ANDREW M. CUOMO
GOVERNOR

JOE MARTENS
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233-1010

JUN 27 2013

Ms. Judith A. Enck
Regional Administrator
U.S. Environmental Protection Agency, Region 2
290 Broadway, 26th Floor
New York, New York 10007-1866

Dear Administrator Enck:

DEC is hereby submitting a redesignation request and maintenance plan for the 1997 annual and 2006 24-hour fine particulate matter ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS) pertaining to the New York portion of the New York-Northern New Jersey-Long Island, NY-NJ-CT nonattainment area. This redesignation request is being submitted pursuant to section 107(d)(3)(D) of the Clean Air Act (CAA). Also included is a maintenance plan that provides for continued maintenance of these NAAQS through 2025, as required by CAA section 175A.

This proposed revision to the New York State Implementation Plan (SIP) demonstrates that the New York metropolitan area first came into attainment of both the annual and 24-hour NAAQS in 2009 (with design values based on 2007-2009 monitored air quality data). Subsequent design values have also been below both standards. These reduced ambient air concentrations are the result of permanent and enforceable measures enacted by DEC and EPA, which are detailed in the document.

In light of the January 4, 2013 ruling by the U.S. Court of Appeals for the D.C. Circuit, additional information has been added to the redesignation request and maintenance plan to affirm that they comply with the requirements of CAA Part D, Subpart 4. The control measures relied upon for attainment of the NAAQS primarily focused on reductions from sulfur dioxide and nitrogen oxides, the pollutants that most significantly contribute to secondary PM formation; volatile organic compounds also contribute to a lesser extent, while ammonia is not considered a significant precursor. By attaining the $PM_{2.5}$ NAAQS through the targeted emissions reductions of these precursors, DEC has satisfied the provisions of CAA section 189(e). Attainment of the NAAQS in this expeditious manner also demonstrates that the Reasonably Available Control Measure requirements for $PM_{2.5}$ and significant precursors have been satisfied.

The proposed redesignation request and maintenance plan underwent a public review process. On February 6, 2013, a Notice of Public Hearing was published in the Environmental Notice Bulletin and in newspapers in the affected area. A public hearing was held in Long Island City on March 26, 2013. The comment period closed on April 2, 2013; comments were received only from EPA.

Enclosed with this proposed SIP revision are the following:

1. Notice of Public Hearing as published in the Environmental Notice Bulletin on February 6, 2013
2. Copies of the Proofs of Publication of the proposal in local newspapers
3. Hearing Report for the public hearing held in Long Island City, NY on March 26, 2013
4. Copy of transcript from the public hearing
5. Response to comments received regarding the submission
6. Disk containing New York State on-road air emission inventory data

Please call Mr. David Shaw, Director of the Division of Air Resources, at (518) 402-8452 if you have any questions.

Sincerely,

Joseph J. Martens

Enclosures

c: R. Ruvo, EPA
K. Fradkin, EPA
D. Shaw, NYSDEC

Copy

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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In the Matter of the Redesignation Request and Maintenance Plan for the 1997 and 2006 Fine Particulate Matter National Ambient Air Quality Standards; Carbon Monoxide Limited Maintenance Plan for the New York Metropolitan Area; and Repeal of 6 NYCRR Part 203, Indirect Sources of Air Contamination.

---x

New York State Department
of Environmental Conservation,
47-40 21st Street,
Long Island City, New York

Tuesday, March 26, 2013

The above entitled matter came on for Hearing at 2:00 p.m.

BEFORE: THOMAS JOHN, P.E.

A P P E A R A N C E S:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

47-40 21st Street

Long Island City, New York 11101

BY: SCOTT GRIFFIN, ENVIRONMENTAL ENGINEER

P R O C E E D I N G S

HEARING OFFICER: This session is called to order. This is the administrative public hearing with a legislative format before the New York State Department of Environmental Conservation in the matter of Department's proposed revisions to regulations 6 NYCRR Parts 200, 203, and 621; and revisions to the State Implementation plan.

The purpose of this hearing is to receive public comment on the proposed revisions. If you wish to make a statement, please fill out one of the cards and give it to me. The cards will be used to call the speakers in the order that I receive the cards.

I am Thomas John, serving as the hearing officer for the Department.

All persons, organizations, corporations or government agencies that may be affected by the proposal are invited to submit either written or oral statements. All statements taken today, whether written

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or spoken, will be incorporated into the official record of this proceeding. Statements are not given under oath, nor will there be any cross examination. We have made arrangements for a stenographer to record these proceedings. If you read a prepared statement, please read it slowly, and, if possible, leave a copy with the stenographer for ease of transcription.

Written statements received during the public comment period and oral statements made at the hearing will be given equal weight. Please submit any lengthy statements in writing; if you wish, you may summarize such statements verbally. Written comments can also be submitted on or before 5:00 p.m. on April 2, 2013.

Notice of Public Hearing.

Notices of the hearing were published in the February 6, 2013 edition of State Register and Environmental Notice Bulletin. Notices were also published on February 6, 2013 in the New York Post, Newsday, the Albany Times Union, the Glens Fall Post Star, the Syracuse

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Post-Standard, the Rochester Democrat and Chronicle, and the Buffalo Evening News.

I will now call upon Scott Griffin, of the Division of Air Resources, to make a brief statement.

MR. GRIFFIN: Good afternoon. My name is Scott Griffin. I am an Environmental Engineer with New York State Department of Conservation in the Division of Air Resources.

The New York State Department of Environmental Conservation is proposing to submit to the U.S. Environmental Agency a redesignation request and associated maintenance plan for fine particular matter, or PM2.5. The redesignation request and maintenance were developed pursuant to Clean Air Act sections 107(d)(3)(D) and 175A, respectively.

This submission demonstrates that the New York metropolitan area, consisting of New York City and Nassau, Suffolk, Orange, Rockland, and Westchester Counties, is now in compliance with the 1997

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annual and 2006 24-hour National Ambient Air Quality Standards, or NAAQS, for PM2.5. Three-year averages of monitored PM2.5 concentrations have indicated compliance with both NAAQS since 2009.

The maintenance plan provides for continued attainment of the PM2.5 NAAQS in the New York metropolitan area through 2025, based on emissions inventory projections. Approval of the redesignation request and maintenance plan will allow EPA to officially redesignate the New York metropolitan area as attainment for the annual and 24 hour PM2.5 NAAQS, and thus alleviate additional requirements faced by areas subject to nonattainment designations.

The redesignation request and maintenance plan document is available for viewing on the Department's website at www.dec.ny.gov. The Department is accepting comments on this submission until 5:00 p.m., April 2, 2013. For answers to any questions regarding this submission, you can contact me at 518-402-8396 or via e-mail at

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airsips@gw.dec.state.ny.us. Thank you."

HEARING OFFICER: He is going to read a second statement on the NYC limited maintenance plan

MR. GRIFFIN: "The New York State Department of Environmental Conservation is proposing to submit to the U.S. Environmental Protection Agency a revision to the New York Metropolitan Area carbon monoxide or CO State Implementation Plan which consists of a limited maintenance plan that demonstrates continued attainment of the CO National Ambient Air Quality Standards or NAAQS until at least 2022.

The New York State portion of the New York Metropolitan Area CO nonattainment area (consisting of New York City and Westchester and Nassau counties) was redesignated to attainment of the CO standards effective May 20, 2002. This submission satisfies the requirement of Clean Air Act Section 175(A)(b) that requires that states submit an additional revision of the CO SIP that demonstrates continued attainment

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of the CO NAAQS for ten years after the expiration of the original ten-year period post redesignation. In order to use the LMP, design values (two years of monitoring data) must be at or below 85% of exceedance levels of the CO NAAQS.

Additionally, the design value for the area must continue to be at or below 85% of exceedance levels of the CO NAAQS until the time of final EPA action or the redesignation. The existing primary NAAQS for CO are 9 parts per million over an eight-hour period. Design values in the New York Metropolitan area for the CO NAAQS are 2.3 parts per million, which is 25% of the eight-hour standard, and well within the requirements of a maintenance plan.

DEC has addressed and satisfied all the criteria of Section 175A of the Clean Air Act. The maintenance demonstration shows that future year CO emissions will not exceed the level of the attainment year and effective safeguards are in place for the NAAQS for at least ten years

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following EPA's redesignation.

The Carbon Monoxide Limited Maintenance Plan is available for viewing on the Department's website at www.dec.ny.gov. The Department is accepting comments on this submission until 5:00 p.m. on April 2, 2013. For answers to any questions regarding this submission, you may contact Diana Rivenburgh at 518-402-8396 or via email at airsips@gw.dec.state.ny.us."

HEARING OFFICER: Now Scott Griffin is going read the third statement which is repeat of Part 203.

MR. GRIFFIN: "The Department is proposing to repeal 6 NYCRR Part 203, Indirect Sources of Air Contamination, while simultaneously revising 6 NYCRR Parts 200, General Provisions, and Part 621, Uniform Procedures, to remove all references to Part 203. Indirect source permitting is an intrastate air pollution control regulation that exclusively applies to any new or modified indirect source of air contamination located in New York County

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(Manhattan) south of 60th Street. An indirect source of air contamination is any facility, structure or installation where the associated vehicular movements (i.e., the traffic related to the source) contribute to air pollution. The principle air pollutant of concern in Part 203 is carbon monoxide, although the regulation also addresses ozone and nitrogen dioxide in the case of the construction of highway sections of certain size. The existing regulation prohibits the construction or modification of an indirect source of air contamination without the Department issuing a permit to construct prior to construction prior to construction or modification.

The Department is proposing to repeal Part 203 because it has become obsolete and has been superseded by other regulations, most notably 6 NYCRR Part 240, Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. or the Federal Transit Laws;

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40 CFR 93 Subpart B, Determining Conformity of General Federal Actions to State or Federal Implementation Plans; and 6 NYCRR Part 617, State Environmental Quality Review. Therefore, the Department proposes to repeal Part 203 in order to eliminate redundancy from the State's environmental regulations.

Since the promulgation of Part 203 in September of 1971, other federal and state regulations have been adopted which regulate air pollution from indirect sources. The construction and operation of highway projects for CO and ozone control is now covered under Part 240, which includes the establishment of motor vehicle emission budgets and "hot spot" (sensitive local area) evaluation procedures. Non-highway, non-federal projects, such as private office buildings or parking garages, are subject to review under the State Environmental Quality Review Act, 6 NYCRR, Part 617. The reviews required by these regulations either duplicate or are more comprehensive than the analyses required under Part 203.

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In addition, the Department is in the process of preparing a limited maintenance plan for CO, the primary air pollutant of concern under Part 203, because the CO design value in maintenance area is equal to or less than 85 percent of the CO National Ambient Air Quality Standard.

Furthermore, a review of the Department's records determined that only one Part 203 Permit has been issued since 1988. This permit, issued in 1995, is for the New York State Department of Transportation Route 9A Reconstruction Project. The conditions attached to the permit are generic, and could apply to any Department permit. There is nothing contained within the permit that provides any additional environmental protection beyond the Department's current regulations and programs.

The Department is accepting comments on this rulemaking until 5:00 p.m. on Tuesday, April 2, 2013. Michael Sheehan, of the Division or Air Resources in Albany,

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may be reached at 518-402-8396 to answer any questions concerning the rulemaking. Thank you."

HEARING OFFICER: Is there anyone who wishes to speak today?

Is there anyone that has a compelling reason that makes it necessary for them to offer their statement right now, or can everyone abide by calling names from the cards in the order that I received them?

Are there any elected federal, State or County officials here?

There is no one to speak today so off the record.

(Off-the-record discussion held at this time.)

HEARING OFFICER: A reminder that the public comment period will close at 5:00 p.m. on April 2, 2013.

The time is now 2:22 p.m. and there is no one who wishes to comment. This hearing is adjourned.

Thank you all for coming.

(Time noted: 2:22 p.m.)

CERTIFICATE

STATE OF NEW YORK)
: ss.
COUNTY OF QUEENS)

I, AYDIL M. TORRES, a Notary Public within and for the State of New York, do hereby certify that the foregoing record of proceedings is a full and correct transcript of the stenographic notes taken by me therein.

IN WITNESS WHEREOF, I have hereunto set my hand this 4th day of April, 2013.

Aydil M. Torres

AYDIL M. TORRES

Assessment of Public Comments

Redesignation Request and Maintenance Plan for the
1997 Annual and 2006 24-Hour $PM_{2.5}$ NAAQS:
New York–Northern New Jersey–Long Island, NY–NJ–CT Nonattainment Area

Comment: p.22: In the list of regulations/laws provided in the proposed revision, the section of the New York State Environmental Conservation Law regarding requirements for *Ultra Low Sulfur Heating Oil* is incorrectly listed as ECL 19-0303, which is the section of the ECL addressing requirements for codes, rules, and regulations. The correct reference should be 19-0325. The incorrect reference is also listed in Appendix J-Projected Emissions Reductions from New Control Strategies.

Response: This error has been corrected in section II.C.3 and Appendix J.

Comment: On January 4, 2013, the DC Circuit Court ruled that the Clean Air Act (CAA) requires implementation of the $PM_{2.5}$ NAAQS under subpart 4 rather than implementation under subpart 1. Relative to subpart 1, subpart 4 is more specific about what states must do to bring areas into attainment. New York should include emissions data in tables 8 thru 13 for ammonia, a $PM_{2.5}$ precursor. New York can also supplement with an additional analysis demonstrating that ammonia is an insignificant portion of the inventory, and is not projected to increase, or increase significantly.

Response: Ammonia figures have been added to the emissions data tables 8 through 13. Growth factors that were developed (see the MANE-VU technical support documents, presented as Appendices F, G, and H to the redesignation request and maintenance plan) show that there is no significant increase in ammonia emissions in the projection years—there is, in fact, a projected decline of 18 percent from 2007 to 2025.

Comment: Please indicate what quality assurance procedures were done on the point, area, nonroad and on-road mobile source inventories.

Response: Text has been added to the SIP document (as section III.B.2.c, "QA/QC for Nonroad Inventory") to outline the quality assurance procedures for the Nonroad Inventory methodology located in Section III.B.2. The quality assurance procedures for the on-road inventory are included in Appendix D – *New York State On-Road Motor Vehicle Emission Budget MOVES Technical Support Documentation*. Point and non-point quality assurance procedures are outlined in the MANE-VU technical support documents

Comment: Please provide the 2007 annual VOC and NH3 base year emissions inventory by general source sector type: point, area, nonroad mobile and on-road mobile emissions for each $PM_{2.5}$ nonattainment area.

Response: Tables 11 through 13 have been revised to account for NH3 by source sector type in 2007, 2017, and 2025.

Comment: Please explain how the 2007 VOC and NH3 point, area, nonroad mobile and onroad mobile source inventory were developed, what models were used and cite the reference document(s) for additional information.

Response: The MANE-VU technical support documents (Appendices F, G, and H) describe the development of these inventories and the models that were used.

Comment: See NYSDEC's Point and Nonpoint $PM_{2.5}$ Maintenance Plan CD dated October 18, 2012: For facility emissions, emissions are expressed as $PM_{2.5}$ Fil and $PM_{2.5}$, and PM_{10} and PM_{10} Fil. Please indicate which pollutants represent PM_{10}-Primary (Filterables and Condensibles) and $PM_{2.5}$-Primary (Filterables and Condensibles) emissions.

Response: PM filterables are the PM values used, though condensibles are listed as well.

Comment: See NYSDEC's Point and Nonpoint $PM_{2.5}$ Maintenance Plan CD dated October 18, 2012. File Pollutant Name, subfolder pivot tables. Please explain what is $PM_{2.5}$GO and $PM_{2.5}$GC.

Response: GO refers to “Growth Only” and GC refers to “Growth and Control.”

Comment: p.40: Transportation Conformity - Since the conformity budgets are for both the annual and daily $PM_{2.5}$ standard this needs to be clearly stated in both the section 3.d narrative and the table.

Response: This text has been added to the SIP document.

Comment: p.41: Tappan Zee Bridge General Conformity - The narrative in section 3.e doesn't state for which specific years the 457 tons of NOx is included.

Response: Text has been added to the SIP document specifying that 2017 is the relevant year.

Comment: MOVES model inputs - The hourly temperature data for 2009 appear to be incorrect. In the State's data, the daily low temperatures occur between 10-11 am and daily high temperatures occur between 8-9 pm. This is not consistent with observed temperature variations and may be due to the conversion of data from MOBILE6 to MOVES format. Please review meteorological data and correct as necessary.

Response: As noted in the comment, there was an error in converting hourly temperature data into MOVES input format for the 2009 inventory runs. This error has been corrected and new MOVES runs have been completed to account for the correct temperature inputs. All MOVES documentation and files have been updated based on these new MOVES runs and the motor vehicle emission budget table has also been updated to reflect the revised emission totals.

In review of this comment, the Department also found typographical errors in the motor vehicle emissions budgets contained in Table 15 – “Transportation Conformity Emission Budgets for the NYMA $PM_{2.5}$ Maintenance Area (Tons).” The Department found an error in early model runs that was corrected and included in all other SIP documentation except for the MVEBs in this table. The table has been updated to correct this error.

Comment: Section 175A of the CAA requires that a maintenance plan include contingency measures as EPA deems necessary to assure that a state will promptly correct a violation of the NAAQS that occurs after redesignation. The plan should identify the measures to be adopted, a schedule and procedure for adoption and implementation, and a specific time limit for action by the state. The state should also identify specific indicators, or triggers, which will be used to determine when the contingency measures need to be implemented. See September 1992 EPA memorandum from John Calcagni, Procedures for Processing Requests to Redesignate Areas to Attainment available at http://www.epa.gov/ttn/oarpglt5/memoranda/redesignmem090492.pdf.

In Section III.D, New York has included a list of regulations that have either been proposed, or are still being drafted by the Department, but are generally expected to be adopted within the next couple of years. The regulations would not assure prompt correction of a violation of the NAAQS should a violation occur after redesignation. Section III.D does not include a schedule, nor specific indicators, or triggers, for determining when contingency measures would be implemented.

New York should identify the measures listed as candidate control measures for purposes of contingency, and include a commitment to finalizing or fully adopting those measures that are necessary and appropriate to promptly correct a violation of the NAAQS, after further analysis to determine the appropriate remedy for the cause of any future violation. Include a timeline and indicators for prompt action to determine when contingency measures are needed and a process of developing and implementing necessary control measures.

It is also acceptable to include those measures that have been adopted, but not fully implemented, such as vehicle turnover, as contingency measures.

EPA can provide examples of how the contingency measure requirements have been addressed in other redesignation rulemakings.

Response: The process through which New York State proposes and adopts regulations does not allow for the establishment of “triggers” for control measures that would result in them going into effect should either $PM_{2.5}$ NAAQS be exceeded in the future. For this reason, the DEC included in section III.D. of the maintenance plan a list of the regulations that are currently being pursued (and which are in various stages of adoption).

Additionally, the DEC will not simply wait for a NAAQS exceedance to employ these additional measures. They will be adopted once the rulemaking process has concluded, which will result in further reductions of $PM_{2.5}$ or its precursors. In this way, the decline of ambient $PM_{2.5}$ concentrations will continue in the regions impacted by these new regulations, which includes the New York metropolitan area (NYMA).

Ambient concentrations of $PM_{2.5}$ have remained low for several years, with the last exceedance in the NYMA occurring over the 2006-2008 design value period. The redesignation request identifies the control measures that have been adopted and implemented recently that will keep the NYMA in attainment of the annual and 24-hour NAAQS.

Note that vehicle turnover, which will result in additional emission reductions, has already been accounted for in the emissions projections and is therefore not included among the contingency measures.

Commenter: U.S. Environmental Protection Agency, Region 2

Department of Environmental Conservation
Division of Air Resources

Joe Martens
Commissioner

REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR THE 1997 ANNUAL AND 2006 24-HOUR $PM_{2.5}$ NAAQS: NEW YORK–NORTHERN NEW JERSEY–LONG ISLAND, NY–NJ–CT NONATTAINMENT AREA

FINAL PROPOSED REVISION **JUNE 2013**

New York State Department of Environmental Conservation
Andrew M. Cuomo, GOVERNOR ***Joe Martens, COMMISSIONER***

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List of Commonly Used Acronyms and Abbreviations

$\mu g/m^3$	Micrograms per cubic meter
ADRP	Acid Deposition Reduction Program
AQS	Air Quality System
ARM	Approved Regional Method
BART	Best Available Retrofit Technology
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CFR	Code of Federal Regulations
CMV	Commercial Marine Vessel
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CSAPR	Cross-State Air Pollution Rule
CSN	Chemical Speciation Network
Department	New York State Department of Environmental Conservation
DG	Distributed Generation
EDMS	Emission Dispersion Modeling System
EGU	Electric Generating Unit
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Administration
FEM	Federal Equivalent Method
FIP	Federal Implementation Plan
FRM	Federal Reference Method
GVWR	Gross Vehicle Weight Rating
HDV	Heavy-Duty Vehicle
HPMS	Highway Performance Monitoring System
I/M	Inspection/Maintenance
LPG	Liquefied Petroleum Gas
LTO	Landing and Take-Off
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MARAMA	Mid-Atlantic Regional Air Management Association
MPO	Metropolitan Planning Organization
MOVES	Motor Vehicle Emissions Simulator
MVEB	Motor Vehicle Emission Budget
NAAQS	National Ambient Air Quality Standard
NAMS	National Air Modeling Station
NEI	National Emission Inventory
NH_3	Ammonia
NO_x	Oxides of Nitrogen
NYCRR	New York Codes, Rules, and Regulations

NYMA	New York Metropolitan Area
NYSERDA	New York State Energy Research and Development Authority
NYTEST	New York Transient Emission Short Test
NYVIP	New York Vehicle Inspection Program
OBD	On-Board Diagnostics
PM	Particulate Matter
$PM_{2.5}$	Fine PM; Particulate Matter with an aerodynamic diameter $\leq$ 2.5 micrometers
PM_{10}	Coarse PM; Particulate Matter with an aerodynamic diameter $\leq$ 10 micrometers
QA	Quality Assurance
QC	Quality Control
RACT	Reasonably Available Control Technology
RE	Rule Effectiveness
RFG	Reformulated Gas
RVP	Reid Vapor Pressure
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Stations
SO_2	Sulfur Dioxide
TIP	Transportation Implementation Plan
TPY	Tons per Year
TSD	Technical Support Document
TZHRC	Tappan Zee Hudson River Crossing
ULSD	Ultra Low Sulfur Diesel
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound

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I. INTRODUCTION

A. Proposal

The New York State Department of Environmental Conservation (Department) is proposing a State Implementation Plan (SIP) revision for redesignation to attainment of the 1997 annual and the 2006 24-hour National Ambient Air Quality Standards (NAAQS) for fine particulates ($PM_{2.5}$). This redesignation request affects 10 counties in the New York Metropolitan Area (NYMA), which represents the New York State portion of the New York–N. New Jersey–Long Island, NY–NJ–CT nonattainment area. The New York counties included in the nonattainment area are Bronx, Kings, Nassau, New York, Orange, Queens, Richmond, Rockland, Suffolk, and Westchester Counties. This redesignation demonstration is being submitted pursuant to Clean Air Act (CAA) section 107(d)(3)(D). This document also contains a maintenance plan which ensures continued compliance with the annual and 24-hour NAAQS pursuant to CAA section 175A, and which is required in order for the U.S. Environmental Protection Agency (EPA) to promulgate a redesignation of the NYMA from nonattainment to attainment. It should be noted that approval action on SIP elements and the redesignation request may occur simultaneously.

This request for redesignation for the annual and 24-hour $PM_{2.5}$ NAAQS is based on the results of ambient air quality monitoring for $PM_{2.5}$ within the New York–N. New Jersey–Long Island, NY–NJ–CT nonattainment area. Recent certified monitoring data demonstrate compliance with both the annual and 24-hour $PM_{2.5}$ NAAQS within the entire tri-state nonattainment area. The Department understands that all three states are formally pursuing the redesignation/maintenance process for both the annual and 24-hour $PM_{2.5}$ NAAQS.

As a result of monitoring data indicating compliance with the annual $PM_{2.5}$ NAAQS, on June 9, 2010, the Department submitted a clean data petition for the New York–N. New Jersey–Long Island, NY–NJ–CT nonattainment area for the annual $PM_{2.5}$ NAAQS. EPA concurred with the Department's finding, and on December 15, 2010, finalized its determination that this area had attained the annual NAAQS.[1] This Federal Register notice is available as Appendix A – *EPA Determination of NYMA Attainment of the 1997 Annual $PM_{2.5}$ NAAQS.*

The Department also submitted on May 5, 2011 a clean data petition for this area pertaining to the 24-hour $PM_{2.5}$ NAAQS. On December 31, 2012, EPA finalized its approval of this petition, determining that the New York–N. New Jersey–Long Island, NY–NJ–CT nonattainment area had attained the 24-hour NAAQS.[2] This Federal Register notice is available as Appendix B – *EPA Determination of NYMA Attainment of the 2006 24-Hour $PM_{2.5}$ NAAQS.*

Final approval of these clean data petitions eliminates the need to complete and submit attainment SIPs. Approval of this redesignation request and maintenance plan, meanwhile, will officially redesignate the NYMA to attainment for the annual and 24-hour standards, and thus alleviate additional program requirements faced by states subject to nonattainment designations.

[1] **Federal Register** / Vol. 75, No. 219, p. 69589; published November 15, 2010
[2] **Federal Register** / Vol. 77, No. 250, p. 76867; published December 31, 2012

B. Background of the $PM_{2.5}$ NAAQS

EPA established NAAQS for six criteria air pollutants, including particulate matter (PM) to protect the public health and welfare. EPA describes PM as “a complex mixture of extremely small particles and liquid droplets…made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.”[3]

$PM_{2.5}$ (i.e., PM with an aerodynamic diameter less than or equal to 2.5 micrometers) is produced by combustion, including vehicle exhaust, and by chemical reactions of gases such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOCs), and ammonia (NH_3). Adverse health effects from breathing air with high $PM_{2.5}$ concentrations include premature death, increased respiratory symptoms and disease, chronic bronchitis, and decreased lung function—particularly for individuals with asthma.

Due to these potential health impacts, EPA introduced the $PM_{2.5}$ NAAQS in 1997.[4] (Previously, standards had been set for coarse particles, or PM_{10}.) NAAQS were established at 15 micrograms per cubic meter ($\mu g/m^3$), based on an annual arithmetic mean over three years, and at 65 $\mu g/m^3$, based on the 98th percentile of 24-hour values averaged over three years. These are known as the annual and 24-hour standards, respectively.

In 2006, based upon new scientific evidence, EPA revised the 24-hour standard, lowering it from 65 $\mu g/m^3$ to 35 $\mu g/m^3$.[5] This standard became effective December 18, 2006. At the same time, EPA decided to retain the existing annual standard of 15 $\mu g/m^3$.

C. Designations under Annual $PM_{2.5}$ NAAQS

Designations for the 1997 annual $PM_{2.5}$ NAAQS were issued by EPA on December 17, 2004 and became effective on April 5, 2005.[6] EPA identified 39 areas nationwide in nonattainment of the 15 $\mu g/m^3$ annual standard, based upon the 3-year average of annual mean $PM_{2.5}$ concentrations for the years 2001 through 2003. Among the areas designated as nonattainment was the New York–N. New Jersey–Long Island, NY–NJ–CT area. This nonattainment area includes the following New York counties: Bronx, Kings, Nassau, New York, Orange, Queens, Richmond, Rockland, Suffolk, and Westchester. The nonattainment area also includes ten counties in northern New Jersey and two counties in southwestern Connecticut.

In response to this designation, the Department was obligated to undertake planning and consider pollution control activities in order to attain this standard as quickly as possible. Under CAA section 172(a)(2)(A) the attainment deadline for this area is five years after designation, or April 5, 2010.

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[3] U.S. Environmental Protection Agency, “Particulate Matter” webpage, www.epa.gov/pm/
[4] **Federal Register** / Vol. 62, No. 138, p. 38652; published July 18, 1997
[5] **Federal Register** / Vol. 71, No. 200, p. 61144; published October 17, 2006
[6] **Federal Register** / Vol. 70, No. 3, p. 944; published January 5, 2005

D. Designations under 24-hour $PM_{2.5}$ NAAQS

Designations for the 2006 24-hour $PM_{2.5}$ NAAQS were made final by EPA effective December 14, 2009.[7] EPA identified 31 areas nationwide that exceeded the 35 $\mu g/m^3$ 24-hour standard, based upon 98th percentile values from 2006 through 2008. Among the areas designated as nonattainment was the New York–N. New Jersey–Long Island, NY–NJ–CT area, with a 2008 design value of 38 $\mu g/m^3$. This nonattainment area includes the same 22 counties in New York, New Jersey, and Connecticut that were designated nonattainment under the annual standard.

In response to this designation, the Department was obligated to undertake planning and consider pollution control regulations in order to attain this standard as quickly as possible. Under CAA section 172(a)(2)(A) the attainment deadline for this area is five years after designation, or December 14, 2014.

II. DOCUMENTATION OF COMPLIANCE WITH REDESIGNATION REQUIREMENTS

In accordance with section 107(d)(3)(E) of the CAA, the EPA Administrator may not grant a request to redesignate an area to attainment unless the following conditions have been satisfied:

- The Administrator determines that the area has attained the NAAQS;
- The Administrator has fully approved the applicable implementation plan for the area under CAA section 110(k);
- The Administrator determines that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the applicable implementation plan and applicable federal air pollutant control regulations and other permanent and enforceable reductions;
- The Administrator has fully approved a maintenance plan for the area as meeting the requirements of CAA section 175A; and,
- The state containing such area has met all requirements applicable to the area under CAA section 110 and Part D.

The following sections document that the New York portion of the New York–N. New Jersey–Long Island, NY–NJ–CT nonattainment area has met all the necessary requirements for redesignation to attainment under the 1997 annual and 2006 24-hour $PM_{2.5}$ standards.

A. Attainment of the 1997 Annual and 2006 24-Hour $PM_{2.5}$ NAAQS

This section discusses the means by which the Department is demonstrating attainment of the 1997 annual and 2006 24-hour $PM_{2.5}$ standards in the NYMA. On November, 15, 2010, EPA determined that the New York–N. New Jersey–Long Island, NY–NJ–CT area, designated nonattainment for the 1997 annual $PM_{2.5}$ NAAQS, had since attained that standard. This determination was based upon quality assured, quality controlled, and certified ambient air monitoring data for the 2007 through 2009 monitoring period (i.e., a 2009 design value).

[7] **Federal Register** / Vol. 74, No. 218, p. 58688; published November 13, 2009

Compliance with the standard was further demonstrated with the subsequent availability of 2010 monitoring data.

EPA's initial designations for the 24-hour standard were made based on monitored values for years 2006 through 2008 (i.e., a 2008 design value). On May 5, 2011 the Department submitted to EPA a clean data petition for the NYMA which demonstrated that, based on 2009 and 2010 design values, the NYMA is now in full compliance with this NAAQS. EPA finalized approval of this petition on December 31, 2012.

Monitored data for 2011 further demonstrate the permanent nature of these reduced $PM_{2.5}$ concentrations. These data are presented in Appendix C – *NYMA 2011 Design Values for the Annual and 24-Hour $PM_{2.5}$ NAAQS*. The highest 2011 annual design value for the tri-state NYMA was 11.9 $\mu g/m^3$, recorded at the Morrisania (NY) monitor. This represents a decrease from the NYMA's peak 2010 design value of 12.5 $\mu g/m^3$, also recorded at Morrisania. Meanwhile, the NYMA's highest 2011 24-hour design value was 30 $\mu g/m^3$, recorded at New Jersey's Elizabeth Turnpike monitor. This matched 2010's peak design value for the NYMA, also at the Elizabeth Turnpike monitor.

1. The $PM_{2.5}$ Monitoring Network

The Department maintains a monitoring network that fulfills EPA requirements and is sufficient to accurately gauge air quality in the NYMA and other regions of New York State. As required by Title 40 of the Code of Federal Regulations (CFR), Part 58.10(d), "*the State...agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this Part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network.*"

The Department completed and submitted to EPA its "New York State Ambient Air Monitoring Program Network Assessment" in May, 2010 in order to meet this requirement. As a part of this plan, all monitoring networks operated by the Department's Bureau of Air Quality Surveillance in the Division of Air Resources were evaluated to ensure they met the monitoring objectives as defined by the regulations. Considerations were given to population and geographical coverage, air quality trends, attainment classification, emissions inventory, parameters monitored, special purpose monitors, health-related and scientific research, external data users, new and proposed regulations, quality assurance (QA), technology, personnel, and training.

Additionally, starting in July, 2007, each state (or where applicable, local) agency is required to "*adopt and submit to the Regional Administrator an annual monitoring network plan which shall provide for the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations including FRM, FEM, and ARM monitors that are part of SLAMS, NCore stations, CSN stations, state speciation stations, SPM stations, and/or, in serious, severe and extreme ozone nonattainment areas, PAMS stations, and SPM monitoring stations.*"[8] The Department prepares an Annual Monitoring Network Plan as part of the

[8] **Code of Federal Regulations** / Title 40, Section 58.10

fulfillment of these requirements. EPA approved the majority of the latest version of this plan on October 18, 2012.

The State and Local Air Monitoring Stations (SLAMS) together with the National Air Monitoring Stations (NAMS) constitute New York's Ambient Air Monitoring System which provides the data used to demonstrate attainment. The principal objective of the $PM_{2.5}$ monitoring network is to determine the exposure of the state's population to ambient $PM_{2.5}$. This objective is the primary focus of the Federal Reference Method (FRM) filter-based samplers as well as for the continuous mass monitoring network. The protocols and equipment used for the FRM network are meticulously specified in the CFR to ensure that the measurements are consistent from one state to another. The continuous mass monitoring instruments cannot accurately provide data for direct comparison with the NAAQS, but these instruments actually provide the most useful data for population exposure. The continuous $PM_{2.5}$ data are updated every hour in order to provide near real-time health related forecasts, warnings, and updates of current pollution concentrations.

The QA provided for all ambient air monitoring activities in New York State ensures that the ambient air monitoring data are accurate, precise, and complete. Oversight is provided through a series of QA field audits completed independently from the monitoring operators' routine checks and audits. All QA requirements specified in the monitoring rules (i.e., 40 CFR Parts 53 and 58) are adhered to.

The Department's Ambient Air Monitoring Section in the Bureau of Quality Assurance conducts two types of audits, which are performed at each monitoring location at approximately six month intervals:

- A Performance Audit checks the accuracy of the field monitoring equipment. It is performed by Department oversight staff with QA Standards Laboratory audit equipment, thus ensuring independence from the normal monitoring operators and their calibration equipment.
- A Systems Audit is a check on the entire operation of the monitoring program. This audit examines the field operators' procedures, techniques, and schedules. It also checks the supervising engineers' review of the operators' records, the actual data obtained, and the results being recorded in the database.

Once the QA process is complete and ambient air monitoring data have been assured as accurate, precise, and complete, these data are submitted by the Department to EPA's Air Quality System (AQS) for public access.

The monitoring data for these NYMA redesignation requests are provided by the monitors that are listed in Table 1 and shown in Figures 1 and 2 (with Figure 2 providing a more detailed view of monitors in New York City). These monitors are FRM samplers which are a part of the overall $PM_{2.5}$ monitoring network used for comparison to the NAAQS. All samplers employ 1-in-3 day sampling with the exception of the IS 52 and Queens College monitors, which sample daily.

Table 1. $PM_{2.5}$ FRM Samplers Serving the New York Metropolitan Area

Monitor	AQS ID	Address	County	Coordinates
Hempstead	36-059-0008	Lawrence High School Arlington Place, Cedarhurst 11516	Nassau	40.6310 N -73.7339 W
Babylon	36-103-0002	Farmingdale Water District 72 Gazza Blvd., Babylon 11735	Suffolk	40.7429 N -73.41919 W
JHS 45	36-061-0079	NYC Dept. of Education - JHS 45 2351 1st Ave., New York 10035	New York	40.79970 N -73.93432 W
PS 19	36-061-0128	NYC Dept. of Education – PS 19 185 1st Ave., New York 10003	New York	40.73000 N -73.98446 W
Division Street	36-061-0134	NYC Dept. of Education - PS 124 40 Division St., New York 10002	New York	40.71436 N -73.99518 W
Morrisania	36-005-0080	Diagnostic & Treatment Center 1225-57 Gerard Ave., Bronx 10452	Bronx	40.83606 N -73.92009 W
Botanical Garden [sampler moved from Harding to Pfizer 1/1/08]	Harding Lab: 36-005-0083	200th St. & Southern Blvd., Bronx 10458	Bronx	40.86585 N -73.88083 W
	Pfizer Lab: 36-005-0133			40.86790 N -73.87809 W
IS 52	36-005-0110	NYC Dept. of Education - PS 52/MS 302 681 Kelly St., Bronx 10455	Bronx	40.8162 N -73.9020 W
JHS 126	36-047-0122	NYC Dept. of Education - JHS 126 424 Leonard St., JHS 126, Brooklyn 11222	Kings	40.71961 N -73.94771 W
Queens College/ PS 219	36-081-0124	144-39 Gravett Rd., Flushing 11367	Queens	40.73619 N -73.82318 W
Susan Wagner	36-085-0067	NYC Dept. of Education - Susan Wagner HS 1200 Manor Ave., Staten Island 10314	Richmond	40.59664 N -74.12525 W
Port Richmond	36-085-0055	U.S. Post Office - Port Richmond Station 364 Port Richmond Ave, Staten Island 10302	Richmond	40.63307 N -74.13719 W
Newburgh	36-071-0002	Public Safety Building 55 Broadway, Newburgh 12550	Orange	41.49916 N -74.00885 W
Mamaroneck	36-119-1002	NYSDOT - Larchmont Maintenance Facility 627 5th Ave., Larchmont 10538	Westchester	40.93149 N -73.76575 W

Figure 1. NYMA $PM_{2.5}$ Monitor Locations

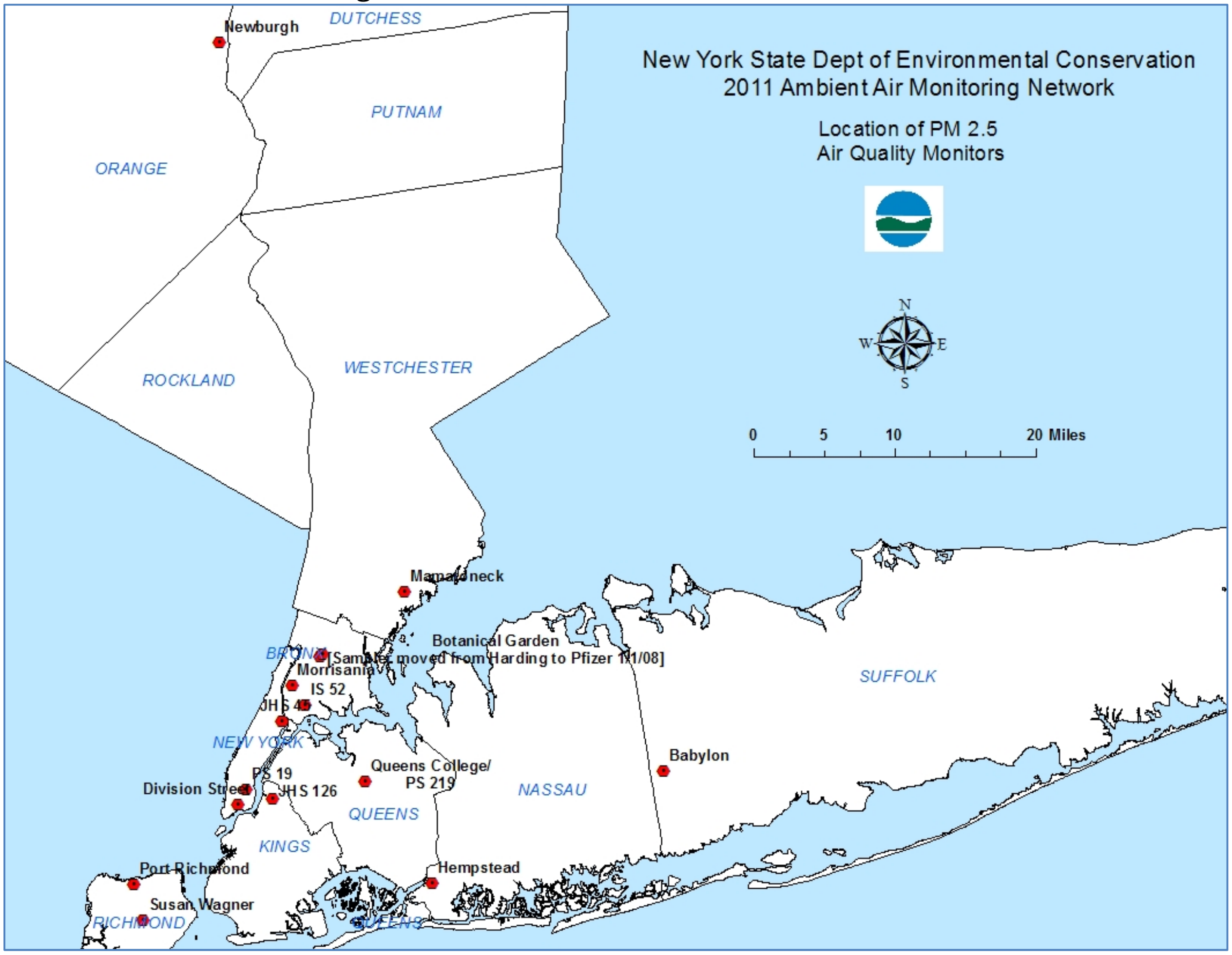
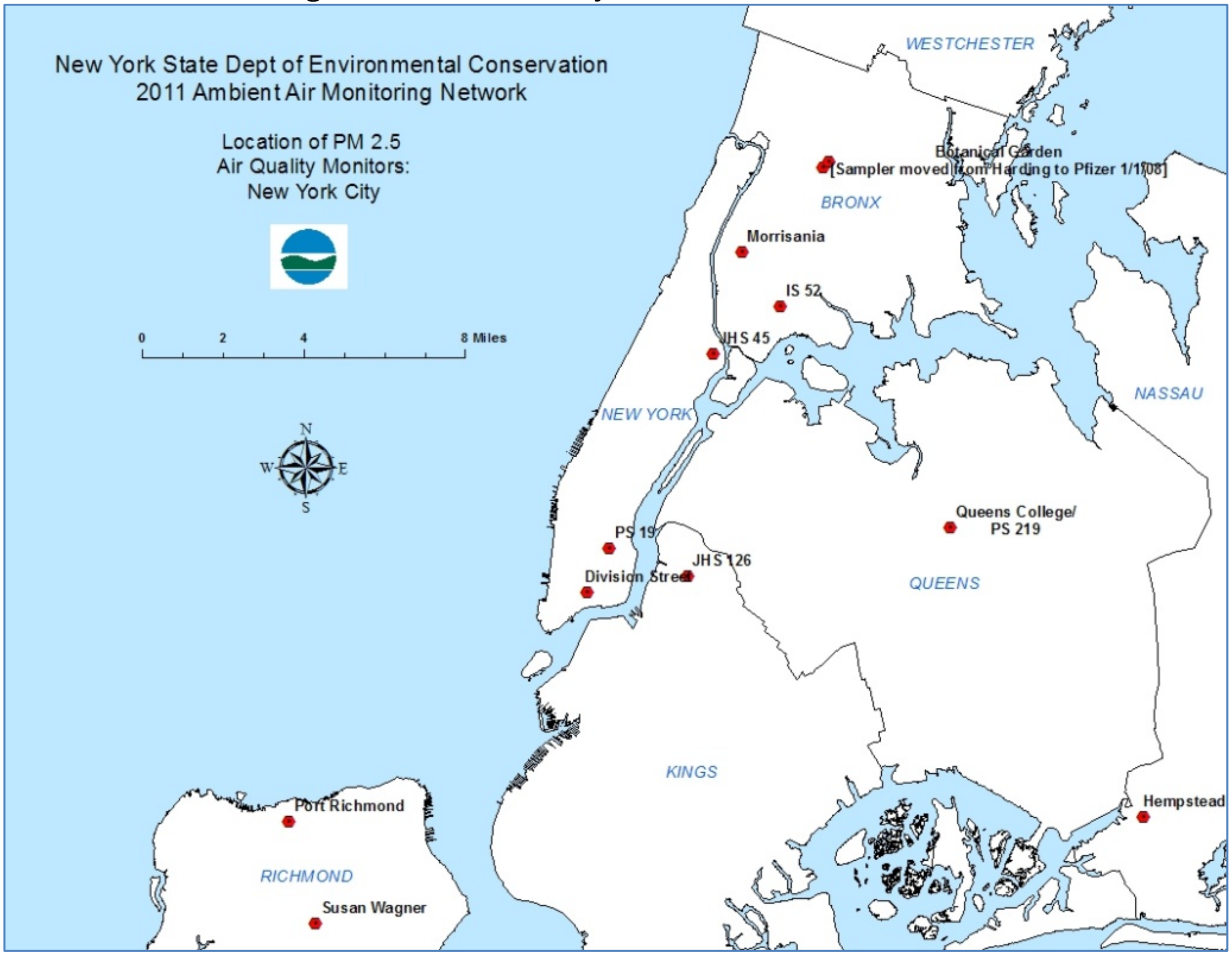


Figure 2. New York City $PM_{2.5}$ Monitor Locations



2. 2009 and 2010 Design Values

The 2009 and 2010 design values (based on monitoring data from years 2007 through 2009, and 2008 through 2010, respectively) are presented in Table 2 for the annual standard and in Table 3 for the 24-hour standard. At each population-oriented monitor within an area, the design values for the annual standard are based on the annual arithmetic mean over three years; the design values for the 24-hour standard are based on the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area.

As shown in these tables, the maximum 2009 and 2010 design values for the annual standard are 13.9 $\mu g/m^3$ and 12.5 $\mu g/m^3$, respectively, both associated with the Morrisania monitor. The maximum 2009 and 2010 design values for the 24-hour standard are 33 $\mu g/m^3$ and 29 $\mu g/m^3$, respectively, with each being associated with multiple monitors.

Table 2. 2009 and 2010 Design Values for the 1997 Annual $PM_{2.5}$ Standard ($\mu g/m^3$)

Monitoring Site	AQS ID	2007 Avg.	2008 Avg.	2009 Avg.	2010 Avg.	2009 Design Value	2010 Design Value
Hempstead	36-059-0008	11.1	10.9	9.0	8.7	10.3	9.5
Babylon	36-103-0002	10.9	10.1	8.1	8.4	9.7	8.9
JHS 45	36-061-0079	13.6	12.2	10.4	9.8	12.1	10.8
Division Street	36-061-0134	13.3	13.2	11.6	11.5	12.7	12.1
Morrisania	36-005-0080	15.6	13.5	12.7	11.4	13.9	12.5
Botanical Garden	36-005-0083/0133	13.2	11.7	10.0	10.0	11.6	10.6
IS 52	36-005-0110	12.8	11.8	10.8	10.2*	11.8	N/A
JHS 126	36-047-0122	13.9	12.0	10.7	9.9	12.2	10.9
Queens College	36-081-0124	11.4	11.0	9.5	9.4	10.6	10.0
Susan Wagner	36-085-0067	11.5	10.7	8.5	8.2	10.2	9.1
Port Richmond	36-085-0055	13.0	12.1	9.8	9.7	11.6	10.5
Newburgh	36-071-0002	10.6	9.5	7.9	8.1	9.3	8.5
Mamaroneck	36-119-1002	11.7	11.0	9.1	8.8	10.6	9.6

*Sampling suspended during latter half of 2010 due to nearby construction

Table 3. 2009 and 2010 Design Values for the 2006 24-Hour $PM_{2.5}$ Standard ($\mu g/m^3$)

Monitoring Site	AQS ID	2007 98th %	2008 98th %	2009 98th %	2010 98th %	2009 Design Value	2010 Design Value
Hempstead	36-059-0008	28.5	29.2	25.8	20.2	28	25
Babylon	36-103-0002	28.8	26.8	21.6	26.1	26	25
JHS 45	36-061-0079	34.3	32.3	28.8	25.2	32	29
Division Street	36-061-0134	37.1	31.8	29.0	27.0	33	29
Morrisania	36-005-0080	36.2	31.3	30.0	27.0	33	29
Botanical Garden	36-005-0083/0133	32.5	29.8	27.4	24.8	30	27
IS 52	36-005-0110	34.4	29.9	30.6	25.4*	32	N/A
JHS 126	36-047-0122	33.6	29.4	26.9	24.8	30	27
Queens College	36-081-0124	31.8	30.3	26.7	25.5	30	28
Susan Wagner	36-085-0067	28.8	27.7	23.0	21.5	27	24
Port Richmond	36-085-0055	32.8	28.7	24.6	25.5	29	26
Newburgh	36-071-0002	30.4	26.0	20.6	26.5	26	24
Mamaroneck	36-119-1002	30.6	30.4	27.0	26.7	29	28

*Sampling suspended during latter half of 2010 due to nearby construction

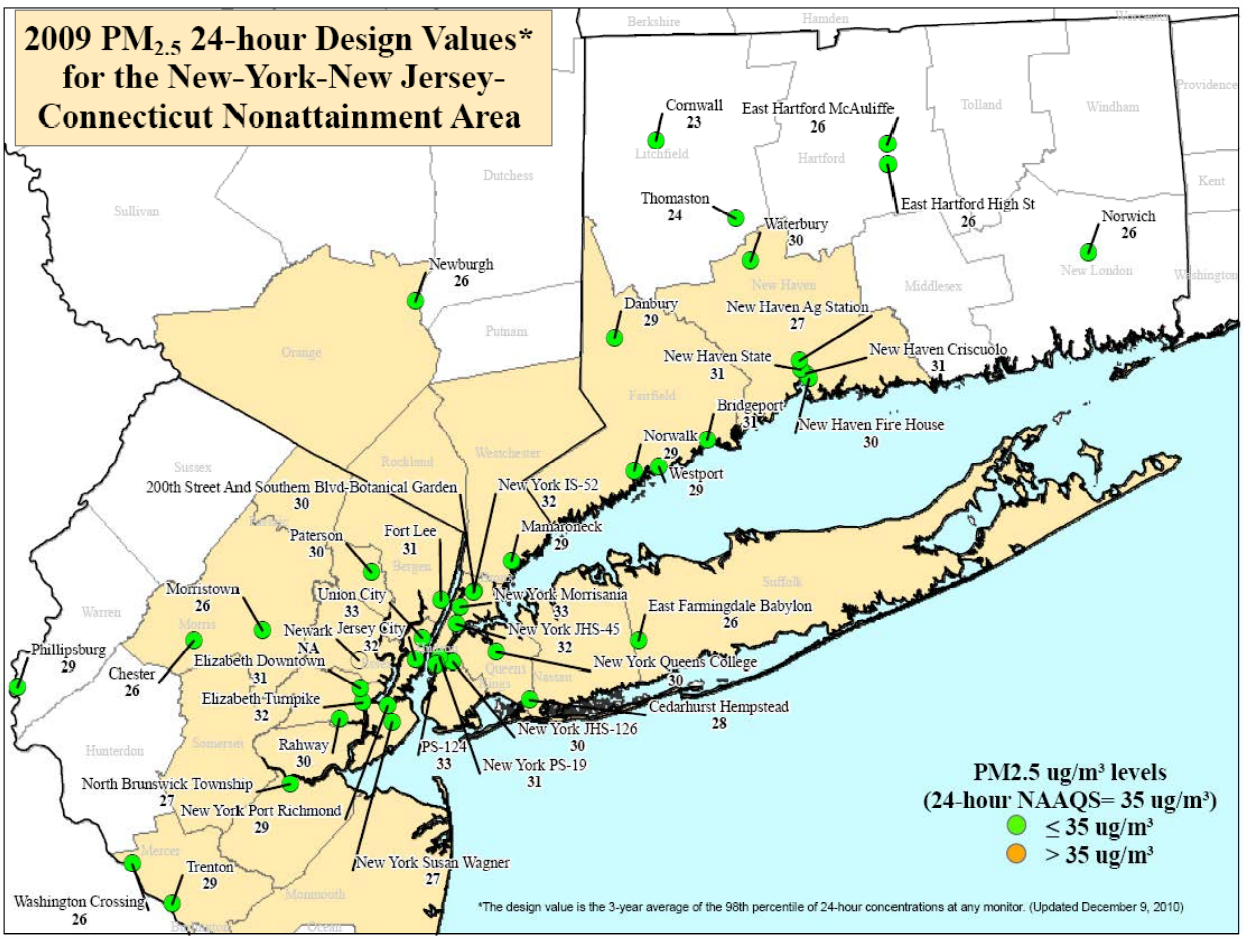
Certain data completeness issues arose when calculating these 2009 and 2010 design values for the annual and 24-hour standards. This included monitors with inadequate sampling rates during an individual quarter, suspension of sampling affecting multiple quarters (commonly due to nearby construction, which greatly impacts ambient $PM_{2.5}$ concentrations), and the permanent closure of two monitoring sites.

Data-handling conventions for these standards are illustrated in Appendix N of 40 CFR Part 50. Appendix N states that "[t]he use of less than complete data is subject to the approval of EPA, which may consider factors such as monitoring site closures/moves, monitoring diligence, and nearby concentrations in determining whether to use such data."[9] The Department presented solutions to these data completeness issues in an attachment to its clean data petition for the 24-hour $PM_{2.5}$ NAAQS, which was submitted to EPA on May 5, 2011 and approved on December 31, 2012. These issues should therefore not affect the finding that the NYMA has reached attainment of these standards.

3. Adjacent States within the Nonattainment Area

Portions of the states of Connecticut and New Jersey, in addition to a portion of New York, comprise the New York–N. New Jersey–Long Island, NY–NJ–CT nonattainment area. It is thus important to assess and evaluate the monitoring data for these adjacent areas in addition to the data for the New York portion of the nonattainment area. Figure 3 shows the location of the $PM_{2.5}$ monitors within the entire nonattainment area, as well as the associated 24-hour design values for 2009. [10]

Figure 3. Tri-State Monitor Locations and 2009 24-Hour Design Values



[9] 40 CFR Chapter 1, Part 50, Appendix N – "*Interpretation of the National Ambient Air Quality Standards for $PM_{2.5}$*," July 1, 2011 edition, p.127
[10] Source: Connecticut Department of Environmental Protection

Tables 4 and 5 display the yearly values and the 2009 and 2010 design values for the annual and 24-hour standards, respectively, for each monitoring site within the New Jersey and Connecticut portions of the NY-NJ-CT nonattainment area. All design values in these states are also below the relevant standards.

Table 4. 2009 and 2010 Design Values for the 1997 Annual $PM_{2.5}$ Standard – CT and NJ

	Monitoring Site	AQS ID	2007 Avg.	2008 Avg.	2009 Avg.	2010 Avg.	2009 Design Value	2010 Design Value
Connecticut	Bridgeport Roosevelt	09-001-0010	12.7	11.9	9.4	8.8	11.3	10.0
	Danbury WCSU	09-001-1123	12.0	11.7	9.2	9.1	11.0	10.0
	Norwalk*	09-001-3005	11.9	11.8	9.5	8.7	11.1	10.0
	Westport	09-001-9003	10.9	10.2	8.9	8.6	10.0	9.2
	New Haven Fire House**	09-009-0026	11.6	11.5	9.2	10.2	10.8	N/A
	New Haven Criscuolo Park	09-009-0027	11.5	11.3	9.7	8.9	10.8	9.9
	New Haven State St	09-009-1123	12.3	12.1	9.9	9.0	11.4	10.3
	New Haven Ag. Station*	09-009-2008	10.8	10.6	8.5	9.0	10.0	N/A
	Waterbury	09-009-2123	12.0	11.7	9.4	9.2	11.0	10.1
New Jersey	Fort Lee	34 003 0003	13.3	11.6	9.0	8.8	11.3	9.8
	Newark Cultural Center***	34 013 0015	13.4	13.7	N/A	N/A	N/A	NA
	Newark Firehouse****	34 013 0003	N/A	N/A	N/A	9.2	N/A	NA
	Jersey City Primary	34 017 1002	13.2	12.1	10.3	9.6	11.9	10.6
	Union City	34 017 2002	15.1	13.3	10.7	10.6	13.0	11.5
	Trenton	34 021 0008	12.1	11.2	9.2	9.6	10.9	10.0
	Washington Crossing	34 021 8001	10.2	10.0	7.8	8.2	9.3	8.7
	New Brunswick	34 023 0006	12.3	10.9	8.0	7.4	10.4	8.8
	Morristown	34 027 0004	11.5	9.4	8.1	8.5	9.7	8.7
	Chester	34 027 3001	10.4	8.8	7.1	7.6	8.8	7.8
	Paterson	34 031 0005	13.5	11.4	8.9	8.9	11.3	9.7
	Elizabeth Turnpike Primary	34 039 0004	13.9	12.9	11.2	10.6	12.7	11.6
	Elizabeth Downtown	34 039 0006	13.1	12.4	9.3	9.2	11.6	10.3
	Rahway	34 039 2003	13.2	12.0	9.3	9.3	11.5	10.2

*Data incomplete due to multiple technical issues at site
**Data incomplete due to site shutdown (redundancy study determined it to be low priority)
***Monitor at Newark Cultural Center shut down 7/24/2008
****Monitor at Newark Firehouse commenced operation 6/30/2009

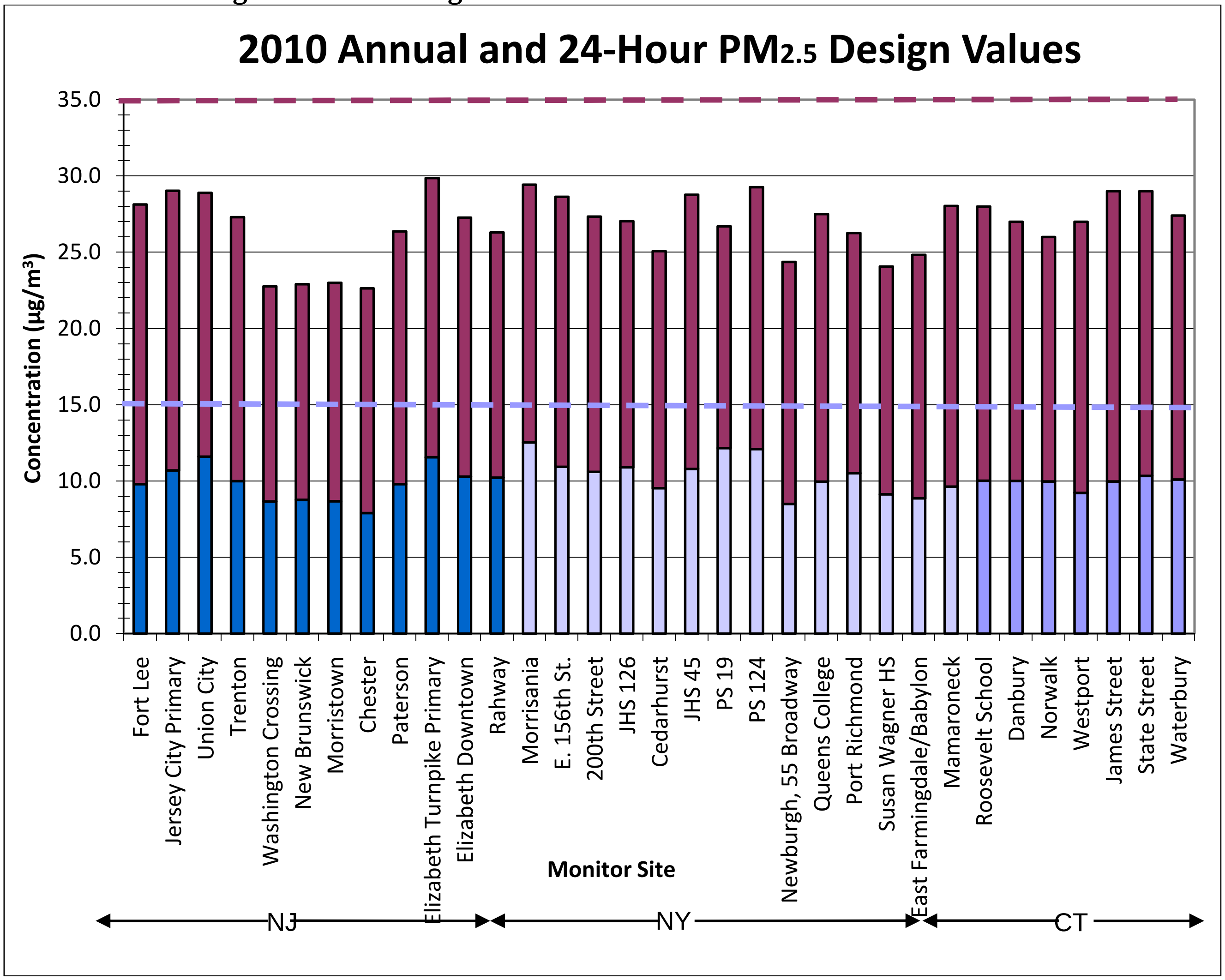
Table 5. 2009 and 2010 Design Values for the 2006 24-Hour $PM_{2.5}$ Standard – CT and NJ

	Monitoring Site	AQS ID	2007 98th %	2008 98th %	2009 98th %	2010 98th %	2009 Design Value	2010 Design Value
Connecticut	Bridgeport Roosevelt	09-001-0010	30.2	32.3	29.3	23.3	31	28
	Danbury WCSU	09-001-1123	30.4	27.5	27.6	25.7	29	27
	Norwalk*	09-001-3005	31.9	26.3	29.3	23.0	29	26
	Westport	09-001-9003	29.0	30.7	26.4	24.2	29	27
	New Haven Firehouse**	09-009-0026	29.8	30.9	28.5	21.7	30	N/A
	New Haven Criscuolo Park	09-009-0027	30.5	31.5	30.2	25.5	31	29
	New Haven State St	09-009-1123	30.6	32.1	30.8	23.9	31	29
	New Haven Ag. Station*	09-009-2008	28.5	25.4	27.3	19.5	27	N/A
	Waterbury	09-009-2123	32.7	28.4	28.1	25.7	30	27
New Jersey	Fort Lee	34 003 0003	34.5	32.2	27.0	25.1	31	28
	Newark Cultural Center***	34 013 0015	34.9	28.7	N/A	N/A	N/A	N/A
	Newark Firehouse****	34 013 0003	N/A	N/A	N/A	24.0	N/A	N/A
	Jersey City Primary	34 017 1002	34.9	32.0	29.0	26.4	32	29
	Union City	34 017 2002	39.1	33.4	25.0	26.7	33	29
	Trenton	34 021 0008	32.5	31.0	23.0	27.7	29	27
	Washington Crossing	34 021 8001	27.2	27.6	25.0	18.5	27	23
	New Brunswick	34 023 0006	30.4	28.9	21.0	19.1	27	23
	Morristown	34 027 0004	32.4	23.8	22.0	23.3	26	23
	Chester	34 027 3001	31.4	24.3	21.0	22.7	26	23
	Paterson	34 031 0005	36.6	28.6	26.0	24.4	30	26
	Elizabeth Tpk. Primary	34 039 0004	35.0	33.8	28.0	28.1	32	30
	Elizabeth Downtown	34 039 0006	35.9	31.1	26.0	25.1	31	27
	Rahway	34 039 2003	33.4	29.9	25.0	23.8	30	26

*Data incomplete due to multiple technical issues at site
**Data incomplete due to site shutdown (redundancy study determined it to be low priority)
***Monitor at Newark Cultural Center shut down 7/24/2008
****Monitor at Newark Firehouse commenced operation 6/30/2009

Figure 4 shows these 2010 24-hour and annual $PM_{2.5}$ design values graphically for all monitors in the tri-state nonattainment area.[11] The lower portion of each bar (blue) shows the annual design values for each monitor location, with the corresponding 24-hour design value stacked on top (brown). As seen in Tables 4 and 5, all locations have both annual and 24-hour design values below the respective standards of 15 µg/m^3 and 35 µg/m^3.

Figure 4. 2010 Design Values for the Tri-State Nonattainment Area



Looking further back in time, the design values for all three states show a downward trend over the past 10 years for both the annual and 24-hour standards. This is evidenced in Table 6—the "maximum design value" refers to the value at the NYMA monitor with the highest design value within each state.

[11] Source: New Jersey Department of Environmental Protection

Table 6. Recent Maximum Design Values in the NYMA

Year	Max Annual DV			Max Annual % NAAQS			Max 24-Hr DV			Max 24-Hr % NAAQS		
	CT	NJ	NY	CT	NJ	NY	CT	NJ	NY	CT	NJ	NY
2001	16.8	17.5	-	112%	117%	-	40	48	-	114%	137%	-
2002	16.4	16.6	17.6	109%	111%	117%	40	44	40	114%	126%	114%
2003	16.6	16.3	17.6	111%	109%	117%	41	39	40	117%	111%	114%
2004	12.6	16.8	16.8	84%	112%	112%	39	40	40	111%	114%	114%
2005	13.4	17.4	17.0	89%	116%	113%	40	44	41	114%	126%	117%
2006	13.2	15.7	15.6	88%	105%	104%	38	43	40	109%	123%	114%
2007	13.2	14.4	15.8	88%	96%	105%	36	41	39	103%	117%	111%
2008	12.4	14.1	14.3	83%	94%	95%	34	38	36	97%	109%	103%
2009	11.4	13.0	13.9	76%	87%	93%	31	33	33	89%	94%	94%
2010	10.3	11.6	12.5	69%	77%	83%	29	30	30	83%	86%	86%

The data from Table 6 are displayed graphically in Figures 5 and 6. Connecticut's maximum design values have not exceeded the annual NAAQS since 2003, and New Jersey's maximum design values have not exceeded that standard since 2006. Likewise, Connecticut has not exceeded the 24-hour NAAQS since 2007, and New Jersey has not exceeded that standard since 2008.

Figure 5. Maximum Annual Design Value Trends in the NYMA

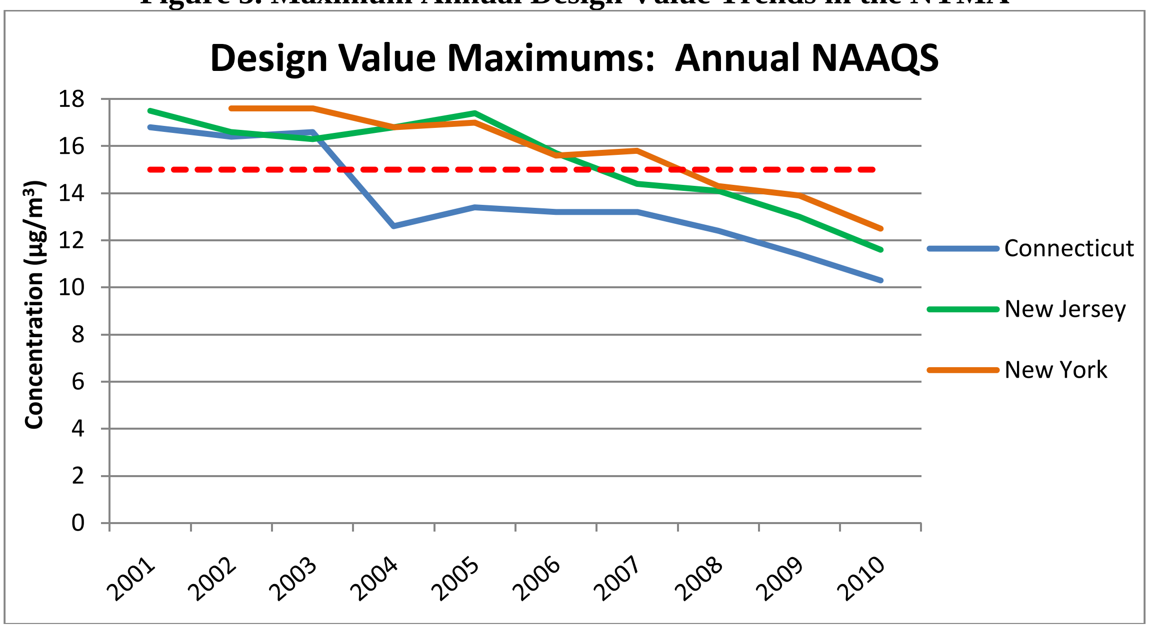
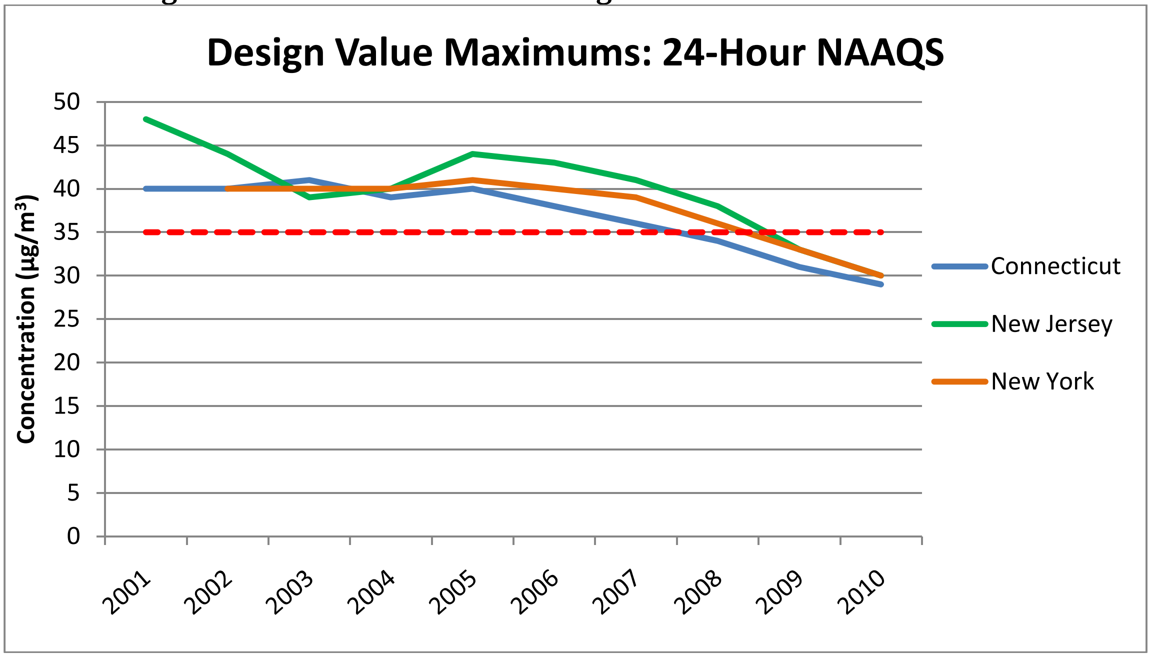


Figure 6. Maximum 24-Hour Design Value Trends in the NYMA



B. Fully Approved SIP under Section 110(k)

The granting of a redesignation is contingent on EPA approving an area's SIP or SIP revision under CAA section 110(k). The Department submitted to EPA an attainment SIP for the annual $PM_{2.5}$ standard on October 27, 2009. A clean data petition was later submitted on June 9, 2010, using a 2009 design value to demonstrate attainment. As previously noted, a clean data determination was granted by EPA. (Note that since EPA approved the clean data petition, there was no longer any reason to approve the attainment SIP.)

The monitoring data for the NYMA demonstrated attainment of the 2006 24-hour standard just a year after designations were made, and prior to the deadline by which to submit an attainment SIP. In lieu of submitting a full attainment SIP for the 24-hour standard to EPA, the Department submitted a clean data petition to EPA on May 5, 2011. This petition relied on the same 2009 and 2010 design values included in this redesignation request. On December 31, 2012, EPA published approval of this petition. This approved clean data determination suspends the requirements for submitting a SIP revision concerning attainment demonstrations, reasonable further progress measures, and contingency measures. The clean data determination does not eliminate the emission inventory, New Source Review, or transportation conformity requirements, however.

The maintenance plan portion of this document contains a 2007 base year emissions inventory for the NYMA. With approval of this base year inventory, EPA will have fully approved the New York SIP for the NYMA under section 110(k) for all requirements applicable for purposes of redesignation.

The Department has therefore satisfied the requirements for demonstrating attainment of the annual and 24-hour standards for $PM_{2.5}$. New York will continue to operate its air quality monitoring network, and if the NYMA or another area within New York experiences a violation of either standard, that area would be subject to a requirement to submit the pertinent SIP revision(s) and would also need to address the requirements for attainment demonstrations, reasonable further progress measures, and contingency measures.

C. Permanent and Enforceable Reductions

Redesignation requests must demonstrate that improvements in air quality are based on permanent and enforceable emission reductions. These reductions would come from such sources as applicable federal rules, state regulations, and permit limits.

In a January 4, 2013 decision by the U.S. Court of Appeals for the D.C. Circuit, the court upheld a challenge to EPA's use of CAA Part D, Subpart 1 for the $PM_{2.5}$ NAAQS. The court ruled that Part D, Subpart 4, despite its references only to the PM_{10} NAAQS, applied to all PM having a diameter equal to or less than 10 micrometers, including $PM_{2.5}$. The Department affirms that this redesignation request and the associated maintenance plan comply with the requirements of Subpart 4.

The permanent and enforceable measures discussed in this document primarily resulted in emission reductions from SO_2 and NO_x, the pollutants that most significantly contributed to secondary PM formation. VOCs, to a lesser extent, also contributed to PM formation, while ammonia was not considered a significant precursor. (Ammonia emissions in the NYMA are currently low, particularly when compared to emissions of other precursors and direct PM, and are projected to decrease approximately 18 percent between the 2007 base year and 2025 projection year.) By expeditiously attaining the $PM_{2.5}$ NAAQS through the targeted emissions reductions of these precursors, the Department has satisfied the provisions of CAA section 189(e). Attainment of the NAAQS in this expeditious manner also demonstrates that the Reasonably Available Control Measure requirements for $PM_{2.5}$ and the significant precursors have been satisfied.

Figures 7 and 8 display the trend in $PM_{2.5}$ concentrations over the last decade for the New York NYMA monitors. In Figure 7, the concentration for each year was calculated by averaging the arithmetic mean values (as used to calculate the annual design values) at the monitors listed in Table 1 and shown in Figure 1. Figure 8 displays the trends using average concentrations based on the 98^{th} percentile values (as used to calculate the 24-hour design values) at these same monitors.

Figure 7. NYMA Design Value Trend for the Annual NAAQS

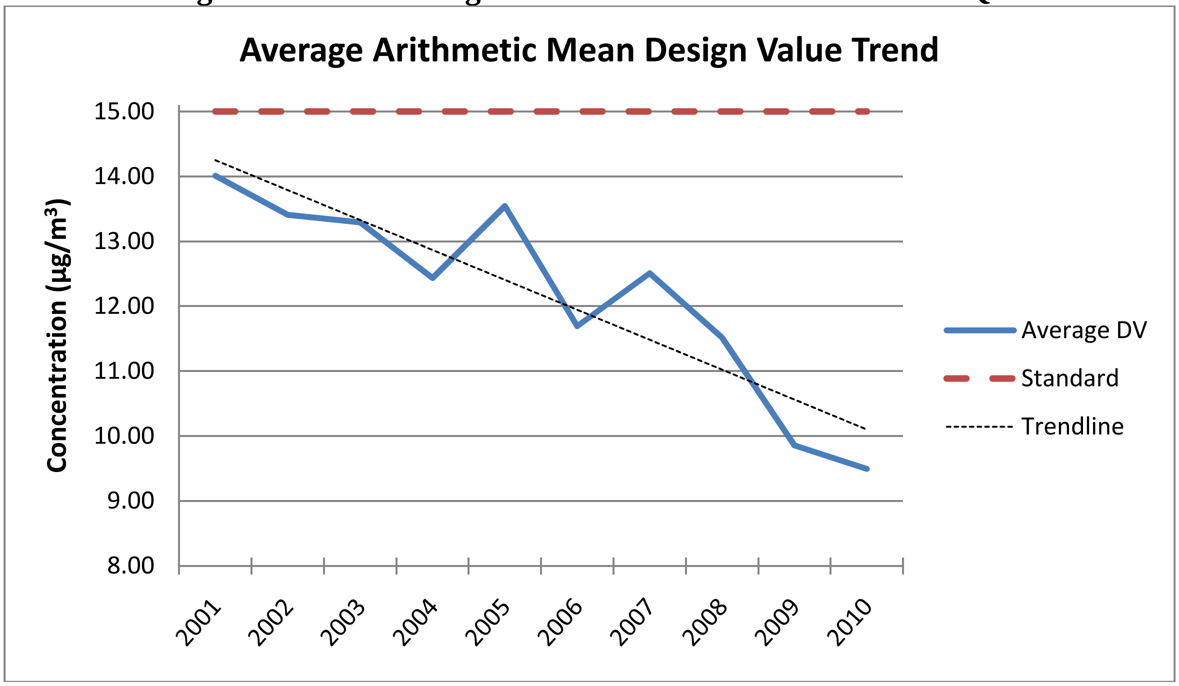
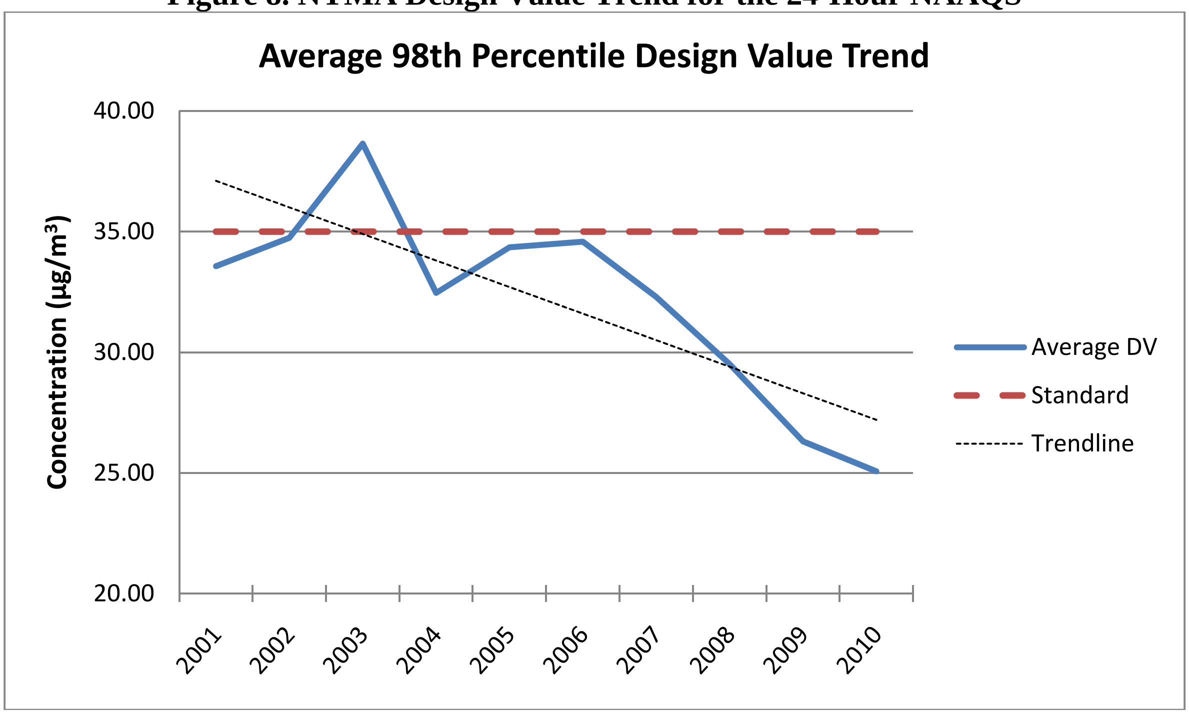


Figure 8. NYMA Design Value Trend for the 24-Hour NAAQS



These graphs display the average design value among all NYMA monitors – whereas the maximum design value at an individual monitor is compared to the NAAQS for attainment/nonattainment purposes. They serve to illustrate the general downward trend of $PM_{2.5}$ concentrations in the NYMA which the Department attributes to permanent and enforceable reductions resulting from the many state and federal control programs targeting PM and its precursors. This decline in ambient $PM_{2.5}$ concentrations in the NYMA is the result of years of planning and concerted effort at the local, state, and federal levels in an effort to reduce SO_2, NO_x, VOC, and direct PM emissions. These planning efforts have focused on the point, area, and mobile source sectors, both in New York City and across the state. Emission reductions from upwind portions of the state also benefit air quality in the NYMA.

1. Stationary and Area Sources

There are few state and federal regulations that place specific requirements on direct PM emissions from stationary and area sources. The Department's New Source Review regulation does contain requirements for $PM_{2.5}$; otherwise, PM pollution is most commonly reduced through regulations that affect precursors—generally SO_2, NO_x, and, while not a significant precursor for $PM_{2.5}$ formation, VOCs. VOCs are precursors to ozone formation and, as a result, are regulated for ozone and therefore have the co-benefit of reducing secondary $PM_{2.5}$ formation.

Some of these emissions reductions have resulted from federal trading programs: the NO_x Budget Trading Program for ozone season NO_x emissions, the Acid Deposition Reduction Program (ADRP) for SO_2 and non-ozone season NO_x emissions, and the Clean Air Interstate Rule (CAIR) for SO_2 and NO_x emissions. The Department, meanwhile, has promulgated many regulations under Title 6 of the New York Codes, Rules, and Regulations (NYCRR) that target PM precursors in order to comply with the PM NAAQS as well as other NAAQS and air quality requirements. A number of these regulations have resulted from efforts of the Ozone Transport Commission (OTC) to address regional ozone issues. Because NO_x and VOCs represent the primary precursors of ozone formation, the OTC collaborates to devise impactful yet cost-effective model rules for states to then officially adopt as needed. Additional model rules are typically developed for successive ozone NAAQS, as greater levels of emissions reductions are continuously needed.

To that end, the Department has promulgated a number of regulations for the stationary and area source sectors that have resulted in decreased secondary PM formation. The federal and state measures listed below have generally been implemented since the annual and 24-hour $PM_{2.5}$ NAAQS were finalized. Because these measures have been implemented by the Department as revisions to the SIP, they cannot be repealed or relaxed without equivalent reductions from other source(s) pursuant to the backsliding provisions of the CAA (e.g., section 110(l)).

These control measures typically result in reductions of precursor emissions of PM. In some cases, particularly for RACT regulations, the thresholds at which a source becomes applicable for a rule are lower in the NYMA. Some of these regulations (e.g., Part 205, Subpart 227-2) are periodically updated with more stringent control requirements as control technology improves and/or becomes less costly, and as additional emission reductions are needed. The continued implementation of these control regulations will aid in sustaining the declining concentration trends seen in Figures 7 and 8, and as projected in section III of this document. In addition to these regulations, a recent shift in fossil fuel use to natural gas (due to increased supply and greatly reduced cost) is aiding in PM reductions, mostly due to the negligible SO_2 content of the fuel.

- 6 NYCRR Part 205 – *Architectural and Industrial Maintenance (AIM) Coatings* (latest revision effective 1/1/05)
    - Sets limits on the VOC content of materials defined as architectural coatings and industrial maintenance coatings.
- 6 NYCRR Section 212.10 – *Reasonably Available Control Technology for Major Facilities* (latest revision effective 9/22/94)
    - Although this regulation was not revised since the $PM_{2.5}$ NAAQS were promulgated, it continues to achieve emission reductions as it requires major stationary sources to apply RACT to all emission points of NO_x and VOC.
- 6 NYCRR Part 226 – *Solvent Metal Cleaning Processes* (latest revision effective 5/7/03)
    - This RACT regulation sets guidelines and operating requirements for the cleaning of metal surfaces by VOC-containing substances.
- 6 NYCRR Subpart 227-2 – *Reasonably Available Control Technology (RACT) for Major Facilities of Oxides of Nitrogen (NO_x)* (previous revision effective 2/11/04)
    - Updated the existing subpart 227-2, which contains NO_x emission limits for boilers of various sizes and combustion turbines, with additional/more stringent NO_x limits.

2. Mobile Sources

Mobile sources are a significant source of $PM_{2.5}$ within the NYMA. New York has implemented a series of increasingly stringent control measures that address emissions of $PM_{2.5}$ and its precursors which derive from mobile sources. Inventory data for mobile sources continue to show a downward trend similar to the one demonstrated in the annual $PM_{2.5}$ attainment SIP. These data are presented in Table 7 for the 2007 base-year inventory, and are projected to 2017 and 2025 based on the future-year inventory. (See section III.A for additional inventory data).

Table 7. On-Road Mobile Source Inventories

	2007 Inventory		2017 Projection Inventory		2025 Projection Inventory	
Pollutant	**Tons**	**Percent***	**Tons**	**Percent***	**Tons**	**Percent***
$PM_{2.5}$	6,835.30	26.3%	3,897.71	20.0%	3,291.09	17.3%
SO_2	982.77	1.2%	939.20	1.8%	935.40	1.8%
NO_x	149,501.91	52.0%	68,362.66	36.7%	51,260.81	31.2%

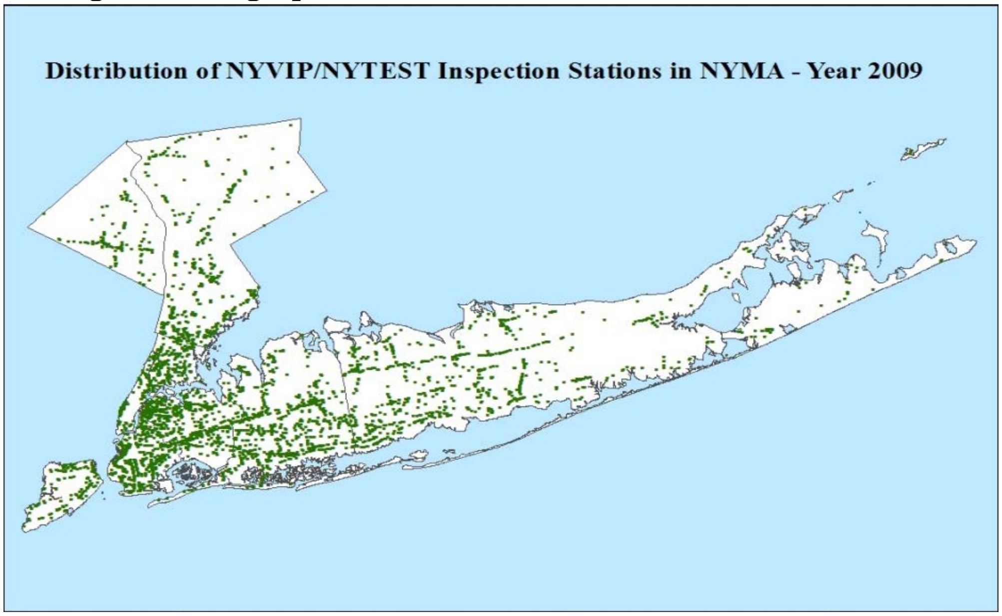
*Percent of entire New York State emissions inventory (not considering Rule Effectiveness)

A key element of the control measures that New York deploys to reduce $PM_{2.5}$ emissions from mobile sources is the Vehicle Inspection and Maintenance (I/M) Program. New York's I/M program (regulated under Subparts 217-1 and 217-4) has been modified over time to reflect state and federal regulatory changes, most notably the implementation of new emission test types (e.g., NYTEST, OBD II). New York's enhanced I/M programs have resulted in the following SIP revisions which further reduced mobile source emissions:

- Enhanced Motor Vehicle Inspection/Maintenance Program (March 1996);
- New York Vehicle Inspection Program – NYVIP (March 2006);
- New York Metropolitan Area Enhanced I/M Program (June 2009).

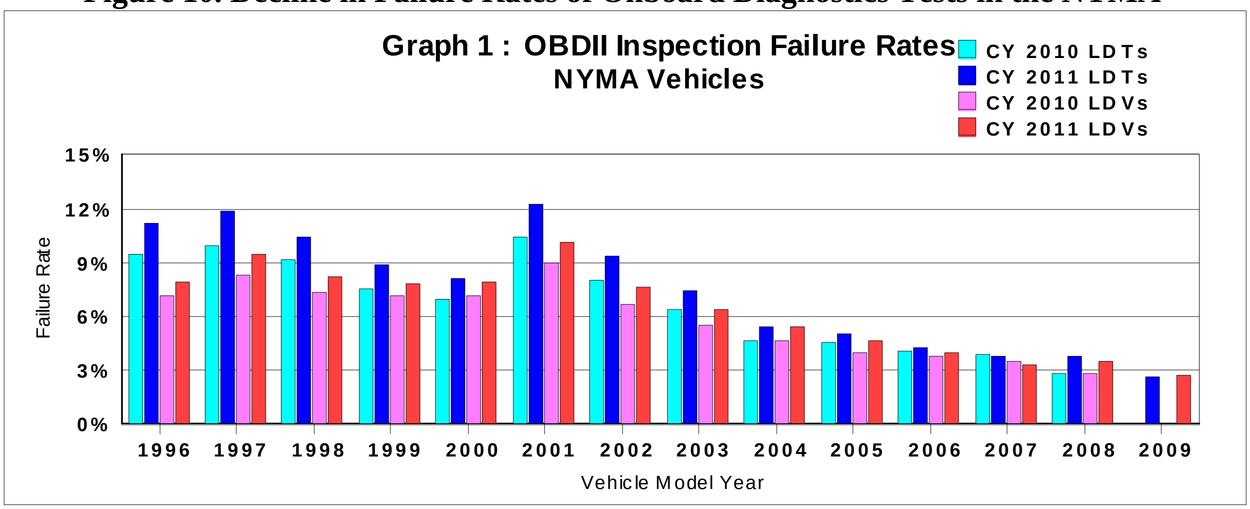
During calendar year 2010, more than 3.34 million light-duty vehicles and trucks received initial Onboard Diagnostics (OBD II) inspections in NYMA from over 3,700 inspection stations. Figure 9 illustrates the geographic distribution of these inspection stations within the NYMA for 2009.

Figure 9. Geographic Location of NYVIP/NYTEST Sites in 2009



The number of vehicles receiving initial OBD II tests in 2010 represented nearly 88 percent of the total emissions-tested fleet within the NYMA. Figure 10 illustrates the steady decline in failure rates for OBD-tested vehicles in the NYMA region from 2001 to 2009.

Figure 10. Decline in Failure Rates of Onboard Diagnostics Tests in the NYMA



An additional 458,000 light-duty vehicles, light-duty trucks, and heavy-duty vehicles received tailpipe initial inspections under the NYTEST program, which represent an increasingly smaller fraction of the emissions-tested fleet, as those vehicles are pre-1996 model-year vehicles not subject to OBD II testing under NYVIP. Light-duty diesel-fueled vehicles, a source of PM, represented only 0.14 percent of the NYMA light-duty vehicle fleet.

In addition to the state I/M program, EPA has led an integrated approach to mobile source emissions control that advances vehicle and engine design while fuels become cleaner and of higher quality. EPA expects emissions to continue their downward trend even as the number of vehicle miles traveled increases. The federal rules that have been adopted or began being phased since the promulgation of the $PM_{2.5}$ NAAQS are listed below:

- Federal *Tier 2 Gasoline Sulfur Program* (effective 4/10/00)
    - Phased in from 2004-2007, and now in full effect, the program requires refiners to meet an annual corporate average gasoline sulfur level of 30 ppm (with no individual batch exceeding 80 ppm). This represents up to a 90 percent reduction in sulfur content from uncontrolled levels.
- Federal *Cleaner Diesel Fuel Program*
    - This program refers to a collection of mobile-source related regulations. Under this program, a 15 ppm ULSD specification was phased in for highway diesel fuel from 2006-2010. Additionally, a low sulfur (500 ppm) and ULSD fuel specification is being phased in for nonroad, locomotive, and marine engines from 2007-2014.
- Federal Rule – *Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land-Based)* (effective 1/7/03)
    - A variety of previously unregulated nonroad engines were targeted for NO_x, CO, and hydrocarbon emission reductions with this rulemaking. Various standards went into effect for the different engine types between 2004 and 2007.
- Federal Rule – *Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel* (effective 8/30/04)
    - This rule established NO_x and PM emissions standards for nonroad diesel engines that began being phased-in in 2008. EPA cites sulfur oxide reductions of greater than 99 percent from its nonroad diesel fuel sulfur reductions. These fuel sulfur reductions were implemented with an interim step of 500 ppm in June, 2007, with the final 15 ppm limit in place in June, 2010.

3. Recently Adopted or Revised Control Measures

In addition to the previously established control measures discussed above, there are a number of control measures that were recently adopted or revised as a result of planning for the 1997 annual $PM_{2.5}$ NAAQS, the 1997 8-hour ozone NAAQS, or the Regional Haze program, or which resulted from additional state and federal mandates. The measures summarized below have been adopted by the Department since 2009, when the NYMA first demonstrated attainment with the annual and 24-hour $PM_{2.5}$ NAAQS. Emissions reductions have already been realized by some of these regulations; others will be coming into effect in the approaching years. While some of these regulations do not directly impact the NYMA (e.g., no cement or glass plants regulated under Part 220 exist within the NYMA boundary), upwind emission reductions still contribute to improving air quality. Collectively, these regulations help ensure New York's continued compliance with the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS.

NO_x:

- 6 NYCRR Section 212.12 – *Hot Mix Asphalt Production Plants* (new; effective 9/30/2010)
    - Introduced requirements for annual burner tune-ups on asphalt plant burners and stockpile moisture control in an effort to reduce the amount of fuel burned and the ensuing NO_x emissions. These requirements were effective in 2011. The regulation also requires an analysis of low-NO_x burner technology for future burner replacements at existing plants, and requires new plants to have low-NO_x burners installed.
- 6 NYCRR Subpart 220-1 – *Portland Cement Plants* (revised; effective 7/11/2010)
    - Requires an updated RACT analysis at portland cement plants (currently two exist in the state). Equipment deemed as RACT was required to be operating by July 1, 2012.
- 6 NYCRR Subpart 220-2 – *Glass Plants* (revised; effective 7/11/2010)
    - Requires a RACT analysis from glass plants (currently four affected in the state). Equipment deemed as RACT was required to be operating by July 1, 2012.
- 6 NYCRR Subpart 227-2 – *Reasonably Available Control Technology (RACT) for Major Facilities of Oxides of Nitrogen (NO_x)* (revised; effective 7/8/2010)
    - Updates the presumptive NOx RACT emission limits for boilers and combustion engines, with a compliance date of July 1, 2014. Also includes a requirement for case-by-case RACT analyses for combined cycle/cogeneration combustion turbines.

VOC

- 6 NYCRR Part 228 – *Surface Coating Processes, Commercial and Industrial Adhesives, Sealants and Primers* (revised; effective 9/30/2010)
    - Achieves VOC reductions through two basic components: sale and manufacture restrictions that limit the VOC content of specified adhesives, sealants and primers sold in New York State; and use restrictions that apply primarily to commercial/industrial applications.
- 6 NYCRR Part 234 – *Graphic Arts* (revised; effective 7/8/2010)
    - Expands the current regulation's applicability to include letterpress printing and establishes more stringent RACT for VOCs for facilities that engage in flexographic, offset lithographic and rotogravure printing.
- 6 NYCRR Part 235 – *Consumer Products* (revised; effective 10/15/2009)
    - Existing regulation was updated to implement additional VOC product content limits.
- 6 NYCRR Part 239 – *Portable Fuel Container Spillage Control* (revised; effective 7/30/2009)
    - Existing regulation was revised with the following changes: eliminate existing automatic shutoff feature, fill height, and flow rate standards; simplify compliance testing requirements; and, require certification of portable fuel containers.

- 6 NYCRR Part 241 – *Asphalt Pavement and Asphalt Based Surface Coating* (new; effective 1/1/2011)
    - Updates the permissible VOC content limits for pavement and surface coatings.

Multiple/Other

- 6 NYCRR Part 249 – *Best Available Retrofit Technology (BART)* (new; effective 5/6/2010)
    - Adopted from a federal program aimed at reducing the impacts of visibility-impairing pollutants in Class I areas. This regulation targets emissions of SO_2, NO_x, and PM_{10} from certain categories of stationary sources which began operation between 1962 and 1977. The Department identified 19 subject facilities in New York State. Facilities are complying through a variety of options including unit shutdown, emission caps, add-on control technology, and process modifications. Compliance is required by January 1, 2014.
- ECL §19-0325 – *Ultra Low Sulfur Heating Oil* (new; effective 7/20/2010)
    - On July 20, 2010, then-Governor David Paterson signed a law mandating lower-sulfur heating fuel in New York State. Specifically, the law required the sulfur content of all oil sold for use in residential, commercial, or industrial heating within the state to be no greater than 15 ppm by July 1, 2012. This decreases the allowable limit from the current range of 2,000 to 15,000 ppm.
- Federal Rule – *Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder* (new; effective 7/7/2008)
    - Consists of a three-part emission control strategy to target PM and NO_x emissions from locomotives and marine diesel engines. These strategies consist of standards for existing engines (beginning 2008), near-term “Tier 3” emission standards for newly-built engines (phased-in beginning 2009), and long-term “Tier 4” emission standards for newly-built engines (phased-in beginning 2014 for marine diesel engines and 2015 for locomotives).

D. Requirements for a Fully Approved Maintenance Plan

Section 175A of the CAA outlines the requirements that must be contained in the SIP for a former nonattainment area, providing for continuing maintenance of the NAAQS. Specifically, this section contains the following requirements:

- A demonstration that compliance with the NAAQS will be maintained for at least 10 years after redesignation;
- Eight years following redesignation, an additional demonstration of compliance with the NAAQS for 10 years after the expiration of the initial 10-year period; and,
- A contingency provision to correct any violations of the standard that might occur after the area is redesignated to attainment.

The complete maintenance plan for the first 10-year period for the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS is contained in section III of this document. It contains predicted emission reductions that will be sufficient to maintain the standard through 2025, carrying on the trend of improving ambient concentrations seen in Figures 7 and 8. Section III also contains the contingency measures the Department expects to go into effect within the next few years, which would further ensure the reduction of $PM_{2.5}$ concentrations for the purpose of maintaining the annual and 24-hour NAAQS.

The Department will be able to demonstrate continued compliance with the 1997 and 2006 $PM_{2.5}$ standards through various means. The air monitor network established in the NYMA (see section II.A.1) will continue to be operated to ensure compliance with the current, and future, NAAQS, and to ensure adequate protection of public health. The Department is required to review the adequacy of its monitoring plan yearly, and submit its findings to EPA in the Annual Monitoring Network Plan.

The Department also develops a statewide emission inventory every three years. These inventories are based on actual emissions data from major stationary sources, calculated emissions from minor stationary sources, and modeled data for mobile sources. Emission inventories allow the Department to determine whether statewide emission levels are adequate, and to identify sectors for further regulation if necessary.

E. Satisfy All Requirements under Section 110 and Part D

1. Section 110

Pursuant to CAA sections 110(a)(1) and (2), states are required to submit an "infrastructure" demonstration showing that New York's air program addresses basic SIP requirements related to the attainment of new or revised NAAQS, including emission inventories, monitoring and modeling to assure attainment, maintenance, and enforcement of the standards. Section 110(a)(1) contains the general requirements for submitting a SIP after promulgation of a new or revised NAAQS. Section 110(a)(2) contains specific elements to be included in these plans.

States are also required to submit a "transport SIP" under section 110(a)(2)(D)(i). This section of the CAA requires states to demonstrate that the interstate transport of a criteria pollutant does not contribute significantly to nonattainment in, nor interfere with maintenance by, any other state with respect to a NAAQS, or interfere with measures required to be included in the applicable implementation plan for any other state to prevent significant deterioration of air quality or to protect visibility.

In March, 2010 the Department submitted to EPA a joint infrastructure demonstration and transport SIP to satisfy these section 110 requirements for the 2006 24-hour $PM_{2.5}$ NAAQS. The Department believes the submission satisfies each of the requirements of section 110. It is understood that EPA must approve these required SIP elements before the NYMA redesignation can be granted. The infrastructure elements addressed by the plan are as follows:

- 110(a)(2)(A): Enforceable emission limitations and other control measures
- 110(a)(2)(B): Ambient air quality monitoring, compilation, analysis and reporting
- 110(a)(2)(C): Enforcement and stationary source permitting
- 110(a)(2)(D): Interstate transport
- 110(a)(2)(E): Assurance of adequate resources
- 110(a)(2)(F): Stationary source monitoring system and reporting

- 110(a)(2)(G): Emergency powers and contingency plans
- 110(a)(2)(H): Authority for SIP revisions for revised NAAQS
- 110(a)(2)(I): Authority for SIP revisions for new nonattainment areas
- 110(a)(2)(J): Consultation, public notification and prevention of significant deterioration (PSD) and visibility
- 110(a)(2)(K): Air quality monitoring and reporting
- 110(a)(2)(L): Permitting fees
- 110(a)(2)(M): Consultation/participation with affected local entities

On July 20, 2011, EPA issued a final disapproval of New York's transport SIP component for the 2006 24-hour NAAQS—specifically section 110(a)(2)(D)(i)(I).[12,13] EPA disapproved New York's transport SIP because it relied on the CAIR trading program to resolve the state's transport obligations. EPA stated that this was problematic for two reasons: First, CAIR was designed to address the 1997 annual $PM_{2.5}$ NAAQS, not the 2006 24-hour standard. Second, because CAIR was later remanded to EPA by the U.S. Court of Appeals for "more than several fatal flaws,"[14] states are not able to permanently rely upon the emission reductions expected under CAIR.

New York State has enacted a number of control programs for PM and its precursors, as shown in section II.C. Additional control programs, as listed in section III.D, will continue to lessen $PM_{2.5}$ concentrations in the NYMA and downwind areas. While these actions were primarily taken to reduce in-state emissions, they also effect improvements in downwind areas.

A technical support document for EPA's Cross-State Air Pollution Rule (CSAPR) cited two areas in which New York State significantly contributes to nonattainment for the 1997 annual $PM_{2.5}$ NAAQS (Cuyahoga Co., OH and Allegheny Co., PA), and four areas in which the state significantly contributes to nonattainment for the 2006 24-hr $PM_{2.5}$ NAAQS (St. Clair Co., MI; Wayne Co., MI; Cuyahoga Co., OH; and Lancaster Co., PA).[15] Of these areas, all but Allegheny Co., PA are now in attainment, based on 2009-2011 monitoring data available through EPA's AirData website. Furthermore, EPA's CSAPR proposal notes that "EPA believes that the monitor in Allegheny County that remains in nonattainment is in an area where the air quality problem is primarily local."[16] This is evidence that, even without an updated trading rule for interstate pollution in place, New York State has successfully ameliorated its impacts to downwind states and fulfilled its obligations under section 110(a)(2)(D).

On November 19, 2012, EPA released guidance regarding how it intends to handle various SIP-related actions that were affected by the court decision which vacated CSAPR.[17] In this memo, EPA states that continuing to rely on CAIR emission reductions as permanent and enforceable is

[12] **Federal Register** / Vol. 76, No. 139, p. 43153; published July 20, 2011
[13] Action was not taken on section 110(a)(2)(D)(i)(II), nor the associated infrastructure demonstration at that time.
[14] State of North Carolina v. EPA, U.S. Court of Appeals for the D.C. Circuit, decided July 11, 2008, p.4
[15] "Air Quality Modeling Final Rule Technical Support Document," EPA, 2011, Appendix D–2012 Base Case State-by-State Contributions to Nonattainment and Maintenance for 8-Hour Ozone, Annual $PM_{2.5}$, and 24-Hour $PM_{2.5}$
[16] **Federal Register** / Vol. 75, No. 147, p.45281; published August 2, 2010
[17] "Next Steps for Pending Redesignation Requests and State Implementation Plan Actions Affected by the Recent Court Decision Vacating the 2011 Cross-State Air Pollution Rule"; November 19, 2012, Gina McCarthy (Assistant Administrator) to Regional Air Directors

appropriate until either the CSAPR decision is overturned, or a valid replacement rule is finalized and associated implementation plans are developed by states and approved by EPA. EPA action on this redesignation request and maintenance plan may therefore proceed despite EPA's prior disapproval of section 110(a)(2)(D)(i)(I) of New York's transport SIP for the 24-hour $PM_{2.5}$ NAAQS.

2. Part D

Part D of the CAA contains general SIP requirements that are applicable to all nonattainment areas (Subpart 1), as well as SIP requirements that pertain to nonattainment areas for specific pollutants (Subparts 2 through 5). Subpart 4 of Part D consists of the specific requirements for particulate matter. A January 4, 2013 decision from the D.C. Circuit Court of Appeals found that EPA had been erroneously applying Subpart 1 provisions for $PM_{2.5}$-related implementation issues. This document adheres to the D.C. Circuit Court's finding that Subpart 4 governs implementation of $PM_{2.5}$. This document therefore addresses the requirements of Subpart 4, including the consideration of ammonia as a potential precursor to $PM_{2.5}$.

The Department is in compliance with the additional general requirements of Subpart 1 of Part D. CAA section 175A pertains to maintenance plans for areas that seek redesignation to attainment; this document fulfills the requirement of section 175A(a) of a SIP revision providing for maintenance of the standards for at least 10 years. Pursuant to section 175A(b), The Department is committing to submit, within eight years of redesignation, a SIP revision to provide for maintenance of these NAAQS for a subsequent 10 year period. Contingency measures pursuant to CAA section 175A(d) are listed in section III.D.

III. MAINTENANCE PLAN FOR 1997 ANNUAL AND 2006 24-HR $PM_{2.5}$ NAAQS

A. Emissions Inventory

The Department has prepared a series of inventories to demonstrate the emission trends that are projected to occur under current and expected regulatory programs.[18] The base year for this redesignation request is 2007, which represents an actual attainment year inventory and includes actual emissions from stationary sources (adjusted for rule-effectiveness) based on their submission of emissions statements, as well as estimates of area source and mobile source emissions. Because CAA section 175A requires that states "provide for the maintenance of the [NAAQS]…for at least 10 years after the redesignation," 2025 was chosen as the projection year. The Department also selected 2017 as an interim projection year as required by recent EPA guidance.[19]

[18] Summarized inventory data are presented in this section. Full inventory data will be submitted to EPA electronically. These data are also available upon request.
[19] "Implementation Guidance for the 2006 24-Hour Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS)"; March 2, 2012, Steven D. Page (Director, Office of Air Quality Planning) to Regional Air Directors

The inventories that have been developed support the fact that the NYMA will continue to demonstrate attainment with the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. Because the area is currently achieving these standards and emissions are projected to decrease further, it stands to reason that continued attainment can be assured. Furthermore, EPA finalized revisions to the $PM_{2.5}$ NAAQS on December 14, 2012 (specifically, a lowering of the level of the annual standard to 12 $\mu g/m^3$), which will potentially call for additional regulatory programs if the NYMA is designated as nonattainment by EPA. Continued attainment may also be a function of upwind states' responsibilities to control emissions: should states such as Pennsylvania and Ohio continue to reduce their emissions of $PM_{2.5}$ and precursors, maintenance in the NYMA will be further assured.

Tables 8 through 10 summarize the emissions for the 10 New York counties in the NYMA. Summary tables are provided for the 2007 base year, 2017 interim projection year, and 2025 projection year. Figure 11 displays graphically the projected reductions in PM and PM precursor emissions, while Tables 11 through 13 summarize the inventory by source sector. These tables include stationary source actual emissions and their projections, as well as emissions adjusted for rule-effectiveness.[20]

[20] The elevated $PM_{2.5}$ values for Orange County in Tables 8 through 10, as well as the large discrepancy between $PM_{2.5}$ totals in Tables 11 through 13, are the direct result of the application of an 80 percent rule-effectiveness value to three highly controlled particulate sources in Orange County.

Table 8. 2007 Base Year Inventory by County with RE (Tons)

County	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Bronx	15,047.66	16,072.26	63,427.45	2,973.86	1,296.29	2,028.00	273.71
Kings	28,662.51	29,076.44	124,999.42	4,799.25	2,383.33	4,181.63	433.64
Nassau	31,927.15	38,757.58	237,855.45	7,698.63	3,244.15	4,161.52	891.06
New York	24,969.47	38,674.46	156,401.62	7,897.92	3,256.44	8,379.15	573.40
Orange	10,047.89	16,401.52	74,321.45	10,299.57	120,451.70	17,457.67	1,258.36
Queens	31,752.34	49,624.79	182,710.39	7,142.92	3,331.36	7,175.21	766.23
Richmond	7,991.66	11,116.46	50,837.44	2,353.33	892.64	1,348.56	164.63
Rockland	6,773.37	10,861.11	50,646.73	2,298.98	5,254.22	8,090.90	333.66
Suffolk	44,149.39	53,819.10	309,309.17	13,763.17	5,630.24	23,161.04	1,142.61
Westchester	21,273.64	24,706.33	160,065.09	9,410.87	2,540.15	4,451.51	572.77
Total	**222,595.08**	**289,110.05**	**1,410,574.21**	**68,638.51**	**148,280.52**	**80,435.19**	**6,410.08**

Table 9. 2017 Interim Projection Year Inventory by County with RE (Tons)

County	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Bronx	12,112.80	9,460.93	39,905.03	2,382.79	924.91	570.10	195.23
Kings	22,317.71	17,925.67	78,895.41	3,694.19	1,722.45	1,876.27	298.05
Nassau	20,334.10	21,576.11	146,367.91	6,069.83	2,350.01	1,209.10	616.41
New York	17,709.12	25,740.64	112,483.64	6,338.66	2,446.43	3,964.15	445.78
Orange	7,217.53	11,847.65	47,941.66	5,263.63	119,826.95	15,718.83	1,208.67
Queens	23,583.06	34,838.52	113,502.89	5,649.71	2,461.80	5,085.91	573.19
Richmond	6,397.10	7,768.51	34,455.91	2,123.65	733.59	1,053.11	130.43
Rockland	4,527.46	7,633.39	34,380.00	1,515.25	4,434.51	7,312.84	288.18
Suffolk	28,745.40	35,245.65	214,435.45	12,638.31	4,821.86	15,478.61	939.13
Westchester	14,470.39	15,229.93	108,921.41	4,996.79	1,632.78	779.24	429.61
Tappan Zee Project	N/A	457.00	N/A	N/A	N/A	N/A	N/A
Total	**157,414.67**	**187,724.00**	**931,289.32**	**50,672.82**	**141,355.28**	**53,048.17**	**5,124.68**

Table 10. 2025 Projection Year Inventory by County with RE (Tons)

County	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Bronx	12,001.94	7,843.65	39,228.79	2,437.95	853.18	563.84	196.75
Kings	21,890.14	15,315.75	78,139.60	3,716.69	1,581.36	1,915.10	291.83
Nassau	18,782.44	18,286.53	146,242.98	6,493.00	2,308.79	1,235.89	622.02
New York	17,331.41	22,496.16	118,659.27	6,719.35	2,291.81	3,986.13	446.83
Orange	6,830.76	10,860.76	48,138.05	5,374.59	119,815.34	15,712.22	1,239.75
Queens	23,319.79	33,134.26	113,218.21	6,011.59	2,364.83	5,288.51	574.26
Richmond	6,391.30	7,085.86	35,661.72	2,468.27	768.78	1,113.59	139.63
Rockland	4,243.68	7,059.19	35,786.47	1,573.17	4,425.59	7,316.57	295.83
Suffolk	26,051.63	31,473.05	220,845.67	13,869.88	4,948.16	15,578.36	989.56
Westchester	13,657.59	13,592.12	113,243.94	5,259.37	1,605.61	810.39	445.12
Total	**150,500.68**	**167,147.34**	**949,164.70**	**53,923.85**	**140,963.45**	**53,520.61**	**5,241.57**

Figure 11. Projected Emission Trends of PM and PM Precursors Through 2025

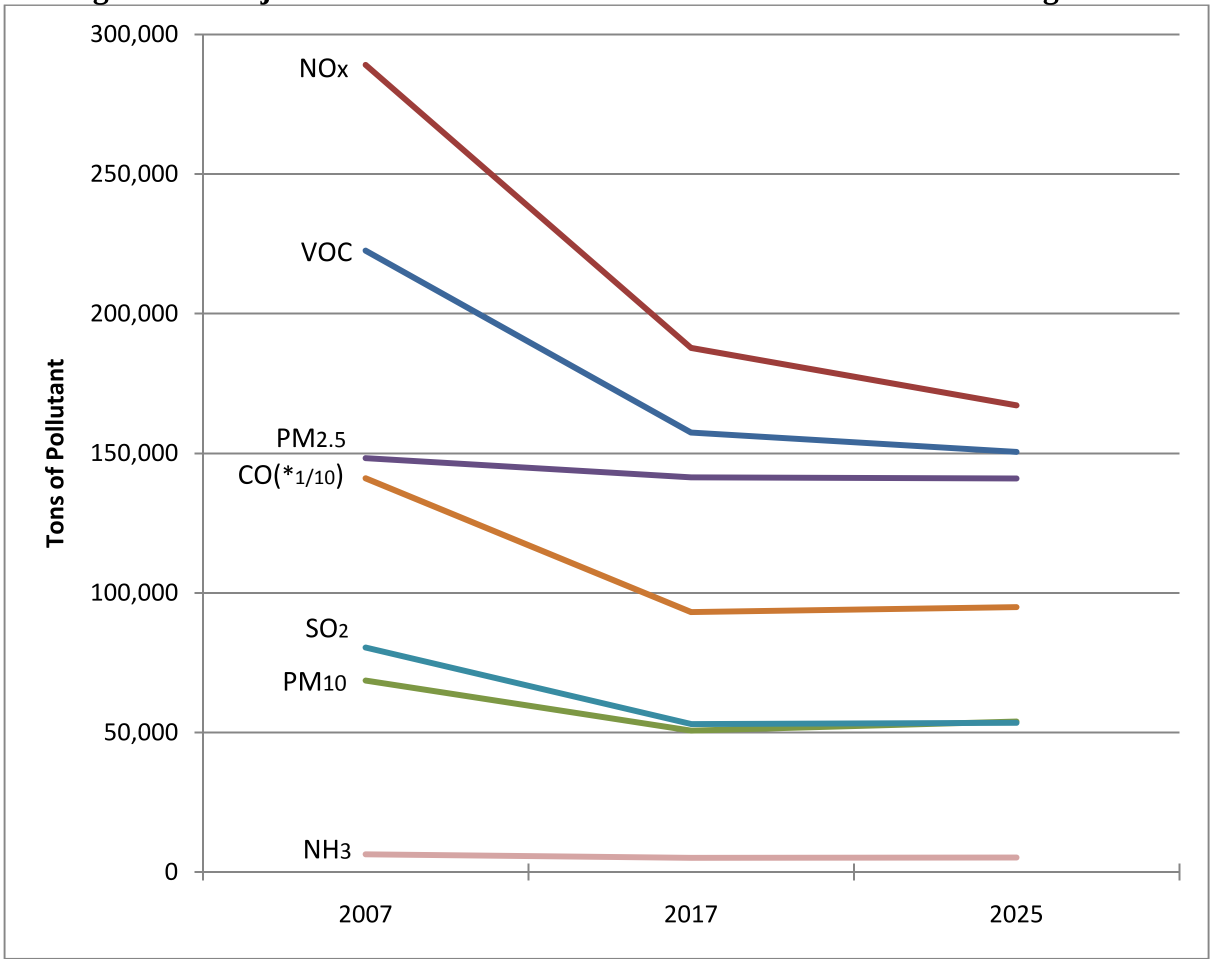


Table 11. 2007 Base Year Inventory by Source Sector (Tons)

Sector	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Point	3,269.78	36,829.68	12,013.83	2,913.32	2,435.34	43,886.32	862.89
Point w/RE	3,707.01	38,195.94	13,137.41	3,206.28	124,750.31	43,886.32	862.89
Nonpoint	101,481.89	41,899.74	23,211.41	48,054.84	11,621.00	29,513.22	1,960.83
Nonroad	46,026.72	59,512.46	474,292.00	4,170.45	3,899.30	6,052.88	1.96
On-road	71,379.46	149,501.91	899,933.39	9,723.36	6,835.30	982.77	3,584.40
Road Dust	N/A	N/A	N/A	3,483.59	1,174.60	N/A	N/A
Total	**222,157.85**	**287,743.79**	**1,409,450.63**	**68,345.56**	**25,965.55**	**80,435.19**	**6,410.08**
Total w/RE	**222,595.08**	**289,110.05**	**1,410,574.21**	**68,638.51**	**148,280.52**	**80,435.19**	**6,410.08**

Table 12. 2017 Interim Projection Year Inventory by Source Sector (Tons)

Sector	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Point	3,242.86	35,729.48	12,269.28	2,882.25	2,417.29	43,484.27	867.60
Point w/RE	4,131.72	37,066.75	13,730.42	3,193.99	124,290.57	43,484.29	867.60
Nonpoint	93,790.95	36,640.38	22,438.48	34,306.76	9,403.95	4,412.25	1,915.00
Nonroad	26,408.16	45,197.21	392,576.80	3,040.77	2,809.06	4,212.42	1.12
On-road	33,083.83	68,362.66	502,543.63	7,171.83	3,897.71	939.20	2,340.95
Road Dust	N/A	N/A	N/A	2,959.46	954.01	N/A	N/A
Tappan Zee Project	N/A	457.00	N/A	N/A	N/A	N/A	N/A
Total	**156,525.80**	**186,386.73**	**929,828.18**	**50,361.08**	**19,482.01**	**53,048.15**	**5,124.68**
Total w/RE	**157,414.67**	**187,724.00**	**931,289.32**	**50,672.82**	**141,355.28**	**53,048.17**	**5,124.68**

Table 13. 2025 Projection Year Inventory by Source Sector (Tons)

Sector	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Point	3,261.75	36,306.85	12,455.94	2,889.47	2,423.51	43,591.03	872.33
Point w/RE	4,153.64	37,645.59	13,929.75	3,201.53	124,294.66	43,596.39	872.33
Nonpoint	94,698.56	35,467.73	22,764.61	38,066.67	10,126.70	4,389.48	1,924.66
Nonroad	24,737.31	42,773.21	430,459.94	2,519.12	2,290.95	4,599.34	1.05
On-road	26,911.17	51,260.81	482,010.40	6,952.22	3,291.09	935.40	2,443.53
Road Dust	N/A	N/A	N/A	3,184.31	960.05	N/A	N/A
Total	**149,608.78**	**165,808.60**	**947,690.89**	**53,611.79**	**19,092.30**	**53,515.25**	**5,241.57**
Total w/RE	**150,500.68**	**167,147.34**	**949,164.70**	**53,923.85**	**140,963.45**	**53,520.61**	**5,241.57**

B. Inventory Methodology

1. On-Road Inventory

a. On-Road Methodology for Base Year 2007

The on-road component of the 2007 base year inventory includes an estimate of emissions from all motorized vehicles operated on public roadways. All on-road mobile source emissions were estimated using EPA's Motor Vehicle Emissions Simulator (MOVES) model using locally-developed inputs for each of the 62 New York counties. These inputs include varying meteorological data, vehicle activity, fuel characteristics, and emissions control programs.

"Base-year" inventory inputs were derived from 2007 data, where applicable, and reflect the programs and controls that were in effect in 2007. Once all inputs were developed, the Department modeled the inventory, whether annual and/or daily, in accordance with EPA's guidance "*Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b" (EPA-420-B-12-028, April 2012*). More detailed descriptions of the Department's methodologies for developing MOVES-specific inputs can be found in Appendix D – *New York State On-Road Motor Vehicle Emission Budget MOVES Technical Support Documentation*.

b. On-Road Projection Methodology

New York State is modeled using county-specific inputs for meteorology, vehicle activity and population, fuel formulation data, and I/M program information. The on-road mobile source projection inventory was developed by using MOVES with vehicle mile travelled (VMT) and vehicle population projections for each future inventory year based on a linear regression of Highway Performance Monitoring System (HPMS) historical data for forecasting VMT prepared by the NYSDOT. These projections employed HPMS data from 1981 to 2007. MOVES is then run to produce emissions for each vehicle and road type combination for all required counties.

c. On-Road Mobile Source Emissions and Re-entrained Road Dust

The Department has included road dust estimates as part of this SIP submission. This inventory was developed as part of our SIP modeling inventory and the methodology is contained in Appendix E - *Road Dust Estimation for Paved and Unpaved Roads*. For the more rural counties (i.e., Nassau, Orange, Rockland, Suffolk and Westchester), speciated monitoring indicates that road dust emissions represent approximately 3.3 percent of the total mass. The Department has adjusted the calculated road dust emissions estimates for these counties so that they represent 3.3 percent of the total mass from the monitoring results. The Department also adjusted Bronx, Kings, New York, Queens and Richmond Counties to 5.0 percent to more closely represent speciated monitoring at an urban monitor.

The Department believes that the values estimated using EPA's preferred methodology are inaccurate for inclusion in the SIP.[21] For the purposes of this submission, the Department has included an adjusted road dust inventory based on speciated monitoring.

The speciated monitoring data shows that the fraction known as the "crustal fraction" can be subtotaled yielding 3 to 5 percent of the $PM_{2.5}$ total mass on filters collected in the NYMA

[21] This methodology is outlined in AP-42, Chapter 13, §13.2.1 for paved roads and §13.2.2 for unpaved roads.

nonattainment area. This crustal fraction is a measure of particulate from any geological origin, not just from road dust (i.e. sand and gravel operations and their transportation, residential, commercial or roadway construction and demolition including trackout, other forms of trackout, waste transfer processes, fugitive dusts from roadway accidents and spillage, etc.).

Original emissions (as contrasted to the re-entrained portions) are considered by the Department to minimally include brake wear, tire wear, and pavement wear. A case can be made that only pavement wear is road dust, but such estimates are indeterminate as well. Furthermore, for accounting purposes in this plan, tire wear (TW) and brake wear (BW) estimates are included as part of the on-road sector for fine PM. They are included in the $PM_{2.5}$ estimates made for the on-road mobile sources, together with exhaust gas PM (GASPM), organic (O_CARBON) and elemental (E_CARBON) carbon estimates.

Therefore, for purposes of conformity, tire and brake wear $PM_{2.5}$ emissions are included in the conformity budget, presented in section III.C.3. The percent contribution (shown above) of each of these subcategories of $PM_{2.5}$ is approximately the same whether it is for the 10-county NYMA nonattainment area or for a 62-county statewide inventory.

2. Nonroad Inventory

a. Nonroad Methodology for Base Year 2007

Nonroad mobile source emissions are separated by four main categories: aircraft, commercial marine vessels, locomotives, and "other." "Other" nonroad equipment is further broken down into several sub-categories of equipment and vehicles. These include agricultural, commercial, construction and mining, industrial, lawn and garden, logging, pleasure craft, and recreational. Emissions for all sectors were estimated using four separate methodologies. Nonroad emissions for 2007 are estimated for all 62 New York counties. In addition, New York is separated into two areas due to the federally mandated Reformulated Gas (RFG) Program.

The sub-categories of "other" nonroad equipment are separated by 2-stroke gasoline, 4-stroke gasoline, liquefied petroleum gas (LPG), compressed natural gas (CNG), and diesel-fueled engine types. All emissions from these sources for 2007 were estimated using version 2008a of the EPA Nonroad Model. The software was finalized for use in SIP development on June 12, 2006. Using the EPA Nonroad Model, nonroad emissions from New York were estimated for each individual county for each month of the year. Temperature and fuels blend data varied by month for each county across the state.

Temperature data for 2007 was acquired from the National Oceanic and Atmospheric Administration which included historical weather data from 33 airport locations across New York State as well as surrounding locations. This information was used to develop average high and low temperatures for each month on a county-by-county basis. The results were inputted to the Nonroad Model.

Gasoline and diesel fuels blend data for 2007 were acquired from the New York State Department of Agriculture and Markets. These data are based on thousands of samples collected across the state from fueling stations and retention areas. These samples are then analyzed for many profiles including oxygen content, Reid Vapor Pressure (RVP), and sulfur content. The data provided average monthly fuels profiles on a county-by-county basis. The results were inputted to the Nonroad Model.

Aircraft emissions for New York State in 2007 were estimated using the Federal Aviation Administration's (FAA) Emission Dispersion Modeling System (EDMS) Version 5.1. Airport-specific landing and take-off (LTO) data by aircraft type acquired from FAA are used as inputs to the model. EDMS uses this information to estimate from both aircraft and ground service equipment.

Commercial Marine Vessel (CMV) emissions for 2007 are based on version 2 of the 2008 National Emission Inventory (NEI). The NEI emissions from Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk and Westchester Counties are built off of the CMV emissions report prepared by the Starcrest Consulting Group in conjunction with their work on the New York Harbor Deepening Project. This emissions report was undertaken as part of the Harbor Deepening Project to update the baseline inventory and to optimize the offsets that would be utilized by the Army Corps of Engineers. These data are based on actual 2002 operational data from an intensive survey of all CMV types, activity, and fuel consumption, and took several months to complete. While the Department would like to use the Starcrest methodology to update the CMV inventory for the rest of the state, it would require an intensive effort to survey all of the counties bordering Lake Erie, Niagara River, Lake Ontario, the St. Lawrence Seaway, Lake Champlain, Hudson River, Mohawk River, Erie Canal, and both the Long Island Sound and Atlantic Ocean since Suffolk County was not included in the Starcrest inventory. The detailed CMV emissions inventory methodology can be found in the EPA document entitled "*Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Components of the National Emissions Inventory – Volume I – Methodology*."[22]

Locomotive emissions for 2007 are based on version 2 of the 2008 NEI. These emissions were derived from a locomotive emissions report developed by the New York State Energy Research and Development Authority (NYSERDA) in conjunction with the Department. The report is entitled "*NYSERDA Clean Diesel Technology: Non-Road Field Demonstration Program; Development of the 2002 Locomotive Survey & Inventory for New York State*." The report included an intensive survey of all locomotive activity throughout New York State.

b. Nonroad Projection Methodology

All 2017 and 2025 emissions from "other" nonroad equipment (which include 2-stroke gasoline, 4-stroke gasoline, LPG, CNG, and diesel fueled non-road vehicles, as well as emissions from recreational marine vessels) were estimated using version 2008a of the EPA Nonroad Model. When completing future year projections, the model incorporates emissions effects that result from both anticipated changes in equipment activity as well as deterioration of equipment. The model also accounts for expected turnover of old equipment. In addition, the following EPA nonroad emission control programs are built into the model:

- New Phase 2 Standards for Small Spark-Ignition Non-Handheld Engines (March 1999) which covers NO_x and hydrocarbon reductions from mowers, edgers, lawn tractors, and other non-handheld gasoline equipment.

[22] Available at ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002nei_mobile_nonroad_methods.pdf

- Final Phase 2 Standards for Small Spark-Ignition Handheld Engines (March 2000) which covers NO_x and hydrocarbon reductions from trimmers, leaf blowers, chain saws, and other handheld gasoline equipment.
- Emission Standards for New Non-Road Engines (September 2002) which covers NO_x, hydrocarbons, and CO from the following new engines and vehicles:
  - Large Industrial Spark-Ignition Engines (forklifts, electric generators, airport baggage tow trucks, etc.);
  - Recreational Vehicles (snowmobiles, dirt-bikes, ATVs);
  - Recreational Diesel Marine Engines (for use in yachts and cruisers).
- Clean Air Nonroad Diesel Rule (May 2004) which covers NO_x, PM and oxide of sulfur (SO_x) emissions from diesel engines used in most construction, agricultural, industrial, and airport equipment. In addition, this rule includes and requires a 99 percent reduction in diesel sulfur by 2010.

Aircraft, commercial marine vessel, and locomotive emissions for 2007 were grown to 2017 and 2025 using growth factors developed by the Mid-Atlantic Regional Air Management Association, Inc. (MARAMA). Details of how these growth factors were derived can be found in the MARAMA report entitled "*Growth/Control Factors and Emission Projections for MAR Categories*" (August 16, 2010). The subsections below summarize the MARAMA report:

i. Aircraft Growth Factors

Aircraft operations were projected to future years by applying activity growth using LTO data at airports. Projections came from data available from the FAA's Terminal Area Forecast System for 2009-2030.[23] This information is available for approximately 3,300 individual airports. Actual LTOs are reported for 2007 and projected LTOs are provided for all years up to 2030. The data were aggregated and applied to the airport and county level for each of the four available operation types: commercial, general, air taxi, and military.

ii. Commercial Marine Vessel Growth Factors

For Category 1 and 2 diesel vessels, EPA used projection data for domestic shipping from the Energy Information Administration (EIA) Annual Energy Outlook 2006 (AEO2006).[24] The annual growth rate reported in the RIA is 0.9 percent; the annual growth rate for energy use for passenger rail is 1.2 percent; and the annual growth rate for domestic shipping is 0.5 percent. A passenger rail annual growth rate of 0.5 percent was used for CMV port emissions (SCC 22-80-002-100) and CMV underway emissions (SCC 22-80-002-200).

iii. Railroad Growth Factors

EPA again used projection data from the AEO2006. Table A-7 of AEO2006 showed that freight rail energy use will grow 1.6 percent annually. There are separate growth factors for passenger rail and freight rail energy use. The annual growth rate for energy use for passenger rail is 1.2 percent; the annual growth rate for energy use for freight rail is 0.7 percent. A passenger rail annual growth rate of 1.2 percent for inter-city passenger train locomotives (SCC 22-85-002-008) and independent commuter rail systems (SCC 22-85-002-009) was used. The freight rail

[23] http://www.apo.data.faa.gov/main/taf.asp
[24] http://www.eia.doe.gov/oiaf/archive/aeo06/pdf/0383(2006).pdf

annual growth rate was 0.7 percent for Class I line haul (SCC 22-85-002-006), Class II/III line haul (SCC 22-85-002-007), and yard switch (SCC 22-85-002-010) locomotives.

c. QA/QC for Nonroad Inventory

Quality assurance (QA) is the systematic measurement, comparison with a standard, monitoring of processes, and an associated feedback loop that confers error prevention. Assuring that the Nonroad Model and EDMS model inputs are accurate should eliminate most mistakes. Therefore, the majority of QA for nonroad inventory development includes management of the model inputs. Through collaboration with the Department of Agriculture and Markets, the National Oceanic and Atmospheric Administration, and the FAA, accurate Nonroad model and EDMS model inputs are developed. The Department receives additional QA of model inputs by sharing information with our partners, such as EPA, MARAMA, and other states. Through this process the Department receives feedback that is used to make any necessary adjustments to the model inputs.

QA can be contrasted with Quality Control (QC) which is focused on process outputs. In developing the nonroad inventory through the Nonroad and EDMS models, Department staff, along with their many partners, relied on inspection of the completed inventories to ensure alignment with expected outcomes. For this effort multiple iterations of the inventory were developed, and minor adjustments were made based on output inconsistencies found through comparison of the Department's data with the EPA-developed state inventories. In some instances this output QC resulted in changes to the input, in how the model was run, and in adjustments to post-processing scripts, all of which resulted in a better quality inventory.

While there are levels of uncertainty associated with every component in an inventory, the Department believes that applying QA/QC procedures throughout every step of the process results in the development of the best inventory possible. The Department further believes that by inspecting both the inputs to the model and the inventory outputs, and by sharing both during inventory development, we are constantly able to improve our emissions results. For two sectors of the inventory—CMV and locomotive—the Department accepted EPA values. Here we relied heavily on the QA/QC undertaken by EPA in the development of those inventories.

3. Nonpoint Source Inventory

For nonpoint source emissions, including those for ammonia, the Department referenced a series of technical support documents (TSD) that were prepared for MARAMA, which are attached to this document as the following appendices:

- 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; January 23, 2012*
- Appendix G – *Technical Support Document for the Development of the 2017/2020 Emission Inventories for Regional Air Quality Modeling in the Northeast/Mid-Atlantic Region; ver. 3.3; January 23, 2012*
- Appendix H – *Technical Support Document for the Development of the 2025 Emission Inventory for PM Nonattainment Counties in the MANE-VU Region; ver. 3.3, rev. 2; January 23, 2012*

These documents explain the data sources, methods, and results for preparing emission projections for 2017 and 2025 for PM nonattainment areas in the Mid-Atlantic/Northeast Visibility Union (MANE-VU) region. The MANE-VU region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Virginia is not included in the MANE-VU region, though several cities and counties in northern Virginia were included in this inventory as they are part of a nonattainment area that includes MANE-VU jurisdictions.

The Department has provided representative calculations of nonpoint sources in Appendix I – *Nonpoint Source Emissions Sample Calculations*. These sample calculations are provided for various source sectors to demonstrate the data sources and equations involved.

4. Point Source Inventory

The point source inventory, including EGUs as well as sources of ammonia, was also developed with the MANE-VU states. The methodology is described in the MARAMA TSDs listed previously (i.e., Appendices F through H). The Department used the compiled data and applied rule effectiveness per the method outlined in EPA guidance.[25]

It is acknowledged that point sources do not always run all controls at all times. To account for this, the Department has adopted the EPA recommendation in the use of rule effectiveness (RE). EPA guidance from 2005 was used to generate RE values for point sources within New York State. Once an RE value was calculated, it was applied to all relevant sources at the process level. When RE is applied, the result is increased emission estimates reflecting less than 100 percent compliance. The formulas below were adopted from the 2005 guidance, and illustrate how the application of RE will increase emissions values significantly for those processes that do not have an RE value of 100 percent:

RE Data Example #1

NAP - KENT AVENUE FACILITY, DEC ID: 2610100016
Process ID: P02FP
Pollutant: VOC
Control Type: INCINERATOR AFTERBURNER
Control Efficiency: 90%
Rule Effectiveness: 80%
Reported 2007 Emissions: 75.115 tons

Calculate uncontrolled emissions:

$$Uncontrolled\ emissions = \frac{controlled\ emissions}{(1 - control\ efficiency)}$$

[25] "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter for National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations"; EPA, August 2005.

$$Uncontrolled\ emissions = \frac{75.115\ tons}{(1 - 0.90)} = 751.15\ tons$$

Controlled emissions incorporating rule effectiveness:

$$Uncontrolled\ emissions\ \times\ [1 - (control\ efficiency\ \times RE)] = controlled\ emissions$$

$$751.15\ tons\ \times\ [1 - (0.90\ \times 0.80)]\ =\ 210.32\ tons$$

RE Data Example #2

R G E RUSSELL STATION, DEC ID: 8262800068
Process ID: CR4FP
Pollutant: $PM_{2.5}$
Control Type: Electrostatic Precipitator
Control Efficiency: 97.5%
Rule Effectiveness: 90%
Reported 2007 Emissions: 29.27 tons

Calculate uncontrolled emissions:

$$Uncontrolled\ emissions = \frac{controlled\ emissions}{(1 - control\ efficiency)}$$

$$Uncontrolled\ emissions = \frac{29.27\ tons}{(1 - 0.975)} = 1170.8\ tons$$

Controlled emissions incorporating rule effectiveness:

$$Uncontrolled\ emissions\ \times\ [1 - (control\ efficiency\ \times RE)] = controlled\ emissions$$

$$1170.8\ tons\ \times\ [1 - (0.975\ \times 0.90)]\ =\ 143.42\ tons$$

RE was generally applied to all processes where a control device or technique was used. However, the Department did consider the limitations which are presented when a blanket RE is applied absolutely. This was also discussed in EPA's 2005 guidance (cited above):

> *…[N]ot all emission estimated involving use of a control device or technique need to be adjusted to account for RE.   In some instances, a state or local agency may conclude that a control device that operated in conjunction with a continuous emissions monitor, or is equipped with an automatic shutdown device, may provide a sufficient level of assurance that intended emission reductions will be achieved, and therefore an adjustment for rule effectiveness is not necessary.*

Another example would be in instances where a direct determination of emissions, such as via a mass balance calculation, can be made (US EPA, 2005, B-3).

To determine RE for point sources, the Department utilized criteria given in EPA guidance tailored to New York's facilities and rules. A rule effectiveness matrix (Table 14) was developed and several criteria were evaluated to give an RE percentage to each appropriate process.

Table 14. NYSDEC Rule Effectiveness Matrix

NYSDEC Compliance Factors Considered	Rule Effectiveness
1. Source specific monitoring used for compliance 2. Records filed at least every 4 months 3. Compliant for at least 8 quarters 4. High accuracy compliance test methods are utilized 5. NYSDEC has the authority to impose punitive measures 6. Operators follow daily O&M instructions 7. Subject to Title V (or other) compliance certification 8. Subject to inspection once every 2 years or more frequently	100%
1. Source specific monitoring used as indicator of compliance 2. Records filed every 6-9 months 3. Facility is believed to have been compliant for at least 8 quarters 4. Process parameters & control equipment are inspected 5. NYSDEC has the authority to impose punitive measures 6. Operators follow daily O&M instructions 7. Subject to Title V (or other) compliance certification 8. Subject to inspection once every 3 years or more frequently	90%
1. Source specific monitoring used as indicator of compliance 2. Records filed every year 3. Facility is believed to be meeting its compliance schedule 4. Process review and inspection of control equipment 5. NYSDEC has the authority to impose punitive measures 6. Operators follow daily or weekly O&M instructions 7. Not subject to compliance certification 8. Subject to inspection once every 5 years or more frequently	80%

C. Conformity Requirements

The CAA prohibits federally-funded projects from interfering with the ability of a state to come into compliance with a NAAQS through its SIP. SIPs establish baseline emissions and also project emission changes through the period of future years covered by the SIP. The projected emission levels throughout this period are considered to be a part of the state's budget for emissions of the pollutant(s) covered by the SIP.

Under conformity requirements, emissions from federally-funded or approved projects are not allowed to cause these emission budgets to be exceeded. The motor vehicle emissions budgets (MVEBs) are presented in section III.C.3; the general conformity budget for the Tappan Zee

Bridge construction emissions is discussed in section III.C.3, and appears in Tables 9 and 12 for the year in the plan that coincides with the Tappan Zee Hudson River Crossing (TZHRC) project schedule, 2017.

1. Transportation Conformity

Under the CAA, federally funded transportation projects must not cause or contribute to new air quality violations, worsen existing violations, or delay timely attainment of NAAQS. In other words, these projects, and any emissions changes resulting from them, must "conform" to implementation plans developed by states for the criteria pollutants. Conformity generally applies to projects funded or approved by the Federal Highway Administration or the Federal Transit Administration in areas that do not meet or previously have not met a NAAQS for a criteria pollutant (i.e., nonattainment or maintenance areas). A one year grace period is allowed for newly-designated nonattainment or maintenance areas.

Conformity does not apply in attainment or unclassifiable areas. Conformity determinations are also not required for certain exempt projects, such as safety projects (e.g., lighting, guardrails), vehicle rehabilitation, shelters, and maintenance building construction, and other projects such as sign removal, noise reduction, and planning.

Generally, the metropolitan planning organizations (MPOs) involved in transportation planning for each area are responsible for determining if projects and their overall transportation implementation plan (TIP) conform to the state's SIP. The MPOs develop the necessary conformity determinations allowing for public input and hearings in the process demonstrating that their transportation projects meet conformity requirements. State transportation departments and air agencies, and the Federal Highway Administration, Federal Department of Transportation, and EPA are all involved in reviewing conformity determinations and TIPs developed by the MPOs.

State air quality plans contain emission reductions for each pollutant or precursor for each source sector (on-road motor vehicles, nonroad equipment and vehicles, and stationary and area sources). The level of emissions for on-road motor vehicles, such as cars, trucks, and buses, is referred to as the "motor vehicle emissions budget." Budgets are developed as part of the air quality planning process by state air quality or environmental agencies, and approved by EPA. For transportation conformity, projected emission changes resulting from construction projects involving highway and transit use must not cause this budget to be exceeded. Both long- and short-term emissions must be considered, including the direct emissions of $PM_{2.5}$ from exhaust, brake and tire wear, and road and construction dust, along with indirect $PM_{2.5}$ precursor emissions.

To maintain conformity, emissions from new projects can be mitigated or offset. This can be done through planning strategies or Transportation Control Measures, which are specific projects or programs designed to reduce emissions from transportation sources by reducing vehicle use, changing traffic flow, or congestion conditions. Examples include programs for improving public transit, developing high occupancy vehicle facilities, and ordinances to promote non-motorized vehicle travel.

2. General Conformity

Section 176(c) of the CAA prohibits federal agencies from conducting activities in nonattainment or maintenance areas that do not conform to a state's SIP. General conformity requirements are in place to ensure federal activities not related to transportation or highway projects do not interfere with the SIP budgets, do not cause or contribute to new violations, and ensure the timely attainment and maintenance of the NAAQS as the schedule exists in the SIP. Examples of these sorts of activities are harbor dredging or beach rehabilitation by the Army Corps of Engineers, where heavy diesel equipment is used both on land and on off-shore vessels, increasing the emissions of PM and NO_x.

General conformity differs from transportation conformity in that it applies to projects that were not considered in the TIP, as the TIP applies to highways and mass transit. All federal actions not covered under transportation conformity are covered under general conformity requirements unless the actions do not exceed de minimis levels. General conformity requirements can be met by: (1) showing emission increases are already covered in the SIP; (2) the state agreeing to modify the SIP to include the emissions; (3) finding offsets for the increased emissions; or, (4) mitigating the increased emissions. Conformity restrictions may also be avoided through construction strategies or planning, such as conducting construction operations outside of the ozone season when specific NO_x emission restrictions do not apply.

3. Conformity Budgets

a. Motor Vehicle Emission Budgets

For the purposes of transportation conformity, the emission budget is essentially a cap on the total emissions allocated to on-road vehicles. The projected regional emissions calculated based on a transportation plan, transportation improvement program, or project may not exceed the MVEB or cap contained in the appropriate SIP. Emissions in years for which no motor vehicle emissions budgets are specifically established must be less than or equal to the motor vehicle emissions budget established for the most recent prior year.

b. $PM_{2.5}$ Precursors

For transportation conformity, four $PM_{2.5}$ precursors – NO_x, VOCs, NH_3, and SO_x – must be considered in the conformity process in $PM_{2.5}$ nonattainment areas. The EPA requirements for the consideration of $PM_{2.5}$ precursors are:

- Regional emissions analysis must include NO_x as a $PM_{2.5}$ precursor in all $PM_{2.5}$ nonattainment areas, unless the head of the state air agency and the USEPA Regional Administrator make a finding that NO_x is not a significant contributor to the $PM_{2.5}$ air quality problem in a given area;
- Regional emissions analyses are not required for VOC, SO_x or NH_3 before an approved SIP budget for such precursors is established, unless the head of the state air agency or the EPA Regional Administrator makes a finding that on-road emissions of any of these precursors is a significant contributor. The following criteria are considered in making significance or insignificance findings for $PM_{2.5}$ precursors:
    - The contribution of on-road emissions of the precursor to the total 2007 baseline SIP inventory;
    - The current state of air quality for the area;

- The results of speciation monitoring for the area;
- The likelihood that future motor vehicle control measures will be implemented for a given precursor; and,
- Projections of future on-road emissions of the precursor.

After reviewing the EPA requirements and the criteria regarding significance, the transportation conformity budgets for $PM_{2.5}$ precursors will only include the establishment of an annual NO_x budget for the $PM_{2.5}$ nonattainment area addressed by this attainment demonstration SIP revision.

c. Road Dust and Construction Related Fugitive Dust

The Federal Transportation Conformity Rule specifies that re-entrained road dust is to be included as a component of direct $PM_{2.5}$ for transportation conformity regional emissions analysis only if the EPA Regional Administrator or the director of the state air agency has made a finding that emissions from re-entrained road dust within the area are a significant contributor to the $PM_{2.5}$ nonattainment problem and has so notified the MPO and the Department. Also, for $PM_{2.5}$ areas in which the implementation plan does not identify construction-related fugitive $PM_{2.5}$ as a significant contributor to the nonattainment problem, the fugitive $PM_{2.5}$ emissions associated with highway and transit project construction are not required to be considered in the regional emissions analysis.

The EPA has indicated that a finding of significance for re-entrained road dust would be based on a case-by-case review of the following factors: the contribution of road dust to current and future $PM_{2.5}$ nonattainment; an area's current design value for the $PM_{2.5}$ standard; whether control of road dust appears necessary to reach attainment; and whether increases in re-entrained dust emissions may interfere with attainment. Such a review would include consideration of local air quality data and/or air quality or emissions modeling results.

Findings of significance have not been made for either re-entrained road dust or construction-related fugitive dust for the NYMA nonattainment area. Previous review of speciated data by the Department indicates that between three to six percent of fine particulate mass is attributable to all sources of geologic material. Therefore, neither re-entrained road dust emissions nor fugitive dust emissions from highway and transit project construction have been included in the $PM_{2.5}$ transportation conformity budgets. A more detailed discussion of re-entrained road dust is included in section III.B.1.c.

d. Maintenance Budgets for the Annual $PM_{2.5}$ NAAQS

The proposed maintenance transportation conformity emission budgets for directly emitted $PM_{2.5}$ and annual NO_x ($PM_{2.5}$ precursor) are provided in Table 15. These budgets are for both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. The proposed maintenance budgets are based on the latest planning assumptions. These budgets are based on MOVES modeling and the development of a 2007 base year inventory and projection inventories for 2017 and 2025. In order to develop appropriate MVEB maintenance budgets for 2009, the Department ran the MOVES model and did not project 2007 emissions. The 2009 runs were based on appropriate inputs for 2009 including 2009 VMT and registration data as well as all other appropriate inputs.

Table 15. Transportation Conformity Emission Budgets for the 1997 Annual and 2006 24-Hour $PM_{2.5}$ NAAQS for the NYMA $PM_{2.5}$ Maintenance Area (Tons/Year)

Type of Budget	$PM_{2.5}$ [(a)]	NO_x
NYMA nonattainment area 2009 MVEB[(b)]	5,516.75	106,020.09
NYMA nonattainment area 2017 MVEB[(c)]	3,897.71	68,362.66
NYMA nonattainment area 2025 MVEB[(c)]	3,291.09	51,260.81

Notes: (a) Direct $PM_{2.5}$ consists of the sum of: organic carbon, elemental carbon, particulate matter from gasoline vehicles, brake particles, and tire particles
(b) 2009 MVEB's are based on 2009 inputs[26]
(c) 2017 and 2025 MVEB are projections from the 2007 base year inventory

e. A Budget to Address the Tappan Zee Hudson River Crossing Project Construction Emissions

The Department actively participated in the review of the Environmental Impact Statement (EIS) for the TZHRC project. As part of that process, DEC agreed with the U.S. Army Corps of Engineers and the U.S. Coast Guard determination that general conformity applies to the emissions associated with the TZHRC construction. These include bridge construction, demolition of the existing bridge, dredging activities and transport of dredged materials to the Historic Area Remediation Site. In addition to the inclusion of these emissions in the Final EIS by the project sponsors, the Department committed to adopt and submit the necessary SIP revisions to include construction emissions from the TZHRC project.

In particular, the environmental impact statement for the TZHRC included a demonstration that the emissions of CO and NO_x exceed the *de minimis* thresholds in 40 CFR Part 93.153(b)(1). Specifically, peak construction emissions are estimated to be 101.7 tons per year (TPY) of CO in the New York State portion of the New York-New Jersey-Connecticut CO maintenance area and 457.0 TPY of NO_x in the New York State portion of the New York-New Jersey-Connecticut ozone and $PM_{2.5}$ nonattainment areas. It should be noted that the Department's commitment letter to EPA, dated May 24, 2012, included emissions estimates of 106.5 TPY for CO and 560.5 TPY for NO_x. An error was found in the assumptions used to develop the emissions estimates between the Draft and Final EIS. As such, the Department has included the corrected emissions in Tables 9 and 12 of this document for the year in the plan that coincides with the TZHRC project schedule, 2017.

To address the general conformity NO_x *de minimis* exceedance, the Department has included, per 40 CFR Part 93.158(a)(5)(i)(B), the 457.0 tons per year of NO_x in this SIP submission. The Department has also included an analysis demonstrating that all SIP requirements and milestones will continue to be met with the inclusion of the NO_x emissions from the TZHRC. In addition, this submission includes the identification of specific measures that have been incorporated into

[26] 2009 maintenance budgets are being included for transportation conformity purposes. The NYMA $PM_{2.5}$ maintenance area attained the standard in 2009 and these maintenance budgets are consistent with the timing of the area reaching attainment and the Department's clean data submission.

the plan as well as a demonstration that all existing applicable SIP requirements are being implemented in the area for the pollutants affected by the TZHRC.

The Department has determined that the responsible federal agencies are requiring all reasonable mitigation measures associated with their actions (Clean Fuels, Best Available Tailpipe Reduction Technologies, Utilization of Newer Equipment, Tug Boat Emissions Reduction, Concrete Batch Plant Controls, and Idling Restrictions) and they have included a detailed air quality analysis supporting their conformity determination.

D. Contingency Measures

In addition to the adopted regulations listed in section II.C, several other state regulations are being pursued that would further ensure the reduction of $PM_{2.5}$ concentrations for the purpose of maintaining the annual and 24-hour NAAQS. These regulations have either already been proposed, or are still being drafted by the Department, but are generally expected to be adopted within the next couple years.

The Department is unable to prepare contingency regulations that are automatically "triggered" into effectiveness should a future design value in the NYMA again exceed either $PM_{2.5}$ NAAQS. The regulations listed below, however, are part of the Department's continuous planning for various criteria pollutants. For example, revisions to the fuel sulfur content regulations of Part 225 are designed to assist in compliance with the $PM_{2.5}$ NAAQS, the SO_2 NAAQS, and obligations under the regional haze program. Additionally, EPA's revision of the $PM_{2.5}$ NAAQS, announced December 14, 2012, may prompt additional planning by states to meet the more stringent annual standard.

- Revisions to 6 NYCRR Part 225 – *Fuel Composition and Use*
  - The Department adopted on April 5, 2013 revisions to subpart 225-1 – *Fuel Composition and Use – Sulfur Limitations*. Previous limits for residual (#6) fuel oil range from 0.30 to 1.50 percent sulfur by weight, depending on location. This revision lowers the maximum sulfur level to 0.50 percent by weight in all areas of the state where it is not already lower (i.e. New York City (0.30 percent) and Nassau, Rockland, and Westchester Counties (0.37 percent)). Facilities will be required to purchase residual oil with these revised sulfur contents beginning July 1, 2014, and to fire such oil beginning July 1, 2016. The sulfur content limit of distillate (#2) fuel oil is also being reduced, to 15 ppm from various previous limits. Compliance with this new distillate limit is required by July 1, 2014 or July 1, 2016, depending on the type of fuel that is currently burned.
- New 6 NYCRR Part 222 – *Distributed Generation*
  - The Department is drafting a regulation affecting distributed generation (DG) sources. A DG source generates electricity exclusively for the facility at which it is located, and may include emergency generators, demand response sources, economic dispatch sources, and combined heat and power systems. The regulation would likely place NO_x and/or PM standards on new and/or existing DG sources that are not already subject to state or federal limits.

- Revisions to 6 NYCRR Part 228 – *Surface Coating Processes, Commercial and Industrial Adhesives, Sealants and Primers*
    - The Department adopted on June 5, 2013 a revision to subpart 228-1 – *Surface Coating Processes* to incorporate VOC RACT requirements contained in federal Control Techniques Guidelines (CTGs) that had been issued by EPA. The CTGs, and the dates they were issued, are as follows: Flat Wood Paneling Coatings (September 2006); Metal Furniture Coatings (September 2007); Large Appliance Coatings (September 2007); Automobile and Light-Duty Truck Assembly Coatings (September 2008); Miscellaneous Metal and Plastic Parts Coatings (September 2008); Paper, Film, and Foil Coatings (September 2007); and, Wood Furniture Coatings (April 1996).
- Revisions to 6 NYCRR Part 230 – *Gasoline Dispensing Sites and Transport Vehicles*
    - The Department is drafting a proposal to revise Part 230 to further reduce VOC emissions from gasoline dispensing facilities (GDFs) and transport vehicles. Emissions of VOCs from the transfer of gasoline can be significant: over six billion gallons of gasoline are distributed to about 7,500 retail sites in New York each year. The major changes being considered are the adoption of EPA's stage I requirements, and the removal of stage II requirements in the NYMA in light of increased propagation of onboard refueling vapor recovery (ORVR) systems.

IV. SUMMARY

The Department believes it has addressed and satisfied all the criteria of section 107(d)(3)(E) of the CAA for the EPA redesignation of a nonattainment area to attainment. This SIP submittal specifically demonstrates attainment of the NAAQS, with monitored design values below the annual and 24-hour levels since the 2007-2009 time period. It also details the regulations and control requirements that have been adopted to reduce ambient concentrations, and provides for continued maintenance of the NAAQS. Because the area is currently achieving the annual and 24-hour standards, and emissions are projected to decrease further as a result of state and federal regulations, it stands to reason that continued attainment can be assured.

Based on fulfillment of the CAA section 107(d)(3)(E) criteria, the Department is formally requesting that EPA redesignate the New York portion of the NY-NJ-CT $PM_{2.5}$ nonattainment area to attainment for the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS.

Appendix A

EPA Determination of NYMA Attainment of the 1997 Annual $PM_{2.5}$ NAAQS

under the criteria set forth in Executive Order 12866.

Because no general notice of proposed rulemaking is required for this amendment, the Regulatory Flexibility Act of 1980 does not apply. *See* 5 U.S.C. 601(2).

List of Subjects in 29 CFR Part 4022

Employee benefit plans, Pension insurance, Pensions, Reporting and recordkeeping requirements.

■ In consideration of the foregoing, 29 CFR part 4022 is amended as follows:

PART 4022—BENEFITS PAYABLE IN TERMINATED SINGLE-EMPLOYER PLANS

■ 1. The authority citation for part 4022 continues to read as follows:

Authority: 29 U.S.C. 1302, 1322, 1322b, 1341(c)(3)(D), and 1344.

■ 2. In appendix B to part 4022, Rate Set 206, as set forth below, is added to the table.

Appendix B to Part 4022—Lump Sum Interest Rates For PBGC Payments

* * * * *

Rate set	For plans with a valuation date		Immediate annuity rate (percent)	Deferred annuities (percent)				
	On or after	Before		i_1	i_2	i_3	n_1	n_2
*	*		*	*	*	*	*	
206	12–1–10	1–1–11	2.25	4.00	4.00	4.00	7	8

■ 3. In appendix C to part 4022, Rate Set 206, as set forth below, is added to the table.

Appendix C to Part 4022—Lump Sum Interest Rates For Private-Sector Payments

* * * * *

Rate set	For plans with a valuation date		Immediate annuity rate (percent)	Deferred annuities (percent)				
	On or after	Before		i_1	i_2	i_3	n_1	n_2
*	*		*	*	*	*	*	
206	12–1–10	1–1–11	2.25	4.00	4.00	4.00	7	8

Issued in Washington, DC, on November 8, 2010.

Vincent K. Snowbarger,

Deputy Director for Operations, Pension Benefit Guaranty Corporation.

[FR Doc. 2010–28570 Filed 11–12–10; 8:45 am]

BILLING CODE 7709–01–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 52

[Docket No. EPA–R02–OAR–2010–0659; FRL–9225–6]

Approval and Promulgation of Air Quality Implementation Plans; New York, New Jersey, and Connecticut; Determination of Attainment of the 1997 Fine Particle Standard

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency (EPA) is determining that the New York-Northern New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area for the 1997 fine particle National Ambient Air Quality Standard (NAAQS) has attained the 1997 $PM_{2.5}$ NAAQS.

DATES: *Effective Date:* This rule will become effective on December 15, 2010.

ADDRESSES: EPA has established a docket for this action under Docket ID Number EPA–R02–OAR–2010–0659. All documents in the docket are listed in the *http://www.regulations.gov* Web site. Although listed in the electronic docket, some information is not publicly available, *i.e.,* confidential business information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically through *http://www.regulations.gov* or in hard copy for public inspection during normal business hours at the Air Programs Branch, U.S. Environmental Protection Agency, Region II, 290 Broadway, New York, New York 10007.

FOR FURTHER INFORMATION CONTACT: Henry Feingersh, (212) 637–3382, or by e-mail at *feingersh.henry@epa.gov* if you have questions related to New York or New Jersey. If you have questions related to Connecticut, please contact Alison C. Simcox, (617) 918–1684, or by e-mail at *simcox.alison@epa.gov.*

SUPPLEMENTARY INFORMATION: Throughout this document whenever "we", "us", or "our" is used, we mean EPA.

The **SUPPLEMENTARY INFORMATION** section is arranged as follows:

I. What action is EPA taking?

EPA is determining that the New York-Northern New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area, referred to from this point forward as the NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area, for the 1997 $PM_{2.5}$ NAAQS has attained the 1997 $PM_{2.5}$ NAAQS. This determination is based upon quality assured, quality controlled and certified ambient air monitoring data that show the area has monitored attainment of the 1997 $PM_{2.5}$ NAAQS for the 2007–2009 monitoring period. Other specific requirements of the determination and the rationale for

EPA's proposed action are explained in the proposed rulemaking published on August 2, 2010 (75 FR 45076) and will not be restated here.

In addition, EPA is determining that the 1997 $PM_{2.5}$ NAAQS has been attained for the NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area by the initial attainment date of no later than April 5, 2010 as required under the provisions of EPA's $PM_{2.5}$ implementation rule (*see* 40 CFR 51.1004).

EPA notes that the State of New York provided information in support of the Clean Data Determination which EPA considered in this action. On June 9, 2010, EPA received a Clean Data petition from New York, requesting a determination that the New York State portion of the NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area for the 1997 $PM_{2.5}$ NAAQS has attained the 1997 $PM_{2.5}$ NAAQS. In the petition, New York provided additional technical information supporting a Clean Data determination for the area, including a list of Federal and State emission control measures that have contributed to attainment of the 1997 $PM_{2.5}$ NAAQS, and a listing of annual $PM_{2.5}$ design values for the 2007–09 time period for air monitors located in the NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area. New York also provided an estimate of design values for sites that had less than complete air monitoring data due to site closure. The additional information provided by New York is further discussed in the Technical Support document (TSD), and is available in the docket.

II. What comments were received and what is EPA's response?

No public comments were received in response to the proposal.

III. What is the effect of this action?

This final action, in accordance with 40 CFR 51.1004(c), suspends the requirements for this area to submit an attainment demonstration, associated reasonably available control measures, reasonable further progress plans (RFP), contingency measures, and other planning State implementation plans (SIPs) related to attainment of the 1997 $PM_{2.5}$ NAAQS for so long as the area continues to attain the 1997 $PM_{2.5}$ NAAQS.

This action does not constitute a redesignation to attainment under section 107(d)(3) of the Clean Air Act (CAA), because the area does not have an approved maintenance plan as required under section 175A of the CAA, nor a determination that the area has met the other requirements for redesignation. The designation status of the area remains nonattainment for the 1997 annual $PM_{2.5}$ NAAQS until such time as EPA determines that it meets the CAA requirements for redesignation to attainment.

IV. Final Action

EPA is determining that the NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area for the 1997 $PM_{2.5}$ NAAQS has attained the 1997 $PM_{2.5}$ NAAQS. This determination is based upon quality assured, quality controlled, and certified ambient air monitoring data that show that the area has monitored attainment of the 1997 $PM_{2.5}$ NAAQS for the 2007–2009 monitoring period. This final action, in accordance with 40 CFR 51.1004(c), will suspend the requirements for this area to submit an attainment demonstration, associated reasonably available control measures, RFP, contingency measures, and other planning SIPs related to attainment of the 1997 $PM_{2.5}$ NAAQS for so long as the area continues to attain the 1997 $PM_{2.5}$ NAAQS.

V. Statutory and Executive Order Reviews

A. General Requirements

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is not a "significant regulatory action" and therefore is not subject to review by the Office of Management and Budget. For this reason, this action is not subject to Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 FR 28355, May 22, 2001). This action makes a determination based on air quality data, and results in the suspension of certain Federal requirements. Accordingly, the Administrator certifies that this rule will not have a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*). Because this rule makes a determination based on air quality data, and results in the suspension of certain Federal requirements, it does not contain any unfunded mandate or significantly or uniquely affect small governments, as described in the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4).

This rule also does not have Tribal implications because it will not have a substantial direct effect on one or more Indian Tribes, on the relationship between the Federal Government and Indian Tribes, or on the distribution of power and responsibilities between the Federal Government and Indian Tribes, as specified by Executive Order 13175 (65 FR 67249, November 9, 2000). This action also does not have Federalism implications because it does not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132 (64 FR 43255, August 10, 1999), because it merely makes a determination based on air quality data and results in the suspension of certain Federal requirements, and does not alter the relationship or the distribution of power and responsibilities established in the Clean Air Act (CAA). This rule also is not subject to Executive Order 13045 "Protection of Children from Environmental Health Risks" (62 FR 19885, April 23, 1997) because it determines that air quality in the affected area is meeting Federal standards.

The requirements of section 12(d) of the National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272 note) do not apply because it would be inconsistent with applicable law for EPA, when determining the attainment status of an area, to use voluntary consensus standards in place of promulgated air quality standards and monitoring procedures otherwise satisfying the provisions of the CAA.

This rule does not impose an information collection burden under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*).

Under Executive Order 12898, EPA finds that this rule involves a determination of attainment based on air quality data and will not have disproportionately high and adverse human health or environmental effects on any communities in the area, including minority and low-income communities.

B. Submission to Congress and the Comptroller General

The Congressional Review Act, 5 U.S.C. 801 *et seq.*, as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this action and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A major rule cannot take effect until 60 days after it is published in the **Federal Register**.

This action is not a "major rule" as defined by 5 U.S.C. 804(2).

C. Petitions for Judicial Review

Under section 307(b)(1) of the CAA, petitions for judicial review of this action must be filed in the United States Court of Appeals for the appropriate circuit by January 14, 2011. Filing a petition for reconsideration by the Administrator of this final rule does not affect the finality of this action for the purposes of judicial review nor does it extend the time within which a petition for judicial review may be filed, and shall not postpone the effectiveness of such rule or action. This action, pertaining to the NY-NJ-CT $PM_{2.5}$ nonattainment area clean data determination, may not be challenged later in proceedings to enforce its requirements. (*See* section 307(b)(2).)

List of Subjects in 40 CFR Part 52

Environmental protection, Air pollution control, Incorporation by reference, Particulate matter.

Dated: October 19, 2010.

H. Curtis Spalding,

Acting Regional Administrator, Region I.

Dated: September 29, 2010.

Judith A. Enck,

Acting Regional Administrator, Region II.

■ Part 52, chapter I, title 40 of the Code of Federal Regulations is amended as follows:

PART 52—[AMENDED]

■ 1. The authority citation for part 52 continues to read as follows:

Authority: 42 U.S.C. 7401 *et seq.*

Subpart H—Connecticut

■ 2. Section 52.379 is amended by redesignating the introductory paragraph as paragraph (a) and adding a new paragraph (b) to read as follows:

§ 52.379 Control strategy: $PM_{2.5}$.

(a) * * *

(b) *Determination of Attainment.* EPA has determined, as of December 15, 2010, that the New York-Northern New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area has attained the 1997 $PM_{2.5}$ National Ambient Air Quality Standard. This determination, in accordance with 40 CFR 51.1004(c), suspends the requirements for this area to submit an attainment demonstration, associated reasonably available control measures, a reasonable further progress plan, contingency measures, and other planning SIPs related to attainment of the standard for as long as the area continues to attain the 1997 $PM_{2.5}$ NAAQS.

Subpart FF—New Jersey

■ 3. Section 52.1602 is amended by adding new paragraph (c) to read as follows:

§ 52.1602 Control strategy and regulations: $PM_{2.5}$.

* * * * *

(c) Determination of Attainment. EPA has determined, as of December 15, 2010, that the New York-Northern New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area has attained the 1997 $PM_{2.5}$ National Ambient Air Quality Standard. This determination, in accordance with 40 CFR 51.1004(c), suspends the requirements for this area to submit an attainment demonstration, associated reasonably available control measures, a reasonable further progress plan, contingency measures, and other planning SIPs related to attainment of the standard for as long as the area continues to attain the 1997 $PM_{2.5}$ NAAQS.

Subpart HH—New York

■ 4. Section 52.1678 is amended by adding new paragraph (e) to read as follows:

§ 52.1678 Control strategy and regulations: Particulate matter.

* * * * *

(e) Determination of Attainment. EPA has determined, as of December 15, 2010, that the New York-Northern New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area has attained the 1997 $PM_{2.5}$ National Ambient Air Quality Standard. This determination, in accordance with 40 CFR 51.1004(c), suspends the requirements for this area to submit an attainment demonstration, associated reasonably control available measures, a reasonable further progress plan, contingency measures, and other planning SIPs related to attainment of the standard for as long as the area continues to attain the 1997 $PM_{2.5}$ NAAQS.

[FR Doc. 2010–28504 Filed 11–12–10; 8:45 am]

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Medicare & Medicaid Services

42 CFR Part 447

[CMS–2238–F2]

RIN 0938–AP67

Medicaid Program; Withdrawal of Determination of Average Manufacturer Price, Multiple Source Drug Definition, and Upper Limits for Multiple Source Drugs

AGENCY: Centers for Medicare & Medicaid Services (CMS), HHS.

ACTION: Final rule.

SUMMARY: This final rule withdraws two provisions from the "Medicaid Program; Prescription Drugs" final rule (referred to hereafter as "AMP final rule") published in the July 17, 2007 **Federal Register**. The provisions we are withdrawing are as follows: The determination of average manufacturer price, and the Federal upper limits for multiple source drugs. We are also withdrawing the definition of "multiple source drug" as it was revised in the "Medicaid Program; Multiple Source Drug Definition" final rule published in the October 7, 2008 **Federal Register**.

DATES: *Effective Date:* These regulations are effective on December 15, 2010.

FOR FURTHER INFORMATION CONTACT: Wendy Tuttle, (410) 786–8690.

SUPPLEMENTARY INFORMATION:

I. Background

On September 3, 2010, we published a proposed rule (75 FR 54073) in the **Federal Register** to withdraw two provisions from the "Medicaid Program; Prescription Drugs" final rule published in the July 17, 2007 **Federal Register** (72 FR 39142) (referred to hereafter as "AMP final rule"). The provisions we proposed to withdraw are as follows:

- Section 447.504 "Determination of AMP."
- Section 447.514 "Upper limits for multiple source drugs."

We also proposed to withdraw the definition of "multiple source drug" as it was revised in the "Medicaid Program; Multiple Source Drug Definition" final rule published in the October 7, 2008 **Federal Register** (73 FR 58491).

The AMP final rule, published in the July 17, 2007 **Federal Register** (72 FR 39142), implemented sections 6001(a) through (d), 6002, and 6003 of the Deficit Reduction Act of 2005 (Pub. L. 109–171, enacted on February 8, 2006) (DRA) as well as codified parts of

Appendix B

EPA Determination of NYMA Attainment of the 2006 24-Hour $PM_{2.5}$ NAAQS

economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or (4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.''

The economic, interagency, budgetary, legal, and policy implications of this regulatory action have been examined, and it has been determined to be a significant regulatory action under Executive Order 12866.

Unfunded Mandates

The Unfunded Mandates Reform Act of 1995 requires, at 2 U.S.C. 1532, that agencies prepare an assessment of anticipated costs and benefits before issuing any rule that may result in an expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more (adjusted annually for inflation) in any given year. This rule will have no such effect on State, local, and tribal governments, or on the private sector.

Regulatory Flexibility Act

The Secretary hereby certifies that this interim final rule will not have a significant economic impact on a substantial number of small entities as they are defined in the Regulatory Flexibility Act, 5 U.S.C. 601–612. This interim final rule will temporarily freeze the copayments that certain veterans are required to pay for prescription drugs furnished by VA. The interim final rule affects individuals and has no impact on any small entities. Therefore, pursuant to 5 U.S.C. 605(b), this rulemaking is exempt from the initial and final regulatory flexibility analysis requirements of sections 603 and 604.

Catalog of Federal Domestic Assistance

The Catalog of Federal Domestic Assistance program number and title for this rule are as follows: 64.005, Grants to States for Construction of State Home Facilities; 64.007, Blind Rehabilitation Centers; 64.008, Veterans Domiciliary Care; 64.009, Veterans Medical Care Benefits; 64.010, Veterans Nursing Home Care; 64.011, Veterans Dental Care; 64.012, Veterans Prescription Service; 64.013, Veterans Prosthetic Appliances; 64.014, Veterans State Domiciliary Care; 64.015, Veterans State Nursing Home Care; 64.016, Veterans State Hospital Care; 64.018, Sharing Specialized Medical Resources; 64.019, Veterans Rehabilitation Alcohol and Drug Dependence; 64.022, Veterans Home Based Primary Care; and 64.024, VA Homeless Providers Grant and Per Diem Program.

Signing Authority

The Secretary of Veterans Affairs, or designee, approved this document and authorized the undersigned to sign and submit the document to the Office of the Federal Register for publication electronically as an official document of the Department of Veterans Affairs. John R. Gingrich, Chief of Staff, Department of Veterans Affairs, approved this document on December 7, 2012, for publication.

List of Subjects in 38 CFR Part 17

Administrative practice and procedure, Alcohol abuse, Alcoholism, Claims, Day care, Dental health, Drug abuse, Foreign relations, Government contracts, Grant programs-health, Grant programs-veterans, Health care, Health facilities, Health professions, Health records, Homeless, Medical and dental schools, Medical devices, Medical research, Mental health programs, Nursing homes, Philippines, Reporting and recordkeeping requirements, Scholarships and fellowships, Travel and transportation expenses, Veterans.

Approved: December 7, 2012.

John R. Gingrich,

Chief of Staff, Department of Veterans Affairs.

For the reasons set forth in the preamble, VA amends 38 CFR part 17 as follows:

PART 17—MEDICAL

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 38 U.S.C. 501(a), and as noted in specific sections.

§ 17.110 [Amended]

■ 2. Amend § 17.110 as follows:

■ a. In paragraphs (b)(1)(ii) and (b)(2), remove ''December 31, 2012'' each place it appears and add, in each place, ''December 31, 2013''.

■ b. In paragraphs (b)(1)(iii) and (b)(1)(iv), remove ''December 31, 2011'' each place it appears and add, in each place, ''December 31, 2013''.

[FR Doc. 2012–31432 Filed 12–28–12; 8:45 am]

BILLING CODE 8320–01–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 52

[Docket No. EPA–R02–OAR–2012–0504; FRL–9763–6]

Approval and Promulgation of Air Quality Implementation Plans; New York, New Jersey, and Connecticut; Determination of Attainment of the 2006 Fine Particle Standard

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency (EPA) is determining that the New York-N. New Jersey-Long Island, NY–NJ–CT fine particle ($PM_{2.5}$) nonattainment area for the 2006 24-hour $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) has attained the 2006 24-hour $PM_{2.5}$ NAAQS. The determination of attainment will suspend the requirements for the New York-N. New Jersey-Long Island, NY–NJ–CT $PM_{2.5}$ nonattainment area to submit an attainment demonstration, associated reasonably available control measures, reasonable further progress, contingency measures, and other planning state implementation plans (SIPs) related to attainment of the 2006 24-hour $PM_{2.5}$ NAAQS for so long as the area continues to attain the 2006 24-hour $PM_{2.5}$ NAAQS.

DATES: *Effective Date:* This rule is effective on December 31, 2012.

ADDRESSES: EPA has established a docket for this action under Docket ID Number EPA–R02–OAR–2012–0504. All documents in the docket are listed in the *http://www.regulations.gov* web site. Although listed in the electronic docket, some information is not publicly available, i.e., confidential business information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically through *http://www.regulations.gov* or in hard copy for public inspection during normal business hours at the Air Programs Branch, U.S. Environmental Protection Agency, Region II, 290 Broadway, New York, New York 10007.

FOR FURTHER INFORMATION CONTACT: Gavin Lau, (212) 637–3708, or by email at *lau.gavin@epa.gov* if you have questions related to New York or New Jersey. If you have questions related to Connecticut, please contact Alison C.

Simcox, (617) 918–1684, or by email at *simcox.alison@epa.gov.*

SUPPLEMENTARY INFORMATION:

Throughout this document whenever ''we,'' ''us,'' or ''our'' is used, we mean EPA.

The **SUPPLEMENTARY INFORMATION** section is arranged as follows:

I. What action Is EPA taking?

EPA is determining that the New York-N. New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area for the 2006 24-hour $PM_{2.5}$ NAAQS, referred to from this point forward as the NY-NJ-CT $PM_{2.5}$ nonattainment area, has attained the 2006 24-hour $PM_{2.5}$ NAAQS. This determination is based upon quality-assured, quality-controlled and certified ambient air monitoring data that show the area has monitored attainment of the 2006 24-hour $PM_{2.5}$ NAAQS for the 2007–2009, 2008–2010, and 2009–2011 monitoring periods. Specific details regarding the determination and the rationale for EPA's action are explained in the proposed rulemaking published in the **Federal Register** (FR) on August 30, 2012 (77 FR 52626).

II. What is the background for EPA's action?

EPA's determination is being made in accordance with its longstanding interpretation under the Clean Data Policy, and with previously issued rules and determinations of attainment. A brief description of the Clean Data Policy with respect to the 2006 $PM_{2.5}$ standard is set forth below. In addition, the docket for this rulemaking includes documentation providing more detail regarding the application of EPA's Clean Data Policy to determinations of attainment for the 2006 $PM_{2.5}$ NAAQS.

In April 2007, EPA issued its $PM_{2.5}$ Implementation Rule for the 1997 $PM_{2.5}$ standard. 72 FR 20586; (April 25, 2007). In March, 2012, EPA published implementation guidance for the 2006 $PM_{2.5}$ standard. *See* Memorandum from Stephen D. Page, Director, Office of Air Quality Planning and Standards, ''Implementation Guidance for the 2006 24-Hour Final Particle ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS)'' (March 2, 2012). In that guidance, EPA stated its view ''that the overall framework and policy approach of the 2007 $PM_{2.5}$ Implementation Rule continues to provide effective and appropriate guidance on the EPA's interpretation of the general statutory requirements that states should address in their SIPs. In general, the EPA believes that the interpretations of the statute in the framework of the 2007 $PM_{2.5}$ Implementation Rule are relevant to the statutory requirements for the 2006 24-hour $PM_{2.5}$ NAAQS * * *'' *Id.,* page 1. With respect to the statutory provisions applicable to 2006 $PM_{2.5}$ implementation, the guidance emphasized that ''EPA outlined its interpretation of many of these provisions in the 2007 $PM_{2.5}$ Implementation Rule. In addition to regulatory provisions, the EPA provided substantial general guidance for attainment plans for $PM_{2.5}$ in the preamble to the final the [*sic*] 2007 $PM_{2.5}$ Implementation Rule.'' *Id.,* page 2. In keeping with the principles set forth in the guidance, and with respect to the effect of a determination of attainment for the 2006 $PM_{2.5}$ standard, EPA is applying the same interpretation here with respect to the implications of clean data determinations that it set forth in the preamble to the 1997 $PM_{2.5}$ standard and in the regulation that embodies this interpretation. 40 CFR 51.1004(c).[1] EPA has long applied this interpretation in regulations and individual rulemakings for the 1-hour ozone and 1997 8-hour ozone standards, the PM–10 standard, and the lead standard.

In 1995, based on the interpretation of Clean Air Act (CAA) sections 171 and 172, and section 182 in the General Preamble, EPA set forth what has become known as its ''Clean Data Policy'' for the 1-hour ozone NAAQS. *See* Memorandum from John S. Seitz, Director, Office of Air Quality Planning and Standards, ''Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard'' (May 10, 1995). In 2004, EPA indicated its intention to extend the Clean Data Policy to the $PM_{2.5}$ NAAQS. *See* Memorandum from Steve Page, Director, EPA Office of Air Quality Planning and Standards, ''Clean Data Policy for the Fine Particle National Ambient Air Quality Standards'' (December 14, 2004).

The Clean Data Policy represents EPA's interpretation that certain requirements of subpart 1 of part D of the Act are by their terms not applicable to areas that are currently attaining the NAAQS.[2] The specific requirements that are inapplicable to an area attaining the standard are the requirements to submit a SIP that provides for: attainment of the NAAQS; implementation of all reasonably available control measures; reasonable further progress (RFP); and implementation of contingency measures for failure to meet deadlines for RFP and attainment.

It is important to note that the obligation of a State with respect to an area which attains the 2006 $PM_{2.5}$ standard based on three years of data, to submit an attainment demonstration and related planning submissions is suspended only for so long as the area continues to attain the standard. If EPA subsequently determines, after notice-and-comment rulemaking, that the area has violated the NAAQS, the requirements for the State to submit a SIP to meet the previously suspended requirements would be reinstated. It is likewise important to note that the area remains designated nonattainment pending a further redesignation action.

III. What comments did EPA receive on its proposal and what is EPA's response?

EPA received one adverse comment on the proposal, from a pseudonymous commenter. A summary of the comment submitted and EPA's response is provided below.

Comment: The commenter alleges that the determination of attainment for the NY-NJ-CT $PM_{2.5}$ nonattainment area is inappropriate due to particulate matter released from burning and allegedly inadequate air quality monitoring. The commenter also questioned the interaction between the New Jersey Department of Environmental Protection and EPA.

Response: In this rulemaking, EPA is making the determination that the NY-NJ-CT $PM_{2.5}$ nonattainment area has attained the 2006 $PM_{2.5}$ NAAQS. EPA is finalizing its determination only after conducting notice and comment rulemaking, through a transparent process in which the information on which the determination is based has been made available in the docket and also placed in the Technical Support Document for this rulemaking. EPA's determination of attainment is based on quality-assured, quality-controlled, and certified ambient air monitoring data. These data establish that, for 2007–2009, 2008–2010, and 2009–2011 the NY-NJ-CT $PM_{2.5}$ nonattainment area

[1] While EPA recognizes that 40 CFR 51.1004(c) does not itself expressly apply to the 2006 $PM_{2.5}$ standard, the statutory interpretation that it embodies is identical and is applicable to both the 1997 and 2006 $PM_{2.5}$ standards.

[2] This discussion refers to subpart 1 because subpart 1 contains the requirements relating to attainment of the 2006 $PM_{2.5}$ NAAQS.

meets the 2006 24-hour $PM_{2.5}$ NAAQS. Air monitoring data available for 2012 also indicate that the NY-NJ-CT $PM_{2.5}$ nonattainment area is continuing to meet the 2006 24-hour $PM_{2.5}$ NAAQS. Contrary to the commenter's contention, the air monitoring networks for Connecticut, New Jersey, and New York are adequate, and meet the requirements for monitoring as specified in 40 CFR Part 58. EPA meets annually with the states to determine the adequateness of the monitoring networks. Air monitoring network approval letters are included in the Technical Support Document and docket for the proposed rule. In conclusion, the determination of attainment is being made based on quality-assured air quality data from approved monitoring networks. The suspension of requirements for this area to submit attainment-related planning SIP submission requirements lasts only as long as the area continues to meet that standard. No other requirements are suspended and no control measures in the SIP are being relaxed. This action does not change the implementation of control measures, or air quality, in the area.

Table 1 shows the design values by county (i.e., the 3-year average of 98th percentile 24-hour $PM_{2.5}$ concentrations) for the 2006 24-hour $PM_{2.5}$ NAAQS for the NY–NJ–CT $PM_{2.5}$ nonattainment area monitors for the years 2007 through 2011 based on complete (except where otherwise noted), quality-assured and certified air quality monitoring data. As shown in Table 1, none of the design values for the periods of 2007–2009, 2008–2010, and 2009–2011 in the NY–NJ–CT $PM_{2.5}$ nonattainment area exceeds the 2006 24-hour $PM_{2.5}$ NAAQS of 35.0 micrograms per cubic meter (μg/m³).

TABLE 1—DESIGN VALUES [3] BY COUNTY FOR THE 2006 24-HOUR $PM_{2.5}$ NAAQS FOR THE NY–NJ–CT MONITORS IN MICROGRAMS PER CUBIC METER (μG/M³). THE STANDARD FOR THE 2006 24-HOUR $PM_{2.5}$ NAAQS IS 35.0 μG/M³

County	2007–2009 $PM_{2.5}$ Design Values	2008–2010 $PM_{2.5}$ Design Values	2009–2011 $PM_{2.5}$ Design Values
New York			
Bronx	33	29	28
Kings	30	27	25
Nassau [4]	INC	25	23
New York [5]	[6] 33	[6] 31	28
Orange	26	24	23
Queens	30	28	26
Richmond	29	26	24
Rockland	NM	NM	NM
Suffolk	26	25	23
Westchester	29	28	25
NJ			
Bergen	31	28	25
Essex [7]	[6] 30	[6] 26	INC
Hudson	32	29	28
Mercer	29	27	26
Middlesex	27	23	20
Monmouth	NM	NM	NM
Morris	26	23	23
Passaic	30	INC	25
Somerset	NM	NM	NM
Union	[6] 32	30	30
Connecticut			
Fairfield	31	28	26
New Haven	31	29	28

NM—No monitor located in county.
INC—Counties listed as INC did not meet 75 percent data completeness requirement for the relevant time period.

[3] $PM_{2.5}$ Design Values can be found at: *http://www.epa.gov/airtrends/values.html.*

[4] The monitor located in Nassau County had incomplete data for 2007 which led to inability to calculate design values for the period of 2007–2009. The monitor did not show previous violations and therefore it was deemed that determining the design values though alternative procedures was not necessary.

[5] The monitor in New York County located at Public School 59 was the highest reading monitor in the County at the time EPA made designations for the 2006 $PM_{2.5}$ NAAQS. Midway through 2008, the monitor at PS 59 was shut down due to the demolition of the building site. Since missing 2008 data affected calculation of the design value for the 24-hour standard, EPA used an alternative procedure to determine the design value for the 24-hour standard. Detailed information on this alternative procedure can be found in the Technical Support Document for this rulemaking.

[6] Design Value was calculated using the alternative procedure described in the Technical Support Document for this rulemaking.

[7] The air monitor at the Newark Willis Center station in Essex County was discontinued on July 24, 2008 due to an unexpected loss of access, and replaced with a new monitor at the Newark Firehouse. $PM_{2.5}$ monitoring was established at the firehouse on May 13, 2009. EPA used an alternative procedure to determine the design value for the 24-hour standard for 2007–2009 and 2008–2010. The monitor did not show any violations in 2009 and 2010, therefore it was deemed that determining the design value for 2009–2011 through alternative procedures was not necessary. For 2009 and 2010, the 98th percentile value for the new monitor was 24 μg/m³. Detailed information on this alternative procedure can be found in the Technical Support Document for this rulemaking.

IV. What is the effect of this action?

This final action, in accordance with the Clean Data Policy, which is reflected in 40 CFR 51.1004(c), suspends the requirements for the States of Connecticut, New Jersey, and New York, to submit an attainment demonstration, associated reasonably available control measures, RFP, contingency measures, and other planning SIPs related to attainment of the 2006 24-hour $PM_{2.5}$ NAAQS for the NY-NJ-CT $PM_{2.5}$ nonattainment area for so long as the area continues to attain the 2006 $PM_{2.5}$ NAAQS.

This action does not constitute a redesignation to attainment under section 107(d)(3) of the CAA, because the area does not have an approved maintenance plan as required under section 175A of the CAA. Nor is it a determination that the area has met the other requirements for redesignation. The designation status of the area remains nonattainment for the 2006 24-hour $PM_{2.5}$ NAAQS until such time as EPA determines that the area, and/or a State portion thereof, meets the CAA requirements for redesignation to attainment.

V. What is EPA's final action?

EPA is determining that the NY-NJ-CT $PM_{2.5}$ nonattainment area for the 2006 24-hour $PM_{2.5}$ NAAQS has attained the 2006 24-hour $PM_{2.5}$ NAAQS. This determination is based upon quality-assured, quality-controlled, and certified ambient air monitoring data that show that the area has monitored attainment of the 2006 24-hour $PM_{2.5}$ NAAQS for the 2007–2009 and 2008–2010 and 2009–2011 monitoring periods. Preliminary air monitoring data available for 2012 are consistent with the determination that the NY-NJ-CT $PM_{2.5}$ nonattainment area is continuing to meet the 2006 24-hour $PM_{2.5}$ NAAQS. This final action, in accordance with the Clean Data Policy, suspends the requirements for the States of New York, New Jersey and Connecticut to submit, for the NY-NJ-CT $PM_{2.5}$ nonattainment area, an attainment demonstration, associated reasonably available control measures, RFP, contingency measures, and other planning SIPs related to attainment of the 2006 24-hour $PM_{2.5}$ NAAQS in the area for so long as the area continues to attain the 2006 24-hour $PM_{2.5}$ NAAQS. If EPA subsequently determines, after notice-and-comment rulemaking in the **Federal Register**, that the NY-NJ-CT $PM_{2.5}$ nonattainment area has violated the 2006 24-hour $PM_{2.5}$ NAAQS, the basis for the suspension of the specific requirements would no longer exist for the area, and the affected States would thereafter have to address the applicable requirements for the 2006 24-hour $PM_{2.5}$ NAAQS.

In accordance with 5 U.S.C. 553(d), EPA finds there is good cause for this action to become effective immediately upon publication. A delayed effective date is unnecessary due to the nature of a determination of attainment, which suspends the obligation to submit certain attainment-related CAA planning requirements that would otherwise apply. The immediate effective date for this action is authorized under both 5 U.S.C. 553(d)(1), which provides that rulemaking actions may become effective less than 30 days after publication if the rule ''grants or recognizes an exemption or relieves a restriction,'' and section 553(d)(3), which allows an effective date less than 30 days after publication ''as otherwise provided by the agency for good cause found and published with the rule.'' The purpose of the 30-day waiting period prescribed in section 553(d) is to give affected parties a reasonable time to adjust their behavior and prepare before the final rule takes effect. Today's rule, however, does not create any new regulatory requirements such that affected parties would need time to prepare before the rule takes effect. Rather, today's rule relieves the affected States of the obligation to submit certain attainment-related planning requirements for this $PM_{2.5}$ nonattainment area. For these reasons, EPA finds good cause under 5 U.S.C. 553(d)(3) for this action to become effective on the date of publication of this notice.

VI. Statutory and Executive Order Reviews

This action makes an attainment determination based on air quality and results in the suspension of certain Federal requirements, and it does not impose additional requirements beyond those imposed by state law.

For these reasons, this action:

- Is not a ''significant regulatory action'' subject to review by the Office of Management and Budget under Executive Order 12866 (58 FR 51735, October 4, 1993);
- Does not impose an information collection burden under the provisions of the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*);
- Is certified as not having a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*);
- Does not contain any unfunded mandate or significantly or uniquely affect small governments, as described in the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4);
- Does not have Federalism implications as specified in Executive Order 13132 (64 FR 43255, August 10, 1999);
- Is not an economically significant regulatory action based on health or safety risks subject to Executive Order 13045 (62 FR 19885, April 23, 1997);
- Is not a significant regulatory action subject to Executive Order 13211 (66 FR 28355, May 22, 2001);
- Is not subject to requirements of Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272 note) because application of those requirements would be inconsistent with the CAA; and
- Does not provide EPA with the discretionary authority to address, as appropriate, disproportionate human health or environmental effects, using practicable and legally permissible methods, under Executive Order 12898 (59 FR 7629, February 16, 1994).

In addition, this rule does not have tribal implications as specified by Executive Order 13175 (65 FR 67249, November 9, 2000), because the SIP is not approved to apply in Indian country located in the state, and EPA notes that it will not impose substantial direct costs on tribal governments or preempt tribal law.

The Congressional Review Act, 5 U.S.C. 801 *et seq.,* as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this action and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A major rule cannot take effect until 60 days after it is published in the **Federal Register**. This action is not a ''major rule'' as defined by 5 U.S.C. 804(2).

Under section 307(b)(1) of the Clean Air Act, petitions for judicial review of this action must be filed in the United States Court of Appeals for the appropriate circuit by March 1, 2013. Filing a petition for reconsideration by the Administrator of this final rule does not affect the finality of this action for the purposes of judicial review nor does it extend the time within which a petition for judicial review may be filed, and shall not postpone the effectiveness of such rule or action.

This action may not be challenged later in proceedings to enforce its requirements. (See section 307(b)(2).)

List of Subjects in 40 CFR Part 52

Environmental protection, Air pollution control, Incorporation by reference, Particulate matter.

Dated: November 28, 2012.

Judith A. Enck,

Regional Administrator, Region II.

Dated: December 11, 2012.

H. Curtis Spalding,

Regional Administrator, Region I.

Part 52, chapter I, title 40 of the Code of Federal Regulations is amended as follows:

PART 52—APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS

■ 1. The authority citation for part 52 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart H—Connecticut

■ 2. Section 52.379 is amended by adding paragraph (g) to read as follows:

§ 52.379 Control strategy: $PM_{2.5}$.

* * * * *

(g) *Determination of Attainment.* EPA has determined, as of December 31, 2012, that the New York-N. New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area has attained the 2006 $PM_{2.5}$ National Ambient Air Quality Standard. This determination suspends the requirements for this area to submit an attainment demonstration, associated reasonably available control measures, a reasonable further progress plan, contingency measures, and other planning SIPs related to attainment of the standard for as long as the area continues to attain the 2006 $PM_{2.5}$ NAAQS.

Subpart FF—New Jersey

■ 3. Section 52.1602 is amended by adding paragraph (e) to read as follows:

§ 52.1602 Control strategy and regulations: $PM_{2.5}$.

* * * * *

(e) *Determination of Attainment.* EPA has determined, as of December 31, 2012, that the New York-N. New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area has attained the 2006 $PM_{2.5}$ National Ambient Air Quality Standard. This determination suspends the requirements for this area to submit an attainment demonstration, associated reasonably available control measures, a reasonable further progress plan, contingency measures, and other planning SIPs related to attainment of the standard for as long as the area continues to attain the 2006 $PM_{2.5}$ NAAQS.

Subpart HH—New York

■ 4. Section 52.1678 is amended by adding paragraph (f) to read as follows:

§ 52.1678 Control strategy and regulations: Particulate matter.

* * * * *

■ (f) *Determination of Attainment.* EPA has determined, as of December 31, 2012, that the New York-N. New Jersey-Long Island, NY-NJ-CT fine particle ($PM_{2.5}$) nonattainment area has attained the 2006 $PM_{2.5}$ National Ambient Air Quality Standard. This determination suspends the requirements for this area to submit an attainment demonstration, associated reasonably control available measures, a reasonable further progress plan, contingency measures, and other planning SIPs related to attainment of the standard for as long as the area continues to attain the 2006 $PM_{2.5}$ NAAQS.

[FR Doc. 2012–31214 Filed 12–28–12; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 52

[EPA–R08–OAR–2011–0770, FRL–9734–8]

Approval and Promulgation of Implementation Plans; State of Colorado; Regional Haze State Implementation Plan

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: EPA is approving a State Implementation Plan (SIP) revision submitted by the State of Colorado on May 25, 2011 that addresses regional haze. Colorado submitted this SIP revision to meet the requirements of the Clean Air Act (CAA or ''the Act'') and our rules that require states to prevent any future and remedy any existing man-made impairment of visibility in mandatory Class I areas caused by emissions of air pollutants from numerous sources located over a wide geographic area (also referred to as the ''regional haze program''). EPA is taking this action pursuant to section 110 of the CAA.

DATES: This final rule is effective January 30, 2013.

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA–R08–OAR–2011–0770. All documents in the docket are listed on the *www.regulations.gov* Web site.

Publicly available docket materials are available either electronically through *www.regulations.gov*, or in hard copy at the Air Program, Environmental Protection Agency (EPA), Region 8, 1595 Wynkoop Street, Denver, Colorado 80202–1129. EPA requests that if, at all possible, you contact the individual listed in the **FOR FURTHER INFORMATION CONTACT** section to view the hard copy of the docket. You may view the hard copy of the docket Monday through Friday, 8 a.m. to 4 p.m., excluding Federal holidays.

FOR FURTHER INFORMATION CONTACT: Laurel Dygowski, Air Program, Mailcode 8P–AR, Environmental Protection Agency, Region 8, 1595 Wynkoop Street, Denver, Colorado 80202–1129, (303) 312–6144, *dygowski.laurel@epa.gov.*

SUPPLEMENTARY INFORMATION:

Table of Contents

Definitions

For the purpose of this document, we are giving meaning to certain words or initials as follows:

i. The words or initials *Act* or *CAA* mean or refer to the Clean Air Act, unless the context indicates otherwise.

Appendix C

NYMA 2011 Design Values for the Annual and 24-Hour $PM_{2.5}$ NAAQS

State	Monitoring Site	AQS ID	2009 Avg.	2010 Avg.	2011 Avg.	2011 Annual Design Value
New York	Hempstead	36-059-0008	9.0	8.7	8.9	8.9
	Babylon	36-103-0002	8.1	8.4	8.8	8.4
	JHS 45	36-061-0079	10.4	9.8	10.7	10.3
	PS 19	36-061-0128	N/A	11.5	12.1	N/A
	Division Street	36-061-0134	11.6	11.5	N/A	N/A
	Morrisania	36-005-0080	12.7	11.4	11.6	11.9
	Botanical Garden	36-005-0083/0133	10.0	10.0	10.0	10.0
	IS 52	36-005-0110	10.8	N/A	N/A	N/A
	JHS 126	36-047-0122	10.7	9.9	10.3	10.3
	Queens College	36-081-0124	9.5	9.4	9.4	9.4
	Susan Wagner	36-085-0067	8.5	8.2	8.8	8.5
	Port Richmond	36-085-0055	9.8	9.7	9.9	9.8
	Newburgh	36-071-0002	7.9	8.1	8.6	8.2
	Mamaroneck	36-119-1002	9.1	8.8	9.3	9.1
Connecticut	Bridgeport Roosevelt	09-001-0010	9.4	8.8	10.0	9.4
	Danbury WCSU	09-001-1123	9.2	9.1	9.6	9.3
	Norwalk	09-001-3005	9.5	8.7	10.0	9.4
	Westport	09-001-9003	8.9	8.6	9.5	9.0
	New Haven Fire House	09-009-0026	9.2	10.2	N/A	N/A
	New Haven Criscuolo Park	09-009-0027	9.7	8.9	10.1	9.6
	New Haven State St	09-009-1123	9.9	9.0	10.0	9.6
	New Haven Ag. Stn	09-009-2008	8.5	9.0	N/A	N/A
	Waterbury	09-009-2123	9.4	9.2	9.9	9.5
New Jersey	Fort Lee	34 003 0003	9.0	8.8	9.8	9.2
	Newark Firehouse	34 013 0003	N/A	9.2	10.5	N/A
	Jersey City Primary	34 017 1002	10.3	9.6	10.8	10.2
	Union City	34 017 2002	10.7	10.6	11.9	11.1
	Trenton	34 021 0008	9.2	9.6	10.3	9.7
	Washington Crossing	34 021 8001	7.8	8.2	8.4	8.1
	New Brunswick	34 023 0006	8.0	7.4	8.3	7.9
	Morristown	34 027 0004	8.1	8.5	8.7	8.4
	Chester	34 027 3001	7.1	7.6	7.9	7.5
	Paterson	34 031 0005	8.9	8.9	N/A	N/A
	Elizabeth Turnpike Primary	34 039 0004	11.2	10.6	12.2	11.3
	Elizabeth Downtown	34 039 0006	9.3	9.2	10.0	9.5
	Rahway	34 039 2003	9.3	9.3	10.1	9.6

	Monitoring Site	AQS ID	2009 98th %	2010 98th %	2011 98th %	2011 24-Hr Design Value
New York	Hempstead	36-059-0008	25.8	20.2	23.1	23
	Babylon	36-103-0002	21.6	26.1	21.7	23
	JHS 45	36-061-0079	28.8	25.2	25.2	26
	PS 19	36-061-0128	N/A	25.4	26.4	N/A
	Division Street	36-061-0134	29.0	27.0	N/A	N/A
	Morrisania	36-005-0080	30.0	27.0	27.0	28
	Botanical Garden	36-005-0083/0133	27.4	24.8	23.0	25
	IS 52	36-005-0110	30.6	N/A	N/A	N/A
	JHS 126	36-047-0122	26.9	24.8	24.3	25
	Queens College	36-081-0124	26.7	25.5	24.7	26
	Susan Wagner	36-085-0067	23.0	21.5	23.6	23
	Port Richmond	36-085-0055	24.6	25.5	23.2	24
	Newburgh	36-071-0002	20.6	26.5	20.8	23
	Mamaroneck	36-119-1002	27.0	26.7	22.7	25
Connecticut	Bridgeport Roosevelt	09-001-0010	29.3	23.3	23.7	25
	Danbury WCSU	09-001-1123	27.6	25.7	24.8	26
	Norwalk	09-001-3005	29.3	23.0	25.2	26
	Westport	09-001-9003	26.4	24.2	28.7	26
	New Haven Fire House	09-009-0026	28.5	21.7	N/A	N/A
	New Haven Criscuolo Park	09-009-0027	30.2	25.5	27.5	28
	New Haven State St	09-009-1123	30.8	23.9	26.6	27
	New Haven Ag. Stn	09-009-2008	27.3	19.5	N/A	N/A
	Waterbury	09-009-2123	28.1	25.7	24.3	26
New Jersey	Fort Lee	34 003 0003	27.0	25.1	23.5	25
	Newark Firehouse	34 013 0003	N/A	24.0	23.9	N/A
	Jersey City Primary	34 017 1002	29.0	26.4	28.2	28
	Union City	34 017 2002	25.0	26.7	25.7	26
	Trenton	34 021 0008	23.0	27.7	27.7	26
	Washington Crossing	34 021 8001	25.0	18.5	19.7	21
	New Brunswick	34 023 0006	21.0	19.1	20.5	20
	Morristown	34 027 0004	22.0	23.3	21.0	22
	Chester	34 027 3001	21.0	22.7	24.4	23
	Paterson	34 031 0005	26.0	24.4	25.4	25
	Elizabeth Turnpike Primary	34 039 0004	28.0	28.1	32.9	30
	Elizabeth Downtown	34 039 0006	26.0	25.1	21.5	24
	Rahway	34 039 2003	25.0	23.8	23.8	24

Appendix D

New York State On-Road Motor Vehicle Emission Budget MOVES Technical Support Documentation

New York State On-Road

Motor Vehicle Emission Budget

MOVES Technical Support Documentation

Prepared by:

New York State Department of Environmental Conservation

Division of Air Resources

Bureau of Air Quality Planning

Mobile Source Section

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1.0 Introduction

In early 2010, the U.S. Environmental Protection Agency (EPA) released the Motor Vehicle Emissions Simulator (MOVES). MOVES is used to calculate average in-use fleet emission factors for a wide variety of on-road vehicle types, model years, and pollutants. The MOVES model represents a major change from EPA's MOBILE6 emission factor model released in 2002. This latest version differs significantly from previous versions in the type and quantity of data (both required and optional) that the model is capable of utilizing.

MOVES includes default values for most inputs; however, using these default values gives results that are designed to reflect national average values. In order to produce results that give more representative estimates of local emissions it is necessary to provide MOVES with appropriate local inputs. This document outlines the sources of these local inputs and provides references, where necessary, with even more detailed information.

2.0 Vehicle Miles Traveled

2.1 VMT (HPMSVtypeVMT Table)

MOVES requires annual, county-level VMT by HPMS Vehicle type for each county input table. The following discussion describes the development of this information.

The Planning and Strategy Group of the New York State Department of Transportation (NYSDOT) developed the Vehicle Miles Traveled (VMT) data used to calculate the emissions for the on-road mobile inventory. The NYSDOT uses their submittal of the US Department of Transportation's Highway Performance Monitoring System (HPMS) VMT as the basis for developing county-level, grouped functional class VMT estimates. This process is described in more detail in the NYSDOT report "Estimated County Level Vehicle Miles of Travel," of April 1, 1989 and updated in an April 27, 1992 memo, both authored by Nathan Earlbaum of NYSDOT. These documents are labeled as Attachment 1 to this document and are available upon request.

A new 2007 Daily Vehicle Miles Traveled (DVMT) inventory was constructed by NYSDOT to provide DVMT estimates by county, geographic component (urban, small urban, and rural) and grouped functional class. In addition, functional class shares are provided to expand the DVMT to more specific functional classes The DVMT inventory is updated on a continuous cycle every three years. The methodology employed to develop the 2007 DVMT inventory remains the same as documented in the Radian Report, NYS 1990 Base Year Carbon Monoxide and Ozone Precursor On-Road Mobile Source Inventory, Final Report March 1993, Appendix B: Background Documentation for the Development of VMT Estimates. Future years are linearly forecast using all available data starting from 1981 to determine the slope.

DVMT by county and by grouped functional class are multiplied by functional class shares to expand the DVMT to the 12 functional classes. The by-functional class DVMT is then multiplied by seasonal adjustment factors and the number of days per month to get the annual vmt by functional class. The seasonal adjustment factors are also supplied by the NYSDOT. For more information on the seasonal adjustment factors see Section 10.0 Seasonal Adjustment Factors. Next, the annual VMT by functional class is summed over geographic component to get the annual county-level VMT by functional class. Annual VMT by functional class is then aggregated to MOVES road type. In order to fit the new MOVES framework, Functional Class 01 becomes Rural Restricted, classes 02, 06, 07, 08, & 09 become Rural Unrestricted, classes 11 and 12 are Urban Restricted and classes 14, 16, 17, & 19 become Urban Unrestricted. The next step is to apply the vehicle mix by MOVES source type and road type to the annual VMT by road type. This will yield the annual VMT by MOVES Road type and Source type which is then summed over MOVES road type. Development of vehicle mix is discussed in section 2.3 below. Finally, the resulting annual VMT by MOVES source type is aggregated to HPMS vehicle type which is then used to populate the county-level HPMSVType VMT tables.

2.2 RoadTypeDistribution Table

The road type distribution table contains the fraction of VMT allocated to each MOVES road type for each vehicle type. This information is calculated during the above HPMS vehicle type VMT process. Once the annual VMT by MOVES Road type and Source type is developed the fraction of VMT allocated to each road type is calculated. This is done at the county level.

2.3 Vehicle Mix

The vehicle mix for each of the 11 NYSDOT regions in New York State are used to produce the by vehicle type VMT. Vehicle types are the 13 Use Types and 6 Fuel Types that are used by MOVES. The main objective of the process is to create a separate, distinct (where justified) vehicle mix for each of the four roadway types used in MOVES.

Ideally, sufficient roadway survey data would exist to characterize the vehicle mix reliably into the level of detail required by MOVES. In reality, data from roadway surveys is available by 6 roadway types by only three broad vehicle categories. These categories, called FHWA vehicle classifications, or the FHWA "F" scheme (of which there are thirteen, i.e. f1 to f13, characterized by axle count and tractor/trailer combinations), are traditionally consolidated down to three by NYSDOT because of sample size concerns. The three categories provided are a combined f1 & f2 that represents motorcycles and light duty vehicles, f3 which is currently considered by New York State Department of Environmental Conservation (NYSDEC) to be all LDT3 and LDT4 (in the EPA MOBILE6 scheme of vehicle types), and f4 thru f13 lumped as a single aggregate count representing all heavy duty vehicles. In order to expand these 3 broad categories into the 13 vehicle types of the MOVES framework, data from other sources, namely New York State Department of Motor Vehicles (NYSDMV) registrations along with NYSDOT and EPA mileage accumulations, are used to create the requisite vehicle mixes.

The process used by NYSDEC to generate a vehicle mix is a three-step process. The first step utilizes NYSDMV registration data resulting in counts of vehicles registered on or around July 1st of the analysis year. The process of obtaining and refining this registration data is outlined in Section 11.0 Decoding the NYSDMV Database. This process yields vehicle populations for the thirteen MOVES vehicle types for each of the 62 counties in NYS. The county counts are aggregated to eleven NYSDOT regions.

Registration-based counts, while relatively easy to assemble, do not adequately represent the mix of vehicles on various roadway types. This is because certain vehicle types drive many more miles than others. In an attempt to compensate for this, the next step is to take the thirteen vehicle type categories, subdivide each category further by vehicle age, and then apply an adjustment (weighting factor) based on mileage accumulation. The EPA mileage accumulation data for cars and light trucks are supplemented by NYS-specific results from the NPTS (National Personal Transportation Survey). This step is detailed in Section 9.0 Mileage Accumulation Rate

The third step of the NYSDEC process uses the 'intermediate vehicle mix' to adjust the roadway classification counts developed by NYSDOT and provided as the three groupings of the FHWA "Scheme F" classification system discussed earlier. The 'intermediate vehicle mix' is applied to these three axle count groups, yielding a vehicle mix for the thirteen MOVES vehicle types.

2.4 Hour VMT Fraction Table

Hourly VMT fractions are developed for 26 specific regions (counties) through analysis of the 1995 National Personal Transportation Survey (NPTS) by NYSDOT. The NPTS Time of Day graphs are contained in a document labeled as Attachment 2 which is available upon request. Hourly VMT fraction assignments are shown in table 2.1 below.

Table 2.1 - Hourly VMT Fraction Assignments 2007	
Hourly VMT Fraction Profile	Counties
Albany	Albany
Bronx	Bronx
Broome	Broome
Chemung	Chemung
Dutchess	Dutchess
Erie	Erie
Kings	Kings
Monroe	Monroe
Nassau	Nassau
New York	New York
Niagara	Niagara
Oneida	Oneida
Onondaga	Onondaga
Orange	Orange
Putnam	Putnam
Queens	Queens
Rensselaer	Rensselaer
Richmond	Richmond
Rockland	Rockland
Saratoga	Saratoga
Schenectady	Schenectady
Suffolk	Suffolk
Tompkins	Tompkins
Warren	Warren
Washington	Washington
Westchester	Westchester
Remainder	Remaining counties in state

2.5 Day VMT Fraction Table

NYSDEC utilizes a uniform allocation of VMT over all days of the week for all counties and as such populated the Day VMT fraction table accordingly.

2.6 Month VMT Fraction Table

Monthly VMT fractions are developed based on the seasonal adjustment factors described in section 10.

2.7 References

1. Estimated County Level Vehicle Miles of Travel. Erlbaum, Nathan S., New York State Department of Transportation, Planning Division. April 1, 1989

2. “Estimation of Vehicle Miles of Travel for 1990, by County and Functional Class and Method Documentation”. Memorandum from Erlbaum, Nathan S., Traffic Monitoring Section to Cioffi, G., Office of the Commissioner, New York State Department of Transportation. April 27, 1992 pp. 1 to 5. (APPENDIX B of Radian Report listed below)

3. New York State 1990 Base Year Carbon Monoxide and Ozone Precursor On-Road Mobile Source Inventory. Radian Corporation. March 1993, revised by NYSDEC on April 1993.

3.0 Ramp Fraction Table

The ramp fraction table allows for the input of specific ramp driving times for the restricted access road types. Neither NYSDEC nor NYSDOT is in possession of ramp VMT or speed data, so the default value 0.08 (8%) was used for all counties.

4.0 Average Speed Distribution Table

The Planning Division of the NYSDOT developed speed estimates for air quality modeling in 1994. Speeds were computed through a number of steps detailed in a 1994 report copied and included as Attachment 3. Speeds were developed for 15 areas, some as small as a single county, throughout the state along with each of the 12 possible functional classes and 4 time periods (Morning, Daytime, Evening, and Nighttime). The resulting speeds are contained in 6 tables which have been included as Attachment 4. A weighted average using 2007 VMT was used to determine the new speeds for each of the 4 roadways in MOVES. Table 4.1below shows the speed distribution assignments for New York counties.

Table 4.1 Average Speed Distribution Assignment 2007	
Speed Distribution	**Counties**
Capital District	Albany, Rensselaer, Saratoga, Schenectady & Saratoga
Syracuse	Onondaga, Oswego & Jefferson
Rochester	Genesee, Livingston, Monroe, Ontario, Orleans, & Wayne Counties
Buffalo	Erie & Niagara
Rest of State	Remaining Upstate Counties
Putnam	Putnam
Westchester	Westchester
Rockland	Rockland
Bronx	Bronx
New York	New York
Queens	Queens
Kings	Kings
Richmond	Richmond
Nassau	Nassau
Suffolk	Suffolk

5.0 Fuel Data

5.1 Fuel Supply Table

New York State uses two types of gasoline: eastern conventional gasoline for upstate counties and reformulated gasoline for the NY Metropolitan area including Putnam and Orange counties. In 1990 NYSDEC conducted a fuel sampling program. The results of this survey are provided in the New York State 1990 Base Year Carbon Monoxide and Ozone Precursor On-Road Mobile Source Inventory Appendix D.3 Based on the results of this survey, fuel formulations were selected from the default table which closely matched the sample data. Formulations were also selected to take into account the lower sulfur content of diesel fuel mandated by the Federal Highway Diesel rule implemented in late 2006. Table 5.1 includes the fuel sample data for conventional and reformulated gasoline and the selected fuel formulations used to populate the fuel supply table for each of the county input files. The fuel supply assignments for New York Counties are shown in Table 5.2.

Table 5.1 Fuel Sample Data and Selected Fuel Formulations for New York Counties 2007										
RFG Sample										
Month	RVP	T10	T50	T90	Benzene	Sulfur	Oxygen		E200	E300
	(psi)	(°F)	(°F)	(°F)	(v%)	(ppm)	(wt%)	(%E10)	(%)	(%)
January	13.1	109	158	315	0.62	20	3.8		70.6	86.2
February	12.6	111	158	316	0.69	35	3.8		70.6	86.0
March	12.4	111	158	312	0.63	32	3.7		70.6	86.9
April	10.4	120	181	315	0.57	31	3.3		59.3	86.2
May	7.3	135	206	315	0.42	28	3.5		47.0	86.2
June	6.9	136	211	319	0.41	29	3.6		44.6	85.4
July	6.9	136	209	316	0.36	35	3.6		45.6	86.0
August	6.9	135	208	311	0.30	32	3.6		46.1	87.1
September	7.1	134	207	313	0.29	35	3.6		46.6	86.7
October	10.6	117	169	306	0.34	25	3.7		65.2	88.2
November	12.4	113	162	309	0.37	42	3.8		68.6	87.6
December	12.7	113	165	312	0.41	48	3.7		67.1	86.9
Winter	12.64	111.4	160.2	312.8	0.544	35.40	3.76		69.5	86.7
Summer	7.02	135.2	208.2	314.8	0.356	31.80	3.58		46.0	86.3
Sprall	10.50	118.5	175.0	310.5	0.455	28.00	3.50		62.2	87.2
RFG Formulas Used (Selected from FuelFormulation Table)										
Formula	**RVP**				**Benzene**	**Sulfur**			**E200**	**E300**
8841	12.5864				0.5400	30			57.5155	92.3729
8519	7.01143				0.6857	30			51.8284	86.3126
8874	10.4738				0.5400	30			54.8602	92.5775
Conventional Gasoline Sample										
Month	RVP	T10	T50	T90	Benzene	Sulfur	Oxygen		E200	E300
	(psi)	(°F)	(°F)	(°F)	(v%)	(ppm)	(wt%)	(%E10)	(%)	(%)
January	12.80	109	208	320	1.06	31	0.2		46.1	85.1
February	13.30	108	206	322	0.76	30	0.3		47.0	84.7
March	13.00	108	203	316	1.03	35	0.2		48.5	86.0
April	10.30	121	212	325	1.21	33	0.3		44.1	84.0
May	8.50	128	214	320	1.21	38	0.2		43.1	85.1
June	8.50	130	214	320	1.18	50	0.1		43.1	85.1
July	8.30	132	215	319	0.99	40	0.2		42.6	85.4
August	8.40	131	215	319	1.02	37	0.1		42.6	85.4
September	8.30	130	213	319	0.9	41	0.1		43.6	85.4
October	10.40	119	213	322	0.81	51	0		43.6	84.7
November	11.50	116	205	317	0.74	47	0.2		47.5	85.8
December	12.80	111	196	318	0.88	76	0.4		51.9	85.6
Winter	12.68	110.4	203.6	318.6	0.894	43.80	0.26	0.07	48.216	85.448
Summer	8.40	130.2	214.2	319.4	1.06	41.20	0.14	0.04	43.022	85.272
Sprall	10.35	120.0	212.5	323.5	1.01	42.00	0.15	0.04	43.855	84.37
Conventional Gasoline Formulas Used (Selected from FuelFormulation Table)										
Formula	**RVP**				**Benzene**	**Sulfur**			**E200**	**E300**
7788	12.7571				0.935	45.5725			53.9283	85.5086
7800	8.39143				1.085	45.5725			44.9932	84.0594
7962	10.3708				0.983333	42.4925			50.1003	87.2421

Table 5.2 New York State Fuel Supply Assignments	
Fuel	**Counties**
Reformulated	Bronx, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk & Westchester
Eastern Conventional	All Remaining Upstate Counties

5.2 Fuel Formulation Table

MOVES contains a default fuel formulation table containing thousands of unique fuel formulations for gasoline and diesel fuel each with an assigned fuel formula ID. NYSDEC used this table as a source for selecting fuel formula ID's to assign to the fuel sampling data discussed above.

5.3 Stage II Refueling

The Stage II Refueling program began for the NYMA area in 1989. While refueling emissions are estimated using MOVES and the locally developed data described in this document, they are included in the area source inventory.

5.4 References

1. New York State 1990 Base Year Carbon Monoxide and Ozone Precursor On-Road Mobile Source Inventory. Radian Corporation. March 1993, revised by NYSDEC on April 1993.

6.0 Meteorological Data

6.1 Surface Temperature

Surface meteorological data, including temperature and dew point temperature for 2007, were obtained from the National Climatic Data Center for all available National Weather Service offices and reporting stations across the state. Monthly average diurnal temperature and relative humidity were subsequently calculated for each dataset. Meteorological data was then selected for each county based on climatological representativeness and/or location of the available stations. If a county did not have a specific NWS office located in it, data from a nearby office with similar meteorological conditions were used. Based on these considerations, a county assignment table (Table 6.1) was developed and used to populate the respective ZoneMonthHour tables for each county input file.

Table 6.1 New York State meteorological data assignments for county input files 2007

County	FIPS Code	Synoptic Station Code	Airport Code	Airport/Location
Albany	36001	725180	ALB	Albany International Airport
Allegany	36003	725157	ELZ	Wellsville Municipal Airport
Bronx	36005	725030	LGA	LaGuardia Airport
Broome	36007	725150	BGM	Greater Binghamton Airport
Cattaraugus	36009	725235	JHW	Chautauqua County Airport
Cayuga	36011	725194	PEO	Penn Yan Airport
Chautauqua	36013	725235	JHW	Chautauqua County Airport
Chemung	36015	725156	ELM	Elmira - Corning Regional Airport
Chenango	36017	725150	BGM	Greater Binghamton Airport
Clinton	36019	726170	BTV	Burlington International Airport
Columbia	36021	725180	ALB	Albany International Airport
Cortland	36023	725155	ITH	Tompkins County
Delaware	36025	725150	BGM	Greater Binghamton Airport
Dutchess	36027	725036	POU	Dutchess County Airport
Erie	36029	725280	BUF	Buffalo/Niagara International Airport
Essex	36031	726170	BTV	Burlington International Airport
Franklin	36033	726223	MSS	Massena International Airport- Richards Field
Fulton	36035	725180	ALB	Albany International Airport
Genesee	36037	725290	ROC	Monroe County Airport | Rochester Airport
Greene	36039	725180	ALB	Albany International Airport
Hamilton	36041	726228	SLK	Adirondack Regional Airport
Herkimer	36043	725196	RME	Griffiss AFB
Jefferson	36045	726227	ART	Watertown International Airport
Kings	36047	744860	JFK	John F Kennedy International Airport
Lewis	36049	743700	GTB	Wheeler-Sack Airfield | Great Bend
Livingston	36051	725157	ELZ	Wellsville Municipal Airport
Madison	36053	725190	SYR	Hancock International Airport
Monroe	36055	725290	ROC	Monroe County Airport | Rochester Airport
Montgomery	36057	725180	ALB	Albany International Airport
Nassau	36059	744864	FRG	Farmindale - Republic Field
New York	36061	725033	NYC	Central Park
Niagara	36063	725289	IAG	Niagara Falls International Airport
Oneida	36065	725196	RME	Griffiss AFB
Onondaga	36067	725190	SYR	Hancock International Airport
Ontario	36069	725290	ROC	Monroe County Airport | Rochester Airport
Orange	36071	725015	MGJ	Orange County Airport
Orleans	36073	725290	ROC	Monroe County Airport | Rochester Airport
Oswego	36075	725146	FZY	Oswego County
Otsego	36077	725196	RME	Griffiss AFB
Putnam	36079	725086	DXR	Danbury Municipal Airport
Queens	36081	725030	LGA	LaGuardia Airport
Rensselaer	36083	725180	ALB	Albany International Airport
Richmond	36085	725020	EWR	Newark Airport
Rockland	36087	725037	HPN	Westchester County Airport
St. Lawrence	36089	726223	MSS	Massena International Airport- Richards Field
Saratoga	36091	725180	ALB	Albany International Airport
Schenectady	36093	725180	ALB	Albany International Airport
Schoharie	36095	725180	ALB	Albany International Airport
Schuyler	36097	725194	PEO	Penn Yan Airport
Seneca	36099	725194	PEO	Penn Yan Airport
Steuben	36101	725156	ELM	Elmira - Corning Regional Airport
Suffolk	36103	744865	FOK	Suffolk County Airport
Sullivan	36105	725145	MSV	Monticello
Tioga	36107	725150	BGM	Greater Binghamton Airport
Tompkins	36109	725155	ITH	Tompkins County
Ulster	36111	725036	POU	Dutchess County Airport
Warren	36113	725185	GFL	Floyd Bennett Memorial Airport (Warren County Airport)
Washington	36115	725185	GFL	Floyd Bennett Memorial Airport (Warren County Airport)
Wayne	36117	725290	ROC	Monroe County Airport | Rochester Airport
Westchester	36119	725037	HPN	Westchester County Airport
Wyoming	36121	725157	ELZ	Wellsville Municipal Airport
Yates	36123	725194	PEO	Penn Yan Airport

6.2 Relative Humidity

The relative humidity data was calculated from hourly NWS observations that NYSDEC obtained from the National Climatic Data Center. Dew point observations for the same dates and locations that were used in temperature calculations were also used to determine hourly relative humidity values. The calculation method assumed standard atmospheric pressure to determine saturation vapor pressure from the temperature and vapor pressure from the dew point. The vapor pressure divided by the saturation vapor pressure, multiplied by 100, equals relative humidity. Monthly average diurnal humidity was then calculated from the hourly values.

7.0 Inspection/Maintenance Program (IMCoverage Table)

In 2007, several Inspection and Maintenance programs were in effect across the state. Statewide, the NYVIP program was in effect and tested light duty gasoline vehicles starting with the 1996 model year. This program included both evaporative and exhaust system OBD tests as well as a gas cap check. It gave vehicles that were 25 years and older an exemption and granted a grace period for vehicles 2 years old or newer. NYMA counties were also subject to the NYTEST program which included an IM240 and an idle program for heavy duty gasoline vehicles. Both programs tested vehicles starting with model year 1983. All programs also include a 30% stringency, 98% compliance rate and include a gas cap pressure test and no credit for technician training program. A waiver rate of 2% for NYMA counties and 3% for upstate counties was used to calculate the Compliance factor for the MOVES I/M Coverage table

8.0 LEV Programs

Beginning in the 1990's, a number of states chose to adopt California LEV standards in place of federal standards. The effects of these LEV standards are not included in the MOVES database. As a result EPA has created a separate input database for states adopting California LEV program regulations. The California LEV input database provides a set of alternative VOC, CO and NOx start and running emissions factors based of EPA and CARB analysis of LEV programs. The input database provides rates from model year 1994 until model year 2050, including both the California LEV 1 and LEV 2 standards. These rates replace the rates in the default database for these particular pollutants.

EPA has provided a MySQL script along with the supplemental database to replace the emissions rates depending on when states adopted the LEV program. The use of this script and supplemental database are outlined in the EPA guidance document "Instructions for using LEV and NLEV Inputs for MOVES". NYSDEC followed this guidance and created the appropriate supplemental database called ny_lev and used it along with the other local inputs.

8.1 References

1. "Instructions for using LEV and NLEV Inputs for MOVES", EPA-420-B-10-003a, August 2010, Assessment and Standards Division, EPA OTAQ, http://www.epa.gov/oms/models/moves/tools.htm

9.0 Mileage Accumulation Rate

Mileage accumulation rates were used in the development of the vehicle mix. The following section discusses the origins of these rates

Mileage Accumulation Rates for LDGV, LDDV, LDGT1, and LDGT2 were developed in conjunction with the NYSDOT. Mileage accumulation rates for MC were carried over from MOBILE5 default rates. All other vehicle type mileage accumulation rates are taken from the EPA's Fleet Characterization Data for MOBILE6.

The NYSDOT used the vehicle file component of the National Personal Transportation Survey (NPTS) to create annual mileage utilization rates for four LDV types. Part of these vehicle files is an average annualized vehicle odometer reading for passenger vehicles. The NYSDOT report Improving Air Quality Models in New York State: Utility of the 1995 Nationwide Personal Transportation Survey May 13, 1999, presented as Attachment 5, goes into more detail regarding the procedure used to curve fit New York specific data. This curve fitted data was then used to replace the national data for LDGV, LDDV, LDGT1, and LDGT2. The New York specific mileage accumulation table is included as Attachment 6. These mileage accumulation rates were then applied to the MOVES vehicle types where appropriate.

The report also illustrates the differences in New York and national curve fitted annual mileage accumulation data, specifically that while initial (first three years) mileage accumulation rates are lower for New York than the national average, older New York vehicles maintain higher mileage rates for longer periods of time. It is these significant differences that led to the decision to use New York specific data for these vehicle classes instead of using EPA recommended MOBILE6 defaults. These mileage accumulation rates were carried over from MOBILE5.

9.1 References

1. Fleet Characterization Data for MOBILE6. (EPA420-R-01-047), U.S. Environmental Protection Agency, Sept 2001.

2. Improving Air Quality Models in New York State: Utility of the 1995 Nationwide Personal Transportation Survey. New York State Department of Transportation, May 13, 1999. (Attachment 5)

10.0 Seasonal Adjustment Factors

The Planning Division of the NYSDOT develops seasonal adjustment factors in conjunction with their AADT-based DVMT estimates. After consultation with NYSDOT Planning & Strategy Group's Data Analysis & Forecasting Section it was decided that the three available Factor Groups (FG30, FG40, FG60) be used where applicable throughout the State to more accurately determine Ozone Season VMT in highly variable areas. Note that this is a change from previous modeling methodology that used FG30 (large urban area) for all roadways in New York State. Attachment 7 is a March 28, 2003 memo from NYSDOT Planning & Strategy Group with their recommendations, and Attachment 8 is a summary table of the spreadsheet referenced in the memo.

Further analysis (as shown in graphs on following pages) of the seasonal adjustment factors indicated that each factor group's values are relatively constant from year to year and that variations are within the range of sampling errors. Due to this NYSDEC has decided to take the average SAF for each factor group and use that value for all years rather than change it every three years. The graphs below show four lines, the annual ozone season factor for that functional group, plus one standard deviation, minus one standard deviation, and the average of the factors.

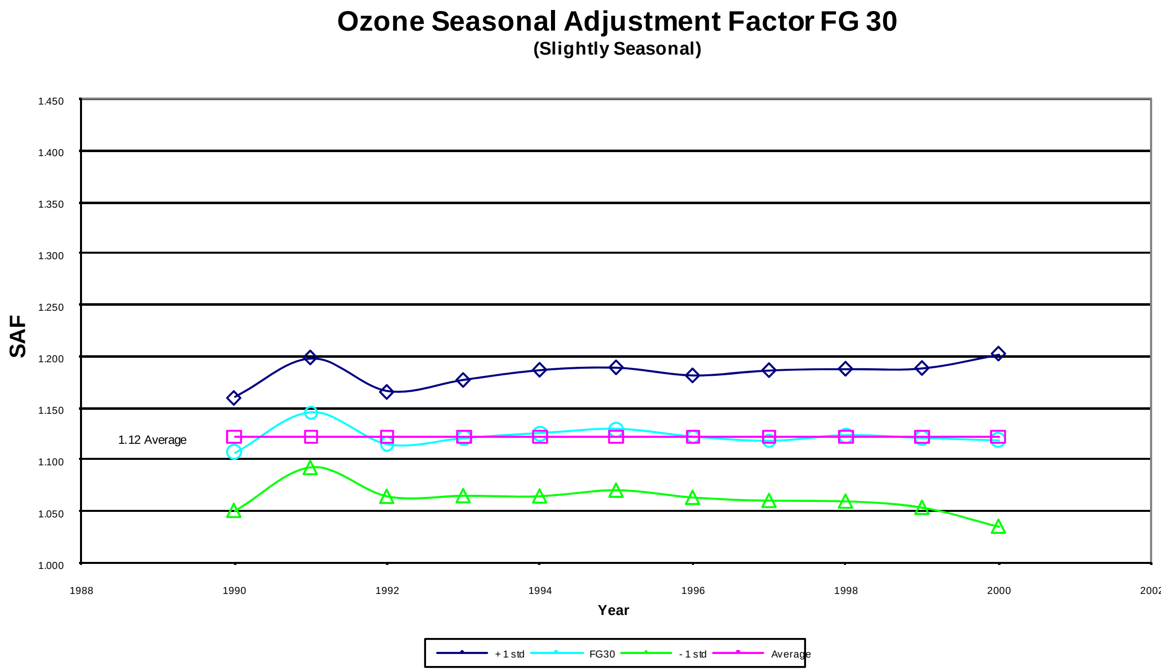

Figure 10-1

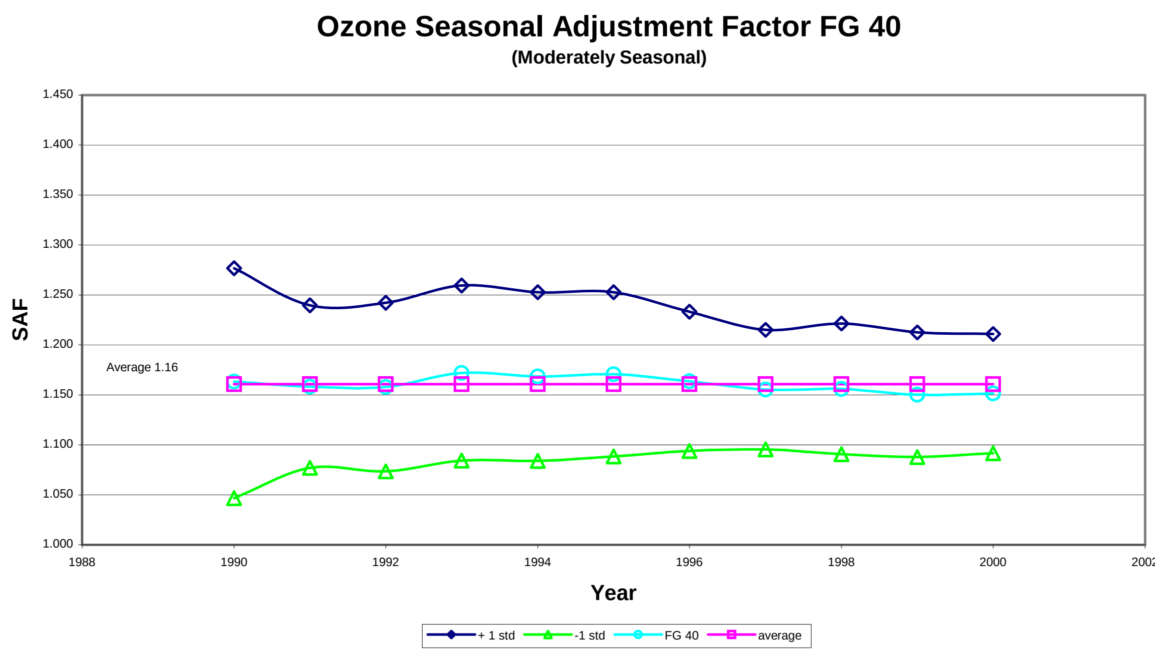

Figure 10-2

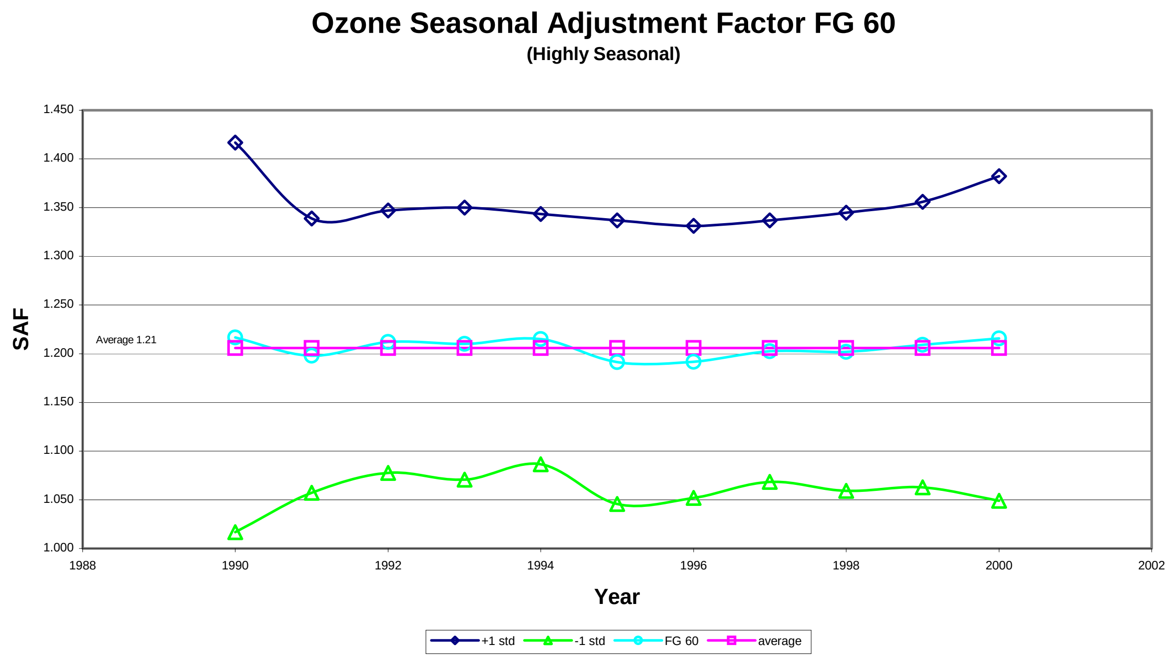

Figure 10-3

11.0 Decoding the NYSDMV database

11.1 Introduction

The MOVES model is different from previous EPA emissions models in that it is designed with a modular database structure. Now, when new data becomes available, it can easily be incorporated into the model. In addition, MOVES allows easier importation of local data that is specific to a user's unique needs. However, these changes required a complete re-write of the modeling framework.

The MOVES model includes a “default” database that will produce summary emissions for the entire United States. While national level emission estimates will be adequate utilizing this database, for many uses, up-to-date local inputs will be more appropriate, especially for analyses supporting State Implementation Plans (SIPs) and conformity determinations.

The first set of these local inputs are those that describe the local fleet. These inputs consist of Source Type (a.k.a. Vehicle Type) Age Distributions, Source Type Populations and Fuel Fractions. The two significant changes from MOBILE6 are the requirement for the number of vehicles (used to calculate start emissions) and the change from vehicle types to source types. There are 13 different source types; however, the information required to accurately count and classify all of them is not obtainable.

The next several pages step through the methodology used by the NYSDEC in sorting the 2007 NYSDMV Registration Database into the required vehicle inputs for MOVES. Table 11.1 provides a sample of what the sorting table looks like. The complete table contains each of the State's 62 counties and vehicle ages from 0 to 31+ with the Count column being the total of all vehicles of that type in that county regardless of age.

Table 11.1 Sample Sorting Table

County	County Code	Body Number	Body_Type	Count	0	1	2	3	4	5	6
1	001	11	MC	0	0	0	0	0	0	0	0
1	001	21	CAR	0	0	0	0	0	0	0	0
1	001	31	PTRUCK	0	0	0	0	0	0	0	0
1	001	32	COMMTRUCK	0	0	0	0	0	0	0	0
1	001	41	IBUS	0	0	0	0	0	0	0	0
1	001	42	TBUS	0	0	0	0	0	0	0	0
1	001	43	SBUS	0	0	0	0	0	0	0	0
1	001	51	REFUSETRUCK	0	0	0	0	0	0	0	0
1	001	52	SUSHORTTRUCK	0	0	0	0	0	0	0	0
1	001	53	SULONGTRUCK	0	0	0	0	0	0	0	0
1	001	54	MH	0	0	0	0	0	0	0	0
1	001	61	CSHORTTRUCK	0	0	0	0	0	0	0	0
1	001	62	CLONGTRUCK	0	0	0	0	0	0	0	0

11.2 Starting Point

The NYSDMV database that NYSDEC acquires each year contains the following data: VIN, NYSDMV Registration Type, County, Weight/Seating Capacity, Suspended Individual, NYSDMV Body Type, Fuel Type, Vehicle Year, Make, and Color. In 2007 there were 11,137,009 records. Table 11.2 below provides a snapshot of one record from that database.

Table 11.2 Snapshot of NYSDMV Database									
July2007RegData									
VIN	Reg Type	County	Wt/Seating Capacity	Susp Ind	Body Type	Fuel	Vehicle Year	Make	Color
4T1BE46K77U613161	16	41	003253	N	13	GAS	2007	TOYOT	GY

These records now need to be distilled into the following 13 Source Types:

Table 11.3 Thirteen Source Types		
SourceTypeID	SourceType Name	SourceType Abbreviation
11	Motorcycle	MC
21	Passenger Car	CAR
31	Passenger Truck	PTRUCK
32	Light Commercial Truck	COMMTRUCK
41	Intercity Bus	IBUS
42	Transit Bus	TBUS
43	School Bus	SBUS
51	Refuse Truck	REFUSETRUCK
52	Single Unit Short-Haul Truck	SUSHORTTRUCK
53	Single Unit Long-Haul Truck	SULONGTRUCK
54	Motor Home	MH
61	Combination Short-Haul Truck	CSHORTTRUCK
62	Combination Long-Haul Truck	CLONGTRUCK

The NYSDMV Body Type code is the most useful descriptor for sorting the various vehicle types into the MOVES Source Type ID's provided above. Additional refinement of the vehicle count is accomplished by also using the registration, gross vehicle weight, and even the color (school busses) for allocating vehicle counts into the appropriate MOVES vehicle categories.

The Body Type decoder in Table 11.4 below, provided by NYSDMV, has 71 different body types listed. Sixty-one of the body types account for the 11,137,009 vehicles included in the July 2007 database. Only 36 body types represent vehicles to be processed and considered for inclusion as an input for development of the on-road emission inventory. The removal of body types that contain invalid codes and types not considered to be on-road sources (267,252 records removed) results in 10,869,757 vehicles considered for further processing.

Table 11.4 NYSDMV Body Type Decoder		
Computer	Body Type	Count
01	Limited Use Vehicle - Sedan	
02	Limited Use Mcy – A	
03	Limited Use Mcy – B	
04	Limited Use Mcy - A, B or C	
05	Motorized Bicycle	
06	Limited Use Mcy - A, B or C or Motorized	
07	Limited Use Mcy - C	
08	Police	
09	Fire	677
10	Convertible	170,076
11	Sedan	29,737
12	Suburban	3,312,529
13	4 Door Sedan	4,492,050
14	2 Door Sedan	854,783
15	House on Wheels	29,384
18	All Terrain Vehicle	158,461
19	Motorcycle	300,322
20	Hearse-Invalid Comb.	112
21	Locomotive	8
22	Custom	143
23	Replica	14
30	Unknown Truck	
31	Unknown Passenger	1
32	Minibike	
33	Snowmobile	
34	Other Off-Highway Vehicle	
35	Bicyclist	
36	Pedestrian	
37	Other (Person)	
38	Misc. Farm Vehicle	
39	Ambulance	968
41	Power Shovel	11,477
42	Road Building Machine	12,457
43	Road Roller	1,281
44	Road Sweepers	4,847
45	Sand Spreader	1,642
46	Snow Plow	2,003
47	Snow Traveler	27
48	Snowmobile	10
49	Traction Engine	217
50	Tractor Crane	1,000

Computer	Body Type	Count
51	Truck Crane	2,674
52	Small Wheel Truck	940
53	Well Driller	666
54	Well Servicing Rig	352
55	Feed Processing Machine	73
56	Mobile Car Crusher	111
57	Earth Mover	687
58	Tractor	38,733
59		8,280
60	Delivery Truck	22,226
61	Dump Truck	103,375
62	Flat Bed Truck	19,300
63	Pick-up Truck	1,034,553
64	Stake Truck	17,956
65	Tank Truck	9,849
66	Refrigerated Truck	3,461
67	Tow Truck	7,229
68	Van Truck	256,974
70	Utility Truck	51,049
71	Pole Trailer	4
80	Boat Trailer	139
81	House Trailer	44,329
82	/1	
83	Semi-Trailer or Misc.	2,271
84	/1	
85	Trailer	14,228
87	Light Trailer /2	4,097
90	Bus (Omnibus)	85,858
91	Limousine (Omnibus)	1,075
92	Hearse (Ambulance)	798
93	Taxi	12,073
94	Disable Commercial /3	693
95	Cement Mixer	1,693
96	Moped /4	4,482
97	Manufactured Home	
98	Snowmobile	
99	Low Speed Vehicle	2,548
*26, 69, 76	*Invalid Body Type codes found in 2007	7

11.3 FUEL TYPES (ALTERNATIVE VEHICLE AND FUEL TECHNOLOGIES TABLE)

The NYSDMV Database includes 8 different fuel codes. These codes are included in Table 11.5.

Table 11.5 NYSDMV Fuel Tables		
CODE	DMV FUEL	COUNT
C	CNG	2,601
D	Diesel	425,980
E	Electric	3,836
F	Flex	2,709
G	Gasoline	10,629,389
P	Propane	478
O	Other	1,236
U	Unknown/Blank	70,780

The MOVES model has 6 possible fuel types, these are listed in Table 11.6.

Table 11.6 MOVES Fuel Types	
FuelTypeID	MOVES FUEL TYPE
1	Gasoline
2	Diesel
3	CNG
4	LPG (Propane)
5	Ethanol
6	
7	
8	
9	Electric

For modeling purposes, vehicles identified as Flex fuel types will be added to the Gasoline counts, while vehicles with “Other” and “Unknown” fuel types will be discarded. Because there is no hybrid code in the database hybrid vehicles cannot be counted individually and are instead counted under one of the above fuel types. The number of hybrids modeled in NYS in 2007 is zero.

Diesel Fractions are obtained at the same time as the registration distributions. The by-county and by-vehicle type totals created for the registration distributions are further sorted by fuel type and converted into the percent of diesel-powered vehicles by type and by age. The results are then used to populate the Alternative Vehicle Fuels Technology table.

Once vehicles are categorized by fuel type, the NYSDEC begins to move those vehicles into their appropriate source type by fuel. The next set of tables contain vehicle counts by MOVES source and fuel types along with a description of each necessary adjustment made for processing final vehicle counts. Adjustments include removal of records with any combination of invalid county identifiers, registration types and/or fuel types per category.

11.4 Source Type ID 11 - Motorcycles

The body types that could be considered "motorcycles" are #02 – #07 the Limited use Motorcycles Types A – C, #18 All Terrain Vehicle, #19 Motorcycle, #32 Minibike, & #96 Moped. Of these body types only #19 Motorcycles, and #96 Mopeds are being used by the NYSDMV. There are 304,804 motorcycles in Table 11.7 provided below with the percentage by fuel type showing that nearly all motorcycles operate on gasoline.

Table 11.7 Motorcycles		
MOTORCYCLES (Body Types 19, 96)		
DMV FUEL	COUNT	PERCENTAGE
CNG	6	0.00%
Diesel	30	0.01%
Electric	39	0.01%
Flex	39	0.01%
Gasoline	304,609	99.94%
Propane	0	0.00%
Other	2	0.00%
Unknown/Blank	79	0.03%

Further processing of this category requires removal of various registration types such as "84", "85", or "86" (trailers), "63" (in transit), and "35" (all terrain vehicles) which represent counts for registered vehicles other than on-road motorcycles. Other registration types that need to be identified and removed include contradictory registration types such as codes corresponding to busses, trucks, and tractor trailers, as examples. Removing additional records consisting of invalid county identifiers and fuel types "other" and "unknown" (758 records removed), provides a final total of 304,046 motorcycles in NYS, for emission inventory year 2007, under MOVES source type 11.

11.5 Source Type ID 21 - Passenger Car

The body types that could be considered “passenger cars” are #01 Limited Use Vehicle – Sedan, #8 Police, #10 Convertible, #11 Sedan, #13 4 Door Sedan, #14 2 Door Sedan, #20 Hearse-Invalid Comb. , #22 Custom, #23 Replica, #31 Unknown Passenger, #91 Limousine (Omnibus), #92 Hearse (Ambulance) and #93 Taxi. Body type #99 Low Speed Vehicle consist of mostly electric vehicles (2537 of 2548) and because of their limited range and speed, will not be considered true passenger cars. It was noted that in 2007, there are no vehicles registered as either body type #01 Limited Use Vehicle – Sedan or #8. A count of the valid body types listed returns 5,560,862 vehicles that could be passenger cars with nearly all operating on gasoline. These are shown in Table 11.8.

Table 11.8 Passenger Cars		
PASSENGER CARS (Body Types 01, 08, 10, 11, 13, 14, 20, 22, 23, 31, 91, 92, 93)		
DMV FUEL TYPE	COUNT	PERCENTAGE
CNG	852	0.02%
Diesel	11,326	0.20%
Electric	448	0.01%
Flex	1,221	0.02%
Gasoline	5,545,460	99.72%
Propane	44	0.00%
Other	422	0.01%
Unknown/Blank	1,089	0.02%

Further processing of this category requires removal of various registration types such as “84”, “85”, or “86” (trailers), and “63” (in transit) which represent counts for registered vehicles other than on-road passenger cars. Other registration types that need to be identified and removed include contradictory registration types such as codes corresponding to motorcycles, busses, trucks, and tractor trailers, as examples. Removing additional records consisting of invalid county identifiers and fuel types “other” and “unknown” (62,551 records removed), provides a final total of 5,498,311 passenger cars in NYS, for emission inventory year 2007, under MOVES source type 21.

11.6 Source Type IDs 31- Passenger Truck & 32 - Light Commercial Truck

The body types that are part of these two groups are #12 Suburban, #63 Pick-up Truck, and #68 Van Trucks up to 10,000lbs Gross Vehicle Weight Rating (GVWR). The trucks are separated into the appropriate source types of passenger or commercial based on corresponding registration codes. All vehicles of these body types having an estimated gross weight greater than 10,000 lbs. will be counted as source type ID 52, Single Unit/Short-Haul trucks, regardless of their registration code. There are a total of 4,604,056 Pick-ups, Suburbans, and Vans in the database. These are shown in Table 11.9.

Table 11.9 Light Commercial Trucks		
PASSENGER/COMMERCIAL TRUCKS (Body Types 12, 63, 68)		
DMV FUEL TYPE	COUNT	PERCENTAGE
CNG	804	0.02%
Diesel	127,684	2.77%
Electric	161	0.00%
Flex	1,362	0.03%
Gasoline	4,472,598	97.14%
Propane	171	0.00%
Other	253	0.01%
Unknown/Blank	1023	0.02%

Further processing of this category requires removal of 68,629 vehicles with an estimated gross weight greater than 10,000 lbs which are added to MOVES source type ID 52. Commercial registration codes are used to separate out commercial trucks from the three valid body types for vehicles with an estimated gross weight of 10,000 lbs. or less. Registration types such as “84”, “85”, or “86” (trailers), and “63” (in transit) which represent counts for registered vehicles other than on-road passenger trucks are removed. Registration codes are also used to identify and remove contradictory registration types such as codes corresponding to motorcycles, busses, and tractor trailers, as examples. Removing additional records consisting of invalid county identifiers and fuel types “other” and “unknown” (48,798 records removed), provides a final total of 3,667,233 passenger trucks (MOVES source type ID 31) and 819,396 commercial trucks (MOVES source type ID 32) in NYS, for emission inventory year 2007.

11.7 Source Type ID 41 - Intercity Busses, 42 - Transit Busses, & 43 - School Busses

The Body Type that is used for busses is #90 Bus (Omnibus). There are 85,858 Busses registered in New York State. Table 11.10 lists the number of vehicles with the various registration types. Table 11.11 lists busses by fuel type.

Table 11.10 Bus Registration Types		
BUSSES (Body Type 90)		
Number of Vehicles	Registration Type	
59,390	Political Subdivision (Municipal or Thruway)	69.17%
22,403	Omnibus (regular)	26.09%
2,698	School Car	3.14%
478	Omnibus (vanity + livery)	0.56%
301	International Reg Plan	0.35%
172	State Agencies	0.20%
113	Commercial (Regular)	0.13%
95	Omnibus (Public Service)	0.11%
42	Omnibus (Taxi)	0.05%
90	Passenger or Suburban (Regular)	0.10%
30	Omnibus (Special)	0.03%
26	Farm/Ag	0.03%
18	Historical	0.02%
2	Other	0.00%

Table 11.11 Bus Fuel Types		
Busses (Body Type 90)		
DMV FUEL	COUNT	PERCENTAGE
CNG	909	1.06%
Diesel	64,178	74.75%
Electric	508	0.59%
Flex	25	0.03%
Gasoline	19,667	22.91%
Propane	2	0.00%
Other	462	0.54%
Unknown/Blank	107	0.12%

Further processing of this category requires removal of various registration types such as “84”, “85”, or “86” (trailers), and “63” (in transit) which represent counts for registered vehicles other than on-road passenger cars. Other registration types that need to be identified and removed include contradictory registration types such as codes corresponding to motorcycles, trucks, and tractor trailers, as examples. Removing additional records consisting of invalid county identifiers and fuel types “other” and “unknown” (1,423 records removed), provides a final total of 84,426 busses.

Additional segregation of the valid vehicle count is necessary to separate busses into source type ID’s 41 - Intercity (5,882), 42 - Transit (19,993) and 43 - School (58,551). This step requires reapportioning busses by registration type and vehicle color (“YW” = yellow) for all valid records, as provided in Table 11.12 below.

Table 11.12 Bus Reapportion by Registration and Color					
BUSSES		INTERCITY	TRANSIT	SCHOOL	# of Records
Registration Type	[#]	Src ID 41	Src ID 42	Src ID 43	Removed
Political Subdivision	[88]	0	19,899	38,340	1,151
Omnibus (regular)	[56]	4,763	0	17,640	0
School Car	[19]	0	0	2,571	127
Omnibus (vanity + livery)	[55, 57]	469	0	0	9
International Reg Plan	[70]	301	0	0	0
State Agencies	[77]	172	0	0	0
Commercial (Regular)	[76]	111	0	0	2
Omnibus (Public Service)	[53]	0	94	0	1
Omnibus (Taxi)	[54]	42	0	0	0
Passenger or Suburban (Regular)	[16]	0	0	0	90
Omnibus (Special)	[52]	24	0	0	6
Farm/Ag	[46, 72]	0	0	0	26
Historical	[21]	0	0	0	18
Other	[10, 69]	0	02	0	
Totals		5,882	19,993	58,551	1,432

For comparison, in *School Bus Fleet Magazine 2001 Fact Book* there are 22,497 District-owned busses and 23,000 Contractor-owned busses for a total of 45,497 school busses in NY State. The *2007 National Transit Database* lists 9,288 transit busses in NY State.

11.8 Source Type ID 51 - Refuse Trucks

There is no Body or Registration Type that corresponds to any type of Garbage or Refuse trucks. It was therefore not possible to pick them out of the 2007 database with any type of certainty. New York will continue to work on identifying methods for accurately segregating, from other source types, vehicle counts associated with MOVES source type 51 - Refuse Trucks in future efforts.

11.9 Source Type ID 52 - Single Unit Short-Haul & 53 - Long-Haul Trucks

There are several truck types that will have a portion of the registered vehicles fall into the Single Unit Truck Category. These Body Types are #09 Fire, #39 Ambulance, #45 Sand Spreaders, #46 Snow Plows, #51 Truck Cranes, #52 Small Wheel Truck, #53 Well Driller, #54 Well Servicing Rig, #60 Delivery Truck, #61 Dump Truck, #62 Flat Bed Truck, #64 Stake Truck, #65 Tank Truck, #66 Refrigerated Truck, #67 Tow Truck, #70 Utility Truck, #95 Cement Mixer. There were 314,689 of these vehicle body types in New York in 2007. These are shown in Table 11.13.

Table 11.13 Single Unit Short-Haul Trucks		
Single Unit, Short-Haul Trucks (Body Type 09, 39, 45, 46, 51, 52, 53, 54, 60, 61, 62, 64, 65, 66, 67, 70, 95 & overweight 12, 63, 68)		
DMV FUEL	COUNT	PERCENTAGE
CNG	25	0.01%
Diesel	199,657	63.45%
Electric	71	0.02%
Flex	21	0.01%
Gasoline	112,199	35.65%
Propane	333	0.11%
Other	105	0.03%
Unknown/Blank	2,278	0.72%

Further processing of this category requires removal of various registration types such as “84”, “85”, or “86” (trailers), and “63” (in transit) which represent counts for registered vehicles other than on-road passenger cars. 68,629 total overweight trucks have to also be added and processed to remove invalid records resulting in 64,982 valid records from the passenger and light commercial truck categories.

Because NYSDEC does not have data that would indicate if a vehicle was of a long-haul or short-haul variety, all single unit trucks will be modeled as the short-haul variety in much the same way that all combination unit trucks are being modeled as long-haul. Therefore, there are 280,654 trucks registered in New York, for emission inventory year 2007, under MOVES source type 52.

11.10 Source Type ID 54 - Motor Homes

The Body Types of #15 “House on Wheels” will be allocated to Motor Homes. There are 29,384 vehicles with a Body Type of #15. These are shown in Table 11.14.

Table 11.14 Motor Homes		
MOTOR HOMES (Body Type 15)		
DMV FUEL	COUNT	PERCENTAGE
CNG	1	0.00%
Diesel	3,352	11.41%
Electric	0	0.00%
Flex	6	0.02%
Gasoline	25,465	86.66%
Propane	0	0.00%
Other	0	0.00%
Unknown/Blank	560	1.91%

Further processing of this category requires removal of various registration types such as “84”, “85”, or “86” (trailers), and “63” (in transit) which represent counts for registered vehicles other than on-road motor homes. Other registration types that need to be identified and removed include contradictory registration types such as codes corresponding to motorcycles, busses, and tractor trailers, as examples. Removing additional records consisting of invalid county identifiers and fuel types “other” and “unknown” (646 records removed), provides a final total of 28,738 motor homes registered in New York, for emission inventory year 2007, under MOVES source type 54.

11.11 Source Type ID 61 - Combination Short-Haul & 62 - Long-Haul Trucks

Body Type 58 “Tractor” is the only body type being used for either of the combination type trucks. Because NYSDEC does not have data that would indicate if a vehicle was of a long-haul or short-haul variety, all combination trucks will be modeled as the long-haul variety in much the same way that all single unit trucks are being modeled as short-haul. There are 38,733 vehicles of this body type in the database. These are shown in Table 11.15.

Table 11.15 Combination Long-Haul Trucks		
Combination Long-Haul Trucks (Body Type 58)		
DMV FUEL	COUNT	PERCENTAGE
CNG	0	0.00%
Diesel	36,861	95.17%
Electric	3	0.01%
Flex	2	0.01%
Gasoline	1,849	4.77%
Propane	0	0.00%
Other	0	0.00%
Unknown/Blank	18	0.05%

Further processing of this category for removal of various registration types such as “84”, “85”, or “86” (trailers), and “63” (in transit) or for other types inconsistent with this category resulted in no invalid matches for combination trucks. Removing additional records consisting of invalid county identifiers and fuel types “other” and “unknown” (135 records removed), provides a final total of 38,598 combination long-haul trucks registered in New York, for emission inventory year 2007, under MOVES source type 62.

12.0 QA/QC

Quality assurance (QA) is the systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention. By getting the on-road model inputs right most mistakes should be eliminated. QA for on-road inventory development includes management of the model inputs. Through the interagency consultation process defined under the transportation conformity regulation and regional inventory efforts, NYSDEC accomplishes high levels of input QA by sharing information with our partners. Through this process NYSDEC receives feedback that is used to make all necessary adjustments to the model inputs. For this inventory, our partners included all of the state’s municipal planning organizations, the NYSDOT, the Federal Highway Administration, the Federal Transit Administration, the EPA (regional staff and staff from the Office of Transportation and Air Quality), other state agencies and regional organizations.

QA can be contrasted with Quality Control (QC) which is focused on process outputs. In developing the on-road inventory through the MOVES model NYSDEC staff, along with its many partners, relied on inspection of the completed inventories to ensure its alignment with expected outcomes. For this effort multiple iterations of the inventory were developed, and adjustments were made based on output inconsistencies found through comparison of NYSDEC's data with other state inventories. In some instances this output QC resulted in changes to the input, in how the model was run and in adjustments to post processing scripts, all of which resulted in a better quality inventory.

While there are levels of uncertainty associated with every component an inventory, the NYSDEC believes that by applying QA/QC procedures throughout every step of the process we are developing the best inventory possible. NYSDEC further believes that by inspecting both the inputs to the model and the inventory outputs and by sharing both during inventory development we are constantly able to improve on our emissions results.

Attachment 3

SPEED METHODOLOGY MEMO FROM NYSDOT

SPEED ESTIMATES FOR USE IN

1994 AIR QUALITY STATE IMPLEMENTATION PLAN

October 24, 1994

by GUNNAR HALL, Associate Transportation Analyst
PLANNING DIVISION
NEW YORK STATE DEPARTMENT OF TRANSPORTATION

CONTENTS

1. OVERVIEW

This report documents the procedures, data sources and estimated highway speeds for 1990 through 2007, needed for this year's update of the Air Quality State Implementation Plan. A Lotus worksheet was prepared to carry out the necessary calculations. The average highway speeds for 1990, 1996, 1999, 2002, 2005 and 2007 for selected urban areas and the rest of the State are presented at the end of the report.

The NYS Department of Environmental Conservation requested the speeds for six urban and six rural functional classes, in four time periods (morning, day, evening and night) for each geographic area.

Speeds have changed from last year's submission for four major reasons: 1) The requested time periods - morning, day, evening and night - are different from those used last year - prime time and off-prime for the New York Metropolitan area; peak, off-peak, midday and midnight for upstate areas. 2) 12 functional classes are used, versus 6 functional class groups last year. 3) Additional speed and VMT data was obtained from urban areas with a functioning urban transportation model, and finally 4) The speed estimation procedure is

more directly tied to procedures recommended in the current Highway Capacity Manual, while consistency with last year's results have been attempted.

Speeds are determined for each time period through a number of successive steps that will be described in detail below. A general outline of the procedure is shown in Table 1. It may be useful for quick reference when the details have become familiar.

TABLE 1: SUMMARY REVIEW OF SPEED ESTIMATION PROCEDURE	
1	**Speed data for a base and a future year is collected from Metropolitan Planning Organizations (MPOs) that maintain urban transportation network analysis models. Upstate MPOs provide peak hour and off-peak hour speeds for all functional classes; the NYMTC provides 24 hour average speeds for three functional class groups for the New York metropolitan area (NYA).**
2	**Speeds for intermediate years are linearly interpolated between the base and future years.**
3	**The relationship between speed and the volume-capacity ratio (vcr) for different functional classes are identified from the 1985 Highway-Capacity Manual (HCM) and other sources. While these relationships are given in different forms, and converted to equations in the final speed calculation worksheet, they are referred to here as the HCM speed-vcr curves.**
4	**Speeds are described as initial, preliminary and final speeds. Initial speeds are read or computed directly from the HCM speed-vcr curves. Preliminary speeds are generally proportional to the initial speeds obtained from the HCM speed curves. The final speeds are based on adjustments of the preliminary speeds to reflect differences between MPO model and HCM based off-peak speed data. Final speeds are the speeds presented in the worksheet.**
5	**The peak hour vcr for freeways and expressways in upstate areas is estimated from the peak hour speed and HCM curves. The HCM speed-vcr curves were designed for individual facilities rather than for systems (functional classes) with a variety of different facilities. However, interstates and freeways are designed to similar standards everywhere and therefore, the freeway speed-vcr curves should closely match actual speeds.**
6	**The peak hour vcr for upstate urban and rural freeways provide reference points from which the vcr and corresponding speeds for each time period is determined. For urban arterial, collector and local systems, the volume capacity ratio at peak periods have been assumed to be the same as the freeway vcr. In rural areas these speed-vcr relationships are linear and speeds can be determined directly from the**

	peak and off-peak data supplied by the MPOs.
7	**In the NYA, traffic during the evening period is assumed to equal capacity for all functional class systems except for freeways in Suffolk, Westchester, & Rockland where the evening peak vcr is assumed equal .9 and in Putnam where .8 is assumed. Evening speed is then read from the HCM curves.**
8	**The vcr for a requested time period is related to peak hour or peak period vcr through the known temporal distribution of VMT. With vcr calculated, the speed-vcr curve allows the calculation of initial speeds.**
9	**In the NYA and for upstate arterial and local systems, preliminary speeds are assumed to be proportional to, but not the same as the initial speeds obtained directly from the HCM speed-vcr relationships.**
10	**In the NYA, preliminary speeds are computed as functions of the 24 hour average speeds obtained from the NYMTC model, the initial time period speeds read from the HCM speed-vcr curve and the computed 24 hour average speeds based on these initial period speeds.**
11	**Upstate, the preliminary speeds are calculated as a function of the peak period speed obtained from the MPO models, the initial time period speeds and the initial peak period speed computed from the HCM speed-vcr curves.**
12	**In the NYA, the 24 hour average speeds in each county were available for only three functional classes. To estimate speeds by the required 6 functional classes, the distribution of VMT between functional classes were obtained from HPMS data. A speed difference between the two functional classes represented in each functional class group was assumed: The average speed in the lower functional class was assumed to be 95% of the average speed in the higher functional class.**
13	**To calculate the 24 hour average speeds from HCM, a selected vmt is divided by the total travel time for that vmt for all time periods, in both functional classes included in a functional class group.**
14	**Adjustments to preliminary upstate speeds are made to insure that estimated off-peak speeds are consistent with off-peak speed data submitted by the MPOs. The off-peak vcr was determined from the assumptions made by the MPOs for computing these speeds. Initial and preliminary off-peak speeds were then estimated based on the HCM speed-vcr curves.**
15	**The adjustment factor is applied to the difference between the peak period speed and the preliminary speed calculated for any given time period. At the peak hour, no adjustment is needed, since at this point the HCM initial speed is the reported or assumed speed.**

2. DATA COLLECTED IN 1994

Estimates of highway speeds by 6 urban and 6 rural functional classes were requested from New York's Metropolitan Planning Organizations (MPOs) on February 17 (Attachment 2). These organizations maintain urban transportation network analysis models designed to estimate such speeds for the facilities included in their coded network. These networks include arterial and freeway facilities and most major collectors but do not include a representative sample of minor collectors or local roads.

Upstate MPOs provide peak hour and off-peak hour speeds for all functional classes represented; the NYMTC provides 24 hour average speeds for three groups of two functional classes each in the New York metropolitan area (NYA). For functional classes not adequately represented in their analysis models, some MPOs provided speed estimates, others did not. The speed estimates received was examined and generally accepted. Default values estimated based on speed data provided in other areas were used in a few cases when speeds were omitted or apparently unreasonable, as follows:

system	peak hour speed	off-peak speed
CDTC, urb, local rur, local		25 25
NFTS, rur, maj. collectors min. collectors local	40 35 30	45 40 35
BMTS	last year's data	last year's data

Speeds for the 1990 base year were provided by all MPOs; future year speeds were generally for the year of their "planning horizon" (2010 or 2015). The differences in present and future speeds were generally small and the selected linear interpolation of given speeds for the necessary forecast years should give reasonable results.

3. TIME PERIODS

The specific hours of the day included in each time period were suggested by DEC, as indicated in Attachment 1: Time of Day Factors used to Estimate Hourly VMT. The temporal distri-bution of travel by hour of the day shown in this attachment for the New York metropolitan area was developed by NYMTC and reflect survey results of the Nationwide Personal Transportation Study. The distribution shown for upstate urban and upstate rural areas was supplied by DOT Data Services Bureau. These data items are described in a memo from Cohen to Cioffi, dated 5/26/92.

Table 1 summarizes this data by the four requested time periods and for the peak hour:

TABLE 2: PERCENT OF VMT PER DAY

Time Period	No of Hours	N.Y. Metro Area	No of Hour s	Upstate Urban	Upstate Rural
Morning	5	23.0%	4	17.0%	21.7%
Day	4	21.0%	6	36.7%	30.2%
Evening	5	40.6%	3	23.4%	25.0%
Night	10	15.3%	11	23.9%	23.1%
Peak hour vmt	1	8.8%	1	8.2%	8.9%

4. SPEED - TRAVEL VOLUME RELATIONSHIPS

The relationship between speed and the volume-capacity ratio (vcr) for the facility types typical of each functional class was identified from the 1985 Highway-Capacity Manual (HCM) and other sources. These relationships are given in different forms, and converted to equations in the final speed calculation worksheet. Seven facility types were used:

for freeways and expressways in the New York Metro area;

B. Freeways with 70mph design speed, 4 lanes (HCM, figure 3-4), for upstate urban and rural freeways, urban expressways and rural principal arterials;

C. Urban arterials with 10 signals per mile (HCM, table 11-9),
for principal and minor arterials in Manhatten;
D. Urban arterials with 5 signals per mile (HCM, table 11-8),
for arterials in urban areas other than Manhatten, and
for collectors and local streets in the New York Metro area;
E. Rural arterials with 55mph max speed (HCM 1965, figure 10-1),
for rural minor arterials and major collectors;
F. Urban streets (HCM 1965, figure 10-3),
for urban collectors and local streets outside NYA;
G. Local roads with 45mph max speed (HCM 1965, figure 10-1),
for rural minor collectors and local roads.

As noted, some of these relationships are given by tables and some are given graphically. Each of these were converted into one or two algebraic equations for use in the worksheet as follows:

TABLE 3: SPEED-VCR RELATIONSHIPS	
A	prelim. spd read directly from HCM figure 3-4 (since NYA vcr is assumed)
B	spd = 30 + (50000*(1-vcr))^.333 for .80 < vcr <= 1 spd = 60 - 1.46*vcr - 11.46*vcr^2 for 0 < vcr < .80
C	prelim. spd read directly from HCM table 11-9 (since NYA ref.vcr=1)
D	spd = 12.8 + 21*(1-vcr)^.65 for .74 < vcr <= 1 spd = 12.8 + 12*(1-vcr)^.30 for 0 < vcr < .75
E	spd = 55 - 25*vcr
F	spd = 15 + 24.4*(1-vcr)^.48 for .65 < vcr <= 1 spd = 17 + 15*(1-vcr)^.14 for 0 < vcr < .65 NYA prelim. spd read directly from HCM(65) fig 10-1 (since ref.vcr=1)
G	spd = 45 - 25*vcr

5. NOTES ON SPEED CALCULATIONS

With speeds the basic input data source, a reference point in the speed-vcr curve is needed in order to use them to determine the average speeds in the desired time periods. In upstate urban and rural areas, the urban transportation models determined the peak hour

speed for each functional class (speeds in the "rest of the State" are assumed to equal speeds in the Binghamton urban area). With this speed, the corresponding vcr is determined, using the assumed relationships.

In the New York metropolitan area, the NYMTC highway evaluation model (HEM) determine the 24 hour average speed, which can not be related to a point on the speed-vcr curves. However, in this area we know that most of the highway system operates near capacity levels in the evening peak period. For freeways and expressways within the city, a peak period volume capacity ratio of 1 is assumed. In Suffolk, Westchester and Rockland counties, vcr=.9 was assumed and in Putnam county, vcr=.8. This deviation from a general vcr = 1 was needed to assure consistent reasonable speeds in other time periods. For other systems in the New York metropolitan area, the volume capacity ratio of 1 is assumed since this will only impact differences in speed between time periods but not their average value. With the vcr assumed we have a reference point on the speed-vcr curve.

The Volume Capacity Ratio for a requested time period is related to peak vcr through the known temporal distribution of VMT. From the data given in Table 1 above, the VMT per hour is calculated for any system, with an assumed total VMT of 100,000 per day. Since the physical capacity of the system is the same in all time periods, the vcr for a requested time period equals the vcr computed or known for the peak period multiplied by the ratio of hourly volumes in the given time period and the peak period.

From the vcr for a given time period, an initial or preliminary average speed for that period is computed from the formulas shown in Table 2 above. In the NYA and for upstate arterial and local systems, where preliminary speeds are assumed to be proportional to, but not the same as the speeds obtained from the HCM speed-vcr relationships, preliminary speeds are computed from the following relationship:

upstate:

SPEED(period) = SPEED(peak) * SPEED(period,HCM) / SPEED(peak,HCM)

in the NYA:

SPEED(period) = SPEED(24hr ave) * SPEED(period,HCM) / SPEED(24hr ave, HCM)

where

SPEED(period) = preliminary speed computed for a given time period.
SPEED(period,HCM) = initial speed for the time period from the HCM curves.
SPEED(peak) = known peak hour speed obtained from urban models.
SPEED(peak,HCM) = initial peak speed estimated from the HCM curves,

using the peak vcr estimated for freeways.
SPEED(24hr ave) = 24 hour average speed in the NYA, from NYMTC.
SPEED(24hr ave,HCM) = initial 24 hour average speed from HCM relationships, estimated by dividing a selected daily level of VMT by the corresponding number of hours travelled, at the initial speeds in all time periods.

To calculate the 24 hour average speeds from HCM, a selected vmt is divided by the total travel time for that vmt for all time periods, in both functional classes included in a functional class group.

The numerator and denominator in the formula for the period speed of a given system may use different formulas from Table 2 when the vcr for the peak and the desired time period straddle the validity range limit. Thus, the formulas used to calculate, say evening speeds for upstate urban arterials, may not be the same for all upstate urban areas.

In the NYA, the 24 hour average speeds in each county were available for only three functional classes. To estimate speeds by the required 6 functional classes, the distribution of VMT between functional classes were obtained from HPMS data and a speed difference between the two functional classes represented in each functional class group was made: The average speed in the lower functional class was assumed to be 95% of the average speed in the higher functional class.

Adjustments to preliminary speeds are made to insure that estimated off-peak speeds are consistent with off-peak speed data submitted by the MPOs. First, the volume capacity ratios corresponding to the off-peak speeds were determined. The MPOs defined off-peak speeds in different ways and therefore, the vcr for off-peak speeds varied by geographic area. The Capital District and Rochester urban area transportation systems were modeled using 38% of peak hour trips to obtain off-peak speeds. Thus off-peak vcr was assumed to be 38% of peak hour vcr. Syracuse used 50% of peak hour trips to obtain off-peak speeds. Buffalo determined off-peak speeds based on free-flow conditions, so for this area the off-peak vcr was assumed equal to zero.

Given the off-peak vcr, an off-peak speed based on the HCM speed-vcr curve is easily determined. At this vcr, the final adjustment is simply this HCM speed estimate less the MPO based off-peak speed. For other time periods the adjustment depend on the difference in estimated time period speed and the peak hour speed.

The preliminary speeds for the four desired time periods are adjusted using a speed multiplication factor. This factor is the difference between the off-peak speed as calculated from the HCM curves at the off-peak vcr and the assumed correct off-peak speed reported by the MPOs, divided by the difference in estimated off-peak and peak hour speeds,

multiplied by the difference in estimated preliminary time period speed and the peak hour speed. At the peak hour, the adjustment is zero; for the off-peak vcr, the adjustment is as calculated above.

6. ACTUAL COMPUTATIONS

Attachment 3 illustrates how the computations discussed above are carried out in the worksheet.

Pages 3a through 3d show a section of the worksheet with all formulas used for the calculation of night, morning, day and evening speeds for urban functional classes in the Capital District. All data elements used in these calculations are shown and referenced to their location.

Pages 3e through 3g similarly show a section from the New York Metropolitan Area. The data given above row 141 and to the right of column R is not shown in the final printout of results. As noted above, the procedure and formulas used are different from those used in upstate urban areas.

7. WORKSHEET ORIENTATION

A. Final Results and Printouts:

a16....r65	**Upstate urban areas of Capital District, Syracuse and Rochester**
a66...r112	**Upstate urban areas of Buffalo and Binghamton**
a153..q207	**New York Metropolitan Area; Manhatten, Bronx, Kings, Queens, Richmond, Nassau, Suffolk**
a208..q232	**New York Metropolitan Area; Westchester, Rockland, Putnam.**
a233..r248	**Rest of State.**

B. Data Required for Worksheet Operation

a8.....r15	Upstate VMT and Time Period data
s17...w112	Upstate Peak and Off-Peak Speeds, 1990 and horizon year; adjustment factors.
x16...y112	Upstate Off-peak adjustments DMAX; estimate years.
a116..l151	Downstate VMT and Initial Speed data
s153..v230	Downstate 24 hour speeds, 1990, 1996, 2005, 2015.
w153.aa230	Downstate hours travelled, by time period and total.
aa97..ae112	Peak and Off-Peak Speeds and VMT data for Binghamton

C. Speed Calculation Factors and Formulas (not printed)

a254..k342	Upstate general data, Freeways and Expressways, Arterials, Local Roads and Streets
a346..l364	Downstate general data, Freeways and Expressways, Arterials, Local Roads and Streets

D. Miscellaneous (not printed)

b1......c8	Print Macros \p, \r, \i, \n
e1......r6	Formulas used
z1....aw21	Formula development

8. RESULTS

TO: J. Ralston, NYSDEC

FROM: G. J. Cioffi, Urban Planning Section, 4-206

SUBJECT: SPEED ESTIMATES FOR AIR QUALITY STATE IMPLEMENTATION PLAN

DATE: November 4, 1994

Attached for your use are average highway travel speeds for 1990, 1996, 1999, 2002, 2005 and 2007; they are presented in the attached report "Speed Estimates for use in 1994 Air Quality State Implementation Plan". The speed data was developed using the functional classes, geographic breakdown and time periods requested (four time periods; 12 functional classes; selected urban areas and rest of State).

A draft of this report, dated June 15, was sent to you on August 26 by Mike Fay. The major changes from the draft are described on a separate, attached sheet. The new grouping of VMT by morning, day, evening and night in the New York Metropolitan area resulted in significant changes in the corresponding speeds. Other changes had minor impacts, but were included to improve the general quality of the report.

The report documents the procedures and data sources used to calculate these speeds. A Lotus worksheet named 94SPEEDS.WK3 was prepared to carry out the necessary calculations. It shows precisely how the speed data was developed and is included to clarify any procedures that may have been inadequately described in the attached documentation. We hope that it addresses the relevant issues regarding speeds for the SIP analysis. If you have further concerns, please call.

Attachments

cc: **R. Tweedie, Data Services Bureau, 4-115**
J. Zamurs, Envir. Analysis Bureau, 5-303
N. Erlbaum, Data Services Bur., 4-115
G. Hall, Urban Planning Section, 4-207

TO REVIEWERS OF JUNE 15 DRAFT:

The major changes from the previous draft of this report are as follows:

1. **The temporal distribution of VMT in the New York Metropolitan Area and the grouping of VMT by morning, day, evening and night has changed. This affected all speed estimates for all counties in the New York area. The revised temporal distribution is summarized in Table 2 on page 6 and included in Attachment 1.**

2. **Page 4, first paragraph and Page 8, first paragraph: With the evening peak period now 5 hours, it has been assumed that freeways and expressways in Suffolk, Westchester and Rockland counties have an average vcr = .9 during the evening peak and in Putnam county, vcr = .8. This deviation from the previously used assumption of vcr = 1 for all systems in the metropolitan area was needed to assure consistent and reasonable speeds in non-peak time periods. For other systems, the assumed vcr = 1 is retained since the assumed volume capacity ratios will only impact differences in speed between time periods and not their average level.**

3. **The speed - volume relationship for arterials in the New York Metropolitan area counties outside Manhattan has been changed to follow Table 11-8 (Table 11-9 was used before) of the highway capacity manual. Table 11-8 is also used for urban collectors and streets in these counties. This is stated on page 6, section 4 C & D and reflected in the tables of section 12.**

   These changes result in final speed estimates that more closely conform with earlier estimates by NYMTC.

4. **An attempted clarification of Table 1, section 4 on page 3. A typographic correction of the same table, in section 12 last line to read: 95% rather than 90%.**

5. **Miscellaneous minor wording and cosmetic changes.**

Attachment 4

SPEED TABLES

COUNTY	TIME PERIOD	R_INT	R_PA	R_MNA	R_MJC	R_MNC	R_LCL	U_INT	U_EXP	U_PA	U_MNA	U_MJC	U_LCL	YEAR
New York	Night	NA	NA	NA	NA	NA	NA	37.8	35.9	12.1	11.5	5.6	5.4	1990
New York	Morning	NA	NA	NA	NA	NA	NA	34.0	32.3	11.5	10.9	5.5	5.2	1990
New York	Daytime	NA	NA	NA	NA	NA	NA	32.9	31.3	11.1	10.5	5.3	5.1	1990
New York	Evening	NA	NA	NA	NA	NA	NA	21.7	20.6	5.2	4.9	3.0	2.9	1990
Kings	Night	NA	NA	NA	NA	NA	NA	48.8	46.3	21.2	20.1	11.4	10.9	1990
Kings	Morning	NA	NA	NA	NA	NA	NA	43.8	41.6	20.6	19.5	11.1	10.5	1990
Kings	Daytime	NA	NA	NA	NA	NA	NA	42.5	40.3	20.0	19.0	10.8	10.3	1990
Kings	Evening	NA	NA	NA	NA	NA	NA	28.0	26.6	11.4	10.9	6.2	5.9	1990
Queens	Night	NA	NA	NA	NA	NA	NA	47.5	45.1	20.4	19.3	12.5	11.8	1990
Queens	Morning	NA	NA	NA	NA	NA	NA	42.6	40.5	19.8	18.8	12.1	11.5	1990
Queens	Daytime	NA	NA	NA	NA	NA	NA	41.3	39.3	19.2	18.3	11.8	11.2	1990
Queens	Evening	NA	NA	NA	NA	NA	NA	27.3	25.9	11.0	10.4	6.7	6.4	1990
Bronx	Night	NA	NA	NA	NA	NA	NA	51.2	48.6	22.9	21.8	12.8	12.1	1990
Bronx	Morning	NA	NA	NA	NA	NA	NA	46.0	43.7	22.3	21.1	12.4	11.8	1990
Bronx	Daytime	NA	NA	NA	NA	NA	NA	44.6	42.3	21.7	20.6	12.1	11.5	1990
Bronx	Evening	NA	NA	NA	NA	NA	NA	29.4	27.9	12.4	11.8	6.9	6.5	1990
Richmond	Night	NA	NA	NA	NA	NA	NA	54.7	51.9	25.5	24.2	14.5	13.8	1990
Richmond	Morning	NA	NA	NA	NA	NA	NA	49.1	46.6	24.7	23.5	14.1	13.4	1990
Richmond	Daytime	NA	NA	NA	NA	NA	NA	47.6	45.2	24.1	22.9	13.7	13.0	1990
Richmond	Evening	NA	NA	NA	NA	NA	NA	31.4	29.8	13.8	13.1	7.8	7.5	1990
Nassau	Night	NA	NA	NA	NA	NA	NA	50.7	48.1	21.2	20.2	13.6	12.9	1990
Nassau	Morning	NA	NA	NA	NA	NA	NA	45.5	43.2	20.6	19.6	13.2	12.5	1990
Nassau	Daytime	NA	NA	NA	NA	NA	NA	44.1	41.9	20.1	19.1	12.8	12.2	1990
Nassau	Evening	NA	NA	NA	NA	NA	NA	29.1	27.6	11.5	10.9	7.3	7.0	1990
Suffolk	Night	55.2	52.4	29.3	27.8	18.2	17.3	55.2	52.4	29.3	27.8	18.2	17.3	1990
Suffolk	Morning	49.6	47.2	28.4	27.0	17.7	16.8	49.6	47.2	28.4	27.0	17.7	16.8	1990
Suffolk	Daytime	48.1	45.7	27.7	26.3	17.2	16.3	48.1	45.7	27.7	26.3	17.2	16.3	1990
Suffolk	Evening	39.1	37.2	15.8	15.0	9.8	9.3	39.1	37.2	15.8	15.0	9.8	9.3	1990
Westchester	Night	53.9	51.2	28.5	27.0	17.1	16.2	53.9	51.2	28.5	27.0	17.1	16.2	1990
Westchester	Morning	48.5	46.1	27.6	26.2	16.6	15.7	48.5	46.1	27.6	26.2	16.6	15.7	1990
Westchester	Daytime	47.1	44.7	26.9	25.6	16.1	15.3	47.1	44.7	26.9	25.6	16.1	15.3	1990
Westchester	Evening	38.2	36.3	15.4	14.6	9.2	8.8	38.2	36.3	15.4	14.6	9.2	8.8	1990
Rockland	Night	54.6	51.9	30.1	28.6	18.2	17.3	54.6	51.9	30.1	28.6	18.2	17.3	1990
Rockland	Morning	49.1	46.7	29.2	27.7	17.7	16.8	49.1	46.7	29.2	27.7	17.7	16.8	1990
Rockland	Daytime	47.7	45.3	28.4	27.0	17.2	16.4	47.7	45.3	28.4	27.0	17.2	16.4	1990
Rockland	Evening	38.7	36.8	16.2	15.4	9.8	9.3	38.7	36.8	16.2	15.4	9.8	9.3	1990
Putnam	Night	59.9	56.9	39.6	37.6	23.9	22.7	59.9	56.9	39.6	37.6	23.9	22.7	1990
Putnam	Morning	55.0	52.2	38.4	36.5	23.2	22.0	55.0	52.2	38.4	36.5	23.2	22.0	1990
Putnam	Daytime	53.9	51.2	37.4	35.6	22.6	21.4	53.9	51.2	37.4	35.6	22.6	21.4	1990
Putnam	Evening	47.9	45.5	21.4	20.3	12.9	12.3	47.9	45.5	21.4	20.3	12.9	12.3	1990
Capital District	Night	59.5	54.4	44.5	44.5	39.2	26.2	57.8	57.8	38.0	31.6	28.2	25.2	1990
Capital District	Morning	57.9	53.0	43.3	43.3	38.6	23.1	56.1	56.1	36.0	30.3	27.8	24.8	1990
Capital District	Daytime	58.1	53.2	43.4	43.4	38.7	23.5	53.1	53.1	33.0	28.3	27.2	24.2	1990
Capital District	Evening	55.6	50.8	42.2	42.2	38.1	20.5	49.0	49.0	27.7	24.8	24.0	21.0	1990
Onondaga	Night	55.9	55.9	48.1	45.3	42.0	39.3	46.6	46.6	29.2	27.0	24.9	28.9	1990
Onondaga	Morning	54.5	54.5	46.3	44.1	40.7	39.1	46.0	46.0	28.5	26.4	24.6	28.7	1990
Onondaga	Daytime	54.7	54.7	46.5	44.2	40.9	39.1	44.7	44.7	27.5	25.5	24.2	28.3	1990
Onondaga	Evening	52.3	52.3	44.8	43.0	39.6	38.8	42.4	42.4	24.8	23.3	21.3	25.8	1990
Monroe	Night	54.2	49.8	49.0	43.1	38.9	32.4	49.5	49.5	30.3	29.8	28.3	19.3	1990
Monroe	Morning	53.8	48.8	46.4	42.5	38.7	32.4	48.6	48.6	29.5	29.2	28.1	19.3	1990
Monroe	Daytime	53.9	49.0	46.7	42.6	38.7	32.4	46.8	46.8	28.1	28.2	27.7	19.2	1990
Monroe	Evening	53.2	47.3	44.1	42.0	38.4	32.5	43.5	43.5	25.0	25.7	25.4	18.6	1990
Buffalo Area	Night	55.0	54.5	53.6	46.2	41.2	36.2	56.5	55.9	37.2	34.6	37.3	37.2	1990
Buffalo Area	Morning	55.0	54.4	50.9	43.1	38.1	33.1	55.7	55.1	36.5	34.0	37.1	37.0	1990
Buffalo Area	Daytime	55.0	54.4	51.2	43.5	38.5	33.5	54.1	53.8	35.4	33.1	36.8	36.7	1990
Buffalo Area	Evening	54.9	54.2	48.4	40.5	35.5	30.5	53.0	52.9	34.9	32.8	35.8	35.7	1990
Rest of State	Night	55.7	53.0	46.6	44.3	36.5	34.7	54.8	52.1	35.2	33.2	25.7	24.4	1990
Rest of State	Morning	55.7	53.0	46.0	43.7	36.5	34.7	54.4	51.7	33.7	32.2	25.4	24.1	1990
Rest of State	Daytime	55.7	53.0	46.1	43.8	36.5	34.7	53.5	51.0	31.6	30.7	24.8	23.7	1990
Rest of State	Evening	55.7	53.0	45.5	43.2	36.5	34.7	52.9	50.3	30.9	29.0	23.2	21.9	1990

1990 SPEEDS used for 1990-1992 modeling runs

Morning hours are 5am to 8am, Daytime hours are 9am to 2pm, Evening hours are 3pm to 5pm, and Night hours are 6pm to 4am

Capital District includes the counties of Albany, Rensselaer, Saratoga, and Schenectady

Bufalo Area includes the counties of Erie and Niagara

COUNTY	TIME PERIOD	R_INT	R_PA	R_MNA	R_MJC	R_MNC	R_LCL	U_INT	U_EXP	U_PA	U_MNA	U_MJC	U_LCL	YEAR
New York	Night	NA	NA	NA	NA	NA	NA	36.9	35.0	12.4	11.8	5.7	5.5	1995
New York	Morning	NA	NA	NA	NA	NA	NA	33.1	31.5	11.8	11.3	5.6	5.3	1995
New York	Daytime	NA	NA	NA	NA	NA	NA	32.1	30.5	11.4	10.8	5.4	5.2	1995
New York	Evening	NA	NA	NA	NA	NA	NA	21.2	20.1	5.3	5.1	3.1	2.9	1995
Kings	Night	NA	NA	NA	NA	NA	NA	48.3	45.9	20.9	19.9	11.3	10.8	1995
Kings	Morning	NA	NA	NA	NA	NA	NA	43.4	41.2	20.3	19.3	11.0	10.4	1995
Kings	Daytime	NA	NA	NA	NA	NA	NA	42.1	39.9	19.8	18.8	10.7	10.2	1995
Kings	Evening	NA	NA	NA	NA	NA	NA	27.7	26.3	11.3	10.7	6.1	5.8	1995
Queens	Night	NA	NA	NA	NA	NA	NA	47.1	44.7	20.1	19.1	12.3	11.7	1995
Queens	Morning	NA	NA	NA	NA	NA	NA	42.3	40.2	19.5	18.5	12.0	11.4	1995
Queens	Daytime	NA	NA	NA	NA	NA	NA	41.0	38.9	19.0	18.0	11.7	11.1	1995
Queens	Evening	NA	NA	NA	NA	NA	NA	27.0	25.7	10.8	10.3	6.7	6.3	1995
Bronx	Night	NA	NA	NA	NA	NA	NA	50.9	48.3	22.7	21.6	12.7	12.0	1995
Bronx	Morning	NA	NA	NA	NA	NA	NA	45.7	43.4	22.0	20.9	12.3	11.7	1995
Bronx	Daytime	NA	NA	NA	NA	NA	NA	44.3	42.1	21.5	20.4	12.0	11.4	1995
Bronx	Evening	NA	NA	NA	NA	NA	NA	29.2	27.7	12.3	11.7	6.8	6.5	1995
Richmond	Night	NA	NA	NA	NA	NA	NA	53.6	51.0	24.6	23.4	14.2	13.5	1995
Richmond	Morning	NA	NA	NA	NA	NA	NA	48.2	45.8	23.9	22.7	13.8	13.1	1995
Richmond	Daytime	NA	NA	NA	NA	NA	NA	46.7	44.3	23.3	22.1	13.4	12.8	1995
Richmond	Evening	NA	NA	NA	NA	NA	NA	30.8	29.3	13.3	12.6	7.7	7.3	1995
Nassau	Night	NA	NA	NA	NA	NA	NA	50.0	47.5	20.9	19.9	13.4	12.8	1995
Nassau	Morning	NA	NA	NA	NA	NA	NA	44.9	42.7	20.3	19.3	13.0	12.4	1995
Nassau	Daytime	NA	NA	NA	NA	NA	NA	43.6	41.4	19.8	18.8	12.7	12.1	1995
Nassau	Evening	NA	NA	NA	NA	NA	NA	28.7	27.3	11.3	10.7	7.3	6.9	1995
Suffolk	Night	54.4	51.7	28.7	27.3	17.9	17.1	54.4	51.7	28.7	27.3	17.9	17.1	1995
Suffolk	Morning	48.9	46.5	27.9	26.5	17.4	16.5	48.9	46.5	27.9	26.5	17.4	16.5	1995
Suffolk	Daytime	47.5	45.1	27.1	25.8	17.0	16.1	47.5	45.1	27.1	25.8	17.0	16.1	1995
Suffolk	Evening	38.6	36.6	15.5	14.7	9.7	9.2	38.6	36.6	15.5	14.7	9.7	9.2	1995
Westchester	Night	53.5	50.8	28.1	26.7	16.9	16.1	53.5	50.8	28.1	26.7	16.9	16.1	1995
Westchester	Morning	48.1	45.7	27.3	25.9	16.4	15.6	48.1	45.7	27.3	25.9	16.4	15.6	1995
Westchester	Daytime	46.7	44.3	26.6	25.2	16.0	15.2	46.7	44.3	26.6	25.2	16.0	15.2	1995
Westchester	Evening	37.9	36.0	15.2	14.4	9.1	8.7	37.9	36.0	15.2	14.4	9.1	8.7	1995
Rockland	Night	53.9	51.2	29.5	28.1	18.0	17.1	53.9	51.2	29.5	28.1	18.0	17.1	1995
Rockland	Morning	48.5	46.1	28.7	27.2	17.4	16.6	48.5	46.1	28.7	27.2	17.4	16.6	1995
Rockland	Daytime	47.0	44.7	27.9	26.5	17.0	16.1	47.0	44.7	27.9	26.5	17.0	16.1	1995
Rockland	Evening	38.2	36.3	15.9	15.2	9.7	9.2	38.2	36.3	15.9	15.2	9.7	9.2	1995
Putnam	Night	59.3	56.3	39.0	37.0	23.6	22.4	59.3	56.3	39.0	37.0	23.6	22.4	1995
Putnam	Morning	54.4	51.7	37.8	35.9	22.9	21.7	54.4	51.7	37.8	35.9	22.9	21.7	1995
Putnam	Daytime	53.3	50.7	36.8	35.0	22.3	21.2	53.3	50.7	36.8	35.0	22.3	21.2	1995
Putnam	Evening	47.4	45.0	21.0	20.0	12.7	12.1	47.4	45.0	21.0	20.0	12.7	12.1	1995
Capital District	Night	59.5	54.3	44.6	44.6	39.3	26.2	57.6	57.6	37.9	31.4	28.0	25.2	1995
Capital District	Morning	57.8	52.5	43.0	43.0	38.5	23.1	55.8	55.8	36.1	30.2	27.6	24.8	1995
Capital District	Daytime	58.0	52.8	43.2	43.2	38.6	23.5	52.5	52.5	33.1	28.2	27.0	24.3	1995
Capital District	Evening	55.2	49.8	41.7	41.7	37.7	20.5	47.0	47.0	26.7	23.9	23.4	21.1	1995
Onondaga	Night	55.9	55.9	48.0	45.3	41.9	39.2	46.6	46.6	29.2	27.0	24.9	28.6	1995
Onondaga	Morning	54.4	54.4	46.2	44.0	40.6	39.0	45.9	45.9	28.5	26.4	24.6	28.4	1995
Onondaga	Daytime	54.6	54.6	46.4	44.1	40.8	39.0	44.6	44.6	27.4	25.5	24.1	28.0	1995
Onondaga	Evening	52.1	52.1	44.6	42.8	39.5	38.8	42.1	42.1	24.8	23.2	21.2	25.6	1995
Monroe	Night	54.3	49.6	49.0	43.2	38.9	32.4	49.7	49.7	30.3	29.9	28.3	19.3	1995
Monroe	Morning	53.8	48.6	46.4	42.4	38.6	32.4	48.7	48.7	29.4	29.2	28.1	19.3	1995
Monroe	Daytime	53.9	48.7	46.7	42.5	38.6	32.4	46.8	46.8	28.0	28.1	27.7	19.1	1995
Monroe	Evening	53.1	47.0	44.1	41.8	38.3	32.4	43.4	43.4	24.7	25.6	25.3	18.5	1995
Buffalo Area	Night	55.0	54.5	53.9	46.2	41.2	36.2	56.4	55.8	37.2	34.5	37.3	37.2	1995
Buffalo Area	Morning	54.9	54.2	50.5	43.1	38.1	33.1	55.4	54.9	36.5	33.9	37.0	37.0	1995
Buffalo Area	Daytime	54.9	54.2	50.9	43.5	38.5	33.5	53.5	53.2	35.4	33.0	36.6	36.6	1995
Buffalo Area	Evening	54.7	53.8	47.4	40.5	35.5	30.5	51.6	51.6	34.3	32.1	35.1	35.1	1995
Rest of State	Night	55.7	53.0	46.4	44.0	36.5	34.7	54.9	52.1	35.2	33.2	25.7	24.4	1995
Rest of State	Morning	55.7	53.0	45.7	43.5	36.4	34.6	54.3	51.6	33.6	32.2	25.3	24.1	1995
Rest of State	Daytime	55.7	53.0	45.8	43.5	36.4	34.6	53.4	50.9	31.4	30.5	24.7	23.6	1995
Rest of State	Evening	55.7	53.0	45.2	42.9	36.2	34.4	52.7	50.1	30.4	28.6	22.7	21.5	1995

1995 SPEEDS used for 1993-1997 modeling runs

Morning hours are 5am to 8am, Daytime hours are 9am to 2pm, Evening hours are 3pm to 5pm, and Night hours are 6pm to 4am

Capital District includes the counties of Albany, Rensselaer, Saratoga, and Schenectady

Bufalo Area includes the counties of Erie and Niagara

COUNTY	TIME PERIOD	R_INT	R_PA	R_MNA	R_MJC	R_MNC	R_LCL	U_INT	U_EXP	U_PA	U_MNA	U_MJC	U_LCL	YEAR
New York	Night	NA	NA	NA	NA	NA	NA	35.9	34.1	12.8	12.1	5.8	5.6	2000
New York	Morning	NA	NA	NA	NA	NA	NA	32.3	30.7	12.2	11.6	5.7	5.4	2000
New York	Daytime	NA	NA	NA	NA	NA	NA	31.3	29.7	11.7	11.1	5.5	5.2	2000
New York	Evening	NA	NA	NA	NA	NA	NA	20.6	19.6	5.5	5.2	3.2	3.0	2000
Kings	Night	NA	NA	NA	NA	NA	NA	47.8	45.4	20.6	19.6	11.2	10.6	2000
Kings	Morning	NA	NA	NA	NA	NA	NA	43.0	40.8	20.0	19.0	10.9	10.3	2000
Kings	Daytime	NA	NA	NA	NA	NA	NA	41.6	39.6	19.5	18.5	10.6	10.1	2000
Kings	Evening	NA	NA	NA	NA	NA	NA	27.5	26.1	11.1	10.6	6.1	5.7	2000
Queens	Night	NA	NA	NA	NA	NA	NA	46.7	44.4	19.8	18.8	12.2	11.6	2000
Queens	Morning	NA	NA	NA	NA	NA	NA	41.9	39.8	19.2	18.2	11.9	11.3	2000
Queens	Daytime	NA	NA	NA	NA	NA	NA	40.6	38.6	18.7	17.8	11.6	11.0	2000
Queens	Evening	NA	NA	NA	NA	NA	NA	26.8	25.5	10.7	10.1	6.6	6.3	2000
Bronx		NA	NA	NA	NA	NA	NA	50.6	48.0	22.5	21.4	12.6	11.9	2000
Bronx		NA	NA	NA	NA	NA	NA	45.4	43.2	21.8	20.7	12.2	11.6	2000
Bronx	Daytime	NA	NA	NA	NA	NA	NA	44.0	41.8	21.3	20.2	11.9	11.3	2000
Bronx	Evening	NA	NA	NA	NA	NA	NA	29.0	27.6	12.2	11.5	6.8	6.4	2000
Richmond	Night	NA	NA	NA	NA	NA	NA	52.6	50.0	23.8	22.6	13.9	13.2	2000
Richmond	Morning	NA	NA	NA	NA	NA	NA	47.3	44.9	23.1	21.9	13.5	12.8	2000
Richmond	Daytime	NA	NA	NA	NA	NA	NA	45.8	43.5	22.5	21.4	13.2	12.5	2000
Richmond	Evening	NA	NA	NA	NA	NA	NA	30.2	28.7	12.8	12.2	7.5	7.1	2000
Nassau		NA	NA	NA	NA	NA	NA	49.4	46.9	20.6	19.6	13.3	12.6	2000
Nassau		NA	NA	NA	NA	NA	NA	44.4	42.2	20.0	19.0	12.9	12.2	2000
Nassau	Daytime	NA	NA	NA	NA	NA	NA	43.0	40.9	19.5	18.5	12.5	11.9	2000
Nassau	Evening	NA	NA	NA	NA	NA	NA	28.4	26.9	11.1	10.6	7.2	6.8	2000
Suffolk	Night	53.6	50.9	28.1	26.7	17.7	16.8	53.6	50.9	28.1	26.7	17.7	16.8	2000
Suffolk	Morning	48.2	45.8	27.3	25.9	17.2	16.3	48.2	45.8	27.3	25.9	17.2	16.3	2000
Suffolk	Daytime	46.8	44.4	26.6	25.3	16.7	15.9	46.8	44.4	26.6	25.3	16.7	15.9	2000
Suffolk	Evening	38.0	36.1	15.2	14.4	9.6	9.1	38.0	36.1	15.2	14.4	9.6	9.1	2000
Westchester	Night	53.0	50.4	27.8	26.4	16.8	15.9	53.0	50.4	27.8	26.4	16.8	15.9	2000
Westchester	Morning	47.7	45.3	27.0	25.6	16.3	15.5	47.7	45.3	27.0	25.6	16.3	15.5	2000
Westchester	Daytime	46.3	43.9	26.3	24.9	15.9	15.1	46.3	43.9	26.3	24.9	15.9	15.1	2000
Westchester	Evening	37.6	35.7	15.0	14.3	9.1	8.6	37.6	35.7	15.0	14.3	9.1	8.6	2000
Rockland	Night	53.2	50.5	29.0	27.5	17.7	16.8	53.2	50.5	29.0	27.5	17.7	16.8	2000
Rockland	Morning	47.9	45.5	28.1	26.7	17.2	16.3	47.9	45.5	28.1	26.7	17.2	16.3	2000
Rockland	Daytime	46.4	44.1	27.4	26.0	16.7	15.9	46.4	44.1	27.4	26.0	16.7	15.9	2000
Rockland	Evening	37.7	35.8	15.6	14.9	9.6	9.1	37.7	35.8	15.6	14.9	9.6	9.1	2000
Putnam	Night	58.6	55.7	38.3	36.4	23.2	22.1	58.6	55.7	38.3	36.4	23.2	22.1	2000
Putnam	Morning	53.8	51.2	37.2	35.3	22.5	21.4	53.8	51.2	37.2	35.3	22.5	21.4	2000
Putnam	Daytime	52.8	50.1	36.2	34.4	22.0	20.9	52.8	50.1	36.2	34.4	22.0	20.9	2000
Putnam	Evening	46.9	44.6	20.7	19.6	12.5	11.9	46.9	44.6	20.7	19.6	12.5	11.9	2000
Capital District	Night	59.6	54.2	44.8	44.8	39.4	26.2	57.5	57.5	37.9	31.2	27.8	25.1	2000
Capital District	Morning	57.7	52.1	42.8	42.8	38.3	23.1	55.5	55.5	36.1	30.0	27.4	24.9	2000
Capital District	Daytime	58.0	52.4	43.0	43.0	38.5	23.5	52.0	52.0	33.1	28.0	26.8	24.3	2000
Capital District	Evening	54.9	48.9	41.1	41.1	37.4	20.5	45.2	45.2	25.9	23.2	22.9	21.2	2000
Onondaga	Night	55.9	55.9	48.0	45.2	41.8	39.2	46.5	46.5	29.2	27.0	24.9	28.2	2000
Onondaga	Morning	54.3	54.3	46.1	43.9	40.5	38.9	45.8	45.8	28.5	26.4	24.6	28.0	2000
Onondaga	Daytime	54.6	54.6	46.3	44.0	40.7	38.9	44.4	44.4	27.4	25.4	24.1	27.7	2000
Onondaga	Evening	51.9	51.9	44.5	42.7	39.4	38.7	41.7	41.7	24.7	23.0	21.1	25.5	2000
Monroe	Night	54.3	49.5	49.0	43.2	39.0	32.5	49.8	49.8	30.3	30.0	28.4	19.3	2000
Monroe	Morning	53.8	48.4	46.4	42.3	38.6	32.4	48.7	48.7	29.4	29.3	28.1	19.2	2000
Monroe		53.9	48.5	46.7	42.4	38.6	32.4	46.9	46.9	27.9	28.1	27.7	19.1	2000
Monroe		53.1	46.7	44.1	41.6	38.2	32.3	43.2	43.2	24.5	25.5	25.1	18.4	2000
Buffalo Area	Night	55.0	54.4	54.2	46.2	41.2	36.2	56.3	55.7	37.3	34.5	37.2	37.2	2000
Buffalo Area	Morning	54.8	54.0	50.0	43.1	38.1	33.1	55.1	54.6	36.5	33.9	37.0	36.9	2000
Buffalo Area	Daytime	54.8	54.0	50.5	43.5	38.5	33.5	52.9	52.7	35.2	32.9	36.5	36.5	2000
Buffalo Area	Evening	54.5	53.3	46.4	40.5	35.5	30.5	50.3	50.5	33.6	31.6	34.5	34.5	2000
Rest of State	Night	55.7	53.0	46.1	43.8	36.6	34.8	54.9	52.1	35.2	33.3	25.8	24.4	2000
Rest of State	Morning	55.7	53.0	45.5	43.2	36.3	34.5	54.3	51.6	33.6	32.1	25.3	24.1	2000
		55.7	53.0	45.6	43.3	36.3	34.5	53.3	50.8	31.2	30.4	24.7	23.6	2000
Rest of State	Evening	55.7	53.0	44.9	42.7	36.0	34.2	52.5	49.9	30.0	28.2	22.3	21.2	2000

2000 SPEEDS used for 1998-2002 modeling runs

Morning hours are 5am to 8am, Daytime hours are 9am to 2pm, Evening hours are 3pm to 5pm, and Night hours are 6pm to 4am

Capital District includes the counties of Albany, Rensselaer, Saratoga, and Schenectady

Bufalo Area includes the counties of Erie and Niagara

COUNTY	TIME PERIOD	R_INT	R_PA	R_MNA	R_MJC	R_MNC	R_LCL	U_INT	U_EXP	U_PA	U_MNA	U_MJC	U_LCL	YEAR
New York	Night	NA	NA	NA	NA	NA	NA	35.0	33.2	13.1	12.5	5.9	5.6	2005
New York	Morning	NA	NA	NA	NA	NA	NA	31.4	29.8	12.5	11.9	5.8	5.5	2005
New York	Daytime	NA	NA	NA	NA	NA	NA	30.4	28.9	12.0	11.4	5.6	5.3	2005
New York	Evening	NA	NA	NA	NA	NA	NA	20.1	19.1	5.6	5.3	3.2	3.1	2005
Kings	Night	NA	NA	NA	NA	NA	NA	47.4	45.0	20.3	19.3	11.1	10.5	2005
Kings	Morning	NA	NA	NA	NA	NA	NA	42.5	40.4	19.7	18.7	10.8	10.2	2005
Kings	Daytime	NA	NA	NA	NA	NA	NA	41.2	39.2	19.2	18.3	10.5	10.0	2005
Kings	Evening	NA	NA	NA	NA	NA	NA	27.2	25.8	11.0	10.4	6.0	5.7	2005
Queens	Night	NA	NA	NA	NA	NA	NA	46.3	44.0	19.5	18.5	12.1	11.5	2005
Queens	Morning	NA	NA	NA	NA	NA	NA	41.6	39.5	18.9	18.0	11.8	11.2	2005
Queens	Daytime	NA	NA	NA	NA	NA	NA	40.3	38.3	18.4	17.5	11.4	10.9	2005
Queens	Evening	NA	NA	NA	NA	NA	NA	26.6	25.2	10.5	10.0	6.5	6.2	2005
Bronx	Night	NA	NA	NA	NA	NA	NA	50.3	47.8	22.3	21.2	12.5	11.8	2005
Bronx	Morning	NA	NA	NA	NA	NA	NA	45.1	42.9	21.6	20.5	12.1	11.5	2005
Bronx	Daytime	NA	NA	NA	NA	NA	NA	43.8	41.6	21.1	20.0	11.8	11.2	2005
Bronx	Evening	NA	NA	NA	NA	NA	NA	28.9	27.4	12.0	11.4	6.7	6.4	2005
Richmond	Night	NA	NA	NA	NA	NA	NA	51.6	49.0	23.0	21.8	13.6	12.9	2005
Richmond	Morning	NA	NA	NA	NA	NA	NA	46.3	44.0	22.3	21.2	13.2	12.5	2005
Richmond	Daytime	NA	NA	NA	NA	NA	NA	44.9	42.7	21.7	20.6	12.9	12.2	2005
Richmond	Evening	NA	NA	NA	NA	NA	NA	29.6	28.1	12.4	11.8	7.4	7.0	2005
Nassau	Night	NA	NA	NA	NA	NA	NA	48.8	46.3	20.3	19.3	13.1	12.5	2005
Nassau	Morning	NA	NA	NA	NA	NA	NA	43.8	41.6	19.7	18.7	12.7	12.1	2005
Nassau	Daytime	NA	NA	NA	NA	NA	NA	42.5	40.3	19.2	18.2	12.4	11.8	2005
Nassau	Evening	NA	NA	NA	NA	NA	NA	28.0	26.6	11.0	10.4	7.1	6.7	2005
Suffolk	Night	52.8	50.1	27.5	26.2	17.4	16.6	52.8	50.1	27.5	26.2	17.4	16.6	2005
Suffolk	Morning	47.5	45.1	26.7	25.4	16.9	16.1	47.5	45.1	26.7	25.4	16.9	16.1	2005
Suffolk	Daytime	46.1	43.8	26.0	24.7	16.5	15.7	46.1	43.8	26.0	24.7	16.5	15.7	2005
Suffolk	Evening	37.4	35.6	14.9	14.1	9.4	8.9	37.4	35.6	14.9	14.1	9.4	8.9	2005
Westchester	Night	52.5	49.9	27.4	26.1	16.6	15.8	52.5	49.9	27.4	26.1	16.6	15.8	2005
Westchester	Morning	47.3	44.9	26.6	25.3	16.2	15.3	47.3	44.9	26.6	25.3	16.2	15.3	2005
Westchester	Daytime	45.9	43.6	25.9	24.6	15.7	14.9	45.9	43.6	25.9	24.6	15.7	14.9	2005
Westchester	Evening	37.3	35.4	14.8	14.1	9.0	8.5	37.3	35.4	14.8	14.1	9.0	8.5	2005
Rockland	Night	52.5	49.9	28.4	27.0	17.5	16.6	52.5	49.9	28.4	27.0	17.5	16.6	2005
Rockland	Morning	47.2	44.9	27.6	26.2	16.9	16.1	47.2	44.9	27.6	26.2	16.9	16.1	2005
Rockland	Daytime	45.8	43.5	26.9	25.5	16.5	15.7	45.8	43.5	26.9	25.5	16.5	15.7	2005
Rockland	Evening	37.2	35.4	15.4	14.6	9.4	9.0	37.2	35.4	15.4	14.6	9.4	9.0	2005
Putnam	Night	58.0	55.1	37.6	35.7	22.9	21.8	58.0	55.1	37.6	35.7	22.9	21.8	2005
Putnam	Morning	53.3	50.6	36.5	34.7	22.2	21.1	53.3	50.6	36.5	34.7	22.2	21.1	2005
Putnam	Daytime	52.2	49.6	35.6	33.8	21.6	20.6	52.2	49.6	35.6	33.8	21.6	20.6	2005
Putnam	Evening	46.4	44.1	20.3	19.3	12.4	11.7	46.4	44.1	20.3	19.3	12.4	11.7	2005
Capital District	Night	59.6	54.1	44.9	44.9	39.5	26.2	57.3	57.3	37.9	31.0	27.6	25.1	2005
Capital District	Morning	57.5	51.7	42.6	42.6	38.2	23.1	55.3	55.3	36.1	29.8	27.2	24.9	2005
Capital District	Daytime	57.9	52.1	42.9	42.9	38.3	23.5	51.6	51.6	33.0	27.8	26.6	24.4	2005
Capital District	Ev ening	54.5	48.1	40.6	40.6	37.0	20.5	44.0	44.0	25.3	22.6	22.5	21.4	2005
Onondaga	Night	55.9	55.9	47.9	45.2	41.8	39.1	46.5	46.5	29.2	27.0	24.8	27.8	2005
Onondaga	Morning	54.2	54.2	46.0	43.8	40.4	38.8	45.7	45.7	28.5	26.4	24.6	27.7	2005
Onondaga	Daytime	54.5	54.5	46.2	43.9	40.6	38.9	44.3	44.3	27.4	25.4	24.1	27.4	2005
Onondaga	Evening	51.8	51.8	44.3	42.5	39.3	38.6	41.4	41.4	24.7	22.9	21.0	25.4	2005
Monroe	Night	54.3	49.3	49.0	43.2	39.0	32.5	49.9	49.9	30.2	30.0	28.4	19.3	2005
Monroe	Morning	53.8	48.1	46.4	42.2	38.5	32.3	48.8	48.8	29.3	29.3	28.1	19.2	2005
Monroe	Daytime	53.9	48.3	46.7	42.3	38.6	32.4	46.9	46.9	27.8	28.1	27.7	19.1	2005
Monroe	Evening	53.1	46.4	44.1	41.4	38.1	32.2	43.1	43.1	24.3	25.3	24.9	18.3	2005
Buffalo Area	Night	54.9	54.4	54.4	46.2	41.2	36.2	56.2	55.6	37.3	34.4	37.2	37.2	2005
Buffalo Area	Morning	54.7	53.8	49.6	43.1	38.1	33.1	54.8	54.4	36.4	33.8	36.9	36.9	2005
Buffalo Area	Daytime	54.7	53.9	50.2	43.5	38.5	33.5	52.4	52.2	35.1	32.7	36.4	36.4	2005
Buffalo Area	Evening	54.3	52.8	45.4	40.5	35.5	30.5	49.0	49.3	33.0	31.0	33.9	33.9	2005
Rest of State	Night	55.7	53.0	45.9	43.6	36.7	34.8	54.9	52.1	35.3	33.3	25.8	24.4	2005
Rest of State	Morning	55.7	53.0	45.2	43.0	36.2	34.4	54.3	51.6	33.6	32.1	25.3	24.1	2005
Rest of State	Daytime	55.7	53.0	45.3	43.0	36.2	34.4	53.2	50.7	31.1	30.2	24.6	23.5	2005
Rest of State	Evening	55.7	53.0	44.7	42.4	35.8	34.0	52.3	49.7	29.6	27.8	21.9	20.8	2005

2005 SPEEDS used for 2003-2007 modeling runs

Morning hours are 5am to 8am, Daytime hours are 9am to 2pm, Evening hours are 3pm to 5pm, and Night hours are 6pm to 4am

Capital District includes the counties of Albany, Rensselaer, Saratoga, and Schenectady

Bufalo Area includes the counties of Erie and Niagara

COUNTY	TIME PERIOD	R_INT	R_PA	R_MNA	R_MJC	R_MNC	R_LCL	U_INT	U_EXP	U_PA	U_MNA	U_MJC	U_LCL	YEAR
New York	Night	NA	NA	NA	NA	NA	NA	34.0	32.3	13.5	12.8	6.0	5.7	2010
New York	Morning	NA	NA	NA	NA	NA	NA	30.6	29.0	12.8	12.2	5.9	5.6	2010
New York	Daytime	NA	NA	NA	NA	NA	NA	29.6	28.1	12.3	11.7	5.7	5.4	2010
New York	Evening	NA	NA	NA	NA	NA	NA	19.5	18.6	5.8	5.5	3.3	3.1	2010
Kings	Night	NA	NA	NA	NA	NA	NA	46.9	44.5	20.0	19.0	11.0	10.4	2010
Kings	Morning	NA	NA	NA	NA	NA	NA	42.1	40.0	19.4	18.5	10.6	10.1	2010
Kings	Daytime	NA	NA	NA	NA	NA	NA	40.8	38.8	18.9	18.0	10.4	9.8	2010
Kings	Evening	NA	NA	NA	NA	NA	NA	26.9	25.6	10.8	10.3	5.9	5.6	2010
Queens	Night	NA	NA	NA	NA	NA	NA	45.9	43.6	19.2	18.2	12.0	11.4	2010
Queens	Morning	NA	NA	NA	NA	NA	NA	41.2	39.2	18.6	17.7	11.6	11.1	2010
Queens	Daytime	NA	NA	NA	NA	NA	NA	39.9	38.0	18.1	17.2	11.3	10.8	2010
Queens	Evening	NA	NA	NA	NA	NA	NA	26.3	25.0	10.4	9.8	6.5	6.2	2010
Bronx	Night	NA	NA	NA	NA	NA	NA	50.0	47.5	22.1	21.0	12.4	11.7	2010
Bronx	Morning	NA	NA	NA	NA	NA	NA	44.9	42.6	21.4	20.3	12.0	11.4	2010
Bronx	Daytime	NA	NA	NA	NA	NA	NA	43.5	41.3	20.9	19.8	11.7	11.1	2010
Bronx	Evening	NA	NA	NA	NA	NA	NA	28.7	27.2	11.9	11.3	6.7	6.3	2010
Richmond	Night	NA	NA	NA	NA	NA	NA	50.6	48.1	22.1	21.0	13.3	12.6	2010
Richmond	Morning	NA	NA	NA	NA	NA	NA	45.4	43.2	21.5	20.4	12.9	12.3	2010
Richmond	Daytime	NA	NA	NA	NA	NA	NA	44.0	41.8	20.9	19.9	12.6	11.9	2010
Richmond	Evening	NA	NA	NA	NA	NA	NA	29.0	27.6	11.9	11.3	7.2	6.8	2010
Nassau	Night	NA	NA	NA	NA	NA	NA	48.2	45.8	20.0	19.0	13.0	12.3	2010
Nassau	Morning	NA	NA	NA	NA	NA	NA	43.3	41.1	19.4	18.4	12.6	12.0	2010
Nassau	Daytime	NA	NA	NA	NA	NA	NA	41.9	39.8	18.9	17.9	12.3	11.6	2010
Nassau	Evening	NA	NA	NA	NA	NA	NA	27.6	26.3	10.8	10.3	7.0	6.7	2010
Suffolk	Night	52.0	49.4	27.0	25.6	17.2	16.3	52.0	49.4	27.0	25.6	17.2	16.3	2010
Suffolk	Morning	46.8	44.5	26.2	24.9	16.7	15.8	46.8	44.5	26.2	24.9	16.7	15.8	2010
Suffolk	Daytime	45.4	43.1	25.5	24.2	16.2	15.4	45.4	43.1	25.5	24.2	16.2	15.4	2010
Suffolk	Evening	36.9	35.0	14.6	13.8	9.3	8.8	36.9	35.0	14.6	13.8	9.3	8.8	2010
Westchester	Night	52.1	49.5	27.1	25.7	16.5	15.7	52.1	49.5	27.1	25.7	16.5	15.7	2010
Westchester	Morning	46.9	44.5	26.3	25.0	16.0	15.2	46.9	44.5	26.3	25.0	16.0	15.2	2010
Westchester	Daytime	45.5	43.2	25.6	24.3	15.6	14.8	45.5	43.2	25.6	24.3	15.6	14.8	2010
Westchester	Evening	36.9	35.1	14.6	13.9	8.9	8.5	36.9	35.1	14.6	13.9	8.9	8.5	2010
Rockland	Night	51.8	49.2	27.9	26.5	17.2	16.3	51.8	49.2	27.9	26.5	17.2	16.3	2010
Rockland	Morning	46.6	44.3	27.0	25.7	16.7	15.9	46.6	44.3	27.0	25.7	16.7	15.9	2010
Rockland	Daytime	45.2	42.9	26.3	25.0	16.3	15.5	45.2	42.9	26.3	25.0	16.3	15.5	2010
Rockland	Evening	36.7	34.9	15.1	14.3	9.3	8.8	36.7	34.9	15.1	14.3	9.3	8.8	2010
Putnam	Night	57.4	54.6	37.0	35.1	22.6	21.4	57.4	54.6	37.0	35.1	22.6	21.4	2010
Putnam	Morning	52.7	50.1	35.9	34.1	21.9	20.8	52.7	50.1	35.9	34.1	21.9	20.8	2010
Putnam	Daytime	51.7	49.1	34.9	33.2	21.3	20.3	51.7	49.1	34.9	33.2	21.3	20.3	2010
Putnam	Evening	45.9	43.6	20.0	19.0	12.2	11.6	45.9	43.6	20.0	19.0	12.2	11.6	2010
Capital District	Night	59.7	54.0	45.0	45.0	39.6	26.2	57.1	57.1	37.9	30.8	27.4	25.1	2010
Capital District	Morning	57.4	51.3	42.4	42.4	38.0	23.1	55.1	55.1	36.0	29.6	27.0	24.9	2010
Capital District	Daytime	57.8	51.8	42.7	42.7	38.2	23.5	51.4	51.4	32.9	27.5	26.4	24.4	2010
Capital District	Evening	54.2	47.4	40.1	40.1	36.7	20.5	43.2	43.2	24.8	22.0	22.1	21.6	2010
Onondaga	Night	55.9	55.9	47.8	45.2	41.7	39.0	46.5	46.5	29.1	27.0	24.8	27.5	2010
Onondaga	Morning	54.1	54.1	45.9	43.7	40.3	38.8	45.6	45.6	28.5	26.4	24.6	27.3	2010
Onondaga	Daytime	54.4	54.4	46.1	43.8	40.5	38.8	44.1	44.1	27.4	25.3	24.1	27.0	2010
Onondaga	Evening	51.6	51.6	44.2	42.3	39.2	38.5	41.1	41.1	24.6	22.8	20.9	25.2	2010
Monroe	Night	54.3	49.1	49.0	43.3	39.0	32.6	50.0	50.0	30.2	30.1	28.4	19.3	2010
Monroe	Morning	53.8	47.9	46.4	42.1	38.5	32.3	48.9	48.9	29.3	29.4	28.1	19.2	2010
Monroe	Daytime	53.9	48.1	46.7	42.3	38.5	32.3	46.9	46.9	27.7	28.1	27.7	19.1	2010
Monroe	Evening	53.1	46.1	44.1	41.1	38.0	32.1	43.0	43.0	24.0	25.2	24.8	18.2	2010
Buffalo Area	Night	54.9	54.3	54.7	46.2	41.2	36.2	56.1	55.5	37.2	34.4	37.2	37.1	2010
Buffalo Area	Morning	54.6	53.5	49.2	43.1	38.1	33.1	54.6	54.2	36.4	33.7	36.9	36.8	2010
Buffalo Area	Daytime	54.6	53.7	49.9	43.5	38.5	33.5	52.0	51.9	35.0	32.6	36.3	36.3	2010
Buffalo Area	Evening	54.1	52.4	44.4	40.5	35.5	30.5	47.8	48.2	32.5	30.5	33.3	33.3	2010
Rest of State	Night	55.7	53.0	45.6	43.3	36.7	34.9	54.9	52.1	35.3	33.3	25.8	24.5	2010
Rest of State	Morning	55.7	53.0	45.0	42.7	36.1	34.3	54.3	51.6	33.5	32.1	25.3	24.1	2010
Rest of State	Daytime	55.7	53.0	45.0	42.8	36.2	34.4	53.1	50.6	31.0	30.1	24.5	23.4	2010
Rest of State	Evening	55.7	53.0	44.4	42.2	35.6	33.8	52.1	49.5	29.1	27.4	21.5	20.4	2010

2010 SPEEDS used for 2008-2012 modeling runs

Morning hours are 5am to 8am, Daytime hours are 9am to 2pm, Evening hours are 3pm to 5pm, and Night hours are 6pm to 4am

Capital District includes the counties of Albany, Rensselaer, Saratoga, and Schenectady

Bufalo Area includes the counties of Erie and Niagara

COUNTY	TIME PERIOD	R_INT	R_PA	R_MNA	R_MJC	R_MNC	R_LCL	U_INT	U_EXP	U_PA	U_MNA	U_MJC	U_LCL	YEAR
New York	Night	NA	NA	NA	NA	NA	NA	33.1	31.4	13.8	13.1	6.1	5.8	2015
New York	Morning	NA	NA	NA	NA	NA	NA	29.7	28.2	13.1	12.5	6.0	5.7	2015
New York	Daytime	NA	NA	NA	NA	NA	NA	28.8	27.3	12.6	12.0	5.8	5.5	2015
New York	Evening	NA	NA	NA	NA	NA	NA	19.0	18.0	5.9	5.6	3.3	3.2	2015
Kings	Night	NA	NA	NA	NA	NA	NA	46.4	44.1	19.7	18.8	10.9	10.3	2015
Kings	Morning	NA	NA	NA	NA	NA	NA	41.7	39.6	19.2	18.2	10.5	10.0	2015
Kings	Daytime	NA	NA	NA	NA	NA	NA	40.4	38.4	18.7	17.7	10.3	9.7	2015
Kings	Evening	NA	NA	NA	NA	NA	NA	26.6	25.3	10.7	10.1	5.9	5.6	2015
Queens	Night	NA	NA	NA	NA	NA	NA	45.5	43.2	18.9	17.9	11.9	11.3	2015
Queens	Morning	NA	NA	NA	NA	NA	NA	40.9	38.8	18.3	17.4	11.5	10.9	2015
Queens	Daytime	NA	NA	NA	NA	NA	NA	39.6	37.6	17.8	17.0	11.2	10.7	2015
Queens	Evening	NA	NA	NA	NA	NA	NA	26.1	24.8	10.2	9.7	6.4	6.1	2015
Bronx	Night	NA	NA	NA	NA	NA	NA	49.7	47.2	21.8	20.7	12.3	11.6	2015
Bronx	Morning	NA	NA	NA	NA	NA	NA	44.6	42.4	21.2	20.1	11.9	11.3	2015
Bronx	Daytime	NA	NA	NA	NA	NA	NA	43.2	41.1	20.6	19.6	11.6	11.0	2015
Bronx	Evening	NA	NA	NA	NA	NA	NA	28.5	27.1	11.8	11.2	6.6	6.3	2015
Richmond	Night	NA	NA	NA	NA	NA	NA	49.6	47.1	21.3	20.2	13.0	12.3	2015
Richmond	Morning	NA	NA	NA	NA	NA	NA	44.5	42.3	20.6	19.6	12.6	12.0	2015
Richmond	Daytime	NA	NA	NA	NA	NA	NA	43.1	41.0	20.1	19.1	12.3	11.7	2015
Richmond	Evening	NA	NA	NA	NA	NA	NA	28.5	27.0	11.5	10.9	7.0	6.7	2015
Nassau	Night	NA	NA	NA	NA	NA	NA	47.5	45.2	19.7	18.7	12.8	12.2	2015
Nassau	Morning	NA	NA	NA	NA	NA	NA	42.7	40.6	19.1	18.1	12.4	11.8	2015
Nassau	Daytime	NA	NA	NA	NA	NA	NA	41.4	39.3	18.6	17.7	12.1	11.5	2015
Nassau	Evening	NA	NA	NA	NA	NA	NA	27.3	25.9	10.6	10.1	6.9	6.6	2015
Suffolk	Night	51.2	48.6	26.4	25.1	16.9	16.1	51.2	48.6	26.4	25.1	16.9	16.1	2015
Suffolk	Morning	46.1	43.8	25.6	24.3	16.4	15.6	46.1	43.8	25.6	24.3	16.4	15.6	2015
Suffolk	Daytime	44.7	42.5	24.9	23.7	16.0	15.2	44.7	42.5	24.9	23.7	16.0	15.2	2015
Suffolk	Evening	36.3	34.5	14.2	13.5	9.1	8.7	36.3	34.5	14.2	13.5	9.1	8.7	2015
Westchester	Night	51.6	49.1	26.8	25.4	16.4	15.6	51.6	49.1	26.8	25.4	16.4	15.6	2015
Westchester	Morning	46.5	44.1	26.0	24.7	15.9	15.1	46.5	44.1	26.0	24.7	15.9	15.1	2015
Westchester	Daytime	45.1	42.8	25.3	24.0	15.5	14.7	45.1	42.8	25.3	24.0	15.5	14.7	2015
Westchester	Evening	36.6	34.8	14.4	13.7	8.8	8.4	36.6	34.8	14.4	13.7	8.8	8.4	2015
Rockland	Night	51.1	48.5	27.3	25.9	17.0	16.1	51.1	48.5	27.3	25.9	17.0	16.1	2015
Rockland	Morning	46.0	43.7	26.5	25.2	16.5	15.6	46.0	43.7	26.5	25.2	16.5	15.6	2015
Rockland	Daytime	44.6	42.4	25.8	24.5	16.0	15.2	44.6	42.4	25.8	24.5	16.0	15.2	2015
Rockland	Evening	36.2	34.4	14.8	14.0	9.2	8.7	36.2	34.4	14.8	14.0	9.2	8.7	2015
Putnam	Night	56.8	54.0	36.3	34.5	22.2	21.1	56.8	54.0	36.3	34.5	22.2	21.1	2015
Putnam	Morning	52.2	49.6	35.2	33.5	21.6	20.5	52.2	49.6	35.2	33.5	21.6	20.5	2015
Putnam	Daytime	51.1	48.6	34.3	32.6	21.0	20.0	51.1	48.6	34.3	32.6	21.0	20.0	2015
Putnam	Evening	45.5	43.2	19.6	18.6	12.0	11.4	45.5	43.2	19.6	18.6	12.0	11.4	2015
Capital District	Night	59.7	53.8	45.2	45.2	39.7	26.2	56.9	56.9	38.0	30.6	27.2	25.1	2015
Capital District	Morning	57.3	51.0	42.1	42.1	37.9	23.1	54.9	54.9	36.0	29.3	26.8	24.9	2015
Capital District	Daytime	57.7	51.5	42.5	42.5	38.1	23.5	51.1	51.1	32.8	27.2	26.2	24.5	2015
Capital District	Evening	53.8	46.8	39.5	39.5	36.3	20.5	42.8	42.8	24.2	21.5	21.8	21.8	2015
Onondaga	Night	55.9	55.9	47.8	45.2	41.6	39.0	46.4	46.4	29.1	27.0	24.8	27.1	2015
Onondaga	Morning	54.1	54.1	45.8	43.6	40.2	38.7	45.6	45.6	28.5	26.4	24.5	27.0	2015
Onondaga	Daytime	54.4	54.4	46.0	43.8	40.4	38.7	44.0	44.0	27.4	25.3	24.0	26.7	2015
Onondaga	Evening	51.4	51.4	44.0	42.2	39.1	38.4	40.8	40.8	24.6	22.6	20.8	25.1	2015
Monroe	Night	54.4	49.0	49.0	43.3	39.0	32.6	50.1	50.1	30.2	30.2	28.4	19.2	2015
Monroe	Morning	53.8	47.7	46.4	42.0	38.4	32.3	49.0	49.0	29.2	29.4	28.2	19.2	2015
Monroe	Daytime	53.9	47.9	46.7	42.2	38.5	32.3	46.9	46.9	27.6	28.1	27.7	19.0	2015
Monroe	Evening	53.1	45.8	44.1	40.9	37.9	32.0	42.9	42.9	23.8	25.1	24.6	18.1	2015
Buffalo Area	Night	54.9	54.3	55.0	46.2	41.2	36.2	56.0	55.5	37.2	34.3	37.2	37.1	2015
Buffalo Area	Morning	54.5	53.3	48.8	43.1	38.1	33.1	54.5	54.0	36.3	33.6	36.8	36.8	2015
Buffalo Area	Daytime	54.6	53.5	49.5	43.5	38.5	33.5	51.6	51.5	34.8	32.4	36.2	36.2	2015
Buffalo Area	Evening	53.9	51.9	43.3	40.5	35.5	30.5	46.7	47.2	31.9	30.0	32.8	32.7	2015
Rest of State	Night	55.7	53.0	45.3	43.1	36.8	34.9	54.9	52.1	35.3	33.4	25.8	24.5	2015
Rest of State	Morning	55.7	53.0	44.7	42.5	36.0	34.2	54.2	51.6	33.5	32.0	25.3	24.0	2015
Rest of State	Daytime	55.7	53.0	44.8	42.5	36.1	34.3	53.0	50.5	30.8	30.0	24.4	23.3	2015
Rest of State	Evening	55.7	53.0	44.2	42.0	35.3	33.6	51.8	49.3	28.7	27.0	21.1	20.0	2015

2015 SPEEDS used for 2013 and beyond modeling runs

Morning hours are 5am to 8am, Daytime hours are 9am to 2pm, Evening hours are 3pm to 5pm, and Night hours are 6pm to 4am

Capital District includes the counties of Albany, Rensselaer, Saratoga, and Schenectady

Bufalo Area includes the counties of Erie and Niagara

Attachment 5

IMPROVING AIR QUALITY MODELS IN NEW YORK STATE: UTILITY OF THE
1995 NATIONWIDE PERSONAL TRANSPORTATION SURVEY

Improving Air Quality Models in New York State: Utility of the 1995 Nationwide Personal Transportation Survey

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Introduction

The New York State Department of Transportation (NYSDOT) is legislatively responsible for the management of 14% of the 112,000 miles of public roads that carried 52% of the 118 billion vehicle miles of travel in 1996. These roads are comprised primarily of the Interstate and State Highway System which serve as the backbone for highway transportation in the state. As a state agency, the Department is concerned with many issues including infrastructure maintenance, safety, mobility, economic development, congestion management, and air quality. The Department's capital program is multi modal with investments in public transportation facilities, as well as constructing, operating and maintaining the highway infrastructure. Its goal is to insure transportation access and mobility to all of its citizens.

This paper will describe several analyses of the 1995 Nationwide Personal Transportation Survey undertaken by the New York State Department of Transportation. These analyses are presented to illustrate the value of the Nationwide Personal Transportation Survey for New York State and the ability of NYSDOT to focus transportation studies on state-based travel characteristics. The analyses address issues raised by the New York State Department of Environmental Conservation (ENCON), the state's environmental agency, and the New York State Department of Transportation. They were identified during the development of the Air Quality State Implementation Plan, and related activities, such as creating vehicle miles of travel inventories, updating ENCON's emission model, and the conformity analyses of the Department's Transportation Program.

Background

Early travel surveys, limited primarily to automobile and truck travel, were conducted in a number of States between 1930 and 1940 and again between 1950 and 1960. As transportation planning evolved, metropolitan area surveys became more common. In 1961, a survey was conducted by the Federal Highway Administration (FHWA) to determine on a nationwide basis the characteristics of travel, and the ownership and use of automobiles. In 1969, the Nationwide Personal Transportation Survey as we know it was conducted. Since then this survey has been conducted almost every five years, expanding in scope and geographic coverage. In 1990 and 1995, it was possible for metropolitan areas and states to participate with FHWA to obtain additional samples for greater local coverage.

In each survey prior to 1995, New York State was represented more by its largest urban area (New York Metropolitan area), because of its sheer size within the nation than by the distribution of population in other areas-- both urban and rural--within the State. New York State has 12 large urban areas: three of which have populations around 100,000, five between 250,000-500,000 in population, two between 700,000-800,000 in population, and one at 1.2 million in population. The twelfth and the largest is the ten county New York Metropolitan area with a population of 11.2 million (with six of the ten counties having populations greater than one million). Yet as urban as New York State seems, a population of 2.8 million resides in the non urban counties making the State the fourth most rural state in the nation in the 1990 Census.

This very diverse population distribution shows why participation in a survey such as the Nationwide Personal Transportation Survey is important for describing the personal travel characteristics of the different urban and rural areas, or for characterizing the state as a whole. Given the diversity in population sizes, New York State is a microcosm of the country. The nature of the transportation problems are diverse and transportation planning issues facing the state during the next 20 years require a broad, but detailed state-level database. Although individual Metropolitan Planning Organizations (MPOs) have conducted area-specific surveys over the years, the most recent comprehensive statewide home interview survey for transportation was collected during the late 1960s.

The recognition of the limitations of existing data that is available to characterize travel on a statewide and urban-area basis and the need to understand non urban travel led the New York State Department of Transportation (NYSDOT) to choose to become an add-on participant with the Federal Highway Administration (FHWA) in the conduct of 1995 Nationwide Personal Transportation Survey. The 1995 Nationwide Personal Transportation Survey as conducted in New York State, surveyed 11,000 households. The sample varied in size from 425 to 650 households in the primary counties in each urban area and 1,400 households in the remaining rural counties. The New York Metropolitan area had almost 4,000 households sampled within its ten county area. Each county represented a separate sample area varying from almost 300 to 500 households.

In addition to participating in the 1995 Nationwide Personal Transportation Survey, NYSDOT undertook two separate but related initiatives to address the transportation planning challenges facing the state. The first initiative was the acquisition of a detailed county and sub-county forecast of demographics and business economics, and the development of a vehicle miles of travel model driven by these data. This model is calibrated against the Highway Performance Monitoring System travel data for each of the 12 large urban areas, and the small urban and rural aggregated areas. The second initiative was a review of the state of the practice(s) in travel demand modeling currently in effect in each of the urban areas. Both initiatives, along with the Nationwide Personal Transportation Survey add-on, will enable NYSDOT to better address the patterns and characteristics of current and future travel in the state.

This paper examines five issues that arose during the reevaluation of air quality inventories and modeling for conformity analysis of the Department=s Transportation Program. The first topic examines:

- Tele-Commuting or Work at Home - a comparison of results from the 1990 Census and the 1995 Nationwide Personal Transportation Survey. It studies the emerging pattern of increasing number of workers who Awork at home@ that suggests a possible reduction in the number of work trips.

The remaining four topics originate from the desire of NYSDOT to reflect New York State-based data in ENCON=s use and adaptation of EPA=s MOBILE Emission Model.

- Hourly Vehicle Distributions - a comparison of hourly Nationwide Personal Transportation Survey-based vehicle trip distributions with hourly ground count data

- Area-wide Speeds - a comparison of Nationwide Personal Transportation Survey derived speeds with four-step model-based network speeds

- Vehicle Use - a comparison of Nationwide Personal Transportation Survey-based estimates of annual vehicle usage (miles traveled) with distributions developed by the U.S. Environmental Protection Agency for use with its MOBILE 6 Emissions Model.

- Engine Mode of Operation - a comparison of Nationwide Personal Transportation Survey-based estimates of area-wide 24-hour hot and cold starts with the four time period estimates currently being used in the New York State Environmental Conservation=s Mobile 5b Emission Model.

TELE-COMMUTING OR WORK AT HOME

After the 1995 Nationwide Personal Transportation Survey (NPTS) data became available, analysis of total travel, not just journey to work travel as in the 1990 Census, became possible. One of the first questions posed was whether tele-commuting or working at home was affecting the journey to work. If technology such as cellular telephones, laptop computers, and Internet access typically used by the mobile work force were having an impact, then a significant change in the number of workers working at home should appear in the data. Unfortunately, neither the Census nor the 1995 Nationwide Personal Transportation Survey specifically addressed Atele-commuting@ as a work activity. While this is a definite shortcoming, both surveys identified in different ways the number of workers who worked at home.

Focusing on this issue, the 1990 Census asked about mode to work: A**How did this person usually get to work last week?**@ One possible response was Awork at home.@ The 1995 Nationwide Personal Transportation Survey asked a very different question: A**What is the one-way distance from your home to your workplace?**@ Possible NPTS responses included the specific number of blocks or miles coded as Agoes to work,@ and two alternatives when distance was not provided Ano fixed work place@ or Aworks at or out of home.@ The intent of the 1995 Nationwide Personal Transportation Survey category Ano fixed work place@ was meant to capture migrant workers following work, as in construction or farming. This category *may* also contain sales persons, such as a manufacturer=s representative who did not have a fixed work location, and who may not have work from home. Unfortunately, the 1995 Nationwide Personal Transportation Survey lacked a category to describe the classification of the work site, job, or why a person was working at home.
Table 1 illustrates that the number of workers and the percentage of those who Awork at home@ for both the 1990 Census and the 1995 Nationwide Personal Transportation Survey for New York State. The data for New York State are summarized in this table for the sample strata with the constituent counties noted. *The number of workers who Awork at home@ in the 1995 Nationwide Personal Transportation Survey for New York State was about double that of the 1990 Census.* The 1990 Census sampled 16.7% of the households in New York State. The 1995 Nationwide Personal Transportation Survey sampled 0.2% of the households in 1995, a smaller number, but reliable at the 95% confidence level. ***Table 1*** *shows that the number of workers who Awork at home@ in New York State has increased from 2.6% of all workers in the 1990 Census to 5.1% in the 1995 Nationwide Personal Transportation Survey for New York State. This doubling has occurred in most areas shown in* ***Table 1****. However, it is interesting to note that the share of the workforce working at home is highest in Ithaca, Glens Falls, Poughkeepsie, Westchester, Putnam and Rockland counties and the aggregate Arest of state@ area. These areas may be viewed as places where workers may commute a much longer distance to an employment location in a nearby urban area (e.g., Ithaca to Syracuse or Binghamton, Glens Falls to Albany, Westchester, Putnam and Rockland counties to New York City, and any of the rural counties to an urban area).*

The observation that the increase in Awork at home@ is occurring across the state, and is an increasing proportion of all workers in areas with Along commutes@ to a nearby urban area, raises a number of further policy questions. In what areas will Awork at home@ continue to increase and at what rate? In which industries, job classifications or professions are these workers engaged? Can reasons for working at home be enumerated? *Clearly the findings of* ***Table 1*** *suggest that the design of the year 2000 Nationwide Personal Transportation Survey must focus more attention on these questions.*

Table 1 Working at Home, Census V. Nationwide Personal Transportation Survey

	1995 Nationwide Personal Transportation Survey Work Location				1990 Census Table P49-Journey to Work		
	(Shown by NYS 1995 NPTS Sample Stratum)						
	All Workers	Work@ Home	%		All Workers	Work@ Home	%
Upstate Areas (Sample Counties)							
Albany (Albany, Rensselaer, Saratoga, Schenectady)	410,418	20,636	5.0%		382,229	8,474	2.2%
Glens Falls (Warren, Washington)	58,973	5,633	9.6%		51,864	1,933	3.7%
Utica-Rome (Herkimer, Oneida)	150,829	8,446	5.6%		135,041	3,891	2.9%
Syracuse (Onondaga)	244,025	13,694	5.6%		223,650	5,295	2.4%
Ithaca (Tompkins)	49,853	3,050	6.1%		45,175	1,990	4.4%
Rochester (Monroe)	366,085	11,307	3.1%		347,088	7,403	2.1%
Buffalo (Erie, Niagara)	562,013	16,997	3.0%		531,122	9,808	1.9%
Elmira (Chemung)	40,657	1,784	4.4%		40,325	881	2.2%
Poughkeepsie (Dutchess)	136,474	8,371	6.1%		125,726	2,991	2.4%
Binghamton (Broome, Tioga)	114,967	4,920	4.3%		121,274	3,201	2.6%
Newburgh (Orange)	157,607	7,984	5.1%		141,664	3,406	2.4%
Upstate Urban Area Total	2,291,901	102,822	4.5%		2,145,158	49,273	2.3%
New York Metropolitan Area (Sample Counties)							
Bronx	447,511	16,723	3.7%		429,777	5,379	1.3%
Kings	966,600	30,513	3.2%		907,010	14,510	1.6%
New York	845,535	56,275	6.7%		754,148	41,102	5.5%
Queens	950,510	41,488	4.4%		918,063	13,372	1.5%
Richmond	194,047	3,751	1.9%		174,090	2,456	1.4%
New York City Total	3,404,203	148,750	4.4%		3,183,088	76,819	2.4%
Nassau	672,349	30,490	4.5%		650,947	16,383	2.5%
Suffolk	701,974	37,757	5.4%		652,989	12,794	2.0%
Putnam/Rockland (Combined for NPTS)	192,409	13,915	7.2%		177,973	4,481	2.5%
Westchester	439,844	33,930	7.7%		437,753	13,813	3.2%
New York Metropolitan Suburban County Total	2,006,576	116,092	5.8%		1,919,662	47,471	2.5%
Rest-of-State	1,071,958	77,166	7.2%		972,705	39,659	4.1%
New York State	8,774,638	444,830	5.1%		8,220,613	213,222	2.6%

Source:
Unpublished 1995 NPTS Data Extracted from FHWA NPTS web site: http://www-cta.ornl.gov/npts
1990 Census, Journey-to-Work, available from BTS on 1990 CTPP CD-ROM or from Census web site : http://www.census.gov
Prepared by:
NYSDOT, Planning and Strategy Group, March 1998

AN HOURLY TRAFFIC DISTRIBUTION ALTERNATIVE

Air Quality Analysis is a cooperative activity between the New York State Department of Environmental Conservation (ENCON) which performs the emission=s analysis, and the New York State Department of Transportation, which develops the vehicle miles of travel (VMT) inventory and related highway measures for use with the State Implementation Plan. The VMT inventory provides county level area-wide estimates of VMT based on the Highway Performance Monitoring System (HPMS) data by rural, small urban and large urban areas, as well as by roadway functional classification.

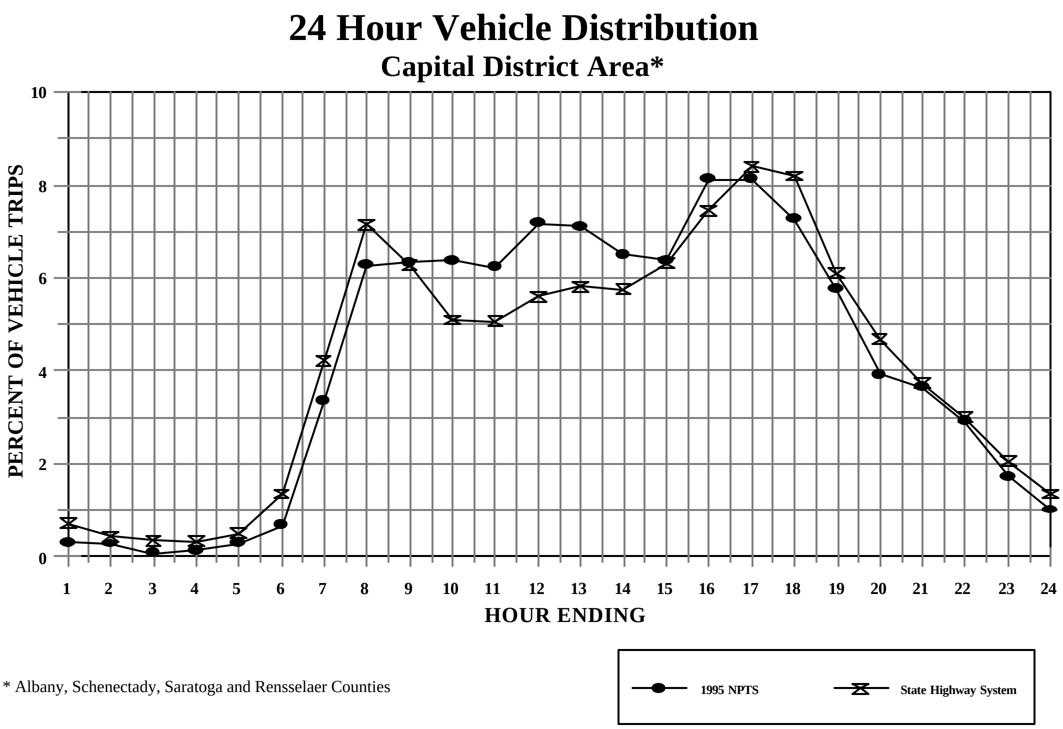
This section will focus on the use of the 1995 Nationwide Personal Transportation Survey for New York State (NPTS_NY) as a source for hourly vehicle distributions to provide greater detail to improve upon the traffic count distributions developed in 1992. That year, ENCON observed that modeled emissions begin to increase in the morning and then drop off by 10:00 a.m., but not rise again until early afternoon following the apparent pattern of the hourly ground count distributions. This was in stark contrast to ozone formation that was observed to increase throughout the day. The Nationwide Personal Transportation Survey collected travel data across the entire day, every day for a whole year. It is possible, therefore, that the 1995 NPTS_NY could shed some light on this problem.

The 1995 Nationwide Personal Transportation Survey for New York State was summarized by urban area strata, for the proportion of hourly Apersonally occupied vehicle@ trips as a percent of the entire day. Since these data represent travel on all roadways within the individual areas, a software routine was developed to construct comparable area-wide hourly vehicle distributions from traffic counts on the State Highway System.

Figure 1 contains two curves; The first is the hourly distribution from the Nationwide Personal Transportation Survey for the Capital District (the counties of Albany, Schenectady, Saratoga, and Rensselaer)-- a typical upstate urban area. The second is the comparable area-wide weighted average hourly traffic count distribution for the State Highway System for the same area. This figure shows that the NPTS_NY hourly distribution of vehicle trips generally follows the State Highway System traffic count pattern especially for the peak periods. However, a midday peak not present in the actual ground count data is observed. This peak is more typical of local non arterial traffic not typically measured in State Highway System arterial counts.

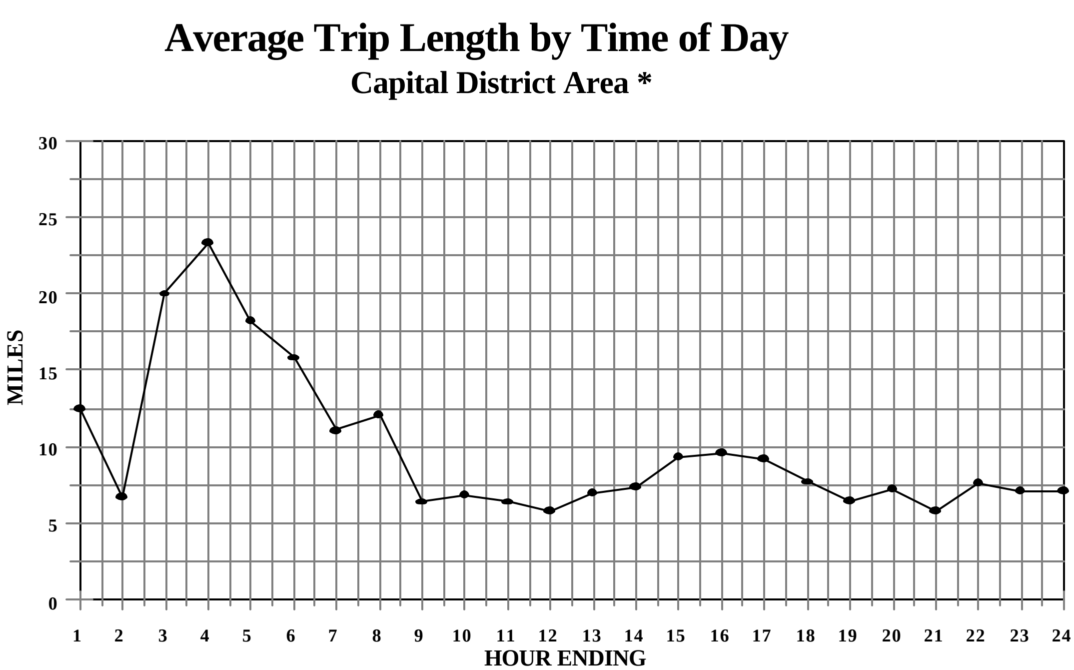
Since midday peaks occurred in the hourly distributions from the NPTS_NY for all urban areas, a computation of the average hourly trip length was undertaken. If the midday peaks are representative of local traffic, it is reasoned that the average trip length would likely be shorter. **Figure 2** for Capital District Area, illustrates the finding for all urban areas, the average trip length is shortest during the midday peak. The very high values in the early morning hours result from fewer observations and longer trip lengths.

Figure 1



* Albany, Schenectady, Saratoga and Rensselaer Counties

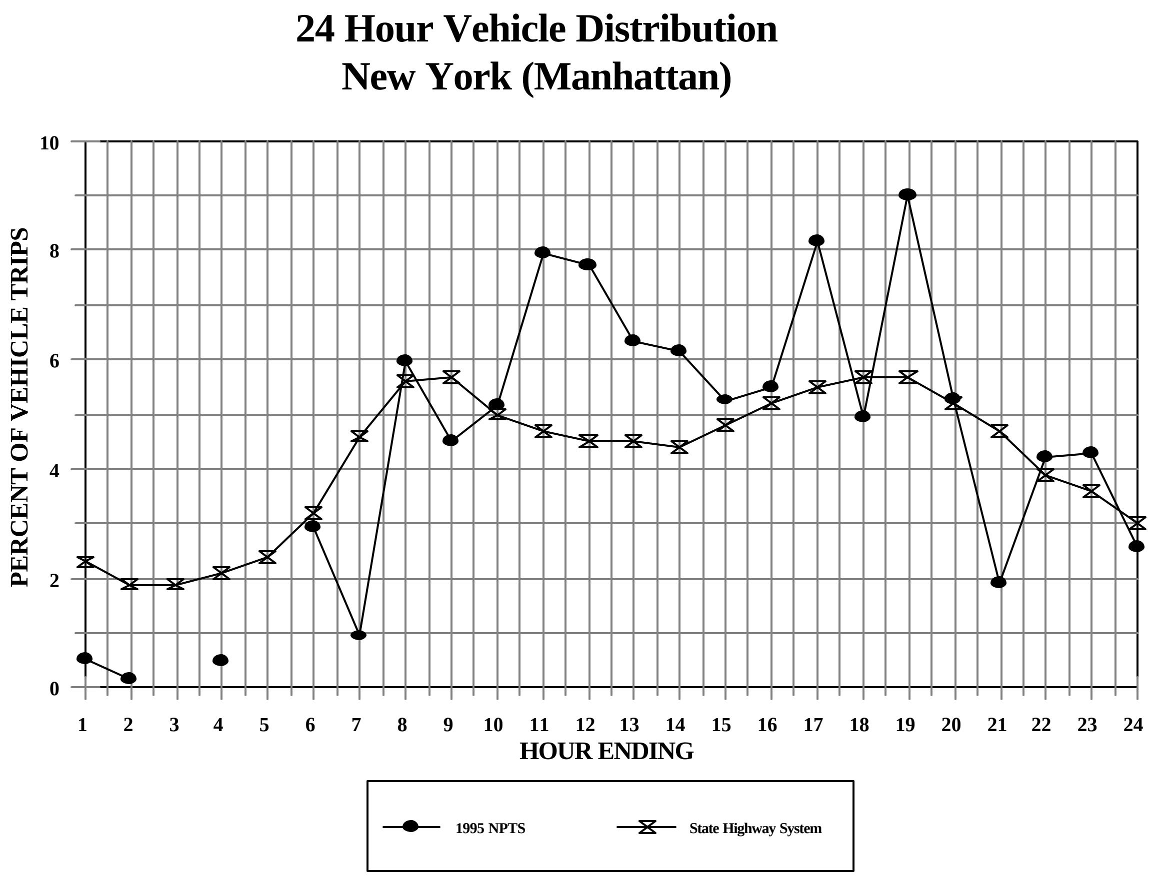
Figure 2



* Albany, Schenectady, Saratoga and Rensselaer Counties

Figure 3 shows the area-wide hourly distributions from both the NPTS_NY and the State Highway System for New York County.

Figure 3



As in **Figure 1**, the prominent midday peak is present along with two or more significant peaks in the evening period. This particular pattern was found in the hourly distributions for each of the five counties within New York City (NYC). The counties of Nassau and Suffolk, east of New York City and the counties of Westchester, Rockland and Putnam, north of New York City exhibited hourly distribution patterns similar to typical urban areas in the state as depicted by **Figure 1**. Depending upon the individual county within New York City, the size of the peaks varied. However, each showed an evening rush hour peak around 5 p.m., an after rush hour peak around 7 p.m., and a smaller late night peak around 10 or 11 p.m. It is probable that the characteristics of New York City, (population density, the individuality of each county as a city within a city, or the nature of local self-contained neighborhoods) may explain the personal vehicle travel behavior noted in the evening peak, compared with that of **Figure 1** for typical upstate areas.

These data were provided to ENCON for each of the urban areas in New York State. For the New York Metropolitan Area, the ten individual county distributions were provided. ENCON replaced the upstate, downstate, and rural hourly distributions with specific NPTS_NY hourly distributions and tested the effects on the EPA MOBILE Emissions model output. *This test showed that the modeled hourly emission results more closely correlate with the increasing hourly profile for the measured ozone data with no significant net change in the overall level of emissions.*

In summary, the data from the Nationwide Personal Transportation Survey for New York State has provided more reliable area-wide hourly traffic distribution for use with ENCON's MOBILE Emissions model. The distribution fits the expected progression of area-wide emissions throughout the day. The NPTS_NY has also shown that the Department's ground count program, when taken in the aggregate, is a good indicator of hourly arterial traffic distributions, but not overall area-wide traffic that includes local roads. Lastly, the NPTS_NY has identified differences in hourly distributions for the evening peak period within the five counties of New York City which requires further examination.

SPEED FROM TRIP LENGTH AND TRAVEL TIME ESTIMATES

One of the critical input parameters for EPA=s MOBILE Emissions Model is the estimate of speed by roadway functional class and time of the day. All transportation projects planned for an air quality non attainment area are required to demonstrate conformity with the area=s emission target. Low speeds and an increasing number of stops per mile are indicative of both high levels of congestion and emissions. As a result, NYSDOT was interested in validating and assessing the accuracy of the speed estimates in current usage.

In 1992, speed estimates by functional classification were developed from each of the urban area network travel demand models. They were based upon Highway Capacity Manual volume/capacity ratios (V/C), and empirical speed data gathered from the field. Three years later, the Nationwide Personal Transportation Survey for New York State (NPTS_NY) collected respondent trip length and travel time which could be used for computing a respondent trip speed. In addition, NYSDOT had the Research Triangle Institute geo-code all trip ends during the conduct of the NPTS_NY. As a result, a separate geo-coded data set exists for New York State.

This section compares several survey-based speed computations and the network travel demand model-based speeds on an urban area-wide basis. In order to examine these different speeds, it is important first to acknowledge some problems with the data:

$ Survey-based travel time clusters around the hour, half, or quarter-hour period. Survey-based distances are reported in whole units and usually rounded to the nearest mile.

$ The geo-coding of the origins and destinations are accurate to the street address, nearest intersection, or zip code centroid.

$ Computation of a straight-line distance between an origin and destination ignores the actual path within the grid-based street network that a traveler might use.

$ Speeds estimated from calibrated network travel demand model assignments are predominantly from arterials and subject to the uniform applicability of capacity type calculations and assumptions about headway and observed V/C at given speeds. Additionally, the tolerance for link volume variations from actual traffic count volumes may introduce variability for V/C and therefore speed calculations from network assignments.

$ Only area-wide speeds can be computed from the Nationwide Personal Transportation Survey for New York State. These are obtained by dividing the reported survey trip length by the reported travel time and for the geo-coded records by using the computed coordinate length between the origin and the destination (the straight-line distance). For comparability, the network travel demand model speeds by roadway functional class were weighted by vehicle miles of travel to construct area-wide speeds for each of the urban areas or counties.

Table 2 contains five columns that compare the computed area-wide speed estimates for the different urban areas or counties. The definitions for these columns are:

$ a) Speeds computed from **all** NPTS_NY trip records for personally occupied vehicle trips using the respondent=s reported trip length and travel time;

$ b) Speeds computed from the respondent=s reported trip length and travel time using personally occupied vehicle trip records from the 82.5% of all records for which geo-coded information exists;

$ c) Speeds computed from the geo-coded straight-line trip length and the respondent=s travel time using the same data records as in b);

$ d) The speed ratio derived from A(c)@ divided by A(b)@ and,

$ e) The vehicle miles of travel weighted average area-wide speeds used by ENCON=s Mobile Emissions model.

Table 2 Estimated Speeds by Stratum

	(a)	(b)	(c)	(d)	(e)
	All NPTS records	NPTS records with O/D coordinates			
Stratums(1)	**Survey Trip Length/ Survey Travel Time**	**Survey Trip Length / Survey Travel Time**	**Coordinate Trip Length / Survey Travel Time**	**Coordinate Trip Length(c) / Survey Trip Length(b)**	**NYS ENCON (Weighted Average Area Speeds 1992 SIP)**
Upstate Areas					
Albany	28.05	29.94	23.36	78.0%	35.8
Glens Falls	29.22	30.78	25.67	83.4%	39.5
Utica-Rome	29.29	32.14	26.11	81.2%	37.0
Syracuse	29.83	31.60	22.66	71.7%	33.7
Ithaca	28.31	31.09	25.73	82.8%	38.1
Rochester	28.97	30.64	23.03	75.2%	31.6
Buffalo	26.35	29.28	22.20	75.8%	40.5
Elmira	27.02	27.67	21.45	77.5%	35.1
Poughkeepsie	28.83	31.05	25.11	80.9%	35.8
Binghamton	29.22	30.72	26.99	87.8%	36.8
Newburgh	21.22	22.07	18.88	85.5%	36.1
Small Urban and Rural Areas					
Small urban in rural counties	24.54	28.78	25.92	90.0%	
Rural Counties w/o small urban	31.57	34.61	29.07	84.0%	
New York City					
Bronx	18.57	19.71	15.06	76.4%	21.0
Kings	17.40	18.96	12.49	65.9%	16.6
New York	19.93	19.53	14.88	76.2%	9.6
Queens	21.79	21.33	17.45	81.8%	17.5
Richmond	20.84	21.49	16.44	76.5%	18.7
Nassau	22.91	26.10	19.62	75.2%	17.5
Suffolk	27.98	28.63	22.75	79.5%	23.7
Putnam/Rockland	30.51	30.87	20.61	66.8%	29.5
Westchester	25.21	25.42	20.06	78.9%	26.7
			Average Ratio (c)/(b)	78.7%	
			SD	5.9%	

(1) NYS 1995 NPTS Add-on Stratum (Primary Urban County)

Speeds from the NPTS_NY are computed in a fashion similar to the interval-grouping for speed based ground counts. The trip records are summarized by speed intervals and the percentage of the total computed for all records within each urban area or county. The weighted harmonic average speed for each area is then computed using the midpoint of each speed interval and its percentage.

Several interesting observations regarding **Tables 2 and 3** are noted:

- The speeds from the selected set of survey records that have geo-coded trip ends (b) are *not appreciably* different from those of the entire survey data set (a) for New York State.

- In *less congested upstate urban areas*, the network-based speed estimates (e) from the travel demand model assignments provide speeds that are on average *25% higher* than the survey-based speeds (b).

- In the ten individual counties within the New York Metropolitan area, the conclusions on speed are varied. For the five counties within New York City except the Bronx, and the suburban counties of Rockland and Putnam the network-based speed estimate (e) is lower than the survey-based speed (b). In most instances the network speed seems to fall between the survey speed (b) and the coordinate length estimates (c) except New York County. In this instance, the network speed estimate (e) is half the survey estimate (b).

Differences In Trip Length Estimates

Column (d) in **Table 2**, shows that the NPTS_NY straight-line speed (c) is 78.7% of the survey length-based speed (b) with a deviation of +/- 5.9%. Travel time is constant in each of the speed estimates and the ratio of these two weighted average speed measures essentially yields the ratio of the coordinate and survey trip length. This means that the coordinate-based trip length is 73% to 85% of the respondent-based trip length in the survey.

Table 3 Column (d) shows that even for different destination trip purposes, the proportional relationship of speed based upon the survey in column (b) is 76.8% of the speed based upon the coordinate or straight-line distance (c) with a deviation of +/- 2.2%. This indicates that trip purpose is not a factor in this difference.

Table 3 Estimated Speeds by Trip Purpose

	(a)	(b)	(c)	(d)
Trip Purpose (1)	**Survey Trip Length / Survey Travel Time**	**Survey Trip Length / Survey Travel Time**	**Coordinate Trip Length / Survey Travel Time**	**Coordinate Trip Length(c) / Survey Trip Length(b)**
Work		31.80	23.95	75.3%
Shop		28.04	22.64	80.8%
School Religion		26.41	20.11	76.2%
Personal Business		27.25	20.65	75.8%
Social Recreation		30.87	22.85	74.0%
Home		27.82	21.85	78.5%
			AVG. ratio	76.8%
			SD ratio	2.2%

(1) WHYTRP95 Re-code Home = codes 17 Work = codes 1,2,3 Shop = codes 4
School Religion = codes 5,6 Personal Business = codes 7 - 10 Social Recreation = codes 11-16

Straight-line distance between two points views the urban street grid system from the standpoint of the Pythagorean Theorem. Evaluating a right triangle with values of two sides between 0.25 and 7.0 in one-quarter increments shows that the ratio of the hypotenuse to the sum of the other two sides is 77.7%, with a variation of +/- 7.4%. Therefore, the difference between straight-line or coordinate distance and survey trip length may be attributed to highway system geometry and not respondent estimation error, because people do not generally travel in a straight line.

In a somewhat related analysis that examined a GIS based network routing solution for geo-coded trip data in the Syracuse urban area, a much more interesting finding was discovered regarding the accuracy of respondents= reported trip length estimates. The average NPTS_NY personally occupied vehicle trip length in the Syracuse area is 9.08 miles. For personally occupied vehicle trip records with intersection geo-coded origins and destinations, 63% of the time the respondent=s estimate of trip length was longer than the network-based trip routing solution by no more then 5%. Moreover, the respondent=s trip length estimate was 5-10% longer than the routing solution 36% of the time. Only 1% of the respondents exceeded the network routing solution by more than 10%. A 5% error in the respondent=s trip length, converts to a difference of less than a half mile. Considering that the respondent is probably rounding distance to at least the nearest mile, this difference suggests that the respondent=s estimate may be very reliable.

The examination of the Nationwide Personal Transportation Survey for New York State and its geo-coded data leads to the conclusion that the network travel demand model estimated speeds are a reasonable approach. *However in the less congested upstate urban areas, the network speeds tend to provide higher calculated area-wide speeds than the survey would suggest. In the more congested counties within the New York Metropolitan area, they are much closer to the survey-based area-wide speeds. The only exception is in New York County (Manhattan) which requires further examination. Straight-line trip length appears to be less accurate than the respondent=s trip length estimate. However, the GIS network-based trip routing solution for intersection geo-coded data in the Syracuse urban area suggests that the respondent=s estimate is an accurate estimate of the actual trip length.*

ANNUAL VEHICLE UTILIZATION

Vehicle emissions are a factor of vehicle age, type, and annual usage during the year. Emissions vary by vehicle model year, as well as a model year=s proportion of the total vehicle population. Vehicle age distributions by vehicle type are readily obtainable from the New York State Department of Motor Vehicles registration data files, but actual vehicle usage is not. The New York State Department of Transportation was concerned that national level data recommended for use with EPA=s MOBILE 6 Emissions Model would not be appropriate for New York State. One of the component data sets in the Nationwide Personal Transportation Survey is the vehicle file. The vehicle data from this file were examined to compare the average annualized vehicle odometer readings with the U.S. distributions and fitted data being supplied with EPA=s MOBILE 6 Emissions Model.

Figures 4, shows this comparison for light duty gas vehicles (LDGV), Aautos.@ **Figure 5**, shows this comparison for light duty gas trucks (LDGT), Apickups, sports utility vehicles, and vans.@ Both figures show the raw data and the fitted exponential curves for both the U. S. and New York State.

Figure 4

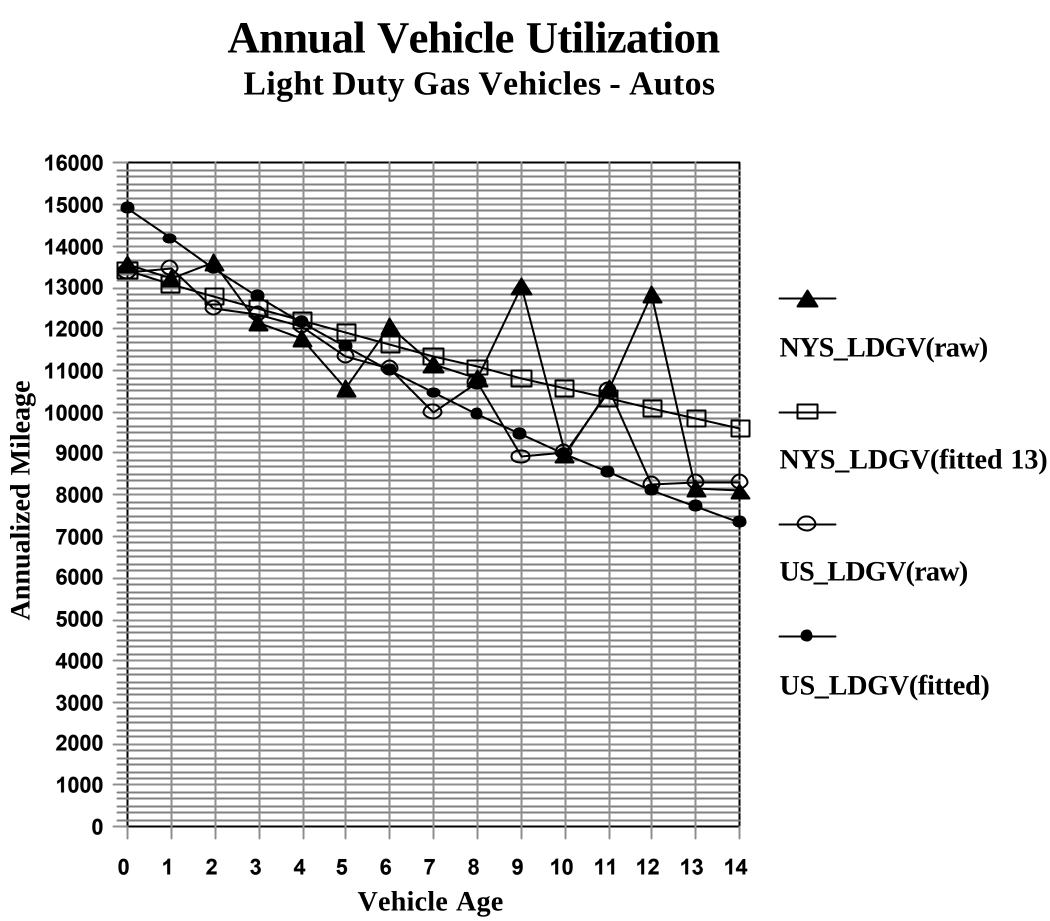
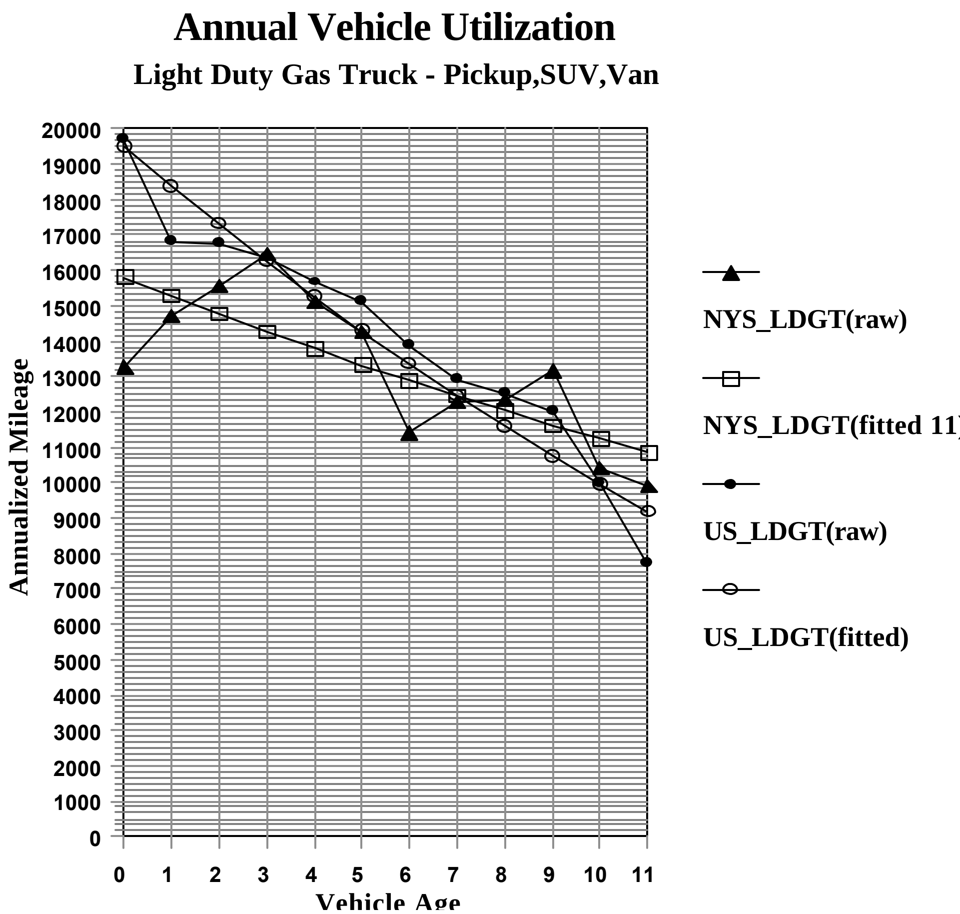


Figure 5



Figures 4 and 5 contain the fitted exponential curves calibrated against the New York State and U.S. average annualized vehicle odometer readings. The figures show that fitted EPA data is significantly different from the fitted New York State data. Of 75,217 vehicle records in the U.S. data set, average annualized mileages were computed for 42.7% of the vehicles. Of the 17,606 vehicle records in the New York State data set (which are part of the national set), average annualized mileages were computed for 46.2% of the vehicles.

Examination of the New York State data set shows extremely wide variations in annualized mileage for vehicles older than 14 or 12 years of age (not shown) respectively, for both autos or light trucks. **Table 4** shows the average number of data points represented by each average annualized mileage point for all vehicle ages and those in **Figures 4 and 5**. Variability in a data set due to outliers or, in this case, too few observations, significantly influences the ability to fit a reliable curve to the raw data. Although these observations are readily identifiable in the New York State data set, the number of observations used in the EPA analysis for MOBILE 6 is not known. A larger data set drives average annualized mileage variation toward the mean in each age cohort and significantly reduces the variability in the data. If this were a problem in the EPA data set, its resolution is unknown, because the data do not exhibit extreme values for average annualized mileage. As a result, the equations fitted for the New York State data were done for vehicle ages 0-13 years for autos, and 0-11 years for light duty trucks as in **Table 4**.

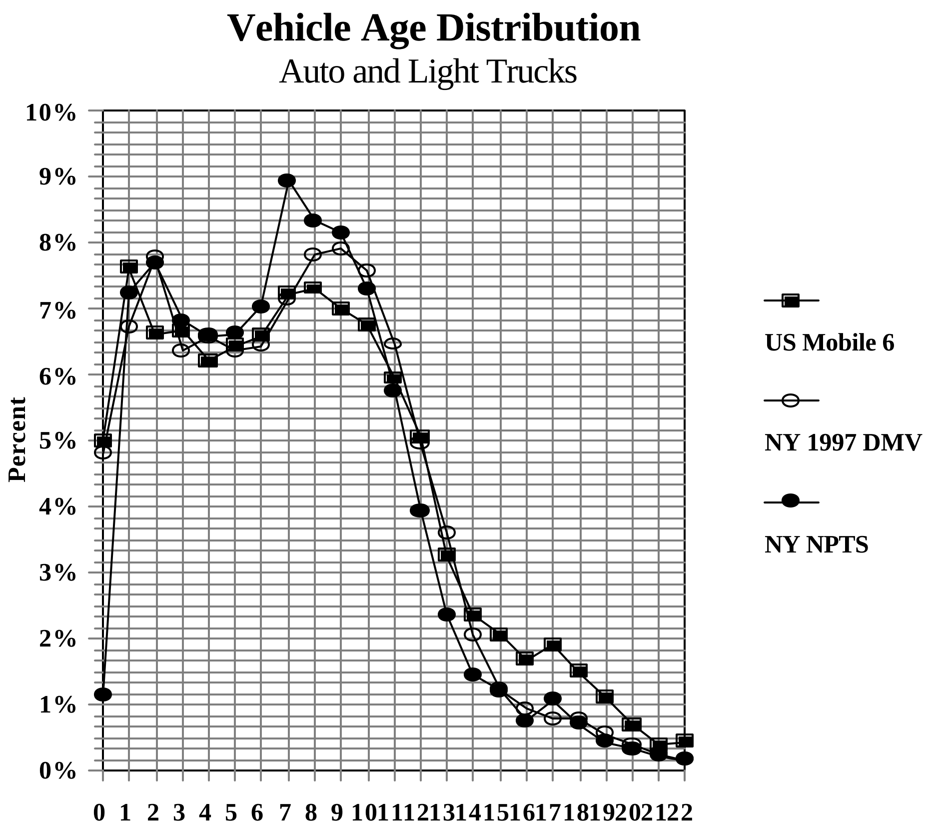
Table 4 Number of Survey Records with Annualized Mileage

Age Cohort	LDGV Avg. # of records		Age Cohort	LDGT Avg. # of records
0 - 13	**391**		0 - 11	**164**
14 - 62+	**15**		12 - 77+	**12**

Examination of the resultant fitted curves in **Figures 4 and 5**, showed that the New York State average annualized mileage does not decline as rapidly as the national data set, especially for autos, and that newer light trucks in general have a lower rate of use than in the nation. ***Figure 4*** *shows that auto use in New York State remains higher over a longer period than for the U. S. The initial annual utilization rates for autos and light trucks are noticeably lower in the first three years than it is for the U. S. Lastly, while light duty trucks have a lower initial average annualized mileage it rises above the national average as the vehicle moves into the 7-10 year age group.*

Figure 6 compares the age distributions for light duty autos and trucks in the 1996 national fleet, with the 1997 New York State Department of Motor Vehicles AVehicles in Operation@ data, and the 1995 vehicle age distributions from the NPTS_NY. The proportion of 5-10 year-old vehicles in the New York State fleet exceed that for the nation based on the area under the curve for these age cohorts. In addition, for all vehicle age cohorts 2-10 years, the New York State vehicle fleet has higher distribution proportions than the national of which it is part. *This indicates that a vehicle=s retention in the fleet lasts longer in New York State.* It is possible that this is the result of the high level of public transit use, primarily in New York City and the lower per capita vehicle ownership that results. *The rate of vehicle retention coupled with the difference in annual usage rates for autos and light trucks in* ***Figures 4 and 5*** *will affect emissions.*

Figure 6


Vehicle Age Distribution
Auto and Light Trucks
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
Percent
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
US Mobile 6
NY 1997 DMV
NY NPTS

ENGINE MODE OF OPERATION

Estimates of hot and cold start percentages are the most problematic of the input parameters to the Mobile Emissions Model. In particular, the range of cold start modes of operation can have as much impact on emissions as speed and ambient temperature input ranges; yet it is more difficult to assess. The current Mobile 5b Emissions Model in use by the New York State Department of Environmental Conservation (ENCON) relies upon percent cold proportions established in 1992. These data were based upon estimates derived from several studies described in the literature dating from the late 1970s to the late1980s. The percentage of hot and cold starts were synthesized for four time periods. The time periods or bands reflected peak and off peak periods in a typical 24-hour traffic volume distribution. The data were prepared for three highway categories (Interstate and Expressway, Arterial, and All Other Roadways). The data were also weighted by the vehicle miles of travel in each highway category. At the time this approach relied upon engineering judgement and the best available data.

The 1995 Nationwide Personal Transportation Survey in New York State (NPTS_NY) provided the opportunity to reexamine this issue both geographically and temporally within a 24-hour period. Because the 1995 NPTS_NY was a residential home interview-based survey, it was only possible to compute area-wide estimates. This approach required the computation of the number of hot and cold starts for the trips taken by each vehicle in the household. By sequencing the trips for the individual vehicles, the duration between the end of one trip and the beginning of the next can be calculated. If the duration between trips was greater than 60 minutes, a cold start was determined. A cold start was assumed for the first trip of the day for all vehicles.

Engine mode of operation was classified into four categories. These categories are based on the length of time (duration) between the ending of one trip and the beginning of the next and in the trip length measured in minutes. The 1995 NPTS_NY trip travel time was compared to nine minutes to reflect the 505 second Federal Test Procedure (FTP) engine start and driving cycle.

The duration is **more** then 60 minutes:
- Cold Start-Cold Mode (**CS_CM**) - vehicle started **cold**, driven **less** than nine minutes.
- Cold Start-Hot Mode (**CS_HM**) - vehicle started **cold**, driven **more** than nine minutes.

The duration is **less** then 60 minutes:
- Hot Start-Cold Mode (**HS_CM**)- vehicle started **hot**, driven **less** than nine minutes.
- Hot Start-Hot Mode (**HS_HM**)- vehicle started **hot**, driven **more** than nine minutes.

Figure 7, shows the 24-hour distribution of the four engine modes of operation for statewide vehicle trips as a percent of all vehicle trips, and the percentage of hourly vehicle trips. Categories CS_HM and HS_HM when taken together represent the hot stabilized emission mode of vehicle operation.

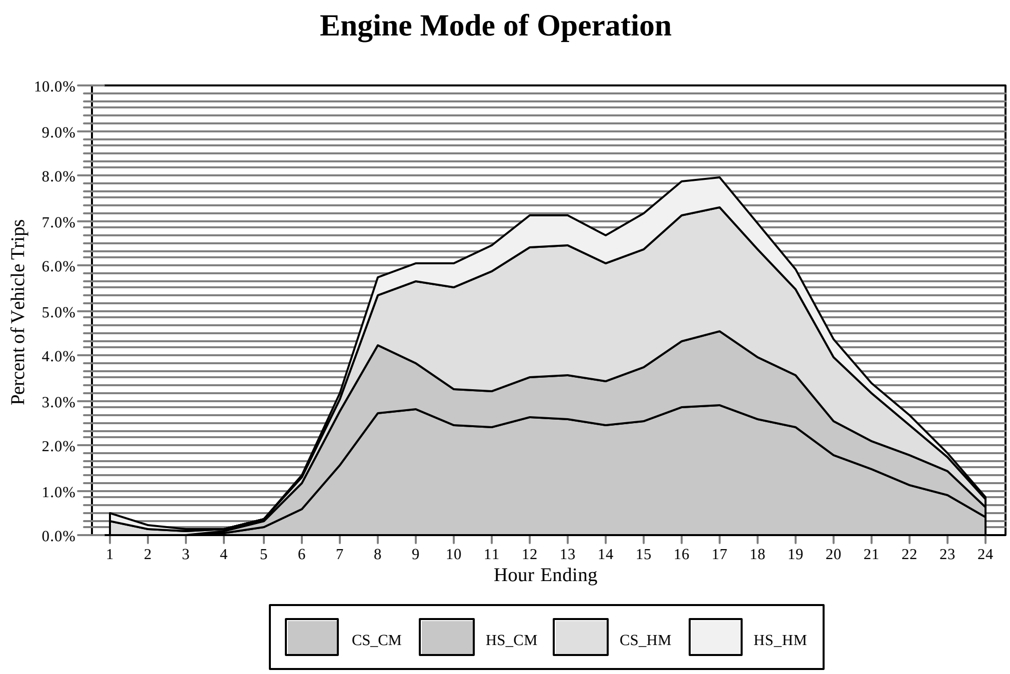
Figure 8, uses the duration between engine starts to classify hot or cold starts. The data are presented for statewide vehicle trips as a percent of all vehicle trips, and for the percentage of hourly vehicle trips.

Figure 9, shows the number and percent of statewide vehicle trips less than and more than nine minutes in duration for vehicle trips as a percent of all vehicle trips, and the percentage of hourly vehicle trips.

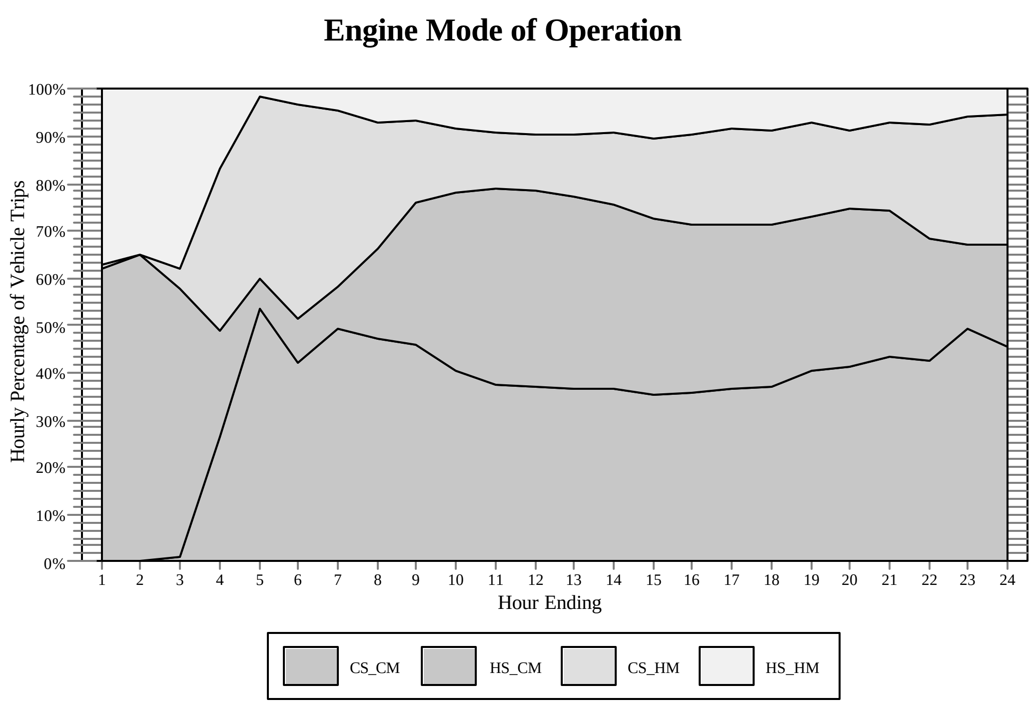
*The 24-hour distribution of statewide vehicle trips in **Figures 7, 8, and 9**, reflects the temporal traffic distribution described in **Figure 1**.* The morning, midday, and evening peaks are evident in these figures. ***Figure 2 and 9** describing average trip lengths and trip time also show consistency.* However, differences in the percent of vehicle trips in hours one and 24 are displayed in **Figures 7, 8** and to a lesser extent **Figure 9**. *This may result from too few trips being reported in this period, or problems with coding trips that did not start or end on the* A*travel day.*@

Figure 10 shows the hot/cold start distribution from the New York State Department of Environmental Conservation=s Mobile 5b emissions model for AAll Other Roads@ as the hourly percentage of vehicle trips (in this roadway category statewide). The short individual trip lengths in the Nationwide Personal Transportation Survey best reflect the AAll Other Roads@ category (Minor Arterial, Major and Minor Collectors and Locals) rather than the longer distance trips that would more likely use the AInterstate or Expressways@ and/or APrincipal Arterial@ roadways. ***Figure 10**, suggests that the peak period cold start cold mode, the midday cold start hot mode, and the midday stabilized mode (CS_HM and HS_HM) estimates currently being used, shared some similarity with those periods in the engine mode of operation data obtained from the NPTS_NY 24-hour statewide distribution in **Figures 7, 8, and 9**. Variation throughout the day as shown in **Figure 10**, is obviously not handled well by the current hot and cold start estimates. The availability of a 24-hour distribution from the NPTS_NY for these data, as well as developing these data for different metropolitan areas within New York State, will clearly have an impact on the accumulation of emissions throughout the day. The continuous 24-hour statewide distribution obtained from the NPTS_NY, also suggests that the hot and cold start estimates for the other two roadway categories may need to be reexamined in light of these findings.*

Figure 7

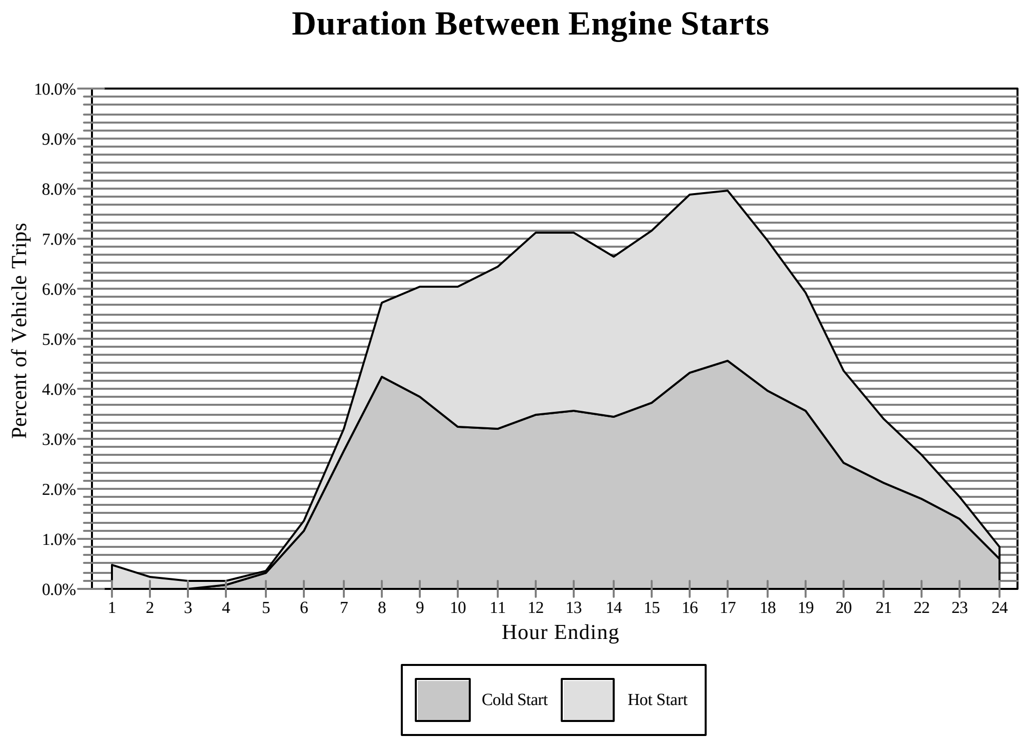


Engine Mode of Operation
Percent of Vehicle Trips
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour Ending
CS_CM
HS_CM
CS_HM
HS_HM

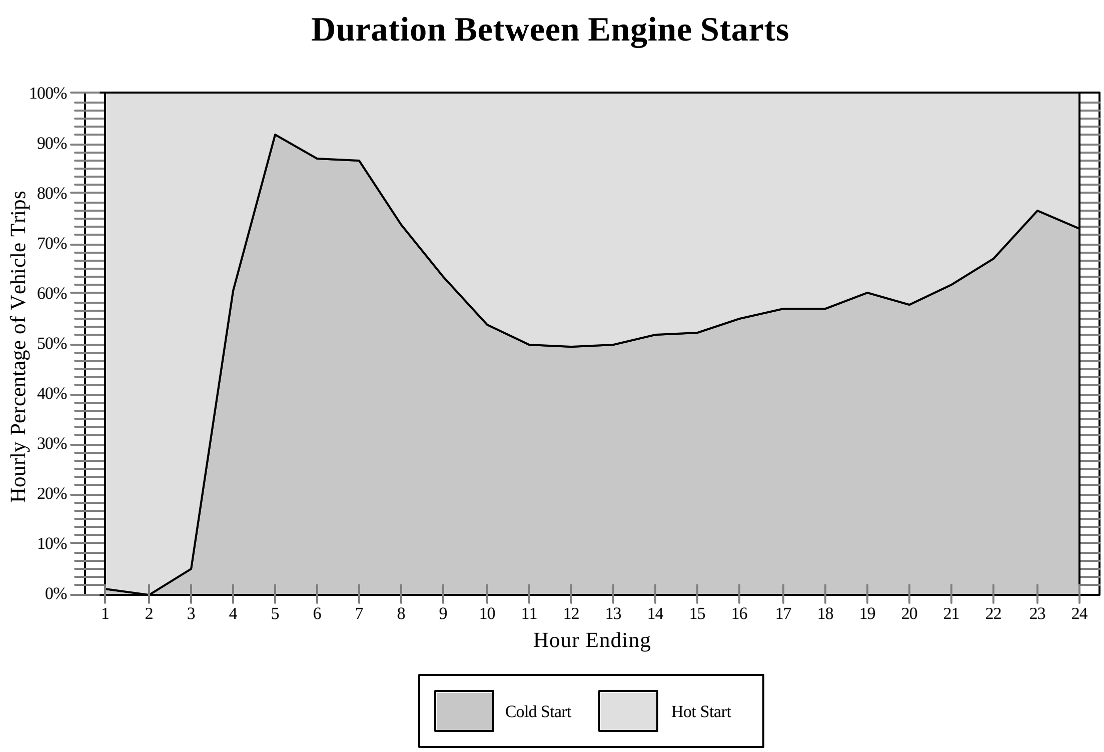


Engine Mode of Operation
Hourly Percentage of Vehicle Trips
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour Ending
CS_CM
HS_CM
CS_HM
HS_HM

Figure 8

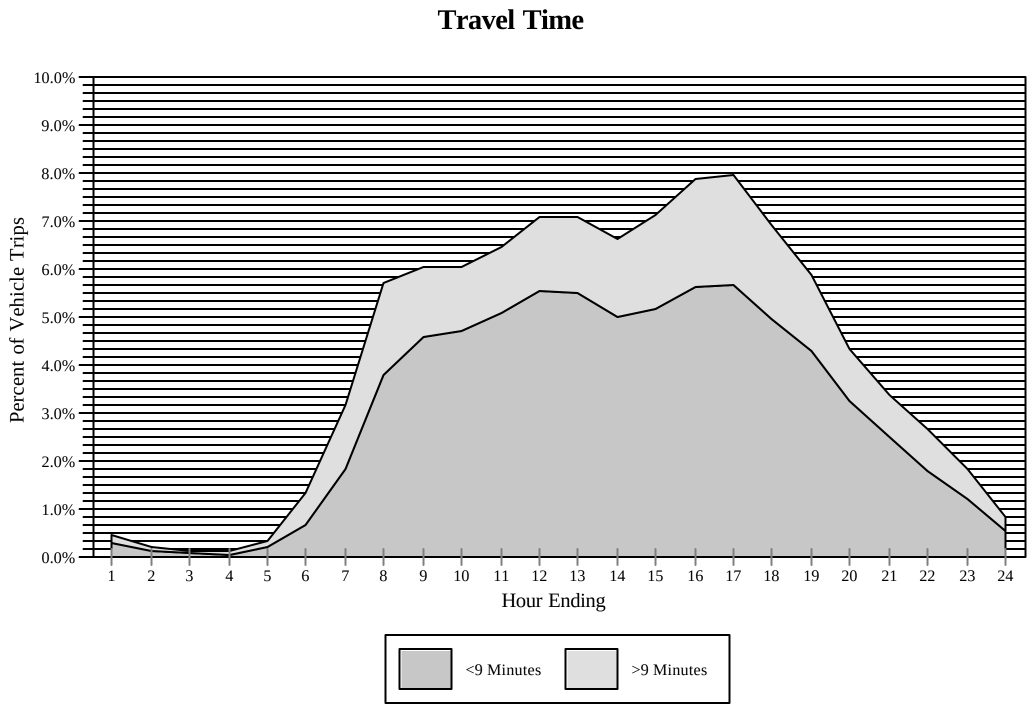


Duration Between Engine Starts
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
Percent of Vehicle Trips
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour Ending
Cold Start
Hot Start



Duration Between Engine Starts
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Hourly Percentage of Vehicle Trips
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour Ending
Cold Start
Hot Start

Figure 9


Travel Time
Percent of Vehicle Trips
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour Ending
<9 Minutes
>9 Minutes

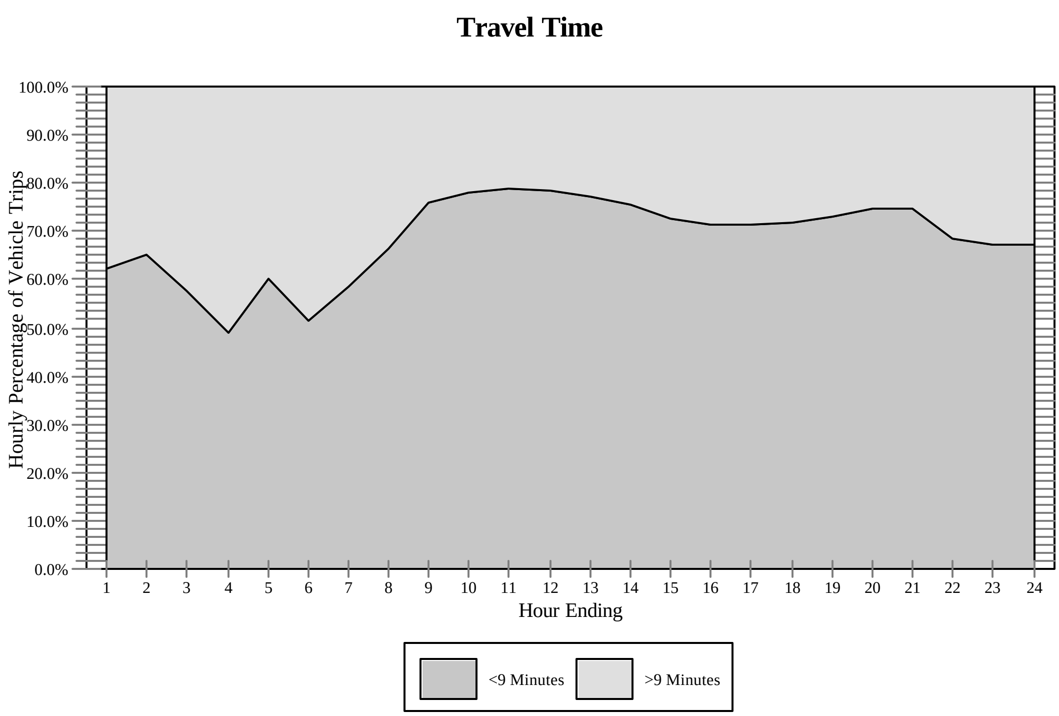
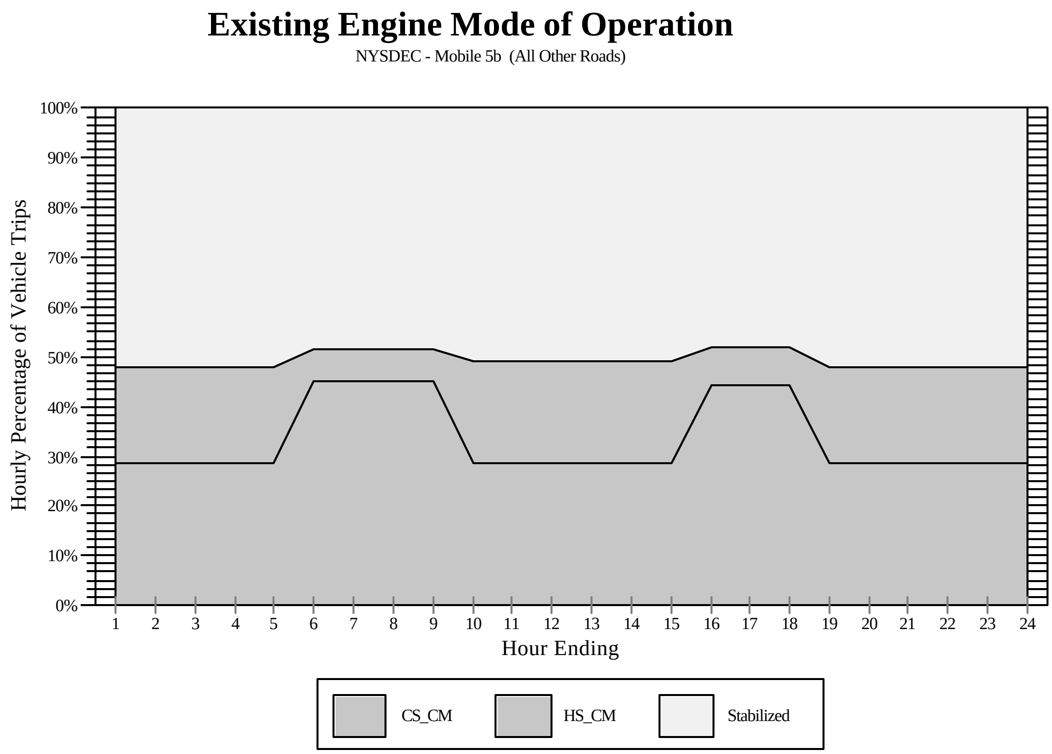

Travel Time
Hourly Percentage of Vehicle Trips
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour Ending
<9 Minutes
>9 Minutes

Figure 10



Existing Engine Mode of Operation
NYSDEC - Mobile 5b (All Other Roads)
Hourly Percentage of Vehicle Trips
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour Ending
CS_CM
HS_CM
Stabilized

General Findings

The 1995 Nationwide Personal Transportation Survey for New York State provides a valuable metropolitan area, and in the case of the New York Metropolitan area, a county data set to address a variety of transportation air quality related questions. Perhaps the most important finding is that a state specific survey has a major role in addressing state transportation issues, especially those related to using state values in EPA=s MOBILE Emission Model.

$ The survey shows that the number of workers working at home in 1995 is 5.1% of all workers--double that reported in the 1990 Census.

$ The survey also suggests that while the number of workers working at home is increasing, the real increase may be occurring with those workers who have long distance commutes to other urban areas for employment.

$ The findings have demonstrated that this survey can serve as a source for area-wide hourly vehicle distributions.

$ These area-wide hourly vehicle distributions capture local traffic that is not part of arterial distributions available from traffic counts on the State Highway System.

$ The survey based, hourly vehicle distributions have improved the correlation between hourly emission model results and measured ozone data.

$ Area-wide speed estimates developed from the survey are a useful measure for testing the reasonableness of the network travel demand model speed estimates.

$ Area-wide speed estimates from the survey also indicate that the network-based speed methodology may overestimate speeds in less congested areas, and provide comparable speeds in more congested areas. However, speeds in New York County (Manhattan) may require further examination.

$ A GIS network routing solution for geo-coded NPTS_NY vehicle trip data in the Syracuse urban area suggests that the respondents= trip length estimate may indeed be an accurate estimate of how far they travel. However, this requires further confirmation by examining other urban areas in the data set.

$ Analysis of the vehicle file in the NPTS_NY reveals that national average annualized mileage estimates for auto and light truck usage and the age proportion of these fleets differ noticeably from those for New York State.

$ Analysis of the engine mode of operation from the NPTS_NY discloses a 24-hour distribution that is significantly different from that currently being used. Implementation of this distribution will impact the accumulation of emissions throughout the day.

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Attachment 6

MILEAGE ACCUMULATION RATES

Vehicle Type	LDGV	LDGT1	LDGT2	LDGT3	LDGT4	HDGV2B	HDGV3	HDGV4	HDGV5
yr1	0.13531	0.15810	0.15810	0.21331	0.21331	0.19977	0.19977	0.21394	0.21394
yr2	0.13172	0.15281	0.15281	0.19865	0.19865	0.18779	0.18779	0.19692	0.19692
yr3	0.12823	0.14769	0.14769	0.18500	0.18500	0.17654	0.17654	0.18125	0.18125
yr4	0.12483	0.14274	0.14274	0.17228	0.17228	0.16596	0.16596	0.16683	0.16683
yr5	0.12152	0.13796	0.13796	0.16044	0.16044	0.15601	0.15601	0.15356	0.15356
yr6	0.11830	0.13333	0.13333	0.14942	0.14942	0.14666	0.14666	0.14134	0.14134
yr7	0.11516	0.12885	0.12885	0.13915	0.13915	0.13787	0.13787	0.13010	0.13010
yr8	0.11210	0.12453	0.12453	0.12959	0.12959	0.12961	0.12961	0.11975	0.11975
yr9	0.10912	0.12035	0.12035	0.12068	0.12068	0.12184	0.12184	0.11022	0.11022
yr10	0.10622	0.11630	0.11630	0.11239	0.11239	0.11454	0.11454	0.10145	0.10145
yr11	0.10339	0.11239	0.11239	0.10466	0.10466	0.10768	0.10768	0.09338	0.09338
yr12	0.10064	0.10861	0.10861	0.09747	0.09747	0.10122	0.10122	0.08595	0.08595
yr13	0.09796	0.10495	0.10495	0.09077	0.09077	0.09516	0.09516	0.07911	0.07911
yr14	0.09535	0.10142	0.10142	0.08453	0.08453	0.08946	0.08946	0.07282	0.07282
yr15	0.09281	0.09800	0.09800	0.07872	0.07872	0.08409	0.08409	0.06703	0.06703
yr16	0.09033	0.09470	0.09470	0.07331	0.07331	0.07905	0.07905	0.06169	0.06169
yr17	0.08792	0.09151	0.09151	0.06828	0.06828	0.07432	0.07432	0.05679	0.05679
yr18	0.08557	0.08842	0.08842	0.06358	0.06358	0.06986	0.06986	0.05227	0.05227
yr19	0.08329	0.08543	0.08543	0.05921	0.05921	0.06568	0.06568	0.04811	0.04811
yr20	0.08106	0.08255	0.08255	0.05514	0.05514	0.06174	0.06174	0.04428	0.04428
yr21	0.07889	0.07976	0.07976	0.05135	0.05135	0.05804	0.05804	0.04076	0.04076
yr22	0.07678	0.07706	0.07706	0.04782	0.04782	0.05456	0.05456	0.03752	0.03752
yr23	0.07473	0.07445	0.07445	0.04454	0.04454	0.05129	0.05129	0.03453	0.03453
yr24	0.07273	0.07194	0.07194	0.04184	0.04184	0.04822	0.04822	0.03178	0.03178
yr25	0.07078	0.06950	0.06950	0.03863	0.03863	0.04533	0.04533	0.02926	0.02926

Vehicle Type	HDGV6	HDGV7	HDGV8A	HDGV8B	LDDV	LDDT12	HDDV2B	HDDV3	HDDV4
yr1	0.21394	0.21394	0.21394	0.21394	0.13531	0.27059	0.27137	0.32751	0.30563
yr2	0.19692	0.19692	0.19692	0.19692	0.13172	0.24384	0.24831	0.28984	0.28622
yr3	0.18125	0.18125	0.18125	0.18125	0.12823	0.21973	0.22721	0.25650	0.26805
yr4	0.16683	0.16683	0.16683	0.16683	0.12483	0.19801	0.20791	0.22699	0.25103
yr5	0.15356	0.15356	0.15356	0.15356	0.12152	0.17843	0.19024	0.20088	0.23509
yr6	0.14134	0.14134	0.14134	0.14134	0.11830	0.16079	0.17407	0.17778	0.22016
yr7	0.13010	0.13010	0.13010	0.13010	0.11516	0.14490	0.15928	0.15733	0.20618
yr8	0.11975	0.11975	0.11975	0.11975	0.11210	0.13057	0.14575	0.13923	0.19309
yr9	0.11022	0.11022	0.11022	0.11022	0.10912	0.11766	0.13336	0.12321	0.18083
yr10	0.10145	0.10145	0.10145	0.10145	0.10622	0.10603	0.12203	0.10904	0.16935
yr11	0.09338	0.09338	0.09338	0.09338	0.10339	0.09555	0.11166	0.09650	0.15860
yr12	0.08595	0.08595	0.08595	0.08595	0.10064	0.08610	0.10217	0.08540	0.14853
yr13	0.07911	0.07911	0.07911	0.07911	0.09796	0.07759	0.09349	0.07557	0.13910
yr14	0.07282	0.07282	0.07282	0.07282	0.09535	0.06992	0.08555	0.06688	0.13026
yr15	0.06703	0.06703	0.06703	0.06703	0.09281	0.06301	0.07828	0.05919	0.12199
yr16	0.06169	0.06169	0.06169	0.06169	0.09033	0.05678	0.07163	0.05238	0.11425
yr17	0.05679	0.05679	0.05679	0.05679	0.08792	0.05116	0.06554	0.04635	0.10699
yr18	0.05227	0.05227	0.05227	0.05227	0.08557	0.04610	0.05997	0.04102	0.10020
yr19	0.04811	0.04811	0.04811	0.04811	0.08329	0.04155	0.05488	0.03630	0.09384
yr20	0.04428	0.04428	0.04428	0.04428	0.08106	0.03744	0.05021	0.03213	0.08788
yr21	0.04076	0.04076	0.04076	0.04076	0.07889	0.03374	0.04595	0.02843	0.08230
yr22	0.03752	0.03752	0.03752	0.03752	0.07678	0.03040	0.04204	0.02516	0.07707
yr23	0.03453	0.03453	0.03453	0.03453	0.07473	0.02740	0.03847	0.02227	0.07218
yr24	0.03178	0.03178	0.03178	0.03178	0.07273	0.02469	0.03520	0.01971	0.06760
yr25	0.02926	0.02926	0.02926	0.02926	0.07078	0.02225	0.03221	0.01744	0.06331

Vehicle Type	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B	MC	HDGB	HDDBT	HDDBS	LDDT34
yr1	0.30563	0.40681	0.40681	0.87821	1.24208	0.04786	0.35123	0.45171	0.09939	0.26040
yr2	0.28622	0.36827	0.36827	0.78257	1.12590	0.04475	0.31914	0.43731	0.09939	0.24018
yr3	0.26805	0.33420	0.33420	0.69735	1.02060	0.04164	0.28999	0.42337	0.09939	0.22154
yr4	0.25103	0.30291	0.30291	0.62141	0.92514	0.03853	0.26350	0.40987	0.09939	0.20434
yr5	0.23509	0.27455	0.27455	0.55374	0.83861	0.03543	0.23942	0.39681	0.09939	0.18848
yr6	0.22016	0.24885	0.24885	0.49343	0.76017	0.03232	0.21755	0.38416	0.09939	0.17385
yr7	0.20618	0.22555	0.22555	0.43970	0.68907	0.02921	0.19768	0.37191	0.09939	0.16036
yr8	0.19309	0.20443	0.20443	0.39181	0.62462	0.02611	0.17926	0.36005	0.09939	0.14791
yr9	0.18083	0.18529	0.18529	0.34915	0.56620	0.02300	0.16321	0.34857	0.09939	0.13643
yr10	0.16935	0.16795	0.16795	0.31112	0.51324	0.01989	0.14830	0.33746	0.09939	0.12584
yr11	0.15860	0.15222	0.15222	0.27724	0.46523	0.01678	0.13475	0.32670	0.09939	0.11607
yr12	0.14853	0.13797	0.13797	0.24705	0.42172	0.01368	0.12244	0.31629	0.09939	0.10706
yr13	0.13910	0.12505	0.12505	0.22015	0.38228	0.01368	0.11126	0.30620	0.09939	0.09875
yr14	0.13026	0.11335	0.11335	0.19617	0.34652	0.01368	0.10109	0.29644	0.09939	0.09109
yr15	0.12199	0.10273	0.10273	0.17481	0.31411	0.01368	0.09186	0.28699	0.09939	0.08402
yr16	0.11425	0.09312	0.09312	0.15577	0.28473	0.01368	0.08347	0.27784	0.09939	0.07749
yr17	0.10699	0.08440	0.08440	0.13881	0.25810	0.01368	0.07584	0.26898	0.09939	0.07148
yr18	0.10020	0.07650	0.07650	0.12369	0.23396	0.01368	0.06891	0.26041	0.09939	0.06593
yr19	0.09384	0.06933	0.06933	0.11022	0.21208	0.01368	0.06262	0.25211	0.09939	0.06081
yr20	0.08788	0.06284	0.06284	0.09822	0.19224	0.01368	0.05690	0.24407	0.09939	0.05609
yr21	0.08230	0.05696	0.05696	0.08752	0.17426	0.01368	0.05170	0.23629	0.09939	0.05174
yr22	0.07707	0.05163	0.05163	0.07799	0.15796	0.01368	0.04698	0.22875	0.09939	0.04772
yr23	0.07218	0.04679	0.04679	0.06950	0.14319	0.01368	0.04268	0.22146	0.09939	0.04402
yr24	0.06760	0.04241	0.04241	0.06193	0.12979	0.01368	0.03879	0.21440	0.09939	0.04060
yr25	0.06331	0.03844	0.03844	0.05518	0.11765	0.01368	0.03524	0.20757	0.09939	0.03745

Attachment 7

NYSDOT SEASONAL ADJUSTMENT MEMO

Discussion with DEC Air Quality Staff on Traffic Seasonal Adjustment Factors

This documents the recommendations by NYSDOT Planning & Strategy Group's Data Analysis & Forecasting Section regarding seasonal adjustment factors for estimating mobile source emissions, per our phone discussion of March 25, 2003.

To incorporate the full spectrum of Factor Groups (FG) developed for seasonally adjusting AADT-based DVMT estimates for summer and winter travel periods, it has been suggested that application of the FGs developed for rural areas be used where appropriate. DOT recommendations are as follows:

- Use FG 30 in all large urban areas
- In counties with large urban areas, use FG 30 in urban areas and FG 40 in rural areas.
- In counties with only small urban areas where the county is essentially rural in nature, use FG 40 in the small urban areas and FG 60 in the rural areas.

In applying the above general rule to all the counties in New York State, we also reviewed the lane mileage factor group assignments for the State touring routes by the Department's Regional Offices, in order to determine which Factor Groups dominate the county. Background on the Factor Groups is provided below.

The attached spreadsheet uses the 1999 HPMS Grouped Functional Class DVMT and Forecast to show our recommendation for applying these Factor Groups. A column was added next to the urban area codes (UAC) called "SeasADJ" that provides FG codes for each county's urban and rural areas.

The statewide weighted average FG equals 34.5, indicating the seasonality of total DVMT is closer to that of urban areas than rural areas (FG 30 than FG 40 or 60). Since the weighted average is almost midway between FG 30 and 40, however, this seems to support changing to the use of all FG groups for improved estimates of seasonal traffic volume.

It was noted that these are only recommendations by NYSDOT Planning & Strategy, and the ultimate decision lies with DEC and their partners on the air quality interagency consultation group, including NYSDOT's Environmental Analysis Bureau. While we have kept EAB in the loop and let them know of our recommendations, this does not necessarily represent endorsement of these recommendations by EAB at this time.

Background on Seasonal Adjustment Factor Groups:

The DEC "Radian Report" for establishing 1990 base-year emissions estimates used the FG 30 seasonal factor to develop summer ozone mobile source emission estimates. The majority of DOT's continuous traffic counter stations for developing seasonal adjustment factors are located in urban areas, so FG 30 is a more robust sample of traffic counts compared to FG 40 and 60. However, it may be an improved procedure to use the seasonal adjustment factors for the rural areas as well. These factor groups are roughly constructed as follows:

FG 30 - This factor group is the least variable on a seasonal basis, as it is generally dominated by peak period work trip travel flow. FG 30 originally had a total of 24 continuous traffic counter locations statewide to develop these factors in 1990. Now a total of 70 are used to develop the FG 30 factors. FG 30 mostly consists of facilities classified as urban interstate, urban principal arterial and urban minor arterial.

FG 40 - This category is "moderately seasonal." This group originally had a total of 17 stations, and now has a total of 55 stations statewide. FG 40 consists mostly of locations classified as rural minor arterial and rural major collectors.

FG 60 - This group shows the most "highly seasonal" variability in traffic volume throughout the year. The group originally had 8 continuous counter stations used to develop the factors, and now has 36. FG 60 mostly consists of rural interstate and rural principal arterial locations.

The 1999 DVMT Inventory was based on the roadway functional classifications (FC) in place at the time, which were developed consistent with the 1990 Census urban boundaries. These urban boundaries will be adjusted based on the 2000 Census, which will lead to some changes in the roadway functional classifications. We know from the new population figures that the urban areas in New York have changed in some cases relative to the size of the rural areas. Therefore, any calculation performed with the 1999 DVMT inventory may slightly overestimate DVMT traveling on roadways with rural FCs and slightly underestimate travel on urban FCs.

Attachment 8

SEASONAL ADJUSTMENT FUNCTIONAL GROUP TABLE

COUNTY	AT	UAC*	FG CODE
BRONX	3	1001	30
KINGS	3	1001	30
NEW YORK	3	1001	30
QUEENS	3	1001	30
RICHMOND	3	1001	30
NASSAU	3	1001	30
SUFFOLK	1	0	60
SUFFOLK	2	2	30
SUFFOLK	3	1001	30
PUTNAM	1	0	40
PUTNAM	3	1001	30
PUTNAM	3	11240	30
ROCKLAND	1	0	40
ROCKLAND	3	1001	30
WESTCHESTER	1	0	40
WESTCHESTER	3	1001	30
ALBANY	1	0	40
ALBANY	3	11041	30
RENSSELAER	1	0	40
RENSSELAER	2	2	30
RENSSELAER	3	11041	30
SARATOGA	1	0	40
SARATOGA	2	2	30
SARATOGA	3	11041	30
SARATOGA	3	11341	30
SCHENECTADY	1	0	40
SCHENECTADY	3	11041	30
WARREN	1	0	60
WARREN	3	11341	30
WASHINGTON	1	0	40
WASHINGTON	3	11341	30
HERKIMER	1	0	40
HERKIMER	3	11089	30
ONEIDA	1	0	40
ONEIDA	3	11089	30
ONONDAGA	1	0	40
ONONDAGA	3	11056	30
TOMPKINS	1	0	40
TOMPKINS	3	11077	30
MONROE	1	0	40
MONROE	2	2	30
MONROE	3	11039	30
ERIE	1	0	40
ERIE	3	11016	30
NIAGARA	1	0	40
NIAGARA	3	11016	30
CHEMING	1	0	40
CHEMING	3	11269	30
DUTCHESS	1	0	40
DUTCHESS	3	11270	30
BROOME	1	0	40
BROOME	3	11110	30
TIOGA	1	0	40
TIOGA	3	11110	30
ORANGE	1	0	40
ORANGE	2	2	30
ORANGE	3	11342	30
ESSEX	1	0	60
ESSEX	2	2	40

COUNTY	AT	UAC	FG CODE
GREENE	1	0	40
FULTON	1	0	40
FULTON	2	2	30
HAMILTON	1	0	60
MADISON	1	0	40
MADISON	2	2	30
MONTGOMERY	1	0	40
MONTGOMERY	2	2	30
CAYUGA	1	0	40
CAYUGA	2	2	30
CORTLAND	1	0	40
CORTLAND	2	2	30
OSWEGO	1	0	40
OSWEGO	2	2	30
SENECA	1	0	40
SENECA	2	2	30
GENESEE	1	0	40
GENESEE	2	2	30
LIVINGSTON	1	0	40
LIVINGSTON	2	2	30
ONTARIO	1	0	40
ONTARIO	2	2	30
ORLEANS	1	0	40
ORLEANS	2	2	30
WYOMING	1	0	40
WAYNE	1	0	40
WAYNE	2	2	30
CATTARUAGUS	1	0	40
CATTARUAGUS	2	2	30
CHAUTAQUA	1	0	40
CHAUTAQUA	2	2	30
ALLEGANY	1	0	60
ALLEGANY	2	2	40
SCHUYLER	1	0	40
STEUBEN	1	0	40
STEUBEN	2	2	30
YATES	1	0	40
YATES	2	2	30
CLINTON	1	0	60
CLINTON	2	2	40
FRANKLIN	1	0	60
FRANKLIN	2	2	40
JEFFERSON	1	0	60
JEFFERSON	2	2	40
LEWIS	1	0	40
ST LAWERENCE	1	0	60
ST LAWERENCE	2	2	40
COLUMBIA	1	0	40
COLUMBIA	2	2	30
ULSTER	1	0	40
ULSTER	2	2	30
CHENANGO	1	0	60
CHENANGO	2	2	40
DELAWARE	1	0	60
OTSEGO	1	0	60
OTSEGO	2	2	40
SCHOHARIE	1	0	60
SCHOHARIE	2	2	40
SULLIVAN	1	0	60
SULLIVAN	2	2	40

* AT = Area Type 1=Rural, 2=Small Urban, 3=Urban

UAC = Modified HPMS Areawide Urban Area Code

Appendix E

Road Dust Estimation for Paved and Unpaved Roads

FUGITIVE DUST FROM PAVED ROADS

SCC: 2294000000

Fugitive dust emissions from paved road traffic were estimated for PM10-PRI, PM10-FIL, PM25-PRI, and PM25-FIL. Since there are no PM-CON emissions for this category, PM10-PRI emissions are equal to PM10-FIL emissions and PM25-PRI emissions are equal to PM25-FIL.

Emission Factors

Reentrained road dust emissions for paved roads were estimated using paved road VMT and the emission factor equation from AP-42[1]:

$$E = [\ k * (sL/2)^{0.65} * (W/3)^{1.5} - C\ ] * [1 - P/(4*N)]$$

where: E = paved road dust emission factor (g/VMT)
k = particle size multiplier (7.3 g/VMT for PM-10 and 1.8 g/VMT for PM-2.5)
sL = road surface silt loading (g/m^2)
W = average weight (tons) of all vehicles traveling the road
C = emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear
N = number of days in the month
P = number of days in the month with at least 0.01 inches of precipitation

Paved road silt loadings were assigned to each of the twelve functional roadway classifications (six urban and six rural) based on the average annual traffic volume of each functional system by county, according to the baseline values provided in Table 13.2.1-3 of the AP-42 documentation.[2] This AP-42 table also provides a set of adjustments that can be applied to the baseline silt loading values to better represent "wintertime baseline conditions in areas that experience frozen precipitation with periodic application of antiskid material."[2] Average annual daily traffic volumes (AADTV) were calculated by county and road classification by dividing the average annual daily VMT by the roadway mileage. The silt loading values assigned by AADTV category from the AP-42 documentation are shown in Table 1. The adjusted winter baseline silt loading values are also shown in this table. The MANE-VU States provided information on which months it would be most appropriate to apply this wintertime adjustment to. Based on the information provided by the States, Table 2 lists in which months the winter baseline silt values were applied for each of the MANE-VU States.

The average vehicle weight was calculated separately for each county and road type. This represents an improvement over the NEI method which uses a single average default vehicle weight of 3.2 tons nationwide. Table 3 shows the values that were assumed for the weight of each vehicle class. These values were then multiplied by the fraction of VMT in each county and road class of that vehicle type and these products were then summed by county and road class to determine a weighted average vehicle weight for each county and road class.

The AP-42 equation listed above includes a correction factor term to adjust for the number of days with measurable precipitation in each month. The factor of 4 in the precipitation adjustment accounts for the fact that paved roads dry more quickly than unpaved roads and that precipitation may not occur over the entire 24-hour daily period. The number of days with at least 0.01 inches of precipitation in each month by county was obtained from data provided by the National Climatic Data Center (NCDC).[3] For counties with more than one precipitation collection station with valid data from the NCDC data set, an average number of precipitation days was calculated for each month from all valid stations in the county. Counties with no precipitation collection station or no valid data were assigned the data from an adjacent county. The 2002 monthly precipitation data used for MANE-VU counties is shown in Table 4. This method of assigning monthly precipitation days by county improves on the NEI approach of assigning monthly precipitation data by State.

In some cases, the emission factor calculated using the equation above is negative due to the subtraction of the C term that accounts for vehicle exhaust, brake wear, and tire wear. In these cases, the emission factor was reset to 0, under the assumption that the emissions have been accounted for in the onroad emission inventory.

Activity

Total VMT by county and road type were obtained from the MANE-VU 2002 onroad emission inventory. Paved road VMT was calculated by subtracting the county/road type-level unpaved road VMT from total county/road type total VMT. The estimates of the unpaved road VMT were based on data obtained from the Federal Highway Administration's (FHWA) annual Highway Statistics report by State and road type.[2] The State/road type unpaved VMT was allocated by county/road type based on rural population. Because of differences in the methodologies for calculating total and unpaved VMT, there were several instances where unpaved VMT were higher than total VMT. For these instances, unpaved VMT was reduced to total VMT and paved road VMT was assigned a value of zero. The paved road VMT data were temporally allocated by month using NAPAP temporal allocation factors for VMT.[4]

Controls

The MANE-VU States contain two moderate PM_{10} nonattainment counties. These are New Haven County, Connecticut and New York County, New York. In addition, a portion of Allegheny County, Pennsylvania and Aroostook County, Maine are currently moderate PM_{10} maintenance areas. Paved road dust controls were applied to urban roads in these moderate PM_{10} nonattainment and maintenance areas. The assumed control measure was vacuum sweeping of paved roads twice per month. A control efficiency of 79 percent was assumed for this control measure. The assumed rule penetration varies by road type and these penetration rates are shown in Table 5.

Caveat

It should be noted that the New York State Department of Environmental Conservation believes that **road dust is indeterminate at this time**; the existing model has far too many shortcomings, and does not yield inventory values that correlate with monitoring data, particularly for $PM_{2.5}$.[5] However, for the purposes of consistency with the other MANE-VU States, New York has agreed to include these paved road fugitive dust estimates in the MANE-VU 2002 emission inventory. The District of Columbia supports the findings of New York and lacks confidence in these fugitive dust estimates, but has agreed to include the fugitive dust emission estimates for the District of Columbia in this inventory for consistency with the other MANE-VU States.

References
1. United States Environmental Protection Agency, Office of Air Quality Planning and Standards. "Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 13.2.1 Paved Roads." Research Triangle Park, NC. December 2003.

2. U.S. Department of Transportation, Federal Highway Administration. *Highway Statistics 2001*. Office of Highway Policy Information. Washington, DC. 2002. Available at http://www.fhwa.dot.gov/ohim/hs01/index.htm.

3. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Summary of the Day Element TD-3200, 2002 data provided on CD. National Climatic Data Center. 2003.

4. U.S. Environmental Protection Agency. "The 1985 NAPAP Emissions Inventory: Development of Temporal Allocation Factors," EPA-600/7-89-010d. Air & Energy Engineering Research Laboratory. Research Triangle Park, NC. April 1990.

5. W.J. Pienta. "NYS $PM_{2.5}$ Road Dust Estimates for CY 2002," memorandum prepared by W.L. Pienta, New York State Department of Environmental Conservation, Division of Air Resources, Bureau of Air Quality Planning, October 28, 2004.

Table 1. AP-42 Silt Loading Values by Average Annual Daily Traffic Volume

Average Annual Daily Traffic Volume	Baseline Silt Loading Value (g/m^2)	Winter Baseline Silt Loading Value during Months with Frozen Precipitation (g/m^2)
< 500	0.6	2.4
500 - 5,000	0.2	0.6
5,000 - 10,000	0.06	0.12
>10,000	0.03	0.03
Limited Access Roads	0.015	0.015

Table 2. Months in Which Winter Baseline Silt Loading Values were Applied

State	Months Winter Baseline Silt Loading Values Applied
Connecticut	December - April
Delaware	January - February
District of Columbia	January - February
Maine	November - May 15
Maryland	No winter adjustment
Massachusetts	December - February
New Hampshire	December - April
New Jersey	No winter adjustment
New York	December - February
Pennsylvania	December - February
Rhode Island	December - April
Vermont	December - April

Table 3. Average Vehicle Weight by Vehicle Class

Vehicle Type	Vehicle Type Description	Assumed Average Vehicle Weight (lbs)
LDV	Light-Duty Vehicles (Passenger Cars)	3,075
LDT1	Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)	4,105
LDT2	Light-Duty Trucks 2 (0-6,000 lbs. GVWR, 3751-5750 lbs. LVW)	4,105
LDT3	Light-Duty Trucks 3 (6,001-8,500 lbs. GVWR, 0-5750 lbs. ALVW)	7,000
LDT4	Light-Duty Trucks 4 (6,001-8,500 lbs. GVWR, 5751 lbs. and greater ALVW)	7,000
HDV2B	Class 2b Heavy-Duty Vehicles (8,501-10,000 lbs. GVWR)	9,250
HDV3	Class 3 Heavy-Duty Vehicles (10,001-14,000 lbs. GVWR)	12,000
HDV4	Class 4 Heavy-Duty Vehicles (14,001-16,000 lbs. GVWR)	15,000
HDV5	Class 5 Heavy-Duty Vehicles (16,001-19,500 lbs. GVWR)	17,750
HDV6	Class 6 Heavy-Duty Vehicles (19,501-26,000 lbs. GVWR)	22,750
HDV7	Class 7 Heavy-Duty Vehicles (26,001-33,000 lbs. GVWR)	29,500
HDV8A	Class 8a Heavy-Duty Vehicles (33,001-60,000 lbs. GVWR)	46,500
HDV8B	Class 8b Heavy-Duty Vehicles (>60,000 lbs. GVWR)	70,000
HDBS	School Buses	70,000
HDBT	Transit and Urban Buses	70,000
MC	Motorcycles	550

GVWR = Gross Vehicle Weight Rating
LVW = Loaded Vehicle Weight
ALVW = Average Loaded Vehicle Weight

Table 4. 2002 Number of Days with at Least 0.01 Inches of Precipitation in MANE-VU Counties

State	County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CT	FAIRFIELD	14	8	11	16	10	9	5	5	11	11	13	11
CT	HARTFORD	12	7	13	14	11	12	5	6	10	10	16	12
CT	LITCHFIELD	12	8	13	16	12	10	6	8	8	11	16	12
CT	MIDDLESEX	13	8	11	14	9	10	9	7	11	8	15	12
CT	NEW HAVEN	9	6	12	13	14	11	3	7	8	10	11	11
CT	NEW LONDON	13	8	11	14	9	10	9	7	11	8	15	12
CT	TOLLAND	13	8	11	14	9	10	9	7	11	8	15	12
CT	WINDHAM	10	6	12	14	12	14	7	9	8	8	15	12
DC	WASHINGTON	8	6	13	11	10	9	6	6	9	13	10	8
DE	KENT	11	5	11	13	9	9	7	7	9	13	10	12
DE	NEW CASTLE	11	6	12	12	9	12	8	5	7	14	14	8
DE	SUSSEX	13	5	12	11	9	8	8	3	7	14	12	11
MA	BARNSTABLE	15	7	16	13	9	10	3	5	12	11	14	13
MA	BERKSHIRE	11	6	13	13	15	15	7	8	9	12	17	16
MA	BRISTOL	14	8	13	16	12	15	10	6	10	10	18	12
MA	DUKES	13	9	11	9	8	9	4	5	12	10	16	11
MA	ESSEX	13	7	13	14	13	16	7	7	9	12	15	12
MA	FRANKLIN	9	7	14	16	15	17	9	10	12	17	17	9
MA	HAMPDEN	5	2	3	9	8	11	3	4	4	7	7	4
MA	HAMPSHIRE	12	8	12	16	15	16	7	9	9	14	17	11
MA	MIDDLESEX	11	8	12	13	11	16	8	8	9	10	15	11
MA	NANTUCKET	13	9	11	9	8	9	4	5	12	10	16	11
MA	NORFOLK	13	7	14	14	13	15	10	8	11	10	16	13
MA	PLYMOUTH	14	8	13	16	12	15	10	6	10	10	18	12
MA	SUFFOLK	13	7	13	12	9	15	7	9	11	9	14	12
MA	WORCESTER	13	8	15	16	13	13	8	9	11	11	19	14
MD	ALLEGANY	7	8	11	14	18	13	10	10	11	13	14	13
MD	ANNE ARUNDEL	10	6	12	10	11	6	8	6	6	12	10	8
MD	BALTIMORE	12	7	12	12	8	8	9	7	5	13	9	11
MD	BALTIMORE CITY	12	7	12	12	8	8	9	7	5	13	9	11
MD	CALVERT	10	4	11	10	7	7	8	4	8	14	9	5
MD	CAROLINE	12	4	10	9	7	7	5	5	6	12	10	8
MD	CARROLL	10	6	12	14	12	10	9	7	8	16	10	11
MD	CECIL	7	5	12	12	13	7	7	7	7	11	12	8
MD	CHARLES	10	4	11	10	7	7	8	4	8	14	9	5
MD	DORCHESTER	11	2	12	7	6	5	8	3	4	10	9	9
MD	FREDERICK	9	4	12	13	14	8	7	5	7	14	10	4
MD	GARRETT	9	9	13	14	17	12	11	9	9	16	14	11
MD	HARFORD	7	5	12	12	13	7	7	7	7	11	12	8
MD	HOWARD	9	7	12	11	13	8	6	7	7	13	12	7
MD	KENT	12	4	10	9	7	7	5	5	6	12	10	8
MD	MONTGOMERY	9	7	12	11	13	8	6	7	7	13	12	7
MD	PRINCE GEORGE'S	9	4	11	11	9	9	5	7	7	12	8	8
MD	QUEEN ANNE'S	12	4	10	9	7	7	5	5	6	12	10	8
MD	SOMERSET	13	4	15	12	8	9	9	6	7	16	14	8
MD	ST. MARY'S	10	4	11	10	7	7	8	4	8	14	9	5
MD	TALBOT	12	4	10	9	7	7	5	5	6	12	10	8
MD	WASHINGTON	7	4	11	12	15	10	8	8	8	14	11	9

Table 4 (continued)

State	County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MD	WICOMICO	13	4	15	12	8	9	9	6	7	16	14	8
MD	WORCESTER	15	5	12	12	6	7	5	10	7	12	12	8
ME	ANDROSCOGGIN	11	9	14	15	10	19	12	8	9	12	16	8
ME	AROOSTOOK	14	15	14	12	19	13	18	8	12	15	18	10
ME	CUMBERLAND	11	9	15	15	14	14	11	9	10	13	19	10
ME	FRANKLIN	11	8	11	13	12	14	11	7	8	11	14	5
ME	HANCOCK	14	10	9	12	11	16	17	5	9	9	14	8
ME	KENNEBEC	10	7	12	13	12	13	13	8	10	13	17	8
ME	KNOX	16	10	10	14	9	14	17	9	10	12	19	11
ME	LINCOLN	16	9	12	15	14	14	14	6	8	12	18	9
ME	OXFORD	13	9	14	14	12	17	11	9	8	13	15	10
ME	PENOBSCOT	15	10	10	13	13	13	12	7	10	11	15	11
ME	PISCATAQUIS	11	11	14	17	12	12	15	9	11	13	17	7
ME	SAGADAHOC	11	9	13	13	12	15	13	7	7	9	17	8
ME	SOMERSET	15	10	13	15	13	15	14	6	10	11	14	7
ME	WALDO	13	6	7	12	9	10	8	2	6	10	11	5
ME	WASHINGTON	10	10	13	17	13	14	14	6	9	11	16	7
ME	YORK	11	8	15	14	11	17	9	6	9	12	16	10
NH	BELKNAP	13	7	15	15	13	15	5	7	12	13	20	10
NH	CARROLL	13	7	14	15	12	17	7	9	10	14	16	12
NH	CHESHIRE	10	11	15	14	16	17	4	7	6	19	17	13
NH	COOS	24	15	20	21	19	17	15	8	11	19	20	20
NH	GRAFTON	11	7	14	12	16	15	11	11	8	15	17	13
NH	HILLSBOROUGH	12	6	15	15	13	21	4	9	9	9	15	11
NH	MERRIMACK	12	7	13	15	15	14	5	9	12	12	16	12
NH	ROCKINGHAM	14	9	11	14	10	16	8	5	8	12	15	11
NH	STRAFFORD	11	8	15	14	11	18	7	7	9	15	17	11
NH	SULLIVAN	13	10	13	11	10	16	7	9	7	13	17	10
NJ	ATLANTIC	12	7	12	15	9	11	8	9	7	15	12	9
NJ	BERGEN	11	6	10	14	9	8	3	9	7	11	10	10
NJ	BURLINGTON	9	7	11	10	10	11	5	8	7	12	11	10
NJ	CAMDEN	9	7	11	10	10	11	5	8	7	12	11	10
NJ	CAPE MAY	11	5	13	10	9	8	9	7	7	15	11	7
NJ	CUMBERLAND	8	6	11	15	12	12	9	6	7	17	12	7
NJ	ESSEX	11	5	13	16	8	9	3	8	7	13	12	8
NJ	GLOUCESTER	9	7	11	10	10	11	5	8	7	12	11	10
NJ	HUDSON	11	7	11	12	9	9	2	8	7	12	12	9
NJ	HUNTERDON	9	4	13	14	11	10	5	10	5	14	11	11
NJ	MERCER	10	6	12	13	11	12	6	10	8	14	12	11
NJ	MIDDLESEX	9	6	11	13	11	11	4	10	7	13	9	9
NJ	MONMOUTH	8	2	9	9	9	10	2	5	7	10	8	9
NJ	MORRIS	10	7	9	12	11	11	4	7	7	10	10	7
NJ	OCEAN	8	2	9	9	9	10	2	5	7	10	8	9
NJ	PASSAIC	9	6	10	13	14	11	5	8	7	11	10	9
NJ	SALEM	8	6	11	15	12	12	9	6	7	17	12	7
NJ	SOMERSET	9	6	12	14	11	10	4	9	7	14	11	10
NJ	SUSSEX	10	7	10	13	11	11	4	7	7	10	9	8
NJ	UNION	9	5	10	15	10	10	4	9	7	13	13	9
NJ	WARREN	9	3	12	14	15	15	7	11	9	17	14	13
NY	ALBANY	11	9	14	16	15	18	7	10	6	12	18	13
NY	ALLEGANY	10	11	17	19	18	12	9	8	9	11	19	15

Table 4 (continued)

State	County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NY	BRONX	11	7	10	12	10	9	5	9	7	13	11	7
NY	BROOME	15	10	16	16	18	13	10	6	10	14	21	16
NY	CATTARAUGUS	18	13	18	22	21	14	11	12	11	13	19	20
NY	CAYUGA	15	11	15	18	17	14	5	7	7	13	18	18
NY	CHAUTAUQUA	16	12	17	18	16	9	7	11	10	13	17	17
NY	CHEMUNG	9	6	12	12	18	12	8	7	4	13	11	11
NY	CHENANGO	14	12	20	15	20	14	9	13	9	18	21	20
NY	CLINTON	12	9	12	13	13	14	7	2	8	13	15	12
NY	COLUMBIA	6	7	8	15	12	13	5	9	8	13	10	9
NY	CORTLAND	17	13	15	21	17	17	7	12	12	14	21	21
NY	DELAWARE	16	12	15	15	17	12	7	10	9	14	19	18
NY	DUTCHESS	11	7	13	14	13	12	4	8	9	11	17	13
NY	ERIE	15	13	22	20	16	13	9	8	8	13	19	16
NY	ESSEX	25	13	14	14	15	16	10	11	9	16	19	16
NY	FRANKLIN	17	15	14	14	14	17	8	7	8	15	24	14
NY	FULTON	13	7	15	13	18	13	7	9	7	15	10	17
NY	GENESEE	9	3	9	13	16	16	9	6	9	12	14	11
NY	GREENE	11	11	17	15	17	15	6	13	9	14	15	15
NY	HAMILTON	20	12	18	14	20	15	9	9	10	19	21	16
NY	HERKIMER	25	15	18	14	20	14	8	9	10	16	20	19
NY	JEFFERSON	13	11	16	15	16	13	6	5	8	17	19	14
NY	KINGS	10	6	11	14	8	8	4	10	7	13	0	11
NY	LEWIS	24	16	20	18	20	16	6	9	8	19	21	21
NY	LIVINGSTON	11	11	16	14	18	12	10	9	8	9	13	16
NY	MADISON	20	17	21	18	18	16	9	11	11	15	22	23
NY	MONROE	12	15	18	16	17	12	8	7	7	14	19	22
NY	MONTGOMERY	10	10	16	13	16	15	8	10	7	15	10	11
NY	NASSAU	11	10	11	14	11	11	6	10	9	12	14	11
NY	NEW YORK	10	7	11	15	8	10	6	8	7	13	15	12
NY	NIAGARA	16	14	20	18	18	14	7	7	8	14	17	17
NY	ONEIDA	16	15	20	17	17	17	6	8	11	17	21	21
NY	ONONDAGA	21	16	19	15	16	13	7	5	9	20	23	20
NY	ONTARIO	12	10	15	15	18	13	7	9	10	14	14	15
NY	ORANGE	6	4	10	12	12	11	4	9	4	10	10	10
NY	ORLEANS	10	8	12	17	13	11	4	7	7	12	14	10
NY	OSWEGO	14	14	25	15	17	10	6	5	5	12	14	14
NY	OTSEGO	17	13	16	16	18	15	6	10	8	15	14	17
NY	PUTNAM	11	7	13	14	13	12	4	8	9	11	17	13
NY	QUEENS	11	7	10	12	10	9	5	9	7	13	11	7
NY	RENSSELAER	13	9	13	18	19	14	6	12	8	14	16	12
NY	RICHMOND	10	6	11	14	8	8	4	10	7	13	0	11
NY	ROCKLAND	11	6	10	14	9	8	3	9	7	11	10	10
NY	SARATOGA	12	6	11	16	16	14	6	11	5	13	15	10
NY	SCHENECTADY	10	10	16	13	16	15	8	10	7	15	10	11
NY	SCHOHARIE	10	10	16	13	16	15	8	10	7	15	10	11
NY	SCHUYLER	12	10	15	15	18	13	7	9	10	14	14	15
NY	SENECA	12	10	15	15	18	13	7	9	10	14	14	15
NY	ST. LAWRENCE	14	14	16	13	17	13	7	4	9	15	17	7
NY	STEUBEN	11	10	13	16	19	12	7	8	6	16	15	11
NY	SUFFOLK	13	8	11	12	9	10	4	8	11	10	13	10
NY	SULLIVAN	12	8	14	15	16	13	4	10	8	14	16	14

Table 4 (continued)

State	County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NY	TIOGA	10	9	14	13	17	12	6	8	7	11	13	14
NY	TOMPKINS	12	9	11	14	20	15	8	7	7	12	20	15
NY	ULSTER	11	5	15	15	13	12	7	10	8	13	13	11
NY	WARREN	12	11	13	15	13	13	7	7	7	15	20	12
NY	WASHINGTON	8	9	10	14	16	16	7	7	7	14	12	12
NY	WAYNE	12	12	13	17	17	13	8	8	7	13	18	17
NY	WESTCHESTER	11	6	11	16	10	12	5	9	9	9	12	9
NY	WYOMING	12	10	16	17	20	12	11	10	8	12	14	17
NY	YATES	12	10	15	15	18	13	7	9	10	14	14	15
PA	ADAMS	8	7	11	14	15	10	9	9	7	14	13	9
PA	ALLEGHENY	12	9	14	16	16	10	8	10	6	12	14	15
PA	ARMSTRONG	10	8	12	13	11	11	5	9	3	12	14	15
PA	BEAVER	11	12	14	16	15	11	5	8	9	13	15	15
PA	BEDFORD	7	5	9	13	15	11	9	10	11	14	11	10
PA	BERKS	6	7	8	13	13	11	5	8	8	12	9	7
PA	BLAIR	9	7	13	13	16	9	8	9	10	13	15	10
PA	BRADFORD	7	6	13	14	19	8	8	7	6	13	11	7
PA	BUCKS	8	7	11	13	11	12	5	9	7	16	11	11
PA	BUTLER	11	12	13	13	17	13	10	11	9	13	14	15
PA	CAMBRIA	9	11	10	10	13	12	7	8	7	11	13	13
PA	CAMERON	16	12	13	19	17	13	7	9	8	16	20	17
PA	CARBON	9	6	8	10	12	8	4	8	6	13	9	7
PA	CENTRE	10	8	10	13	18	12	8	11	7	15	11	13
PA	CHESTER	9	7	11	13	13	13	6	6	7	14	12	13
PA	CLARION	15	12	16	20	15	12	8	11	7	12	16	16
PA	CLEARFIELD	8	6	9	13	13	11	5	6	11	14	14	7
PA	CLINTON	11	8	13	18	19	11	8	5	4	14	13	15
PA	COLUMBIA	12	7	12	13	18	9	8	8	7	12	9	12
PA	CRAWFORD	18	15	17	22	16	13	7	9	8	13	19	19
PA	CUMBERLAND	8	4	11	12	14	8	7	9	7	14	12	8
PA	DAUPHIN	8	6	11	13	13	8	7	11	7	16	12	8
PA	DELAWARE	11	7	13	14	9	11	7	6	6	11	13	8
PA	ELK	15	12	15	18	17	11	10	11	8	16	19	18
PA	ERIE	18	14	19	19	15	10	7	8	7	12	18	19
PA	FAYETTE	11	10	15	16	14	11	11	9	9	14	16	14
PA	FOREST	19	12	16	19	16	14	6	10	10	13	14	18
PA	FRANKLIN	8	5	13	14	13	9	7	10	9	15	11	9
PA	FULTON	8	5	13	14	13	9	7	10	9	15	11	9
PA	GREENE	9	7	12	14	11	10	11	8	10	14	17	12
PA	HUNTINGDON	6	6	10	12	14	11	7	10	11	13	13	10
PA	INDIANA	15	10	14	15	17	15	11	11	8	17	16	15
PA	JEFFERSON	15	12	15	18	17	11	10	11	8	16	19	18
PA	JUNIATA	8	6	12	13	16	12	9	9	7	14	10	11
PA	LACKAWANNA	9	9	12	15	14	11	7	12	8	15	13	11
PA	LANCASTER	8	6	11	14	12	10	6	8	8	14	11	10
PA	LAWRENCE	9	10	13	19	18	12	8	11	8	10	14	14
PA	LEBANON	7	4	10	16	11	11	8	8	8	15	12	12
PA	LEHIGH	9	6	12	18	11	10	5	8	7	15	12	10
PA	LUZERNE	9	9	12	15	14	11	7	12	8	15	13	11
PA	LYCOMING	10	6	13	13	16	9	9	9	9	16	16	12
PA	MCKEAN	17	12	19	17	18	10	11	10	12	16	23	18

Table 4 (continued)

State	County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PA	MERCER	13	12	15	13	16	14	6	8	6	9	14	8
PA	MIFFLIN	6	9	11	13	17	11	5	8	7	12	12	9
PA	MONROE	10	7	12	15	15	11	5	10	6	18	15	12
PA	MONTGOMERY	9	6	12	13	17	14	5	9	8	15	13	10
PA	MONTOUR	12	7	12	13	18	9	8	8	7	12	9	12
PA	NORTHAMPTON	8	7	11	13	11	12	5	9	7	16	11	11
PA	NORTHUMBERLAND	9	6	9	13	16	11	6	8	8	13	11	10
PA	PERRY	8	6	11	13	13	8	7	11	7	16	12	8
PA	PHILADELPHIA	11	6	10	12	10	12	8	4	8	14	15	9
PA	PIKE	12	9	12	13	19	13	4	12	7	15	16	10
PA	POTTER	15	11	17	18	16	11	5	9	8	17	17	14
PA	SCHUYLKILL	9	6	11	15	14	12	5	7	8	13	12	14
PA	SNYDER	8	6	12	13	16	12	9	9	7	14	10	11
PA	SOMERSET	11	12	12	16	21	12	8	8	11	10	18	16
PA	SULLIVAN	15	10	15	13	17	13	9	13	8	15	13	17
PA	SUSQUEHANNA	12	9	12	14	17	11	8	9	8	13	10	14
PA	TIOGA	9	7	11	11	13	12	6	6	6	13	11	10
PA	UNION	7	5	10	15	15	11	9	6	7	15	12	12
PA	VENANGO	14	12	13	17	13	12	6	13	9	15	14	15
PA	WARREN	19	11	14	18	16	11	7	9	8	15	20	19
PA	WASHINGTON	11	8	12	16	15	12	9	9	8	15	14	13
PA	WAYNE	5	4	10	7	9	8	4	7	6	10	9	9
PA	WESTMORELAND	12	8	14	13	16	11	7	8	7	13	15	13
PA	WYOMING	15	10	15	13	17	13	9	13	8	15	13	17
PA	YORK	8	6	10	12	12	9	8	9	8	13	12	9
RI	BRISTOL	15	8	15	15	12	12	6	6	11	9	13	13
RI	KENT	12	8	13	12	11	13	5	7	11	7	12	13
RI	NEWPORT	15	8	15	15	12	12	6	6	11	9	13	13
RI	PROVIDENCE	14	9	14	14	11	13	7	9	10	12	14	12
RI	WASHINGTON	12	7	13	13	11	13	4	7	10	12	16	11
VT	ADDISON	11	8	13	14	15	12	11	9	9	16	13	11
VT	BENNINGTON	14	10	16	15	18	18	5	9	7	15	19	15
VT	CALEDONIA	20	11	17	15	15	16	13	9	11	17	19	14
VT	CHITTENDEN	15	9	12	16	15	17	11	10	10	12	19	13
VT	ESSEX	17	12	15	14	20	18	14	8	10	14	20	14
VT	FRANKLIN	17	9	13	13	16	14	10	9	10	11	14	12
VT	GRAND ISLE	17	9	13	13	16	14	10	9	10	11	14	12
VT	LAMOILLE	18	14	13	15	15	17	11	7	8	13	20	17
VT	ORANGE	16	10	14	13	18	18	11	10	8	20	19	16
VT	ORLEANS	13	11	13	8	11	14	10	2	6	10	9	6
VT	RUTLAND	15	7	11	15	12	13	10	8	6	15	19	15
VT	WASHINGTON	17	7	14	13	16	13	15	8	10	15	21	12
VT	WINDHAM	15	12	16	14	18	20	8	6	11	18	19	14
VT	WINDSOR	14	10	20	15	12	17	8	11	12	16	21	16

Table 5. Penetration Rate of Paved Road Vacuum Sweeping

PM_{10} Nonattainment Status	Roadway Type	Vacuum Sweeping Penetration Rate
Moderate	Urban Intersate	0.42
Moderate	Urban Freeway & Expressway	0.67
Moderate	Urban Other Principal Arterial	0.90
Moderate	Urban Minor Arterial	0.67
Moderate	Urban Collector	0.64
Moderate	Urban Local	0.88

FUGITIVE DUST FROM UNPAVED ROADS
SCC: 2296000000

Fugitive dust emissions from unpaved road traffic were estimated for PM10-PRI, PM10-FIL, PM25-PRI, and PM25-FIL. Since there are no PM-CON emissions for this category, PM10-PRI emissions are equal to PM10-FIL emissions and PM25-PRI emissions are equal to PM25-FIL.

Emission Factors

Reentrained road dust emissions for unpaved roads were estimated using unpaved road VMT and the emission factor equation from AP-42[1]:

$$E = [k * (s/12)^a * (SPD/30)^b] / (M/0.5)^c - C$$

where k, a, b, and c are empirical constants given in Table 6 and

E = size specific emission factor (lb/VMT)
s = surface material silt content (%)
SPD = mean vehicle speed (mph)
M = surface material moisture content (%)
C = emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear (lb/VMT)

Average State-level unpaved silt content values, developed as part of the 1985 National Acid Precipitation Assessment Program (NAPAP) Inventory, were obtained from the Illinois State Water Survey.[2] Silt contents of over 200 unpaved roads from over 30 States were obtained. Average silt contents of unpaved roads were calculated for each State that had three or more samples for that State. For States that did not have three or more samples, the average for all samples from all States was used. Table 7 provides a table of the silt content values by State, and identifies if the values are based on samples or are default values.

Table 8 lists the speeds modeled on the unpaved roads by roadway type. These speeds were determined based on national average speeds modeled for onroad emission calculations and weighted to determine a single average speed for each of the roadway types. The value of 0.5 percent for M was chosen as the national default as sufficient resources were not available to determine more locally-specific values for this variable.

Correction factors were applied to the emission factors to account for the number of days with a sufficient amount of precipitation to prevent road dust resuspension. Monthly corrected emission factors by State and roadway classification were calculated using the following equation:

$$E_{corr} = E * [(D-p)/D]$$

where: E_{corr} = unpaved road dust emission factor corrected for precipitation effects
E = uncorrected emission factor
D = number of days in the month
p = number of days in the month with at least 0.01 inches of precipitation

The number of days in each county with at least 0.01 inches of precipitation in each month was obtained from the National Climatic Data Center.[3] For counties with more than one precipitation collection station with valid data from the NCDC data set, an average number of precipitation days was calculated for each month from all valid stations in the county. Counties with no precipitation collection station or no valid data were assigned the data from an adjacent county. The 2002 monthly precipitation data for MANE-VU counties is shown in Table 4. This method of assigning monthly precipitation days by county improves on the NEI approach of assigning monthly precipitation data by State. These are the same precipitation data used to calculate paved road emissions for the MANE-VU States.

Activity

Unpaved roadway mileage estimates were obtained from the FHWA's 2002 Highway Statistics report.[4] Table HM-51 of this publication lists the unpaved road mileage by State for the following six roadway categories: rural major collectors, rural minor collectors, rural locals, urban minor arterials, urban collectors, and urban locals. In the 1996 Highway Statistics publication (the last year that these data were published), mileage on urban and rural local roads was broken down into four groups of average daily travel (ADT) volume ranges. These groups are shown in Table 9. The fraction of ADT occurring in each of these four groups was then multiplied by the 2002 mileage for the rural and urban local roads to allocate the 2002 unpaved local road mileage to these same volume groups. As shown in Table 9, a single value of ADT was assigned to each volume group. The estimated mileage in each group was then multiplied by the assigned ADT value and the four values summed to obtain an estimate of VMT on rural and urban local roads in each State. Once the VMT for the rural and urban local roads were determined, the overall ADT on these roads was calculated for each State by dividing the VMT by the total mileage for urban or rural local roads in that State. The calculated ADT for rural local roads was then multiplied by the mileage for the remaining rural unpaved road types in the State to estimate total daily VMT on those roads. Similarly, the calculated ADT for urban local roads was then multiplied by the mileage for the remaining urban unpaved road types in the State to estimate total daily VMT on those roads. These values were then all multiplied by 365 to obtain annual VMT estimates.

Note that Maine provided unpaved road mileage by county. These values were used rather than the Highway Statistics unpaved road mileage for Maine. However, the data from Highway Statistics were used to break the Maine unpaved road mileage down by functional class. VMT on the Maine unpaved roads were then calculated in a manner similar to that described above. There are no unpaved roads in Delaware or the District of Columbia, so no unpaved road VMT or unpaved road fugitive dust emissions were calculated for these areas.

Allocation of VMT

The State/road type-level unpaved road VMT estimates were allocated by county using estimates of the ratio of county rural population to the State rural population from the U.S. Census Bureau as shown by the following equation:

$$UNPVMT_{x,y} = (CL_x / SL) * UNPVMT_{,y}$$

where: $UNPVMT_{x,y}$ = unpaved road VMT for county x and road type y (millions of miles)
CL_x = rural population in county x
SL = rural population in the State
$UNPVMT_{,y}$ = unpaved road VMT in entire State for road type y (millions of miles)

The unpaved road VMT data were temporally allocated by month using the NAPAP temporal allocation factors.[5]

Controls

The MANE-VU States contain only moderate PM_{10} nonattainment areas. These are New Haven County, Connecticut and New York County, New York. In addition, a portion of Allegheny County, Pennsylvania and Aroostook County, Maine are currently moderate PM_{10} maintenance areas and, therefore, the unpaved road controls were applied in these counties as well. It should be noted that these two maintenance areas cover only a small portion of the counties, but without further information, the unpaved road controls were applied countywide. The controls assumed for urban unpaved roads in moderate PM_{10} nonattainment and maintenance areas was paving of the unpaved road. A control efficiency of 96 percent and a rule penetration of 50 percent were applied. No controls were applied on rural roads in the moderate PM_{10} nonattainment and maintenance areas.

Caveat

It should be noted that the New York State Department of Environmental Conservation believes that **road dust is indeterminate at this time**; the existing model has far too many shortcomings, and does not yield inventory values that correlate with monitoring data, particularly for $PM_{2.5}$.[6] However, for the purposes of consistency with the other MANE-VU States, New York has agreed to include these unpaved road fugitive dust estimates in the MANE-VU 2002 emission inventory.

Note that New Jersey provided its own unpaved road fugitive dust emissions and did not use the unpaved road dust emissions calculated by MANE-VU.

References

1. United States Environmental Protection Agency, Office of Air Quality Planning and Standards. "Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 13.2.2 Unpaved Roads." Research Triangle Park, NC. 2003.

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4. U.S. Department of Transportation, Federal Highway Administration. *Highway Statistics 2002.* Office of Highway Policy Information. Washington, DC. 2003. Available at http://www.fhwa.dot.gov/ohim/hs02/index.htm.

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6. W.J. Pienta. "NYS $PM_{2.5}$ Road Dust Estimates for CY 2002," memorandum prepared by W.L. Pienta, New York State Department of Environmental Conservation, Division of Air Resources, Bureau of Air Quality Planning, October 28, 2004.

Table 6. Constants for Unpaved Roads Reentrained Dust Emission Factor Equation

Constant	PM-2.5	PM-10
k (lb/VMT)	0.27	1.8
a	1	1
b	0.5	0.5
c	0.2	0.2
C	0.00036	0.00047

Source : AP-42

Table 7. State-level Unpaved Road Surface Material Silt Content Values Used in MANE-VU Fugitive Dust Calculations

State	Unpaved Road Surface Material Silt Content (%)	Data Source
Connecticut	3.9	DEFAULT
Delaware	0	No Unpaved Roads
DC	0	No Unpaved Roads
Maine	3.9	DEFAULT
Maryland	3.9	DEFAULT
Massachusetts	3.9	DEFAULT
New Hampshire	3.9	DEFAULT
New Jersey	N/A	Used State-calculated unpaved road dust emissions
New York	4.7	SAMPLES
Pennsylvania	3.3	SAMPLES
Rhode Island	3.9	DEFAULT
Vermont		DEFAULT

Table 8. Speeds Modeled by Roadway Type on Unpaved Roads

Unpaved Roadway Type	Speed (mph)
Rural Minor Arterial	39
Rural Major Collector	34
Rural Minor Collector	30
Rural Local	30
Urban Other Principal Arterial	20
Urban Minor Arterial	20
Urban Collector	20
Urban Local	20

Table 9. Assumed Values for Average Daily Traffic Volume by Volume Group

Rural Roads				
Volume Category (vehicles per day per mile)	< 50	50-199	200-499	> 500
Assumed ADTV	5*	125**	350**	550***
Urban Roads				
Volume Category (vehicles per day per mile)	< 200	200-499	500-1999	> 2000
Assumed ADTV	20*	350**	1250**	2200***

Notes: *10% or volume group's maximum range endpoint
** Average of volume group's range endpoints
*** 110% or volume group's minimum

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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List of Exhibits

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

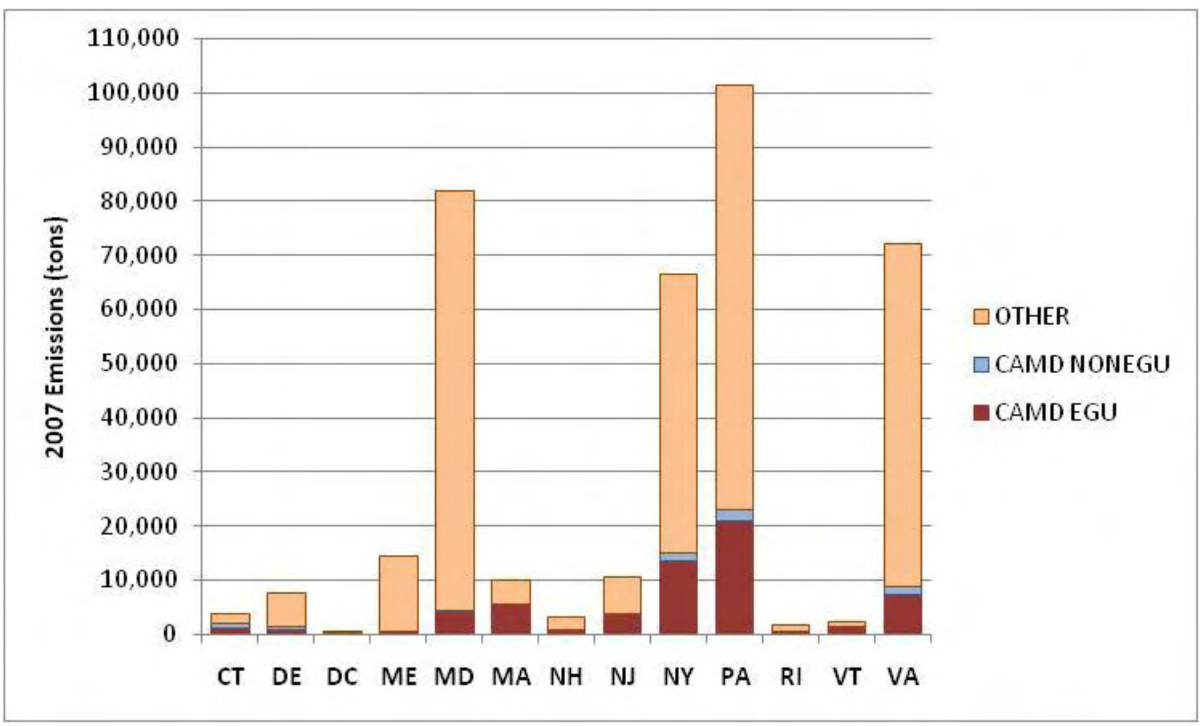


Exhibit 2.9 – 2002 and 2007 Point Source NH3 Emissions by State (tons/year)

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

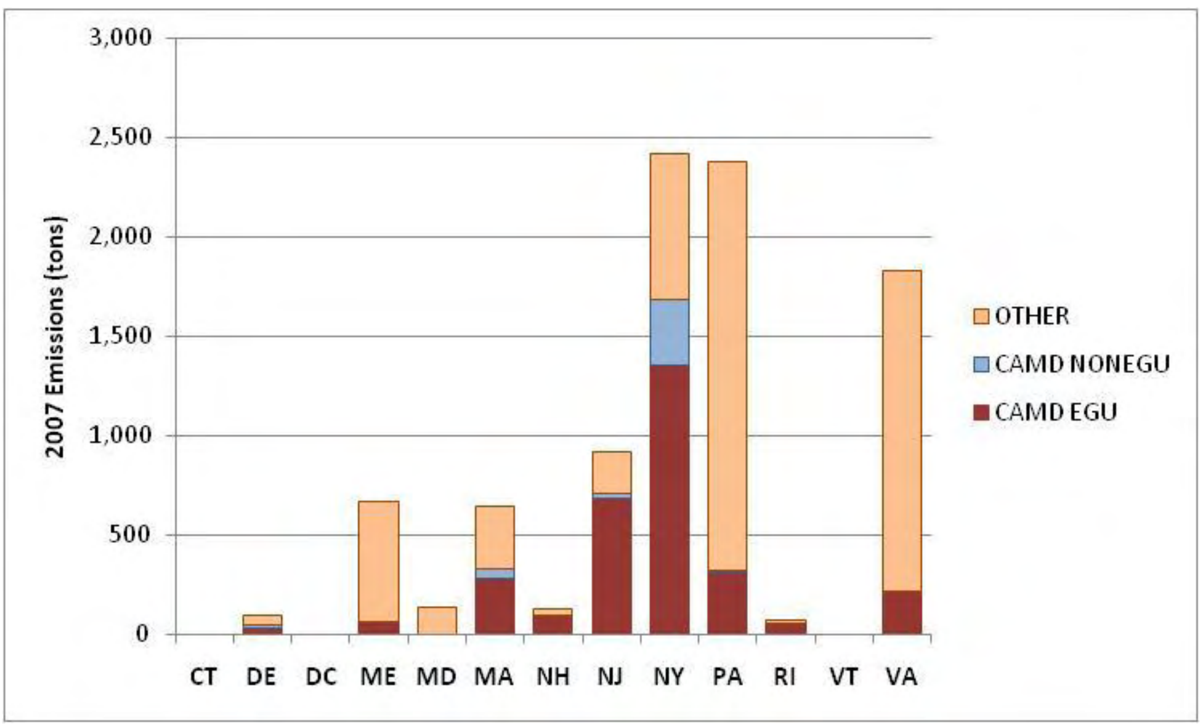


Exhibit 2.11 – 2002 and 2007 Point Source NOx Emissions by State (tons/year)

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

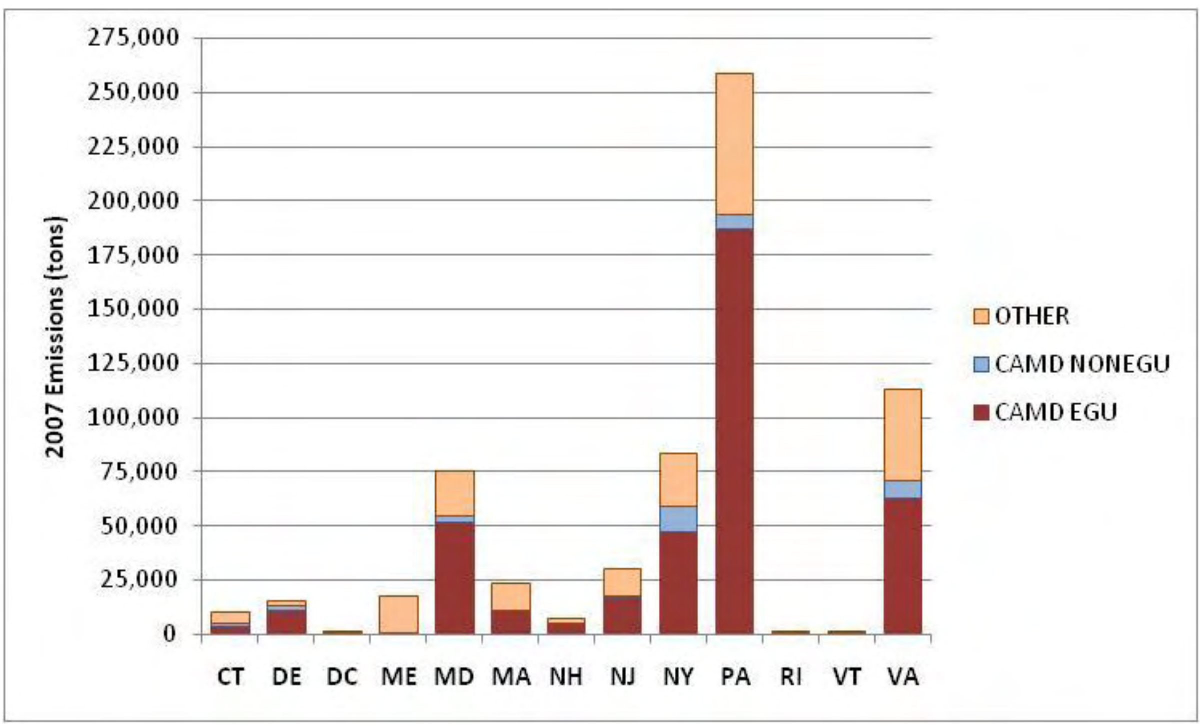


Exhibit 2.13 – 2002 and 2007 Point Source PM10-PRI Emissions by State (tons/year)

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

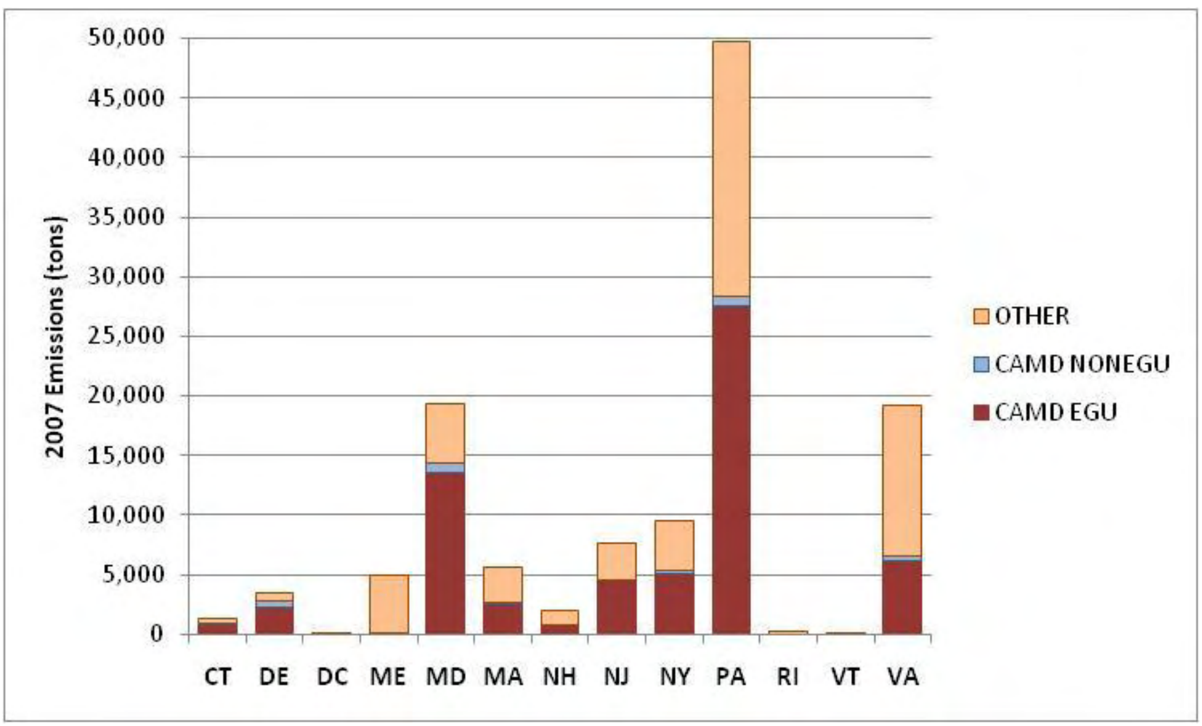


Exhibit 2.15 – 2002 and 2007 Point Source PM25-PRI Emissions by State (tons/year)

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

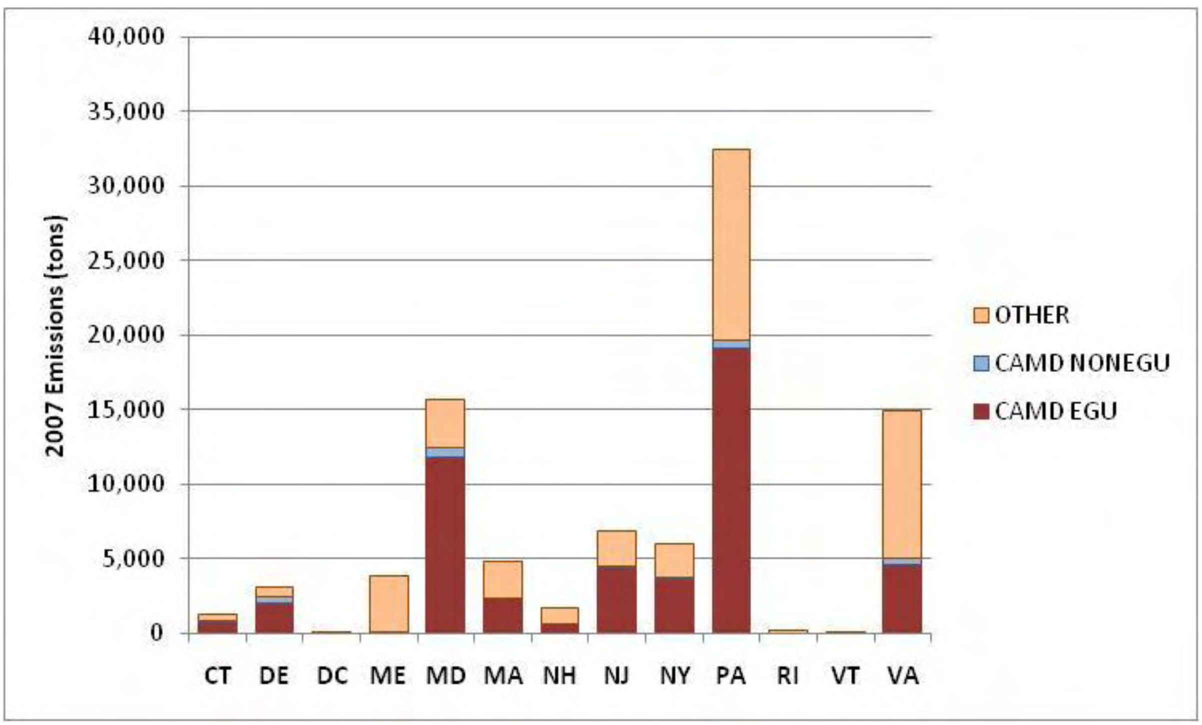


Exhibit 2.17 – 2002 and 2007 Point Source SO2 Emissions by State (tons/year)

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

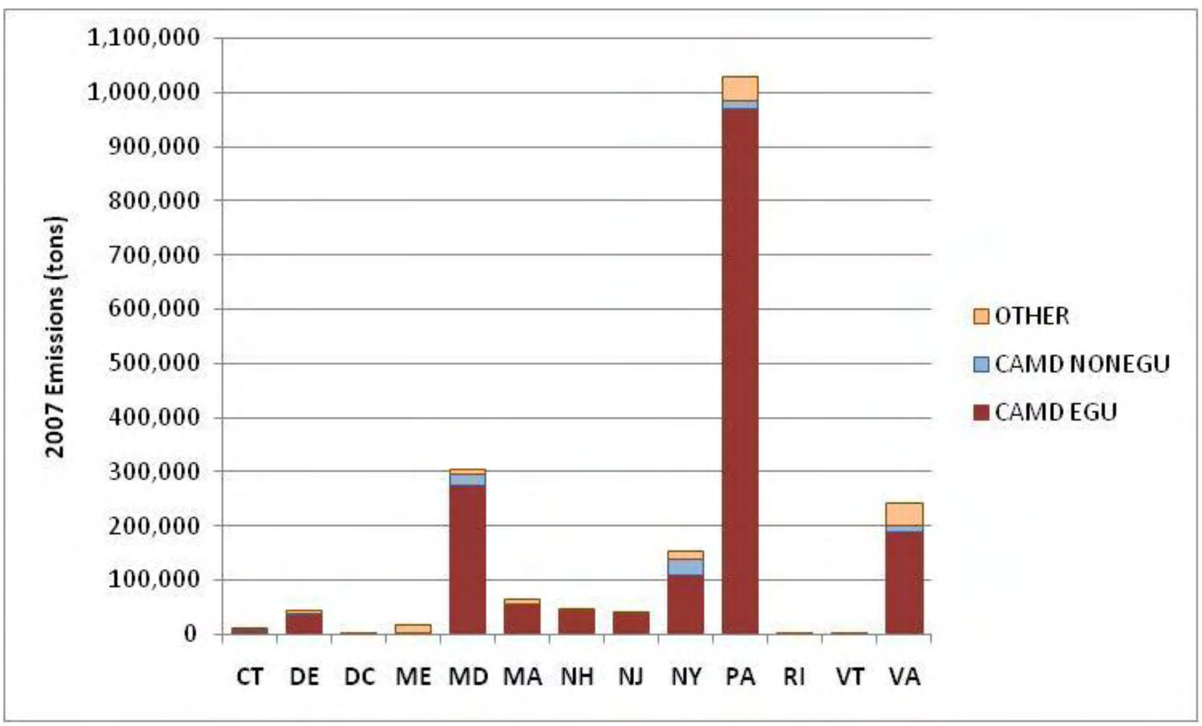
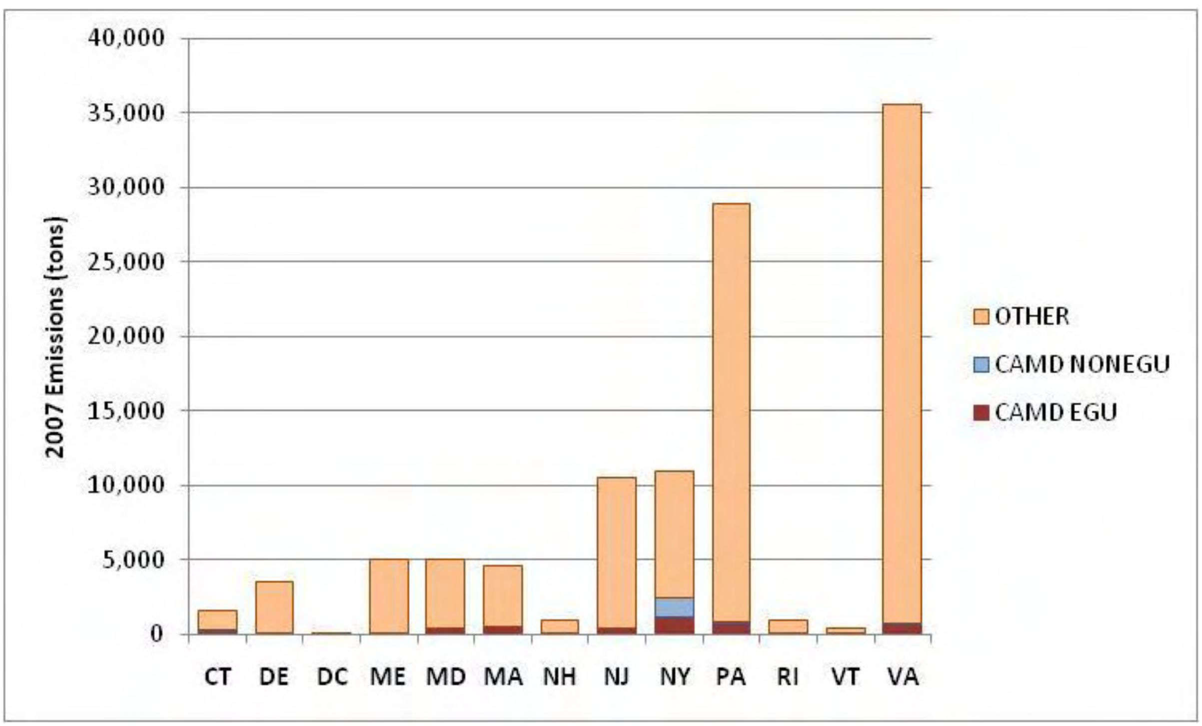


Exhibit 2.19 – 2002 and 2007 Point Source VOC Emissions by State (tons/year)

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:

<u>Hourly NOx emissions</u>

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

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

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

Where annual factor = hourly CAMD heat input / 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**

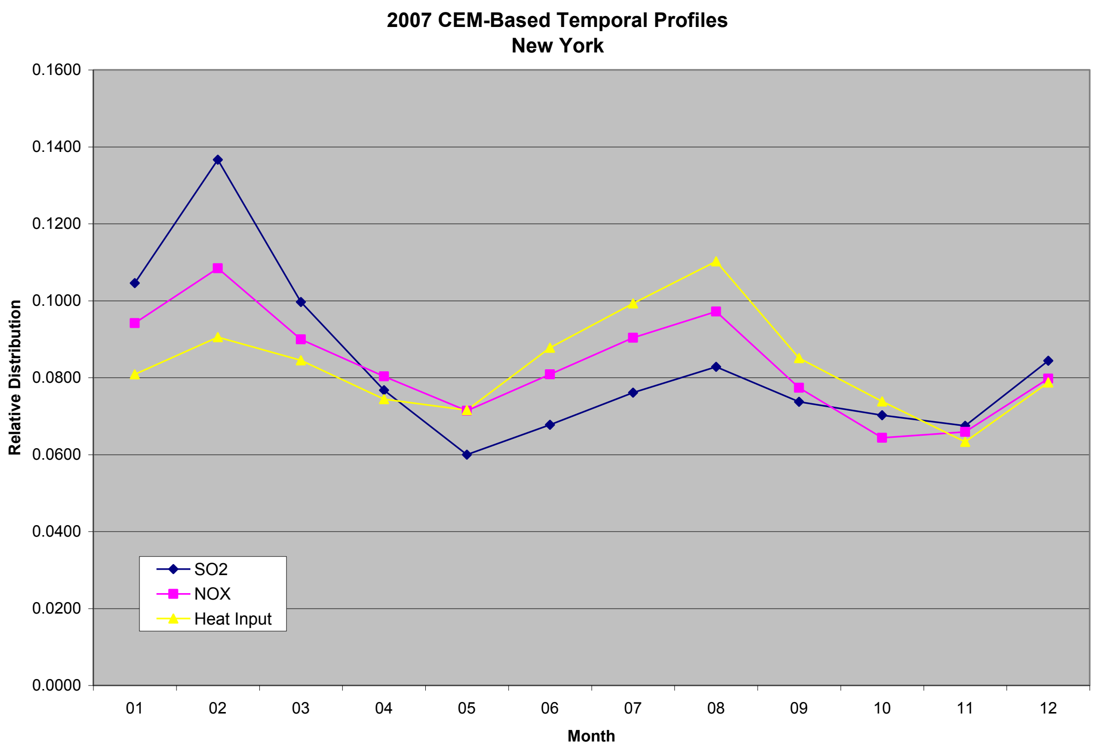


Exhibit 3.4 - Example SMOKE profile for monthly distribution of New York annual emissions using heat input.

	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

	PM10-PRI		PM25-PRI	
State	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)

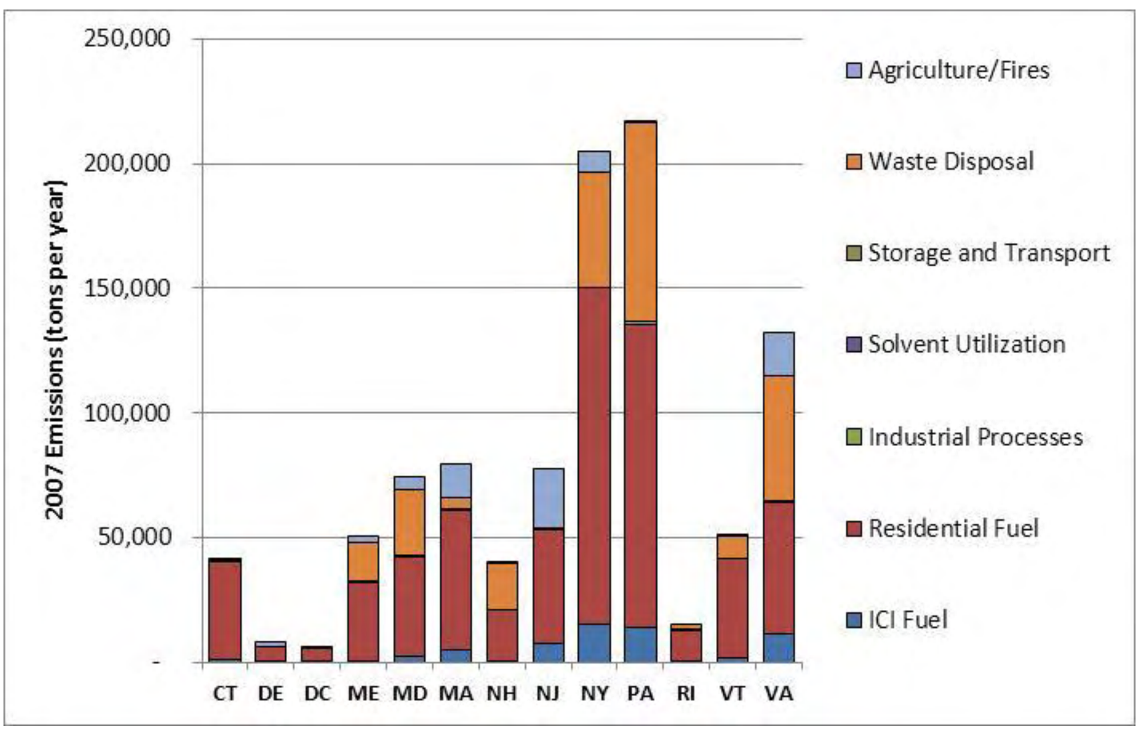


Exhibit 4.8 – 2002 and 2007 Area Source NH3 Emissions by State (tons/year)

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)

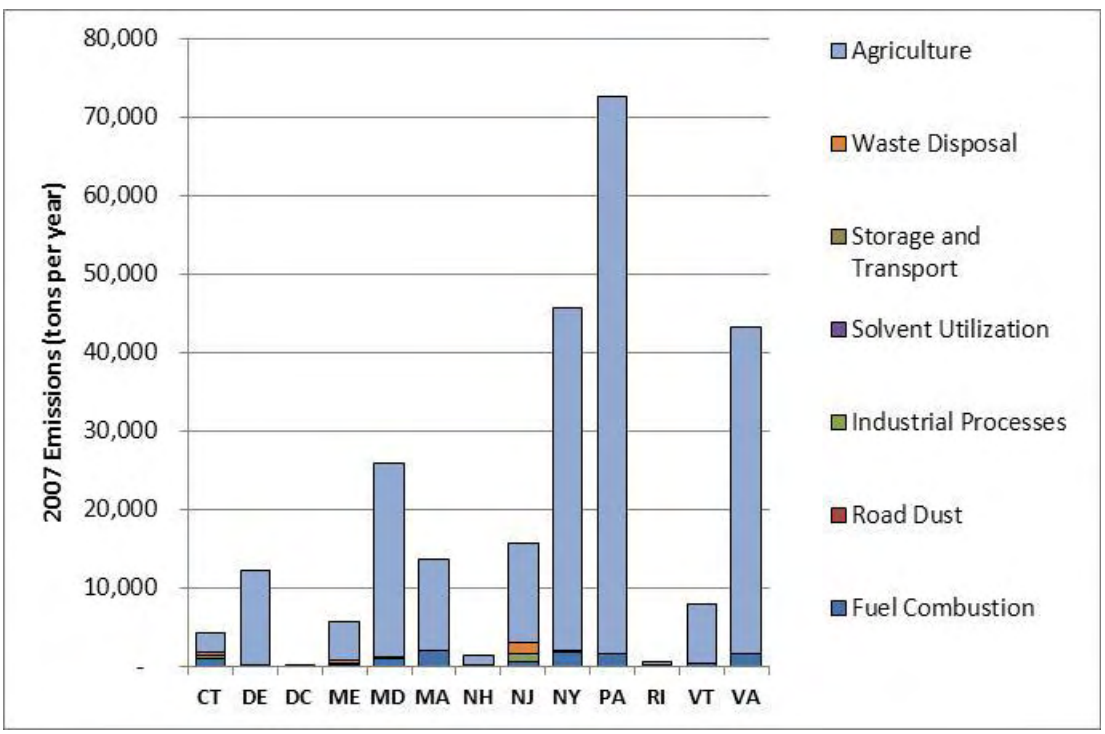


Exhibit 4.10 – 2002 and 2007 Area Source NOx Emissions by State (tons/year)

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)

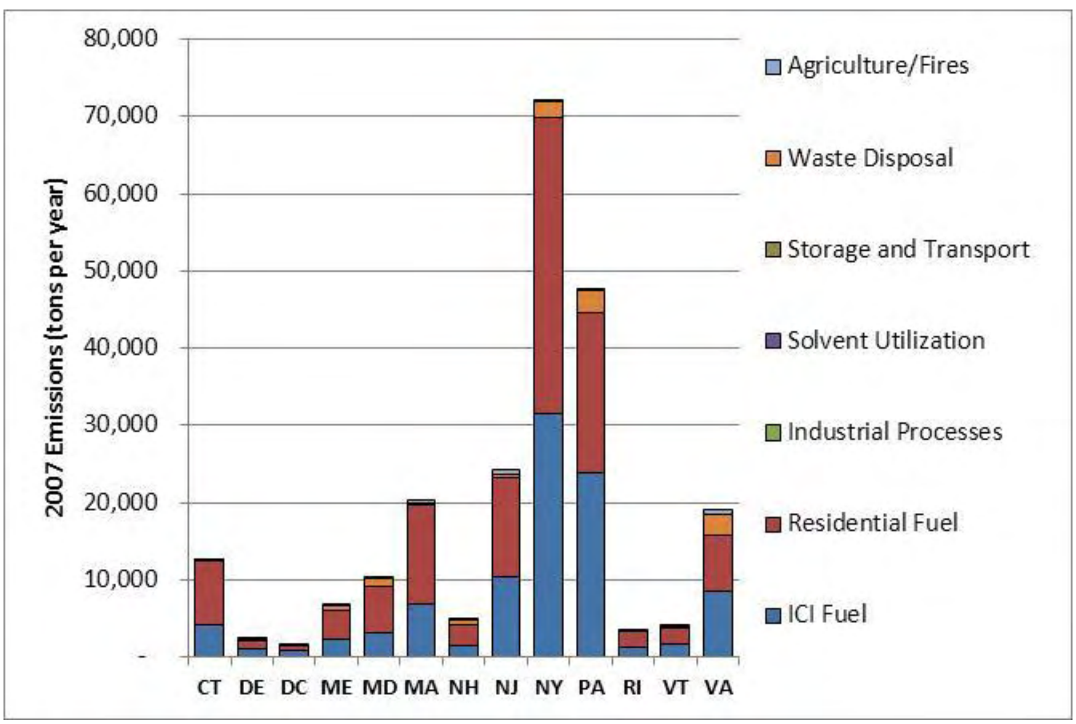


Exhibit 4.12 – 2002 and 2007 Area Source PM10-PRI Emissions by State (tons/year)

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)

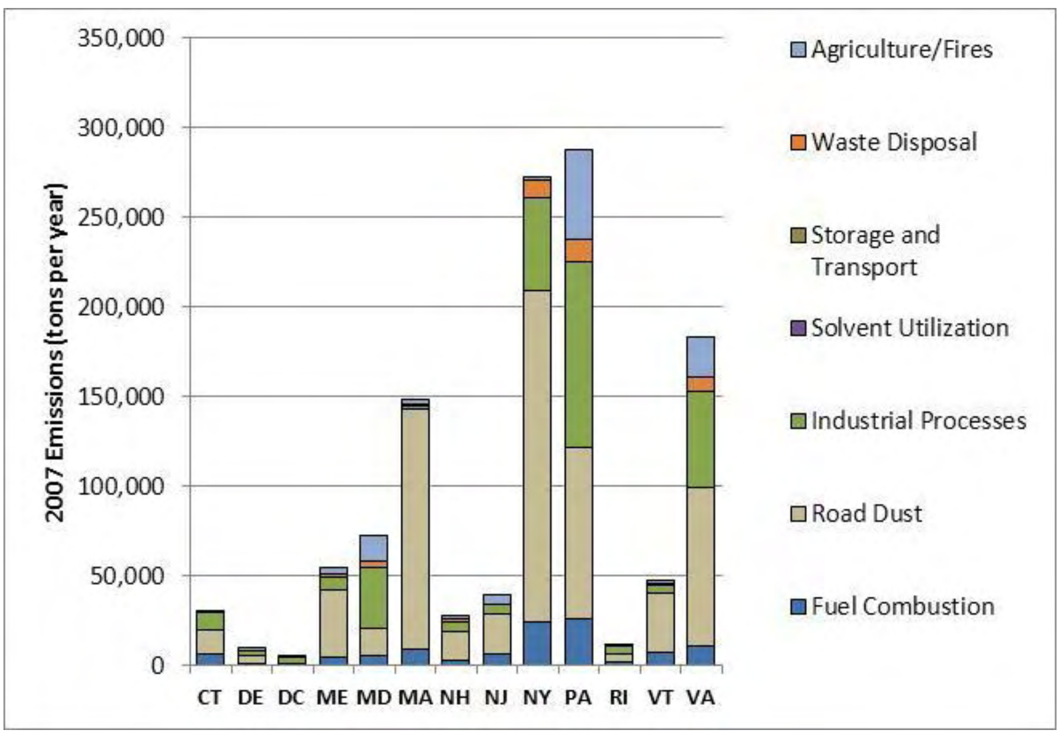


Exhibit 4.14 – 2002 and 2007 Area Source PM25-PRI Emissions by State (tons/year)

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)

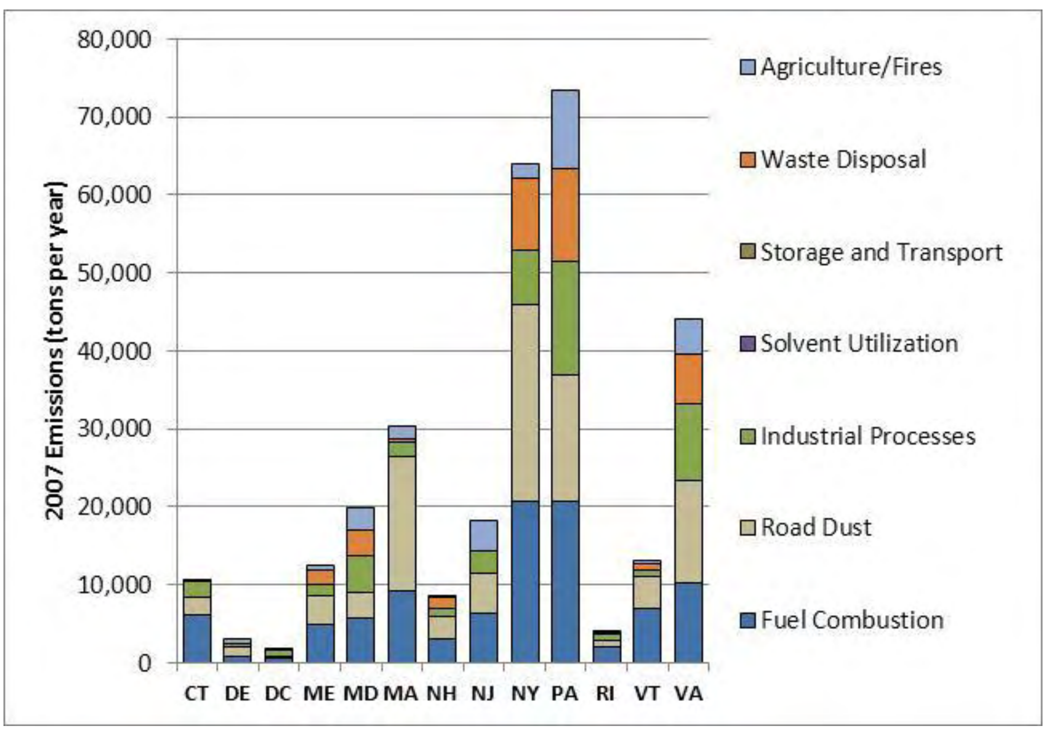


Exhibit 4.16 – 2002 and 2007 Area Source SO2 Emissions by State (tons/year)

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)

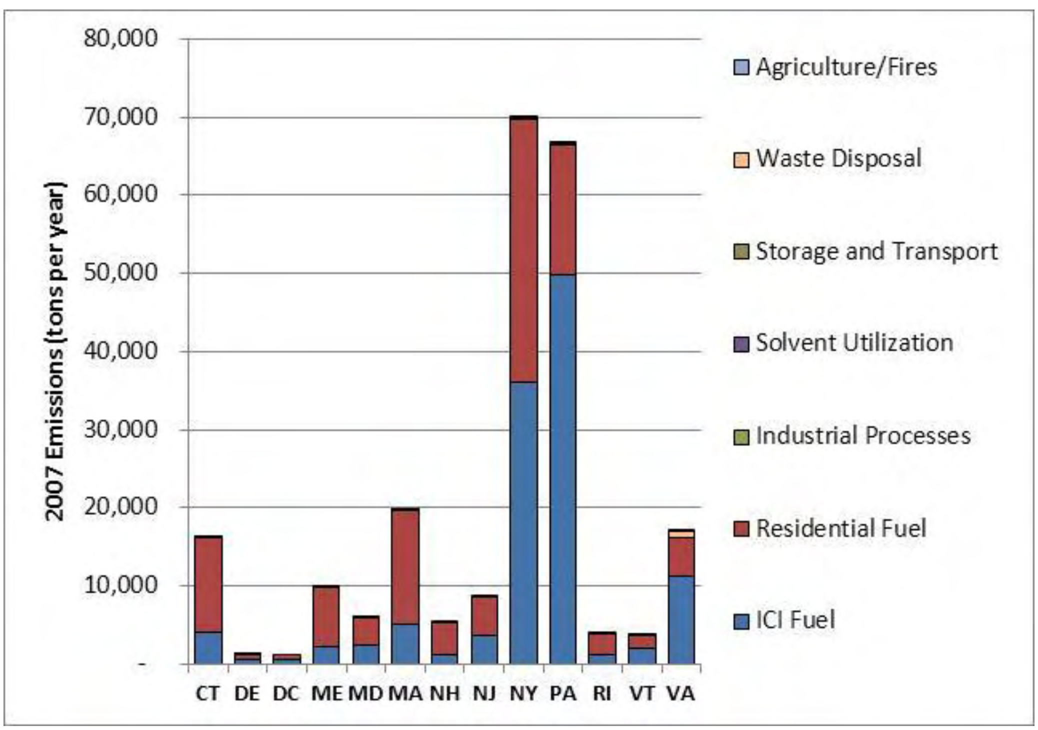
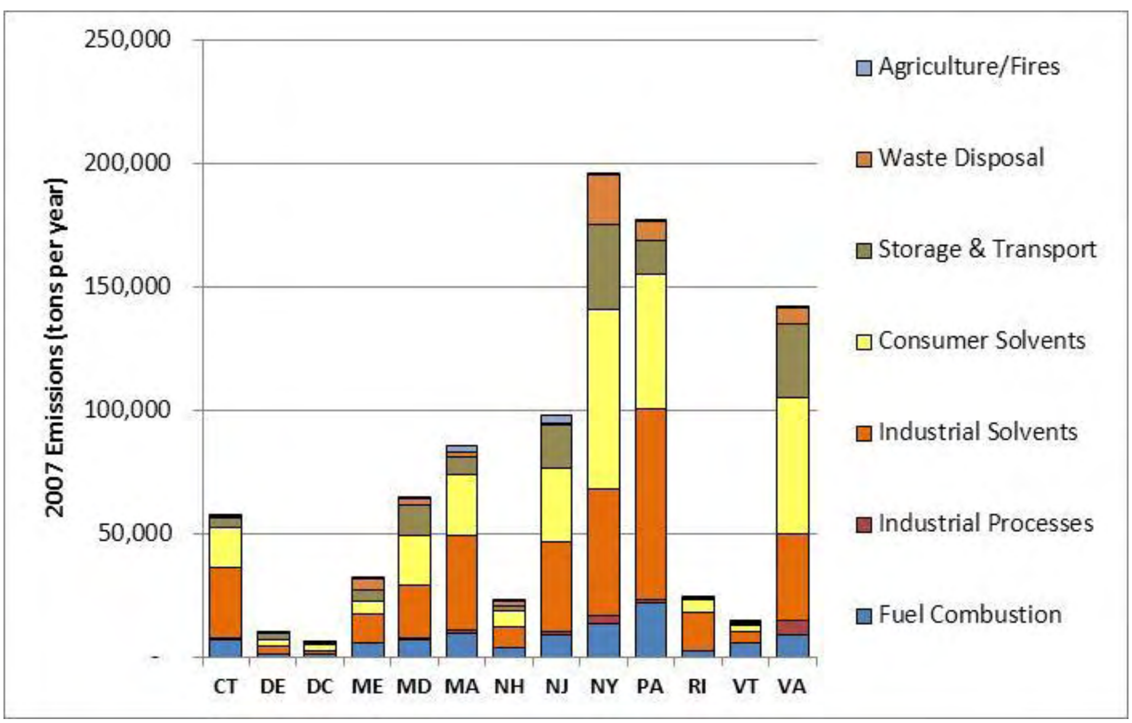


Exhibit 4.18 – 2002 and 2007 Area Source VOC Emissions by State (tons/year)

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)

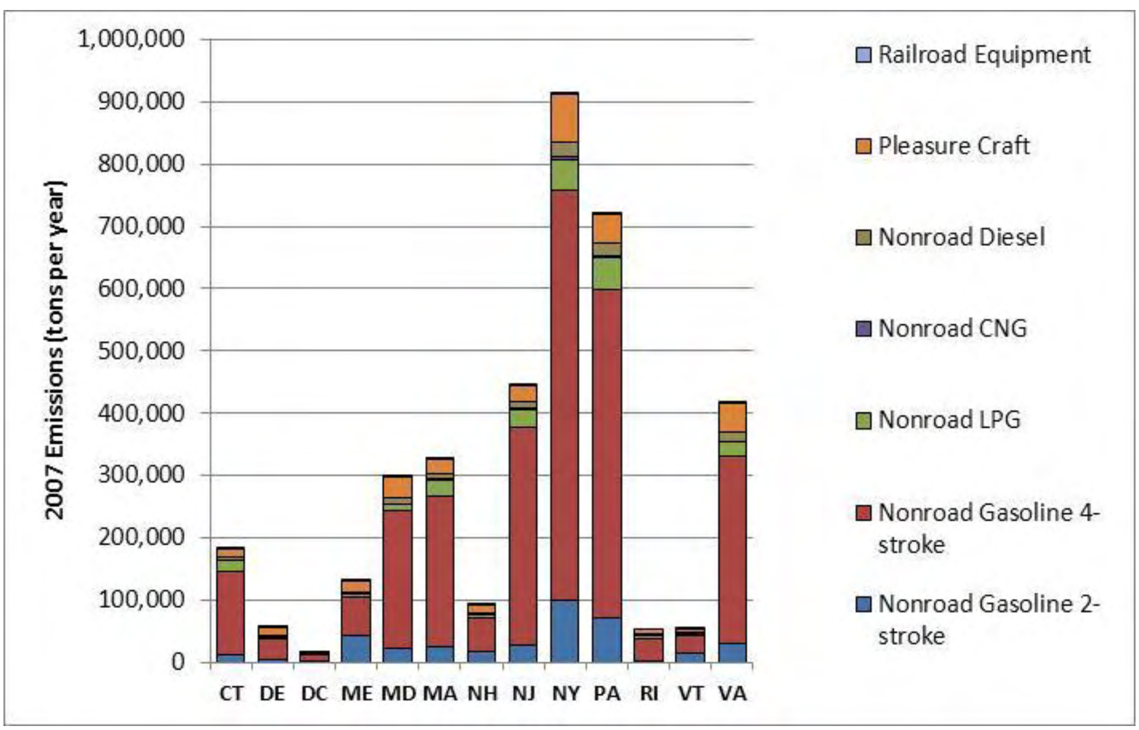


Exhibit 5.5 – 2002 and 2007 NMIM/NONROAD NH3 Emissions by State (tons/year)

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)

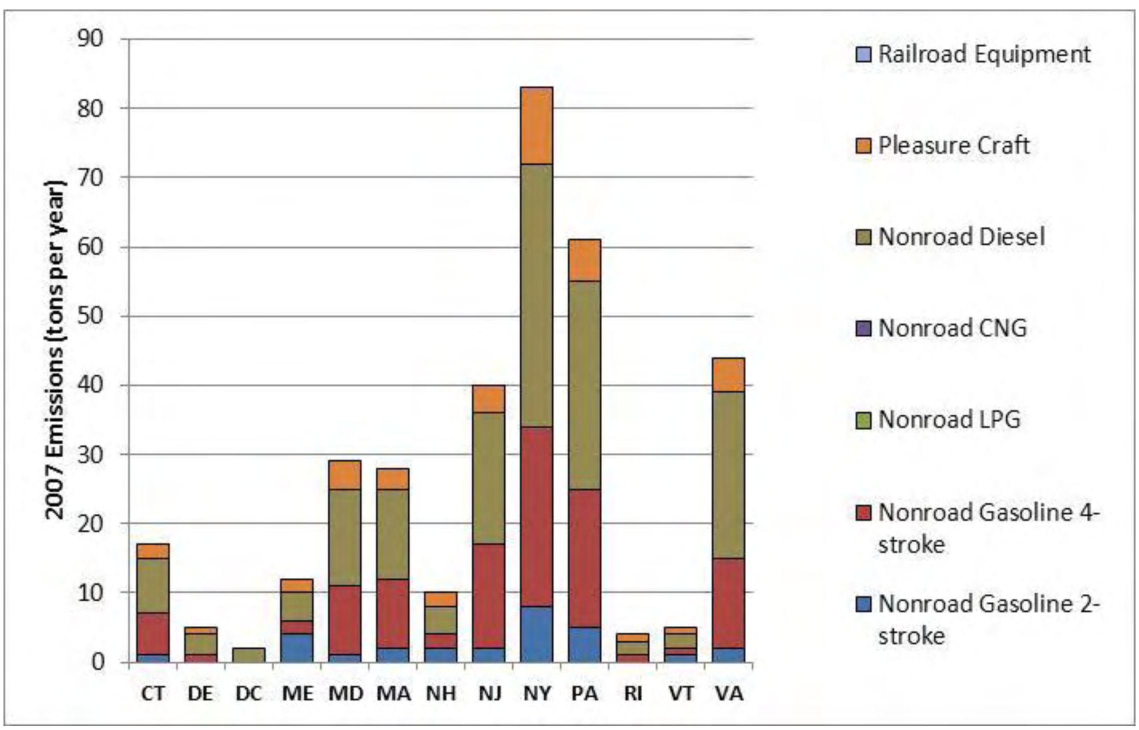


Exhibit 5.7 – 2002 and 2007 NMIM/NONROAD NOx Emissions by State (tons/year)

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)

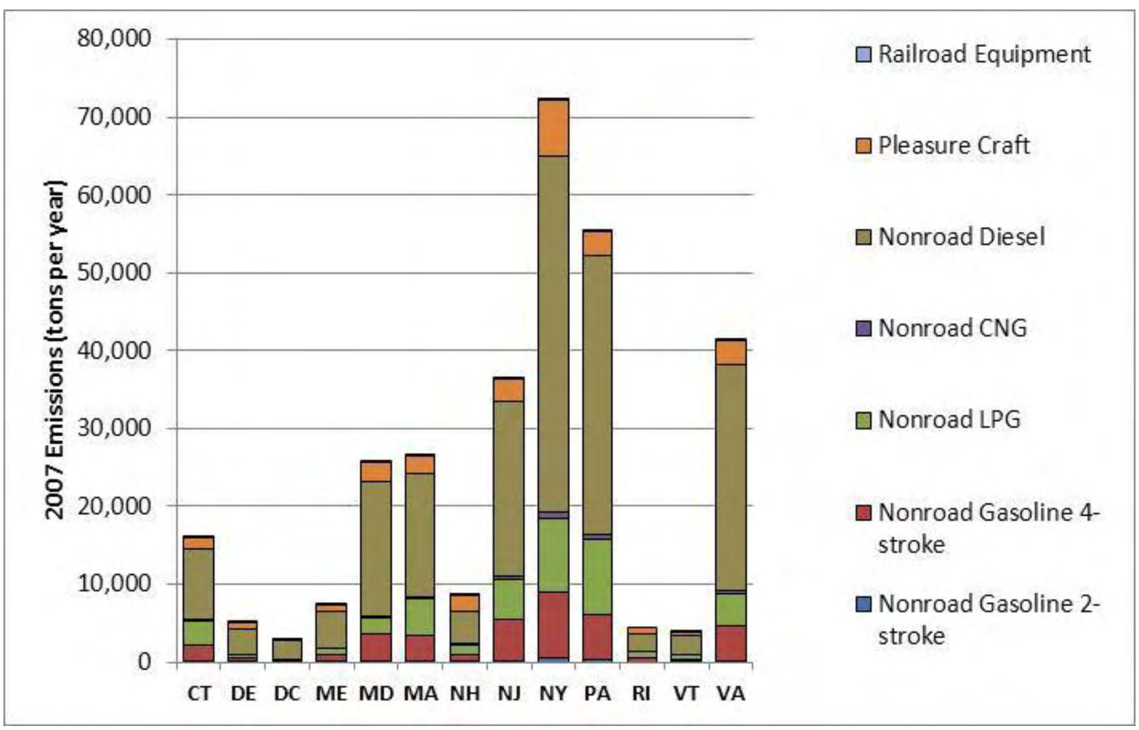


Exhibit 5.9 – 2002 and 2007 NMIM/NONROAD PM10-PRI Emissions by State (tons/year)

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)

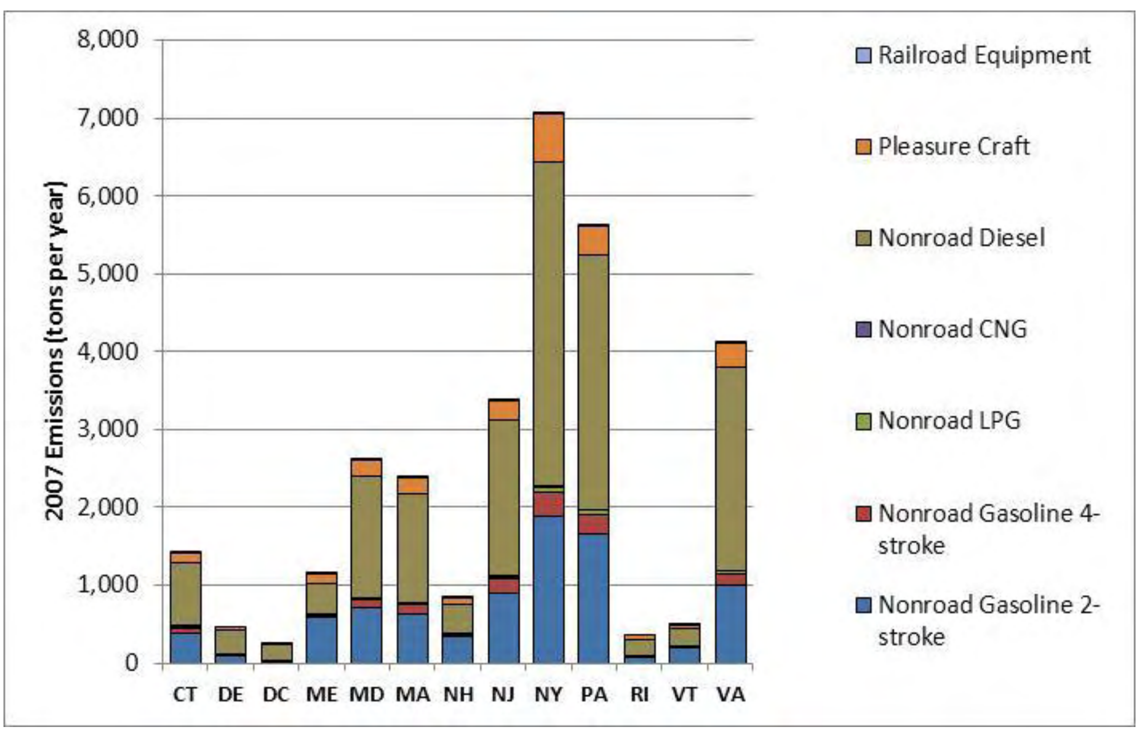


Exhibit 5.11 – 2002 and 2007 NMIM/NONROAD PM25-PRI Emissions by State (tons/year)

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)

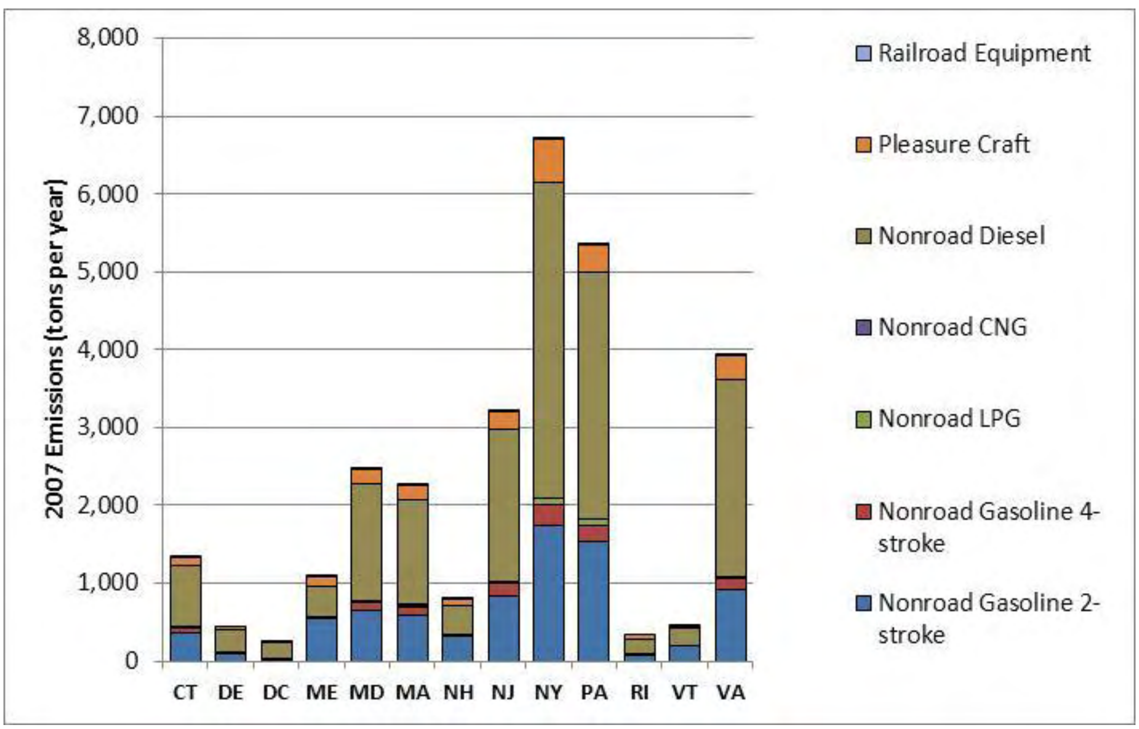


Exhibit 5.3 – 2002 and 2007 NMIM/NONROAD SO2 Emissions by State (tons/year)

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)

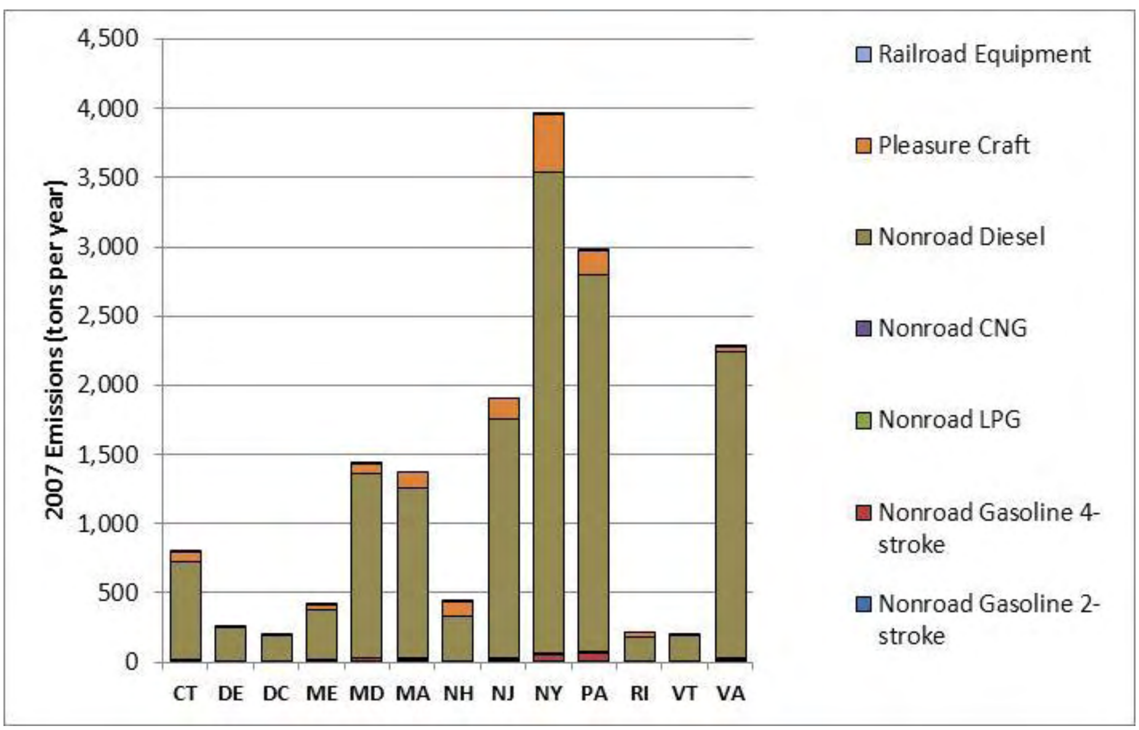
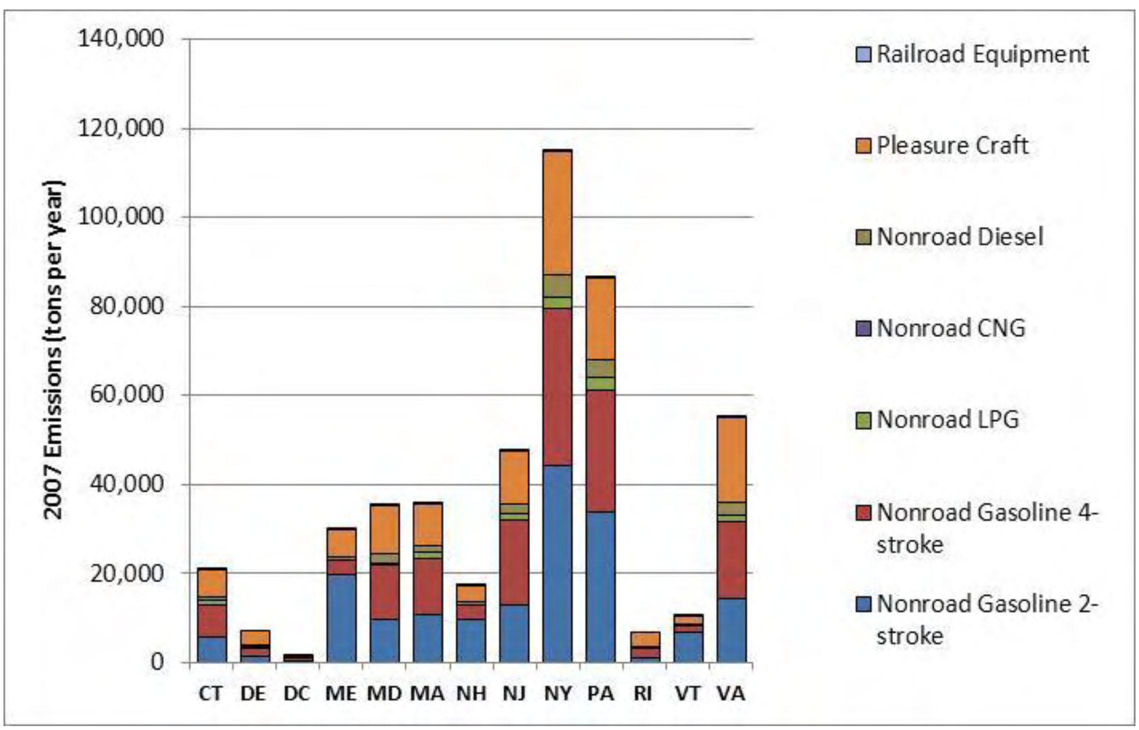


Exhibit 5.15 – 2002 and 2007 NMIM/NONROAD VOC Emissions by State (tons/year)

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%**

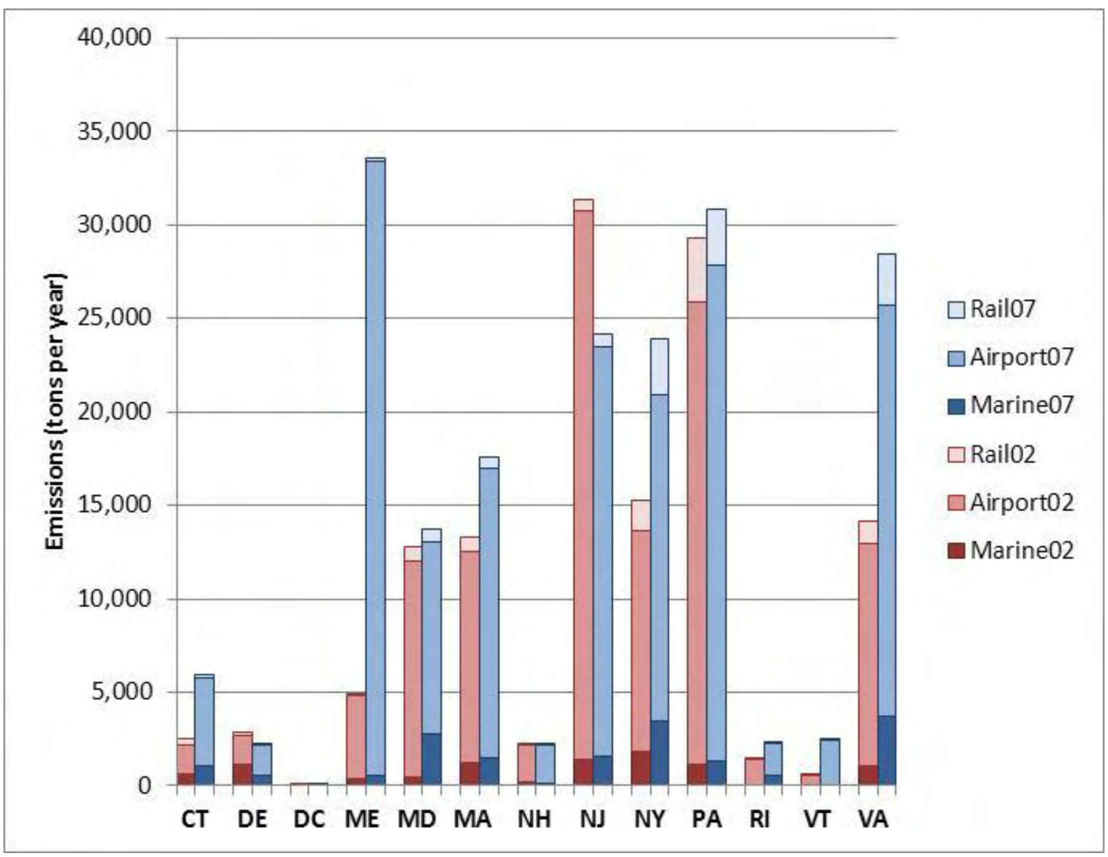


Exhibit 6.5 – 2002 and 2007 MAR NH3 Emissions by State (tons/year)

	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**

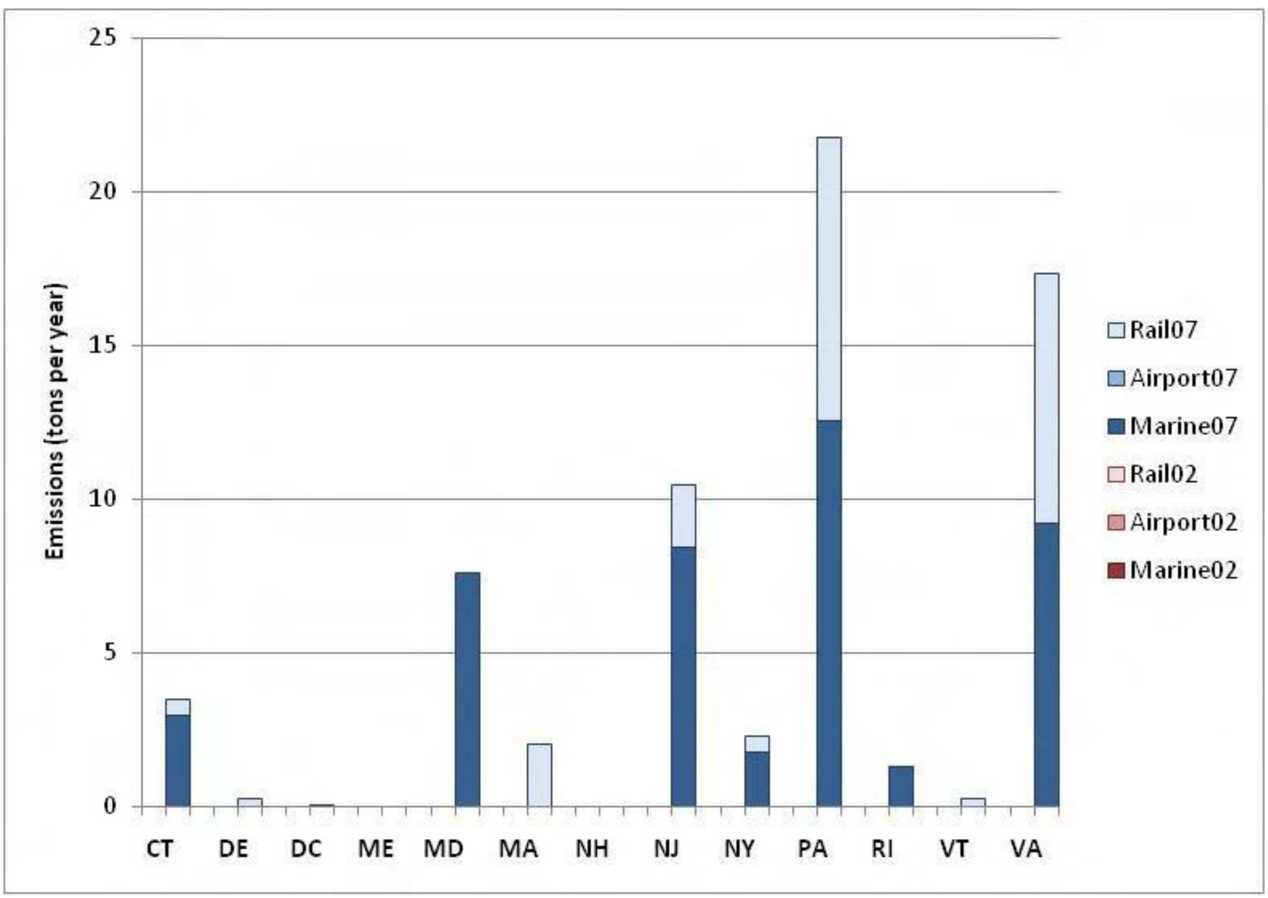


Exhibit 6.6 – 2002 and 2007 MAR NOx Emissions by State (tons/year)

	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%**

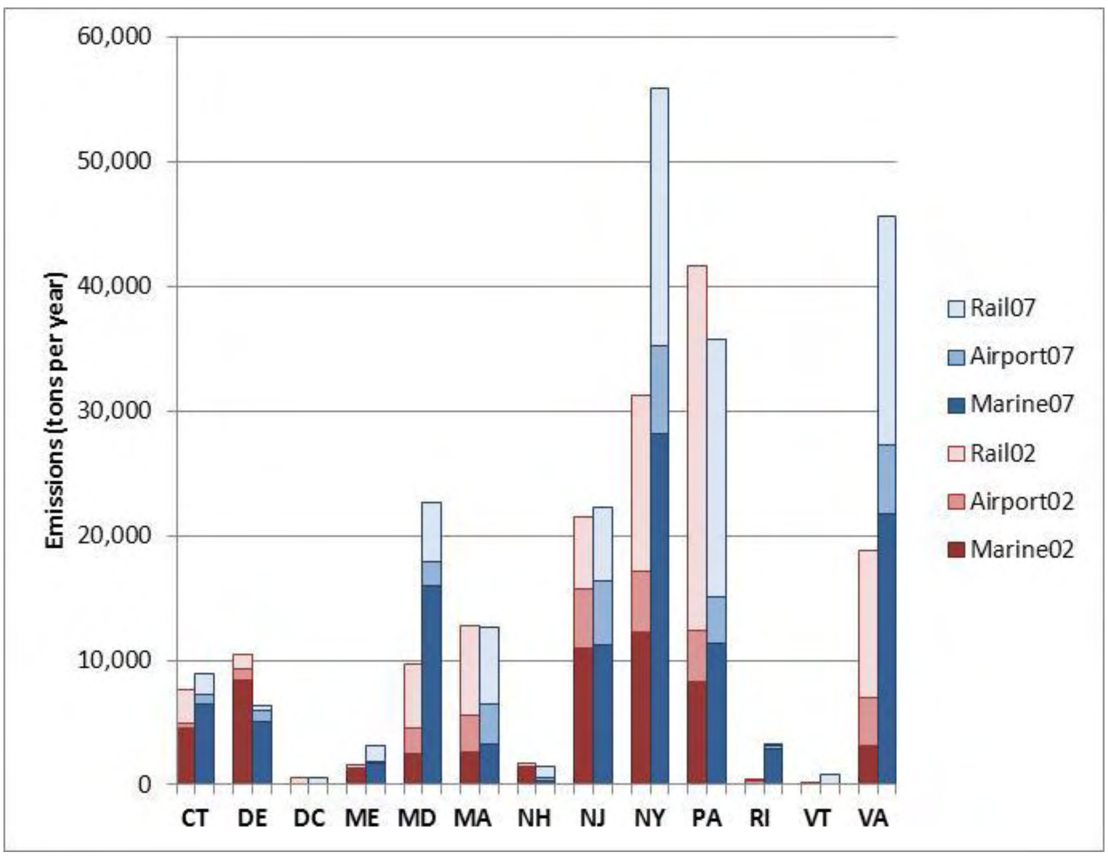


Exhibit 6.7 – 2002 and 2007 MAR PM10-PRI Emissions by State (tons/year)

	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%**

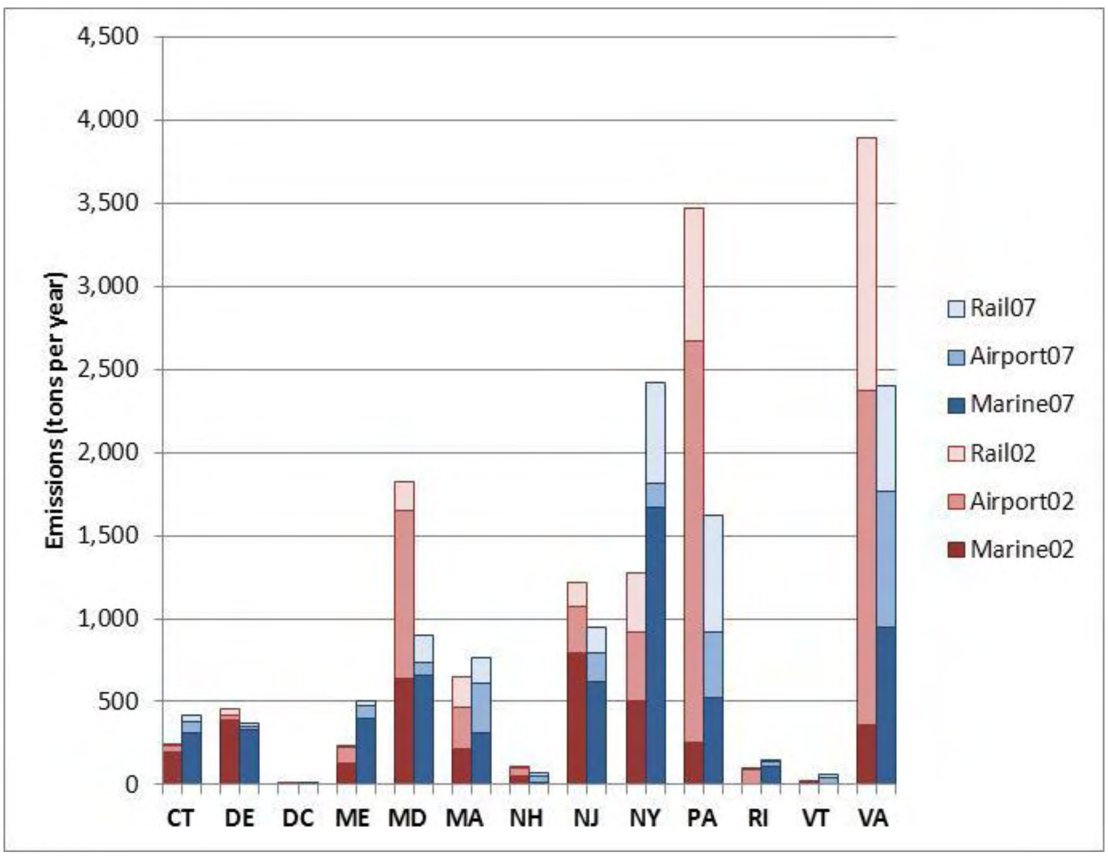


Exhibit 6.8 – 2002 and 2007 MAR PM25-PRI Emissions by State (tons/year)

	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%**

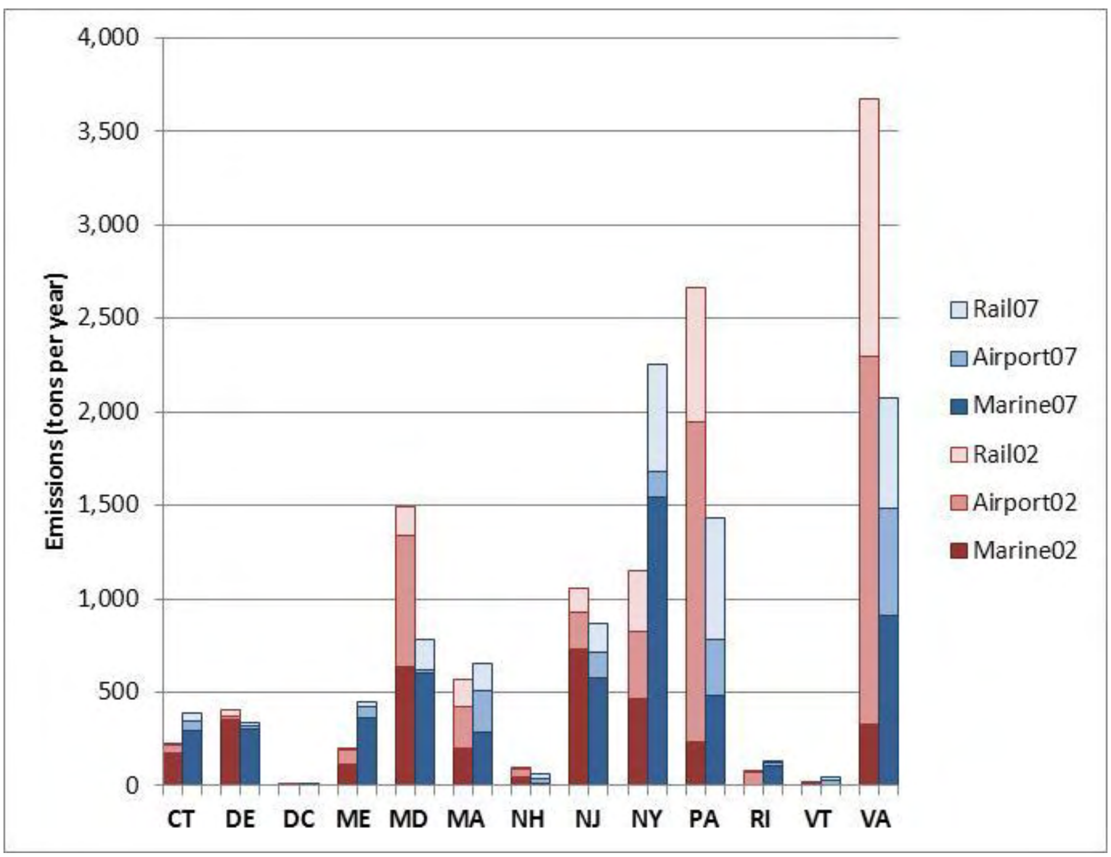


Exhibit 6.9 – 2002 and 2007 MAR SO2 Emissions by State (tons/year)

	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%**

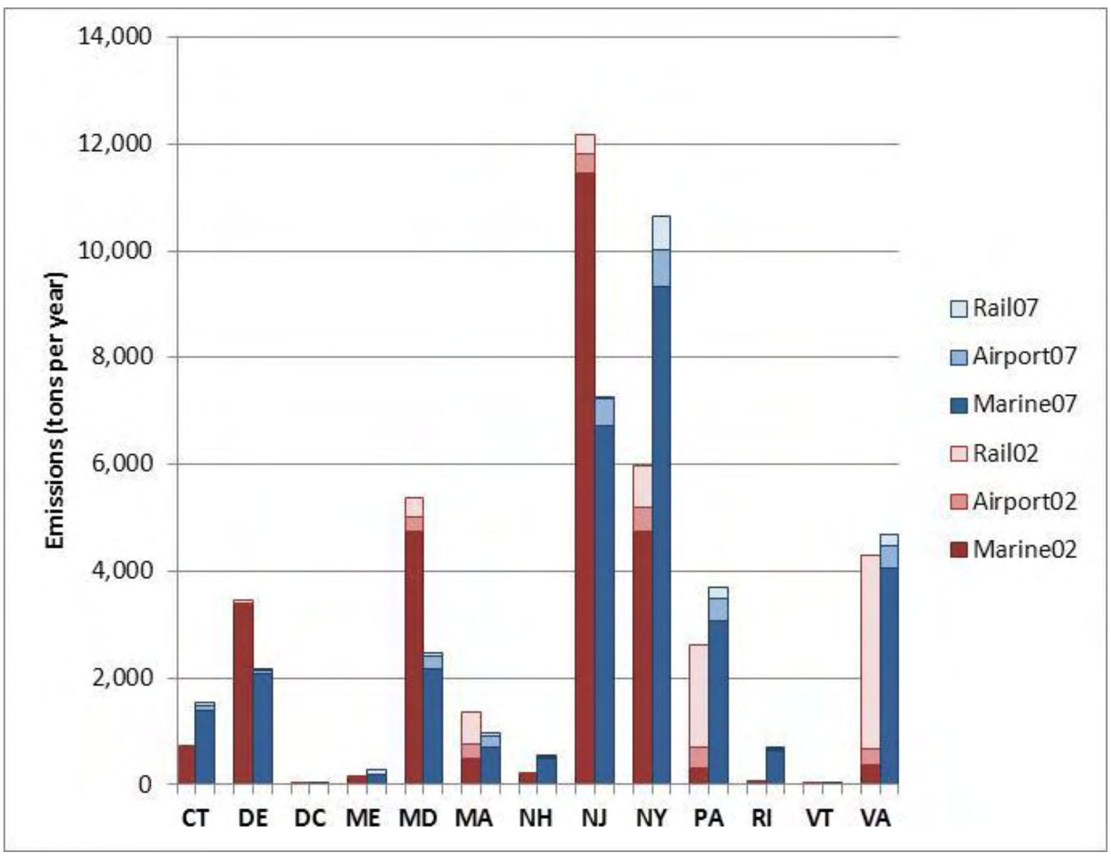
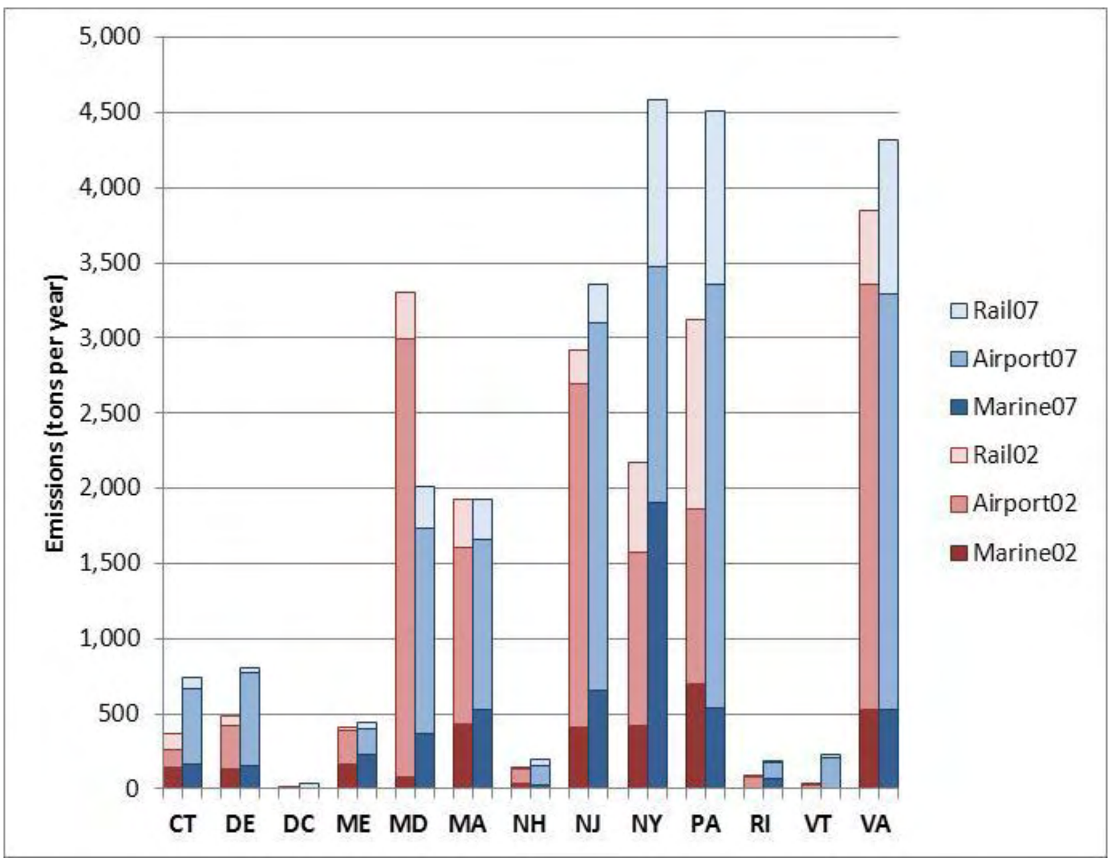


Exhibit 6.10 – 2002 and 2007 MAR VOC Emissions by State (tons/year)

	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

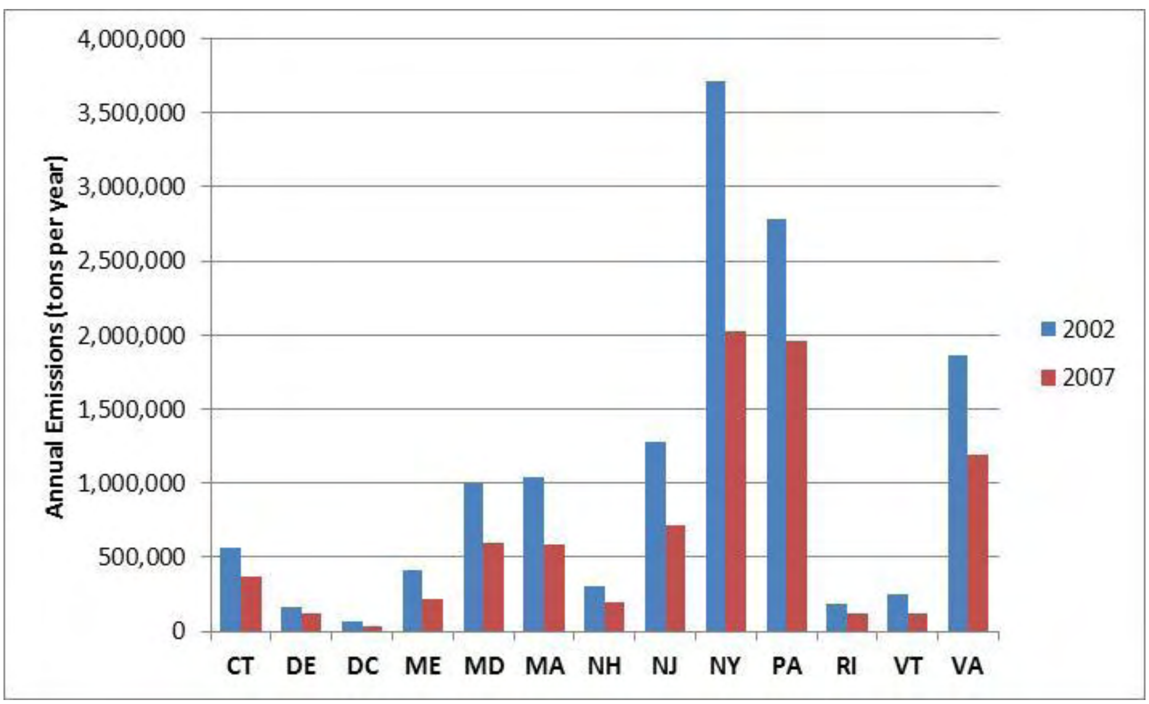


Exhibit 7.3 – 2002 and 2007 Onroad NH3 Emissions by State (tons/year)

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

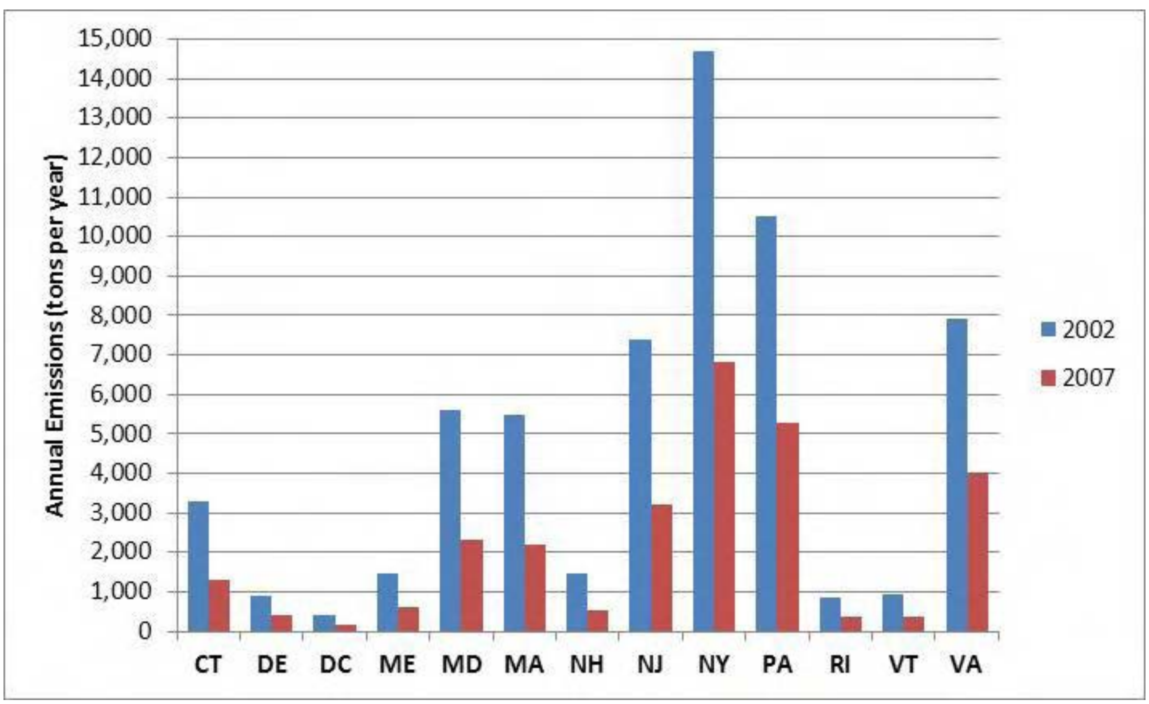


Exhibit 7.4 – 2002 and 2007 Onroad NOx Emissions by State (tons/year)

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

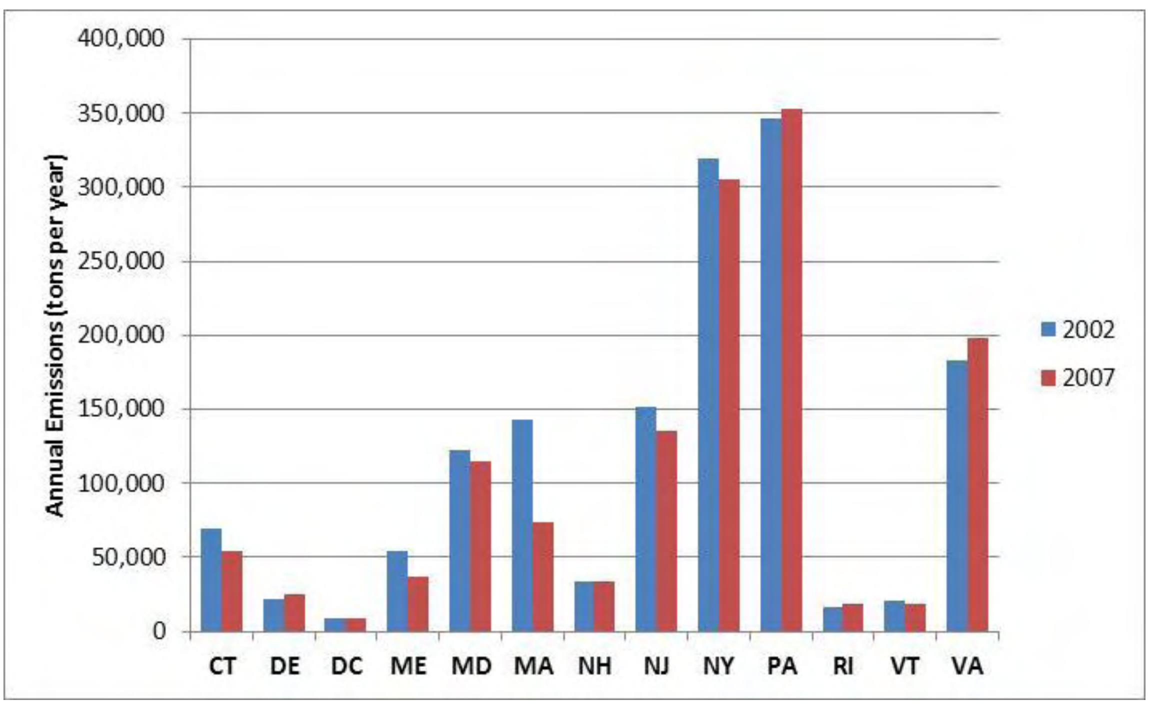


Exhibit 7.5 – 2002 and 2007 Onroad PM10-PRI Emissions by State (tons/year)

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

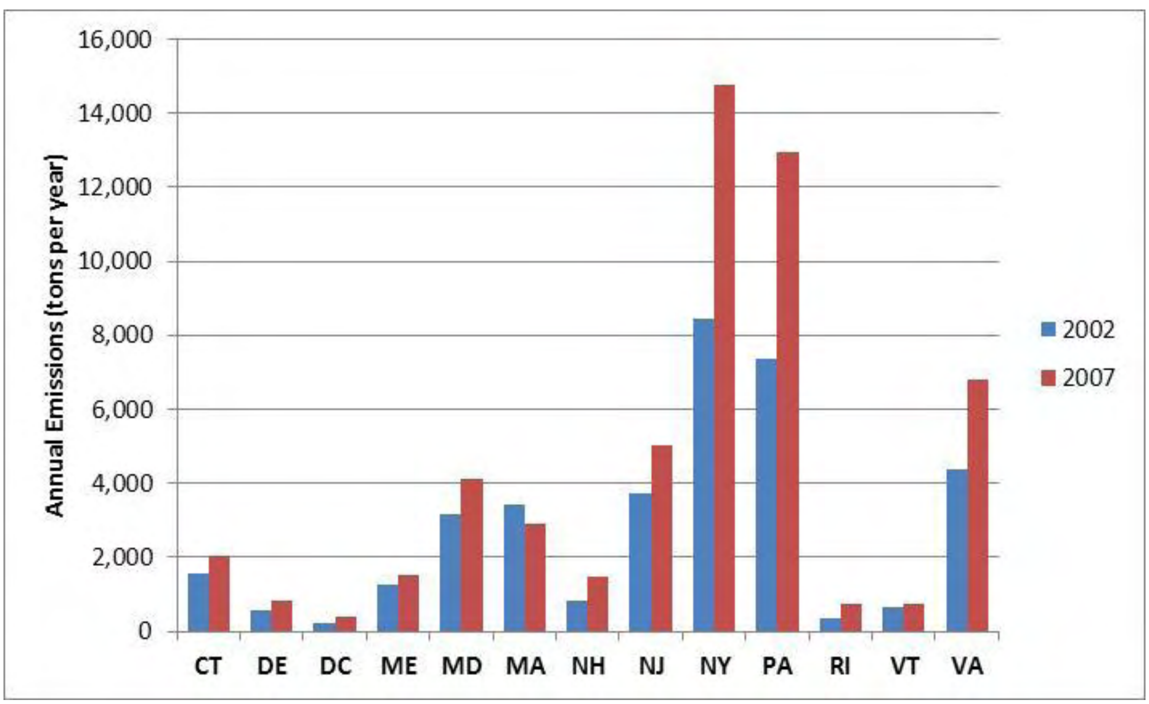


Exhibit 7.6 – 2002 and 2007 Onroad PM25-PRI Emissions by State (tons/year)

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

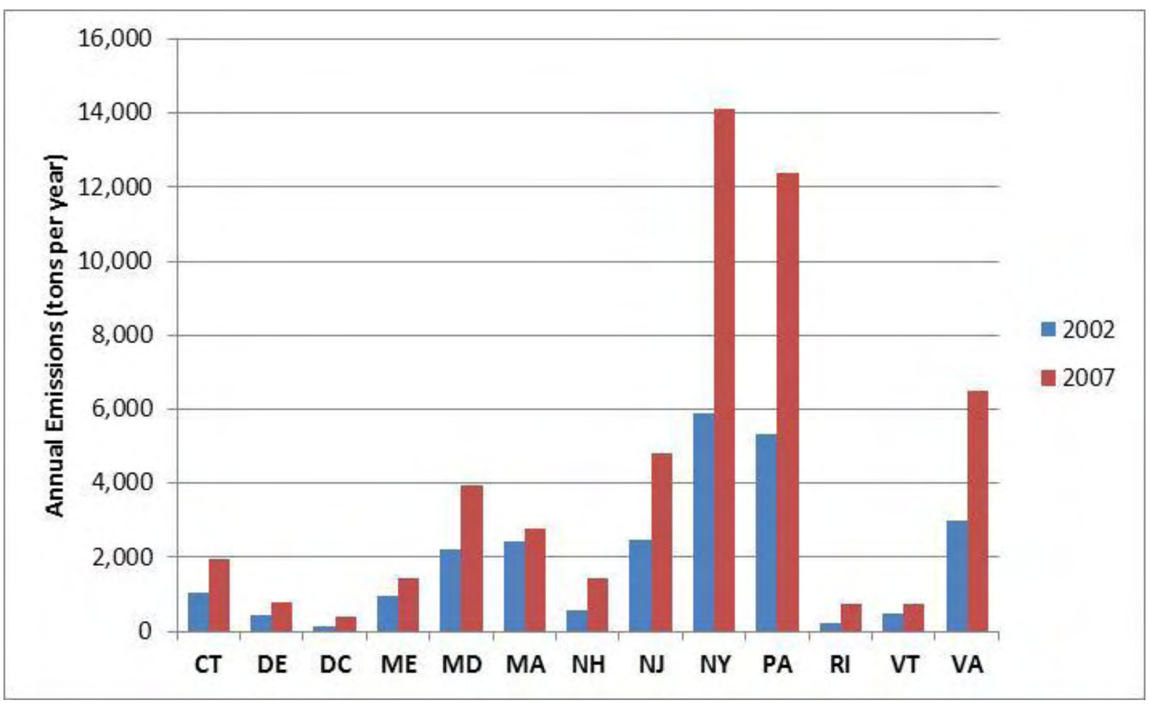


Exhibit 7.7 – 2002 and 2007 NMIM/NONROAD SO2 Emissions by State (tons/year)

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

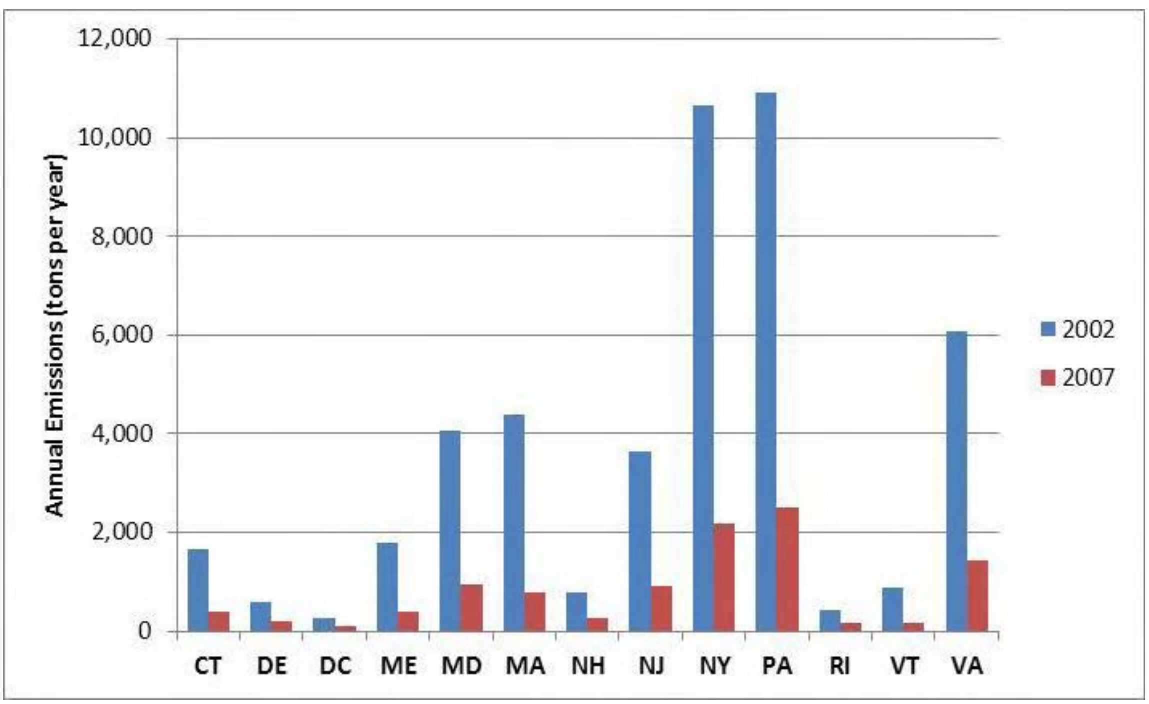
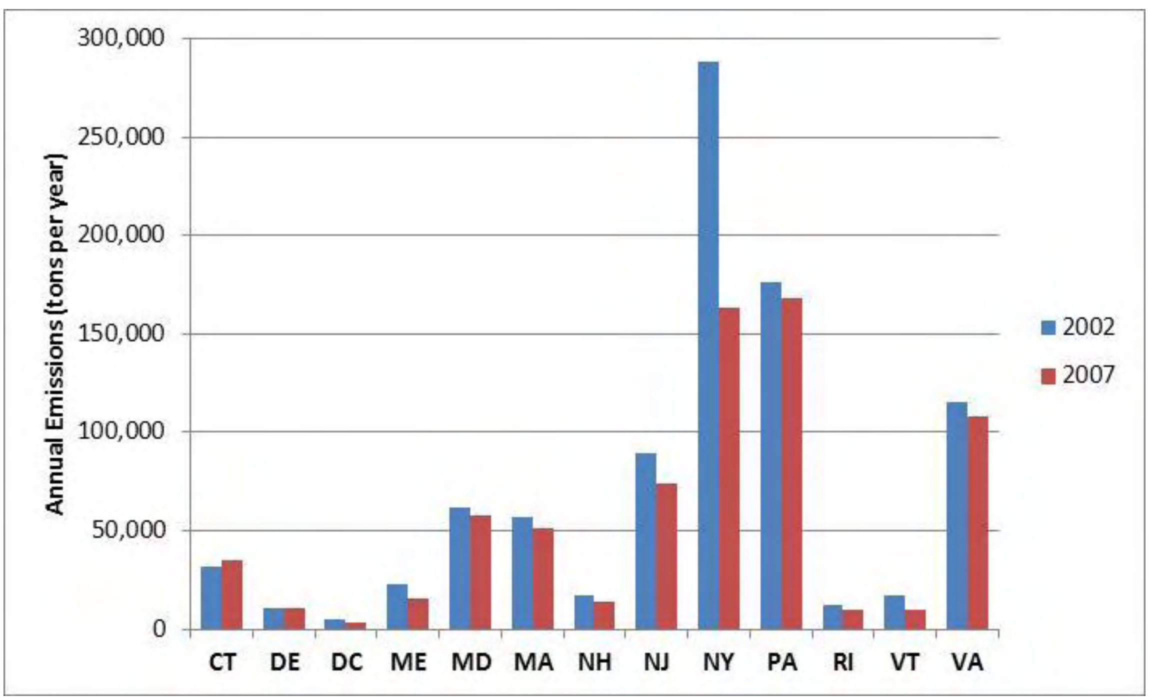


Exhibit 7.8 – 2002 and 2007 Onroad VOC Emissions by State (tons/year)

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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Appendix G

Technical Support Document for the Development of the 2017/2020 Emission Inventories for Regional Air Quality Modeling in the Northeast/Mid-Atlantic Region; ver. 3.3

Technical Support Document
for the
Development of the 2017 / 2020
Emission Inventories
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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List of Exhibits

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
CTG	Control Technique Guideline
EGU	Electric Generating Unit
ERTAC	Eastern Regional Technical Advisory Committee
FIPS	Federal Information Processing Standard
GACT	Generally available control technology
GSE	Ground Support Equipment
MACT	Maximum Achievable Control Technology
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 (< 1 micron)
PM-FIL	Primary PM, Filterable portion only
PM-PRI	Primary PM, includes filterables and condensables PM-PRI= PM-FIL + PM-CON

Acronym	Description
PM10-FIL	Primary PM10, Filterable portion only
PM10-PRI	Primary PM10, includes filterables and condensables, PM10- PRI = PM0-FIL + PM-CON
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 and methods used to prepare criteria air pollutant (CAP) and ammonia (NH3) emission projections for 2017 and 2020 for the Northeast and Mid-Atlantic/Northeast region. The region includes the jurisdictions in the Mid-Atlantic / Northeast Visibility Union (MANE-VU) area plus Virginia. In this document, these jurisdictions 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.

1.1 INVENTORY PURPOSE

The MANE-VU+VA regional inventories 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. The emission inventories will support a single integrated, one-atmosphere air quality modeling platform, state air quality attainment demonstrations, and other state air quality technical analyses.

The future year inventories account for emissions growth associated with changes in population, fuel use, and economic activity. The future year inventories also refect the emission changes between 2007 and the two future years that are projected under two emission control scenarios:

- Existing Controls – this scenario represents the best estimates for the future year, accounting for all in-place controls that are fully adopted into federal or individual state regulations or State Implementation Plans (SIPs). In the past, this inventory is also referred to as the "on-the-books (OTB)" inventory. Air quality modelers often refer to this scenario as the "future base case."
- Potential New OTC Controls – this scenario accounts for all of the emission reductions from the existing control scenario plus new state or regional measures that are under consideration by the Ozone Transport Commission (OTC) or individual states. This is a "what if" scenario that assumes that all states in the MANE-VU+VA region except Virginia will adopt all new OTC control measures under consideration by 2017. Air quality modelers sometimes call this the "future control case." It does not include any potential new federal control measures that are under consideration.

The U.S. Environmental Protection Agency (USEPA) has provided guidance on developing emission projections to be used with models and other analyses for demonstrating attainment of air quality goals for ozone, fine particles, and regional haze (USEPA 1999, USEPA 2005a, USEPA 2007a). In addition, the USEPA has recently developed its own emission projections that provide data on growth and future controls that were useful in developing the MANE-VU+VA future year emission inventories (USEPA 2010a). The guidance and information available from USEPA was followed and used, as appropriate, in developing the future year emission projections.

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 six general categories are needed to support air quality modeling: electric generating units (EGUs), stationary nonEGU point-sources, stationary area-sources, on-road mobile sources, nonroad mobile sources, and biogenic/geogenic emissions. This report documents the development of emission projections for three of these sectors, as follows:

- **NonEGU Point Sources** are individual facilities and are further subdivided by stack, emission unit ("point"), and emission process ("segment"). Point source data include source-specific information on source location (e.g., latitude/longitude coordinates); stack parameters (stack diameter and height, exit gas temperature and velocity); type of process (source classification code {SCC}); and annual emissions.

- **Stationary Area Sources** include sources that in and of themselves are quite small, but in aggregate may contribute significant emissions. Examples include small industrial/commercial facilities, residential heating furnaces, VOCs volatizing from house painting or consumer products, gasoline service stations, and agricultural fertilizer/pesticide application.

- **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 railroad locomotives (MAR), 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 MAR sources, these emissions were estimated based on data and methodologies used in recent USEPA regulatory impact analyses.

For these three sectors, emissions projections were compiled on an annual basis to represent conditions in 2017 and 2020.

Emission projections for the three other sectors are being developed by the OTC under separate efforts:

- **EGU Point Sources** are units that generate electric power and sell most of that power to the electrical grid. Emission projections for EGUs are being developed as part of an inter-RPO coordination effort under the direction of the Eastern Regional Technical Advisory Committee (ERTAC).

- **On-road Mobile Sources** are sources of air pollution from internal combustion engines used to propel cars, trucks, buses, and other vehicles on public roadways. Emission projections for on-road mobile sources are being developed under a separate effort by the OTC that will use the USEPA Motor Vehicle Emission Simulator (MOVES) model.

- **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. Emission projections for biogenic sources will be developed under a separate effort by the OTC modeling team.

Documentation of the emission projections for these three sectors will be available from the OTC.

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). Spreadsheets summarizing emissions by county, sector, source classification code, and pollutant were also prepared.

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 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. Emission inventory files were prepared in SMOKE compatible format.

1.5 INVENTORY VERSIONS

1.5.1 Version 1 Modeling Inventory

Work commenced in 2009 to assemble comprehensive 2007 and future year emission inventories to support air quality modeling. Using data available from state agencies and the USEPA, detailed point and area source emission inventories were compiled. The NONROAD model was used to estimate emissions for the nonroad equipment categories included in the model. State and USEPA data were used to assemble the inventory for nonroad sources not included in the NONROAD model (marine vessels, aircraft, and railroad locomotives, collectively referred to as the MAR sector).

For the point, area, and MAR sectors, growth factors are applied to account for changes in population, fuel use and economic activity. Next, control factors are applied to account for future emission reductions from post-2007 control measures. The NONROAD model was used to project emissions for the nonroad equipment included in the model. The control scenario developed accounted for post-2007 emission reductions from promulgated federal, State, local, and site-specific control programs and proposed control programs that are reasonably anticipated to result in post-2007 emission reductions. A series of quality assurance steps are conducted to ensure the development of complete, accurate, and consistent emission inventories. The inventories are provided in two formats – SMOKE One-Record-Per-Line (ORL) format and a spreadsheet format suitable for SIP submittals. Finally, emission summary tables by state and pollutant were developed.

Version 1 of the 2007 base year inventory and the emission projections for 2013/2017/2020 were released for state and stakeholder review in late 2009 and early 2010.

1.5.2 Version 2 Modeling Inventory

Following the review of Version 1, significant efforts were made to improve the inventory by using more state-specific data and correcting errors or omissions that were uncovered. These improvements were completed in February of 2011 and are referred to as Version 2 of the MANE-VU+VA 2007 and 2013/2017/2020 inventories. The inventories were documented in two TSDs (MARAMA 2011a, MARAMA 2011b).

1.5.3 Version 3 Modeling Inventories with Existing and Potential Controls

Beginning in the fall of 2011, MARAMA sponsored development of Version 3 of the 2007 base year modeling inventory to incorporate new paved road emission estimates, revised modeling of nonroad and onroad sources, and other state-specific changes (MARAMA2012).

This report documents the development of Version 3 of the future year inventories for the area source, nonEGU, and nonroad sectors. The future year modeling inventories for EGU) are currently being developed under a separate effort lead by ERTAC. The future year modeling inventories for onroad sources are currently being developed by NESCAUM, MARAMA or individual states.

In Version 3, the state Air Directors issued guidance on the future year emission control scenarios to be developed, as follows:

- "A special meeting of the Air Directors was convened to discuss the controlled inventory. During that call many Air Directors indicated that they would not be able to clearly identify which of the control measures their states would adopt because of the uncertainty surrounding the ozone standard. Therefore, all states, except Virginia, requested that the contractor be instructed to calculate the effect of all measures being fully adopted by both 2017 and 2020. This will allow modelers to assess the potential effect of the measures if they were fully implemented on air quality. We can also then test the assumptions that we have been making about the cumulative percent reduction from the measures."

Thus, these TSD discusses two future control scenarios: an "existing controls" scenario scenario intended to include all 2017/2020 control measaures included in an individual state's regulations or SIP, and a "what if" scenario that assumes that all states adopt certain new control measures by 2017.

1.6 REPORT ORGANIZATION

Section 2 describes how point source emission units were classified into the EGU or nonEGU point source categories. Section 3 discusses the growth projection factors assembled for area and nonEGU point sources. Sections 4 and 5 describe the control factors used for area and nonEGU point sources, respectively. Section 6 describes the NONROAD model runs made for the future years. Section 7 documents how emissions for marine vessels, aircraft, and railroad equipment were projected. Section 8 provides state level emission pollutant summaries for area, nonEGU point, NONROAD, and MAR sectors. Section 9 documents the creation of SMOKE inventory modeling input files. Section 10 identifies the file names for final deliverable products. References for the TSD are provided in Section 11.

2.0 IDENTIFICATION OF EGU AND NONEGU POINT SOURCES

Only the emissions from point sources classified as nonEGUs are being projected using the methods and data contained in this report. Emissions from EGU point sources are being developed by ERTAC.

States were asked to classify units in the 2007 MANE-VU+VA emissions inventory as either EGU or nonEGU. Most, but not all, of the units that are required to report hourly emissions to USEPA's Clean Air Markets Division (CAMD) are classified as EGUs. CAMD implements USEPA's rule found in Volume 40 Part 75 of the Code of Federal Regulations (CFR), which requires an hourly accounting of emissions from each affected unit - i.e., sources participating in an emissions cap and trade program under the Acid Rain Control Program, the NOx Budget Trading Program, or the Clean Air Interstate Rule.

For the ERTAC projection methodology, the following guidance was provided to states to classify a unit as an EGU if it meets the following criteria:

- An EGU sells most of the power generated to the electrical grid;
- An EGU burns mostly commercial fuel. Commercial fuel in this case means natural gas, oil, and coal. Wood is not considered a commercial fuel because some states identify wood as renewable. Therefore, to avoid double counting, units that burn wood and other renewable sources (depending on each state's own definition) should not be considered as an EGU (unless it is already in the CAMD database).

The following are units were not considered as EGU for emission projections: (1) a unit that generates power for a facility but occasionally sells to the grid; (2) emergency generators; or (3) distributed generation units.

States were provided with a list of units that report to CAMD (USEPA 2009a) and a list of units with an electric generating unit SCC (1-01-xxx-xx or 2-01-xxx-xx). States identified which units should be classified as EGUs and which should be classified as nonEGUs. Appendix A identifies the units that report emissions to CAMD and whether they are classified as EGUs or nonEGUs for emission projection purposes. A few states also identified units with SCCs beginning with 1-01 or 2-01 that do not report to CAMD but which should be classified as EGUs; however, for emission projection purposes these units will be processed using the nonEGU projection methodology described in this report.

Exhibits 2.1 to 2.7 summarize EGU and nonEGU emissions for 2007. For these exhibits, EGUs are defined as units that report emissions to CAMD and have been classified as EGUs by the states for emission projection purposes.

Exhibit 2.1 2007 EGU and NonEGU Point Source CO Emissions (tons per year)

State	EGU	NonEGU	Total
CT	1,095	2,584	3,679
DE	726	7,027	7,753
DC	10	301	311
ME	460	14,023	14,483
MD	4,196	77,574	81,770
MA	5,516	4,592	10,108
NH	910	2,254	3,164
NJ	3,640	6,932	10,572
NY	13,480	52,877	66,357
PA	20,900	80,540	101,440
RI	602	1,051	1,653
VT	1,444	702	2,146
VA	7,273	63,080	70,353
TOTAL	**60,252**	**313,537**	**373,789**

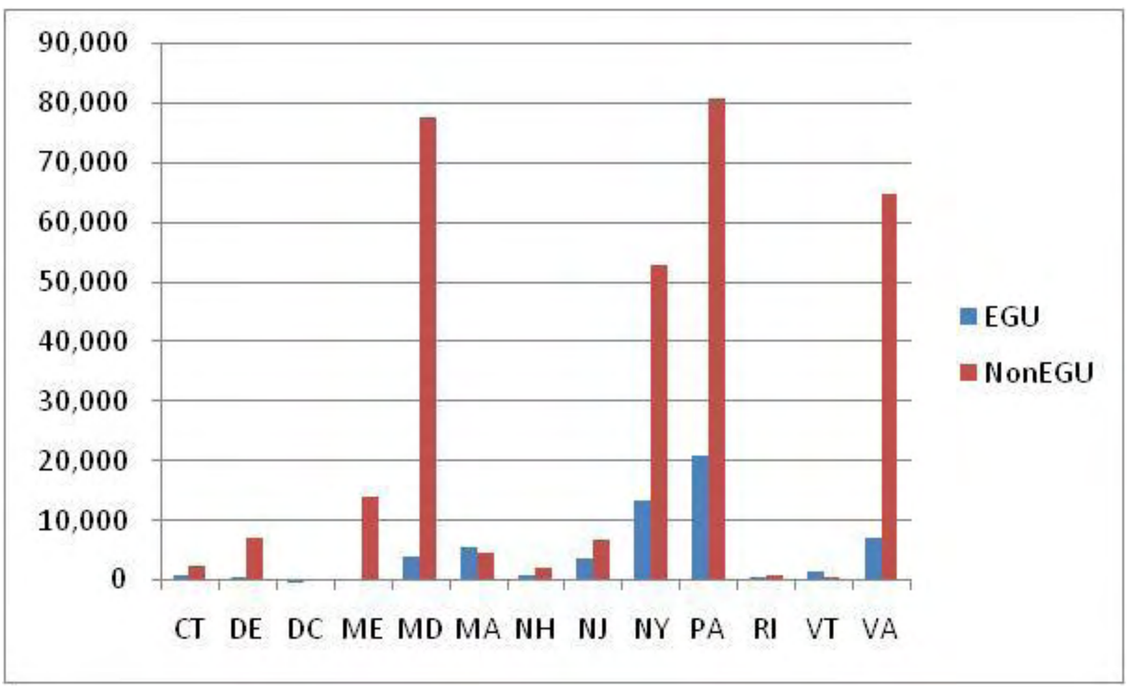


Exhibit 2.2 2007 EGU and NonEGU Point Source NH3 Emissions (tons per year)

State	EGU	NonEGU	Total
CT	0	0	0
DE	32	62	94
DC	0	0	0
ME	59	606	665
MD	0	137	137
MA	283	365	648
NH	98	30	128
NJ	708	210	918
NY	1,354	1,063	2,417
PA	309	2,070	2,379
RI	58	16	74
VT	0	0	0
VA	212	1,618	1,830
TOTAL	**3,113**	**6,177**	**9,290**

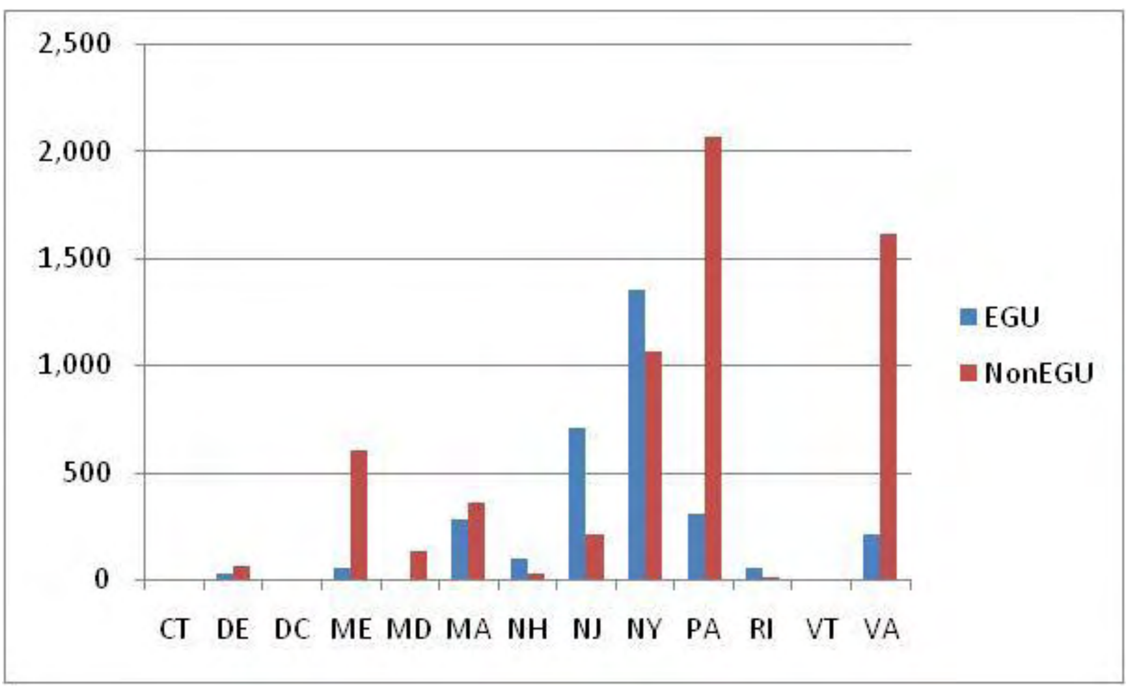


Exhibit 2.3 2007 EGU and NonEGU Point Source NOx Emissions (tons per year)

State	EGU	NonEGU	Total
CT	3,760	6,301	10,061
DE	10,507	5,121	15,628
DC	55	734	789
ME	696	17,050	17,746
MD	51,418	23,472	74,890
MA	10,755	12,873	23,628
NH	4,754	2,687	7,441
NJ	16,571	14,030	30,601
NY	47,450	35,583	83,033
PA	186,997	71,382	258,379
RI	494	950	1,444
VT	370	441	811
VA	62,673	50,265	112,938
TOTAL	**396,500**	**240,889**	**637,389**

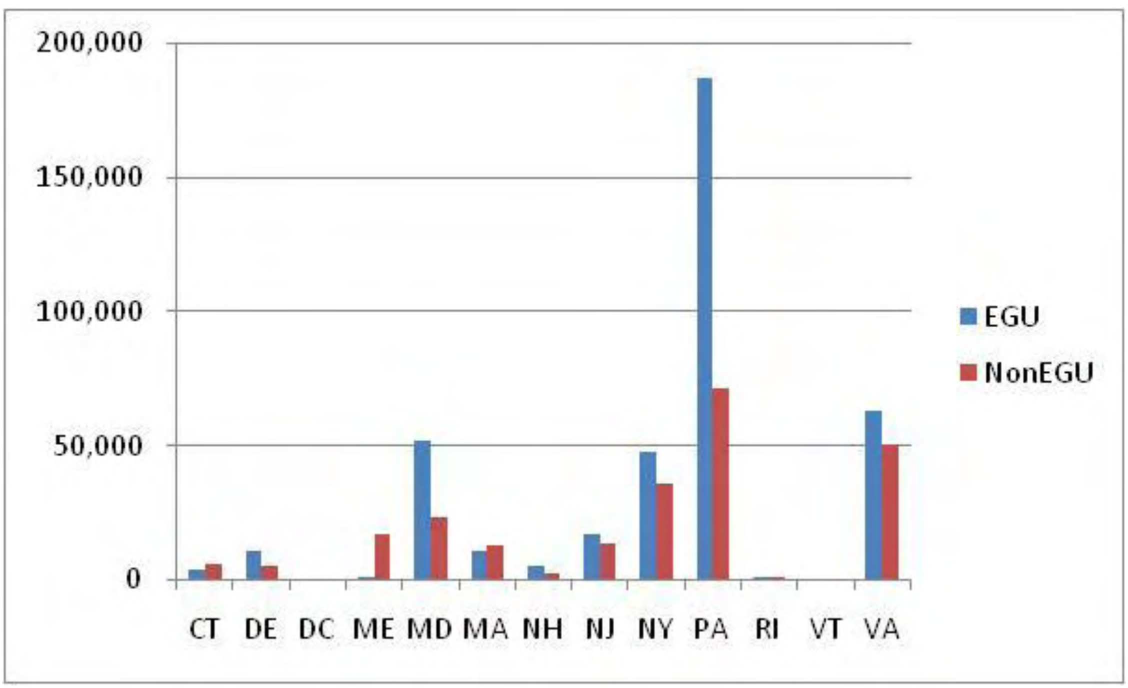


Exhibit 2.4 2007 EGU and NonEGU Point Source PM10 Emissions (tons per year)

State	EGU	NonEGU	Total
CT	705	645	1,350
DE	2,268	1,197	3,465
DC	13	46	59
ME	148	4,748	4,896
MD	13,611	5,711	19,322
MA	2,575	3,029	5,604
NH	784	1,141	1,925
NJ	4,496	3,188	7,684
NY	5,044	4,463	9,507
PA	27,470	22,275	49,745
RI	16	173	189
VT	0	146	146
VA	6,175	13,028	19,203
TOTAL	**63,305**	**59,790**	**123,095**

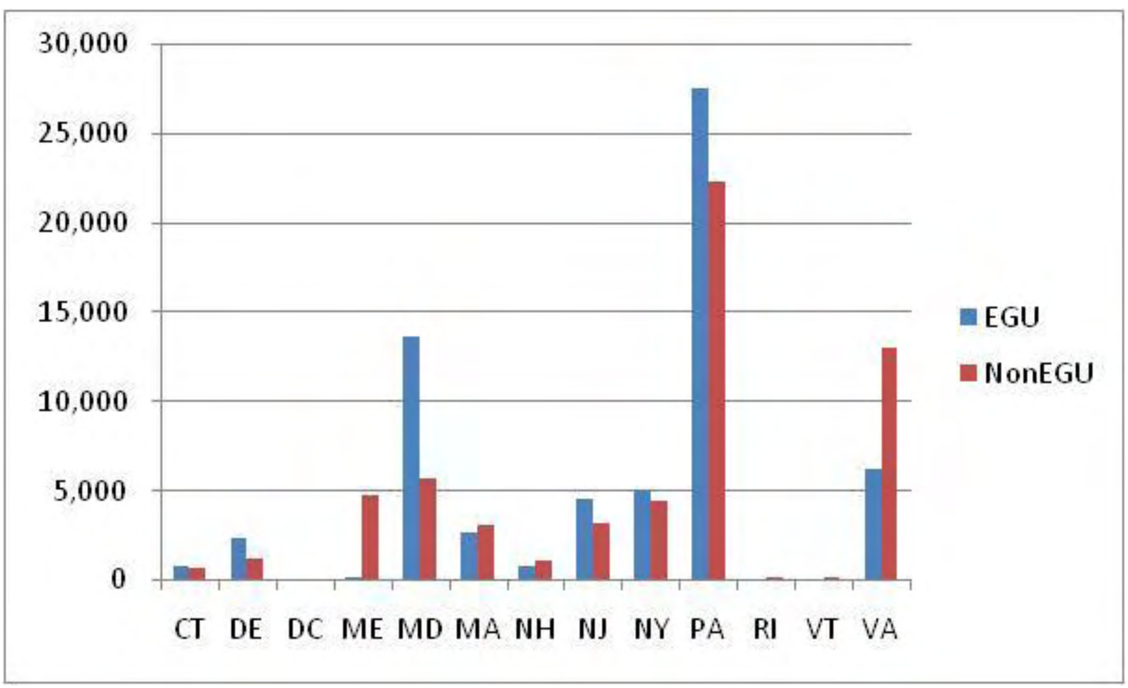


Exhibit 2.5 2007 EGU and NonEGU Point Source PM2.5 Emissions (tons per year)

State	EGU	NonEGU	Total
CT	669	573	1,242
DE	2,024	1,083	3,107
DC	10	43	53
ME	125	3,727	3,852
MD	11,805	3,877	15,682
MA	2,292	2,572	4,864
NH	602	1,061	1,663
NJ	4,410	2,453	6,863
NY	3,585	2,414	5,999
PA	19,071	13,389	32,460
RI	16	124	140
VT	0	114	114
VA	4,593	10,295	14,888
TOTAL	**49,202**	**41,725**	**90,927**

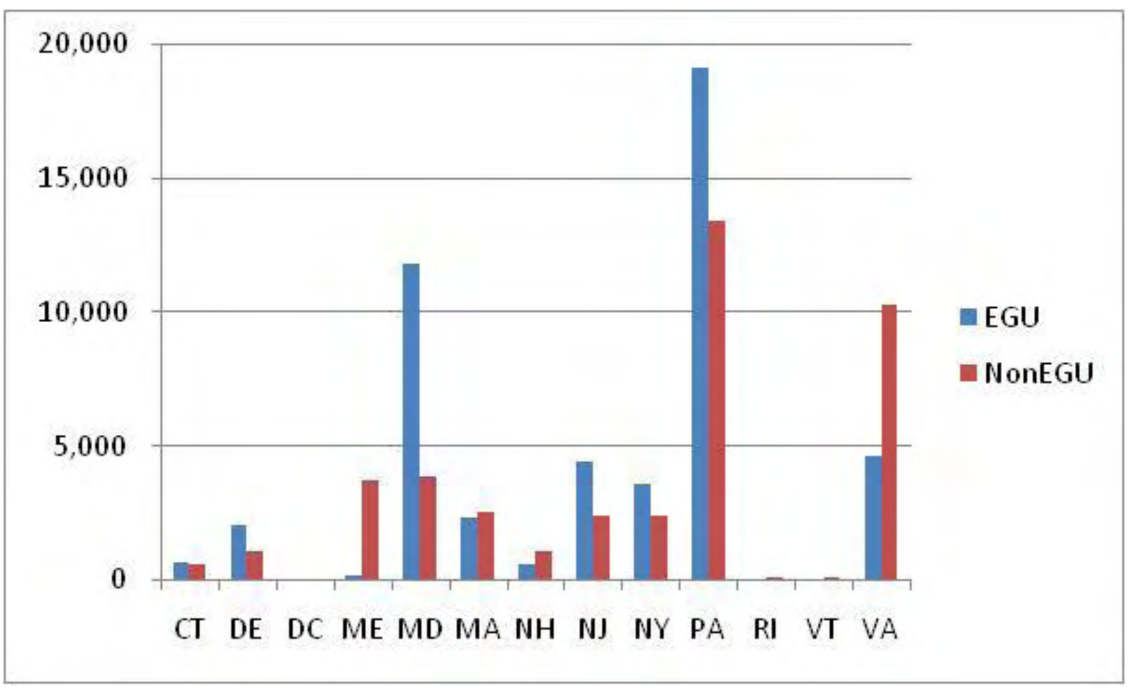


Exhibit 2.6 2007 EGU and NonEGU Point Source SO2 Emissions (tons per year)

State	EGU	NonEGU	Total
CT	4,786	3,185	7,971
DE	34,882	8,206	43,088
DC	141	471	612
ME	1,677	15,571	17,248
MD	274,207	31,176	305,383
MA	54,172	9,057	63,229
NH	42,524	2,734	45,258
NJ	37,302	3,490	40,792
NY	108,444	44,307	152,751
PA	970,726	57,330	1,028,056
RI	16	1,500	1,516
VT	6	316	322
VA	188,562	54,486	243,048
TOTAL	**1,717,445**	**231,829**	**1,949,274**

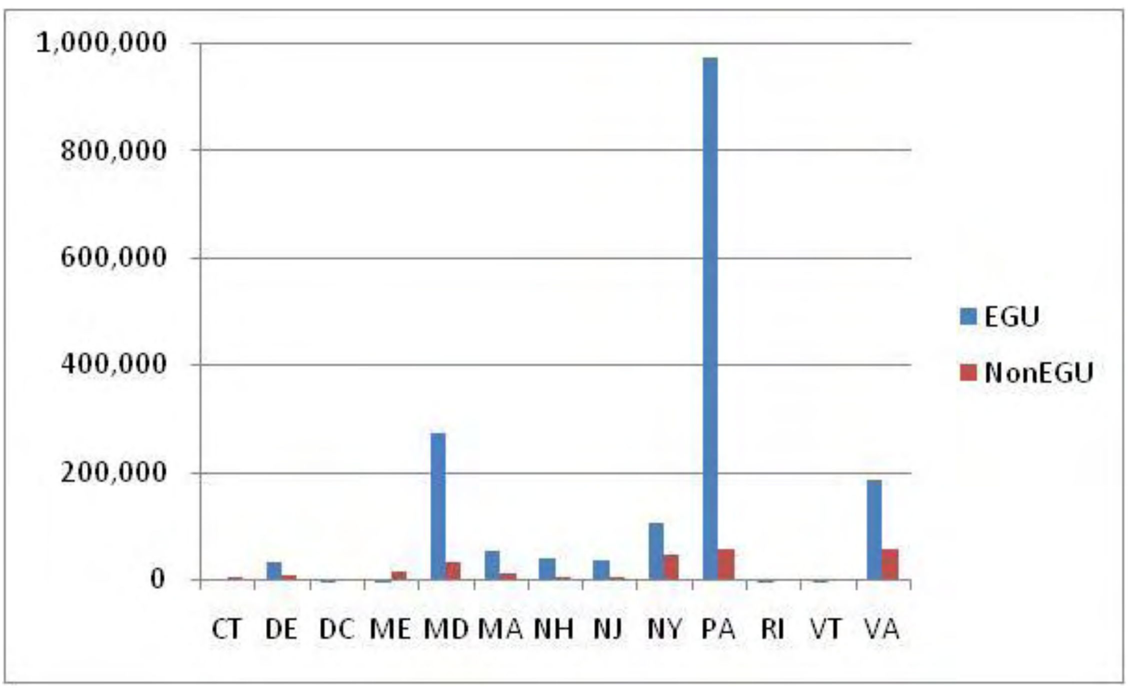
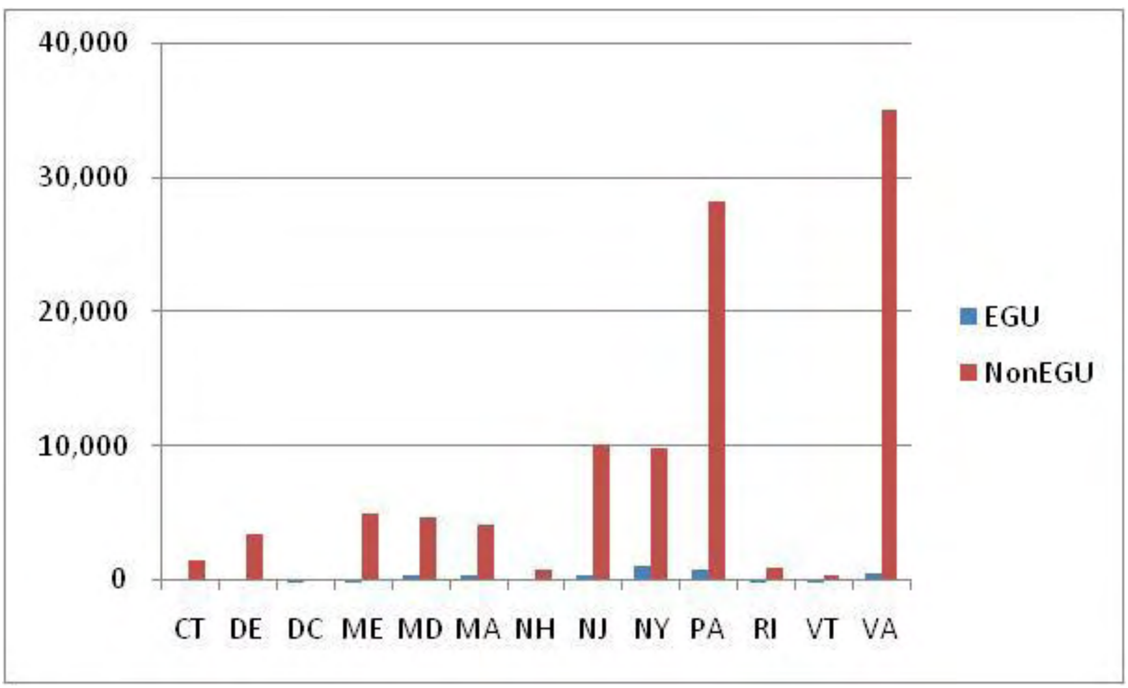


Exhibit 2.7 2007 EGU and NonEGU Point Source VOC Emissions (tons per year)

State	EGU	NonEGU	Total
CT	143	1,447	1,590
DE	83	3,406	3,489
DC	2	57	59
ME	35	4,987	5,022
MD	389	4,597	4,986
MA	463	4,094	4,557
NH	110	806	916
NJ	420	10,620	11,040
NY	1,119	9,772	10,891
PA	770	28,195	28,965
RI	49	921	970
VT	22	373	395
VA	600	35,018	35,618
TOTAL	**4,205**	**104,293**	**108,498**



3.0 GROWTH PROJECTION FACTORS FOR NONEGUs AND AREA SOURCES

The area and nonEGU point source growth factors were developed using six sets of data:

- The Annual Energy Outlook (AEO) fuel consumption forecasts;
- County-level population projections;
- State-level employment projections by NAICS code;
- County-level vehicle miles travelled (VMT) projections;
- USEPA projections for livestock and residential wood combustion; and
- Other state-specific emission projection data.

The priority for applying these growth factors was to first use the state-supplied projection data (if available). If state-supplied data were not provided, then the AEO projection factors were used for fuel consumption sources, and the population/employment/VMT data were used for other source categories.

3.1 AEO FUEL USE PROJECTIONS

The AEO is published annually by the U.S. Energy Information Administration (EIA). It presents long-term projections of energy supply, demand, and prices through 2035, based on results from EIA's National Energy Modeling System (NEMS). NEMS projects the production, imports, conversion, consumption, and prices of energy, subject to assumptions on macroeconomic and financial factors, world energy markets, resource availability and costs, behavioral and technological choice criteria, energy technology cost and performance characteristics, and demographics.

AEO provides regional fuel-use forecasts for various fuel types (e.g., coal, residual oil, distillate oil, natural gas) by end use sector (e.g., residential, commercial, industrial, transportation, and electric power). Energy use projections are reported at the Census division level. The census divisions grouped states as follows:

- South Atlantic - DE, DC, MD, VA
- Middle Atlantic – NJ, NY, PA
- New England – CT, ME, MA, NH, RI, VT

Appendices B1, B2, and B3 contain the AEO2010 fuel use projections for each of these three regions. Appendices B4, B5, and B6 contain the AEO2011 fuel use projections

Version 2 of the MANE-VU+VA future year inventories was developed using AEO2010 (EIA2010). After the release of Version 2, AEO2011 was published (EIA2011). MARAMA reviewed the updated fuel forecasts and compared the AEO2010 and AEO2011 projections. Appendix B7 documents MARAMA's analysis. MARAMA calculated the difference in projected fuel usage between AEO2010 and AEO2011 for the residential, commercial, industrial, transportation, and electric power sector for the distillate fuel oil, residual fuel oil, coal, natural gas, and renewable fuel types. MARAMA identified thresholds for what constitutes a major change as follows:

- An increase or decrease of 1% or less is considered to be no change and did not warrant a change in the growth factors between Versions 2 and 3 of the inventory;
- An increase or decrease of between 1% and 5% is considered to be a minor change, and states agreed that these differences between AEO2010 and AEO2011 did not warrant a change in the growth factors between Versions 2 and 3 of the inventory;
- An increase or decrease above 5% is considered a major change, and warrants a change in the growth factors used in Version 3.

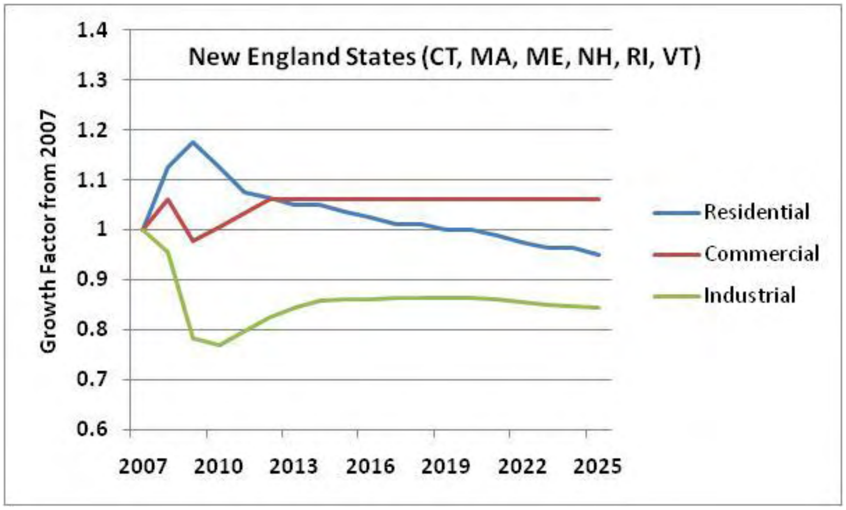
MARAMA recommended that the AEO2010 projections be retained for all residential, commercial, and industrial sector fuel use, except for industrial natural gas usage, where the AEO2011 projections will be used for Version 3 of the future year modeling inventory. New Jersey elected to use the more recent growth factors from AEO2011 instead of the AEO2010 growth factors for all area source fossil fuel use categories.

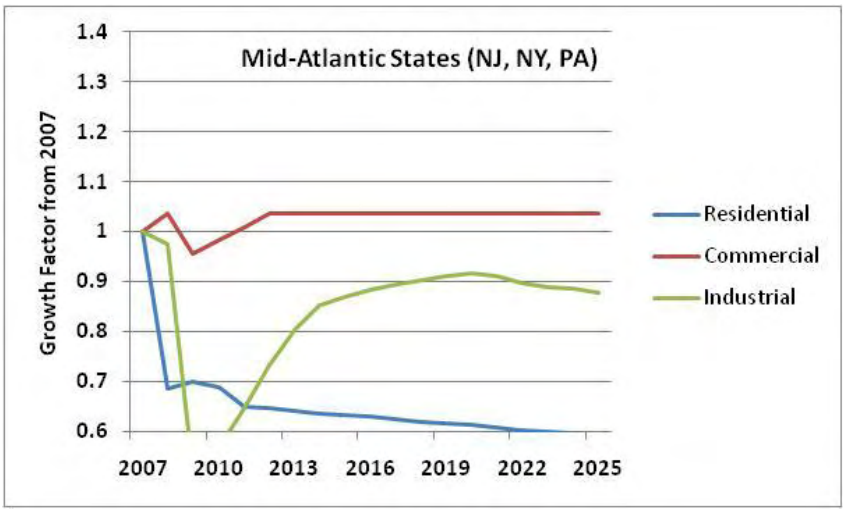
Exhibits 3.1 to 3.5 summarize the projected fuel use rates by source sector (residential, commercial, industrial, transportation) , AEO region, and fuel type for the years 2007 to 2025. The unusual growth in commercial residual oil use in the South Atlantic region could not be explained; Maryland elected to use manufacturing employment instead of the AEO2010 growth factor for commercial residual oil combustion, while Virginia and the District chose to assume flat growth in this sector.

3.2 POPULATION PROJECTIONS

States provided county-level 2007 populations and projections for future years. The historical and projection years varied from state-to-state, so values were interpolated, when necessary, to create population estimates for each year from 2007 to 2025. The population data were normalized to create growth factors from 2007 for each future year. For example, Delaware had a population of 861,087 in 2007 and the projected population in 2017 is 953,204, then the growth factor for 2017 is 953,204 / 861,087 = 1.107.

Population projections are provided in Appendix C. Exhibit 3.6 summarizes the population growth factors by state and AEO2010 region. Population is projected to grow in every state between 2007 and 2025. The population growth in the New England states varies significantly by state. Population growth in the South Atlantic states is projected to be much higher than in the New England and Mid-Atlantic states.





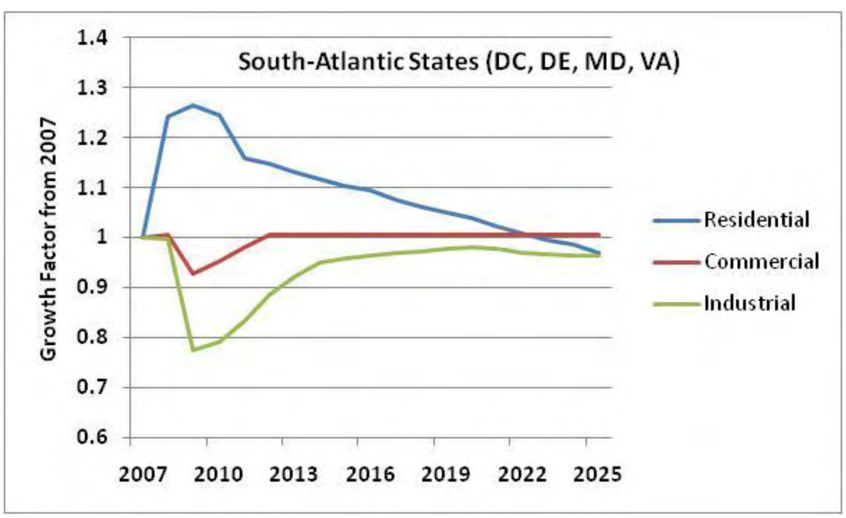
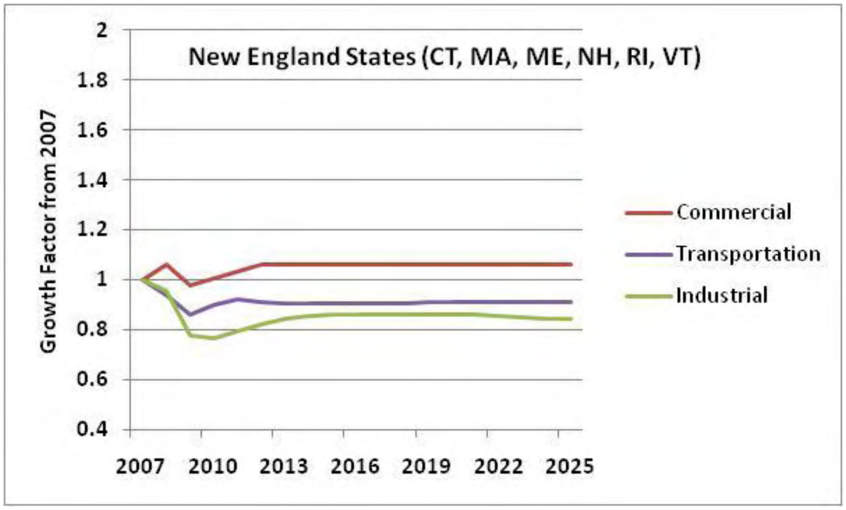
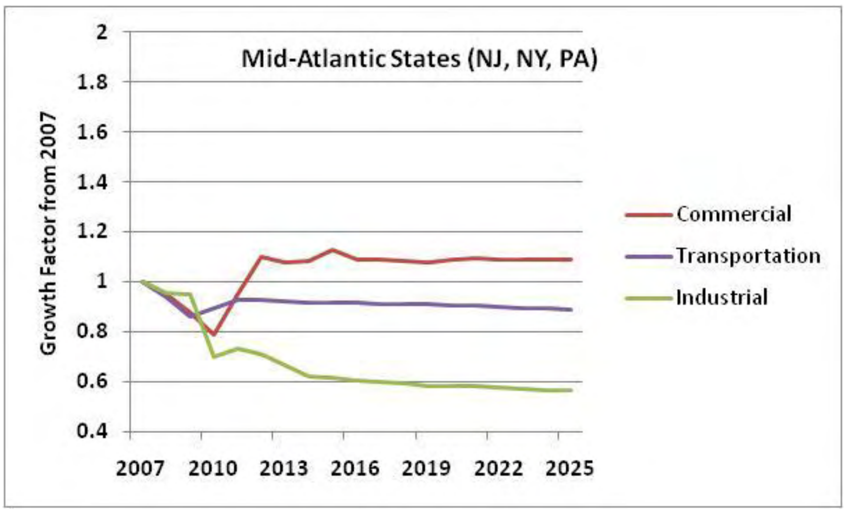


Exhibit 3.1 AEO2010 Growth Factors for Coal by AEO Region 2007 – 2025





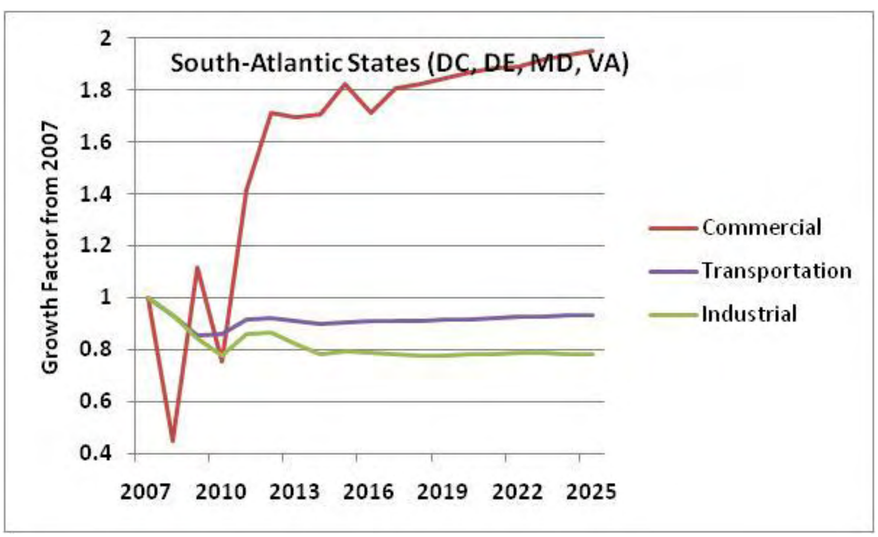
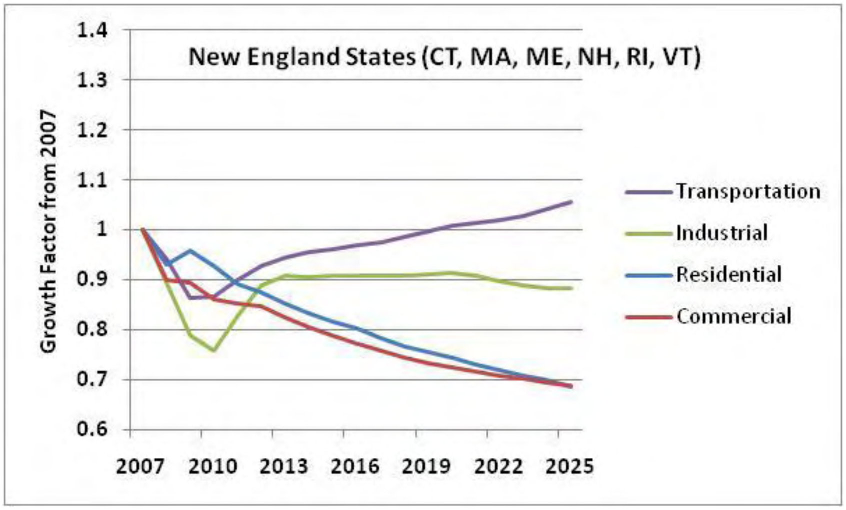
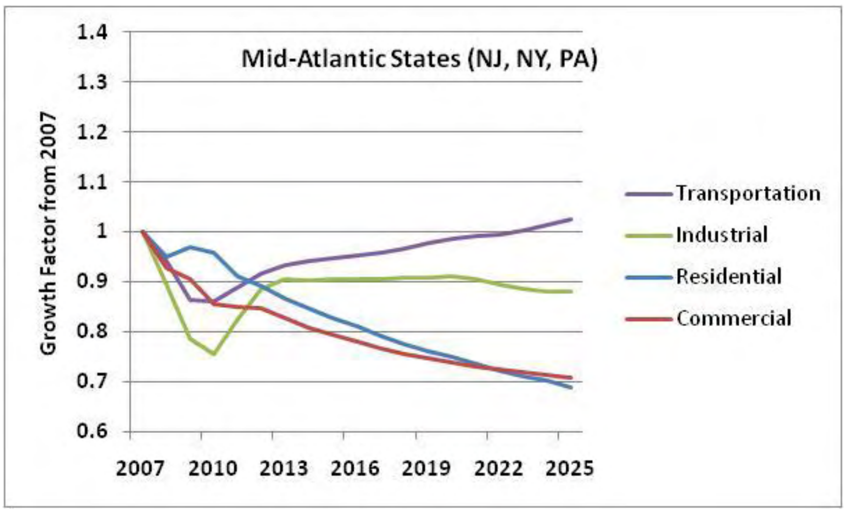


Exhibit 3.2 Growth Factors for Residual Oil by AEO Region 2007 – 2025





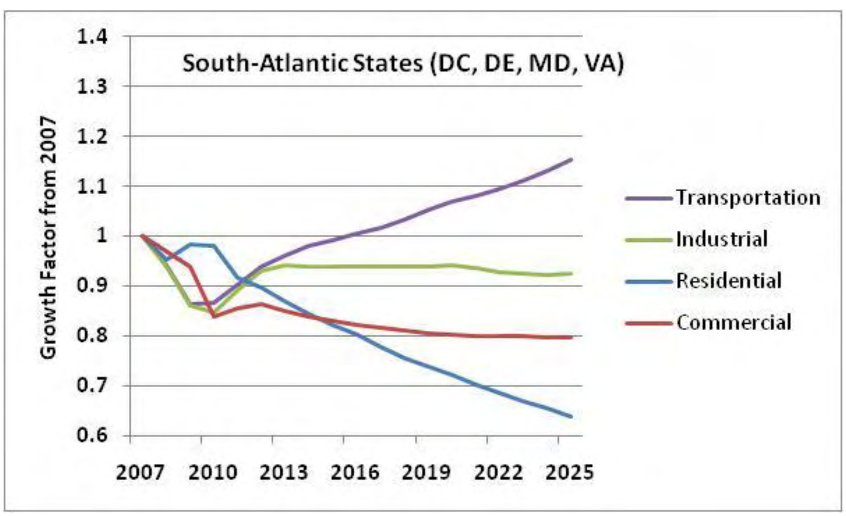
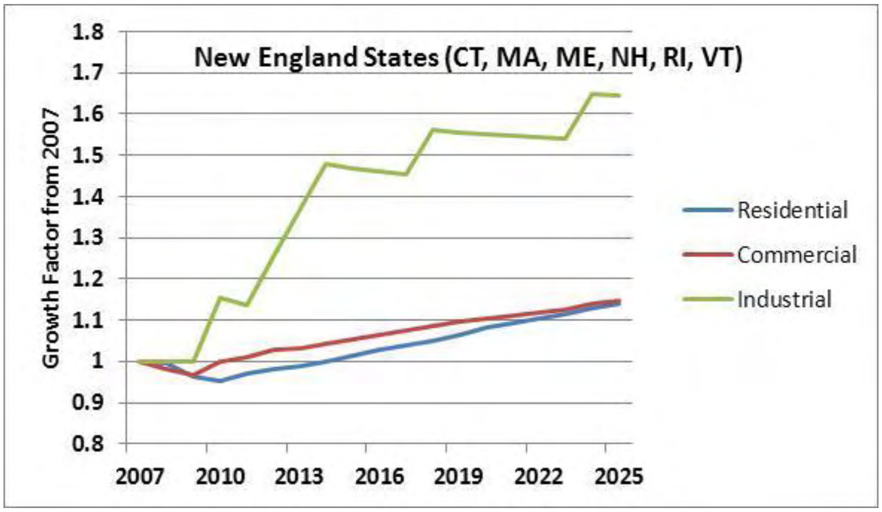
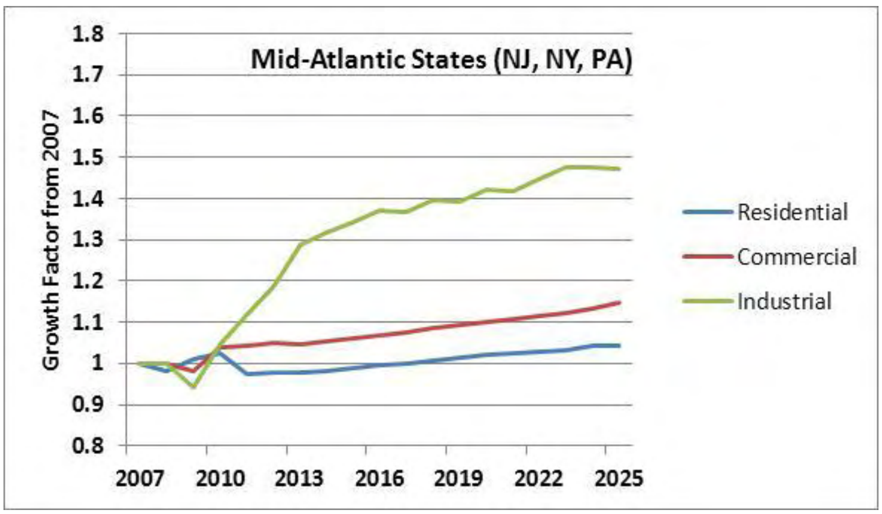


Exhibit 3.3 AEO2010 Growth Factors for Distillate Oil by AEO Region 2007 – 2025





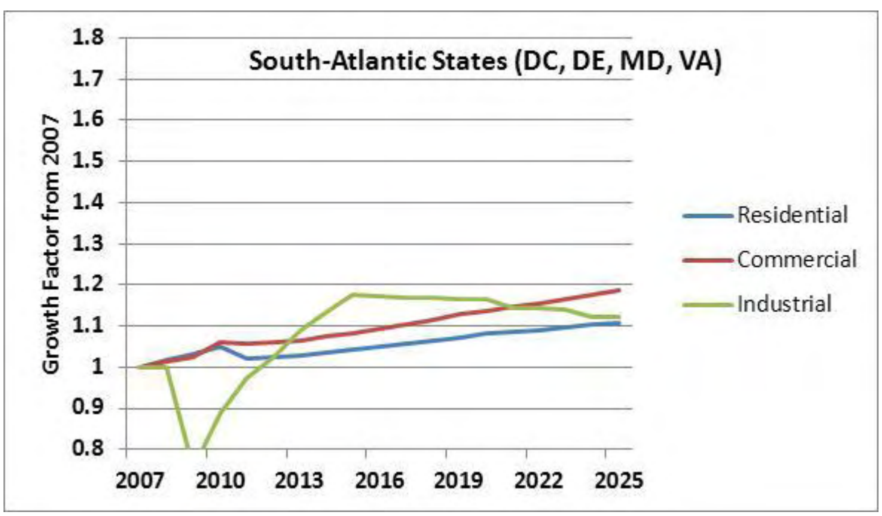


Exhibit 3.4 Growth Factors for Natural Gas by AEO Region 2007 – 2025
AEO2010 for Residential/Commercial, AEO2011 for Industrial

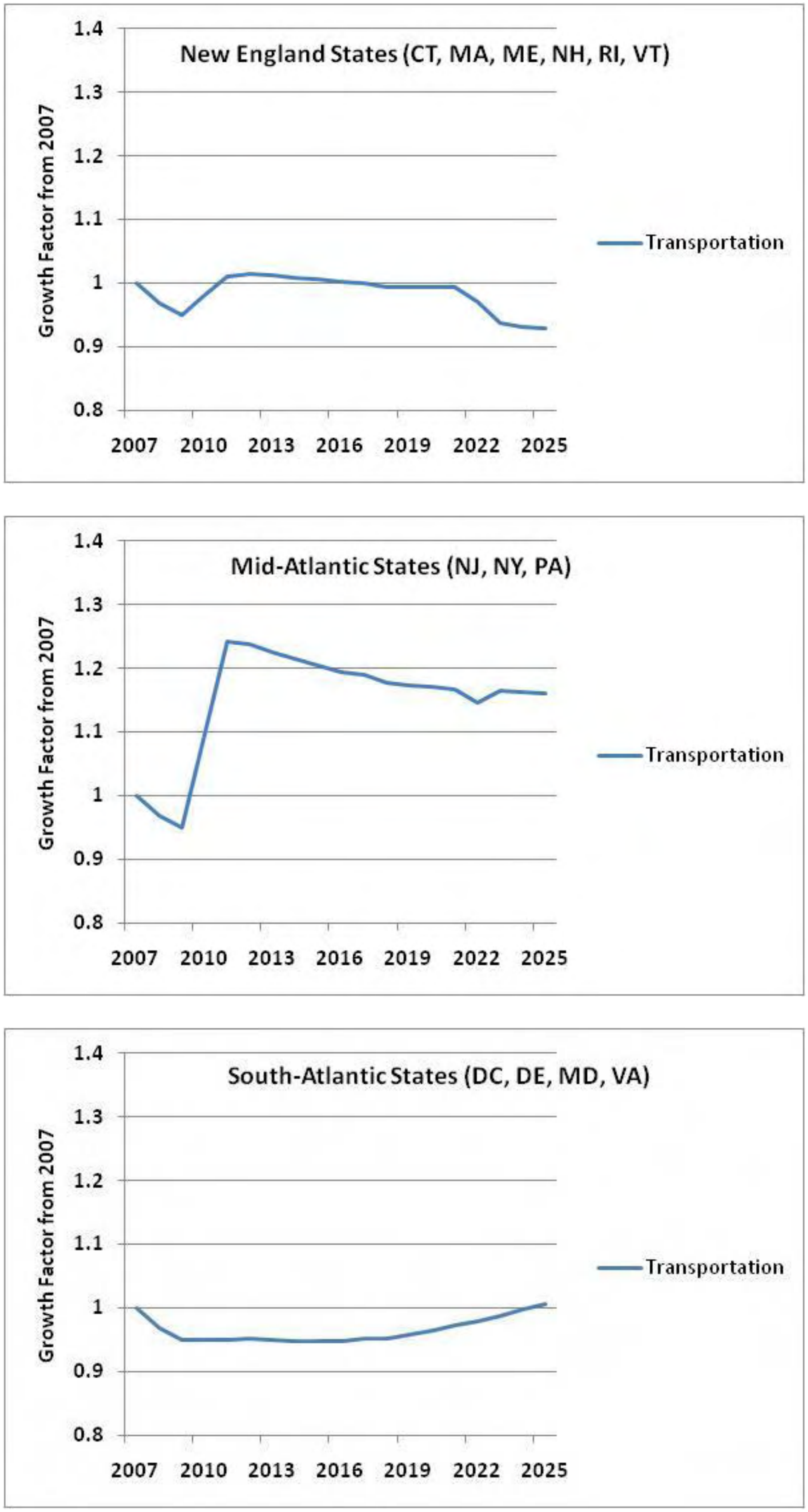
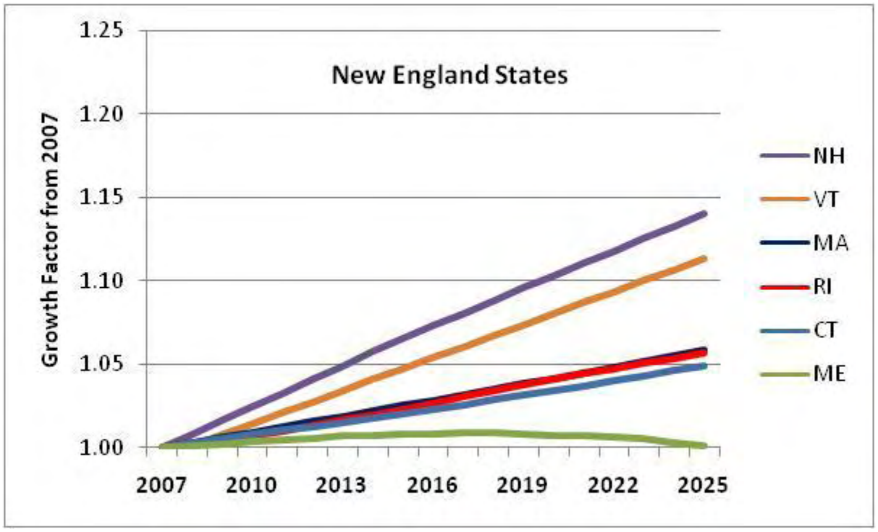
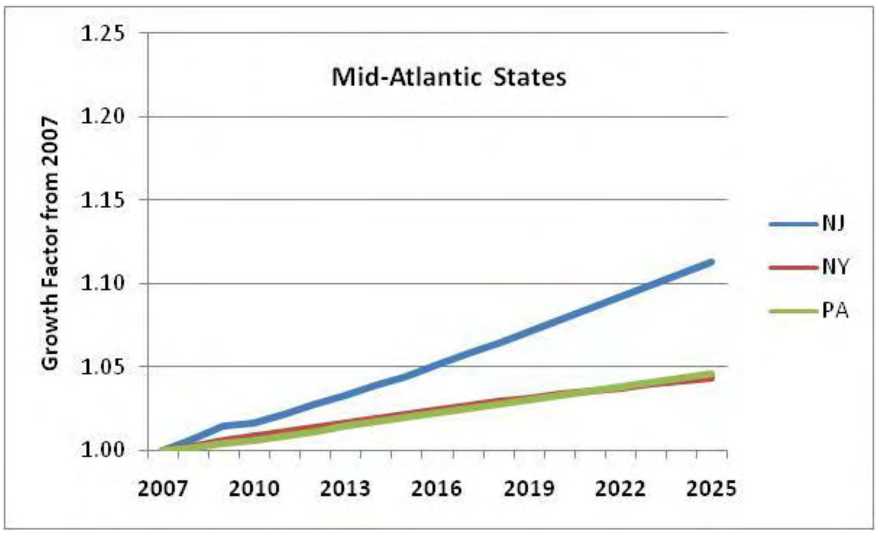


Exhibit 3.5 AEO2010 Growth Factors for Gasoline by AEO Region 2007 – 2025





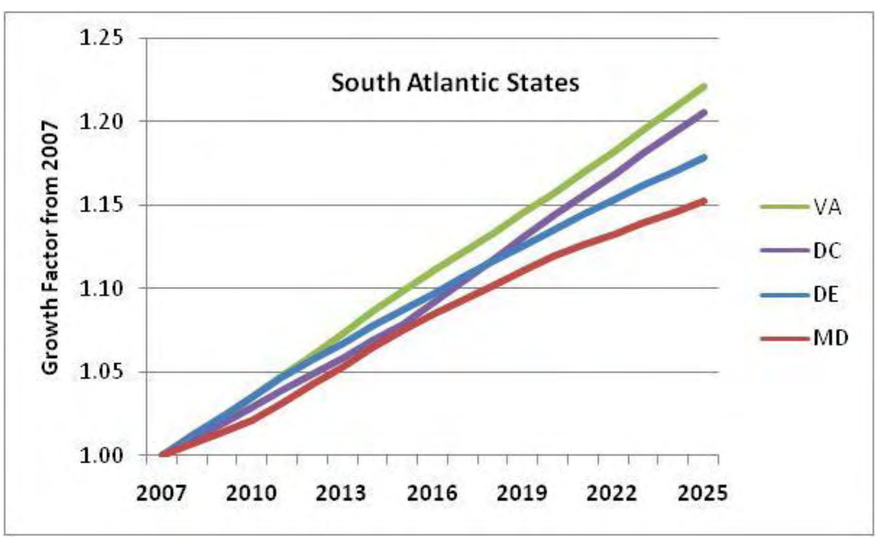


Exhibit 3.6 Population Growth Factors by AEO Region 2007 – 2025

3.3 EMPLOYMENT PROJECTIONS

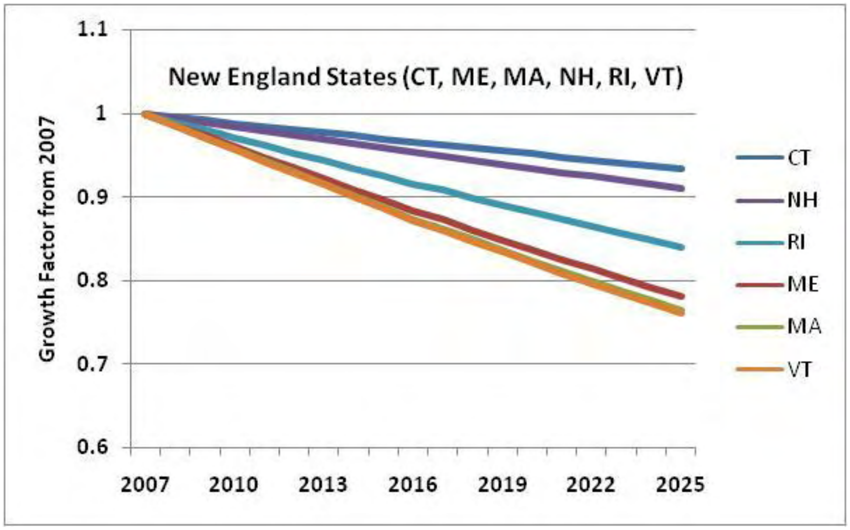
Every two years, the federal Bureau of Labor Statistics produces long-term industry and occupation forecasts for ten future years and states are asked to do the same for their respective economies. The most recent projections from state Department's of Labor of for the period 2006 to 2016, most of which were published in 2008. These 10-year forecasts are updated every other year. The next set of state-specific projections will be for the period 2008 to 2018. Only the District of Columbia and Delaware were able to provide employment projections for 2008 to 2018; the 2008 to 2018 projections were not available for other states in time for use on this project. The employment projections are state-wide by 3-digit NAICS code. Employment projections are provided in Appendix D. Exhibit 3.7 summarizes the manufacturing employment (NAICS sector 31-33) growth factors by state and AEO2010 region. States in the Northeast / Mid-Atlantic region show a marked decrease in manufacturing employment from 2007 forward.

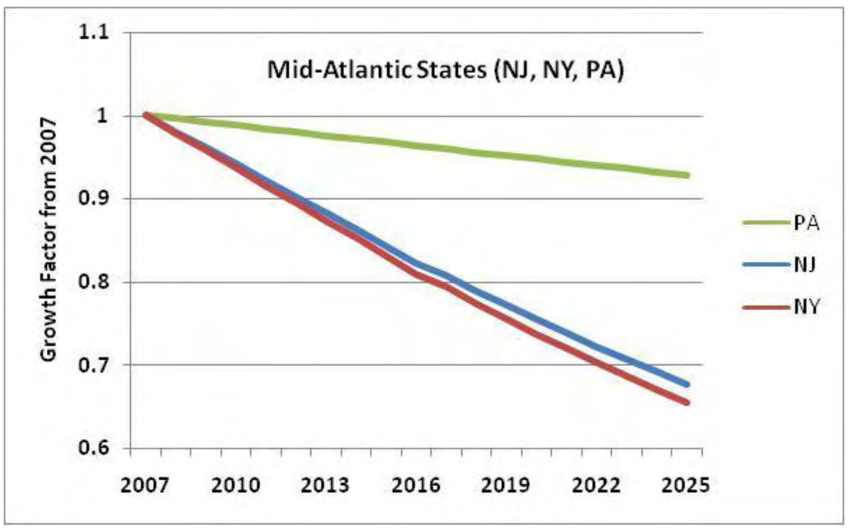
3.4 VEHICLE MILES TRAVELED PROJECTIONS

States developed projections of vehicle miles traveled (VMT) for 2007, 2017 and 2020 which were used as the growth factor for projecting emissions from re-entrained road dust from travel on paved roads (SCC 22-94-000-000). The 2007 and future year VMT are identical to those used in the MOVES modeling. Exhibit 3.8 shows the state level VMT growth between 2007 and 2020. Growth factors for years where VMT were not directly provided by states were estimated by a linear interpolation of available data. County-specific VMT projections are provided in Appendix E.

3.5 NO GROWTH ASSIGNMENT FOR CERTAIN AREA SOURCE CATEGORIES

For several area source categories, it seems reasonable that emissions would not change from the 2007 values. No growth was applied to the 2007 emissions for the area source categories shown in Exhibit 3.9.





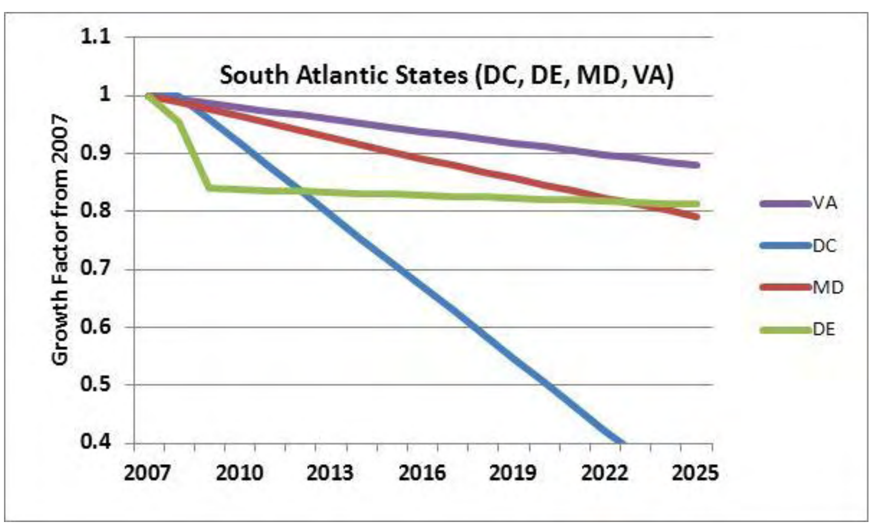


Exhibit 3.7. Manufacturing Employment Growth Factors by AEO Region 2007 - 2025

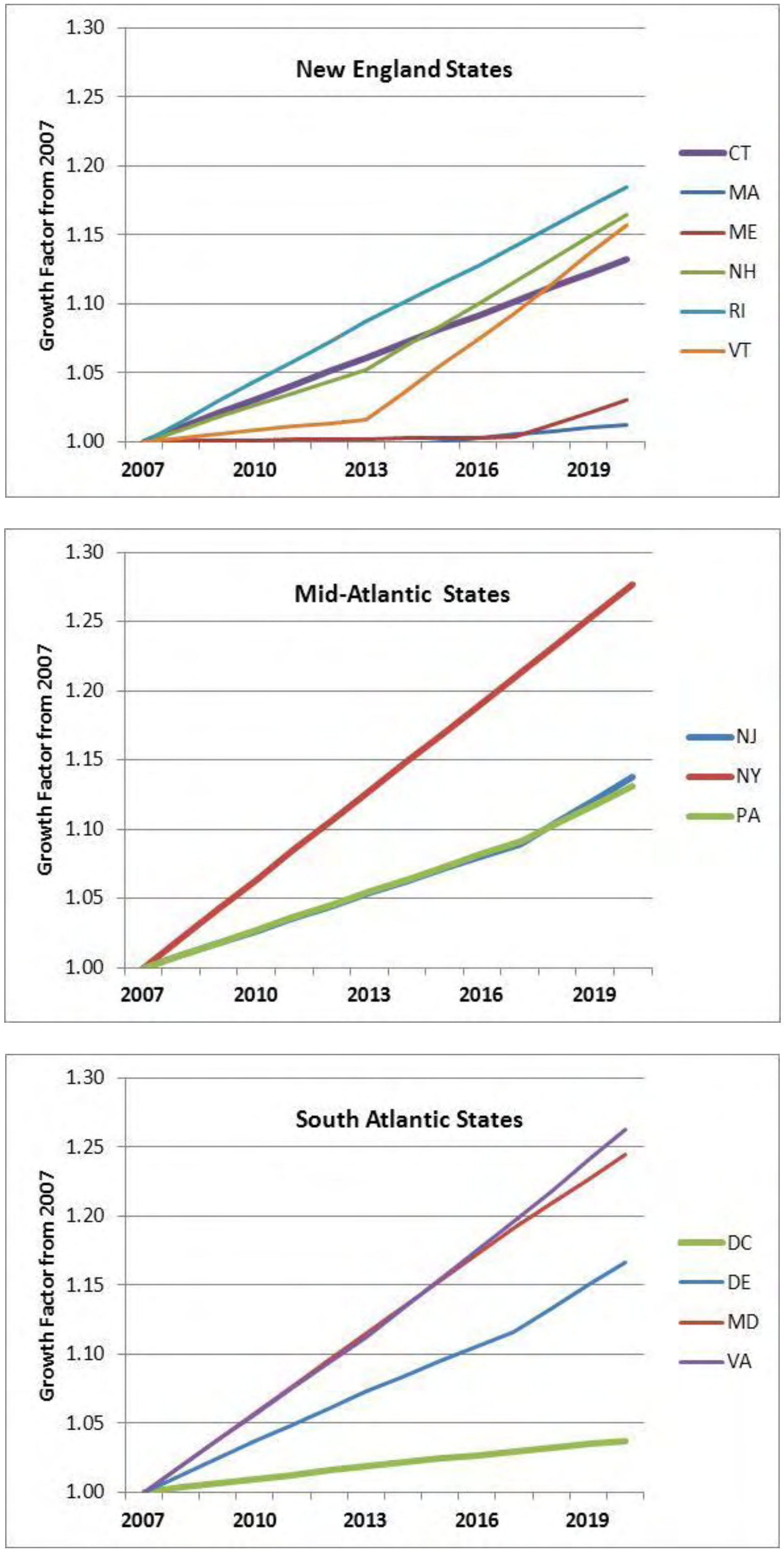


Exhibit 3.8 State VMT Growth Factors 2007 – 2020

Exhibit 3.9 Area Source Categories with No Growth Assignment

SCC	SCC Description
2296000000	Unpaved Roads /All Unpaved Roads /Total: Fugitives
2401008000	Surface Coating /Traffic Markings /Total: All Solvent Types
2461020000	Misc Non-industrial: Commercial /Asphalt Application: All Processes /Total: All
2461021000	Misc Non-industrial: Commercial /Cutback Asphalt /Total: All Solvent Types
2461022000	Misc Non-industrial: Commercial /Emulsified Asphalt /Total: All Solvent Types
2461023000	Misc Non-industrial: Commercial /Asphalt Roofing /Total: All Solvent Types
2601000000	On-site Incineration /All Categories /Total
2601010000	On-site Incineration /Industrial /Total
2601010000	On-site Incineration /Industrial /Total
2601020000	On-site Incineration /Commercial/Institutional /Total
2601020000	On-site Incineration /Commercial/Institutional /Total
2601030000	On-site Incineration /Residential /Total
2610000100	Open Burning /All Categories /Yard Waste - Leaf Species Unspecified
2610000400	Open Burning /All Categories /Yard Waste - Brush Species Unspecified
2610000500	Open Burning /All Categories /Land Clearing Debris (use 28-10-005-000 for Loggin
2610030000	Open Burning /Residential /Household Waste (use 26-10-000-xxx for Yard Wastes)
2610040400	Open Burning /Municipal (from residences, parks,other for central burn)
2660000000	Leaking Underground Storage Tanks /Leaking Underground Storage Tanks /Total: All
2680001000	Composting /100% Biosolids (e.g., sewage sludge, manure, mixtures of these matls
2680002000	Composting /Mixed Waste (e.g., a 50:50 mixture of biosolids and green wastes)
2806010000	Domestic Animals Waste Emissions /Cats /Total
2806015000	Domestic Animals Waste Emissions /Dogs /Total
2807020001	Wild Animals Waste Emissions /Bears /Black Bears
2807020002	Wild Animals Waste Emissions /Bears /Grizzly Bears
2807025000	Wild Animals Waste Emissions /Elk /Total
2807030000	Wild Animals Waste Emissions /Deer /Total
2807040000	Wild Animals Waste Emissions /Birds /Total
2810001000	Forest Wildfires - Wildfires – Unspecified
2810005000	Managed Burning, Slash (Logging Debris) /Unspecified Burn Method
2810010000	Human Perspiration and Respiration /Total
2810014000	Prescribed Burning /Generic - Unspecified land cover, ownership, class/purpose
2810015000	Prescribed Forest Burning /Unspecified
2810020000	Prescribed Rangeland Burning /Unspecified
2810030000	Structure Fires /Unspecified
2810035000	Firefighting Training /Total
2810050000	Motor Vehicle Fires /Unspecified
2810060200	Cremation /Animals
2810090000	Open Fire /Not categorized
2820010000	Cooling Towers /Process Cooling Towers /Total
2830000000	Catastrophic/Accidental Releases /All Catastrophic/Accidental Releases /Total
2830010000	Catastrophic/Accidental Releases /Transportation Accidents /Total

3.6 EPA 2020 PROJECTIONS FOR RESIDENTIAL WOOD AND LIVESTOCK

EPA's Office of Air Quality Planning and Standards (OAQPS) made available its 2020 emissions projections associated with its 2005-based v4 modeling platform. MARAMA used the OAQPS emission projection parameters for two area source sectors –livestock and residential wood combustion. OAQPS's methodology and data sources are summarized below (USEPA 2008a).

OAQPS projected residential wood combustion emissions are based on the expected increase in the number of low-emitting wood stoves and the corresponding decrease in other types of wood stoves. As newer, cleaner woodstoves replace older, more polluting stoves, there will be an overall reduction of emissions from this category. The approach used by OAQPS was developed as part of a modeling exercise to estimate the expected benefits of the woodstove changeout program. This methodology uses a combination of growth and control factors and is based on activity not pollutant. The growth and control are accounted for in a single factor for each residential wood SCC (certain SCCs represent controlled equipment, while other SCCs represent uncontrolled equipment). Control factors are indirectly incorporated based on which stove is used. The specific assumptions OAQPS made were:

- Fireplaces, SCC=2104008001: increase 1%/year;
- Old woodstoves, SCC=2104008002, 2104008010, 2104008051: decrease 2%/year;
- New woodstoves, SCC=2104008003, 2104008004, 2104008030, 2104008050, 2104008052 or 2104008053: increase 2%/year.

For the general woodstoves and fireplaces category (SCC 2104008000) OAQPS computed a weighted average distribution based on 19.4% fireplaces, 71.6% old woodstoves, 9.1% new woodstoves using 2002 Platform emissions for PM2.5. These fractions are based on the fraction of emissions from these processes in states that did not have the "general woodstoves and fireplaces" SCC in the 2002 NEI. This approach results in an overall decrease of 1.056% per year for this source category. Appendix F contains the residential wood projection data from OAQPS.

OAQPS based growth in emissions from livestock on projections of growth in animal population. Except for dairy cows and turkeys, the animal projection factors are derived from national-level animal population projections from the U.S. Department of Agriculture (USDA) and the Food and Agriculture Policy and Research Institute (FAPRI).

For dairy cows and turkeys OAQPS assumed that there would be no growth in emissions. This assumption was based on an analysis of historical trends in the number of such animals compared to production rates. While productions rates have increased, the number of animals has declined. In particular, the dairy cow population is projected to decrease in the future as it has for the past few decades; however, milk production is expected to increase over the same period. Thus, OAQPS does not believe that production forecasts provide representative estimates of the future number of cows and turkeys. Therefore, OAQPS did not use these forecasts for estimating future-year emissions from these animals. Note that the ammonia emissions from dairies are related to both animal population and nitrogen excretion. Appendix G contains the livestock projection data from OAQPS.

3.7 SCC, SIC, NAICS AND GROWTH PARAMETER CROSSWALK

Since the employment projections were based on 3-digit NAICS code, it was necessary to map NAICS codes to SCCs and SIC codes that were used by states. Employment projections at the more specific 4-digit or 6-digit NAICS codes were not available.

The first step for developing a comprehensive crosswalk between the different source classification codes (SCC, SIC, and NAICS codes) and emission activity growth indicators was to compile a complete list of the NAICS codes in the 2007 point source inventory. Some states use the SIC code while other use the NAICS code. Still other states use both the SIC and NAICS codes. When the NAICS code was not available SIC codes were converted to NAICS codes. The 6-digit NAICS code was truncated to a 3-digit code, which represents major industry subsectors of the economy. A U.S. Census Bureau document was used to perform this conversion (CENSUS 2000).

The next step was to review parameters that could be used as the emission activity growth indicator for each SCC or NAICS. We initially relied on two USEPA crosswalks (USEPA 2004a, USEPA 2004b) to match area and nonEGU point source SCCs to AEO2010 categories, employment NAICS codes, and population. The sector specific spreadsheets identify the growth parameter used to project emissions for each SCC.

3.8 FINAL GROWTH FACTORS FOR NONEGU / AREA SOURCES

The previous section described the growth factors initially recommended to project future year emissions inventories for area and non-EGU sources. Draft growth and control factors, and a draft technical support document, were circulated for review by MARAMA and state agencies. During the review, it was noted that several emissions categories show negative growth into the future, particularly categories related to fossil fuel combustion and manufacturing employment.

Many of the growth factors used to project emissions for area and non-EGU sources were based on the AEO2010 fuel consumption forecasts and state-level employment projections. The AEO2010 forecasts show declining trends for many fuel consumption sectors, especially industrial, residential, and commercial distillate fuel oil use. Similarly, the employment projections show declines in the predicted number of employees for many sectors of the economy. This is particularly true for the manufacturing sector, which is of interest because this sector is often associated with higher emissions than those for other sectors. By contrast, the employment projections show increasing trends in retail and service-related sectors. However, these sectors are not typically associated with significant emissions.

Predicted declines in fuel use and employment resulted in growth factors less than unity (i.e., represent negative growth) for many area and non-EGU point source categories. Consequently, for some categories, emissions are lower for the projected future years than for the base year, even before the application of control assumptions (i.e. the future "growth only" emissions are lower than the base year emissions). The MARAMA emissions inventory workgroup met on several occasions via conference calls and email exchanges to discuss whether the negative growth projections were realistic, and what additional assumptions should be made. A topic of particular concern is negative growth for non-EGU point sources versus the treatment of Emissions Reduction Credits (ERCs) in the future year inventories (see Section 3.9 for a discussion of how ERCs were handled).

One conclusion the workgroup reached is that growth methods and assumptions for area sources and non-EGUs should be as consistent as possible with those that are being used by the Eastern Regional Technical Advisory Committee (ERTAC) for the projection of emissions from EGUs. ERTAC is using AEO2010 as a starting point for estimating projected future year emissions, and their preliminary analysis shows some indications of negative growth. But their analysis is still on-going, and it is too early in the process to draw firm conclusions or make solid recommendations at this time regarding their work and its relationship to the area and non-EGU projections.

A few states cited the importance of the negative growth issue for non-EGUs and how it relates to their ERC programs which are critical to new businesses being able to locate in those states. Because businesses could apply for and sell ERCs at the level of the base year inventory, it would not be realistic to show negative growth for non-EGU point sources. During an economic downturn, a facility could shut down and sell its ERCs, making the effective level of future year emissions equal to (i.e. no lower than) the base year. Therefore, a recommended conservative approach for addressing negative growth for non-EGU point sources is to set a minimum growth rate of 1 (no growth).

During the July 23, 2010 conference call held to discuss the negative growth issue, state and agency representatives on the call were polled as to whether or not they felt that the current set of proposed growth factors - including the negative growth factors - were realistic for their state or district. In reply, some representatives mentioned that they have observed historic state-specific data that supports the trends displayed by the proposed growth factors. Other representatives mentioned that they feel comfortable with the growth factors and don't have a technical basis to change them or suggest others.

As a result of these discussions, each state provided guidance on how to handle projections when negative growth is indicated. Exhibit 3.10 shows the state recommendations for nonEGU point source, and Exhibit 3.11 shows the state recommendations for area sources. The sector specific spreadsheets identify the growth parameter used to project emissions for each SCC.

3.9 EMISSION REDUCTION CREDITS

Mulitple states (Connecticut, Maryland, Massachesetts, New Hampshire and New Jersey) added county level records account for account emission reduction credits (ERCs) issued to stationary sources pursuant to state regulations. 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 2017 and 2020 inventories, ERC emissions were set to the amount of banked emissions available in 2007.

Delaware included the banked credits at the specific locations that they were generated.

Virginia does not have a formal banking and trading program. Virginia used growth rates of 1 for those SCCs in the point source emissions inventory that showed a negative growth. In addition, for units that have or are projected to have shut down, Virginia preserved the 2007 emissions in the inventory to account for potential use as offsets or credits.

Other states did not provide any additional information on how to account for ERCs.

Exhibit 3.10 State Recommendations to Address Negative Growth for the NonEGU Point Source Sector

State	AEO Growth Factors	Employment Growth Factors
CT	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use state DOL employment projections by 3-digit NAICS
DE	Use AEO2010 growth rates	For 2013, use state DOL employment projections by 3-digit NAICS; For 2017 and 2020, use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
DC	Use AEO2010 growth rates	Use 2008-2018 employment projections; use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
ME	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
MD	Do not use AEO growth factors Use MD DOL employment projections for industrial and commercial fuel use SCCs, unless employment growth rate is negative, in which case use no growth (growth factor=1)	Use updated state DOL employment projections by 3-digit NAICS; For DoD facilities, account for impacts of Base Realignment and Closure; For source that have closed, account for emission reduction credits
MA	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
NH	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
NJ	New Jersey submitted state specific growth factors. Used either state specific growth factors, no growth (growth factor=1) when state AEO growth is negative or AEO if positive growth	NJ submitted state specific growth factors. Used either state specific factors, no growth (growth factor=1) when state DOL employment growth is negative or employment if positive growth
NY	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
PA	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
RI	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
VT	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
VA	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth

Exhibit 3.11 State Recommendations to Address Negative Growth and Other Growth Factors for the Area Source Sector

State	AEO Growth Factors	Employment Growth Factors	Population Growth Factors
CT	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
DE	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	For 2013, use state DOL employment projections by 3-digit NAICS; For 2017 and 2020, use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth	Use county-level population projections
DC	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	Use DOL employment growth for NAICS 722 for food and kindred product SCC; otherwise use orginial estimates	For dry cleaning, use employment growth for NAICS 812 instead of population
ME	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
MD	Not using AEO2010; used employment for commercial & institurional fuel; used housing units for residential fuel	Provided updated employment projections; changed xwalk between NAICS code and SCC for selected source categories	Provided updated population projections by county
MA	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
NH	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
NJ	NJ submitted state specific growth factors. For fuel combustion categories only, used AEO2011 growth rates except for residual oil (use no growth)	NJ submitted state specific growth factors.	NJ submitted state specific growth factors and provided population projections by county
NY	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
PA	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
RI	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
VT	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
VA	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections

4.0 AREA SOURCE CONTROL FACTORS

Control factors were developed to estimate post-2007 emission reductions resulting from on-the-books regulations and proposed regulations/actions. Control factors were developed for the following national and regional measures:

- Federal Rules Affecting Area Sources
- Federal MACT Rules
- Control Technique Guidelines
- OTC Model Rules

These control programs are discussed in the following subsections. The control factors used for area sources are provided in V3_3 Area_07_17_20.xlsx

4.1 FEDERAL RULES AFFECTING AREA SOURCES

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform (USEPA 2010b). USEPA accounted for control strategies for four area source categories. These categories, and their treatment in the emission projection inventories, are described below:

- Woodstoves - As noted in Section 3.6, USEPA developed projection factors to account for the replacement of retired woodstoves that emit at pre-new source performance standard (NSPS) levels with lower-emitting woodstoves. We used USEPA's latest methodology which uses a combination growth and control factor and is based on activity and not pollutant. The growth and control are accounted for in a single factor for specific SCCs that account for the turnover from pre-NSPS to post-NSPS woodstove.
- Landfills: USEPA estimated a 75% reduction in VOC emissions from municipal solid waste landfills. However, since the compliance date for this standard was January 2004, no post-2007 reductions were applied to the MANE-VU+VA projection inventory since the emission reductions from this MACT standard should be reflected in the 2007 inventory and not as an additional post-2007 credit.
- Vehicle Refueling (Stage II): VOC emissions from the gasoline Stage II (vehicle refueling) are affected by two emission control programs. Many areas in the region have Stage II vapor recovery rules that were in effect prior to 2007 that require the capture of gasoline vapors generated when a motor vehicle fuel tank is filled at a gasoline station. The vapors are transferred from the fuel tank in the vehicle to the storage tank at the station as the vehicle fuel tank is filled. Beginning with the 1998 model year, USEPA established a phase-in schedule requiring vehicles to

incorporate on-board equipment to capture the gasoline vapor emissions from refueling. These controls, referred to as on-board refueling vapor recovery (ORVR), have been required on the vast majority of gasoline powered motor vehicles since the 2006 model year. VOC emissions for 2020 from vehicle refueling were estimated by NESCAUM using the MOVES model (NESCAUM2011). VOC emissions for 2017 were estimated by interpolating between the MOVES 2007 and 2020 results. Appendix H contains the VOC control efficiencies by county used in the MOVES modeling for displacement losses and for spillage losses.

- Portable fuel containers (PFCs): VOC emissions from PFCs will be reduced due to the federal regulation controlling air toxic emissions from mobile sources promulgated in 2007. Most northeastern and mid-Atlantic states had already adopted similar regulations prior to the federal rule. Refer to the OTC 2006 model rules subsection later in this document (Section 4.4.6) for a discussion of the approach for accounting for VOC emission reductions from PFCs.

4.2 FEDERAL MACT RULES

USEPA developed guidance for estimating VOC and NOx emission changes from MACT Rules (USEPA 2007b). We reviewed the guidance to identify possible area source controls associated with the federal maximum achievable control technology (MACT) standards for controlling hazardous air pollutants (HAPs). Although designed to reduce HAPs, many of the MACT standards also provide a reduction in criteria air pollutants. The USEPA document provides an estimate of the percent reduction in VOC and NOx from each standard, and the compliance date for the standard. This information was used to determine whether the MACT standard provided post-2007 emission reductions. For example, if a compliance period of a MACT standard was 2007 or earlier, then we assumed that the emission reductions from the MACT standard should be reflected in the baseline year and not as an additional post- 2007 credit.

Only one area source category was listed in the USEPA guidance document - municipal solid waste landfills. Since the compliance date for this standard was January 2004, no post-2007 reductions were applied since the emission reductions from the MACT standard should be reflected in the 2007 inventory and not as an additional post-2007 credit.

USEPA has or will soon develop MACT standards for about 70 area source categories. We reviewed USEPA's 2020 emissions projections described in the previous section and found that USEPA did not include emission reductions from recent area source MACT standards. We conducted a review of USEPA's air toxic website and found that USEPA determined that many area source MACT standards would result in nationwide reductions in criteria air pollutants in addition to the reductions in HAP emissions. However, many states in the MANE-VU+VA region already have emission standards for many categories that are as stringent as the Federal area source MACT standards. For example, many states in the MANE-VU+VA region already have requirements as stringent as the Gasoline Distribution MACT and GACT (generally achievable control technology) standards, and little additional VOC reductions would be realized in the region. Given the resources allocated to this project, it was beyond the scope to conduct an analysis of the area source MACT requirements and state-by-state emission regulations to determine whether there would be emission reductions resulting from the area source MACT standards.

The only exception to the above discussion of area source MACT standards pertains to the recently promulgated rules for reciprocating internal combustion engines (RICE). USEPA made available an estimate of the percent reduction in emissions attributable to the RICE MACT rule in 2012 and 2014 (USEPA 2010c). The USEPA 2014 estimates shown in Exhibit 4.1 were used for the MANE-VU+VA 2017 and 2020 inventories.

4.3 RECENT CONTROL TECHNIQUE GUIDELINES

Control Techniques Guidelines (CTGs) are documents issued by USEPA to provide states with recommendation on VOC controls from a specific product or source category in an ozone nonattainment area. USEPA issued new or updated CTGs for 13 VOC categories in 3 groups during 2006, 2007 and 2008 (USEPA 2008b). The categories are:

- 2006 CTGs
    - Flat Wood Paneling Coatings
    - Industrial Cleaning Solvents
    - Flexible Package, Lithographic and Letterpress Printing
- 2007 CTGs
    - Large Appliance Surface Coating
    - Metal Furniture Coatings
    - Paper Film and Foil Coatings
- 2008 CTGs
    - Miscellaneous Metal Parts Coatings
    - Plastic Parts Coatings
    - Auto and Light-duty Truck Assembly Coatings
    - Fiberglass Boat Manufacturing
    - Miscellaneous Industrial Adhesives

States indicated that they expected very littleadditional reductions from these new or amended CTGs. Therefore, no emission reductions were included in the inventory.

Exhibit 4.1 USEPA Estimated Percent Reductions for RICE MACT Standard by 2014

SCC	CO	NOx	PM10	PM2.5	VOC	SCC Description
2101004000	12.42		7.57	7.57	30.85	Electric Utility;Distillate Oil;Total: Boilers and IC Engines
2101004002	16.9		11.81	11.81	33.78	Electric Utility;Distillate Oil;All IC Engine Types
2101006000	11.07	7.97			16.71	Electric Utility;Natural Gas;Total: Boilers and IC Engines
2101006002	15.47	9.87			21.24	Electric Utility;Natural Gas;All IC Engine Types
2102004000	12.42		7.57	7.57	30.85	Industrial;Distillate Oil;Total: Boilers and IC Engines
2102006000	11.07	7.97			16.71	Industrial;Natural Gas;Total: Boilers and IC Engines
2102006002	15.47	9.87			21.24	Industrial;Natural Gas;All IC Engine Types
2103004000	12.42		7.57	7.57	30.85	Commercial/Institutional;Distillate Oil;Total: Boilers and IC Engines
2103006000	11.07	7.97			16.71	Commercial/Institutional;Natural Gas;Total: Boilers and IC Engines
2199004000	12.42		7.57	7.57	30.85	Area Source Fuel Combustion;Distillate Oil;Total: Boilers and IC Engines
2199004002	16.9		11.81	11.81	33.78	Area Source Fuel Combustion;Distillate Oil;All IC Engine Types
2199006000	11.07	7.97			16.71	Area Source Fuel Combustion;Natural Gas;Total: Boilers and IC Engines
2310000000	19.86	12.53			23.87	Oil and Gas Production: All Processes;Total: All Processes
2310000220	19.86	12.53			23.87	Oil and Gas Exploration/Production; Drill Rigs
2310000440	19.86	12.53			23.87	Oil and Gas Exploration/Production; Saltwater Disposal Engines
2310001000	19.86	12.53			23.87	Oil and Gas Production: SIC 13; On-shore;Total: All Processes
2310002000	19.86	12.53			23.87	Oil and Gas Production: SIC 13; Off-shore;Total: All Processes
2310020000	19.86	12.53			23.87	Oil and Gas Production: SIC 13;Natural Gas;Total: All Processes
2310020600	19.86	12.53			23.87	Oil and Gas Exploration and Production;Natural Gas;Compressor Engines
2310023000	19.86	12.53			23.87	Oil and Gas Exploration and Production;Natural Gas;Cbm Gas Well - Dewatering Pump Engines

4.4 OTC MODEL RULES FOR AREA SOURCES

The Ozone Transport Commission (OTC) developed model rules for member states in 2001 for several area source categories: consumer products, architectural and industrial maintenance (AIM) coatings, portable fuel containers (PFCs), mobile equipment repair and refinishing, solvent cleaning, and industrial boilers. In 2006 the OTC introduced model rules for two additional area source categories (adhesives/sealants and asphalt paving), more stringent requirements for consumer products, portable fuel containers, and industrial boilers. In 2009/2010, the OTC recommended additional controls for autobody refinishing operations, consumer products, AIM coatings, and small new natural gas-fired boilers. In addition, MANE-VU states committed to the use of low sulfur home heating, distillate and residual fuel oil. Exhibit 4-2 briefly describes the OTC and MANE-VU control measures affecting area sources that have been recommended for adoption by the states in the OTR.

Individual states are in various stages of adopting the OTC recommendations into their rules and SIPs. OTC's status reports were reviewed to identify each state's adoption status (OTC 2009, OTC 2011a, OTC2011b). To obtain further clarification, states were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the OTC model rule or recommendation and whether credit for each rule was already accounted for in the 2007 inventory.

To evaluate the impact of the rules currently in place as well as the potential adoption of all control measures by all states except Virginia, the state Air Directors specified that two emission control scenarios should be developed as follows:

- Existing Controls - this scenario represents the best estimates for the future year, accounting for all in-place controls that are fully adopted into federal or individual state regulations or SIPs.

- Potential New OTC Controls – this scenario accounts for all of the emission reductions from the existing control scenario plus new state or regional measures that are under consideration by the OTC or individual states. This is a "what if" scenario that assumes that all states in the MANE-VU+VA region except Virginia will adopt all new OTC control measures under consideration by 2017. It does not include any potential new federal control measures that are under consideration.

The following paragraphs describe the control factors applied for each control measure by state and future year.

Exhibit 4.2 Summary of Area Source OTC Control Measures

Source Category	Pollutants	Description
Consumer Products	VOC	OTC 2001. Specified VOC content limits for certain categories that are more stringent than Federal limits OTC 2006. Included additional products and more restrictive VOC limits for certain products OTC 2009/2010. Specified more restrictive VOC limits for 14 existing consumer product categories and three new categories
Architectural and Industrial Maintenance Coatings	VOC	OTC 2001. Specified VOC content limits for certain categories that are more stringent than Federal limits OTC 2009/2010. Eliminated 15 categories (replaced by new categories or deemed unnecessary), added 10 new categories, and specified stricter VOC limits for 19 categories
Portable Fuel Containers	VOC	OTC 2001. Provided container design specifications to reduce emissions from spillage and evaporation OTC 2006. Revised and clarified design specifications and added kerosene containers and utility jugs.
Mobile Equipment Repair and Refinishing	VOC	OTC 2001. Required use of high efficiency coating application equipment, spray gun cleaning equipment that minimizes solvent loss, and enclosed spray gun cleaning. OTC 2009/2010. Limited the VOC content of coatings more stringent than the Federal limits and the VOC content of cleaning solvents
Solvent Cleaning	VOC	OTC 2001. Established hardware and operating requirements for specified vapor cleaning machines, and solvent volatility limits and operating practices for cold cleaners
Adhesives and Sealants	VOC	OTC 2006. Provided VOC content limits and other restrictions on adhesives used primarily by commercial and industrial users.
Asphalt Paving	VOC	OTC 2006. Suggested VOC content limits for emulsified and cutback asphalts use for road paving
NOx ICI Boiler Controls	NOx	OTC 2001. Recommended NOx emission rate limits for industrial boilers greater than 5 mmBtu/hour OTC 2006. Recommended lower NOx emission rate limits for industrial, commercial, and institutional boilers OTC 2010. Recommended national NOx controls for ICI boilers
Small Natural Gas-Fired Boilers	NOx	OTC 2009/2010. Recommended NOx emission rate limits for new boilers less than 5 mmBtu/hr
Low Sulfur Fuel Oil	SO2	MANE-VU 2006. Recommends sulfur content limits for home heating oil, distillate oil, and residual oil

4.4.1 OTC Model Rule for Adhesives/Sealants

VOC emissions in this category are primarily from commercial applications such as floor covering installation (carpet and wood flooring), roof installations and repair and upholstery shops. The category also includes industrial applications such as wood product manufacturers. Adhesives in small containers are not included in this category but are regulated under the consumer products regulations.

The OTC 2006 model rule for industrial adhesives and sealants is based on the reasonably available control technology (RACT) and best available retrofit control technology (BARCT) determination by the California Air Resources Board (CARB) developed in 1998. The OTC model rule regulates the application of adhesives, sealants, adhesive primers and sealant primers by providing options for appliers to either use a product with a VOC content equal to or less than a specified limit or to use add-on controls to achieve an equivalent reduction. The emission reduction benefit estimation methodology for area sources is based on information developed and used by CARB as discussed in their 1998 RACT report. A 64.4 percent reduction in VOC emissions was estimated for SCC 24-40-020-000.

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. State-by-state recommendations are shown in Exhibit 4.3.

It should be noted that not all states account for emissions from this category in a separate area source inventory. Some states, based on information received from USEPA, excluded this category because the emissions to some extent may be accounted for in the area source commercial and consumer products category or in the nonEGU point source inventory.

Exhibit 4.3 State Recommendations for OTC Industrial Adhesives/Sealants Rule

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	64.4	0	64.4	0
DE	No	64.4	0	64.4	0
DC	No	n/a	n/a	n/a	n/a
ME	No	64.4	0	64.4	0
MD	No	64.4	0	64.4	0

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
MA	No	64.4	0	64.4	0
NH	No	n/a	n/a	n/a	n/a
NJ	No	64.4	0	64.4	0
NY	No	64.4	0	64.4	0
PA	No	64.4	0	64.4	0
RI	No	n/a	n/a	n/a	n/a
VT	n/a	n/a	n/a	n/a	n/a
VA	No	n/a	n/a	n/a	n/a

* n/a means SCC 24-40-020-000 not included in 2007 inventory; see text for further discussion

4.4.2 OTC Model Rules for Architectural and Industrial Maintenance Coatings

On August 14, 1998, USEPA issued the final version of their National Volatile Organic Compound Emission Standards for Architectural Coatings under Section 183(e) of the Clean Air Act. This final rule applied only to manufacturers and importers of architectural coatings, and set VOC content limits for 61 coating categories. This rule specifically allowed states or local governments to adopt more stringent coating limits.

The OTC adopted an AIM model rule more stringent than the national rule, and based primarily on the 2000 CARB suggested control measure (SCM) for AIM coatings. The 2001 OTC model rule was estimated to provide a 31 percent incremental reduction in VOC emissions compared to the Federal Part 59 rule and was applied to the following SCCs:

- 24-01-001-000 All Architectural Coatings
- 24-01-002-000 Architectural Coatings Solvent Based
- 24-01-003-000 Architectural Coatings Water Based
- 24-01-008-000 Traffic Markings
- 24-01-100-000 Industrial Maintenance Coatings
- 24-01-200-000 Other Special Purpose Coatings

The OTC 2009/2010 model rule is an update of the 2001 model rule. It is based the 2007 CARB suggested control measure. The OTC 2009/2010 rule includes new categories which were defined in the 2007 CARB measure and revised limits for several coating categories In addition to the revised limits in the 2007 CARB SCM, the OTC model rule also includes a more stringent VOC limit for the Industrial Maintenance (IM) coating category that was included in the 2000 CARB SCM. The 2000 CARB SCM proposed a limit of 250 g/L with an optional limit of 340 g/L for colder climates. The 2002 OTC model rule included the 340 g/l due to concerns about the ability to comply in the colder northeast. Because of the success of implementing the revised limit throughout California and the advent of t-butyl acetate as a delisted solvent, OTC believes a 250 g/L VOC limit is now feasible and has included this new lowered limit in the 2010 model rule.

The CARB SCM data was used to estimate a 34.4 percent reduction for architectural coatings and a 9.7 percent reduction for traffic markings. For industrial maintenance coatings, a 26.5 percent reduction was estimated based on lowering the VOC content limit from 340 g/L to 250 g/L. Other specialty coatings are another form of industrial high performance maintenance coatings (IM), so the IM control factor was also used for the other specialty coatings SCC.

States were polled to determine whether they had adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. Many states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the rule was not accounted for in their 2007 inventory. State-by-state recommendations to account for the AIM rule are shown in Exhibit 4.4.

Exhibit 4.4 State Recommendations for OTC AIM Rule

State	Is OTC 2001 Rule Accounted for in 2007 Inventory*	Incremental VOC Percent Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	31 AIM	34.4 ARCH 9.7 TM 26.5 IM	31 AIM	34.4 ARCH 9.7 TM 26.5 IM
DE	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
DC	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
ME	No	31 AIM	34.4 ARCH 9.7 TM	31 AIM	34.4 ARCH 9.7 TM

State	Is OTC 2001 Rule Accounted for in 2007 Inventory*	Incremental VOC Percent Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
			26.5 IM		26.5 IM
MD	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
MA	No	31 AIM	34.4 ARCH 9.7 TM 26.5 IM	31 AIM	34.4 ARCH 9.7 TM 26.5 IM
NH	No	0 AIM	55.5 ARCH 37.7 TM 49.4 IM	0 AIM	55.5 ARCH 37.7 TM 49.4 IM
NJ	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
NY	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
PA	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
RI	No	31 AIM	34.4 ARCH 9.7 TM 26.5 IM	31 AIM	34.4 ARCH 9.7 TM 26.5 IM
VT	No	0 AIM	55.5 ARCH 37.7 TM 49.4 IM	0 AIM	55.5 ARCH 37.7 TM 49.4 IM
VA-NVA	Yes	0 AIM	0 AIM	0 AIM	0 AIM
VA-FRD	No	31 AIM	0 AIM	31 AIM	0 AIM
VA-Other	No	0 AIM	0 AIM	0 AIM	0 AIM

AIM – includes all AIM coatings listed below:
ARCH – architectural
TM - traffic markings
IM - industrial maintenance

VA-NVA includes the cities/counties in the Northern Virginia emission control area
VA-FRD includes the cities/counties in the Fredericksburg emission control area
VA-Other includes cities/counties in Virginia not listed above

4.4.3 OTC Model Rule for Asphalt Paving

OTC Resolution 06-02 recommends that states establish rules to achieve a 20 percent reduction in VOC emissions from the application and use of emulsified and cutback asphalt. The reductions apply to the following SCCs:

- 24-61-021-000 Cutback Asphalt
- 24-61-022-000 Emulsified Asphalt

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. Some states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the rule was not accounted for in their 2007 inventory. State recommendations to account for the asphalt paving recommendation are shown in Exhibit 4.5.

Exhibit 4.5 State Recommendations for OTC Cutback and Emulsified Asphalt Paving Recommendation

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Percent Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	20	0	20	0
DE	Yes	0	0	0	0
DC	No	0	20	0	20
ME	No emissions in inventory	0	0	0	0
MD	No	0	20	0	20
MA	No	20	0	20	0
NH	No	0	20	0	20
NJ	No	56% Cutback 25% Emulsified	0	56% Cutback 25% Emulsified	0
NY	No	20	0	20	0
PA	No	0	20	0	20
RI	No	20	0	20	0
VT	No emissions in inventory	0	0	0	0
VA-NVA	No	0	0	0	0
VA-Other	No	0	0	0	0

4.4.4 OTC Model Rules for Consumer Products

Several states began regulating the VOC content of consumer products in the early 1990s. The USEPA promulgated a national rule in 1998 (40CFR, Part 59, Subpart C). Both the California Air Resources Board (CARB) and the OTC states have periodically updated their state rules to obtain VOC reductions beyond those required by the federal rule. Following the lead of CARB, the OTC 2001 model rule for consumer products adopted more stringent VOC content limits for certain categories. The OTC 2006 model rule modified the OTC 2001 model rule based on amendments adopted by CARB in July 2005 to include additional products and more stringent VOC limits for certain products. CARB amended their rules again in 2006 and the OTC 2010 model rule is based on those amendments.

The OTC 2010 model amendments have more restrictive VOC limits for 14 existing consumer product categories (15 including subcategories) and three new categories (five including subcategories) will be regulated for the first time with VOC limits. The OTC 2010 model rule amendments also clarify or modify previously defined or regulated categories. The model rules also contained optional prohibitions on the use of chlorinated toxic compounds in certain consumer product categories. CARB adopted these provisions simultaneous with their VOC limits to address the use of non-VOC chlorinated solvent use increasing as they are used as replacement compounds.

The VOC percentage reduction from the various rules and amendments are summarized in Exhibit 4.6. The emissions reductions from the latest OTC consumer products rule update used information developed by CARB for its 2006 amendments. The OTC estimated a 4.8 percent reduction of the total consumer products inventory for states that included CARB's ban of chlorinated toxic compounds in brake cleaners, and an estimated 3.3 percent reduction of the total consumer products inventory for states that did not include this ban.

States reported VOC emissions from consumer products inventory in two different manners – using an aggregated SCC or subcategory SCCs, as follows:

Aggregated SCC:	24-60-000-000 Consumer Products, All Products
	24-65-000-000 Consumer Products, All Products
Disaggregated SCCs:	24-60-100-000 Consumer Products, Personal Care Products
	24-60-200-000 Consumer Products, Household Products
	24-60-400-000 Consumer Products, Auto Aftermarket Products
	24-60-500-000 Consumer Products, Coatings
	24-60-600-000 Consumer Products, Adhesives and Sealants
	24-60-800-000 Consumer Products, FIFRA Products
	24-60-900-000 Consumer Products, Misc. Products

Exhibit 4.6 VOC Emission Factors for Consumer Products

Uncontrolled Emission Factor:	=	7.84 lbs/capita
Emission Factor after 1998 Federal Rule:	=	7.06 lbs/capita
Percent Reduction from 1998 Federal Rule compared to uncontrolled	= =	100%* (7.84 - 7.06) / 7.84 9.95%
Emission Factor after 2001 OTC Rule	=	6.06 lbs/capita
Percent Reduction from 2001 OTC Rule compared to Federal Rule	= =	100%* (7.06 - 6.06) / 7.06 14.2%
Emission Factor after 2006 OTC Rule	=	5.94 lbs/capita
Percent Reduction from 2006 OTC Rule compared to OTC 2001 Rule	= =	100%* (6.06 -5.94) / 6.06 2.0%
Emission Factor after 2010 OTC Rule (without brake cleaner chlorinated toxic ban)	=	5.745 lbs/capita
Percent Reduction from 2010 OTC Rule compared to OTC 2006 Rule	= =	100%* (5.94 – 5.745) / 5.94 3.3%
Emission Factor after 2010 OTC Rule (with brake cleaner chlorinated toxic ban)	=	5.655 lbs/capita
Percent Reduction from 2010 OTC Rule compared to OTC 2006 Rule	= =	100%* (5.94 – 5.655) / 5.94 4.8%

The reductions shown above were applied to the above SCCs based on each state's adoption of the various rules and amendments as well as the decision with respect to the ban on chlorinated toxic compounds used in brake cleaners. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the OTC 2006 recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. For the 2001 OTC rule, some states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the OTC 2001 rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the OTC 2001 rule was not accounted for in their 2007 inventory. None of the states have accounted for the OTC 2006 rule in their 2007 inventories. State-by-state recommendations to account for both the OTC 2001 and 2006 consumer products rules are shown in Exhibit 4.7.

Exhibit 4.7 State Recommendations for OTC 2001 and 2006 Consumer Products Rules

State	Is 2001 Rule Accounted for in 2007 Inventory	Is 2006 Rule Accounted for in 2007 Inventory	VOC Percent Reduction to use in:			
			2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	No	15.9	4.8	15.9	4.8
DE	Yes	No	2.0	4.8	2.0	4.8
DC	No	No	2.0	4.8	2.0	4.8
ME	No	No	15.9	4.8	15.9	4.8
MD	Yes	No	2.0	4.8	2.0	4.8
MA	No	No	15.9	4.8	15.9	4.8
NH	No	No	14.2	5.2	14.2	5.2
NJ	Yes	No	2.0	4.8	2.0	4.8
NY	Yes	No	2.0	4.8	2.0	4.8
PA	Yes	No	2.0	4.8	2.0	4.8
RI	No	No	15.9	4.8	15.9	4.8
VT	No	No	0	18.6	0	18.6
VA-NVA	Yes	No	2.0	0	2.0	0
VA-FRD	No	No	15.9	0	15.9	0
VA-RCH	No	No	15.9	0	15.9	0
VA-Other	No	No	0	0	0	0

NH indicated that their amendments to include the OTC 2006 recommendations won't be completed in time to include in the OTB/OTW inventory

4.4.5 OTC Model Rules for Mobile Equipment Repair and Refinishing

The USEPA promulgated a national rule in 1998 (40CFR, Part 59, Subpart B) to limit the VOC content of coatings usedin the refinishing of automobiles. The federal standards were estimated to reduce nationwide emissions of VOC by about 37 percent compared to uncontrolled 1998 emissions. The 2002 OTC model rule established requirements for using higher efficiency coating application equipment, such as high volume-low pressure paint guns, using spray gun cleaning equipment that minimizes solvent loss, and enclosed spray gun cleaning. The Federal VOC limits on the paints was maintained in the model rule. An incremental control effectiveness of 38 percent was estimated for the OTC 2001 model rule (post-1998 federal standard emissions).

The 2009 OTC model rule for Motor Vehicle and Mobile Equipment Non-assembly Line Coating Operations (2009 OTC MVME model rule) seeks to limit the VOC content in coatings and cleaning solvents used in motor vehicle and mobile equipment non-assembly line coating operations. The 2009 OTC MVME model rule is an update of the 2002 OTC MERR model rule. The OTC developed the 2009 OTC MVME Model Rule using the CARB 2005 Suggested Control Measure (SCM) for Automotive Coatings as a guideline. The CARB 2005 SCM estimated a 65 percent reduction in VOC emissions from 2002 CARB baseline emissions, which are post-1998 federal standard emissions. Similar reductions of 65 percent are expected from implementation of the 2009 OTC MVME Model Rule.

A few OTC states adopted the 2002 OTC model rule and accounted for the 38 percent reduction in the 2007 MANEVU+VA inventory. Other states adopted the 2002 OTC model rules after 2007, so the reduction was not included in 2007 but was included in the 2017/2020 "on-the-books" inventory. Still other states have not yet adopted the 2002 OTC model rule. Exhibit 4.8 summarizes the percent reductions that will be applied based on the adoption status of each state:

Exhibit 4.8 VOC Emission Reductions for Auto Refinishing

State Rule Adoption Status	VOC Reduction:	
	2017/2020 Existing	2017/2020 Potential
Accounted for 2002 OTC rule in 2007 inventory Will adopt 2009 OTC rule by 2017	0 %	65 %
Did not account for 2002 OTC rule in 2007 inventory Did account for 2002 OTC rule in 2017/2020 OTB inventory Will adopt 2009 OTC rule by 2017	38 %	65 %
Did not account for 2002 OTC rule in 2007 inventory Did not account for it in 2017/2020 OTB inventory Will adopt 2009 OTC rule by 2017	0 %	78.3 %

The reductions have traditionally been applied to the following area source SCCs:

24-01-005-000 Auto Refinishing / All Solvent Types

24-01-005-500 Auto Refinishing / Surface Preparation Solvents

24-01-005-600 Auto Refinishing / Primers

24-01-005-700 Auto Refinishing / Top Coats

24-01-005-800 Auto Refinishing / Clean-up Solvents

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. Many states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the rule was not accounted for in their 2007 inventory. State-by-state recommendations to account for the auto refinishing rule are shown in Exhibit 4.9.

Exhibit 4.9 State Recommendations for OTC Auto Refinishing Rule

State	Is OTC 2001 Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	Yes	0	65	0	65
DE	Yes	0	65	0	65
DC	No	38	65	38	65
ME	No	38	65	38	65
MD	Yes	Yes	0	65	0
MA	No	0	78.3	0	78.3
NH	No	0	78.3	0	78.3
NJ	Yes	0	65	0	65
NY	Yes	0	65	0	65
PA	Yes	0	65	0	65
RI	Yes	0	65	0	65
VT	No emissions in inventory	0	0	0	0
VA-NVA	Yes	0	0	0	0
VA-FRD	No	38	0	38	0
VA-Other	No	0	0	0	0

4.4.6 OTC Model Rules for Portable Fuel Containers

In 2001, the OTC developed a model rule to control VOC emissions from portable fuel containers. The 2001 model rule was based on the technical work conducted by California Air Resources Board (CARB) for developing California's 2000 fuel container rule. Several, but not all, of the MANEVU+VA states adopted regulations which became effective prior to 2007.

After OTC developed its model rule in 2001, CARB realized that its original study and rule had some defects and decided to conduct further studies and research on fuel containers. Based on its new studies, CARB revised its rule twice. In 2006, the OTC developed a second model rule for PFCs to reflect the CARB revisions. Thereafter, USEPA developed a federal rule in 2007 which included, among other things, requirements for portable fuel containers equivalent to OTC's 2006 requirements.

The federal requirements became effective on January 1, 2009. States have analyzed the federal rule and determined that the federal rule has requirements that are essentially equivalent to the OTC 2006 model rule. These new federal requirements will reduce hydrocarbon emissions from uncontrolled fuel containers by approximately 75 percent. Assuming a 10-year turnover to compliant cans, only 10 percent of the existing inventory of PFCs will comply with the new requirements in 2010. Therefore, only 10 percent of the full emission benefit estimated by USEPA will occur by 2010 – the incremental reduction will be about 7.5 percent in 2010. In 2013, there will be a 40 percent turnover to compliant cans, resulting in an incremental reduction of about 60 percent. By 2017, the will be 80 percent penetration to compliant PFCs, resulting in an incremental reduction of 58 percent in 2018. By 2020, there will be 100 percent penetration to compliant PFCs, resulting in an incremental reduction of 75 percent in 2020.

The reductions apply to the following SCCs:

- 25-01-011-xxx Residential PFCs
- 24-01-012-xxx Commercial PFCs

States were polled to determine the status of PFC regulations in each state. Some states have adopted a rule that would achieve reductions equivalent to the 2001 or 2006 OTC rules. Other states will rely exclusively on the Federal rule. State-by-state recommendations to account for the OTC and federal PFC rules are shown in Exhibit 4.10.

Exhibit 4.10 State Recommendations for OTC and Federal Portable Fuel Container Rules

State	Compliance Date for OTC 2001 Rule	Compliance Date for OTC 2006 Rule	Rely on Federal Rule?	VOC Percent Reduction to use in:			
				2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	May 2004	Jun 2008	No	81	0	81	0
DE	Jan 2003	Apr 2010	Yes	75	0	78	0
DC	Dec 2004	Feb 2012	Yes	79	0	81	0
ME	Jan 2004	n/a	Yes	77	0	80	0
MD	May 2003	Jan 2009	No	76	0	79	0
MA	n/a	n/a	Yes	77	0	85	0
NH	n/a	Jan 2008	No	85	0	85	0
NJ	Jan 2005	Jan 2009	No	83	0	83	0
NY	Jan 2005	Jan 2010	Yes	79	0	82	0
PA	Jan 2005	n/a	Yes	75	0	78	0
RI	n/a	n/a	Yes	77	0	85	0
VT	n/a	n/a	Yes	77	0	85	0
VA-NVA	Jan 2005	Aug 2010	Yes	79	0	82	0
VA-FRD	Jan 2008	Aug 2010	Yes	83	0	85	0
VA-RCH	n/a	n/a	Yes	77	0	85	0
VA-Oth	n/a	n/a	Yes	77	0	85	0

4.4.7 OTC Model Rule for Solvent Cleaning

The OTC model rule establishes hardware and operating requirements for specified vapor cleaning machines, and solvent volatility limits and operating practices for cold cleaners. An incremental control effectiveness of 66 percent was estimated for the OTC model rule relative to the base case. The reductions apply SCCs in the 24-15-xxx-xxx series (Degreasing All Industries and Processes). States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2001 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. Many states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the rule was not accounted for in their 2007 inventory. State-by-state recommendations to account for the solvent cleaning rule are shown in Exhibit 4.11.

Exhibit 4.11 State Recommendations for 2001 OTC Solvent Cleaning Rule

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	66	0	66	0
DE	Yes	0	0	0	0
DC	No	66	0	66	0
ME	No	66	0	66	0
MD	Partially	30	0	30	0
MA	No	66	0	66	0
NH	No	0	66	0	66
NJ	Yes	0	0	0	0
NY	Yes	0	0	0	0
PA	Yes	0	0	0	0
RI	No	66	0	66	0
VT	n/a	0	66	0	66
VA-NVA	Yes	0	0	0	0
VA-Other	No	0	0	0	0

4.4.8 OTC Model Rules for ICI Boilers

In Resolution 06-02, the OTC Commissioners recommended that OTC member states pursue as necessary and appropriate state-specific rulemakings or other implementation methods to establish emission reduction percentages, emission rates or technologies for ICI boilers based on guidelines that varied by boiler size and fuel type.

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in NOx emissions should be applied in 2017 and 2020. All but one state indicated that they have not adopted rules for area sources equivalent to the 2006 OTC recommendations. New Jersey specified that they have post-2007 ICI boiler rules that reduce NOx emissions and provided the estimates of the reductions in NOx emissions by SCC resulting from boiler tuneup requirements, as shown in Exhibit 4.12:

Exhibit 4.12 Area Source Emission Reductions from New Jersey ICI Boiler NOx Rules

SCC	Source Category	Percent Reduction from Tuneups 2007-2017	Rule Effectiveness	Rule Penetration	Overall Percent Reduction 2007-2017
2102004000	Industrial Distillate	25%	80%	30%	6%
2102005000	Industrial Residual	25%	80%	30%	6%
2102006000	Industrial Natural Gas	25%	80%	30%	6%
2102007000	Industrial LPG	25%	80%	30%	6%
2103004000	Commercial Distillate	25%	80%	30%	6%
2103005000	Commercial Residual	25%	80%	30%	6%
2103006000	Commercial Natural Gas	25%	80%	30%	6%
2103007000	Commercial LPG	25%	80%	30%	6%

Other states indicated that they will likely depend on USEPA national rule for possible inclusion in the BOTW inventory. OTC Resolution 10-01 (June, 2010) called on USEPA for national regulations for ICI boilers. The guidelines from OTC Resolution 06-02 shown in Exhibit 4.13 were used to estimate potential area source NOx reductions for the "what if" control scenario for all states in the MANE-VU+VA inventory except New Jersey and Virginia.

Exhibit 4.13 OTC Resolution 06-02 Guidelines for ICI Boiler NOx Rules

Boiler Size (mmBtu/hr)	NOx Percent Reduction from Base Emissions by Fuel Type			
	Natural Gas	#2 Fuel Oil	#4/#6 Fuel Oil	Coal
<25	10	10	10	10
25 to 50	50	50	50	50*
50 to 100	10	10	10	10*
100 to 250	76	40	40	40*
>250	**	**	**	**

* Resolution 06-02 did not specify a percent reduction for coal; for modeling purposes, the same percent reduction specified for #4/#6 fuel oil was used for coal.

** Resolution 06-02 specified the reduction for > 250mmBtu/hour boilers to be the "same as EGUs of similar size." The OTC Commissioners have not yet recommended an emission rate or percent reduction for EGUs. As a result, no reductions for ICI boilers > 250 mmBtu/hour were included in the potential controls inventory.

Since the above guidelines vary by boiler size and fuel type, the specific percent reduction applied to an area source category depends on the SCC and design capacity of the source. The SCC identifies the fuel type (for example, SCC 21-02-004-xxx describes distillate oilfired industrial boilers, SCC 21-02-006-xxx describes natural gas-fired industrial boilers). The area source inventory does not contain any information on the sizes of the units included in the inventories. To apportion area source emissions to the boiler size ranges listed above, we used data from an Oak Ridge National Laboratory study (EEA 2005). We used the national estimates of boiler capacity by size range to calculate the percentage of total boiler capacity in each size range. Since the Oak Ridge report distinguished between industrial boilers and commercial/institutional boilers, we developed separate profiles for industrial boilers and for commercial/institutional boilers. We used these boiler size profiles to calculate weighted average percent reductions industrial boilers by fuel type and commercial/institutional boilers by fuel type, as follows:

- 34.5 percent reduction in NOx emissions from industrial boilers, all fuel types
- 28.1 percent reduction in NOx emissions from commercial/institutional boilers, all fuel types

Appendix I contains the data used to develop the NOx control factors for area source ICI boilers.

4.4.9 OTC Model Rule for New, Small, Natural Gas-fired Boilers

The provisions of this model rule limit NOx emissions from new natural gas-fired ICI and residential boilers, steam generators, process heaters, and water heaters greater than 75,000 BTUs and less than 5.0 million BTUs. This model rule may be implemented as a manufacturing restriction, a sales restriction, a use restriction, or a combination of these restrictions. Each implementing state agency will choose the entities to regulate after consideration of the agency's compliance assurance and enforcement practices and policies.

The emission limits of this model rule were developed from requirements now in effect in certain jurisdictions, including: (1) San Joaquin Valley Air Pollution Control District Rule 4308 for boilers, steam generators, process heaters and water heaters with maximum rated heat input capacity equal to or greater than 75,000 Btu/hr and up to but less than 2.0 million Btu/hr; (2) San Joaquin Valley Air Pollution Control District Rule 4307 for gas-fired and liquid fuel-fired boilers, steam generators, and process heaters with maximum rated capacity of 2.0 million Btu/hr up to and including 5.0 million Btu/hr; and (3) similar rules adopted by other California Air Pollution Control Districts and the State of Texas.

Since the OTC model rule is based on SJVAPCD Rules 4307 and 4308, one method for estimating potential NOx reductions for the OTC states from both Rule 4307 and Rule 4308 is to compare the natural gas usage in the San Joaquin Valley to the natural gas usage in the OTC states and calculate the proportional NOx reductions.

The SJV 4308 Rule, Final Staff Report estimated NOx reductions of 2.0 annual average tons per day (730 tons per year), and the 2008 SJV 4307 Rule Proposal estimated NOx reductions of 1.15 annual average tons per day (420 tons per year). The total reduction from both rules was estimated to be 3.15 tons per day (1,150 tons per year) after a 15-year period for complete turnover to compliant equipment. These SJV data were used to calculate a ton per year emission reduction, assuming implementation begins in 2014, as summarized in Exhibit 4.14 and further documented in Appendix J.

Exhibit 4.14 NOx Control Factors for the OTC Rule for New, Small, Natural Gas-fired Units

State	Percent Reduction in NOx Emissions from Residential and Commercial Natural Gas Use	
	2017	2020
CT	5.0%	8.4%
DE	6.1%	10.1%
DC	2.3%	3.9%
ME	0.0%	0.0%
MD	3.2%	5.4%
MA	5.3%	8.8%
NH	7.1%	11.8%
NJ	3.5%	5.9%
NY	5.1%	8.5%
PA	4.7%	7.8%
RI	7.0%	11.7%
VT	3.1%	5.1%
VA	0%	0%

4.4.10 MANE-VU Low Sulfur Fuel Oil Strategy

MANE-VU developed a low sulfur fuel oil strategy to help states develop Regional Haze SIPs (MANE_VU 2007). The sulfur in fuel oil recommendations are shown in Exhibit 4.15 and vary by state, type of fuel oil, and year of implementation.

Exhibit 4.15 MANE-VU Low Sulfur Fuel Oil Strategy

Inner Zone States (DE, NJ, NY, PA)		
Fuel Oil Type	**Sulfur Content 2012**	**Sulfur Content 2016**
Distillate	500 ppm	15 ppm
#4 Residual	0.25 %	0.25 %
#6 Residual	0.3 to 0.5 %	0.3 to 0.5 %
Outer Zone States (CT, DC, MA, MD, ME, NH, RI, VT)		
Fuel Oil Type	**Sulfur Content 2014**	**Sulfur Content 2018**
Distillate	500 ppm	15 ppm
#4 Residual	n/a	0.25 to 0.5 %
#6 Residual	n/a	0.5 %

Each state was polled and asked to provide guidance as to when, if at all, the MANE-VU strategy would be incorporated into their state rules. States were also asked to provide the 2007 sulfur contents for each fuel type by county in order to calculate the percent reduction in emissions for the future years. Three states (MD, NJ, and NY) have adopted or are committed to adopting the strategy into their rules. The reductions for these three states were accounted for in the "existing controls" inventory. All other jurisdictions indicated that not enough regulatory development progress has been made to include the reductions in future years with absolute certainty. The potential reductions for these states were accounted for in the "potential new controls" inventory. One state (VA) has no plans to adopt the low sulfur fuel oil strategy. The percent reductions by fuel type and county are contained in Appendix K.

5.0 NONEGU POINT SOURCE CONTROL FACTORS

Control factors were developed to estimate post-2007 emission reductions resulting from on-the-books regulations and proposed regulations/actions. Control factors were considered for the following national and regional measures:

- Federal Rules Affecting NonEGU Point Sources
- Control Technique Guidelines
- OTC Model Rules

These control programs are discussed in the following subsections. The control factors used for nonEGU point sources are provided in V3_3 NonEGU_07_17_20.xlsx.

5.1 FEDERAL ACTIONS AFFECTING NONEGU POINT SOURCES

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform (USEPA 2010a). These categories, and how they were accounted for in the MANE-VU+VA emission projection inventories, are described below:

- <u>MACT Standards</u> - USEPA developed guidance for estimating VOC and NO_x emission changes from MACT Rules (USEPA 2007b). We reviewed the guidance to identify nonEGU source controls associated with MACT standards for controlling HAPs. The information concerning MACT compliance periods was used to determine whether the MACT standard resulted in post-2007 emission reductions. Because major source categories had a compliance period of 2007 or earlier, we assumed that the emission reductions from the MACT standard should be reflected in the baseline year and not as an additional post- 2007 credit. The only exception to the above discussion of area source MACT standards pertains to the recently promulgated rules for reciprocating internal combustion engines. USEPA made available an estimate of the percent reduction in emissions attributable to the RICE MACT rule in 2012 and 2014 (USEPA 2010b). These reductions by SCC are shown in Exhibit 5.1. The USEPA 2014 estimates were used for the MANE-VU+VA 2017, 2020 and 2025 inventories.

- <u>Industrial, Commercial, and Institutional Boilers and Process Heaters MACT Standard</u> - USEPA' s 2020 control factor file identified a number of solid fuel-burning SCCs for which they estimated an 87% reduction in both PM10 and PM2.5. These were used for 2025 also for the affected SCCs.

Exhibit 5.1 USEPA Estimated Percent Reductions for RICE MACT Standard

SCC	CO	NOx	PM10	PM2.5	VOC	SCC Description
20100102	20.36		15.14	15.14	36.72	Electric Generation;Distillate Oil (Diesel);Reciprocating
20100105	20.36		15.14	15.14	36.72	Electric Generation;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby
20100107	20.36		15.14	15.14	36.72	Electric Generation;Distillate Oil (Diesel);Reciprocating: Exhaust
20100202	19.86	12.53			23.87	Electric Generation;Natural Gas;Reciprocating
20100207	19.86	12.53			23.87	Electric Generation;Natural Gas;Reciprocating: Exhaust
20200102	20.36		15.14	15.14	36.72	Industrial;Distillate Oil (Diesel);Reciprocating
20200104	20.36		15.14	15.14	36.72	Industrial;Distillate Oil (Diesel);Reciprocating: Cogeneration
20200107	20.36		15.14	15.14	36.72	Industrial;Distillate Oil (Diesel);Reciprocating: Exhaust
20200202	19.86	12.53			23.87	Industrial;Natural Gas;Reciprocating
20200204	19.86	12.53			23.87	Industrial;Natural Gas;Reciprocating: Cogeneration
20200207	19.86	12.53			23.87	Industrial;Natural Gas;Reciprocating: Exhaust
20200253	19.18	37.96			29.74	Industrial;Natural Gas;4-cycle Rich Burn
20200254	37.85				28.59	Industrial;Natural Gas;4-cycle Lean Burn
20200256	37.85				28.59	Industrial;Natural Gas;4-cycle Clean Burn
20200301	19.18	37.96			29.74	Industrial;Gasoline;Reciprocating
20200307	19.18	37.96			29.74	Industrial;Gasoline;Reciprocating: Exhaust
20201001	19.86	12.53			23.87	Industrial;Liquified Petroleum Gas (LPG);Propane
20201002	19.86	12.53			23.87	Industrial;Liquified Petroleum Gas (LPG);Butane
20201702	19.18	37.96			29.74	Industrial;Gasoline;Reciprocating Engine
20201707	19.18	37.96			29.74	Industrial;Gasoline;Reciprocating: Exhaust
20300101	20.36		15.14	15.14	36.72	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating
20300105	20.36		15.14	15.14	36.72	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby
20300106	20.36		15.14	15.14	36.72	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Evaporative Losses
20300107	20.36		15.14	15.14	36.72	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Exhaust
20300201	19.86	12.53			23.87	Commercial/Institutional;Natural Gas;Reciprocating

SCC	CO	NOx	PM10	PM2.5	VOC	SCC Description
20300204	19.86	12.53			23.87	Commercial/Institutional;Natural Gas;Cogeneration
20300207	19.86	12.53			23.87	Commercial/Institutional;Natural Gas;Reciprocating: Exhaust
20300301	19.18	37.96			29.74	Commercial/Institutional;Gasoline;Reciprocating
20300307	19.18	37.96			29.74	Commercial/Institutional;Gasoline;Reciprocating: Exhaust
20301001	19.86	12.53			23.87	Commercial/Institutional;Liquified Petroleum Gas (LPG);Propane
20301002	19.86	12.53			23.87	Commercial/Institutional;Liquified Petroleum Gas (LPG);Butane
20400401	19.18	37.96			29.74	Engine Testing;Reciprocating Engine;Gasoline
20400402	20.36		15.14	15.14	36.72	Engine Testing;Reciprocating Engine;Diesel/Kerosene
20400403	20.36		15.14	15.14	36.72	Engine Testing;Reciprocating Engine;Distillate Oil: CI: CI: VOC 2005cr = 0
31000203	19.86	12.53			23.87	Oil and Gas Production;Natural Gas Production;Compressors
50100421	19.86	12.53			23.87	Solid Waste Disposal;Landfill Dump;Waste Gas Recovery: Internal Combustion Device

- Petroleum refinery enforcement settlements - For the facilities identified by USEPA located in New Jersey and Pennsylvania we applied post-2007 estimated reductions for NO_x, PM10, PM2.5, and SO_2 to affected units.

5.2 RECENT CONTROL TECHNIQUE GUIDELINES

Control Techniques Guidelines (CTGs) are documents issued by USEPA to provide states with the USEPA's recommendation on how to control the emissions of VOC from a specific type of product or source category in an ozone nonattainment area. USEPA issued new or updated CTGs for 13 VOC categories in 3 groups during 2006, 2007 and 2008 (USEPA 2008b). The categories are:

- 2006 CTGs
  - Flat Wood Paneling Coatings
  - Industrial Cleaning Solvents
  - Flexible Package Printing
  - Lithographic Printing
  - Letterpress Printing
- 2007 CTGs
  - Large Appliance Surface Coating
  - Metal Furniture Coatings
  - Paper Film and Foil Coatings
- 2008 CTGs
  - Miscellaneous Metal Parts Coatings
  - Plastic Parts Coatings
  - Auto and Light-duty Truck Assembly Coatings
  - Fiberglass Boat Manufacturing
  - Miscellaneous Industrial Adhesives

States indicated that they expected very little additional reductions from these new or amended CTGs. Therefore, no emission reductions were included in the inventory.

5.3 OTC MODEL RULES FOR NONEGUs

The OTC developed NOx control measures for industrial, commercial, and institutional (ICI) boilers and distributed generation units in 2001 (OTC 2001). We reviewed the OTC's status reports to identify states status in adopting the OTC 2001 model rules (OTC 2009). Most states have adopted the OTC model rules with compliance dates in 2007 or earlier. As a result, we assumed that the emission reductions from the 2001 OTC model rules for nonEGUs are already reflected in the 2007 inventory and no post- 2007 reductions were applied.

In 2006, the OTC introduced model rules (OTC 2007) for one nonEGU VOC source category (adhesives/sealants) and new/more stringent requirements for several NOx source categories (asphalt production plants, cement kilns, glass/fiberglass furnaces, and industrial, commercial, and institutional {ICI} boilers).

These model rules and recommendations provided a consistent framework for air pollution regulation throughout the region. In addition, MANE-VU provided recommendations to require low sulfur home heating, distillate and residul fuel oil. Exhibit 5-2 briefly describes the OTC and MANE-VU control measures affecting point sources that have been recommended for adoption by the states in the OTR. Recommendations for EGUs are not addressed in this section since the projection of EGU emissions is being accomplished by ERTAC under a separate agreement.

Individual states are in various stages of adopting the OTC recommendations into the rules and SIPs. We reviewed the OTC's status reports to identify each state's adoption status (OTC 2009, OTC 2011a, OTC2011b). To obtain further clarification, states were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the OTC model rule or recommendation and whether credit for each rule was already accounted for in the 2007 inventory.

Not all states have adopted all rules. In order to evaluate the impact of both the rules currently in place as well as the potential adoption of all control measures by all states, the state Air Directors specified that two emission control scenarios should be developed.

- Existing Controls - this scenario represents the best estimates for the future year, accounting for all in-place controls that are fully adopted into federal or individual state regulations or SIPs.

- Potential New OTC Controls – this scenario accounts for all of the emission reductions from the existing control scenario plus new state or regional measures that are under consideration by the OTC or individual states. This is a "what if" scenario that assumes that all states in the MANE-VU+VA region except Virginia will adopt all new OTC control measures under consideration by 2017. It does not include any potential new <u>federal</u> control measures that are under consideration.

The following paragraphs describe the control factors applied for each control measure by state and future year.

Exhibit 5.2 Summary of Point Source OTC Control Measures

Source Category	Pollutants	Description
EGUs	NOx	OTC 2001. Provided emission standards for stationary combustion turbines, emergency generators, and load shaving units. OTC 2009/2010. Recommended NOx emission rate limits for oil and gas boilers serving EGUs and emission rate limits for high energy demand day combustion turbines.
Asphalt Production Plants	NOx	OTC 2006. Provided emission rate limits and recommended a 35% reduction in NOx emissions.
Cement Kilns	NOx	OTC 2006. Provided emission rate limits and recommended a 60% reduction in NOx emissions.
Glass Furnaces	NOx	OTC 2006. Provided emission rate limits and recommended a 85% reduction in NOx emissions.
ICI Boiler Controls	NOx	OTC 2001. Recommended NOx emission rate limits for industrial boilers greater than 5 mmBtu/hour OTC 2006. Recommended lower NOx emission rate limits for industrial, commercial, and institutional boilers OTC 2010. Recommended national NOx controls for ICI boilers
Low Sulfur Fuel Oil	SO2	MANE-VU 2006. Recommends sulfur content limits for home heating oil, distillate oil, and residual oil
Adhesives and Sealants	VOC	OTC 2006. Provided VOC content limits and other restrictions on adhesives used in industrial and commercial settings.
Large Petroleum Storage Tanks	VOC	OTC 2009/2010. Addresses high vapor pressure VOCs, such as gasoline and crude oil, stored in large aboveground stationary storage tanks, which are typically located at refineries, terminals and pipeline breakout stations.

5.3.1 OTC 2006 Model Rule for Adhesives and Sealants

The 2006 OTC model rule is intended to achieve VOC emission reductions from adhesive application sources. The OTC 2006 model rule for adhesives and sealants is based on the reasonably available control technology (RACT) and best available retrofit control technology (BARCT) determination by the California Air Resources Board (CARB) developed in 1998. The emission reduction benefit estimation methodology is based on information developed and used by CARB for their RACT/BARCT determination in 1998. The vast majority of the emissions regulated by this rule are in the area source inventory.

For point sources, we first identified those sources applying adhesives and sealants (using the SCC of 4-02-007-xx, adhesives application). Next, we reviewed the 2007 inventory to determine whether these sources had existing capture and control systems. Most of the sources did not have control information in the NIF database. However, several sources reported capture and destruction efficiencies in the 70 to 99 percent range, with a few sources reporting capture and destruction efficiencies of 99+ percent. Sources with existing control systems that exceeded an 85 percent overall capture and destruction efficiency would comply with the OTC 2006 model rule provision for add-on air pollution control equipment; therefore, no additional reductions were calculated for these sources. For point sources without add-on control equipment, we used a 64.4 percent reduction based on the CARB determination.

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC model rule and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. New Hampshire indicated that they have no existing rule in place and no reductions should be applied. Virginia indicated that reductions from existing rules only apply in three regions:

- Northern Virginia (Arlington, Alexandria, Manassas, Manassas Park, Prince William, Loudon, Fairfax, Fairfax City, Falls Church, and Stafford),
- Fredericksburg (Fredericksburg and Spotsylvania), and
- Richmond (Charles City, Colonial Heights, Chesterfield, Hopewell, Hanover, Petersburg, Henrico, City of Richmond, and Prince George).

All other states have existing rules in place that will require VOC reductions before 2017. Exhibit 5.3 shows the reduction that were applied by state under both the existing controls inventory and the “what if” inventory.

Exhibit 5.3 State Recommendations for OTC Adhesives/Sealants Rule

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	64.4	0	64.4	0
DE	No	64.4	0	64.4	0
DC	n/a	n/a	n/a	n/a	n/a
ME	No	64.4	0	64.4	0
MD	No	64.4	0	64.4	0
MA	No	64.4	0	64.4	0
NH	No	0	64.40	0	64.4
NJ	No	64.4	0	64.4	0
NY	No	64.4	0	64.4	0
PA	No	64.4	0	64.4	0
RI	No	64.4	0	64.4	0
VT	n/a	n/a	n/a	n/a	n/a
VA-NVA	No	64.4	0	64.4	0
VA-FRD	No	64.4	0	64.4	0
VA-RCH	No	64.4	0	64.4	0
VA-Other	No	0	0	0	0

* Some sources in the 2007 inventory had VOC controls greater than 85% and already complied with the requirements; no incremental reduction was taken for these sources (see text)
n/a - no affected point sources identified in the inventory

5.3.2 OTC 2009/2010 Model Rule for Large Storage Tanks

The OTC model rule addresses high vapor pressure VOCs, such as gasoline and crude oil, stored in large aboveground stationary storage tanks, which are typically located at refineries, terminals and pipeline breakout stations. The OTC model rule is based on recent revisions to New Jersey's VOC storage tank rules located at N.J.A.C. 7:27-16.2. The OTC model rules requires: 1) retrofiting floating roof tanks to reduce emissions from deck fittings; 2) retrofitting external floating roof tanks with domes; 3) controlling roof landing losses; and 4) adding controls for degassing and interior tank cleaning. New Jersey estimated reductions for tanks located in New Jersey would total approximately 2,000 tons per year by 2020. In making these estimates, New Jersey developed the following VOC percent reduction estimates for the following categories of storage tanks:

Tank Location	Point Source SCC	VOC Percent Reduction	
		2017	2020
Refinery	4-03-011-xx (floating roof tank SCCs, gasoline or crude oil only)	82	85
Bulk Terminal	4-04-001-xx (floating roof tank SCCs)	40	50
Bulk Plant and Pipeline Breakout Station	4-04-002-xx (floating roof tank SCCs gasoline or crude oil only)	52	65

Only New Jersey has existing rules in place, and the above percent reductions were applied to the existing controls inventory.

For all other states with affected sources, the potential reductions from the OTC rule were applied in the "what if" inventory.

5.3.3 OTC 2006 Model Rule for Asphalt Production Plants

The OTC recommended that member states pursue state-specific rulemakings or other implementation methods that would achieve a 35 percent reduction in NOx emissions. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC model rule and whether the estimated reduction in NOx emissions should be applied in 2017 and 2020. Only Maine, New Jersey and New York indicated that the reductions should be applied. A 35 percent reduction in NOx emissions for fuel burning SCCs in the 3-05-002-xx series was applied to the existing controls inventory for Maine, New Jersey, and New York.

All other states indicated that the NOx reductions should not be applied in the existing controls inventory. The 35 percent reduction for other states was applied in the "what if" inventory.

5.3.4 OTC 2006 Model Rule for Cement Manufacturing Plants

Cement kilns are located in Maine, Maryland, New York, Pennsylvania, and Virginia. The OTC recommended state-specific rulemakings or other implementation methods that would result in about a 60 percent reduction in uncontrolled levels NOx emissions or meet the following emission limits based on kiln type:

- Wet: 3.88 lb/ton clinker
- Long Dry: 3.44 lb/ton clinker
- Preheater: 2.36 lb/ton clinker
- Precalciner: 1.52 lb/ton clinker

Cement kilns are already subject to NOx controls as part of Phase I of the NO_x SIP call or state-specific RACT requriements. The emission reductions resulting from the NOx SIP call or RACT requirements are already accounted for in the 2007 inventory.

The following methods were used to calculate the additional reductions from the OTC 2006 Control Measure in each state:

- Maine has a single kiln that was converted from an existing wet process cement kiln to a dry process (preheater/precalciner type) kiln and underwent a BACT review around 2005. The permitted emission rate is 1,533 tons per year with an annual capacity of 766,500 tons of clinker (e.g., about 4 lbs/ton of clinker). Maine does not plan on any additional controls, so no incremental reductions were applied for the either the existing controls or "what if" inventory.

- Maryland indicated controls will become effective in 2011 for the two facilities in the state. Maryland specified a 25 percent reduction for the Holcim facility and a 40 percent reduction for the Lehigh facility for the existing controls inventory. No reductions were specified for the two kilns at the Essroc facility for the existing controls inventory. No additional reductions were specified for any cement kiln for the "what if" inventory.

- New York three cement plants: Each has a different RACT requirement effective 7/1/2012. The three limits are; 6.59 lb/ton, 2.88 lb/ton and 1.5 lb/tom (30 day rolling average). For this inventory, we have assumed that these post-2007 RACT requirements have an incremental control efficiency of 40 percent and we have applied this reduction in the existing controls inventory. No additional reductions were specified for any cement kiln for the "what if" inventory.

- Pennsylvania provided kiln-specific projected future year NOx emissions for 2017 and 2020 based on existing post-2007 state requirements. A kiln-specific control factor was calculated based on the ratio of the future year emissions to the 2007 emissions and was applied for the existing controls inventory. No additional reductions were specified for any cement kiln for the "what if" inventory.

- Virginia has a single preheater/precalciner kiln that is not located in the OTR. Virginia does not plan on any additional controls since the facility is not in the OTR, so no incremental reductions were applied for the either the existing controls or "what if " inventories.

5.3.5 OTC 2006 Model Rule for Glass and Fiberglass Furnaces

The OTC recommended state-specific rulemakings or other implementation methods to achieve an approximately 85 percent reduction in NOx emissions from uncontrolled levels. Emission reductions for glass and fiberglass furnaces were calculated using the methodology previously developed and documented in the OTC report (OTC 2007). Glass and fiberglass furnaces are located in Maryland, Massachusetts, New Jersey, New York, Pennsylvania, and Virginia. The following methods were used to calculate the additional reductions from the OTC 2006 Control Measure in each state:

- Maryland indicated that a 48 percent reduction should be applied to the single glass manufacturing facility in Maryland.
- Massachusetts indicated that they have a single facility with two furnaces furnaces; one furnace installing oxy-firing at 1.3 lb NOx per ton of glass, and the other at 5.3 lb/ton. The facility will be complying with EPA NSR enforcement Consent Decree by 2017. Massachusetts indicated that plant-wide emissions are expected to decrease by 35 percent in 2017 and 2020.
- New Jersey indicated that a 50 percent reduction in NOx emissions should be applied to glass and fiberglass furnaces in 2013, 2017, 2020 and 2025.
- New York did not provide guidance regarding glass and fiberglass furnaces. We used the percent reductions developed and documented in the previous round of emission projections developed for MARAMA (MARAMA 2007). An incremental control efficiency of 70 percent was used for New York glass and fiberglass furnaces in that inventory.
- Virginia indicated that they have no plans to implement the OTC measure, and no NOx reductions were applied to glass/fiberglass furnaces in Virginia.

All of the above reductions for glass and fiberglass furnaces were accounted for in the existing controls inventory. No additional reductions were specified for any glass or fiberglass furnace for the “what if” inventory.

5.3.6 OTC 2006 Model Rule for ICI Boilers

In Resolution 06-02, the OTC recommended that OTC member states pursue as necessary and appropriate state-specific rulemakings or other implementation methods to establish emission reduction percentages, emission rates or technologies for ICI boilers based on guidelines that varied by boiler size and fuel type..

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in NOx emissions should be applied in 2017 and 2020. Most states have not adopted rules equivalent to the 2006 OTC recommendations. These states indicated that they will likely to depend on USEPA national rule for possible inclusion in the BOTW inventory. Specifically, the OTC Resolution 10-01 (June, 2010) called on USEPA for national regulations for ICI boilers.

Three states specified that that have adopted post-2007 ICI boiler rules to reduce NOx emissions. The percent reductions for ICI boilers were for these states were calculated as describe in the following paragraphs.

New Jersey provided NOx percent reductions that varied by heat input rate and fuel/boiler type and included an 80 percent rule effectiveness adjustment, as shown in Exhibit 5.4. The NIF file submitted by New Jersey for this project did not include the boiler design capacity. This data gap was filled using the boiler design capacities previously developed for the OTC study in 2006, if available; otherwise the SCC description was used to assign a default boiler design capacity. No additional reductions were specified for the "what if" inventory for New Jersey.

Exhibit 5.4 NonEGU Point Source Emission Reductions from New Jersey ICI Boiler NOx Rules

Heat Input Rate (mmBtu/hr)	Fuel/Boiler Type	Overall % Reduction 2007-2017
at least 5 but < 10	All	20%
at least 10 but < 20	All	20%
at least 25 but < 50	Natural gas only	40%
	No. 2 Fuel oil only	40%
	Refinery fuel gas and other gaseous fuels	40%
	Other liquid fuels	40%
	Duel Fuel using fuel oil and/or natural gas	40%
at least 50 but < 100	Natural gas only	40%
	No. 2 Fuel oil only	27%
	Other liquid fuels	27%
	Duel Fuel using fuel oil and/or natural gas	40%
at least 100 or greater	No. 2 Fuel oil only	40%

New York specified that a 50 percent reduction should be applied in the existing controls inventory for all boilers with greater than 25 mmBtu/hour design capacity. The NIF file submitted by New York for this project did not include the boiler design capacity. This data gap was filled using the boiler design capacities previously developed for the OTC study in 2006, if available; otherwise the SCC description was used to assign a default boiler design capacity. No additional reductions were specified for the "what if" inventory for New York.

New Hampshire specified that reductions should be applied to boilers in the 50-100 and 100-250 mmBtu/hour size ranges. We used the methodology previously developed and documented in the OTC report (OTC 2007). Reductions vary by size range and fuel type. State-by-state emission reduction percentages were developed by comparing the state emission limit in lbs/mmBTU to the OTC 2006 recommended limit. There are no coal-fired ICI boilers in New Hampshire. For other fossil fuels used in New Hampshire, the NOx percent reduction was as follows:

- Natural gas, 50-100 mmBtu/hr: 50% reduction
- Natural gas, 100-250 mmBtu/hr: 0% reduction
- Residual/distillate oil, 50-100 mmBtu/hr: 33.3% reduction
- Residual/distillate oil, 100-250 mmBtu/hr: 33.3% reduction

No additional reductions were specified for the "what if" inventory for New Hampshire.

All other states do not have existing rules that would result in post-2007 emission reductions. These states indicated that they will likely to depend on USEPA national rule for possible inclusion in the BOTW inventory. Specifically, the OTC Resolution 10-01 (June, 2010) called on USEPA for national regulations for ICI boilers. However, in order to estimate the potential NOx emission reductions for the "what if" control scenario, the guidelines from OTC Resolution 06-02 shown in Exhibit 5.5 were used to estimate potential NOx reductions in the "what if" inventory for those states without existing rules, except Virginia.

Exhibit 5.5 OTC Resolution 06-02 Guidelines for ICI Boiler NOx Rules

Boiler Size (mmBtu/hr)	NOx Percent Reduction from Base Emissions by Fuel Type			
	Natural Gas	#2 Fuel Oil	#4/#6 Fuel Oil	Coal
<25	10	10	10	10
25 to 50	50	50	50	50*
50 to 100	10	10	10	10*
100 to 250	76	40	40	40*

>250	**	**	**	**

* Resolution 06-02 did not specify a percent reduction for coal; for modeling purposes, the same percent reduction specified for #4/#6 fuel oil was used for coal.

** Resolution 06-02 specified the reduction for > 250mmBtu/hour boilers to be the "same as EGUs of similar size." The OTC Commissioners have not yet recommended an emission rate or percent reduction for EGUs. As a result, no reductions for ICI boilers > 250 mmBtu/hour were included in the potential controls inventory.

Since the above guidelines vary by boiler size and fuel type, the specific percent reduction applied to an individual source depends on the SCC and design capacity of the source. The SCC identifies the fuel type, while the design capacity identifies the boiler size. In many cases, the design capacities in the MANE-VU NIF database were missing. The following hierarchy was used in filling in gaps where design capacities were missing:

- Use the design capacity field from the NIF EU table, if available;
- Use the design capacities provided by agencies to fill in the data gaps in the MANE-VU 2002 inventory;
- Use design capacity as reported either the Unit Description field in the NIF EU table or the Process Description field from the NIF EP table, if available;
- Use design capacity from the source's Title V permit, if the Title V permit was online;
- Use the SCC description to determine the design capacity (for example, SCC 1-02-006-01 describes a >100 mmBtu/hr natural gas-fired boiler, SCC 1-02-006-02 describes a 10-100 mmBtu/hr natural gas-fired boiler).

After performing this gap-filling exercise, each boiler was assigned to one of the size ranges and fuel types shown in the above table. The emission reduction percentages by boiler size range and fuel type were then applied.

5.4 FUEL OIL SULFUR LIMITS

MANE-VU developed a low sulfur fuel oil strategy to help states develop Regional Haze SIPs (MANE-VU 2007). As previously discussed in Section 4.5, Each state was polled and asked to indicate when, if at all, the MANE-VU strategy would be incorporated into their state rules. States were also asked to provide the 2007 sulfur contents for each fuel type by county in order to calculate the percent reduction in emissions for the future years. Three states (MD, NJ, and NY) have adopted or are committed to adopting the strategy into their rules. The reductions for these three states were accounted for in the "existing controls" inventory. All other jurisdictions indicated that not enough regulatory development progress has been made to include the reductions in future years with absolute certainty. The potential reductions for these states were accounted for in the "potential new controls" inventory. One state (VA) has no plans to adopt the low sulfur fuel oil strategy. The percent reductions by fuel type and county are contained in Appendix K.

5.5 STATE-SPECIFIC NONEGU CONTROL FACTORS

The following state-specific nonEGU control factors were provided:

- **Bellefield Boiler Plant, Allegheny County.** Allegheny County indicated that this facility changed their fuel source from coal to natural gas in July 2009 and future year emissions were changed to reflect the fuel switch.
- **USS Clairton Works**, **Allegheny County.** The facility will remove Batteries 7-9 and have Battery C operational by 2013, resulting in a change in PM emissions in 2013. Also, USS Clairton Works will remove Batteries 1-3 and have Battery D operational in 2015, resulting in a change in PM emissions in 2017 and 2020.
- **Chrysler, Delaware.** The Chrysler facility (ID 1000300128) shut down in 2009. Delaware specified that only a 25 percent reduction should be taken for all pollutants since some emissions will be banked for future use by other sources.
- **O S G Ship Management (ID 1000500093), Delaware.** Delaware provided source-specific growth factors and percent reductions in VOC emissions for 2017 and 2020 from the lightering operations at O S G Ship Management (ID 1000500093).
- **Control Technology Guidance (CTG) Documents, Delaware.** Delaware determined that VOC emission reductions from new CTG recommendations would be very small. Although the new CTGs set up new recommendations for higher control efficiencies, the actual VOC reductions would be minimum, if not none, because most DE's existing facilities are not affected by the new requirements and emissions from those facilities are relatively small (based on 2002 inventory).
- **Unit Shutdowns, Delaware.** Delaware identified several emission units that have shut down at the following facilities: Dow Reichhold Specialty Latex (ID 1000100016), SPI Poly-Ols (ID 1000300426), and Invistas (ID 1000500002). Emissions for all pollutants were set to zero for these units.

- **Dover Air Force Base, Delaware.** Delaware identified four boilers at Dover Air Force Base (ID 1000100001) that ceased using fuel oil in March 2010. SO2 emissions for these boilers were set to zero.
- **Premcor Refinery NOx Plantwide Cap, Delaware.** The refinery was sold to the Delaware City Refining Company and an agreement was reached with DNREC's Secretary that allows plant-wide applicability limit (cap) for NOx. To project emissions, as well as for modeling purposes, Delaware decided to spread out the NOx-cap to each stack. Delaware estimated a plantwide reduction of 10.05 percent in 2013 and 41.22 percent in both 2017 and 2020.
- **Wausau Paper Specialty Products, Maine.** The Wausau Paper Specialty Products facility (ID 2300700007) closed in 2009. All emissions were set to zero for this facility in the 2017 and 2020 projection inventories.
- **2009 NJ Rule for NOx for Municipal Solid Waste Incinerators, New Jersey.** This rule will achieve a 27 percent reduction from one facility - Camden County Energy Recovery Associates, L.P. (ID 3400751614).
- **NJ rule for VOC Storage Tanks, New Jersey.** New Jersey provided expected VOC emission reductions resulting from post-2007 rules for VOC storage tanks. For refinery floating roof storage tanks (SCC 4-03-011-xx), the reductions are 75 percent for 2013, 82 percent for 2017, and 85 percent for 2020. For bulk terminal tanks (SCC 4-04-001-xx), the reductions are 20 percent for 2013, 40 percent for 2017, and 50 percent for 2020. For pipeline breakout stations (SCCs 4-04-002-xx and 4-06-005-xx), the reductions are 26 percent for 2013, 52 percent for 2017, and 65 percent for 2020.
- **International Paper – Franklin Mill, Virginia.** The International Paper – Franklin Mill (ID 5109300006) closed effective 2010. All emissions were set to zero for this facility in the 2017 and 2020 projection inventories.

6.0 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 (CNG) or liquefied petroleum gas (LPG) engines.

The National Mobile Inventory Model (NMIM) was developed by USEPA to develop county-level emission estimates for certain types of nonroad equipment. NMIM uses the current version the NONROAD model to develop emission estimates and was used to develop the projection inventories discussed here. 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 National County Database (version NCD20090531), and NONROAD2008a (July 2009 version) as a starting point. Changes were made to the NCD20090531 based on review of data by the States. The purpose of this review was to create a new NCD specific to the 2007 base year model runs and the three projection year model runs. Changes were made to a copy of the NCD20090531 to create a new NCD used for the emission inventory runs. That NCD is called NCD20090910MARAMA.

6.1 STATE REVIEW OF NMIM FUEL CHARACTERISTICS

For the 2017 and 2020 projection year inventories, AMEC provided data on fuel characteristics from the NCD20090531 to the States to determine if they had additional changes required for the fuel characteristics for future year inventories. None of the States had changes to the fuel characteristics, except for CT which provided revisions to the six fuels that they had provided for the 2007 base year inventory to account for a number of changes including changes to RVP and fuel sulfur.

Connecticut provided updated values for the volume and market share components for ethanol which is used by NMIM to determine the oxygen percentage for NONROAD runs. Complete data replacement records were obtained for CT for the following tables: gasoline inputs, diesel inputs, countymonthyear inputs, and datasource inputs. CT added six new fuels which were given NRGasolineIds of 5000-5005 inclusive. Data was provided for both the base year (2007) and projection years (2013, 2017, and 2020).

The diesel fuel sulfur values for the projection years were maintained at their default values for all other States since they matched the USEPA recommended values.

6.2 USE OF EXTERNAL FILES IN THE PROJECTION YEAR NMIM RUNS

For the 2007 base year inventory (MARAMA 2012), revisions were made to the allocation files for several categories. These files are used to allocate emissions calculated at the state level down to the county level and to add entries to the countynrfile NCD table. States were asked if they would like to revise this table for future years. No revisions were recommended. Thus external files used for the 2007 base year runs were used in the runs for the projection years.

6.3 NMIM RUN SPECIFICATIONS

The specifications for each NMIM run were developed for groups of States within the MANE-VU+VA region. All States except for CT, NY, NJ and PA were run together for each year. CT was run alone for 2007, 2017, and 2020 because changes were requested for the base year. NY, NJ and PA were run together for each individual projection year. The settings for each specification panel within the NMIM model for the projection year runs are detailed below.

- Description: A short descriptive term for the run was entered for each specific run.
- Geography: The "county" option was selected for each run. All counties within the State were selected.
- Time: Every month in the Months check box area was selected. On the time panel, the year (2017 or 2020) was selected in the drop down box and added to the year selections area. With the exception of the CT, all runs were performed for only one year. The Use Yearly Weather Data check box was selected; however, year specific data was not available within NMIM for the projection years. The only years included within the NMIM model for NCD20090531 are 1999-2008 inclusive. If the specific year requested is not available, then NMIM uses 20 year average data for the estimates. Thus while the Use Yearly Weather Data box was checked, since the specific year was not there (except for the CT 2007 base year re-run), the 20 year average data in the countymonthhour table are used. However, because the meteorology data for future years will be assumed to be the same as was used for 2007, AMEC revised the AverageTemp and AverageRelHumidity values in the countymonthhour table of the NCD20090910MARAMA to reflect actual 2007 values. Thus the values in that table are 2007 values not 20 year average values and thus causes the NMIM model to run with the same data used for the 2007 base year runs.
- Vehicles/Equipment: Only the nonroad vehicle/equipment area was selected. All fuels and all vehicle types were selected for each State run. Aircraft ground support

equipment was included in the run specifications but those records were removed during post-processing steps.

- Fleet: No selections or information was entered in this panel.
- Pollutants: Exhaust PM10, PM2.5, and Criteria pollutants (with HC reported as VOC) were selected except for CO_2.
- 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 externalfiles directory of the NCD. Entries for all external files included were included in the countynrfiles table of the NCD.

6.4 REMOVAL OF AIRPORT GROUND SUPPORT EQUIPMENT

The NMIM/NONROAD model calculates emissions from airport ground support equipment. As discussed in Section 7 of this TSD, emissions from airport ground support equipment is also included in USEPA's aircraft inventory 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.

6.5 STATE AND STAKEHOLDER REVIEW AND COMMENT

New York state provided the results of their own NONROAD model runs for 2017 and 2020. These model results were provided by month and were used instead of the NMIM model runs made by MACTEC.

6.6 CHANGES MADE FOR VERSION 3 MODEL RUNS

Two sectors of the inventory were updated in version 3. First, Virginia and New York requested that their emissions be recalculated using the information developed through Version 2 of the inventory for the MARAMA States. The Virginia reruns were performed for all categories except for ground support equipment and for recreational marine vessels. Recreational marine vessel emissions for Virginia were calculated along with those for other states (see below). Those values replaced the SEMAP supplied values used in versions prior to Version 3. In addition, estimates for all sectors of the inventory for New York other than ground support equipment and recreational marine vessels were calculated using NMIM default data for the MARAMA area. New York had originally provided data from NONROAD model runs that they performed separately. For Version 3 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 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. 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 in version 3 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. Estimates for Virginia, Vermont and Maine were prepared using the growth algorithm built into the NMIM/NONROAD model. For all other states, revised population data was estimated for the years 2017 and 2020. EPA had recommended that rather than use the default growth algorithm of the model for those states that had their 2007 base year data updated for this category, separate population estimates for each projection year should be prepared and included in the population files. The 2007 population data was 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 (formerly 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. The sailboat populations were split among two of the default categories. In addition, New Hampshire provided their own revised population file. Their population data for New Hampshire was provided by the New Hampshire DMV and is not from NMMA.

AMEC then used the national growth factors supplied in the default NMIM/NONROAD model to estimate populations for each year. Each horsepower/population category in the 2007 population file was grown to either 2017 or 2020 using the ratio between the 2005 and 2015 growth factors (to represent growth between 2007 and 2017) and between the 2005 and 2025 growth factors (to represent growth between 2007 and 2020). Those ratios were used to grow the 2007 population to 2017 and 2020 respectively. The only exception to this was Pennsylvania. Pennsylvania presented data indicating that there was little growth expected during the time periods that were considered and thus maintained the 2007 population estimates for both 2017 and 2020.

Pennsylvania presented information showing from historical data that indicated a downward trend in the overall motorized pleasure craft population in 6 of the last 9 years. The data also indicated that the population was essentially unchanged in the last three years due to an adverse economic environment. Populations of all motorized pleasure craft in Pennsylvania as tracked by the Pennsylvania Fish and Boat Commission showed nearly a 6 percent decline from 2001 to 2007 or an average annual decline of 1.0 percent over that period. Pleasure craft populations remained nearly unchanged from 2008 to 2010.

As a consequence, they forecaste zero percent growth for pleasure craft is from 2007 to 2017 and 2007 to 2020. The types of pleasure craft affected by this growth rate are:

- 2282005010, 2-stroke outboard,
- 2282005015, 2-stroke personal water craft,
- 2282010005, 4-stroke inboard/sterndrive,
- 2282020005, diesel inboard/sterndrive, and
- 2282020010, diesel outboards

6.7 NMIM/NONROAD GROWTH AND CONTROL INFORMATION

In estimating future year emissions, the NMIM/NONROAD model includes growth and scrappage rates for equipment in addition to a variety of control programs. It is not possible separate out the future year emissions due to "growth only" or "control only" in a single run. That is, the model run provides a single future year estimate that is a "growth and control" scenario.

The growth data used in the NMIM/NONROAD model is documented in a USEPA report (USEPA 2004c). The GROWTH packet of the NONROAD model cross-references each SCC to a growth indicator code. The indicator code is an arbitrary code that identifies an actual predicted value such as human population or employment that is used to estimate the future year equipment population. The GROWTH packet also defines the scrappage curves used to estimate the future year model year distribution.

The NMIM/NONROAD model also accounts for all USEPA emission standards for nonroad equipment. There are mulitiple standards that vary by equipment type, rated power, model year, and pollutatant. Exhibit 6.1 is a summary of the emission control programs accounted for in the NMIM/NONROAD model. A complete summary of the nonroad equipment emission standards can be found on the USEPA nonroad emission standards reference guide website (USEPA 2011).

Exhibit 6.1 Control Programs Included in the NMIM/NONROAD Model

Regulation	Description
Control of Air Pollution; Determination of Significance for Nonroad Sources and Emission Standards for New Nonroad Compression Ignition Engines At or Above 37 Kilowatts 59 FR 31036 June 17, 1994	This rule establishes Tier 1 exhaust emission standards for HC, NOx, CO, and PM for nonroad compression-ignition (CI) engines ≥37kW (≥50hp). Marine engines are not included in this rule. The start dates and pollutants affected vary by hp category as follows: 50-100 hp: Tier 1,1998; NOx only 100-175 hp: Tier 1, 1997; NOx only 175-750 hp: Tier 1, 1996; HC, CO, NOx, PM >750 hp: Tier 1, 2000; HC, CO, NOx, PM
Emissions for New Nonroad Spark-Ignition Engines At or Below 19 Kilowatts; Final Rule 60 FR 34581 July 3, 1995	This rule establishes Phase 1 exhaust emission standards for HC, NOx, and CO for nonroad spark-ignition engines ≤19kW (≤25hp). This rule includes both handheld (HH) and nonhandheld (NHH) engines. The Phase 1 standards become effective in 1997 for : Class I NHH engines (<225cc), Class II NHH engines (≥225cc), Class III HH engines (<20cc), and Class IV HH engines (≥20cc and <50cc). The Phase 1 standards become effective in 1998 for: Class V HH engines (≥50cc)
Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts 61 FR 52088 October 4, 1996	This rule establishes exhaust emission standards for HC+NOx for personal watercraft and outboard (PWC/OB) marine SI engines. The standards are phased in from 1998-2006.
Control of Emissions of Air Pollution From Nonroad Diesel Engines 63 FR 56967 October 23, 1998	This final rule sets Tier 1 standards for engines under 50 hp, phasing in from 1999 to 2000. It also phases in more stringent Tier 2 standards for all engine sizes from 2001 to 2006, and yet more stringent Tier 3 standards for engines rated over 50 hp from 2006 to 2008. The Tier 2 standards apply to NMHC+NOx, CO, and PM, whereas the Tier 3 standards apply to NMHC+NOx and CO. The start dates by hp category and tier are as follows:

Regulation	Description
	hp<25: Tier 1,2000; Tier 2, 2005; no Tier 3 25-50 hp: Tier 1, 1999; Tier 2, 2004; no Tier 3 50-100 hp: Tier 2, 2004; Tier 3, 2008 100-175 hp: Tier 2, 2003; Tier 3, 2007 175-300 hp: Tier 2, 2003; Tier 3, 2006 300-600 hp: Tier 2, 2001, Tier 3, 2006 600-750 hp: Tier 2, 2002; Tier 3, 2006 >750 hp: Tier 2, 2006, no Tier 3 This rule does not apply to marine diesel engines above 50 hp.
Phase 2: Emission Standards for New Nonroad Nonhandheld Spark Ignition Engines At or Below 19 Kilowatts 64 FR 15207 March 30, 1999	This rule establishes Phase 2 exhaust emission standards for HC+NOx for nonroad nonhandheld (NHH) spark-ignition engines ≤19kW (≤25hp). The Phase 2 standards for Class I NHH engines (<225cc) become effective on August 1, 2007 (or August 1, 2003 for any engine initially produced on or after that date). The Phase 2 standards for Class II NHH engines (≥225cc) are phased in from 2001-2005.
Phase 2: Emission Standards for New Nonroad Spark-Ignition Handheld Engines At or Below 19 Kilowatts and Minor Amendments to Emission Requirements Applicable to Small Spark-Ignition Engines and Marine Spark-Ignition Engines; Final Rule 65 FR 24268 April 25, 2000	This rule establishes Phase 2 exhaust emission standards for HC+NOx for nonroad handheld (HH) spark-ignition engines ≤19kW (≤25hp). The Phase 2 standards are phased in from 2002-2005 for Class III and Class IV engines and are phased in from 2004-2007 for Class V engines.
Control of Emissions From Nonroad Large Spark-Ignition Engines and Recreational Engines (Marine and Land-Based); Final Rule 67 FR 68241 November 8, 2002	This rule establishes exhaust and evaporative standards for several nonroad categories: 1) Two tiers of emission standards are established for large spark-ignition engines over 19 kW. Tier 1 includes exhaust standards for HC+NOx and CO and is phased in from 2004-2006. Tier 2 becomes effective in 2007 and includes exhaust standards for HC+NOx and CO as well as evaporative controls affecting fuel line permeation, diurnal emissions and running loss emissions. 2) Exhaust and evaporative emission standards are established for recreational vehicles, which include snowmobiles, off-highway motorcycles, and all-terrain vehicles (ATVs). For snowmobiles, HC and CO exhaust standards are phased-in from 2006-2012. For off-highway motorcycles, HC+NOx and CO exhaust emission standards are phased in from 2006-2007. For ATVs, HC+NOx and CO exhaust emission standards are phased in from 2006-2007. Evaporative emission standards for fuel tank and hose permeation apply to all recreational vehicles beginning in 2008. 3) Exhaust emission standards for HC+NOx, CO, and PM for recreational marine diesel engines over 50 hp begin in 2006-2009, depending on the engine displacement. These are “Tier 2” equivalent standards.

Regulation	Description
Control of Emissions of Air Pollution From Nonroad Diesel Engines and Fuel; Final Rule (Clean Air Nonroad Diesel Rule – Tier 4) 69 FR 38958 June 29, 2004	This final rule sets Tier 4 exhaust standards for CI engines covering all hp categories (except marine and locomotives), and also regulates nonroad diesel fuel sulfur content. 1) The Tier 4 start dates and pollutants affected vary by hp and tier as follows: hp<25: 2008, PM only 25-50 hp: Tier 4 transitional, 2008, PM only; Tier 4 final, 2013, NMHC+NOx and PM 50-75 hp: Tier 4 transitional, 2008; PM only; Tier 4 final, 2013, NMHC+NOx and PM 75-175 hp: Tier 4 transitional, 2012, HC, NOx, and PM; Tier 4 final, 2014, HC,NOx,PM 175-750 hp:Tier 4 transitional, 2011, HC, NOx, and PM; Tier 4 final, 2014, HC,NOx,PM >750 hp: Tier 4 transitional, 2011, HC, NOx, and PM; Tier 4 final, 2015, HC,NOx,PM 2) This rule will reduce nonroad diesel fuel sulfur levels in two steps. First, starting in 2007, fuel sulfur levels in nonroad diesel fuel will be limited to a maximum of 500 ppm, the same as for current highway diesel fuel. Second, starting in 2010, fuel sulfur levels in most nonroad diesel fuel will be reduced to 15 ppm.
Control of Emissions From Nonroad Spark-Ignition Engines and Equipment; Final Rule (Bond Rule) 73 FR 59034 October 8, 2008	This rule establishes exhaust and evaporative standards for small SI engines and marine SI engines: 1) Phase 3 HC+NOx exhaust emission standards are established for Class I NHH engines starting in 2012 and for Class II NHH engines starting in 2011. There are no new exhaust emission standards for handheld engines. New evaporative standards are adopted for both handheld and nonhandheld equipment. The new evaporative standards control fuel tank permeation, fuel hose permeation, and diffusion losses. The evaporative standards begin in 2012 for Class I NHH engines and 2011 for Class II NHH engines. For handheld engines, the evaporative standards are phased-in from 2012-2016. 2) More stringent HC+NOx and CO standards are established for marine SI PWC/OB engines beginning in 2010. In addition, new exhaust HC+NOx and CO standards are established for sterndrive and inboard (SD/I) marine SI engines also beginning in 2010. High performance SD/I engines are subject to separate HC+NOx and CO exhaust standards that are phased-in from 2010-2011. New evaporative standards were also adopted for all marine SI engines that control fuel hose permeation, diurnal emissions, and fuel tank permeation emissions. The hose permeation, diurnal, and tank permeation standards take effect in 2009, 2010, and 2011.

Source: USEPA 2010e

7.0 NONROAD MAR SOURCE CATEGORIES

The USEPA's NONROAD model does not estimate emissions for three nonroad source categories: commercial marine vessel, aircraft, and railroad locomotives. The emission projection methodology and data sources for these three categories (collectively referred to as marine, airport, railroad {or MAR}) are discussed in this section. The data used to calculate the growth and control factors for MAR sources are included in Appendix L.

7.1 COMMERCIAL MARINE VESSELS

For the purpose of emission calculations, marine vessel engines are divided into three categories based on displacement (swept volume) per cylinder. Category 1 and Category 2 marine diesel engines typically range in size from about 500 to 8,000 kW (700 to 11,000 hp). These engines are used to provide propulsion power on many kinds of vessels including tugboats, pushboats, supply vessels, fishing vessels, and other commercial vessels in and around ports. They are also used as stand-alone generators for auxiliary electrical power on vessels. Category 3 marine diesel engines typically range in size from 2,500 to 70,000 kW (3,000 to 100,000 hp). These are very large marine diesel engines used for propulsion power on ocean-going vessels such as container ships, oil tankers, bulk carriers, and cruise ships.

The majority of marine vessels are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of emission inventories, USEPA has assumed that Category 3 vessels primarily use residual blends while Category 1 and 2 vessels typically use distillate fuels.

EPA developed national emission inventories for Category 1 and 2 vessels and Category 3 vessels for calendar years 2002 through 2040 as part of its effort to develop emission standards for these vessels. The methodologies used to develop the emission projections (for both a baseline and controlled scenario) are documented in a regulatory impact assessment (USEPA 2008c). We used the USEPA data and methodologies from these RIAs to develop separate growth and control factors for Category 1 and 2 vessels (diesel) and Category 3 vessels (residual).

7.1.1 CMV Diesel Growth Factors

For Category 1 and 2 diesel vessels, USEPA used projection data for domestic shipping from the AEO2006 (EIA 2006). The annual growth rate reported in the RIA is 0.9%. More recent growth data for domestic shipping is available in the AEO2010 (EIA 2010). Since Category 1 and 2 vessels primarily accounts for activity data for ships that carry domestic cargo, we decided to use the recent growth data for domestic shipping available in the AEO2010. We used Table A-7 of the AEO2010 for international shipping to calculate the growth factor for 2007-2013 to be 0.975, for 2007-2017 to be 1.003, and for 2007-2020 to be 1/033. These growth factors were used for for CMV diesel port emissions (SCC 22-80-002-100) and CMV diesel underway emissions (SCC 22-80-002-200).

7.1.2 CMV Diesel Control Factors

In developing their emission projections, USEPA developed two scenarios that accounted for both the 2004 nonroad diesel rule and the 2008 diesel marine vessel rule:

- The USEPA's baseline (pre-control) inventory accounted for:
    1. the 0.9 percent annual growth in fuel use,
    2. the impact of existing engine regulations that took effect in 2008,
    3. the 2004 Clean Air Nonroad Diesel Rule that will decrease the allowable levels of sulfur in fuel beginning in 2012, and
    4. fleet turnover.
- The USEPA's controlled inventory accounted for:
    1. the 0.9 percent annual growth in fuel use;
    2. the reductions included in the baseline inventory, and the reductions from USEPA's 2008 rule Final Locomotive-Marine rule for Tier 3 and 4 engines; and
    3. The 2008 final rule that includes the first-ever national emission standards for existing marine diesel engines, applying to engines larger than 600kW when they are remanufactured. The rule also sets Tier 3 emissions standards for newly-built engines that are phasing in from 2009. Finally, the rule establishes Tier 4 standards for newly-built commercial marine diesel engines above 600kW, phasing in beginning in 2014.

To calculate a control factor that accounts for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 0.9 percent annual growth rate to the 2006 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions. Exhibit 7.1 shows the control factors for 2017 and 2020 for diesel commercial marine vessels.

Exhibit 7.1 CMV Diesel Control Factors by Year and Pollutant

Year	CO	NOx	PM10	PM2.5	SO2	VOC
2013	0.885	0.787	0.747	0.747	0.464	0.871
2017	0.830	0.642	0.550	0.550	0.076	0.708
2020	0.801	0.537	0.460	0.460	0.032	0.586

7.1.3 CMV Residual Oil Growth Factors

For Category 3 residual oil vessels, data from an USEPA-sponsored study was used to develop an annualized growth factor of 4.5 percent for the region. A few states considered the growth rate to be extremely high and not reflective of recent economic conditions. Since USEPA's Category 3 vessel inventory is primarily based on activity data for ships that carry foreign cargo, we decided to use the recent growth data for international shipping available in the AEO2010. We used data from Table A-7 of the AEO2010 for international shipping to calculate the growth factor for 2007-2013 to be 0.940, for 2007-2017 to be 0.946, and for 2007-2020 to be 0.950. These growth factors were used for CMV residual oil port emissions (SCC 22-80-003-100) and CMV residual oil underway emissions (SCC 22-80-003-200).

7.1.4 CMV Residual Oil Control Factors

On December 22nd, 2009, USEPA announced final emission standards under the Clean Air Act for new marine diesel engines with per-cylinder displacement at or above 30 liters (called Category 3 marine diesel engines) installed on U.S.-flagged vessels. The final engine standards are equivalent to those adopted in the amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (a treaty called "MARPOL"). The emission standards apply in two stages: near-term standards for newly-built engines will apply beginning in 2011, and long-term standards requiring an 80 percent reduction in NOx will begin in 2016. USEPA also adopted changes to the diesel fuel program to allow for the production and sale of diesel fuel with no more than 1,000 ppm sulfur for use in Category 3 marine vessels. The regulations generally forbid production and sale of fuels with more than 1,000 ppm sulfur for use in most U.S. waters, unless operators achieve equivalent emission reductions in other ways.

On March 26, 2010, the International Maritime Organization (IMO) officially designated waters off North American coasts as an emissions control area (ECA) in which stringent international emission standards will apply to ships. In practice, implementation of the ECA means that ships entering the designated area would need to use compliant fuel for the duration of their voyage that is within that area, including time in port and voyages whose routes pass through the area without calling on a port. The North American ECA includes waters adjacent the Atlantic extending up to 200 nautical miles from east coast of the United States. The quality of fuel that complies with the ECA standard will change over time. From the effective date in 2012 until 2015, fuel used by vessels operating in designated areas cannot exceed 1.0 percent sulfur (10,000 ppm). Beginning in 2015, fuel used by vessels operating in these areas cannot exceed 0.1 percent sulfur (1000 ppm). Beginning in 2016, NOx aftertreatment requirements become applicable.

To calculate a control factor that accounted for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 4.5 percent annual growth rate to the 2006 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions.

Exhibit 7.2 shows the control factors for 2017 and 2020 for residual oil commercial marine vessels.

Exhibit 7.2 CMV Residual Oil Control Factors by Year and Pollutant

Year	CO	NOx	PM10	PM2.5	SO2	VOC
2013	1.000	0.736	0.353	0.353	0.270	1.000
2017	1.000	0.654	0.216	0.216	0.120	1.000
2020	1.000	0.597	0.137	0.137	0.036	1.000

7.1.5 Military Vessels Growth and Control Factors

Virginia reported emissions for military vessels, but did not distinguish between diesel or residual fuels. We assumed that there would be "no growth" for military vessel activity and emissions in Virginia would remain at 2007 levels in 2017 and 2020. Virginia was the only state to report emission from military vessels.

7.2 AIRCRAFT

Aircraft emissions in the 2007 MANE-VU+VA inventory are available on either a county-by-county or airport-by-airport basis for six types of aircraft operations:

- Air carrier operations represent landings and take-offs (LTOs) of commercial aircraft with seating capacity of more than 60 seats;
- Commuter/air taxi operations are one category. Commuter operations include LTOs by aircraft with 60 or fewer seats that transport regional passengers on

scheduled commercial flights. Air taxi operations include LTOs by aircraft with 60 or fewer seats conducted on non-scheduled or for-hire flights;

- General aviation represents all civil aviation LTOs not classified as commercial;
- Military operations represent LTOs by military aircraft;
- Ground Support Equipment (GSE) typically includes aircraft refueling and baggage handling vehicles and equipment, aircraft towing vehicles, and passenger buses; and
- Auxiliary power units (APUs) provide power to start the main engines and run the heating, cooling, and ventilation systems prior to starting the main engines.

7.2.1 Aircraft Growth Factors

Aircraft operations were projected to future years by applying activity growth using data on itinerant (ITN) operations at airports as reported in the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System for 2009-2030 (FAA 2010). The ITN operations are defined as aircraft take-offs or landings. This information is available for approximately 3300 individual airports. Actual LTOs are reported for 2007 and projected LTOs are provided for all years up to 2030.

We aggregated and applied this information at the county level for the four operation types: commercial, general, air taxi, military. We computed growth factors for each operation type by dividing future-year ITN by 2007-year ITN. We assigned factors to inventory SCCs based on the operation type, as shown in Exhibit 7.3.

Exhibit 7.3 Crosswalk between SCC and FAA Operations Type

SCC	SCC Description	FAA Operation Type Used for Growth Factor
2265008005	Airport Ground Support Equipment, 4-Stroke Gas	Total Itinerant Operations
2267008005	Airport Ground Support Equipment, LPG	Total Itinerant Operations
2268008005	Airport Ground Support Equipment, CNG	Total Itinerant Operations
2270008000	Airport Ground Support Equipment, Diesel	Total Itinerant Operations
2270008005	Airport Ground Support Equipment, Diesel	Total Itinerant Operations
2275001000	Aircraft /Military Aircraft /Total	Itinerant Military Operations
2275020000	Aircraft /Commercial Aircraft /Total: All Types	Itinerant Air Carrier Operations
2275050000	Aircraft /General Aviation /Total	Itinerant General Aviation Operations
2275050011	Aircraft /General Aviation /Piston	Itinerant General Aviation Operations
2275050012	Aircraft /General Aviation /Turbine	Itinerant General Aviation Operations

SCC	SCC Description	FAA Operation Type Used for Growth Factor
2275060000	Aircraft /Air Taxi /Total	Itinerant Air Taxi Operations
2275060011	Aircraft /Air Taxi /Piston	Itinerant Air Taxi Operations
2275060012	Aircraft /Air Taxi /Turbine	Itinerant Air Taxi Operations
2275070000	Aircraft /Aircraft Auxiliary Power Units /Total	Total Itinerant Operations

Exhibit 7.4 summarizes the region-wide growth factors by FAA operation type. The growth factor for individual airports/counties may deviate substantially from these region-wide growth factors.

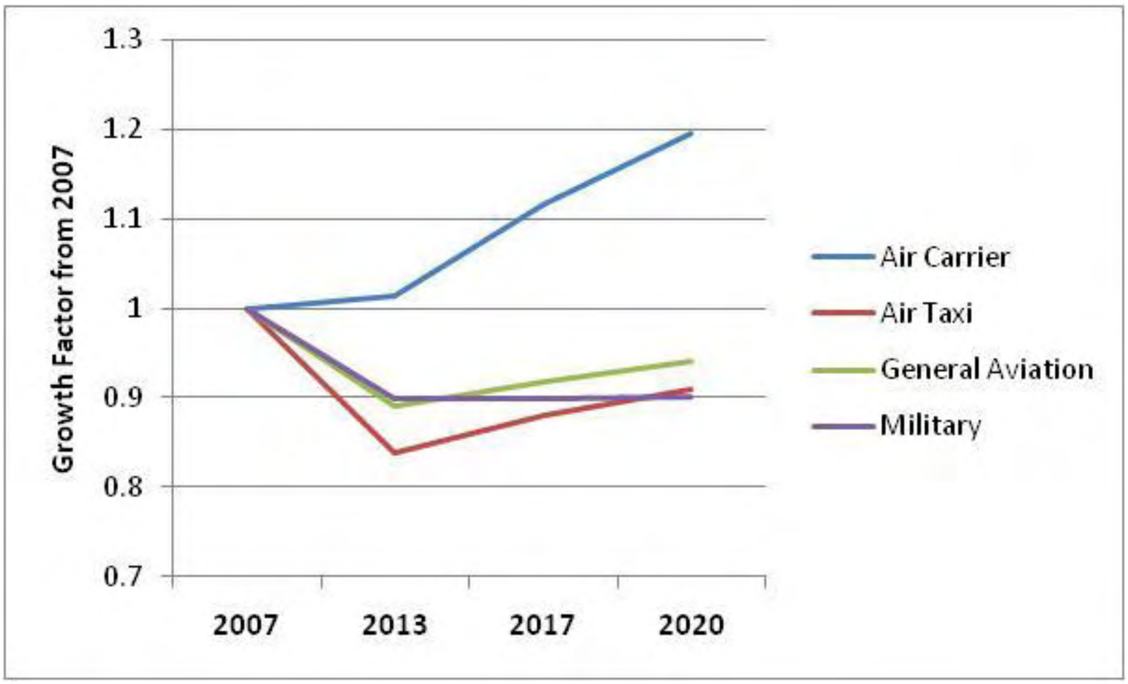


Exhibit 7.4 Region-wide Growth Factors from 2007 by FAA Operations Type

7.2.2 Aircraft Control Factors

The NOx aircraft engine emissions standards adopted by USEPA in November 2005 (USEPA 2005b) were reviewed. The standards are equivalent to the NOx emission standards (adopted in 1999 for implementation beginning in 2004) of the United Nations International Civil Aviation Organization (ICAO), and will bring the United States aircraft standards into alignment with the international standards. The standards apply to new aircraft engines used on commercial aircraft including small regional jets, single-aisle and twin-aisle aircraft, and 747s and larger aircraft. The standards also apply to general aviation and military aircraft, which sometimes use commercial engines. For example, small regional jet engines are used in executive general aviation aircraft, and larger commercial aircraft engines may be used in military transport aircraft.

Nearly all previously certified or in-production engine models currently meet or perform better than the standards USEPA adopted in the November 2005 rule. In addition, manufacturers have already been developing improved technology in response to the ICAO standards. According to USEPA's recent analysis for the proposed transport rule (USEPA 2010a), this rule is expected to reduce NOx emissions by approximately 2 percent in 2015 and 3 percent in 2020. Because of the relatively small amount of NOx reductions, our aircraft emission projections do not account for this control program.

EPA has also issued an Advance Notice of Proposed Rulemaking (ANPR) on lead emissions from piston-engine aircraft using leaded aviation gasoline (USEPA 2010d). However, this rule has not yet been adopted and co-benefits for criteria air pollutants are likely to be small. Therefore, the effects of this rule were not included in the future-year emissions projections.

7.3 RAILROAD EQUIPMENT

Railroad locomotive engine emissions in the 2007 MARAMA inventory are classified into the following categories:

- Class I line haul locomotives are operated by large freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-006);
- Class II/III line haul locomotives are operated by smaller freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-007);
- Inter-city passenger train locomotives are operated primarily by Amtrak to provide inter-city passenger transport (SCC 22-85-002-008);
- Independent commuter rail systems operate locomotives provide passenger transport within a metropolitan area (SCC 22-85-002-009); and
- Yard/switch locomotives are used in freight yards to assemble and disassemble trains, or for short hauls of trains that are made up of only a few cars (SCC 22-85-002-010).

7.3.1 Railroad Growth Factors

In March 2008, USEPA finalized a three part program that will dramatically reduce emissions from diesel locomotives of all types -- line-haul, switch, and passenger rail. As part of this work USEPA developed a national emission inventory for calendar years 2002 through 2040. Emission projections methodologies for a baseline and controlled scenario were developed and documented (USEPA 2008c). USEPA used projection data from the AEO2006 (EIA 2006). Table A-7 of AEO2006 showed that freight rail energy use will grow 1.6 percent annually.

More recent growth data is available in the AEO2010 which was published in May 2010. There are separate projections for passenger rail and freight rail energy use. For the MANE VU+VA inventory we relied on the more recent AEO2010 growth projections.

Passenger rail data from AEO2010 Table A-7 was used to calculate the growth factor for 2007-2013 to be 1.046, for 2007-2017 to be 1.121, and for 2007-2020 to be 1.171. These growth factors were applied to inter-city passenger train locomotives (SCC 22-85-002-008) and independent commuter rail systems (SCC 22-85-002-009).

For freight rail, the data from AEO2010 Table A-7 was used to calculate the growth factor for 2007-2013 to be 0.969, for 2007-2017 to be 1.018, and for 2007-2020 to be 1.053. We used the freight rail annual growth factors for Class I line haul (SCC 22-85-002-006), Class II/III line haul (SCC 22-85-002-007), and yard switch (SCC 22-85-002-010) locomotives.

7.3.2 Railroad Control Factors

USEPA developed two scenarios that accounted for both the 2004 nonroad diesel rule and the 2008 diesel locomotive rule:

- The USEPA baseline (pre-control) inventory accounted for

    1. AEO2006 annual growth in fuel use,
    2. The impact of existing regulations for Tier 0, 1, and 2 locomotive engines that take effect in 2008,
    3. The 2004 Clean Air Nonroad Diesel Rule that will decrease allowable levels of sulfur in locomotives fuel beginning in 2012, and
    4. Fleet turnover.

- The USEPA controlled inventory accounted for

    1. AEO2006 annual growth in fuel use,
    2. Reductions included in the baseline inventory, and

3. Reductions from USEPA's 2008 rule Final Locomotive-Marine rule for Tier 3 and 4 engines. This rule lowered diesel sulfur content and tightened emission standards for existing and new locomotives.
4. Voluntary retrofits under the National Clean Diesel Campaign are not included in our projections.

To calculate a factor that accounted for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 1.6% annual growth rate to the 2006 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions.

Exhibit 7.5 shows the control factors for 2017 and 2020 for the five locomotive classifications and pollutants.

Exhibit 7.5 Rail Control Factors by Year, Pollutant, and SCC

Year	NOx	PM10	PM2.5	HC	CO	VOC	SO2
SCC 22-85-002-006 Line Haul Class I Operations							
2017	0.633	0.449	0.449	0.480	1.000	0.480	0.003
2020	0.547	0.364	0.364	0.382	1.000	0.382	0.003
SCC 22-85-002-007 Line Haul Class II / III Operations							
2017	0.960	0.791	0.791	1.000	1.000	1.000	0.003
2020	0.920	0.752	0.752	1.000	1.000	1.000	0.003
SCC 22-85-002-008 Inter-City Passenger							
2017	0.421	0.402	0.402	0.437	0.917	0.437	0.003
2020	0.340	0.294	0.294	0.290	0.895	0.290	0.003
SCC 22-85-002-009 Commuter Rail							
2017	0.421	0.402	0.402	0.437	0.917	0.437	0.003
2020	0.340	0.294	0.294	0.290	0.895	0.290	0.003
SCC 22-85-002-010 Yard / Switch							
2017	0.843	0.712	0.712	0.809	1.000	0.809	0.003
2020	0.771	0.650	0.650	0.726	1.000	0.726	0.003

8.0 SUMMARY OF PROJECTED EMISSIONS

8.1 AREA SOURCE PROJECTED EMISSIONS

Exhibits 8.1 to 8.7 summarize the 2007 and projected future year area source emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

CO emissions in most states decline between 2007 and 2020, primarily due to decreases in residential wood combustion emissions resulting from the turnover to NSPS-compliant wood stoves. The two exceptions are DC and NY, where there is a slight increase in CO emissions from 2007 to 2020. There are no additional reductions expected from potential new OTC control measures.

NH3 emissions are projected to increase in most states between 2007 and 2020. This is due primarily to the growth predicted for fertilizer application on cropland and certain livestock waste products. There are no additional reductions expected from any existing control program or any potential new OTC control measures.

Under the "growth only" scenario, NOx emissions are projected to decline by about 5 percent between 2007 and 2017 due to AEO fuel use projections that generally show decreases in residential, commercial, and industrial fuel consumption. Under the "existing controls" scenario, NOx emissions in 2017 are projected to decrease by about 6.7 percent regionwide from 2007 levels due primarily to RICE MACT controls. Under the "potential new OTC controls" scenario, NOx emissions are projected to decrease by about 17 percent between 2007 and 2017 due to potential new controls on ICI boilers and new, small, natural gas-fired units.

PM10-PRI emissions are projected to increase slightly in all states between 2007 and 2017. Reentrained road dust on paved roads is a large source of PM10-PRI emissions and is directly proportional to the projected increases in VMT on paved roads. These increases from paved road dust are somewhat offset by decreases resulting from the turnover to NSPS-compliant wood stoves and the AEO fuel use projections that generally show decreases in residential, commercial, and industrial fuel consumption, especially for coal and oil. There are no additional reductions expected from potential new OTC control measures.

PM25-PRI emissions are projected to increase slightly from 2007 to 2020. Increases from paved road dust are somewhat offset by decreases resulting from the turnover to NSPS-compliant wood stoves and the AEO fuel use projections that generally show decreases in residential, commercial, and industrial fuel consumption, especially for coal and oil. There are no additional reductions expected from potential new OTC control measures.

Under the "growth only" scenario, SO2 emissions are projected to decline by about 16 percent between 2007 and 2017 due to AEO fuel use projections that generally show decreases in residential, commercial, and industrial fuel consumption, especially for coal and oil. Under the "existing controls" scenario, SO2 emissions in 2017 are projected to decrease by about 42 percent regionwide from 2007 levels due primarily to low sulfur fuel oil limits in MD, NJ, and NY. Under the "potential new OTC controls" scenario, SO2 emissions are projected to decrease by about 68 percent between 2007 and 2017 due to the potential implementation of low sulfur fuel oil limits in other MANE-VU states.

Under the "growth only" scenario, VOC emissions are projected to decrease slightly due to the turnover to NSPS-compliant wood stoves and the turnover over of vehicles equipped with on-board vapor recovery canisters. Under the "existing controls" scenario, VOC emissions in 2017 are projected to decrease by about 10 percent regionwide from 2007 levels due implementation of various OTC control measures in multiple states. Under the "potential new OTC controls" scenario, VOC emissions are projected to decrease by about 15 percent between 2007 and 2017 due to the continued implementation of both OTC control measures.

Exhibit 8.1 2007 and Projected Future Year Area Source CO Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	41,496	38,245	38,161	38,161	37,352	37,266	37,266
DE	8,266	7,961	7,881	7,881	7,857	7,776	7,776
DC	5,488	5,319	5,247	5,247	5,274	5,200	5,200
ME	50,496	47,290	47,266	47,266	46,359	46,337	46,337
MD	74,188	72,896	72,631	72,631	72,501	72,231	72,231
MA	79,226	75,912	75,482	75,482	75,073	74,626	74,626
NH	39,677	37,470	37,405	37,405	36,883	36,816	36,816
NJ	77,687	74,444	73,562	73,562	73,298	72,406	72,406
NY	205,055	218,875	218,374	218,374	223,510	223,021	223,021
PA	217,079	205,020	203,489	203,489	202,084	200,507	200,507
RI	15,419	14,391	14,308	14,308	14,097	14,011	14,011
VT	51,109	46,595	46,551	46,551	45,288	45,243	45,243
VA	132,098	129,923	129,479	129,479	129,390	128,937	128,937
	997,285	**974,342**	**969,836**	**969,836**	**968,966**	**964,377**	**964,377**

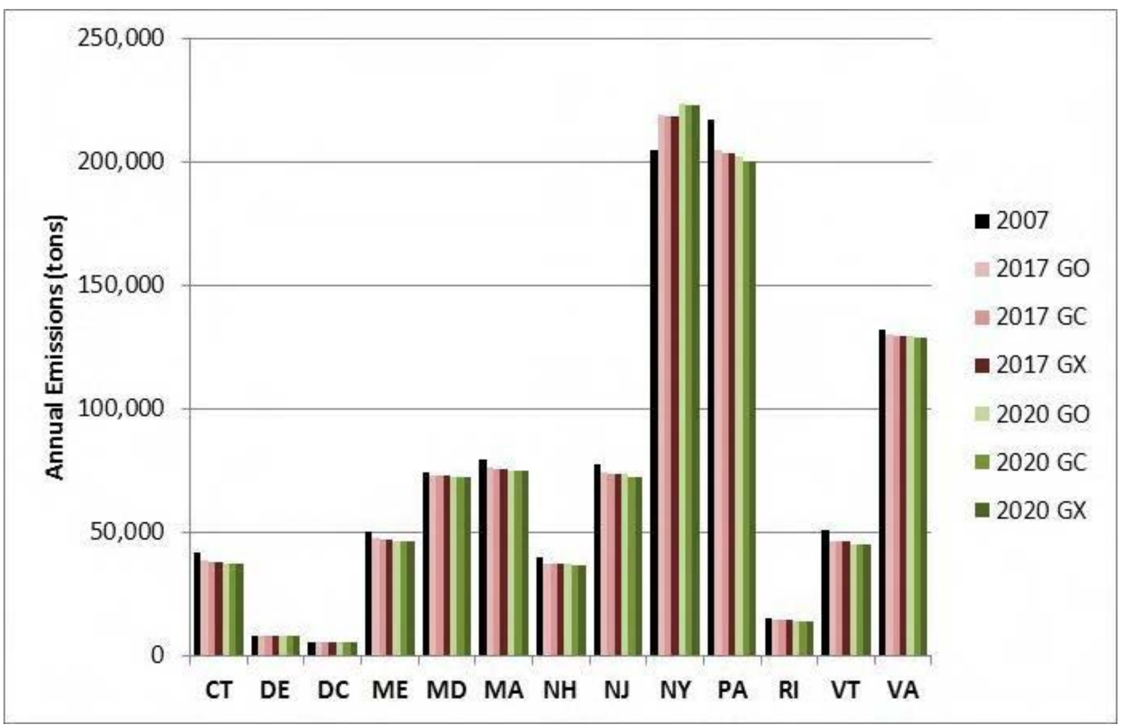


Exhibit 8.2 2007 and Projected Future Year Area Source NH3 Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	4,421	4,451	4,451	4,451	4,476	4,476	4,476
DE	12,382	15,233	15,233	15,233	15,924	15,924	15,924
DC	183	188	188	188	191	191	191
ME	5,736	6,203	6,203	6,203	6,337	6,337	6,337
MD	26,006	26,081	26,081	26,081	26,102	26,102	26,102
MA	13,791	13,913	13,913	13,913	13,996	13,996	13,996
NH	1,500	1,528	1,528	1,528	1,534	1,534	1,534
NJ	15,736	16,375	16,375	16,375	16,593	16,593	16,593
NY	45,693	46,221	46,221	46,221	46,368	46,368	46,368
PA	72,569	77,383	77,383	77,383	78,550	78,550	78,550
RI	625	629	629	629	636	636	636
VT	8,013	8,013	8,013	8,013	8,013	8,013	8,013
VA	43,394	45,862	45,862	45,862	46,434	46,434	46,434
	250,049	**262,079**	**262,079**	**262,079**	**265,152**	**265,152**	**265,152**

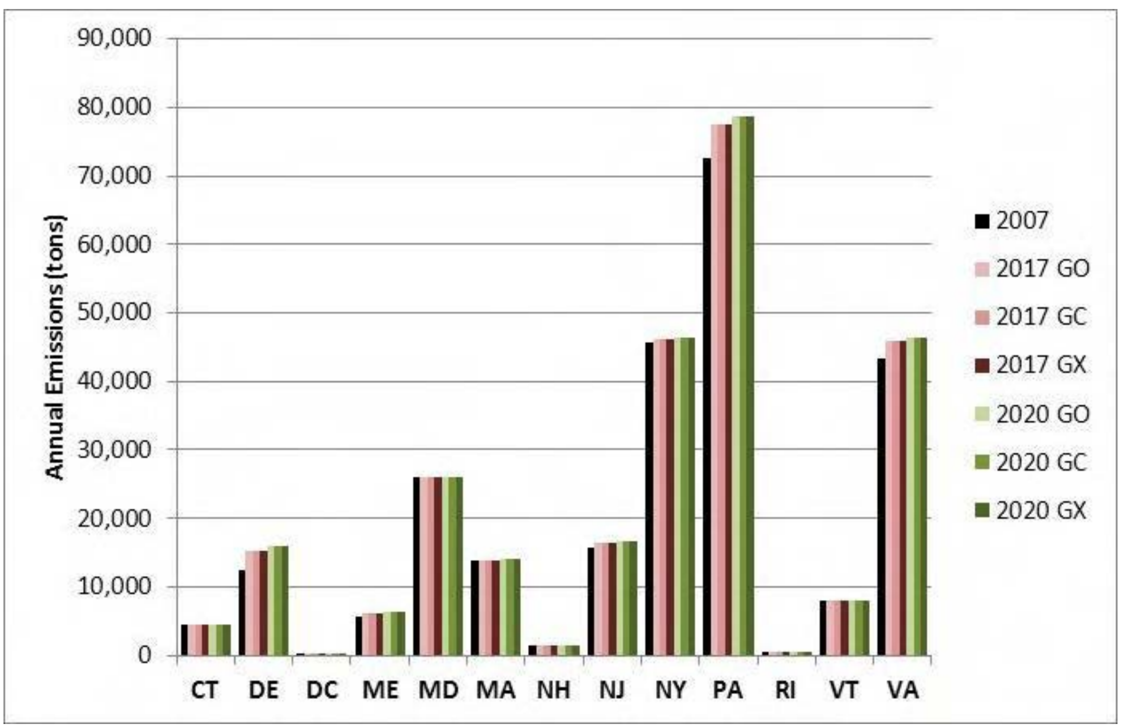


Exhibit 8.3 2007 and Projected Future Year Area Source NOx Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	2007	2017 GO	2017 GC	2017 GX	2020 GO	2020 GC	2020 GX
CT	12,421	11,278	11,101	9,747	11,232	11,049	9,560
DE	2,237	2,292	2,210	1,796	2,300	2,218	1,768
DC	1,547	1,620	1,560	1,318	1,654	1,592	1,325
ME	6,656	5,960	5,960	5,734	5,851	5,851	5,633
MD	10,312	11,148	10,948	9,887	11,389	11,185	9,978
MA	20,252	19,316	18,984	16,730	19,498	19,151	16,638
NH	4,737	4,196	4,152	3,761	4,156	4,111	3,699
NJ	24,175	24,662	23,331	22,727	24,685	23,339	22,310
NY	72,053	63,961	63,711	55,057	63,337	63,082	53,872
PA	47,545	47,179	45,925	37,636	47,613	46,318	37,392
RI	3,469	3,370	3,301	2,830	3,400	3,329	2,788
VT	3,996	3,667	3,641	3,305	3,672	3,645	3,302
VA	19,056	18,704	18,411	18,411	18,821	18,520	18,520
	228,457	**217,352**	**213,235**	**188,939**	**217,608**	**213,387**	**186,784**

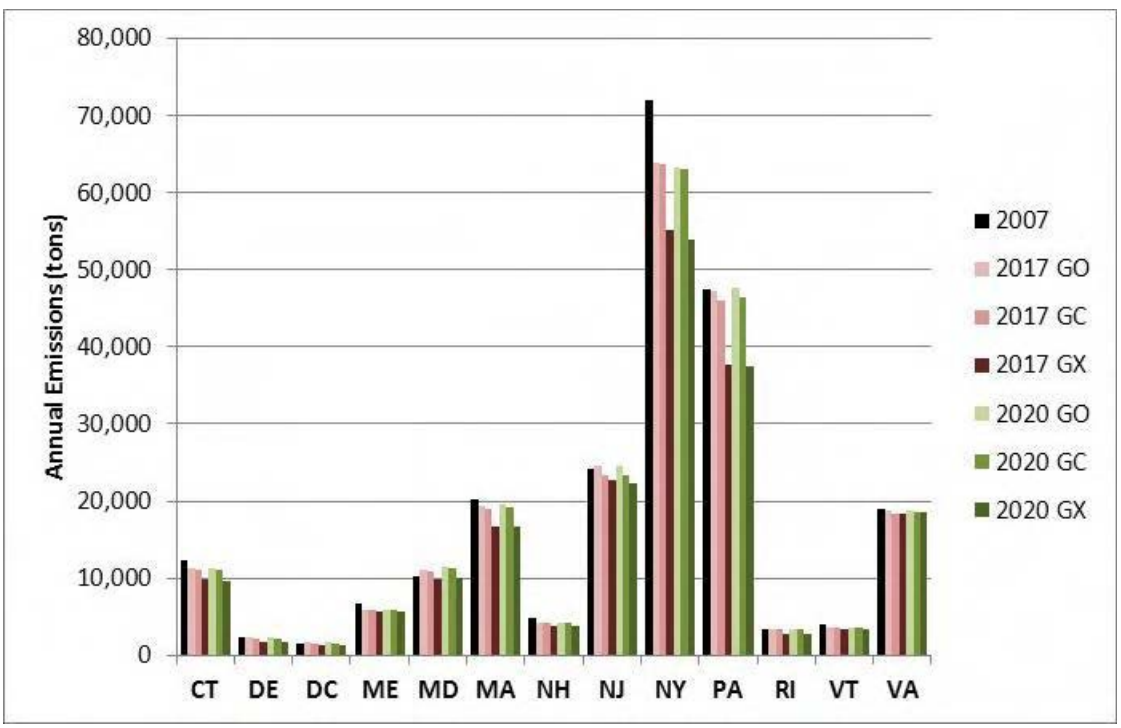


Exhibit 8.4 2007 and Projected Future Year Area Source PM10-PRI Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	30,577	31,061	31,052	31,052	31,224	31,214	31,214
DE	10,499	11,169	11,168	11,168	11,675	11,675	11,675
DC	4,873	5,078	5,077	5,077	5,141	5,141	5,141
ME	54,445	54,438	54,431	54,431	54,995	54,988	54,988
MD	72,454	78,559	78,555	78,555	80,345	80,340	80,340
MA	148,756	148,471	148,459	148,459	148,577	148,564	148,564
NH	27,742	28,916	28,912	28,912	29,420	29,416	29,416
NJ	39,140	41,202	41,189	41,189	42,104	42,090	42,090
NY	272,674	291,578	291,476	291,476	297,738	297,639	297,639
PA	287,998	295,026	295,006	295,006	298,020	298,001	298,001
RI	11,361	12,151	12,150	12,150	12,395	12,394	12,394
VT	47,993	47,675	47,671	47,671	47,823	47,819	47,819
VA	183,341	188,240	188,211	188,211	190,126	190,097	190,097
	1,191,853	**1,233,566**	**1,233,356**	**1,233,356**	**1,249,581**	**1,249,377**	**1,249,377**

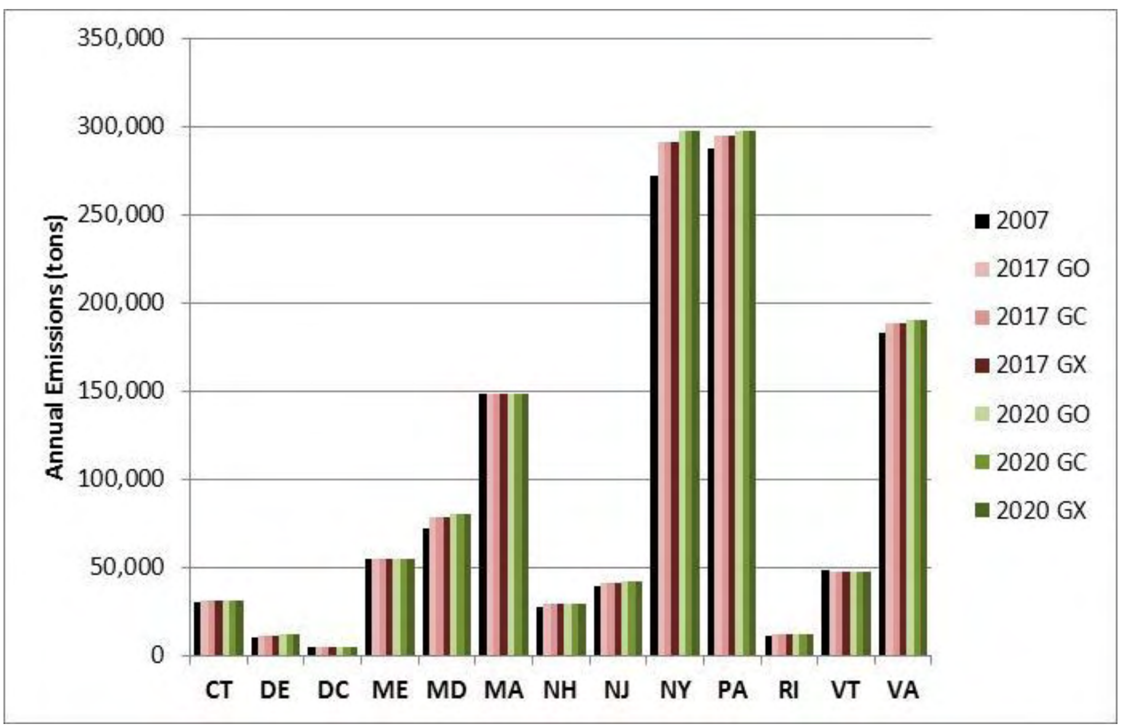


Exhibit 8.5 2007 and Projected Future Year Area Source PM25-PRI Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	10,606	10,298	10,290	10,290	10,225	10,217	10,217
DE	3,031	3,131	3,131	3,131	3,212	3,212	3,212
DC	1,542	1,560	1,560	1,560	1,567	1,566	1,566
ME	12,526	12,068	12,062	12,062	12,005	11,999	11,999
MD	19,789	20,888	20,884	20,884	21,206	21,201	21,201
MA	30,438	29,955	29,945	29,945	29,893	29,883	29,883
NH	8,623	8,602	8,598	8,598	8,637	8,633	8,633
NJ	18,299	18,453	18,441	18,441	18,579	18,568	18,568
NY	63,906	68,492	68,408	68,408	70,080	70,000	70,000
PA	73,514	73,070	73,054	73,054	73,243	73,227	73,227
RI	3,896	3,923	3,922	3,922	3,937	3,936	3,936
VT	13,106	12,596	12,593	12,593	12,520	12,517	12,517
VA	44,102	44,872	44,851	44,851	45,237	45,216	45,216
	303,378	**307,908**	**307,739**	**307,739**	**310,340**	**310,175**	**310,175**

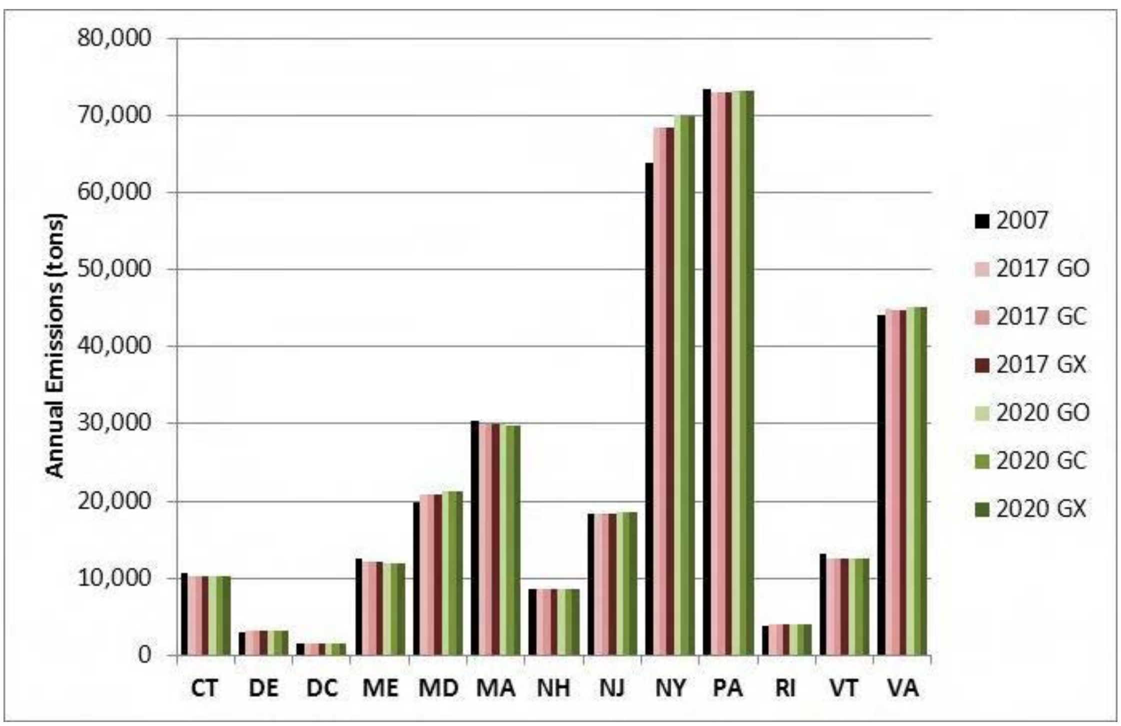


Exhibit 8.6 2007 and Projected Future Year Area Source SO2 Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	16,083	12,943	12,943	3,325	12,401	12,401	838
DE	1,144	946	946	107	911	911	106
DC	1,241	995	995	181	953	953	23
ME	9,812	7,870	7,870	1,450	7,609	7,609	200
MD	5,960	6,566	1,674	1,674	6,745	1,704	1,704
MA	19,859	15,996	15,996	4,093	15,357	15,357	1,391
NH	5,283	4,176	4,176	804	3,991	3,991	147
NJ	8,811	7,423	706	706	7,090	704	704
NY	70,044	58,753	11,651	11,651	57,030	11,670	11,670
PA	66,584	55,878	55,878	32,309	55,018	55,018	32,278
RI	3,897	3,222	3,222	1,270	3,108	3,108	491
VT	3,752	3,158	3,158	1,654	3,085	3,085	634
VA	17,098	14,880	14,880	14,880	14,616	14,616	14,616
	229,569	**192,807**	**134,097**	**74,104**	**187,914**	**131,127**	**64,803**

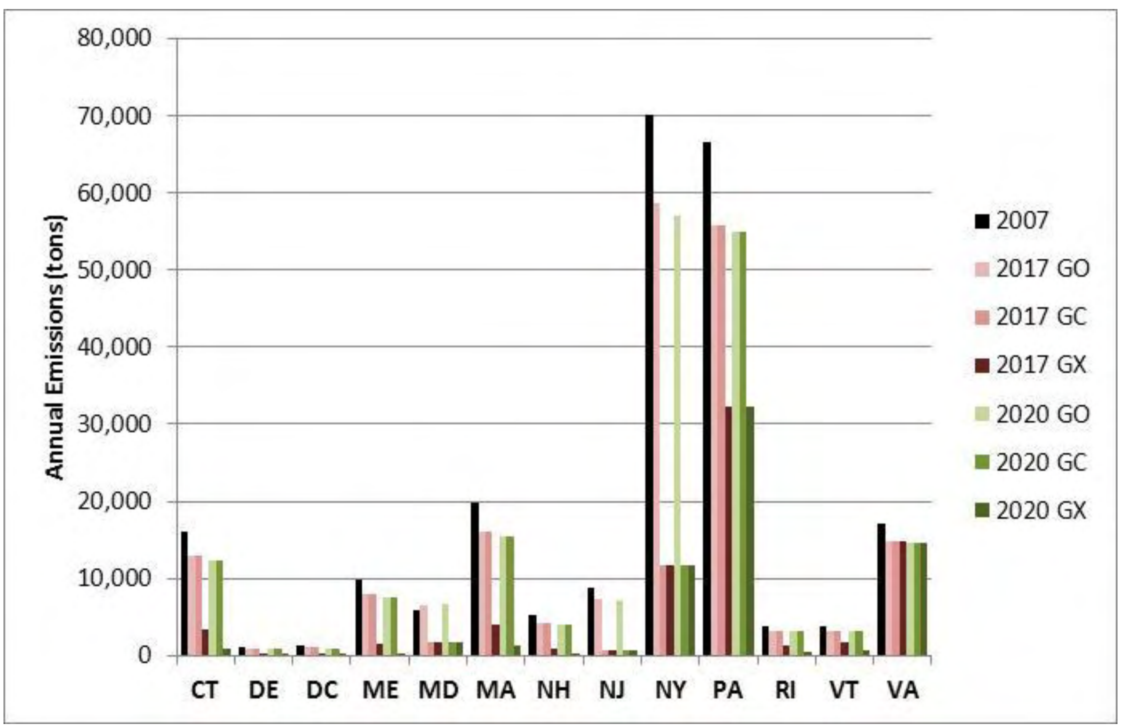
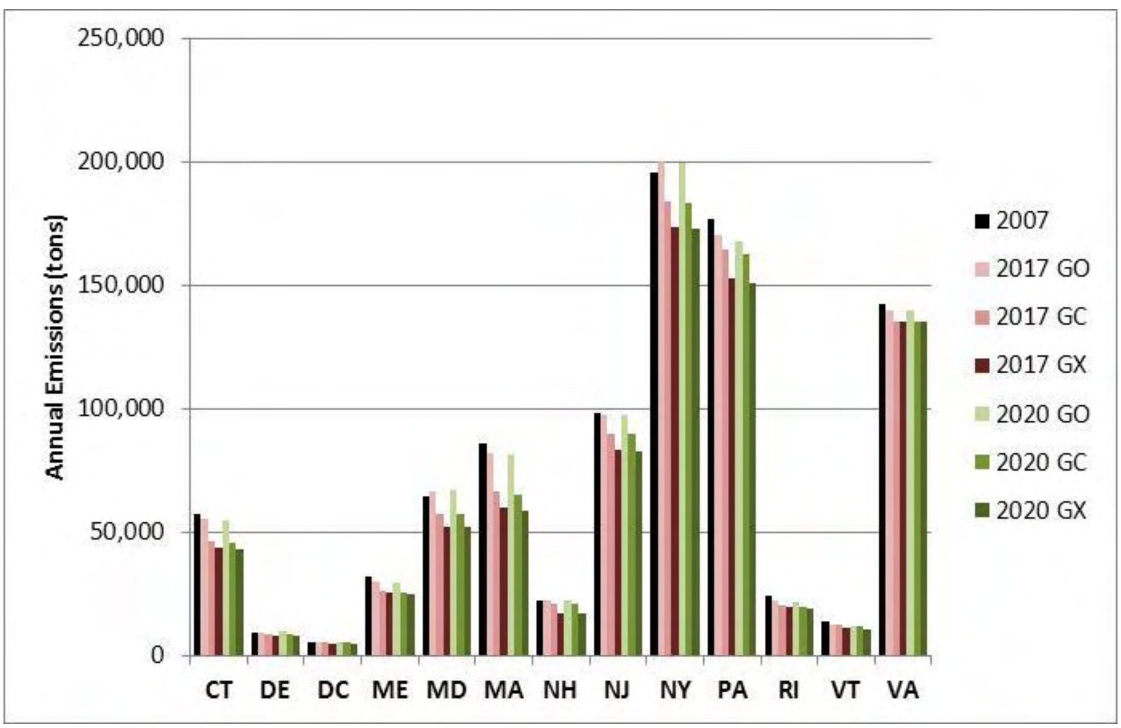


Exhibit 8.7 2007 and Projected Future Year Area Source VOC Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	57,253	55,386	46,364	43,764	54,857	45,849	43,229
DE	9,482	9,525	8,631	7,910	9,596	8,673	7,930
DC	5,568	5,540	5,324	4,932	5,591	5,369	4,965
ME	31,966	29,957	26,113	25,412	29,422	25,631	24,931
MD	64,429	66,399	57,045	52,018	66,825	57,042	51,901
MA	85,870	82,334	66,211	59,886	81,373	65,306	58,945
NH	22,343	22,117	20,894	17,258	22,041	20,807	17,164
NJ	98,121	97,769	89,972	83,323	97,551	89,699	82,956
NY	195,976	199,975	184,269	173,703	199,522	183,721	173,081
PA	176,781	170,123	164,863	153,166	167,744	162,374	150,596
RI	24,214	22,319	20,292	19,603	21,796	19,750	19,053
VT	14,108	12,516	12,311	10,972	12,127	11,904	10,561
VA	142,218	139,719	135,379	135,379	139,631	135,002	135,002
	928,330	**913,678**	**837,668**	**787,325**	**908,077**	**831,128**	**780,314**



8.2 NONEGU POINT SOURCE PROJECTED EMISSIONS

Exhibits 8.8 to 8.14 summarize the 2007 and projected future year area source emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

Regionwide, CO emissions increase slightly between 2007 and 2020. Maryland shows a significant decline due to a source closure. Maine, New Hampshire, and Vermont show significant increases due to projected increases in nonEGU wood combustion. There are no additional reductions expected from potential new OTC control measures.

NH3 emissions are projected to increase slightly between 2007 and 2020. There are no additional reductions expected from any existing control program or any potential new OTC control measures.

Under the "growth only" scenario, regional NOx emissions are projected to increase by about 12 percent from 2007 to 2017. This is due partially to the projected increases in fuel consumption and the addition of ERCs to the inventory. Under the "existing controls" scenario, NOx emissions are projected to be about 2 percent lower in 2017 than in 2007 because of petroleum refinery enforcement settlements; source shutdowns; ICI boiler controls in New Hampshire, New Jersey, and New York; and additional controls on glass furnace and cement kilns. Under the "potential new OTC controls" scenario, NOx emissions are projected to be about 5 percent lower in 2017 than in 2007 because of ICI boiler controls in additional states.

Under the "growth only" scenario, regional PM10-PRI and PM2.5-PRI emissions are projected to increase slightly. Under the "existing controls" scenario, PM10-PRI and PM2.5-PRI are project to be about 5 percent lower in 2017 than in 2007 due primarily to reductions the ICI boiler MACT standard and source closures. There are no additional reductions expected from potential new OTC control measures.

Under the "growth only" scenario, regional SO2 emissions are projected to remain relatively constant from 2007 to 2017. Under the "existing controls" scenario, SO2 emissions are projected to be about 5 percent lower in 2017 than in 2007 because of petroleum refinery enforcement settlements; source shutdowns; and low sulfur fuel oil requirements in Maryland, New Jersey, and New York. Under the "potential new OTC controls" scenario, SO2 emissions are projected to be about 8 percent lower in 2017 than in 2007 because of low sulfur fuel oil limits in additional states. SO2 emission are projected to be about 12 percent lower in 2020 than in 2007 because of additional low sulfur fuel oil limits in outer zone states that are projected to take effect in 2018..

VOC emissions are projected to increase slightly between 2007 and 2020 under the "growth only" scenario due primarily to the inclusion of ERCs in the future year inventories. Under the "existing controls" scenario, VOC emissions are projected to be less than 1 percent lower in 2017 than in 2007, with reductions resulting from the RICE MACT standard and OTC adhesives application rule. Under the "potential new OTC controls" scenario, VOC emissions are projected to be about 1.5 percent lower in 2017 than in 2007 due to the projected implementation of the OTC rule on large storage tanks.

Exhibit 8.8 2007 and Projected Future Year NonEGU CO Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	2,583	3,067	3,041	3,041	3,197	3,171	3,171
DE	7,027	7,300	7,271	7,271	7,320	7,292	7,292
DC	301	335	327	327	338	330	330
ME	14,023	20,975	20,941	20,941	21,238	21,204	21,204
MD	77,574	68,273	68,221	68,221	68,323	68,268	68,268
MA	4,592	5,999	5,919	5,919	6,165	6,082	6,082
NH	2,255	4,977	4,975	4,975	5,084	5,081	5,081
NJ	6,907	7,227	7,151	7,151	7,323	7,246	7,246
NY	52,877	54,959	54,646	54,646	55,439	55,115	55,115
PA	80,540	84,178	83,211	83,211	84,799	83,800	83,800
RI	1,051	873	870	870	940	937	937
VT	702	1,242	1,242	1,242	1,294	1,294	1,294
VA	63,079	67,090	65,740	65,740	67,833	66,212	66,212
	313,512	**326,496**	**323,556**	**323,556**	**329,293**	**326,031**	**326,031**

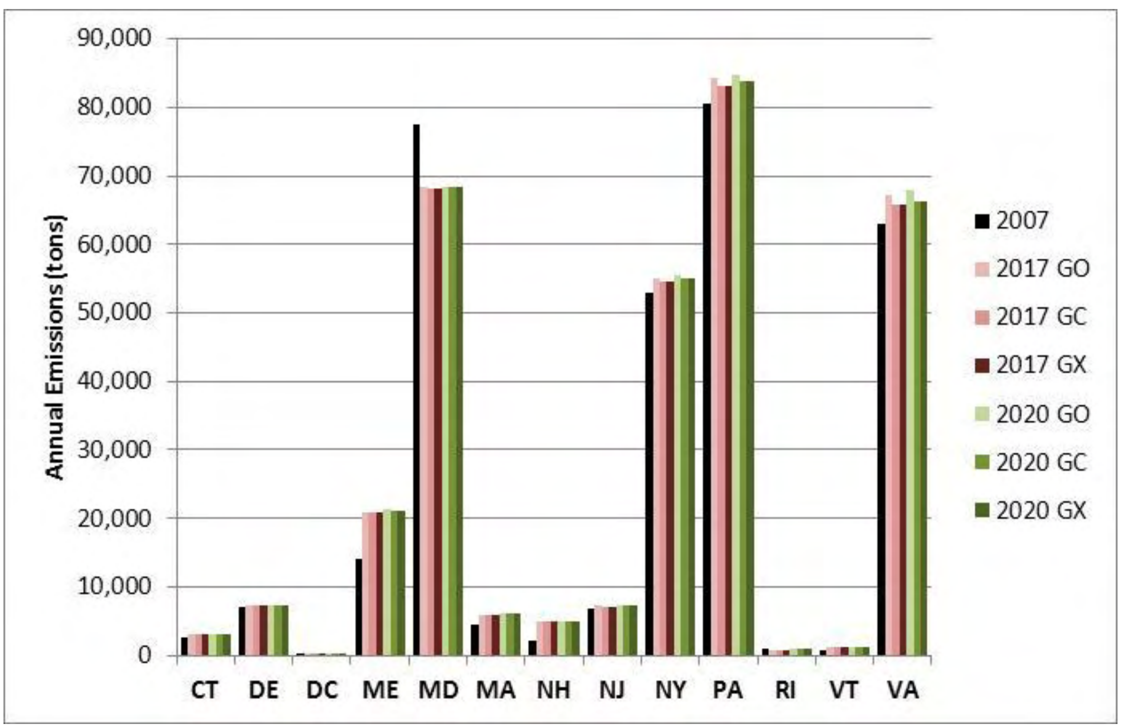


Exhibit 8.9 2007 and Projected Future Year NonEGU NH3 Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	0	0	0	0	0	0	0
DE	62	63	58	58	63	58	58
DC	0	0	0	0	0	0	0
ME	605	588	585	585	569	566	566
MD	137	137	137	137	137	137	137
MA	365	353	353	353	357	357	357
NH	30	36	36	36	36	36	36
NJ	208	216	216	216	219	219	219
NY	1,064	1,083	1,083	1,083	1,086	1,086	1,086
PA	2,070	2,111	2,111	2,111	2,119	2,119	2,119
RI	16	13	13	13	13	13	13
VT	0	0	0	0	0	0	0
VA	1,618	1,698	1,698	1,698	1,709	1,709	1,709
	6,175	**6,298**	**6,290**	**6,290**	**6,307**	**6,300**	**6,300**

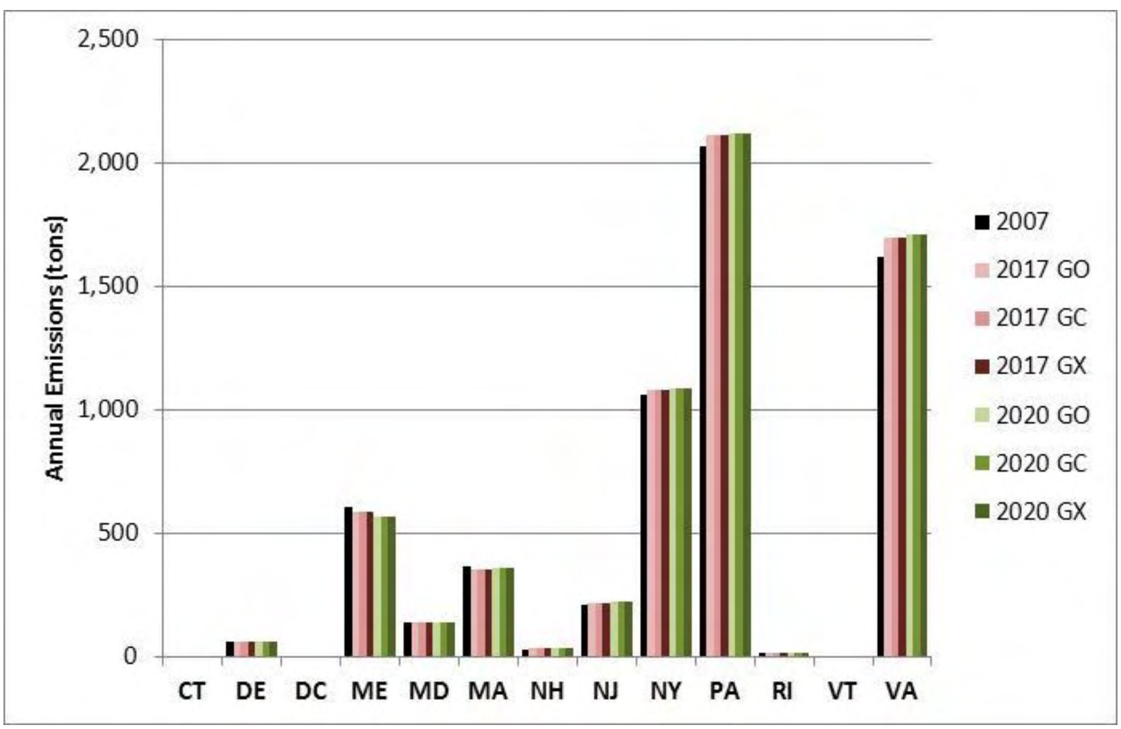


Exhibit 8.10 2007 and Projected Future Year NonEGU NOx Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	6,302	8,949	8,913	8,531	9,336	9,297	8,900
DE	5,122	4,774	3,328	2,861	4,652	3,271	2,796
DC	734	844	779	598	860	792	609
ME	17,050	20,527	20,398	19,272	20,573	20,447	19,332
MD	23,472	28,520	26,322	25,197	28,694	26,496	25,353
MA	12,872	15,011	14,797	13,238	15,525	15,298	13,695
NH	2,687	5,529	3,388	3,277	5,642	3,467	3,356
NJ	13,517	14,880	11,879	11,879	15,155	12,092	12,092
NY	35,583	38,125	27,632	27,632	38,686	28,080	28,080
PA	71,382	76,378	63,904	61,046	77,220	62,606	59,691
RI	950	857	854	720	868	862	727
VT	441	791	791	743	808	808	761
VA	50,265	53,919	53,236	53,236	54,476	53,591	53,591
	240,378	**269,103**	**236,221**	**228,228**	**272,496**	**237,107**	**228,984**

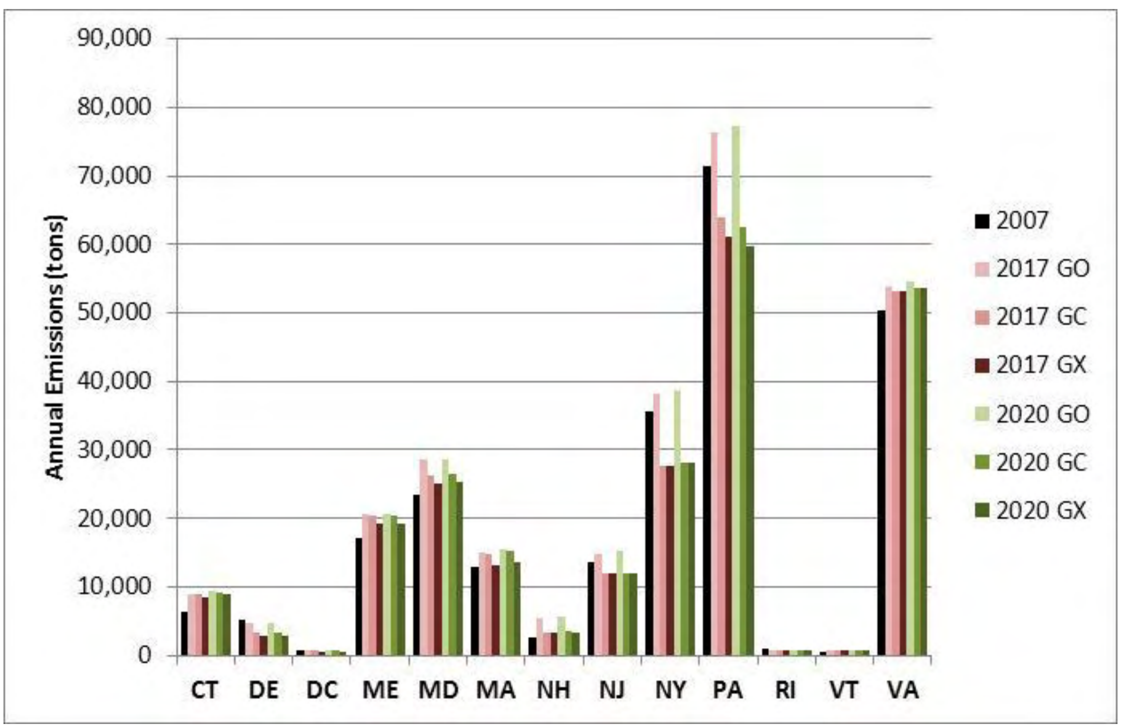


Exhibit 8.11 2007 and Projected Future Year NonEGU PM10-PRI Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	645	702	594	594	717	609	609
DE	1,197	1,140	973	973	1,115	947	947
DC	46	52	29	29	53	30	30
ME	4,748	4,667	4,475	4,475	4,636	4,449	4,449
MD	5,711	6,177	5,498	5,498	6,181	5,502	5,502
MA	3,029	2,927	2,904	2,904	2,977	2,953	2,953
NH	1,141	1,259	1,258	1,258	1,270	1,269	1,269
NJ	3,147	3,381	3,331	3,331	3,444	3,392	3,392
NY	4,463	4,572	4,260	4,260	4,595	4,283	4,283
PA	22,275	22,832	20,891	20,891	22,937	20,996	20,996
RI	173	174	174	174	179	179	179
VT	146	128	128	128	128	128	128
VA	13,028	13,419	12,517	12,517	13,507	12,602	12,602
	59,749	**61,430**	**57,032**	**57,032**	**61,741**	**57,339**	**57,339**

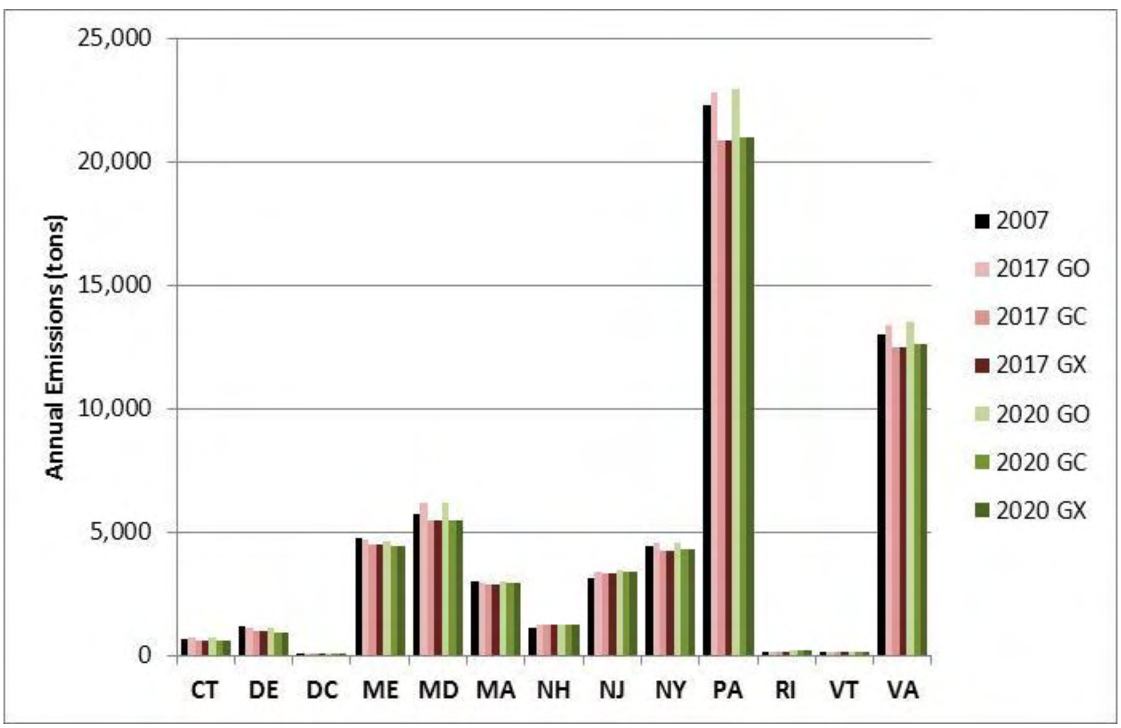


Exhibit 8.12 2007 and Projected Future Year NonEGU PM25-PRI Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	573	627	526	526	641	540	540
DE	1,083	1,021	876	876	993	848	848
DC	43	48	28	28	48	29	29
ME	3,727	3,811	3,658	3,658	3,802	3,653	3,653
MD	3,876	4,328	3,764	3,764	4,336	3,772	3,772
MA	2,572	2,495	2,485	2,485	2,542	2,532	2,532
NH	1,061	1,169	1,169	1,169	1,179	1,179	1,179
NJ	2,452	2,583	2,533	2,533	2,625	2,574	2,574
NY	2,415	2,517	2,329	2,329	2,538	2,350	2,350
PA	13,389	13,851	12,729	12,729	13,934	12,845	12,845
RI	124	124	124	124	128	128	128
VT	114	98	98	98	97	97	97
VA	10,296	10,611	9,885	9,885	10,674	9,947	9,947
	41,726	**43,281**	**40,204**	**40,204**	**43,538**	**40,492**	**40,492**

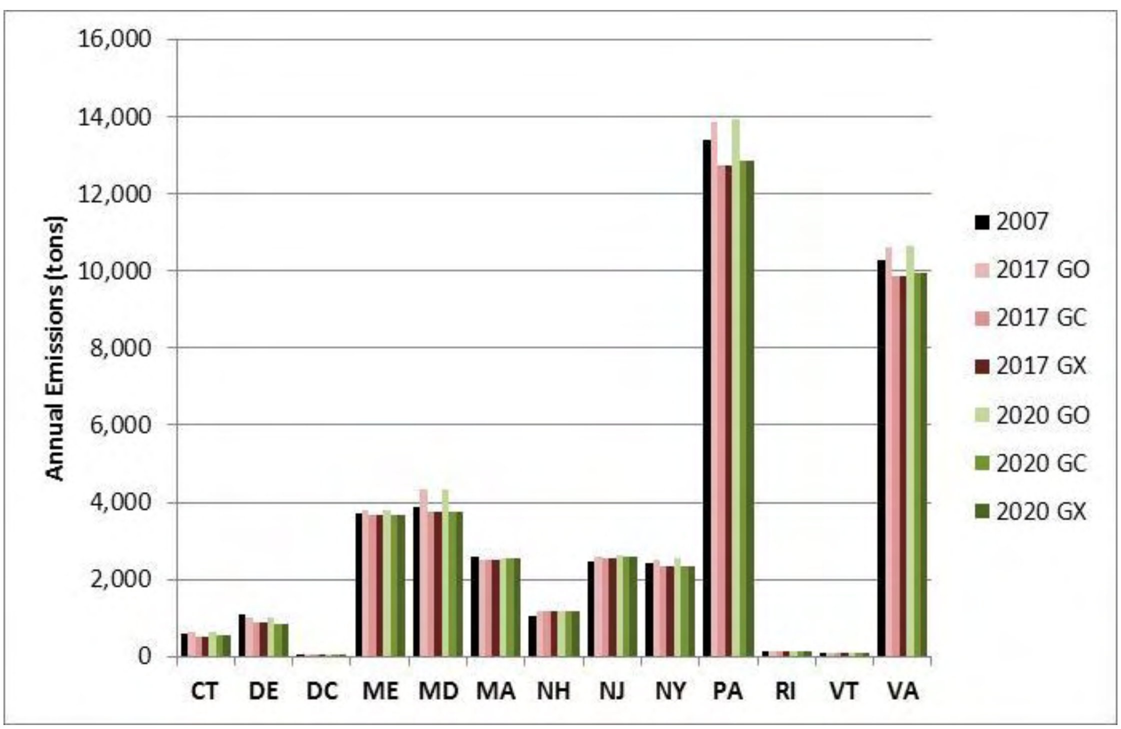


Exhibit 8.13 2007 and Projected Future Year NonEGU SO2 Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	3,185	3,236	3,236	3,117	3,253	3,253	2,773
DE	8,206	7,883	6,541	5,598	7,703	6,357	5,378
DC	471	510	380	358	518	382	337
ME	15,571	13,194	12,678	12,462	13,049	12,545	6,510
MD	31,176	36,658	34,278	34,278	36,636	34,289	34,289
MA	9,057	8,259	8,041	7,592	8,254	8,041	5,192
NH	2,734	2,655	2,655	2,582	2,658	2,658	1,030
NJ	3,401	3,736	2,591	2,591	3,818	2,645	2,645
NY	44,307	44,712	42,072	42,072	44,792	42,150	42,150
PA	57,330	58,464	53,489	49,814	58,627	53,652	49,975
RI	1,501	1,415	1,415	1,321	1,437	1,437	1,002
VT	316	248	248	243	243	243	92
VA	54,486	55,328	52,044	52,044	55,623	52,338	52,338
	231,742	**236,297**	**219,668**	**214,071**	**236,610**	**219,988**	**203,710**

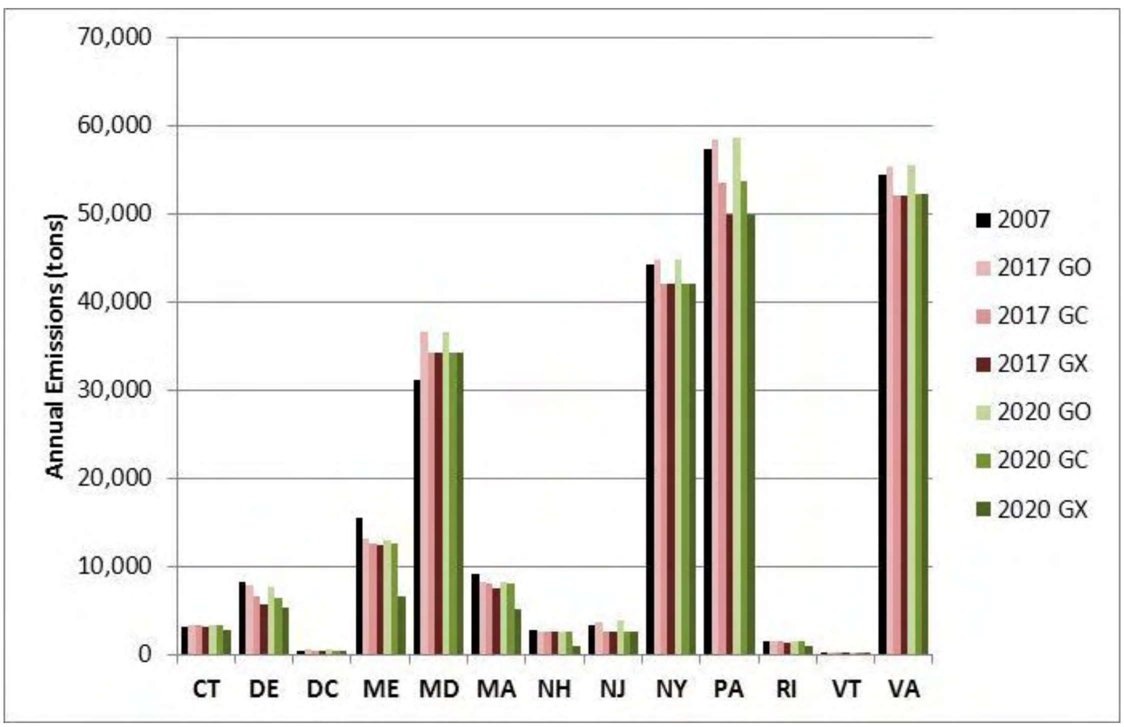
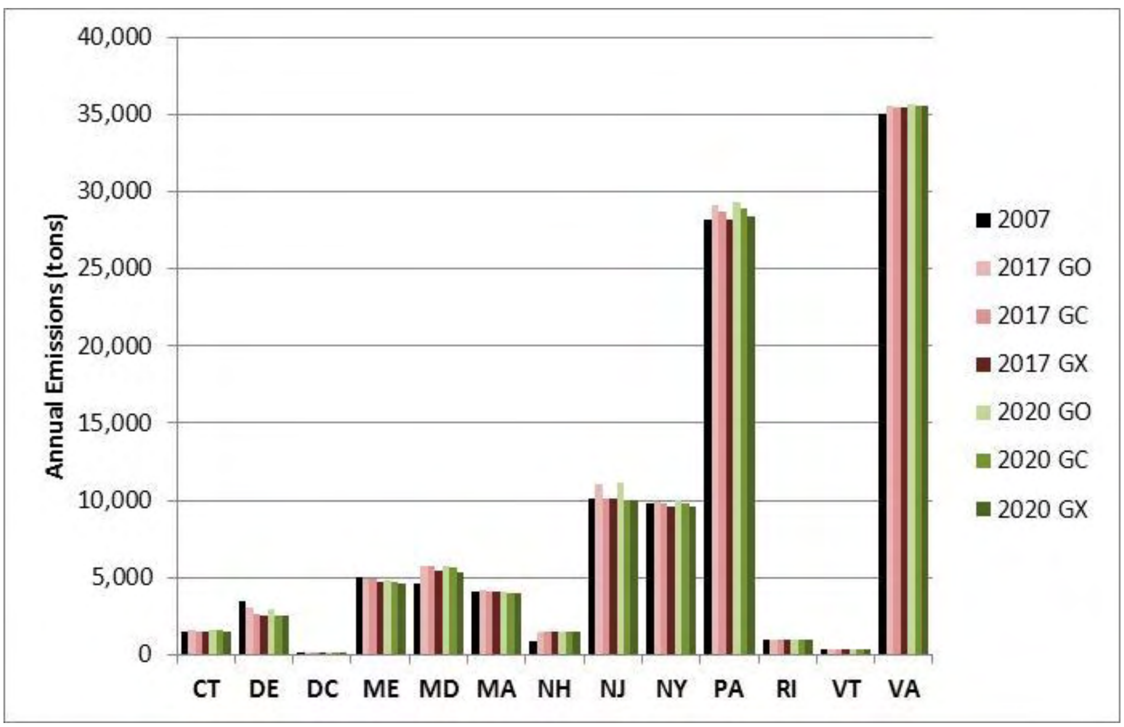


Exhibit 8.14 2007 and Projected Future Year NonEGU VOC Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,447	1,547	1,530	1,468	1,574	1,556	1,476
DE	3,406	3,068	2,588	2,547	2,972	2,572	2,530
DC	58	60	59	59	60	59	59
ME	4,987	4,931	4,885	4,745	4,760	4,718	4,559
MD	4,598	5,745	5,715	5,466	5,707	5,677	5,367
MA	4,094	4,156	4,102	4,057	4,077	4,022	3,965
NH	807	1,490	1,489	1,448	1,479	1,478	1,440
NJ	10,106	11,044	10,086	10,086	11,180	10,041	10,041
NY	9,772	9,948	9,815	9,640	9,985	9,849	9,635
PA	28,195	29,153	28,712	28,236	29,376	28,925	28,396
RI	922	950	945	919	967	963	930
VT	373	316	316	316	302	302	302
VA	35,018	35,538	35,461	35,461	35,670	35,593	35,593
	103,783	**107,947**	**105,705**	**104,450**	**108,110**	**105,755**	**104,292**



8.3 NONROAD NMIM SOURCE PROJECT EMISSIONS

Exhibits 8.15 to 8.21 summarize the 2007 and projected emissions for NONROAD model sources by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

It is not possible to isolate the emission changes due to growth versus the emission changes due to future controls in a single NMIM run. Therefore, the emissions under the growth only (GO) and growth and existing controls (GC) scenarios are the same. There are currently no potential new OTC control measures for sources whose emissions are estimated by the NONROAD model. Therefore, the emissions under the growth and existing controls (GC) and with growth, existing and potential new OTC controls (GX) scenarios are the same.

Exhibit 8.15 presents a state-level comparison of 2007, 2017 and 2020 annual CO emissions for NMIM/NONROAD sources. Emissions decrease by about 21% between 2007 and 2013, but remain relatively flat from 2017 to 2020.

Exhibit 8.16 shows that annual NH3 emissions are very small relative to other source sectors (e.g., agricultural ammonia) and generally increase slightly from 2007 to 2020.

Exhibit 8.17 shows that annual NOx emissions decrease by about 42% between 2007 and 2020 and by about 49% between 2007 and 2020 due to the turnover to newer engines subject to more stringent national emission standards.

Exhibits 8.18 and 8.19 shows that PM10-PRI and PM25-PRI emissions decrease about 33% between 2007 and 2020 and by about 41% between 2007 and 2020.

Exhibit 8.20 shows that annual SO2 emissions are virtually eliminated by 2017 due to lower national limits on the sulfur content of nonroad diesel fuel.

Exhibit 8.21 shows that annual VOC emissions decrease by about 41% between 2007 and 2020 and by about 46% between 2007 and 2020 due to the turnover to newer engines subject to more stringent national emission standards.

Exhibit 8.15 2007/2013/2017/2020 NMIM/NONROAD CO Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	181,817	143,586	143,586	143,586	147,193	147,193	147,193
DE	55,173	40,188	40,188	40,188	40,703	40,703	40,703
DC	14,319	10,246	10,246	10,246	10,322	10,322	10,322
ME	131,319	92,029	92,029	92,029	90,629	90,629	90,629
MD	297,832	247,766	247,766	247,766	254,083	254,083	254,083
MA	324,793	240,812	240,812	240,812	246,540	246,540	246,540
NH	90,461	73,012	73,012	73,012	73,294	73,294	73,294
NJ	445,302	362,054	362,054	362,054	372,857	372,857	372,857
NY	911,813	716,153	716,153	716,153	730,897	730,897	730,897
PA	719,517	533,798	533,798	533,798	542,133	542,133	542,133
RI	54,028	35,863	35,863	35,863	36,713	36,713	36,713
VT	52,497	35,978	35,978	35,978	35,608	35,608	35,608
VA	415,093	335,531	335,531	335,531	341,458	341,458	341,458
	3,693,965	**2,867,016**	**2,867,016**	**2,867,016**	**2,922,431**	**2,922,431**	**2,922,431**

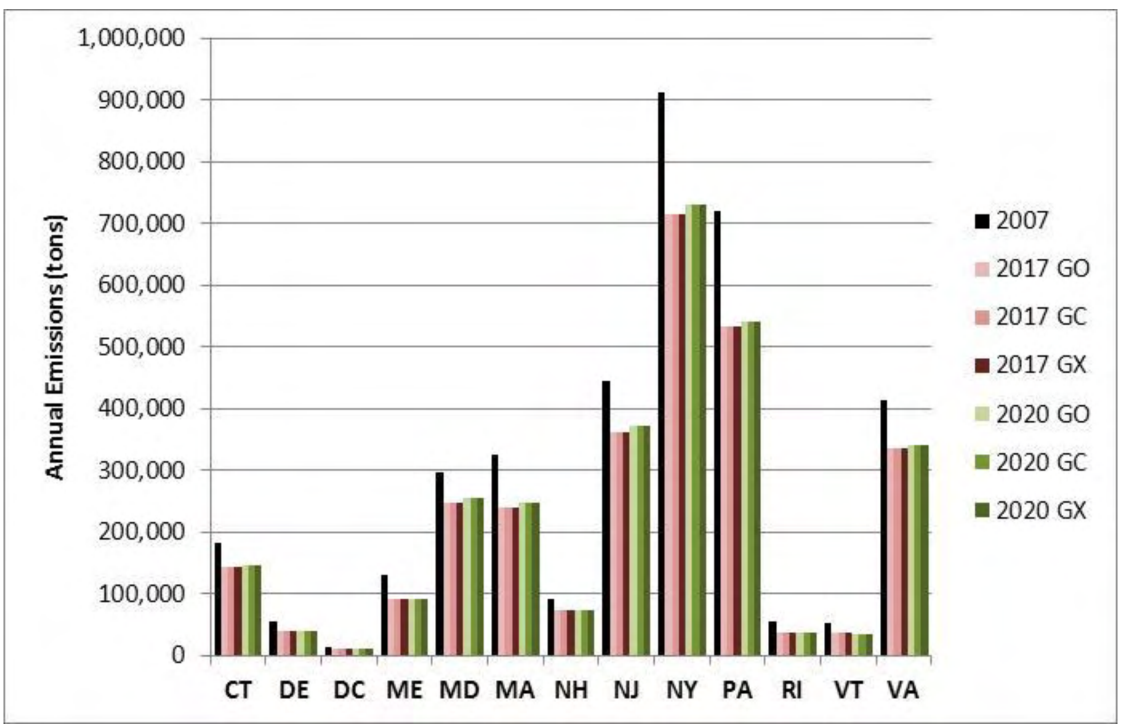


Exhibit 8.16 2007/2013/2017/2020 NMIM/NONROAD NH3 Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	16	20	20	20	21	21	21
DE	6	6	6	6	7	7	7
DC	3	3	3	3	3	3	3
ME	13	15	15	15	15	15	15
MD	29	35	35	35	37	37	37
MA	28	34	34	34	36	36	36
NH	10	12	12	12	13	13	13
NJ	40	47	47	47	50	50	50
NY	83	99	99	99	105	105	105
PA	60	71	71	71	74	74	74
RI	5	5	5	5	5	5	5
VT	5	6	6	6	6	6	6
VA	45	53	53	53	55	55	55
	342	**405**	**405**	**405**	**427**	**427**	**427**

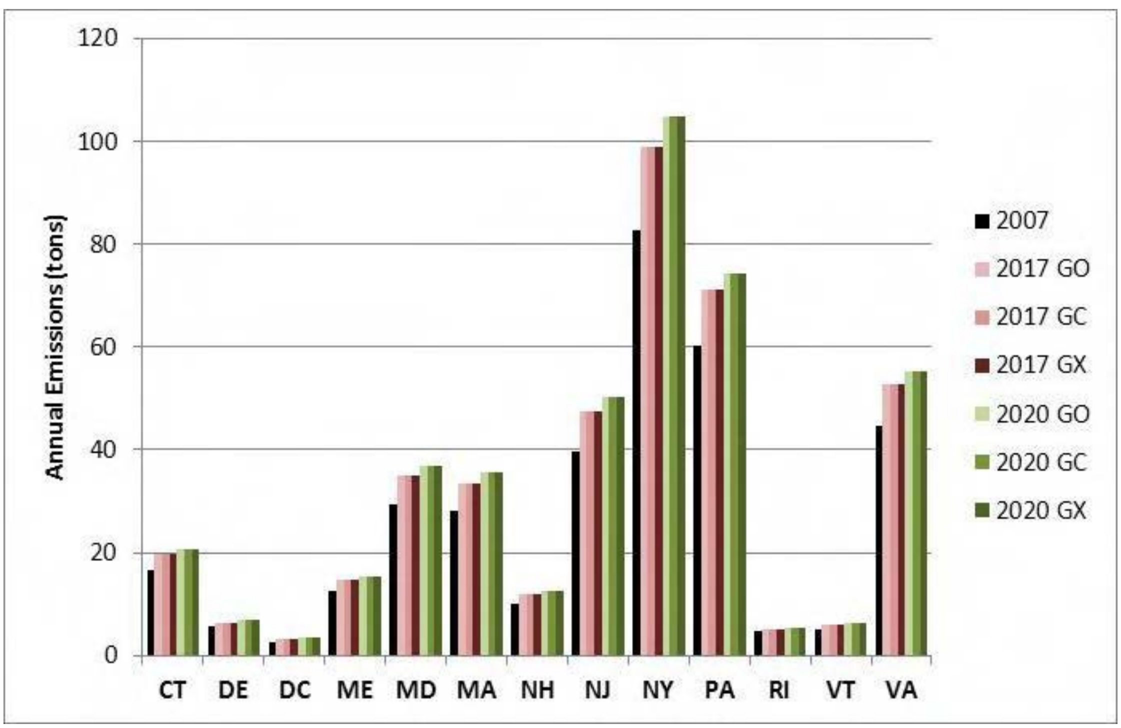


Exhibit 8.17 2007/2013/2017/2020 NMIM/NONROAD NOx Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	16,056	8,748	8,748	8,748	7,786	7,786	7,786
DE	4,998	3,096	3,096	3,096	2,723	2,723	2,723
DC	2,788	1,534	1,534	1,534	1,250	1,250	1,250
ME	7,439	5,216	5,216	5,216	4,783	4,783	4,783
MD	25,726	15,357	15,357	15,357	13,481	13,481	13,481
MA	26,471	14,820	14,820	14,820	13,163	13,163	13,163
NH	8,562	5,530	5,530	5,530	5,277	5,277	5,277
NJ	36,345	20,713	20,713	20,713	18,361	18,361	18,361
NY	72,271	43,490	43,490	43,490	38,871	38,871	38,871
PA	55,362	30,467	30,467	30,467	26,182	26,182	26,182
RI	4,388	2,348	2,348	2,348	2,114	2,114	2,114
VT	3,743	2,364	2,364	2,364	2,109	2,109	2,109
VA	41,325	23,658	23,658	23,658	20,189	20,189	20,189
	305,475	**177,343**	**177,343**	**177,343**	**156,288**	**156,288**	**156,288**

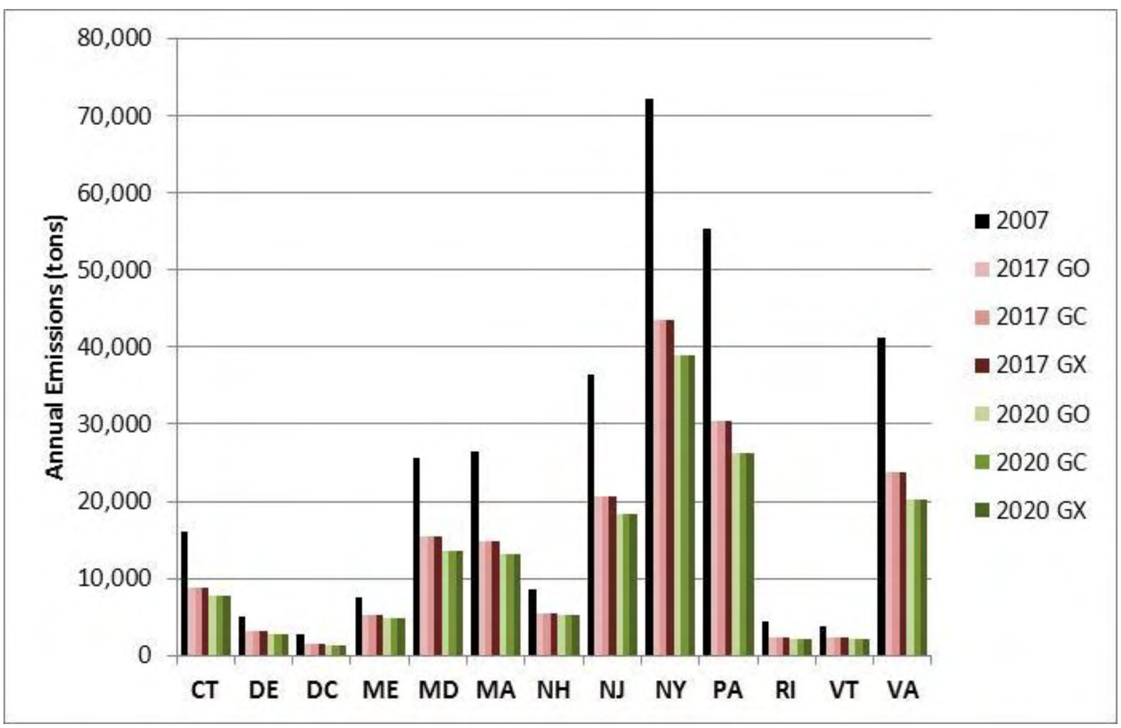


Exhibit 8.18 2007/2013/2017/2020 NMIM/NONROAD PM10-PRI Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	2007	2017 GO	2017 GC	2017 GX	2020 GO	2020 GC	2020 GX
CT	1,412	976	976	976	868	868	868
DE	476	300	300	300	258	258	258
DC	242	138	138	138	106	106	106
ME	1,151	810	810	810	706	706	706
MD	2,600	1,781	1,781	1,781	1,570	1,570	1,570
MA	2,384	1,630	1,630	1,630	1,438	1,438	1,438
NH	846	595	595	595	527	527	527
NJ	3,377	2,347	2,347	2,347	2,086	2,086	2,086
NY	7,059	4,684	4,684	4,684	4,075	4,075	4,075
PA	5,623	3,717	3,717	3,717	3,217	3,217	3,217
RI	367	229	229	229	202	202	202
VT	482	327	327	327	281	281	281
VA	4,128	2,695	2,695	2,695	2,319	2,319	2,319
	30,146	**20,229**	**20,229**	**20,229**	**17,652**	**17,652**	**17,652**

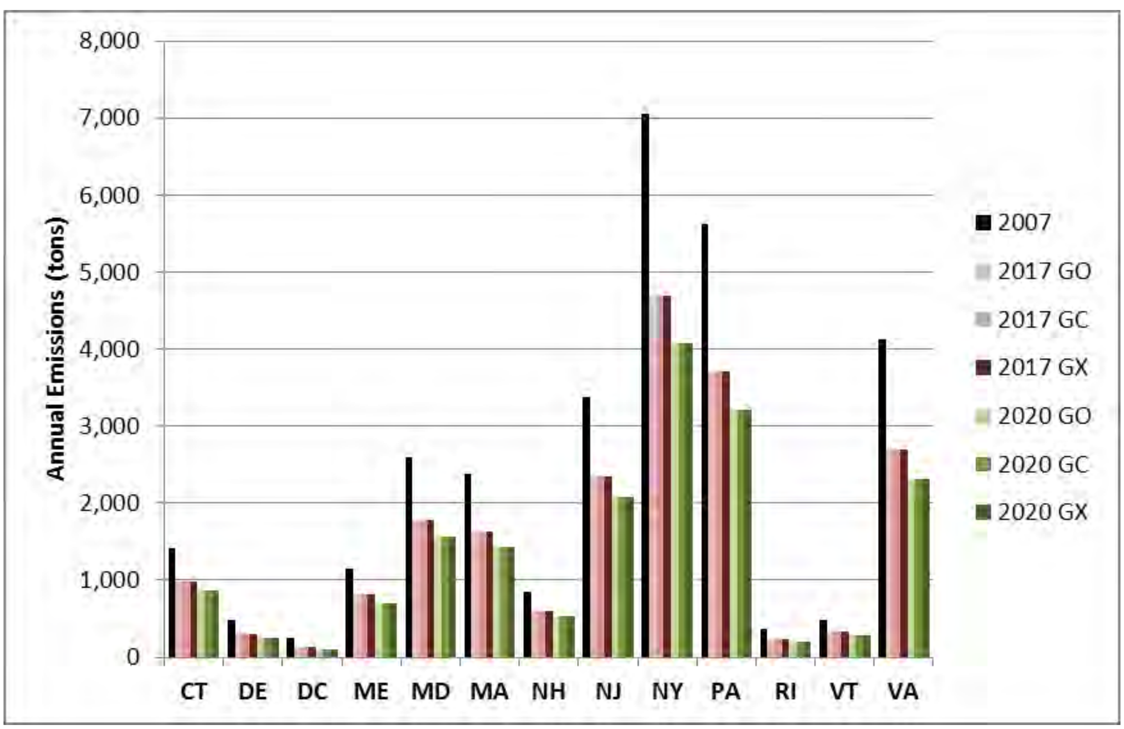


Exhibit 8.19 2007/2013/2017/2020 NMIM/NONROAD PM25-PRI Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,343	922	922	922	818	818	818
DE	453	284	284	284	243	243	243
DC	234	132	132	132	102	102	102
ME	1,080	756	756	756	657	657	657
MD	2,473	1,681	1,681	1,681	1,477	1,477	1,477
MA	2,268	1,540	1,540	1,540	1,355	1,355	1,355
NH	799	559	559	559	494	494	494
NJ	3,213	2,217	2,217	2,217	1,964	1,964	1,964
NY	6,715	4,430	4,430	4,430	3,843	3,843	3,843
PA	5,346	3,511	3,511	3,511	3,029	3,029	3,029
RI	349	216	216	216	191	191	191
VT	455	307	307	307	263	263	263
VA	3,933	2,549	2,549	2,549	2,185	2,185	2,185
	28,660	**19,105**	**19,105**	**19,105**	**16,621**	**16,621**	**16,621**

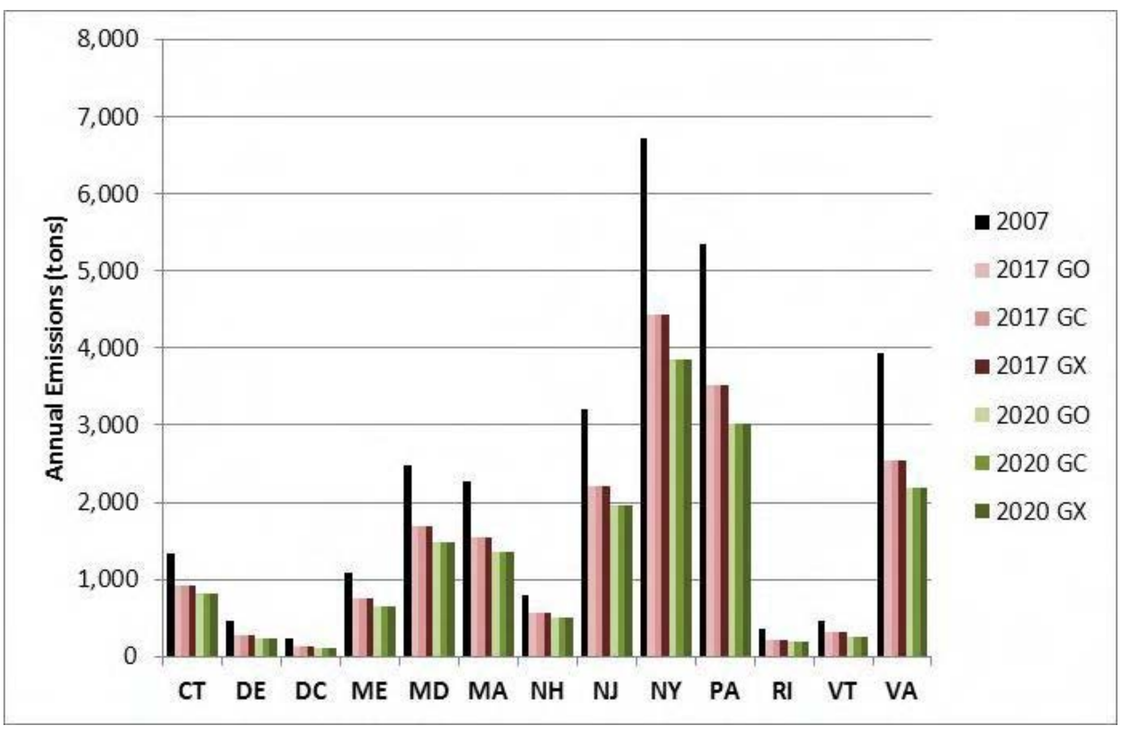


Exhibit 8.20 2007/2013/2017/2020 NMIM/NONROAD SO2 Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	802	30	30	30	32	32	32
DE	266	7	7	7	7	7	7
DC	196	3	3	3	3	3	3
ME	416	16	16	16	17	17	17
MD	1,436	36	36	36	38	38	38
MA	1,377	41	41	41	44	44	44
NH	441	16	16	16	18	18	18
NJ	1,905	55	55	55	58	58	58
NY	3,957	118	118	118	126	126	126
PA	2,972	84	84	84	86	86	86
RI	211	7	7	7	7	7	7
VT	202	7	7	7	7	7	7
VA	2,284	90	90	90	94	94	94
	16,464	**511**	**511**	**511**	**537**	**537**	**537**

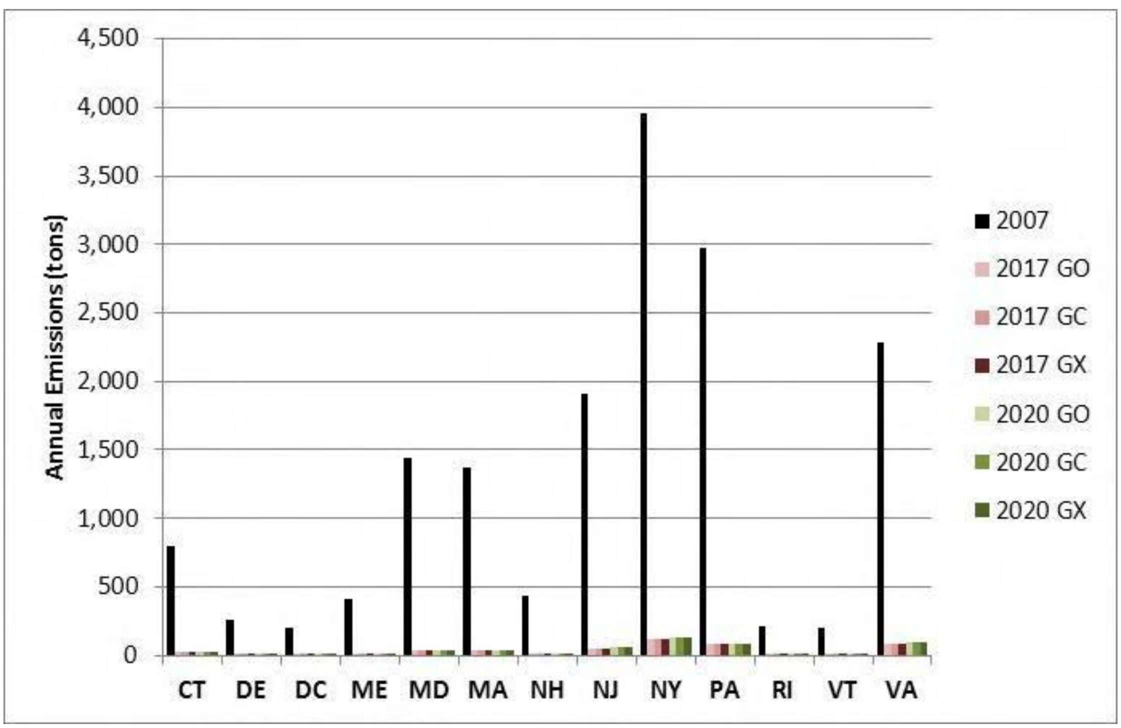
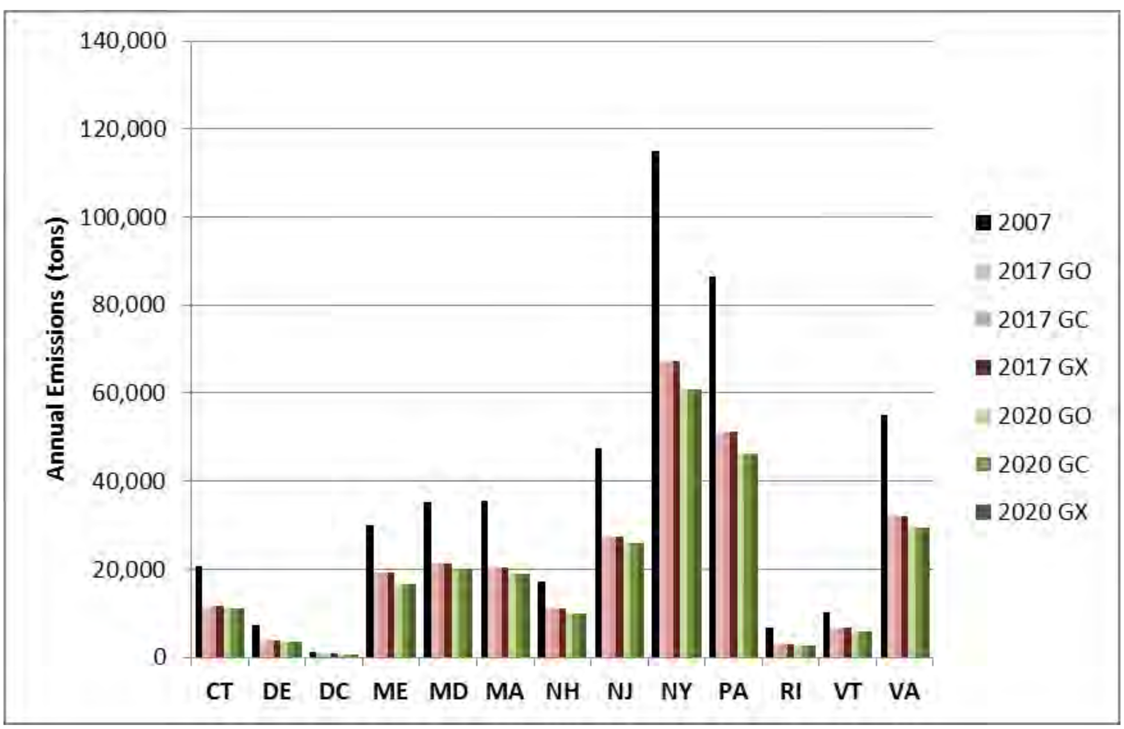


Exhibit 8.21 2007/2013/2017/2020 NMIM/NONROAD VOC Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	20,721	11,803	11,803	11,803	10,985	10,985	10,985
DE	7,157	3,888	3,888	3,888	3,498	3,498	3,498
DC	1,324	749	749	749	710	710	710
ME	29,880	19,303	19,303	19,303	16,729	16,729	16,729
MD	35,160	21,226	21,226	21,226	19,890	19,890	19,890
MA	35,676	20,510	20,510	20,510	18,990	18,990	18,990
NH	17,108	11,030	11,030	11,030	9,785	9,785	9,785
NJ	47,521	27,430	27,430	27,430	25,802	25,802	25,802
NY	114,935	67,238	67,238	67,238	60,945	60,945	60,945
PA	86,397	51,382	51,382	51,382	46,399	46,399	46,399
RI	6,721	2,885	2,885	2,885	2,657	2,657	2,657
VT	10,339	6,714	6,714	6,714	5,864	5,864	5,864
VA	55,135	32,141	32,141	32,141	29,303	29,303	29,303
	468,074	**276,299**	**276,299**	**276,299**	**251,556**	**251,556**	**251,556**



8.4 NONROAD COMMERCIAL MARINE VESSEL EMISSIONS

Exhibits 8.22 to 8.28 summarize the 2007 and projected future year commercial marine vessel emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

Emissions of all pollutants except NH3 are projected to decrease as a result of Federal rules affecting Category 1 / 2 and Category 3 marine engines, including more stringent engine emission standards and sulfur in fuel limitations. There are currently no potential new OTC control measures for commercial marine vessels.

Exhibit 8.22 presents a state-level comparison of 2007, 2017 and 2020 annual CO emissions for commercial marine vessels. Emissions decrease by about 13 percent from 2007 to 2017, and 12 percent from 2007 to 2020.

Exhibit 8.23 shows that there are very little NH3 emissions from this sector.

Exhibit 8.24 shows that annual NOx emissions from commercial marine vessels decrease by 32 percent from 2007 to 2017 and 40 percent from 2007 to 2020.

Exhibits 9.25 and 9.26 show that annual PM10-PRI and PM2.5-PRI emissions from commercial marine vessels decrease substantially after 2007. For both pollutants, emissions are reduced by about 57 percent from 2007 to 2017 and 66 percent from 2007 to 2020.

Exhibit 8.27 shows that that annual SO2 emissions from commercial marine vessels decrease dramatically after 2007. SO2 emissions are reduced by about 89 percent from 2007 to 2017 and 93 percent from 2007 to 2020.

Exhibit 8.28 shows that annual VOC emissions from commercial marine vessels decrease by 15 percent from 2007 to 2017, and 20 percent from 2007 to 2020.

Exhibit 8.22 2007 and Projected CO Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,078	1,073	912	912	1,102	908	908
DE	554	543	485	485	554	484	484
DC	1	1	1	1	1	1	1
ME	522	521	438	438	536	435	435
MD	2,795	2,792	2,350	2,350	2,871	2,337	2,337
MA	1,473	1,475	1,232	1,232	1,518	1,225	1,225
NH	89	84	83	83	85	84	84
NJ	1,619	2,202	2,067	2,067	2,427	2,254	2,254
NY	3,476	3,452	2,961	2,961	3,541	2,949	2,949
PA	1,294	1,283	1,106	1,106	1,315	1,102	1,102
RI	522	523	437	437	538	434	434
VT	0	0	0	0	0	0	0
VA	3,735	3,731	3,166	3,166	3,831	3,150	3,150
	17,156	**17,681**	**15,238**	**15,238**	**18,319**	**15,363**	**15,363**

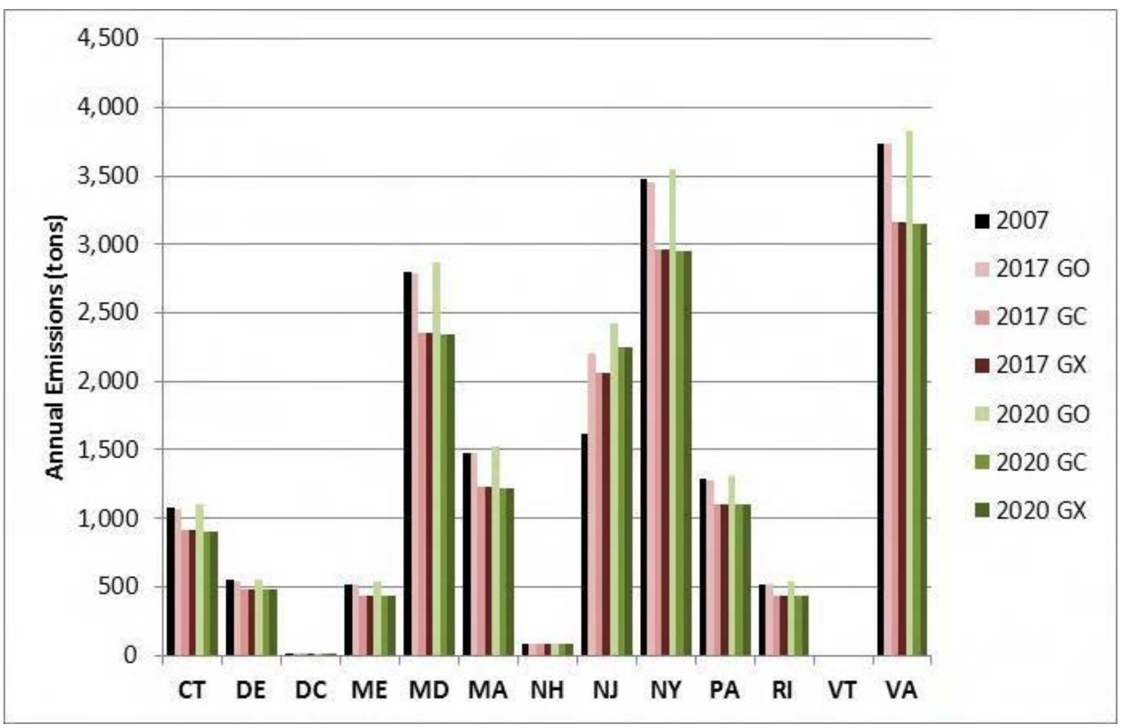


Exhibit 8.23 2007 and Projected NH3 Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	3	3	3	3	3	3	3
DE		0	0	0	0	0	0
DC	0	0	0	0	0	0	0
ME		0	0	0	0	0	0
MD	8	8	8	8	8	8	8
MA		0	0	0	0	0	0
NH		0	0	0	0	0	0
NJ	8	11	11	11	12	12	12
NY	2	2	2	2	2	2	2
PA	13	12	12	12	13	13	13
RI	1	1	1	1	1	1	1
VT	0	0	0	0	0	0	0
VA	9	9	9	9	9	9	9
	44	**46**	**46**	**46**	**47**	**47**	**47**

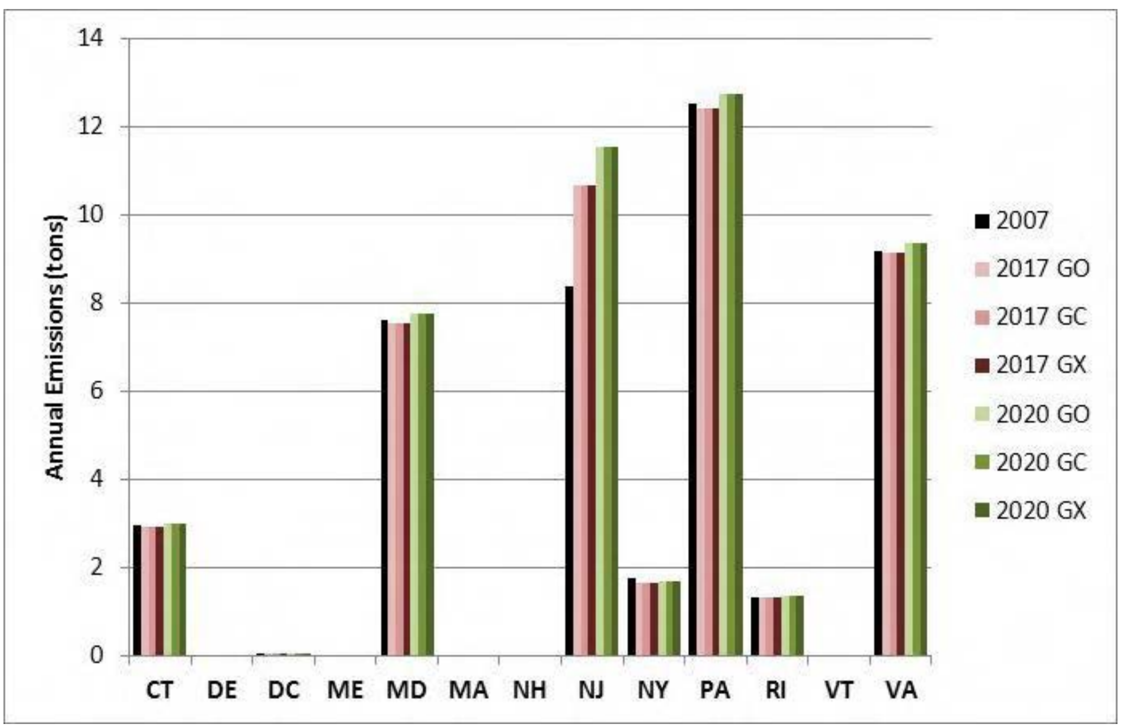


Exhibit 8.24 2007 and Projected NOx Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	6,528	6,454	4,162	4,162	6,608	3,642	3,642
DE	5,095	4,966	3,217	3,217	5,054	2,857	2,857
DC	6	6	4	4	6	3	3
ME	1,659	1,638	1,057	1,057	1,676	926	926
MD	16,027	15,929	10,256	10,256	16,343	8,922	8,922
MA	3,246	3,247	2,086	2,086	3,340	1,803	1,803
NH	271	258	169	169	260	154	154
NJ	11,197	15,318	11,140	11,140	16,906	10,251	10,251
NY	28,180	27,913	17,990	17,990	28,598	15,709	15,709
PA	11,378	11,237	7,249	7,249	11,498	6,350	6,350
RI	2,829	2,825	1,816	1,816	2,904	1,572	1,572
VT	0	0	0	0	0	0	0
VA	21,760	21,643	14,445	14,445	22,172	12,750	12,750
	108,175	**111,435**	**73,591**	**73,591**	**115,365**	**64,937**	**64,937**

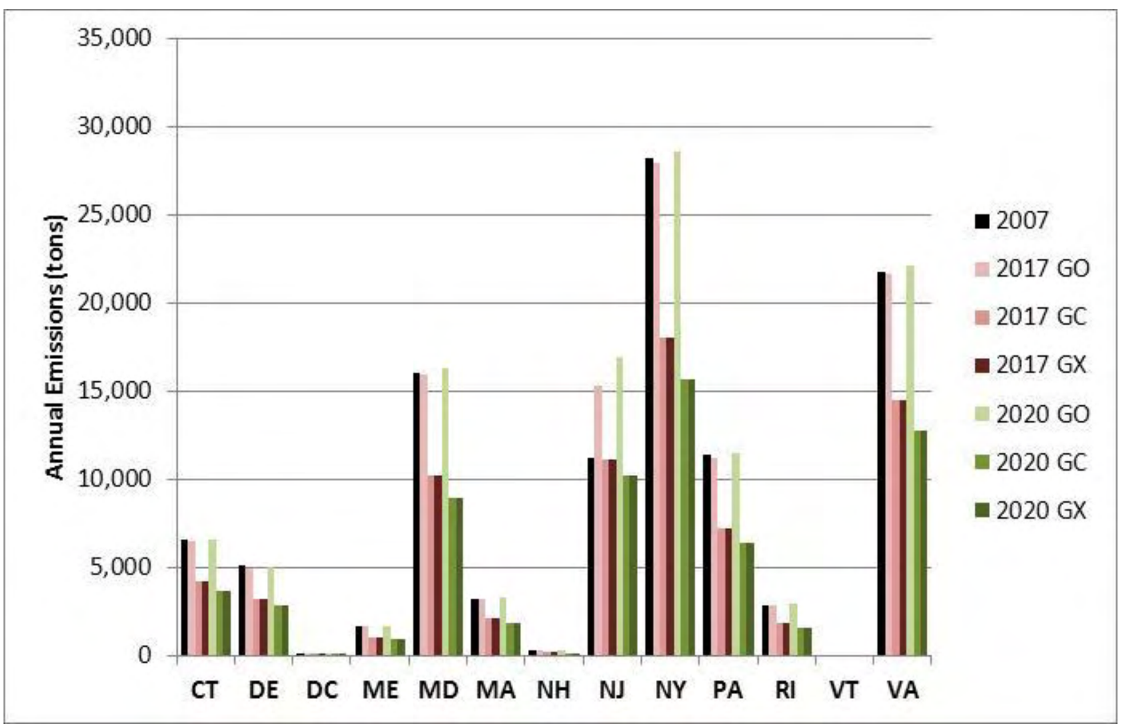


Exhibit 8.25 2007 and Projected PM10-PRI Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	312	305	124	124	310	101	101
DE	327	315	99	99	319	75	75
DC	0	0	0	0	0	0	0
ME	395	384	144	144	391	114	114
MD	657	649	301	301	664	251	251
MA	316	315	162	162	323	138	138
NH	13	12	3	3	13	2	2
NJ	622	887	244	244	989	241	241
NY	1,671	1,649	753	753	1,686	626	626
PA	524	511	197	197	519	158	158
RI	112	112	55	55	115	47	47
VT	0	0	0	0	0	0	0
VA	947	934	461	461	953	394	394
	5,897	**6,072**	**2,543**	**2,543**	**6,283**	**2,146**	**2,146**

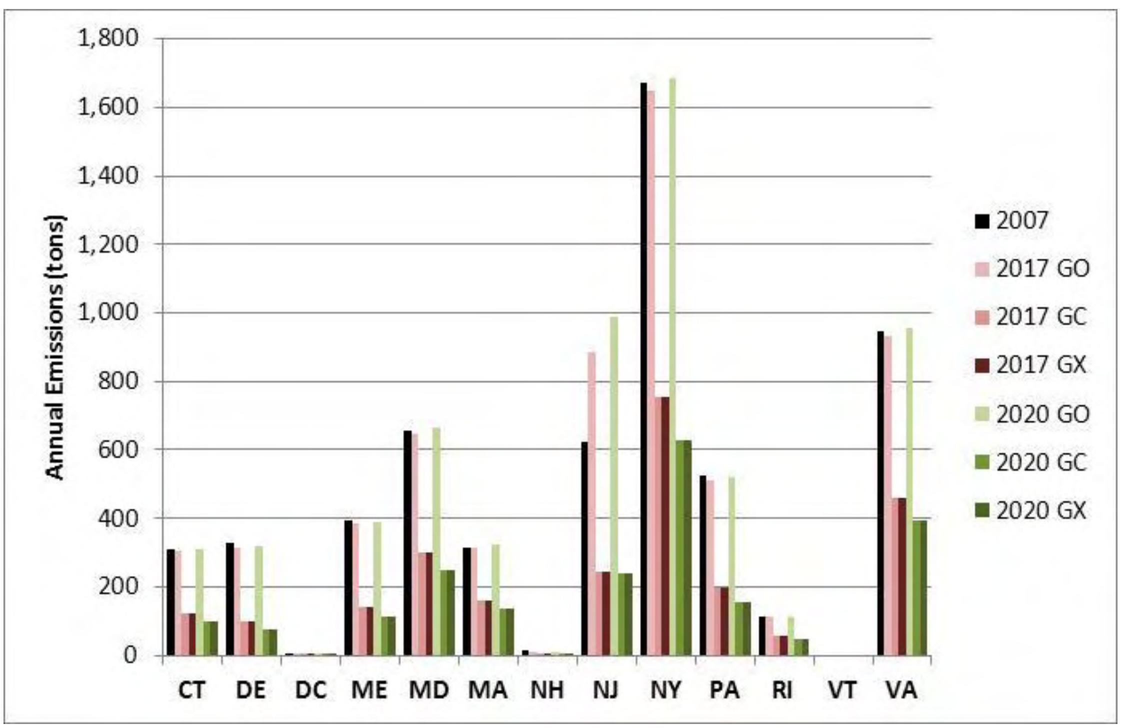


Exhibit 8.26 2007 and Projected PM25-PRI Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	296	290	119	119	295	97	97
DE	305	294	93	93	297	70	70
DC	0	0	0	0	0	0	0
ME	364	354	132	132	359	105	105
MD	606	600	285	285	614	239	239
MA	290	289	149	149	297	127	127
NH	12	11	3	3	12	2	2
NJ	575	820	225	225	915	223	223
NY	1,541	1,520	695	695	1,555	578	578
PA	484	472	183	183	480	146	146
RI	108	107	53	53	110	45	45
VT	0	0	0	0	0	0	0
VA	908	896	446	446	915	383	383
	5,491	**5,654**	**2,384**	**2,384**	**5,851**	**2,016**	**2,016**

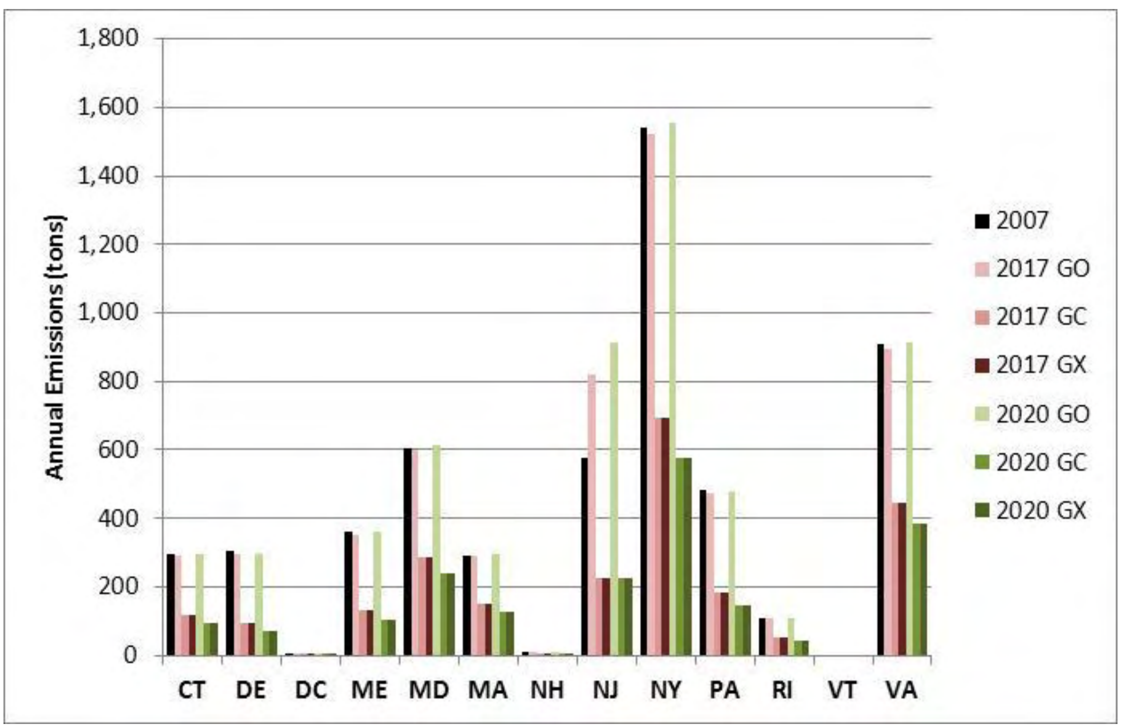


Exhibit 8.27 2007 and Projected SO2 Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,386	1,327	147	147	1,341	60	60
DE	2,079	1,984	225	225	2,000	84	84
DC	1	1	0	0	1	0	0
ME	189	185	17	17	189	12	12
MD	2,170	2,099	217	217	2,128	109	109
MA	698	684	64	64	698	42	42
NH	506	482	55	55	486	20	20
NJ	6,712	10,085	403	403	11,405	452	452
NY	9,321	9,181	821	821	9,383	601	601
PA	3,067	2,909	343	343	2,925	111	111
RI	632	607	66	66	613	28	28
VT	0	0	0	0	0	0	0
VA	4,058	3,928	940	940	3,969	747	747
	30,820	**33,473**	**3,296**	**3,296**	**35,139**	**2,268**	**2,268**

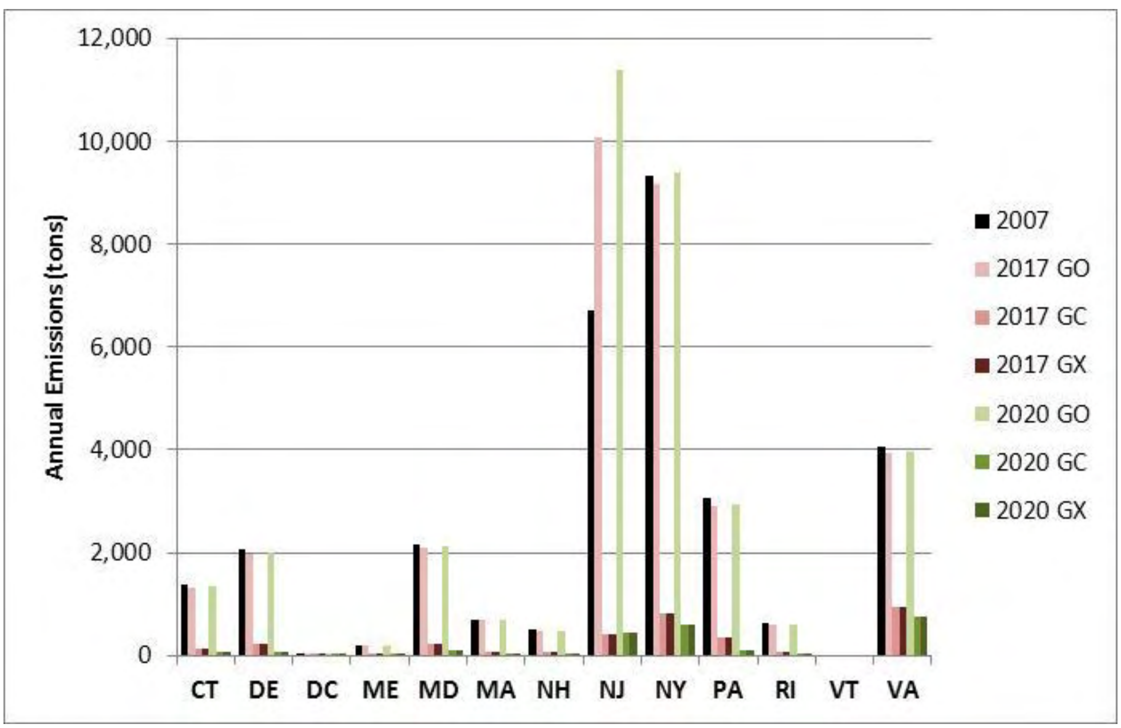
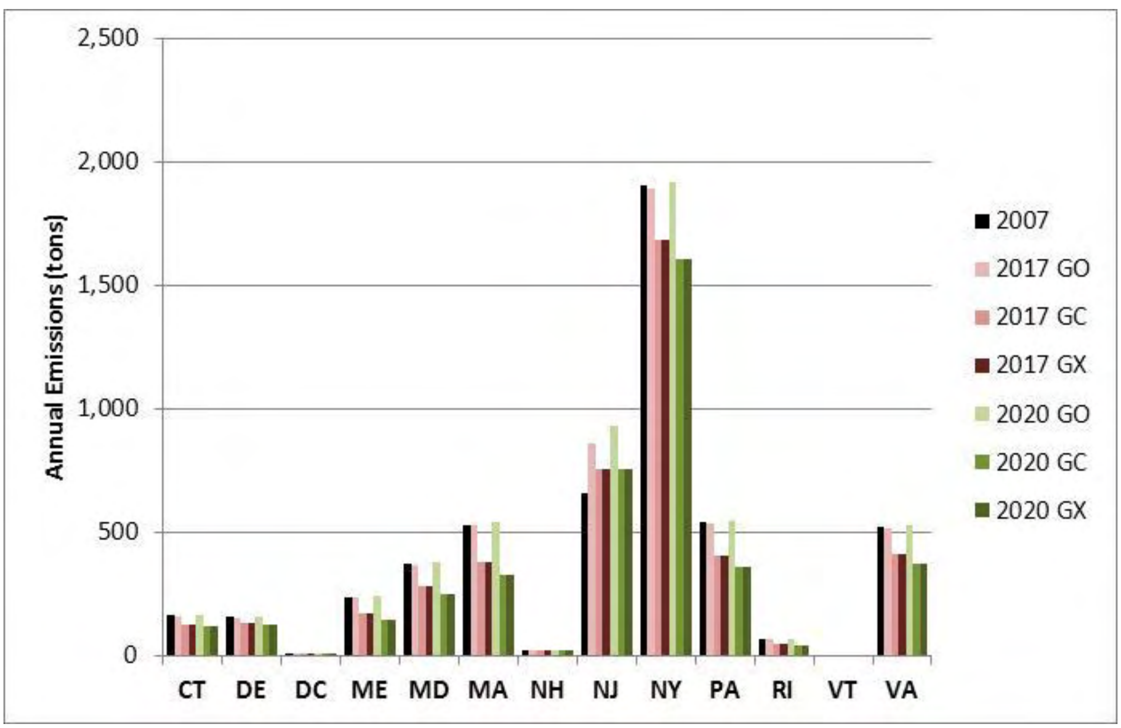


Exhibit 8.28 2007 and Projected VOC Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	161	158	127	127	162	117	117
DE	158	153	133	133	156	127	127
DC	0	0	0	0	0	0	0
ME	234	234	168	168	240	145	145
MD	371	367	282	282	376	252	252
MA	528	529	381	381	544	328	328
NH	23	21	21	21	22	21	21
NJ	658	857	753	753	933	754	754
NY	1,906	1,895	1,681	1,681	1,918	1,606	1,606
PA	538	534	406	406	547	360	360
RI	64	64	47	47	66	42	42
VT	0	0	0	0	0	0	0
VA	523	518	409	409	530	370	370
	5,164	**5,331**	**4,410**	**4,410**	**5,493**	**4,121**	**4,121**



8.5 NONROAD AIRPORT EMISSIONS

Exhibits 9.29 to 9.35 summarize the 2007 and projected future year airport emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

There were no NH3 emissions reported for airport operations. Emissions of other pollutants are projected to change as a result of changes in airline activity levels. No state or Federal rules were identified that would reduce emissions from aircraft operations in the future. There are currently no potential new OTC control measures for airports.

CO, PM10, PM2.5 and VOC emissions are projected to remain relatively constant between 2007 levels by 2017. By 2020, the will be a slight increase in emissions from 2007 due to increased operations by 2020.

NOx and SO2 emissions are projected to increase by 7 percent from 2007 levels by 2017 and by 13 percent by 2020 due to increased air traffic.

Exhibit 8.29 2007 and Projected CO Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	4,659	4,224	4,224	4,224	4,386	4,386	4,386
DE	1,625	1,550	1,550	1,550	1,593	1,593	1,593
DC	14	14	14	14	14	14	14
ME	32,879	32,774	32,774	32,774	32,802	32,802	32,802
MD	10,265	10,042	10,042	10,042	10,335	10,335	10,335
MA	15,495	14,592	14,592	14,592	14,940	14,940	14,940
NH	2,089	1,861	1,861	1,861	1,883	1,883	1,883
NJ	21,878	21,837	21,837	21,837	22,411	22,411	22,411
NY	17,403	18,579	18,579	18,579	19,706	19,706	19,706
PA	26,540	26,165	26,165	26,165	27,345	27,345	27,345
RI	1,739	2,255	2,255	2,255	2,280	2,280	2,280
VT	2,420	2,100	2,100	2,100	2,127	2,127	2,127
VA	22,009	22,689	22,689	22,689	23,190	23,190	23,190
	159,016	**158,684**	**158,684**	**158,684**	**163,012**	**163,012**	**163,012**

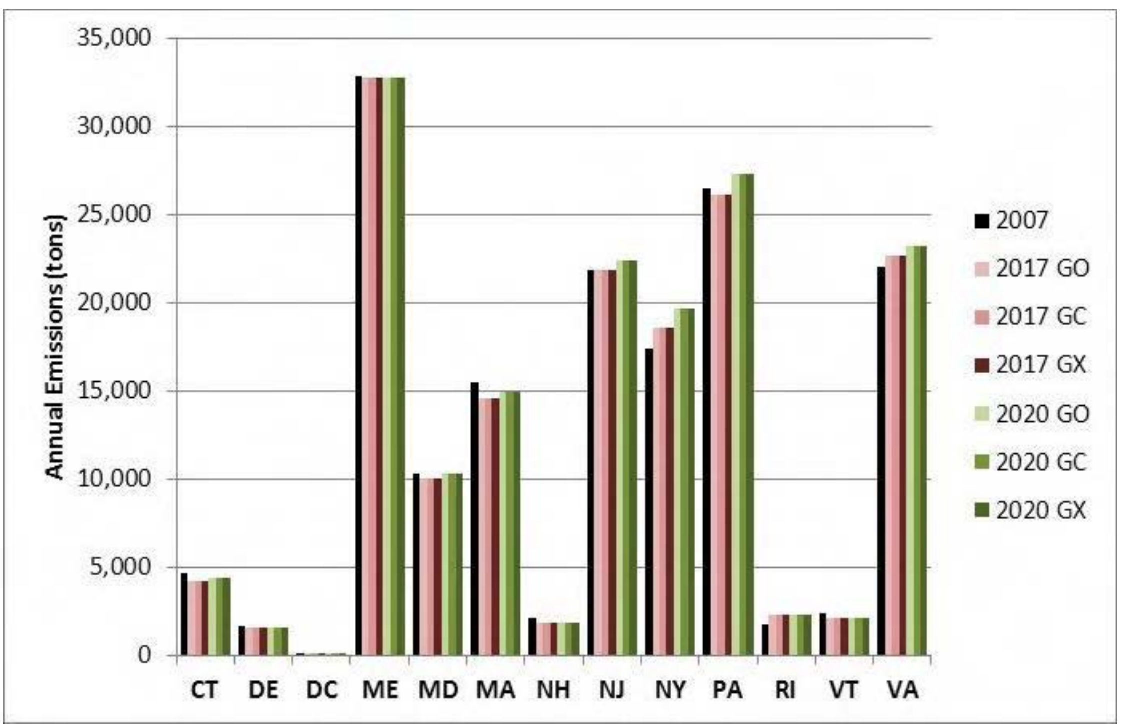


Exhibit 8.30 2007 and Projected NH3 Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	2007	2017 GO	2017 GC	2017 GX	2020 GO	2020 GC	2020 GX
CT	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0
DC	0	0	0	0	0	0	0
ME	0	0	0	0	0	0	0
MD	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0
	0	0	0	0	0	0	0

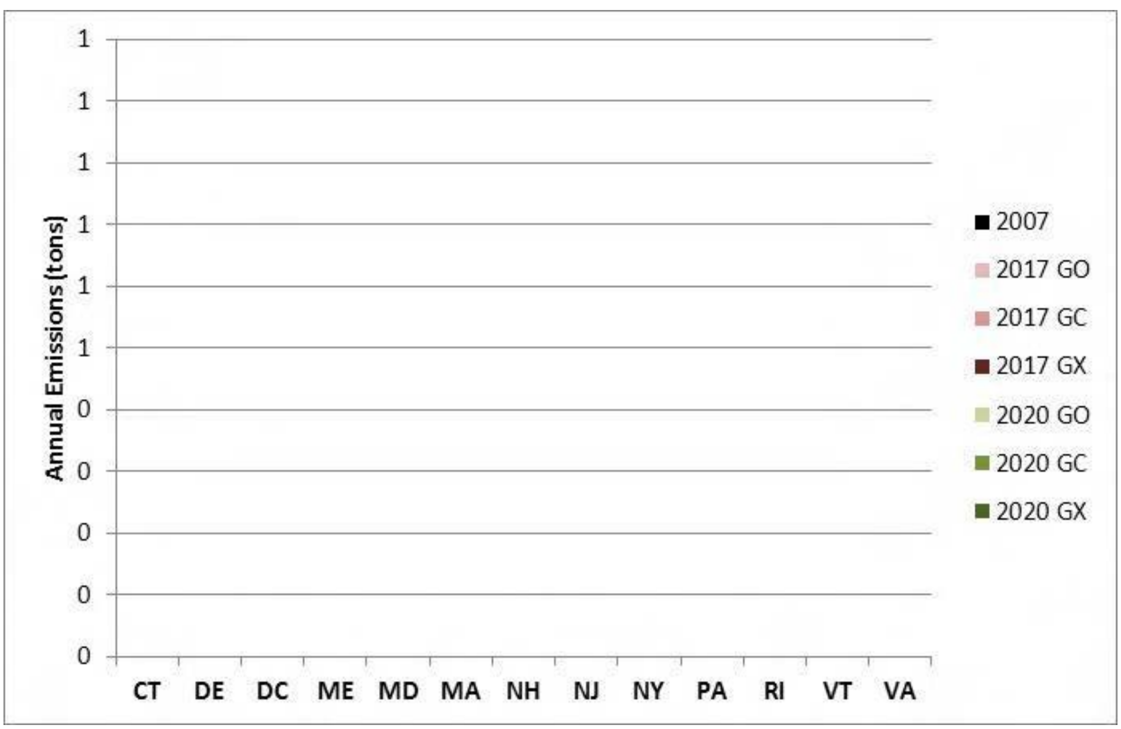


Exhibit 8.31 2007 and Projected NOx Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	713	657	657	657	688	688	688
DE	805	801	801	801	802	802	802
DC	0	0	0	0	0	0	0
ME	134	144	144	144	144	144	144
MD	1,910	2,021	2,021	2,021	2,119	2,119	2,119
MA	3,190	3,267	3,267	3,267	3,365	3,365	3,365
NH	278	256	256	256	260	260	260
NJ	5,105	5,408	5,408	5,408	5,612	5,612	5,612
NY	6,998	8,081	8,081	8,081	8,789	8,789	8,789
PA	3,738	4,094	4,094	4,094	4,406	4,406	4,406
RI	289	281	281	281	294	294	294
VT	103	113	113	113	117	117	117
VA	5,520	5,762	5,762	5,762	5,889	5,889	5,889
	28,783	**30,885**	**30,885**	**30,885**	**32,485**	**32,485**	**32,485**

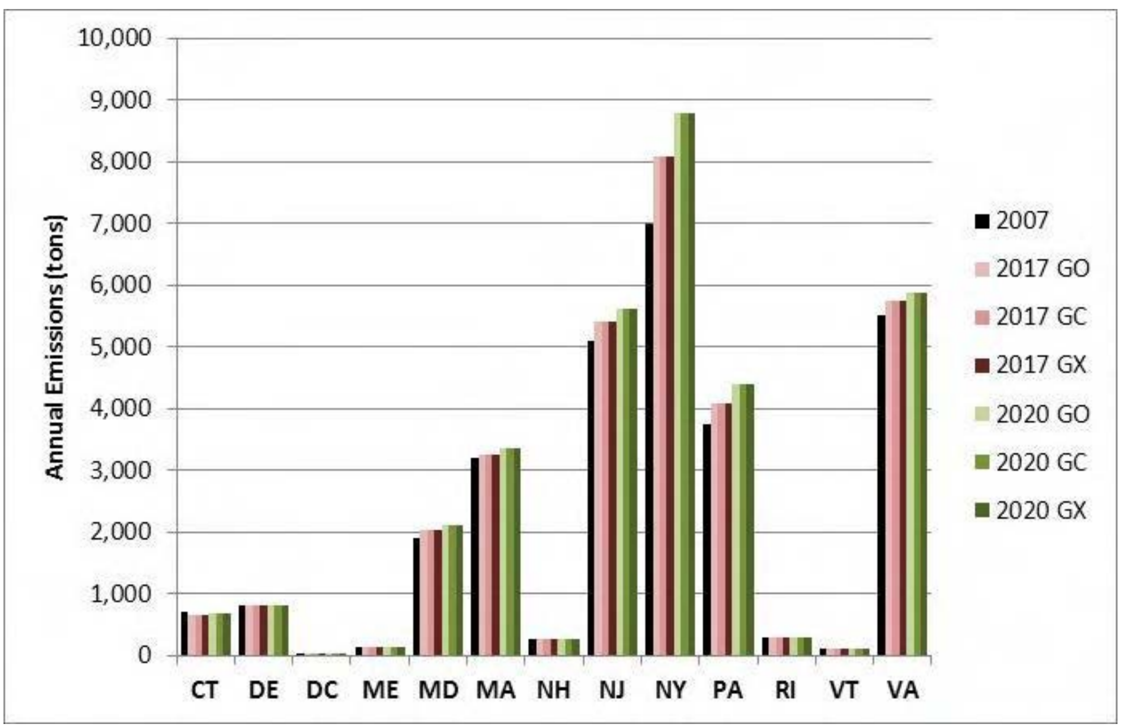


Exhibit 8.32 2007 and Projected PM10-PRI Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	66	59	59	59	61	61	61
DE	27	25	25	25	25	25	25
DC	0	0	0	0	0	0	0
ME	83	82	82	82	82	82	82
MD	74	70	70	70	73	73	73
MA	295	284	284	284	289	289	289
NH	37	34	34	34	34	34	34
NJ	170	173	173	173	177	177	177
NY	140	158	158	158	170	170	170
PA	396	385	385	385	400	400	400
RI	22	33	33	33	33	33	33
VT	46	40	40	40	40	40	40
VA	821	840	840	840	847	847	847
	2,176	**2,183**	**2,183**	**2,183**	**2,234**	**2,234**	**2,234**

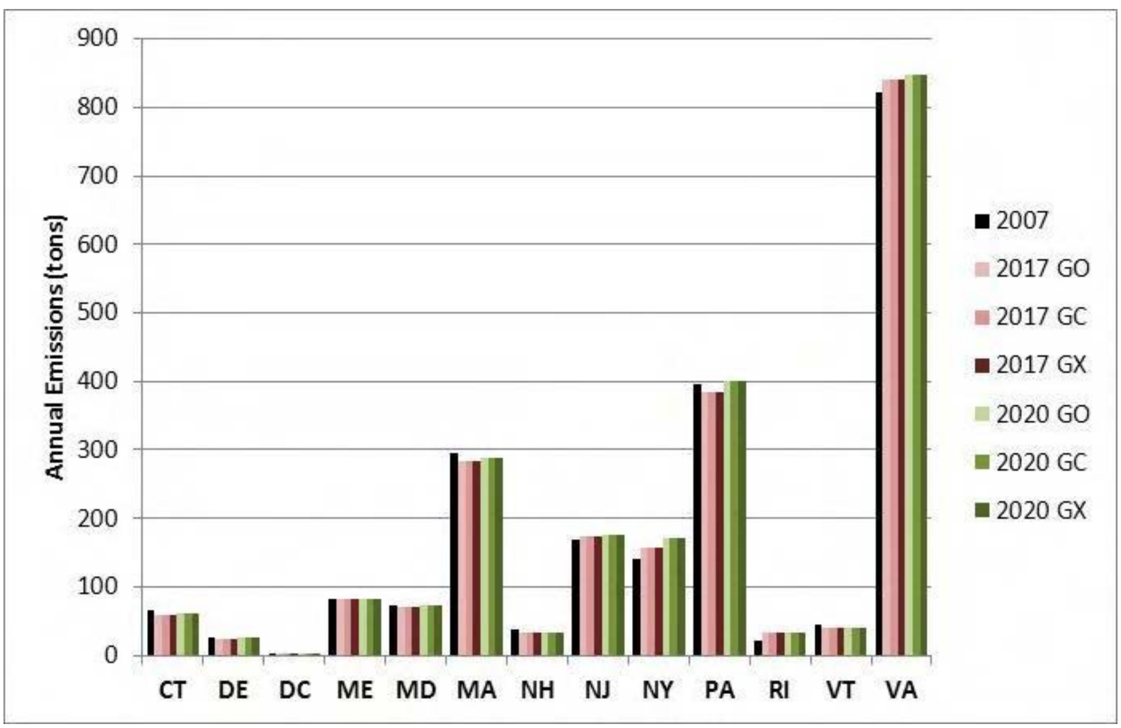


Exhibit 8.33 2007 and Projected PM25-PRI Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	2007	2017 GO	2017 GC	2017 GX	2020 GO	2020 GC	2020 GX
CT	51	46	46	46	48	48	48
DE	19	17	17	17	18	18	18
DC	0	0	0	0	0	0	0
ME	61	61	61	61	61	61	61
MD	16	17	17	17	17	17	17
MA	215	208	208	208	212	212	212
NH	27	25	25	25	25	25	25
NJ	143	146	146	146	150	150	150
NY	139	157	157	157	170	170	170
PA	294	288	288	288	300	300	300
RI	17	25	25	25	25	25	25
VT	32	28	28	28	29	29	29
VA	580	595	595	595	601	601	601
	1,595	**1,613**	**1,613**	**1,613**	**1,656**	**1,656**	**1,656**

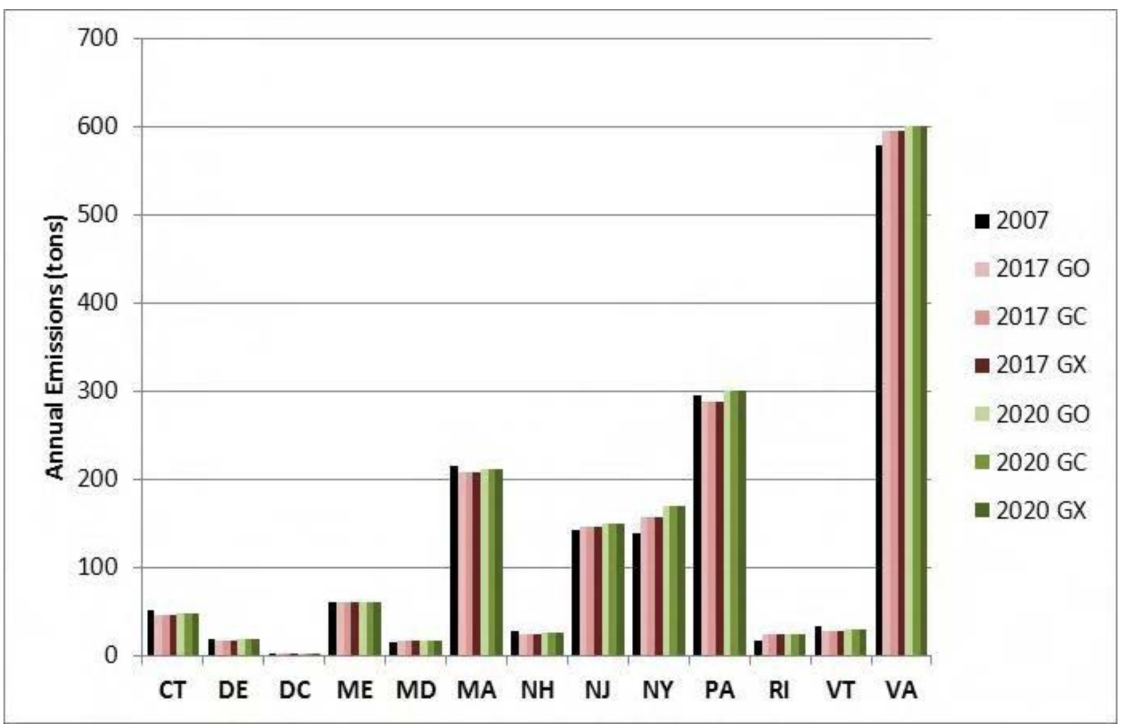


Exhibit 8.34 2007 and Projected SO2 Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	96	87	87	87	91	91	91
DE	55	55	55	55	55	55	55
DC	0	0	0	0	0	0	0
ME	14	16	16	16	16	16	16
MD	247	255	255	255	266	266	266
MA	218	226	226	226	236	236	236
NH	28	26	26	26	26	26	26
NJ	507	534	534	534	557	557	557
NY	699	808	808	808	877	877	877
PA	416	455	455	455	488	488	488
RI	30	29	29	29	31	31	31
VT	12	13	13	13	13	13	13
VA	424	455	455	455	466	466	466
	2,746	**2,959**	**2,959**	**2,959**	**3,122**	**3,122**	**3,122**

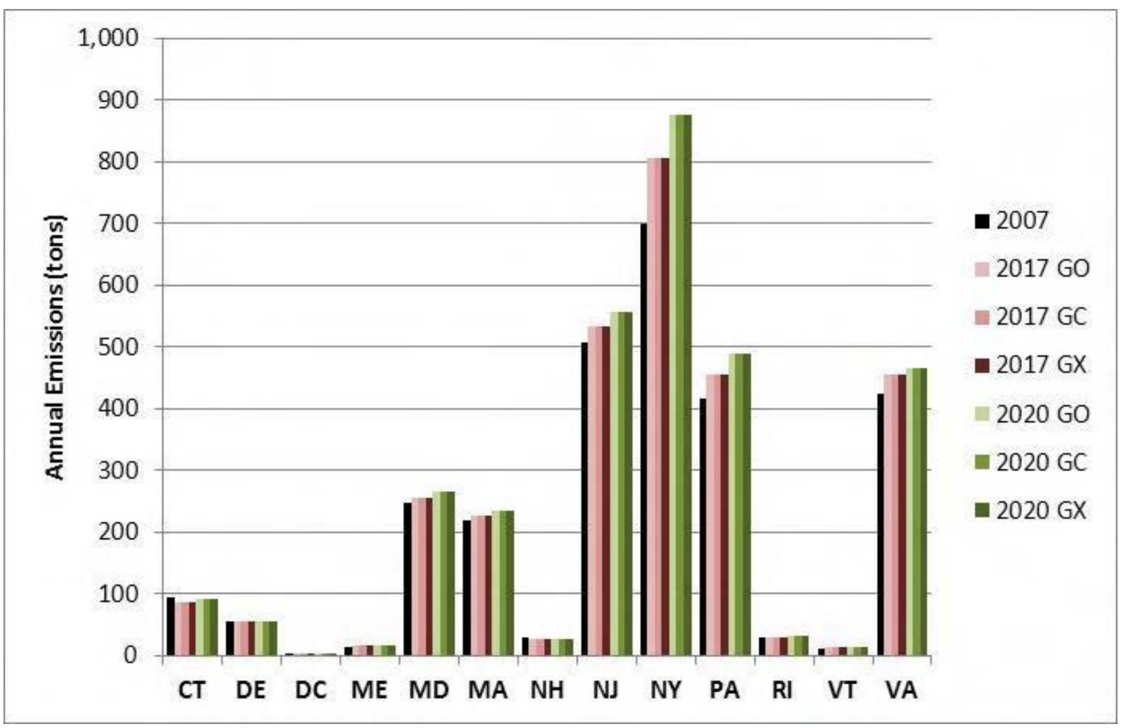
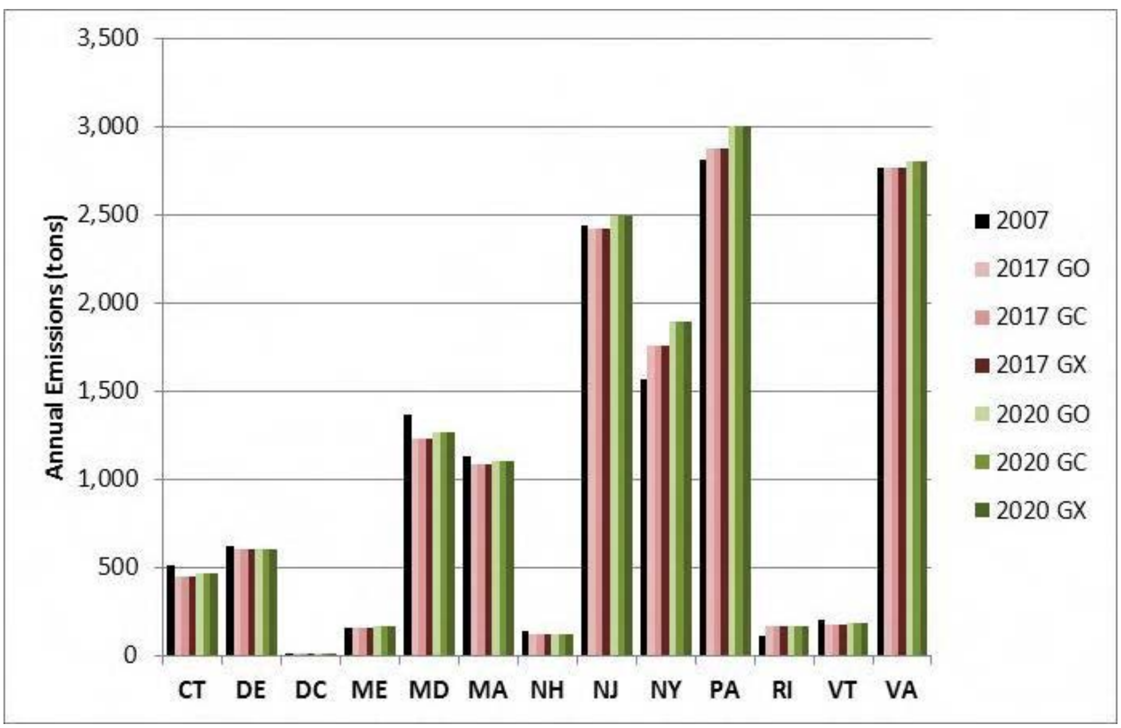


Exhibit 8.35 2007 and Projected VOC Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	509	452	452	452	469	469	469
DE	620	598	598	598	600	600	600
DC	1	1	1	1	1	1	1
ME	161	161	161	161	162	162	162
MD	1,365	1,228	1,228	1,228	1,265	1,265	1,265
MA	1,129	1,080	1,080	1,080	1,105	1,105	1,105
NH	134	116	116	116	118	118	118
NJ	2,438	2,426	2,426	2,426	2,498	2,498	2,498
NY	1,571	1,761	1,761	1,761	1,896	1,896	1,896
PA	2,813	2,879	2,879	2,879	3,004	3,004	3,004
RI	112	166	166	166	168	168	168
VT	204	179	179	179	181	181	181
VA	2,764	2,764	2,764	2,764	2,802	2,802	2,802
	13,822	**13,813**	**13,813**	**13,813**	**14,269**	**14,269**	**14,269**



8.6 NONROAD RAILROAD LOCOMOTIVE EMISSIONS

Exhibits 9.36 to 9.42 summarize the 2007 and projected future year railroad locomotive emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

Emissions of all pollutants except CO and NH3 are projected to decrease as a result of Federal rules affecting railroad locomotive engines, including more stringent engine emission standards and sulfur in fuel limitations. There are currently no potential new OTC control measures for railroad locomotives.

Exhibit 8.36 presents a state-level comparison of 2007, 2017 and 2020 annual CO emissions for railroad locomotives. CO emissions show small changes (< 7 percent) between 2007 and 2017/2020.

Exhibit 8.37 shows that there are very little NH3 emissions from this sector.

Exhibit 8.38 shows that annual NOx emissions from railroad locomotives decrease by 33 percent from 2007 to 2017, and 39 percent from 2007 to 2020.

Exhibits 9.39 and 9.40 show that annual PM10-PRI and PM2.5-PRI emissions from railroad locomotives decrease substantially after 2007. For both pollutants, emissions are reduced by about 49 percent from 2007 to 2017, and 57 percent from 2007 to 2020.

Exhibit 8.41 shows that SO2 emissions from railroad locomotives are virtually eliminatd by 2017.

Exhibit 8.42 shows that annual VOC emissions from railroad locomotives decrease by 42 percent from 2007 to 2017 and 50 percent from 2007 to 2020.

Exhibit 8.36 2007 and Projected CO Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	184	198	188	188	206	193	193
DE	75	76	76	76	79	79	79
DC	73	75	75	75	78	77	77
ME	188	191	191	191	198	198	198
MD	700	720	713	713	746	736	736
MA	646	695	662	662	723	679	679
NH	88	90	90	90	93	93	93
NJ	665	780	744	744	818	771	771
NY	3,061	3,181	3,122	3,122	3,298	3,220	3,220
PA	2,987	3,044	3,041	3,041	3,149	3,145	3,145
RI	15	15	15	15	16	16	16
VT	72	74	74	74	76	76	76
VA	2,701	2,758	2,750	2,750	2,854	2,843	2,843
	11,456	**11,899**	**11,741**	**11,741**	**12,333**	**12,126**	**12,126**

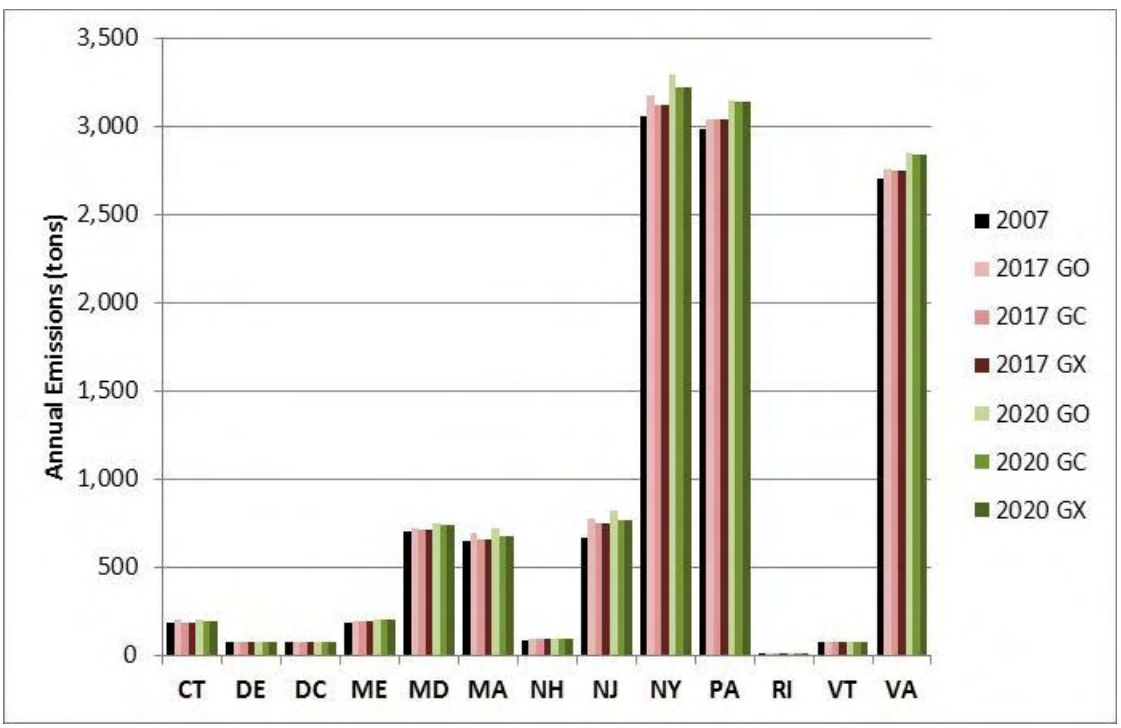


Exhibit 8.37 2007 and Projected NH3 Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1	1	1	1	1	1	1
DE	0	0	0	0	0	0	0
DC	0	0	0	0	0	0	0
ME	0	0	0	0	0	0	0
MD	0	0	0	0	0	0	0
MA	2	2	2	2	2	2	2
NH	0	0	0	0	0	0	0
NJ	2	2	2	2	3	3	3
NY	0	1	1	1	1	1	1
PA	9	9	9	9	10	10	10
RI	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0
VA	8	8	8	8	9	9	9
	23	**24**	**24**	**24**	**25**	**25**	**25**

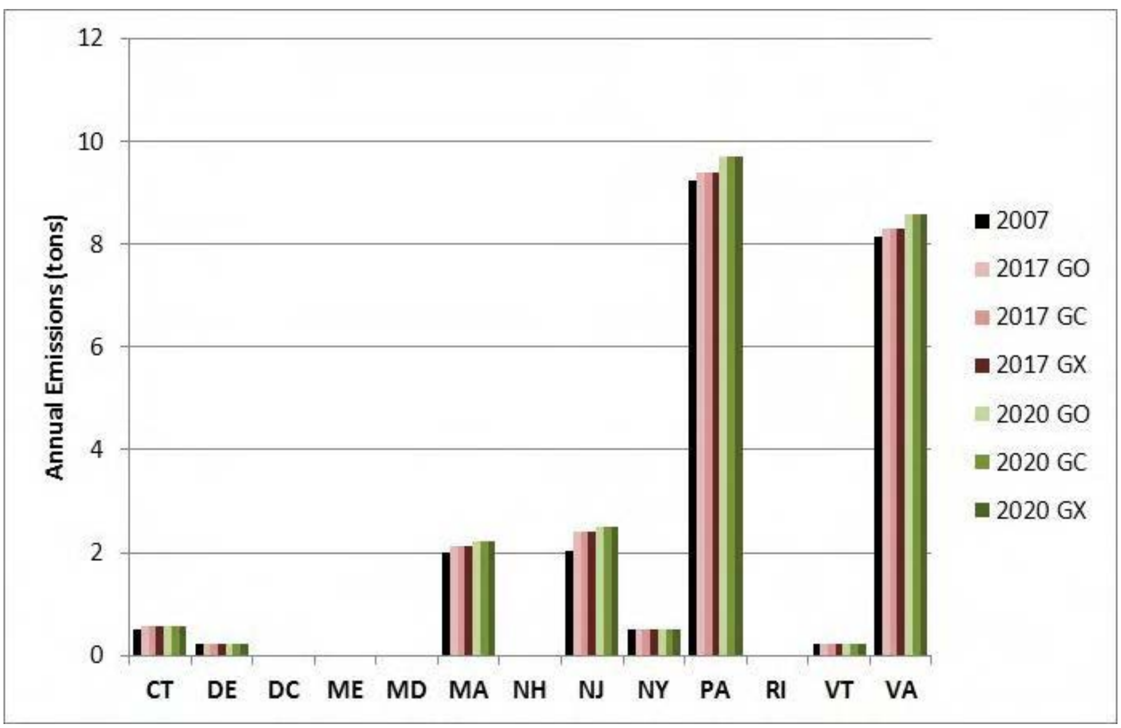


Exhibit 8.38 2007 and Projected NOx Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,723	1,866	1,088	1,088	1,942	991	991
DE	384	391	279	279	404	256	256
DC	505	521	353	353	540	322	322
ME	1,369	1,394	1,289	1,289	1,442	1,262	1,262
MD	4,767	4,904	3,127	3,127	5,078	2,815	2,815
MA	6,133	6,623	3,743	3,743	6,893	3,368	3,368
NH	891	907	871	871	939	864	864
NJ	5,957	6,982	3,839	3,839	7,323	3,469	3,469
NY	20,675	21,473	13,144	13,144	22,259	11,782	11,782
PA	20,675	21,080	14,413	14,413	21,808	13,174	13,174
RI	144	147	99	99	152	90	90
VT	736	749	719	719	775	713	713
VA	18,319	18,728	12,061	12,061	19,381	10,856	10,856
	82,279	**85,765**	**55,025**	**55,025**	**88,936**	**49,960**	**49,960**

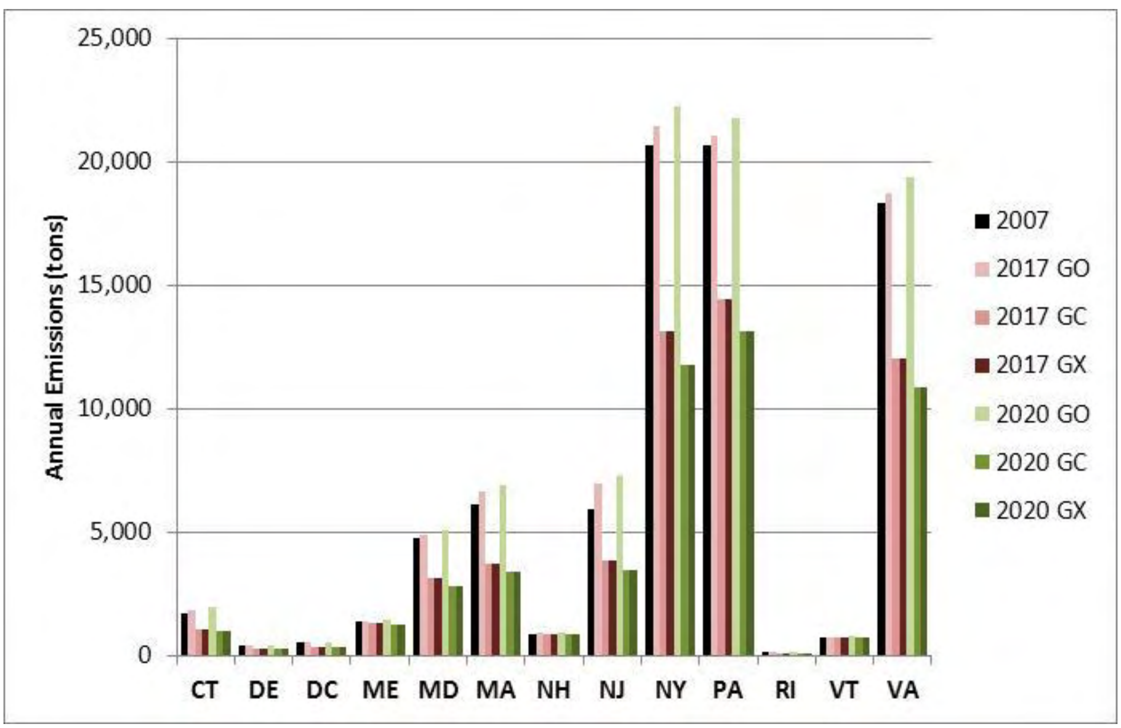


Exhibit 8.39 2007 and Projected PM10-PRI Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	46	49	27	27	51	23	23
DE	15	16	8	8	16	7	7
DC	12	12	6	6	13	6	6
ME	28	28	22	22	29	21	21
MD	166	171	80	80	177	68	68
MA	159	171	84	84	178	71	71
NH	22	22	18	18	23	17	17
NJ	160	187	89	89	196	75	75
NY	608	631	295	295	654	249	249
PA	704	717	356	356	742	309	309
RI	4	4	2	2	4	2	2
VT	18	18	15	15	19	14	14
VA	634	648	303	303	670	257	257
	2,574	**2,675**	**1,303**	**1,303**	**2,772**	**1,119**	**1,119**

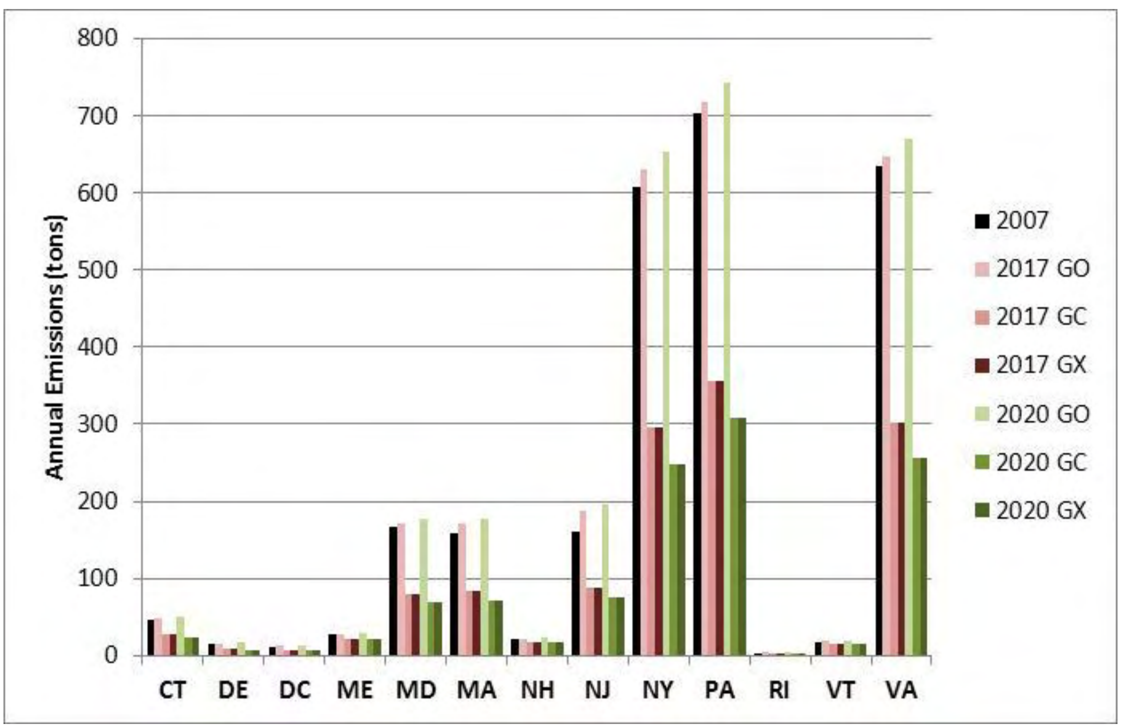


Exhibit 8.40 2007 and Projected PM25-PRI Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	39	42	22	22	44	19	19
DE	15	15	8	8	16	7	7
DC	11	12	6	6	12	6	6
ME	25	26	20	20	27	19	19
MD	161	166	78	78	172	66	66
MA	145	157	77	77	163	65	65
NH	21	21	17	17	22	17	17
NJ	147	173	82	82	181	69	69
NY	572	595	278	278	616	235	235
PA	650	663	330	330	686	286	286
RI	3	3	2	2	3	1	1
VT	17	17	13	13	18	13	13
VA	586	599	280	280	620	238	238
	2,395	**2,488**	**1,213**	**1,213**	**2,579**	**1,041**	**1,041**

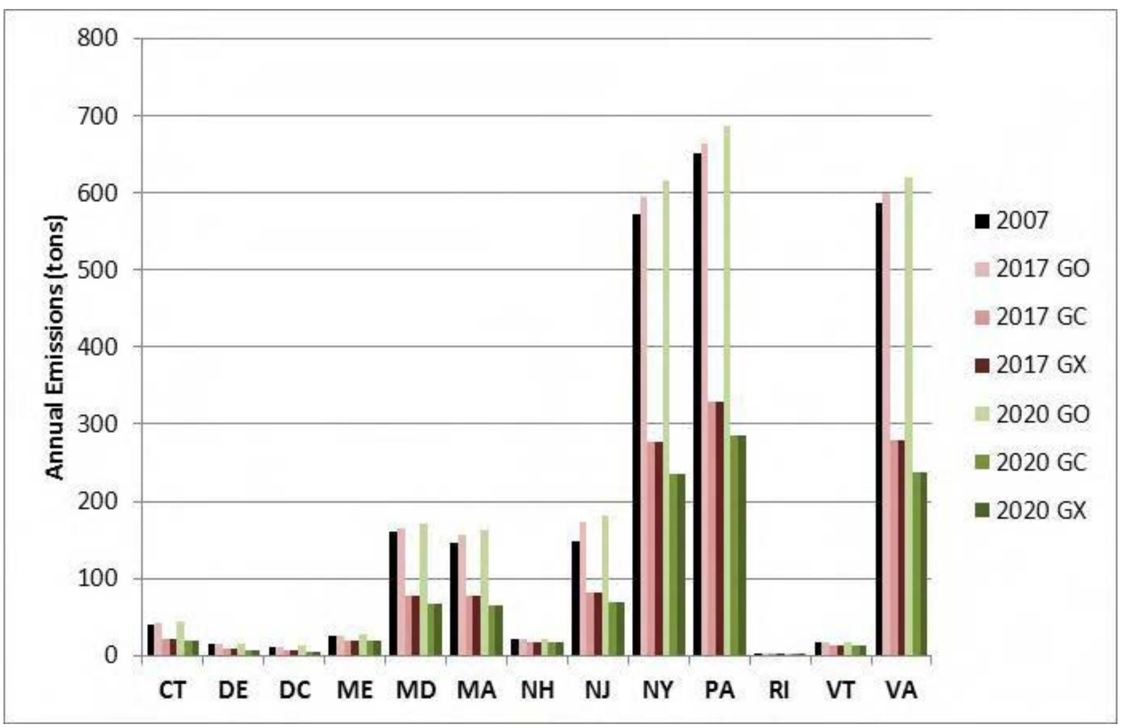


Exhibit 8.41 2007 and Projected SO2 Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	57	61	5	5	64	5	5
DE	5	5	0	0	6	0	0
DC	37	38	0	0	39	0	0
ME	92	94	0	0	97	0	0
MD	64	66	0	0	68	0	0
MA	66	70	0	0	73	0	0
NH	10	10	0	0	11	0	0
NJ	52	61	0	0	64	0	0
NY	616	641	2	2	665	2	2
PA	211	216	1	1	223	1	1
RI	5	6	0	0	6	0	0
VT	5	5	0	0	5	0	0
VA	192	196	1	1	203	1	1
	1,413	**1,469**	**9**	**9**	**1,522**	**10**	**10**

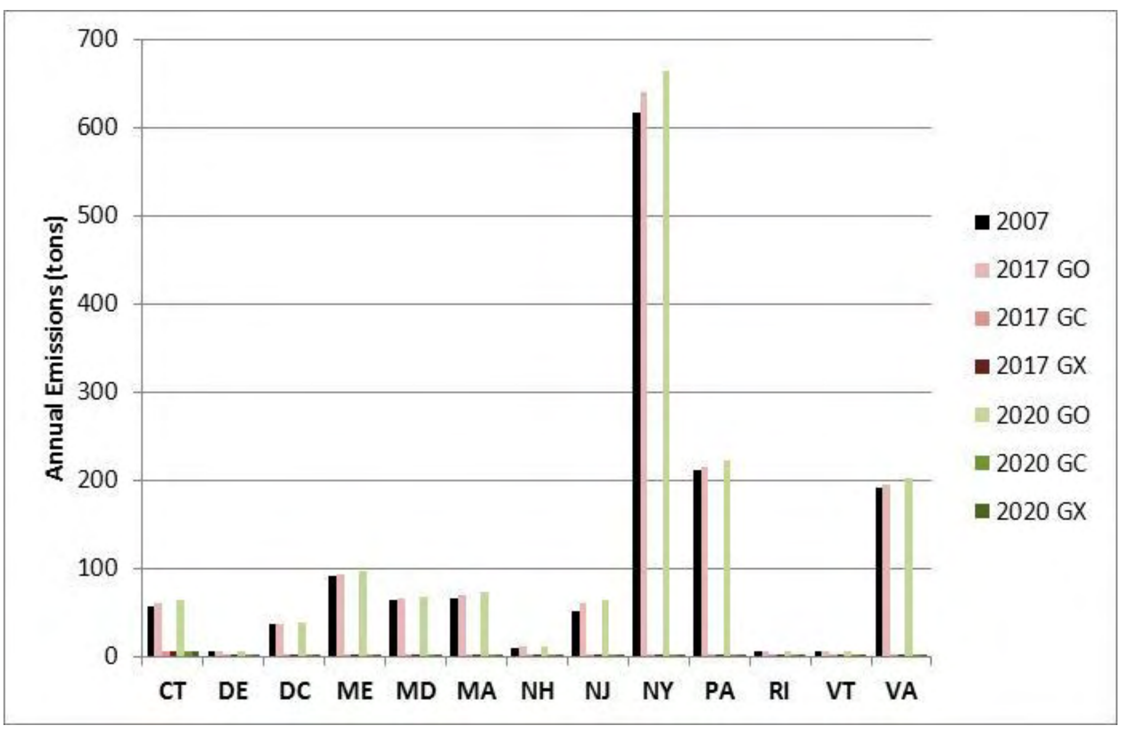
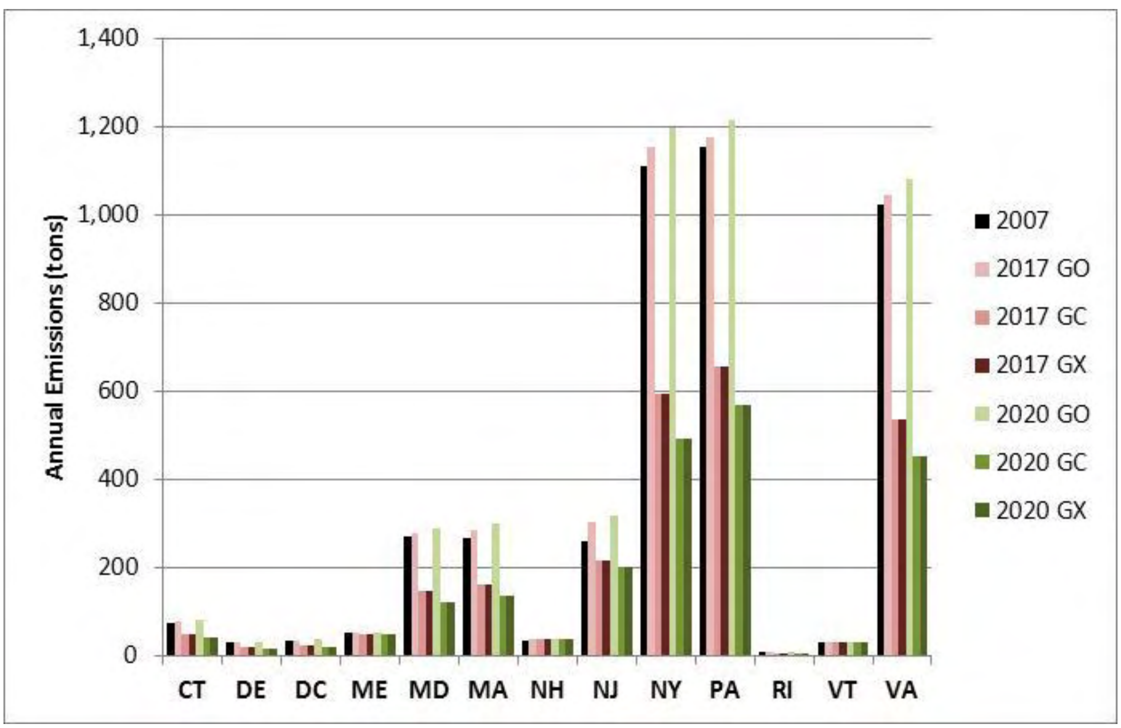


Exhibit 8.42 2007 and Projected VOC Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	73	79	49	49	82	42	42
DE	28	29	17	17	30	15	15
DC	34	35	23	23	36	20	20
ME	51	51	47	47	53	47	47
MD	271	279	146	146	289	122	122
MA	267	286	162	162	298	135	135
NH	35	36	36	36	37	37	37
NJ	258	302	216	216	317	200	200
NY	1,112	1,155	596	596	1,197	493	493
PA	1,153	1,176	655	655	1,216	569	569
RI	8	8	4	4	8	4	4
VT	29	29	29	29	30	30	30
VA	1,025	1,047	537	537	1,083	451	451
	4,343	**4,511**	**2,519**	**2,519**	**4,676**	**2,167**	**2,167**



9.0 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. . SMOKE inventory files were created for the following types of sources (which are described in Section 1.3):

9.1 NONEGU POINT SOURCE SMOKE EMISSION FILES

Annual nonEGU point source inventories were prepared in SMOKE PTINV ORL format.

9.2 AREA SOURCE SMOKE EMISSION FILES

Annual area source inventories for 2017 and 2020 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 (USEPA 2007c) were used to reduce the PM10-PRI and PM25-PRI emissions in the area source inventories. 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 fraction 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. Region wide, PM10-PRI emissions are reduced by about 54 percent and PM25-PRI emissions are reduced by about 25 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.

9.3 NONROAD NMIM SMOKE EMISSION FILES

As discussed in Section 7, 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. Summary reports were prepared to verify agreement between the average day, monthly, and annual emissions.

9.4 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).

10.0 FINAL DELIVERABLES

Exhibits 10.1 to10.3 identify the deliverable products for the 2017 and 2020 MANE-VU+VA emission inventories developed by MACTEC under this contract. The exhibit also identifies deliverables associated with the 2017 and 2020 MANE-VU+VA inventories under development by other agencies.

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 2017 2020 (Version 3_3)/NIF

\MARAMA 07-17-20 Version 3\Final 2017 2020 (Version 3_3)/SMOKE

\MARAMA 07-17-20 Version 3\Final 2017 2020 (Version 3_3)/TSD

\MARAMA 07-17-20 Version 3\Final 2017 2020 (Version 3_3)/XLS

The contents of each folder are provided in Exhibits 10.1, 10.2, and 10.3.

Exhibit 10.1 – NIF Data Files for the 2017/2020 MANE-VU+VA Emission Inventories

File Description	File Name	Format	Notes
2017 Annual Point Source Emission Inventory in NOF format	MANEVU+VA_V3_3 Point_2017_NOF.mdb	NOF ACCESS	File includes only those point sources classified as "nonEGU" according to the ERTAC definition. See file for Field Definitions
2020 Annual Point Source Emission Inventory in NOF format	MANEVU+VA_V3_3 Point_2020_NOF.mdb	NOF ACCESS	
2017 Annual Area Source Emission Inventory in NOF format	MANEVU+VA_V3_3 Area_2017_NOF.mdb	NOF ACCESS	See file for Field Definitions
2020 Annual Area Source Emission Inventory in NOF format	MANEVU+VA_V3_3 Area_2020_NOF.mdb	NOF ACCESS	See file for Field Definitions
2017 Annual NMIM/NONROAD Emission Inventory in NOF format	2017MARAMANMIMv3.mdb	NOF ACCESS	See file for Field Definitions
2020 Annual NMIM/NONROAD Emission Inventory in NOF format	2020MARAMANMIMv3.mdb	NOF ACCESS	See file for Field Definitions
2017 Annual MAR Emission Inventory in NOF format	MANEVU+VA_V3_3_MAR_2017_NOF.mdb	NOF ACCESS	See file for Field Definitions
2020 Annual MAR Emission Inventory in NOF format	MANEVU+VA_V3_3_MAR_2020_NOF.mdb	NOF ACCESS	See file for Field Definitions

Exhibit 10.2 – Summary Spreadsheet Files for the 2017/2020 MANE-VU+VA Emission Inventories

File Description	File Name	Format	Notes
County/SCC level emissions for all 2017/2020 scenarios	V3_3 Area_07_17_20.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_Area_2017_ExistingControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_Area_2017_What IfControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_Area_2020_ExistingControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_Area_2020_What IfControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Tables and graphs used in the TSD	TSD V3_3 2017_2020 Area Graphs.xlsx	MS EXCEL	See file for Field Definitions
County/SCC level emissions for all 2017/2020 scenarios	V3_3 MAR_07_17_20.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_MAR_2017_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_MAR_2020_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Tables and graphs used in the TSD	TSD V3_3 2017_2020 MAR Graphs.xlsx	MS EXCEL	See file for Field Definitions
Process level emissions for all 2017/2020 scenarios	V3_3 NonEGU_07_17_20.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_NonEGU_2017_ExistingControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_NonEGU_2017_What IfControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_NonEGU_2020_ExistingControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions

Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_NonEGU_2020_What IfControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Tables and graphs used in the TSD	TSD V3_3 2017_2020 NonEGU Graphs.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_NMIM_2017_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_NMIM_2020_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Tables and graphs used in the TSD	TSD V3_3 2017_2020 NMIM Graphs.xlsx	MS EXCEL	See file for Field Definitions

Exhibit 10.2 – SMOKE Files for the 2013/2017/2020 MANE-VU+VA Emission Inventories

File Description	File Name	Format	Notes
2017 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2017_NonHourly_ExistingControls_Jan2012.orl	SMOKE PTINV ORL	Files includes only those point sources classified as "nonEGU" according to the ERTAC definition. See file for Field Definitions
2017 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2017_NonHourly_WhatIfControls_Jan2012.orl	SMOKE PTINV ORL	
2020 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2020_NonHourly_ExistingControls_Jan2012.orl	SMOKE PTINV ORL	
2020 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2020_NonHourly_WhatIfControls_Jan2012.orl	SMOKE PTINV ORL	
2017 Annual Area Source Emission Inventory in SMOKE ORL format	ARINV_2017_Area_ExistingControls_Jan2012.orl	SMOKE ARINV ORL Nonpoint	These files have the PM transport factors by county applied to the NOF emissions. See section 10.2 for discussion. See http://www.smoke-model.org/version2.6/html/ for file format
2017 Annual Area Source Emission Inventory in SMOKE ORL format	ARINV_2017_Area_WhatIfControls_Jan2012.orl	SMOKE ARINV ORL Nonpoint	
2020 Annual Area Source Emission Inventory in SMOKE ORL format	ARINV_2020_Area_ExistingControls_Jan2012.orl	SMOKE ARINV ORL nonpoint	
2020 Annual Area Source Emission Inventory in SMOKE ORL format	ARINV_2020_Area_WhatIfControls_Jan2012.orl	SMOKE ARINV ORL nonpoint	
2013 Annual MAR Source Emission Inventory in SMOKE ORL format	ARINV_2017_MAR_Jan2012.txt	SMOKE ARINV ORL Nonpoint	See http://www.smoke-model.org/version2.6/html/ for file format
2017 Annual MAR Source Emission Inventory in SMOKE ORL format	ARINV_2020_MAR_Jan2012.txt	SMOKE ARINV ORL Nonpoint	See http://www.smoke-model.org/version2.6/html/ for file format

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Appendix H

Technical Support Document for the Development of the 2025 Emission Inventory for PM Nonattainment Counties in the MANE-VU Region; ver. 3.3

Technical Support Document for the Development of the 2025 Emission Inventory for PM Nonattainment Counties in the MANE-VU Region Version 3.3

Rev.2

Prepared for:

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January 23, 2012
MARAMA Contract Agreement FY2011-004

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Charlottesville, VA 22911
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Note: Revision 1 includes a revision by New Jersey to Exhibit 7.7.
Revision 2 includes revised CT & VA NMIM runs. – By MARAMA, Mar. 2012

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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.

Table of Contents

List of Appendices

List of Exhibits

Acronyms and Abbreviations

Acronym	Description
CAA	Clean Air Act
CAMD	Clean Air Markets Division (USEPA)
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
MACT	Maximum achievable control technology
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 model
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System code
NCD	National county database
NEI	National Emission Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
NIF3.0	NEI Input Format Version 3.0
NMIM	National Mobile Input Model
NOF3.0	NEI Output Format Version 3.0
NONROAD	USEPA model
NO_x	Oxides of nitrogen
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 (< 1 micron)
PM-FIL	Primary PM, Filterable portion only
PM-PRI	Primary PM, includes filterable and condensable PM-PRI= PM-FIL + PM-CON
PM10-FIL	Primary PM10, filterable portion only
PM10-PRI	Primary PM10, includes filterable and condensable, PM10- PRI = PM0-FIL + PM-CON
PM25-FIL	Primary PM2.5, filterable portion only

Acronym	Description
PM25-PRI	Primary PM2.5, includes filterable and condensable 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
SO_2	Sulfur dioxide
TSD	Technical Support Document
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 emission projections for 2025 for particulate matter (PM) nonattainment areas in the Mid-Atlantic / Northeast Visibility Union (MANE-VU) region. The MANE-VU region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Virginia is not included in the MANE-VU region; however, several cities and counties in northern Virginia were included in this inventory as they are part of a nonattainment area that includes MANE-VU jurisdictions.

1.1 INVENTORY PURPOSE

The Clean Air Act (CAA), as amended, requires each state with areas failing to meet the National Ambient Air Quality Standards (NAAQS) to develop State Implementation Plans (SIPs) to expeditiously attain and maintain the standards. The CAA allows states to request nonattainment areas to be re-designated to attainment provided certain criteria are met. For particulate matter, the U.S. Environmental Protections Agency's (USEPA's) re-designation guidance requires the submittal of a comprehensive inventory of direct PM2.5 emissions and emissions of PM precursors representative of the year when the area achieves attainment of the PM2.5 air quality standards. Another emission inventory related requirement includes a projection of the emission inventory to a year at least 10 years following re-designation.

To support state's efforts in developing PM2.5 maintenance plans and re-designation requests, MARAMA issued a contract to AMEC to assemble a comprehensive emission inventory for 2025. A workgroup was formed to guide the 2025 inventory development process. Participants included a member from each state with a PM2.5 nonattainment area, as follows: Paul Bodner (CT), Dave Fees and Jack Sipple (DE), Roger Thunell (MD), Judy Rand and Danny Wong (NJ), Ron Stannard (NY), Arleen Shulman (PA), and Doris McLeod (VA). The committee has met via teleconference on multiple occasions to discuss plans for the 2025 inventory. The 2025 inventory was developed using a combination of MARAMA's in-house resources, support from state agencies and contractor support from AMEC and SRA International, Inc.

1.2 SOURCE CATEGORIES

This report documents the development of annual emission projections for 2025 for each of these sectors, as follows:

- **EGU Point Sources** are units that generate electric power and sell most of the power generated to the electrical grid.
- **NonEGU Point Sources** are individual industrial, commercial, and institutional facilities and are further subdivided by stack, emission unit, and emission process.
- **Stationary Area Sources** include sources that in and of themselves are quite small, but in aggregate may contribute significant emissions. Examples include small industrial/commercial facilities, residential heating furnaces, VOCs volatizing from house painting or consumer products, gasoline service stations, and agricultural fertilizer/pesticide application.
- **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 railroad locomotives (MAR), the inventory was developed using the most current version of USEPA's NONROAD model as embedded in the National Mobile Inventory Model (NMIM). Because the NONROAD model does not include emissions from MAR sources, these emissions were estimated based on data and methodologies used in recent USEPA regulatory impact analyses.
- **On-road Mobile Sources** are sources of air pollution from internal combustion engines used to propel cars, trucks, buses, and other vehicles on public roadways. Emission projections for on-road mobile sources were developed by MARAMA or state staff using USEPA's Motor Vehicle Emission Simulator (MOVES) model.

Biogenic/geogenic emissions are not included in this inventory.

1.3 GEOGRAPHIC AND TEMPORAL RESOLUTION

The geographic area for the 2025 inventory includes only those counties that are classified as nonattainment for the annual (1997) or daily (2006) particulate matter NAAQS. The inventory was developed at the county-level for non-point sources and at the process level for point sources.

Annual inventories are required for re-designation of areas designated as nonattainment for the 1997 and 2006 NAAQS. Other inventory elements required by USEPA (such as interim inventory years) are being addressed by individual states in their SIP submittals.

1.4 POLLUTANTS

The inventory includes emissions for directly emitted PM and PM-precursors (oxides of nitrogen {NO_x}, and sulfur dioxide {SO_2}). The PM species in the inventory are categorized as particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers (PM25-PRI), which includes both condensable particles (PM-CON) and filterable particles (PM25-FIL).

1.5 DATA FORMATS

For each sector, we prepared easy-to-review spreadsheets that provide 2007 emissions and 2025 growth factors, control factors, and emissions. We also prepared county level and nonattainment area summaries for all PM nonattainment counties and areas. The summaries show the 2007 and 2025 emissions, along with the percent change in emissions from 2007 to 2025 for each source sector.

1.6 INVENTORY VERSIONS

The development of base and future year inventories is an iterative process that continually attempts to use the best data available to meet air quality planning needs, given time and resource constraints. The following subsections summarize the work completed to date.

1.6.1 Version 2 Modeling Inventories with Existing Controls

MARAMA developed comprehensive emission inventories to support air quality modeling in the region. MARAMA developed a calendar year 2007 (MARAMA 2011a) inventory for all sectors except the onroad sector. These inventories, completed in February of 2011, are referred to as Version 2 of the MANE-VU+VA 2007 base year inventory. The inventories were provided in formats required for air quality modeling. Under a separate effort, the Northeast States for Coordinated Air Use Management (NESCAUM) developed a 2007 onroad inventory using the MOVES model to support air quality modeling.

MARAMA also prepared emission projections for 2013/2017/2020 (MARAMA 2011b) for all sectors except the electric generation and onroad sectors. These projections reflect a scenario representing the best estimates for the future year, accounting for all in-place controls that are fully adopted into federal or individual state regulations or SIPs. In the past, this inventory is also referred to as the "on-the-books" inventory. Modelers often refer to this scenario as the "future base case".

1.6.2 Version 3 Modeling Inventories with Existing Controls

Beginning in the fall of 2011, MARAMA sponsored development of Version 3_3 of the 2007 base year modeling inventory to incorporate new paved road emission estimates, revised modeling of nonroad and onroad sources, and other state-specific changes (MARAMA2012a). MARAMA developed Version 3_3 of the future year inventory to account for changes to the 2007 base year inventory and selected changes in growth and control factors identified by states (MARAMA2012b). The future year modeling inventories for electric generating units (EGUs) are currently being developed under a separate effort lead by the Eastern Regional Technical Advisory Committee (ERTAC). The future year modeling inventories for onroad sources are currently being developed by NESCAUM, MARAMA or individual states.

1.6.3 Version 3 2025 Inventory for PM Nonattainment Counties

The 2025 inventory for PM nonattainment counties was developed using Version 3_3 of the modeling inventory, with the following exceptions:

- Growth and control factors for 2025 were developed for the area, nonEGU point, and nonroad MAR sectors, using the same methodologies and data sources that were used to develop the 2017/2020 inventories with existing controls.

- For nonroad sources included in NMIM, Version 2 results were available for 2007, 2017, and 2020. MARAMA and New York made additional NMIM runs for 2025 based on Version 2 inputs. MARAMA made revisions to some of the inputs to NMIM for Version 3_3 of the modeling inventory; however, these revised NMIM runs were not used in the 2025 PM nonattainment county inventory due to time constraints.

- For onroad sources included in the MOVES model, MARAMA and states executed the model in the inventory mode for 2007 and 2025. Version 3_3 of the modeling inventory used results of the MOVES model executed in a manner to support air quality modeling.

- For EGU point sources, the results of the ERTAC EGU projection methodology are not currently available. An alternative methodology for projecting EGU emissions based on growth and control factors was used, as described in Section 4.

- Only counties classified as nonattainment for the PM2.5 annual or 24-hour NAAQS were included.

Exhibit 1-1 shows the data sources used for the 2025 PM nonattainment area inventory. Exhibit 1-2 lists the counties included in the 2025 PM nonattainment area inventory.

1.7 REPORT ORGANIZATION

Sections 2 to 6 describe the emission projection process for the following source sectors: area sources; point sources; nonroad mobile sources included in the NMIM model; other nonroad mobile sources (marine vessels, aircraft, and railroad locomotives); and onroad mobile sources included in the MOVES model. Section 7 provides nonattainment area emission pollutant summaries. Section 8 provides a description of the final deliverables, including the file names for all final deliverable products. References for the TSD are provided in Section 9.

Exhibit 1.1 – Comparison of Data Used for Version 3 of the Modeling Inventory and the 2025 PM Nonattainment Inventory

Sector	Modeling Inventory		2025 PM Nonattainment Inventory	
	2007	2017/2020	2007	2025
Area	Version 3_3	Version 3_3	Version 3_3	Version 3_3
Nonroad-NMIM	Version 3_3	Version 3_3	Version 2	2025 NMIM run based on Version 2 inputs (1)
Nonroad-MAR	Version 3_3	Version 3_3	Version 3_3	Version 3_3
Onroad	MOVES runs by NESCAUM to support AQ modeling	MOVES runs by NESCAUM to support AQ modeling	MOVES runs by MARAMA or states in inventory mode	MOVES runs by MARAMA or states in inventory mode
Point-EGU	Version 3_3	To be developed by ERTAC	Version 3_3	See section 4 for projection methodology
Point-nonEGU	Version 3_3	Version 3_3	Version 3_3	Version 3_3

(1) Except CT and VA where Version 3 inputs were used.

Exhibit 1.2 – List of PM Nonattainment Areas and Counties

Nonattainment Area	State	FIPS Code	County	PM Nonattainment? 2006 Daily NAAQS	PM Nonattainment? 1997 Annual NAAQS
Allentown, PA	PA	42077	Lehigh	Yes	Yes
	PA	42095	Northampton	Yes	Yes
Baltimore, MD	MD	24003	Anne Arundel	No	Yes
	MD	24005	Baltimore	No	Yes
	MD	24013	Carroll	No	Yes
	MD	24025	Harford	No	Yes
	MD	24027	Howard	No	Yes
	MD	24510	Baltimore City	No	Yes
Hagerstown-Martinsburg, MD-WV	MD	24043	Washington	No	Yes
Harrisburg-Lebanon-Carlisle-York, PA	PA	42041	Cumberland	Yes	Yes
	PA	42043	Dauphin	Yes	Yes
	PA	42075	Lebanon	Yes	Yes
	PA	42133	York*	Yes	No
Johnstown, PA	PA	42021	Cambria	Yes	Yes
	PA	42063	Indiana(P)	Yes	Yes
Lancaster, PA	PA	42071	Lancaster	Yes	Yes
New York-N. New Jersey-Long Island, NY-NJ-CT	CT	09001	Fairfield	Yes	Yes
	CT	09009	New Haven	Yes	Yes
	NJ	34003	Bergen	Yes	Yes
	NJ	34013	Essex	Yes	Yes
	NJ	34017	Hudson	Yes	Yes
	NJ	34021	Mercer	Yes	Yes
	NJ	34023	Middlesex	Yes	Yes
	NJ	34025	Monmouth	Yes	Yes
	NJ	34027	Morris	Yes	Yes
	NJ	34031	Passaic	Yes	Yes
	NJ	34035	Somerset	Yes	Yes
	NJ	34039	Union	Yes	Yes
	NY	36005	Bronx	Yes	Yes
	NY	36047	Kings	Yes	Yes
	NY	36059	Nassau	Yes	Yes
	NY	36061	New York	Yes	Yes
	NY	36071	Orange	Yes	Yes
	NY	36081	Queens	Yes	Yes
	NY	36085	Richmond	Yes	Yes
	NY	36087	Rockland	Yes	Yes
	NY	36103	Suffolk	Yes	Yes
	NY	36119	Westchester	Yes	Yes
Philadelphia-Wilmington, PA-NJ-DE	DE	10003	New Castle	Yes	Yes
	NJ	34005	Burlington	Yes	Yes
	NJ	34007	Camden	Yes	Yes
	NJ	34015	Gloucester	Yes	Yes
	PA	42017	Bucks	Yes	Yes

Nonattainment Area	State	FIPS Code	County	PM Nonattainment? 2006 Daily NAAQS	1997 Annual NAAQS
	PA	42029	Chester	Yes	Yes
	PA	42045	Delaware	Yes	Yes
	PA	42091	Montgomery	Yes	Yes
	PA	42101	Philadelphia	Yes	Yes
Pittsburgh-Beaver Valley, PA	PA	42003	Allegheny(P)	Yes	Yes
	PA	42005	Armstrong(P)	Yes	Yes
	PA	42007	Beaver	Yes	Yes
	PA	42019	Butler	Yes	Yes
	PA	42059	Greene(P)	Yes	Yes
	PA	42073	Lawrence(P)*	Yes	Yes
	PA	42125	Washington	Yes	Yes
	PA	42129	Westmoreland	Yes	Yes
Reading, PA	PA	42011	Berks	No	Yes
Washington, DC-MD-VA	DC	11001	Washington	No	Yes
	MD	24017	Charles	No	Yes
	MD	24021	Frederick	No	Yes
	MD	24031	Montgomery	No	Yes
	MD	24033	Prince George	No	Yes
	VA	51013	Arlington	No	Yes
	VA	51059	Fairfax	No	Yes
	VA	51107	Loudoun	No	Yes
	VA	51153	Prince William	No	Yes
	VA	51510	Alexandria	No	Yes
	VA	51600	Fairfax City	No	Yes
	VA	51610	Falls Church	No	Yes
	VA	51683	Manassas City	No	Yes
	VA	51685	Manassas Park	No	Yes
York, PA	PA	42133	York*	No	Yes

* York County, PA, is in one nonattainment area for the 2006 24-hour standard (Harrisburg-Lebanon-Carlisle-York, PA) and another for the 1997 annual standard (York, PA).

(P) indicates that only part of the county is in the nonattainment area; for this inventory, emissions for the entire county are included.

2.0 AREA SOURCES

2.1 AREA SOURCE CATEGORIES

The area source sector contains emissions estimates for sources which individually are too small in magnitude or too numerous to inventory as individual point sources, and which can often be estimated more accurately as a single aggregate source for a county. Examples are emissions from home heating systems, house painting, consumer products usage, and small industrial/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.

2.2 2007 INVENTORY DEVELOPMENT

The emission projections for the 2025 area source inventory were based on Version 3_3 of the 2007 MANE-VU+VA inventory and are fully documented in the TSD for that effort (MARAMA 2012a). The only adjustment to the 2007 Version 3_3 area source inventory was to apply “transport factors” to fugitive dust sources, as described in the following subsection.

2.2.1 Adjustments to the 2007 Inventory Used for the 2025 Projections

Grid air quality models consistently overestimate fugitive dust impacts as compared to ambient samples. USEPA developed a methodology to reduce fugitive dust emissions for use in grid modeling analyses. It is considered a logical step to improve the ability to account for the removal of particles near their emission source by vegetation and surface features and can be useful in grid-based modeling analyses.

In February 2011, MARAMA developed 2007 emission modeling files for area sources which applied the USEPA “transport factor” to reduce fugitive dust emissions to account for the removal of particles near their emission source by vegetation and surface features. The standard transport fractions and SCC assignments from USEPA’s CHIEF website (USEPA 2007a) were used to reduce the PM25-PRI emissions in this inventory. Two files were used. Exhibit 2.1 shows the list of nonEGU 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. Exhibit 2.2 lists the transport fractions for PM nonattainment counties which vary by county. For example, the transport factors ranges from 0.1375 in Camden, New Jersey to 0.80 in Suffolk County, New York. For Virginia, no transport fraction was provided for the City of Fairfax; Fairfax County’s transport fraction was used for this jurisdiction.

Exhibit 2.1 Area Source SCCs Affected by PM Transport Fraction

SCC	SCC Description
2294000000	Paved Roads: All Paved Roads: Total: Fugitives
2296000000	Unpaved Roads: All Unpaved Roads: Total: Fugitives
2311000000	Construction: All Processes: Total
2311010000	Construction: General Building Construction: Total
2311020000	Construction: Heavy Construction: Total
2311030000	Construction: Road Construction: Total
2801000000	Miscellaneous Area Sources;Agriculture Production - Crops;Agriculture - Crops;Total
2801000001	Ag crops: Agriculture - Crops: Land Breaking
2801000002	Ag crops: Agriculture - Crops: Planting
2801000003	Ag crops: Agriculture - Crops: Tilling
2801000004	Ag crops: Agriculture - Crops: Defoliation
2801000005	Ag crops: Agriculture - Crops: Harvesting
2801000006	Ag crops: Agriculture - Crops: Drying
2801000007	Ag crops: Agriculture - Crops: Loading
2801000008	Ag crops: Agriculture - Crops: Transport
2805000000	Ag livestock: Agriculture - Livestock: Total
2805001000	Ag livestock: Beef Cattle Feedlots: Total (also see 2805020000)
2805001001	Ag livestock: Beef Cattle Feedlots: Feed Preparation
2805005000	Ag livestock: Poultry Operations: Total
2805010000	Ag livestock: Dairy Operations: Total
2805015000	Ag livestock: Hog Operations: Total
2805020000	Ag livestock: Cattle and Calves Composite: Total
2805025000	Ag livestock: Hogs and Pigs Composite: Total
2805030000	Ag livestock: Poultry and Chickens Composite: Total
2805035000	Ag livestock: Horses and Ponies Composite: Total
2805040000	Ag livestock: Sheep and Lambs Composite: Total
2805045001	Ag livestock: Goats: Total

Exhibit 2.2 PM Transport Fractions for PM Nonattainment Counties

State	FIPS	County	PM Transport Fraction
CT	09001	FAIRFIELD	0.4347
CT	09009	NEW HAVEN	0.4442
DE	10003	NEW CASTLE	0.5087
DC	11001	WASHINGTON	0.3953
MD	24003	ANNE ARUNDEL	0.4874
MD	24005	BALTIMORE	0.4047
MD	24013	CARROLL	0.5641
MD	24017	CHARLES	0.4879
MD	24021	FREDERICK	0.4904
MD	24025	HARFORD	0.5147
MD	24027	HOWARD	0.2798
MD	24031	MONTGOMERY	0.3089
MD	24033	PRINCE GEORGES	0.2950
MD	24043	WASHINGTON	0.4003
MD	24510	BALTIMORE (CITY)	0.4874
NJ	34003	BERGEN	0.2657
NJ	34005	BURLINGTON	0.3008
NJ	34007	CAMDEN	0.1375
NJ	34013	ESSEX	0.3461
NJ	34015	GLOUCESTER	0.4361
NJ	34017	HUDSON	0.5286
NJ	34021	MERCER	0.3472
NJ	34023	MIDDLESEX	0.3273
NJ	34025	MONMOUTH	0.5468
NJ	34027	MORRIS	0.2297
NJ	34031	PASSAIC	0.1971
NJ	34035	SOMERSET	0.3635
NJ	34039	UNION	0.3117
NY	36005	BRONX	0.6145
NY	36059	NASSAU	0.6595
NY	36061	NEW YORK	0.6483
NY	36071	ORANGE	0.3803
NY	36081	QUEENS	0.6505
NY	36085	RICHMOND	0.7159
NY	36087	ROCKLAND	0.3556
NY	36103	SUFFOLK	0.7997
NY	36119	WESTCHESTER	0.3531
PA	42003	ALLEGHENY	0.2308
PA	42005	ARMSTRONG	0.3289
PA	42007	BEAVER	0.3141

State	FIPS	County	PM Transport Fraction
PA	42011	BERKS	0.4682
PA	42017	BUCKS	0.3980
PA	42019	BUTLER	0.3621
PA	42021	CAMBRIA	0.2253
PA	42029	CHESTER	0.4757
PA	42041	CUMBERLAND	0.4649
PA	42043	DAUPHIN	0.3438
PA	42045	DELAWARE	0.3515
PA	42059	GREENE	0.3224
PA	42063	INDIANA	0.2884
PA	42071	LANCASTER	0.6183
PA	42073	LAWRENCE	0.4422
PA	42075	LEBANON	0.4521
PA	42077	LEHIGH	0.4487
PA	42091	MONTGOMERY	0.3729
PA	42095	NORTHAMPTON	0.4306
PA	42101	PHILADELPHIA	0.3471
PA	42125	WASHINGTON	0.3436
PA	42129	WESTMORELAND	0.2875
PA	42133	YORK	0.5134
VA	51013	ARLINGTON	0.3534
VA	51059	FAIRFAX	0.2457
VA	51107	LOUDOUN	0.3345
VA	51153	PRINCE WILLIAM	0.1814
VA	51510	ALEXANDRIA	0.3745
VA	51610	FALLS CHURCH	0.3400
VA	51683	MANASSAS	0.3474
VA	51685	MANASSAS PARK	0.3551

Exhibit 2.3 – Comparison of 2007 Paved Road Dust PM10 Emission Estimates

Nonattainment Area	Without Transport Factor		With Transport Factor	
	Version2	Version 3 New Method	Version2	Version 3 New Method
Allentown	4,228	1,733	1,859	764
Baltimore	15,175	5,412	6,658	2,400
Hagerstown	1,490	263	596	105
Harrisburg-Lebanon-Carlisle-York	9,133	4,124	4,149	1,855
Johnstown	2,663	1,133	673	289
Lancaster	4,339	1,808	2,683	1,118
New York-Northern NJ-Long Island-CT	58,512	28,747	29,128	14,260
Philadelphia-Wilmington	29,379	12,644	11,070	4,801
Pittsburgh-Beaver Valley	14,470	6,173	4,491	1,920
Reading	3,346	1,423	1,567	666
Washington, DC-MD-VA	21,067	9,909	6,846	3,194
York	3,684	1,458	1,891	749

Exhibit 2.4 – Comparison of 2007 Paved Road Dust PM2.5 Emission Estimates

Nonattainment Area	Without Transport Factor		With Transport Factor	
	Version2	Version 3 New Method	Version2	Version 3 New Method
Allentown	264	433	116	191
Baltimore	1,770	1,328	782	589
Hagerstown	196	64	78	26
Harrisburg-Lebanon-Carlisle-York	605	1,031	277	464
Johnstown	198	283	50	72
Lancaster	295	452	182	280
New York-Northern NJ-Long Island-CT	2,400	7,173	1,252	3,547
Philadelphia-Wilmington	1,396	3,165	547	1,202
Pittsburgh-Beaver Valley	942	1,543	299	480
Reading	209	356	98	167
Washington, DC-MD-VA	1,713	2,432	594	784
York	257	365	132	187

2.3 2025 INVENTORY DEVELOPMENT

The general procedures and data used for projecting emissions for the area source sector are summarized in this section. Growth factors were applied to the MANE-VU+VA 2007 inventory to account for changes in fuel use, population, economic activity. Next, control factors were applied to account for future emission reductions from control regulations. The 2025 inventory accounts for post-2007 emission reductions from promulgated federal, State, local, and site-specific control programs and proposed control programs that are reasonably anticipated to result in post-2007 emission reductions.

2.3.1 Area Source Growth Factors

The area and nonEGU point source growth factors were developed using six sets of data:

- The Annual Energy Outlook (AEO) fuel consumption forecasts;
- County-level population projections;
- State-level employment projections by NAICS code;
- County-level vehicle miles travelled (VMT) projections;
- USEPA projections for livestock and residential wood combustion; and
- Other state-specific emission projection data.

The priority for applying these growth factors was to first use the state-supplied projection data (if available). If state-supplied data were not provided, then the AEO projection factors were used for fuel consumption sources, and the population/employment/VMT data were used for other source categories.

2.3.1.1 AEO Fuel Use Projection

The AEO is published annually by the U.S. Energy Information Administration (EIA). It presents long-term projections of energy supply, demand, and prices through 2035, based on results from EIA's National Energy Modeling System (NEMS). NEMS projects the production, imports, conversion, consumption, and prices of energy, subject to assumptions on macroeconomic and financial factors, world energy markets, resource availability and costs, behavioral and technological choice criteria, energy technology cost and performance characteristics, and demographics.

AEO provides regional fuel-use forecasts for various fuel types (e.g., coal, residual oil, distillate oil, natural gas) by end use sector (e.g., residential, commercial, industrial, transportation, and electric power). Energy use projections are reported at the Census division level. The census divisions grouped states as follows:

- South Atlantic - DE, DC, MD, VA
- Middle Atlantic – NJ, NY, PA
- New England – CT, ME, MA, NH, RI, VT

Appendices A1, A2, and A3 contain the AEO2010 fuel use projections for each of these three regions. Appendices A4, A5, and A6 contain the AEO2011 fuel use projections

Version 2 of the MANE-VU+VA future year inventories was developed using AEO2010 (EIA2010). After the release of Version 2, AEO2011 was published (EIA2011a). MARAMA reviewed the updated fuel forecasts and compared the AEO2010 and AEO2011 projections. Appendix A7 documents MARAMA's analysis. MARAMA calculated the difference in projected fuel usage between AEO2010 and AEO2011 for the residential, commercial, industrial, transportation, and electric power sector for the distillate fuel oil, residual fuel oil, coal, natural gas, and renewable fuel types. MARAMA identified thresholds for what constitutes a major change as follows:

- An increase or decrease of 1% or less is considered to be no change and did not warrant a change in the growth factors between Versions 2 and 3 of the inventory;
- An increase or decrease of between 1% and 5% is considered to be a minor change, and states agreed that these differences between AEO2010 and AEO2011 did not warrant a change in the growth factors between Versions 2 and 3 of the inventory;
- An increase or decrease above 5% is considered a major change, and warrants a change in the growth factors used in Version 3.

MARAMA recommended that the AEO2010 projections be retained for all residential, commercial, and industrial sector fuel use, except for industrial natural gas usage, where the AEO2011 projections will be used for Version 3 of the future year modeling inventory. New Jersey elected to use the more recent growth factors from AEO2011 instead of the AEO2010 growth factors for all area source fossil fuel use categories.

Exhibits 2.5 to 2.9 summarize the projected fuel use rates by source sector (residential, commercial, industrial, transportation) and AEO geographic area for the years 2007 to 2025. The unusual growth in commercial residual oil use in the South Atlantic region could not be explained; Maryland elected to use employment instead of the AEO2010 growth factor for commercial residual oil combustion, while Virginia and the District chose to assume flat growth in this sector.

2.3.1.2 Population Projections

States provided county-level historic population data and projections for future years. The historical and projection years varied from state to state, so values were interpolated, when necessary, to create population estimates for each year from 2007 to 2025. The population data were then normalized to create growth factors from 2007 for each year future year.

For example, Delaware had a population of 861,087 in 2007, and the projected population in 2017 is 953,204. Thus, the growth factor for 2017 is 953,204 / 861,087 = 1.107.

Exhibit 2.10 summarizes the population growth factors by state and AEO2010 region. Population is projected to grow in every state between 2007 and 2025. The population growth in the New England states varies significantly by state. Population growth in the South Atlantic states is projected to be much higher than in the New England and Mid-Atlantic states. Appendix B contains the data use to develop the population projections.

2.3.1.3 Employment Projections

Every two years, the federal Bureau of Labor Statistics produces long-term industry and occupation forecasts for ten future years, and states are asked to do the same for their respective economies. The most recent projections are from state Departments of Labor for the period 2006 to 2016, most of which were published in 2008. These 10-year forecasts are updated every other year. The next set of state-specific projections will be for the period 2008 to 2018. Only the District of Columbia and Delaware were able to provide employment projections for 2008 to 2017; the 2008 to 2018 projections were not available for other states in time for use on this project. The employment projections are state-wide by 3-digit NAICS code. Exhibit 2.11 summarizes the manufacturing employment (NAICS sector 310) growth factors by state and AEO2010 region. States in the Northeast / Mid-Atlantic region show a marked decrease in manufacturing employment from 2007 forward. Appendix C contains the data that were used to develop the employment projections.

2.3.1.4 VMT Projections

States developed projections of vehicle miles traveled (VMT) for 2007 and 2025 which were used as the growth factor for projecting emissions from re-entrained road dust from travel on paved roads (SCC 22-94-000-000). The 2007 and 2025 VMT are identical to those used in the MOVES modeling discussed in Section 8. Exhibit 2.12 shows the county level VMT for 2007 and 2025, and the growth factor for projecting 2007 emissions to 2025. Growth factors for 2013, 2017, and 2020 were based on a linear interpolation of the 2007 and 2025 VMT. Appendix D contains additional information on the data used to develop the VMT growth factors.

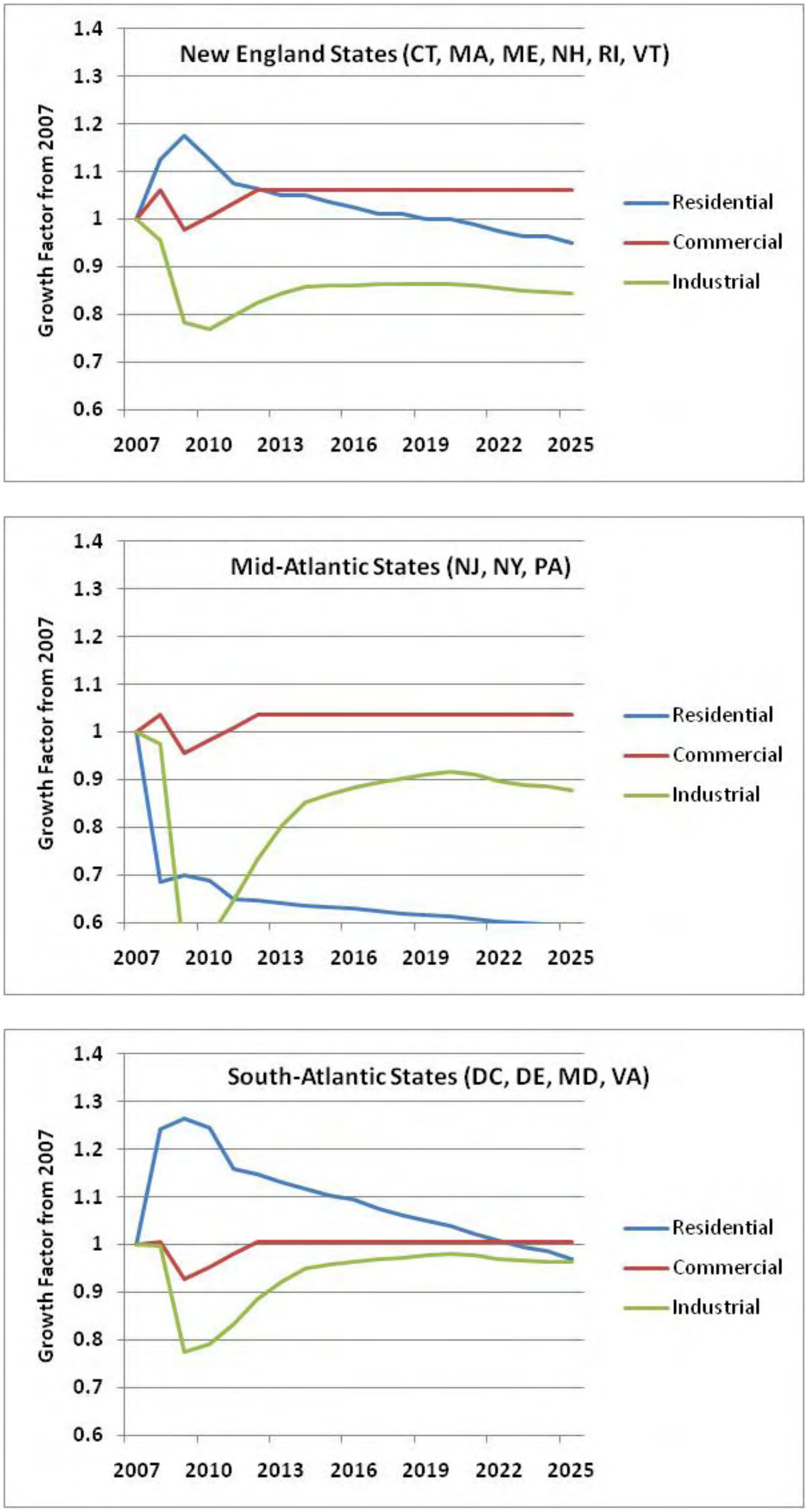
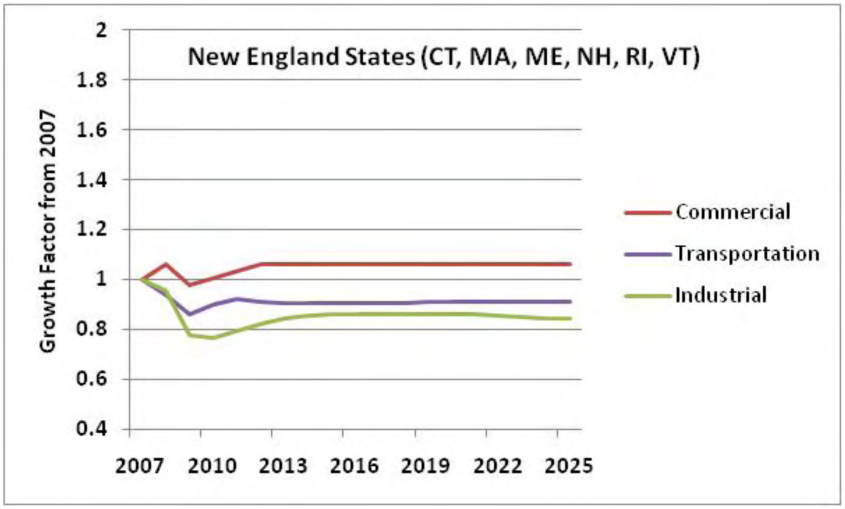
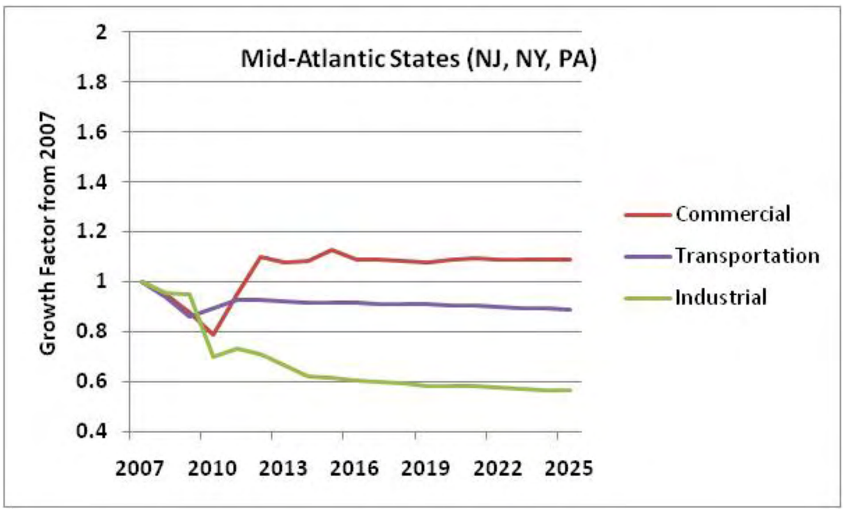


Exhibit 2.5 AEO2010 Growth Factors for Coal by AEO Region 2007 – 2025





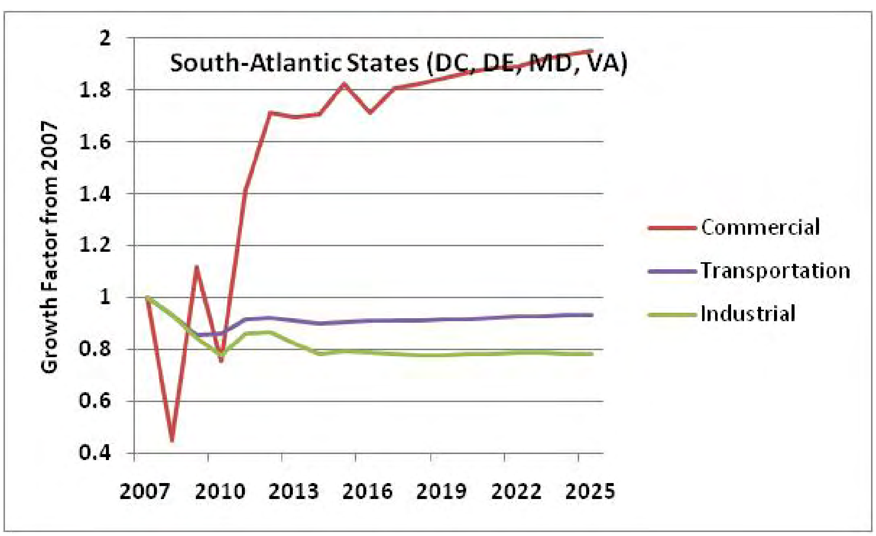
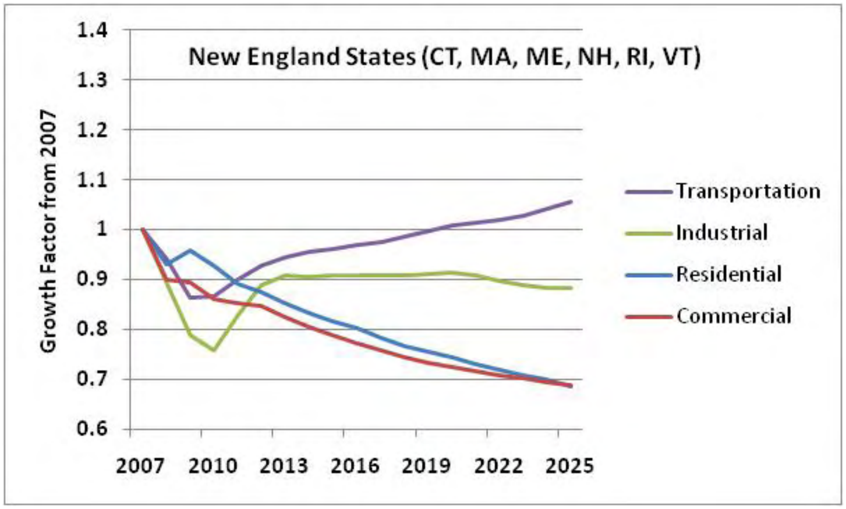
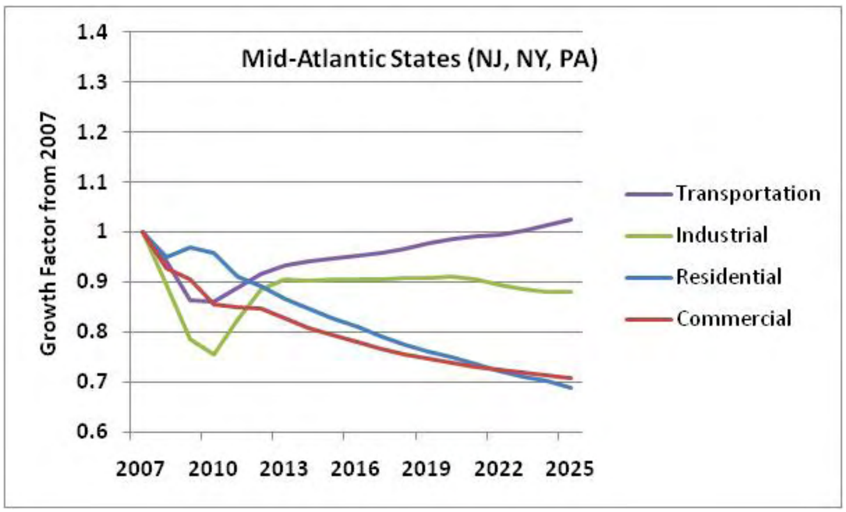


Exhibit 2.6 Growth Factors for Residual Oil by AEO Region 2007 – 2025





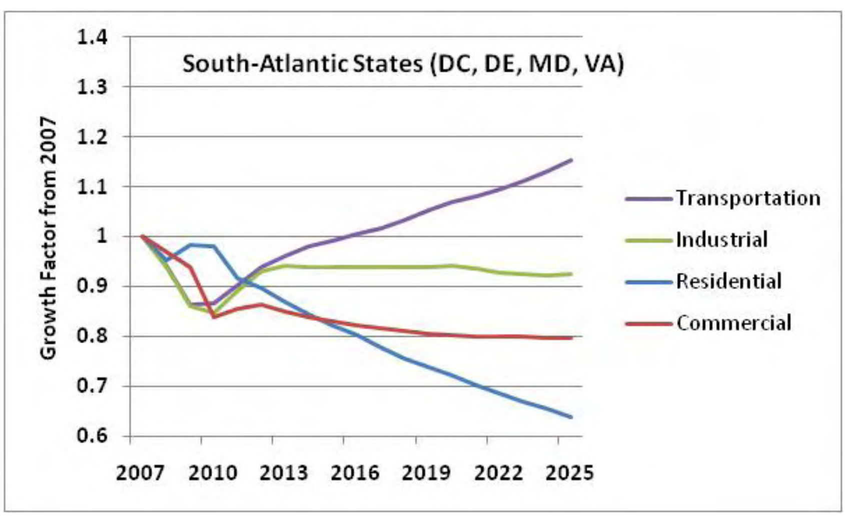
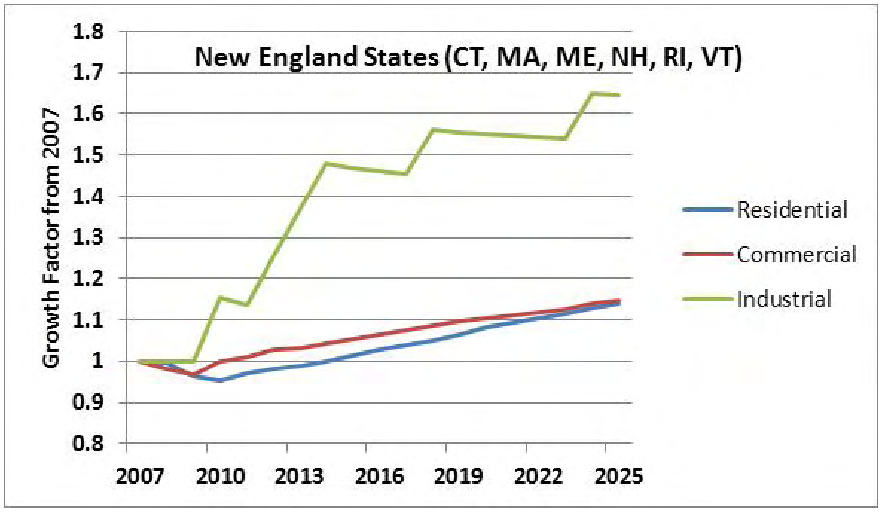
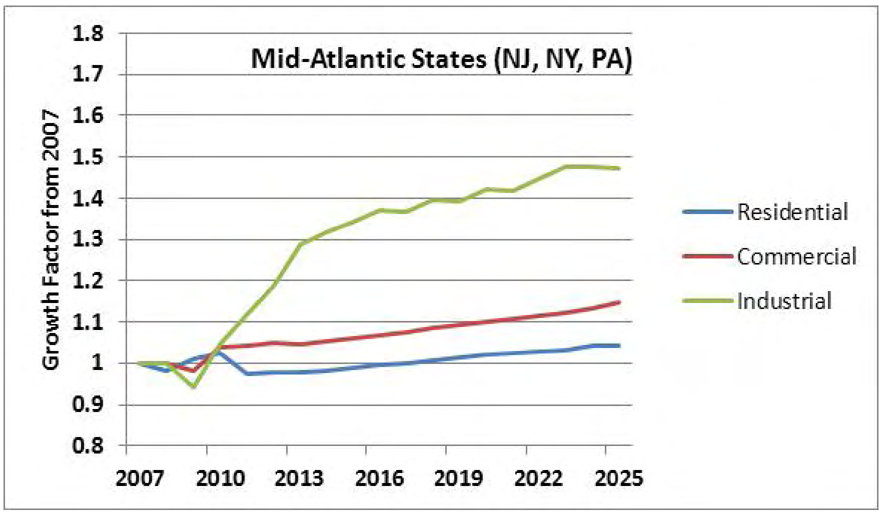


Exhibit 2.7 AEO2010 Growth Factors for Distillate Oil by AEO Region 2007 – 2025





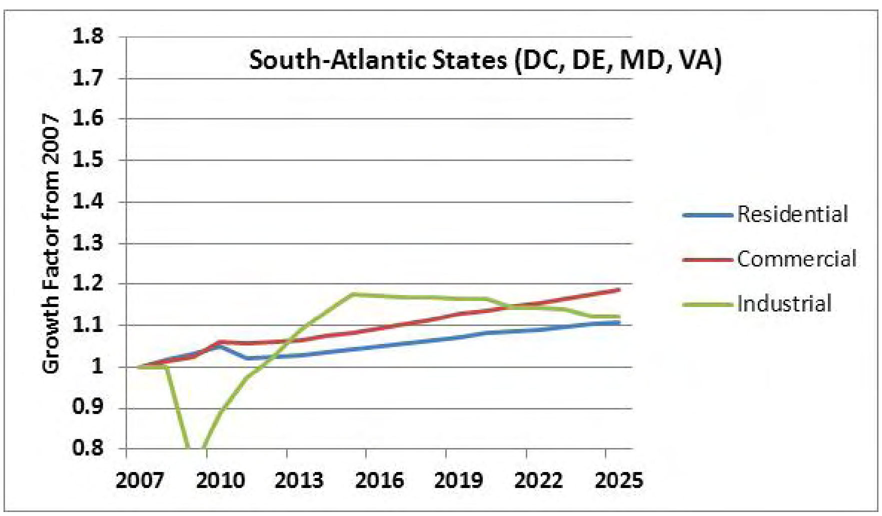
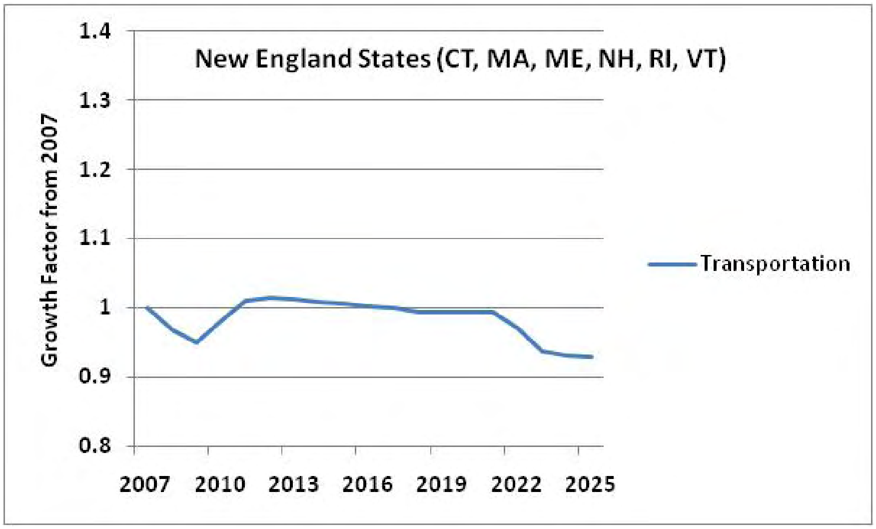
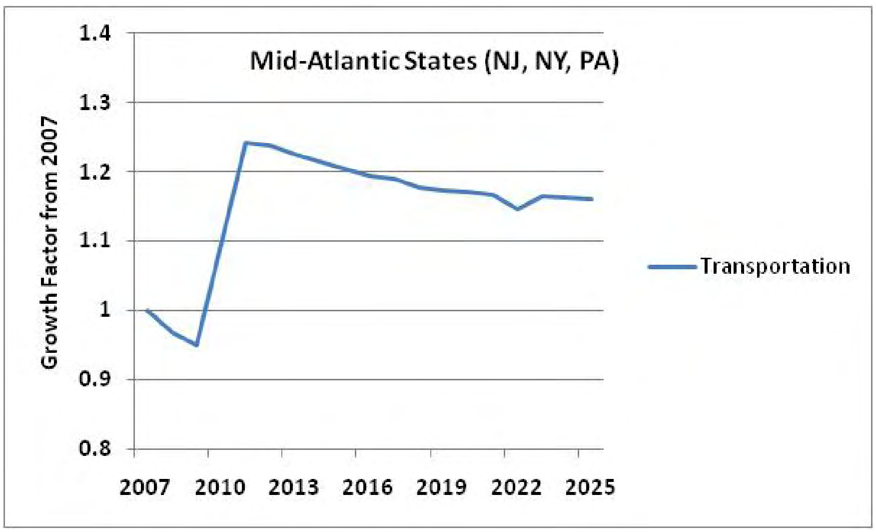


Exhibit 2.8 Growth Factors for Natural Gas by AEO Region 2007 – 2025
AEO2010 for Residential/Commercial, AEO2011 for Industrial





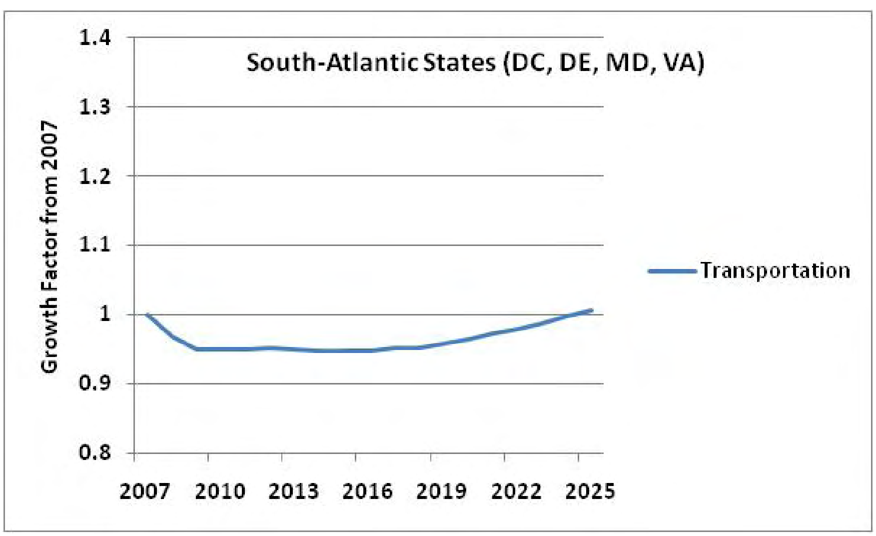
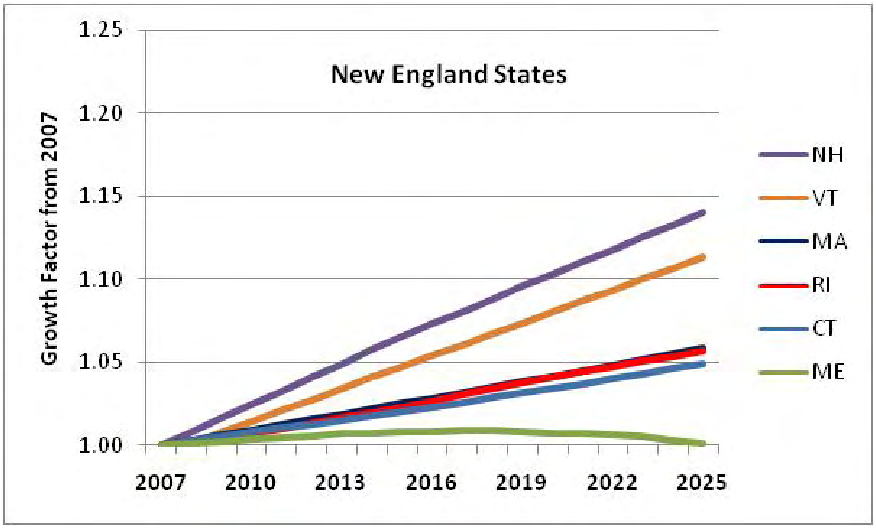
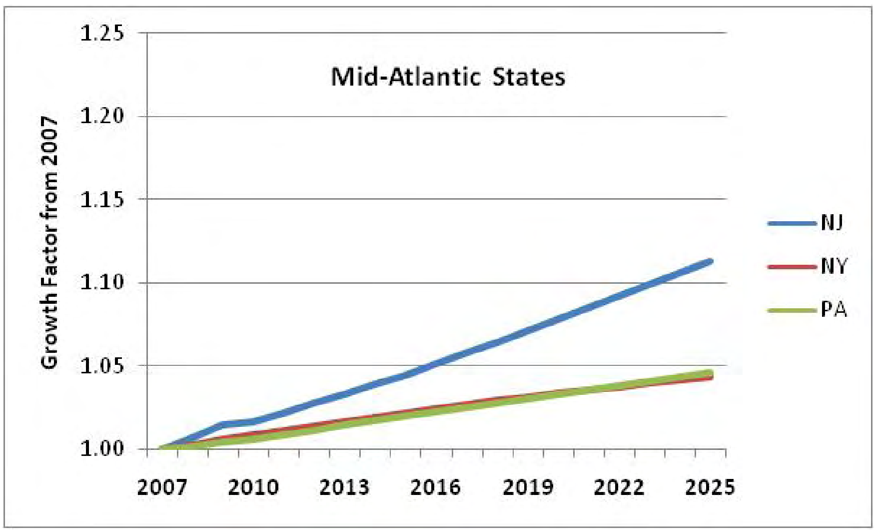


Exhibit 2.9 AEO2010 Growth Factors for Gasoline by AEO Region 2007 – 2025





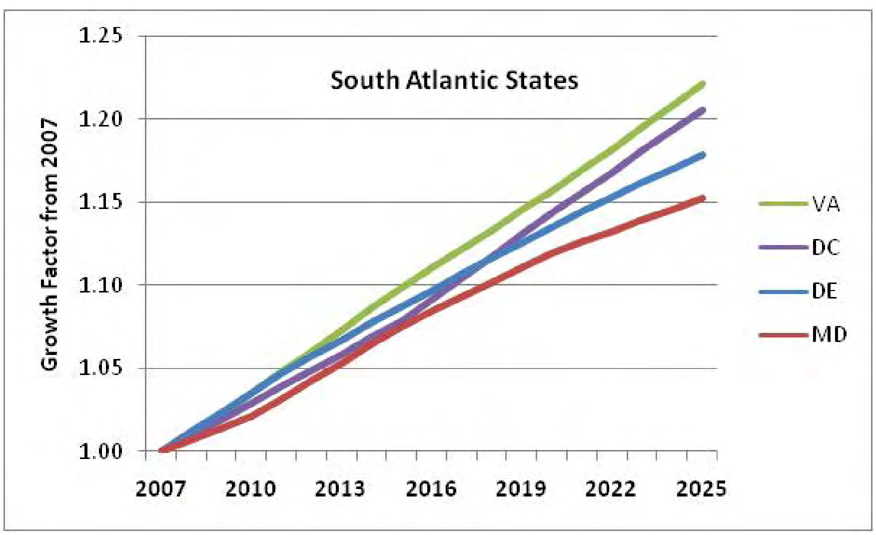
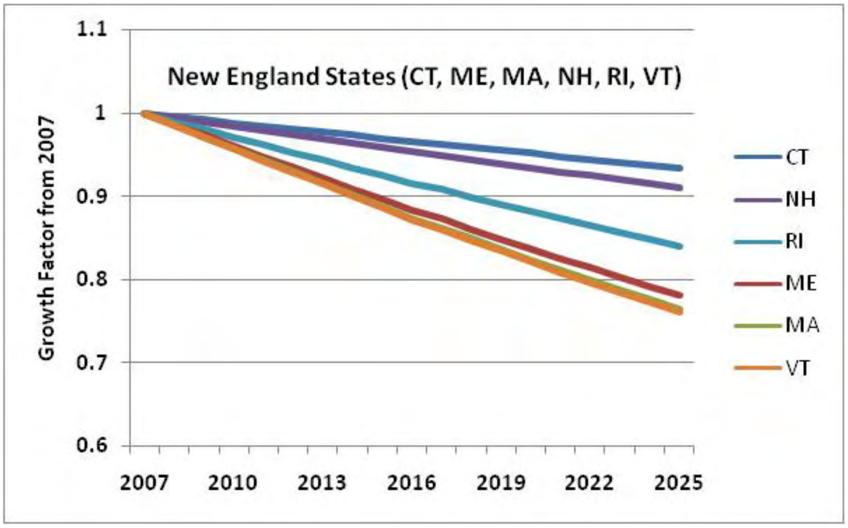
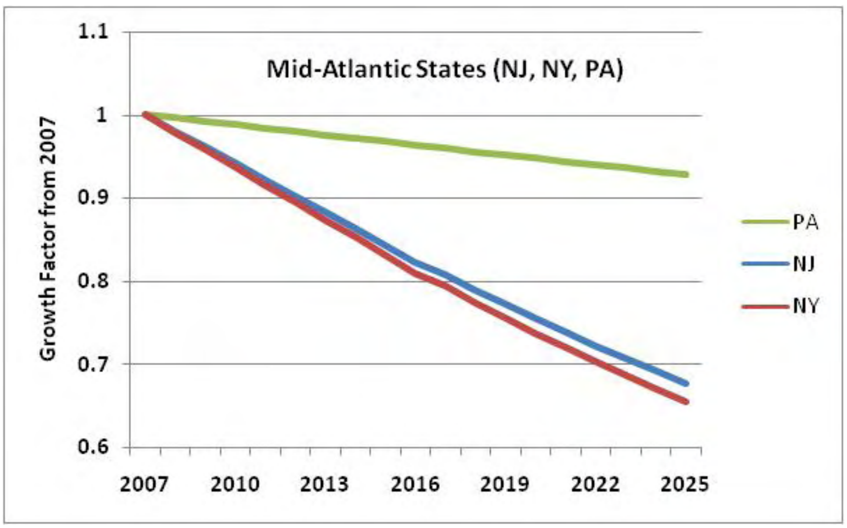


Exhibit 2.10 Population Growth Factors by AEO Region 2007 – 2025





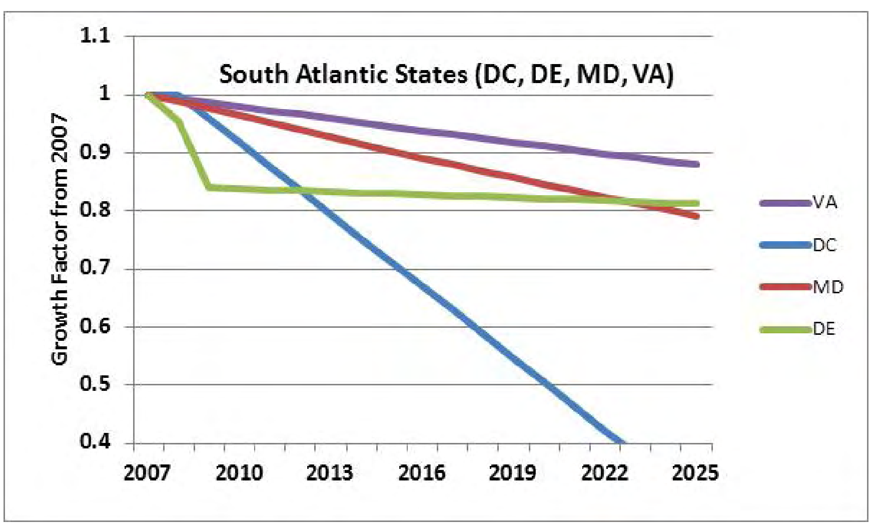


Exhibit 2.11 Manufacturing Employment Growth Factors by Region 2007 - 2025

Exhibit 2.12 2007 and 2025 VMT and the 2007-2025 Growth Factor

Nonattainment Area	County	FIPS	Million VMT 2007	Million VMT 2025	Growth 2007-2005
Allentown	Lehigh	42077	2,947	3,700	1.256
Allentown	Northampton	42095	2,020	2,629	1.301
Baltimore	Anne Arundel	24003	5,786	7,907	1.367
Baltimore	Baltimore	24005	8,261	10,330	1.251
Baltimore	Carroll	24013	1,296	1,766	1.363
Baltimore	Harford	24025	2,362	3,060	1.296
Baltimore	Howard	24027	3,815	6,059	1.588
Baltimore	Baltimore City	24510	3,626	4,150	1.145
Hagerstown	Washington	24043	2,090	2,940	1.407
Harrisburg-Lebanon-Carlisle-York	Cumberland	42041	2,861	3,704	1.295
Harrisburg-Lebanon-Carlisle-York	Dauphin	42043	3,072	3,689	1.201
Harrisburg-Lebanon-Carlisle-York	Lebanon	42075	1,209	1,507	1.247
Harrisburg-Lebanon-Carlisle-York	York	42133	3,304	4,209	1.274
Johnstown	Cambria	42021	1,157	1,110	0.959
Johnstown	Indiana	42063	844	928	1.100
Lancaster	Lancaster	42071	4,255	5,395	1.268
New York Metro NY/NJ/CT	Fairfield	9001	7,560	8,568	1.133
New York Metro NY/NJ/CT	New Haven	9009	6,856	8,085	1.179
New York Metro NY/NJ/CT	Bergen	34003	7,879	10,464	1.328
New York Metro NY/NJ/CT	Essex	34013	4,895	6,131	1.253
New York Metro NY/NJ/CT	Hudson	34017	2,313	2,801	1.211
New York Metro NY/NJ/CT	Mercer	34021	3,566	3,996	1.121
New York Metro NY/NJ/CT	Middlesex	34023	7,810	9,748	1.248
New York Metro NY/NJ/CT	Monmouth	34025	6,319	8,595	1.360
New York Metro NY/NJ/CT	Morris	34027	5,530	6,523	1.180
New York Metro NY/NJ/CT	Passaic	34031	2,918	3,490	1.196
New York Metro NY/NJ/CT	Somerset	34035	3,230	3,667	1.135
New York Metro NY/NJ/CT	Union	34039	4,623	5,730	1.239
New York Metro NY/NJ/CT	Bronx	36005	3,677	4,830	1.314
New York Metro NY/NJ/CT	Kings	36047	5,461	6,272	1.148
New York Metro NY/NJ/CT	Nassau	36059	11,780	14,705	1.248
New York Metro NY/NJ/CT	New York	36061	3,938	5,203	1.321
New York Metro NY/NJ/CT	Orange	36071	4,431	5,906	1.333
New York Metro NY/NJ/CT	Queens	36081	8,859	10,949	1.236
New York Metro NY/NJ/CT	Richmond	36085	2,152	3,354	1.558
New York Metro NY/NJ/CT	Rockland	36087	2,675	4,060	1.517
New York Metro NY/NJ/CT	Suffolk	36103	13,767	20,514	1.485
New York Metro NY/NJ/CT	Westchester	36119	8,201	11,811	1.490
Philadelphia PA/DE/NJ	New Castle	10003	5,544	6,959	1.255
Philadelphia PA/DE/NJ	Burlington	34005	4,704	5,062	1.076

Nonattainment Area	County	FIPS	Million VMT 2007	Million VMT 2025	Growth 2007-2005
Philadelphia PA/DE/NJ	Camden	34007	4,090	4,267	1.043
Philadelphia PA/DE/NJ	Gloucester	34015	2,723	3,284	1.206
Philadelphia PA/DE/NJ	Bucks	42017	5,047	6,516	1.291
Philadelphia PA/DE/NJ	Chester	42029	4,423	6,201	1.402
Philadelphia PA/DE/NJ	Delaware	42045	3,766	4,371	1.161
Philadelphia PA/DE/NJ	Montgomery	42091	7,075	8,220	1.162
Philadelphia PA/DE/NJ	Philadelphia	42101	5,973	6,337	1.061
Pittsburgh-Beaver Valley	Allegheny	42003	9,345	10,134	1.084
Pittsburgh-Beaver Valley	Armstrong	42005	628	672	1.071
Pittsburgh-Beaver Valley	Beaver	42007	1,487	1,585	1.066
Pittsburgh-Beaver Valley	Butler	42019	1,762	2,173	1.233
Pittsburgh-Beaver Valley	Greene	42059	464	504	1.086
Pittsburgh-Beaver Valley	Lawrence	42073	812	880	1.084
Pittsburgh-Beaver Valley	Washington	42125	2,245	2,531	1.127
Pittsburgh-Beaver Valley	Westmoreland	42129	3,512	3,898	1.110
Reading	Berks	42011	3,341	4,079	1.221
Washington DC/MD/VA	DC	11001	3,666	3,861	1.053
Washington DC/MD/VA	Charles	24017	1,284	1,825	1.421
Washington DC/MD/VA	Frederick	24021	3,009	4,442	1.476
Washington DC/MD/VA	Montgomery	24031	7,471	9,711	1.300
Washington DC/MD/VA	Prince George's	24033	8,754	11,616	1.327
Washington DC/MD/VA	Arlington	51013	1,663	1,917	1.153
Washington DC/MD/VA	Fairfax	51059	10,123	13,880	1.371
Washington DC/MD/VA	Loudoun	51107	2,403	3,741	1.557
Washington DC/MD/VA	Prince William	51153	3,202	4,643	1.450
Washington DC/MD/VA	Alexandria	51510	736	866	1.177
Washington DC/MD/VA	Fairfax	51600	193	220	1.143
Washington DC/MD/VA	Falls Church	51610	64	76	1.186
Washington DC/MD/VA	Manassas	51683	273	360	1.317
Washington DC/MD/VA	Manassas Park	51685	26	30	1.166

2.3.1.5 No Growth Assignment for Certain Area Source Categories

For several area source categories, it seems reasonable that emissions would not change from the 2007 values. No growth was applied to the 2007 emissions for the area source categories shown in Exhibit 2.13.

Exhibit 2.13 Area Source Categories with No Growth Assignment

SCC	SCC Description
2296000000	Unpaved Roads /All Unpaved Roads /Total: Fugitives
2401008000	Surface Coating /Traffic Markings /Total: All Solvent Types
2461020000	Misc Non-industrial: Commercial /Asphalt Application: All Processes /Total: All
2461021000	Misc Non-industrial: Commercial /Cutback Asphalt /Total: All Solvent Types
2461022000	Misc Non-industrial: Commercial /Emulsified Asphalt /Total: All Solvent Types
2461023000	Misc Non-industrial: Commercial /Asphalt Roofing /Total: All Solvent Types
2601000000	On-site Incineration /All Categories /Total
2601010000	On-site Incineration /Industrial /Total
2601010000	On-site Incineration /Industrial /Total
2601020000	On-site Incineration /Commercial/Institutional /Total
2601020000	On-site Incineration /Commercial/Institutional /Total
2601030000	On-site Incineration /Residential /Total
2610000100	Open Burning /All Categories /Yard Waste - Leaf Species Unspecified
2610000400	Open Burning /All Categories /Yard Waste - Brush Species Unspecified
2610000500	Open Burning /All Categories /Land Clearing Debris (use 28-10-005-000 for Logging
2610030000	Open Burning /Residential /Household Waste (use 26-10-000-xxx for Yard Wastes)
2610040400	Open Burning /Municipal (from residences, parks, other for central burn)
2660000000	Leaking Underground Storage Tanks /Leaking Underground Storage Tanks /Total: All
2680001000	Composting /100% Biosolids (e.g., sewage sludge, manure, mixtures of these matls
2680002000	Composting /Mixed Waste (e.g., a 50:50 mixture of biosolids and green wastes)
2806010000	Domestic Animals Waste Emissions /Cats /Total
2806015000	Domestic Animals Waste Emissions /Dogs /Total
2807020001	Wild Animals Waste Emissions /Bears /Black Bears
2807020002	Wild Animals Waste Emissions /Bears /Grizzly Bears
2807025000	Wild Animals Waste Emissions /Elk /Total
2807030000	Wild Animals Waste Emissions /Deer /Total
2807040000	Wild Animals Waste Emissions /Birds /Total
2810001000	Forest Wildfires - Wildfires – Unspecified
2810003000	Cigarette Smoke /Total
2810005000	Managed Burning, Slash (Logging Debris) /Unspecified Burn Method
2810010000	Human Perspiration and Respiration /Total
2810014000	Prescribed Burning /Generic - Unspecified land cover, ownership, class/purpose

SCC	SCC Description
2810015000	Prescribed Forest Burning /Unspecified
2810020000	Prescribed Rangeland Burning /Unspecified
2810030000	Structure Fires /Unspecified
2810035000	Firefighting Training /Total
2810050000	Motor Vehicle Fires /Unspecified
2810060200	Cremation /Animals
2810090000	Open Fire /Not categorized
2820010000	Cooling Towers /Process Cooling Towers /Total
2830000000	Catastrophic/Accidental Releases /All Catastrophic/Accidental Releases /Total
2830010000	Catastrophic/Accidental Releases /Transportation Accidents /Total

2.3.1.6 USEPA 2020 Projections for Residential Wood

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform. MARAMA decided to use USEPA emission projection parameters for residential wood combustion. USEPA's methodology and data sources are summarized below (USEPA 2010a).

USEPA projected residential wood combustion emissions are based on the expected increase in the number of low-emitting wood stoves and the corresponding decrease in other types of wood stoves. As newer, cleaner woodstoves replace older, more polluting stoves, there will be an overall reduction of emissions from this category. The approach used by USEPA was developed as part of a modeling exercise to estimate the expected benefits of the woodstove change-out program. This methodology uses a combination growth and control factors and is based on activity not pollutant. The growth and control are accounted for in a single factor for each residential wood SCC (certain SCCs represent controlled equipment, while other SCCs represent uncontrolled equipment). Control factors are indirectly incorporated based on which stove is used. The specific assumptions USEPA made were:

- Fireplaces, SCC=2104008001: increase 1%/year;
- Old woodstoves, SCC=2104008002, 2104008010, 2104008051: decrease 2%/year;
- New woodstoves, SCC=2104008003, 2104008004, 2104008030, 2104008050, 2104008052 or 2104008053: increase 2%/year.

For the general woodstoves and fireplaces category (SCC 2104008000) USEPA computed a weighted average distribution based on 19.4% fireplaces, 71.6% old woodstoves, 9.1% new woodstoves using 2002 Platform emissions for PM2.5. These fractions are based on the fraction of emissions from these processes in the states that did not have the "general woodstoves and fireplaces" SCC in the 2002 NEI. This approach results in an overall decrease of 1.056% per year for this source category. Appendix E contains the residential wood projection data from USEPA.

2.3.1.7 SCC, SIC, NAICS and Growth Parameter Crosswalk

Since the employment projections were based on 3-digit NAICS code, it was necessary to map NAICS codes to SCCs and SIC codes that were used by states. Employment projections at the more specific 4-digit or 6-digit NAICS codes were not available.

The first step for developing a comprehensive crosswalk between the different source classification codes (SCC, SIC, and NAICS codes) and emission activity growth indicators was to compile a complete list of the NAICS codes in the 2007 point source inventory. Some states use the SIC code while other use the NAICS code. Still other states use both the SIC and NAICS codes. When the NAICS code was not available SIC codes were converted to NAICS codes. The 6-digit NAICS code was truncated to a 3-digit code, which represents major industry subsectors of the economy. A U.S. Census Bureau document was used to perform this conversion (CENSUS 2000).

The next step was to review parameters that could be used as the emission activity growth indicator for each SCC or NAICS. We initially relied on two USEPA crosswalks (USEPA 2004a, USEPA 2004b) to match area and nonEGU point source SCCs to AEO2010 categories, employment NAICS codes, and population.

2.3.1.8 Final Version 2 Growth Factors for Area Sources

The previous sections described the initial growth factors recommended to develop projected future year emissions inventories for area and non-EGU sources. Draft growth and control factors, and a draft technical support document, were circulated for review by MARAMA and state agencies. During the review, it was noted that several emissions categories show negative growth into the future, particularly categories related to fossil fuel combustion and manufacturing employment.

Many of the growth factors used to project emissions for area and non-EGU sources were based on the AEO2010 fuel consumption forecasts and state-level employment projections. The AEO2010 forecasts show declining trends for many fuel consumption sectors, especially industrial, residential, and commercial distillate fuel oil use. Similarly, the employment projections show declines in the predicted number of employees for many sectors of the economy. This is particularly true for the manufacturing sector, which is of interest because this sector is often associated with higher emissions than those for other sectors. By contrast, the employment projections show increasing trends in retail and service-related sectors. However, these sectors are not typically associated with significant emissions.

Predicted declines in fuel use and employment resulted in growth factors less than unity (i.e., represent negative growth) for many area and non-EGU point source categories. Consequently, for some categories, emissions were initially projected to be lower for the projected future years than for the base year, even before the application of control assumptions (i.e., the future "growth only" emissions are lower than the base year emissions). A conference call was held to discuss the negative growth issue, and states were polled as to whether or not they felt that the current set of proposed growth factors - including the negative growth factors - were realistic for their state. In reply, some representatives mentioned that they have observed historic state-specific data that supports the trends displayed by the proposed growth factors. Other representatives mentioned that they feel comfortable with the growth factors and don't have a technical basis to change them or suggest others. Some states will supply their own factors or make their own assumptions.

As a result of these discussions, each state provided guidance on how to handle projections when negative growth is indicated. Exhibit 2.14 shows the state recommendations for area sources.

2.3.1.9 Version 3 Update to New Jersey Growth Factors for Area Sources

New Jersey provided updated growth factors for area source for use in developing the 2025 inventory for PM nonattainment counties. One of the key revisions was to use the more recent data from AEO2011 for energy consumption instead of the AEO2010 projections. New Jersey also provided updated employment, paved road, pesticide and agricultural livestock growth factors.

2.3.1.10 Version 3 Update to Growth Factors for the District of Columbia

The District of Columbia provided updated employment growth factors based on DC Department of Labor forecasts for the period 2008 to 2018.

Exhibit 2-14 State Recommendations to Address Negative Growth and Other Growth Factors for the Area Source Sector

State	AEO2010 Growth Factors	Employment Growth Factors	Population Growth Factors
CT	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
DE	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	For 2013, use state DOL employment projections by 3-digit NAICS; For 2017 and 2020, use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth	Use county-level population projections
DC	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	Use DOL employment growth for NAICS 722 for food and kindred product SCC; otherwise use 2008-2018 data	For dry cleaning, use employment growth for NAICS 812 instead of population
MD	Not using AEO2010; used employment for commercial & institutional fuel; used housing units for residential fuel	Provided updated employment projections; changed cross-walk between NAICS code and SCC for selected source categories	Provided updated population projections by county
NJ	NJ submitted state specific growth factors. For fuel combustion categories only, used AEO2011 growth rates except for residual oil (use no growth)	NJ submitted state specific growth factors.	NJ submitted state specific growth factors and provided population projections by county
NY	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
PA	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
VA	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections

2.3.2 Area Source Control Factors

Control factors were developed to estimate post-2007 emission reductions resulting from on-the-books regulations and other emission reduction measures. Control factors were developed for the following national, regional and state measures:

- Federal Rules Affecting Area Sources
- Federal MACT Rules
- OTC 2001 Model Rules
- OTC 2006 Model Rules
- MANE-VU Sulfur in Fuel Oil Limitations

These control programs, including their impact on PM2.5 and PM precursor emissions, are discussed in the following subsections.

2.3.2.1 Federal Rules Affecting Area Sources

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform (USEPA 2010a). USEPA accounted for control strategies for four area source categories, only one of which reduced emissions of PM2.5 or PM2.5 precursors. USEPA developed projection factors to account for the replacement of retired woodstoves that were installed before promulgation of the new source performance standard (NSPS). We used USEPA's latest methodology which uses a combination growth and control factor and is based on activity and not pollutant. The growth and control are accounted for in a single factor for specific SCCs that account for the turnover from pre-NSPS to post-NSPS woodstove.

2.3.2.2 Federal MACT Rules

USEPA developed guidance for estimating VOC and NO_x emission changes from MACT Rules (USEPA 2007b). We reviewed the guidance to identify area source controls associated with the federal maximum achievable control technology (MACT) standards for controlling hazardous air pollutants (HAPs). Although designed to reduce HAPs, many of the MACT standards also provide a reduction in criteria air pollutants. USEPA's guidance document provides an estimate of the percent reduction in VOC and NO_x from each standard, and the compliance date for the standard. The information concerning MACT compliance periods provided was used to determine whether the MACT standard provided post-2007 emission reductions. For example, if a compliance period of a MACT standard was 2007 or earlier, then we assumed that the emission reductions from the MACT standard should be reflected in the baseline year and not as an additional post-2007 credit.

Only one area source category was listed in USEPA's guidance document - municipal solid waste landfills. As the compliance date for this standard was January 2004, no post-2007 reductions were applied because the emission reductions from the MACT standard should be reflected in the 2007 inventory and not as an additional post-2007 credit.

USEPA has or will soon develop MACT standards for about 70 area source categories. We reviewed USEPA's 2020 emissions projections described in the previous section and found that USEPA did not include emission reductions from recent area source MACT standards. We conducted a review of USEPA's air toxic website and found that USEPA determined that many area source MACT standards would result in nationwide reductions in criteria air pollutants in addition to the reductions in HAP emissions. However, many States in the MANE-VU+VA region already have emission standards for many categories that are as stringent as the Federal area source MACT standards. For example, many states in the MANE-VU+VA region already have requirements as stringent as the Gasoline Distribution MACT and GACT (generally achievable control technology) standards, and little additional VOC reductions would be realized in the region. Given the resources allocated to this project, it was beyond the scope to conduct an analysis of the area source MACT requirements and state-by-state emission regulations to determine whether there would be emission reductions resulting from the area source MACT standards.

The only exception to the above discussion of area source MACT standards pertains to the recently promulgated rules for reciprocating internal combustion engines (RICE). USEPA made available an estimate of the percent reduction in emissions attributable to the RICE MACT rule in 2012 and 2014 (USEPA 2010b). These reductions by SCC are shown in Exhibit 2-15. The USEPA 2014 estimates were used for the MANE-VU+VA 2017, 2020 and 2025 inventories.

2.3.2.3 OTC Model Rules for VOC Sources

The Ozone Transport Commission (OTC) developed model rules for its member states in 2002 for several area source VOC categories: consumer products, architectural and industrial maintenance (AIM) coatings, portable fuel containers (PFCs), mobile equipment repair and refinishing, and solvent cleaning (OTC 2001). In 2006 the OTC introduced model rules for two additional area source categories (adhesives/sealants and asphalt paving) and more stringent requirements for consumer products and portable fuel containers (OTC 2007). These rules resulted in reductions of VOC emissions. Because VOC emissions are generally not considered to be significant PM precursors, and these rules did not result in reductions in PM2.5 or precursor emissions, no further discussion of the OTC model rules for VOC sources is warranted.

Exhibit 2-15 USEPA Estimated Percent Reductions for RICE MACT Standard

SCC	NOx	PM2.5	SCC Description
2101004000		7.57	Electric Utility;Distillate Oil;Total: Boilers and IC Engines
2101004002		11.81	Electric Utility;Distillate Oil;All IC Engine Types
2101006000	7.97		Electric Utility;Natural Gas;Total: Boilers and IC Engines
2101006002	9.87		Electric Utility;Natural Gas;All IC Engine Types
2102004000		7.57	Industrial;Distillate Oil;Total: Boilers and IC Engines
2102006000	7.97		Industrial;Natural Gas;Total: Boilers and IC Engines
2102006002	9.87		Industrial;Natural Gas;All IC Engine Types
2103004000		7.57	Commercial/Institutional;Distillate Oil;Total: Boilers and IC Engines
2103006000	7.97		Commercial/Institutional;Natural Gas;Total: Boilers and IC Engines
2199004000		7.57	Area Source Fuel Combustion;Distillate Oil;Total: Boilers and IC Engines
2199004002		11.81	Area Source Fuel Combustion;Distillate Oil;All IC Engine Types
2199006000	7.97		Area Source Fuel Combustion;Natural Gas;Total: Boilers and IC Engines
2310000000	12.53		Oil and Gas Production: All Processes;Total: All Processes
2310000220	12.53		Oil and Gas Exploration/Production; Drill Rigs
2310000440	12.53		Oil and Gas Exploration/Production; Saltwater Disposal Engines
2310001000	12.53		Oil and Gas Production: SIC 13; On-shore;Total: All Processes
2310002000	12.53		Oil and Gas Production: SIC 13; Off-shore;Total: All Processes
2310020000	12.53		Oil and Gas Production: SIC 13;Natural Gas;Total: All Processes
2310020600	12.53		Oil and Gas Exploration and Production;Natural Gas;Compressor Engines
2310023000	12.53		Oil and Gas Exploration and Production;Natural Gas;Cbm Gas Well - Dewatering Pump Engines

2.3.2.4 OTC Model Rule for ICI Boilers

The OTC recommended that member states pursue state-specific rulemakings or other implementation methods to achieve NO_x emission reduction for industrial, commercial, and institutional (ICI) boilers based on guidelines that varied by boiler size and fuel type. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in NO_x emissions should be applied in 2013, 2017, and 2020.

All but one state, New Jersey, indicated that they have not adopted rules for area sources equivalent to the 2006 OTC recommendations. New Jersey specified that the state has post-2007 ICI boiler rules that reduce NO_x emissions and provided the estimates of the reductions in NO_x emissions by SCC resulting from boiler tune-up requirements, as shown in Exhibit 2.16:

Exhibit 2.16 Area Source Emission Reductions from New Jersey ICI Boiler NO_x Rules

SCC	SOURCE CATEGORY	Percent Reduction from Tune-ups 2007-2013	Rule Effectivenes s	Rule Penetratio n	Overall Percent Reduction 2007-2013
2102004000	Industrial: Distillate	25%	80%	30%	6%
2102005000	Industrial: Residual	25%	80%	30%	6%
2102006000	Industrial: Nat Gas	25%	80%	30%	6%
2102007000	Industrial: LPG	25%	80%	30%	6%
2103004000	Comm/Inst: Distillate	25%	80%	30%	6%
2103005000	Comm/Inst: Residual	25%	80%	30%	6%
2103006000	Comm/Inst: Nat Gas	25%	80%	30%	6%
2103007000	Comm/Inst - LPG	25%	80%	30%	6%

2.3.2.5 MANE-VU Fuel Oil Sulfur Strategy

MANE-VU developed a low sulfur fuel oil strategy to help states develop Regional Haze SIPs (MANE_VU 2007). The sulfur in fuel oil recommendations are shown in Exhibit 2.17 and vary by state, type of fuel oil, and year of implementation.

Exhibit 2.17 MANE-VU Low Sulfur Fuel Oil Strategy

Inner Zone States (DE, NJ, NY, PA)		
Fuel Oil Type	**Sulfur Content 2012**	**Sulfur Content 2016**
Distillate	500 ppm	15 ppm
#4 Residual	0.25 %	0.25 %
#6 Residual	0.3 to 0.5 %	0.3 to 0.5 %
Outer Zone States (CT, DC, MD)		
Fuel Oil Type	**Sulfur Content 2014**	**Sulfur Content 2018**
Distillate	500 ppm	15 ppm
#4 Residual	n/a	0.25 to 0.5 %
#6 Residual	n/a	0.5 %

Each state was polled and asked to provide guidance as to when, if at all, the MANE-VU strategy would be incorporated into their state rules. States were also asked to provide the 2007 sulfur contents for each fuel type by county in order to calculate the percent reduction in emissions for the future years. Three states (MD, NJ, NY) have adopted or are committed to adopting the strategy into their rules. Four jurisdictions (CT, DC, DE, PA) indicated that not enough regulatory development progress has been made to include the reductions in future years with absolute certainty. One state (VA) has no plans to adopt the low sulfur fuel oil strategy. The response from each jurisdiction is summarized below:

- **Connecticut** will not include the reductions from MANE-VU low sulfur fuel oil strategy at this time for official SIP inventories used for the PM2.5 redesignation effort. Section 16a-21a of the Connecticut General Statutes (as amended by PA 10-74) conditions implementation of number two heating oil sulfur limitation (50 ppm beginning 7/1/2011 and 15 ppm beginning 7/1/2014) on similar implementation in NY, MA and RI. NY has taken action, but the other states have not done so yet. CTDEP expects that 15ppm residential heating oil will be in place in CT by the "MANE-VU Ask" 2018 target date. However, until the other states act, SIP emission inventories will not be approvable with the 15 ppm value. Therefore, at this time CT elects to retain the 2007 sulfur value through 2025. For residual oil, Section 22a-174-19a of the Regulations of CT State Agencies (RCSA) limits sources >=15MW and boilers >=250 mmBtu/hr to 0.5% and further limits any of those sources that are also Title IV acid rain sources to 0.3%. For affected sources, these limits are consistent with the "MANE-VU Ask", and should be reflected in the actual emissions incorporated into the 2007 point source inventory. Other sources (including most area sources) not otherwise restricted by permit/order are limited to 1.0% by RCSA 22a-174-19. As both of these regulations have not changed after 2007, there are no new controls (i.e., post 2007 control factors are 1.0) for residual oil.
- The **District of Columbia** does not have a low sulfur rule in place yet. They do have a draft, and anticipate adopting a rule by 2014, but are inclined not to take credit for reductions at this point in time.
- **Delaware's** low-sulfur fuel regulation development is running behind schedule and will not be promulgated done in time to include in the re-designation requests/maintenance plans. Emission reductions from MANE-VU low sulfur fuel oil strategy are not included in the 2025 inventory at this time.
- **Maryland** expects to revise COMAR 26.11.09.07 (Sulfur Content Limitations for Fuel) by 2014 to adopt the limits in the MANE-VU low sulfur fuel oil strategy.

- **New Jersey** has revised N.J.A.C. 7:27-9.2 (Sulfur content standards) to adopt the 2016 sulfur content limits and schedule shown in Exhibit 2.19. All of the PM nonattainment counties in New Jersey already meet the MANE-VU limits for residual oil.
- **New York** adopted a law that limits the sulfur content of No. 2 heating oil to no more than 15 parts per million starting in July 2012, down from the current range of 2,000 to 15,000 parts per million. New York expects to revise 6 NYCRR Subpart 225-1 (Fuel Composition and Use - Sulfur Limitations) to lower the sulfur content of distillate fuel oil for all stationary sources (including home heating) and stationary internal combustion engines. Nearly all of the PM nonattainment counties in New York already meet the MANE-VU limits for residual oil. For the two counties (Orange and Suffolk), compliance with the MANE-VU limits is expected by 2017.
- **Pennsylvania** low-sulfur fuel regulation development is running behind schedule and will not be promulgated done in time to include in the re-designation requests/maintenance plans. Emission reductions from MANE-VU low sulfur fuel oil strategy are not included in the 2025 inventory at this time.
- **Virginia** will not include the emission reductions from low sulfur fuel oil, as it is not part of MANE-VU and has no plans to adopt the low sulfur fuel oil strategy.

The state responses regarding the currently adopted sulfur contents for home heating oil, distillate oil, and residual oil are summarized in Exhibits 2.18, 2.19 and 2.20, respectively. For the purposes of developing the 2025 inventory that will be used for re-designations and maintenance plans, the sulfur contents and control factors shown in the Exhibits were used on a county-by-county basis to account for the emission reductions from the MANE-VU low sulfur fuel oil strategy. There are separate columns in the detailed area source inventory spreadsheet that specify SO_2 control factors and emissions for each projection year for a "currently adopted" scenario that includes reductions for states (MD, NJ, NY) that have or are committed to having rules in place. No emission reductions are applied for the other states (CT, DC, DE, PA, VA) in the "currently adopted" scenario.

For other air quality planning purposes, we accounted separately for emission reductions that would occur assuming all states fully adopt the MANE-VU low sulfur fuel limits by 2025. There are separate columns for SO_2 control factors and emissions for a "fully adopted" scenario where all states (except Virginia) have the MANE-VU low sulfur fuel oil limits in place.

Exhibit 2.18 Currently Adopted Sulfur Content and Control Factors for Residential Fuel Oil Combustion

			Sulfur Content (ppm)					Control Factor			
STATE	FIPS	CNTY_NAME	2007	2013	2017	2020	2025	CF_07_13	CF_07_17	CF_07_20	CF_07_25
CT	09001	Fairfield	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
CT	09009	New Haven	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
DE	10003	New Castle	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
DC	11001	Washington	1000	1000	1000	1000	1000	1.000	1.000	1.000	1.000
MD	24003	Anne Arundel	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24005	Baltimore	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24013	Carroll	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24017	Charles	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24021	Frederick	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24025	Harford	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24027	Howard	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24031	Montgomery	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24033	Prince Georges	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24043	Washington	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24510	Baltimore City	3000	3000	15	15	15	1.000	0.005	0.005	0.005
NJ	34003	Bergen	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34005	Burlington	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34007	Camden	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34013	Essex	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34015	Gloucester	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34017	Hudson	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34021	Mercer	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34023	Middlesex	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34025	Monmouth	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34027	Morris	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34031	Passaic	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075

			Sulfur Content (ppm)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
NJ	34035	Somerset	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34039	Union	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NY	36005	Bronx	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36047	Kings	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36059	Nassau	3700	15	15	15	15	0.004	0.004	0.004	0.004
NY	36061	New York	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36071	Orange	3700	15	15	15	15	0.004	0.004	0.004	0.004
NY	36081	Queens	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36085	Richmond	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36087	Rockland	3700	15	15	15	15	0.004	0.004	0.004	0.004
NY	36103	Suffolk	3700	15	15	15	15	0.004	0.004	0.004	0.004
NY	36119	Westchester	3700	15	15	15	15	0.004	0.004	0.004	0.004
PA	42003	Allegheny	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42005	Armstrong	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42007	Beaver	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42011	Berks	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42017	Bucks	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42019	Butler	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42021	Cambria	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42029	Chester	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42041	Cumberland	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42043	Dauphin	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42045	Delaware	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42059	Greene	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42063	Indiana	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42071	Lancaster	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42073	Lawrence	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42075	Lebanon	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000

			Sulfur Content (ppm)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
PA	42077	Lehigh	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42091	Montgomery	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42095	Northampton	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42101	Philadelphia	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42125	Washington	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42129	Westmoreland	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42133	York	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51013	Arlington	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51059	Fairfax	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51107	Loudoun	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51153	Prince William	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51510	Alexandria	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51600	Fairfax City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51610	Falls Church	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51683	Manassas City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51685	Manassas Park City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000

Exhibit 2.19 Currently Adopted Sulfur Content and Control Factors for Distillate Fuel Oil Combustion

			Sulfur Content (% S)					Control Factor			
STATE	FIPS	CNTY_NAME	2007	2013	2017	2020	2025	CF_07_13	CF_07_17	CF_07_20	CF_07_25
CT	09001	Fairfield	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
CT	09009	New Haven	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
DE	10003	New Castle	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
DC	11001	Washington	1000	1000	1000	1000	1000	1.000	1.000	1.000	1.000
MD	24003	Anne Arundel	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24005	Baltimore	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24013	Carroll	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24017	Charles	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24021	Frederick	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24025	Harford	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24027	Howard	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24031	Montgomery	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24033	Prince Georges	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24043	Washington	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24510	Baltimore City	3000	3000	15	15	15	1.000	0.005	0.005	0.005
NJ	34003	Bergen	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34005	Burlington	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34007	Camden	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34013	Essex	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34015	Gloucester	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34017	Hudson	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34021	Mercer	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34023	Middlesex	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34025	Monmouth	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34027	Morris	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34031	Passaic	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
NJ	34035	Somerset	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34039	Union	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NY	36005	Bronx	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36047	Kings	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36059	Nassau	3700	3700	15	15	15	1.000	0.004	0.004	0.004
NY	36061	New York	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36071	Orange	3700	3700	15	15	15	1.000	0.004	0.004	0.004
NY	36081	Queens	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36085	Richmond	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36087	Rockland	3700	3700	15	15	15	1.000	0.004	0.004	0.004
NY	36103	Suffolk	3700	3700	15	15	15	1.000	0.004	0.004	0.004
NY	36119	Westchester	3700	3700	15	15	15	1.000	0.004	0.004	0.004
PA	42003	Allegheny	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42005	Armstrong	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42007	Beaver	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42011	Berks	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42017	Bucks	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42019	Butler	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42021	Cambria	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42029	Chester	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42041	Cumberland	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42043	Dauphin	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42045	Delaware	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42059	Greene	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42063	Indiana	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42071	Lancaster	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42073	Lawrence	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42075	Lebanon	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
PA	42077	Lehigh	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42091	Montgomery	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42095	Northampton	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42101	Philadelphia	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42125	Washington	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42129	Westmoreland	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42133	York	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51013	Arlington	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51059	Fairfax	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51107	Loudoun	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51153	Prince William	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51510	Alexandria	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51600	Fairfax City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51610	Falls Church	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51683	Manassas City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51685	Manassas Park City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000

Exhibit 2.20 Currently Adopted Sulfur Content and Control Factors for Residual Fuel Oil Combustion

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
CT	09001	Fairfield	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
CT	09009	New Haven	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
DE	10003	New Castle	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
DC	11001	Washington	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
MD	24003	Anne Arundel	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24005	Baltimore	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24013	Carroll	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24017	Charles	2.0	2.0	0.5	0.5	0.5	1.000	0.250	0.250	0.250
MD	24021	Frederick	2.0	2.0	0.5	0.5	0.5	1.000	0.250	0.250	0.250
MD	24025	Harford	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24027	Howard	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24031	Montgomery	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24033	Prince Georges	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24043	Washington	2.0	2.0	0.5	0.5	0.5	1.000	0.250	0.250	0.250
MD	24510	Baltimore City	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
NJ	34003	Bergen	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34005	Burlington	0.5	0.5	0.5	0.5	0.5	1.000	1.000	1.000	1.000
NJ	34007	Camden	0.5	0.5	0.5	0.5	0.5	1.000	1.000	1.000	1.000
NJ	34013	Essex	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34015	Gloucester	0.5	0.5	0.5	0.5	0.5	1.000	1.000	1.000	1.000
NJ	34017	Hudson	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34021	Mercer	0.5	0.5	0.5	0.5	0.5	1.000	1.000	1.000	1.000
NJ	34023	Middlesex	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34025	Monmouth	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34027	Morris	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34031	Passaic	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
NJ	34035	Somerset	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34039	Union	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36005	Bronx	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36047	Kings	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36059	Nassau	0.37	0.37	0.37	0.37	0.37	1.000	1.000	1.000	1.000
NY	36061	New York	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36071	Orange	1.5	1.5	0.5	0.5	0.5	1.000	0.333	0.333	0.333
NY	36081	Queens	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36085	Richmond	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36087	Rockland	0.37	0.37	0.37	0.37	0.37	1.000	1.000	1.000	1.000
NY	36103	Suffolk	1	1	0.5	0.5	0.5	1.000	0.500	0.500	0.500
NY	36119	Westchester	0.37	0.37	0.37	0.37	0.37	1.000	1.000	1.000	1.000
PA	42003	Allegheny	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42005	Armstrong	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42007	Beaver	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42011	Berks	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42017	Bucks	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42019	Butler	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42021	Cambria	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42029	Chester	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42041	Cumberland	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42043	Dauphin	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42045	Delaware	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42059	Greene	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42063	Indiana	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42071	Lancaster	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42073	Lawrence	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42075	Lebanon	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
PA	42077	Lehigh	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42091	Montgomery	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42095	Northampton	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42101	Philadelphia	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42125	Washington	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42129	Westmoreland	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42133	York	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
VA	51013	Arlington	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51059	Fairfax	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51107	Loudoun	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51153	Prince William	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51510	Alexandria	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51600	Fairfax City	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51610	Falls Church	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51683	Manassas City	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51685	Manassas Park City	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000

3.0 POINT SOURCES

3.1 POINT SOURCE CATEGORIES

States were asked to classify units in the 2007 MANE-VU+VA point source emissions inventory as either EGU or nonEGU. Most, but not all, units that report hourly emissions to USEPA's Clean Air Markets Division (CAMD) are classified as EGUs.

CAMD implements USEPA's rule found in Volume 40 Part 75 of the Code of Federal Regulations (CFR), which requires an hourly accounting of emissions from each affected unit - i.e., sources participating in an emissions cap and trade program under the Acid Rain Control Program, the NO_x Budget Trading Program, or the Clean Air Interstate Rule. Most of the CAMD sources are traditional power plants that sell electricity to the electrical grid. However, there are other types of sources that report to CAMD that are not considered to be EGUs, such as petroleum refineries and cement kilns.

The following criteria was provided to states to classify a unit as an EGU:

- An EGU sells most of the power generated to the electrical grid;
- An EGU burns mostly commercial fuel. Commercial fuel in this case means natural gas, oil, and coal. Wood is not considered a commercial fuel because some states identify wood as renewable. Therefore, to avoid double counting, units that burn wood and other renewable sources (depending on each state's own definition) should not be considered as an EGU (unless it is already in the CAMD database).

The following units were <u>not</u> considered EGUs for emission projections: (1) a unit that generates power for a facility but occasionally sells to the grid; (2) emergency generators; or (3) distributed generation units.

The emission projection methodology for units classified as nonEGUs is discussed in Section 3.3. The emission projection methodology for EGUs is discussed in Section 3.4.

3.2 2007 INVENTORY DEVELOPMENT

The emission projections for the 2025 point source were based on Version 3_3 of the 2007 MANE-VU+VA inventory and are fully documented in the TSD for that effort (MARAMA 2012a). The only adjustment to the 2007 Version 3_3 point source source inventory was to apply "transport factors" to fugitive dust sources, as described in the following subsection.

3.2.1 Adjustments to the 2007 Inventory Used for the 2025 Projections

As described previously in Section 2.2.1.1, PM2.5 emissions for point sources were adjusted using the USEPA PM transport fractions for fugitive dust sources. Exhibit 3.1 shows the list of nonEGU SCCs for which the transport factor was applied. The major source categories included various operations in the mineral products and construction industries. Exhibit 2.2 in the previous Section 2 shows the transport fractions for each PM nonattainment county.

Exhibit 3.1 NonEGU Point Source SCCs Affected by PM Transport Fraction

SCC	SCC Description
30300519	Prim Metal Prod: Primary Copper Smelting: Unpaved Road Traffic: Fug Emiss
30300831	Prim Metal Prod: Iron Production: Unpaved Roads: Light Duty Vehicles
30300832	Prim Metal Prod: Iron Production: Unpaved Roads: Med Duty Vehicles
30300833	Prim Metal Prod: Iron Production: Unpaved Roads: Heavy Duty Vehicles
30300834	Prim Metal Prod: Iron Production: Paved Roads: All Vehicle Types
30302321	Prim Metal Prod: Taconite Iron Ore Processing: Haul Road: Rock
30302322	Prim Metal Prod: Taconite Iron Ore Processing: Haul Road: Taconite
30500290	Industrial Processes;Mineral Products;Asphalt Concrete;Haul Roads: General
30501024	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Hauling
30501030	Industrial Processes;Mineral Products;Coal Mining, Cleaning, and Material Handling (See 305310);Tops
30501031	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Scrapers: Travel Mode
30501039	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Hauling: Haul Trucks
30501045	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Bulldozing: Overburden
30501046	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Bulldozing: Coal
30501047	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Grading
30501048	Industrial Processes;Mineral Products;Coal Mining, Cleaning, and Material Handling (See 305310);Over
30501049	Industrial Processes;Mineral Products;Coal Mining, Cleaning, and Material Handling (See 305310);Wind
30501050	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Vehicle Traffic: Light/Medium Vehicles
30501090	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Haul Roads: General
30501640	Mineral Products: Lime Manufacture: Vehicle Traffic
30502011	Mineral Products: Stone Quarrying - Processing: Hauling
30502504	Mineral Products: Construction Sand and Gravel: Hauling
30531090	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Haul Roads: General
31100101	Building Const: Construction: Building Contractors: Site Preparation: Topsoil Removal
31100102	Building Const: Construction: Building Contractors: Site Prep: Earth Moving (Cut and Fill)

SCC	SCC Description
31100103	Building Const: Construction: Building Contractors: Site Prep: Aggregate Hauling (On Dirt)
31100205	Building Const: Demolitions/Special Trade Contracts: On-site Truck Traffic
31100206	Building Const: Demolitions/Special Trade Contracts: On-site Truck Traffic
50100401	Waste Disposal;Solid Waste Disposal - Government;Landfill Dump;Unpaved Road Traffic

3.3 2025 NONEGU INVENTORY DEVELOPMENT

3.3.1 NonEGU Growth Factors

NonEGU point source growth factors were developed using three sets of data:

- Annual Energy Outlook fuel consumption forecasts;
- State-level employment projections by NAICS code; and
- Other state-specific emission projection data.

The priority for applying these growth factors was to first use the state-supplied projection data (if available). If no state-supplied data are available, then we used AEO projection factors for fuel consumption sources and employment data for other source categories. The AEO fuel consumption forecasts and employment projections by NAICS code used for area sources were also used for nonEGU point sources. See Section 2.3.1 of this report for a description of these data sets.

Section 2 described the growth factors used to develop projected future year emissions inventories for both area and non-EGU sources. Draft growth and control factors, and a draft technical support document, were circulated for review by MARAMA and state agencies. During the review, it was noted that several emissions categories show negative growth into the future, particularly categories related to fossil fuel combustion and manufacturing employment. The AEO forecasts show declining trends for many fuel consumption sectors, especially industrial, residential, and commercial distillate fuel oil use. Similarly, the employment projections show declines in the predicted number of employees for many sectors of the economy. This is particularly true for the manufacturing sector, which is of interest because this sector is often associated with higher emissions than those for other sectors. By contrast, the employment projections show increasing trends in retail and service-related sectors.

Predicted declines in fuel use and employment resulted in growth factors less than unity (i.e., represent negative growth) for many area and non-EGU point source categories. Consequently, for some categories, emissions are lower for the projected future years than for the base year, even before the application of control assumptions (i.e., the future "growth only" emissions are lower than the base year emissions). The MARAMA emissions inventory workgroup met on several occasions via conference calls and email exchanges to discuss whether the negative growth projections were realistic, and what additional assumptions should be made. A topic of particular concern is negative growth for non-EGU point sources versus the treatment of Emissions Reduction Credits (ERCs) in the future year inventories.

A few states cited the importance of the negative growth issue for non-EGUs and how it relates to their ERC programs which are critical to new businesses being able to locate in those states. Because businesses could apply for and sell ERCs at the level of the base year inventory, it would not be realistic to show negative growth for non-EGU point sources. During an economic downturn, a facility could shut down and sell its ERCs, making the effective level of future year emissions equal to (i.e., no lower than) the base year. Therefore, a recommended conservative approach for addressing negative growth for non-EGU point sources is to set a minimum growth rate of 1 (no growth).

During the conference call held on July 23, 2010 to discuss the negative growth issue, state agency representatives were polled as to whether or not they felt that the current set of proposed growth factors - including the negative growth factors - were realistic for their state or district. In reply, some representatives mentioned that they have observed historic state-specific data that supports the trends displayed by the proposed growth factors. Other representatives mentioned that they feel comfortable with the growth factors and don't have a technical basis to change them or suggest others. Some states will supply their own factors or make their own assumptions.

As a result of these discussions, each state provided guidance on how to handle projections when negative growth is indicated. Exhibit 3.2 shows the state recommendations for nonEGU point sources.

Exhibit 3.2 State Recommendations to Address Negative Growth for the NonEGU Point Source Sector

State	AEO2010 Growth Factors	Employment Growth Factors
CT	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use state DOL employment projections by 3-digit NAICS
DE	Use AEO2010 growth rates	For 2013, use state DOL employment projections by 3-digit NAICS; For 2017 and 2020, use no growth (growth factor=1) when employment growth is

State	AEO2010 Growth Factors	Employment Growth Factors
		negative; otherwise use employment if positive growth
DC	Use AEO2010 growth rates	Use state 2008-2018 DOL employment projections by 3-digit NAICS; no growth when employment is projected to decrease
MD	Not using AEO2010 growth factors (except for the electric power generation SCCs); Use MD DOL employment projections for industrial and commercial fuel use SCCs, unless employment growth rate is negative, in which case use no growth (growth factor=1)	Use updated state DOL employment projections by 3-digit NAICS; For DoD facilities, account for impacts of Base Realignment and Closure; For source that have closed, account for emission reduction credits
NJ	New Jersey submitted state specific growth factors. Used either state specific growth factors, no growth (growth factor=1) when state AEO growth is negative or AEO if positive growth	NJ submitted state specific growth factors. Used either state specific factors, no growth (growth factor=1) when state DOL employment growth is negative or employment if positive growth
NY	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
PA	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
VA	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth

3.3.2 Emission Reduction Credits

Mulitple states (Connecticut, Maryland, and New Jersey) added county level records account for account emission reduction credits (ERCs) issued to stationary sources pursuant to state regulations. 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 2017 and 2020 inventories, ERC emissions were set to the amount of banked emissions available in 2007.

Delaware included the banked credits at the specific locations that they were generated. New York and Pennsylvania did not explicitly provide any information on ERCs.

The District of Columbia and Virginia do not have a formal banking and trading program. They used growth rates of 1 for those SCCs in the point source emissions inventory that showed a negative growth. In addition, for units that have or are projected to have shut down, they preserved the 2007 emissions in the inventory to account for potential use as offsets or credits.

3.3.3 NonEGU Control Factors

Control factors were developed for both on-the-books regulations and proposed regulations and other actions to estimate emission reductions in future years. Control factors were considered for the following national or regional control measures:

- Federal Rules Affecting NonEGU Point Sources
- OTC 2001 Model Rules
- OTC 2006 Model Rules
- MANE-VU Sulfur in Fuel Oil Strategy

These control programs are discussed in the following subsections.

3.3.3.1 Federal Actions Affecting NonEGU Point Sources

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform (USEPA 2010a). These categories, and how they were accounted for in the MANE-VU+VA emission projection inventories, are described below:

- MACT Standards - USEPA developed guidance for estimating VOC and NO_x emission changes from MACT Rules (USEPA 2007b). We reviewed the guidance to identify nonEGU source controls associated with MACT standards for controlling HAPs. The information concerning MACT compliance periods was used to determine whether the MACT standard resulted in post-2007 emission reductions. Because major source categories had a compliance period of 2007 or earlier, we assumed that the emission reductions from the MACT standard should be reflected in the baseline year and not as an additional post- 2007 credit. The only exception to the above discussion of area source MACT standards pertains to the recently promulgated rules for reciprocating internal combustion engines. USEPA made available an estimate of the percent reduction in emissions attributable to the RICE MACT rule in 2012 and 2014 (USEPA 2010b). These reductions by SCC are shown in Exhibit 3.3. The USEPA 2014 estimates were used for the MANE-VU+VA 2017, 2020 and 2025 inventories.

- Industrial, Commercial, and Institutional Boilers and Process Heaters MACT Standard - USEPA’ s 2020 control factor file identified a number of solid fuel-burning SCCs for which they estimated an 87% reduction in both PM10 and PM2.5. These were used for 2025 also for the affected SCCs.

- Petroleum refinery enforcement settlements - For the facilities identified by USEPA located in New Jersey and Pennsylvania we applied post-2007 estimated reductions for NO_x, PM10, PM2.5, and SO_2 to affected units.

Exhibit 3.3 USEPA Estimated Percent Reductions for RICE MACT Standard

SCC	NOx	PM2.5	SCC Description
20100102		15.14	Electric Generation;Distillate Oil (Diesel);Reciprocating
20100105		15.14	Electric Generation;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby
20100107		15.14	Electric Generation;Distillate Oil (Diesel);Reciprocating: Exhaust
20100202	12.53		Electric Generation;Natural Gas;Reciprocating
20100207	12.53		Electric Generation;Natural Gas;Reciprocating: Exhaust
20200102		15.14	Industrial;Distillate Oil (Diesel);Reciprocating
20200104		15.14	Industrial;Distillate Oil (Diesel);Reciprocating: Cogeneration
20200107		15.14	Industrial;Distillate Oil (Diesel);Reciprocating: Exhaust
20200202	12.53		Industrial;Natural Gas;Reciprocating
20200204	12.53		Industrial;Natural Gas;Reciprocating: Cogeneration
20200207	12.53		Industrial;Natural Gas;Reciprocating: Exhaust
20200253	37.96		Industrial;Natural Gas;4-cycle Rich Burn
20200301	37.96		Industrial;Gasoline;Reciprocating
20200307	37.96		Industrial;Gasoline;Reciprocating: Exhaust
20201001	12.53		Industrial;Liquified Petroleum Gas (LPG);Propane
20201002	12.53		Industrial;Liquified Petroleum Gas (LPG);Butane
20201702	37.96		Industrial;Gasoline;Reciprocating Engine
20201707	37.96		Industrial;Gasoline;Reciprocating: Exhaust
20300101		15.14	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating
20300105		15.14	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby
20300106		15.14	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Evaporative Losses
20300107		15.14	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Exhaust
20300201	12.53		Commercial/Institutional;Natural Gas;Reciprocating
20300204	12.53		Commercial/Institutional;Natural Gas;Cogeneration
20300207	12.53		Commercial/Institutional;Natural Gas;Reciprocating: Exhaust
20300301	37.96		Commercial/Institutional;Gasoline;Reciprocating
20300307	37.96		Commercial/Institutional;Gasoline;Reciprocating: Exhaust
20301001	12.53		Commercial/Institutional;Liquified Petroleum Gas (LPG);Propane
20301002	12.53		Commercial/Institutional;Liquified Petroleum Gas (LPG);Butane
20400401	37.96		Engine Testing;Reciprocating Engine;Gasoline

SCC	NOx	PM2.5	SCC Description
20400402		15.14	Engine Testing;Reciprocating Engine;Diesel/Kerosene
20400403		15.14	Engine Testing;Reciprocating Engine;Distillate Oil: CI: CI: VOC 2005cr = 0
31000203	12.53		Oil and Gas Production;Natural Gas Production;Compressors
50100421	12.53		Solid Waste Disposal;Landfill Dump;Waste Gas Recovery: Internal Combustion Device

3.3.3.2 OTC 2001 Model Rules for NonEGUs

The OTC developed NO_x control measures for industrial, commercial, and institutional (ICI) boilers and distributed generation units in 2001 (OTC 2001). We reviewed the OTC's status reports to identify states status in adopting the OTC 2001 model rules (OTC 2009a). Most states have adopted the OTC model rules with compliance dates in 2007 or earlier. As a result, we assumed that the emission reductions from the 2001 OTC model rules for nonEGUs are already reflected in the 2007 inventory and no post- 2007 reductions were applied.

3.3.3.3 OTC 2006 Model Rules for NonEGUs

In 2006, the OTC introduced model rules (OTC 2007) for one nonEGU VOC source category (adhesives/sealants) and new/more stringent requirements for several NO_x source categories (asphalt production plants, cement kilns, glass/fiberglass furnaces, and industrial, commercial, and institutional {ICI} boilers). We reviewed the OTC's status reports to identify where state status in adopting the OTC 2006 model rules (OTC 2009b). To obtain further clarification of each state's status, states were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the OTC model rule, whether credit for each rule was already accounted for in the 2007 inventory, and whether the estimated reduction in emissions should be applied in 2013, 2017, 2020 and 2025. The following paragraphs describe the control factors applied for each rule by state and future year.

3.3.3.3.1 OTC 2006 Model Rule for Asphalt Production Plants

The OTC recommended that member states pursue state-specific rulemakings or other implementation methods that would achieve a 35 percent reduction in NO_x emissions. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC model rule and whether the estimated reduction in NO_x emissions should be applied in 2013, 2017, 2020 and 2025. Only New Jersey indicated that the reductions should be applied. New York did not provide guidance, and it was assumed that the NO_x reductions should be applied in New York for three future years. All other states indicated that the NO_x reductions should not be applied in the future years. For those states that indicated they wanted to include the reductions, a 35 percent reduction in NO_x emissions was applied for SCC 3-05-002-xx.

3.3.3.3.2 OTC 2006 Model Rule for Cement Manufacturing Plants

Cement kilns are located in Maryland, New York, and Pennsylvania. Virginia has one cement kiln, which is not located in a PM nonattainment county. The OTC recommended state-specific rulemakings or other implementation methods that would result in about a 60 percent reduction in uncontrolled levels NO_x emissions. This emission reduction for cement kilns was calculated using the methodology previously developed and documented in the OTC report (OTC 2007). Cement kilns are already subject to NO_x controls as part of Phase I of the NO_x SIP call. Emission reductions resulting from the NO_x SIP call are already accounted for in the 2007 inventory.

The following methods were used to calculate the additional reductions from the OTC 2006 Control Measure in each state:

- Maryland indicated controls will become effective in 2011 for the two facilities in the state. Maryland specified a 25 percent reduction for the Holcim facility and a 40 percent reduction for the Lehigh facility. No reductions were specified for the two kilns at the Essroc facility.
- New York did not provide guidance regarding cement kilns. We used the percent reductions previously developed and documented in the previous round of emission projections developed for MARAMA (MARAMA 2007). An incremental control efficiency of 40 percent was used for New York cement kilns in that inventory.
- Pennsylvania provided kiln-specific projected future year NO_x emissions for 2013, 2017, and 2020. The 2020 controlled emissions were also used for 2025. A kiln-specific control factor was calculated based on the ratio of the future year emissions to the 2007 emissions.

3.3.3.3.3 OTC 2006 Model Rule for Glass and Fiberglass Furnaces

The OTC recommended state-specific rulemakings or other implementation methods to achieve an approximately 85 percent reduction in NO_x emissions from uncontrolled levels. Emission reductions for glass and fiberglass furnaces were calculated using the methodology previously developed and documented in the OTC report (OTC 2007). Glass and fiberglass furnaces are located in Maryland, New Jersey, New York, and Pennsylvania. There are no other States with facilities in a PM nonattainment county.

The following methods were used to calculate the additional reductions from the OTC 2006 Control Measure in each state:

- Maryland indicated that a 48 percent reduction should be applied to the single glass manufacturing facility in Maryland.
- New Jersey indicated that a 50 percent reduction in NO_x emissions should be applied to glass and fiberglass furnaces in 2013, 2017, 2020 and 2025.
- New York did not provide guidance regarding glass or fiberglass furnaces. We used the percent reductions developed and documented in the previous round of emission projections developed for MARAMA (MARAMA 2007). An incremental control efficiency of 70 percent was used for New York glass and fiberglass furnaces in that inventory.
- Pennsylvania provided furnace-specific projected future year NO_x emissions for 2017 and 2020 for all facilities, including those in Allegheny County. The 2020 controlled emissions were also used for 2025. A furnace-specific control factor was calculated based on the ratio of the future year emissions to the 2007 emissions.
- For the three glass manufacturing facilities in Allegheny County, we used the percent reductions previously developed and documented in the previous round of emission projections developed for MARAMA (MARAMA 2007). An incremental control efficiency of 86 percent was used for Allegheny County glass and fiberglass furnaces in that inventory.

3.3.3.3.4 OTC 2006 Model Rule for ICI Boilers

The OTC recommended that member states pursue state-specific rulemakings or other implementation methods to achieve NO_x emission reduction for industrial, commercial, and institutional (ICI) boilers based on guidelines that varied by boiler size and fuel type. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in NO_x emissions should be applied in 2013, 2017, 2020, and 2025.

Most states have not adopted rules equivalent to the 2006 OTC recommendations. These states indicated that they will likely depend on a USEPA national rule for possible inclusion in the BOTW inventory. Specifically, the OTC Resolution 10-01 (June, 2010) called on USEPA for national regulations for ICI boilers.

New Jersey provided NO_x percent reductions that varied by heat input rate and fuel/boiler type and included an 80 percent rule effectiveness adjustment, as shown in Exhibit 3.4.

Exhibit 3.4 NonEGU Point Source Emission Reductions from New Jersey ICI Boiler NO_x Rules

Heat Input Rate (mmBtu/hr)	Fuel/Boiler Type	Overall % Reduction 2007-2025
at least 5 but < 10	All	20%
at least 10 but < 20	All	20%
at least 25 but < 50	Natural gas only	40%
	No. 2 Fuel oil only	40%
	Refinery fuel gas and other gaseous fuels	40%
	Other liquid fuels	40%
	Duel Fuel using fuel oil and/or natural gas	40%
at least 50 but < 100	Natural gas only	40%
	No. 2 Fuel oil only	27%
	Other liquid fuels	27%
	Duel Fuel using fuel oil and/or natural gas	40%
at least 100 or greater	No. 2 Fuel oil only	40%

The NIF file submitted by New Jersey for this project did not include the boiler design capacity. This data gap was filled using the boiler design capacities previously developed for the OTC study in 2006, if available; otherwise the SCC description was used to assign a default boiler design capacity.

New York specified that a 50 percent reduction should be applied in the existing controls inventory for all boilers with greater than 25 mmBtu/hour design capacity. The NIF file submitted by New York for this project did not include the boiler design capacity. This data gap was filled using the boiler design capacities previously developed for the OTC study in 2006, if available; otherwise the SCC description was used to assign a default boiler design capacity.

3.3.3.4 MANE-VU Fuel Oil Sulfur Strategy

MANE-VU developed a low sulfur fuel oil strategy to help states develop Regional Haze SIPs (MANE-VU 2007). The sulfur in fuel oil recommendations were previously shown in Section 2.3.2.5 and vary by state, fuel oil type, and implementation year.

3.3.3.5 State-specific NonEGU Control Factors

The following state-specific nonEGU control factors were provided:

- **Bellefield Boiler Plant, Allegheny County.** Allegheny County indicated that this facility changed their fuel source from coal to natural gas in July 2009 and future year emissions were changed to reflect the fuel switch.
- **USS Clairton Works**, **Allegheny County.** The facility will remove Batteries 7-9 and have Battery C operational by 2013, resulting in a change in PM emissions in 2013. Also, USS Clairton Works will remove Batteries 1-3 and have Battery D operational in 2015, resulting in a change in PM emissions in 2017, 2020 and 2025.
- **Chrysler, Delaware.** The Chrysler facility (ID 1000300128) shut down in 2009. Delaware specified that only a 25 percent reduction should be taken for all pollutants as some emissions will be banked for future use by other sources.
- **OSG Ship Management (ID 1000500093), Delaware.** Delaware provided source-specific growth factors and percent reductions in VOC emissions for 2013, 2017, and 2020 from the lightering operations at OSG Ship Management (ID 1000500093). The 2025 emissions were expected to be the same as the 2020 emissions.
- **Control Technology Guidance (CTG) Documents, Delaware.** Delaware determined that VOC emission reductions from new CTG recommendations would be very small. Although the new CTGs set up new recommendations for higher control efficiencies, the actual VOC reductions would be minimum, if not none, because most DE's existing facilities are not affected by the new requirements and emissions from those facilities are relatively small (based on 2002 inventory).
- **Unit Shutdowns, Delaware.** Delaware identified several emission units that have shut down at the following facilities: Dow Reichhold Specialty latex (ID 1000100016), SPI Poly-Ols (ID 1000300426), and Invistas (ID 1000500002). Emissions for all pollutants were set to zero for these units.
- **Premcor Refinery** NO_x **Plantwide Cap, Delaware.** The refinery was sold to the Delaware City Refining Company and an agreement was reached with DNREC's Secretary that allows plant-wide applicability limit (cap) for NO_x. Delaware decided to devide the NO_x -cap to each stack equally. Delaware estimated a plantwide reduction of 10.05 percent in 2013 and 41.22 percent in 2017, 2020 and 2025.
- **PEPCO Benning Road, District of Columbia.** This facility is scheduled for deactivation in 2012. All emissions were set to zero in the projection inventories.

- **2009 New Jersey Rule for NO_x for Municipal Solid Waste Incinerators.** This rule will achieve a 27 percent reduction from one facility - Camden County Energy Recovery Associates, L.P. (ID 3400751614).

- **New Jersey Rule for VOC Storage Tanks.** New Jersey provided expected VOC emission reductions resulting from post-2007 rules for VOC storage tanks. For refinery floating roof storage tanks (SCC 4-03-011-xx), the reductions are 75 percent for 2013, 82 percent for 2017, and 85 percent for 2020. For bulk terminal tanks (SCC 4-04-001-xx), the reductions are 20 percent for 2013, 40 percent for 2017, and 50 percent for 2020. For pipeline breakout stations (SCCs 4-04-002-xx and 4-06-005-xx), the reductions are 26 percent for 2013, 52 percent for 2017, and 65 percent for 2020 and 2025.

3.4 2025 EGU INVENTORY DEVELOPMENT

An emission projection methodology for EGUs is being developed as part of an inter-RPO coordination effort under the direction of ERTAC. The computer code to implement the ERTAC methodology will not be available in time for use in state's re-designation requests or maintenance plans. An interim approach for projecting EGU emissions is discussed in the following paragraph.

Annual 2007 EGU point emissions were grown to 2025 based on electricity generation projections that are delineated by region and fuel. Growth factors are based on AEO2011 Table 96 - Electricity Generation by Electricity Market Module Region and Fuel Source (see Appendix F). The 2007 emissions were extracted for those units flagged as EGUs in the MANE-VU+VA 2007 inventory. The appropriate AEO2011 growth factor was applied to the 2007 emissions to calculate a "growth only" emission value for 2025. The following key assumptions were made:

- Growth beyond unit capacity or permit limits was not considered (e.g., fuel consumption was allowed to grow beyond a unit's physical capacity or permit limit);

- Generation from specific new units that are anticipated to operate in 2025 but did not in 2007 is not explicitly accounted for, but instead is assumed to be accounted for in the AEO2011 growth forecasts;

- Similarly, generation from specific units that have or are anticipated to shut down after 2007 is not explicitly accounted for, but instead are assumed to be accounted for in the AEO2011 growth forecasts.

- States indicated where post-2007 controls or shut downs were to be applied on a unit by unit basis. The control factors were applied to the grown emissions to calculate a "growth and control" emission value for 2025.

Details on the growth and control factors are provided in the following sections.

3.4.1 EGU Growth Factors

Table 96 of the AEO2011 provides electricity generation projections by electricity market module region and fuel source for the years 2007 to 2035 (EIA 2011b). AEO2011 disaggregates generation to 22 sub-regions for electricity planning and dispatch This is a new approach started in AEO2011. Disaggregation of the Electricity Market Module (EMM) is intended to reduce errors that result from aggregation and averaging, to better represent environmental and regional issues, and thus to improve the projections of capacity additions and fuels consumed for generation. Exhibit 4.1 identifies the 22 sub-regions.

1.	ERCT	ERCOT All	12.	SRDA	SERC Delta
2.	FRCC	FRCC All	13.	SRGW	SERC Gateway
3.	MROE	MRO East	14.	SRSE	SERC Southeastern
4.	MROW	MRO West	15.	SRCE	SERC Central
5.	NEWE	NPCC New England	16.	SRVC	SERC VACAR
6.	NYCW	NPCC NYC/Westchester	17.	SPNO	SPP North
7.	NYLI	NPCC Long Island	18.	SPSO	SPP South
8.	NYUP	NPCC Upstate NY	19.	AZNM	WECC Southwest
9.	RFCE	RFC East	20.	CAMX	WECC California
10.	RFCM	RFC Michigan	21.	NWPP	WECC Northwest
11.	RFCW	RFC West	22.	RMPA	WECC Rockies

Exhibit 3.5 Electricity Market Module Regions

The EIA provided a file that assigns each EGU to an EMM region. Units in the PM nonattainment counties included in this analysis reside in one of the following seven EMM regions:

- Northeast Power Coordinating Council / Northeast (NEWE)
- Northeast Power Coordinating Council / NYC Westchester (NYCW)
- Northeast Power Coordinating Council / Long Island (NYLI)
- Northeast Power Coordinating Council / Upstate New York (NYUP)
- Reliability First Corporation / East (RFCE)
- Reliability First Corporation / West (RFCW)
- SERC Reliability Corporation / Virginia Carolina (SRVC)

Exhibit 3.6 shows the growth factors for electricity generation for coal. The AEO2011 shows zero generation from coal in the NYC Westchester and Long Island regions. Generation from coal is projected to decline significantly in the Northeast and Upstate New York regions. Generation from coal is expected to decline slightly in the RFC East, RFC West, and SERC Virginia-Carolina regions.

Exhibit 3.7 shows the growth factors for electricity generation for petroleum. The AEO2011 shows that the growth factors vary widely by EMM region. A positive growth rate (e.g., growth factor > 1) from 2007 to 2025 is projected for the RFC East and SERC Virginia-Carolina regions. In all other EMM regions in the study area, generation from petroleum is projected to decline (e.g., growth factor < 1).

Exhibit 3.8 shows the growth factors for electricity generation for natural gas. The AEO2011 shows that the growth factors vary widely by EMM region. A negative growth rate (e.g., growth factor < 1) from 2007 to 2025 is projected for the NYC Westchester and SERC Virginia-Carolina regions. In all other EMM regions in the study area, generation from natural gas is projected to increase (e.g., growth factor > 1).

Exhibit 3.9 shows the growth factors for electricity generation for renewables. The AEO2011 shows that the growth factors vary widely by EMM region. A large increase in generation from renewables from 2007 to 2025 is projected for the RFC East, RFC West and SERC Virginia-Carolina regions. A more modest increase in renewable is projected for the Northeast and Upstate New York regions. A slight decline is projected for the NYC Westchester and Long Island regions.

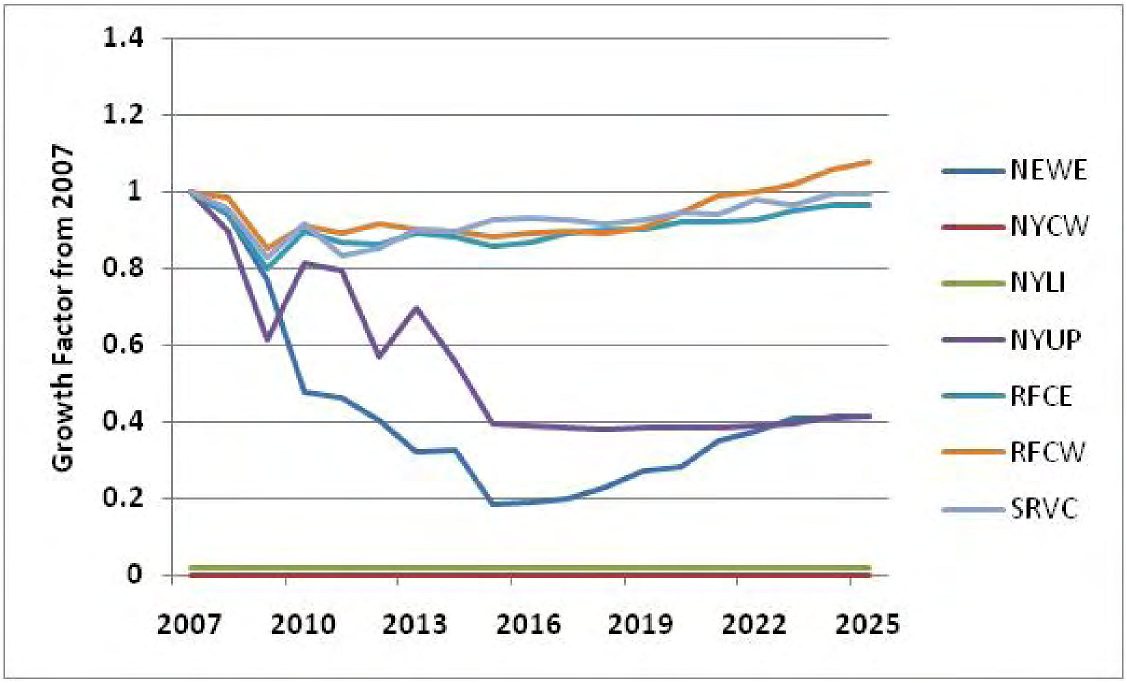


Exhibit 3.6 Electricity Generation Growth Factors for Coal

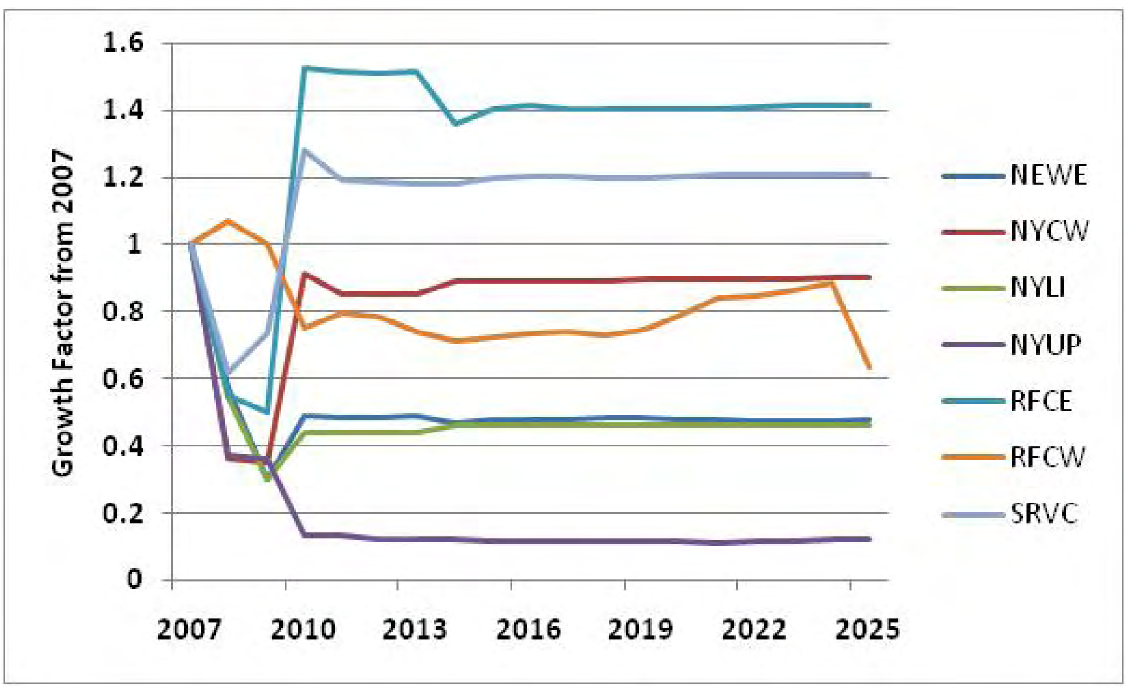


Exhibit 3.7 Electricity Generation Growth Factors for Petroleum

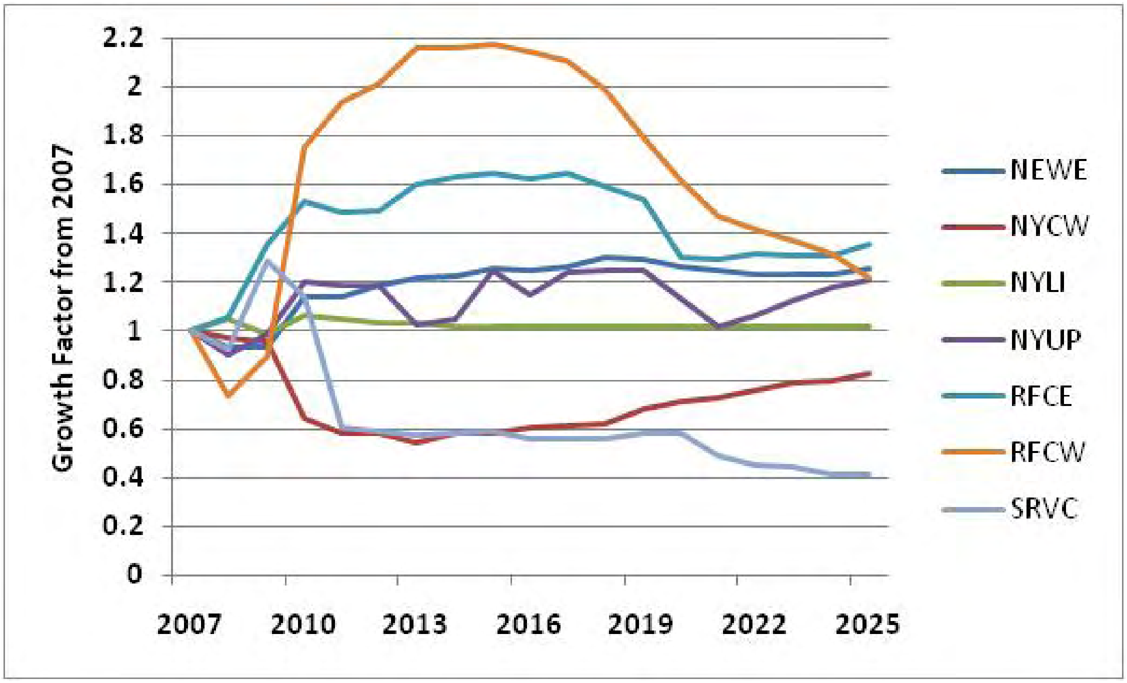


Exhibit 3.8 Electricity Generation Growth Factors for Natural Gas

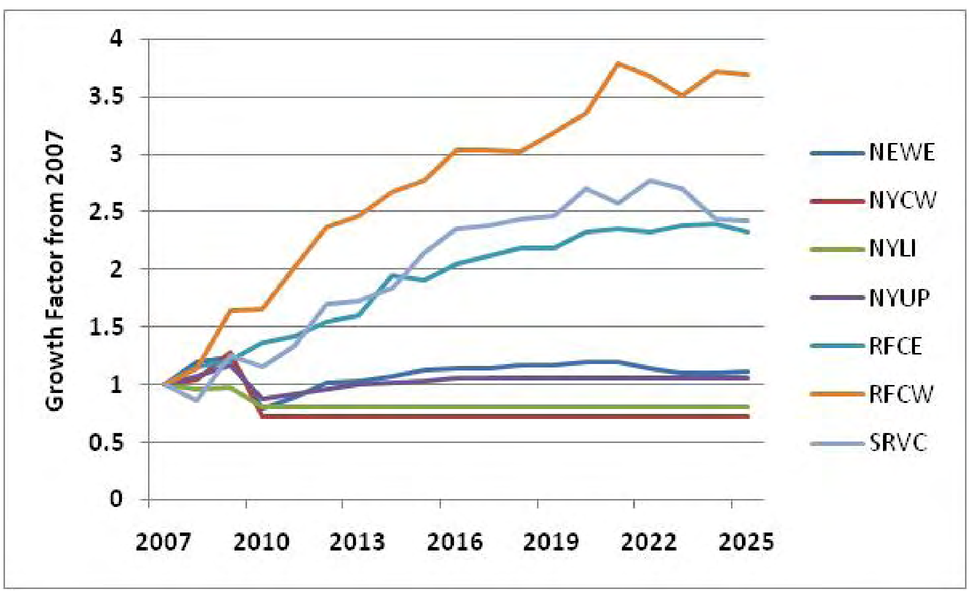


Exhibit 3.9 Electricity Generation Growth Factors for Renewables

After reviewing the AEO growth factors, New York had doubts about the AEO projections. To be conservative, New York specified that a growth factor of 1.0 should be used for any unit where AEO growth was projected to be negative.

3.4.2 EGU Control Factors

States provided information on post-2007 controls or shut downs to be applied on a unit by unit basis for the 2025 inventory. This control information was provided in a format that is being used by the ERTAC EGU Projection Methodology (Appendix G UAF NEEDS Control FileMASTER92211.xls).

In addition to the ERTAC control file, the following comments were received:

- Delaware – The Edge Moor facility (ORIS=593) plans to switch from coal to natural gas/# 6 oil. However, the Title V permit is not yet approved. Delaware made the decision to assume the facility still is burning coal in 2025 for the purposes of this PM re-designation inventory. Delaware may change the EGU estimates at a future date when the SIP submittal is written.

- District of Columbia – The PEPCO Benning Road facility (ORIS=603) is scheduled to shut down permanently in 2012 and all future year emissions have been set to zero.

- Maryland – The Healthy Air Act sets unit-specific emission caps (tons/year) for SO_2 and NO_x. Maryland provided unit specific control factors to ensure that the future year emissions were equal to the Healthy Air Act emission caps. Affected facilities include CP Crane, Herbert A Wagner, R. Paul Smith, Chalk Point, Dickerson, Morgantown, and Brandon Shores.

- New Jersey – Control factors for SO_2 and NO_x for each unit were calculated based on the ratio of the future controlled emission rate (lbs/mmBtu) to the 2007 actual emission rate (lbs/mmBtu). Large reductions in SO_2 emissions are expected from the installation of control equipment at the Hudson and Mercer generating stations. NO_x controls were also installed at the Hudson generating station in 2010.

- Pennsylvania – RRI's Portland Generating Station is under a USEPA Order to reduce SO_2 emissions. SO_2emissions beyond 013 were reduced by 95 percent to address the ordered emission reductions. SO_2 controls were installed at RRI Keystone, PPL Brunner Island, and Allegheny Energy Hatfields Ferry in 2010. SO_2 controls at the Cheswick Station were installed in 2011. Units 1 and 2 at PPL Martins Creek, Units 1 and 2 at Exelon Cromby, and Units 1 and 2 at Exelon

Eddystone are or will be permanently shut down by 2013 and the emissions for all pollutants were set to zero for 2017/2020/2025. The future operation of Unit 1 at Exelon Schuylkill are projected to be about 250 hours, compared to 1,037 hours in 2007. Future emissions for this unit were reduced by 75 percent to reflect this lowered operating capacity.

- Virginia – Dry scrubbers at the Potomac River Generating Station were installed in 2008. In 2008, the facility received a federally enforceable facility-wide permit that placed limits on the facility's annual potential to emit of both NO_X and SO_2.

3.4.3 Consideration of CSAPR Emission Allowances

On July 6, 2011, the USEPS finalized the Cross-State Air Pollution Rule (CSAPR) that requires 27 states to reduce power plant emissions that contribute to ozone and/or fine particle pollution in other states. This final rule replaces the 2005 Clean Air Interstate Rule (CAIR). Under the final rule, USEPA distributes a annual SO2 and NOx emission allowances to covered units in each state, the sum of which equals the annual SO2 and NOx budgets for those states (allowing for a two percent set-aside for new units).

USEPA provided allocations for each affected unit. States initially considered whether these unit-level allocations for SO2 and NOx provided a more realistic estimate of future year emissions than the growth and control methodology described in Sections 4.3.1 and 4.3.2 of this report. However, the United States Court of Appeals for the District of Columbia issued an order staying CSAPR on December 31, 2011, pending the resolution of an appeal of the rule. Because of the uncertainty regarding implementation of CSAPR, states decided to use the growth and control methodology described in Sections 4.3.1 and 4.3.2 rather than the proposed CSAPR caps for SO2 and NOx.

4.0 NONROAD MOBILE SOURCES INCLUDED IN NMIM

4.1 NONROAD MODEL CATEGORIES

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 (CNG) or liquefied petroleum gas (LPG) engines.

NMIM was developed by USEPA to develop county-level emission estimates for certain types of nonroad equipment. NMIM uses the current version the NONROAD model to develop emission estimates and was used to develop the projection inventories discussed here. 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.

4.2 2007 INVENTORY DEVELOPMENT

MARAMA used the NMIM model to develop county level emission estimates by SCC for 2007 (see {MARAMA 2011a} for complete documentation). For this analysis, the NMIM2008 software (version NMIM20090504), the NMIM County Database (version NCD20090531), and NONROAD2008a (July 2009 version) were used as starting points (USEPA 2009a). Changes were made to the NCD20090531 based on state review and comment.

A summary of the major adjustments to the default NMIM County Database for the 2007 NMIM model runs includes:

- State review and adjustments to fuel characteristics (Reid Vapor Pressure, sulfur and oxygenate fractions) to better represent county-specific fuel characteristics in 2007; and

- States identified discrepancies in the housing and population data contained in the NONROAD model and these data were updated using 2007 housing information and updated 2007 population estimates.

- The recreational marine vessel populations were revised using population data 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.

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.

4.3 2025 INVENTORY DEVELOPMENT

MARAMA ran the NMIM model for 2025 for six jurisdictions (VA, CT, DE, DC, MD, PA). One state, New York, did their own NONROAD modeling and provided 2025 NMIM results for the affected counties.

4.4 REMOVAL OF AIRPORT GROUND SUPPORT EQUIPMENT

The NMIM/NONROAD model includes emissions from airport ground support equipment. 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 both the 2007 and 2025 inventories to avoid double counting emissions.

4.5 NMIM/NONROAD GROWTH AND CONTROL INFORMATION

In estimating future year emissions, the NMIM/NONROAD model includes growth and scrappage rates for equipment in addition to a variety of control programs. It is not possible to separate out the future year emissions due to "growth only" or "control only" in a single run. That is, the model run provides a single future year estimate that is a "growth and control" scenario.

The growth data used in the NMIM/NONROAD model is documented in a USEPA report (USEPA 2004c). The GROWTH packet of the NONROAD model cross-references each SCC to a growth indicator code. The indicator is an arbitrary code that identifies an actual predicted value such as human population or employment that is used to estimate the future year equipment population. The GROWTH packet also defines the scrappage curves used to estimate the future year model year distribution.

The NMIM/NONROAD model also accounts for all USEPA emission standards for nonroad equipment. There are multiple standards that vary by equipment type, rated power, model year, and pollutant. Exhibit 4.1 is a summary of the emission control programs accounted for in the NMIM/NONROAD model. A complete summary of the nonroad equipment emission standards can be found on USEPA's nonroad emission standards reference guide website (USEPA 2011).

Exhibit 4.1 Control Programs Included in the NMIM/NONROAD Model

Regulation	Description
Control of Air Pollution; Determination of Significance for Nonroad Sources and Emission Standards for New Nonroad Compression Ignition Engines At or Above 37 Kilowatts 59 FR 31036 June 17, 1994	This rule establishes Tier 1 exhaust emission standards for HC, NO_x, CO, and PM for nonroad compression-ignition (CI) engines ≥37kW (≥50hp). Marine engines are not included in this rule. The start dates and pollutants affected vary by hp category as follows: 50-100 hp: Tier 1,1998; NO_x only 100-175 hp: Tier 1, 1997; NO_x only 175-750 hp: Tier 1, 1996; HC, CO, NO_x, PM >750 hp: Tier 1, 2000; HC, CO, NO_x, PM
Emissions for New Nonroad Spark-Ignition Engines At or Below 19 Kilowatts; Final Rule 60 FR 34581 July 3, 1995	This rule establishes Phase 1 exhaust emission standards for HC, N NO_x Ox, and CO for nonroad spark-ignition engines ≤19kW (≤25hp). This rule includes both handheld (HH) and non-hand-held (NHH) engines. The Phase 1 standards become effective in 1997 for : Class I NHH engines (<225cc), Class II NHH engines (≥225cc), Class III HH engines (<20cc), and Class IV HH engines (≥20cc and <50cc). The Phase 1 standards become effective in 1998 for: Class V HH engines (≥50cc)
Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts 61 FR 52088 October 4, 1996	This rule establishes exhaust emission standards for HC+ NO_x for personal watercraft and outboard (PWC/OB) marine SI engines. The standards are phased in from 1998-2006.
Control of Emissions of Air Pollution From Nonroad Diesel Engines 63 FR 56967 October 23, 1998	This final rule sets Tier 1 standards for engines under 50 hp, phasing in from 1999 to 2000. It also phases in more stringent Tier 2 standards for all engine sizes from 2001 to 2006, and yet more stringent Tier 3 standards for engines rated over 50 hp from 2006 to 2008. The Tier 2 standards apply to NMHC+ NO_x, CO, and PM, whereas the Tier 3 standards apply to NMHC+ NO_x and CO. The start dates by hp category and tier are as follows: hp<25: Tier 1,2000; Tier 2, 2005; no Tier 3 25-50 hp: Tier 1, 1999; Tier 2, 2004; no Tier 3 50-100 hp: Tier 2, 2004; Tier 3, 2008 100-175 hp: Tier 2, 2003; Tier 3, 2007 175-300 hp: Tier 2, 2003; Tier 3, 2006 300-600 hp: Tier 2, 2001, Tier 3, 2006 600-750 hp: Tier 2, 2002; Tier 3, 2006 >750 hp: Tier 2, 2006, no Tier 3 This rule does not apply to marine diesel engines above 50 hp.

Regulation	Description
Phase 2: Emission Standards for New Nonroad Nonhandheld Spark Ignition Engines At or Below 19 Kilowatts 64 FR 15207 March 30, 1999	This rule establishes Phase 2 exhaust emission standards for HC+ NO_x for nonroad nonhandheld (NHH) spark-ignition engines ≤19kW (≤25hp). The Phase 2 standards for Class I NHH engines (<225cc) become effective on August 1, 2007 (or August 1, 2003 for any engine initially produced on or after that date). The Phase 2 standards for Class II NHH engines (≥225cc) are phased in from 2001-2005.
Phase 2: Emission Standards for New Nonroad Spark-Ignition Handheld Engines At or Below 19 Kilowatts and Minor Amendments to Emission Requirements Applicable to Small Spark-Ignition Engines and Marine Spark-Ignition Engines; Final Rule 65 FR 24268 April 25, 2000	This rule establishes Phase 2 exhaust emission standards for HC+ NO_x for nonroad handheld (HH) spark-ignition engines ≤19kW (≤25hp). The Phase 2 standards are phased in from 2002-2005 for Class III and Class IV engines and are phased in from 2004-2007 for Class V engines.
Control of Emissions From Nonroad Large Spark-Ignition Engines and Recreational Engines (Marine and Land-Based); Final Rule 67 FR 68241 November 8, 2002	This rule establishes exhaust and evaporative standards for several nonroad categories: 1) Two tiers of emission standards are established for large spark-ignition engines over 19 kW. Tier 1 includes exhaust standards for HC+ NO_x and CO and is phased in from 2004-2006. Tier 2 becomes effective in 2007 and includes exhaust standards for HC+ NO_x and CO, as along with evaporative controls affecting fuel line permeation, diurnal emissions and running loss emissions. 2) Exhaust and evaporative emission standards are established for recreational vehicles, which include snowmobiles, off-highway motorcycles, and all-terrain vehicles (ATVs). For snowmobiles, HC and CO exhaust standards are phased-in from 2006-2012. For off-highway motorcycles, HC+ NO_x and CO exhaust emission standards are phased in from 2006-2007. For ATVs, HC+NO_x and CO exhaust emission standards are phased in from 2006-2007. Evaporative emission standards for fuel tank and hose permeation apply to all recreational vehicles beginning in 2008. 3) Exhaust emission standards for HC+ NO_x, CO, and PM for recreational marine diesel engines over 50 hp begin in 2006-2009, depending on the engine displacement. These are “Tier 2” equivalent standards.
Control of Emissions of Air Pollution From Nonroad Diesel Engines and Fuel; Final Rule (Clean Air Nonroad Diesel Rule – Tier 4) 69 FR 38958 June 29, 2004	This final rule sets Tier 4 exhaust standards for CI engines covering all hp categories (except marine and locomotives), and also regulates nonroad diesel fuel sulfur content. 1) The Tier 4 start dates and pollutants affected vary by hp and tier as follows: hp<25: 2008, PM only 25-50 hp: Tier 4 transitional, 2008, PM only; Tier 4 final, 2013, NMHC+ NO_x and PM

Regulation	Description
	50-75 hp: Tier 4 transitional, 2008; PM only; Tier 4 final, 2013, NMHC+ NO_x and PM 75-175 hp: Tier 4 transitional, 2012, HC, NO_x, and PM; Tier 4 final, 2014, HC, NO_x,PM 175-750 hp:Tier 4 transitional, 2011, HC, NO_x, and PM; Tier 4 final, 2014, HC, NO_x,PM >750 hp: Tier 4 transitional, 2011, HC, NO_x, and PM; Tier 4 final, 2015, HC, NO_x,PM 2) This rule will reduce nonroad diesel fuel sulfur levels in two steps. First, starting in 2007, fuel sulfur levels in nonroad diesel fuel will be limited to a maximum of 500 ppm, the same as for current highway diesel fuel. Second, starting in 2010, fuel sulfur levels in most nonroad diesel fuel will be reduced to 15 ppm.
Control of Emissions From Nonroad Spark-Ignition Engines and Equipment; Final Rule (Bond Rule) 73 FR 59034 October 8, 2008	This rule establishes exhaust and evaporative standards for small SI engines and marine SI engines: 1) Phase 3 HC+ NO_x exhaust emission standards are established for Class I NHH engines starting in 2012 and for Class II NHH engines starting in 2011. There are no new exhaust emission standards for handheld engines. New evaporative standards are adopted for both handheld and nonhandheld equipment. The new evaporative standards control fuel tank permeation, fuel hose permeation, and diffusion losses. The evaporative standards begin in 2012 for Class I NHH engines and 2011 for Class II NHH engines. For handheld engines, the evaporative standards are phased-in from 2012-2016. 2) More stringent HC+ NO_x and CO standards are established for marine SI PWC/OB engines beginning in 2010. In addition, new exhaust HC+ NO_x and CO standards are established for sterndrive and inboard (SD/I) marine SI engines also beginning in 2010. High performance SD/I engines are subject to separate HC+ NO_x and CO exhaust standards that are phased-in from 2010-2011. New evaporative standards were also adopted for all marine SI engines that control fuel hose permeation, diurnal emissions, and fuel tank permeation emissions. The hose permeation, diurnal, and tank permeation standards take effect in 2009, 2010, and 2011, respectively.

Source: USEPA 2010c

5.0 MARINE VESSELS, AIRPORTS, AND RAILROADS

5.1 MAR INVENTORY CATEGORIES

This category of sources is collectively referred to as the MAR (marine, airports, railroads) sector. It includes nonroad engines associated with the following activities:

- **Marine Vessels** - The Commercial Marine Vehicle (CMV) sector includes all boats and ships used either directly or indirectly in the conduct of commerce or military activity. The majority of these vessels are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of this inventory it is assumed that Category 3 vessels primarily use residual blends, while Category 1 and 2 vessels typically used distillate fuels.

- **Airports** - The aircraft sector includes all aircraft types used for public, private, and military purposes. This includes four types of aircraft 1) Commercial; 2) Air Taxis; 3) General Aviation; and 4) Military. Ground support equipment (GSE) and auxiliary power units (APU) are also included.

- **Railroads** - The railroad sector includes railroad locomotives powered by diesel-electric engines. Locomotives are divided into Class I line haul, Class II/III line haul, commuter/passenger and Class I yard.

5.2 2007 INVENTORY DEVELOPMENT

The emission projections for the 2025 point source were based on Version 3_3 of the 2007 MANE-VU+VA inventory and are fully documented in the TSD for that effort (MARAMA 2012a). There were no adjustment to the 2007 Version 3_3 MAR inventory for this analysis.

5.3 2025 INVENTORY DEVELOPMENT

Appendix H contains the data that were used to develop growth and control factors for the commercial marine vessel, airport, and railroad sectors.

5.3.1 Commercial Marine Vessels

For the purpose of emission calculations, marine vessel engines are divided into three categories based on displacement (swept volume) per cylinder. Category 1 and Category 2 marine diesel engines typically range in size from about 500 to 8,000 kW (700 to 11,000 hp). These engines are used to provide propulsion power on many kinds of vessels including tugboats, pushboats, supply vessels, fishing vessels, and other commercial vessels in and around ports. They are also used as stand-alone generators for auxiliary electrical power on vessels. Category 3 marine diesel engines typically range in size from 2,500 to 70,000 kW (3,000 to 100,000 hp). These are very large marine diesel engines used for propulsion power on ocean-going vessels such as container ships, oil tankers, bulk carriers, and cruise ships.

The majority of marine vessels are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of emission inventories, USEPA has assumed that Category 3 vessels primarily use residual blends, while Category 1 and 2 vessels typically use distillate fuels.

USEPA developed national emission inventories for Category 1 and 2 vessels and Category 3 vessels for calendar years 2002 through 2040 as part of its effort to develop emission standards for these vessels. The methodologies used to develop the emission projections (for both a baseline and controlled scenario) are documented in three regulatory impact assessments (USEPA 2008b, USEPA 2009c, USEPA 2009d). The USEPA data and methodologies from these RIAs were used to develop separate growth and control factors for Category 1 and 2 vessels (diesel) and Category 3 vessels (residual).

5.3.1.1 CMV Diesel Growth Factors

For Category 1 and 2 diesel vessels, USEPA used projection data for domestic shipping from the AEO2006 (EIA 2006). The annual growth rate reported in the RIA is 0.9%. More recent growth data for domestic shipping is available in the AEO2010 (EIA 2010). Because Category 1 and 2 vessels primarily account for activity data for ships that carry domestic cargo, we decided to use the recent growth data for domestic shipping available in the AEO2010. We used Table A-7 of the AEO2010 for domestic shipping to calculate the growth factor for 2007-2025 to be 1.064. This growth factor was used for CMV diesel port emissions (SCC 22-80-002-100) and CMV diesel underway emissions (SCC 22-80-002-200).

5.3.1.2 CMV Diesel Control Factors

In developing their emission projections, USEPA developed two scenarios that accounted for both the 2004 nonroad diesel rule and the 2008 diesel marine vessel rule:

- USEPA's baseline (pre-control) inventory accounted for:
    1. the 0.9 percent annual growth in fuel use based on AEO2006,
    2. the impact of existing engine regulations that took effect in 2008,
    3. the 2004 Clean Air Nonroad Diesel Rule that will decrease the allowable levels of sulfur in fuel beginning in 2012, and
    4. fleet turnover.

- USEPA's controlled inventory accounted for:

    1. the 0.9 percent annual growth in fuel use based on AEO2006;
    2. the reductions included in the baseline inventory, and the reductions from USEPA's 2008 rule Final Locomotive-Marine rule for Tier 3 and 4 engines;
    3. The 2008 final rule that includes the first-ever national emission standards for existing marine diesel engines, applying to engines larger than 600kW when they are remanufactured. The rule also sets Tier 3 emissions standards for newly-built engines that are phasing in from 2009. Finally, the rule establishes Tier 4 standards for newly-built commercial marine diesel engines above 600kW, phasing in beginning in 2014.

To calculate a control factor that accounts for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 0.9 percent annual growth rate to the 2007 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions. Exhibit 5.1 shows the control factors for 2013, 2017, 2020, and 2025 for diesel commercial marine vessels.

Exhibit 5.1 CMV Diesel Control Factors by Year and Pollutant

Year	NOx	PM2.5	SO2
2013	0.787	0.747	0.464
2017	0.642	0.550	0.076
2020	0.537	0.460	0.032
2025	0.401	0.353	0.031

5.3.1.3 CMV Residual Oil Growth Factors

For Category 3 residual oil vessels, data from a USEPA-sponsored study was used to develop an annualized growth factor of 4.5 percent for the region. A few states considered the growth rate to be extremely high and not reflective of recent economic conditions. Because USEPA's Category 3 vessel inventory is primarily based on activity data for ships that carry foreign cargo, we decided to use the recent growth data for international shipping available in the AEO2010. We used data from Table A-7 of the AEO2010 for international shipping to calculate the growth factor for 2007-2025 to be 0.956. These growth factors were used for CMV residual oil port emissions (SCC 22-80-003-100) and CMV residual oil underway emissions (SCC 22-80-003-200).

5.3.1.4 CMV Residual Oil Control Factors

On December 22, 2009, USEPA announced final emission standards under the Clean Air Act for new marine diesel engines with per-cylinder displacement at or above 30 liters (called Category 3 marine diesel engines) installed on U.S.-flagged vessels. The final engine standards are equivalent to those adopted in the amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (a treaty called "MARPOL"). The emission standards apply in two stages: near-term standards for newly-built engines will apply beginning in 2011, and long-term standards requiring an 80 percent reduction in NO_x will begin in 2016. USEPA also adopted changes to the diesel fuel program to allow for the production and sale of diesel fuel with no more than 1,000 ppm sulfur for use in Category 3 marine vessels. The regulations generally forbid production and sale of fuels with more than 1,000 ppm sulfur for use in most U.S. waters, unless operators achieve equivalent emission reductions in other ways.

On March 26, 2010, the International Maritime Organization (IMO) officially designated waters off North American coasts as an emissions control area (ECA) in which stringent international emission standards will apply to ships. In practice, implementation of the ECA means that ships entering the designated area would need to use compliant fuel for the duration of their voyage that is within that area, including time in port and voyages whose routes pass through the area without calling on a port. The North American ECA includes waters adjacent the Atlantic extending up to 200 nautical miles from east coast of the US. The quality of fuel that complies with the ECA standard will change over time. From the effective date in 2012 until 2015, fuel used by vessels operating in designated areas cannot exceed 1.0 percent sulfur (10,000 ppm). Beginning in 2015, fuel used by vessels operating in these areas cannot exceed 0.1 percent sulfur (1000 ppm). Beginning in 2016, NO_x after treatment requirements become applicable.

To calculate a control factor that accounted for reductions included in the USEPA controlled inventory, it was necessary to first calculate a “growth only” scenario applying USEPA’s 4.5 percent annual growth rate to the 2007 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year “growth only” emissions.

Exhibit 5.2 shows the control factors for 2013, 2017, and 2020 for residual oil commercial marine vessels.

Exhibit 5.2 CMV Residual Oil Control Factors by Year and Pollutant

Year	NOx	PM2.5	SO2
2013	0.736	0.353	0.270
2017	0.654	0.216	0.120
2020	0.597	0.137	0.036
2025	0.480	0.137	0.036

5.3.1.5 Military Vessels Growth and Control Factors

Virginia reported emissions for military vessels, but did not distinguish between diesel or residual fuels. An assumption of “no growth” for military vessel activity and emissions in Virginia was made so that emissions remain at 2007 levels in 2025. Virginia was the only state to report emission from military vessels.

5.3.1.6 State-specific CMV Updates for 2025

New Jersey provided updated CMV emission estimates for 2007, 2013, 2017, 2020, and 2025, and growth and control factors for 2013, 2017, 2020, and 2025. These data were used to replace the emission estimates previously used for the 2007 MANE-VU+VA base year inventory and the MANE-VU+VA future year inventories.

5.3.2 Airports

Aircraft emissions in the 2007 MANE-VU+VA inventory are available on either a county-by-county or airport-by-airport basis for six types of aircraft operations:

- Air carrier operations represent landings and take-offs (LTOs) of commercial aircraft with seating capacity of more than 60 seats;
- Commuter/air taxi operations are one category. Commuter operations include LTOs by aircraft with 60 or fewer seats that transport regional passengers on scheduled commercial flights. Air taxi operations include LTOs by aircraft with 60 or fewer seats conducted on non-scheduled or for-hire flights;
- General aviation represents all civil aviation LTOs not classified as commercial;
- Military operations represent LTOs by military aircraft;
- Ground Support Equipment (GSE) typically includes aircraft refueling and baggage handling vehicles and equipment, aircraft towing vehicles, and passenger buses;
- Auxiliary power units (APUs) provide power to start the main engines and run the heating, cooling, and ventilation systems prior to starting the main engines.

5.3.2.1 Airport Growth Factors

Aircraft operations were projected to future years by applying activity growth using data on itinerant (ITN) operations at airports as reported in the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System for 2009-2030 (FAA 2010). The ITN operations are defined as aircraft take-offs or landings. This information is available for approximately 3300 individual airports. Actual LTOs are reported for 2007 and projected LTOs are provided for all years up to 2030.

The data was aggregated and applied at the county level for the four operation types: commercial, general, air taxi, military. A growth factor was computed for each operation type by dividing future-year ITN by 2007-year ITN. Inventory SCCs were assigned factors based on the operation type, as shown in Exhibit 5.3.

Exhibit 5.3 Crosswalk between SCC and FAA Operations Type

SCC	SCC Description	FAA Operation Type Used for Growth Factor
2265008005	Airport Ground Support Equipment, 4-Stroke Gas	Total Itinerant Operations
2267008005	Airport Ground Support Equipment, LPG	Total Itinerant Operations
2268008005	Airport Ground Support Equipment, CNG	Total Itinerant Operations
2270008000	Airport Ground Support Equipment, Diesel	Total Itinerant Operations
2270008005	Airport Ground Support Equipment, Diesel	Total Itinerant Operations
2275001000	Aircraft /Military Aircraft /Total	Itinerant Military Operations
2275020000	Aircraft /Commercial Aircraft /Total: All Types	Itinerant Air Carrier Operations
2275050000	Aircraft /General Aviation /Total	Itinerant General Aviation Operations
2275050011	Aircraft /General Aviation /Piston	Itinerant General Aviation Operations
2275050012	Aircraft /General Aviation /Turbine	Itinerant General Aviation Operations
2275060000	Aircraft /Air Taxi /Total	Itinerant Air Taxi Operations
2275060011	Aircraft /Air Taxi /Piston	Itinerant Air Taxi Operations
2275060012	Aircraft /Air Taxi /Turbine	Itinerant Air Taxi Operations
2275070000	Aircraft /Aircraft Auxiliary Power Units /Total	Total Itinerant Operations

Exhibit 5.4 summarizes the region-wide growth factors by FAA operation type. The growth factor for individual airports/counties may deviate substantially from these region-wide growth factors.

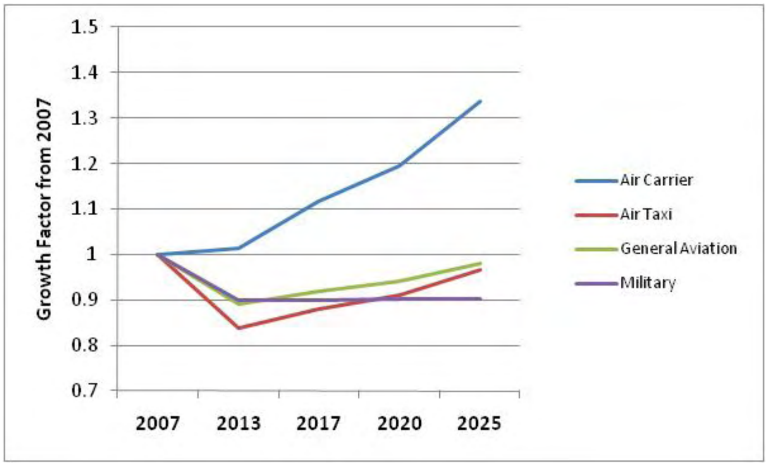


Exhibit 5.4 Region-wide Growth Factors from 2007 by FAA Operations Type

5.3.2.2 Aircraft Control Factors

The NO_x aircraft engine emissions standards adopted by USEPA in November 2005 (USEPA 2005) were reviewed. The standards are equivalent to the NO_x emission standards (adopted in 1999 for implementation beginning in 2004) of the United Nations International Civil Aviation Organization (ICAO), and will bring the US aircraft standards into alignment with the international standards. The standards apply to new aircraft engines used on commercial aircraft including small regional jets, single-aisle and twin-aisle aircraft, and 747s and larger aircraft. The standards also apply to general aviation and military aircraft, which sometimes use commercial engines. For example, small regional jet engines are used in executive general aviation aircraft, and larger commercial aircraft engines may be used in military transport aircraft.

Nearly all previously certified or in-production engine models currently meet or perform better than the standards USEPA adopted in the November 2005 rule. In addition, manufacturers have already been developing improved technology in response to the ICAO standards. According to USEPA's recent analysis for the proposed transport rule (USEPA 2010b), this rule is expected to reduce NO_x emissions by approximately 2 percent in 2015 and 3 percent in 2020. Because of the relatively small amount of NO_x reductions, our aircraft emission projections do not account for this control program.

USEPA has also issued an Advance Notice of Proposed Rulemaking (ANPR) on lead emissions from piston-engine aircraft using leaded aviation gasoline (USEPA 2010c). However, this rule has not yet been adopted and co-benefits for criteria air pollutants are likely to be small. Therefore, the effects of this rule were not included in the future-year emissions projections.

5.3.2.3 State-specific Airport Updates for 2025

After reviewing the growth factors described in the previous section, Connecticut provided state-specific growth factors for 2025 by SCC and county. These state-specific factors were used instead of the factors described in the previous section.

New Jersey provided updated aircraft growth factors and emission estimates for 2007, 2013, 2017, 2020, and 2025. These data were used to replace the emission estimates previously used for the 2007 MANE-VU+VA base year inventory and the MANE-VU+VA future year inventories.

5.3.3 Railroad Locomotives

Railroad locomotive engine emissions in the 2007 MARAMA inventory are classified into the following categories:

- Class I line haul locomotives are operated by large freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-006);
- Class II/III line haul locomotives are operated by smaller freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-007);
- Inter-city passenger train locomotives are operated primarily by Amtrak to provide inter-city passenger transport (SCC 22-85-002-008);
- Independent commuter rail systems operate locomotives that provide passenger transport within a metropolitan area (SCC 22-85-002-009); and
- Yard/switch locomotives are used in freight yards to assemble and disassemble trains, or for short hauls of trains that are made up of only a few cars (SCC 22-85-002-010).

5.3.3.1 Railroad Growth Factors

In March 2008, USEPA finalized a three part program that will dramatically reduce emissions from diesel locomotives of all types -- line-haul, switch, and passenger rail. As part of this work USEPA developed a national emission inventory for calendar years 2002 through 2040. Emission projections methodologies for a baseline and controlled scenario were developed and documented (USEPA 2008b). USEPA used projection data from the AEO2006 (EIA 2006). Table A-7 of AEO2006 showed that freight rail energy use will grow 1.6 percent annually.

More recent growth data is available in the AEO2010 which was published in May 2010. There are separate projections for passenger rail and freight rail energy use. For the MANE VU+VA inventory the more recent AEO2010 growth projections were used.

Passenger rail data from AEO2010 Table A-7 was used to calculate the growth factor for 2007-2025 to be 1.241. These growth factors were applied to inter-city passenger train locomotives (SCC 22-85-002-008) and independent commuter rail systems (SCC 22-85-002-009).

For freight rail, the data from AEO2010 Table A-7 was used to calculate the growth factor for 2007-2025 to be 1.098. The freight rail annual growth factors for Class I line haul (SCC 22-85-002-006), Class II/III line haul (SCC 22-85-002-007), and yard switch (SCC 22-85-002-010) locomotives were used.

5.3.3.2 Railroad Control Factors

USEPA developed two scenarios that accounted for both the 2004 nonroad diesel rule and the 2008 diesel locomotive rule:

- USEPA's baseline (pre-control) inventory accounted for

    1. AEO2006 annual growth in fuel use,
    2. The impact of existing regulations for Tier 0, 1, and 2 locomotive engines that take effect in 2008,
    3. The 2004 Clean Air Nonroad Diesel Rule that will decrease allowable levels of sulfur in locomotives fuel beginning in 2012, and
    4. Fleet turnover.

- USEPA's controlled inventory accounted for

    1. AEO2006 annual growth in fuel use,
    2. Reductions included in the baseline inventory, and
    3. Reductions from USEPA's 2008 rule Final Locomotive-Marine rule for Tier 3 and 4 engines. This rule lowered diesel sulfur content and tightened emission standards for existing and new locomotives.
    4. Voluntary retrofits under the National Clean Diesel Campaign are not included in our projections.

To calculate a factor that accounted for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 1.6% annual growth rate to the 2006 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions.

Exhibit 5.5 shows the control factors for 2013, 2017, 2020, and 2025 for the five locomotive classifications and pollutants.

5.3.3.3 State-specific Railroad Updates for 2025

New Jersey provided updated railroad growth factors, control factors, and emission estimates for 2007, 2013, 2017, 2020, and 2025. These data were used to replace the emission estimates previously used for the 2007 MANE-VU+VA base year inventory and the MANE-VU+VA future year inventories.

Exhibit 5.5 Rail Control Factors by Year, Pollutant, and SCC

Year	NOx	PM2.5	SO2
SCC 22-85-002-006 Line Haul Class I Operations			
2013	0.771	0.595	0.003
2017	0.633	0.449	0.003
2020	0.547	0.364	0.003
2025	0.412	0.252	0.003
SCC 22-85-002-007 Line Haul Class II / III Operations			
2013	1.000	0.829	0.003
2017	0.960	0.791	0.003
2020	0.920	0.752	0.003
2025	0.852	0.688	0.003
SCC 22-85-002-008 Inter-City Passenger			
2013	0.571	0.566	0.003
2017	0.421	0.402	0.003
2020	0.340	0.294	0.003
2025	0.241	0.180	0.003
SCC 22-85-002-009 Commuter Rail			
2013	0.571	0.566	0.003
2017	0.421	0.402	0.003
2020	0.340	0.294	0.003
2025	0.241	0.180	0.003
SCC 22-85-002-010 Yard / Switch			
2013	0.912	0.777	0.003
2017	0.843	0.712	0.003
2020	0.771	0.650	0.003
2025	0.634	0.534	0.003

6.0 ONROAD MOBILE SOURCES INCLUDED IN MOVES

6.1 MOVES MODEL CATEGORIES

USEPA's MOVES model estimates emissions from vehicles travel such as cars, trucks, buses and motorcycles. These vehicles are powered by diesel, gasoline, and alternative fuel formulations. MOVES2010 includes the capability to estimate both vehicle exhaust and evaporative emissions (including vehicle refueling emissions) and brake wear and tire wear emissions for criteria pollutants and precursors. However, MOVES2010 does not include the capability to estimate emissions of re-entrained road dust. Estimates of emissions from re-entrained road dust are included in the area source inventory.

6.2 2007 MOVES MODEL INVENTORY

MARAMA provided county-level MOVES results for 2007 for CT, DE, DC, and MD. Other states (NJ, NY, PA, VA) provided results for affected counties in their states.

6.3 2025 MOVES MODEL INVENTORY

MARAMA provided county-level MOVES results for 2025 for CT, DE, DC, and MD. Other states (NJ, NY, PA, VA) provided results for affected counties in their states.

7.0 EMISSION SUMMARIES

Exhibits 7.1 to 7.12 summarize PM2.5 and PM precursor emissions by PM nonattainment area and source sector for 2007 and 2025. Some general observations by pollutant include:

- PM2.5 emissions are projection to decrease between 2007and 2025 in all PM nonattainment areas. The reductions are due to the turnover to cleaner onroad vehicles, nonroad engines, and residential wood combustion equipment. The PM2.5 emissions shown account for the application of the PM transport factor (see discussion in Section 2.2.1.1 of this TSD).

- NO_x emissions decline in all PM nonattainment areas between 2007 and 2025 and by more than 50 percent in a few areas. Most of the decline results from the turnover of the onroad vehicle fleet to vehicles with improved emission controls and fuel efficiency. Reductions in nonroad sources are also substantial. Three areas (Baltimore, NY/NJ/CT, and Washington DC/MD/VA) also show substantial reductions due to controls on EGUs.

- SO_2 emissions decrease in all PM nonattainment areas. All areas are showing reductions due to the lower sulfur contents of fuels used by onroad vehicles and nonroad equipment. Additional reductions in areas located in Maryland, New Jersey, and New York are due to the lower sulfur content regulations in those state for home heating, distillate oil, and residual oil. Connecticut, Delaware, the District of Columbia, Pennsylvania, and Virginia did not take credit for any reductions for low sulfur fuel oils since they have not adopted the MANE-VU recommendations into their regulations (see discussion in Section 2.3.2.5 of the TSD). Especially large reductions are found in areas where controls are projected to be in place on EGUs (Allentown, Baltimore, Harrisburg, Metro New York, Philadelphia, Pittsburgh, Washington DC/MD/VA, and York, PA).

County-by-county emissions for 2007 and 2025 are available on the MARAMA ftp site.

Exhibit 7.1 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions
Nonattainment Area: Allentown, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) from 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	1,987	1,936	-51	-2.6%
Nonroad MAR	516	277	-239	-46.3%
Nonroad NMIM	2,661	1,007	-1,654	-62.1%
Onroad MOVES	15,652	4,190	-11,462	-73.2%
Point EGU	7,763	5,837	-1,927	-24.8%
Point nonEGU	5,900	2,114	-3,786	-64.2%
	34,480	**15,362**	**-19,117**	**-55.4%**
Direct PM2.5				
Area	2,150	1,958	-192	-8.9%
Nonroad MAR	26	15	-11	-42.3%
Nonroad NMIM	229	113	-117	-51.0%
Onroad MOVES	528	190	-338	-64.0%
Point EGU	2,264	2,138	-125	-5.5%
Point nonEGU	1,301	1,227	-75	-5.7%
	6,498	**5,640**	**-858**	**-13.2%**
Sulfur Dioxide (SO2)				
Area	2,552	1,118	-1,434	-56.2%
Nonroad MAR	12	4	-8	-70.4%
Nonroad NMIM	147	4	-143	-97.3%
Onroad MOVES	118	43	-75	-63.2%
Point EGU	48,203	3,962	-44,241	-91.8%
Point nonEGU	5,868	5,875	7	0.1%
	56,900	**11,005**	**-45,895**	**-80.7%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.2 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Baltimore, MD

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	4,732	5,167	435	9.2%
Nonroad MAR	16,703	8,521	-8,182	-49.0%
Nonroad NMIM	10,466	4,265	-6,201	-59.2%
Onroad MOVES	43,939	15,900	-28,038	-63.8%
Point EGU	23,572	8,939	-14,634	-62.1%
Point nonEGU	11,981	13,362	1,380	11.5%
	111,394	**56,154**	**-55,240**	**-49.6%**
Direct PM2.5				
Area	5,004	5,197	193	3.9%
Nonroad MAR	572	201	-371	-64.8%
Nonroad NMIM	969	519	-450	-46.4%
Onroad MOVES	1,503	749	-755	-50.2%
Point EGU	6,677	7,134	456	6.8%
Point nonEGU	2,296	2,366	71	3.1%
	17,022	**16,166**	**-855**	**-5.0%**
Sulfur Dioxide (SO2)				
Area	2,316	315	-2,001	-86.4%
Nonroad MAR	1,803	268	-1,535	-85.1%
Nonroad NMIM	581	15	-566	-97.4%
Onroad MOVES	375	380	5	1.3%
Point EGU	93,665	18,922	-74,744	-79.8%
Point nonEGU	4,759	4,867	108	2.3%
	103,499	**24,766**	**-78,733**	**-76.1%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.3 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Hagerstown Martinsburg, MD-WV

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) from 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	296	339	43	14.5%
Nonroad MAR	289	144	-145	-50.2%
Nonroad NMIM	793	301	-492	-62.0%
Onroad MOVES	5,124	1,966	-3,158	-61.6%
Point EGU	1,398	1,390	-8	-0.6%
Point nonEGU	1,982	1,518	-465	-23.4%
	9,883	**5,657**	**-4,225**	**-42.8%**
Direct PM2.5				
Area	501	538	37	7.3%
Nonroad MAR	10	3	-7	-68.6%
Nonroad NMIM	74	33	-41	-55.6%
Onroad MOVES	185	69	-117	-62.8%
Point EGU	310	299	-11	-3.5%
Point nonEGU	188	188	0	0.1%
	1,269	**1,131**	**-138**	**-10.9%**
Sulfur Dioxide (SO2)				
Area	274	83	-191	-69.7%
Nonroad MAR	5	2	-4	-69.4%
Nonroad NMIM	45	1	-44	-97.6%
Onroad MOVES	44	47	3	6.4%
Point EGU	5,536	4,590	-946	-17.1%
Point nonEGU	1,277	1,271	-6	-0.5%
	7,182	**5,993**	**-1,189**	**-16.5%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: only includes emissions for Washington County, MD; emissions for West Virginia portion of the nonattainment area will be provided by Maryland in their SIP submittal.

Exhibit 7.4 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Harrisburg-Lebanon-Carlisle-York, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	3,874	3,705	-169	-4.4%
Nonroad MAR	1,775	981	-793	-44.7%
Nonroad NMIM	5,329	2,055	-3,274	-61.4%
Onroad MOVES	36,440	9,338	-27,102	-74.4%
Point EGU	15,985	15,531	-454	-2.8%
Point nonEGU	10,965	9,646	-1,319	-12.0%
	74,368	**41,255**	**-33,113**	**-44.5%**
Direct PM2.5				
Area	5,452	5,201	-251	-4.6%
Nonroad MAR	74	35	-39	-52.3%
Nonroad NMIM	474	211	-263	-55.4%
Onroad MOVES	1,225	346	-879	-71.8%
Point EGU	2,123	2,060	-63	-3.0%
Point nonEGU	923	915	-8	-0.9%
	10,272	**8,769**	**-1,503**	**-14.6%**
Sulfur Dioxide (SO2)				
Area	4,900	2,763	-2,136	-43.6%
Nonroad MAR	30	15	-15	-50.2%
Nonroad NMIM	293	8	-285	-97.3%
Onroad MOVES	255	89	-165	-64.9%
Point EGU	106,189	5,179	-101,010	-95.1%
Point nonEGU	11,520	11,539	19	0.2%
	123,186	**19,593**	**-103,593**	**-84.1%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.5 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Johnstown, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	861	822	-39	-4.5%
Nonroad MAR	1,132	568	-564	-49.8%
Nonroad NMIM	909	366	-543	-59.7%
Onroad MOVES	6,017	1,217	-4,800	-79.8%
Point EGU	41,440	40,004	-1,435	-3.5%
Point nonEGU	932	1,097	165	17.7%
	51,291	**44,074**	**-7,216**	**-14.1%**
Direct PM2.5				
Area	1,198	1,114	-84	-7.0%
Nonroad MAR	45	18	-27	-60.6%
Nonroad NMIM	84	36	-48	-56.9%
Onroad MOVES	195	43	-152	-78.2%
Point EGU	2,867	2,768	-99	-3.4%
Point nonEGU	231	234	3	1.4%
	4,619	**4,212**	**-407**	**-8.8%**
Sulfur Dioxide (SO2)				
Area	1,179	593	-586	-49.7%
Nonroad MAR	13	1	-12	-95.9%
Nonroad NMIM	51	1	-50	-97.4%
Onroad MOVES	45	12	-32	-72.3%
Point EGU	143,303	141,481	-1,821	-1.3%
Point nonEGU	30	35	4	14.7%
	144,621	**142,123**	**-2,498**	**-1.7%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: summary includes emissions for all of Indiana County; however, only part of the county is in the nonattainment area.

Exhibit 7.6 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Lancaster, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	1,827	1,704	-122	-6.7%
Nonroad MAR	293	140	-153	-52.1%
Nonroad NMIM	2,880	1,170	-1,710	-59.4%
Onroad MOVES	14,163	3,779	-10,384	-73.3%
Point EGU	0	0	0	0.0%
Point nonEGU	1,147	1,383	236	20.5%
	20,310	**8,177**	**-12,133**	**-59.7%**
Direct PM2.5				
Area	1,827	1,704	-122	-6.7%
Nonroad MAR	293	140	-153	-52.1%
Nonroad NMIM	2,880	1,170	-1,710	-59.4%
Onroad MOVES	14,163	3,779	-10,384	-73.3%
Point EGU	0	0	0	0.0%
Point nonEGU	1,147	1,383	236	20.5%
	20,310	**8,177**	**-12,133**	**-59.7%**
Sulfur Dioxide (SO2)				
Area	3,030	1,766	-1,264	-41.7%
Nonroad MAR	4	0	-3	-87.6%
Nonroad NMIM	144	5	-139	-96.8%
Onroad MOVES	104	38	-66	-63.4%
Point EGU	0	0	0	0.0%
Point nonEGU	102	120	18	17.5%
	3,384	**1,929**	**-1,454**	**-43.0%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.7 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Metro New York/Northern New Jersey/Long Island NY/NJ/CT

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	64,044	56,873	-7,170	-11.2%
Nonroad MAR	46,842	31,820	-15,023	-32.1%
Nonroad NMIM	70,841	13,603	-57,238	-80.8%
Onroad MOVES	252,723	74,474	-178,249	-70.5%
Point EGU	36,928	33.841	-3,087	-8.4%
Point nonEGU	20,117	20,881	765	3.8%
	491,675	**231,660**	**-260,014**	**-52.9%**
Direct PM2.5				
Area	18,512	19,318	805	4.4%
Nonroad MAR	1,705	755	-950	-55.7%
Nonroad NMIM	5,873	1,534	-4,339	-73.9%
Onroad MOVES	10,189	4,878	-5,311	-52.1%
Point EGU	6,267	4,274	-1,994	-31.8%
Point nonEGU	1,530	1,704	174	11.4%
	44,131	**32,457**	**-11,674**	**-26.5%**
Sulfur Dioxide (SO2)				
Area	42,122	10,353	-31,768	-75.4%
Nonroad MAR	11,823	1,957	-9,865	-83.4%
Nonroad NMIM	3,720	56	-3664	-98.5%
Onroad MOVES	1,750	1,564	-186	-10.6%
Point EGU	63,236	44,139	-19,097	-30.2%
Point nonEGU	5,293	5,351	59	1.1%
	126,427	**63,420**	**-63,005**	**-43.7%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: 2025 NMIM emissions for New York counties are missing from the above summaries.

Note 2: New Jersey made changes to Point EGU values in this table after AMEC finalized the project. The changes were made by MARAMA.

Note 3: GSE Emissions were removed from 2025 total for consistency.

Note 4: 2007 and 2025 Connecticut NMIM was updated with runs that use Version 3 inputs, including revisions to the Pleasurecraft population file.

Exhibit 7.8 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Philadelphia-Wilmington, PA/DE/NJ

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	18,043	17,741	-302	-1.7%
Nonroad MAR	12,271	9,357	-2,913	-23.7%
Nonroad NMIM	19,579	8,305	-11,274	-57.6%
Onroad MOVES	106,315	26,648	-79,668	-74.9%
Point EGU	12,616	4,873	-7,743	-61.4%
Point nonEGU	19,143	14,944	-4,199	-21.9%
	187,967	**81,869**	**-106,099**	**-56.4%**
Direct PM2.5				
Area	13,811	12,983	-829	-6.0%
Nonroad MAR	658	299	-360	-54.7%
Nonroad NMIM	1,808	1,059	-749	-41.4%
Onroad MOVES	3,795	1,443	-2,352	-62.0%
Point EGU	1,048	813	-236	-22.5%
Point nonEGU	3,524	3,062	-462	-13.1%
	24,644	**19,657**	**-4,987**	**-20.2%**
Sulfur Dioxide (SO2)				
Area	16,763	9,756	-7,007	-41.8%
Nonroad MAR	5,136	677	-4,459	-86.8%
Nonroad NMIM	998	32	-966	-96.7%
Onroad MOVES	773	422	-351	-45.4%
Point EGU	20,665	4,563	-16,102	-77.9%
Point nonEGU	14,370	8,990	-5,380	-37.4%
	58,705	**24,440**	**-34,265**	**-58.4%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.9 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Pittsburgh-Beaver Valley, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	8,608	8,613	5	0.1%
Nonroad MAR	14,258	7,116	-7,142	-50.1%
Nonroad NMIM	9,827	4,223	-5,605	-57.0%
Onroad MOVES	56,652	12,725	-43,927	-77.5%
Point EGU	82,657	84,453	1,795	2.2%
Point nonEGU	20,217	18,760	-1,456	-7.2%
	192,219	**135,890**	**-56,330**	**-29.3%**
Direct PM2.5				
Area	7,562	6,835	-728	-9.6%
Nonroad MAR	467	196	-271	-58.1%
Nonroad NMIM	880	432	-448	-50.9%
Onroad MOVES	1,905	531	-1,374	-72.1%
Point EGU	6,293	6,348	55	0.9%
Point nonEGU	5,108	5,109	1	0.0%
	22,216	**19,450**	**-2,766**	**-12.4%**
Sulfur Dioxide (SO2)				
Area	13,589	10,791	-2,798	-20.6%
Nonroad MAR	260	95	-165	-63.4%
Nonroad NMIM	529	15	-514	-97.2%
Onroad MOVES	419	141	-278	-66.4%
Point EGU	429,186	93,130	-336,056	-78.3%
Point nonEGU	13,247	13,699	451	3.4%
	457,230	**117,871**	**-339,359**	**-74.2%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: summary includes emissions for all of Allegheny, Armstrong, Greene and Lawrence counties; however, only parts of those counties are in the nonattainment area.

Exhibit 7.10 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Reading, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	1,289	1,114	-175	-13.6%
Nonroad MAR	621	307	-314	-50.5%
Nonroad NMIM	1,911	696	-1,215	-63.6%
Onroad MOVES	11,370	2,831	-8,538	-75.1%
Point EGU	2,506	2,432	-74	-2.9%
Point nonEGU	3,288	1,919	-1,369	-41.6%
	20,983	**9,298**	**-11,685**	**-55.7%**
Direct PM2.5				
Area	1,859	1,727	-132	-7.1%
Nonroad MAR	30	15	-15	-51.5%
Nonroad NMIM	161	72	-88	-54.9%
Onroad MOVES	379	96	-284	-74.7%
Point EGU	947	921	-26	-2.7%
Point nonEGU	325	331	6	1.8%
	3,701	**3,161**	**-540**	**-14.6%**
Sulfur Dioxide (SO2)				
Area	2,389	1,223	-1,166	-48.8%
Nonroad MAR	7	1	-7	-92.6%
Nonroad NMIM	99	3	-96	-97.1%
Onroad MOVES	81	27	-53	-66.3%
Point EGU	14,491	13,990	-501	-3.5%
Point nonEGU	649	660	11	1.7%
	17,716	**15,903**	**-1,812**	**-10.2%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.11 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Washington DC/MD/VA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	8,936	9,342	406	4.5%
Nonroad MAR	6,700	6,711	11	0.2%
Nonroad NMIM	20,097	8,000	-12,097	-60.2%
Onroad MOVES	42,971	14,067	-28,904	-67.3%
Point EGU	29,029	13,919	-15,109	-52.0%
Point nonEGU	8,826	11,253	2,427	27.5%
	116,643	**63,295**	**-53,348**	**-45.7%**
Direct PM2.5				
Area	9,528	9,725	198	2.1%
Nonroad MAR	201	160	-40	-20.2%
Nonroad NMIM	2,005	1,110	-895	-44.7%
Onroad MOVES	1,467	728	-739	-50.4%
Point EGU	4,984	4,996	12	0.2%
Point nonEGU	563	594	32	5.6%
	18,746	**17,316**	**-1,430**	**-7.6%**
Sulfur Dioxide (SO2)				
Area	5,733	3,862	-1,871	-32.6%
Nonroad MAR	416	488	72	17.3%
Nonroad NMIM	1,233	28	-1,205	-97.8%
Onroad MOVES	387	347	-40	-10.4%
Point EGU	179,243	24,694	-154,549	-86.2%
Point nonEGU	4,206	3,570	-636	-15.1%
	191,215	**32,990**	**-158,225**	**-82.7%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: 2007 and 2025 MOVES onroad emissions for Virginia counties are missing from the above summaries.

Note2: GSE Emissions were removed from 2025 total for consistency.

Exhibit 7.12 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions
Nonattainment Area: York, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	1,680	1,678	-2	-0.1%
Nonroad MAR	198	104	-93	-47.2%
Nonroad NMIM	2,463	836	-1,627	-66.1%
Onroad MOVES	10,519	2,740	-7,779	-74.0%
Point EGU	15,760	15,226	-534	-3.4%
Point nonEGU	6,404	6,431	28	0.4%
	37,024	**27,015**	**-10,008**	**-27.0%**
Direct PM2.5				
Area	2,394	2,325	-69	-2.9%
Nonroad MAR	13	7	-6	-48.7%
Nonroad NMIM	189	77	-112	-59.4%
Onroad MOVES	348	121	-227	-65.2%
Point EGU	2,098	2,026	-72	-3.4%
Point nonEGU	364	365	1	0.3%
	5,407	**4,921**	**-486**	**-9.0%**
Sulfur Dioxide (SO2)				
Area	1,684	1,059	-625	-37.1%
Nonroad MAR	2	0	-2	-88.4%
Nonroad NMIM	132	3	-129	-97.5%
Onroad MOVES	79	28	-50	-63.8%
Point EGU	106,158	5,136	-101,021	-95.2%
Point nonEGU	9,743	9,749	6	0.1%
	117,798	**15,977**	**-101,821**	**-86.4%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

8.0 DELIVERABLES

Files are stored on MARAMA ftp site:

Address: ftp.marama.org

Login ID: regionalei

Password: marama2007

Folder: /2025/Final 2025 (Version 3_3)

Exhibit 8.1 lists the file names for all final deliverables.

Exhibit 8.1 Final Deliverables

File Name	Description
TSD V3_3 MANE-VU 2025 Inventory PM Nonattainment Counties.docx	Technical Support Document for 2025 emission inventory for PM nonattainment counties
Appendix A1 AEO2010 New England.xls	AEO2010 Energy Consumption by Sector and Source for New England Region (CT, MA, ME, NH, RI, VT) and calculated growth factors
Appendix A2 AEO2010 Mid Atlantic.xls	AEO2010 Energy Consumption by Sector and Source for Mid-Atlantic Region (NJ, NY, PA) and calculated growth factors
Appendix A3 AEO2010 South Atlantic.xls	AEO2010 Energy Consumption by Sector and Source for South Atlantic Region (DC, DE, MD, VA) and calculated growth factors
Appendix A4 AEO2011 New England.xls	AEO2011 Energy Consumption by Sector and Source for New England Region (CT, MA, ME, NH, RI, VT) and calculated growth factors
Appendix A5 AEO2011 Mid Atlantic.xls	AEO2011 Energy Consumption by Sector and Source for Mid-Atlantic Region (NJ, NY, PA) and calculated growth factors
Appendix A6 AEO2011 South Atlantic.xls	AEO2011 Energy Consumption by Sector and Source for South Atlantic Region (DC, DE, MD, VA) and calculated growth factors
Appendix A7 AEO2010 vs AEO2011 Comparison.docx	Technical Memorandum comparing AEO2010 and AEO2011 energy consumption projections
Appendix B Population_Factors.xls	County-level population growth factors as provided by states

File Name	Description
Appendix C Employment_Factors.xls	State-level employment growth factors provided by states
Appendix D VMT GF Nonattainment Counties.xls	County-level VMT for 2007 and 2025
Appendix E EPA2020 Res Wood.xls	USEPA growth factor formulas by SCC for residential wood combustion
Appendix F AEO2011-Electricity Generation by EMM.xlsx	AEO 2011 Electricity Generation by Electricity Market Module Region and Source, Reference case, and associated growth factors
Appendix G UAF NEEDS Control FileMASTER92211.xls	State information on future EGU controls and emission rates
Appendix H MAR Growth and Control.xls	USEPA and FAA data used to develop growth and control factors for commercial marine vessels, airports, and railroads
V3_3 Area_07_25 PM Nonattainment.xlsx	County and SCC-level emissions and growth/control factors for area sources
V3_3 EGU_07_25 PM Nonattainment.xlsx	Unit level emissions and growth/control factors for EGUs
V3_3 MAR_07_25 PM Nonattainment.xlsx	County and SCC-level emissions and growth/control factors for commercial marine vessels, airports, and railroad locomotives
V3_3 MOVES_07_25 PM Nonattainment.xlsx	County level emissions for onroad vehicles included in USEPA's MOVES model
V3_3 NMIM_07_25 PM Nonattainment.xlsx	County and SCC-level emissions for nonroad equipment included in USEPA's NMIM/NONROAD model
V3_3 NonEGU_07_25 PM Nonattainment.xlsx	Unit level emissions and growth/control factors for nonEGUs
V3_3 Summaries_ 07_25 PM Nonattainment.xlsx	Emission summaries by county and nonattainment area

9.0 REFERENCES

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Appendix I

Nonpoint Source Emissions Sample Calculations

Nonpoint Source Emissions Sample Calculations

2007 Prescribed Burning
AMS: 2810014000
Suffolk County, NY (FIPS: 36103)

PM2.5 Flaming Fuel Emission Calculations:

((Acres burned)[1] × (Fuel Loading Factor (tons/acre burned))[2] × (PM2.5 Flaming Fuel Emission Factor (lb/ton)))[2] × 0.75 = PM2.5 Flaming Fuel Emissions (lbs/yr)

((77.5 acres burned) × (8.2 tons/acre burned) × (24.1 lb/ton)) × 0.75
= 11,490 lbs/yr

PM2.5 Smoldering Fuel Emission Calculations:

((Acres burned)[1] × (Fuel Loading Factor (tons/acre burned))[2] × (PM2.5 Emission Factor (lb/ton)))[3] × 0.25 = PM2.5 Smoldering Fuel Emissions (lbs/yr)

((77.5 acres burned) × (8.2 tons/acre burned) × (24.1 lb/ton)) × 0.25
= 3,830 lbs/yr

PM2.5 Annual Emissions = PM2.5 Flaming Fuel Emissions + PM2.5 Smoldering Fuel Emissions
= 11,490 lbs/yr + 3,830 lbs/yr
= 15,320 lbs/yr
= 7.66 tons/yr

Notes:

1. 2007 data was compiled by the New York State Department of Environmental Conservation's Division of Lands And Forests.

2. Fuel Loading factor and Emission Factors: EPA's Documentation For The 1996 Base Year National Toxics Inventory for Area Sources dated May 31, 2001 (Appendix A; Pages A-31 and A-32).

3. PM2.5 Emission Factor: The PM2.5 emission factor (24.1 lbs/ton) was forwarded to the Department's Division of Air Resources in an email from Randy Strait of E. H. Pechan & Associates, Inc. on 08/02/2004.

2007 Residential Heating (Oil)
AMS: 2104004000 & 2104011000
Nassau, NY (FIPS: 36059)

1. County: Nassau

2. Allocation of Fuel to County Level

   a. Raw Data

      i number of households heated w/oil: 247,586 (2000 Census)

      ii heating degree days (2007 calendar year): 5,252 days (NOAA)

      iii statewide fuel usage for sector:

      distillate oil: 1,338,120 x 10^3 gallons
      kerosene: 52,164 x 10^3 gallons

   b. Weighted Average Allocation

   For each county, the product of census data times heating degree days was determined. For Nassau County:

   = (247,586 homes)(5,252 heating degree days)
   = 1,300,321,672 homes-heating degree days

   The statewide sum: 12,925,564,782 homes-heating degree days

   The Nassau County allocation factor (AF) for residential fuel oil then is calculated by dividing the county-specific value by the statewide value:

   AF = (1,209,210,024)/(11,988,704,610)
   AF = <u>0.1006</u>

   The residential fuel oil allocation for Nassau County is then determined by multiplying the statewide fuel usage for the sector by AF:

   distillate oil: (0.1006)(1,338,120 x 10^3 gallons)

   = <u>134,615 x 10^3 gallons</u>

   kerosene: (0.1006)(52,164 x 10^3 gallons)

   = <u>5,248 x 10^3 gallons</u>

3. Emission Factors

   a. sulfur content of fuel oil:

   distillate oil: 0.21 percent
   kerosene: 0.053 percent

   NOTE: Sulfur content in fuel oil as reported on 2007 Emission Statements submitted by facilities in Rockland and Nassau Counties.

   b. Area Source Classifications:

   distillate oil: 2104004000

kerosene: 2104011000

c. Emission Factors (EF)

Sources: AP-42, FIRE for commercial/institutional facilities using distillate or kerosene.

Pollutant	EF (lb/10^3 gallons)
NO_x	24
CO	5
PM_{10}	2.38
SO_2	142[S] where [S] is sulfur content (%)

4. Emissions Calculations – Residential Heating Oil – Nassau County

a. Annual

Emissions calculated by multiplying fuel allocation by emission factors. Sample calculations presented below:

1. Distillate Oil

NO_x (134,615 x 10^3 gallons)(24 lb/10^3 gallons) = 3,230,800 lb = 1615.4 tons
CO (134,615 x 10^3 gallons)(5 lb/10^3 gallons) = 673,100 lb = 336.6 tons
PM_{10} (134,615 x 10^3 gallons)(2.38 lb/10^3 gallons) = 320,400 lb = 160.2 tons
SO_2 (134,615 x 10^3 gallons)(142 lb/10^3 gallons)(0.21) = 4,014,200 lb = 2007.1 tons

2. Kerosene

NO_x (5,248 x 10^3 gallons)(24 lb/10^3 gallons) = 126,000 lb = 63.0 tons
CO (5,248 x 10^3 gallons)(5 lb/10^3 gallons) = 26,240 lb = 13.1 tons
PM_{10} (5,248 x 10^3 gallons)(2.38 lb/10^3 gallons) = 12,490 lb = 6.2 tons
SO_2 (5,248 x 10^3 gallons)(142 lb/10^3 gallons)(0.053) = 39,500 lb = 19.8 tons

2007 Residential Natural Gas Combustion
AMS: 2104006000
Nassau, NY (FIPS: 36059)

1. County: Nassau

2. Allocation of Fuel to County Level

   a. Raw Data
      i number of households heated w/CH_4: 171,500 (2000 Census)
      ii total number of households in state heated w/CH_4: 3,651,869
      iii statewide fuel usage for sector:

      natural gas: 397,000 x 10^6 cubic feet

   b. Weighted Average Allocation

   The Nassau County allocation factor (AF) for residential natural gas combustion is then calculated by dividing the number of households in the county heated with natural gas by the statewide value:

   AF = (171,500)/(3,651,869)
   AF = 0.04696

   The residential natural gas allocation for Nassau County is then determined by multiplying the statewide fuel usage for the sector by AF:

   natural gas: (0.04696)(397,000 x 10^6 cubic feet)

   = 18,640 x 10^6 cubic feet

3. Emission Factors

   a. Area Source Classification: 2104006000

   b. Emission Factors (EF)

   Sources: AP-42, FIRE for commercial/institutional facilities using natural gas.

Pollutant	EF (lb/10^6 cubic feet)
NO_x	94
CO	40
PM_{10}	7.6
SO_2	0.6

4. Emissions Calculations – Residential Natural Gas Combustion – Nassau County

   a. Annual

   Emissions calculated by multiplying fuel allocation by emission factors. Sample calculations presented below:

NO_x	(18,640 x 10^6 cubic feet)(94 lb/10^6 cubic feet) = 1,752,200 lb = 876.1 tons
CO	(18,640 x 10^6 cubic feet)(40 lb/10^6 cubic feet) = 745,600 lb = 372.8 tons
PM_{10}	(18,640 x 10^6 cubic feet)(7.6 lb/10^6 cubic feet) = 141,700 lb = 70.9 tons
SO_2	(18,640 x 10^6 cubic feet)(0.6 lb/10^6 cubic feet) = 11,180 lb = 5.6 tons

2007 Residential Wood Combustion
AMS: 2104008100, 2104008320 & 2104008700
Nassau, NY (FIPS: 36059)

1. County: Nassau

2. Allocation of Fuel to County Level

   a. Raw Data

      i number of households heated w/wood: 157 (2000 Census)

      ii heating degree days (2007 calendar year): 5,252 days (NOAA)

      iii statewide fuel usage for sector:

      wood: 1,208,917 tons

   b. Weighted Average Allocation

For each county, the product of census data times heating degree days was determined. For Nassau County:

= (157 homes)(5,252 heating degree days)
= 824,564 homes-heating degree days

The statewide sum: 568,220,462 homes-heating degree days

The Nassau County allocation factor (AF) for residential fuel oil then is calculated by dividing the county-specific value by the statewide value:

AF = (824,564)/(568,220,462)
AF = <u>0.001451</u>

The residential wood allocation for Nassau County is then determined by multiplying the statewide fuel usage for the sector by AF:

wood: (0.001451)(1,208,917 tons)

= <u>1754 tons</u>

3. Emission Factors

   a. Area Source Classifications and Allocations:

Category	SCC	Fraction of Wood	Nassau Co. (tons)
Indoor Fireplaces	2104008100	0.57	999.8
Indoor Wood Stoves	2104008320	0.38	666.5
Outdoor Sources	2104008700	0.05	87.7
Total		1.00	1754

   b. Emission Factors (EF)

      Sources: AP-42, GLC

Pollutant	Fireplaces	EF (lb/ton) Wood Stoves	Outdoor
NO_x	2.6	2	2.6
PM_{10}	23.6	20.4	23.6
SO_2	0.4	0.4	0.4

4. Emissions Calculations – Residential Wood Combustion – Nassau County

a. Annual

Emissions calculated by multiplying fuel allocation by emission factors. Sample calculations presented below:

Fireplaces

NO_x (999.8 tons)(2.6 lb/ton) = 2600 lb = 1.3 tons
PM_{10} (999.8 tons)(23.6 lb/ ton) = 23,600 lb = 11.8 tons
SO_2 (999.8 tons)(0.4 lb/ ton) = 400 lb = 0.20 tons

Indoor Woodstoves

NO_x (666.5 tons)(2 lb/ton) = 1,333 lb = 0.67 tons
PM_{10} (666.5 tons)(20.4 lb/ ton) = 13,600 lb = 6.8 tons
SO_2 (666.5 tons)(0.4 lb/ ton) = 267 lb = 0.13 tons

Outdoor Sources

NO_x (87.7 tons)(2.6 lb/ton) = 228 lb = 0.11 tons
PM_{10} (87.7 tons)(23.6 lb/ ton) = 2070 lb = 1.04 tons
SO_2 (87.7 tons)(0.4 lb/ ton) = 35 lb = 0.02 tons

2007 Commercial/Institutional Natural Gas Combustion
AMS: 2103004001, 2103011000 & 2103004002
Nassau, NY (FIPS: 36059)

1. County: Nassau

2. Allocation of Fuel to County Level

   a. Number of people employed in C/I sector in Nassau County: 510,757.2
   b. Total number of people employed in C/I sector in the state: 6,874,365.98
   c. The fraction of those employed in the C/I sector that live in Nassau County was determined by:

      AF = (510,757.2 employees in Nassau Co.)/(6,874,365.98 employees statewide)

      = 0.0743

   d. Statewide Fuel Use – C/I Sector
      i. All Sources (NYSERDA)
         1. Natural Gas: 78,836 x 10^6 cubic feet
      ii. Title V Sources (based upon 2007 Emission Statements)
         1. Natural Gas: 20,500.45 x 10^6 cubic feet

   e. Allocation Calculation

      Natural Gas (Nassau) = AF(All Sources – Title V Sources)

      = (0.0743)(78,836 x 10^6 cubic feet – 20,500.45 x 10^6 cubic feet)
      = 4334 x 10^6 cubic feet

   f. Emission Factors

      NO_x: 100 lb/10^6 cubic feet
      PM2.5: 7.6 lb/10^6 cubic feet

   g. Emissions Calculations
      i. Annual

      NO_x: (100 lb/10^6 cubic feet)(4334 x10^6 cubic feet)

      = 433,400 lb = 216.7 tons

      PM2.5: (7.6 lb/10^6 cubic feet)(4334 x10^6 cubic feet)

      = 32,900 lb = 16.5 tons

2007 Commercial/Institutional Fuel Oil Combustion
AMS: 2103004001, 2103011000, 2103004002
Nassau, NY (FIPS: 36059)

1. County: Nassau

2. Allocation of Fuel to County Level

   a. Number of people employed in C/I sector in Nassau County: 510,757.2
   b. Number of Heating Degree Days in Nassau County: 5,252
   c. For each county, the product of the employment data times heating degree days was determined. For Nassau County:

      = (510,757.2 employees)(5,252 heating degree days)
      = 2,682,496,814 employee-heating degree days

   d. The statewide sum: 38,759,752,656 employee-heating degree days
   e. The allocation factor (AF) for fuel oil consumption by the C/I sector in Nassau County:
      AF = 2,682,496,814 /38,759,752,656
      = <u>0.0692</u>

   f. Statewide Fuel Use – C/I Sector
      i. All Sources (NYSERDA)
         1. No. 2 oil: 608,118 x 10^3 gallons
         2. Kerosene: 20,706 x 10^3 gallons
      ii. Title V Sources (based upon 2007 Emission Statements)
         1. No. 2 oil: 11,047 x 10^3 gallons
         2. Kerosene: 0

   g. Process Level Data

Process	Fuel	ASC	Process Factor (PF)
Boilers	No. 2	2103004001	0.938
	Kerosene	2103011000	1
Engines	No. 2	2103004002	0.062

   h. Calculation. For each process, the following equation was used for allocating distillate oil consumption in Nassau County:

      Distillate Oil: (AF)(PF)(Fuel Used by All C/I Sources – Fuel Used at Title V Facilities)

      ASC: 2103004001:

      = (0.0692)(0.938)(649,278 x 10^3 gallons – 10,688.17 x 10^3 gallons)
      = <u>41,450 x 10^3 gallons No.2 fuel oil</u>

      ASC: 2103004002:

      = (0.0692)(0.062)(649,278 x 10^3 gallons – 10,688.17 x 10^3 gallons)
      = <u>2,740 x 10^3 gallons No. 2 fuel oil</u>

      ASC: 2103011000:

      = (0.0692)(1)(114 x 10^3 gallons - 114 x 10^3 gallons)
      = <u>0 x 10^3 gallons kerosene</u>

3. Emission Factors

ASC	Pollutant	EF ($lb/10^3$ gallons)
2103004001	NO_x	24
	PM2.5	2.38
2103004002	NO_x	604
	PM2.5	42.5
2103011000	NO_x	24
	PM2.5	1.833

4. Emissions Calculations

a. Annual

ASC: 2103004001:

NOx: (24 $lb/10^3$ gallons)(41,450 $x10^3$ gallons) = 994,800 lb = 497.4 tons

PM2.5: (2.38 $lb/10^3$ gallons)(41,450 $x10^3$ gallons) = 98,700 lb = 49.4 tons

ASC: 2103004002:

NOx: (604 $lb/10^3$ gallons)(2,740 $x10^3$ gallons) = 1,655,000 lb = 827.5 tons

PM2.5: (42.5 $lb/10^3$ gallons)(2,740 $x10^3$ gallons) = 116,500 lb = 58.3 tons

ASC: 2103011000:

NO_x: (24 $lb/10^3$ gallons)(0 $x10^3$ gallons) = 0 lb

PM2.5: (1.833 $lb/10^3$ gallons)(0 $x10^3$ gallons) = 0 lb

Appendix J

Projected Emission Reductions from New Control Strategies

SCC	2007 (tons)	2017 Growth & Control (tons)	2025 Growth & Control (tons)	SCC Category
Part 228 - VOC				
Surface Coating Processes, Commercial and Industrial Adhesives, Sealants and Primers				
2401005000	3.54	3.72	3.87	Surface Coating /Auto Refinishing /Total: All Solvent Types
2461200000	3,129.49	3,283.77	3,397.51	Misc Non-industrial: Commercial /Adhesives & Sealants /Total: All Solvent T
2440020000	2,268.73	640.89	528.93	Misc Industrial /Adhesive (Industrial) Application /Total: All Solvent Type
Total	**5,401.76**	**3,928.38**	**3,930.32**	
Part 234 - VOC				
Graphic Arts				
2425000000	**2,994.73**	**2,265.93**	**1,794.50**	Graphic Arts /All Processes /Total: All Solvent Types
Part 235 - VOC				
Consumer Products				
2465000000	**30,141.94**	**30,995.32**	**32,068.93**	Misc Non-indus: Consumer /All Products/Processes /Total: All Solvent Types
Part 239 - VOC				
Portable Fuel Container Spillage Control				
2501011011	961.36	239.86	200.77	Residential Portable Gas Cans /Permeation
2501011012	6,637.90	1,656.13	1,386.27	Residential Portable Gas Cans /Evaporation (includes Diurnal losses)
2501012011	37.68	9.40	7.87	Commercial Portable Gas Cans /Permeation
2501012012	20.62	5.15	4.31	Commercial Portable Gas Cans /Evaporation (includes Diurnal losses)
Total	**7,657.56**	**1,910.54**	**1,599.22**	
Part 241 - VOC				
Asphalt Pavement and Asphalt Based Surface Coating				
2401008000	**130.12**	**130.12**	**130.12**	Surface Coating /Traffic Markings /Total: All Solvent Types

SCC	2007 (tons)	2017 Growth & Control (tons)	2025 Growth & Control (tons)	SCC Category
ECL 19-0303				
Ultra Low Sulfur Heating Oil - PM2.5				
2101004000	0.05	0.06	0.06	Stationary Fuel Comb /Electric Utility /Distillate Oil /Total: Boilers and
2102004000	17.66	14.80	14.37	Stationary Fuel Comb /Industrial /Distillate Oil /Total: Boilers and IC Eng
2103004001	330.35	234.08	216.00	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boil
2103004002	506.28	358.75	331.04	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boil
2104004000	848.86	671.97	584.85	Stationary Fuel Comb /Residential /Distillate Oil /Total: All Combustor Typ
TOTAL	**1,703.20**	**1,279.65**	**1,146.32**	
Ultra Low Sulfur Heating Oil - PM10				
2101004000	2.01	2.31	2.36	Stationary Fuel Comb /Electric Utility /Distillate Oil /Total: Boilers and
2102004000	73.60	61.66	59.89	Stationary Fuel Comb /Industrial /Distillate Oil /Total: Boilers and IC Eng
2103004001	428.93	303.94	280.46	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boil
2103004002	506.28	358.75	331.04	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boil
2104004000	1,102.18	872.50	759.38	Stationary Fuel Comb /Residential /Distillate Oil /Total: All Combustor Typ
TOTAL	**2,112.99**	**1,599.15**	**1,433.13**	