Attachment

Revision to Connecticut's State Implementation Plan

$PM_{2.5}$ Redesignation Request and Maintenance Plan

Technical Support Document

Connecticut Department of Energy and Environmental Protection

February 27, 2012

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Executive Summary

This document presents the Connecticut Department of Energy and Environmental Protection's (DEEP) request to redesignate Connecticut's portion of the New York-New Jersey-Connecticut (NY-NJ-CT) nonattainment area to attainment for the federal 1997 annual and 2006 24-hour National Ambient Air Quality Standards (NAAQS) for fine particulate matter less than a nominal 2.5 micrometers in diameter ($PM_{2.5}$). Evidence is provided satisfying Clean Air Act (CAA) sections 107(d)(3)(E) and 175A, which specify the requirements that must be met for the U.S. Environmental Protection Agency (EPA) to redesignate a nonattainment area to attainment status. These requirements include demonstrations that:

- The area has attained the NAAQS;
- The applicable implementation plan is fully approved under CAA section 110(k) and the area has met all applicable requirements of CAA section 110 and part D;
- The air quality improvements are due to permanent and enforceable emission reductions;
- The area has a fully approved a maintenance plan satisfying CAA section 175A.

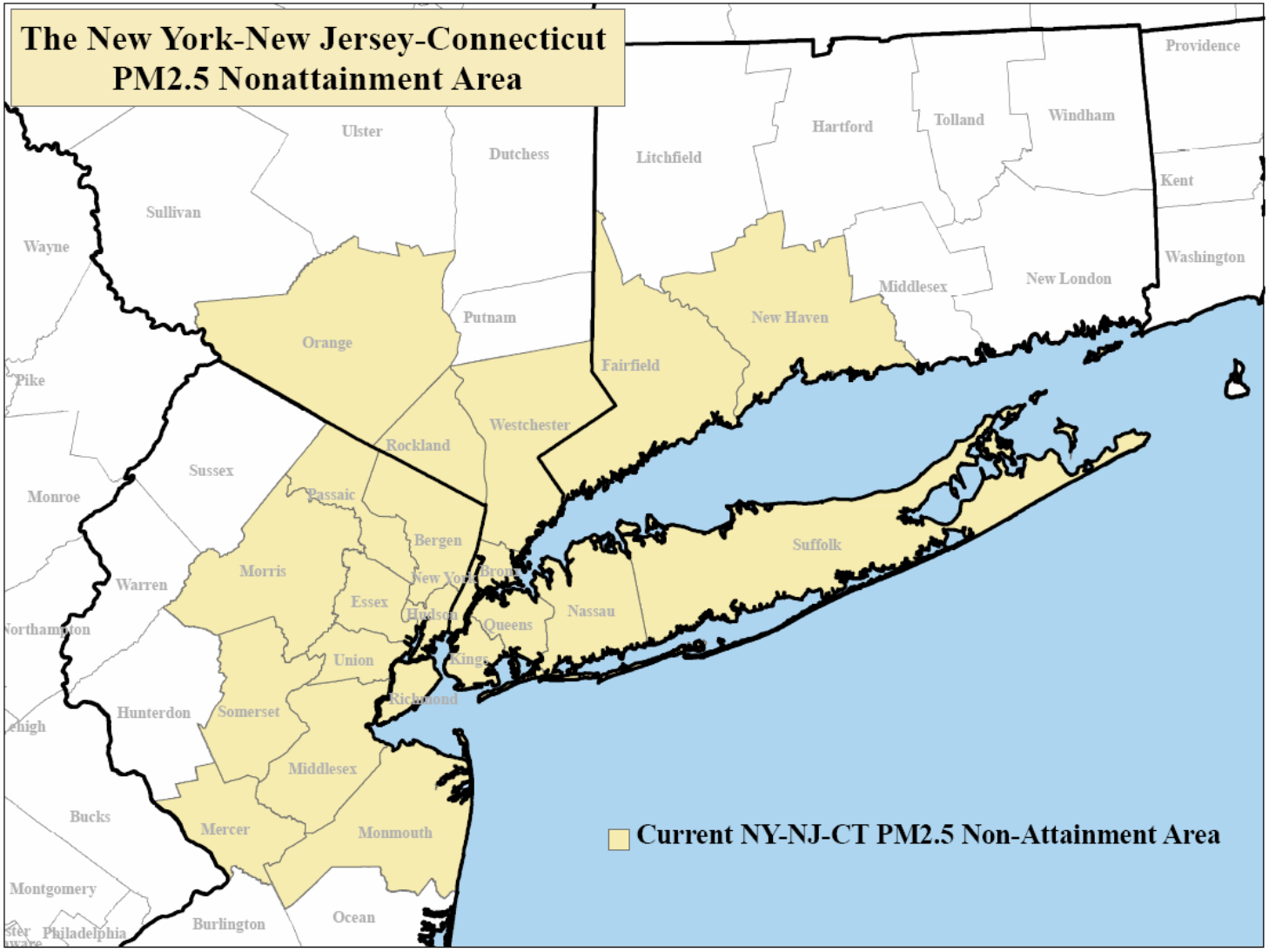
E.1 Background

Fine particles in the atmosphere are comprised of a complex mixture of components including sulfate (SO_4), nitrate (NO_3), ammonium, elemental carbon, organic compounds and inorganic material (e.g., metals, dust, sea salt) generally referred to as 'crustal material.' Primary particles are emitted directly into the air as solid or liquid particles (e.g., elemental carbon from diesel engines). Secondary particles form in the atmosphere over time because of various chemical reactions (e.g., gaseous sulfur dioxide and ammonia reacting to form ammonium sulfate particles). Consequently, $PM_{2.5}$ experienced at one location can have origins both nearby and distant.

The annual average and 24-hour average $PM_{2.5}$ NAAQS were initially established by EPA in 1997 and revised in 2006, based on evidence demonstrating that serious health effects are associated with exposure to elevated levels of $PM_{2.5}$, mainly because particles of this size can easily reach into the deepest regions of the lungs. Significant health effects associated with $PM_{2.5}$ exposure include premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function and difficulty breathing, asthma attacks, and cardiovascular problems such as heart attacks and cardiac arrhythmia. Particularly sensitive individuals include older adults, people with heart and lung disease, and children.

Connecticut's Fairfield and New Haven Counties are currently designated by EPA as nonattainment for both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS and are grouped with several counties in New York and northern New Jersey in a multi-state (NY-NJ-CT) nonattainment area that encompasses metropolitan New York City, as shown in Figure E-1. EPA established these nonattainment areas in 2005 for the annual NAAQS and in 2009 for the 24-hour NAAQS based on $PM_{2.5}$air quality measured prior to those years.

Figure E-1. New York-New Jersey-Connecticut (NY-NJ-CT) Annual/24-hour $PM_{2.5}$ Nonattainment Area



E.2 Monitoring Shows Compliance with $PM_{2.5}$ NAAQS

As shown in Figures E-2 and E-3, $PM_{2.5}$ air quality has improved significantly over the last decade in the Connecticut portion of the NY-NJ-CT area. Similar improvements have occurred in the New York and New Jersey portions of the area as well. Connecticut's portion of the nonattainment area measures compliance with the 15 $\mu g/m^3$ annual NAAQS, with a maximum 2010 design value of 10.3 $\mu g/m^3$. As a whole, the area first reached compliance with the annual NAAQS in 2008, with a most recent (i.e., 2010) maximum design value of 12.5 $\mu g/m^3$, measured in New York City.

Connecticut's portion of the area first measured compliance with the 35 $\mu g/m^3$ 24-hour NAAQS in 2008, with a maximum 2010 design value of 29 $\mu g/m^3$. As a whole, the NY-NJ-CT area first complied with the 24-hour NAAQS in 2009 and has a most recent (i.e. 2010) maximum design value of 30 $\mu g/m^3$, measured in New Jersey. Therefore, the entire NY-NJ-CT area has measured full compliance with both NAAQS since 2009.

E.3 Applicable CAA Section 110 and Title 1 Part D Requirements are Satisfied

Connecticut has submitted "infrastructure SIPs" addressing CAA section 110(a) requirements, for both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. EPA has found Connecticut's infrastructure SIP submittal for the 1997 annual NAAQS to be complete, but has not yet issued rulemakings to approve the infrastructure SIPs for either of the NAAQS. Nonetheless, previous redesignation rulemakings issued by EPA for other areas conclude that section 110 elements not connected with nonattainment plan submissions and not linked with an area's attainment status are not applicable requirements for purposes of redesignation because a state remains subject to these requirements after redesignation.

CAA Subpart 1 of part D sets forth the basic nonattainment requirements applicable to all nonattainment areas. All areas that were designated nonattainment for the 1997 annual or the 2006 24-hour $PM_{2.5}$ NAAQS were designated under this subpart of the CAA and the requirements applicable to them are contained in sections 172 and 176. For purposes of evaluating redesignation requests, the applicable part D, subpart 1 SIP requirements are contained in sections 172(c)(1)–(9) and in section 176.

States with nonattainment areas are required to submit a plan to reach attainment. Connecticut submitted an attainment demonstration for its portion of the annual nonattainment area in November 2008, meeting the requirements of CAA sections 172 and 176. EPA has not yet acted on that plan. Attainment demonstrations for the 24-hour NAAQS are due in December 2012.

As discussed earlier, all monitors in the NY-NJ-CT area show compliance with both the annual and 24-hour NAAQS. EPA has already recognized that the multi-state area has "clean data" in accordance with 40 CFR 51.1004(c), for the annual NAAQS. Connecticut has requested a similar "clean data" finding for the 24-hour NAAQS and is awaiting EPA action. The requirement to submit the 24-hour NAAQS attainment demonstration would no longer apply if EPA issues a "clean data" finding for that NAAQS, or if EPA approves this redesignation request for the 24-hour NAAQS before the December 2012 due date.

Figure E-2 Annual Design Value Trends in Connecticut's Portion of the NY-NJ-CT Area

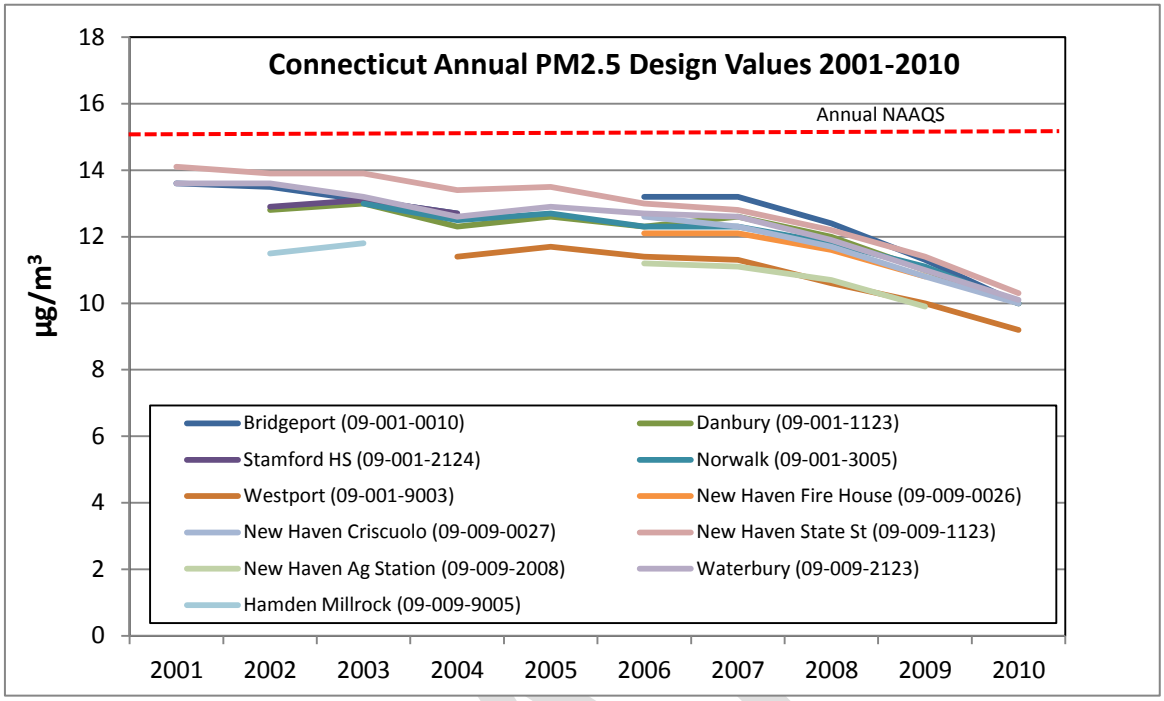
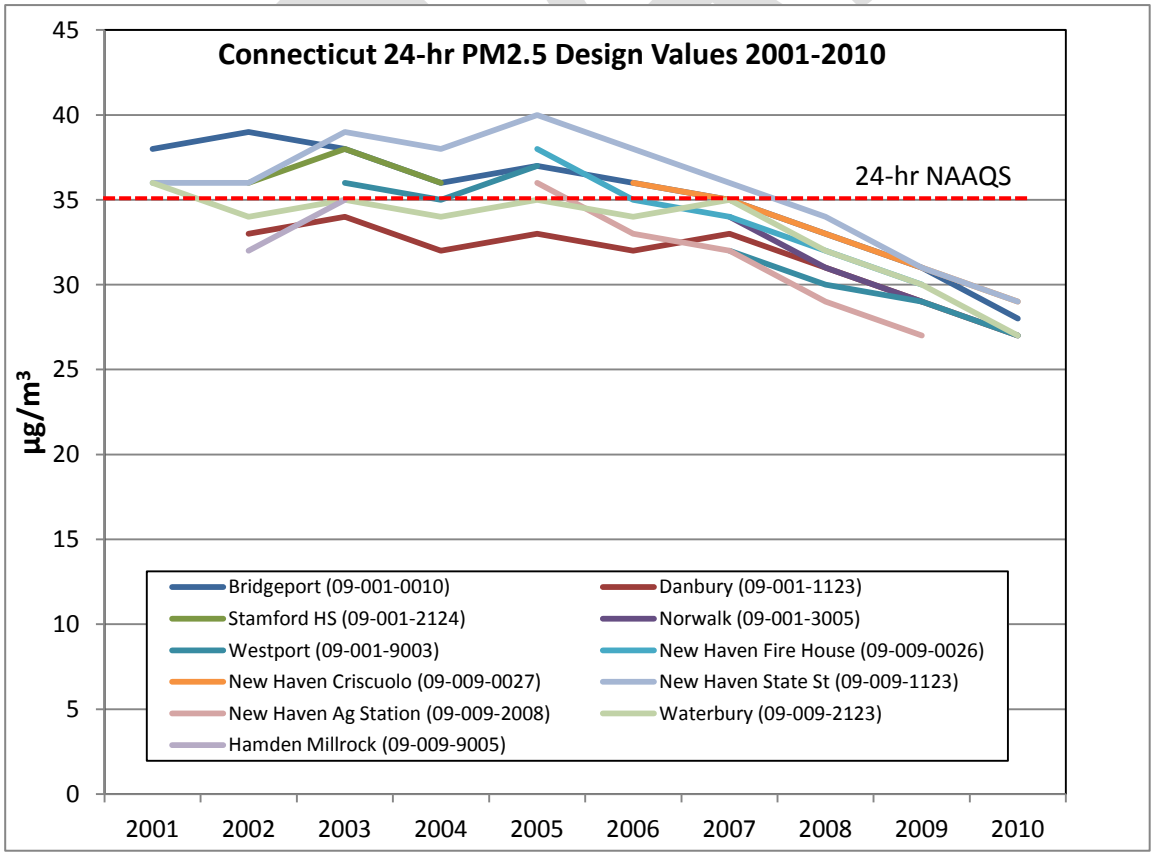


Figure E-3 24-Hour Design Value Trends in Connecticut's Portion of the NY-NJ-CT Area



CAA section 172(c)(3) requires an inventory of actual emissions. Included as part of this redesignation request is a 2007 base year emissions inventory meeting the requirement.

EPA's $PM_{2.5}$ implementation rules require states to adopt specified new source review (NSR) permitting revisions by July 20, 2012. DEEP held a public hearing in November 2011 to consider revisions to RCSA sections 22a-174-1 and 22a-174-3a to include significant impact levels, significant emissions rates and increments for $PM_{2.5}$, consistent with EPA's requirements. Assuming EPA makes no changes to the implementation rules, DEEP intends to continue to pursue adoption of the revised regulations. Nonetheless, because all states are subject to this updated NSR requirement and the deadline for compliance has not yet arrived, DEEP maintains that approval of this redesignation request is not dependent upon prior EPA approval of the updated NSR provision. Therefore, Connecticut has satisfied all applicable CAA Section 110 and Title 1 Part D requirements necessary for $PM_{2.5}$ redesignation.

E.4 Attainment Results from Permanent and Enforceable Emission Reductions

Numerous federal and state emission control programs have been adopted and implemented over the last decade, providing permanent and enforceable reductions in direct $PM_{2.5}$ and $PM_{2.5}$ precursor emissions (e.g., SO_2 and NO_x) in Connecticut and some upwind areas. Table E-1 lists post-2002 NO_x, SO_2 and $PM_{2.5}$ control measures that are largely responsible for the significant improvements realized in measured $PM_{2.5}$ air quality. Some of these control programs (e.g., on-road vehicle and non-road engine standards) will provide additional emission reductions during the maintenance period, ensuring continued compliance with the NAAQS.

E.5 Maintenance Plan Provides for Continuing Attainment

CAA section 175A establishes the required elements of a maintenance plan for areas seeking redesignation from nonattainment to attainment. Plans must include an inventory sufficient to ensure attainment, a demonstration using inventory projections that the plan provides for continued NAAQS compliance through the first 10-year maintenance period, a commitment to maintain an appropriate monitoring network, methods to track the progress of the maintenance plan and contingency measures to be implemented if NAAQS violations occur during the maintenance period.

Attainment and Future Year Inventories Demonstrate Continued NAAQS Compliance

Comprehensive inventories were developed in collaboration with other states in the Mid-Atlantic/Northeast Visibility Union (MANE-VU) to support future multi-pollutant planning efforts. That regional effort also served as the basis for developing inventories needed by states, such as Connecticut, seeking $PM_{2.5}$ redesignation. Figures E-4, E-5 and E-6 compare $PM_{2.5}$, NO_x and SO_2 emission estimates, respectively, in Connecticut's portion of the NY-NJ-CT area for the representative attainment year (2007), an interim year (2017) and the end of the maintenance period (2025).

Table E-1 Adopted Post-2002 Federal and Connecticut Control Measures

Control Measure	PM	NO_X	SO_2
Federal Programs			
Tier 2 Vehicle Standards and Gasoline Sulfur Standards	X	X	X
Heavy-Duty Diesel and Gasoline Highway Vehicle Standards	X	X	X
Motorcycle Exhaust Standards		X	
Large Non-road Diesel Engine Standards	X	X	X
Non-road Spark-Ignition Engines and Recreational Engine Standards	X	X	X
NOx SIP Call		X	
CAIR		X	X
State Programs			
Control of Sulfur Dioxide and Nitrogen Oxide Emissions from Power Plants and Other Large Stationary Sources RCSA Sections 22a-174-19a and 22a-174-22(e)(3)		X	X
The Post-2002 Nitrogen Oxides (NOx) Budget Program RCSA Section 22a-174-22b		X	
CAIR NO_X Ozone Season Trading Program RCSA Section 22a-174-22c		X	
Outdoor Wood Burning Furnace Restrictions Section 22a-174k of the Connecticut General Statutes	X		
Improvements in the Control of Particulate Matter and Visible Emissions RCSA Section 22a-174-18	X	X	
Connecticut Enhanced Inspection and Maintenance Program (ASM 2525 final standards and OBD II program) RCSA Section 22a-174-27		X	
CT's California Low Emission Vehicle Phase 2 (CALEV2) RCSA Section 22a-174-36b	X	X	
Reductions in NOx emissions from Municipal Waste Combustors (Phase 2) RCSA Section 22a-174-38		X	
NSR Permit to Construct and Operate Stationary Sources RCSA Section 22a-174-3a	X	X	X

Figure E-4 Projected $PM_{2.5}$ Emissions for CT's Portion of the NY-NJ-CT Area

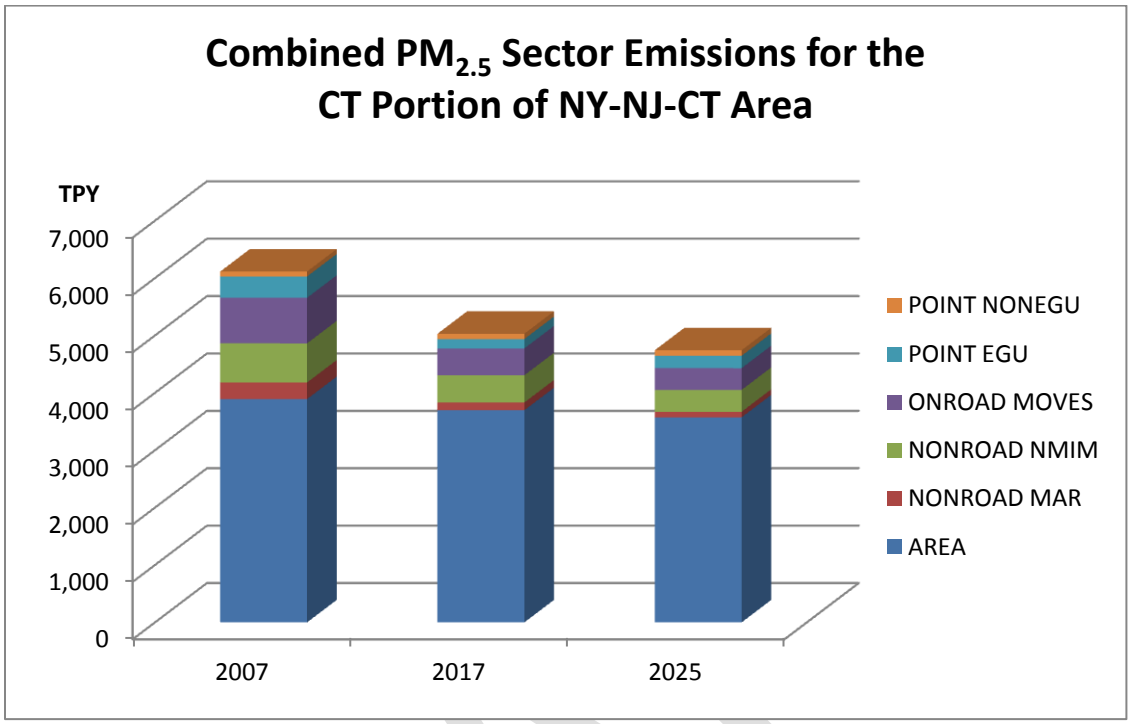


Figure E-5 Projected NO_x Emissions for CT's Portion of the NY-NJ-CT Area

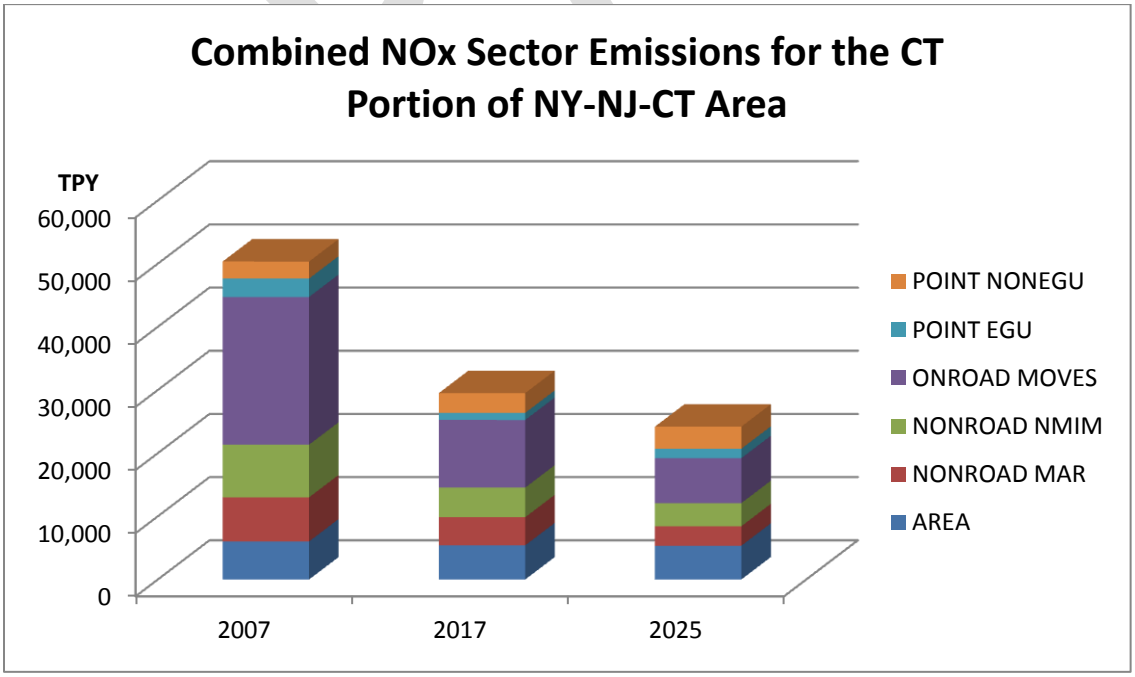
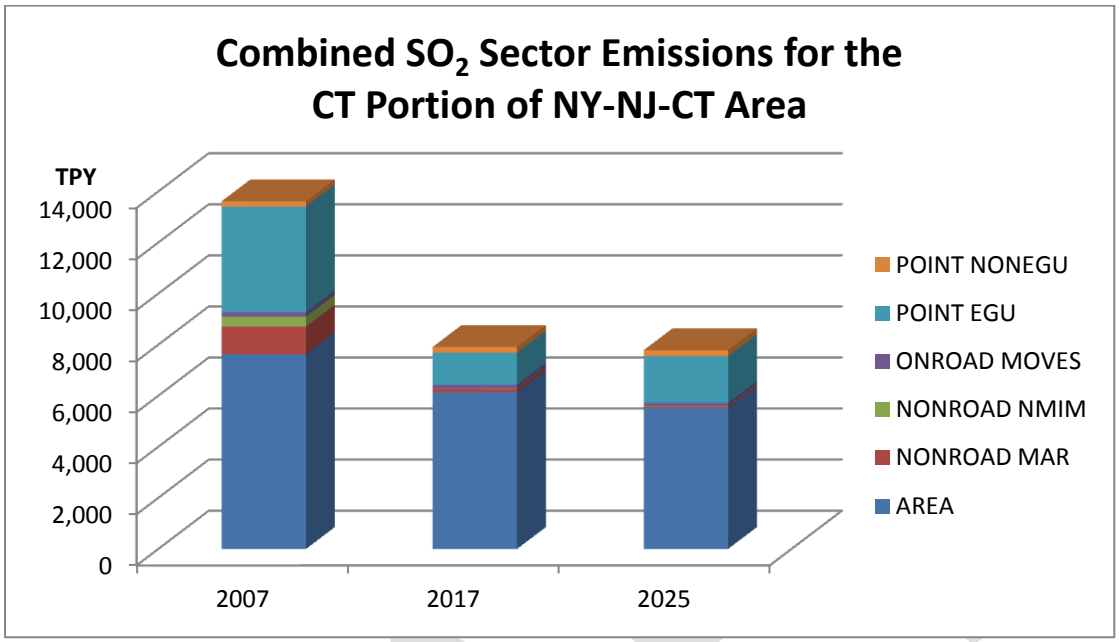


Figure E-6 Projected SO_2 Emissions for CT's Portion of the NY-NJ-CT Area



Results demonstrate that total emissions of all three $PM_{2.5}$-related pollutants decrease significantly through the maintenance period, with $PM_{2.5}$ emissions decreasing by 22%, NO_x by 52% and SO_2 by 43% between 2007 and 2025. These projected reductions occur due to the currently adopted federal and state control programs listed in Table E-1, with no additional control strategies necessary to maintain the NAAQS through 2025. Therefore, the Section 175A mandate to demonstrate continued compliance during the maintenance period is satisfied.

Motor Vehicle Emission Budgets

The maintenance plan establishes $PM_{2.5}$ and NO_x transportation conformity budgets for 2009[1], 2017 and 2025 to ensure that future emissions from on-road mobile sources provide for continuing attainment of the $PM_{2.5}$ NAAQS. Since total combined emissions from all source sectors are projected to decline significantly during the maintenance period (see Figure E-4), both the 2017 and 2025 projected emission levels provide a "safety margin" relative to total emissions in the 2007 attainment year. DEEP is allocating a small portion (i.e., 10%) of that safety margin to the conformity budgets for 2017 and 2025, as shown in Table E-2.

[1] EPA previously approved 2009 $PM_{2.5}$ and NOx conformity budgets for CT's portion of the nonattainment area that were established using EPA's emissions model, MOBILE6.2. Emissions budgets in the maintenance plan are based on EPA's recently released MOVES model, which supplanted the MOBILE6.2 model as EPA's required method of determining on-road emissions. The 2009 MOVES budgets replace the current 2009 MOBILE6.2 budgets, corresponding to an updated estimate of the level of on-road emissions that are consistent with measured $PM_{2.5}$ attainment during the 2007-2009 period. CT elected to use 2009 emission estimates for on-road sources because they are lower than estimates for 2007, providing greater certainty that attainment level emissions are identified.

Table E-2 Transportation Conformity Budgets for the Connecticut Portion of the NY-NJ-CT Area

Year		$PM_{2.5}$	NO_x
2009	**2009 Conformity Budget**	**794.0**	**23,391.7**
2017	On-Road Inventory	467.4	10,708.0
	Safety Margin vs 2007	1083.9	20,837.8
	10% of Safety Margin	108.4	2,083.8
	2017 Conformity Budget	**575.8**	**12,791.8**
2025	On-Road Inventory	378.9	7,113.4
	Safety Margin vs 2007	1371.3	26,146.9
	10% of Safety Margin	137.1	2,614.7
	2025 Conformity Budget	**516.0**	**9,728.1**

Monitoring Commitment and Tracking Progress of the Maintenance Plan

DEEP commits to maintaining an appropriate $PM_{2.5}$ monitoring network through the maintenance period, with any potential changes to be developed in collaboration with EPA and subject to stakeholder review that occurs with annual monitoring network plans and five-year network assessment reports. DEEP will continue to conduct ambient $PM_{2.5}$ monitoring in accordance with 40 CFR 58 requirements and expeditiously review data as it becomes available to evaluate any risk of impending NAAQS violations. DEEP will also regularly review available emission inventory updates produced by EPA and DEEP. Both of these indicators will be used as potential triggers for early action in the contingency plan described below.

Contingency Plan

DEEP will implement a two-level plan to identify, examine and, if necessary, implement appropriate action for monitored $PM_{2.5}$ levels that approach or violate the 1997 annual or 2006 24-hour $PM_{2.5}$ NAAQS. An initial Warning Level Response will be triggered based on $PM_{2.5}$ levels that approach the NAAQS. This voluntary commitment is intended to evaluate the need for early actions to prevent violations of the NAAQS from ever occurring during the maintenance period. The Warning Level Response will be triggered based on annual reviews of measured $PM_{2.5}$ levels. If either a single year's 98th percentile daily value or a single year's annual average exceeds the NAAQS (note that violations are based on three year averages), DEEP will examine available information (e.g., meteorology, exceptional events, local changes in source activity, source malfunctions/noncompliance or unexpected emissions increases) to identify contributing factors and make a judgment on whether any early corrective actions are warranted.

Should early actions not be successful and a subsequent verified violation occurs, an Action Level Response will be triggered. DEEP will first conduct the same types of investigations described above to determine potential causes and available resolutions. If the causes are within the jurisdiction and control of DEEP (e.g., not predominantly due to interstate transport or exceptional events), one or more control measures such as those in the example list below will be pursued for implementation. Ultimately,

contingency measures will be selected from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. The selection of measures will be based upon the presumed cause of the violation, cost effectiveness, emission reduction potential, economic and social considerations, or other appropriate factors. Stakeholder input will be solicited from interested and affected persons in the maintenance area prior to selecting any appropriate contingency measures. Because it is not possible at this time to determine what control measure will be appropriate at any future time during the maintenance period, the list of possible measures below is not intended to be exclusive or exhaustive.

- Control measures already adopted, but designed to produce additional reductions after the verified violation occurred (e.g., mobile source measures that involve fleet turnover);
- New control measures that may be adopted for other purposes (e.g., Tier 3 or CALEV3);
- Corrections to source noncompliance or malfunctions;
- Alternative fuel and/or diesel retrofit programs for fleet vehicle operations;
- New or more stringent $PM_{2.5}$, NOx or SO_2 controls on stationary sources;
- Wood stove change out program;
- "No burn" days during cold weather inversion events;
- Enhanced idle restrictions;
- Transportation control measures selected in consultation with the Connecticut Department of Transportation (CTDOT) and affected local metropolitan planning organizations (e.g., traffic flow improvements, transit improvements, trip reduction programs, other new or innovative transportation measures).

DEEP commits to pursue adoption of any appropriate measures with a goal of achieving implementation within 18 months from the date when the violation triggering the Action Level Response is verified. As required by CAA 175A(d), upon verification of a NAAQS violation, DEEP also commits to implement all measures which were contained in the SIP before the area was redesignated to attainment.

Commitment to Revise Plan

DEEP commits to submit a revised maintenance plan eight years after EPA finalizes redesignation. The revision will demonstrate that attainment will continue to be maintained for the 10 years following the initial 10-year period, as required by CAA section 175A(b).

Chapter 1 Introduction and Background

This technical support document (TSD) presents the Connecticut Department of Energy and Environmental Protection's (DEEP) request to redesignate Connecticut's portion of the New York-New Jersey-Connecticut (NY-NJ-CT) area to attainment for the federal 1997 annual and 2006 24-hour National Ambient Air Quality Standard (NAAQS) for fine particulate matter less than a nominal 2.5 micrometers in diameter ($PM_{2.5}$). The plan demonstrates that Connecticut's air quality meets both standards due to a combination of national, regional and local control measures implemented to reduce emissions and presents a maintenance plan that will ensure continued attainment through the year 2025.

1.1 Particulate Matter Formation and Health Effects

Fine particles in the atmosphere are comprised of a complex mixture of components. Common constituents include: sulfate (SO_4); nitrate (NO_3); ammonium; elemental carbon; a great variety of organic compounds; and inorganic material (including metals, dust, sea salt, and other trace elements) generally referred to as 'crustal material'. Primary particles are emitted directly into the air as a solid or liquid particle (e.g., elemental carbon from diesel engines or fire activities, or condensable organic particles from gasoline engines). Secondary particles form in the atmosphere over time because of various chemical reactions (e.g., gaseous sulfur dioxide and ammonia reacting to form ammonium sulfate particles). Consequently, $PM_{2.5}$ experienced at one location can have origins both nearby and distant.

The annual average and 24-hour average $PM_{2.5}$ NAAQS were initially established by the United States Environmental Protection Agency (EPA) in 1997 and revised in 2006, based on evidence from numerous health studies demonstrating that serious health effects are associated with exposure to elevated levels of $PM_{2.5}$. Epidemiological studies have shown statistically significant correlations between elevated $PM_{2.5}$ levels and premature mortality. Individuals particularly sensitive to $PM_{2.5}$ exposure include older adults, people with heart and lung disease, and children.[1]

The health effects associated with exposure to fine particles are significant, mainly because very small particles of this size can easily reach into the deepest regions of the lungs. Significant health effects associated with fine particle exposure include:

- premature mortality;
- aggravation of respiratory and cardiovascular disease (as evidenced by increased hospital admissions, emergency room visits, school/work absences, and restricted activity days);
- decreased lung function and difficulty breathing;
- asthma attacks; and
- certain cardiovascular problems such as heart attacks and cardiac arrhythmia.[2,3,4]

[1] 62 FR 38652-690 (July 18, 1997).
[2] 72 FR 20586, April 25, 2007.
[3] "Air Quality Criteria for Particulate Matter", United States Environmental Protection Agency, Research Triangle Park, North Carolina: National Center for Environmental Assessment—RTP, Office of Research and Development; report no. EPA/600/P–99/002aF and EPA/600/P–99/002bF. October 2004.

The EPA has estimated that attainment of the annual and daily $PM_{2.5}$ standards nationally would prolong tens of thousands of lives and prevent tens of thousands of hospital admissions each year.[5] In addition, these standards would prevent hundreds of thousands of doctor visits, absences from work and school, and respiratory illnesses in children. The elderly have been shown to be particularly at risk for premature death from the effects of particulate matter. Health studies indicate there is no clear threshold below which adverse effects are not experienced by at least certain segments of the population.

Although fine particulate matter generated from all sources can cause serious health impacts, particulate matter generated from diesel combustion is particularly troublesome. The concern over diesel particulate matter is two-fold. First, while diesel engines collectively are large sources of NO_x and direct fine particle emissions, they also emit significant amounts of toxic air pollutants.[6] Second, the size of diesel particulate matter may add to its health impacts. Almost all of the particles produced by diesel exhaust are fine particulate matter (below 2.5 micrometers in diameter), much in the ultra-fine range (that is, particles with an aerodynamic diameter of less than 0.1 micrometer). Since both fine and ultra-fine particles are respirable, many of these particles are not captured by the human respiratory system's defense mechanisms and enter deeply into the lungs. Studies have shown that ultra-fine particles are so small that they are capable of penetrating all the way to the cellular level, where they may induce structural damage in the body's core building blocks.

1.2 Particulate Matter NAAQS History

The 1970 Clean Air Act (CAA) amendments established health and welfare protective limits, or national ambient air quality standards (NAAQS), for a number of air pollutants, including particulate matter. EPA first issued standards for total suspended particulate matter in 1971 and revised the standards to target PM_{10} (i.e., particles less than a nominal 2.5 micrometers in diameter) in 1987 and $PM_{2.5}$ 1997. In September 2006, the Agency revised the 1997 $PM_{2.5}$ standards.

1.2.1 1997 $PM_{2.5}$ NAAQS

On July 18, 1997, the EPA established two primary NAAQS for fine particles:

- An annual $PM_{2.5}$ health-based standard of 15 micrograms per cubic meter ($\mu g/m^3$) (annual arithmetic mean not to be exceeded over a three year average); and
- A daily (24-hour) $PM_{2.5}$ health-based standard of 65 $\mu g/m^3$ (the three year average of 98^{th} percentile days not to be exceeded).[7,8]

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[4] "Provisional Assessment of Recent Studies on Health Effects of Particulate Matter Exposure; National Center for Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency; Research Triangle Park, NC 27711; EPA/600/R-06/063; July 2006.

[5] 62 FR 38652-690, July 18, 1997.

[6] EPA. Health Assessment Document for Diesel Engine Exhaust. United States Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington, DC, EPA/600/8-90/057F, May 1, 2002.

[7] 62 FR 38652-760, July 18, 1997.

Simultaneously, the EPA established secondary (welfare-based) $PM_{2.5}$ standards identical to the primary standards. These standards are hereafter referred to as the 1997 $PM_{2.5}$ standards. The EPA set the $PM_{2.5}$ standards with 24-hour and annual averaging times to protect against effects from short- and long-term exposure identified by a number of published epidemiological studies.

A number of events delayed implementation of the 1997 $PM_{2.5}$ standard.[9] Specifically, the EPA's 1997 standards were challenged by the American Trucking Association, the U.S. Chamber of Commerce, and other state and business groups. The Transportation Equity Act for the Twenty-first Century (TEA-21) revised the deadline to publish nonattainment designations in order to provide additional time to collect three years of air quality monitoring data. In February 2001, the Supreme Court upheld the EPA's authority under the Clean Air Act to set NAAQS that protect the American public from the harmful effects of air pollution. The Supreme Court also sent the case back to the D.C. Circuit Court of Appeals to resolve several additional issues. In March 2002, the D.C. Circuit Court addressed all remaining legal challenges to the EPA's 1997 ambient air quality standards for $PM_{2.5}$.

On December 17, 2004, the EPA finalized attainment/ nonattainment designations for the 1997 $PM_{2.5}$ standards, which became effective on April 5, 2005.[10] EPA determined that air quality in Connecticut complied with the 1997 24-hour $PM_{2.5}$ NAAQS, but that emissions from Fairfield and New Haven Counties contributed to measured violations of the annual $PM_{2.5}$ NAAQS in New York City. As a result, EPA included those two Connecticut counties in a multi-state nonattainment area also comprised of the New York and New Jersey counties that make up the New York City Metropolitan Area. The multi-state NY-NJ-CT nonattainment area is depicted in Figure 1-1. The three affected states were responsible for developing and coordinating revisions to their respective air quality State Implementation Plans (SIPs) to provide for attainment of the 1997 annual $PM_{2.5}$ NAAQS by the 2010 attainment deadline. Connecticut submitted an attainment demonstration SIP to EPA on November 18, 2008 for the 1997 annual $PM_{2.5}$ NAAQS.[11]

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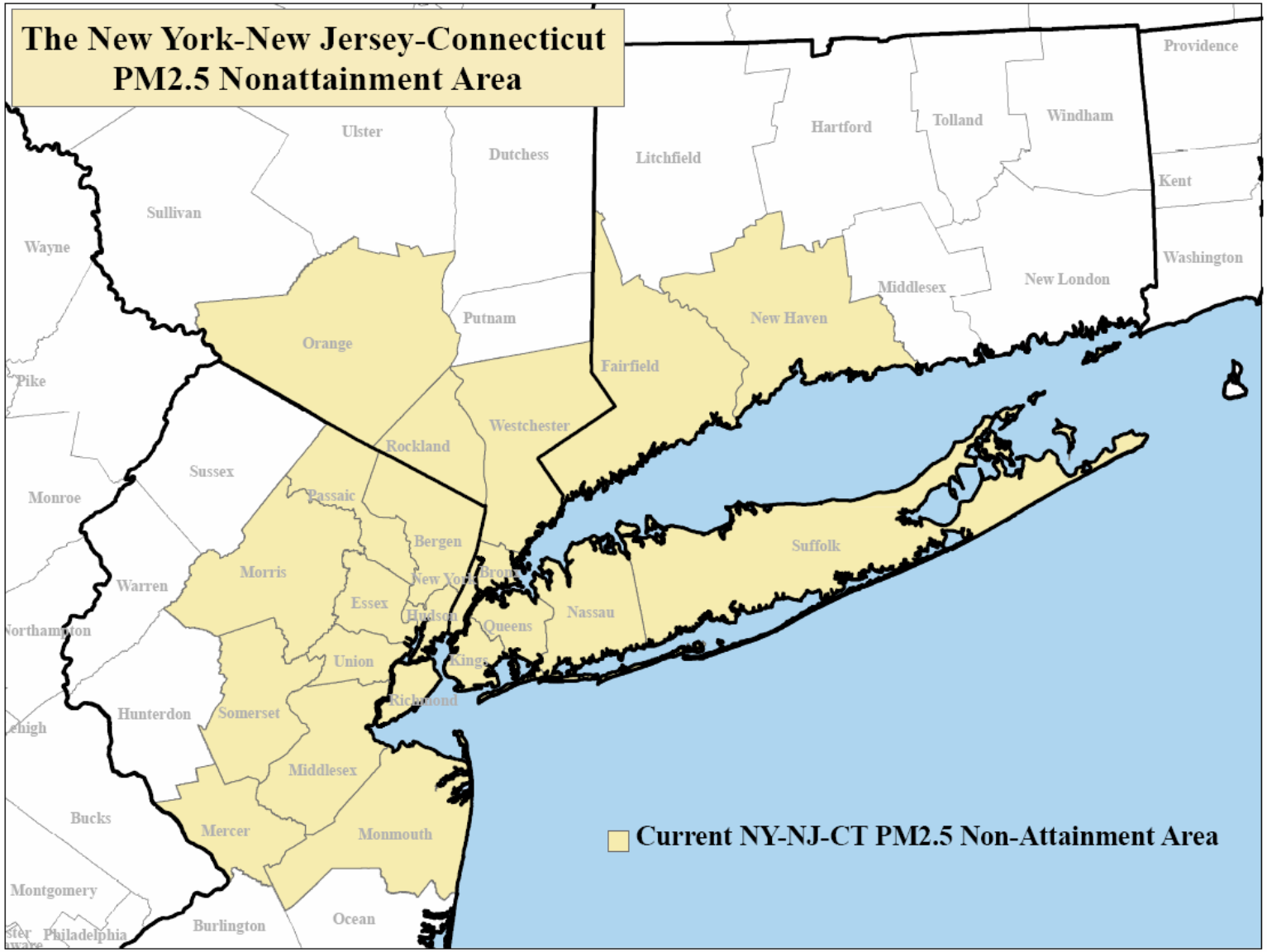
[8] The EPA also revised the PM_{10} NAAQS by revising the 24-hour form of the PM_{10} standard to the 99th percentile averaged over 3 years but retaining the 24-hour PM_{10} level (i.e., 150 mg/m^3) (62 FR 38652 (July 18, 1997)). In 2006, the EPA revoked the annual PM_{10} standard (71 FR 61144 (October 17, 2006)). Connecticut was not designated in nonattainment of the PM_{10} NAAQS and continues to meet the revised PM_{10} standards.

[9] EPA. Fact Sheet: Areas Designated Nonattainment for the Fine Particle National Air Quality Standards. United States Environmental Protection Agency, December 17, 2004, http://www.epa.gov/pmdesignations/documents/final/factsheet.htm, accessed June 28, 2007.

[10] 72 FR 20586-667, April 25, 2007.

[11] Revision to Connecticut's State Implementation Plan: Annual $PM_{2.5}$ Attainment Demonstration; Connecticut Department of Environmental Protection; November 18, 2008. EPA has yet to take action on this SIP revision.

Figure 1.1 The NY-NJ-CT Annual and 24-hour $PM_{2.5}$ Nonattainment Areas



1.2.2 2006 $PM_{2.5}$ NAAQS

Meanwhile, as required by Clean Air Act (CAA) section 109(d)(1) and governed by a March 2003 consent decree reached with national environmental organizations, EPA conducted a review of more recent health effects studies to assess the adequacy of the 1997 $PM_{2.5}$ NAAQS. As result of that review, EPA promulgated[12] revised NAAQS for $PM_{2.5}$. The EPA retained the annual $PM_{2.5}$ standard of 15 $\mu g/m^3$ and revised the 24-hour $PM_{2.5}$ standard, changing it from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. The effective date for the new 24-hour $PM_{2.5}$ standard became December 18, 2006. In December 2007, Connecticut submitted a recommendation that New Haven and Fairfield Counties be designated nonattainment for the $PM_{2.5}$ 24-hour NAAQS based on an analysis of monitored data for the 2004-2006 period. On November 13, 2009, EPA published final designations, effective December 13, 2009,[13] including those two counties in a NY-NJ-CT 24-hour $PM_{2.5}$ nonattainment area (see Figure 1.1). EPA designated the remainder of the state as unclassifiable/attainment.

As described in Section 2, $PM_{2.5}$ air quality has improved significantly over the last decade due to emissions reductions resulting from various federal, regional and state control measures. Monitors throughout the NY-NJ-CT area are currently measuring compliance with both the 1997 and 2006 $PM_{2.5}$ NAAQS, meeting one of several eligibility requirements for redesignation to attainment status for both the annual and 24-hour standards. Other eligibility requirements are outlined below.

1.3 Required Elements for $PM_{2.5}$ Redesignation

Section 107(d) (3) (E) of the CAA provides the mechanism for EPA to redesignate an area from nonattainment to attainment. Redesignation is contingent upon the EPA Administrator finding that:

- The area has attained the subject NAAQS;
- The applicable implementation plan for the area is fully approved under CAA section 110(k);
- The State containing such area has met all requirements applicable to the area under CAA section 110 and part D;
- The improvement in air quality is due to permanent and enforceable emission reductions;
- The area has a fully approved a maintenance plan meeting CAA section 175A requirements.

EPA has provided guidance on redesignation in the General Preamble for the Implementation of title I of the CAA Amendments of 1990 (April 16, 1992, 57 FR 13498, and supplemented on April 28, 1992, 57 FR 18070) and has provided further guidance on processing redesignation requests in the following documents:

- "Procedures for Processing Requests to Redesignate Areas to Attainment"; Memorandum from John Calcagni, Director, Air Quality Management Division; September 4, 1992.
- "State Implementation Plan (SIP) Actions Submitted in Response to Clean Air Act (CAA) Deadlines"; Memorandum from John Calcagni, Director, Air Quality Management Division; October 28, 1992.

[12] 71 FR 61144, October 17, 2006.
[13] 74 FR 58688, November 13, 2009.

- "Part D New Source Review (Part D NSR) Requirements for Areas Requesting Redesignation to Attainment"; Memorandum from Mary D. Nichols, Assistant Administrator for Air and Radiation; October 14, 1994.

The remainder of this TSD provides information describing how Connecticut's portion of the NY-NJ-CT nonattainment area meets these requirements for redesignation to attainment for both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. Section 2 provides a review of monitored $PM_{2.5}$ data, analyzing trends and showing that Connecticut's monitors comply with the NAAQS. Section 3 documents that Connecticut's SIP meets all applicable CAA Section 110 and part D requirements. Section 4 describes the regulatory control programs that have produced the improvements in $PM_{2.5}$ air quality. Section 5 presents the maintenance plan for the CT portion of the NY-NJ-CT area, addressing each of the required elements of CAA Section 175A, including transportation conformity emission budgets that will be used in the development of future transportation plans by the Connecticut Department of Transportation (CTDOT) and affected Metropolitan Planning Organizations (MPO) in the area. Section 6 summarizes the TSD, requesting EPA action to redesignate the area to attainment. Several appendices are also included, providing supporting details for the previous sections.

Chapter 2 Demonstration of Attainment of the $PM_{2.5}$ Standards

This section documents that the 1997 annual and 2006 24-hour (daily) NAAQS for $PM_{2.5}$ have been attained at all monitors located throughout the NY-NJ-CT nonattainment area. Measured attainment of the NAAQS is a key factor in meeting the eligibility requirements of CAA section 107(d)(3)(E) for redesignation to attainment. The EPA has already finalized a finding that the area has attained the annual $PM_{2.5}$ NAAQS.[14] On February 8, 2011, DEEP made a formal request[15] to EPA to make a similar determination that the NY-NJ-CT non-attainment area has attained the 2006 24-hour NAAQS for $PM_{2.5}$. EPA is currently considering this request. An analysis of relevant monitoring data is provided below, with a focus on Connecticut's monitoring network.[16]

2.1 Monitoring Network

The DEEP maintains a comprehensive network of $PM_{2.5}$ air quality monitors located throughout Connecticut with the primary objective being to determine compliance with the $PM_{2.5}$ NAAQS. The DEEP submits network reviews to the EPA Region 1 annually, demonstrating that air monitoring operations meet or surpass all applicable federal requirements. Figure 2.1 is a map illustrating the portion of Connecticut within the NY-NJ-CT nonattainment area and the locations of Connecticut's federal reference method (FRM) $PM_{2.5}$ monitors as of the end of 2010. DEEP continues to operate these eleven FRM $PM_{2.5}$ sites, with seven of the monitors located in Connecticut's portion of the nonattainment area. In addition, in 2009, DEEP shut down two sites in the City of New Haven that were operating as special purpose monitors. $PM_{2.5}$ levels at those sites were lower than measurements at the remaining two sites in the city.

2.2 Data Handling and Quality Assurance

State air monitoring data are submitted to EPA's data repository called the Air Quality System (AQS). All Connecticut data described in this section are included in AQS and have been quality assured, meeting the requirements specified in *Title 40 of the Code of Federal Regulations Part 58 Appendix A.* The completeness criteria for ambient monitoring data are specified in *40 CFR, Part 50, National Primary and Secondary Ambient Air Quality Standards: Appendix N.* A minimum completeness of 75 percent per quarter for each year period is required at each monitoring site. Data completeness information is presented in Table 2.1. Six of Connecticut's current seven $PM_{2.5}$ monitors located

[14] 75 FR 69589, November 15, 2010. EPA's "clean data" finding established that the area is measuring compliance with the NAAQS, although the area remains classified as nonattainment until EPA approves a redesignation request documenting that all CAA sections 107(d)(3)(E) have been satisfied.

[15] Clean Data Request Letter for 24-hr $PM_{2.5}$ NAAQS, February 8, 2011.

[16] Design values for monitors in the NY and NJ portions of the nonattainment area are also summarized in this section. Both NY and NJ have indicated their intention to submit similar $PM_{2.5}$ redesignation requests, which will include more detailed descriptions of their states' monitoring networks and data trends.

Figure 2.1 Connecticut's $PM_{2.5}$ Monitoring Network

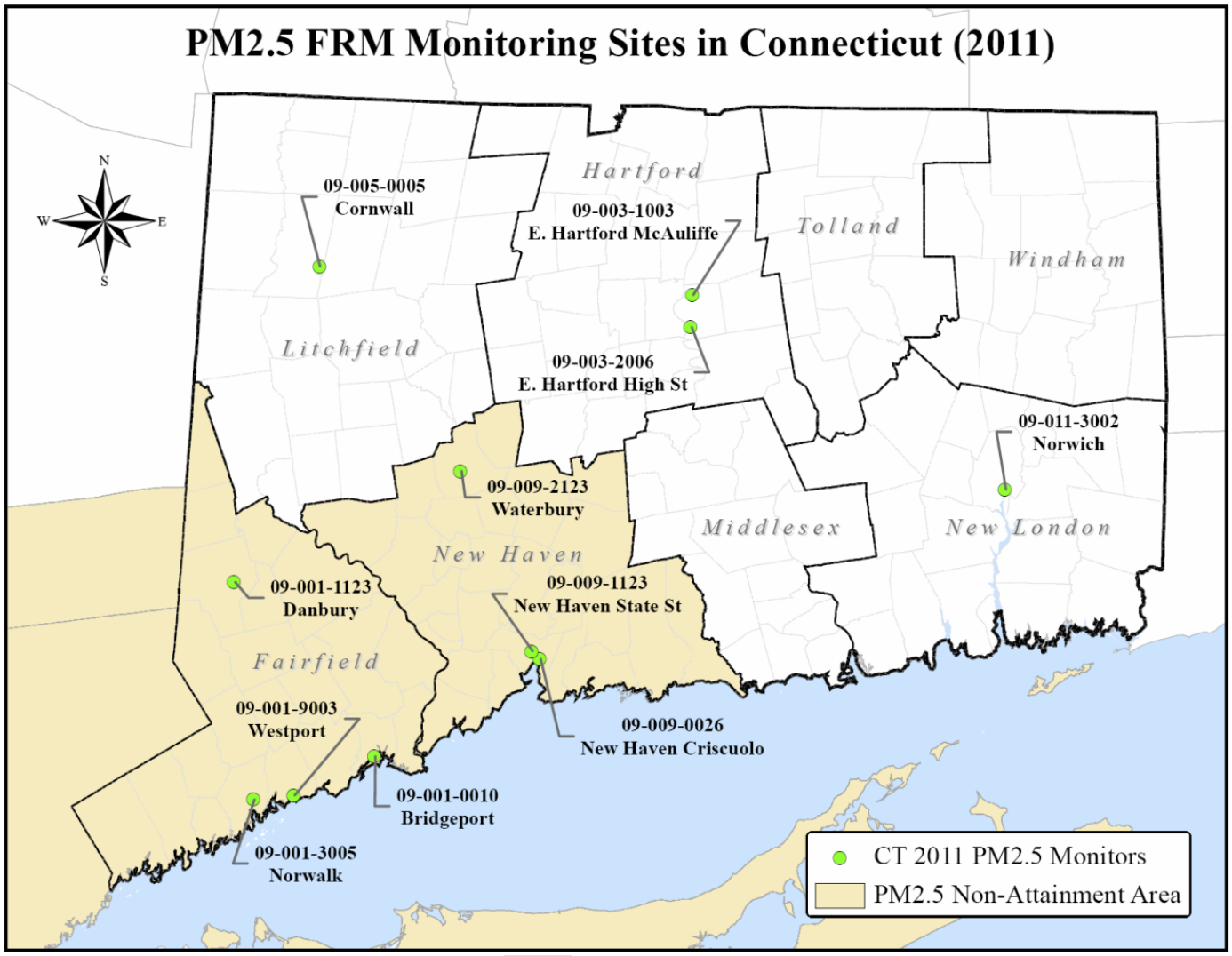


Table 2.1 Connecticut $PM_{2.5}$ Monitors: Data Completeness by Quarter 2008 – 2010

SITE	% Complete 2008 Qtr1	% Complete 2008 Qtr2	% Complete 2008 Qtr3	% Complete 2008 Qtr4	% Complete 2009 Qtr1	% Complete 2009 Qtr2	% Complete 2009 Qtr3	% Complete 2009 Qtr4	% Complete 2010 Qtr1	% Complete 2010 Qtr2	% Complete 2010 Qtr3	% Complete 2010 Qtr4
Bridgeport (090010010)	87%	100%	81%	90%	87%	97%	93%	90%	97%	100%	77%	100%
Danbury (90011123)	94%	97%	94%	97%	93%	97%	93%	100%	90%	100%	100%	100%
Norwalk (090013005)	90%	97%	90%	87%	90%	90%	93%	97%	57%*	100%	100%	100%
Westport (090019003)	84%	100%	99%	99%	84%	93%	99%	86%	100%	97%	100%	98%
New Haven Firehouse (090090026)	100%	100%	97%	97%	100%	100%	100%	100%	37%**			
New Haven Criscuolo (090090027)	96%	97%	95%	100%	94%	99%	98%	100%	98%	99%	98%	99%
New Haven State Street (090091123)	100%	100%	87%	100%	100%	100%	100%	94%	100%	100%	94%	94%
New Haven Ag Station (090092008)	100%	100%	87%	83%	87%	100%	100%	100%	37%**			
Waterbury (090092123)	97%	100%	100%	100%	100%	87%	100%	100%	100%	100%	100%	100%

* Data incomplete due to roof construction.

** Site removed 2/1/2010.

in the NY-NJ-CT nonattainment area met the completeness criteria for the 2008-2010 period. The Norwalk monitor was temporarily removed during the first quarter of 2010 to allow roof repair/construction. Historically, measured values at the Norwalk site have been among the lowest in Connecticut's portion of the NY-NJ-CT area.

2.3 $PM_{2.5}$ Monitoring Data Analysis

Data from air quality monitors are used to calculate design values (DV)[17] at each site. The monitor with the highest DV dictates whether the area complies with the NAAQS. For the annual $PM_{2.5}$ NAAQS, the annual DV for each monitor is defined as the three-year average of valid annual means. When calculating an annual DV, intermediate calculations are not rounded, while final values are rounded to the nearest 0.1 $\mu g/m^3$. Rounded values at or below 15.0 $\mu g/m^3$ meet the standard. Rounded values equal to or greater than 15.1 $\mu g/m^3$ exceed the standard.

The design value for the 24-hour NAAQS is calculated for each site as the three-year average of the annual 98th percentile 24-hour average values. When calculating a monitor's 24-hour DV, intermediate calculations are not rounded, while final values rounded to the nearest 1 $\mu g/m^3$. Rounded values at or below 35 $\mu g/m^3$ meet the standard. Rounded values equal to or greater than 36 $\mu g/m^3$ exceed the standard.

Current (i.e., 2010) $PM_{2.5}$ design values throughout the NY-NJ-CT nonattainment area are in compliance with both the annual NAAQS of 15.0 $\mu g/m^3$ and the 24-hour NAAQS of 35 $\mu g/m^3$, as shown in Figures 2.2 and 2.3, respectively. The maximum 2010 DVs measured anywhere in the NY-NJ-CT area are 12.5 $\mu g/m^3$ for the annual standard (Morrisania monitor in the Bronx, NY) and 30 $\mu g/m^3$ for the 24-hour NAAQS (Elizabeth Turnpike site in New Jersey).

$PM_{2.5}$ air quality has improved significantly over the last decade in Connecticut and throughout the NY-NJ-CT nonattainment area. Annual design values for 2007 through 2010 are summarized in Table 2.2 for monitors in Connecticut's portion of the NY-NJ-CT nonattainment area. Annual DVs at each Connecticut site have complied with the annual $PM_{2.5}$ NAAQS throughout the period, with maximum DVs in Connecticut of 13.2 $\mu g/m^3$ in 2007, 12.4 $\mu g/m^3$ in 2008, 11.4 $\mu g/m^3$ in 2009 and 10.3 $\mu g/m^3$ in 2010. Maximum DVs anywhere in the NY-NJ-CT area were 15.9 $\mu g/m^3$ in 2007, 14.3 $\mu g/m^3$ in 2008, 13.9 $\mu g/m^3$ in 2009 and 12.5 $\mu g/m^3$ in 2010, indicating that the NY-NJ-CT area first achieved attainment levels of the annual NAAQS in 2008.

Table 2.3 summarizes 24-hour design values for 2007 through 2010 for monitors in Connecticut's portion of the NY-NJ-CT nonattainment area. Maximum 24-hour DVs for the Connecticut monitors were 36 $\mu g/m^3$ in 2007, 34 $\mu g/m^3$ in 2008, 31 $\mu g/m^3$ in 2009 and 29 $\mu g/m^3$ in 2010. Maximum DVs in the

[17] A basic summary of design value calculations is provided here. For a more complete description, see 40 CFR Part 50 Appendix N: Interpretation of the National Ambient Air Quality Standards for $PM_{2.5}$.

Figure 2.2 2010 Annual Design Values

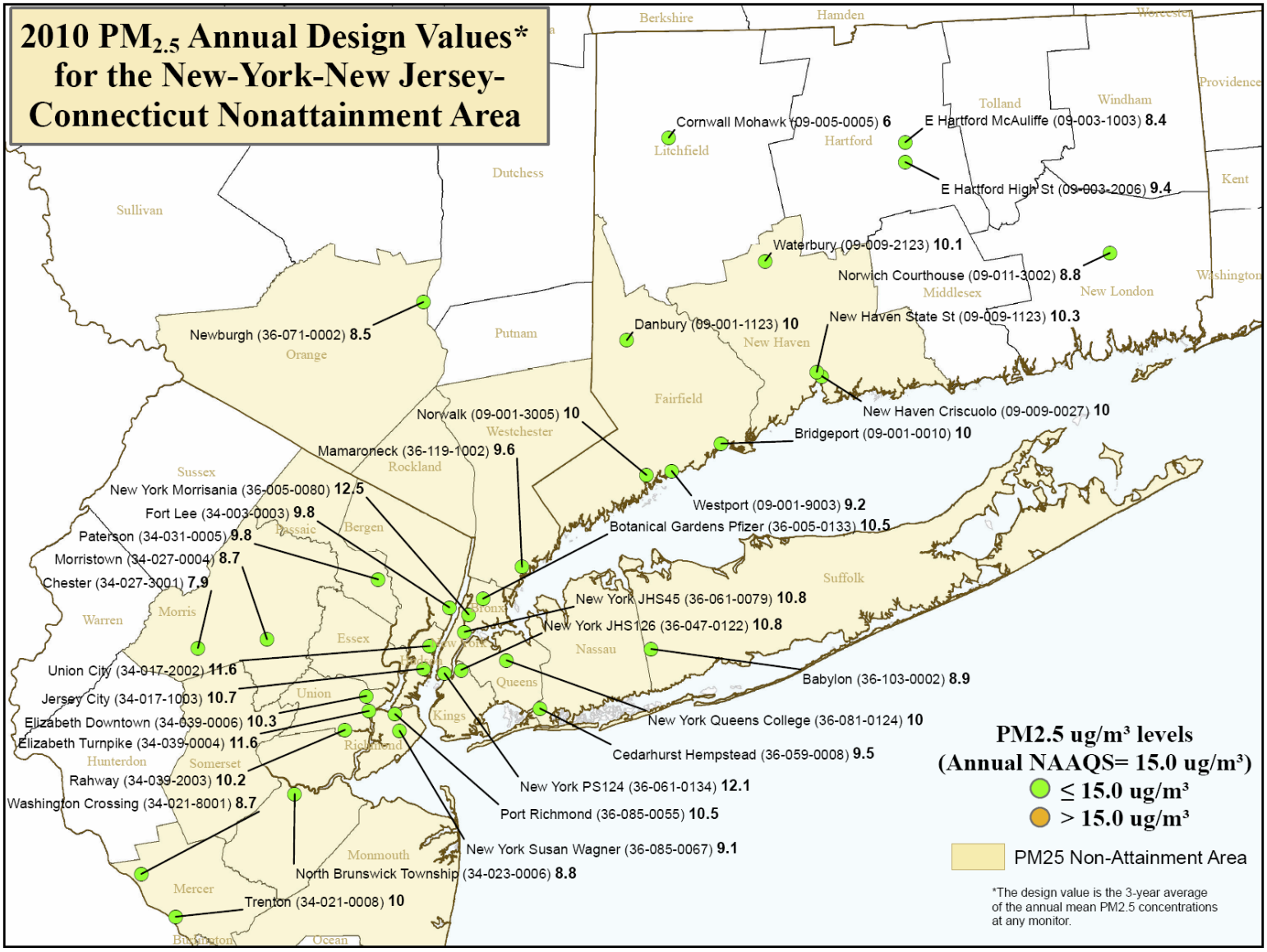


Figure 2.3 2010 24-hour Design Values

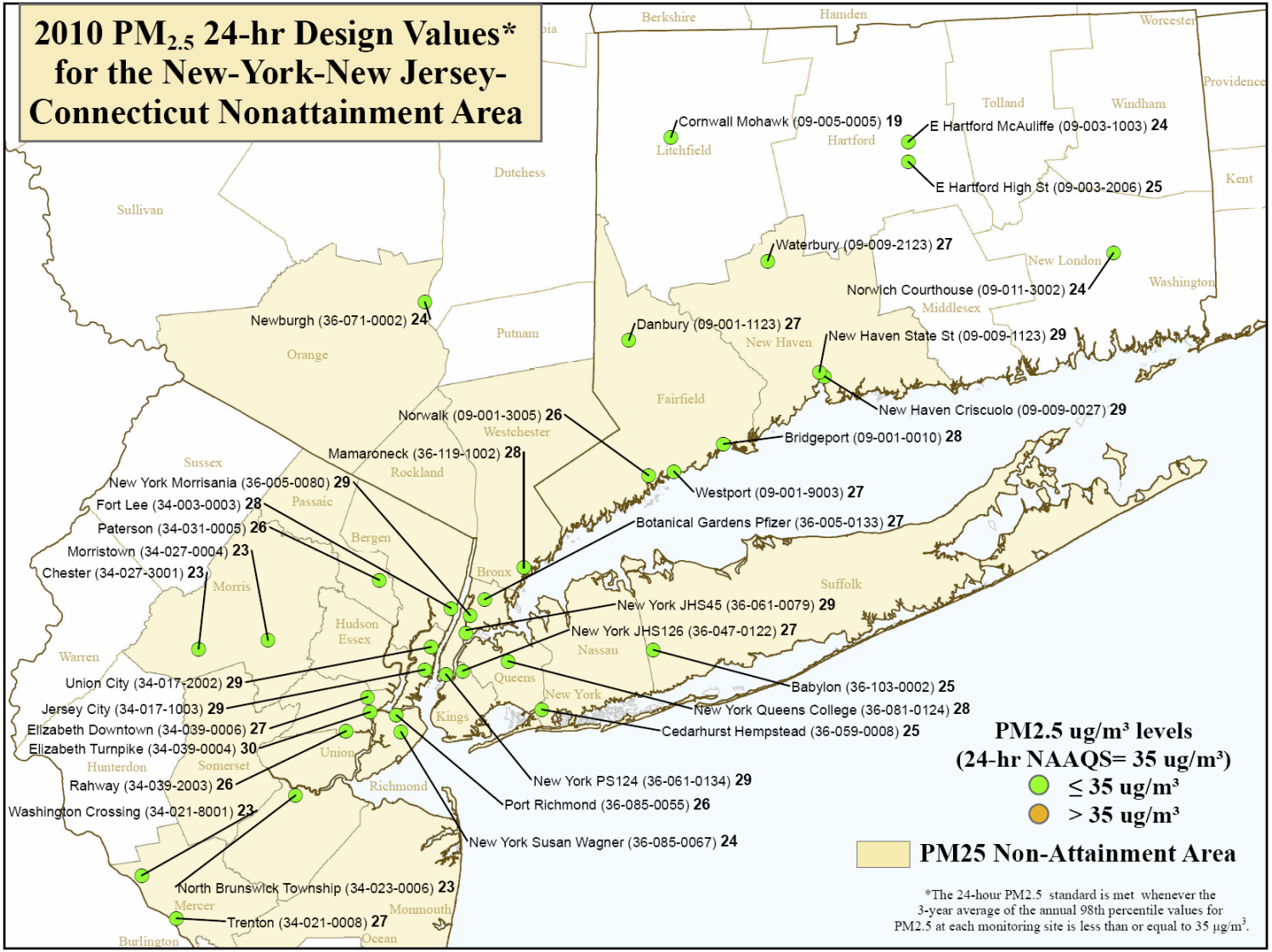


Table 2.2 Annual $PM_{2.5}$ Design Values[1] in Connecticut's Portion of the NY-NJ-CT Nonattainment Area[2] ($\mu g/m^3$)				
Site	**2007**	**2008**	**2009**	**2010**
Bridgeport (09-001-0010)	13.2	12.4	11.3	10.0
Danbury (09-001-1123)	12.6	12.0	11.0	10.0
Norwalk (09-001-3005)	12.3	11.8	11.1	10.0
Westport (09-001-9003)	11.3	10.6	10.0	9.2
New Haven Fire House (09-009-0026)	12.1	11.6	10.8	Removed[3]
New Haven Criscuolo (09-009-0027)	12.3	11.7	10.8	10.0
New Haven State St (09-009-1123)	12.8	12.2	11.4	10.3
New Haven Ag Station (09-009-2008)	11.1	10.7	9.9	Removed[3]
Waterbury (09-009-2123)	12.6	11.9	11.0	10.1

Table 2.3 24-hour $PM_{2.5}$ Design Values[1] in Connecticut's Portion of the NY-NJ-CT Nonattainment Area[2] ($\mu g/m^3$)				
Site	**2007**	**2008**	**2009**	**2010**
Bridgeport (09-001-0010)	35	33	31	28
Danbury (09-001-1123)	33	31	29	27
Norwalk (09-001-3005)	34	31	29	26 (Inc[4])
Westport (09-001-9003)	32	30	29	27
New Haven Fire House (09-009-0026)	34	32	30	Removed[3]
New Haven Criscuolo (09-009-0027)	35	33	31	29
New Haven State Street (09-009-1123)	36	34	31	29
New Haven Ag Station (9-009-2008)	32	29	27	Removed[3]
Waterbury (09-009-2123)	35	32	30	27

Notes for both tables:

[1] The annual $PM_{2.5}$ NAAQS is 15.0 $\mu g/m^3$. The 24-hour $PM_{2.5}$ NAAQS is 35 $\mu g/m^3$.

[2] Data from EPA's design value website: **http://www.epa.gov/airtrends/values.html**

[3] These sites were removed in 2010 after measuring lower values than other New Haven sites.

[4] The Norwalk site had one incomplete calendar quarter in 2010 (less than 75% data capture), due to roof construction that required temporary monitor removal.

NY-NJ-CT nonattainment area were 41 µg/m^3 in 2007, 38 µg/m^3 in 2008, 33 µg/m^3 in 2009 and 30 µg/m^3 in 2010. Tables 2.2 and 2.3 demonstrate that Connecticut's portion of the nonattainment area have been in compliance with the 24-hour NAAQS since 2008, while the NY-NJ-CT area as a whole first achieved attainment levels in 2009.

The overall downward trend in $PM_{2.5}$ concentrations is evident in the 10-year DV trend plots displayed in Figures 2.4 through 2.9. Figures 2.4 through 2.6 respectively show the significant decline in annual DVs in the Connecticut, New York and New Jersey portions of the nonattainment area during the 2001-2010 period. Similar trends are obvious in Figures 2.7 through 2.9, which depict 24-hour DVs in each state's portion of the nonattainment area. See Section 4 for a discussion of national, regional and state emission control programs that have prompted the improvements in $PM_{2.5}$ air quality. Existing control programs are expected to provide further air quality improvements through the maintenance period.

Figure 2.4 Annual Design Value Trends for Monitors in Connecticut's Portion of the NY-NJ-CT Area

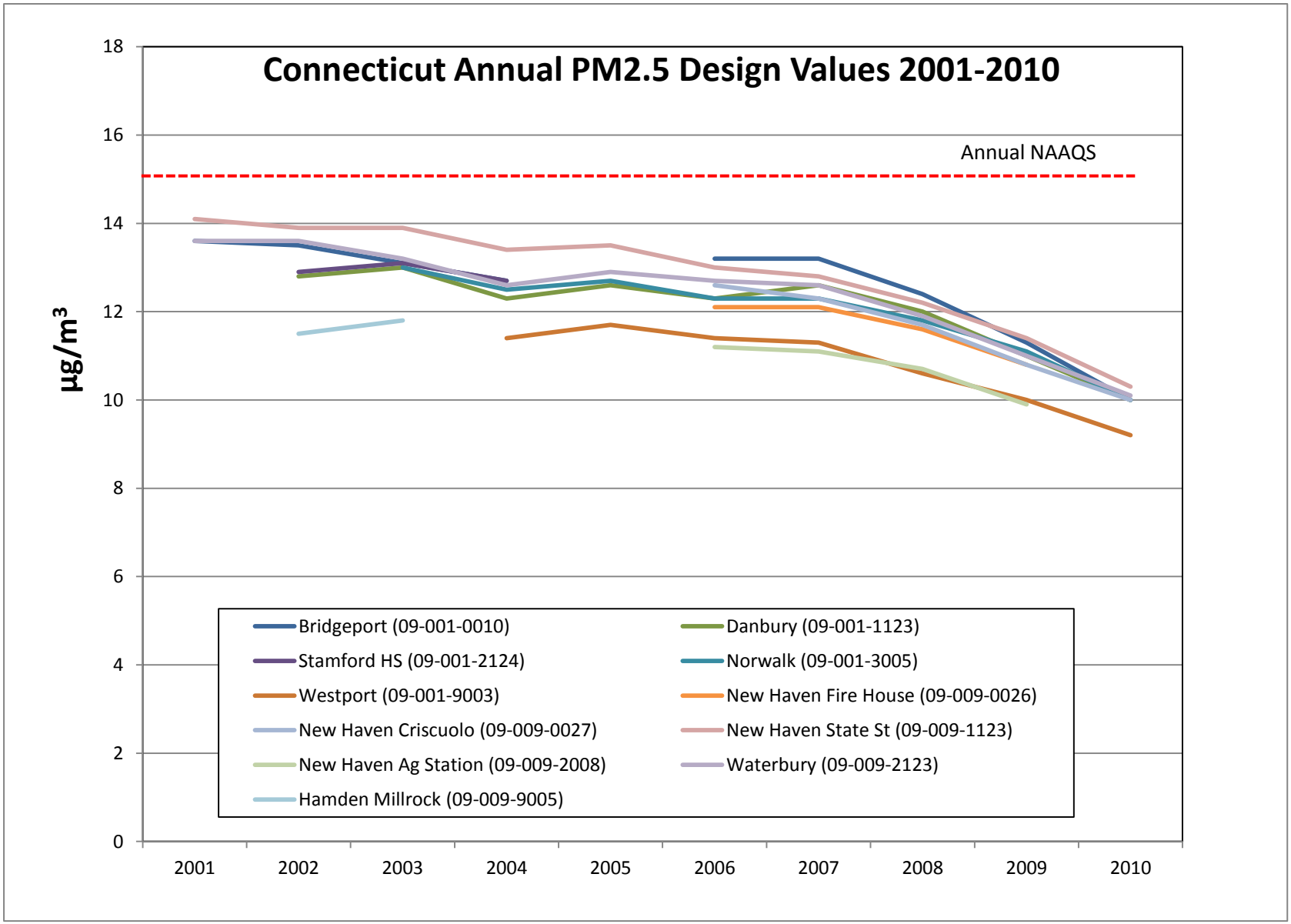


Figure 2.5 Annual Design Value Trends for Monitors in New York's Portion of the NY-NJ-CT Area

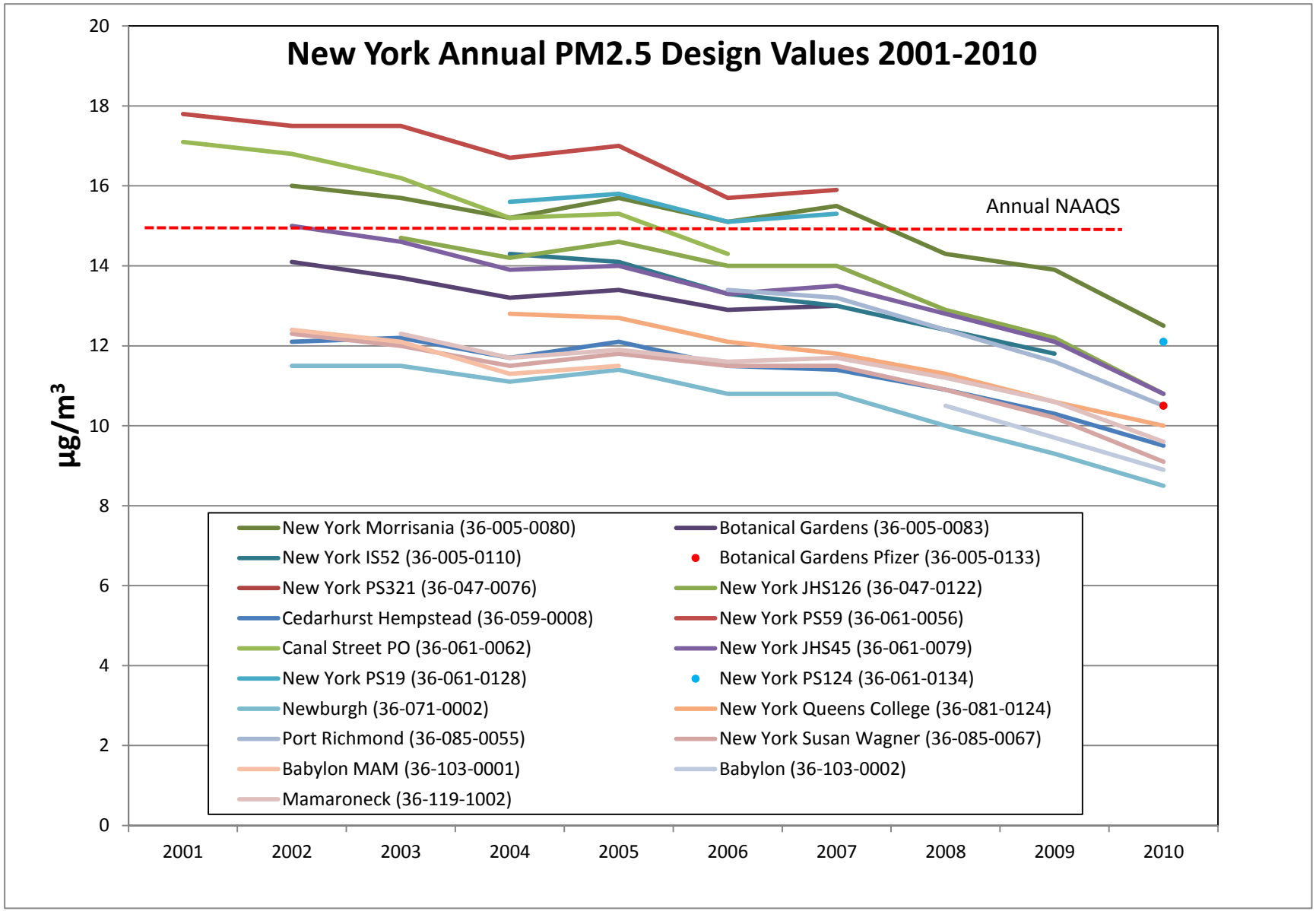


Figure 2.6 Annual Design Value Trends for Monitors in New Jersey's portion of the NY-NJ-CT Area

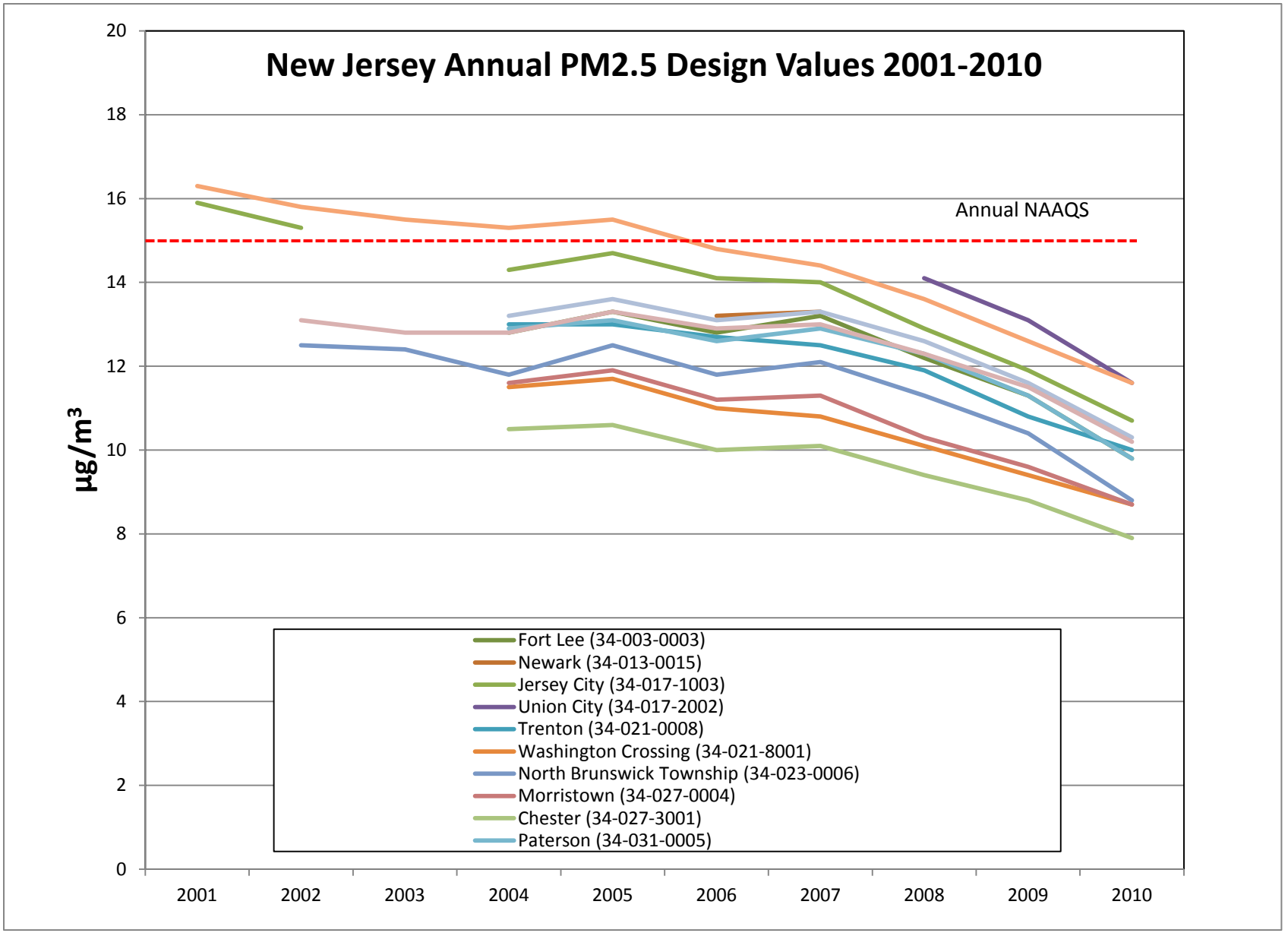


Figure 2.7 24-hour Design Value Trends for Monitors in Connecticut's portion of the NY-NJ-CT Area

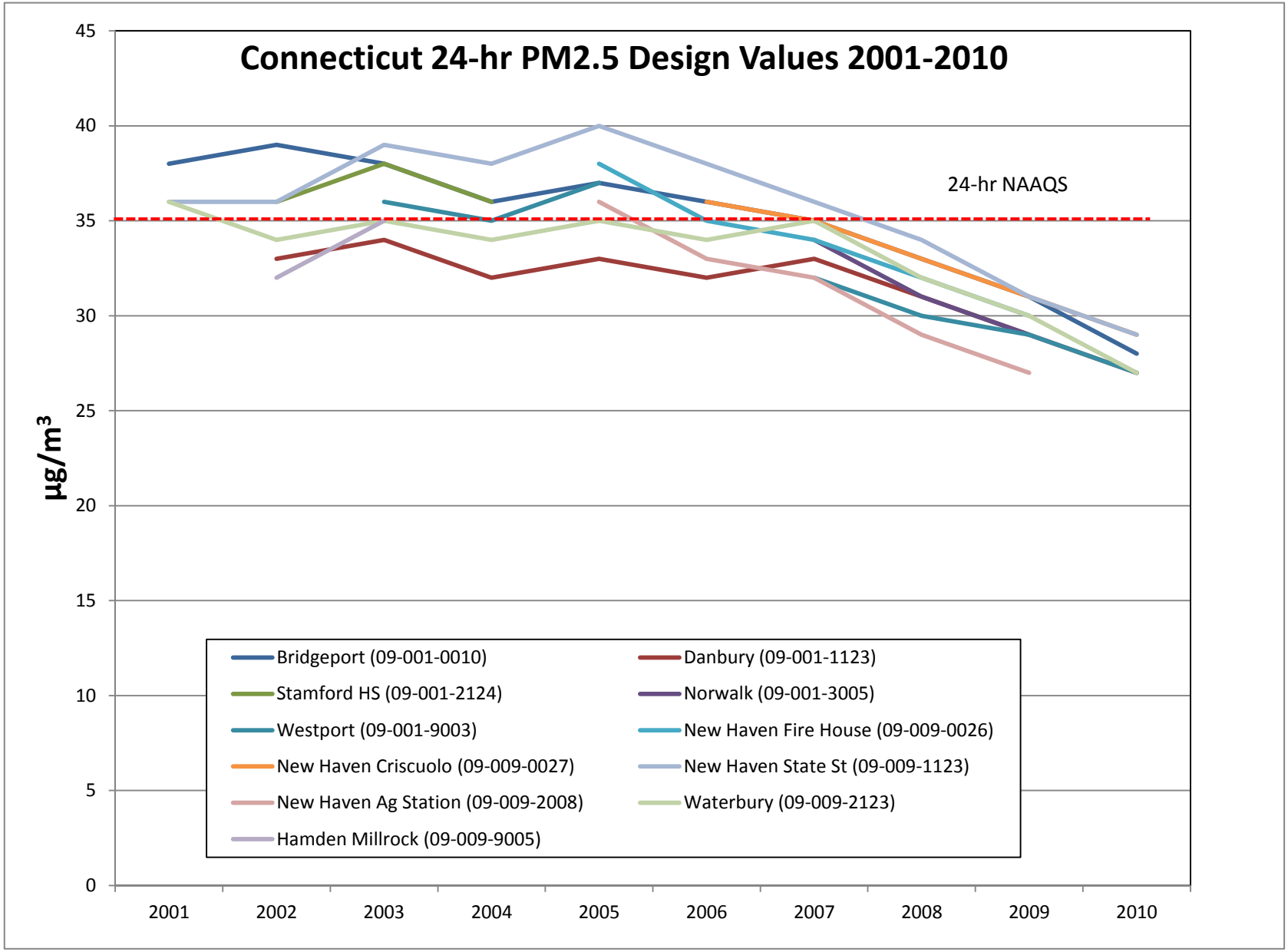


Figure 2.8 24-hour Design Value Trends for Monitors in New York's portion of the NY-NJ-CT Area

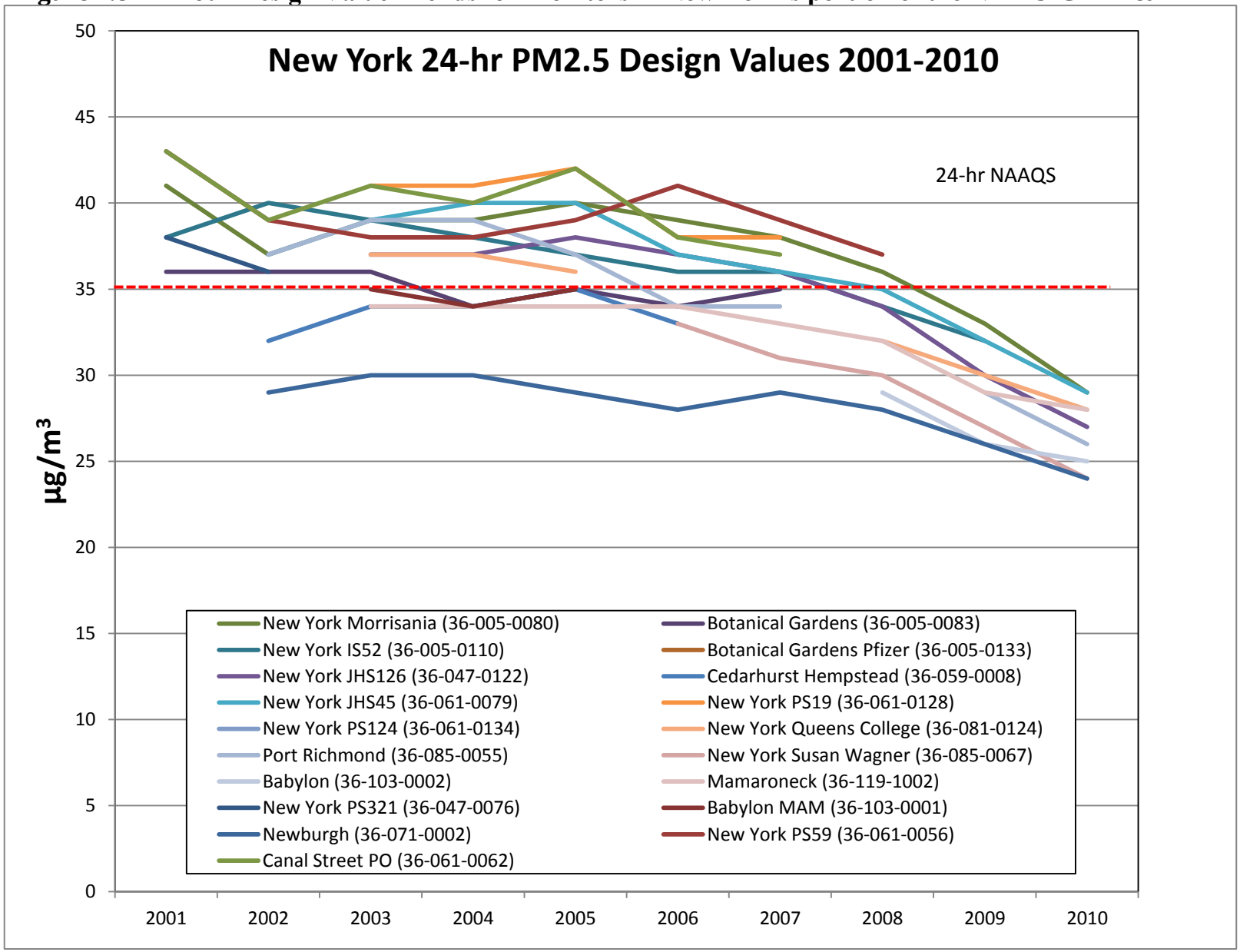
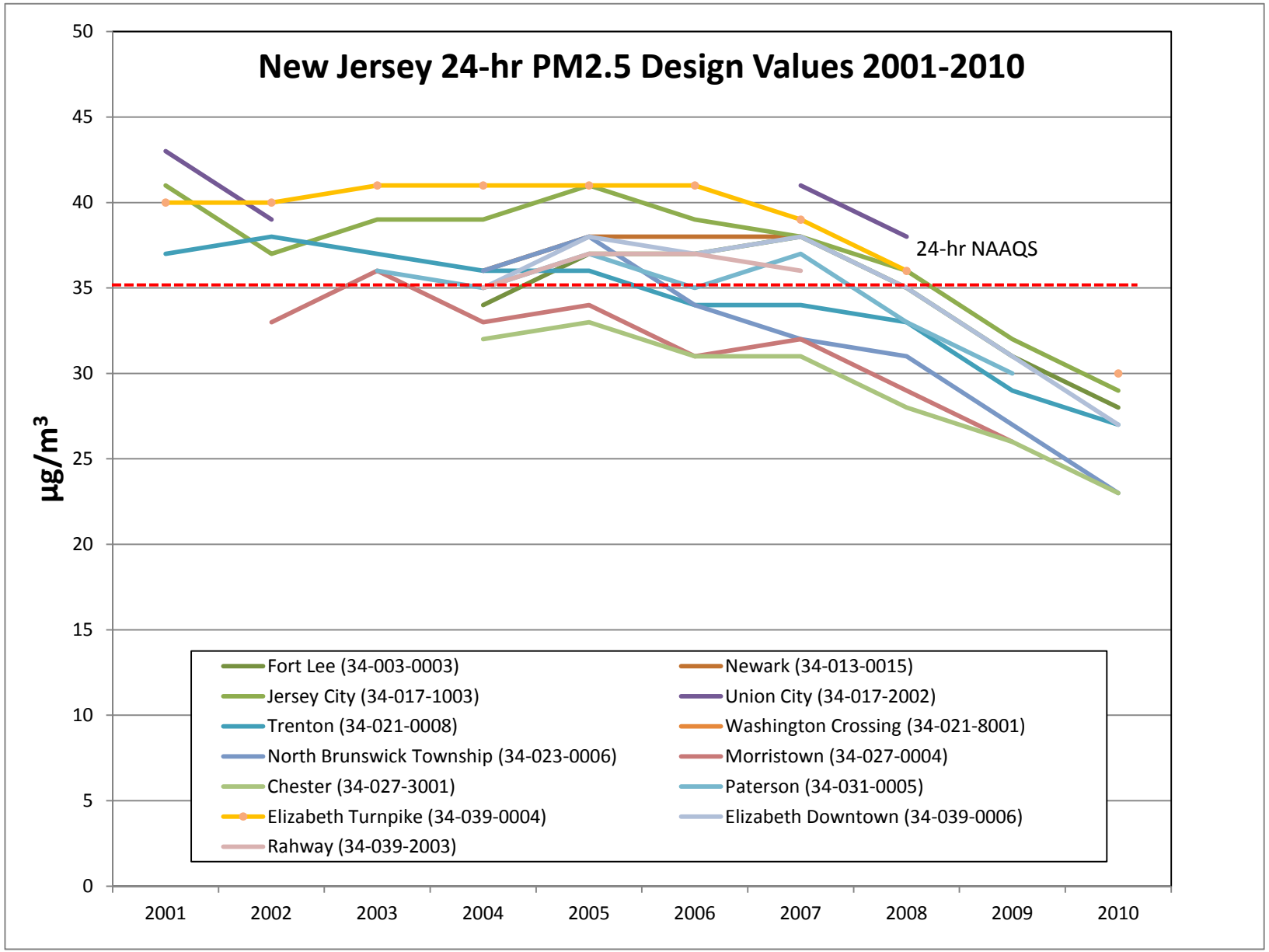


Figure 2.9 24-hour Design Value Trends for Monitors in New Jersey's portion of the NY-NJ-CT Area



Chapter 3 Applicable Requirements Under CAA Section 110 and Title 1 Part D

As a precondition to redesignating a nonattainment area to attainment, the CAA requires EPA to determine that the state has met all applicable requirements under section 110 and part D of title I of the CAA (per CAA section 107(d)(3)(E)(v)) and that the state has a fully approved SIP under section 110(k) for the area (per CAA section 107(d)(3)(E)(ii)). In previous $PM_{2.5}$ redesignation approvals for other areas,[18] EPA has described the elements that must be in place to satisfy each of these requirements, differentiating between the elements that are applicable for purposes of redesignation and those that are not. Drawing from these previous EPA rulemakings, this section describes how Connecticut has met the relevant requirements.

3.1 Satisfying Section 110 General SIP Requirements

Section 110(a) of Title I of the CAA contains the general requirements for a SIP. Section 110(a)(2) provides that the implementation plan submitted by a state must have been adopted by the state after reasonable public notice and hearing, and, among other things, must:

- Include enforceable emission limitations and other control measures, means or techniques necessary to meet the requirements of the CAA;
- Provide for establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor ambient air quality;
- Provide for implementation of a source permit program to regulate the modification and construction of any stationary source within the areas covered by the plan;
- Include provisions for the implementation of part C, Prevention of Significant Deterioration (PSD) and part D, New Source Review (NSR) permit programs;
- Include criteria for stationary source emission control measures, monitoring, and reporting; and
- Include provisions for air quality modeling; and provide for public and local agency participation in planning and emission control rule development.

Connecticut has submitted "infrastructure SIPs," addressing each of these CAA section 110(a)(2) requirements, for both the 1997 annual[19] and 2006 24-hour[20] $PM_{2.5}$ NAAQS. EPA has found Connecticut's infrastructure SIP submittal for the 1997 annual NAAQS to be complete,[21] but has not taken final action. EPA has not taken any action on the 24-hour $PM_{2.5}$ infrastructure SIP. Regardless, EPA's previous rulemakings have concluded that, for purposes of redesignation, an area is only subject to those section 110 elements connected with nonattainment plan submissions or an area's attainment status because the area will still be subject to all other section 110 elements after redesignation to attainment.

Similarly, CAA section 110(a)(2)(D) requires that SIPs contain measures to prevent sources in a state from significantly contributing to air quality problems in another state. EPA's previous redesignation

[18] For examples, see 76 FR 59512 (September 27, 2011), 76 FR 70078 and 76 FR 70091 (both November 10, 2011).
[19] Submitted to EPA on 9/4/2008.
[20] Submitted to EPA on 9/18/2009, with supplements submitted on 1/7/2011 and 8/19/2011.
[21] 73 FR 62902 (October 22, 2008).

rulemakings have concluded that this requirement is not applicable for purposes of redesignation[22] because the transport SIP submittal requirements, where applicable, continue to apply to a state regardless of the designation of any one particular area within that state.

3.2 Satisfying Part D Requirements

CAA Title I, Part D, Subpart 1 sets forth the basic nonattainment requirements applicable to all nonattainment areas. All areas that were designated nonattainment for the 1997 annual or the 2006 24-hour $PM_{2.5}$ NAAQS were designated under this subpart of the CAA and the requirements applicable to them are contained in sections 172 and 176. For purposes of evaluating redesignation requests, the applicable part D, subpart 1 SIP requirements are contained in sections 172(c)(1)–(9) and in section 176.[23]

As described in Section 1 of this document, in December 2004 EPA designated the NY-NJ-CT area as nonattainment for the 1997 annual $PM_{2.5}$ NAAQS, triggering the requirement for an implementation plan under CAA section 172(b). On April 25, 2007, EPA promulgated its $PM_{2.5}$ implementation rule,[24] providing guidance for states to develop implementation plans for the annual NAAQS. Connecticut subsequently submitted an attainment demonstration for its portion of the annual nonattainment area on November 18, 2008, meeting the requirements of EPA's implementation rule and CAA sections 172 and 176. EPA has not yet acted on that plan.

In 2006, EPA promulgated revisions to the $PM_{2.5}$ NAAQS, lowering the 24-hour standard to 35 $\mu g/m^3$. Final designations for the revised 24-hour standard became effective in December 2009, retaining the same NY-NJ-CT nonattainment boundaries as for the annual NAAQS. Attainment demonstrations addressing CAA sections 172 and 176 for the 24-hour NAAQS are due in December 2012. EPA has yet to promulgate a corresponding implementation rule. The requirement for a state to submit an attainment demonstration will no longer apply if EPA rules that an area measures attainment of the NAAQS (i.e., the area has "clean data" in accordance with 40 CFR 51.1004(c)), or if EPA approves a redesignation request for the 24-hour NAAQS before the December 2012 due date.

Section 2 of this document described how $PM_{2.5}$ air quality has significantly improved over the last decade. In fact, all monitors in the NY-NJ-CT area have complied with both the annual and 24-hour NAAQS since 2009. EPA recognized the improvement by promulgating "clean data" findings[25] that the multi-state nonattainment area has attained the annual NAAQS and that attainment was achieved by April 5, 2010, as required under the provisions of EPA's $PM_{2.5}$ implementation rule. Connecticut has also formally requested[26] similar "clean data" findings for the 24-hour NAAQS and is awaiting EPA action.

[22] Nonetheless, EPA modeling in support of the Cross-State Air Pollution Rule (76 FR 48208, August 8, 2011) shows that Connecticut does not significantly contribute to nonattainment or maintenance issues in any other state for the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS, thus satisfying CAA section 110(a)(2)(D) requirements.
[23] A thorough discussion of the requirements contained in section 172 can be found in the General Preamble for Implementation of Title I (see 57 FR 13498, April 16, 1992). The preamble also includes EPA's view of applicable requirements for purposes of evaluating redesignation requests when an area is attaining a standard.
[24] 72 FR 20664, April 25, 2007. Codified at 40 CFR Part 51, subpart Z.
[25] 75 FR 69589, November 15, 2010. See also see 40 CFR 51.1004.
[26] Clean Data Request Letter for 24-hr $PM_{2.5}$ NAAQS, February 8, 2011.

As stipulated in 40 CFR 51.1004(c), EPA's "clean data" finding for the annual NAAQS suspends the requirements for Connecticut to submit an attainment demonstration and associated reasonably available control measures (CAA section 172(c)(1) and (c)(6)), reasonable further progress requirements (172(c)(2)), contingency measures (172(c)(9)), and other planning SIPs related to attainment of the 1997 $PM_{2.5}$ annual NAAQS for so long as the area continues to attain that NAAQS. As noted above, Connecticut previously submitted all of these CAA section 172 planning elements to EPA for approval as part of the attainment demonstration for the annual $PM_{2.5}$ NAAQS, although EPA has yet to take action approving the implementation plan. Nonetheless, per the "clean data" finding, and since the NY-NJ-CT area continues to measure attainment of the annual $PM_{2.5}$ NAAQS, the requirement for these implementation plan elements remains suspended and are, therefore, not applicable. A similar conclusion would apply for the 24-hour NAAQS, assuming EPA approves Connecticut's request for a "clean data" finding, either prior to or along with approval of the redesignation request and maintenance plan.

Section 172(c)(4) requires the identification and quantification of allowable emissions for major new and modified stationary sources in an area, and section 172(c)(5) requires source permits for the construction and operation of new and modified major stationary sources in the nonattainment area. EPA has previously issued approvals of Connecticut's new source review (NSR) program.[27] In addition, when the 1997 annual $PM_{2.5}$ NAAQS was promulgated, EPA allowed states to use the pollutant PM_{10} as a surrogate for $PM_{2.5}$ in new source review (NSR) permitting programs until certain technical problems were resolved and EPA issued guidance for the states. EPA subsequently issued two relevant implementation rules[28] and required states to adopt the necessary requirements by July 20, 2012. DEEP held a public hearing on November 9, 2011 to consider revisions to RCSA sections 22a-174-1 and 22a-174-3a to include significant impact levels, significant emissions rates and increments for $PM_{2.5}$, consistent with EPA's requirements. Assuming EPA makes no changes to the implementation rules, DEEP intends to continue to pursue adoption of the revised regulations. Nonetheless, because all states are subject to this updated NSR requirement and the deadline for compliance has not yet arrived, DEEP maintains that approval of this redesignation request is not dependent upon prior EPA approval of the updated NSR provision.

EPA has previously ruled that areas need not have a fully approved nonattainment NSR program for purposes of redesignation[29] since prevention of significant deterioration (PSD) requirements will apply after redesignation. Connecticut's current PSD program will become effective in the Connecticut portion of the NY-NJ-CT area upon redesignation to attainment.

Section 172(c)(7) requires the SIP to meet the applicable provisions of section 110(a)(2). As noted above in Section 3.1, EPA's previous rulemakings have concluded that this requirement is not applicable for purposes of redesignation because the transport SIP submittal requirements continue to apply to a state regardless of the designation of any one particular area within that state.

[27] 40 CFR 52.385.
[28] 73 FR 28321, May 16, 2008 and 75 FR 64864, October 20, 2010.
[29] Memorandum from Mary Nichols, Assistant Administrator for Air and Radiation; "Part D New Source Review Requirements for Areas Requesting Redesignation to Attainment"; October 14, 1994,

Section 176(c) of the CAA requires states to establish criteria and procedures to ensure that federally supported or funded activities, including highway projects, conform to the air quality planning goals in the applicable SIPs. The requirement to determine conformity applies to transportation plans, programs, and projects developed, funded, or approved under Title 23 of the U.S. Code and the Federal Transit Act (transportation conformity) as well as to all other federally-supported or funded projects (general conformity). EPA interprets the conformity SIP requirements as not applying for purposes of evaluating a redesignation request under section 107(d) because state conformity rules are still required after redesignation and federal conformity rules apply where state rules have not been approved. Section 5.1.9 of this document includes transportation conformity budgets that, upon approval by EPA, will be required for use in future transportation planning efforts.

The only remaining part D, subpart 1 element that must be addressed for both the annual and 24-hour $PM_{2.5}$ NAAQS is the section 172(c)(3) requirement for an inventory of actual emissions for the area. Included as part of this redesignation request (see Section 5), is a 2007 base year emissions inventory that meets the section 172(c)(3) requirement. When EPA approves this inventory, Connecticut's portion of the NY-NJ-CT area will meet the applicable SIP requirements for purposes of redesignation under title I, part D of the CAA.

3.3 Fully Approved SIP Under Section 110(k)

As described above, consistent with the previous EPA rulemakings approving other $PM_{2.5}$ redesignation requests, when EPA issues final approval of Connecticut's base year emissions inventory, EPA will have fully approved the applicable Connecticut SIP for Connecticut's portion of the NY-NJ-CT annual and 24-hour $PM_{2.5}$ nonattainment areas under CAA section 110(k) for all requirements applicable for purposes of redesignation.

Chapter 4 Permanent and Enforceable Emission Reductions

CAA section 107(d)(3)(E)(iv) specifies that a nonattainment area cannot be redesignated to attainment unless EPA determines that the improvements in air quality are due to permanent and enforceable emission reductions. This section documents that reductions in direct $PM_{2.5}$ and $PM_{2.5}$ precursor emissions (e.g., SO_2 and NO_x) have occurred in Connecticut and in upwind areas as a result of permanent and enforceable federal and state control measures, accounting for the significant improvements realized in measured $PM_{2.5}$ air quality. Post-2002 NOx, SO_2 and $PM_{2.5}$ control measures that have resulted in improvements in ambient $PM_{2.5}$ levels are listed in Table 4.1. Descriptions of the federal and state measures follow.

4.1 Federal Control Measures

Improvements in Connecticut's ambient $PM_{2.5}$ air quality are partially due to federal control programs that have reduced emissions in Connecticut and other states. Transported emission are especially important because $PM_{2.5}$ concentrations in Connecticut are strongly affected by $PM_{2.5}$ secondary components such as sulfates and nitrates that result from precursor emissions of SO_2 and NOx from upwind states. Post-2002[30] federal measures that have contributed to measured attainment of the annual and 24-hour $PM_{2.5}$ NAAQS are listed in Table 4.1 and described below.

4.1.1 Tier 2 Vehicle Standards and Gasoline Sulfur Standards

The federal Tier 2 rule[31], promulgated in February 2000, phased in more stringent vehicle emission standards between 2004 and 2009, resulting in lower emissions of NOx, PM and sulfur compounds from new cars and light duty trucks, including large sport utility and passenger vans. The final Tier 2 standards limit NO_x levels for new vehicles to an average of 0.07 grams per mile (g/mi), requiring new vehicles to be 77% to 95% lower emitting than those on the road prior to the program. The Tier 2 standards also reduced the sulfur content of gasoline to 30 parts per million (ppm) by 2006, about an order of magnitude lower than 2002 levels. Sulfur in gasoline interferes with the operation of catalytic converters on vehicles resulting in higher NO_x emissions. In addition to facilitating lower emissions from new Tier 2 equipped vehicles, the required lower sulfur levels also produced immediate emission reductions from older pre-Tier 2 vehicles due to less poisoning of catalysts on those vehicles. Further reductions will occur through the maintenance period as vehicle turnover increases the proportion of Tier 2 vehicles in the fleet.

[30] Designations for the 1997 annual $PM_{2.5}$ NAAQS were based on 2001-2003 monitored data; therefore, reductions since 2002 have contributed to measured air quality improvements since that period.
[31] http://www.epa.gov/fedrgstr/EPA-AIR/2000/February/Day-10/a19a.pdf

Table 4.1 Post-2002 Control Measures

Control Measure	PM	NO_X	SO_2
Federal Programs			
Tier 2 Vehicle Standards and Gasoline Sulfur Standards	X	X	X
Heavy-Duty Diesel and Gasoline Highway Vehicle Standards	X	X	X
Motorcycle Exhaust Standards		X	
Large Non-road Diesel Engine Standards	X	X	X
Non-road Spark-Ignition Engines and Recreational Engine Standards	X	X	X
NOx SIP Call		X	
CAIR		X	X
State Programs			
Control of Sulfur Dioxide and Nitrogen Oxide Emissions from Power Plants and Other Large Stationary Sources RCSA Sections 22a-174-19a and 22a-174-22(e)(3)		X	X
The Post-2002 Nitrogen Oxides (NOx) Budget Program RCSA Section 22a-174-22b		X	
CAIR NO_X Ozone Season Trading Program RCSA Section 22a-174-22c		X	
Outdoor Wood Burning Furnace Restrictions Section 22a-174k of the Connecticut General Statutes	X		
Improvements in the Control of Particulate Matter and Visible Emissions RCSA Section 22a-174-18	X	X	
Connecticut Enhanced Inspection and Maintenance Program (ASM 2525 final standards and OBD II program) RCSA Section 22a-174-27		X	
CT's California Low Emission Vehicle Phase 2 (CALEV2) RCSA Section 22a-174-36b	X	X	
Reductions in NOx emissions from Municipal Waste Combustors (Phase 2) RCSA Section 22a-174-38		X	
NSR Permit to Construct and Operate Stationary Sources RCSA Section 22a-174-3a	X	X	X

4.1.2 Heavy-Duty Diesel and Gasoline Highway Vehicle Standards

New U.S. EPA standards[32,33] designed to reduce NO_x and VOC emissions from heavy-duty diesel and gasoline highway vehicles took effect in 2004 and 2005, respectively. A second phase of standards,[34] commencing in 2007, established tighter PM and NO_x emission limits for heavy-duty diesel and gasoline highway engines and also required highway diesel fuel sulfur content to be reduced by 97% to 15 ppm to minimize potential damage to emission control devices. EPA estimates that the total program achieves a 90% reduction in PM emissions and a 95% reduction in NO_x emissions from new engines using low sulfur diesel, compared to previous generation engines using higher sulfur content diesel. The reduction in fuel sulfur content also provided additional immediate reductions in sulfate particle emissions from all on-road diesel vehicles. Further emission reductions will occur through the maintenance period with fleet turnover.

4.1.3 Motorcycle Exhaust Standards

In 2004, EPA published a final rule to implement improved exhaust emission standards on new highway motorcycles.[35] These exhaust emission standards apply to all 2006 model year and newer motorcycles, including scooters and mopeds. In addition, motorcycles with the largest engines are subject to more stringent NO_x and hydrocarbon standards beginning with the 2010 model year.

4.1.4 Large Non-road Diesel Engine Standards

In May 2004, EPA expanded on previous requirements[36] by adopting a new rule[37] establishing tighter emission limits for large non-road diesel engines, such as those used in construction, agricultural, and industrial equipment, to be phased in between 2008 and 2014. The non-road diesel rule also required reductions in the sulfur content of non-road diesel fuel from pre-rule levels of approximately 3,400 ppm to 500 ppm by 2006, with a further reduction to 15 ppm by 2010, a total reduction of over 99 percent. The combined engine and fuel rules reduced NO_x and PM emissions from new large non-road diesel engines by over 90%, compared to previous generation non-road engines using higher sulfur content diesel. Given the timing of the new requirements, most of the reductions will occur during the maintenance period as the fleet of older non-road diesel engines is gradually replaced with the newer, lower emitting engines. Nonetheless, the required reduction in fuel sulfur content did yield an immediate reduction in sulfate particle emissions from all non-road diesel vehicles.

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[32] http://www.epa.gov/fedrgstr/EPA-AIR/1997/October/Day-21/a27494.htm
[33] http://www.epa.gov/fedrgstr/EPA-AIR/2000/October/Day-06/a20144.pdf
[34] http://www.epa.gov/fedrgstr/EPA-AIR/2001/January/Day-18/a01a.pdf
[35] 69 FR 2398; January 15, 2004. See http://www.epa.gov/fedrgstr/EPA-GENERAL/2004/January/Day-15/g006.htm
[36] http://www.epa.gov/fedrgstr/EPA-AIR/1998/October/Day-23/a24836.htm
[37] http://edocket.access.gpo.gov/2004/pdf/04-11293.pdf

4.1.5 Non-road Spark-Ignition Engines and Recreational Engine Standards

In November 2002, EPA promulgated emission standards[38] for groups of previously unregulated non-road engines. These engines include large spark-ignition engines such as those used in forklifts and airport ground service equipment; recreational vehicles using spark-ignition engines such as off highway motorcycles, all-terrain vehicles, and snowmobiles; and recreational marine diesel engines. Emission standards from large spark ignition engines were implemented in two tiers, with Tier 1 starting in 2004 and Tier 2 in 2007. Recreational vehicle emission standards are being phased in from 2006 through 2012. Marine diesel engine standards were phased in from 2006 through 2009. With full implementation of the entire non-road spark-ignition engine and recreational engine standards, an 80% reduction in NOx is expected by 2020, as the affected fleets are gradually replaced.

4.1.6 NO_x SIP Call, CAIR and CSAPR Programs

In October 1998, EPA issued a NO_x SIP Call[39] requiring the District of Columbia and 22 states (including Connecticut) to reduce emissions of NO_x. The program was primarily targeted at securing emission reductions from electric generating units (EGUs or power plants) in states that were determined to be significantly contributing to violations of the 1-hour ozone NAAQS in other, downwind states. Affected states were required to comply with Phase I of the SIP Call beginning in 2003/2004 and Phase II beginning in 2007.

Subsequent to the 1997 revisions to the ozone and $PM_{2.5}$ NAAQS, EPA promulgated the Clean Air Interstate Rule[40] (CAIR) in May 2005 and associated Federal Implementation Plans[41] (FIPs) in April 2006 in order to reduce transported SO_2 and NO_x emissions from 28 states (including Connecticut) and improve air quality in many areas across the Eastern United States. However, on July 11, 2008, the United States Court of Appeals for the District of Columbia Circuit vacated and remanded both CAIR and the associated CAIR FIPs in their entirety.[42] EPA petitioned for a rehearing, and the D.C. Circuit issued an order in December 2008 remanding CAIR and the CAIR FIPs to EPA without vacatur,[43] directing that CAIR remain in place in order to ''temporarily preserve the environmental values covered by CAIR'' until EPA replaced it with a rule consistent with the Court's opinion.

EPA responded to the Court's directive in August 2011, finalizing the Cross-State Air Pollution Rule[44] (CSAPR) to address interstate transport of emissions and resulting secondary air pollutants and to replace CAIR. In response to subsequent challenges to CSAPR, the D.C. Circuit issued a stay[45] of CSAPR on December 30, 2011, specifying that CAIR requirements remain in place while the Court considers and

[38] http://www.epa.gov/fedrgstr/EPA-AIR/2002/November/Day-08/a23801.pdf
[39] 63 FR 57356; October 27, 1998. See http://www.epa.gov/fedrgstr/EPA-AIR/1998/October/Day-27/a26773a.htm
[40] 70 FR 25162; May 12, 2005.
[41] 71 FR 25328; April 28, 2006.
[42] North Carolina v. EPA, 531 F.3d 836 (D.C. Cir. 2008).
[43] See North Carolina v. EPA, 550 F.3d 1176 (D.C. Cir. 2008).
[44] 76 FR 48208; August 8, 2011.
[45] See http://epa.gov/airtransport/pdfs/CourtDecision.pdf.

rules on pending petitions in the case. CSAPR would retain the CAIR emission reduction requirements[46] through 2011, requiring similar or greater emission reductions of SO_2 and/or NO_x from EGU's in 28 eastern states in 2012 and beyond. Assuming CSAPR is ultimately upheld by the Court, the post-2011 emission reductions will further reduce transport into Connecticut, helping to ensure continued attainment through the maintenance period.

Because $PM_{2.5}$ concentrations in Connecticut are significantly impacted by the transport of sulfates and nitrates, the area's air quality is strongly affected by regulation of SO_2 and NO_x emissions from power plants in upwind states. Table 4.2 presents actual EGU emissions data downloaded from EPA's Clean Air Markets Division[47] (CAMD) website for the years 2002 and 2007 through 2009, the period when the NY-NJ-CT area first attained both the annual and 24-hour $PM_{2.5}$ NAAQS. EGU emissions are included for all states that, according to EPA's CSAPR modeling,[48] are estimated to significantly impact Connecticut monitors at a level equal to or exceeding 1% of the annual or 24-hour $PM_{2.5}$ NAAQS in the absence of CAIR or CSAPR. Emissions for 2002 reflect implementation of the federal acid rain program and, for states in the Ozone Transport Region, a regional NO_x control program that was implemented during the late 1990's. Emissions for 2007 also include reductions implemented under the NO_x SIP Call, with CAIR Phase 1 NO_x requirements reflected by 2009. Although CAIR SO_2 limits were not in place until 2010, some early reductions were realized by 2009. Overall, the table shows a dramatic decrease in EGU emissions across the states impacting Connecticut, totaling 66% reductions in NO_x and 48% reductions in SO_2 emissions between 2002 and 2009.

4.2 Connecticut Control Measures

In addition to the federal control measures described above, Connecticut implemented several state-specific programs that contributed to the significant improvements observed in ambient $PM_{2.5}$ levels. Details regarding state measures were provided in Connecticut's attainment demonstration SIP[49] for the 1997 annual $PM_{2.5}$ NAAQS. Connecticut's post-2002 NO_x, SO_2 and $PM_{2.5}$ control measures that have resulted in improvements in ambient $PM_{2.5}$ levels were listed in Table 4.1. Descriptions of the state measures follow.

[46] Note that EPA's revised technical analysis for CSAPR determined that Connecticut was not contributing to downwind attainment issues in any other state, thus Connecticut sources are not subject to CSAPR. However, as described in Section 5, Connecticut plans to adopt a rule to ensure that CAIR emission caps are retained in the state.
[47] Using CAMD's "Quick Report" application, specifying state-level annual acid rain program sources for each year because 2002 data are not available for the CAIR program sources. Differences are judged to be minimal.
[48] http://epa.gov/crossstaterule/pdfs/CSAPR_Ozone%20and%20$PM_{2.5}$_Contributions.xls
[49] $PM_{2.5}$ Attainment Demonstration SIP submitted to EPA on November 18, 2008.
See: http://www.ct.gov/dep/cwp/view.asp?a=2684&Q=419074&depNav_GID=1619.

Table 4.2 Comparison of Actual EGU Emissions from States Impacting Connecticut's $PM_{2.5}$ Air Quality

State	NOx (tpy)					SO_2 (tpy)			
	2002	**2007**	**2008**	**2009**		**2002**	**2007**	**2008**	**2009**
CT	5,102	3,739	3,120	1,604		10,814	4,782	3,955	1,754
GA	146,456	107,471	105,894	57,566		512,654	635,484	514,539	262,258
IL	174,247	118,230	119,976	72,286		353,699	272,571	257,431	229,364
IN	281,146	196,553	196,580	110,969		778,868	714,529	595,966	413,726
KY	198,599	174,841	157,847	78,767		482,653	379,837	344,356	252,002
MA	28,797	10,368	9,357	7,640		90,727	53,863	46,347	35,182
MD	71,457	50,121	35,902	16,946		255,360	272,879	227,197	198,254
MI	132,623	105,862	103,473	78,947		342,999	338,014	326,501	272,621
MO	139,799	105,921	88,600	53,475		235,532	255,202	258,269	240,202
NC	145,706	59,418	54,652	38,783		462,993	370,826	227,030	110,948
NJ	27,960	11,808	9,143	5,219		48,269	34,189	21,204	10,867
NY	69,665	41,167	31,060	22,587		231,984	107,210	65,427	43,616
OH	370,497	237,876	235,018	95,785		1,132,069	954,646	709,444	600,687
PA	200,909	178,656	175,219	110,218		889,766	951,186	831,915	573,619
TN	155,996	102,886	85,543	27,912		336,995	237,231	208,069	108,042
VA	78,868	53,488	43,017	25,881		230,846	172,685	125,985	93,163
WV	225,371	150,849	97,331	36,120		507,110	371,996	301,574	174,583
Total	**2,455,200**	**1,711,261**	**1,553,737**	**842,712**		**6,905,340**	**6,129,139**	**5,067,219**	**3,622,899**
Change vs 2002 (tpy)	**--**	**-743,939**	**-901,463**	**-1,612,488**		**--**	**-776,201**	**-1,838,120**	**-3,282,441**
% Change vs 2002	**--**	**-30%**	**-37%**	**-66%**		**--**	**-11%**	**-27%**	**-48%**

4.2.1 Control of SO_2 and NO_x Emissions from Power Plants and Other Large Stationary Sources

DEEP was required by an executive order of the Governor to adopt regulations to reduce emissions of SO_2 and NO_x from major stationary sources including power plants. In response, in December 2000, DEEP adopted RCSA section 22a-174-19a and amended section 22a-174-22, with the requirements phased in from 2002 to 2003. The requirements apply in general to the Acid Rain program sources and NO_x Budget sources.

The SO_2 emissions reduction requirements include low sulfur fuel requirements (0.3% or 0.5% sulfur, by weight, depending on source type) and comparable quarterly average emissions limits. Revision to the NO_x provisions included the addition of a non-ozone season NO_x limit of 0.15 pounds per MMBtu, which applied to the owners of all sources subject to the NO_x Budget Program of RCSA section 22a-174-22b.

4.2.2 The Post-2002 Nitrogen Oxides (NO_x) Budget Program

EPA's NO_x SIP Call of October 1998 led to Connecticut's adoption of its NO_x Budget Program under RCSA section 22a-174-22b, which was approved by EPA as a SIP strengthening measure on December 27, 2000.[50] RCSA section 22a-174-22b established a statewide NO_x budget and NO_x allowance trading program for large electric generators and other industrial sources beginning with the 2003 ozone season. The budget cap was consistent with EPA's NO_x SIP Call and the September 1994 OTC Memorandum of Understanding establishing the OTC NO_x Budget Program (NBP). In Connecticut, the OTC program was conducted pursuant to RCSA section 22a-174-22a. Both of these regulations were repealed in Connecticut's CAIR regulation, described below.

4.2.3 CAIR and Connecticut's CAIR Replacement Rule

Connecticut complied with EPA's 2005 promulgation of CAIR by electing to participate in the federal CAIR ozone-season NO_x trading program, adopting RCSA section 22a-174-22c on September 4, 2007. EPA subsequently approved[51] the rule on January 24, 2008. Connecticut's CAIR regulation supplanted the previous NOx Budget regulations, which were repealed. All the sources that participated in the RCSA section 22a-174-22b NO_x budget program are subject to Connecticut's CAIR ozone season NO_x trading program, albeit subject to a reduced statewide ozone season budget and a revised allocation system.

As described earlier, in August 2011, EPA published CSAPR in the Federal Register[52] to comply with the Court remand of CAIR. EPA's updated analysis for CSAPR concluded that Connecticut was not

[50] 65 FR 81743, December 27, 2000.
[51] 73 FR 4105; January 24, 2008.
[52] 76 FR 48208, August 8, 2011.

significantly contributing to nonattainment or maintenance issues in any other state, thus CSAPR requirements do not apply to sources in Connecticut. Connecticut is obligated to maintain in-state emission reductions realized by RCSA section 22a-174-22c, but must revise its regulations because EPA did not include Connecticut in CSAPR's interstate trading programs.

On December 15, 2011, DEEP held a hearing on the proposed adoption of a new intrastate ozone season nitrogen oxides (NO_x) trading program (RCSA section 22a-174-22c), which would replace the interstate Clean Air Interstate Rule (CAIR) NO_x Trading Program now in effect under RCSA section 22a-174-22c when CSAPR is implemented. The proposed program is structured similarly to the program now in effect under RCSA section 22a-174-22c, and EPA will administer the intrastate trading program in a similar manner. The regulated units are subject to an emission budget of 2,691 tons per ozone season, exactly the same state emissions budget now in effect under RCSA section 22a-174-22c.

As noted earlier, the D.C. Circuit issued a stay of CSAPR on December 30, 2011, specifying that CAIR requirements remain in place while the Court considers and rules on pending petitions in the case. As a result, the new regulation proposes to be effective when CAIR sunsets by federal action after the CSAPR issues are resolved, thereby ensuring that the emission reductions originally secured by CAIR are retained into the future.

4.2.4 Outdoor Wood Burning Furnace (OWBF) Restrictions

As of July 2005, CGS Section 22a-174k prohibits the construction and use of an OWBF unless the OWBF is located more than 200 feet from any residence, meets certain stack height criteria and the owner complies with certain operating practices, including a requirement to burn only clean wood. These requirements address the siting and operation of these units in a manner that will work to limit exposure to particulate matter emissions.

The statute includes a sunset clause[53] that is triggered upon " … the effective date of regulations promulgated by the United States Environmental Protection Agency to regulate outdoor wood-burning furnaces." EPA is currently considering pursuing adoption of a New Source Performance Standard (NSPS) that would include emission limits for OWBFs. The requirements of CGS Section 22a-174k would no longer apply upon the effective date of a federal NSPS, if one is eventually adopted in final form.

4.2.5 Improvements in the Control of Particulate Matter and Visible Emissions

RCSA section 22a-174-18 was revised in 2004 to (1) improve the enforceability of the opacity requirements by specifying the form and averaging time of the existing opacity standards for stationary sources and including provisions specific to sources with continuous emissions monitors; (2) add

[53] The full text of CGS Section 22a-174k is available here.

particulate matter standards appropriate to fuel-burning equipment using certain fossil fuels; and (3) add particulate matter emissions standards and requirements for stationary reciprocating internal combustion engines.

4.2.6 Connecticut Enhanced I/M (ASM 2525 final standards) and OBD-II Enhanced I/M

In August 2004, DEEP updated the motor vehicle emissions testing program standards implemented by the Connecticut Commissioner of Motor Vehicles to conform to revisions to the underlying federal program standards. Specifically, the revisions to RCSA section 22a-174-27: (1) defined new on-board diagnostic test requirements; (2) added new emissions standards for vehicles subject to a pre-conditioned two speed idle exhaust emissions test procedure; (3) required ASM 2525 exhaust emission standards consistent with federal guidance but for which the federal government has not adopted analogous standards; and (4) added new emissions standards for diesel vehicles subject to a modified snap acceleration smoke opacity test.

In 2003, Connecticut began operating a decentralized I/M testing infrastructure through a new I/M contractor. The revised I/M program requires the use of the on-board diagnostics II (OBDII) test, the ASM 2525 test, the pre-conditioned two-speed idle (PCTSI) test, or one of two types of opacity testing, depending on the age, weight and fuel type of each vehicle. Virtually all vehicles that weigh less than 10,000 pounds (gross vehicle weight rating) and that are between 4 and 25 years of age are subject to the program. DEEP filed a SIP revision with EPA on December 20, 2007 to incorporate these changes to the I/M program.

4.2.7 California Low Emission Vehicle 2 (CALEV2)

The State of Connecticut is implementing the light-duty motor vehicle emission standards of the State of California applicable to motor vehicles of model year 2008 and later. California's revision of their Low Emission Vehicle (LEV) standards also includes adoption of greenhouse gas emission standards for passenger cars, light-duty trucks and medium duty passenger vehicles commencing with 2009 and subsequent model year vehicles. The program is implemented through RCSA section 22a-174-36b, which was adopted in Connecticut in December 2005.

4.2.8 Reducing NO_x Emissions from Municipal Waste Combustors

Connecticut's regulation to limit air pollutant emissions from the state's municipal waste combustor (MWC) units is described in the previous section. An October 26, 2000 amendment to RCSA section 22a-174-38 reduced the NO_x emission limits below the 1999 levels beginning May 1, 2003. EPA

approved the amended regulation and associated emissions reductions for 1-hour ozone NAAQS attainment on December 6, 2001.[54]

4.2.9 Conclusions

Connecticut's attainment demonstration SIP[55] for the annual $PM_{2.5}$ NAAQS included emission reduction estimates between 2002 and 2009 resulting from the federal and state control programs cited above. Significant annual emission reductions were estimated in Connecticut for direct $PM_{2.5}$ (679 tons, or 4%), NO_x (36,166 tons, or 30%) and SO_2 (9,233 tons, or 29%) between 2002 and 2009. When paired with the upwind impact of the federal controls described previously, the combined emission reductions are responsible for the NAAQS-compliant levels of $PM_{2.5}$ that continue to be measured in Connecticut and the rest of the NY-NJ-CT area.

[54] 66 FR 63311, December 6, 2001.

[55] Connecticut Attainment Demonstration SIP for the 1997 Annual $PM_{2.5}$ NAAQS; Technical Support Document (Section 5); Submitted to EPA on November 18, 2008.

Chapter 5 Maintenance Plan

Section 107(d)(3)(E)(iv) of the CAA stipulates that, for an area to be redesignated to attainment, EPA must fully approve a maintenance plan that meets the requirements of section 175A. A state may submit both the redesignation request and the maintenance plan at the same time and rulemaking on both may proceed on a parallel track.

CAA section 175A establishes the required elements of a maintenance plan for areas seeking redesignation from nonattainment to attainment. Under section 175A, the plan must demonstrate continued attainment of the applicable NAAQS for at least 10 years after EPA approves an area's redesignation to attainment. The plan must contain additional measures, if any, necessary to ensure such maintenance. Eight years after the redesignation approval, the state must submit a revised maintenance plan demonstrating that attainment will continue for the 10 years following the initial maintenance period. To address the possibility of future NAAQS violations, section 175 also specifies that the maintenance plan must contain contingency measures necessary to assure prompt correction of any violation of the standard that occurs after redesignation of the area to attainment.

EPA has provided further guidance[56] expanding on the required content of a maintenance plan, explaining that a maintenance plan should include the following five elements:

- An inventory sufficient to ensure attainment;
- A demonstration that the plan ensures continued maintenance of the NAAQS through a 10 year maintenance period commencing when EPA approves the redesignation request;
- A commitment to maintain an appropriate monitoring network;
- A method to track the progress of the maintenance plan; and
- Contingency measures to be implemented if NAAQS violations occur during the maintenance period.

The remainder of this section addresses each of the required elements. The first two elements, the attainment inventory and demonstration of continues maintenance, are addressed together in Section 5.1.

5.1 Attainment Inventory and Demonstration of Continued Maintenance

EPA's guidance for maintenance plans calls for states to provide an emissions inventory representative of the level of emissions sufficient to attain the NAAQS. In addition, the maintenance plan should include a demonstration of continued compliance by showing that future emissions during the maintenance period will not exceed the level of emission in the attainment inventory.

[56] "Procedures for Processing Requests to Redesignate Areas to Attainment"; Memorandum from John Calcagni, Director, Air Quality Management Division; September 4, 1992.

As was described in Section 2 of this TSD, three-year design values measured in the NY-NJ-CT area have shown compliance with the annual NAAQS since 2008 and the 24-hour NAAQS since 2009. In the Connecticut portion of the area, annual compliance extends back to at least 2001, while compliance with the 24-hour NAAQS was initially achieved in 2008. As a result, 2007 was selected as an appropriate year for the attainment inventory. The end of the maintenance period was established as 2025, consistent with the CAA section 175A(a) requirement that the plan provide for maintenance of the NAAQS for at least 10 years after EPA formally approves the redesignation request. Emission estimates were developed for direct $PM_{2.5}$, as well as for the most important $PM_{2.5}$ precursors, SO_2 and NO_x. As described below, emissions are projected to decrease from the levels in the 2007 attainment inventory through the end of the maintenance period in 2025, including in the selected interim year of 2017, thus providing for continuing maintenance of the NAAQS.

Annual inventories used for the $PM_{2.5}$ redesignation effort were developed as an extension of regional efforts in the Mid-Atlantic/Northeast Visibility Union (MANE-VU) area to create inventories for use in photochemical modeling for the 2008 ozone NAAQS, potential future revisions to the $PM_{2.5}$ NAAQS, and regional haze SIPs. Representatives from MANE-VU states and the Mid-Atlantic Regional Air Management Association (MARAMA), with contractor support, were already in the process of developing multi-pollutant inventories for 2007, 2017 and 2020 for the MANE-VU states (Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont) and Virginia. When the opportunity arose in several areas to pursue $PM_{2.5}$ redesignation, MARAMA took the lead on coordinating with affected states to create a supplemental inventory for 2025 and to make appropriate modifications to the 2007 inventory for use in the redesignation effort.

The paragraphs below summarize the inventory development process. Further inventory details are provided in the following appendices prepared by MARAMA's contractor in cooperation with the MANE-VU states.

Appendix A: VERSION 3.3 Technical Support Document for the Development of the 2007 Emission Inventory for Regional Air Quality Modeling in the Northeast/Mid-Atlantic Region; Prepared for MARAMA by AMEC Environment & Infrastructure and SRA International, Inc.; January 23, 2012.
Appendix B: VERSION 3.3 Technical Support Document for the Development of the 2025 Emission Inventory for PM Nonattainment Counties in the MANE-VU Region; Prepared for MARAMA by AMEC Environment & Infrastructure and SRA International, Inc.; January 23, 2012.
Appendix C: VERSION 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; Prepared for MARAMA by AMEC Environment & Infrastructure and SRA International, Inc.; January 23, 2012.

Detailed inventory data and other related documentation can be accessed through MARAMA's ftp website. See Appendix D for directions for accessing that site.

5.1.1 Pollutants

The inventories developed for the $PM_{2.5}$ redesignation effort include directly emitted $PM_{2.5}$ and $PM_{2.5}$-precursors (i.e., NO_x and SO_2). The $PM_{2.5}$ 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).

5.1.2 Source Categories

Emission estimates were developed for sources in the following categories:

- **Electric Generating Unit (EGU) Point Sources** are units that generate electric power and sell most of the power generated to the electrical grid.
- **Non-EGU Point Sources** are individual industrial, commercial, and institutional facilities and are further subdivided by stack, emission unit, and emission process.
- **Stationary Area Sources** include small, non-permitted sources that in aggregate may contribute significant emissions. Examples include small industrial/commercial facilities, residential heating furnaces, and road dust re-entrainment.
- **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 EPA'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 EPA 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 using EPA's Motor Vehicle Emission Simulator (MOVES) model.

Biogenic/geogenic emissions are not included in this inventory.

5.1.3 Geographic and Temporal Resolution

The MANE-VU $PM_{2.5}$ redesignation inventories were prepared only for those areas classified as nonattainment for the annual or 24-hour $PM_{2.5}$ NAAQS (e.g., Fairfield County and New Haven County in Connecticut). The inventories were developed at the county level for the area and mobile source categories and at the process level for point sources categories, which were then summed to the county level.

Discussions between MANE-VU states and EPA concluded that the use of annual inventories would also be appropriate for demonstrating continued compliance with the 24-hour $PM_{2.5}$ NAAQS during the

maintenance period if monitoring data analysis for an area showed that elevated 24-hour $PM_{2.5}$ levels occur in multiple seasons. DEEP performed such an analysis, summarized in Appendix E, and found that elevated $PM_{2.5}$ levels do occur in multiple seasons (primarily summer and winter) in Connecticut; therefore, annual inventories can be used to demonstrate compliance with both the annual and 24-hour NAAQS during the maintenance period.

5.1.4 Point Source Inventory Procedures

As part of the regional MANE-VU inventory effort, DEEP supplied MARAMA with actual 2007 emissions for all EGU and non-EGU point sources. For consistency in both reporting emissions and projecting emissions to the future, states agreed to group as EGU sources only those EGU sources that report hourly emissions to EPA's CAMD database. All other point sources (including non-EGUs in CAMD, small non-CAMD EGUs and all other non-EGUs) were grouped as non-EGU point sources.

Quality Assurance

The point source inventory underwent a multi-step iterative review process to ensure data quality.[57] The review process included:

- EPA's Basic Format and Content Checker tool was used to verify format and check for referential integrity and duplicate record issues;
- Facility-level comparisons were made between the 2007 source list and the 2002 MARAMA inventory to identify and verify/correct any facilities included in only one of those inventories;
- For facilities included in both inventories, large emission changes between 2002 and 2007 were examined for reasonableness, with corrections made if warranted;
- Crosswalks were developed to compare and verify linkages between the CAMD and state-supplied NIF source data sets.
- Source location coordinates were checked to ensure location in the correct county;
- Source files were made available for stakeholder review, with requested changes evaluated by states for possible revisions.

The quality assurance process resulted in several changes to DEEP's original 2007 point source submittal. Revisions included corrections for PM-related pollutant codes for some combustion sources and recalculation of actual emissions where rule effectiveness should not have been included. In addition, stakeholder comments resulted in minor revisions to emission estimates for two facilities.

PM Augmentation

Similar to other states, Connecticut's 2007 point source inventory, as supplied to MARAMA, did not include all components of PM emissions (i.e., PM-PRI, PM-FIL, PM-CON). The contractor applied PM augmentation procedures[58] to calculate missing components, with different procedures used for EGU and

[57] See Section 2.1 through 2.7 of Appendix A for a full description of point source quality assurance procedures.
[58] See Section 2.2 of Appendix A for a more complete explanation of PM augmentation procedures.

non-EGU sources. The EGU process used updated condensable emission factors, with preference given to the use of emission factors developed from EGU source tests where nitrogen purging occurred so as to minimize overestimation of condensable emissions due to sulfur artifact. For non-EGU sources, PM augmentation employed essentially the same process used in developing the 2002 MANE-VU Version 3 inventory.

Banked Emission Reduction Credits

DEEP maintains a registry of continuous emission reduction credits (CERCs) for potential use as offsets in new source review permits. In order to preserve potential future use of these credits, any CERCs initiated prior to the 2007 attainment inventory year must be accounted for in the 2007 and future year inventories that are included in this maintenance plan. Table 5-1 summarizes CERCs that have been included in the inventories. These emissions are reflected in the non-EGU inventory on a county-by-county basis under source classification code (SCC) 23-99-000-000. All county-level emissions were assigned to a fictitious facility located at the county centroid with an assumed release height of 30 feet.

Table 5.1 DEEP Banked Emission Reduction Credits

DEEP Emission Reduction Credit Bank of NOx Emissions Included in 2007, 2017 and 2025 Inventories		FIPS	NOx (tpy)
Totals by County*:	Fairfield	09001	392.0
	Hartford	09003	0.0
	Litchfield	09005	0.0
	Middlesex	09007	23.0
	New Haven	09009	476.8
	New London	09011	179.0
	Tolland	09013	0.0
	Windham	09015	247.0

* Fairfield and New Haven Counties are part of the NY-NJ-CT $PM_{2.5}$ nonattainment area.

Non-EGU Point Source Growth Factors

Non-EGU point source growth factors were developed for Connecticut using employment or fuel consumption projections, depending on the source category.[59] Connecticut Department of Labor 2006-2016 employment forecasts by industry sector were provided for use as growth factors for non-fuel burning sources (such as manufacturing operations). MARAMA's contractor extrapolated the employment forecasts through 2025 to develop emission estimates for these sources. Manufacturing employment projections for Connecticut are projected to decline by about 7% during the period, although declines are not as severe as those projected for other MANE-VU states.

[59] See Section 3.1.1 and 2.3.1 of Appendix B for more detailed discussions of non-EGU growth factors.

Annual Energy Outlook (AEO) fuel use projections published in 2010 by the U.S. Energy Information Administration were used to develop growth factors for fuel consuming sources.[60] AEO provides regional fuel-use forecasts for various fuel types (e.g., coal, residual oil, distillate oil, natural gas) by end uses (e.g., residential, commercial, industrial, transportation, and electric power). New England region forecasts were applied to Connecticut fuel burning sources.

The AEO forecasts show declining trends for many fuel consumption sectors, especially industrial, residential, and commercial distillate fuel oil use. To be conservative in future emission estimates, Connecticut and several other states decided to apply a no-growth assumption (growth factor = 1.0) for any non-EGU point source sector with a negative growth projection based on AEO forecasts. Such an approach could also help justify the creation of additional CERCs for facilities that might shut down during the maintenance period.

Non-EGU Point Source Control Factors

MARAMA's contractor examined adopted federal and regional control strategies to determine those that would result in post-2007 emission reductions of $PM_{2.5}$ or $PM_{2.5}$ precursors from non-EGU point sources.[61] Two federal toxics-related maximum achievable control technology (MACT) standards were identified that affect Connecticut sources, one for reciprocating internal combustion engines (RICE) and the other for industrial/commercial/institutional (ICI) boilers and process heaters. The contractor examined EPA guidance and documentation to determine that the RICE MACT will provide NOx or $PM_{2.5}$ emission reductions and the ICI/process heater MACT will provide $PM_{2.5}$ emission reductions from several non-EGU source classifications during the maintenance period.

EGU Point Source Growth and Control Factors[62]

The 2007 EGU emissions were grown to future years based on AEO2011 electricity generation projections that delineated by market region and fuel type. The 2007 emissions were extracted for those units flagged as EGUs in the MANE-VU 2007 inventory. The appropriate AEO2011 growth factor was applied to the 2007 emissions to calculate a "growth only" emission value for 2017 and 2025. The following key assumptions were made based on the fact that these inventories are not intended to be used for SIP-quality photochemical modeling:

- Any growth beyond unit capacity or permit limits was not limited (e.g., fuel consumption was allowed to grow beyond a unit's physical capacity or permit limit);
- Generation from any new units that may come on line and operate prior to 2025 but did not exist in 2007 is not explicitly included, but instead is assumed to be implicitly accounted for in the AEO2011 growth forecasts;

[60] The 2011 update to the annual AEO forecasts was published midway through the inventory development process. MARAMA compared AEO2010 and AEO2011 projections, concluding that only one sector, industrial natural gas usage, was significantly different. Connecticut's future year inventories were then changed to reflect the AEO2011 forecast for that sector, with growth for all others non-EGU sectors remaining tied to the AEO2010 forecast.

[61] See Section 3.3.2 of Appendix B for a discussion and references related to the identification of appropriate non-EGU control factors.

[62] See Sections 3.4.1 and 3.4.2 of Appendix B for a more complete description of EGU growth and control factors.

- Similarly, generation from specific units that have or may shut down after 2007 is not explicitly accounted for, but instead is assumed to be implicitly accounted for in the AEO2011 growth forecasts.
- States indicated where post-2007 controls 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.

5.1.5 Area Source Inventory Procedures

Area sources are relatively small, but often numerous, sources of air pollutants spread 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, small industrial or commercial operations that are not permitted as point sources, and road dust re-entrainment. There are 356 individual area source categories in the MANE-VU inventory, categorized by a 10-digit SCC.

The EPA regularly develops emission estimation methodologies and estimates for the National Emission Inventory (NEI). The NEI is developed on a three-year cycle, and inventories are available for 2002, 2005, and 2008. DEEP initially instructed MARAMA to use EPA's 2008 NEI[63] emission values for all area source categories for the attainment year inventory. As described below, during the quality assurance effort, a number of categories were either discovered to be missing from the 2008 NEI, or used incorrect emission factor assumptions for Connecticut, so substitutions were made from either the 2005 NEI[64] or from DEEP's draft 2005 periodic emission inventory[65] (PEI). For residential wood combustion (RWC), MARAMA's contractor ran EPA's RWC tool with updated 2007 data to produce emission estimates. EPA's 2011 updated methodology for developing emission factors for re-entrained particulate matter from vehicles traveling over a paved surface was also used.

A full description of the area source development process is provided in the MANE-VU inventory documentation included as Appendix A (Section 4) and Appendix B (Sections 3 and 4). Note that Exhibit 4.3 of Appendix A provides a tabular summary of data sources used for each state, including Connecticut, for each area source category. A summarized description of the area source inventory procedures is provided below, highlighting aspects unique to Connecticut for pollutants impacting the $PM_{2.5}$ redesignation effort.

Quality Assurance

The area source inventory underwent a multi-step iterative review process to ensure data quality.[66] The review process included:

- Checks for missing categories, double counting, outliers and incorrect emission factors;
- Comparisons between the 2007 and previously developed 2002 MANE-VU inventories to identify/verify/correct any facilities included in only one of those inventories;

[63] See http://www.epa.gov/ttnchie1/net/2008inventory.html.
[64] See http://www.epa.gov/ttnchie1/net/2005inventory.html.
[65] See Appendix F for excerpts from Connecticut's draft 2005 PEI for selected area source categories.
[66] See Section 2.1 through 2.7 of Appendix A for a full description of point source quality assurance procedures.

- For facilities included in both inventories, large emission changes between 2002 and 2007 were examined for reasonableness, with corrections made if warranted;
- Source files were made available for stakeholder review, with requested changes evaluated for possible revisions.

The quality assurance process resulted in additions, revisions and corrections to emission estimates for several area source categories in Connecticut, which were initially based solely on EPA's 2008 NEI. The review process identified several area source categories that were not included in the 2008NEI. Missing $PM_{2.5}$-related categories included industrial fuel burning sources, commercial/institutional fuel burning sources, miscellaneous area source other-combustion (SCC 2810), industrial process mining/quarrying (SCC 2325), and miscellaneous area source crop agricultural crop production (SCC 2801). These missing categories were filled in with emission estimates from EPA's 2005 NEI-v2.

More detailed review discovered that EPA's fuel burning estimates assumed a 2.25% sulfur level for residual fuel oil compared to a Connecticut regulatory maximum of 1.0% sulfur. In addition, DEEP could not verify whether EPA's 2005 NEI-v2 adjusted its area source estimates to avoid double counting of point sources. DEEP addressed these issues by providing further updates to 2007 emission estimates for non-wood fuel combustion for the residential, commercial/institutional and industrial source categories. DEEP decided to use emission estimates from its draft-2005 PEI for the non-wood fuel combustion portions of the cited categories. The draft-2005 PEI includes only CO, VOC and NO_x emissions, so fuel use values were multiplied by appropriate EPA emission factors obtained from the 2008 NEI to calculate estimates of annual SO_2 and $PM_{2.5}$ emissions. DEEP's PEI also combined kerosene fuel use with distillate fuel use for the residential, commercial/institutional, and industrial sectors. Therefore, the 2007 MANE-VU inventory was modified by setting emissions for kerosene combustion SCCs to zero to avoid double counting of emissions.

DEEP's review of 2008 NEI emission estimates from land clearing debris activities also resulted in changes to the 2007 MANE-VU inventory. The methodology used for the 2008 NEI assumes all land clearing debris in rural counties is open burned, with no burning of debris in urban counties. This assumption greatly overestimates the mass of land clearing debris occurring in Connecticut, which is very limited. As a result, the 2005 NEI emission estimates were used instead because they are similar to estimates previously calculated by DEEP based on issued open burning permits.

PM Transport Fractions

Grid air quality models have consistently overestimated fugitive dust impacts when compared to ambient samples, indicating the importance of accounting for near-source removal mechanisms such as vegetation and other surface features. To address this issue, EPA developed a methodology to reduce fugitive dust emissions for use in grid modeling analyses.[67] The MANE-VU 2007 and future year inventories apply the EPA defined county-level standard transport fractions and SCC assignments from EPA's CHIEF website to adjust PM25-PRI emissions for specific fugitive dust categories such as paved and unpaved roads, construction activities and agricultural activities. Transport fractions in Connecticut's two $PM_{2.5}$

[67] See the EPA CHIEF website at: http://www.epa.gov/ttnchie1/emch/dustfractions/.

nonattainment counties (Fairfield & New Haven) areas are both about 0.44, midway in the range of 0.14 to 0.80 used for other nonattainment counties in the MANE-VU region.

Area Source Growth Factors

Growth factors were applied to the 2007 MANE-VU area source inventory to account for anticipated changes in fuel use, population and economic activity[68] during the maintenance period. For Connecticut, growth factors were developed using six sets of data:

- Annual Energy Outlook (AEO) New England region fuel consumption forecasts;
- County-level population projections;
- State-level employment projections;
- County-level vehicle miles traveled (VMT) projections; and
- EPA projections for residential wood combustion.

As described earlier for the non-EGU sector, AEO fuel projections published in 2010 (AEO2010) were used for all fuel burning area source sectors, except for industrial natural gas combustion, which was updated to use AEO2011 projections. Industrial natural gas usage was the only sector showing a significant difference in future projections between the AEO2010 and AEO2011 forecasts.

DEEP provided MARAMA's contractor with county-level population projections developed in March 2007 by the Connecticut Data Center at the University of Connecticut. Projected population increases between 2007 and 2025 are 6.7% for Fairfield County and 5.1% for New Haven County. These population-based growth factors were used for consumer-related area source sectors such residential fuel combustion.

The state-level employment projections previously described in Section 5.1.4 were also applied to manufacturing-related area source sectors.

The Connecticut Department of Transportation (CTDOT) supplied VMT growth estimates that were used to project future year emission for re-entrained road dust from paved roads. Total VMT growth of 13.3% and 17.9% between 2007 and 2025 were used for Fairfield and New Haven Counties, respectively.

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 $PM_{2.5}$-related area source categories such as open burning and unpaved road dust.

For residential wood combustion (RWC), the MANE-VU inventories are based on emission projection parameters made available by EPA. EPA's projected RWC emissions are based on the expected increase in the number of lower-emitting woodstoves. As newer, cleaner woodstoves replace older, more polluting stoves, there will be an overall reduction of emissions from this category. The approach used by EPA was developed as part of a modeling exercise to estimate the expected benefits of the woodstove change-out program. This methodology is based on activity, not pollutant. Growth and control are accounted for in a single factor for each residential wood SCC (certain SCCs represent controlled

[68] See Section 2.3.1 of Appendix B for a more detailed discussion of area source growth factors.

equipment, while others represent uncontrolled equipment). Control factors are indirectly incorporated based on which stove is used.

Area Source Control Factors

MARAMA's contractor examined adopted federal and regional control strategies to identify any that would result in post-2007 emission reductions of $PM_{2.5}$ or $PM_{2.5}$ precursors from area source categories.[69] As part of this process, EPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform. EPA's modeling accounted for federal control strategies for four area source categories, only one of which was identified as reducing emissions of $PM_{2.5}$ or $PM_{2.5}$ precursors, the replacement of retired woodstoves installed before promulgation of the new source performance standard (NSPS). As mentioned above, MARAMA's contractor applied EPA's latest RWC methodology[70] 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 woodstoves.

One post-2007 MACT standard was also incorporated into the MANE-VU future year area source inventories, EPA's 2010 rule promulgated for reciprocating internal combustion engines (RICE). EPA made available estimates of the percent reductions in $PM_{2.5}$ and NO_x emissions attributable to the RICE MACT rule in 2012 and 2014.

5.1.6 Non-Road Source Inventory Procedures

Non-road 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 EPA'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 EPA regulatory impact analyses. The procedures used to run the NMIM/NONROAD platform and to determine emissions from MAR sources are discussed below.

5.1.6.1 NMIM/NONROAD Modeling Methodology

NMIM was developed by EPA to estimate county-level emissions for certain types of non-road equipment. NMIM uses the current version the NONROAD model, which 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. 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, MARAMA's contractor

[69] See Section 2.3.2 of Appendix B for a discussion and references related to the identification of appropriate area source control factors.

[70] See Section 2.3.1.6 of Appendix B for a more complete description of EPA's methodology for projecting RWC emissions.

used the NMIM2008 software (version NMIM20090504), the NMIM County Database (version NCD20090531), and NONROAD2008a (July 2009 version) as a starting point. Changes were made to the NCD20090531 based on state review.[71]

Connecticut Changes to the NMIM National County Database and Other Inputs

MANE-VU States, including Connecticut, reviewed the NCD20090531 version of the National County Database (NCD) to determine if any parameters should be corrected or updated. DEEP requested changes to several fuel-related characteristics to make them consistent with reformulated gasoline (RFG) sampling results reported by EPA for RVP, sulfur and ethanol oxygen weight percents in Connecticut's multiple RFG areas.

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 MARAMA's contractor update the allocation files for those categories. As a consequence, the contractor obtained and applied 1 and 2 unit housing information and updated Census Bureau 2007 population estimates for each state, including Connecticut. The revised housing unit data affected the allocation of residential lawn and garden equipment. Revised population files applied to railroad maintenance equipment and AC/refrigeration equipment.

Removal of Airport Ground Support Equipment Emissions

The NMIM/NONROAD model includes emissions from airport ground support equipment. Emissions from airport ground support equipment can also be calculated using the Federal Aviation Administration's (FAA) Emissions and Dispersion Modeling System (EDMS). MARAMA correspondence with EPA indicated that EPA 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 2007, 2017 and 2020 inventories and replaced with EDMS estimates, as described in Section 5.1.6.2.

Future Year 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 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 accounts for all adopted EPA emission standards for non-road equipment. There are multiple standards that vary by equipment type, rated power, model year, and pollutant. Exhibit 4.1 of Appendix C provides a tabular summary of the emission control programs accounted for in the NMIM/NONROAD model.

[71] See Section of 4 of Appendix A for a more complete description of NMIM/MOVES modeling procedures.

Finally, as mentioned above, airport ground service emissions were removed from the future year NMIM/NONROAD runs and were replaced by estimates calculated by the FAA EDMS model.

5.1.6.2 MAR Methodology

This category of sources is collectively referred to as the MAR (marine, airports, and railroads) sector. It includes non-road 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.

2007 Commercial Marine Vessel Inventory Development

Along with several other MANE-VU states, Connecticut elected to use EPA's 2008 NEI data for all commercial marine vessel categories. These estimates include emissions from CMV operation generally within 12 nautical miles of shore. The 2008 NEI data were used directly for 2007 (i.e., the 2007 emissions were assumed to be equal to 2008).

Future Year Commercial Marine Vessel Inventory Development

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, EPA 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 three EPA regulatory impact assessments (RIA).[72] MARAMA's contractor used EPA 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).

2007 Airport Inventory Development

Connecticut aircraft emissions in the 2007 MANE-VU inventory are available on a county-by-county 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.

CT DEEP calculated 2007 airport-related emissions based on the 2008 NEI for airport ground support equipment and auxiliary power units, detailed 2005 aircraft activity data from Connecticut-specific survey data and emission factors obtained from EDMS 5.1, augmented by PM emission factors from EPA 2008 documentation for non-International Civil Aviation Organization (ICAO) certified engines. Growth factors were developed from the 2009 Terminal Air Forecast (TAF) database. No growth was assumed if a TAF-based growth factor was not available. Results were provided to MARAMA for inclusion in the 2007 MANE-VU inventory. See Appendix G for further detail.

Future Year Airport Inventory Development

CT DEEP provided MARAMA with state-specific growth factors through 2025 by SCC and county. These growth factors closely followed the approach used and described in the MARAMA effort; however, the airport specific activity was grown based on the Terminal Air Forecasts for each airport where available (or no growth when not available) rather than applying a composite average growth factor for a county. See Appendix G for further detail.

MARAMA's contractor reviewed NO_x aircraft engine emissions standards adopted by EPA in November 2005. 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,

[72] See Section 5.3.1 of Appendix B for a full description of the EPA methodology used for CMV emission projections and the associated EPA references.

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. 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, the MANE-VU future year aircraft emission projections do not account for this control program.

2007 Railroad Inventory Development

Railroad locomotive engine emissions in the 2007 MANE-VU 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).

Along with many other MANE-VU states, Connecticut participated in the Eastern Regional Technical Advisory Committee (ERTAC) inventory effort for railroad locomotives and rail yards[73] as the starting point for developing the 2007 railroad emissions inventory. The ERTAC rail inventory included only larger categories of locomotive emissions, such as large Class I line-haul and Class I rail yard switchers. This focus did not fit Connecticut's railroad profile of predominantly line haul commuter (e.g. Shoreline East) and passenger (e.g., AMTRAK) activity, with Class II/III short line and regional railroads and a Class I railroad isolated from the Class I hub by Class II and III owned rail and a substandard bridge associated with an inconvenient pathway thru New York. Consequently, the ERTAC effort was not of direct use and CT DEEP calculated all the emissions needed for the 2007 railroad inventory. See Appendix H for further detail.

Future Year Railroad Inventory Development

In March 2008, EPA 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, EPA developed a national emission inventory for calendar years 2002 through 2040. Emission projections methodologies for a baseline and controlled scenario were developed and documented.[74] MARAMA's contractor used

[73] See Section 6.3 of Appendix A for more information on the ERTAC railroad inventory and associated ERTAC reference material.

[74] See Section 5.3.3.1 of Appendix B for a more complete discussion of how the projected railroad emissions were determined, as well as for associated EPA references.

the EPA methodology, updated with AEO2010 projections for passenger rail and freight rail energy use to develop MANE-VU future year inventories.

5.1.7 On-Road Mobile Source Inventory Procedures

EPA's recently released MOVES2010 (**MO**tor **V**ehicle **E**mission **S**imulator) is now the official model for estimating air pollution emissions from on-road mobile sources including buses, cars, trucks and motorcycles for SIP purposes. MOVES2010 replaces MOBILE6.2, EPA's previous mobile source model. MOVES input files are more detailed than the MOBILE6.2 input files. To assist in the transition to the new model, USEPA developed software tools to convert certain MOBILE6.2 inputs for MOVES. These inputs were loaded into the MOVES County Data Manager (CDM), which together with LEV database files and MOVES run Specifications, were used to generate MySQL database output files generated by the MOVES Model. Post processing was accomplished using SQL in either MySQL or MS Access.

States were offered the option of having NESCAUM perform the MOVES modeling using input data provided by and/or reviewed by the states. CT DEEP initially selected this option and provided requested inputs in 2010 from data available at that time. By early 2012, CT DEEP was able to assemble updated MOVES data sets for several required parameters and elected to perform its own MOVES runs with the updated data for 2009, 2017 and 2025. Connecticut's MOVES input data sets are summarized in Tables 5.2 through 5.4, with more detailed documentation provided in Appendix I. Table 5.2 describes the selections made when creating the MOVES 2010a run specifications. Table 5.3 summarizes the CDM inputs loaded into the MOVES model. Table 5.4 lists references cited in the previous two tables.

Connecticut decided to include 2009 MOVES on-road emission estimates in the $PM_{2.5}$ attainment year inventory, rather than using 2007 emission estimates. This was done for several reasons. First, EPA has previously approved 2009 transportation conformity budgets for Connecticut that were determined using MOBILE6.2; the 2009 MOVES estimates will serve to replace those budgets. Second, since on-road emissions are steadily decreasing due to fleet turnover to lower emitting vehicles, 2009 on-road emissions are lower than 2007 estimates, thus the conformity budgets used for the early years of the maintenance plan (i.e., pre-2017) will be more stringent. Similarly, the total attainment year inventory across all source sectors will be more conservative (i.e., lower) than if 2007 on-road emissions were used. Since emissions through the end of the maintenance period must be no higher than during the attainment year, this approach provides additional assurance that NAAQS compliance will continue through the maintenance period.

Table 5.2 MOVES Run Specifications

Scale	
Description	MOVES Scale input page (panel) allows the selection of the Domain/Scale and Calculation Type for the run specification.
Data Source	EPA recommends the use of the county scale for SIP analyses [R3]. The Inventory Calculation type was used to integrate input calculations for a direct result for quick and reliable calculation of emissions.
Time Spans	
Description	MOVES Time Spans panel allows the selection of Time Aggregation Level (inputs), Years, Months, Type of Days and Hours. [R3]
Data Source	For SIP and regional conformity analysis, hour should be selected for Time Aggregation Level. Because emissions of criteria pollutants are dependent on ambient temperature, diurnal, daily, and monthly variations in temperature can have large impacts on emission results. [R3] MOVES can model calendar years 1990 and 1999-2050, inclusive. The County scale in MOVES allows only a single calendar year in a run specification [R3]. For the $PM_{2.5}$ redesignation effort, 2009, 2017 and 2025 were selecteded. A separate run and run specification was needed for each year and for each county. To obtain an annual estimation of direct $PM_{2.5}$ emissions, SO_2 and NO_x, all twelve months, week and weekday were selected under the Day submenu and all hours (24 hours per day) were selected for the time span applicable to the MOVES run.
Geographic Bounds	
Description	MOVES requires the selection of a single county for each year when County is selected for the Domain/Scale. [R1]
Data Source	The Connecticut counties associated with the $PM_{2.5}$ redesignation effort are Fairfield and New Haven. Individual run specifications and detailed county data manager inputs were provided for each count and each year modeled. County Data Manager inputs are further described in the table for MOVES Inputs below.
Vehicles/Equipment - On Road Vehicles	
Description	Allows the selection of Fuels and Source Use Types (types of vehicles) combinations.
Data Source	For SIP and regional conformity analyses, the appropriate fuel and vehicle type combinations in the On Road Vehicle Equipment panel must be selected to reflect the full range of vehicles that will operate in the county for the year selected. [R3] Liquefied Petroleum Gas (LPG) and the Placeholder Fuel Type were not included in the selection of fuels/vehicle combination included in Connecticut's run specification. EPA discourages the inclusion of the placeholder fuel. LPG was not included due to warnings produced at the time of the creation of the RunSpec, which was judged not worth investigating due to zero or extremely low vehicle LPG vehicle populations and VMT.

Table 5.2 MOVES Run Specifications (continued)

Road Type	
Description	There are five available road types: Off-network, Rural Restricted Access, Rural Unrestricted Access, Urban Restricted Access, Urban Unrestricted Access.
Data Source	All five road type categories were selected to calculate a total annual emission estimate for direct $PM_{2.5}$ pollutants.
Pollutants and Processes	
Description	Pollutants, precursors and the processes that can generate them can be selected in this input page [R3]
Data Source	The $PM_{2.5}$ redesignation effort requires estimates for direct $PM_{2.5}$, NO_x and SO_2.
Manage Input Data Sets (MIDS)	
Description	This panel allows users to create and use alternate data tables that are not part of the County Data Manager (CDM) inputs and that will be used in place of data from the MOVES default database [R3].
Data Source	Connecticut was required to use the MIDS option to adjust emission factors associated with early adoption of the Low Emission Vehicle Standards. Connecticut adopted California Low Emission Vehicle (LEV) II standards in 2008 and also adopted early implementation of National Low Emission Vehicle (NLEV) standards for the 1999 and 2000 model years. Connecticut used the EPA's early LEV database and a database created following EPA directions for creating a CALEV database to properly model Connecticut emissions. The early adoption of National LEV (early LEV) and a database for CA LEV II were included in MIDS to adjust emissions for all years considered in this analysis [R5].
Output - General Output	
Description	This panel includes general information about the output.
Data Source	The name of the output database, the units (mass in U. S. Tons, energy in Joules and distance in Miles) for the output and the Activity Output requested. For activity, Distance Traveled and Population were selected to provide a quick check for these inputs.
Output - Output Emissions	
Description	In this subpanel several options can be selected. These options tell the model the level of aggregation of the outputs and how the results should be aggregated.
Data Source	Since the $PM_{2.5}$ redesignation relies on an annual analysis, aggregation of the results at a monthly level greatly simplifies post processing requirements. This makes post processing easy and reduces the possibility of introducing errors. Results were segregated by Fuel Type, Emissions Processes Road Type and Source Use Type to provide the capability to view/review results in different ways.

Table 5.3 MOVES County Data Manager (CDM)

Age Distribution	
Description	Vehicle age is used to determine the vintage of vehicle emission control technologies and vehicle deterioration. Fleets with a higher percentage of older vehicles have higher emissions than fleets with newer vehicles. MOVES covers a 31-year range of vehicle ages, with vehicles 30 years and older grouped together [R3].
Data Source	The 2011 registration data set was fully evaluated, assigned a model year and assigned a MOBILE6.2 16-vehicle type classification based on CT DMV registration data. A MOBILE6.2 age distribution and a MOVES age distribution were developed directly from the results of the DMV data analysis. The EPA's default diesel sales algorithm was used to convert the MOBILE6.2 16-vehicle type classifications to MOBILE6.2 28-vehicle type classifications. Table A.1 of the MOVES Technical Guidance [R3] was used to map the MOBILE6.2 28-vehicle type classification populations to MOVES source type populations.
Average Speed Distribution	
Description	Average speed is used to calculate vehicle run times and to determine the emission factor of the vehicles. Higher speeds for a given VMT reduces run time and the total time for running emissions, however higher speeds are typically associated with higher emission factors. Average speed data specific to vehicle type (sourceTypeID), road type (roadTypeID), and time of day/type of day (hourdayID) provides the data necessary for MOVES to calculate emissions. MOVES defines 16 "speed bins" which describe the average driving speed on a road type or link. MOVES uses a time-based distribution, whereas MOBILE6.2 used a VMT-based speed distribution.
Data Source	Connecticut used EPA Average Speed converters to produce MOVES inputs from MOBILE6.2 Speed-VMT files.
Fuel	
Description	Fuels inputs include both fuel formulation and fuel supply. Fuel Formulation specifies the components of the fuels considered. Fuel Supply indicates the fuel formulation's fraction of the volume consumed in the area (i.e. market share) [R3].
Data Source	MOVES default fuels inputs were used for all fuels except diesel and gasoline. Sulfur is the key parameter for diesel fuel. Diesel values were set at values specified in EPA guidance (i.e. 43 ppm in 2009 and 43 ppm after 2010). [R4] Connecticut specific reformulated gasoline data were used to establish gasoline parameters.
Meteorology	
Description	MOVES meteorological inputs consist of temperature and humidity data for months, zones (counties) and hours included in the MOVES run specification. Temperature and to a lesser extent humidity affect emission estimates; thus, assumptions used for regional conformity analyses must be consistent with those used to establish the emissions budget in the SIP as required in the transportation conformity rule, 40 CFR §93.122(a)(6) [R3].
Data Source	MOVES meteorological inputs used the NMIM National County Database (version NCD20090531) for 2007, 2017 and 2025 to maintain consistency. [R5]

Table 5.3 MOVES County Data Manager (continued)

Road Type Distribution	
Description	Road Type Distribution provides VMT fraction data relating to the vehicle miles traveled by road type (roadTypeVMTFraction) for the county being modeled. This data is entered as a distribution across road types (roadTypeID), where only road types selected by the user in the run specification are included in the distribution. The distribution must sum to one for each source type.
Data Source	Road Type Distribution was calculated for each Connecticut county using a preprocessor to produce a MOVES input table based on localization of adjusted default VMT mixes and Connecticut specific 2010 HPMS vehicle counts. This preprocessor table output county VMT estimates, MOBILE6.2 age distribution from 2011 DMV registration data, Connecticut 2009 VMT by hour observations and ramp fractions were input into EPA's 16 vehicle type / 12 road type level VMT converter to obtain road type distribution outputs.
Source Type Population	
Description	Source type (vehicle type) population is used by MOVES to calculate start and evaporative emissions. Because vehicle population directly determines start and evaporative emission, local data for this input must be developed.
Data Source	The MOVES model categorizes vehicles into 13 source types, which are subsets of 6 MOVES HPMS vehicle types. 2011 Connecticut DMV Registration data was analyzed to develop population data for Mobile 6.2 16-vehicle type classifications. The EPA's default diesel sales algorithm was used to convert the MOBILE6.2 16-vehicle type classifications to MOBILE6.2 28-vehicle type classifications. Table A.1 of the MOVES Technical Guidance [R3] was used to map the MOBILE6.2 28-vehicle type classification populations to MOVES source type populations. Connecticut Specific 2009 HPMS vehicle miles travelled (VMT) from MOVES input files were used to augment vehicle counts for Source Types within the HPMS 50 and 60 type obtained directly from the 2011 registration data. Growth factors based on Connecticut specific DOT estimates for each of the 6 MOVES HPMS vehicle type VMT for each Connecticut county were applied to each of the associated MOVES Source Types to develop Source Type Populations for 2017 and 2025. [R8]
Ramp Fraction	
Description	Ramp Fraction is the fraction of ramp driving time on selected road types. Only limited access road types (freeways and interstates) may have their ramp fractions modified. [R2] MOVES converters improperly indicate ramp VMT fraction. [R2, R9]
Data Source	Ramp VHT was estimated by dividing Ramp VMT by the average speed for the appropriate road types set forth in MOBILE6.2 guidance.

Table 5.3 MOVES County Data Manager (continued)

Vehicle Type VMT	
Description	As input, MOVES requires annual VMT by HPMS vehicle class but users can input average annual daily VMT as well as monthly and weekend day adjustment factors to create the annual VMT by HPMS class and appropriate monthly and daily adjustments needed by MOVES [R3].
Data Source	Annual vehicle type VMT was calculated for each Connecticut county using a preprocessor to produce a MOVES input table based on localization of adjusted default VMT mixes and Connecticut specific 2010 HPMS vehicle counts. This preprocessor table output, county VMT estimates, MOBILE62 age distribution from 2011 DMV registration data, Connecticut 2009 VMT by hour observations and ramp fractions were input into EPA's 16 vehicle type / 12 road type level VMT converter to obtain road type distribution outputs, hourVMTFraction, MOVES Source Type Age Distribution, and road type ramp fractions. The HPMSVTypeYear – daily VMT together with monthly adjustment factor based on seasonal VMT variations and EPA default weekend-day adjustment factor were input into the EPA Annual Average Weekday Vehicles Miles Travelled converter (aadvmtcalculator_hpms.xls) to generate the HPMSVTypeYear (annual), monthVMTFraction, and dayVMTFraction tables from Annual Average Weekday Vehicles Miles Travelled (AADVMT) and monthly/weekend-day adjustment factors [R9]
Inspection and Maintenance (I/M)	
Description	The MOVES I/M input is used to calculate the emission benefit of the I/M program. A unique set of I/M inputs is needed for each calendar year and county modeled. The Connecticut vehicle I/M program is an important part of the strategy to ensure that Connecticut is positioned to attain the National Ambient Air Quality Standard for Ozone. [R6].
Data Source	Connecticut I/M inputs were developed in accordance with the MOVES SIP and conformity Technical Guidance [R3]. I/M program inspection frequency, inspection program, process, pollutant and vehicle regulatory class / MOVES source type applicability mappings were determined based on EPA technical guidance. Compliance factor was calculated based on the light duty vehicle fleet only and the following I/M data: 2009 I/M inputs were based on I/M compliance and waiver rate observations. Future year I/M inputs were based on I/M SIP compliance & waiver rate commitments. [R6,R7] All EPA MOVES default I/M inputs were deactivated by setting the "useIMyn" field to "N".

Table 5.4 References Cited in Table 5.2 and 5.3

Reference Number	Reference
[R1]	EPA. Final Rule to Add PM $_{2.5}$ Precursors to the Transportation Conformity Rule. EPA-420-F-05-005. May 2005. http://www.epa.gov/otaq/stateresources/transconf/regs/420f05005.pdf
[R2]	EPA. Motor Vehicle Emission Simulator (MOVES) User Guide for MOVES2010a. EPA-420-B-10-036. December 2009. http://www.epa.gov/otaq/models/moves/MOVES2010a/420b10036.pdf
[R3]	EPA. Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity. EPA-420-B-10-023. April 2010. http://www.epa.gov/otaq/models/moves/420b10023.pdf
[R4]	EPA. Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation. EPA-420-R-04-013. August 2004. http://www.epa.gov/otaq/models/mobile6/420r04013.pdf
[R5]	NESCAUM. Development of MANE-VU Onroad Mobile Source Emissions for 2007 and 2020 using MOVES. December 2011.
[R6]	De la Torre Klausmeir Consulting. 2007 Connecticut's Inspection/Maintenance Program Evaluation. June 2008. http://www.ct.gov/dep/lib/dep/air/vehicle_emissions/2007imreport&appendicesfinal.pdf
[R7]	Connecticut Department of Environmental Protection. Revision to the Connecticut's State Implementation Plan. Enhanced Motor Vehicle Inspection and Maintenance Program. December, 2007. http://www.ct.gov/dep/lib/dep/air/regulations/proposed_and_reports/final2007_im_sip_revision.pdf
[R8]	EPA. Fleet Characterization Data for MOBILE6: Development and Use of Age Distributions, Average Annual Mileage Accumulation Rates, and Projected Vehicle Counts for Use in MOBILE6 (M6.FLT.007). EPA-420-R-01-047. September 2001. http://www.epa.gov/oms/models/mobile6/r01047.pdf
[R9]	EPA MOVES Converters. http://www.epa.gov/otaq/models/moves/tools.htm

5.1.8 Comparison of Attainment Year and Projected Future Year Emissions

As described earlier, EPA's guidance for maintenance plans calls for states to provide an emissions inventory representative of the level of emissions sufficient to attain the NAAQS. In addition, the maintenance plan should include a demonstration of continued compliance by showing that future emissions during the maintenance period will not exceed the level of emission in the attainment inventory. The inventory procedures described above were applied to determine emission levels for 2007, the representative attainment year. Emissions during the maintenance period were estimated for both an interim year (2017) and the final year (2025) of the maintenance period to show continuing compliance.

Tables 5.5 summarizes estimated annual $PM_{2.5}$ emissions in 2007[75], 2017 and 2025 by major source sector for the two Connecticut counties that are part of the NY-NJ-CT $PM_{2.5}$ nonattainment area, as well totals for the both counties combined. Also listed are the changes (tons/year and percentage) between 2007 and 2025. Tables 5.6 and 5.7 summarize the same information for NO_x and SO_2 emissions, respectively. Appendix D provides information to access MARAMA's ftp site, which includes detailed breakdowns of emissions for all categories except for on-road mobile sources. Further information for on-road mobile emissions is included in Appendix I.

Table 5.5 $PM_{2.5}$ Emissions Inventory Projections 2007-2025

Particulate Matter (PM25-PRI) V3.3				2007 Annual (tons)	2017 Annual (tons)	2025 Annual (tons)	2007 to 2025 Change (tons)	2007 to 2025 Change (Percent)
State	FIPS	County	SECTOR					
CT	09001	Fairfield	AREA	1,991.5	1,892.3	1,827.5	-163.9	-8%
CT	09001	Fairfield	NONROAD MAR	119.9	61.7	45.0	-74.8	-62%
CT	09001	Fairfield	NONROAD NMIM	403.0	292.5	244.1	-158.9	-39%
CT	09001	Fairfield	ONROAD MOVES	404.4	238.0	192.7	-211.7	-52%
CT	09001	Fairfield	POINT EGU	283.5	79.4	131.5	-152.0	-54%
CT	09001	Fairfield	POINT NONEGU	44.7	47.3	49.6	4.9	11%
		Fairfield Total		**3,247.0**	**2,611.2**	**2,490.4**	**-756.5**	**-23%**
CT	09009	New Haven	AREA	1,900.3	1,804.9	1,746.3	-153.9	-8%
CT	09009	New Haven	NONROAD MAR	168.5	73.0	51.6	-117.0	-69%
CT	09009	New Haven	NONROAD NMIM	279.1	181.7	136.8	-142.3	-51%
CT	09009	New Haven	ONROAD MOVES	389.6	229.4	186.2	-203.4	-52%
CT	09009	New Haven	POINT EGU	88.1	84.4	83.8	-4.2	-5%
CT	09009	New Haven	POINT NONEGU	40.4	44.5	46.6	6.2	15%
		New Haven Total		**2,866.0**	**2,417.9**	**2,251.3**	**-614.7**	**-21%**
		Total CT Portion of NY-NJ-CT Area		**6,113.0**	**5,029.1**	**4,741.7**	**-1,371.2**	**-22%**

[75] As described in Section 5.1.7, Connecticut elected to combine on-road mobile source emission estimates for 2009 with 2007 emission estimates for all other source categories when establishing the level of emissions that provides for attainment. Since on-road emissions are steadily decreasing due to fleet turnover to lower emitting vehicles, 2009 on-road estimates are lower than 2007 estimates. Therefore, the total attainment year inventory is more conservative (i.e., lower) than if 2007 on-road emissions were used. Since emissions through the end of the maintenance period must be no higher than during the attainment year, this approach provides additional assurance that NAAQS compliance will continue through the maintenance period.

Table 5.6 NO_x Emissions Inventory Projections 2007- 2025

Oxides of Nitrogen (NOx) V3.3				2007 Annual (tons)	2017 Annual (tons)	2025 Annual (tons)	2007 to 2025 Change (tons)	2007 to 2025 Change (Percent)
State	FIPS	County	SECTOR					
CT	09001	Fairfield	AREA	3,088.8	2,771.3	2,740.1	-348.7	-11%
CT	09001	Fairfield	NONROAD MAR	3,034.2	1,957.5	1,345.4	-1,688.8	-56%
CT	09001	Fairfield	NONROAD NMIM	4,648.1	2,615.8	2,057.3	-2,590.8	-56%
CT	09001	Fairfield	ONROAD MOVES	11,888.9	5,414.1	3,573.2	-8,315.7	-70%
CT	09001	Fairfield	POINT EGU	2,268.5	741.7	1,108.2	-1,160.3	-51%
CT	09001	Fairfield	POINT NONEGU	1,875.4	2,224.0	2,543.5	668.1	36%
		Fairfield Total		**26,804.0**	**15,724.4**	**13,367.8**	**-13,436.2**	**-50%**
CT	09009	New Haven	AREA	2,936.1	2,636.8	2,608.1	-328.0	-11%
CT	09009	New Haven	NONROAD MAR	3,945.9	2,487.0	1,736.2	-2,209.7	-56%
CT	09009	New Haven	NONROAD NMIM	3,688.1	2,076.6	1,603.9	-2,084.3	-57%
CT	09009	New Haven	ONROAD MOVES	11,502.7	5,293.9	3,540.1	-7,962.6	-69%
CT	09009	New Haven	POINT EGU	639.6	386.6	384.5	-255.0	-40%
CT	09009	New Haven	POINT NONEGU	822.7	896.0	951.6	128.9	16%
		New Haven Total		**23,535.1**	**13,776.9**	**10,824.4**	**-12,710.7**	**-54%**
		Total CT Portion of NY-NJ-CT Area		**50,339.1**	**29,501.3**	**24,192.2**	**-26,146.9**	**-52%**

Table 5.7 SO_2 Emissions Inventory Projections 2007-2025

Sulfur Dioxide (SO2) V3.3				2007 Annual (tons)	2017 Annual (tons)	2025 Annual (tons)	2007 to 2025 Change (tons)	2007 to 2025 Change (Percent)
State	FIPS	County	SECTOR					
CT	09001	Fairfield	AREA	3,917.3	3,157.5	2,835.2	-1,082.1	-28%
CT	09001	Fairfield	NONROAD MAR	353.4	39.6	18.5	-334.9	-95%
CT	09001	Fairfield	NONROAD NMIM	215.8	8.5	9.4	-206.4	-96%
CT	09001	Fairfield	ONROAD MOVES	84.3	71.5	66.4	-17.9	-21%
CT	09001	Fairfield	POINT EGU	3,311.2	849.4	1,421.3	-1,889.9	-57%
CT	09001	Fairfield	POINT NONEGU	154.8	167.8	180.0	25.2	16%
		Fairfield Total		**8,036.7**	**4,294.2**	**4,530.8**	**-3,505.9**	**-44%**
CT	09009	New Haven	AREA	3,707.7	2,984.5	2,677.1	-1,030.6	-28%
CT	09009	New Haven	NONROAD MAR	727.4	85.1	35.7	-691.6	-95%
CT	09009	New Haven	NONROAD NMIM	174.1	6.9	7.6	-166.5	-96%
CT	09009	New Haven	ONROAD MOVES	91.8	79.7	74.7	-17.2	-19%
CT	09009	New Haven	POINT EGU	822.7	400.1	398.4	-424.3	-52%
CT	09009	New Haven	POINT NONEGU	55.6	58.5	59.5	3.9	7%
		New Haven Total		**5,579.2**	**3,614.8**	**3,252.9**	**-2,326.3**	**-42%**
		Total CT Portion of NY-NJ-CT Area		**13,615.9**	**7,909.0**	**7,783.7**	**-5,832.2**	**-43%**

Results set forth in tables 5.5, 5.6 and 5.7 demonstrate that total emissions of all three $PM_{2.5}$-related pollutants decrease significantly through the maintenance period, with $PM_{2.5}$ emissions decreasing by 22%, NO_x by 52% and SO_2 by 43% between 2007 and 2025. These projected reductions[76] occur due to the currently adopted federal and state control programs described in Section 4, with no additional control strategies necessary to maintain the NAAQS through 2025. Therefore, the Section 175A mandate to demonstrate continued compliance during the maintenance period is satisfied.

5.1.9 Motor Vehicle Emission Budgets

Under CAA section 176(c), new transportation plans, programs, and projects, such as the construction of new highways, must "conform" to (i.e., be consistent with) motor vehicle emission budgets (MVEBs), the part of the state's air quality plan that addresses emissions from cars and trucks. Conformity to the SIP means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS or any interim milestones. If a transportation plan does not conform, most new projects that would expand the capacity of roadways cannot go forward. Regulations at 40 CFR 93 set forth EPA policy, criteria, and procedures for demonstrating and assuring conformity of such transportation activities to a SIP. Transportation conformity is a requirement for both nonattainment and maintenance areas.

Under the CAA, states submit, at various times, control strategy SIPs and maintenance plans for nonattainment areas. These control strategy SIPs (e.g., attainment demonstrations) and maintenance plans create MVEBs for criteria pollutants and/or their precursors to address pollution from cars and trucks. Per 40 CFR 93, a MVEB must be established for the last year of the maintenance plan. A state may adopt MVEBs for other years as well. The MVEB is the portion of the total allowable emissions in the maintenance demonstration that is allocated to highway and transit vehicle use and emissions (see 40 CFR 93.101). The MVEB serves as a ceiling on emissions from an area's planned transportation system. For $PM_{2.5}$ nonattainment and maintenance areas, MVEBs must be established for direct $PM_{2.5}$ emissions and for NO_x emissions (on-road mobile source SO_2 emissions are judged to be insignificant contributors to ambient $PM_{2.5}$ levels). The MVEB concept is further explained in the preamble to the November 24, 1993, Transportation Conformity Rule (58 FR 62188). The preamble also describes how to establish the MVEB in the SIP and how to revise the MVEB.

Connecticut has elected to develop MVEBs for $PM_{2.5}$ and NO_x for the years 2009 and 2017 and 2025. The MVEBs for 2009 will replace existing 2009 MOBILE6.2 budgets with MOVES budgets to reflect EPA's state-of-the-art method for estimating on-road vehicle emissions. Emissions during 2009 also represent the time period when the area first achieved compliance with the $PM_{2.5}$ NAAQS. The 2009 budgets will apply to any transportation plan year prior to 2017. The 2017 budgets will apply to

[76] This TSD focuses on emission reductions in Connecticut's portion of the NY-NJ-CT nonattainment area. New York and New Jersey plan to submit redesignation requests containing emission projection analyses for their portions of the area. Connecticut anticipates that similar downward trends in $PM_{2.5}$-related emission will be shown by both New York and New Jersey, supporting redesignation of the entire area as attainment.

transportation plan years between 2017 and 2024, while the 2025 budgets will apply for plan years 2025 and later.

The MVEBs for 2009, 2017 and 2025 are summarized in Table 5.8 for the Connecticut portion of the NY-NJ-CT area. The 2017 and 2025 MVEBs reflect the total on-road emissions projected by MOVES for those years, plus an allocation from the available $PM_{2.5}$ and NO_x "safety margins". Under 40 CFR 93.101, the term "safety margin" is the difference between the attainment level (from all sources) and the projected level of emissions (from all sources) in the maintenance plan. All or a portion of the safety margin can be allocated to the transportation sector; however, total emissions across all source sectors must remain below the attainment level. Connecticut has elected to use only 10% of the available safety margins for each pollutant in the 2017 and 2025 MVEBs to account for uncertainties in potential future changes to emission factor models and to provide some flexibility in future vehicle miles traveled projections while still ensuring that emissions remain well below attainment levels.

Table 5.8 Transportation Conformity Budgets for Connecticut's Portion of the NY-NJ-CT Area

Year		$PM_{2.5}$	NO_x
2009	**2009 Conformity Budget**	**794.0**	**23,391.7**
2017	On-Road Inventory	467.4	10,708.0
	Safety Margin vs 2007	1083.9	20,837.8
	10% of Safety Margin	108.4	2,083.8
	2017 Conformity Budget	**575.8**	**12,791.8**
2025	On-Road Inventory	378.9	7,113.4
	Safety Margin vs 2007	1371.3	26,146.9
	10% of Safety Margin	137.1	2,614.7
	2025 Conformity Budget	**516.0**	**9,728.1**

When these budgets are deemed adequate or are approved by EPA (whichever occurs first), subsequent transportation plans must show compliance with the revised 2009 MVEBs for any analysis years prior to 2017, the 2017 budgets for any analysis years from 2017 through 2024, and the 2025 budgets for any analysis years from 2025 onward.

5.2 Ambient Monitoring Network Commitment

EPA's guidance calls for states to commit to maintain an appropriate monitoring network during the maintenance period. As described in Section 2.1, DEEP currently operates a monitoring network with seven $PM_{2.5}$ FRM locations in the Connecticut portion of the NY-NJ-CT nonattainment area (see Figure 2.1). Annual monitoring network plans and five-year network assessment reports are prepared and submitted to EPA. These reports describe, among other things, plans for future changes to the monitoring network. Potential changes in the number and/or location of monitors are discussed with EPA well in advance of implementation. DEEP commits to continuing operation of an appropriate $PM_{2.5}$ monitoring

network through the maintenance period. Any potential changes to the existing network will be considered in collaboration with EPA through the network planning and assessment procedures to make sure the monitoring requirements of the maintenance plan are satisfied. DEEP will also continue to quality assure the monitoring data to meet the requirements of 40 CFR 58 and enter all data into AQS on a timely basis in accordance with federal guidelines.

5.3 Verification of Continued Attainment

EPA's guidance also calls for states to track the progress of the maintenance plan to verify continued compliance during the maintenance period. DEEP plans to use two indicators to verify continued compliance, monitoring data and emissions estimates. DEEP will continue to conduct ambient $PM_{2.5}$ monitoring in accordance with 40 CFR 58 requirements and expeditiously review data as it becomes available to evaluate any risk of impending NAAQS violations. DEEP will also regularly review available emission inventory updates produced by EPA (e.g., NEI updates or inventories developed for potential national rules) and/or DEEP (e.g., periodic inventories required by the Federal Consolidated Emissions Reporting Rule under 40 CFR 51 Subpart A) to identify any projected increases in emissions that might threaten NAAQS compliance. Both of these indicators will be used as potential triggers for early action in the contingency plan described below.

5.4 Contingency Plan

CAA section 175A and EPA guidance specify that maintenance plans include contingency provisions to promptly correct any violation of the NAAQS that occurs after redesignation of the area. Such provisions shall include a requirement that the State will implement all measures with respect to the control of the air pollutant concerned which were contained in the State implementation plan for the area before redesignation of the area as an attainment area. For the purposes of section 175A, a state is not required to have fully adopted contingency measures that will take effect without further action by the state in order for the maintenance plan to be approved.[77] However, the contingency plan is considered an enforceable part of the SIP and should ensure that the contingency measures are adopted in a timely fashion once they are triggered. The plan should clearly identify the measures to be adopted, a schedule and procedure for adoption and implementation, and a specific time limit for action by the state. As a necessary part of the plan, the state should also identify specific indicators, or triggers, which will be used to determine when the contingency measures need to be implemented.

DEEP will implement a two-level plan to identify, examine and, if necessary, implement appropriate action for monitored $PM_{2.5}$ levels that approach or violate the 1997 annual or 2006 24-hour $PM_{2.5}$ NAAQS. An initial Warning Level Response will be triggered based on $PM_{2.5}$ levels that approach the NAAQS, as described in Section 5.4.1. This voluntary commitment is intended to evaluate the need for early actions to prevent violations of the NAAQS from ever occurring during the maintenance period. Should early actions not be successful and a violation occurs, an Action Level Response will be triggered, as described in Section 5.4.2.

[77] "Procedures for Processing Requests to Redesignate Areas to Attainment"; Memorandum from John Calcagni, Director, Air Quality Management Division; September 4, 1992.

5.4.1 Warning Level Response

The initial Warning Level Response is intended to avoid the occurrence of future NAAQS violations by tracking air quality monitoring data and available emission inventory estimates to identify when the area is at risk of violating the NAAQS. For the 24-hour NAAQS, a violation occurs when the three-year average of annual 98th percentile daily values is greater than 35 µg/m^3 at any site. For the annual NAAQS, a violation occurs when the three-year average of annual averages is greater than 15 µg/m^3 at any site. The Warning Level Response will be triggered if either a single year's 98th percentile daily value or a single year's annual average exceeds those respective values at any DEEP site in the maintenance area and is verified. DEEP will examine available information to identify contributing factors such as atypical meteorological conditions, exceptional events, local changes in source activity, or source malfunctions or noncompliance. DEEP will also evaluate available emission inventories and other data repositories (e.g., EPA's CAMD database of hourly EGU emissions) to determine if unexpected emissions increases have occurred. Based on any findings, DEEP will evaluate available and feasible options and make a judgment on whether any early corrective actions are warranted.

5.4.2 Action Level Response

If a verified violation of either $PM_{2.5}$ NAAQS occurs, DEEP will first conduct the same types of investigations described above to determine potential causes and available resolutions. If the causes are within the jurisdiction and control of DEEP (e.g., not predominantly due to interstate transport or exceptional events), one or more control measures such as those in the example list below will be pursued for implementation. Ultimately, contingency measures to be considered will be selected from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. The selection of measures will be based upon cost effectiveness, emission reduction potential, economic and social considerations, or other appropriate factors. Stakeholder input will be solicited from interested and affected persons in the maintenance area prior to selecting any appropriate contingency measures. Because it is not possible at this time to determine what control measure will be appropriate at any future time during the maintenance period, the list of possible measures below is not intended to be comprehensive or exhaustive.

- Control measures already adopted, but designed to produce additional reductions after the verified violation occurred (e.g., mobile source measures that involve fleet turnover);
- New control measures that may be adopted for other purposes (e.g., Tier 3 or CALEV3);
- Alternative fuel and/or diesel retrofit programs for fleet vehicle operations;
- New or more stringent PM2.5, NOx or SO2 controls on stationary sources;
- Wood stove change out program;
- "No burn" days during cold weather inversion events;
- Enhanced idle restrictions;
- Transportation control measures, selected in consultation with CTDOT and affected local metropolitan planning organizations (e.g., traffic flow improvements, transit improvements, trip reduction programs, other new or innovative transportation measures)

DEEP commits to pursue adoption of any appropriate measures with a goal of achieving implementation within 18 months from the date when the violation triggering the Action Level Response is verified. As required by CAA 175A(d), upon verification of a NAAQS violation, DEEP also commits to implement all measures which were contained in the SIP before the area was redesignated to attainment.

5.5 Commitment to Revise Plan

DEEP commits to submit a revised maintenance plan eight years after EPA finalizes redesignation. The revision will demonstrate that attainment will continue to be maintained for the 10 years following the initial 10-year period, as required by CAA section 175A(b).

Chapter 6 Summary and Conclusions

This TSD justifies DEEP's request to redesignate Connecticut's portion of the NY-NJ-CT area to attainment for the federal 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. As summarized below, this redesignation request satisfies all the requirements of Section 107(d)(3)(E) and 175A of the CAA, which specify the conditions that must be met for EPA to redesignate an area from nonattainment to attainment.

6.1 Area Has Attained the NAAQS

As demonstrated in Section 2, $PM_{2.5}$ air quality has improved significantly over the last decade throughout the NY-NJ-CT nonattainment area. The entire area first achieved attainment levels of the 15 $\mu g/m^3$ annual NAAQS in 2008 and the most recent (i.e., 2010) maximum design value is 12.5 $\mu g/m^3$. Connecticut's portion of the nonattainment area has measured compliance with the annual NAAQS throughout the period, with a maximum 2010 design value of 10.3 $\mu g/m^3$.

The NY-NJ-CT area first achieved compliance with the 35 $\mu g/m^3$ 24-hour NAAQS in 2009 and has a most recent (i.e. 2010) maximum design value of 30 $\mu g/m^3$. Connecticut's portion of the area first measured attainment in 2008, with a maximum 2010 design value of 29 $\mu g/m^3$.

6.2 Applicable CAA Section 110 and Title 1 Part D Requirements are Satisfied

As demonstrated in Section 3.1, Connecticut has submitted "infrastructure SIPs" addressing CAA section 110(a) requirements, for both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. EPA has found Connecticut's infrastructure SIP submittal for the 1997 annual NAAQS to be complete, but has not yet issued rulemakings to approve the infrastructure SIPs for either of the NAAQS. Nonetheless, previous redesignation rulemakings issued by EPA for other areas have concluded that section 110 elements not connected with nonattainment plan submissions and not linked with an area's attainment status are also not applicable requirements for purposes of redesignation because a state remains subject to these requirements after an area is redesignated to attainment.

As described in Section 3.2, CAA Subpart 1 of part D sets forth the basic nonattainment requirements applicable to all nonattainment areas. All areas that were designated nonattainment for the 1997 annual or the 2006 24-hour $PM_{2.5}$ NAAQS were designated under this subpart of the CAA and the requirements applicable to them are contained in sections 172 and 176. For purposes of evaluating redesignation requests, the applicable part D, subpart 1 SIP requirements are contained in sections 172(c)(1)–(9) and in section 176.

States with nonattainment areas are required to submit a plan to reach attainment. Connecticut submitted an attainment demonstration for its portion of the 1997 annual $PM_{2.5}$ nonattainment area in November

2008, meeting the requirements of CAA sections 172 and 176. EPA has not yet acted on that plan. Attainment demonstrations for the 24-hour $PM_{2.5}$ NAAQS are due in December 2012.

As demonstrated in Section 2, all air quality monitors in the NY-NJ-CT area now comply with both the annual and 24-hour NAAQS. EPA has already recognized that the multi-state area has "clean data", in accordance with 40 CFR 51.1004(c), for the annual $PM_{2.5}$ NAAQS. Connecticut has requested a similar "clean data" finding for the 24-hour $PM_{2.5}$ NAAQS and is awaiting EPA action. The requirement to submit the 24-hour $PM_{2.5}$ NAAQS attainment demonstration would no longer apply if EPA issues a "clean data" finding for that NAAQS, or if EPA approves a redesignation request for the 24-hour $PM_{2.5}$ NAAQS before the December 2012 due date.

CAA section 172(c)(3) requires an inventory of actual emissions. Included as part of this redesignation request is a 2007 base year emissions inventory that meets the requirement.

EPA's $PM_{2.5}$ implementation rules require states to adopt specified new source review (NSR) permitting revisions by July 20, 2012. DEEP held a public hearing in November 2011 to consider revisions to RCSA sections 22a-174-1 and 22a-174-3a to include significant impact levels, significant emissions rates and increments for $PM_{2.5}$, consistent with EPA's requirements. DEEP intends to submit the revised regulations to EPA as a SIP revision prior to the July 2012 deadline. Since all states are subject to this new NSR requirement and the deadline for compliance has not yet arrived, DEEP maintains that approval of this redesignation request is not dependent upon prior EPA approval of the new NSR provision. Therefore, Connecticut has satisfied all applicable CAA Section 110 and Title 1 Part D requirements necessary for $PM_{2.5}$ redesignation.

6.3 Attainment is Due to Permanent and Enforceable Emission Reductions

Section 4 described adopted federal and state emission control programs that have improved annual and 24-hour $PM_{2.5}$ air quality to levels that qualify the area for redesignation to attainment. As was summarized in Table 4.1, federal controls include more stringent engine emission and fuel standards for on-road and non-road sources, and more restrictive limits on emissions from power plants. State controls include tighter emission limits for power plants and other large sources, improvements to PM and visible emission requirements for stationary sources, adoption of the CALEV2 program for on-road vehicles, enhancements to the on-road vehicle inspection and maintenance program, as well as other measures. The combination of these control programs provides an estimated 30% reduction in NOx emissions, 29% in SO2 emissions and 4% reduction in direct $PM_{2.5}$ emissions in Connecticut between 2002 and 2009, leading to the improvements in ambient $PM_{2.5}$ air quality.

6.4 Maintenance Plan Ensures Continued Attainment

CAA section 175A establishes the required elements of a maintenance plan for areas seeking redesignation from nonattainment to attainment. Section 5 provides Connecticut's maintenance plan, which includes an inventory sufficient to ensure attainment, a demonstration using inventory projections that the plan provides for continued NAAQS compliance through the first 10-year maintenance period, a commitment to maintain an appropriate monitoring network, methods to track the progress of the maintenance plan and contingency measures to be implemented if NAAQS violations occur during the maintenance period.

Having addressed all the requirements of CAA sections 107(d)(3)(E) and 175A, Connecticut requests that EPA take action to redesignate the Connecticut portion of the NY-NJ-CT area to attainment status for both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS.