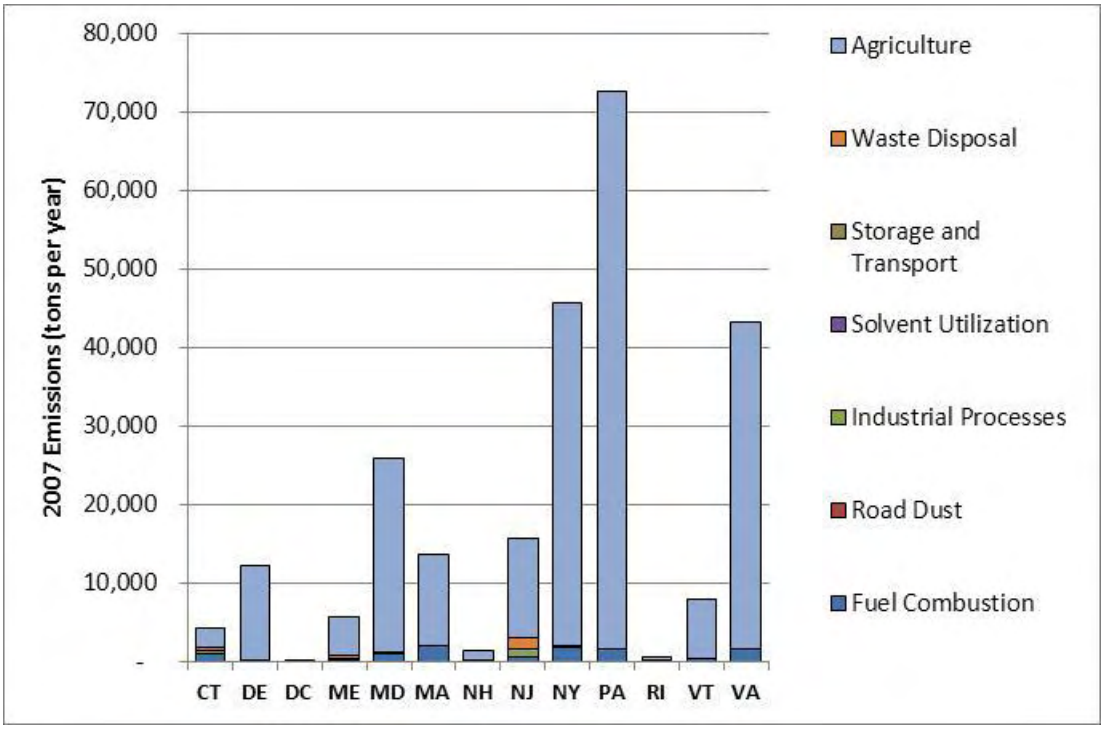


Exhibit 4.10 – 2002 and 2007 Area Source NOx Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	12,689	12,422	-2%
Delaware	2,608	2,237	-14%
District of Columbia	1,644	1,547	-6%
Maine	7,360	6,656	-10%
Maryland	15,678	10,312	-34%
Massachusetts	34,281	20,252	-41%
New Hampshire	10,960	4,737	-57%
New Jersey	26,692	24,175	-9%
New York	98,803	72,053	-27%
Pennsylvania	47,591	47,545	0%
Rhode Island	3,886	3,469	-11%
Vermont	3,208	3,996	25%
Virginia	51,418	19,056	-63%
	316,817	**228,458**	**-28%**

Exhibit 4.11 – 2007 Area Source NOx Emissions by Category and State (tons/year)

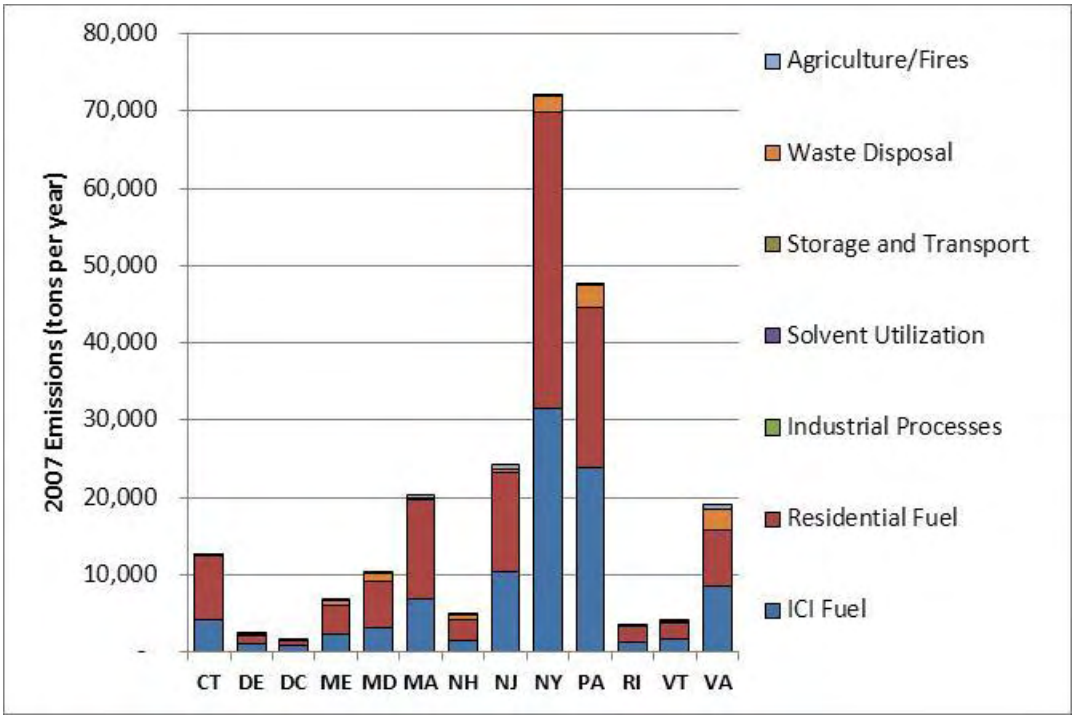


Exhibit 4.12 – 2002 and 2007 Area Source PM10-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	48,281	30,577	-37%
Delaware	13,039	10,499	-19%
District of Columbia	3,269	4,873	49%
Maine	168,953	54,445	-68%
Maryland	95,060	72,454	-24%
Massachusetts	192,860	148,756	-23%
New Hampshire	43,329	27,742	-36%
New Jersey	61,601	39,140	-36%
New York	369,595	272,674	-26%
Pennsylvania	391,897	287,998	-27%
Rhode Island	8,295	11,361	37%
Vermont	56,131	47,993	-14%
Virginia	237,577	183,341	-23%
	1,689,886	**1,191,853**	**-29%**

Exhibit 4.13 – 2007 Area Source PM10-PRI Emissions by Category and State (tons/year)

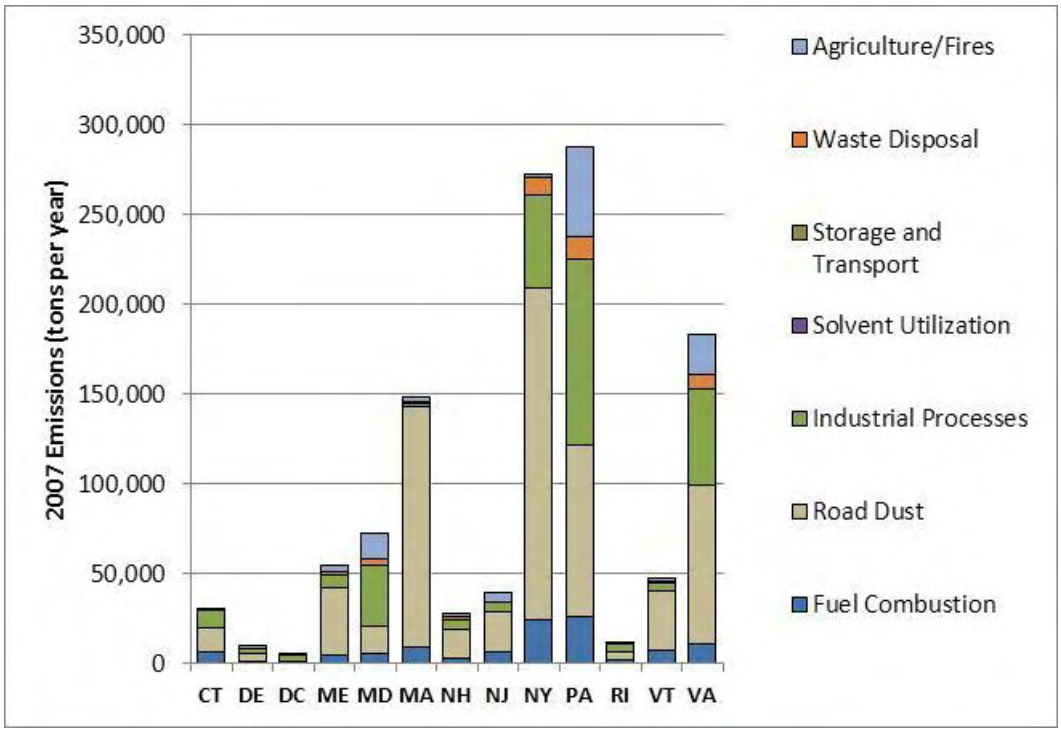


Exhibit 4.14 – 2002 and 2007 Area Source PM25-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	14,247	10,606	-26%
Delaware	3,204	3,031	-5%
District of Columbia	805	1,542	91%
Maine	32,774	12,526	-62%
Maryland	27,318	19,789	-28%
Massachusetts	42,083	30,438	-28%
New Hampshire	17,532	8,623	-51%
New Jersey	19,350	18,299	-5%
New York	87,155	63,906	-27%
Pennsylvania	74,925	73,514	-2%
Rhode Island	2,064	3,896	89%
Vermont	11,065	13,106	18%
Virginia	43,989	44,102	0%
	376,510	**303,378**	**-19%**

Exhibit 4.15 – 2007 Area Source PM25-PRI Emissions by Category and State (tons/year)

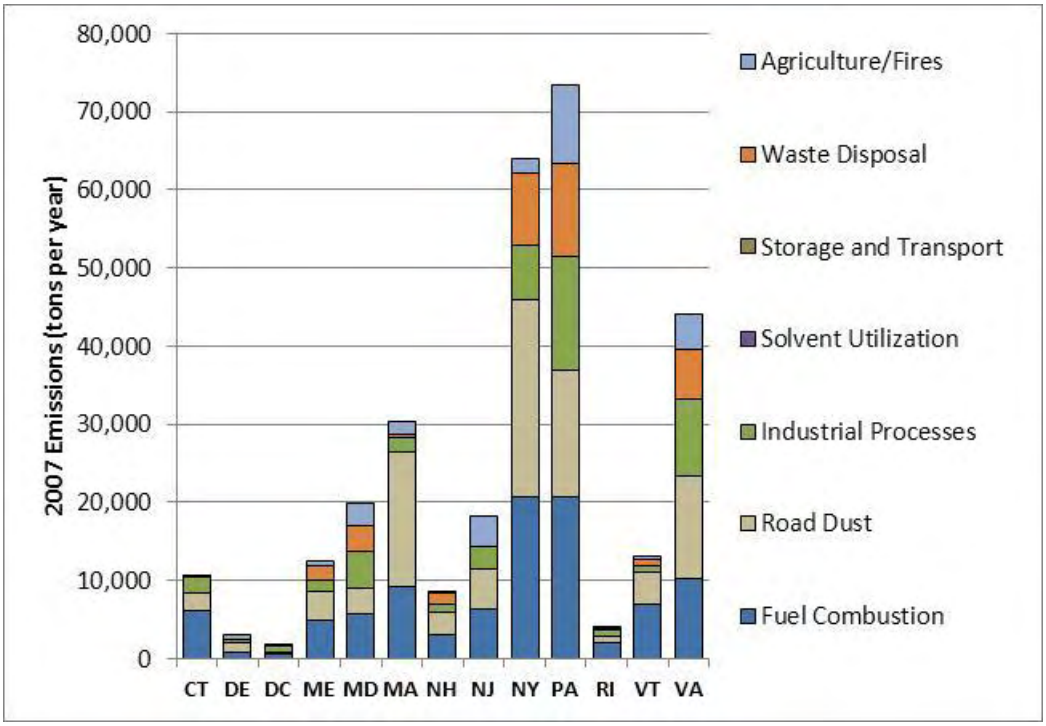


Exhibit 4.16 – 2002 and 2007 Area Source SO2 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	12,419	16,083	30%
Delaware	1,588	1,144	-28%
District of Columbia	1,336	1,241	-7%
Maine	13,149	9,812	-25%
Maryland	12,393	5,960	-52%
Massachusetts	25,488	19,859	-22%
New Hampshire	7,072	5,283	-25%
New Jersey	10,744	8,811	-18%
New York	130,409	70,044	-46%
Pennsylvania	63,679	66,584	5%
Rhode Island	4,557	3,897	-14%
Vermont	4,088	3,752	-8%
Virginia	105,890	17,098	-84%
	392,812	**229,569**	**-42%**

Exhibit 4.17 – 2007 Area Source SO2 Emissions by Category and State (tons/year)

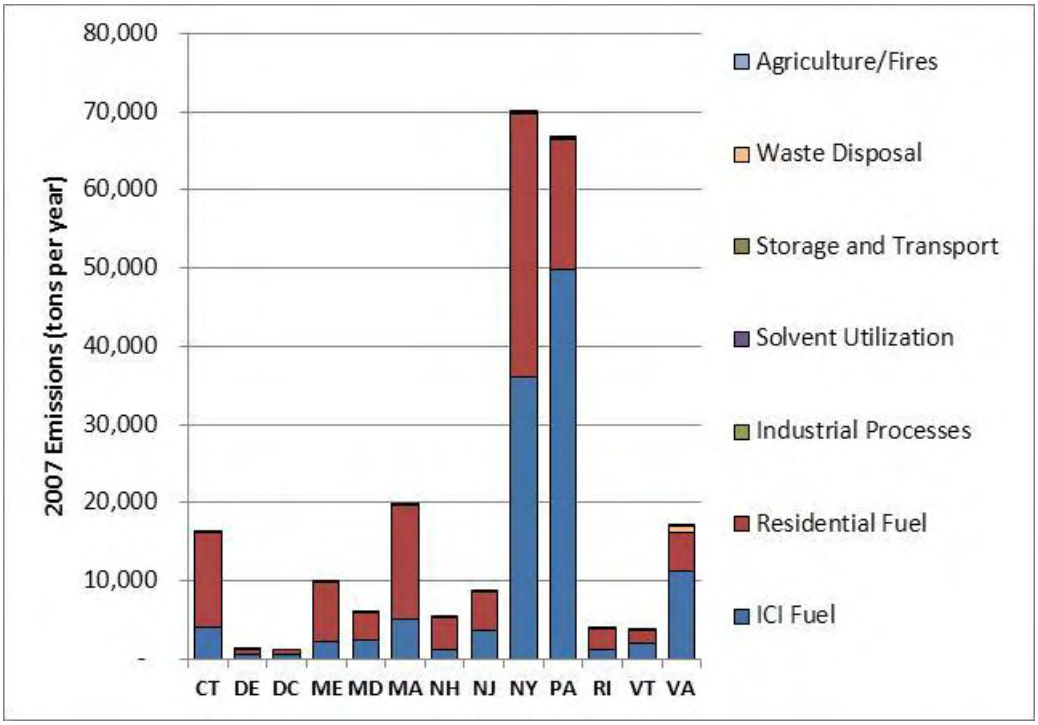
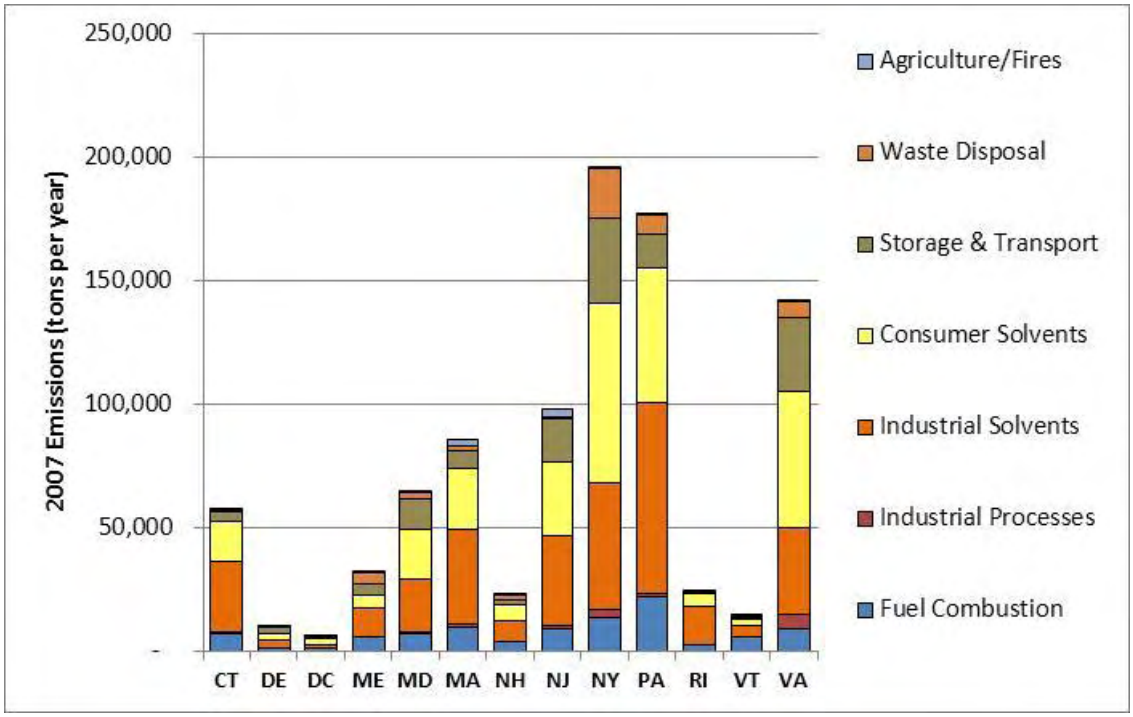


Exhibit 4.18 – 2002 and 2007 Area Source VOC Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	87,302	57,253	-34%
Delaware	15,520	9,482	-39%
District of Columbia	6,432	5,568	-13%
Maine	100,621	31,966	-68%
Maryland	120,254	64,429	-46%
Massachusetts	155,557	85,870	-45%
New Hampshire	65,371	22,343	-66%
New Jersey	167,882	98,121	-42%
New York	507,291	195,976	-61%
Pennsylvania	240,785	176,781	-27%
Rhode Island	31,402	24,214	-23%
Vermont	23,266	14,108	-39%
Virginia	172,989	142,218	-18%
	1,694,670	**928,330**	**-45%**

Exhibit 4.19 – 2007 Area Source VOC Emissions by Category and State (tons/year)



5.0 ANNUAL 2007 INVENTORY FOR NONROAD SOURCES INCLUDED IN THE NONROAD MODEL

5.1 NONROAD MODEL CATEGORIES

The USEPA's NONROAD model estimates emissions from equipment such as recreational marine vessels, recreational land-based vehicles, farm and construction machinery, lawn and garden equipment, aircraft ground support equipment (GSE) and rail maintenance equipment. This equipment is powered by diesel, gasoline, compressed natural gas or liquefied petroleum gas engines.

The National Mobile Inventory Model (NMIM) was developed by USEPA to estimate county-level emissions for certain types of nonroad equipment. NMIM uses the current version the NONROAD model. The NMIM national county database contains monthly input data to reflect county specific fuel parameters and temperatures. Most of the work associated with executing NMIM involved updating the NMIM county database with State-specific information. For this analysis, we used the NMIM2008 software (version NMIM20090504), the NMIM County Database (version NCD20090531), and NONROAD2008a (July 2009 version) as a starting point (USEPA 2009d). Changes were made to the NCD20090531 based on State review.

5.2 VERSION 2 INVENTORY DEVELOPMENT

The following subsections describe how Version 2 of the inventory was prepared.

5.2.1 State Review of NMIM Meteorology Data and Fuel Characteristics

The Contractor obtained from USEPA the National County Database (NCD20090531) for use as a starting point for preparing the modeling data sets. NCD20090531contains the 2007 year-specific meteorology data set that USEPA used to calculate 2007 emissions in addition to fuel revisions for years 2006-2011. These fuel values are updates to those in the 2007 USEPA NMIM run which used NCD20090327. It was decided to use NCD20090531 as a starting point for development of the NONROAD input files for the 2007 modeling inventory. NCD20090531 was made available for state comment.

Several States commented on fuel characteristics data and changes were made to the underlying MySQL database to incorporate those changes into the model. These included changes to Reid Vapor Pressure, sulfur and oxygenate fractions. Where changes were made, the Contractor created new gasoline types and IDs using the NMIM MySQL NCD database default entries as a starting point. Only information related to criteria pollutant emission calculations was changed. Information related to air toxics that was contained in

the initial default fuel characteristic tables was not adjusted. Thus the fuel types created for the NMIM modeling should NOT be used for air toxics modeling. To further separate the data in the fuel characteristics tables from other modeling efforts, the Contractor created a separate NCD for use exclusively for this modeling effort.

Exhibit 5.1 shows the number of added gasoline fuel record types added to the "gasoline" table in the MySQL NCD database. The total number of added fuel records was 118 new gasoline types. These records were given GasolineID values of 4462 to 4479 inclusive.

Exhibit 5.1 – Gasoline Fuel Record Types Add to MySQL NCD Database

State	Number of revised gasoline records
CT	10
MD	48
NH	15
NJ	20
NY	25

Although records were added for NY, they were not used since NY performed their own NONROAD modeling (see below).

5.2.2 Update of NMIM Allocation Files for Population and Housing

Several NONROAD categories use housing unit or population data to allocate the emissions to the county level from State calculations. States identified some discrepancies in the housing and population data contained in the NONROAD model and requested that the Contractor update the allocation files for those categories. As a consequence, the Contractor obtained 1 and 2 unit housing information and updated 2007 population estimates. Data were obtained from the sources listed in Exhibit 5.2. :

Exhibit 5.2 – Data Sources for Population and Housing Data

Source Type	Data Source
2007 Population Data Source	http://www.census.gov/popest/counties/CO-EST2008-01.html
Total Housing Data Source	http://www.census.gov/popest/housing/HU-EST2007-CO.html
1 yr - 1 and 2 Unit Housing Data	2007 American Community Survey 1-Year Estimates
3 yr - 1 and 2 Unit Housing Data	B25024. UNITS IN STRUCTURE - Universe: HOUSING UNITS Data Set: 2005-2007 American Community Survey 3-Year Estimates, Survey: American Community Survey

Three sources for the housing unit data were required to evaluate all counties within the region. Census data are frequently withheld when the data reporting can lead to disclosure

of confidential business information or due to incomplete survey response. For the 1 and 2 unit housing data, the predominant source was the 1 year 1 and 2 unit housing data. If that was unavailable due to either confidentiality issues or lack of survey response, then the 3 year data was used by determining an average value for the three year period. Finally if no data were available for the 3 year 1 and 2 unit housing information, total housing unit data were utilized. The revised housing unit data affected the allocation of residential lawn and garden equipment. Revised allocation files for all MARAMA States (except NY) were developed and utilized in the NMIM modeling for this category.

For the population data, the latest county estimates of population were obtained from the Census Bureau. These estimates were available for all counties within the MARAMA region. Again, revised allocation files were developed for all States within the MARAMA region with the exception of NY. These revised allocation files applied to railroad maintenance equipment and AC/refrigeration equipment.

A revised population allocation file was prepared for NH as part of this effort, but those data were not obtained from the Census Bureau. The NH population data were provided by NH and were obtained from the "2007 Population Estimates of New Hampshire Cities and Towns", New Hampshire Office of Energy and Planning, June 2008." Those data were used in lieu of the Census Bureau data.

In addition, Pennsylvania provided changes to the values for 1 and 2 unit housing for 2007. The source of these data was not cited.

5.2.3 State-Specific Data Incorporated in NMIM

In addition to the global updates to the housing and population allocation files in the MARAMA region, several States submitted additional information used to update the underlying data used to calculate emissions from nonroad sources. The data submitted and the updates resulting from these submittals are discussed below by State.

5.2.3.1 Connecticut

Connecticut only provided updated information related to the gasoline characteristics. No additional changes were submitted.

5.2.3.2 Delaware

Delaware provided revised values for several additional allocation files beyond those for population and housing units. Data for 2005 were submitted and updated files were developed for the following allocation categories: golf courses, recreational marine vessels, snow blowers, number of wholesale establishments, landscaping employees, and

manufacturing employees. In addition, Delaware also submitted data on the engine populations for 2005 for the following recreational marine vessels:

2282005010	2-Str Outboard
2282005015	2-Str Personal Water Craft
2282010005	4-Str Inboard/Sterndrive
2282020005	Dsl - Inboard
2282020010	Dsl - Outboard

The updated population values for 2005 were added to the corresponding file for the NONROAD model and were used for the 2007 runs. Because of the way NONROAD handles missing data, if data for 2007 are not found, the most current data (in this case 2005) are used to assist in determining a 2007 value.

5.2.3.3 Maryland

Maryland only provided information to update the gasoline characteristics. No additional changes were submitted.

5.2.3.4 New Hampshire

As indicated above, New Hampshire provided State-specific population data from their own data source for their counties for use in preparing the population allocation files. A revised population allocation file was prepared for NH as part of this effort, but those data were not obtained from the Census Bureau. The NH population data were provided by NH and were obtained from the "2007 Population Estimates of New Hampshire Cities and Towns", New Hampshire Office of Energy and Planning, June 2008. Those data were used in lieu of the Census Bureau data.

5.2.4 New Jersey

New Jersey provided revised gasoline characteristics values as well as NONROAD equipment population data with revised data on equipment population values for Airport Ground Support Equipment. In addition, NJ provided revised human population data for 2002, 2005, 2010, 2015 and 2020. These data (along with the 2007 data generated from the Census Bureau) were added to the NJ population allocation file.

5.2.4.1 New York

New York opted to not have the Contractor calculate emissions using NMIM for their State. Instead, NY calculated their own emissions for the nonroad category and submitted the output files to the Contractor for post processing. The output files submitted by NY were monthly output runs from the NONROAD model for each county. The Contractor

simply post-processed these files to combine emissions and throughput values for each county into an annual emissions number. Summary annual files were submitted to NY by the Contractor for approval. No other work on the NY emissions was performed by the Contractor.

5.2.4.2 Pennsylvania

Pennsylvania provided revised data for the 1 and 2 unit housing information for 2007. Those data were used in lieu of the Census Bureau data for 2007 in the allocation file. The source of these data was not cited.

5.2.5 NMIM Run Specification

The run specifications for each NMIM run were developed on a State-by-State basis. The settings for each specification panel within the NMIM model are detailed below.

- Description: A short descriptive term for the run was entered for each State specific run.
- Geography: The "county" option was selected for each State specific run. All counties within a State were selected for the run.
- Time: On the time panel, the year 2007 was selected in the drop down box and added to the year selections area. The Use Yearly Weather Data check box was also selected. Every month in the Months check box area was selected.
- Vehicles/Equipment: Only the nonroad vehicle/equipment area was selected. All fuels and all vehicle types were selected for each State run.
- Fleet: No selections or information was entered in this panel.
- Pollutants: All criteria pollutants (with HC reported as VOC) were selected except for CO_2. Exhaust PM10 and PM2.5 were also selected.
- Advanced features: Only the server and database were selected in this panel.
- Output: Under the Geographic Representation panel the County selection was made. In the General Output area, a new database was selected on the server for the output.

All added external files for use in each State run were placed in the external files directory of the NCD. Entries for all external files included were added to the countynrfiles table of the NCD.

5.2.6 State and Stakeholder Review of Version 2

The Contractor completed the NMIM modeling runs in October of 2009. The results were made available to States and Stakeholders for review and comment. Based on the comments received, the following issues were addressed, and in some cases, changes were made to the 2007 nonroad inventory for sources included in NMIM.

5.2.6.1 Connecticut

Connecticut requested several changes to the NMIM inputs, which were incorporated into a new 2007 NMIM run. Connecticut indicated that the RFG areas were not applied to counties correctly. RVP values were modified by a small amount to reflect USEPA RFG sample averages for the appropriate mapping of Connecticut counties to RFG areas. Connecticut identified discrepancies in the RFG average sulfur values for 2007 and provided updated values. Connecticut also provided updated values for the calculated oxygen weight percents for ethanol.

5.2.6.2 New Jersey

New Jersey identified a very minor issue with the fuels data used for the 2007 NMIM runs. After considering the insignificant impact it would have on the emission totals, they agreed the fuels data used in the original NMIM run were adequate.

5.2.7 Removal of Airport Ground Support Equipment Emissions

The NMIM/NONROAD model includes emissions from airport ground support equipment. As discussed in detail in Section 6 of this TSD, emissions from airport ground support equipment is also included in USEPA's aircraft inventory that was prepared using the Federal Aviation Administration's Emissions and Dispersion Modeling System (EDMS). Correspondence with USEPA indicated that USEPA considers the emissions calculated by EDMS to be better than those calculated by NONROAD. For this reason, all emissions calculated by NMIM/NONROAD for airport ground support equipment were removed from the inventory to avoid double counting emissions.

5.3 CHANGES MADE FOR VERSION 3

Two main modifications were made to the nonroad inventory for 2007 for version 3 of the inventory. First, Virginia and New York requested that their emissions be recalculated using the information developed for the MARAMA States. The Virginia reruns were performed for all categories except for ground support equipment and for recreational marine vessels. Those values replaced the SEMAP supplied values used in versions prior to version 3. As indicated above, New York had originally provided data from

NONROAD model runs that they performed separately. For this version of the inventory, New York emissions were calculated using NMIM runs set up using the same criteria as those for other states in earlier versions of the inventory. Both New York and Virginia were provided with the opportunity to review fuel characteristics prior to their runs. Only Virginia made changes to the fuels, however the only changes that were made were to assign alternative default fuels for gasoline powered engines to counties. The fuel characteristics were not modified from the NMIM defaults, only the fuel IDs associated with a particular county/month combination were changed to another default fuel. Those changes were instituted in the NCD developed specifically for MARAMA. Default values for diesel, LPG and CNG were maintained for Virginia. New York did not request any changes to the default values. In addition, the revisions made to the housing population allocation files were instituted for both states.

The second change was to modify the recreational marine vessel populations for all states except Vermont and Maine. A revised population file was prepared for Virginia but not utilized in the version 3 runs. Virginia used the NMIM default engine population for recreational marine vessels for version 3 runs. The revised population data were provided by the National Marine Manufacturers Association (NMMA). Total state populations for each of the three major categories contained in the NONROAD model (outboard, inboard/sterndrive and personal watercraft) were provided for each state. Because the population files used by the NONROAD model (and thus NMIM) were configured with population values for various horsepower categories, AMEC determined the fraction of the total for each marine vessel type in each horsepower category from the NONROAD default population files. These fractions were then used to allocate the total state population obtained from NMMA to the various horsepower categories.

The only exception to this was that some states added in data for sailboats to the NMMA data. The sailboat populations were split among two of the default NONROAD categories. In addition, New Hampshire provided their own revised population file. Their population data were provided by the New Hampshire DMV and is not from NMMA.

5.4 SUMMARY OF NMIM MODELING RESULTS FOR 2007

Exhibits 5.3 to 5.9 present State-level summaries that compare 2002 and 2007 annual emissions for NMIM/NONROAD sources (excluding airport ground support equipment) from Version 3 of the MARAMA inventory. The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia. Note that previous versions of this document had emissions for

Virginia derived from VISTAS/SEMAP NMIM results. For this document the Virginia data is from NMIM runs made consistent with the MARAMA approach.

For most States and pollutants, emissions from NMIM/NONROAD sources decreased from 2002 to 2007.

- CO emissions generally decreased by 15-30% in all States, in part due to turnover to newer, cleaner engines.
- NH3 emissions showed increases from 2002 to 2007 for all states except Connecticut and New Jersey which showed modest decreases.
- Emissions of NO_x, PM10-PRI, and PM25-PRI generally decreased by 9-20% from 2002 to 2007, with some States showing slightly higher or slight lower decreases.
- For SO_2, emissions decreased by 40-50% in all States except New Hampshire and Rhode Island.
- VOC emissions decreased between 5-35% over the same time period.

In addition, the estimated decrease in emissions was due to differences in the versions of the NONROAD model that were used to develop the 2002 and 2007 inventories. The new version of the model (NONROAD 2008a) used for the 2007 inventory accounts for new exhaust and evaporative emission controls, and predicts substantially less HC and CO, and somewhat less NO_x and PM emissions than earlier versions of NONROAD with use of comparable scenario inputs. NH3 was relatively unaffected by the new NONROAD version.

Exhibit 5.3 – 2002 and 2007 NMIM/NONROAD CO Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	274,388	181,817	-34%
Delaware	65,954	55,173	-16%
District of Columbia	18,775	14,319	-24%
Maine	148,555	131,319	-12%
Maryland	424,777	297,832	-30%
Massachusetts	448,399	324,793	-28%
New Hampshire	128,572	90,461	-30%
New Jersey	692,548	445,302	-36%
New York	1,219,168	911,813	-25%
Pennsylvania	903,168	719,517	-20%
Rhode Island	71,573	54,028	-25%
Vermont	61,732	52,497	-15%
Virginia	582,895	415,093	-29%
	5,040,503	**3,693,965**	**-27%**

Exhibit 5.4 – 2007 NMIM CO Emissions by Category and State (tons/year)

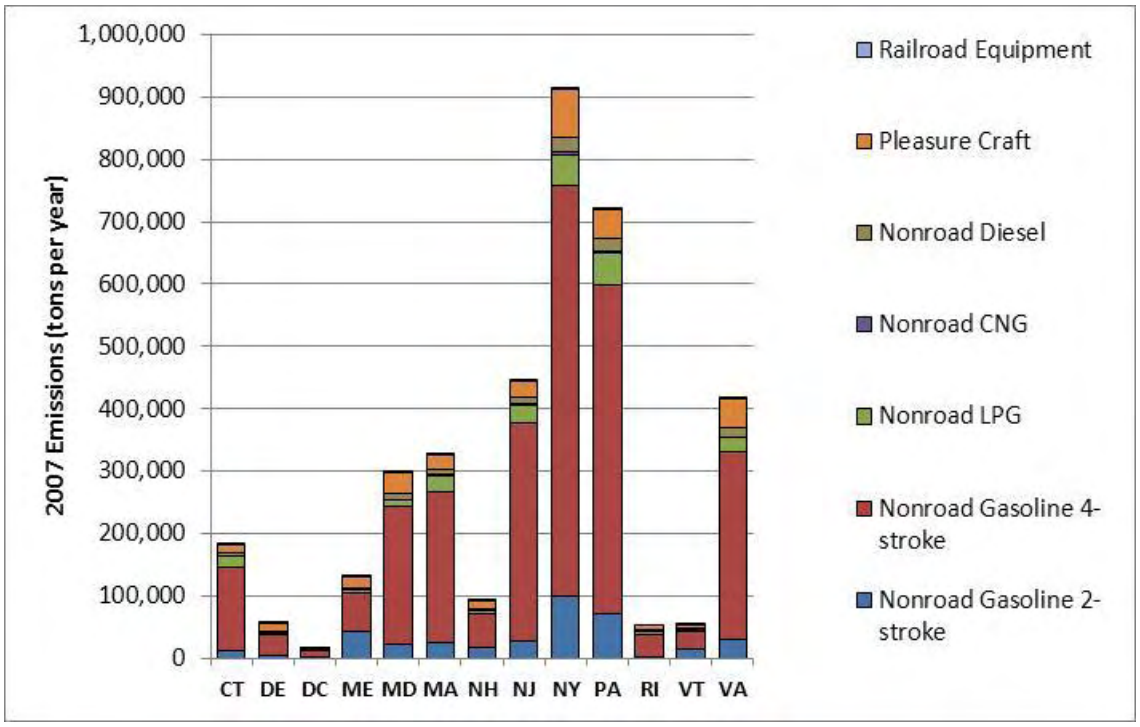


Exhibit 5.5 – 2002 and 2007 NMIM/NONROAD NH3 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	17	16	-1%
Delaware	5	6	13%
District of Columbia	2	3	9%
Maine	11	13	11%
Maryland	28	29	4%
Massachusetts	28	28	0%
New Hampshire	9	10	11%
New Jersey	43	40	-8%
New York	79	83	5%
Pennsylvania	55	60	9%
Rhode Island	4	5	15%
Vermont	5	5	12%
Virginia	42	45	5%
	328	**342**	**4%**

Exhibit 5.6 – 2007 NMIM NH3 Emissions by Category and State (tons/year)

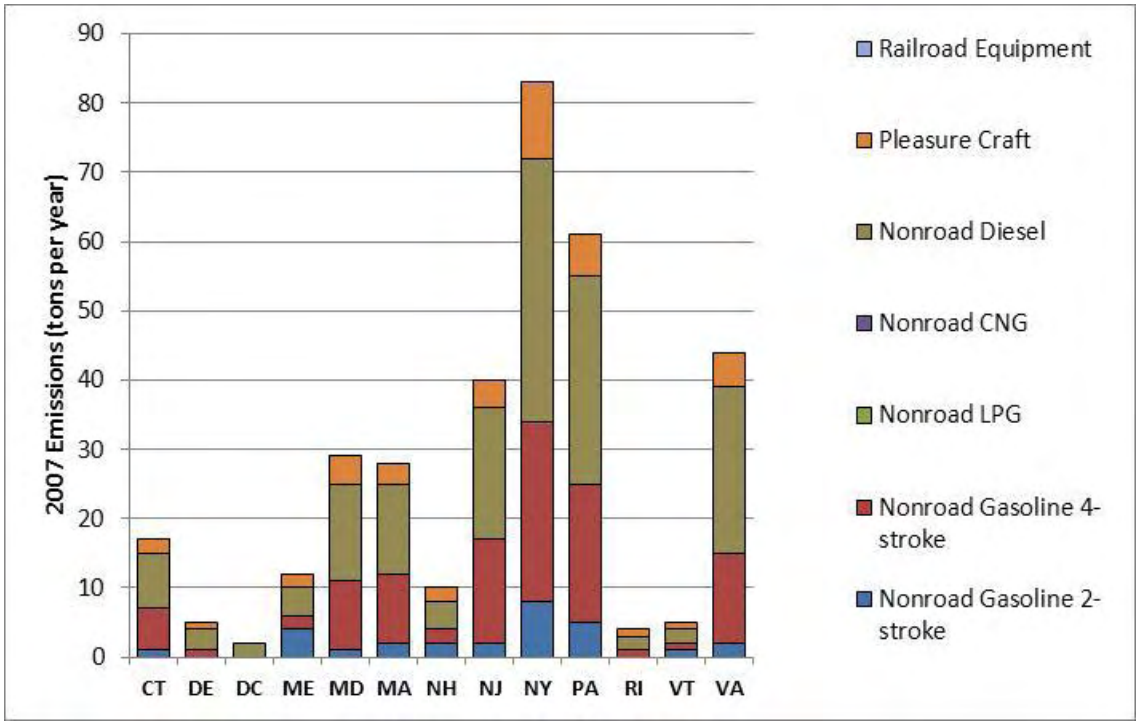


Exhibit 5.7 – 2002 and 2007 NMIM/NONROAD NOx Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	17,897	16,056	-10%
Delaware	5,798	4,998	-14%
District of Columbia	3,066	2,788	-9%
Maine	8,229	7,439	-10%
Maryland	27,789	25,726	-7%
Massachusetts	30,047	26,471	-12%
New Hampshire	8,150	8,562	5%
New Jersey	43,515	36,345	-16%
New York	78,601	72,271	-8%
Pennsylvania	62,265	55,362	-11%
Rhode Island	4,564	4,388	-4%
Vermont	4,170	3,743	-10%
Virginia	40,788	41,325	1%
	334,878	**305,475**	**-9%**

Exhibit 5.8 – 2007 NMIM NOx Emissions by Category and State (tons/year)

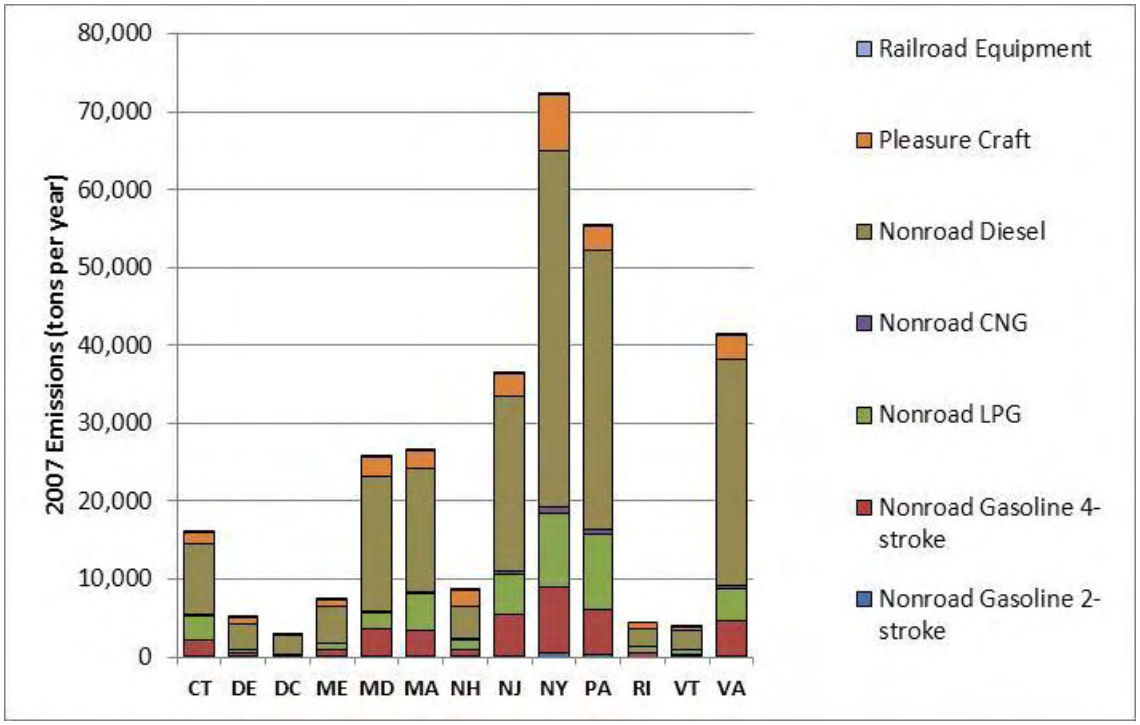


Exhibit 5.9 – 2002 and 2007 NMIM/NONROAD PM10-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,713	1,412	-18%
Delaware	570	476	-17%
District of Columbia	298	242	-19%
Maine	1,204	1,151	-4%
Maryland	3,119	2,600	-17%
Massachusetts	2,887	2,384	-17%
New Hampshire	947	846	-11%
New Jersey	4,285	3,377	-21%
New York	8,332	7,059	-15%
Pennsylvania	6,281	5,623	-10%
Rhode Island	403	367	-9%
Vermont	518	482	-7%
Virginia	4,901	4,128	-16%
	35,459	**30,146**	**-15%**

Exhibit 5.10 – 2007 NMIM PM10-PRI Emissions by Category and State (tons/year)

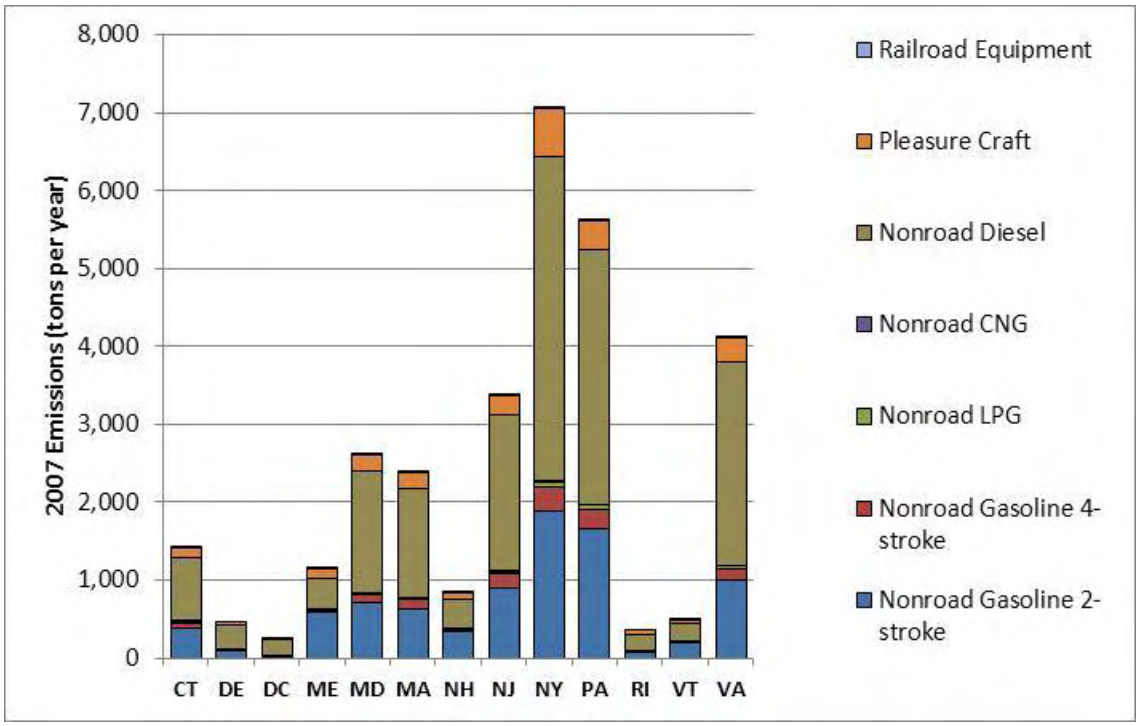


Exhibit 5.11 – 2002 and 2007 NMIM/NONROAD PM25-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,578	1,343	-15%
Delaware	525	453	-14%
District of Columbia	288	234	-19%
Maine	1,135	1,080	-5%
Maryland	2,870	2,473	-14%
Massachusetts	2,659	2,268	-15%
New Hampshire	872	799	-8%
New Jersey	3,951	3,213	-19%
New York	7,670	6,715	-12%
Pennsylvania	5,784	5,346	-8%
Rhode Island	371	349	-6%
Vermont	477	455	-5%
Virginia	4,665	3,933	-16%
	32,844	**28,660**	**-13%**

Exhibit 5.12 – 2007 NMIM PM25-PRI Emissions by Category and State (tons/year)

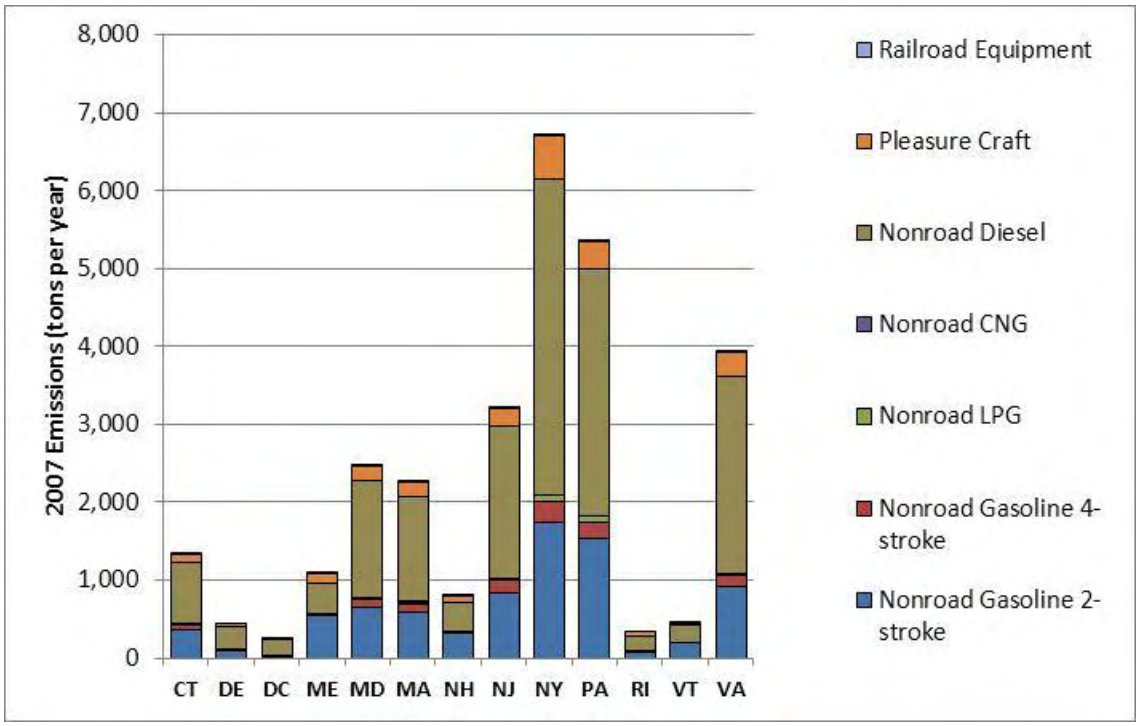


Exhibit 5.3 – 2002 and 2007 NMIM/NONROAD SO2 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,377	802	-42%
Delaware	513	266	-48%
District of Columbia	341	196	-43%
Maine	772	416	-46%
Maryland	2,569	1,436	-44%
Massachusetts	2,428	1,377	-43%
New Hampshire	673	441	-34%
New Jersey	3,525	1,905	-46%
New York	6,961	3,957	-43%
Pennsylvania	5,292	2,972	-44%
Rhode Island	335	211	-37%
Vermont	368	202	-45%
Virginia	3,982	2,284	-43%
	29,136	**16,464**	**-43%**

Exhibit 5.14 – 2007 NMIM SO2 Emissions by Category and State (tons/year)

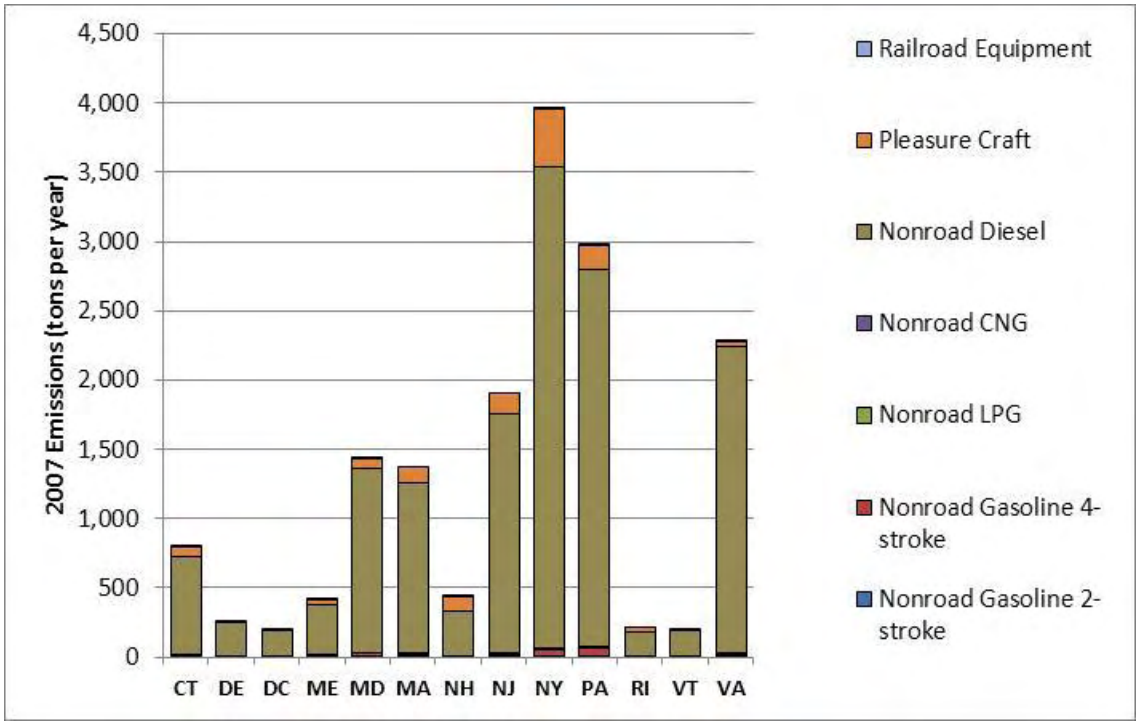
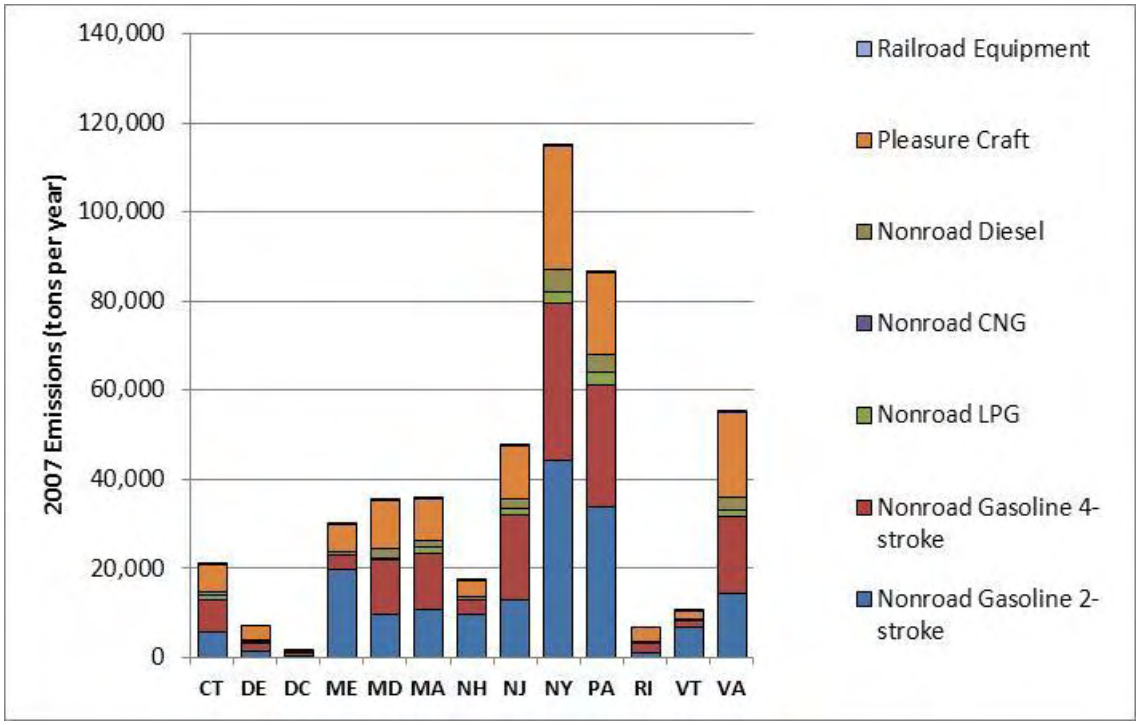


Exhibit 5.15 – 2002 and 2007 NMIM/NONROAD VOC Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	33,519	20,721	-38%
Delaware	7,531	7,157	-5%
District of Columbia	2,053	1,324	-36%
Maine	30,741	29,880	-3%
Maryland	53,035	35,160	-34%
Massachusetts	54,836	35,676	-35%
New Hampshire	22,238	17,108	-23%
New Jersey	81,900	47,521	-42%
New York	155,463	114,935	-26%
Pennsylvania	99,241	86,397	-13%
Rhode Island	7,699	6,721	-13%
Vermont	10,520	10,339	-2%
Virginia	53,487	55,135	3%
	612,262	**468,074**	**-24%**

Exhibit 5.16 – 2007 NMIM VOC Emissions by Category and State (tons/year)



6.0 ANNUAL 2007 INVENTORY FOR NONROAD SOURCES – MARINE VESSELS, AIRPORTS, AND RAIL

The Contractor estimated 2007 base year emissions for the Marine Vessel, Airports, and Rail (MAR) categories using USEPA/ERTAC data, USEPA/ERTAC data revised or augmented with state supplied data; or State supplied data. Data for each MAR category was obtained from USEPA and ERTAC for use as a default data set. The USEPA and ERTAC data, developed to support the 2008 inventory, was provided to states for review. State inventory personnel determined which of the above approaches was appropriate for their state. MARAMA coordinated the collection of supplemental or replacement data from states. The sections below describe the default data sources as well as the modifications received from states for each inventory segment.

6.1 COMMERCIAL MARINE VESSELS

For commercial marine vessels, data was obtained from USEPA 2008 NEI (USEPA 2010d). Initial draft database files were provided to the Contractor by USEPA for Category 1 and 2 CMV and for Category 3 CMV. The Category 1 and 2 database contained emissions for both ports and underway vessels.

The Category 3 database included tables containing emissions from approach, interport, port and RSZ. This database includes emissions from CMV operation within 12 nautical miles of shore. Emissions beyond the 12 nautical mile boundaries are not included in this inventory, but will be provided by USEPA to emission modelers in SMOKE format for inclusion in air quality modeling. These tables were matched to GIS ArcInfo shape files for use in plotting emissions.

Several MARAMA States indicated that they had CMV emissions that they preferred over those provided by USEPA. However, these emissions were only available in NIF area source file format (county/SCC summary level) and not spatially allocated. Thus for consistency, the Contractor summarized the emissions from USEPA to the county/SCC level and input that data into a database format. In late December 2009, USEPA provided the Contractor with a final version of the CMV emissions summarized at the county/SCC level. The file was a Microsoft Access database (2008CMVCntySummary.mdb). That database contained a summary table containing the State/county FIPS code, the SCC, pollutant code and 2008 annual emissions (in tons). The Contractor used that database to update the NIF format database for those MARAMA States that had indicated that they wished to use the USEPA data. The USEPA 2008 NEI data was used directly for 2007.

No changes were made to the 2008 data for 2007 (i.e., the 2007 emissions were assumed to be equal to 2008).

Four States (CT, DC, RI, VA) used the USEPA NEI data for all CMV categories. Virginia supplemented the USEPA CMV data by adding military vessels to the inventory. VT indicated that they wanted to use USEPA data but no CMV emissions were in the USEPA database for VT. Six States (DE, ME, MA, NH, NJ and PA) supplied State specific data for all categories. Maryland used USEPA NEI data for diesel CMV and State-specific data for residual CMV. New York used State-specific data for diesel CMV and upstate residual CMV, and USEPA NEI data for seven counties in the New York City metro area.

Note that NY included VOC emissions from lightering operations in the CMV inventory using SCC 22-80-002-000. Delaware included VOC emissions from lightering operations in the point source inventory. No other State has significant lightering operations.

Exhibit 6.1 indicates the data source by State and SCC for the emissions in the MARAMA 2007 base year inventory for CMV.

Exhibit 6.1 – Data Sources for Commercial Marine Vessel Inventory

State	22-80-002-100 Diesel Port	22-80-002-200 Diesel Underway	22-80-003-100 Residual Port	22-80-003-200 Residual Underway	22-83-000-000 All Fuels Military
CT	EPA	EPA	EPA	EPA	n/a
DE	State	State	State	State	n/a
DC	n/a	EPA	n/a	EPA	n/a
ME	State	State	State	State	n/a
MD	EPA	EPA	State	State	n/a
MA	State*	State*	State	State	n/a
NH	State	State	State	State	n/a
NJ	State	State	State	State	n/a
NY	State	State	State / EPA	State / EPA	n/a
PA	State	State	State	State	n/a
RI	EPA	EPA	EPA	EPA	n/a
VT	n/a	n/a	n/a	n/a	n/a
VA	EPA	EPA	EPA	EPA	State

* MA used different SCCs that the other States for diesel CMV to identify Harbor vessels, fishing vessels, military vessels, port operations, and underway operation.

6.2 AIRPORTS (AIRCRAFT AND GROUND SUPPORT EQUIPMENT)

For airport emissions, states either used their own data or a database developed by USEPA to support the 2008 NEI (USEPA2010e). The USEPA database was developed on an airport by airport basis. Data files provided included:

- EIS facility site ID
- State facility site ID Facility site name
- State and county FIPS code Source classification code
- Pollutant code
- Airport emissions and
- The sum of landing and take offs (LTOs).

In addition, a database containing geographic information on each facility (latitude and longitude) along with operational information related to LTOs but contained no emissions data.

For States that used the USEPA inventory the USEPA 2008 NEI airport data was summarized at the county/SCC level to provide a starting point. The remaining States provided NIF format county/SCC level files. Once the initial inventory was compiled it was formatted in NIF format and the resultant database was provided to the States for review and comment. Changes resulting from States comments were made to the initial inventory.

Exhibit 6.2 indicates by State and SCC which components of the inventory came from different data sources. In those instances where the data source is listed as “EPA”, the data are taken directly from the 2008 NEI. 2008 data were used directly to represent 2007 emissions. No changes to the 2008 data were applied for the 2007 base year inventory. Exhibit 6.2 also indicates that for a number of States, the emission estimates represent blended sources. For example, several of the States providing their own data only provided emission estimates for aircraft emissions but not emissions for ground support equipment (GSE) or auxiliary power units (APUs). For those States, 2008 USEPA NEI data were added to the inventory to provide those estimates. Those States were DE and ME. MD provided State supplied GSE/APU emissions but without a break down of the GSE emissions by fuel type. In addition, NY provided EDMS output files for all aircraft and GSE/APU emissions from each individual airport. Those emissions also had GSE emissions as a single value without an indication of the fuel type of the equipment. In both cases (NY and MD), the fuel type ratios used in the USEPA NEI were used to divide GSE emissions by fuel type. Those ratios were:

SCC	SCC Level Two	Fraction
2265008005	Off-highway Vehicle Gasoline, 4-Stroke	0.1686
2267008005	LPG	0.0165
2268008005	CNG	0.0131
2270008005	Off-highway Vehicle Diesel	0.8017

Finally, while Exhibit 6.2 indicates that most of VA's emissions were derived from USEPA data, military aircraft operations emissions were provided by VA and were added to the USEPA data. However because these data were added as individual airports in counties where there were already emissions, when the data were summarized the data source was maintained as USEPA since the majority of emissions were derived from the USEPA inventory.

For Version 3, the only changes were to use a revised airport inventory for New Jersey.

Exhibit 6.2 – Data Sources for Airport Operations Inventory

State	2265, 2267, 2268, 2270 GSE	2275001xxx Military	2275020xxx Commercial	2275050xxx General Aviation	2275060xxx Air Taxi	2275070xxx APUs
CT	State	State	State	State	State	State
DE	EPA	State	State	State	State	EPA
DC	n/a	n/a	n/a	State	n/a	n/a
ME	EPA	State	State	State	State	EPA
MD	State and EPA	State	State	State	State	State and EPA
MA	EPA	EPA	EPA	EPA	EPA	EPA
NH	State	State	State	State	State	n/a
NJ	State	State	State	State	State	State
NY	State	n/a	State	State	n/a	State
PA	EPA	EPA	EPA	EPA	EPA	EPA
RI	EPA	EPA	EPA	EPA	EPA	EPA
VT	EPA	EPA	EPA	EPA	EPA	EPA
VA	EPA	EPA	EPA	EPA	EPA	EPA

6.3 RAILROAD LOCOMOTIVES AND RAILYARDS

The ERTAC 2008 inventory for railroad locomotives and rail yards was provided to MANEVU+VA States for review to determine if the inventory should be included in the 2007 base year emission inventory (ERTAC 2010a, ERTAC 2010b). The ERTAC rail inventory included three categories of locomotive emissions: Class I line-haul, Class I rail yard switchers, and Class II/III short line and regional railroads. The original files provided to the Contractor for the ERTAC inventory included several spreadsheets. There spreadsheets were:

1. EmissionsByCounty_Round61.xls (county level Class I line haul emissions)
2. EmissionsByState_Round61.xls (State level Class I line haul emissions)
3. R-1 Fuel Use Data Summary 20072.xls (line haul fuel use data for 2007)
4. Rail-Class_II_III_revised 4-20-2010.xls (Class II and III county level emissions by rail line, along with link, mileage, and fuel usage information)

The data in the Class II and III spreadsheet was summarized by county and converted into NIF format. The Class I emissions were also converted into NIF format. Both Class I and Class II/III emissions were reported as hydrocarbons (HC). These emissions were converted to VOC emissions by multiplying the HC emissions by a factor of 1.053 (USEPA 2009e) for all states except Maryland, where a factor of 1.0478 was used. In addition, all 2008 emissions were assumed to equal 2007 emissions.

Three States (PA, VA and VT) used the ERTAC data directly without modification for the three categories included in the ERTAC inventory (Class I Line Haul, Class II/III Line Haul, Yard/Switcher Locomotives). New Jersey used the ERTAC Class I data and State-supplied data for Class II/III and Yard locomotives. New York used the ERTAC yard locomotive data and State-supplied data for Class I and Class II/III. All other States made changes to the 2008 ERTAC inventory, either to add/modify included sources or to revise emission values to 2007 values.

ERTAC did not develop emission estimates for Line Haul Passenger (AMTRAK) or Line Haul Commuter locomotives. Six States (CT, DC, MD, NY, PA, and VA) provided emission estimates for AMTRAK diesel locomotives. Note that the AMTRAK northeast corridor line uses electric powered locomotives, so there are no emissions from diesel AMTRAK locomotives in DE, NJ, RI, and MA. Seven States (CT, DC, MD, MA, NJ, NY, and PA) provided emission estimates for diesel commuter locomotives in their State.

Exhibit 6.3 provides a breakdown by State and SCC of the data sources for emissions from railroads and rail yards. Once the draft inventory was prepared the NIF database was provided to the MARAMA States for review. Only minor corrections were made to the database prior to submittal for stakeholder review and comments.

Exhibit 6.3 – Data Sources for Railroad Locomotive and Railyard Inventory

State	2285002006 Line Haul Class I Ops	2285002007 Line Haul Class II/III Ops	2285002008 Line Haul Passenger	2285002009 Line Haul Commuter	2285002010 Yard Locomotives
CT	State	State	State	State	State
DE	State	State	n/a	n/a	State
DC	State	n/a	State	State	State
ME	n/a	State	n/a	n/a	State
MD	State	State	State	State	State
MA	State	State	n/a	State	State
NH	n/a	State	n/a	n/a	n/a
NJ	EPA / ERTAC	State	n/a	State	State
NY	State	State	State	State	EPA / ERTAC
PA	EPA / ERTAC	EPA / ERTAC	State	State	EPA / ERTAC
RI	State	State	n/a	n/a	State
VT	EPA / ERTAC	EPA / ERTAC	n/a	n/a	n/a
VA	EPA / ERTAC	EPA / ERTAC	State	n/a	EPA / ERTAC

6.4 STAKEHOLDER REVIEW AND COMMENT

Draft inventory data files and documentation for MAR sources was posted on the MARAMA website in August 2010 for stakeholder review. No comments on the MAR inventory were received.

6.5 VERSION 3 REVISIONS

6.5.1 New Jersey MAR Revisions

Following the completion of Version 2 of the 2007 MANE-VU+VA inventory in February 2011, New Jersey provided several revisions to the MAR inventory, as follows:

- developed a new airport inventory using the FAA's EDMS;
- provided revised emission estimates for all commercial marine vessel categories;
- allocated GSE emissions calculated by EDMS to four fuel types (gasoline, LPG, CNG, and diesel) using the apportionment factors listed in Section 6.2. Previously in Version 2, all GSE fuel use was assigned to diesel engines. The revisions did not change the total GSE emissions, simply distributes the EDMS emissions over the four GSE fuel types.

6.5.2 Adjustment of Rail VOC Emissions

It was discovered that the ERTAC-reported rail emissions for VOC were actually hydrocarbon emissions. For locomotive engines, USEPA estimated that VOC emissions can be assumed to be equal to 1.053 times the hydrocarbon emissions (USEPA2009e). This adjustment was not made to the rail inventory developed by ERTAC. The ERTAC inventory assumed that VOC emissions equal hydrocarbon emissions. Some states (DE, NH, RI) made this adjustment in the rail inventories that were used in Version 2. The remaining states did not make the adjustment and the Version 2 VOC emissions were multiplied by 1.053 to generated revised emissions for Version 3. Maryland made a partial adjustment in Version 2, and specified that a factor of 1.0478 should be used to adjust

6.6 SUMMARY OF MAR INVENTORY FOR 2007

Exhibits 6.4 to 6.10 compare the 2002 and 2007 emissions by State and pollutant for MAR sources. The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia. It is likely that many of the differences between the 2002 and 2007 emissions are due to changes in the emission estimation methodologies for CMV, airports, and railroads.

CO emissions are primarily from aircraft and GSE engines used at airports. CMV is the largest sector for NOx emissions, but there are also substantial NOx emissions from airports and railroad locomotives. SO2 emissions are primarily from the CMV category. All three sectors also generate PM and VOC emissions.

Exhibit 6.4 – 2002 and 2007 MAR CO Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	603	1,077	79%	1,565	4,659	198%	362	184	-49%
DE	1,138	554	-51%	1,575	1,625	3%	144	75	-48%
DC	1	1	1%	0	14	n/a	73	73	0%
ME	376	522	39%	4,487	32,879	633%	69	188	173%
MD	431	2,795	548%	11,575	10,265	-11%	789	700	-11%
MA	1,231	1,473	20%	11,294	15,495	37%	748	646	-14%
NH	169	89	-47%	2,031	2,089	3%	71	88	24%
NJ	1,424	1,619	14%	29,375	21,878	-26%	580	665	15%
NY	1,790	3,475	94%	11,895	17,403	46%	1,551	3,061	97%
PA	1,111	1,294	16%	24,799	26,540	7%	3,359	2,987	-11%
RI	0	522	n/a	1,424	1,739	22%	55	15	-73%
VT	0	0	n/a	521	2,420	365%	20	72	262%
VA	1,082	3,735	245%	11,873	22,009	85%	1,186	2,701	128%
	9,356	**17,155**	**83%**	**112,414**	**159,016**	**41%**	**9,007**	**11,456**	**27%**

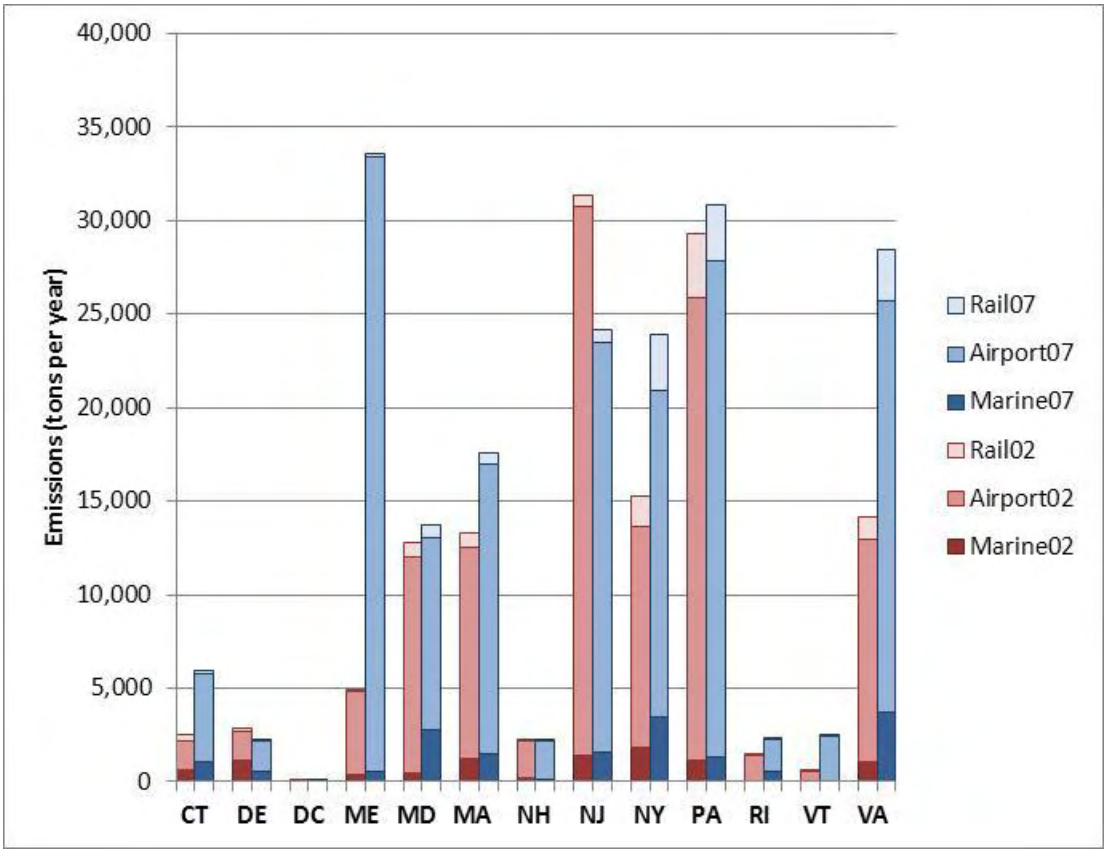


Exhibit 6.5 – 2002 and 2007 MAR NH3 Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	0	3	n/a	0	0	n/a	0	1	n/a
DE	0	0	n/a	0	0	n/a	0	0	n/a
DC	0	0	n/a	0	0	n/a	0	0	n/a
ME	0	0	n/a	0	0	n/a	0	0	n/a
MD	0	8	n/a	0	0	n/a	0	0	n/a
MA	0	0	n/a	0	0	n/a	0	2	n/a
NH	0	0	n/a	0	0	n/a	0	0	n/a
NJ	0	8	n/a	0	0	n/a	0	2	n/a
NY	0	2	n/a	0	0	n/a	0	0	n/a
PA	0	13	n/a	0	0	n/a	0	9	n/a
RI	0	1	n/a	0	0	n/a	0	0	n/a
VT	0	0	n/a	0	0	n/a	0	0	n/a
VA	0	9	n/a	0	0	n/a	0	8	n/a
	0	**44**	**n/a**	**0**	**0**	**n/a**	**0**	**23**	**n/a**

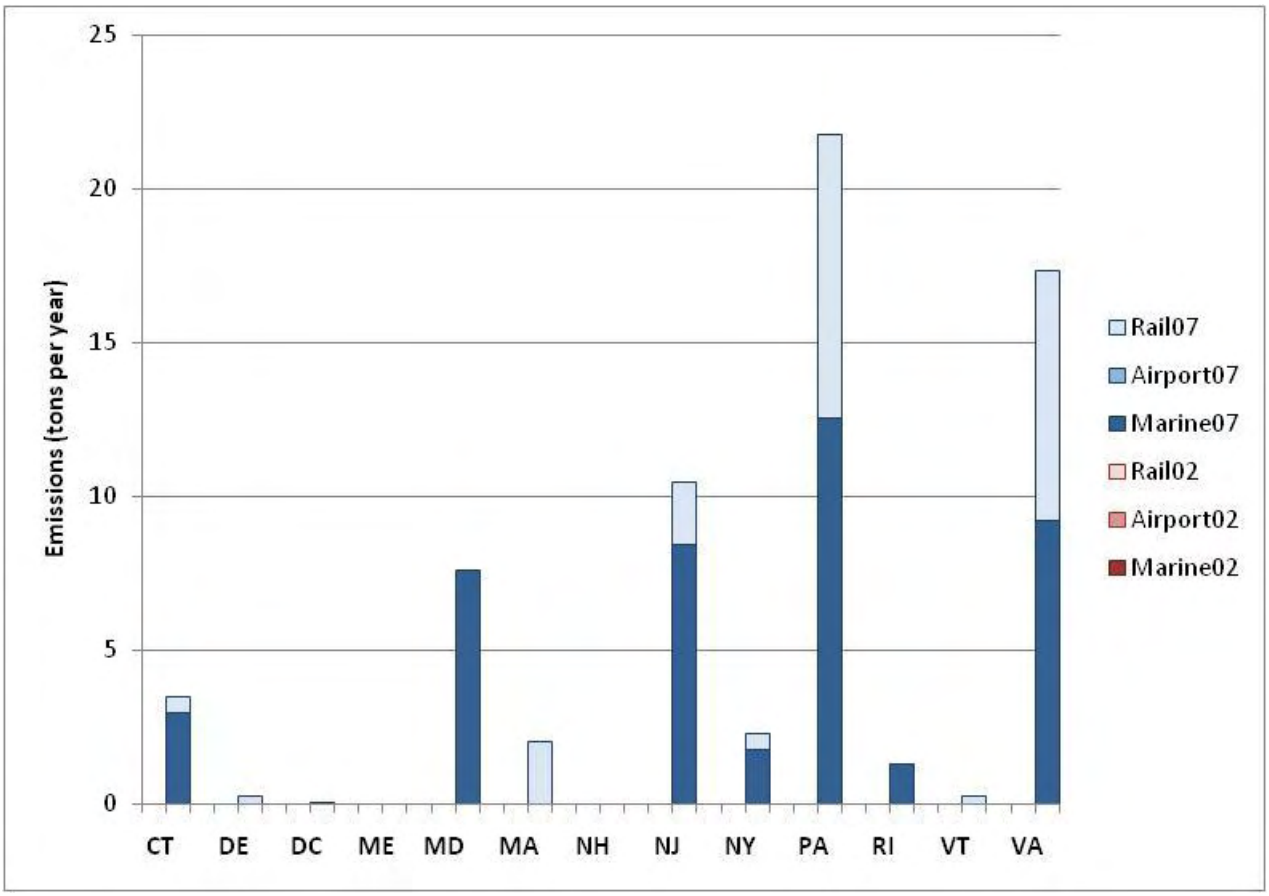


Exhibit 6.6 – 2002 and 2007 MAR NOx Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	4,577	6,528	43%	415	713	72%	2,612	1,723	-34%
DE	8,362	5,094	-39%	970	805	-17%	1,105	384	-65%
DC	4	6	56%	0	0	n/a	502	505	1%
ME	1,154	1,659	44%	184	134	-27%	269	1,369	409%
MD	2,531	16,027	533%	2,038	1,910	-6%	5,145	4,767	-7%
MA	2,590	3,246	25%	2,988	3,190	7%	7,161	6,133	-14%
NH	1,284	271	-79%	162	278	72%	332	891	169%
NJ	10,981	11,197	2%	4,739	5,105	8%	5,721	5,957	4%
NY	12,266	28,180	130%	4,880	6,998	43%	14,162	20,675	46%
PA	8,217	11,378	38%	4,131	3,738	-10%	29,292	20,675	-29%
RI	1	2,829	n/a	263	289	10%	186	144	-22%
VT	0	0	n/a	48	103	114%	7	736	10416%
VA	3,088	21,760	605%	3,885	5,520	42%	11,882	18,319	54%
	55,055	**108,174**	**96%**	**24,703**	**28,783**	**17%**	**78,376**	**82,279**	**5%**

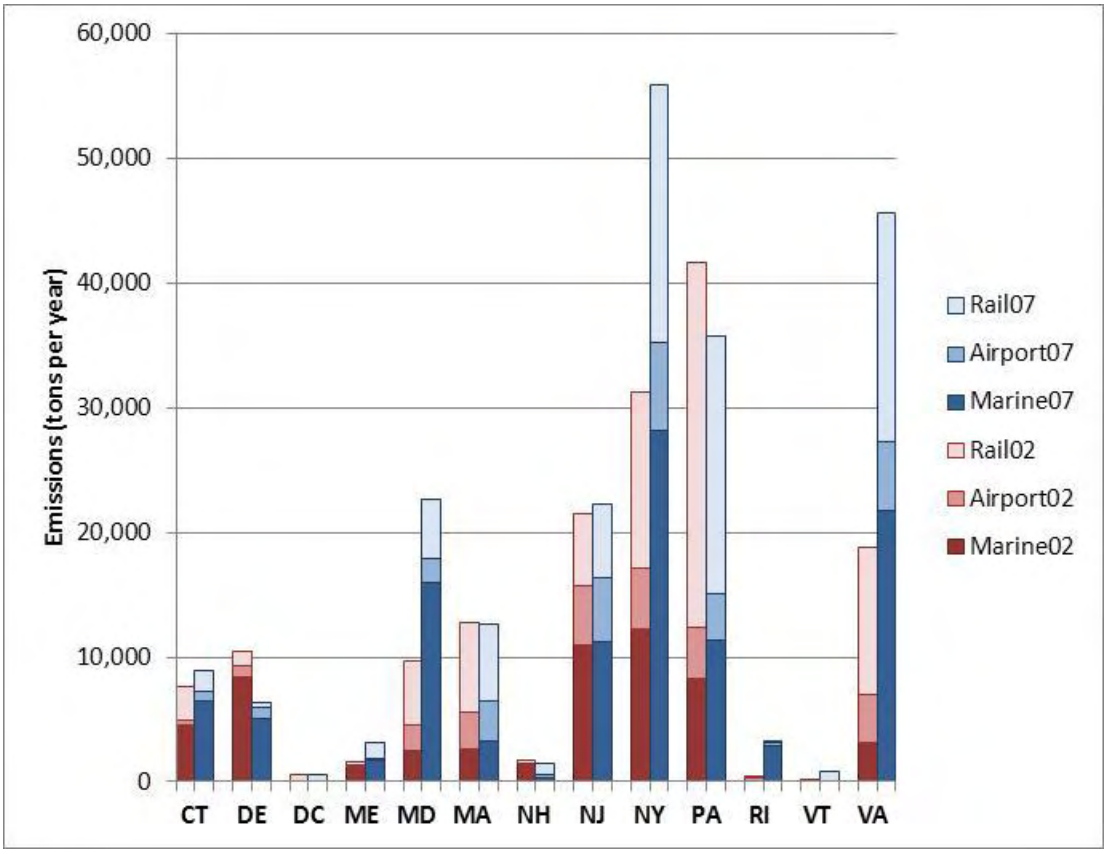


Exhibit 6.7 – 2002 and 2007 MAR PM10-PRI Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	194	311	61%	45	66	46%	5	46	812%
DE	393	327	-17%	28	27	-5%	31	15	-50%
DC	0	0	n/a	0	0	n/a	12	12	-2%
ME	129	395	206%	97	83	-15%	8	28	246%
MD	637	657	3%	1,012	74	-93%	172	166	-3%
MA	217	316	45%	246	295	20%	183	159	-13%
NH	54	13	-76%	49	37	-24%	10	22	120%
NJ	796	622	-22%	280	170	-39%	143	160	12%
NY	506	1,671	230%	409	140	-66%	358	608	70%
PA	253	524	107%	2,421	396	-84%	792	704	-11%
RI	0	112	n/a	93	22	-76%	6	4	-40%
VT	0	0	n/a	12	46	282%	1	18	1712%
VA	359	946	164%	2,010	821	-59%	1,529	634	-59%
	3,538	**5,895**	**67%**	**6,702**	**2,176**	**-68%**	**3,250**	**2,574**	**-21%**

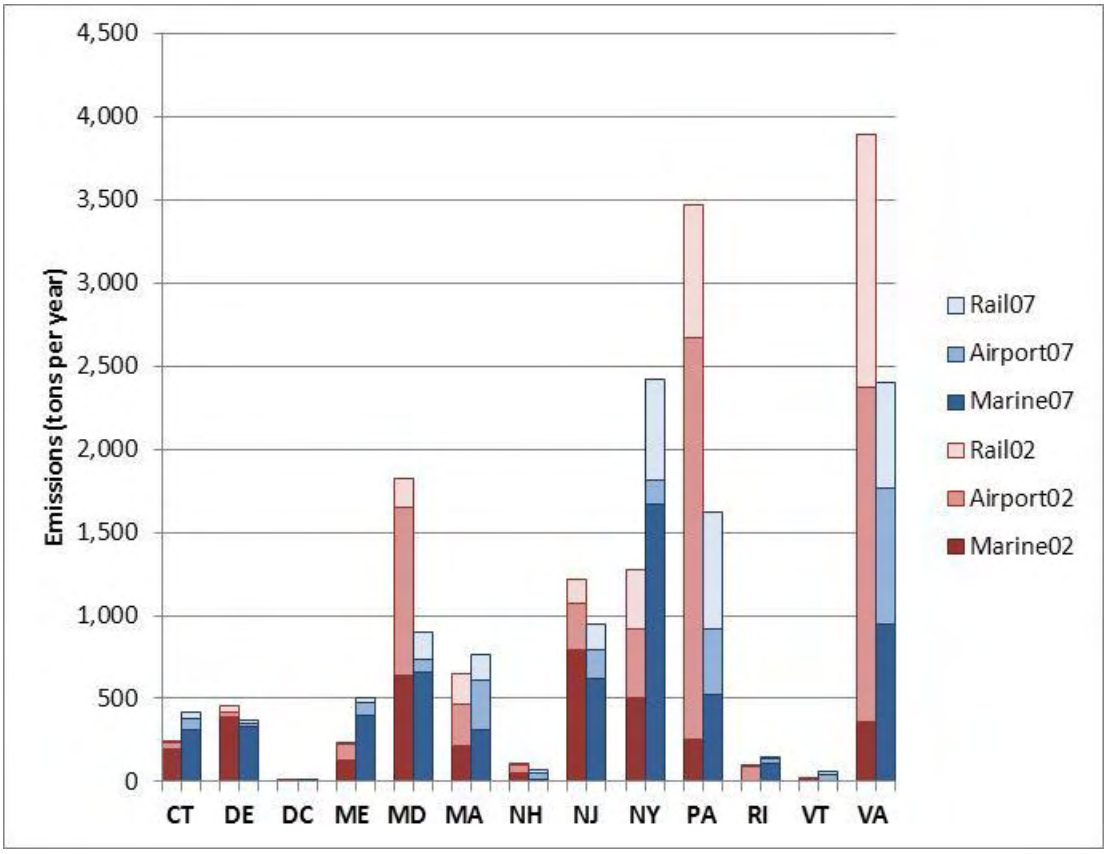


Exhibit 6.8 – 2002 and 2007 MAR PM25-PRI Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	178	296	66%	38	51	35%	5	39	686%
DE	354	305	-14%	20	19	-7%	28	15	-47%
DC	0	0	n/a	0	0	n/a	11	11	4%
ME	119	364	205%	69	61	-11%	8	25	218%
MD	637	606	-5%	698	16	-98%	155	161	4%
MA	200	290	45%	226	215	-5%	143	145	2%
NH	50	12	-76%	36	27	-24%	9	21	132%
NJ	732	575	-21%	195	143	-27%	128	147	15%
NY	466	1,541	231%	362	139	-62%	323	572	77%
PA	232	484	109%	1,718	294	-83%	713	650	-9%
RI	0	108	n/a	68	17	-75%	5	3	-34%
VT	0	0	n/a	9	32	259%	1	17	1567%
VA	330	908	175%	1,970	580	-71%	1,375	586	-57%
	3,298	**5,489**	**66%**	**5,409**	**1,595**	**-71%**	**2,904**	**2,395**	**-18%**

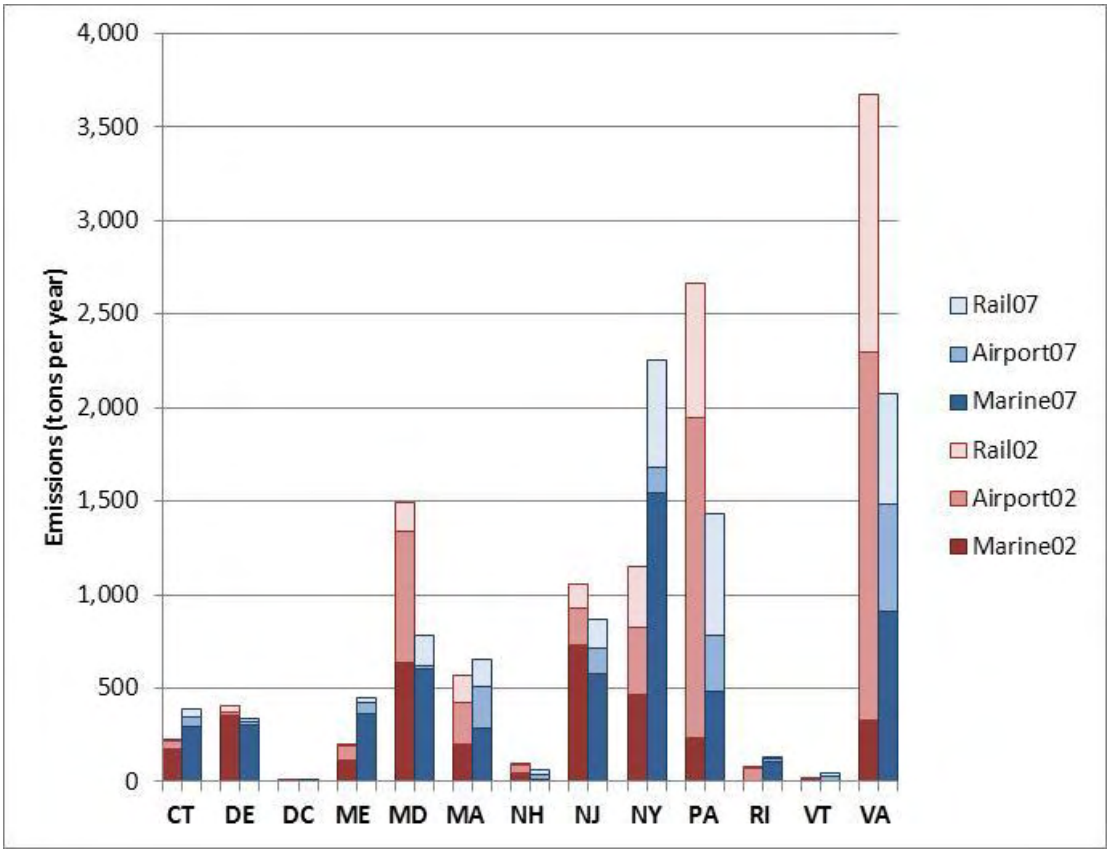


Exhibit 6.9 – 2002 and 2007 MAR SO2 Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	671	1,386	107%	39	96	145%	4	57	1323%
DE	3,377	2,079	-38%	30	55	84%	64	5	-92%
DC	1	1	30%	0	0	n/a	33	37	11%
ME	128	189	47%	3	14	376%	15	92	514%
MD	4,739	2,170	-54%	262	247	-6%	374	64	-83%
MA	489	698	43%	284	218	-23%	591	66	-89%
NH	188	506	169%	15	28	86%	16	10	-36%
NJ	11,444	6,712	-41%	374	507	35%	352	55	-84%
NY	4,753	9,321	96%	440	699	59%	765	616	-19%
PA	297	3,067	933%	399	416	4%	1,934	211	-89%
RI	0	632	n/a	29	30	3%	14	5	-61%
VT	0	0	n/a	5	12	134%	1	5	412%
VA	386	4,058	951%	272	424	56%	3,641	192	-95%
	26,473	**30,819**	**16%**	**2,152**	**2,746**	**28%**	**7,804**	**1,416**	**-82%**

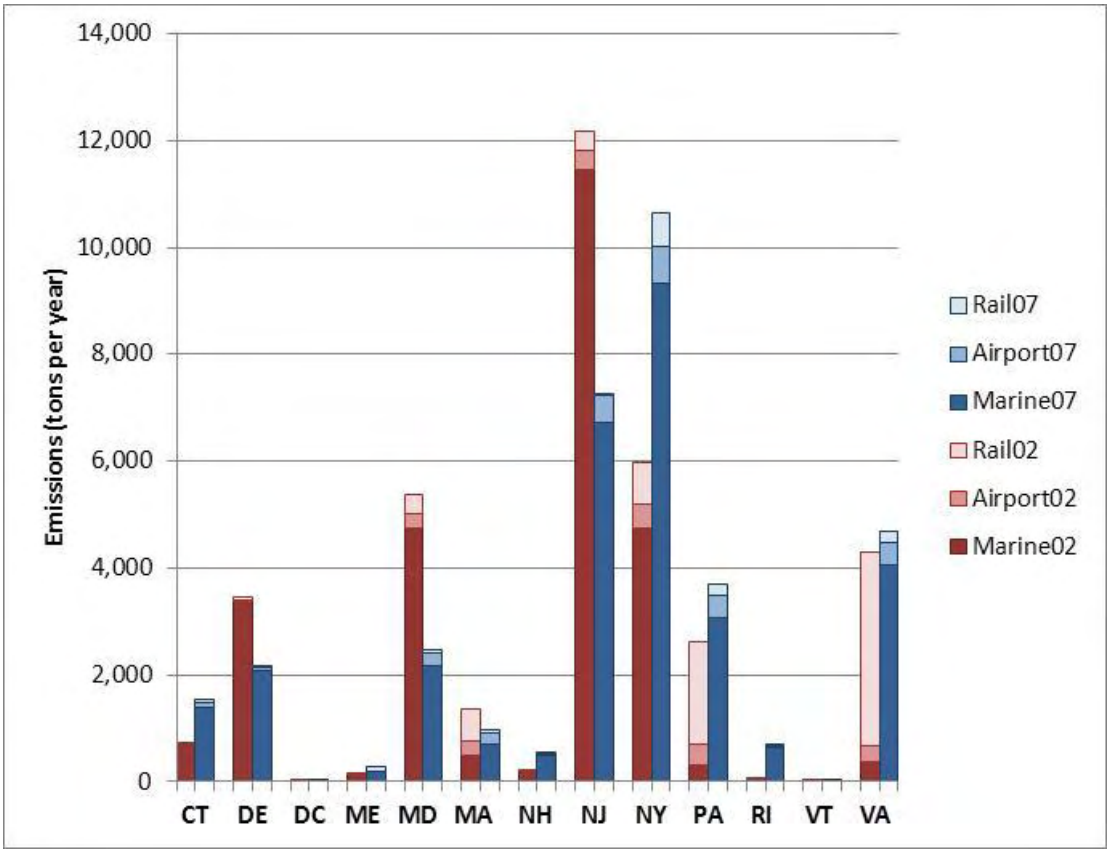
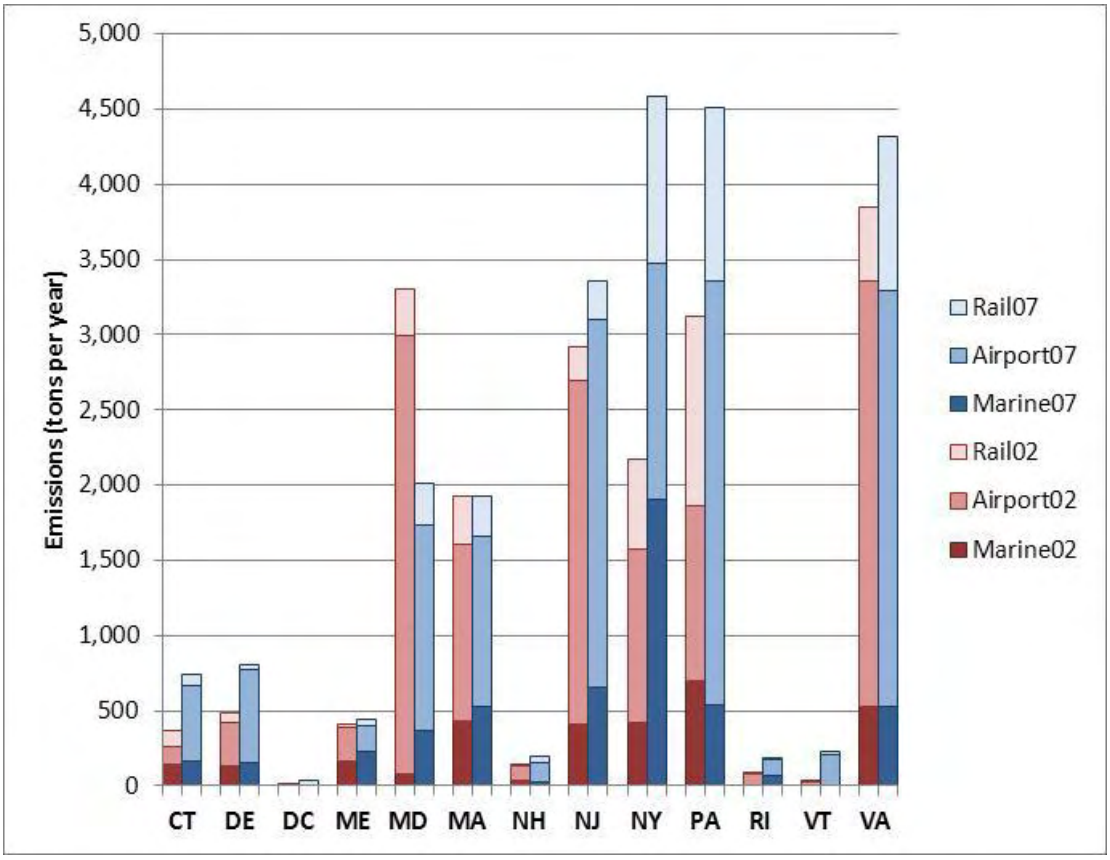


Exhibit 6.10 – 2002 and 2007 MAR VOC Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	143	161	13%	115	509	343%	114	73	-36%
DE	132	158	20%	290	620	114%	60	28	-53%
DC	0	0	n/a	0	1	n/a	20	34	70%
ME	166	233	41%	222	161	-27%	19	51	166%
MD	74	371	401%	2,920	1,365	-53%	312	271	-13%
MA	433	528	22%	1,177	1,129	-4%	312	267	-15%
NH	40	23	-43%	88	134	53%	15	35	136%
NJ	413	658	59%	2,281	2,438	7%	221	258	17%
NY	424	1,905	349%	1,145	1,571	37%	600	1,112	85%
PA	703	538	-23%	1,155	2,813	144%	1,260	1,153	-8%
RI	0	64	n/a	74	112	51%	10	8	-22%
VT	0	0	n/a	27	204	655%	2	29	1331%
VA	531	522	-2%	2,825	2,764	-2%	492	1,025	108%
	3,059	**5,163**	**69%**	**12,319**	**13,822**	**12%**	**3,437**	**4,343**	**26%**



7.0 ANNUAL 2007 INVENTORY FOR ONROAD SOURCES

7.1 OVERALL PROCESS TO DEVELOP THE ONROAD INVENTORY

EPA's recently released MOVES2010 (**MO**tor **V**ehicle **E**mission **S**imulator) is now the official model for estimating air pollution emissions from onroad mobile sources including buses, cars, trucks and motorcycles. MOVES2010 replaces MOBILE6.2, the previous mobile source model. MOVES input files are somewhat more detailed than the MOBILE6.2 input files. To assist in the transition to the new model, USEPA developed software tools to convert MOBILE6.2 inputs for MOVES. In addition, the MOVES model includes a preprocessing tool called the County Data Manager (CDM) to convert spreadsheet based information to MySQL database files required by MOVES.

States were offered the option of having NESCAUM perform the MOVES modeling using input data provided by and/or reviewed by the state. Three states elected to perform the MOVES modeling for their state using in-house resources. Exhibit 7.1 shows the approach selected by each state:

Exhibit 7.1 – MOVES Modeling Approach by State

States Providing MOBILE6.2 Input Files to NESCAUM	States Providing MOVES Input Files to NESCAUM	States Performing MOVES Modeling Themselves
DC, ME, NH, RI	CT, DE, MD, MA, NJ, VT	NY, PA, VA

7.2 MOVES MODEL RUN SPECIFICATIONS AND DOCUMENTATION

Appendix F contains NESCAUM's documentation of the MOVES modeling.

7.3 SUMMARY OF ONROAD INVENTORY

Exhibits 7.2 to 7.8 compare the 2002 and 2007 onroad emissions by state for each pollutant. The 2002 emissions were estimated using MOBILE6, while the 2007 emissions were estimated using MOVES. Differences between 2002 and 2007 results from the change in emission estimation methodologies (MOBILE6 vs. MOVES), VMT growth, and turnover of the vehicle fleet to newer, cleaner fuels and engines.

Exhibit 7.2 – 2002 and 2007 OnroadCO Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	562,124	365,925	-35%
Delaware	160,760	124,893	-22%
District of Columbia	66,018	36,379	-45%
Maine	410,958	215,689	-48%
Maryland	1,000,763	598,180	-40%
Massachusetts	1,039,100	583,234	-44%
New Hampshire	306,793	195,916	-36%
New Jersey	1,273,513	719,402	-44%
New York	3,711,150	2,024,775	-45%
Pennsylvania	2,784,197	1,962,326	-30%
Rhode Island	186,197	115,532	-38%
Vermont	248,248	115,532	-53%
Virginia	1,858,598	1,195,237	-36%
	13,608,417	**8,253,020**	**-39%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

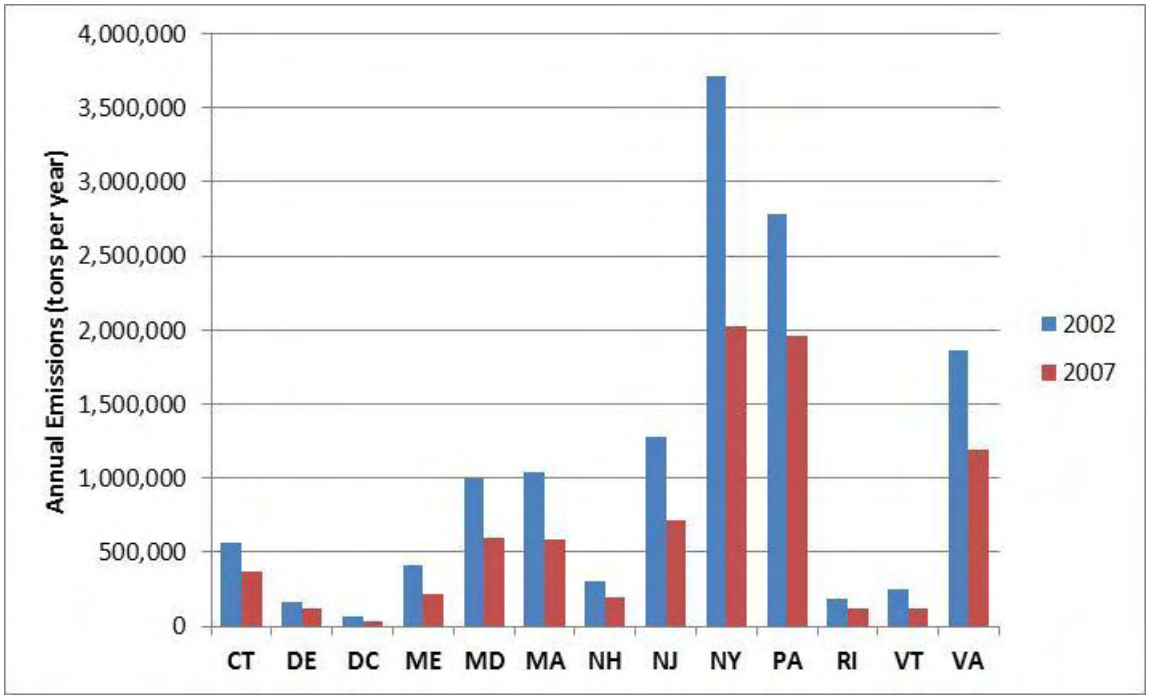


Exhibit 7.3 – 2002 and 2007 Onroad NH3 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	3,294	1,309	-60%
Delaware	903	406	-55%
District of Columbia	398	158	-60%
Maine	1,468	605	-59%
Maryland	5,594	2,335	-58%
Massachusetts	5,499	2,194	-60%
New Hampshire	1,447	511	-65%
New Jersey	7,382	3,216	-56%
New York	14,681	6,831	-53%
Pennsylvania	10,532	5,278	-50%
Rhode Island	853	356	-58%
Vermont	934	356	-62%
Virginia	7,918	4,041	-49%
	60,902	**27,597**	**-55%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

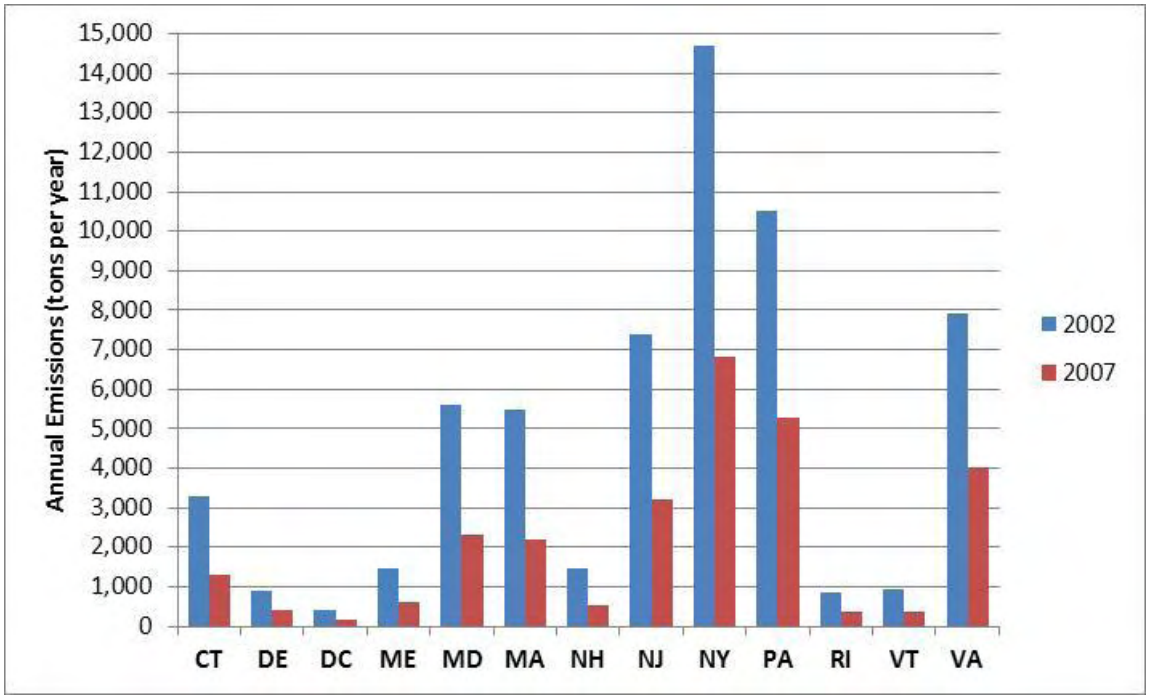


Exhibit 7.4 – 2002 and 2007 Onroad NOx Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	68,816	53,814	-22%
Delaware	21,341	24,456	15%
District of Columbia	8,902	8,714	-2%
Maine	54,687	36,844	-33%
Maryland	122,210	114,792	-6%
Massachusetts	143,368	73,328	-49%
New Hampshire	33,283	33,858	2%
New Jersey	152,076	135,139	-11%
New York	319,733	305,617	-4%
Pennsylvania	346,472	353,083	2%
Rhode Island	16,677	18,055	8%
Vermont	20,670	18,055	-13%
Virginia	182,482	197,822	8%
	1,490,716	**1,373,575**	**-8%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

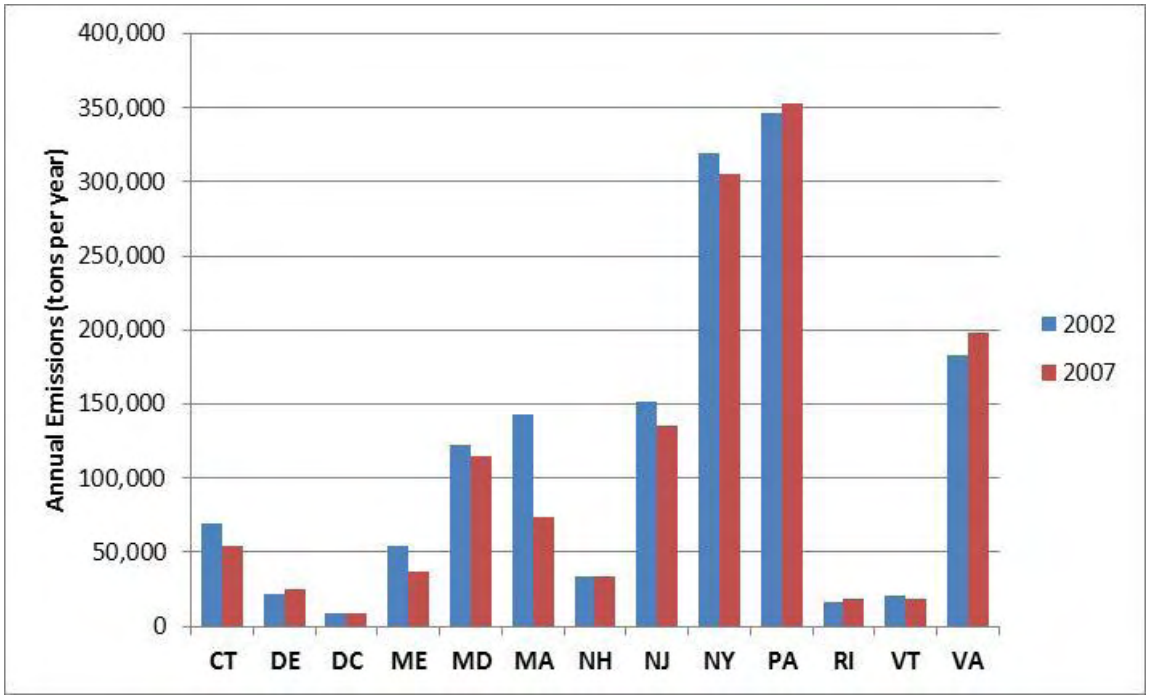


Exhibit 7.5 – 2002 and 2007 Onroad PM10-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,580	2,057	30%
Delaware	581	828	42%
District of Columbia	222	387	74%
Maine	1,239	1,507	22%
Maryland	3,168	4,103	29%
Massachusetts	3,408	2,915	-14%
New Hampshire	814	1,479	82%
New Jersey	3,725	5,013	35%
New York	8,457	14,765	75%
Pennsylvania	7,351	12,947	76%
Rhode Island	345	754	118%
Vermont	670	754	13%
Virginia	4,358	6,799	56%
	35,920	**54,307**	**51%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

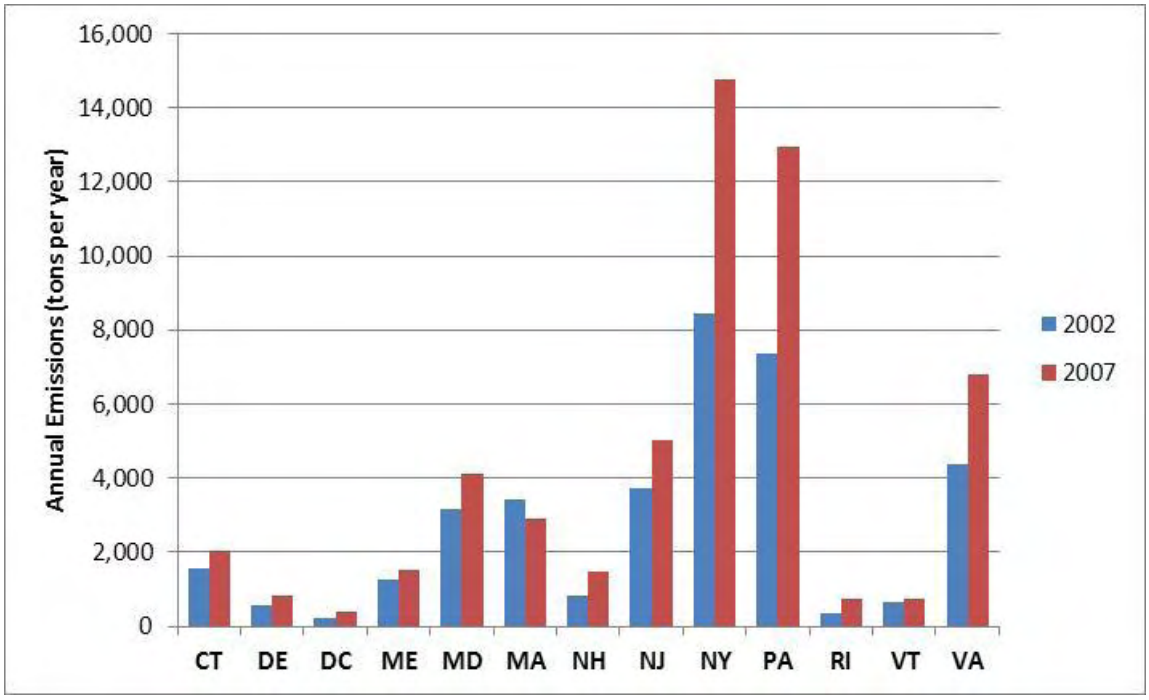


Exhibit 7.6 – 2002 and 2007 Onroad PM25-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,042	1,949	87%
Delaware	415	795	91%
District of Columbia	153	373	144%
Maine	934	1,443	54%
Maryland	2,200	3,924	78%
Massachusetts	2,410	2,768	15%
New Hampshire	562	1,418	152%
New Jersey	2,469	4,789	94%
New York	5,898	14,115	139%
Pennsylvania	5,331	12,393	132%
Rhode Island	211	719	241%
Vermont	483	719	49%
Virginia	2,987	6,499	118%
	25,095	**51,903**	**107%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

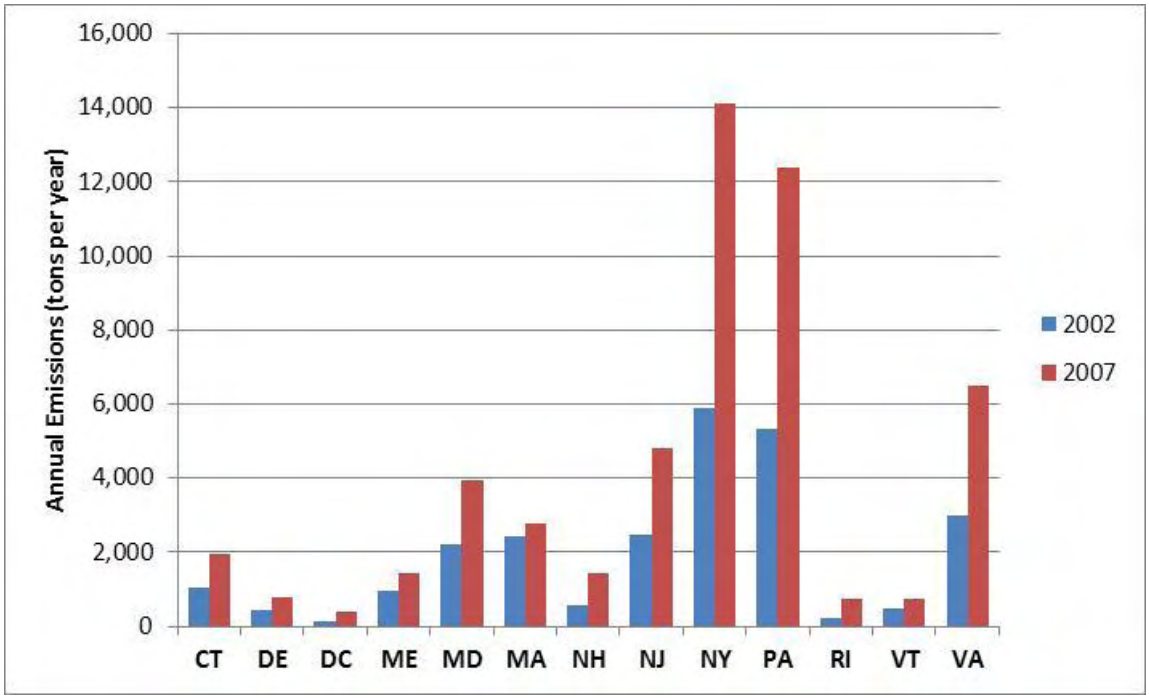


Exhibit 7.7 – 2002 and 2007 NMIM/NONROAD SO2 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,667	402	-76%
Delaware	584	202	-65%
District of Columbia	271	89	-67%
Maine	1,804	377	-79%
Maryland	4,058	936	-77%
Massachusetts	4,399	769	-83%
New Hampshire	777	275	-65%
New Jersey	3,649	921	-75%
New York	10,640	2,187	-79%
Pennsylvania	10,924	2,518	-77%
Rhode Island	425	179	-58%
Vermont	894	179	-80%
Virginia	6,086	1,435	-76%
	46,176	**10,468**	**-77%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

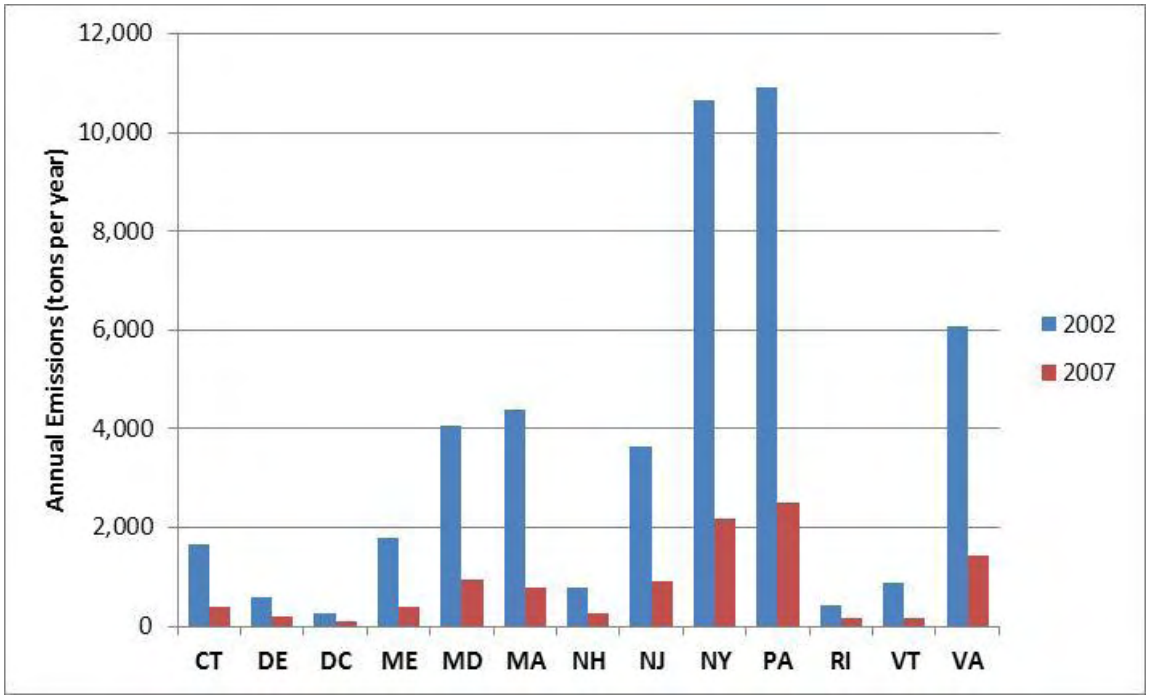
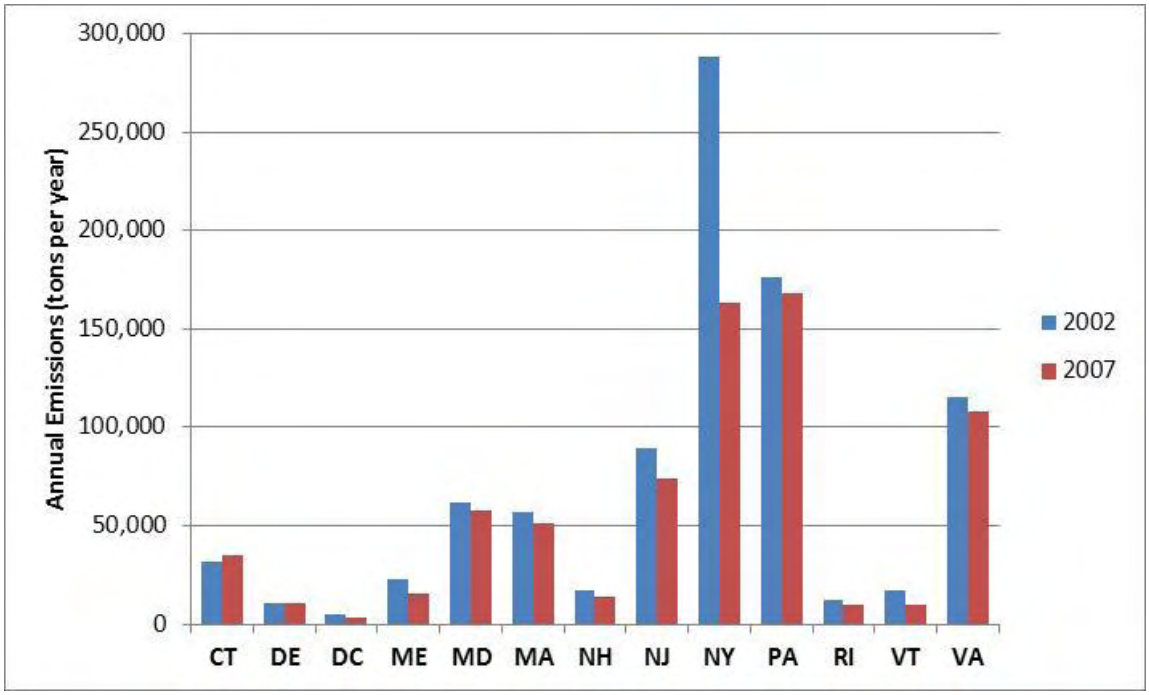


Exhibit 7.8 – 2002 and 2007 Onroad VOC Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	31,755	35,363	11%
Delaware	10,564	10,771	2%
District of Columbia	4,895	3,598	-27%
Maine	23,037	15,382	-33%
Maryland	61,847	57,789	-7%
Massachusetts	57,186	51,149	-11%
New Hampshire	16,762	13,650	-19%
New Jersey	89,753	73,624	-18%
New York	287,845	163,290	-43%
Pennsylvania	176,090	168,289	-4%
Rhode Island	12,538	9,780	-22%
Vermont	17,288	9,780	-43%
Virginia	114,994	108,001	-6%
	904,554	**720,465**	**-20%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES



8.0 PREPARATION OF SMOKE MODEL FILES

Air quality modelers in the Mid-Atlantic and Northeastern States use the SMOKE Modeling System to create gridded, speciated, hourly emissions for input into a variety of air quality models. This section describes how the SMOKE inventory files were developed. It also describes how the SMOKE the temporal allocation, speciation, and spatial allocation profiles, respectively, were developed.

8.1 PREPARATION OF SMOKE EMISSION FILES

8.1.1 Point Source SMOKE Emission Files

Annual point source inventories were prepared in SMOKE PTINV ORL format. As previously discussed in Section 3.2.1, PTINV files were created for the following types of sources:

- Annual emissions for units that reported hourly data to USEPA CAMD for the entire 12 months of 2007;
- Ozone season emissions for units that reported hourly emissions to USEPA CAMD for either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Non-ozone season emissions for units that reported hourly emissions to USEPA CAMD for either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Units that reported hourly emissions to USEPA CAMD for either 6 or 9 months of 2007 in Maryland;
- Units that are classified as distributed generation units by VDEQ; and
- All other units (these are not associated with the hourly PTHOUR files; temporal allocation for these units will be accomplished using the standard SMOKE V2.6 temporal allocation profiles).

The ORL were quality assured to conform to the SMOKE PTINV ORL format and to prevent double counting of emissions in the ORL files.

EPA has developed a methodology to reduce fugitive dust emissions for use in air quality modeling analyses (USEPA 2007b). It is considered a logical step to account for the removal of particles near their emission source by vegetation and surface features. For the MANEVU+VA 2007 inventory the transport factors were NOT applied to the point source inventory because of the very small amount of fugitive particulate emissions in the point source inventory.

Hourly point source inventories were prepared for units that report hourly emissions to USEPA's Clean Air Markets Division in SMOKE PTHOUR EMS-95 format. Because of

the large size of the PTHOUR files, separate files were prepared by month. As previously discussed in Section 3.2.1, the following PTHOUR files were created:

- 12 monthly PTHOUR files for units that reported hourly emissions to USEPA CAMD for the entire 12 months of 2007;
- 5 monthly PTHOUR files (May-September) for units that reported hourly emissions to USEPA CAMD only for the ozone season 2007;
- 12 monthly PTHOUR files for units in Maryland that reported hourly emissions to USEPA CAMD for the either 6 or 9 months of 2007; and
- 12 monthly PTHOUR files for units in Virginia that are classified as distributed generations units

Since some CAMD units only report hourly emissions data for the ozone season, there was a need for a set of actual 2007 hourly temporal profiles to be used in simulating hourly emissions for these units in non-ozone season months. Section 3.4 of this TSD discusses the development of the SMOKE temporal profiles for the non-ozone season months for these units.

8.1.2 Area Source SMOKE Emission Files

Annual area source inventories were prepared in SMOKE ARINV ORL format. In developing the SMOKE ARINV ORL files for area sources, the USEPA "transport factor" was applied to reduce fugitive dust emissions to account for the removal of particles near their emission source by vegetation and surface features. The transport factor was NOT applied to the NIF-formatted annual emissions, but only to the SMOKE ARINV ORL-formatted file.

The standard transport fractions and SCC assignments from the USEPA CHIEF website were used to reduce the PM10-PRI and PM25-PRI emissions in the MANEVU+VA 2007 area source inventory. Two files were used. The first file contains a list of SCCs for which the transport factor was applied. The major source categories included paved and unpaved roads, construction activity, agricultural crop land tilling, and agricultural livestock operations. The second file contains the transport factor which varies by county. For example, in Connecticut the transport factors ranges from 0.21 in Tolland County to 0.44 in New Haven County.

Applying the transport factor to area source fugitive dust emissions significantly reduces that amount of particulate matter included in the air quality modeling. Exhibit 8.1 compares the 2007 area source PM10-PRI and PM25-PRI emissions before and after the application of the transport fraction. Region wide, PM10-PRI emissions are reduced by 53 percent and PM25-PRI emissions are reduced by 29 percent by applying the transport

fraction. The percent reduction varies by State due to the relative importance of the area source fugitive dust emissions compared to non-fugitive dust source emissions. The bottom part of Exhibit 8.1 shows the key area source fugitive dust categories and the reductions applied by using the transport fraction.

Exhibit 8.1 – Comparison of 2007 Area Source Emissions With and Without the Application of the Fugitive Dust Transport Factor (tons/year)

	PM10-PRI			PM25-PRI		
State/SCC	**Without Transport Factor**	**With Transport Factor**	**Percent Reduction**	**Without Transport Factor**	**With Transport Factor**	**Percent Reduction**
Emissions by State for All Area Source SCCs						
CT	30,577	15,591	49	10,606	8,396	21
DE	10,499	7,208	31	3,031	2,407	21
DC	4,873	2,445	50	1,542	1,120	27
ME	54,445	20,227	63	12,526	8,744	30
MD	72,454	38,520	47	19,789	14,710	26
MA	148,756	58,380	61	30,438	18,621	39
NH	27,742	10,650	62	8,623	5,832	32
NJ	39,140	24,801	37	18,299	14,944	18
NY	272,674	140,760	48	63,906	47,023	26
PA	287,998	138,571	52	73,514	50,855	31
RI	11,361	5,553	51	3,896	2,957	24
VT	47,993	19,097	60	13,106	9,434	28
VA	183,341	78,204	57	44,102	29,533	33
All States and SCCs	**1,191,853**	**560,007**	**53**	**303,378**	**214,576**	**29**
MANE-VU+VA Emissions for Selected SCCs						
2294000000 Paved Roads	230,004	78,795	66	54,207	18,727	65
2296000000 Unpaved Roads	417,951	129,150	69	41,525	12,837	69
2311xxxxxxx Construction	205,811	74,598	64	20,934	7,585	64
2801000003 Ag. Tilling	94,443	33,949	64	17,789	6,511	64

8.1.3 Nonroad NMIM SMOKE Emission Files

As discussed in Section 5, the NMIM/NONROAD model was executed using specifications to generate monthly emission files. Monthly SMOKE ARINV ORL files were created. Average day emissions were calculated by dividing the NONROAD generated monthly emissions by the number of days in each month. Various summary reports were prepared to verify agreement between the average day, monthly, and annual emissions.

8.1.4 Nonroad MAR SMOKE Emission Files

Annual inventories for marine vessels, airport operations and railroad locomotives were prepared in SMOKE ARINV ORL format for each county in the region. Average day emissions were calculated by dividing the annual emissions by 365 days. The ORL files for Category 3 commercial marine vessels include only the emissions that occur in State waters (generally from the shoreline to 3–10 nautical miles from shore).

8.1.5 Onroad SMOKE Emission Files

Smoke emission files for the onroad sector are being developed by NESCAUM under a separate contract. Please contact NESCAUM for documentation and data files.

8.1.1 Biogenic SMOKE Emission Files

Smoke emission files for the biogenic sector are being developed by New Jersey and New York under separate efforts. Please contact MARAMA to obtain documentation and data files for biogenic sources.

8.1.1 SMOKE Emission Files for Areas Outside of the MANE-VU+VA Region

Smoke emission files for areas outside of the MANE-VU+VA are currently under development. Contact MARAMA for further information.

8.2 REVIEW OF SMOKE AUXILIARY FILES

The following activities were performed to quality assure and improve the SMOKE speciation, spatial and temporal profiles:

- QA checks were made to ensure that all SCCs in the annual emission inventory files are cross-referenced to SCCs in the SMOKE profiles. In cases where a proper cross-reference does not exist, the SMOKE files were updated using data for similar SCCs or as otherwise determined on a case-by-case basis.

- SMOKE temporal profiles were reviewed and documented for key categories. Recommendations for improving SMOKE temporal profiles were made for categories where improved data is available and are reasonable feasible to use.
- SMOKE spatial profiles were reviewed and documented for selected categories. Recommendations for improving SMOKE spatial profiles were made for categories where improved data is available and are reasonable feasible to use.

Each of these activities is documented in Appendix F of this TSD.

8.2.1 SMOKE Speciation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed the Contractor to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

<u>GSREF Speciation Cross-Reference File</u>

- Added records for SCC/pollutant code combinations in the 2007 inventory that needed to be added to the GSREF file

<u>GSPRO Speciation Profiles</u>

- No changes were needed

8.2.2 SMOKE Spatial Allocation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed the Contractor to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

<u>AMGREF Spatial Allocation Cross-Reference File</u>

- Added records for SCCs in the 2007 inventory that needed to be added to the AMGREF file

<u>SRGDESC Spatial Surrogate Code Descriptions</u>

- No changes were needed

To spatially allocate county-level emissions from airports, SMOKE modelers will use the SMOKE ARTOPNT file to allocate county-level to specific point source airport locations instead of being assigned spatial surrogates. We reviewed this SMOKE file and confirmed the county-level commercial aircraft emissions are being allocated to the location of the

large airport in the county. The only adjustment to the SMOKE ARTOPNT file was as follows:

- Changed the allocation factors for commercial aircraft (SCCs 2275000000, 2275020000, and 2275070000) in Queens County NY to allocate county-level commercial aircraft emissions to JFK Airport and LaGuardia airport based on the 2008 LTO data from USEPA's 2008 emission inventory

Emissions for Category 3 commercial marine vessels will be spatially allocated using the following procedures:

- For operations from shoreline to roughly 3-10 nautical miles from the shore, the county-level Category 3 emissions prepared by States will be allocated to grid cells using the SMOKE spatial allocation files (profile 800 {Marine Ports} for port emissions, profile 810 {Navigable Waterway Activity} for underway emissions);

- For operations outside of State waters (generally 10-200 nautical miles from shore) Northeast / Mid-Atlantic emission modelers will use a Category C3 ORL files (ptinv_eca_imo_fixFIPS_US_caps_2005_19OCT2010_orl.txt) generated by EPA for 2005. The SMOKE modelers will zero out the emissions that have been assigned to counties to avoid double counting of emissions with the State-provided emissions discussed in the previous bullet.

See Appendix F for a further discussion of the Category 3 spatial allocation issue.

8.2.3 SMOKE Temporal Allocation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed the Contractor to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

<u>AMPTREF Temporal Cross-Reference File</u>

- Added records for SCCs in the 2007 inventory that needed to be added to the AMPTREF file

- Changed the monthly allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 246 to 99246 (the new profile code that uses the Bureau of Transportation Statistics {BLS} monthly air travel data for 2007)

- Changed the day-of-week allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 7 to 99007 (the new profile code that uses the BLS day-of-week air travel data for 2007)
- Changed the hour-of-day allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 26 to 99026 (the new profile code that uses the BLS hour-of-day air travel data for 2007)
- Changed the monthly allocation code for SCCs 22-80-003-100 (CMV/Residual/ Port) and 22-80-003-200 (CMV/Residual/Underway) from 262 to 19531, which is the code the EPA recently developed for their C3 inventory

<u>AMPTPRO Temporal Allocation Profiles</u>

- Added the monthly allocation code of 99246 (the new profile code that uses the Bureau of Transportation Statistics {BLS} monthly air travel data for 2007)
- Added the day-of-week allocation code of 99007 (the new profile code that uses the BLS day-of-week air travel data for 2007)
- Added the hour-of-day allocation code of 99026 (the new profile code that uses the BLS hour-of-day air travel data for 2007)

9.0 FINAL DELIVERABLES

Exhibits 9.1 and 9.2 identify all of the deliverable products for the 2007 MANE-VU+VA emission inventory developed by the Contractor under this contract. The exhibit also identifies deliverables associated with the 2007 MANE-VU+VA under development by other agencies.

All files are stored on MARAMA ftp site:

Address: ftp.marama.org

Login ID: regionalei

Password: marama2007

Files are stored in the following directories:

\MARAMA 07-17-20 Version 3\Final 2007 (Version 3_3)\NIF

\MARAMA 07-17-20 Version 3\Final 2007 (Version 3_3)\SMOKE

\MARAMA 07-17-20 Version 3\Final 2007 (Version 3_3)\TSD

\MARAMA 07-17-20 Version 3\Final 2007 (Version 3_3)\XLS

The deliverables are described in 9.1 and 9.2.

Exhibit 9.1 – NIF Data and Emission Summary Files for the 2007 MANE-VU+VA Emission Inventory

File Description	File Name	Format	Notes
2007 Annual Point Source Emission Inventory in NOF format	MANEVU+VA_V3_3_Point_2007_NOF.mdb	NOF ACCESS	EP table modified to include fields to (1) identify units as CAMD-EGU, CAMD-nonEGU, and OTHER; (2) include the CAMD ORIS and UNITID for CAMD units; and (3) identify the percent operating time classification for CAMD units. See file for Field Definitions
2007 Annual Area Source Emission Inventory in NOF format	MANEVU+VA_V3_3_Area_2007_NOF.mdb	NOF ACCESS	See file for Field Definitions
2007 Annual NMIM/NONROAD Source Emission Inventory in NOF format	2007MARAMANRNMIMv3.mdb	NOF ACCESS	See file for Field Definitions.
2007 Annual Commercial Marine Vessel, Airport, and Rail (MAR) Emission Inventory in NOF format	MANEVU+VA_V3_3_MAR_2007.mdb	NOF ACCESS	See file for Field Definitions
2007 Annual Point Source Emission Inventory in a spreadsheet format to facilitate State and Stakeholder review	MANEVU+VA_V3_3_Point_2007_Process_Emissions.xls	MS Excel	See file for Column Definitions
2007 Annual Point Source Emission Inventory summaries by State and Source Classification Code (SCC)	MANEVU+VA_V3_3_Point_2007_State_SCC_Summary.xls	MS Excel	See file for Column Definitions
2007 Annual Area Source Emission Inventory summaries by State/SCC	MANEVU+VA_V3_3_Area_2007_State_SCC_Summary.xls	MS Excel	See file for Column Definitions
2007 Annual NMIM/NONROAD Emission Inventory summaries by State and SCC	MANEVU+VA_V3_3_NMIM_2007_State_SCC_Summary.xls	MS Excel	See file for Column Definitions.
2007 Annual MAR Emission Inventory summaries by State and SCC	MANEVU+VA_V3_3_MAR_2007StateSCCSummaries.xls	MS Excel	See file for Column Definitions

Exhibit 9.2 – SMOKE Files for the 2007 MANE-VU+VA Emission Inventory

File Description	File Name	Format	Notes
2007 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2007_NonHourly_jan2012.orl PTINV_2007_12MonthUnits_feb2011.orl PTINV_2007_Ozone_5MonthUnits_feb2011.orl PTINV_2007_NonOzone_5MonthUnits_feb2011.orl PTINV_2007_VADGUnits_march2010.orl PTINV_2007_MD6MonthUnits_march2010.orl	SMOKE PTINV ORL	One file for all non-hourly units and five separate files for units with hourly emissions. See Section 3.2.1 for the TSD for discussion of the files and Exhibit 3.1 for the file format.
SMOKE PTHOUR EMS-95 zip files with hourly emissions for each month of 2007 for units that report hourly emissions to CAMD for the entire 12 months in 2007. The zip file contains 12 monthly files.	pthour_2007_jan_12MonthUnits_nov2011.ems pthour_2007_feb_12MonthUnits_nov2011.ems pthour_2007_mar_12MonthUnits_nov2011.ems pthour_2007_apr_12MonthUnits_nov2011.ems pthour_2007_may_12MonthUnits_nov2011.ems pthour_2007_jun_12MonthUnits_nov2011.ems pthour_2007_jul_12MonthUnits_nov2011.ems pthour_2007_aug_12MonthUnits_nov2011.ems pthour_2007_sep_12MonthUnits_nov2011.ems pthour_2007_oct_12MonthUnits_nov2011.ems pthour_2007_nov_12MonthUnits_nov2011.ems pthour_2007_dec_12MonthUnits_nov2011.ems	SMOKE PTHOUR EMS-95	See Exhibit 3.2 for file format
SMOKE PTHOUR EMS-95 files with hourly emissions for 5 months of 2007 for units classified as "5-month reporters" in all States except MD. The zip file contains 5 monthly files.	pthour_2007_may_5MonthUnits_Jan2012.ems pthour_2007_jun_5MonthUnits_Jan2012.ems pthour_2007_jul_5MonthUnits_Jan2012.ems pthour_2007_aug_5MonthUnits_Jan2012.ems pthour_2007_sep_5MonthUnits_Jan2012.ems	SMOKE PTHOUR EMS-95	See Exhibit 3.2 for file format
SMOKE PTHOUR EMS-95 files with hourly emissions for each month of 2007 for units classified as "6-month reporters" in MD. The zip file contains 12 monthly files.	pthour_2007_jan_MD6MonthUnits_march2010.ems pthour_2007_feb_MD6MonthUnits_march2010.ems pthour_2007_mar_MD6MonthUnits_march2010.ems pthour_2007_apr_MD6MonthUnits_march2010.ems pthour_2007_may_MD6MonthUnits_march2010.ems pthour_2007_jun_MD6MonthUnits_march2010.ems pthour_2007_jul_MD6MonthUnits_march2010.ems pthour_2007_aug_MD6MonthUnits_march2010.ems pthour_2007_sep_MD6MonthUnits_march2010.ems	SMOKE PTHOUR EMS-95	See Exhibit 3.2 for file format

File Description	File Name	Format	Notes
	pthour_2007_oct_MD6MonthUnits_march2010.ems pthour_2007_nov_MD6MonthUnits_march2010.ems pthour_2007_dec_MD6MonthUnits_march2010.ems		
SMOKE PTHOUR EMS-95 files with hourly emissions for each month of 2007 for units classified as "distributed generation units" by the Virginia DEQ. The zip file contains 12 monthly files.	pthours_2007_jan_VADGunits_march2010.ems pthours_2007_feb_VADGunits_march2010.ems pthours_2007_mar_VADGunits_march2010.ems pthours_2007_apr_VADGunits_march2010.ems pthours_2007_may_VADGunits_march2010.ems pthours_2007_jun_VADGunits_march2010.ems pthours_2007_jul_VADGunits_march2010.ems pthours_2007_aug_VADGunits_march2010.ems pthours_2007_sep_VADGunits_march2010.ems pthours_2007_oct_VADGunits_march2010.ems pthours_2007_nov_VADGunits_march2010.ems pthours_2007_dec_VADGunits_march2010.ems	SMOKE PTHOUR EMS-95	See Exhibit 3.2 for file format
2007 Annual Area Source Emission Inventory in SMOKE ORL format	arinv_marama_2007_jan2012_w_tf_orl.txt.gz	SMOKE ARINV ORL	This file has the PM transport factors by county applied to the NOF emissions. See section 8.1.2 for discussion. See http://www.smoke-model.org/version2.6/html/ for file format
2007 Annual MAR Emission Inventory in SMOKE ORL format	ARINV_2007_MAR_Jan2012.txt	SMOKE ARINV ORL	See http://www.smoke-model.org/version2.6/html/ for file format; includes commercial marine vessels, airports (including GSE), and railroad locomotives
2007 Monthly NMIM/NONROAD Emission Inventory in SMOKE ORL format	arinv_nonroad_2007_jan_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_feb_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_mar_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_apr_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_may_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_jun_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_jul_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_aug_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_sep_29sep2010_v1_orl.txt.gz	SMOKE ARINV ORL	See http://www.smoke-model.org/version2.6/html/ for file format

File Description	File Name	Format	Notes
	arinv_nonroad_2007_oct_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_nov_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_dec_29sep2010_v1_orl.txt.gz		
SMOKE formatted temporal profiles for units that report to CAMD for only part of 2007.	ptpro_2007_marama_egu_13apr2010.txt	SMOKE PTPRO	See http://www.smoke-model.org/version2.6/html/ for file format and Section 3.4 of this TSD for discussion of these files
SMOKE formatted temporal cross-reference tables for annual time periods	ptref_2007_marama_egu_annual_13apr2010.txt	SMOKE PTREF	
SMOKE formatted temporal cross-reference tables for nonozone time periods	ptref_2007_marama_egu_nonozone_13apr2010.txt	SMOKE PTREF	
SMOKE formatted temporal profiles	MARAMA_amptref_v3_3_revised_10feb2011_v1.txt	SMOKE AMPTREF	Updated SMOKE temporal files based on EPA's 2005v4 modeling platform. See Section 8.2.3 of this TSD for discussion of the updates made.
SMOKE formatted temporal cross-reference tables	MARAMA_amptpro_2005_us_can_revised_10feb2011_v0.txt	SMOKE AMPTPRO	
SMOKE formatted spatial fridding cross-reference file	MARAMA_amgref_us_can_mex_revised_17feb20110_v8.txt	SMOKE AMGREF	Updated SMOKE spatial files based on EPA's 2005v4 modeling platform. See Section 8.2.2 of this TSD for discussion of the updates made.
SMOKE formatted spatial surrogate designation file	MARAMA_srgdesc_36km_revised_10feb2011_v1.txt	SMOKE SRGDESC	
SMOKE formatted area to point file for airports	MARAMA_artopnt_2002detroit_10feb2011_v0.txt	SMOKE ARTOPNT	
SMOKE formatted speciation profile	MARAMA_gspro_cmaq_cb05_soa_2005ck_05b_10feb2011.txt	SMOKE GSPRO	Updated SMOKE speciation files based on EPA's 2005v4 modeling platform. See Section 8.2.1 of this TSD for discussion of the updates made.
SMOKE formatted speciation cross-reference file	MARAMA_gsref_cmaq_cb05_soa_2005ck_05b_17feb2011.txt	SMOKE GSREF	

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