

Excerpt from State of New York, State Implementation for the Attainment and Maintenance of the Annual PM_{2.5} National Ambient Air Quality Standard, Chapter 7.0 Air Quality Trends, Baselines & Projections for the New York Nonattainment Area (New York Metropolitan Area, Connecticut and Northern New Jersey):

7.4 Weight of Evidence (WOE) in Support of Modeled Attainment of the PM_{2.5} NAAQS in the New York City Nonattainment Area

The EPA modeling guidance (US EPA, 2007), in conjunction with ambient Federal Reference Method (FRM) PM_{2.5} mass data from 2000-2004 and baseline and future air quality modeling results, has been applied to determine the attainment status of the NY Metro NAA with respect to the annual National Ambient Air Quality Standard (NAAQS). The application of the EPA guidance for estimating the future design values based on the use of relative response factor (RRF) has resulted in one monitor – P.S. 59 (360610056), located in New York County, NY – to exceed the annual PM_{2.5} NAAQS level of 15 ug/m³. The estimated future PM_{2.5} design value at this monitor, based on this procedure, is 15.3 ug/m³. This value falls within the uncertainty range of ±0.5 ug/m³ of the annual PM_{2.5} NAAQS, and supplemental analyses are needed for this monitor to be considered to be in attainment. In the following sections, information is provided to suggest that there is high degree of potential that estimated future design value will be below the annual NAAQS.

7.4.1 Monitoring Network in New York County and Surroundings

For most of the 2000-2004 period New York County, NY had 4 FRM monitors, but only one Speciation Trends Network (STN) monitor collocated with the FRM at the Canal Street site (360610062) to provide information on composition of the baseline PM_{2.5} species. Figure 7-3 displays the location of the four monitors as well as monitors in the surrounding counties. Table 7-12 lists the dates of operation of the FRM monitors in New York County; the base year design value for 2002, which is a weighted average of the measurements in the 2000 to 2004 period; and the nearest STN monitor. It should be noted that not all monitors in New York County were assigned the same STN monitor, because the approach selected was to use the nearest neighborhood monitor to link the FRM and STN. In the case of the J.H.S.45 (36061007) FRM monitor in New York County, the nearest STN monitor is the Bronx County I.S.52 site (360050110), and this site is also included in Table 7-12.

The current speciation levels estimated at these monitors are listed in Table 7-13. Only two of these sites – Canal Street and I.S.52 – have collocated STN monitors, while the species composition at the other FRM sites are only estimates based on the speciation data from a nearby monitor. Examination of the speciation data at Canal Street and I.S.52 suggests that there may be fairly substantial gradients in PM_{2.5} species composition over the non-attainment area, on the order of several tenths of a ug/m³. Thus the estimates listed for the other monitors should only be considered approximate, and in some cases may not necessarily be representative of species composition at these monitors. This is certainly a limitation that needs to be taken into consideration when projecting the future design values using the model results and the current speciation levels.

Although the air quality modeling results are to be used in a relative sense, it is instructive to examine the changes in PM_{2.5} mass that the model predicts in an absolute sense to see the direct impacts of emissions reductions. The CMAQ-predicted average PM_{2.5} mass over the nine-grid cells that surround each of these FRM monitors (see Table 14) in the base (2002) and future (2009) years was examined. Note that CMAQ predicts a consistent reduction of about 16% over each FRM monitor in New York County. Although not shown here, future PM_{2.5} concentrations at each FRM location across the 22-county NY Metro NAA are predicted by CMAQ to decrease by 12-18%.

7.4.2 Other Data Analysis

A recent study by Qin et al. (2006) suggest that sum of sulfate and nitrate comprise about 40% or more of the PM_{2.5} mass in the NYC metropolitan area, and that 70% or more of the PM_{2.5} measured in NYC results from transport into the region. Based on results from source apportionment modeling using Positive Matrix Factorization (PMF), the authors determined that the largest single source factor affecting NYC is “secondary sulfate” associated with SO₂ emissions from upwind regions. It is clear that emission reductions in upwind states will be needed to further reduce PM_{2.5} in the NY Metro NAA.

In TSD-3a, found in the appendices to this document, PM_{2.5} levels appear to be decreasing across the NY Metro NAA. Although the data records for PM_{2.5} are somewhat short, it is estimated that PM_{2.5} mass is decreasing by about 0.1-0.5ug/m³/yr. At the P.S.59 site PM_{2.5} mass measurements are decreasing by about 0.3ug/m³/yr during 1999-2006. In addition to PM_{2.5} mass, several criteria pollutants are also measured at the P.S.59 site.

The trends in SO₂ and NO₂ from 1993 to 2006 were examined using the seasonal Kendall test, and found that ambient levels are declining at rates of 3.4% yr⁻¹ and 1.7% yr⁻¹, respectively. This again points to the potential that this area would be meeting the annual NAAQS, given that there are various measures under consideration that are aimed at decreasing the emissions of PM_{2.5} precursors.

7.4.4 Summary

In summary, the above analysis shows that, based upon the EPA guidance only one monitor in the New York PM_{2.5} nonattainment area falls slightly above the level of the annual NAAQS, but still within the framework of uncertainty. The analysis suggests that lack of collocated speciation monitors and use of speciation information from the nearest neighborhood monitor may have contributed to the estimate of PM_{2.5} being above the level of NAAQS at the P.S.59 monitor. Examining the trends in precursors as well as measured PM_{2.5} at P.S.59 suggests a downward path and that coupled with the observation that the contribution to the secondary species is from upwind regions rather than local, favors strongly that this monitor will also be in attainment similar to the rest of them in the region. Analysis based on the only other monitor (360610062) with similar PM_{2.5} concentrations is projected to be below the level of the annual NAAQS, suggests that P.S.59 (360610056) would also be similarly be below the level of the annual NAAQS.

7.4.5 Additional Information

It should be noted that more specific information and the detailed analyses on the determination of baseline and future design values, and air quality trends, are presented in Appendix B of this document.

7.5 Weight of Evidence: Additional Measures Not Accounted for in Modeling Projections

A number of control programs are being adopted or implemented that are not represented in the projection inventories for 2009. The control programs in this section include:

- Part 222, Distributed Generation
- Part 227-2, NO_x RACT (High Electric Demand Day Units)
- Parts 243, 244, and 245, Clean Air Interstate Rule
- Diesel Emissions Reduction Act of 2006
- Existing and New/Revised State VOC Reduction Measures

- Federal Rules for VOC Reductions
- Proposed Federal Rules for VOC, NO_x and PM Reductions
- PlaNYC (New York City emission reduction initiatives)
- Canadian Air Quality Efforts
- Governor Spitzer's "15 by 15" Initiative
- NYSEERDA Programs

As discussed in section 7.1 of this document, the species composition of PM_{2.5} has a significant influence on the measured levels. In terms of species composition, SO₄ and OC (the primary sources of which are VOC emissions) are the most important species, especially during the summer months, while NO₃ is also an important species during the winter months. It appears that emissions control programs that target precursors of SO₄, NO₃, and OC will be needed to further reduce PM_{2.5} levels across the metropolitan area. The measures described below will reduce PM and precursor emissions by significant amounts. The Part 222 and Subpart 227-2 regulations being adopted by the Department will yield quantifiable, enforceable NO_x emissions reductions on the order of 50 tons per day. When compared to those measures included in the modeling and the base and projected NO_x inventories, it is apparent that reductions of this magnitude have the ability to reduce PM_{2.5} levels substantially. Given that New Jersey and Connecticut as well as other northeastern states (Delaware, Maryland and Pennsylvania) are committing to similar measures that will also yield substantial reductions in PM_{2.5} and precursor emissions, it is expected that NO_x and PM_{2.5} emissions on days of high electricity demand will be reduced substantially throughout the Northeast corridor.

7.5.1 Part 222, Distributed Generation

This regulation will set limits on small generators that are not currently controlled. As minor sources, these sources need only to stay below the major source threshold to avoid reasonably available control technology (RACT). Most of these sources (generally diesel-fired stationary internal combustion engines) tend to operate on days of high electricity demand and when called upon to address reliability concerns. This regulation will place NO_x and PM limits on existing sources as well as restrict the number of megawatts that can be called to operate under demand response. It will also set strict emission standards for new units. It is expected that NO_x emissions on High Electricity Demand Days (HEDD) could be reduced by 10 to 15 tons per day in 2012 through the implementation of this regulation.

7.5.2 NOx RACT (High Electricity Demand Day Units)

This regulatory revision will set new more stringent NOx limits on electricity generating units. On High Electricity Demand Days (HEDD) base loaded, load following and peaking units all increase operations to meet demand. HEDDs are generally those days when the potential for ozone formation is highest (hazy, hot and humid weather). The Department is specifically moving to revise the NOx emission limits for all very large boilers and combustion turbines. These emission limits are expected to result in the reduction of 35 to 40 tons per day of NOx emissions.

7.5.3 Clean Air Interstate Rule

On May 12, 2005, EPA published its Clean Air Interstate Rule (70 FR 25162) designed to reduce northeastern U.S. power plant emissions which affect air quality in downwind states. Because New York State contributes to ozone and PM2.5 nonattainment areas in downwind states, it was required to address NOx and SO2 emissions under CAIR. CAIR specified the reductions necessary in order to fulfill its obligations under CAA Section 110(a)(2)(D), and established budgets for EGUs in New York and the other CAIR states.

The CAIR Trading Program was established in three parts under Title 6 which establish the necessary allowance programs for New York State: Part 243, "CAIR NOx Ozone Season Trading Program; Part 244, "CAIR NOx Annual Trading Program; and Part 245, "CAIR SO2 Trading Program." These three regulations represent the three model rules released by EPA in association with CAIR which the Department chose to adopt.

All three regulations were effective October 19, 2007. Within the regulations, CAIR NOx units and CAIR SO2 units are defined. Also included are permit and monitoring requirements, emission requirements pertaining to allowances, and guidelines for recordkeeping and reporting.

EPA's CAIR Program set the goal of 70 percent SO2 and NOx emissions reductions. Aside from the intended goal of aiding the nonattainment areas in downwind states, these reductions through CAIR will greatly benefit PM2.5 levels within New York State. This includes a reduction of PM2.5 levels in the NYMA nonattainment area due to decreased SO2 and NOx emissions by upwind facilities. The NOx portion of the trading program will go into effect in 2009, while the SO2 trading program goes

into effect in 2010.

7.5.4 Diesel Emissions Reduction Act of 2006

The New York State Senate recently approved the Diesel Emissions Reduction Act of 2006, for which rulemaking is currently underway. This regulation will require thousands of state-owned or -operated diesel-powered vehicles to be retrofitted with emission control equipment to cut down on the release of exhaust particles, of which a large percentage is direct PM emissions. The benefit will be seen with existing engines which are not expected to be replaced with new, cleaner engines for some time. Promulgation of this regulation is currently anticipated to be completed in time to see some reductions in 2009, which will contribute to the attainment of the PM NAAQS.

7.5.4 Existing State VOC Reduction Measures

7.5.4.1 Part 230: Gasoline Dispensing Sites and Transport Vehicles

Requirements for Stage I and Stage II gasoline dispensing sites are contained in 6 NYCRR Part 230, "Gasoline Dispensing Sites and Transport Vehicles." Stage I systems are required state-wide, while Stage II systems are mandated only in the New York Metropolitan Area (NYMA) and lower Orange County. Part 230 affects those gasoline-dispensing sites whose annual throughput exceeds 120,000 gallons. (This minimum throughput level is waived for NYMA.)

A Stage I vapor collection system captures gasoline vapors which are displaced from underground gasoline storage tanks when those tanks are filled. These vapors are forced into a vapor-tight gasoline transport vehicle or vapor control system through direct displacement by the gasoline being loaded. A Stage II vapor collection system captures at least 90 percent, by weight, of the gasoline vapors that are displaced or drawn from a vehicle fuel tank during refueling; these vapors are then captured and either retained in the storage tanks or destroyed in an emission control device.

7.5.4.2 Part 212: General Process Emission Sources

This rule, which applies to both VOC and NO_x emissions, requires the application of Reasonably Available Control Technology (RACT) for each emission point which emits NO_x for major NO_x facilities or VOCs for major VOC facilities. Its requirements are mostly generic, with specific

requirements only for coating operations not subject to Part 228.

7.5.4.3 Part 226: Solvent Metal Cleaning

Guidelines for the cleaning of metal surfaces by VOC-containing substances are expressed in 6 NYCRR Part 226, "Solvent Metal Cleaning Processes." Listed in this regulation are general provisions for storage and recordkeeping, specifications for the types of control equipment to be used, and operating practices for solvent metal cleaning. The Department may accept a lesser degree of control upon submission of satisfactory evidence that the person engaging in solvent metal cleaning is applying RACT and has a plan to develop the technologies necessary to comply with the aforementioned requirements.

7.5.4.4 Part 228: Surface Coating Processes

6 NYCRR Part 228 limits the VOC content for each gallon of coating and sets minimum efficiency for VOC incinerators used as control equipment for VOC emissions from coating processes. It also provides for the use of source-specific analyses of control requirements where the requirements of the rules cannot be met. Additionally, Part 228 contains requirements for paints and coatings used in auto body refinishing and repairing, including spray equipment and housekeeping.

7.5.4.5 Part 229: Petroleum and Volatile Organic Liquid Storage and Transfer

Limitations are placed on VOC emissions from applicable gasoline bulk plants, gasoline loading terminals, marine loading vessels, petroleum liquid storage tanks, and organic liquid storage tanks in 6 NYCRR Part 229, "Petroleum and Volatile Organic Liquid Storage and Transfer." The regulation details the separate applicability thresholds and compliance schedules for NYMA, the Lower Orange County metropolitan area, upstate ozone non-attainment areas, and remaining areas.

7.5.4.6 Part 233: Pharmaceutical and Cosmetic Manufacturing Processes

VOC emissions from synthesized pharmaceutical or cosmetic manufacturing processes at a major source facility are limited under 6 NYCRR Part 233, "Pharmaceutical and Cosmetic Manufacturing Processes." This regulation outlines the separate requirements and compliance schedules for NYMA, the Lower Orange County metropolitan area, and facilities outside these areas. Compliance requires the installation of control devices, along with monitoring, recordkeeping, and

leak repair.

7.5.4.7 Part 205: Architectural and Industrial Maintenance (AIM) Coatings

Applicability of 6 NYCRR Part 205, "Architectural and Industrial Maintenance (AIM) Coatings," extends to anyone who supplies, sells, offers for sale, or manufactures any architectural coating for use within New York State, as well as anyone who applies or solicits the application of any architectural coating within the state. This regulation places VOC content limits on a wide variety of architectural coatings. Part 205 also contains labeling and reporting requirements, compliance provisions and test methods.

7.5.4.8 Part 208: Landfill Gas Collection & Control Systems for Certain Municipal Solid Waste Landfills

The operation of certain municipal solid waste (MSW) landfills is regulated under 6 NYCRR Part 208, "Landfill Gas Collection & Control Systems for Certain Municipal Solid Waste Landfills." For landfills whose non-methane hydrocarbon emissions exceed 50 megagrams per year, the operator must design and install a collection and control system to be operated in accordance with the provisions of the regulation. The regulation additionally contains requirements for monitoring, testing, recordkeeping and reporting.

7.5.5 New or Revised State VOC Reduction Measures

7.5.5.1 Part 228: Surface Coating Processes and Part 235: Consumer Products

As a method to combat ozone issues in nonattainment areas throughout New York State, the Department worked in conjunction with the Ozone Transport Commission (OTC) on measures to reduce NO_x and VOC emissions from a number of sources. In 2006 the OTC released its model rule for VOC emissions from adhesives, sealants, adhesive primers and sealant primers. The Department intends to use this model rule as a guide in revising 6 NYCRR Part 228, "Surface Coating Processes," and Part 235, "Consumer Products." Emission reductions should be observed for area sources as well as point sources, due to the variety of industrial and commercial applications for the subject products.

EPA's consumer and commercial products rule was published September 11, 1998 (40 CFR Part 59 Subpart D). This rule applied only to household adhesive use, and did not regulate adhesives used in commercial and

industrial applications. The OTC's 2001 model rule proposed additional product categories and stricter standards, but its definitions of products generally exempted those products being sold in large containers.

The OTC 2006 model rule, based upon 1998 RACT and Best Available Retrofit Control Technology (BARCT) developments by CARB, places stricter VOC limits on a greater range of products. The proposed rule prohibits the sale or use of adhesives, sealants, adhesive primers or sealant primers in excess of its proposed VOC content limits after January 1, 2009. It also requires that labels have the product's VOC content clearly expressed, and presents an option for add-on control systems to meet the required content limit. OTC calculations predict that New York State will see a savings of 21.5 tons of VOC each summer day, or 3290 tons over the entire 153-day ozone season lasting from May 1-September 30.

7.5.5.2 Part 235: Consumer Products

The Department is intending to modify 6 NYCRR Part 235, "Consumer Products," under which a VOC content limit is placed on a range of consumer and commercial products. A federal consumer and commercial products rule was published on September 11, 1998 as 40 CFR Part 59 Subpart D. Feeling this rule regulated an inadequate portion of the consumer and commercial products inventory, the OTC in 2001 developed model regulations for additional product categories and more stringent VOC limits. These suggestions were used as a basis for the VOC limits contained in Part 235, which took effect on January 1, 2005.

The OTC developed its 2006 model rule, finalized September 13, 2006, to again expand the VOC content limitations that participating states may adopt for their own programs. Included are limits for 13 new product categories, a more restrictive limit on one previously regulated category, and additional requirements for two other previously regulated categories. The OTC rule is influenced by amendments put forth by CARB in July 2005. The Department will again use the OTC's proposed model rule as a guideline for its amendment of Part 235.

The California Air Resources Board (CARB) calculated per capita VOC reductions in conjunction with its 2005 rule. Because the proposed rule mirrors that of CARB so closely, it is assumed that a similar per capita savings will result, which equates to a yearly reduction of 0.122 lb/capita. These reductions come in addition to the 6.06 lb/capita witnessed from the 2001 model rule. Adoption and implementation of the OTC 2006 model

rule will result in VOC emissions reductions of 3.7 tons per summer day and 566 tons over the ozone season in New York State in 2009. CARB estimated the average cost effectiveness of these amendments to be \$4,000 per ton VOC reduced.

7.5.5.3 Part 234: Graphic Arts

Amendments are being made to the graphic arts industry regulations under 6 NYCRR Part 234, "Graphic Arts." These amendments are in response to two Control Techniques Guidelines (CTG) documents published by the EPA in September 2006: "Control Techniques Guidelines for Flexible Package Printing" and "Control Techniques Guidelines for Offset Lithographic Printing and Letterpress Printing."

CAA Section 182(b)(2)(A) provides that for non-attainment areas designated moderate or worse, RACT provisions must be included in the applicable SIP for "each category of VOC sources in the area covered by a CTG document issued by the Administrator between the date of the enactment of the Clean Air Act Amendments of 1990 and the date of attainment." These CTGs present guidance in determining RACT for VOC emissions from inks, coatings, adhesives and cleaning materials within facilities that conduct the aforementioned printing processes. The Department will use the CTG emission limit and control technology recommendations for flexible package printing, offset lithographic printing, and letterpress printing in its revisions to Part 234.

Cost analyses were performed by the EPA, for which details can be found in the CTG documents. These calculations included equipment, instrument and installation costs, as well as estimations of labor, maintenance, utility, and overhead costs. For flexible package printing, a catalytic oxidizer was analyzed under different operating scenarios, leading to estimated costs of \$1,300-\$5,700 per ton VOC removed. Lithographic and letterpress printing presses will see estimated costs of \$2,010 per ton of VOC removed by controls on heatset inks; costs of \$855/ton for cleaning materials; and an actual savings due to alcohol substitutes in fountain solutions. Consumers are not expected to incur any significant price increases.

7.5.5.4 Part 239: Portable Fuel Containers

EPA recently finalized the rule, "Control of Hazardous Air Pollutants From Mobile Sources" (72 FR 8427). The Department is planning to use this federal rule as a basis for amending the existing 6 NYCRR Part 239,

"Portable Fuel Container Spillage Control."

With this federal rule, EPA sets regulations for portable fuel containers (PFCs), as well as for gasoline and passenger vehicles. The purpose is to significantly reduce emissions of hazardous air pollutants from mobile sources, referred to as "mobile source air toxics" (MSATs), to which exposure is known or suspected to cause serious health effects, including cancer. The PFC controls will considerably reduce such MSATs as benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, and naphthalene, in addition to the secondary PM reductions.

Since the Department issued Part 239 in October 2002, a number of problems have been identified, as follows:

- An automatic shutoff feature, intended to cut off fuel flow when the tank reaches a prescribed level, has proven to be incompatible with many types of fuel tanks. This leads to additional spillage and has frustrated many consumers;
- Poor production quality of the PFCs, as demonstrated by a CARB compliance test resulting in nearly 50 percent failure of PFCs that have already been introduced to the market; and
- Storage of gasoline in non-regulated containers designed for other fluids, such as kerosene.

As a result of these issues, emissions will still be lost due to evaporation through the diurnal cycle, as well as through spillage. The federal rule contains methods considered "best available controls" to correct these problems. The anticipated modifications to Part 239 will:

- Eliminate the existing automatic shutoff feature, fill height and flow rate standards to simplify fueling and lessen spillage;
- Require certification and compliance of PFCs prior to their introduction to the market; and
- Expand the definition of a non-compliant container, effectively regulating diesel and kerosene containers in the same manner as PFCs

Along with these modifications, EPA has issued a standard of 0.3 grams per gallon per day (g/gal/day) of hydrocarbons. This standard was

established based upon the emissions from a can over a diurnal test cycle, and requires stringent compliance testing to ensure emissions control over the life of the product. This standard must be met for containers manufactured on or after January 1, 2009. These new requirements will reduce hydrocarbon emissions from uncontrolled fuel containers by approximately 75 percent.

Both area and non-road source inventories are expected to be affected by these amendments. Of the projected VOC emission reductions, approximately 70 percent will be attributed to the area source inventory. These changes come from reductions in diurnal and permeation emissions from storage, and transport/spillage emissions from re-fueling at gas pumps. The remaining 30 percent will be accounted for in the non-road source inventory, where emissions will be reduced during re-fueling of non-road sources (e.g. lawnmowers, personal watercraft, etc.).

7.5.5.5 Part 241: Asphalt Formulation

The Department is considering changes to the use of cutback and emulsified asphalts in paving operations. The proposed ban on cutback asphalts and increased restrictions on emulsified asphalts will be made in 6 NYCRR Part 241, "Asphalt Formulation."

While cutback and emulsified asphalts are used in similar applications, they differ in how they are prepared. In preparing cutback asphalt, asphalt cement is blended with a diluent that is typically 25 to 45 percent by volume petroleum distillate. Emulsified asphalt preparation involves mixing asphalt cement with water and an emulsifying agent, such as soap. It is possible for emulsified asphalts to contain no VOCs, though some may contain up to 12 percent VOC by volume.

Currently, New York permits the use of cutback asphalt only during the cooler portion of the year from October 16 to May 1, and allows for emulsified asphalt to contain 2 to 12 percent VOCs, depending on the grade established by the American Society for Testing and Materials (ASTM). This proposed rule will have a similar, ozone-season ban on cutback asphalt; and will also limit the use of emulsified asphalt to that which contains not more than 0.5mL oil distillate from a 200mL sample—effectively 0.25 percent VOC content. Certain exemptions when necessary may be granted by the State Commissioner.

In calculating reductions resulting from these anticipated rule changes, an average baseline VOC content of 2.5 percent for emulsified asphalt was

assumed. Thus, reducing the average VOC content from 2.5 percent to 0.25 percent represents a 90 percent reduction in emissions. This would lead to a projected savings of 16.5 tons VOC per summer day, or 2525 tons per ozone season for New York State in 2009. It is believed that no additional costs would be incurred from the use of low-VOC emulsified asphalts due to their current availability.

7.5.6 Federal VOC Measures

7.5.6.1 VOC MACT

Pursuant to Section 112 of the CAA, the EPA is required to promulgate National Emission Standards for Hazardous Air Pollutants (NESHAPs), otherwise known as Maximum Achievable Control Technology (MACT) standards for chemicals known to cause cancer or other serious health effects. As EPA updates or releases new MACT standards, they are incorporated by reference into 6 NYCRR Part 200. Many of the chemical substances regulated as VOCs are also listed as HAPs. Therefore, many of the MACT control requirements effectively reduce emissions of VOCs as well.

7.5.6.2 Federal Reformulated Gasoline

Section 211(k) of the CAA deemed that reformulated gasoline, which is blended to burn cleaner and reduce emissions of certain pollutants, must be sold in major metropolitan areas with the worst ozone air pollution problems. Federal reformulated gasoline allows for a maximum of 1 percent benzene by volume. Phase I of the rule took effect January 1, 1995 with preliminary VOC and air toxics standards. These reformulated gasoline standards were replaced with Phase II standards, effective January 1, 2000, which called for broader emissions controls, requiring 25 to 29 percent VOC emission reductions and 20 to 22 percent air toxics reductions. Retail distribution of reformulated gasoline is required in the New York Metropolitan Area and Orange County. Dutchess County and a portion of Essex County have voluntarily opted to use reformulated gasoline.

7.5.7 Proposed Federal Rules

7.5.7.1 Aerosol Coatings Proposed Rule

On July 16, 2007, EPA published its proposed rule titled “National Volatile Organic Compound Emission Standards for Aerosol Coatings” (72 FR 38952). The proposed rule will apply to manufacturers, processors, wholesale distributors, or importers of aerosol coatings used by the general public and in industrial applications. The proposed rule will also apply to distributors who are responsible for labeling of aerosol products.

While traditional VOC limits were based on the weight of VOC ingredients per weight or volume of product, the proposed rule implements a standard based upon the rate of ozone production of the VOC components, expressed in terms of weight of ozone generated from the VOC ingredients per weight of coating material. The proposed regulatory limits are a series of reactivity limits for six general coating categories and 30 subcategories of specialty coatings, expressed in terms of mass of ozone generation per gram of product.

The proposed rule requires all regulated entities to comply by January 1, 2009. Temporary variances may be granted to entities are unable to comply with the proposed requirements. The proposed rule also requires certain labeling, recordkeeping and reporting measures. EPA believes nationwide emissions of VOCs from aerosol products would be reduced by 18 to 19.4 percent from the 1990 baseline value (88.3 tons).

7.5.7.2 Locomotive Engines and Marine Compression-Ignition Engines Proposed Rule

Locomotives and marine diesel engines are important contributors to the nation’s air pollution, as they emit large amounts of direct PM and NOx. In 2007, these engines accounted for approximately 20 percent of mobile source NOx and 25 percent of mobile source diesel PM2.5 emissions. EPA published its proposed rule, “Control of Emissions of Air Pollution From Locomotive Engines and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder” on April 3, 2007 (72 FR 15938) to dramatically reduce emissions from these engines. It would set new exhaust emission standards on all types of locomotive engines, and on all types of marine diesel engines below 30 liters per cylinder displacement.

This proposed program includes a set of near-term emission standards for newly-built engines, which would begin to be phased in starting 2009, and

for existing locomotives, which would take effect as soon as 2008 but no later than 2010 (2013 for Tier 2 locomotives)—as soon as certified remanufacture systems are available. Further long-term standards would be phased in over time, starting in 2014. Provisions are also being proposed to reduce unnecessary locomotive engine idling. Compared to engines meeting current standards, these stricter requirements would ultimately result in estimated PM reductions of 90 percent and NO_x reductions of 80 percent. In addition to PM and NO_x reductions, the proposed standards would effectively reduce nonmethane hydrocarbons, carbon monoxide, and air toxics.

7.5.7.3 Federal Nonroad Spark-Ignition Engines/Equipment Proposed Rule

EPA has proposed emission standards for spark-ignition engines used in marine vessels, including outboard engines, personal watercraft, and sterndrive/inboard engines in their proposed rule, “Control of Emissions from Nonroad Spark-Ignition Engines and Equipment” (72 FR 28098).

The engines and vehicles covered by this proposal are significant sources of air pollution. They account for about 25 percent of mobile source hydrocarbon emissions and 30 percent of mobile source carbon monoxide emissions.

The proposed standards continue the process of establishing nonroad standards as required by the Clean Air Act. EPA is required to study emissions from nonroad engines and vehicles and to set emissions standards if the level of pollutants from these sources cause or significantly contribute to air pollution and, more specifically, if the emissions of CO, NO_x or hydrocarbons contribute significantly to the formation of ozone and carbon monoxide in more than one area of the country currently not meeting ozone and carbon monoxide standards.

EPA has proposed a more stringent level of emission standards for outboard and personal watercraft engines starting with the 2009 model year. The proposed standards for engines above 40 kW are 16 g/kW-hr for HC+NO_x and 200 g/kW-hr for CO. For engines below 40 kW, the standards increase gradually based on the engine's maximum power. It is expected that manufacturers will meet these standards with improved fueling systems and other in-cylinder controls. The levels of the standards

are consistent with the requirements recently adopted by California ARB with the advantage of a simplified form of the standard for different power ratings and with a CO standard.

EPA has also proposed new exhaust emission standards for sterndrive and inboard marine engines. The proposed standards are 5 g/kW-hr for HC+NO_x and 75 g/kW-hr for CO starting with the 2009 model year. Manufacturers are expected to meet these standards with three-way catalysts and closed-loop fuel injection. To ensure proper functioning of these emission control systems in use, a requirement is proposed that engines have a diagnostic system for detecting a failure in the emission control system. For sterndrive and inboard marine engines above 373 kW with high-performance characteristics (generally referred to as "SD/I high-performance engines"), a CO standard of 350 g/kW-hr is being proposed. EPA is also proposing a variety of other special provisions for these engines to reflect unique operating characteristics and to make it feasible to meet emission standards using emission credits. These standards are consistent with the requirements recently adopted by California ARB, with some adjustment to the provisions for SD/I high-performance engines and with a CO standard.

The emission standards described above relate to engine operation over a prescribed duty cycle for testing in the laboratory. Also proposed are "not-to-exceed" standards that require manufacturers to maintain a certain level of emission control when engines operate under normal speed-load combinations that are not included in the certification duty cycle.

EPA is also proposing new standards to control evaporative emissions for all vessels using marine spark-ignition engines. The new standards include requirements to control fuel tank permeation, fuel line permeation, and diurnal emissions, including provisions to ensure that refueling emissions do not increase.

When fully implemented, the proposed standards would result in a 70 percent reduction in HC+NO_x emissions, and a 20 percent reduction in CO from new engines' exhaust. The proposed standards would result in a 70 percent reduction in evaporative emissions.

EPA estimates that by 2030, the proposed standards would result in

significant annual reductions of pollutant emissions from regulated engine and equipment sources nationwide, including 630,000 tons of volatile organic hydrocarbon emissions, 98,000 tons of NOx emissions, and 6,300 tons of direct particulate matter (PM2.5) emissions. These reductions correspond to significant reductions in the formation of ground-level ozone and ambient PM2.5. In addition, these measures are expected to result in annual reductions of 2.7 million tons of carbon monoxide emissions, with the greatest reductions in areas where there have been problems with individual exposures.

7.5.8 PlaNYC

In December of 2006, New York City Mayor Michael Bloomberg announced the intent to develop a strategy to deal with growth, infrastructure, sustainability and the need for environmental improvement. The resulting plan, known as PlaNYC, contains measures that New York City has, or will, institute or promote to address these issues between now and 2030. Many of these will become effective in the near term, however. From the environmental perspective, PlaNYC deals with land issues, water and air quality, energy, transportation and climate change. Though some of the initiatives it includes will not take place for some time, PlaNYC will effect a continuous improvement in all environmental media over more than the next two decades.

The portion of PlaNYC that concerns air quality encompasses a comprehensive program for addressing pollution that originates from residential units, motor vehicles, buses, truck and other diesel equipment, as well as utility operations throughout New York City, which is the core of the nonattainment area. Many of these program elements will result in a reduction of particulate matter and its precursors. These elements include:

- Improving the benefits derived from the area transportation plan by implementing congestion pricing. The plan, and amended and adopted by the Commission would assess an \$8 charge on cars and a \$21 charge on trucks between 6am and 6pm south of 60th Street in Manhattan. Clean trucks that meet 2007 engine standards would pay \$7. The imposition of such a fee would result in a 6.3% reduction of vehicles miles traveled in the area, which could yield a 3.7% reduction in VOC, a 2.8% reduction in NOx, and a 2.8% reduction in carbon

monoxide emissions across the city. This proposal needs to be voted on by the Legislature by 3/31/08.

- Improving the fuel efficiency of private cars by promoting the use of new technologies, cleaner cars and hybrid vehicles, reducing the emissions of both criteria pollutants and CO₂. Actions under PlaNYC would encourage the purchase of the cleanest, most efficient cars through measures such as waiving New York City's sales tax on the cleanest, most efficient vehicles in a five-year pilot program. If the city's gas vehicles were comprised of 10% fuel efficient hybrids, citywide CO₂ emissions would be reduced by 1%, and, by 2030, could result in more than a 3% PM 2.5 emissions reduction. New York City itself has begun utilizing hybrid technologies where possible. Over 1,700 hybrids have been added to the City's vehicle fleet in the past five years and, by 2006, hybrids represented nearly 7% of the City's total fleet, compared with less than 1% of the private vehicles registered in the City. The development of plug-in hybrids is also being tracked. A hydrogen fueling station and a pilot hydrogen vehicles, which emit little more than water vapor upon combustion and are essentially zero-emission vehicles, are planned starting in 2008.
- Reducing emissions from taxis, black cars, and for-hire vehicles by reducing idling and increasing fleet fuel efficiency. PlaNYC notes that taxis account for 4% of all ground transportation CO₂ emissions and 1% of all city CO₂ emissions. The City's efforts will reduce citywide CO₂ emissions by 0.5% while also improving air quality. Many of the city's yellow taxis and black cars spend significant time idling in order to maintain access to their air conditioning and heating. In 2007, the City planned to complete an evaluation of different anti-idling technologies with the black and yellow car industries and select the best option pursuant to a \$6 million CMAQ grant, with implementation planned between 2008 and 2010. The City is also examining other options under the grant to improve fleet fuel use. The City's efforts are also expected to result in the entire fleet being converted to more fuel-efficient vehicles within eight to 10 years. By 2010, the City will require that new cars achieve double the fuel efficiency of today's non-hybrid vehicles. The results of the City's commitment would result in the entire black car fleet being converted to cleaner vehicles within five years. This should yield a 50% decrease in CO₂ emissions from this sector and reduce the emissions of other pollutants.

- Replacement, retrofit, and refuel diesel trucks. According to PlaNYC, a 2002 study concluded that 25% to 50% of the city's local overall criteria pollutant emissions can be traced to heavy duty diesel-trucks. With the new Federal diesel regulations that went into effect in 2007, all new trucks will release 90% fewer emissions. However, existing diesel vehicles will operate for many years into the future. New York City's strategies for reducing these emissions include retrofitting trucks with diesel oxidation catalysts (DOC) or diesel particulate filters (DPF), upgrading engines, using cleaner fuels and reducing idling. Emission reductions of 85 to 90% are possible. Biodiesel has been adopted as fuel in its heavy duty fleet at 5%, increasing to 20%. In addition, city vehicles are being purchased that are fueled by compressed natural gas (CNG). Altogether, the City will work with the State and other parties to create a fund to support costs for retrofits and anti-idling technologies for at least 1,200 more vehicles in the City over five years.
- Decreasing school bus emissions through earlier retirements and retrofits. New York City Local Law 42 mandates the use of ULSD and Best Available Technologies (BATs) in school bus transportation in approximately 3,800 general education buses, and the City has worked with private companies to install DOCs and crankcase filters. The DOE is also testing DPFs to determine the feasibility of installing that higher cost and higher performing equipment. A larger fleet of special education buses, comprised of several thousand large and small school buses, were not subject to this local law. The City is analyzing various options for retrofitting this fleet, with funding provided by New York State DOT and the City. The City will also require that all buses operated by private owners retire earlier than the present 19-year timeframe.
- Retrofitting ferries and promoting the use of cleaner fuels, retrofits and engine replacements. Staten Island ferries operate diesel-fueled vessels, each containing two, three or four engines that emit significant quantities of PM_{2.5}, NO_x, VOCs, and sulfur. The Port Authority is presently providing funding for the replacement or retrofits of engines. This will reduce the eight-boat fleet's total NO_x emissions by an estimated 40%, or 570 tons per year. Though the replacement/retrofit program will also have a positive effect on PM_{2.5}, the City will also install DOCs on each engine, at a cost of \$75,000 to

\$90,000 per engine. Beyond this, the City uses ultra low sulfur fuel with 5% biodiesel, which reduces emissions even more. The city also plans on working with private ferries to reduce their emissions with funding from a federal program, private ferry boats that serve New York City have agreed to install DOCs. The installation will begin on a pilot basis in 2008. The City will also propose a conversion of these ferries to ultra low sulfur fuel that will reduce PM_{2.5} by 5% to 10% beyond those reductions expected from the installation of DOCs.

- Seeking to work with the Port Authority to reduce emissions from Port vehicles, vessels and facilities. Airports and port-related equipment contribute significantly to the emissions, including 11% of particulate matter and 23% of our locally-generated NO_x, according to PlaNYC. These facilities and the associated equipment are largely under the control of the Port Authority. The City plans to work with the Port Authority to develop a comprehensive air quality and greenhouse gas emissions plan. Possible improvements at airports may include the use of electric plug-ins at gate ports, clean auxiliary power units, or towing to move planes to and from the gate.
- Reducing emissions from construction vehicles through the use of add-on controls. The City plans to implement measures to reduce construction-related emissions. Construction equipment contributes significantly to emissions, accounting for as much as 13% of NO_x and 30% of PM from off-road vehicles. Enacted in 2003, Local Law 77 requires that City construction projects use the best available technologies on-site to reduce emissions, such as DPFs, DOCs, and emerging plug-in technologies that allow vehicles to run on electricity instead of burning fuel. Approximately 800 City-owned vehicles and 115 pieces of leased equipment are subject to the law. The City is exploring opportunities to reduce emissions through upgraded equipment on private projects and certain on-road vehicles involved with City projects, such as trucks that remove debris. These requirements can be met either through retrofits or through new vehicle purchases.
- Reduce emissions improving energy efficiency in buildings by decreasing fuel consumption, promoting the use of cleaner burning heating fuels, expanding on-site generation, and facilitating the repowering, replacement, and retirement of the out-of-date equipment at older power plants. This includes the requirements of Local Law

86 which sets energy requirements for building construction or retrofits for nonresidential municipal buildings. Depending on the type of construction and the cost, requirements may include the need to meet Leadership in Energy and Environmental Design (LEED) green building guidelines of the United States Green Building Council (USGBC) ratings, or to exceed New York State energy code requirements by up to 25%.

- PlaNYC indicates that buildings and industry are responsible for roughly 55% of the city's PM_{2.5} emissions. Emission reductions are planned in the City's energy and carbon goals will result in a 15% decrease in PM_{2.5} for this sector, for a reduction of approximately 6% of overall city PM_{2.5} emissions. DEC has announced that it will adopt rules to reduce fuel sulfur limits for No.2 heating oil to 500 ppm by 2012, which is projected to result in 85% reductions of SO₂ and roughly 50% reductions in PM 2.5. This alone will reduce overall PM 2.5 emissions in the city by 5%. DEC plans a second phase of 15 ppm sulfur in 2016. To complement these state and regional sulfur caps, the City will use biodiesel in city-owned buildings and will explore opportunities to use clearing burning biodiesel in private buildings. In addition, the City has set aside funds to convert over 100 school boilers from No. 4 or No. 6 heating oil to natural gas-fired or dual fuel boilers.
- PlaNYC's goal is to see that every New York street is fully lined with trees by 2030, and has funded an initiative to plant one million trees. This will be implemented by revising the zoning code to require new construction and major redevelopment projects to plant one street tree for every 25 feet of street frontage. The City has planted over 30,000 trees since the initiative was launched in October 2007, and will plant over 12,500 per year, prioritizing plantings in six neighborhoods with the greatest asthma and other air quality concerns.
- The City will expand efforts to reforest approximately 2,000 acres of parkland by 2017.
- PlaNYC will strive to reduce the heating effect of asphalt parking lots. Many would be required to provide perimeter plantings and lots over 12,000 square feet would be required to provide a specified number

of canopy trees in planting islands within each lot. This effort not only promotes clean air, but also mitigates the visual impact of large asphalt lots and more effectively managing storm water runoff.

- Launching a collaborative local air quality study in 2008 to monitor, model, map, and track local pollution and local adverse impacts across New York City, and to assess the impact of possible mitigation measures. The City will begin to study, monitor, model, map, and track local pollution and local adverse impact across New York City, with an emphasis on traffic-related emissions. The effort would involve:
 - Measuring the variation in air quality across all neighborhoods over time,
 - Assessing the impact of development, infrastructure changes, traffic variations, and traffic mitigation measures, and
 - Providing guidance for future efforts to improve neighborhood air quality

This study's findings will help to identify priority neighborhoods for improvement and will provide baseline data to track the impact of development, policy, and transit changes.

With the exception of the federally-mandated diesel emission reductions mentioned under the discussion of PlaNYC, none of the initiatives mentioned above were considered in the attainment modeling in this document. As such, there will be improvements in the level of PM_{2.5} beyond those predicted as a result of the implementation of PlaNYC that will help to ensure compliance with the annual standard by 2010.

Summary of PlaNYC Effort

| Initiative | Brief Description | Emissions | Reductions Expected Prior to Jan 1, 2010? |
|---|--|---|--|
| 1. Implement Congestion Pricing | Assess Manhattan drivers (below 60 th St.) \$8 between 6am and 6pm resulting in a 6.7% reduction in VMT, plus providing for a 66% discount for new diesel trucks that meet 2007 emission standards (i.e., \$7 not \$21) | 6.3% reduction in VMT, which could yield a 3.7% reduction in VOC, a 2.8% reduction in NOx, and a 2.8% reduction in CO emissions across the city. | If the legislature approves, will have to be in place by 3/31/09 |
| 2. Improve the fuel efficiency of private cars | Promote the use of new technologies, cleaner cars and hybrid vehicles, and sales tax waiver on hybrids. | If the city's gas vehicles were comprised of 10% fuel efficient hybrids, citywide CO2 emissions would be reduced by 1%, and, by 2030, could result in more than a 3% PM 2.5 emissions reduction. | Ongoing through and beyond 2010 |
| 3. Reduce emissions from taxis, black cars, and for-hire vehicles | Reduce idling and increasing fleet fuel efficiency. By 2010, the City will require that new cars achieve double the fuel efficiency of today's non-hybrid vehicles. | PlaNYC notes that taxis account for 4% of all ground transportation CO2 emissions and 1% of all city CO2 emissions. The City's efforts will reduce citywide CO2 emissions by 0.5% while also improving air quality for other pollutants | New yellow cars will have to be 25 mpg by 10/08, 30 mpg by 10/09. Black cars to be on a schedule that is a little later Anti-idling expected by 12/2009 at the latest |
| 4. Replace, retrofit, and refuel diesel trucks | Aside from the federal requirement, retrofitting of trucks with diesel oxidation catalysts (DOC) or diesel particulate filters (DPF), upgrading engines, using cleaner fuels such, and reducing idling. | Emission reductions of 85 to 90% are possible. | CMAQ grants are issued every year, are implemented on a rolling basis. Biodiesel in city heavy truck fleet – nearly all use B5 now, some have started B20 |

| Initiative | Brief Description | Emissions | Reductions Expected Prior to Jan 1, 2010? |
|--|--|--|---|
| 5. Reduce school bus emissions | New York City Local Law 42 mandates the use of ULSD and Best Available Technologies (BATs) in school bus transportation in approximately 3,800 buses. Also, private companies to retire school buses earlier than the present 19 year timeframe, and install DOC's and crankcase filters. | Use of Best Available Technologies (BATs) and retrofits will reduce emissions significantly. | The City has complied with this law, may go beyond |
| 6. Retrofitting ferries, promote the use of cleaner fuels, and engine replacements. | The Port Authority is presently providing funding for the replacement or retrofits of engines. Though the replacement/retrofit program will also have a positive effect on PM2.5, the City will also install DOCs on each engine, at a cost of \$75,000 to \$90,000 per engine. Beyond this, the use of ultra low sulfur fuel will reduce emissions as well. The City also plans on working with private ferries to reduce their emissions. With funding from a federal program, private ferry boats that serve New York City have agreed to install DOCs in 2007. | Will reduce the eight-boat fleet's total NOx emissions by an estimated 40%, or 570 tons per year. The City will propose a conversion of private ferries to ultra low sulfur fuel that will reduce PM2.5 by 5% to 10% beyond those reductions expected from the installation of DOCs. | Retrofits will be partially installed on public ferries before 2010, and private ferries will be an ongoing effort Before 2010, ferries are going to be using ULSD plus 5% biodiesel |
| 7. Work with the Port Authority to reduce emissions from vehicles, vessels and facilities. | The City plans to work with the Port Authority to develop a comprehensive air quality and greenhouse gas emissions plan. Possible improvements at airports may include the use of electric plug-ins at gate ports, clean auxiliary power units, or towing to move planes to and from the gate. | To be determined | Ongoing, long term project |

| Initiative | Brief Description | Emissions | Reductions Expected Prior to Jan 1, 2010? |
|---|--|--|--|
| 8. Reduce emissions from construction vehicles through the use of add-on controls. | Enacted in 2003, Local Law 77 requires that City construction projects use the best available technologies on-site to reduce emissions, such as DPFs, DOCs, and emerging plug-in technologies that allow vehicles to run on electricity instead of burning fuel. | Construction equipment accounts for as much as 13% of NOx and 30% of PM from off-road vehicles. Equipment used in city construction projects must have the best available technologies on-site to reduce emissions. Approximately 800 City-owned vehicles and 115 pieces of leased equipment are subject to the law. | Yes |
| 9 Reduce fuel consumption in buildings, promote cleaner heating fuels, retirement of equipment at older power plants | Reduce emissions by improving energy efficiency in buildings and decreasing fuel consumption, promoting the use of cleaner burning heating fuels, expanding on-site generation, and facilitating the repowering, replacement, and retirement of the out-of-date equipment at older power plants. Local law 86 sets energy requirements for municipal building construction or retrofits. | To be determined | Yes |
| 10. Reduce fuel sulfur limits for No.2 heating oil to 500 ppm, switch to natural gas-fired power plants or biodiesel blends | Reduce fuel sulfur limits for No.2 heating oil to 500 ppm. In addition, reductions will be enabled by the use of biodiesel in City-owned buildings. 100 school boilers may be converted from No. 4/6 to natural gas or dual fuels | This effort will result in a 15% decrease in PM2.5 for this sector, for a reduction of approximately 5% of overall city PM2.5 emissions. Fuel sulfur limits for No.2 heating oil to 500 ppm are projected to result in 85% reductions of SO2 and roughly 50% reductions in PM 2.5. | NYC is relying on the state for reduced sulfur requirements. In the meantime, the City is promoting biofuel |

11. PlaNYC proposes that every New York street is fully lined with trees by 2030 through the implementation of zoning code revisions. The city will plant an additional 12,500 trees per year, prioritizing in neighborhoods with the greatest air quality concerns.
12. The City will expand efforts to reforest approximately 2,000 acres of parkland by 2017.

13. The heating effect of asphalt parking lots will be reduced through perimeter plantings and requiring the provisions of canopy trees in planting islands.
14. Institute a local air quality study in 2008 to monitor, model, map, and track local pollution and local adverse impacts across New York City, and to assess the impact of possible mitigation measures.

7.5.9 Canadian Emission Reductions

Some portion of the particulate matter present in the air in the northern United States originates in Canada. The sources of this contamination are the industrial and commercial operations, fossil fuel and woodburning and especially the emissions of particulate matter and its precursors from coal-fired power plants. A number of initiatives have been put in place in Canada that will reduce emissions and have a positive effect in the air quality in the northeast United States.

The first of these are the Canada-Wide Standards for Mercury Emissions from Coal-Fired Electric Power Generation Plants. Under these provisions, a reduction of approximately 52% to 58% in mercury emissions is expected nationally by 2010. The Ontario Power Authority (OPA) has been directed to replace Ontario's coal-fired generation facilities by cleaner sources "in the earliest practical time frame that ensures adequate generating capacity and electricity system reliability in Ontario." The reduction in mercury emissions is expected to have the co-benefit of the reduction of the emission of other pollutants as well, including particulate and its precursors (SO₂ and NO_x), organics, metals and greenhouse gases. The replacement of coal-fired units in Ontario, which are most likely to affect New York's air quality, will have a significant effect on ambient particulate concentrations and haze.

The second initiative in Canada that will affect New York's air quality is the promulgation of air quality standards for PM_{2.5} and ozone at a level of 30ug/m³ on a 24-hour basis and 65 ppb on an 8-hour basis, respectively. The intention is to meet these standards by 2010, and the result of which will have a positive effect on New York's air quality as well. Quebec's five-year report on their reduction efforts to date discusses the measures taken from 2001 to 2005¹. The control measures instituted by Canada are

¹http://www.menv.gouv.qc.ca/air/particules_ozone/rapport_quin-en.pdf

aimed at reducing industrial emissions. Specifically, regulations like Quebec's "Regulation respecting the quality of the atmosphere"² contain control measures for new and existing sources of VOC's similar to those in New York and other states, and set ambient air quality standards. VOC controls address surface coating processes, automotive painting operations, printing, dry cleaning, formaldehyde from panelboard mills, pulp and paper operations, styrene from composite material manufacturing (fiberglass and resins), and transportation. Particulate emissions measures include the control of fugitive emissions from mining and sandblasting, granaries, mills, distilleries, breweries, powder milk plants, fertilizer mixing plants, concrete plants, vitreous enamel operations, earthenware and ceramic products plant, polyvinyl chloride production or processing plant, wood processing plants, and aluminum manufacturing. Programs also control particulate and NOx emissions from combustion operations (boilers, turbines, and internal combustion), as well as fuel sulfur content (2.0% by weight for "heavy oil," 1.0% by weight for "intermediate oil," 0.5% by weight for "light oil," and 2.0% in weight for coal). Many other categories are covered as well woodburning, smelting, charcoal kilns, incinerators, refineries, storage tanks, metallic processing plants, as well as other industrial processes.

Additional measures are planned in the next five years to achieve their goals by 2010, including reducing emissions from residential wood heating, establishing and inspection and maintenance program for light vehicles, and implementing "other measures in the transportation, energy and climate change sectors."

The above measures are efforts by the Canadian or Provincial governments to improve air quality. They were not included in the present attainment demonstration and will not be enforceable by New York or the federal government. However, given the proximity to New York State, air quality improvements in Canada will certainly impact New York and the northeastern United States.

7.5.10 New York State's "15 by 15" Program

New York Governor Spitzer has initiated a clean energy plan with the goal of reducing New York's energy demand by 15% by 2015. The plan, known as "15 by 15," focuses on energy efficiency, conservation, and investment in renewable energy sources as the keys to achieving

²http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/Q_2/Q2R20_A.htm

economic and environmental goals. The specific goals and highlights of the plan include:

- Reduce electricity use by 15 percent from forecasted levels by the year 2015 through new energy efficiency programs in industry and government;
- Eliminate incentives in the marketplace that discourages utilities from conserving energy by requiring annual adjustments to rates to make utilities whole for lost revenues caused by energy efficiency programs.
- The approval of 21 contract awards by state agencies for clean, renewable power plants upstate that will replace older plants.
- Establish new appliance efficiency standards and set more rigorous energy building codes;
- Invest \$295 million for renewable energy projects throughout the state; and
- Propose power plant siting legislation that creates an expedited review process for new wind power projects, repowering projects that reduce emissions, and other power plants that have very low levels of carbon dioxide emissions.

The benefits of this plan for New York and for the environment include a reduction in the electricity that must be purchased, the creation of new jobs, and a reduction in emissions as a result of the need to produce less power and the substitution of clean power sources for those already in operation. The emission reductions for the "15 by 15" plan are also estimated to result in an annual carbon dioxide reduction of about 12.8 million tons, which is the equivalent of removing 2.5 million cars from the road.

The Department is not committing to the inclusion of any of these measures as part of the SIP at this time. The Department will evaluate each measure resulting from this initiative individually to determine if it is appropriate to be included in the SIP. The Department will need to consider among other things whether the measure is quantifiable, enforceable, and include emissions reductions that are additional to other adopted SIP measures.

7.5.11 NYSERDA Programs

The New York State Energy Research and Development Authority

(NYSERDA) was established in 1975 and is primarily funded by state rate payers through the System Benefits Charge (SBC). The SBC has recently been extended through June 30, 2011. NYSERDA has introduced a number of programs and services to promote energy efficiency amongst the industrial, commercial, municipal, and residential sectors throughout the state, for which they provide technical and financial assistance.

One initiative that has seen success is the New York Energy \$mart Program. NYSERDA has allocated funding towards energy efficiency programs, low-income energy affordability programs, and research and development projects with focuses on renewable resources, distributed generation, and combined heat and power installations. In the last five years, the New York Energy \$mart Program has created a wealth of economic and environmental benefits³:

- Approximately \$198 million in annual energy savings
 - 1,400 Gwh saved per year
 - 860 MW in reduced demand
 - Fuel savings of 3.3 Tbtu
 - Annual carbon dioxide reduction equivalent to 200,000 fewer cars
 - Significant annual greenhouse gas emission reductions:
 - Nitrogen Oxides - 1,280 tons
 - Sulfur Dioxides - 2,320 tons
 - Carbon Dioxide - 1,000,000 tons

In addition to Energy \$mart, there are many other programs which result in reductions of emissions of PM and its precursors. For example, the Peak-Load Reduction Program offers incentives to offset costs to companies that implement either short-term demand response measures, or long-term permanent demand reduction, for days in which electric demand is very high. The Enhanced Commercial/Industrial Performance Program contains three tiers of incentives for the installation of energy-efficient equipment resulting in reduced electrical demand and cost. A wide range of businesses, schools, universities, state and local governments, and other institutions are eligible for these incentives. And, NYSERDA's Alternative-Fuel Vehicle Program aims to encourage fleets to purchase vehicles powered by natural gas, propane, biofuels, and electricity, and to encourage the use of emission reduction technologies and anti-idling technologies for diesel vehicles.

³http://www.nyserda.org/ny_energy_smart.asp

Table 7-1. Listing of FRM sites, 1999-2006. Some locations have primary (“P”) and duplicate (“D”) samplers. Dates with an asterix denote daily sampling for at least part of the period.

| NYSDEC Region | Site Name | County | Dates |
|----------------------|------------------------------|---------------|---|
| 1 | Eisenhower Park | Nassau | 1/1999 – 12/1999 |
| 1 | Hempstead | Nassau | 1/1999 – 12/2006 |
| 1 | Briarcliffe | Nassau | 2/2000 – 3/2003 |
| 1 | Roslyn | Nassau | 7/2000 – 3/2003 |
| 1 | Roslyn Heights | Nassau | 1/1999 – 3/2000 |
| 1 | Babylon | Suffolk | 1/1999 – 12/2006 |
| 2 | Mabel Dean H.S. | New York | 1/1999 – 6/2001* |
| 2 | J.H.S. 45 | New York | P: 1/2000 – 12/2006 D: 1/2006 – 12/2006 |
| 2 | P.S. 59 | New York | P: 1/1999 – 12/2006 D: 1/1999 – 12/2005 |
| 2 | P.S. 19 | New York | 10/2001 – 12/2006 |
| 2 | Canal Street Post Office | New York | P: 1/1999 – 12/2006 D: 8/1999 – 9/2001 |
| 2 | I.S. 155 | Bronx | P: 1/1999 – 7/1999 D: 1/1999 – 7/1999 |
| 2 | Morrisania II | Bronx | 1/1999 – 12/2006 |
| 2 | N.Y. Botanical Gardens | Bronx | 1/1999 – 12/2006 |
| 2 | I.S. 52 | Bronx | P: 9/1999 – 12/2006* D: 9/1999 – 12/2006 |
| 2 | Greenpoint | Kings | P: 1/1999 – 12/2000 D: 1/1999 – 7/1999 |
| 2 | P.S. 321 | Kings | 1/1999 – 3/2003 |
| 2 | P.S. 314 | Kings | 4/2000 – 1/2003 |
| 2 | J.H.S. 126 | Kings | 1/2001 – 12/2006 |
| 2 | Queensboro Community College | Queens | 1/1999 – 12/2000 |
| 2 | P.S. 29 | Queens | P: 7/1999 – 1/2003 D: 8/1999 – 1/2003 |
| 2 | P.S. 214 | Queens | 4/2000 – 3/2003 |
| 2 | Queens College II/P.S. 219 | Queens | 1/2001 – 4/2006* |
| 2 | Susan Wagner H.S. | Richmond | 1/1999 – 12/2006 |

| NYSDEC Region | Site Name | County | Dates |
|---------------|---------------------------|-------------|-------------------|
| 2 | Port Richmond Post Office | Richmond | 12/1999 – 12/2006 |
| 3 | Poughkeepsie | Dutchess | 7/1999 – 3/2003 |
| 3 | Newburgh | Orange | 2/2000 – 12/2006 |
| 3 | Mamaroneck | Westchester | 2/2000 – 12/2006 |

Table 7-2. Trends in PM_{2.5} mass at the longest running FRM monitors, based on quarterly averages from 1999-2006, in mg m⁻³ yr⁻¹. Only those quarters with at least 10 valid samples are included in this trend estimate.

| Site Name | Trend (ug/m ³ /yr) |
|---------------------------|-------------------------------|
| Hempstead | -0.12 |
| Babylon | -0.34 |
| J.H.S. 45 | -0.42 |
| P.S. 59 | -0.30 |
| Canal Street Post Office | -0.50 |
| Morrisania II | -0.27 |
| N.Y. Botanical Gardens | -0.15 |
| I.S. 52 (P) | -0.33 |
| I.S. 52 (D) | -0.23 |
| Susan Wagner H.S. | -0.13 |
| Port Richmond Post Office | -0.20 |
| Newburgh | -0.20 |
| Mamaroneck | -0.20 |

Figure 7-1 - Map of Downstate FRM Sites

See New York State PM_{2.5} Attainment Demonstration.

Table 7-3. Listing of Speciation Trends Network (STN) sites, 2000-2006. All sites are located in NYSDEC Region 2.

| Site Name | County | Dates |
|----------------------------|---------------|------------------|
| Canal Street Post Office | New York | 8/2002 – 12/2006 |
| N.Y. Botanical Gardens | Bronx | 2/2000 – 12/2005 |
| I.S. 52 | Bronx | 1/2001 – 12/2006 |
| Queens College II/P.S. 219 | Queens | 4/2001 – 12/2006 |

Figure 7-2 - Average PM_{2.5} Speciation – Annual, Winter, and Summer
See New York State PM_{2.5} Attainment Demonstration.

Table 7-4. Listing of FRM sites, 1999-2006. Some locations have primary (“P”) and duplicate (“D”) samplers. Dates with an asterisk denote daily sampling for at least part of the period. The New Haven/Stiles St. monitor was designated as “special purpose,” and is included here for completeness only (*in italics*).

| State | AQS ID | Site Name | County | Dates |
|-------|------------------|------------------------------|---------------------|---|
| CT | 090010010 | Bridgeport/Roosevelt School | Fairfield CT | P: 1/1999 – 12/2006 D: 1/1999 – 1/2003 |
| | 090010113 | Bridgeport/Edison School | Fairfield CT | 9/2000 – 12/2003 |
| | 090011123 | Danbury WCSU | Fairfield CT | 1/1999 – 12/2006 |
| | 090012124 | Stamford H.S. | Fairfield CT | 1/1999 – 12/2004 |
| | 090013005 | Norwalk Health Dept. | Fairfield CT | 3/2000 – 12/2006 |
| | 090019003 | Westport/Sherwood Island | Fairfield CT | 1/1999 – 12/2006 |
| | <i>090090018</i> | <i>New Haven/Stiles St.</i> | <i>New Haven CT</i> | <i>P: 1/1999 – 9/2005*</i> <i>D: 1/1999 – 1/2003</i> |
| | 090090026 | New Haven/Woodward Firehouse | New Haven CT | 4/2003 – 12/2006 |
| | 090090027 | New Haven/Criscuolo Park | New Haven CT | P: 1/2004 – 12/2006* D: 2/2005 – 12/2006 |
| | 090091123 | New Haven/State St. | New Haven CT | P: 1/1999 – 12/2006 D: 1/1999 – 2/2005 |
| | 090092008 | New Haven/Ag. Center | New Haven CT | 4/2003 – 12/2006 |
| | 090092123 | Waterbury/Bank St. | New Haven CT | P: 1/1999 – 12/2006 D: 1/1999 – 12/2006 |
| | 090098003 | West Haven Toll | New Haven CT | 4/2003 – 12/2004 |
| | 090099005 | Hamden Mill Basins | New Haven CT | 7/1999 – 12/2003 |
| | | | | |
| NJ | 340030003 | Fort Lee Library | Bergen NJ | 1/1999 – 12/2006 |
| | 340130011 | Newark/St. Charles | Essex NJ | 1/1999 – 12/1999 |
| | 340130015 | Newark/Willis Center | Essex NJ | 4/1999 – 12/2006 |
| | 340130016 | Newark Lab | Essex NJ | P: 8/2001 – 5/2003 D: 8/2001 – 5/2003 |
| | 340171003 | Jersey City Firehouse | Hudson NJ | P: 1/1999 – 12/2006 D: 12/1999 – 12/2006 |
| | 340172002 | Union City | Hudson NJ | 1/1999 – 3/2002, 7/2005 – 12/2006 |
| | 340210008 | Trenton | Mercer NJ | 1/1999 – 12/2006 |
| | 340218001 | Washington Crossing | Mercer NJ | 1/1999 – 12/2006 |

| State | AQS ID | Site Name | County | Dates |
|--------------|---------------|----------------------------|---------------|---|
| | 340230006 | New Brunswick | Middlesex NJ | 1/1999 – 12/2006 |
| | 340270004 | Morristown Ambulance Squad | Morris NJ | 5/1999 – 12/2006 |
| | 340273001 | Chester | Morris NJ | 1/1999 – 12/2006 |
| | 340310005 | Paterson | Passaic NJ | 1/1999 – 12/2006 |
| | 340390004 | Elizabeth Lab | Union NJ | P: 1/1999 – 12/2006* D: 1/1999 – 12/2006 |
| | 340390006 | Elizabeth/Mitchell Bldg. | Union NJ | 1/1999 – 12/2006 |
| | 340392003 | Rahway | Union NJ | 12/1999 – 12/2006* |

Table 7- 5. Annual average PM_{2.5} levels for sites with at least 75% valid samples in a given year, 2000-2006. Incomplete years are left blank.

| Site Name | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---------------------------------|--------------|--------------|--------------|--------------|--------------|-------|-------|
| Bridgeport/Roosevelt School (P) | 13.88 | 13.71 | 12.72 | 12.98 | 12.92 | 14.32 | 12.51 |
| Bridgeport/Roosevelt School (D) | 15.63 | 13.49 | 11.82 | | | | |
| Bridgeport/Edison School | | 12.77 | 12.88 | 12.27 | | | |
| Danbury WCSU | 12.70 | 13.22 | 12.51 | 13.37 | 11.25 | 13.44 | 12.17 |
| Stamford H.S. | 12.90 | 13.01 | 12.81 | 13.51 | 11.78 | | |
| Norwalk Health Dept. | 12.86 | 13.41 | 12.58 | 12.96 | 12.23 | 13.32 | 11.77 |
| Westport/Sherwood Island | 13.03 | 12.15 | 11.49 | 11.63 | 11.06 | 12.18 | 10.69 |
| <i>New Haven/Stiles St. (P)</i> | <i>15.94</i> | <i>16.88</i> | <i>16.00</i> | <i>16.91</i> | <i>15.40</i> | | |
| <i>New Haven/Stiles St. (D)</i> | <i>18.78</i> | <i>18.60</i> | <i>16.19</i> | | | | |
| New Haven/Woodward Firehouse | | | | | 11.56 | 13.05 | 11.72 |
| New Haven/Criscuolo Park (P) | | | | | 12.21 | 13.62 | 12.21 |
| New Haven/Criscuolo Park (D) | | | | | | 14.01 | 12.81 |
| New Haven/State St. (P) | 14.07 | 14.32 | 13.03 | 13.59 | 12.66 | 13.88 | 12.63 |
| New Haven/State St. (D) | | 14.58 | 12.38 | 15.49 | 12.39 | | |
| New Haven/Ag. Center | | | | | 11.14 | 11.73 | 10.76 |
| Waterbury/Bank St. (P) | 13.61 | 13.98 | 13.23 | 12.64 | 12.04 | 14.00 | 11.98 |
| Waterbury/Bank St. (D) | 14.82 | 14.21 | 12.75 | 14.09 | 11.97 | 14.14 | 12.26 |
| West Haven Toll | | | | | 12.91 | | |
| Hamden Mill Basins | 11.49 | 11.88 | 11.09 | 12.29 | | | |
| Fort Lee Library | 14.57 | 13.85 | 12.99 | 13.34 | 12.05 | 14.65 | 11.82 |
| Newark/Willis Center | 15.60 | 13.06 | 13.16 | 13.84 | 13.17 | 14.35 | 12.12 |
| Newark Lab (P) | | | 14.12 | | | | |
| Newark Lab (D) | | | 14.05 | | | | |
| Jersey City Firehouse (P) | 16.78 | 14.01 | 14.34 | 14.81 | 13.66 | 15.10 | 13.35 |
| Jersey City Firehouse (D) | | | 13.99 | 16.26 | 12.93 | 16.07 | 14.67 |
| Union City | 17.08 | 15.54 | | | | | 13.83 |
| Trenton | 14.71 | 14.46 | 12.94 | 13.41 | 12.48 | 12.90 | 12.19 |

| | | | | | | | |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|
| Washington Crossing | 12.05 | | 11.35 | 12.18 | 10.96 | 12.27 | 10.06 |
| New Brunswick | 13.00 | 12.72 | 11.12 | 12.91 | 11.11 | 13.33 | 10.77 |
| Morristown Ambulance Squad | 12.88 | | 11.48 | 12.16 | 11.27 | 12.33 | 10.12 |
| Chester | 11.09 | | 10.46 | 10.77 | 9.99 | 10.77 | 9.01 |
| Paterson | 13.56 | | 12.90 | 13.26 | 12.60 | 13.44 | 11.88 |
| Elizabeth Lab (P) | | 15.53 | 14.56 | 15.96 | 15.08 | 15.24 | 14.16 |
| Elizabeth Lab (D) | 18.49 | 15.42 | 14.78 | 16.97 | 14.19 | 16.65 | 14.72 |
| Elizabeth/Mitchell Bldg. | 15.20 | 12.88 | 13.11 | 13.97 | 12.68 | 14.33 | 12.36 |
| Rahway | 14.10 | 12.77 | 12.04 | 13.24 | 12.53 | 13.91 | 11.92 |

Table 7-6. The 98th percentile of PM_{2.5} levels for sites with at least 75% valid samples in a given year, 2000-2006. Incomplete years are left blank.

| Site Name | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---------------------------------|-------------|-------------|-------------|-------------|-------------|------|------|
| Bridgeport/Roosevelt School (P) | 41.5 | 40.1 | 32.9 | 39.6 | 34.2 | 38.3 | 36.7 |
| Bridgeport/Roosevelt School (D) | 42.8 | 40.6 | 34.0 | | | | |
| Bridgeport/Edison School | | 32.1 | 33.2 | 40.4 | | | |
| Danbury WCSU | 32.9 | 35.2 | 30.7 | 37.3 | 27.5 | 33.4 | 33.8 |
| Stamford H.S. | 36.3 | 37.4 | 34.5 | 41.5 | 32.2 | | |
| Norwalk Health Dept. | 35.3 | 35.7 | 34.3 | 42.9 | 35.2 | 34.9 | 35.9 |
| Westport/Sherwood Island | 33.4 | 34.5 | 30.8 | 44.0 | 30.9 | 35.2 | 31.3 |
| <i>New Haven/Stiles St. (P)</i> | <i>39.5</i> | <i>40.6</i> | <i>40.4</i> | <i>44.0</i> | <i>34.9</i> | | |
| <i>New Haven/Stiles St. (D)</i> | <i>44.8</i> | <i>43.0</i> | <i>34.5</i> | | | | |
| New Haven/Woodward Firehouse | | | | | 31.5 | 36.4 | 36.5 |
| New Haven/Criscuolo Park (P) | | | | | 33.2 | 38.2 | 36.7 |
| New Haven/Criscuolo Park (D) | | | | | | 39.1 | 31.6 |
| New Haven/State St. (P) | 37.2 | 39.5 | 32.4 | 40.6 | 36.2 | 40.8 | 38.1 |
| New Haven/State St. (D) | | 40.6 | 32.3 | 38.9 | 29.9 | | |
| New Haven/Ag. Center | | | | | 32.1 | 32.8 | 33.9 |
| Waterbury/Bank St. (P) | 34.4 | 35.4 | 32.6 | 37.7 | 30.4 | 34.1 | 35.6 |
| Waterbury/Bank St. (D) | 36.0 | 34.9 | 33.5 | 32.8 | 26.1 | 35.9 | 35.2 |
| West Haven Toll | | | | | 30.8 | | |
| Hamden Mill Basins | 34.7 | 32.1 | 29.4 | 44.0 | | | |
| Fort Lee Library | 36.4 | 34.4 | 33.0 | 38.9 | 31.0 | 40.5 | 38.2 |
| Newark/Willis Center | 41.6 | 32.1 | 32.3 | 39.8 | 34.9 | 40.4 | 39.9 |
| Newark Lab (P) | | | 34.6 | | | | |
| Newark Lab (D) | | | 39.9 | | | | |
| Jersey City Firehouse (P) | 39.5 | 34.1 | 34.3 | 46.4 | 37.4 | 37.9 | 41.0 |
| Jersey City Firehouse (D) | | | 36.8 | 41.1 | 29.1 | 38.3 | 38.9 |
| Union City | 39.3 | 39.5 | | | | | |
| Trenton | 43.1 | 35.4 | 35.4 | 40.5 | 33.3 | 33.6 | 36.2 |

| | | | | | | | |
|----------------------------|------|------|------|------|------|------|------|
| Washington Crossing | 31.5 | | 32.2 | 34.9 | 28.0 | 33.0 | 29.5 |
| New Brunswick | 34.5 | 34.1 | 26.0 | 45.0 | 35.5 | 33.8 | 32.8 |
| Morristown Ambulance Squad | 30.2 | | 29.7 | 36.8 | 31.1 | 32.9 | 30.4 |
| Chester | 29.4 | | 30.0 | 35.7 | 29.8 | 33.4 | 28.3 |
| Paterson | 35.4 | | 34.9 | 39.8 | 31.0 | 40.5 | 33.4 |
| Elizabeth Lab (P) | | 39.7 | 41.7 | 37.0 | 40.5 | 42.5 | 39.8 |
| Elizabeth Lab (D) | 46.6 | 50.3 | 39.3 | 41.2 | 36.5 | 39.8 | 41.9 |
| Elizabeth/Mitchell Bldg. | 36.0 | 33.8 | 30.0 | 40.9 | 33.1 | 38.6 | 38.7 |
| Rahway | 38.0 | 30.4 | 31.1 | 35.2 | 36.6 | 38.2 | 37.5 |

Table 7-7. Trends in PM_{2.5} mass at the longest running FRM monitors, based on quarterly averages from 1999-2006, in ug/m³/yr. Only those quarters with at least 10 valid samples are included in this trend estimate.

| Site Name | Trend (ug/m ³ /yr) |
|---------------------------------|-------------------------------|
| Bridgeport/Roosevelt School (P) | -0.07 |
| Danbury WCSU | -0.05 |
| Norwalk Health Dept. | -0.18 |
| Westport/Sherwood Island | -0.19 |
| <i>New Haven/Stiles St. (P)</i> | <i>+0.02</i> |
| New Haven/State St. (P) | -0.19 |
| New Haven/State St. (D) | -0.32 |
| Waterbury/Bank St. (P) | -0.16 |
| Waterbury/Bank St. (D) | -0.13 |
| Fort Lee Library | -0.25 |
| Newark/Willis Center | -0.37 |
| Jersey City Firehouse (P) | -0.34 |
| Jersey City Firehouse (D) | -0.25 |
| Trenton | -0.27 |
| Washington Crossing | -0.14 |
| New Brunswick | -0.11 |
| Morristown Ambulance Squad | -0.49 |
| Chester | -0.21 |
| Paterson | -0.06 |
| Elizabeth Lab (P) | -0.27 |
| Elizabeth Lab (D) | -0.43 |
| Elizabeth/Mitchell Bldg. | -0.30 |
| Rahway | -0.15 |

Table 7-8. Third quarter 2002 average PM_{2.5} values at the NY and NJ FRM monitors in the NYC NAA, both including and excluding the flagged data from July 2002.

| FRM site | County, State | 3rd Quarter 2002 Average PM_{2.5}, ug/m3 (include flagged days) | 3rd Quarter 2002 Average PM_{2.5}, ug/m3 (exclude flagged days) |
|-----------------|------------------------|---|---|
| 340030003 | Bergen County, NJ | 16.05 | 13.99 |
| 340171003 | Hudson County, NJ | 16.83 | 14.68 |
| 340210008 | Mercer County, NJ | 17.99 | 15.03 |
| 340218001 | Mercer County, NJ | 16.71 | 14.74 |
| 340230006 | Middlesex County, NJ | 16.60 | 13.84 |
| 340270004 | Morris County, NJ | 16.84 | 14.49 |
| 340273001 | Morris County, NJ | 16.14 | 13.63 |
| 340310005 | Passaic County, NJ | 16.50 | 14.43 |
| 340390004 | Union County, NJ | 18.97 | 17.18 |
| 340390006 | Union County, NJ | 13.69 | 13.69 |
| 340392003 | Union County, NJ | 17.03 | 14.37 |
| 360050080 | Bronx County, NY | 16.96 | 14.92 |
| 360050083 | Bronx County, NY | 15.80 | 13.66 |
| 360050110 | Bronx County, NY | 16.82 | 15.85 |
| 360470052 | Kings County, NY | 16.66 | 13.63 |
| 360470076 | Kings County, NY | 15.82 | 13.66 |
| 360470122 | Kings County, NY | 16.50 | 14.34 |
| 360590008 | Nassau County, NY | 13.93 | 11.62 |
| 360610056 | New York County, NY | 17.38 | 15.33 |
| 360610062 | New York County, NY | 17.44 | 15.26 |
| 360610079 | New York County, NY | 16.50 | 14.39 |
| 360610128 | New York County, NY | 17.61 | 15.40 |
| 360710002 | Orange County, NY | 14.84 | 12.96 |
| 360810124 | Queens County, NY | 15.69 | 14.74 |
| 360850055 | Richmond County, NY | 16.26 | 13.90 |
| 360850067 | Richmond County, NY | 14.86 | 12.60 |
| 361030001 | Suffolk County, NY | 14.34 | 12.16 |
| 361191002 | Westchester County, NY | 14.85 | 12.76 |

Table 7-9. Baseline PM_{2.5} design values at all FRM monitors across the NYC NAA as computed by MATS using the official EPA database (which includes flagged data from July 2002 in NY and NJ), and excluding the flagged data from July 2002 in NY and NJ.

| FRM site | County, State | Baseline Design Value, ug/m3 (include flagged days) | Baseline Design Value, ug/m3 (exclude flagged days) |
|-----------------|----------------------|--|--|
| 090010010 | Fairfield County, CT | 13.1 | 13.1 |
| 090010113 | Fairfield County, CT | 12.7 | 12.7 |
| 090011123 | Fairfield County, CT | 12.8 | 12.8 |
| 090012124 | Fairfield County, CT | 12.9 | 12.9 |
| 090013005 | Fairfield County, CT | 13.0 | 13.0 |
| 090019003 | Fairfield County, CT | 11.4 | 11.4 |
| 090091123 | New Haven County, CT | 13.7 | 13.7 |
| 090092123 | New Haven County, CT | 13.1 | 13.1 |
| 090099005 | New Haven County, CT | 11.6 | 11.6 |
| 340030003 | Bergen County, NJ | 13.0 | 12.8 |
| 340171003 | Hudson County, NJ | 14.9 | 14.8 |
| 340210008 | Mercer County, NJ | 13.9 | 13.7 |
| 340218001 | Mercer County, NJ | 11.6 | 11.5 |
| 340230006 | Middlesex County, NJ | 12.5 | 12.2 |
| 340270004 | Morris County, NJ | 11.8 | 11.6 |
| 340273001 | Morris County, NJ | 10.7 | 10.5 |
| 340310005 | Passaic County, NJ | 13.1 | 12.9 |
| 340390004 | Union County, NJ | 15.7 | 15.5 |
| 340390006 | Union County, NJ | 13.2 | 13.2 |
| 340392003 | Union County, NJ | 13.1 | 12.9 |
| 360050080 | Bronx County, NY | 15.8 | 15.6 |
| 360050083 | Bronx County, NY | 13.8 | 13.7 |
| 360050110 | Bronx County, NY | 14.3 | 14.3 |
| 360470052 | Kings County, NY | 15.7 | 15.5 |
| 360470076 | Kings County, NY | 14.6 | 14.4 |

| | | | |
|-----------|------------------------|------|------|
| 360470122 | Kings County, NY | 14.7 | 14.5 |
| 360590008 | Nassau County, NY | 12.2 | 12.0 |
| 360610056 | New York County, NY | 16.9 | 16.7 |
| 360610062 | New York County, NY | 16.3 | 16.1 |
| 360610079 | New York County, NY | 14.7 | 14.5 |
| 360610128 | New York County, NY | 15.9 | 15.6 |
| 360710002 | Orange County, NY | 11.5 | 11.4 |
| 360810124 | Queens County, NY | 12.9 | 12.8 |
| 360850055 | Richmond County, NY | 14.4 | 14.2 |
| 360850067 | Richmond County, NY | 12.1 | 12.0 |
| 361030001 | Suffolk County, NY | 12.1 | 11.9 |
| 361191002 | Westchester County, NY | 12.2 | 12.0 |

Table 7-10. Baseline non-blank species composition at all FRM monitors across the NYC NAA as computed by MATS. “SO₄” is sulfate; “NO_{3r}” is retained nitrate; “OM” is organic aerosol mass; “EC” is elemental carbon (OM+EC = carbonaceous mass); “PBW” is particle-bound water; “NH₄” is ammonium associated with SO₄ and NO_{3r}; “OPP” is other primary PM_{2.5}, assumed to equal the sum of major crustal oxides (Si, Ca, Fe, and Ti); and “Salt” is 1.8xCl.

| FRM site | SO ₄ | NO _{3r} | OM | EC | PBW | NH ₄ | OPP | Salt |
|-----------|-----------------|------------------|------|------|------|-----------------|------|------|
| 090010010 | 3.60 | 0.59 | 4.84 | 0.80 | 1.05 | 1.27 | 0.45 | 0.03 |
| 090010113 | 3.55 | 0.55 | 4.52 | 0.79 | 1.04 | 1.24 | 0.44 | 0.03 |
| 090011123 | 3.75 | 0.65 | 3.97 | 0.87 | 1.15 | 1.36 | 0.46 | 0.04 |
| 090012124 | 3.59 | 0.67 | 4.44 | 0.83 | 1.06 | 1.30 | 0.46 | 0.03 |
| 090013005 | 3.46 | 0.55 | 5.16 | 0.75 | 0.97 | 1.19 | 0.43 | 0.02 |
| 090019003 | 3.59 | 0.62 | 2.78 | 0.88 | 1.19 | 1.37 | 0.46 | 0.06 |
| 090091123 | 3.90 | 0.50 | 4.84 | 0.86 | 1.21 | 1.41 | 0.46 | 0.04 |
| 090092123 | 3.92 | 0.69 | 3.83 | 0.94 | 1.26 | 1.47 | 0.49 | 0.05 |
| 090099005 | 3.59 | 0.65 | 2.93 | 0.89 | 1.18 | 1.38 | 0.46 | 0.06 |
| 340030003 | 3.71 | 0.80 | 3.25 | 1.08 | 1.28 | 1.52 | 0.55 | 0.08 |
| 340171003 | 3.99 | 1.14 | 4.08 | 1.24 | 1.36 | 1.75 | 0.60 | 0.09 |
| 340210008 | 4.51 | 0.98 | 3.06 | 0.74 | 1.52 | 1.81 | 0.50 | 0.05 |
| 340218001 | 3.86 | 0.67 | 2.61 | 0.58 | 1.30 | 1.49 | 0.41 | 0.03 |
| 340230006 | 3.67 | 0.70 | 3.16 | 0.99 | 1.26 | 1.46 | 0.45 | 0.05 |
| 340270004 | 3.93 | 0.59 | 2.72 | 0.71 | 1.28 | 1.45 | 0.38 | 0.03 |
| 340273001 | 3.15 | 0.50 | 2.85 | 0.75 | 1.08 | 1.21 | 0.38 | 0.03 |
| 340310005 | 3.79 | 0.80 | 3.28 | 1.10 | 1.31 | 1.54 | 0.53 | 0.07 |
| 340390004 | 4.29 | 0.99 | 4.95 | 1.02 | 1.45 | 1.76 | 0.56 | 0.08 |
| 340390006 | 3.57 | 0.78 | 3.72 | 1.37 | 1.23 | 1.49 | 0.52 | 0.06 |
| 340392003 | 3.54 | 0.76 | 3.60 | 1.29 | 1.22 | 1.46 | 0.50 | 0.05 |
| 360050080 | 4.11 | 1.02 | 4.91 | 1.19 | 1.41 | 1.74 | 0.62 | 0.12 |
| 360050083 | 4.17 | 1.01 | 2.96 | 1.10 | 1.43 | 1.76 | 0.61 | 0.12 |
| 360050110 | 3.96 | 0.93 | 4.06 | 1.20 | 1.34 | 1.62 | 0.59 | 0.08 |
| 360470052 | 4.13 | 1.18 | 4.44 | 1.28 | 1.41 | 1.81 | 0.61 | 0.10 |
| 360470076 | 3.82 | 1.12 | 4.18 | 1.15 | 1.30 | 1.68 | 0.57 | 0.09 |
| 360470122 | 4.01 | 1.12 | 3.86 | 1.16 | 1.37 | 1.75 | 0.60 | 0.10 |
| 360590008 | 3.67 | 0.82 | 2.84 | 0.83 | 1.26 | 1.51 | 0.50 | 0.09 |
| 360610056 | 4.35 | 1.17 | 5.28 | 1.27 | 1.49 | 1.88 | 0.64 | 0.11 |

| FRM site | SO₄ | NO₃r | OM | EC | PBW | NH₄ | OPP | Salt |
|-----------------|-----------------------|------------------------|-----------|-----------|------------|-----------------------|------------|-------------|
| 360610062 | 4.31 | 1.04 | 4.97 | 1.23 | 1.48 | 1.80 | 0.62 | 0.12 |
| 360610079 | 4.20 | 1.05 | 3.61 | 1.17 | 1.44 | 1.78 | 0.62 | 0.12 |
| 360610128 | 4.02 | 1.19 | 4.84 | 1.23 | 1.37 | 1.78 | 0.60 | 0.10 |
| 360710002 | 3.68 | 0.62 | 2.79 | 0.81 | 1.15 | 1.34 | 0.43 | 0.03 |
| 360810124 | 3.80 | 0.89 | 3.02 | 1.10 | 1.31 | 1.58 | 0.56 | 0.09 |
| 360850055 | 3.94 | 0.92 | 3.71 | 1.47 | 1.36 | 1.66 | 0.58 | 0.08 |
| 360850067 | 3.12 | 0.67 | 3.69 | 1.09 | 1.08 | 1.29 | 0.45 | 0.06 |
| 361030001 | 3.74 | 0.73 | 2.87 | 0.85 | 1.23 | 1.44 | 0.50 | 0.06 |
| 361191002 | 3.64 | 0.76 | 2.80 | 1.05 | 1.23 | 1.44 | 0.53 | 0.06 |

Table 7-11. Baseline and future PM_{2.5} design values at all FRM monitors across the NYC NAA as computed by MATS, excluding flagged FRM days.

| FRM site | County, State | Baseline Design Value, ug/m3 | Future Design Value, ug/m3 |
|-----------|----------------------|------------------------------|----------------------------|
| 090010010 | Fairfield County, CT | 13.1 | 11.7 |
| 090010113 | Fairfield County, CT | 12.7 | 11.2 |
| 090011123 | Fairfield County, CT | 12.8 | 11.2 |
| 090012124 | Fairfield County, CT | 12.9 | 11.5 |
| 090013005 | Fairfield County, CT | 13.0 | 11.7 |
| 090019003 | Fairfield County, CT | 11.4 | 9.8 |
| 090091123 | New Haven County, CT | 13.7 | 12.0 |
| 090092123 | New Haven County, CT | 13.1 | 11.4 |
| 090099005 | New Haven County, CT | 11.6 | 10.0 |
| 340030003 | Bergen County, NJ | 12.8 | 11.3 |
| 340171003 | Hudson County, NJ | 14.8 | 13.2 |
| 340210008 | Mercer County, NJ | 13.7 | 11.6 |
| 340218001 | Mercer County, NJ | 11.5 | 9.6 |
| 340230006 | Middlesex County, NJ | 12.2 | 10.3 |
| 340270004 | Morris County, NJ | 11.6 | 9.7 |
| 340273001 | Morris County, NJ | 10.5 | 8.8 |
| 340310005 | Passaic County, NJ | 12.9 | 11.1 |
| 340390004 | Union County, NJ | 15.5 | 13.5 |
| 340390006 | Union County, NJ | 13.2 | 11.5 |
| 340392003 | Union County, NJ | 12.9 | 11.2 |
| 360050080 | Bronx County, NY | 15.6 | 14.2 |
| 360050083 | Bronx County, NY | 13.7 | 12.2 |
| 360050110 | Bronx County, NY | 14.3 | 13.0 |
| 360470052 | Kings County, NY | 15.5 | 14.0 |
| 360470076 | Kings County, NY | 14.4 | 13.1 |
| 360470122 | Kings County, NY | 14.5 | 13.1 |
| 360590008 | Nassau County, NY | 12.0 | 10.7 |
| 360610056 | New York County, NY | 16.7 | 15.2 |

| FRM site | County, State | Baseline Design Value, ug/m3 | Future Design Value, ug/m3 |
|-----------------|------------------------|-------------------------------------|-----------------------------------|
| 360610062 | New York County, NY | 16.1 | 14.5 |
| 360610079 | New York County, NY | 14.5 | 13.2 |
| 360610128 | New York County, NY | 15.6 | 14.2 |
| 360710002 | Orange County, NY | 11.4 | 10.0 |
| 360810124 | Queens County, NY | 12.8 | 11.5 |
| 360850055 | Richmond County, NY | 14.2 | 12.4 |
| 360850067 | Richmond County, NY | 12.0 | 10.5 |
| 361030001 | Suffolk County, NY | 11.9 | 10.5 |
| 361191002 | Westchester County, NY | 12.0 | 10.6 |

Table 7-12. Information for the five FRM monitors considered in this analysis: site name and ID, dates of operation during 2000-2004, base year PM_{2.5} design value, and the nearest STN monitor.

| Site Name | FRM site | Operational periods during 2000-2004 | Base year Design Value, ug/m ³ | Nearest STN monitor |
|--------------|-----------|---|---|---------------------|
| P.S.59 | 360610056 | 1 st qtr 2000 – 4 th qtr 2004 | 16.9 | 360610062 |
| Canal St | 360610062 | 1 st qtr 2000 – 4 th qtr 2004 | 16.3 | 360610062 |
| J.H.S.4 5 | 360610079 | 1 st qtr 2000 – 4 th qtr 2004 | 14.7 | 360050110 |
| P.S.19 | 360610128 | 3 rd qtr 2001 – 4 th qtr 2004 | 15.9 | 360610062 |
| I.S.52 | 360050110 | 1 st qtr 2000 – 4 th qtr 2004 | 14.7 | 360050110 |

Table 7-13. Current PM_{2.5} species composition at each site: sulfate (SO₄), retained nitrate (NO_{3r}), organic carbon (OC), elemental carbon (EC), particle-bound water (PBW), retained ammonium (NH₄), and other primary PM_{2.5} (OPP).

| FRM site | SO ₄ | NO _{3r} | OC | EC | PBW | NH ₄ | OPP |
|------------|-----------------|------------------|------|------|------|-----------------|------|
| 360610056 | 4.98 | 1.50 | 3.81 | 1.51 | 1.65 | 2.19 | 0.77 |
| 360610062* | 4.81 | 1.40 | 3.66 | 1.45 | 1.59 | 2.10 | 0.74 |
| 360610079 | 4.41 | 1.05 | 3.58 | 1.13 | 1.47 | 1.84 | 0.71 |
| 360610128 | 4.68 | 1.39 | 3.59 | 1.42 | 1.55 | 2.05 | 0.72 |
| 360050110* | 4.39 | 1.08 | 3.56 | 1.14 | 1.46 | 1.84 | 0.71 |

* FRM Monitor with collocated STN

Table 7-14. Annual average PM_{2.5} mass over the nine grid cells surrounding each monitor from the base year (2002) and future year (2009) CMAQ simulations, as well as the absolute and percent reductions.

| FRM site | 2002 avg., ug/m ³ | 2009 avg., ug/m ³ | Change ug/m ³ | Change (%) |
|-----------|------------------------------|------------------------------|--------------------------|------------|
| 360610056 | 24.28 | 20.51 | -3.77 | -15.5 |

| | | | | |
|-----------|-------|-------|-------|-------|
| 360610062 | 23.70 | 19.80 | -3.90 | -16.5 |
| 360610079 | 24.28 | 20.51 | -3.77 | -15.5 |
| 360610128 | 23.66 | 20.01 | -3.65 | -15.4 |
| 360050110 | 24.28 | 20.51 | -3.77 | -15.5 |

Table 7-15. Base and future year PM_{2.5} design values.

| FRM site | Base Year Design Value, ug/m³ | Future PM_{2.5} Design Value, ug/m³ |
|-----------------|---|---|
| 360610056 | 16.9 | 15.3 |
| 360610062 | 16.3 | 14.4 |
| 360610079 | 14.7 | 13.3 |
| 360610128 | 15.9 | 14.3 |
| 360050110 | 14.7 | 13.3 |

Figure 7-3 - PM_{2.5} FRM Sites in New York City