1.0 Introduction and Background

1.1 Purpose of Document

This document presents the Connecticut Department of Environmental Protection's (CTDEP) air quality state implementation plan (SIP) revision for attaining the federal 8-hour National Ambient Air Quality Standard (NAAQS) for ground-level ozone. The plan describes the national, regional and local control measures to be implemented to reduce emissions and uses air quality modeling and other analyses of air quality and meteorological data to assess the likelihood of reaching attainment in Connecticut by the 2010 attainment deadline.

As described in detail in subsequent sections of this document, results of these analyses lead CTDEP to conclude that attainment is likely to be achieved by the end of the 2009 ozone season in the five-county Greater Connecticut portion of the State. For the three-county Southwest Connecticut portion of the greater New York City nonattainment area, evidence suggests that there is a credible case for attainment by the end of the 2009 ozone season, with the probability of attainment increasing in subsequent years, as emissions are reduced, such that attainment is highly likely to occur no later than the 2012 ozone season. Because ozone levels in Connecticut are dominated by transport from upwind areas, attainment can be assured in 2009 by securing additional emission reductions from upwind states that contribute significantly to nonattainment in Connecticut.

1.2 Ozone Production and Health Effects

Ozone is a highly reactive gas, each molecule consisting of three oxygen atoms. It is formed naturally at high altitudes (in the stratosphere) where it acts beneficially to absorb potentially damaging ultraviolet solar radiation before it reaches the earth's surface. Protection of stratospheric ozone is addressed under Title VI of the Clean Air Act (CAA).

Tropospheric, or ground-level ozone is produced through a combination of atmospheric chemical reactions between volatile organic compounds (VOCs) and nitrogen oxides (NO_X) in the presence of sunlight. Ozone precursors are emitted from many human activities as well as from natural processes. Anthropogenic emissions of VOCs include evaporation and combustion of gasoline and evaporation of industrial and commercial solvents and a host of consumer products. VOCs emitted by vegetation and other biogenic sources in Connecticut are estimated to be equivalent in magnitude to anthropogenic VOC emission levels in 2002. Nitrogen oxides are generally formed as a product of high temperature combustion such as in internal combustion engines and utility and industrial boilers. A small quantity of NO_X is produced by lightning and emitted by microbial processes in soil. Variability in weather patterns contributes to considerable yearly differences in the magnitude and frequency of high ozone concentrations. Ozone and the pollutants that form ozone are often transported into Connecticut from pollution sources found hundreds of miles upwind.

The adverse effects of ozone exposure on lung health have been well documented in recent decades. Results show that ground-level ozone at concentrations currently experienced in the U.S. can cause several types of short-term health effects. Ozone can irritate the respiratory

system, causing wheezing and coughing, can irritate the eyes and nose, and can cause headaches. Ozone can affect lung function, reducing the amount of air that can be inhaled and limiting the maximum rate of respiration, even in otherwise healthy individuals. Exposure to high levels of ozone can also increase the frequency and severity of asthmatic attacks, resulting in more emergency room visits, medication treatments and lost school days. In addition, ozone can enhance people's sensitivity to asthma-triggering allergens such as pollen and dust mites.

Other possible short-term effects resulting from exposure to high levels of ozone include aggravation of symptoms in those with chronic lung diseases, such as emphysema, bronchitis and chronic obstructive pulmonary disease (COPD) and increased susceptibility to respiratory infections due to impacts of ozone on the immune system. Studies have also raised the concern that repeated short-term exposure to high levels of ozone could lead to permanent damage to lung function, especially in the developing lungs of children.

1.3 Previous Ozone NAAQS SIP History

The 1970 CAA amendments established health and welfare protective limits, or national ambient air quality standards (NAAQS), for a number of air pollutants, including "photochemical oxidants", of which ozone was a key component. The 1977 CAA amendments modified the photochemical oxidants standard to focus only on ozone, leading to the establishment in 1979 of a 1-hour average ozone NAAQS of 0.12 parts per million (ppm). The U.S. Environmental Protection Agency (EPA) classified areas as "nonattainment" if monitors in the area measured ozone levels exceeding the NAAQS on more than three days over a 3-year period. Nonattainment areas were required to adopt programs to provide for attainment of the ozone standard no later than 1987. Despite implementation of a variety of emission reduction strategies and significant improvement in measured ozone levels, many areas, including Connecticut, did not attain the standard by the 1987 deadline.

In 1990, additional amendments to the CAA were enacted, including the establishment of different classification levels of 1-hour ozone nonattainment, based on the severity of the ozone problem in each area. Areas measuring more severe ozone levels were provided more time to attain but were also required to adopt more stringent control programs. Pursuant to the 1990 amendments, the EPA designated all of Connecticut as nonattainment for the 1-hour NAAQS. Southwest Connecticut (i.e., all of Fairfield County except the town of Shelton, plus the Litchfield County towns of Bridgewater and New Milford) was assigned to the New York-Northern New Jersey-Long Island nonattainment area, with a severe classification and associated attainment date of 2007. The remainder of Connecticut, known as the Greater Connecticut area, was classified as serious nonattainment with a required attainment date of 1999.

CTDEP submitted initial attainment demonstrations for both the Southwest Connecticut and Greater Connecticut ozone nonattainment areas on September 16, 1998. The attainment demonstrations relied on photochemical grid modeling, air quality trends and other corroborating weight-of-evidence (WOE) to demonstrate that adopted and mandated control programs within Connecticut and upwind areas were sufficient to enable all areas of the State to achieve attainment of the 1-hour ozone NAAQS by 2007. The attainment demonstration for Greater Connecticut included a technical analysis, showing that overwhelming transport of ozone and

ozone precursor emissions (*i.e.*, VOCs and NO_X) from upwind areas precluded compliance by that area's required 1999 attainment date, and a request for an extension to 2007. EPA published proposed rulemakings regarding CTDEP's attainment demonstrations on December 16, 1999.[1]

For Greater Connecticut, EPA proposed (in the December 16, 1999 rulemaking) to approve both the 2007 attainment date extension request and the attainment demonstration for the area, contingent upon submittal of an adequate motor vehicle emissions budget that was consistent with attainment. CTDEP submitted the required motor vehicle budgets for Greater Connecticut in February 2000, which were found adequate by EPA on June 16, 2000.[2] As a result, EPA issued final approvals for the 2007 attainment date extension, motor vehicle budgets and attainment demonstration for Greater Connecticut on January 3, 2001.[3]

EPA's December 16, 1999 rulemaking also proposed to approve the ozone attainment SIP for the Southwest Connecticut portion of the New York-Northern New Jersey- Long Island nonattainment area, contingent upon the satisfaction of certain specified conditions. The conditions for SIP approval included: 1) submittal of an adequate 2007 motor vehicle emissions budget consistent with attainment; 2) submittal of measures achieving additional emission reductions identified by EPA as necessary for attainment by 2007 (i.e., the "attainment shortfall"); 3) submittal of an emission reduction rate-of-progress plan for the period from 1999 through 2007; and 4) a commitment to submit the results of a mid-course review of attainment progress by the end of 2003. On July 28, 2000, EPA issued a supplemental notice to the December 16, 1999 rulemaking indicating that a state for which the SIP includes the benefits of EPA's Tier 2 Vehicle and Low Sulfur Gasoline program must commit to revising the 2007 motor vehicle emissions budgets within one year after the official release of EPA's MOBILE6 emissions model.[4] Also, EPA subsequently extended the date for submitting a mid-course review assessing progress towards 1-hour ozone attainment to December 31, 2004, in order to allow inclusion of regional emission reductions resulting from EPA's NO_X SIP Call.[5]

CTDEP addressed EPA's conditional approval of the Southwest Connecticut attainment demonstration with SIP revisions submitted on February 8, 2000 and October 15, 2001, as follows:

- The February 8, 2000 revision included 2007 mobile source budgets, which were subsequently found to be adequate by EPA on June 16, 2000.[6] This SIP revision also included commitments to adopt tighter limits on municipal waste combustor units, to submit additional control measures to address the EPA-identified attainment shortfalls, to revise motor vehicle emission budgets within one year after release of MOBILE6 and to perform a mid-course review by the end of 2003.
- The October 15, 2001 revision included Connecticut's post-1999 rate-of-progress (ROP) plan and associated ROP contingency measures, additional NO_X limits applicable to

[1] 64 FR 70332 and 64 FR 70348.
[2] 65 FR 37778.
[3] 66 FR 634.
[4] 65 FR 46383.
[5] Wegman, Lydia & Mobley, David, "Mid-Course Review Guidance for the 1-Hour Ozone Nonattainment Areas that Rely on Weight-of-Evidence for Attainment Demonstration," memo to EPA Air Division Directors, March 28, 2002.
[6] 65 FR 37778.

municipal waste combustors adopted in October 2000, a commitment to pursue the adoption of additional control measures to eliminate the EPA-identified shortfall so as to attain the 1-hour ozone standard by November 2007 and a commitment to submit a mid-course review for the Southwest Connecticut and Greater Connecticut nonattainment areas by December 31, 2004.

On December 11, 2001,[7] EPA published final approval of the September 16, 1998 attainment demonstration for Southwest Connecticut, as modified on February 8, 2000, and the additional elements submitted on October 15, 2001.

Two subsequent SIP revisions addressed additional commitments for the nonattainment areas, as follows:

- A June 17, 2003 submission included 2007 MOBILE6.2 motor vehicle emissions budgets for the Southwest Connecticut and Greater Connecticut nonattainment areas. EPA approved these budgets on December 18, 2003[8] and found them adequate for conformity purposes on January 20, 2004.[9]
- A December 1, 2004 submission included additional "shortfall" control measures adopted in 2002, 2003 and 2004 and calculations of the emissions reductions associated with those measures. EPA published approval of the shortfall measures on August 31, 2006.[10]

CTDEP satisfied its final remaining 1-hour ozone SIP commitment with the January 10, 2005 submittal of the Mid-Course Review, which concluded that air quality improvements were on pace to provide for attainment of the 1-hour ozone NAAQS by the 2007 deadline. Table 1.3 summarizes control measures implemented to comply with the 1-hour ozone NAAQS.

1.4 Current 8-Hour Ozone NAAQS SIP Requirements

The CAA requires EPA to periodically review (every five years) and revise NAAQS as appropriate to ensure that public health is protected with an adequate margin of safety. Following revisions, states are then required to develop plans to ensure that air quality levels are reduced to below the level of the NAAQS.

1.4.1 8-Hour Ozone NAAQS Designations

Prompted by increasing evidence of health effects at lower concentrations over longer exposure periods, EPA promulgated a more stringent ozone health standard in 1997 based on an 8-hour averaging period. The revised NAAQS was established as an 8-hour average of 0.08 ppm. Compliance is determined in an area using the monitor measuring the highest 3-year average of each year's 4th highest daily maximum 8-hour ozone concentration. In February 2001, after extended delays resulting from legal challenges to this new NAAQS, the US Supreme Court upheld the EPA's authority to establish the 8-hour ozone standards. As required by the Courts through a subsequent consent decree with environmental groups, in April 2004 EPA published

[7] 66 FR 63921.
[8] 68 FR 70437.
[9] 69 FR 2711.
[10] 71 FR 51761.

Table 1.3: Control Strategies Implemented Statewide in Connecticut to Meet the 1-Hour Ozone NAAQS

Control Strategy	Pollutant		Federal Program	State Program	EPA Approval Date	Initial Year of Implementation
	VOC	NO_X				
Stationary Sources						
Consumer Products	●		●		09/11/1998	1999
Architectural & Industrial Maintenance Coatings	●		●		09/11/1998	2000
Autobody Refinishing VOC Limits	●		●		09/11/1998	1999
Stage I Vapor Recovery at Gasoline Service Stations	●			●	10/18/1991	1992
Stage II Vapor Recovery at Gasoline Service Stations	●			●	12/17/1993	1994
VOC RACT	●			●	03/21/1984	1984
Cutback Asphalt: Increased Rule Effectiveness	●			●	10/24/1997	1998
Gasoline Loading Racks: Increased Rule Effectiveness	●			●	10/24/1997	1998
CT NO_X "RACT" Regulation		●		●	10/06/1997	1994
OTC Phase II NO_X Controls		●		●	09/28/1999	1999
NO_X Budget Program (EPA NO_X SIP Call)		●		●	12/27/2000	2003
Municipal Waste Combustor Controls		●		●	04/21/2000;12/06/2001	2000, 2003
Automotive Refinishing Operations (Spray Guns)	●			●	08/31/2006	2002
Gasoline Service Stations Stage II & Pressure-Vent Valves	●			●	08/31/2006	2004, 2005
Portable Fuel Containers	●			●	08/31/2006	2004
Mobile Sources						
Enhanced I/M (ASM 2525 phase-in cutpoints)	●	●		●	03/10/99	2000
Enhanced I/M (ASM 2525 final cutpoints)	●	●		●	10/27/00	2004
OBD-II Enhanced I/M	●	●		●	Awaiting EPA approval	2004
Reformulated Gasoline - Phase I[4]	●	●	●		12/23/91	1995
Reformulated Gasoline - Phase II[4]	●	●	●		02/16/94	2000
Tier 1 Motor Vehicle Controls	●	●	●		06/05/91	1994
On-board Refueling Vapor Recovery	●		●		04/06/94	1997-2005
National Low Emission Vehicle Program	●	●	●		03/02/98	1998 (in CT)
Tier 2 Motor Vehicle Controls/Low Sulfur Gasoline	●	●	●		2/10/00	2004-2008
California Low Emission Vehicle Phase 2 (CALEV2)	●	●	●	●	Awaiting EPA approval	2007
Heavy-Duty Diesel Vehicle Controls and Fuels	●	●	●		10/06/00	2004-2005
Non-Road Engine Standards	●	●	●		1994-2000	1996-2008

final area designations pursuant to CAA section 107(d) and the Transportation Equity Act for the Twenty-first Century (TEA–21) and final area classifications pursuant to CAA sections 172(a) and 181.[11] These determinations became effective on June 15, 2004.

As shown in Figure 1.4.1, Connecticut, along with other states in the Northeast and other areas of the country, was designated as nonattainment by EPA based on measured 8-hour ozone values from the 2001-2003 period. Portions of Connecticut were included in two nonattainment areas. Fairfield, New Haven, and Middlesex Counties were included as part of a moderate 8-hour ozone NAAQS nonattainment area, along with the New York and New Jersey counties that make up the metropolitan New York Consolidated Statistical Area. The remaining five counties in Connecticut were grouped as a separate moderate nonattainment area, known as the Greater Connecticut 8-hour ozone NAAQS nonattainment area.

1.4.2 EPA 8-Hour Ozone NAAQS Implementation Rules

EPA published final 8-hour ozone implementation rules in two phases: Phase 1 on April 30, 2004[12] and Phase 2 on November 29, 2005.[13] Those rules require moderate nonattainment areas, such as those in Connecticut, to submit revisions to the SIP that meet the following planning requirements:

- Reasonable Further Progress (RFP): Achieve 15% VOC reduction within 6 years after the baseline year of 2002 (i.e., reductions must occur by 2008). Equivalent NO_X reductions can substitute for any portion of the required VOC reductions.
- Attainment demonstration: Using modeling and other technical analyses to demonstrate that adopted control measures are sufficient to project attainment of the 8-hour NAAQS by the end of the 2009 ozone season.
- New Source Review (NSR) and Reasonably Available Control Technology (RACT) major source applicability: 100 tons/year (tpy) for NO_X and 50 tpy for VOC (CAA Section 184).
- NSR emission offset ratio: 1.15 to 1 for NO_X and VOC.
- NSR permits: Required for new or modified major stationary sources.
- NO_X control for RACT: requirement for major stationary VOC sources also applies to major NO_X sources.
- RACM/RACT: RACT required for all EPA-defined control technique guideline (CTG) sources and all other major sources. Reasonably available control measures (RACM) required for all other sources.
- Basic Inspection and Maintenance (I/M): Required for light-duty motor vehicles.
- Stage II vapor recovery: Required for gas stations with a throughput of at 10,000 or more gallons per month.

[11] 69 FR 23858.
[12] 69 FR 23951.
[13] 70 FR 71612.

- Transportation conformity budgets: Budgets that are consistent with the attainment plan are required to be established for the RFP year (i.e., 2008) and the attainment year (i.e., 2009).
- Contingency measures: Implementation is required upon failure to meet RFP milestones or attainment.

In addition to prescribing the planning requirements for meeting the 8-hour NAAQS, EPA's ozone implementation rules specified the process for transitioning from the 1-hour to the 8-hour ozone NAAQS. The transition included revocation of the 1-hour NAAQS, effective June 15, 2005, and EPA's approach to preventing backsliding from 1-hour ozone requirements.

Given Connecticut's previous classifications as "severe" (Fairfield County) and "serious" (remainder of the State) for the 1-hour ozone NAAQS, Connecticut's regulations continue to include more stringent requirements pursuant to CAA section 182(d) than are required under the State's current "moderate" 8-hour ozone classification. These more stringent requirements include:

- Lower NSR and RACT point source applicability thresholds of 25 tpy or 50 tpy (depending on location);[14]
- Higher NSR offset ratio requirements of 1.3 to 1 or 1.2 to 1 (depending on location);[15] and
- Lower permit thresholds for point sources of 15 tpy.[16]

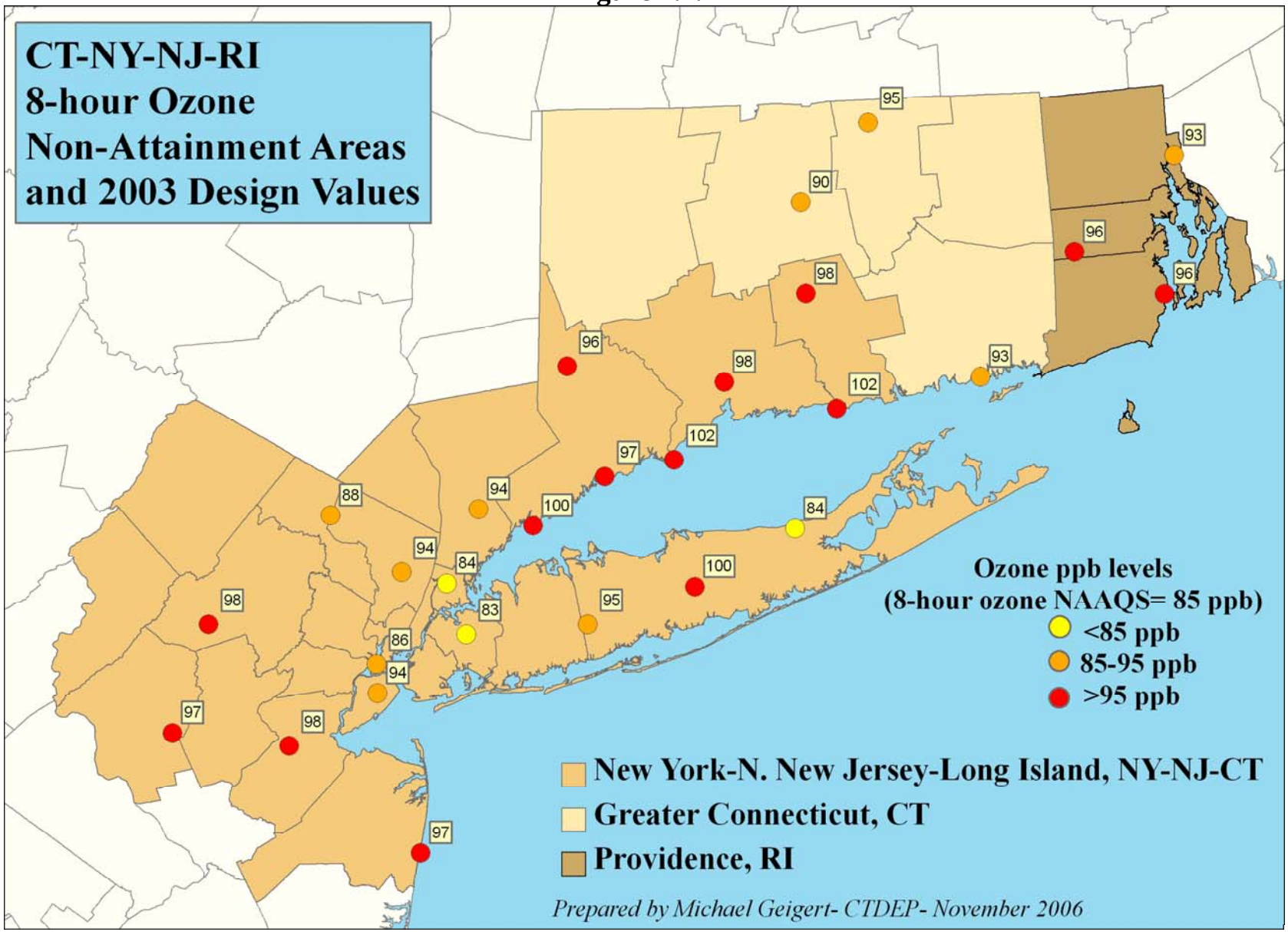
1.4.3 D.C. Circuit Court Ruling on EPA's Implementation Rule

Responding to a petition originated by the South Coast Air Quality Management District (SCAQMD), the U.S. Court of Appeals for the District of Columbia Circuit issued a ruling on December 22, 2006 vacating the EPA's Phase 1 rule to implement the 8-hour ozone NAAQS.[17] Although the Court upheld EPA's revocation of the 1-hour NAAQS, it ruled that EPA took improper action regarding the 8-hour classification scheme and several anti-backsliding provisions, including the treatment of New Source Review (NSR), section 185 penalties, contingency plans and motor vehicle conformity demonstrations.

On March 22, 2007, EPA submitted a motion requesting rehearing on the Court's decision on the Phase I Ozone Implementation Rule. The motion requests rehearing by the original panel on: 1) classifications; 2) CAA section 172(e) anti-backsliding issues (new source review, section 185 fees, and contingency measures); and 3) the scope of the Court's vacatur. On June 8, 2007 the same Court ruled on EPA's petition and in part stated that it intended to vacate only the parts of the Rule for which it (the Court) had sustained challenges, urging EPA to promptly promulgate a revised rule "that effectuates the statutory mandate…deemed necessary to protect the public health a decade ago."

[14] RCSA 22a-174-1(57).
[15] RCSA 22a-174-3a(k)(4)(B)(x).
[16] RCSA 22a-174-3a(a)(1)(D).
[17] 69 FR 23951.

Figure 1.4.1


CT-NY-NJ-RI
8-hour Ozone
Non-Attainment Areas
and 2003 Design Values
95
93
90
96
96
98
96
98
93
102
102
97
94
88
100
84
94
84
100
98
83
95
86
94
97
98
97
Ozone ppb levels
(8-hour ozone NAAQS= 85 ppb)
<85 ppb
85-95 ppb
>95 ppb
New York-N. New Jersey-Long Island, NY-NJ-CT
Greater Connecticut, CT
Providence, RI
Prepared by Michael Geigert- CTDEP- November 2006

As of this writing, it is unclear how or when this case will be resolved, or how it will impact 8-hour ozone planning requirements for Connecticut. In the interim, CTDEP has assembled this plan based on the requirements specified by EPA in the contested implementation rule. In the future, CTDEP will prepare and submit revisions to this plan, as necessary, to comply with the implementation rule that survives final litigation on this matter.

1.5 Summary of Conclusions

As supported by the information described in detail in subsequent sections, CTDEP concludes that 8-hour ozone NAAQS attainment is likely to be achieved by the end of the 2009 ozone season in the five-county Greater Connecticut portion of the State. For the three-county Southwest Connecticut portion of the greater New York City nonattainment area, evidence suggests that there is a credible case for attainment by the end of the 2009 ozone season, with the probability of attainment increasing in subsequent years, as emissions are reduced, such that attainment is highly likely to occur no later than the 2012 ozone season. Because ozone levels in Connecticut are dominated by transport from upwind areas, attainment can be assured in 2009 by securing additional emission reductions from upwind states that contribute to nonattainment in Connecticut.