Ozone Designation Recommendations For the 2008 Ozone National Ambient Air Quality Standards

Technical Support Document

Connecticut Department of Environmental Protection
Bureau of Air Management

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Abstract

On March 12, 2008, the United States Environmental Protection Agency (EPA) promulgated a more stringent National Ambient Air Quality Standard (NAAQS) for ozone, lowering the 8-hour ozone NAAQS from 0.08 parts per million (ppm) to 0.075 ppm. Pursuant to Section 107(d) of the Clean Air Act, the Connecticut Department of Environmental Protection recommends that EPA designate the entire State of Connecticut as nonattainment for the 2008 8-hour ozone NAAQS. The state should be divided into two nonattainment areas, with the same boundaries established for the 1997 8-hour ozone NAAQS, as follows:

1) The **Southwest Connecticut** nonattainment area, comprised of Fairfield, New Haven and Middlesex Counties, as part of a larger multi-state New York City metropolitan nonattainment area; and

2) The **Greater Connecticut** nonattainment area, comprised of Litchfield, Hartford, Tolland, Windham and New London Counties.

These recommendations (depicted on a map in Figure 14) are based on an analysis of air quality, emissions, meteorological, population, traffic and other data relevant under EPA guidance.

1.0 Introduction

On March 12, 2008, the United States Environmental Protection Agency (EPA) promulgated a revised National Ambient Air Quality Standard (NAAQS) for 8-hour ozone. This document presents the Connecticut Department of Environmental Protection (CTDEP's) recommendations regarding attainment and nonattainment designations and boundaries for the 2008 ozone NAAQS, as required by Section 107 of the Clean Air Act (CAA).

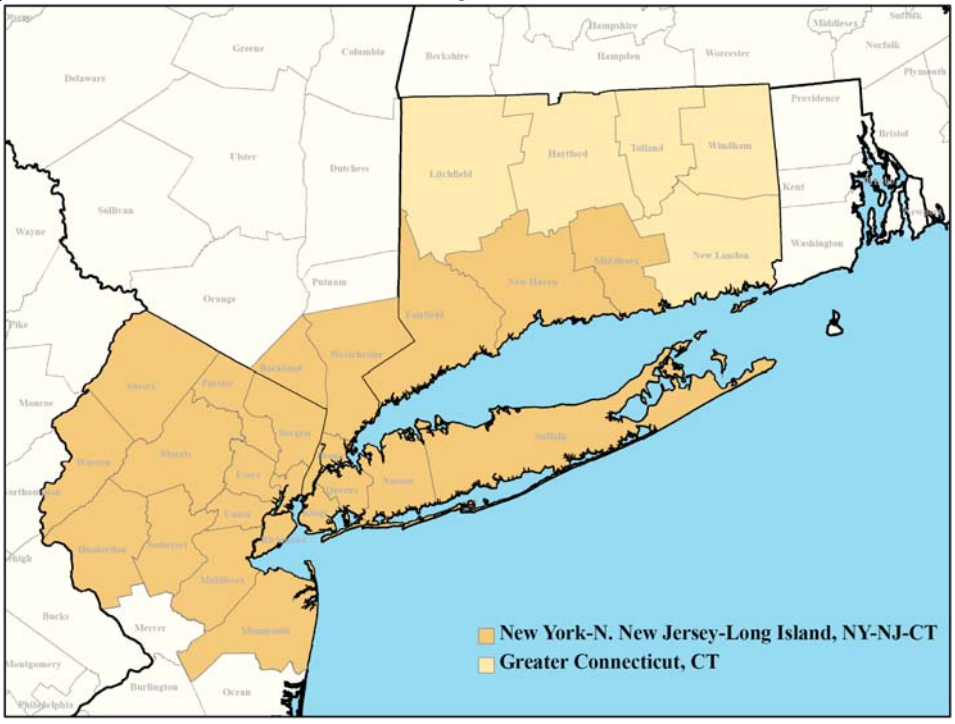
Specifically, CTDEP recommends that all of the State of Connecticut be divided into two nonattainment areas, as follows:

- The **Southwest Connecticut** nonattainment area, comprised of Fairfield, New Haven and Middlesex Counties, as part of a larger multi-state New York City metropolitan nonattainment area; and

- The **Greater Connecticut** nonattainment area, comprised of Litchfield, Hartford, Tolland, Windham and New London Counties.

CTDEP's recommendations are consistent with the 1997 ozone NAAQS area designations in Connecticut. EPA's original July 16, 1997 promulgation of the 8-hour ozone NAAQS set the level of both the primary and secondary standards at 0.08 parts per million (ppm)**.** Because ozone is measured out to three decimal places, the standard effectively became 0.084 ppm. Based on recommendations provided by CTDEP and its own analysis, EPA established two nonattainment areas in Connecticut under the 1997 ozone NAAQS, with boundaries exactly as CTDEP is recommending for the 2008 ozone NAAQS. Both of these nonattainment areas were classified as "moderate" under the 1997 NAAQS, and assigned an attainment date of June 10, 2010. The nonattainment boundaries for the 1997 ozone NAAQS are shown in Figure 1.

Figure 1. 1997 8-Hour Ozone NAAQS Nonattainment Areas in Connecticut



In March 2008, EPA revised both the primary and secondary 8-hour NAAQS to 0.075 ppm (8-hour average) after evaluating the results of numerous new scientific studies conducted over the intervening decade. EPA concluded that ozone causes adverse health and welfare effects at and below the level of the 1997 standard. This new evidence identified important new health endpoints associated with ozone exposure, including mortality, increased use of asthma medication, school absenteeism and cardiac-related effects. Studies also indicated that ozone levels at and below that of the 1997 ozone NAAQS are capable of harming sensitive vegetation and ecosystems.

Section 107(d) of the CAA specifies the process for designating areas as attainment and nonattainment following the establishment of new or revised NAAQS. States are required to submit recommendations concerning both the attainment status and geographical boundary for each area in the state to EPA not later than one year after the promulgation of a new or revised standard – in this case by March 12, 2009 for the 2008 ozone NAAQS. Areas should be identified as attaining, or not attaining, the revised ozone standard, or as not classifiable on the basis of available information. Because the 2008 revised primary and secondary ozone NAAQS are identical, EPA expects that each area will have the same designation and boundary for both standards. EPA ordinarily completes the designation process within two years of the effective date of a new or revised standard.

CAA section 107(d)(1) requires an area to be designated as nonattainment if it is violating the NAAQS or contributing to a violation in a nearby area as a consequence of atmospheric transport. EPA recommends that states identify violating areas using the most recent three years of air quality data. In most cases, initial state recommendations will be based on calendar year 2006-2008 data that are stored in the EPA Air Quality System (AQS). In general, violations are identified using data from Federal reference method (FRM) and Federal equivalent method (FEM) monitors that are sited and operated in accordance with 40 CFR 58, as revised on October 17, 2006 (see 71 FR 61236).

To evaluate an area's contribution to a violation in a nearby area, EPA's guidance document recommends[1] that the Core Based Statistical Area (CBSA) or Combined Statistical Area (CSA)[2], which includes two or more adjacent CBSAs, serve as the presumptive boundary for evaluating the geographic extent of an ozone nonattainment area. Each CBSA consists of a county or counties containing at least one urban core plus adjacent counties that have a high degree of social and economic integration with the urban core as measured by commuting ties. EPA recommends the CBSA and CSAs as presumptive area boundaries because the factors used to establish the CBSAs and CSAs are similar in several ways to the factors EPA considers in determining whether a nearby area is contributing to a violation of a NAAQS. However, EPA also recommends the use of other factors to justify or adjust these boundaries. EPA used this same conceptual approach in the designations process for the 1997 ozone NAAQS. Where a violating monitor is not located in a CBSA or CSA, EPA recommends that the boundary of the

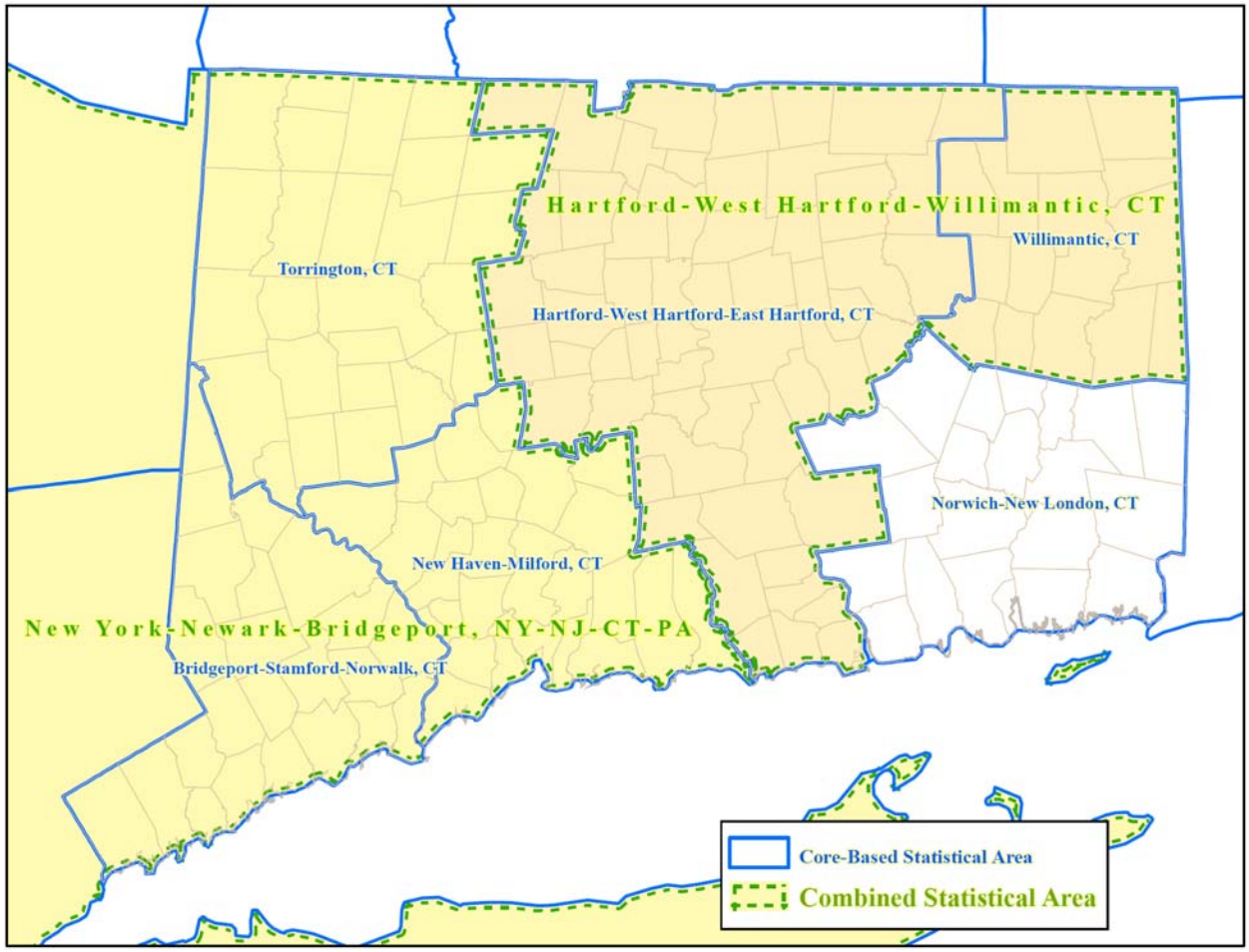
[1] "Area Designations for the 2008 Revised Ozone National Ambient Air Quality Standards;"Memorandum from Robert J. Meyers (EPA OAQPS) to EPA Regional Administrators; December 4, 2008.

[2] The Federal Office of Management and Budget (OMB) is responsible for establishing CBSA and CSA boundaries. OMB issued its most recent update to these boundaries in November 2008. CBSA is a collective term that refers to both metropolitan (population> 50,000) and micropolitan (population between 10,000 and 50,000) statistical areas.

county containing the monitor serve as the starting point for considering the extent of the nonattainment area.

Figure 2 depicts the current[3] county-based CSAs and CBSAs for Connecticut, namely the Hartford-West Hartford-Willimantic, CT CSA; the New York-Newark-Bridgeport, NY-NJ-CT-PA CSA and the Norwich-New London, CT CBSA. Per EPA's recommended approach, each of these three areas would be a presumptive nonattainment area for the 2008 ozone NAAQS. For reasons discussed below, these boundaries are not completely appropriate for designating air quality areas in Connecticut.

Figure 2. 2008 CSA and CBSA Boundaries for Connecticut



In addition to county-based CSA and CBSA classifications, OMB has established a separate town-based classification scheme for the New England states, known as New England City and Town Areas (NECTAs).[4] The NECTA classification scheme recognizes that towns are traditionally a more important level of government than counties in the New England region. As discussed in Section 2.8, CTDEP's recommended nonattainment area boundaries use NECTA classifications to make some adjustments to the presumptive boundaries derived from county-level CSA and CBSA classifications.

[3] See: http://www.whitehouse.gov/omb/assets/omb/bulletins/fy2009/09-01.pdf
[4] See: Ibid.

2.0 Nine Factor Analysis

EPA's guidance[5] for determining the boundaries of 8-hour ozone NAAQS nonattainment areas suggests that, when making boundary recommendations for nonattainment areas, states should evaluate each area on a case-by-case basis. The CAA requires that a nonattainment area must include not only the area that is violating the standard, but also nearby areas that contribute to the violation. Thus, for each ambient ozone monitor or group of monitors that indicate violations of the standard, EPA intends to establish nonattainment boundaries that cover a sufficiently large area to include both the area that violates the standard and the areas that contribute to the violations.

Attainment of the 2008 8-hour ozone NAAQS is achieved when the maximum design value measured in a nonattainment area does not exceed 0.075 ppm. The design value for each monitoring site is determined by averaging the 4th-highest daily maximum 8-hour ozone concentration for each of the three most recent calendar years.

EPA recommends that states base their boundary recommendations for violating areas on an evaluation of the nine factors identified below, as well as on any other relevant factors or circumstances specific to a particular area:

1) Air quality data;
2) Emissions data;
3) Population density and degree of urbanization;
4) Traffic and commuting patterns;
5) Growth rates and patterns;
6) Meteorology;
7) Geography/topography;
8) Jurisdictional boundaries;
9) Level of control of emission sources.

CTDEP's recommended deviations from the presumptive nonattainment area boundaries are influenced largely by air quality data, commuting patterns, meteorology and jurisdictional boundaries, while emissions data, population data, growth rates and topography were found to be largely non-determinative. The recommended area boundaries are also administratively efficient since the planning process and structures are based on the same areas as the 1997 8-hour ozone NAAQS. Such administrative considerations are important to facilitate coordination in a multistate area such as the New York City metropolitan area (NY/NJ/CT area).

2.1 Factor 1: Air Quality

The CTDEP's monitoring network includes eleven FRM ozone monitors. Table 1 lists the 4th-highest 8-hour concentrations recorded at each site for each year from 2006 to 2008 and the corresponding 2008 design value. The 2008 design values indicate that all monitoring locations

[5] "Area Designations for the 2008 Revised Ozone National Ambient Air Quality Standards;" Memorandum from Robert J. Meyers (EPA OAQPS) to EPA Regional Administrators; December 4, 2008.

violated the 2008 8-hour ozone NAAQS, supporting a nonattainment designation for all of Connecticut.

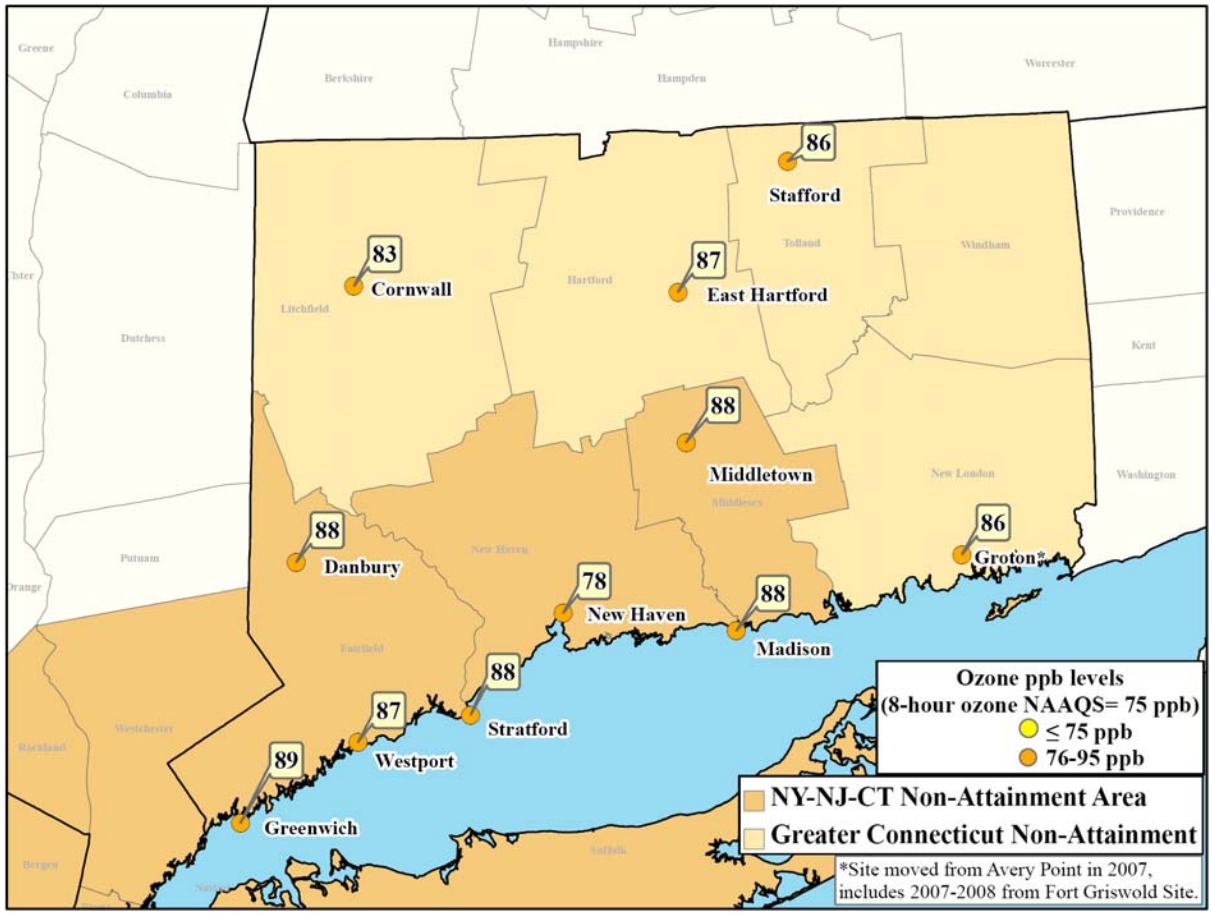
Table 1. Connecticut 2008 8-hour Ozone Design Values

Site	County	AQS Code	Annual 4th High (ppm)			Design Value (ppm)
			2006	2007	2008	
Current NYC-NJ-CT Nonattainment Area						
Greenwich	Fairfield	090010017	0.097	0.084	0.088	0.089
Danbury	Fairfield	090011123	0.087	0.092	0.086	0.088
Middletown	Middlesex	090070007	0.089	0.093	0.082	0.088
Madison	New Haven	090093002	0.095	0.093	0.078	0.088
Stratford	Fairfield	090013007	0.095	0.092	0.078	0.088
Westport	Fairfield	090019003	0.089	0.083	0.090	0.087
New Haven	New Haven	090090027	0.079	0.082	0.074	0.078
Current Greater Connecticut Nonattainment Area						
East Hartford	Hartford	090031003	0.086	0.097	0.080	0.087
Stafford	Tolland	090131001	0.089	0.087	0.084	0.086
Groton*	New London	090110124	n.a.	0.092	0.080	0.086
Cornwall	Litchfield	090050005	0.085	0.089	0.077	0.083

* Groton Fort Griswold has only 2 years of valid data. The design value listed for 2008 is based on the average of the 4th high values for 2007 and 2008.

Design values for 2008 are spatially depicted in the Figure 3. The highest design values were recorded in Fairfield (0.089 ppm), New Haven (0.088 ppm) and Middlesex (0.088 ppm) Counties, with lower values recorded in the remainder of Connecticut (all 0.087 ppb or less). Fairfield, New Haven and Middlesex Counties currently constitute the Southwest Connecticut portion of the NY/NJ/CT nonattainment area established for the 1997 8-hour ozone NAAQS of 0.084 ppm. The remaining counties constitute the Greater Connecticut nonattainment area.

Figure 3. Ozone Monitors in Connecticut with 2008 Design Values



Design value trends over the past 25 years are presented in Figures 4 and 5 for monitors in the current Southwest Connecticut and Greater Connecticut nonattainment areas, respectively. There is a discernable downward trend in design values over the period (1983 through 2008) at all monitors. Note that the ozone levels are plotted in units of parts per billion (0.084 ppm = 84 ppb).

Since the highest 2008 design values occurred in Southwest Connecticut, it makes sense to retain the current nonattainment area boundaries for the 2008 NAAQS. These boundaries will link Connecticut's highest measuring monitors to the upwind emissions region around New York City, where a significant portion of Connecticut's measured ozone originates.

Figure 4. 8-Hour Ozone Design Value Trends for the Southwest Connecticut Portion of the Current NY/NJ/CT Nonattainment Area

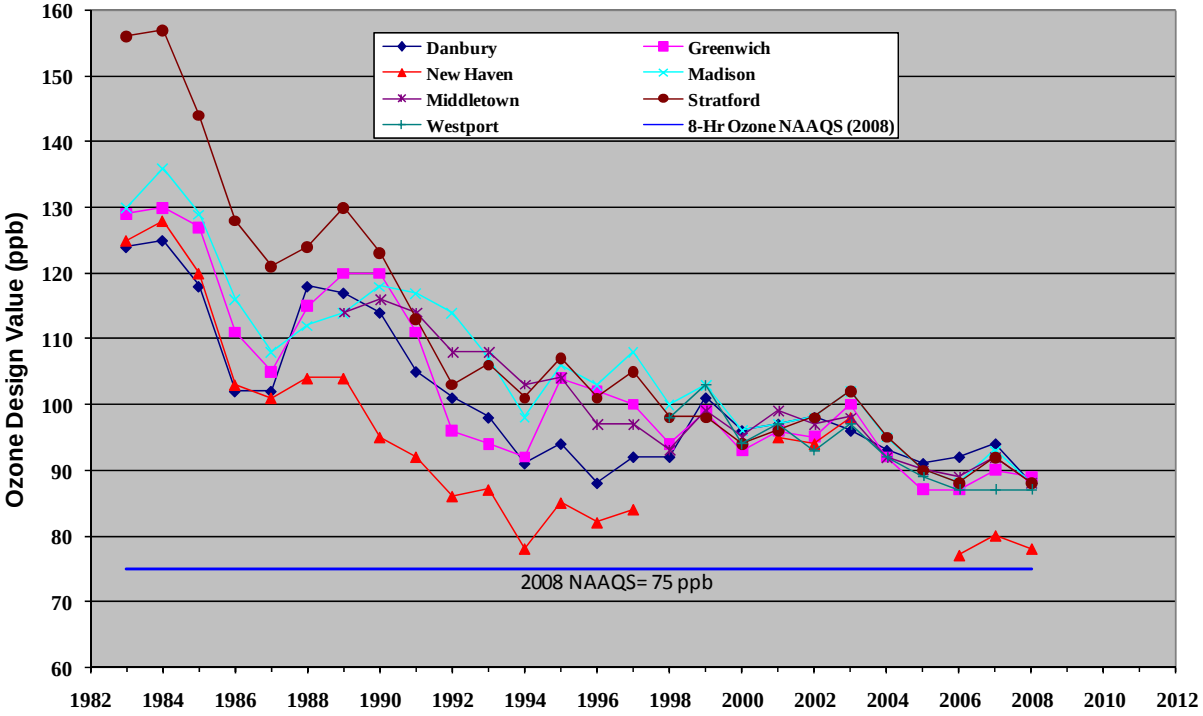
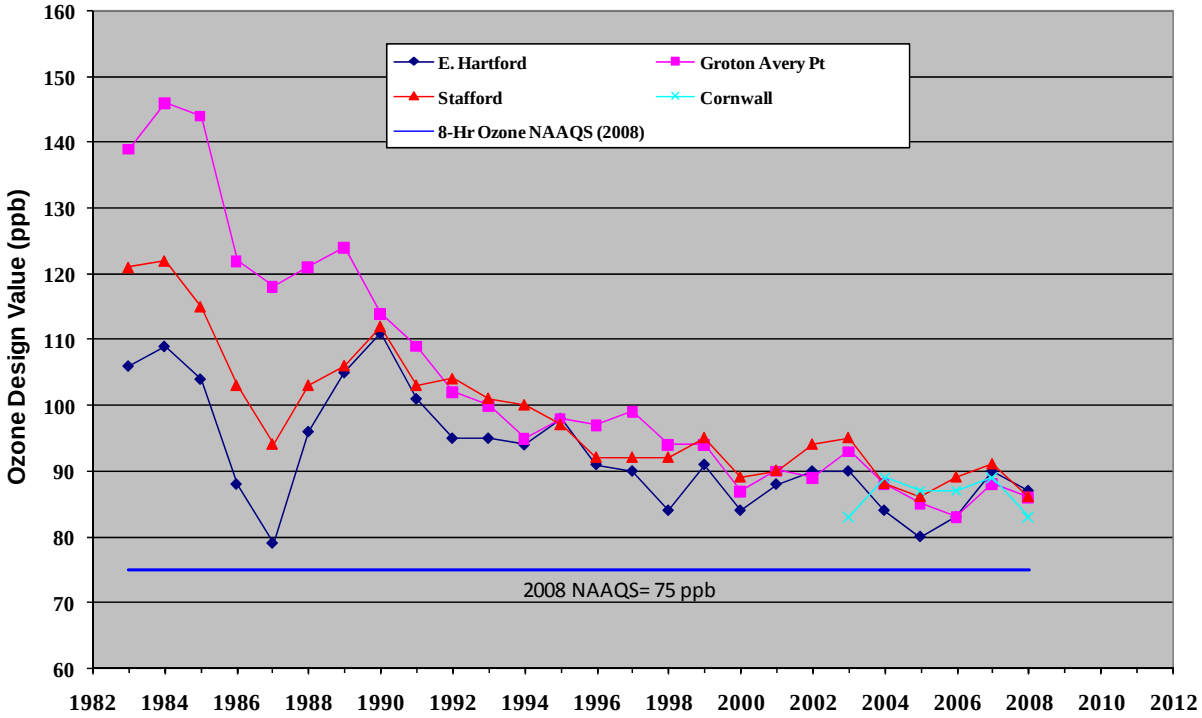


Figure 5. 8-Hour Ozone Design Value Trends for the Current Greater Connecticut Nonattainment Area



2.2 Factor 2: Emissions

Emissions data can be used as an indicator of the potential for an area to contribute to nearby observed violations. Estimates of 2005 ozone season precursor emissions for Connecticut counties are provided in Table 2. These county-level estimates of nitrogen oxides (NOx) and volatile organic compounds (VOC) emitted during the May-September summer ozone period were extracted from EPA's 2005 National Emissions Inventory (NEI), version 1.[6] Figures 6 and 7 provide a further breakdown NOx and VOC emissions, respectively, by source sector.

Table 2. NEI 2005 NOx and VOC Ozone Season Emissions for Connecticut Counties

County	Period	NOx (tons)	VOC (tons)
Fairfield	May- Sept	10,086	15,516
Hartford	May- Sept	9,142	13,290
Litchfield	May- Sept	1,618	4,861
Middlesex	May- Sept	2,861	3,842
New Haven	May- Sept	8,086	14,663
New London	May- Sept	4,261	8,031
Tolland	May- Sept	1,492	2,500
Windham	May- Sept	1,366	2,613
State Total		**38,913**	**65,317**

The on-road mobile source sector is the largest contributor to total NOx emissions in all counties, while the non-EGU stationary source sector is the largest contributor to total VOC emissions in all counties. Connecticut's three most populated urban counties (Fairfield, Hartford and New Haven) produce the highest levels of ozone precursor emissions. Conversely, Connecticut's more rural counties (Litchfield, Middlesex, Tolland and Windham) produce much lower emissions of NOx and VOC. The relatively low level of emissions in Litchfield and Middlesex Counties is not determinative for area designations and supports flexibility in assigning these counties to either a New York City-based or a Hartford-based nonattainment area.

[6] See: http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

Figure 6. NEI 2005 v.1 NOx Ozone Season Emissions for Connecticut Counties

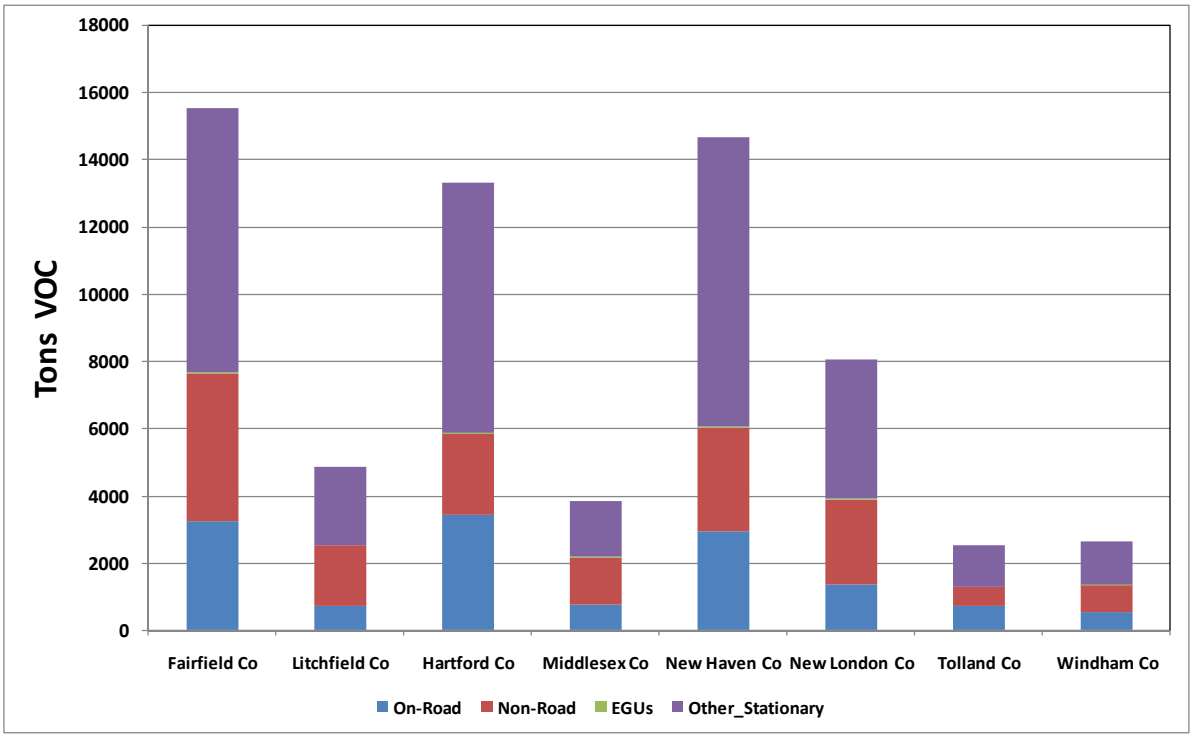
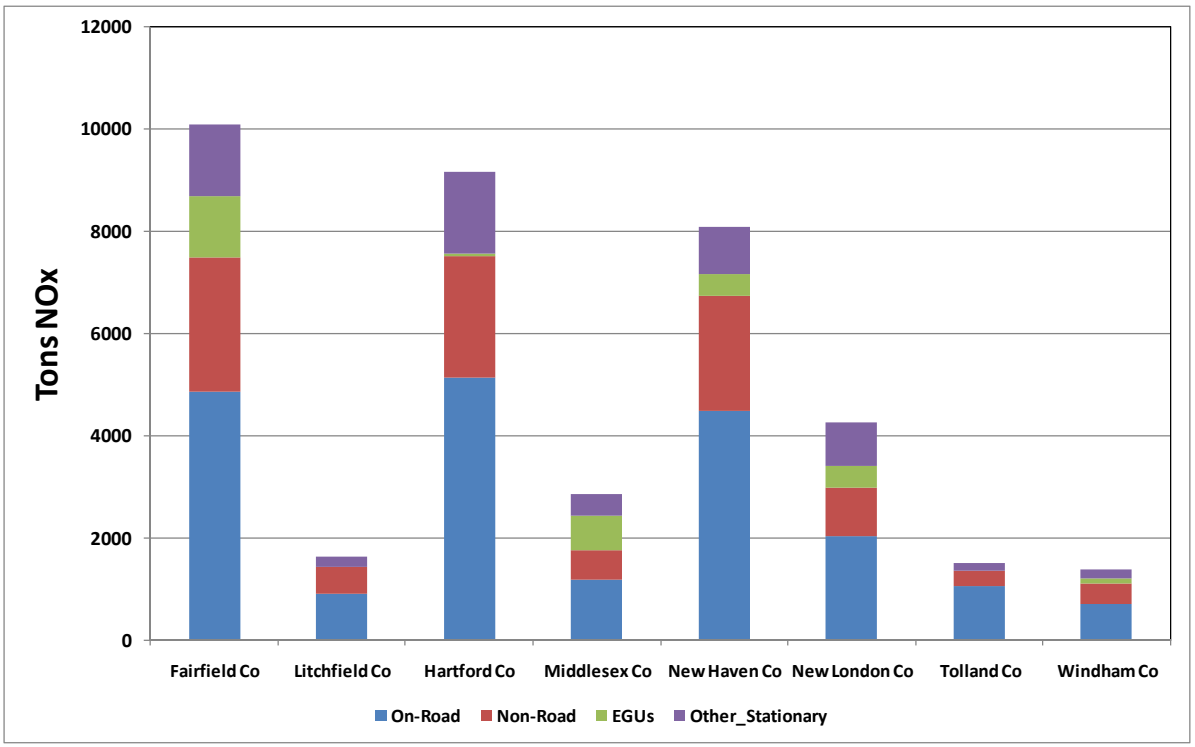


Figure 7. NEI 2005 v.1 VOC Ozone Season Emissions for Connecticut Counties



2.3 Factor 3: Population and Population Density

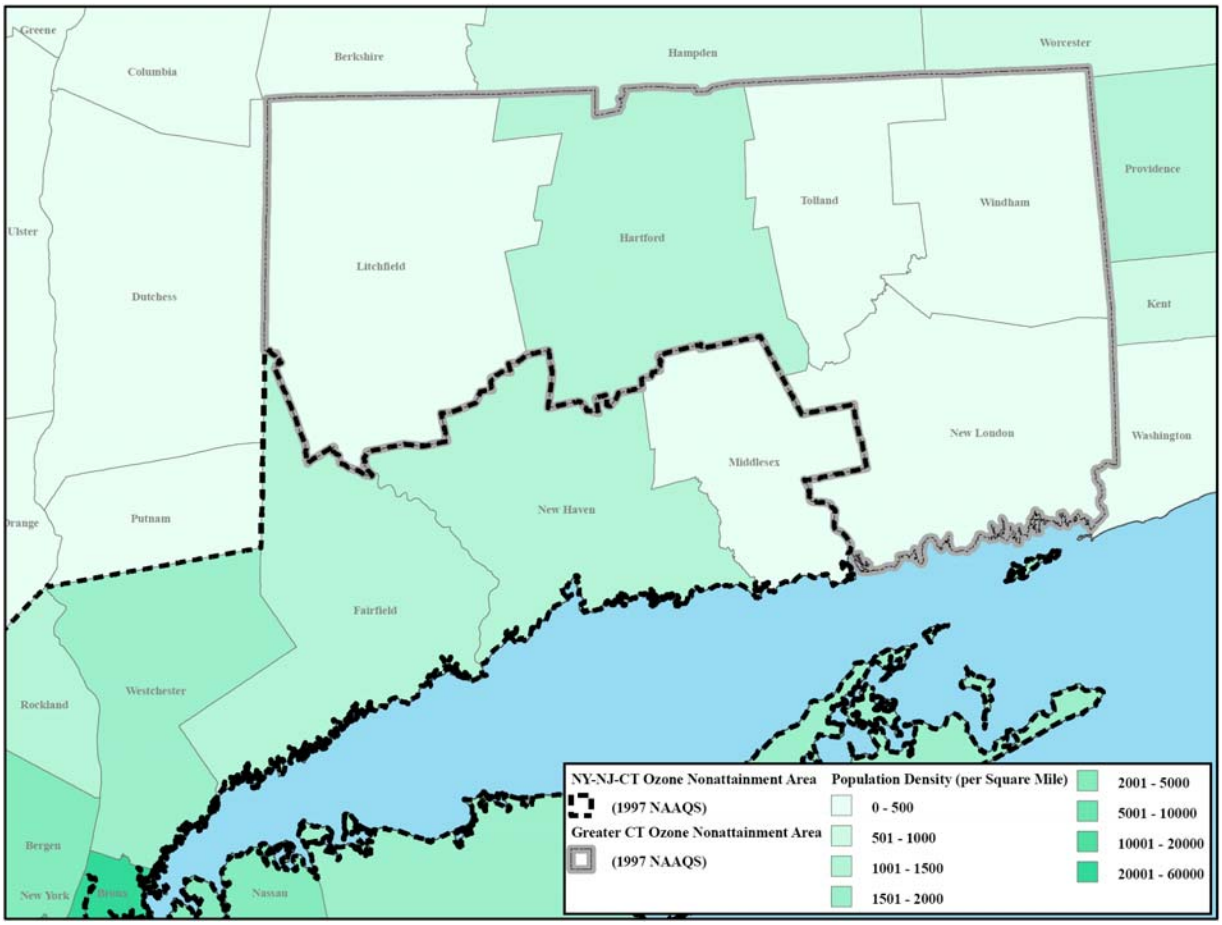
Population data indicate the likelihood of population-based emissions that might contribute to violations. The data in Table 3 shows that both the highest population and the highest population densities in Connecticut occur in Fairfield, Hartford and New Haven Counties, with much lower population and densities in the other five, more rural counties. Note that Litchfield County has the lowest population density of any Connecticut county, with less than 15% of the density of either Fairfield or New Haven Counties. The 2005 population densities for Connecticut and the surrounding area are set out in Figure 8. Portions of New York City have population densities more than 100 times that of Litchfield County. The low population of Litchfield County supports allowing flexibility when assigning the county to a nonattainment area.

Table 3. 2006 Population and Population Densities for Connecticut Counties[7]

County	2006 Population	2006 Population Density (population/square mile)
Fairfield	900,440	1439
Hartford	876,927	1192
Litchfield	190,119	207
Middlesex	163,774	444
New Haven	845,244	1396
New London	263,293	395
Tolland	148,140	361
Windham	116,872	228
State Total	**3,504,809**	**723**

[7] See: http://quickfacts.census.gov/qfd/states/09000.html

Figure 8. Population Densities for Connecticut and Surrounding Counties



2.4 Factor 4: Traffic and Commuting Patterns

Table 4 provides data[8] for annual vehicle miles traveled (VMT) and the daily commuting patterns between Connecticut counties and the existing NY/NJ/CT and Greater Connecticut 8-hour ozone nonattainment areas.[9] Annual VMT totals are highest in Fairfield, New London and Hartford Counties, reflecting the higher population densities in those counties.

[8] Table 4 data were obtained from technical analyses performed in support of EPA's designations for the 2006 24-Hour PM2.5 NAAQS. See: http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#B.

[9] The existing NY/NJ/CT nonattainment area is comprised of the following counties. New Jersey Counties: Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union, Warren; New York Counties: Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester; Connecticut Counties: Fairfield, New Haven, Middlesex. The existing GrCT nonattainment area is comprised of Connecticut Counties: Hartford, Litchfield, New London, Tolland, Windham.

Table 4. Year 2005 VMT and Year 2000 Commuting Data for Connecticut Counties

County	2005 VMT (10^6 Miles)	Commutes to Existing NY/NJ/CT Non-Att Area	Commutes to Existing GrCT Non-Att Area	Total Commutes	% of Commutes to Existing NY/NJ/CT Non-Att Area	% of Commutes to Existing GrCT Non-Att Area
Fairfield	7,649	409,472	5,638	419,237	97.7%	1.3%
Hartford	7,951	31,888	364,479	403,863	7.9%	90.2%
Litchfield	1,557	27,239	65,220	93,934	29.0%	69.4%
Middlesex	1,786	56,144	23,818	80,715	69.6%	29.5%
New Haven	6,948	353,307	32,182	388,050	91.0%	8.3%
New London	3,181	7,410	118,521	129,553	5.7%	91.4%
Tolland	1,660	2,932	66,362	71,434	4.1%	92.9%
Windham	1,160	936	47,147	54,037	1.7%	87.2%
Totals	**31,892**	**889,328**	**723,367**	**1,640,823**	**54.2%**	**44.1%**

Commuting patterns show that Fairfield, New Haven and Middlesex Counties in Connecticut have the greatest total and percentage of commuters into the existing NY/NJ/CT nonattainment area. Although 29% of Litchfield County residents' commutes are to the existing NY/NJ/CT nonattainment area, the vast majority of the commutes (i.e., 69%) are made into the existing Greater Connecticut nonattainment area. Similarly, the majority of commutes from Middlesex County and New London County are to the existing NY/NJ/CT and Greater Connecticut nonattainment areas, respectively. These commuting patterns support retaining the existing 8-hour nonattainment boundaries for the revised ozone NAAQS.

2.5 Factor 5: Growth Rates and Patterns

Table 5 summarizes U.S. Census Bureau population estimates for 2000-2007.[10] Overall, population growth in Connecticut during the period was 2.6%, with the most populous urban counties (Fairfield, Hartford and New Haven) growing at rates less than the state average. The more rural Middlesex, Windham and Tolland Counties show the greatest percentage increases, at two to three times the State average. The fastest growing counties, Tolland and Windham, are located in northeast Connecticut. Litchfield County shows a population growth of 3.1%, slightly above the state average. The three most populous counties, Fairfield, Hartford and New Haven, are clearly set out from the remaining counties in Figure 9, although the slight differences in growth rates identified in Table 5 are difficult to discern due to the scale of the graph.

Growth rates for Connecticut and most nearby Northeast states are expected to remain relatively flat for the foreseeable future, according to projected population data released by the U.S. Census Bureau[11] (see Figure 10). Connecticut's population is projected to increase by about 5% over the period from 2005 to 2030, comparable to the growth predicted in nearby states, except New Jersey, which is expected to grow by about 12% over the period.

[10] http://www.census.gov/popest/counties/CO-EST2007-01.html
[11] See Table 6 at: http://www.census.gov/population/www/projections/projectionsagesex.html.

Table 5. U.S. Census Bureau Population Growth Estimates

	U.S. Census Bureau Annual Population Estimates								
County	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**% Change**
Fairfield	884,614	888,924	892,470	894,976	895,798	895,169	893,987	895,015	**1.2**
Hartford	858,500	861,558	865,378	869,645	869,868	872,242	874,570	876,824	**2.1**
Litchfield	182,622	183,971	185,655	186,791	187,794	187,861	188,360	188,273	**3.1**
Middlesex	155,616	157,055	159,230	160,827	161,455	162,123	163,372	164,150	**5.5**
New Haven	825,032	828,747	833,105	838,485	840,191	841,779	843,441	845,494	**2.5**
New London	259,549	260,956	263,070	265,329	266,918	265,504	268,206	267,376	**3.0**
Tolland	136,856	138,741	141,996	144,498	145,879	146,577	147,454	148,139	**8.2**
Windham	109,201	109,818	110,963	112,413	113,987	115,235	116,363	117,038	**7.2**
Connecticut Total	**3,411,990**	**3,429,770**	**3,451,867**	**3,472,964**	**3,481,890**	**3,486,490**	**3,495,753**	**3,502,309**	**2.6**

Figure 9. U.S. Census Bureau Population Estimates for Connecticut Counties 2000-2007

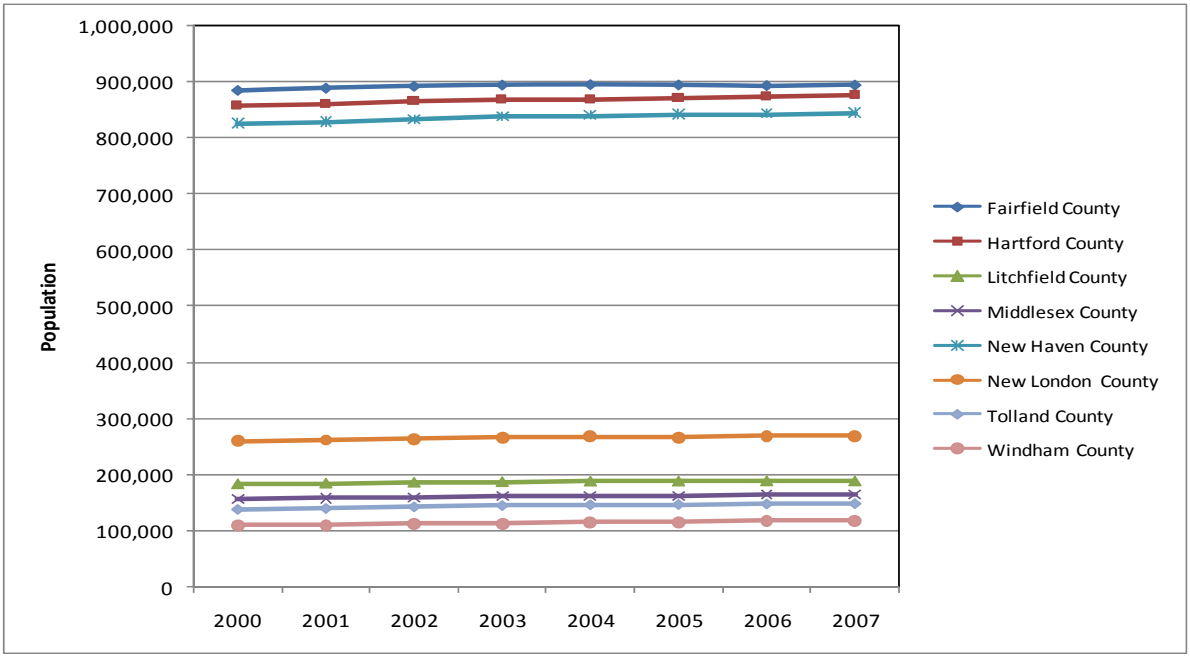
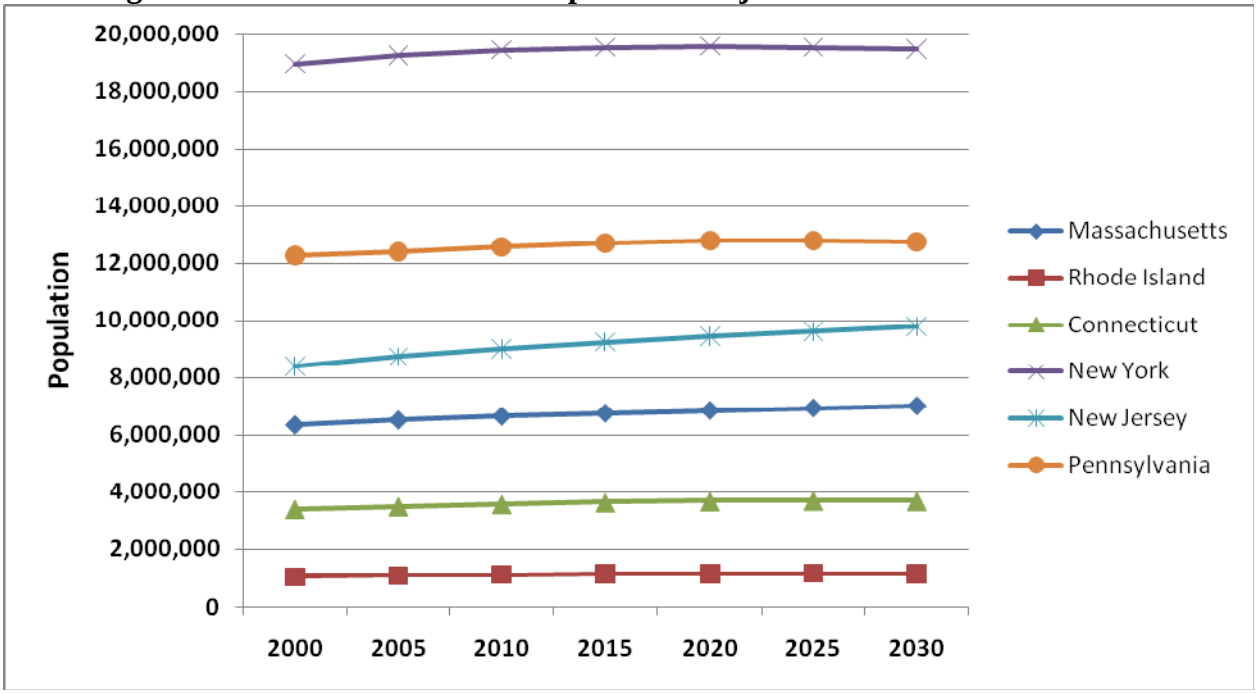


Figure 10. U.S. Census Bureau Population Projections for Northeast States[12]



Projected VMT is another aspect of growth that may bear on area boundaries. Connecticut Department of Transportation projections[13] of daily VMT on Connecticut roads are summarized in Table 6 for the 2002 through 2012 period. Future VMT growth is not expected to exceed 1% annually for all but Tolland and New London Counties, which are forecast to grow at slightly higher rates not exceeding 1.6% annually. Given the relative and consistent low rates of VMT growth throughout Connecticut, that aspect of growth is not determinative of area boundaries.

Table 6. CTDOT VMT Projections Through 2012 (miles traveled per summer day)

County	2002	2008	2009	2012	Avg Annual Growth % 2008-2012
Fairfield	22,473,990	23,758,281	23,964,492	24,537,525	**0.8%**
Hartford	23,438,693	25,453,988	25,728,832	26,449,411	**1.0%**
Litchfield	4,231,315	4,537,429	4,591,780	4,714,207	**1.0%**
Middlesex	5,205,681	5,537,734	5,602,984	5,763,574	**1.0%**
New Haven	20,739,814	22,120,300	22,337,635	22,920,844	**0.9%**
New London	9,066,405	10,052,269	10,225,010	10,705,140	**1.6%**
Tolland	4,497,778	4,848,680	4,907,363	5,094,796	**1.3%**
Windham	3,191,455	3,466,501	3,507,841	3,607,614	**1.0%**
State Total	**92,845,131**	**99,775,182**	**100,865,937**	**103,793,111**	**1.0%**

[12] http://www.census.gov/population/projections/PressTab6.xls
[13] Series 28D projections provided by CTDOT Bureau of Policy and Planning (March, 2007)

2.6 Factor 6: Meteorology

Meteorology is a significant factor in CTDEP's nonattainment area designations. In sum, ozone precursors transported from the south and west contribute significantly to Connecticut's ozone exceedance days. The meteorological basis for the common ozone transport regimes and the relationship between wind direction and ozone concentration are summarized here.

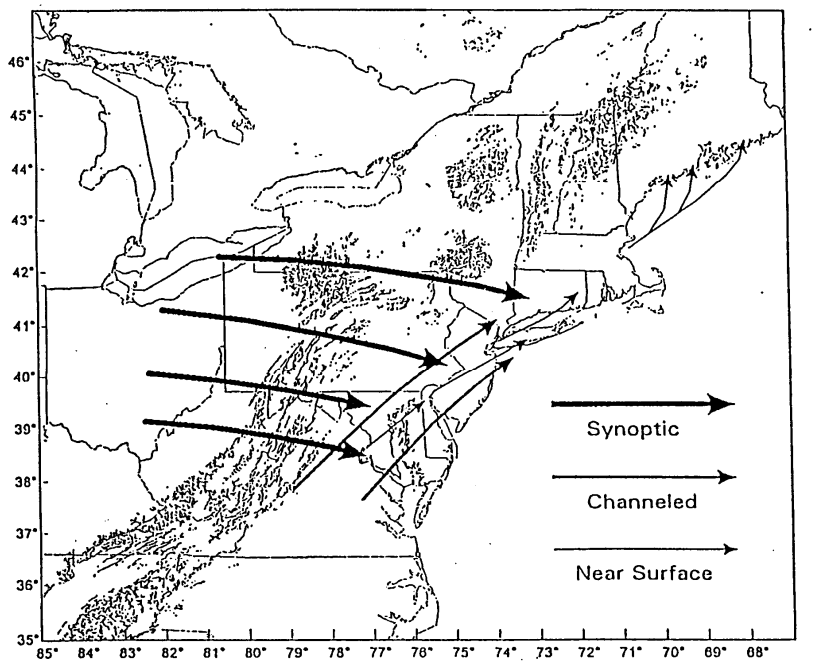
Conceptual Description of the Ozone Problem[14]

Ozone exceedances in Connecticut can generally be classified into four categories based on spatial patterns of measured ozone and the contributing meteorological conditions. Typically, most exceedances occur on sunny summer days with inland maximum surface temperatures approaching or above 90°F, surface winds from the south and west (favorable for transport of pollutants up the Northeast Corridor), and aloft winds from the west-southwest to west-northwest (favorable for transport of pollutants from Midwest power plants). Figure 11 shows typical ozone transport regimes experienced in the northeast. Four common transport regimes affecting Connecticut are the following.

- **Inland-only Exceedances:** Ozone is transported aloft from the west and mixed down to the surface as daytime heating occurs. At times, transport from the southwest can also occur overnight at lower levels aloft due the formation of a nocturnal jet. Strong southerly surface winds during the day bring in clean maritime air from the Atlantic Ocean, resulting in relatively low ozone levels along the coast. The maritime front may not penetrate very far inland, allowing transported and local pollutants to contribute to inland exceedances.
- **Coastal-only Exceedances:** Strong westerly surface winds transport dirty air down Long Island Sound from source regions to the west (e.g., New York and New Jersey). The relatively cool waters of Long Island Sound confine the pollutants in the shallow and stable marine boundary layer. Afternoon heating over coastal land creates a sea breeze with a southerly component, resulting in ozone exceedances along the coast. Inland winds from the west prevent sea breeze penetration and can sometimes contribute to the formation of a convergence zone that can further concentrate ozone along the coast.
- **Western Boundary-only Exceedances:** Southerly maritime surface flow invades the eastern two-thirds of Connecticut, keeping ozone levels in that portion of the state clean. The south-southwest urban winds out of New York City result in exceedances along Connecticut's western boundary. Winds aloft are often weak for this scenario.
- **Statewide Exceedances:** This is the classical worst-case pattern, with flow at the surface in the Northeast up the Interstate-95 corridor, transport at mid-levels also from the southwest via the low level jet and flow at upper levels from the west. All of these flows are from emission-rich upwind areas, serving to transport ozone precursors and previously formed ozone into Connecticut.

[14] For a more detailed discussion, see *Connecticut's 8-Hour Ozone Attainment Demonstration Technical Support Document*, February 1, 2008, available at http://www.ct.gov/dep/lib/dep/air/regulations/proposed_and_reports/section_2.pdf and *The Nature of the Ozone Air Quality Problem in the Ozone Transport Region: A Conceptual Description*, NESCAUM, October 2006, available at http://www.ct.gov/dep/lib/dep/air/regulations/proposed_and_reports/app2a.pdf .

Figure 11. Typical Ozone Transport Regimes for the Northeast States



Transport Regimes Observed During NARSTO-Northeast

Long-range (synoptic scale) transport occurs from west to east across the Appalachian Mountains. Regional scale transport in channeled flows also occurs from west to east through gaps in the Appalachian Mountains and in nocturnal low level jets from southwest to northeast over the Northeast Corridor. Daytime sea breezes can affect local coastal areas by bringing in air pollution originally transported near the surface across water parallel to the coast (e.g., along the Maine coastline)[15].

Pollution Frequency Plots

Figures 12 and 13, respectively, provide ozone concentration/wind direction frequency plots for coastal and inland monitoring sites in Connecticut.[16] Each of these pollution wind roses depicts ozone season wind frequencies for all hours (in blue) and for the hours with the highest 10% of measured ozone concentrations (in red).

For all monitoring locations, the vast majority of high ozone days occur when winds are from the southwest quadrant. At coastal locations, the peak ozone wind direction has a more southerly component at the western monitors (Greenwich and Westport) and a more westerly component at the eastern monitors (Madison and Groton), in all cases pointing back to emission rich regions such as the New York City area and the Northeast's Interstate-95 corridor.

[15] NARSTO. *An Assessment of Tropospheric Ozone Pollution*. NARSTO, July 2000.
[16] These ozone pollution wind roses were compiled from 1997-2005 data by Tom Downs, Maine DEP 2006.

Figure 12. Ozone Concentration/Wind Direction Frequency Plots for Coastal Connecticut Monitoring Sites

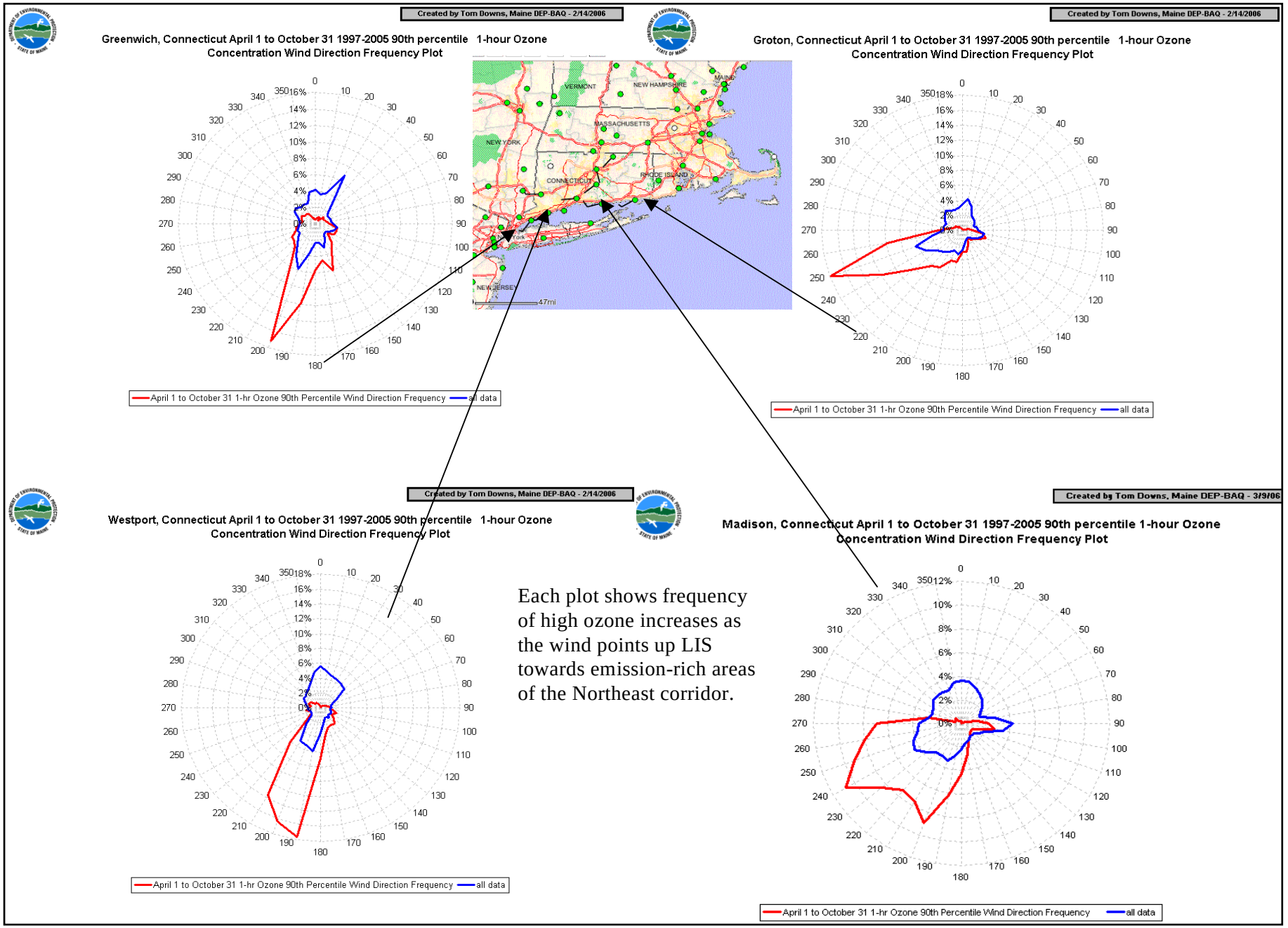
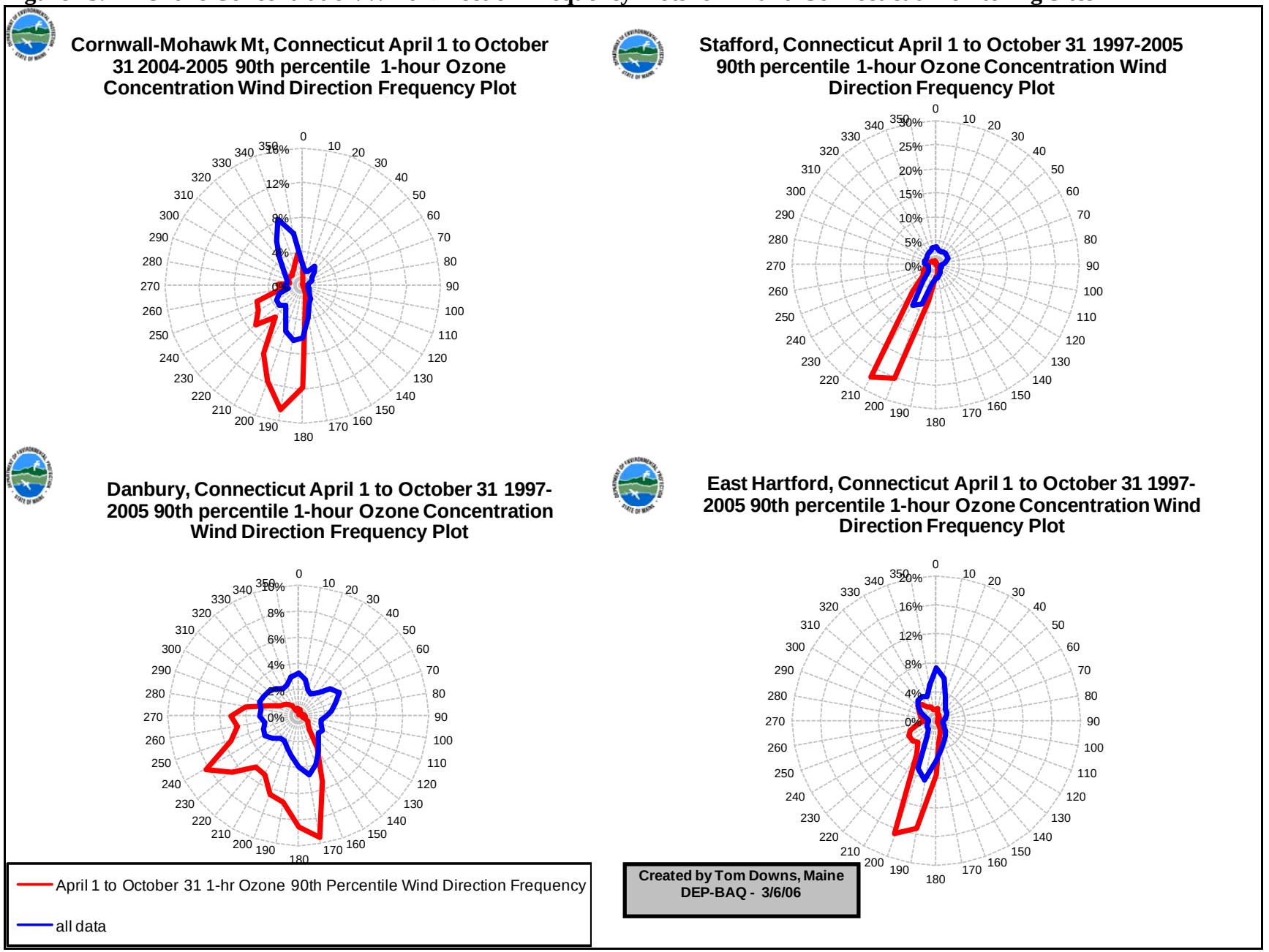


Figure 13. Ozone Concentration/Wind Direction Frequency Plots for Inland Connecticut Monitoring Sites



In summary, the effects of meteorology suggest the highest ozone levels in Connecticut are enhanced significantly from sources outside of Connecticut, especially on hot summer days with air flow from the west and southwest when most exceedances occur. Pollution wind roses indicate that emissions of ozone precursors from inland area such as Litchfield County do not have a significant impact on ozone monitors in the current NY/NJ/CT nonattainment area. These meteorological considerations result in higher design values in Fairfield, New Haven and Middlesex compared to the more inland counties of Greater Connecticut, supporting retention of the existing 8-hour nonattainment boundaries for the revised ozone NAAQS.

2.7 Factor 7: Geography/Topography

Connecticut is a small state geographically, with topographical features that do not have a significant effect on airshed boundaries. This factor does not play a role in determining ozone nonattainment area boundaries.

2.8 Factor 8: Jurisdictional Boundaries

A variety of jurisdictional issues should be considered when determining appropriate nonattainment boundaries for the revised 8-hour ozone NAAQS.

- **Existing Nonattainment Area Boundaries:** As depicted in Figure 1, the entire State of Connecticut is currently classified as nonattainment for the 1997 8-hour ozone NAAQS. Fairfield, New Haven and Middlesex Counties are included as the Southwest Connecticut portion of the NY/NJ/CT nonattainment area, which is also comprised of several southern New York and northern New Jersey counties in the New York City metropolitan area. Connecticut's remaining five counties are included in the Greater Connecticut nonattainment area. As discussed above, there is no compelling technical evidence to support a change in nonattainment boundaries.

- **Alternative NECTA Boundaries:** In addition to the county based CSA/CBSA's that EPA identifies as the presumptive nonattainment boundaries (see Figure 2), NECTAs are available as an alternate set of statistical areas for the New England states. The NECTA classification scheme recognizes towns as a more important level of government than counties in the New England region.

  The NECTA classifications for Connecticut[17] support retention of the current ozone nonattainment boundaries. The Hartford-West Hartford-Torrington Combined NECTA (comparable to a county-based CSA) extends to six towns in Litchfield County, including the Torrington Micropolitan NECTA. Torrington is the most populous municipality in Litchfield County. Based on NECTA classifications, it is appropriate to retain Litchfield County in the Greater Connecticut ozone nonattainment area.

[17] See: http://www.whitehouse.gov/omb/assets/omb/bulletins/fy2009/09-01.pdf.

CTDEP also prefers to retain New London County in the Greater Connecticut nonattainment area rather than establishing a separate New London County nonattainment area. Although the NECTA scheme identifies a Norwich-New London NECTA, which includes the bulk of towns in New London County, the Hartford-West Hartford-Torrington Combined NECTA does include two towns from New London County (Colchester and Lebanon).

Finally, the Bridgeport-New Haven-Stamford Combined NECTA includes eight Middlesex County towns. Most of these towns are located near the Long Island Sound shoreline, where some of the highest ozone events occur. It makes sense to continue to include Middlesex County, along with Fairfield and New Haven Counties, as part of the NY/NJ/CT nonattainment area to directly link Connecticut's highest measuring monitors to the emission rich region around New York City, where a significant portion of Connecticut's measured ozone originates.

- **Transportation Conformity Process:** The current transportation conformity process is implemented using budgets developed using the nonattainment boundaries established for the 1997 ozone NAAQS. The consultation mechanisms in place between CTDEP, the Connecticut Department of Transportation and the numerous metropolitan planning organizations are based on these boundaries and work fairly well. It is desirable, both from an administrative and air quality perspective, to minimize any disruption to the existing process, especially during the transition phase before new conformity budgets can be established for the 2008 NAAQS.

- **CTDEP Regulatory Process:** Historically, CTDEP has elected to adopt regulatory control requirements on a statewide basis, rather than requiring different levels of control based on nonattainment boundaries or severity. CTDEP expects to continue this general practice into the future. Given that the entire state is recommended for a nonattainment designation for the 2008 ozone NAAQS, it makes little difference from a regulatory perspective where the boundary between the two nonattainment areas is assigned.

2.9 Factor 9: Level of Control of Emission Sources

CTDEP's recommendations for 8-hour ozone NAAQS designations are based on monitored design values from the 2006-2008 period. Final designations to be made by EPA will likely rely on monitored data from the 2007-2009 period. CTDEP's nine-factor analysis was prepared using 2005 emission estimates developed by EPA for the 2005 NEI version 1. Emission control programs implemented nationally and in Connecticut since 2005 have, and will continue to produce ozone reductions over the next several years. As explained in Section 2.8, Connecticut's emission control programs apply statewide, making no distinction among nonattainment areas. Therefore, this factor does not influence CTDEP's recommended designations for the 8-hour ozone NAAQS.

3.0 Conclusions

Considering the above nine factors together, CTDEP recommends that Fairfield, New Haven and Middlesex Counties be designated as nonattainment for the 2008 8-hour ozone NAAQS as part of a multi-state NY/NJ/CT nonattainment area, and the remaining five counties in Connecticut be designated as nonattainment as part of a Greater Connecticut nonattainment area (see Figure 14). These recommended designations and boundaries are identical to those of the existing nonattainment areas established by EPA for the 1997 8-hour ozone NAAQS. CTDEP's recommended area boundaries are influenced largely by air quality data, commuting patterns, meteorology, jurisdictional boundaries and administrative efficiencies.

Figure 14. Map of Connecticut's Recommendation for the 2008 8-hour Ozone NAAQS Nonattainment Boundaries