Technical Basis for Designating Areas in New Jersey for Nonattainment for the 2015 8-hour Ozone National Ambient Air Quality Standard of 70 Parts Per Billion

Prepared by the
New Jersey Department
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Protection

November 2016

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Section 1: Introduction

The United States Environmental Protection Agency (EPA) revised the National Ambient Air Quality Standard (NAAQS) for Ozone on October 1, 2015.[1] The primary 8-hour ozone standard was lowered from 75 parts per billion (ppb) to 70 ppb. The secondary standard was strengthened to make it equal to the primary standard. According to Section 107(d)(1)(A) of the federal Clean Air Act (42 U.S.C. §7407 (d)(1)(A)), states have one year from the time the new standard is promulgated to submit a recommendation for designating nonattainment areas to the EPA for consideration. The EPA then has one year to issue the final nonattainment area designations.

The EPA issued guidance for determining the boundaries of ozone nonattainment areas on February 25, 2016.[2] The analysis is based on an evaluation of the following five factors:

1. Air quality data
2. Emissions and emissions-related data
3. Meteorology
4. Geography/topography
5. Jurisdictional boundaries

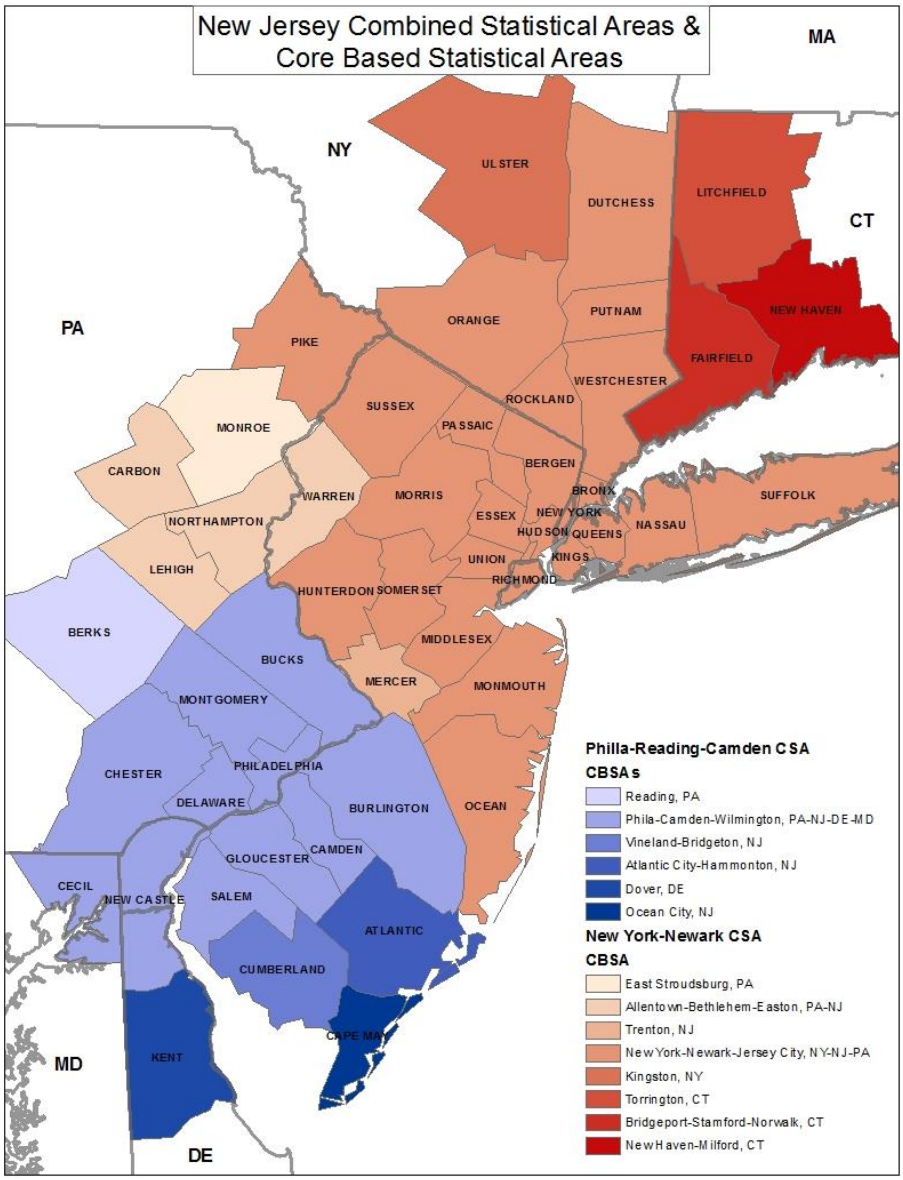
Previously, the EPA finalized attainment/nonattainment designations for the 2008, 75 ppb 8-hour ozone NAAQS in April 2012. Under that standard, the entire state of New Jersey is designated nonattainment and is associated with two multi-state nonattainment areas: the New York-Northern New Jersey-Long Island (NY-NJ-CT) nonattainment area and the Philadelphia-Wilmington-Atlantic City (PA-NJ-DE-MD) nonattainment area. The NY-NJ-CT nonattainment area includes the New Jersey counties of: Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union, and Warren. The PA-NJ-DE-MD nonattainment area includes the New Jersey counties of: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Ocean, and Salem.

A five factor analysis is initiated if a monitor measures air quality above the standard and is used to analyze whether nearby areas contribute emissions to a violating area. The EPA default size for determining the boundary of the nonattainment area is the Combined Statistical Area (CSA)[3]

[1] 80 Fed. Reg. 65292 (October 26, 2015).
[2] Memorandum from Janet G. McCabe, Acting Assistant Administrator on "Area Designations for the 2015 Ozone National Ambient Air Quality Standards." (February 25, 2016).
[3] The United States Office of Management and Budget (OMB) defines a combined statistical area (CSA) as an aggregate of adjacent core based statistical areas that are linked by commuting ties. A complete list of the counties within a CSA can be found at http://www.whitehouse.gov/sites/default/files/omb/assets/fedreg_2010/06282010_metro_standards-Complete.pdf

or, where appropriate, the Core Based Statistical Area (CBSA)[4]. A CSA includes two or more adjacent CBSAs. A state can recommend a different size for its nonattainment area if its five factor analysis shows that areas outside the CSA are contributing to a violation of the NAAQS within the area exceeding the NAAQS. A map of the current CSAs for New Jersey is shown in Figure 1.

Figure 1: Map of New Jersey's Combined Statistical Areas and Core Based Statistical Areas



[4] The United States Office of Management and Budget (OMB) defines a core based statistical area (CBSA) as one or more adjacent counties or county-equivalents having at least one urban cluster of at least 10,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties.

A state can recommend a larger or smaller sized-area for the nonattainment area boundaries compared to the CSA based on the five factor analysis of nearby areas that are or are not contributing to the violation of the NAAQS. New Jersey considered the size of the existing ozone nonattainment areas in its analysis to determine if there should be any changes to these areas due to current data. It was determined that the size of the existing nonattainment area does not adequately capture the nearby areas contributing to ozone nonattainment in New Jersey.

The Clean Air Act definition of a nonattainment area is any area that violates the NAAQS as well as any nearby area that contributes to the violation of the NAAQS. It is understood that the Clean Air Act's section 107(d) provides the EPA with discretion to determine how best to interpret the terms ''contributes to'' and ''nearby'' in the definition of a nonattainment area for a new or revised NAAQS.[5] While it has been the long-standing practice of the EPA to limit the size of the ozone nonattainment area based upon what constitutes ''contribution'' or ''nearby'' for purposes of designations to a CBSA or CSA sized area, the statute permits the EPA to evaluate the appropriate application of these terms as may be appropriate for a particular NAAQS. Given the amount of contribution to New Jersey's ozone levels that is transported from other nearby states into New Jersey, it is appropriate for the EPA to interpret the size of the nonattainment area as being larger than previously established in the past.

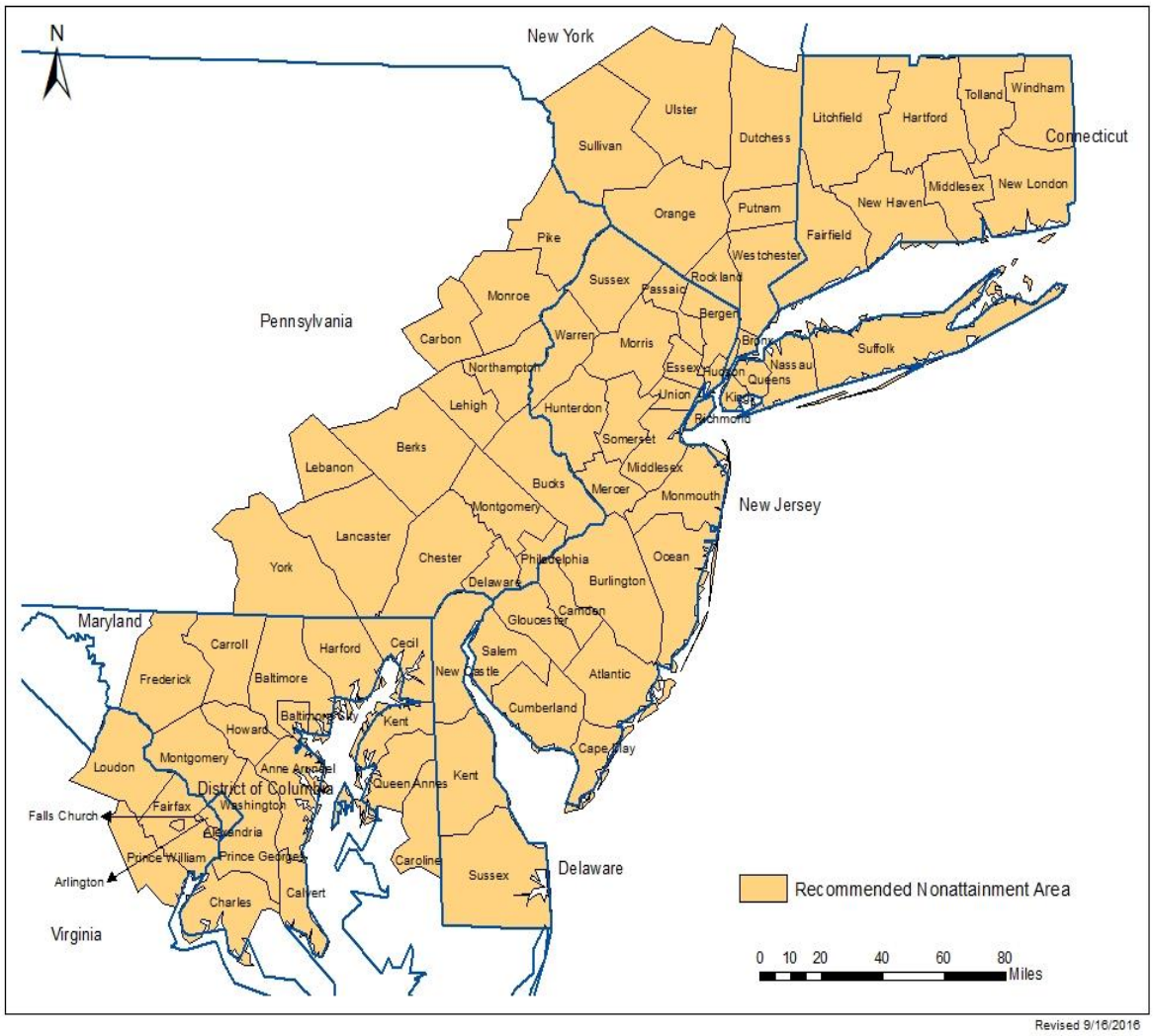
Recent court rulings uphold the EPA's ability to set a larger-sized nonattainment area. Specifically, the court stated that EPA has the ability to set a larger-than-CSA-sized area if a proper five factor analysis is presented.[6] New Jersey's recommendation encompasses certain counties within six (6) states (Connecticut, New York, Pennsylvania, Delaware, Maryland and Virginia) and the District of Columbia that are "nearby" New Jersey. The specific counties were chosen for the following reasons: the areas 1) are within the prevailing wind patterns associated with high ozone levels in New Jersey; 2) measured air quality in violation of the 70 ppb ozone NAAQS; and, 3) are located "nearby" and have significant sources of emissions contributing to those violations.

New Jersey is recommending a nonattainment area that extends from the Washington, D.C. Metropolitan Area to the State of Connecticut, and includes all of the counties in New Jersey's Combined Statistical Areas (CSA) and Core Based Statistical Areas (CBSA), as well as, all of the counties currently not attaining or contributing to violations of the ozone NAAQS within the area mentioned above. Ozone levels within New Jersey's southern CSA are heavily influenced by emissions occurring in the Washington, D.C. and Baltimore metropolitan areas. Similarly, New Jersey's emissions, as well as, Pennsylvania's emissions are influencing ozone levels in Connecticut. A map of New Jersey's recommended nonattainment area, referred to as "recommended nonattainment area" throughout the document, is shown in Figure 2.

[5] This view was confirmed in Catawba County v. EPA, 571 F.3d 20 (D.C. Cir. 2009).

[6] Miss. Comm'n on Envtl. Quality v. EPA, 790 f. 3d 138, 160 (D.C. Cir. 2015), page 21 stated "Hence, the petitioners did not show that the agency "will not enlarge a nonattainment area in response to" the (current) five factor analysis, PADEP, 429 F.3d at 1130. Rather, the States' analyses were simply insufficient to overcome the agency's definitional presumption" of the default CSA-sized nonattainment area being appropriate.

Figure 2: New Jersey's Recommended Nonattainment Area for the 2015 Ozone National Ambient Air Quality Standard



Section 2: Five Factor Analysis for New Jersey's Recommended Ozone Nonattainment Area

Section 2-1: Factor 1 - Air Quality Data

The air quality analysis is an examination of ozone air quality monitoring data, including the design value calculated for each area based on air quality data for a 3-year period. Design values for 2013-2015 were analyzed for this five factor analysis per EPA guidance. Preliminary design values for 2014-2016 were included due to the high level of ozone seen in New Jersey and nearby areas during the 2016 ozone season. The monitoring data for the 2016 ozone season is preliminary and has not been quality-assured and certified at this time.

Table 1 shows a summary of ozone air quality monitoring data in New Jersey for the 2015 ozone season. This table shows that New Jersey is not attaining the 70 ppb ozone NAAQS in both the northern and southern portions of the State.

Table 1: Summary of New Jersey Ozone Monitors (2015 Ozone Season)

	4th Max	4th Max	4th Max	Design Value
Site Name	**2015**	**2014**	**2013**	**2013-2015**
Bayonne	77	72	66	71
Chester	70	68	73	70
Columbia	66	60	61	62
Flemington	73	65	73	70
Leonia	76	73	74	74
Monmouth University	77	64	71	70
Newark Firehouse	72	70	69	69
Ramapo	71	65	69	69
Rutgers University	77	71	70	72
Ancora State Hospital	72	68	68	69
Brigantine	64	61	70	66
Camden Spruce St	79	68	65	70
Clarksboro	76	70	73	73
Colliers Mills	75	72	70	72
Millville	68	67	61	65
Rider University	73	71	70	71
Washington Crossing	75	71	69	71

Source: EPA AirData. Tables of 8-Hour Average Data.
http://aqsdr1.epa.gov/aqsweb/aqstmp/airdata/download_files.html

Of the 17 monitors shown in Table 1, seven measured design values above the 2015 70 ppb ozone NAAQS. The Leonia monitor located in Bergen County has the highest design value of 74 ppb.

Design values for 2013-2015 and preliminary 2014-2016 were analyzed for all sites in the recommended nonattainment area counties. These areas include counties in the following states: Connecticut (CT), New York (NY), Pennsylvania (PA), Delaware (DE), Maryland (MD), District of Columbia (D.C.) and Virginia (VA). Table 2 shows these design values.

Table 2: Ozone Design Values for Monitoring Sites within the Recommended Nonattainment Area (Design values > 70 ppb are highlighted in orange).

Site ID	County	Site Name	Ozone 2013 - 2015 Design Value (ppb)	Preliminary Ozone 2014 - 2016[7] Design Value (ppb)
090010017	Fairfield, CT	Greenwich	81	82
090011123	Fairfield, CT	Danbury	76	78
090013007	Fairfield, CT	Stratford	83	81
090019003	Fairfield, CT	Westport	84	85
090090027	New Haven, CT	Criscuolo Park	76	76
090099002	New Haven, CT	Madison-Beach Rd	78	76
090031003	Hartford, CT	-	76	75
090050005	Litchfield, CT	-	70	74
090070007	Middlesex, CT	Middletown	80	79
090110124	New London, CT	-	75	72
090131001	Tolland, CT	-	76	73
090159991	Windham, CT	-	68	70
110010043	Washington DC, DC	McMillan		70
110010050	Washington DC, DC	Takoma Rec		70
100031007	New Castle, DE	New Castle (LUMS 2)	66	68
100031010	New Castle, DE	New Castle (BCSP)	69	72
100031013	New Castle, DE	New Castle (BELLFNT2)	68	70
100032004	New Castle, DE	New Castle (MLK)	69	70
100010002	Kent, DE	Kent (KILLENS)	65	66
100051002	Sussex, DE	Sussex (Seaford)	64	65
100051003	Sussex, DE	Sussex (LEWES)	69	69
240150003	Cecil, MD	Cecil (Fair Hill), MD	73	76
240030014	Anne Arundel, MD	-	69	60
240051007	Baltimore, MD	Padonia	71	72

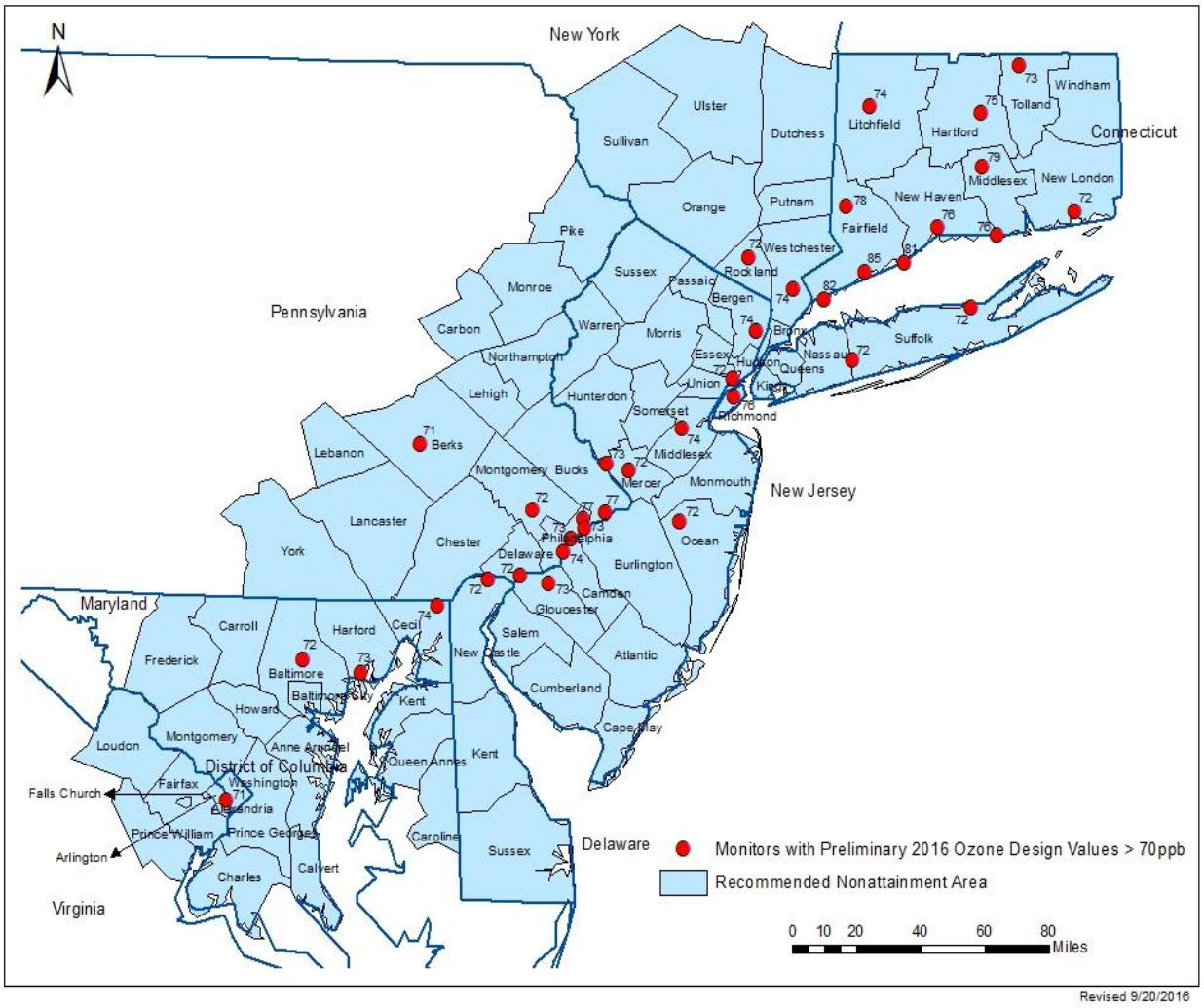
[7] All monitoring values for 2016 have not been quality assured, are preliminary, and are not official. These values are subject to change and are presented for informational purposes only.

Site ID	County	Site Name	Ozone 2013 - 2015 Design Value (ppb)	Preliminary Ozone 2014 - 2016[7] Design Value (ppb)
240053001	Baltimore, MD	Essex	69	72
245100054	Baltimore City, MD	-	65	69
240090011	Calvert, MD	-	68	69
240150003	Carroll, MD	-	67	68
240170010	Charles, MD	S. Maryland	68	69
240210037	Frederick, MD	Frederick Airport	67	66
240251001	Hardford, MD	Edgewood	71	73
240259001	Harford, MD	Aldino	70	73
240290002	Kent, MD	Millington	69	70
240313001	Montgomery, MD	Rockville	68	68
240330030	Prince Georges, MD	HU-Beltsville	68	69
240338003	Prince Georges, MD	PG Equest Center	69	71
240339991	Prince Georges, MD	Beltsville (CASTNET)	69	68
340010006	Atlantic, NJ	Brigantine	66	62
340030006	Bergen, NJ	Leonia	74	74
340070002	Camden, NJ	Camden Spruce St	70	74
340071001	Camden, NJ	Ancora State Hospital	69	68
340110007	Cumberland, NJ	Millville	65	67
340130003	Essex, NJ	Newark Firehouse	69	70
340150002	Gloucester, NJ	Clarksboro	73	73
340170006	Hudson, NJ	Bayonne	71	72
340190001	Hunterdon, NJ	Flemington	70	70
340210005	Mercer, NJ	Rider University	71	72
340219991	Mercer, NJ	Washington Crossing	71	73
340230011	Middlesex, NJ	Rutgers University	72	74
340250005	Monmouth, NJ	Monmouth University	70	70
340273001	Morris, NJ	Chester	70	69
340290006	Ocean, NJ	Colliers Mills	72	72
340315001	Passaic, NJ	Ramapo	69	69
340410007	Warren, NJ	Columbia	62	64
360050110	Bronx, NY	IS52	68	67
360050133	Bronx, NY	Pfizer Lab	70	70
360610135	New York, NY	Convent Av	66	69
360810124	Queens, NY	Queens	69	69
360850067	Richmond, NY	Susan Wagner	74	76
360870005	Rockland, NY	South Mountain Rd	71	72
361030002	Suffolk, NY	Babylon	72	72
361030004	Suffolk, NY	Riverhead	72	72

Site ID	County	Site Name	Ozone 2013 - 2015 Design Value (ppb)	Preliminary Ozone 2014 - 2016[7] Design Value (ppb)
361030009	Suffolk, NY	Holtsville	66	66
361192004	Westchester, NY	White Plains	73	74
360270007	Dutchess, NY	-	66	68
420170012	Bucks, PA	Bucks (BRIS)	75	77
420290100	Chester, PA	Chester (NEWG)	69	70
420450002	Delaware, PA	Delaware (CHES)	72	72
420910013	Montgomery, PA	Montgomery (NORR)	71	72
421010004	Philadelphia, PA	Philadelphia (LAB), PA	54	61
421010024	Philadelphia, PA	Philadelphia (NEA), PA	73	77
421010048	Philadelphia, PA	Philadelphia (NEW), PA	60	74
421011002	Philadelphia, PA	Philadelphia (BAX), PA	71	73
420110006	Berks, PA	Kutztown	63	66
420110011	Berks, PA	Reading Airport	69	71
420710007	Lancaster, PA	-	67	68
420710012	Lancaster, PA	-	65	
420750100	Lebanon, PA	Lebanon	71	71
420770004	Lehigh, PA	State Hospital	68	70
420890002	Monroe, PA	Swiftwater	63	66
4209500025	Northampton, PA	Allentown-Washington and Cambria	67	70
420958000	Northampton, PA	Allentown-17th and Spring Garden	65	69
421330008	York, PA	York	66	66
421330011	York, PA	York Downwind	68	70
510130020	Arlington, VA	-	70	71
510590030	Fairfax, VA	Lee District Park	68	69
511071005	Loudon, VA	-	66	66
511530009	Prince William, VA	-	65	65

As seen from Table 2, almost all of the monitors listed show a higher design value in 2016 than in 2015. In addition to the monitors that are already violated the standard, seven (7) additional monitors that were in attainment in 2015 in DE, MD, NJ, PA and VA violated the standard in 2016. Figure 3 shows that the monitors with preliminary 2016 design values above the 70 ppb standard are predominantly along the Interstate 95 corridor.

Figure 3: Monitored Design Values (2014 – Preliminary 2016) within New Jersey's Recommended Ozone Nonattainment Area Greater than 70 Parts per Billion



Section 2-2: Factor 2 - Emissions and Emissions-Related Data

The following sections show total estimated emission inventories (in tons per year) for the recommended nonattainment area.[8]

Factor 2-2a: Total County Point, Mobile, and Area Emissions of VOC and NO_x

Table 3 shows the emission inventories for volatile organic compounds (VOCs) in the counties for the recommended nonattainment area. County emission totals are presented for several relevant source sectors (e.g.; point, area, mobile, etc.).

Table 3: 2011 VOC State (shaded) and Countywide Emission Inventory by Source Sector

State and County	VOC Tons Per Year						
	Point Sources	Area Sources	Onroad Mobile Sources	Nonroad Mobile Sources	Biogenics	Total	Total Anthropogenic
Fairfield	159	17,294	5,364	4,465	0	27,282	27,282
New Haven	383	16,527	4,944	2,917	10	24,781	24,771
Hartford	248	17,685	5,406	2,697	1	26,037	26,037
Litchfield	21	12,253	1,270	1,993	81	15,619	15,538
Middlesex	44	8,058	1,145	1,208	3	10,458	10,456
New London	112	12,581	1,796	2,059	9	16,558	16,549
Tolland	7	7,780	994	552	10	9,343	9,333
Windham	67	9,200	750	935	12	10,963	10,951
CT	**1,042**	**101,378**	**21,668**	**16,827**	**127**	**141,042**	**140,917**
Washington D.C.	68	5,519	2,146	1,250	0	8,983	8,983
DC	**68**	**5,519**	**2,146**	**1,250**	**0**	**8,983**	**8,983**
New Castle	848	8,867	3,051	1,931	15	14,712	14,696
Kent	85	8,712	1,010	1,127	80	11,013	10,933
Sussex	817	13,723	2,856	2,589	88	20,073	19,985
DE	**1,749**	**31,302**	**6,916**	**5,647**	**183**	**45,797**	**45,614**
Cecil	20	5,465	853	1,055	4	7,397	7,393
Anne Arundel	429	11,965	3,611	2,511	264	18,781	18,516
Baltimore	402	6,341	2,159	1,030	-	9,933	9,933
Baltimore Co.	406	12,762	4,866	2,900	27	20,962	20,934
Calvert	3	5,920	544	495	0	6,962	6,962
Carroll	99	5,919	1,040	782	37	7,877	7,840
Charles	102	10,416	885	868	138	12,409	12,272

[8] https://www.epa.gov/sites/production/files/2016-05/ozone-precursor-emissions-nei-2011-v3.xlsx

State and County	VOC Tons Per Year						
	Point Sources	Area Sources	Onroad Mobile Sources	Nonroad Mobile Sources	Biogenics	Total	Total Anthropogenic
Frederick	73	8,603	1,700	1,126	7	11,509	11,502
Harford	43	7,872	1,557	1,190	12	10,673	10,661
Kent	10	3,968	203	630	94	4,904	4,810
Montgomery	51	12,915	3,859	5,483	147	22,454	22,307
Prince Georges	136	13,096	5,096	2,433	369	21,129	20,761
MD	**1,774**	**105,242**	**26,373**	**20,503**	**1,099**	**154,990**	**153,891**
Atlantic	98	13,868	1,261	2,230	204	17,662	17,458
Bergen	351	10,139	4,650	3,839	2	18,980	18,979
Burlington	237	17,370	2,518	2,036	969	23,129	22,161
Camden	219	8,851	2,450	1,433	259	13,211	12,952
Cape May	21	5,507	517	2,943	-	8,987	8,987
Cumberland	70	10,712	676	780	889	13,126	12,237
Essex	923	8,845	2,764	1,619	0	14,151	14,151
Gloucester	939	9,544	1,499	1,240	25	13,247	13,222
Hudson	722	5,789	1,625	1,292	-	9,429	9,429
Hunterdon	35	5,538	883	829	1	7,288	7,286
Mercer	135	7,346	1,964	1,185	75	10,706	10,630
Middlesex	1,863	11,179	3,850	2,584	2	19,479	19,477
Monmouth	123	12,897	3,226	2,698	137	19,080	18,943
Morris	139	10,781	2,709	2,518	365	16,512	16,147
Ocean	73	15,614	2,636	4,416	1,002	23,741	22,739
Passaic	114	8,071	1,985	1,498	8	11,676	11,668
Salem	199	5,201	387	525	13	6,325	6,312
Somerset	244	6,926	1,682	1,639	15	10,506	10,491
Sussex	55	8,988	814	1,161	1	11,020	11,019
Union	1,136	7,396	2,491	1,586	-	12,608	12,608
Warren	104	5,742	707	647	75	7,276	7,200
NJ	**7,800**	**196,305**	**41,294**	**38,698**	**4,040**	**288,138**	**284,098**
Bronx	40	9,801	2,243	1,183	5	13,272	13,267
Kings	307	17,589	3,860	3,083	31	24,871	24,839
Nassau	267	13,872	8,666	4,815	9	27,629	27,621
New York	215	12,352	3,068	4,832	2	20,469	20,467
Queens	1,220	16,962	6,504	3,082	5	27,772	27,768
Richmond	186	4,244	2,031	1,133	7	7,600	7,593
Rockland	74	5,513	1,867	1,394	14	8,861	8,848

State and County	VOC Tons Per Year						
	Point Sources	Area Sources	Onroad Mobile Sources	Nonroad Mobile Sources	Biogenics	Total	Total Anthropogenic
Suffolk	519	27,321	10,331	11,263	212	49,647	49,435
Westchester	115	13,876	5,546	4,099	7	23,643	23,636
Dutchess	62	12,974	1,808	1,539	108	16,491	16,383
Orange	541	1,398	2,333	1,398	52	19,383	19,331
Putnam	15	5,537	791	690	12	7,044	7,033
Ulster	3	15,351	1,237	1,530	10	18,130	18,120
NY	**3,564**	**156,789**	**50,285**	**40,041**	**473**	**264,812**	**264,340**
Bucks	524	12,614	4,025	3,206	14	20,382	20,368
Chester	799	10,897	3,223	2,646	14	17,759	17,566
Delaware	1,393	6,779	3,000	1,788	491	13,451	12,960
Montgomery	729	12,753	5,016	4,211	0	22,710	22,710
Philadelphia	1,598	12,288	5,641	2,518	-	22,045	22,045
Berks	1,224	13,185	3,831	1,651	168	20,059	19,891
Carbon	196	7,032	807	538	59	8,631	8,572
Lancaster	2,162	12,917	4,619	3,855	28	23,580	23,552
Lebanon	182	5,924	1,332	668	50	8,156	8,107
Lehigh	758	7,585	3,214	1,194	14	12,765	12,751
Monroe	59	9,609	1,816	1,596	164	13,245	13,081
Northampton	345	6,776	2,715	893	12	10,741	10,729
Pike	0	9,773	668	1,380	5	11,828	11,821
York	1,111	15,349	4,081	1,391	154	22,086	21,932
PA	**11,081**	**143,481**	**43,988**	**27,534**	**1,172**	**227,258**	**226,085**
Arlington	208	2,431	744	438	-	3,822	3,822
Fairfax	55	1,137	114	110	-	1,416	1,416
Fairfax Co.	115	14,910	4,494	3,799	65	23,383	23,318
Falls Church	-	914	70	66	-	1,050	1,050
Loudon	281	9,711	1,308	1,705	89	13,095	13,005
Prince William	48	9,922	1,758	1,259	566	13,553	12,987
VA	**707**	**39,025**	**8,488**	**7,377**	**720**	**56,319**	**55,598**
TOTAL	**27,786**	**779,041**	**201,158**	**157,877**	**7,815**	**1,187,339**	**1,179,525**

Source: https://www.epa.gov/ozone-designations/ozone-designations-guidance-and-data

As seen in Table 3, area source emissions, which are typically estimated based on population size, are the largest emission sources of VOCs. The second largest source of VOC emissions is onroad mobile sources, followed by nonroad mobile sources. New Jersey, New York, and Pennsylvania contribute the majority of the Total Anthropogenic (man-made only) VOC

emissions in the recommended nonattainment area at 284,098 tpy (24%), 264,340 tpy (22%) and 226,085 tpy (19%) respectively.

The largest contributions of onroad mobile source emissions are from the New York and Pennsylvania areas. Yet these emissions are only from a portion of the state that is nearby to New Jersey; New York's emissions are representative of 13 counties and Pennsylvania's emissions are representative of 14 counties, whereas New Jersey's emissions are statewide.

Figure 4 shows the range of county-level total tons per year of VOC emissions in the recommended nonattainment area based on 2011 emissions data.[9]

Figure 4: Countywide VOC Emissions for Recommended Nonattainment Area

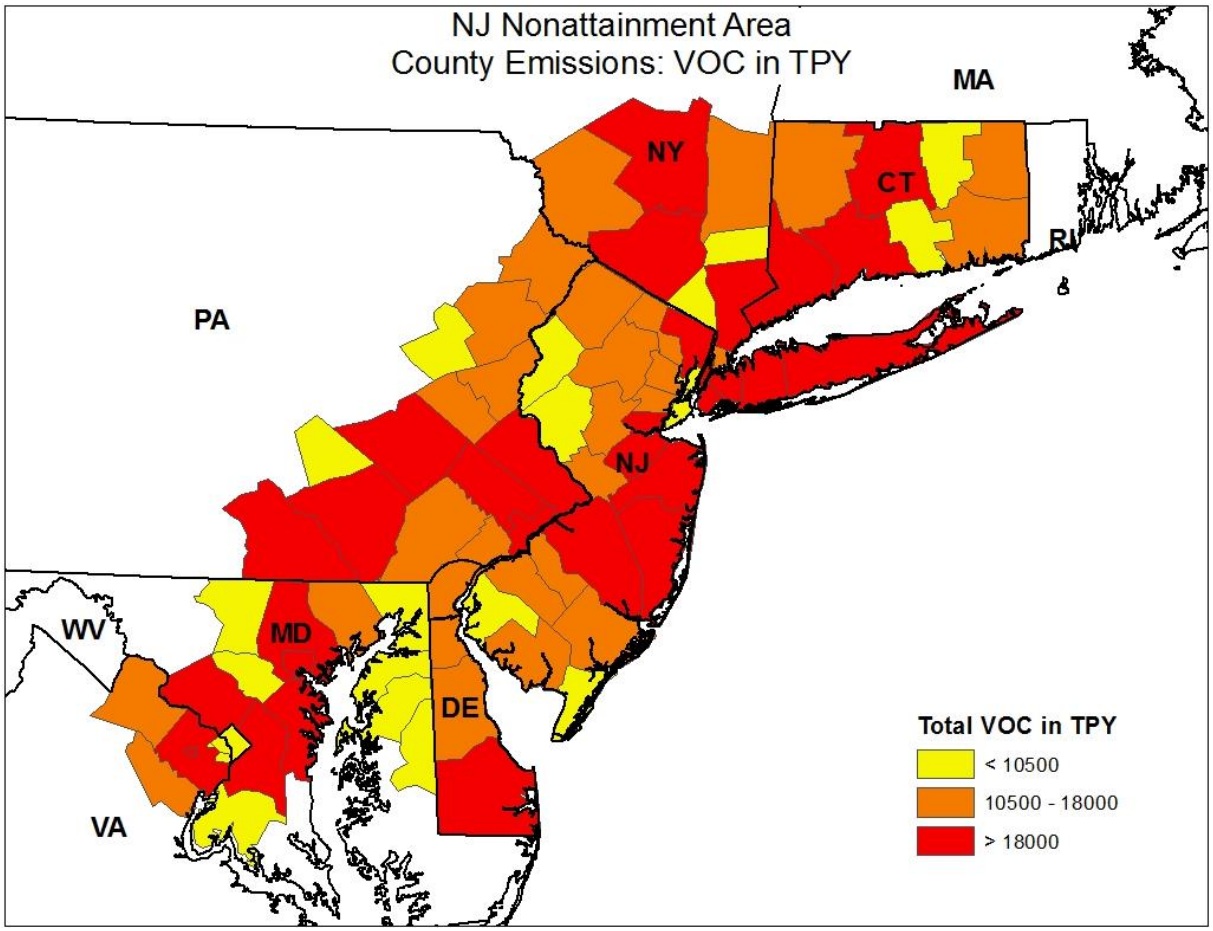


Table 4 lists the emission inventories for nitrogen oxides (NO_x) in the counties for New Jersey's recommended nonattainment area. County emission totals are presented for several relevant source sectors (e.g.; point, area, mobile, etc.).

[9] https://www.epa.gov/ozone-designations/ozone-designations-guidance-and-data

Table 4: 2011 NO_x State (shaded) and Countywide Emission Inventory by Source Sector and Pollutant

State and County	NO_x						
	Tons Per Year						
	Point Sources	Area Sources	Onroad Mobile Sources	Nonroad Mobile Sources	Biogenics	Total	Total Anthropogenic
Fairfield	1,902	4,173	8,628	3,726	0	18,429	18,429
New Haven	383	4,121	8,610	2,936	1	16,050	16,049
Hartford	2,017	3,705	9,269	2,752	0	17,743	17,743
Litchfield	75	810	1,622	758	8	3,273	3,265
Middlesex	709	1,246	2,078	749	0	4,782	4,782
New London	1,047	2,205	3,402	1,180	1	7,835	7,834
Tolland	27	501	1,811	421	1	2,761	2,760
Windham	245	408	1,238	526	1	2,498	2,496
CT	**6,405**	**17,169**	**36,658**	**13,048**	**12**	**73,371**	**73,359**
Washington D.C.	692	1,621	4,739	2,364	0	9,418	9,418
DC	**692**	**1,621**	**4,739**	**2,364**	**0**	**9,418**	**9,418**
New Castle	2,755	3,021	6,459	1,748	7	13,991	13,984
Kent	412	1,322	2,583	878	4	5,198	5,195
Sussex	2,457	2,601	4,399	1,721	11	11,188	11,177
DE	**5,624**	**6,944**	**13,441**	**4,347**	**22**	**30,378**	**30,357**
Cecil	77	651	2,757	529	0	4,014	4,014
Anne Arundel	7,501	3,640	7,673	1,890	27	20,731	20,704
Baltimore	2,079	3,123	4,573	646	0	10,421	10,421
Baltimore Co.	4,020	3,452	11,198	3,463	2	22,136	22,134
Calvert	48	1,158	1,038	373	0	3,017	3,017
Carroll	2,660	751	1,732	661	4	5,808	5,804
Charles	1,422	399	1,675	697	13	4,205	4,192
Frederick	165	1,236	4,354	1,061	1	6,816	6,815
Harford	464	1,012	3,371	1,019	1	5,867	5,866
Kent	29	364	433	347	7	1,180	1,173
Montgomery	2,616	2,214	10,686	2,734	16	18,266	18,250
Prince Georges	5,028	1,826	11,955	2,442	37	21,289	21,252
MD	**26,109**	**19,826**	**61,445**	**15,862**	**108**	**123,350**	**123,242**
Atlantic	202	1,008	2,808	1,161	7	5,186	5,179
Bergen	732	3,638	8,080	3,313	0	15,763	15,763
Burlington	286	1,508	5,936	1,512	30	9,272	9,242
Camden	433	2,486	5,353	1,150	9	9,431	9,422

State and County	NO_x						
	Tons Per Year						
	Point Sources	Area Sources	Onroad Mobile Sources	Nonroad Mobile Sources	Biogenics	Total	Total Anthropogenic
Cape May	602	1,049	1,193	1,227	0	4,072	4,072
Cumberland	723	1,221	1,394	766	29	4,132	4,103
Essex	4,458	2,708	5,162	1,844	0	14,172	14,172
Gloucester	1,758	1,841	3,576	871	2	8,049	8,046
Hudson	1,087	4,635	2,685	1,652	0	10,059	10,059
Hunterdon	183	821	2,125	708	0	3,837	3,837
Mercer	639	1,397	4,659	1,433	7	8,135	8,127
Middlesex	1,643	3,057	7,951	2,922	0	15,574	15,574
Monmouth	154	2,911	5,304	2,418	8	10,795	10,788
Morris	124	1,822	5,273	1,877	15	9,111	9,097
Ocean	255	1,452	3,969	2,264	30	7,970	7,940
Passaic	49	1,438	3,061	1,286	0	5,834	5,833
Salem	1,540	517	1,078	311	1	3,448	3,447
Somerset	171	1,386	3,505	1,302	1	6,366	6,365
Sussex	41	569	1,064	567	0	2,241	2,241
Union	2,525	4,891	4,874	1,346	0	13,636	13,636
Warren	315	501	1,650	371	2	2,840	2,838
NJ	**17,920**	**40,856**	**80,700**	**30,301**	**141**	**169,918**	**169,777**
Bronx	566	3,282	4,297	1,767	0	9,912	9,911
Kings	1,520	6,490	6,463	4,537	1	19,011	19,010
Nassau	2,590	4,892	13,279	3,205	1	23,967	23,966
New York	3,464	16,849	5,664	7,424	0	33,400	33,400
Queens	9,035	5,485	11,095	3,604	0	29,220	29,219
Richmond	834	2,396	3,094	1,208	0	7,531	7,531
Rockland	363	1,343	2,958	830	1	5,494	5,493
Suffolk	3,390	12,474	16,911	6,356	10	39,142	39,132
Westchester	1,475	3,514	8,518	2,755	0	16,263	16,262
Dutchess	196	1,348	2,626	909	10	5,090	5,079
Orange	1,881	1,823	4,177	974	3	8,857	8,854
Putnam	73	299	1,293	307	1	1,973	1,972
Ulster	11	1,350	1,866	551	1	3,780	3,779
NY	**25,398**	**61,545**	**82,241**	**34,427**	**28**	**203,639**	**203,611**
Bucks	1,271	1,777	7,680	2,196	1	12,925	12,924
Chester	1,530	1,446	6,841	2,214	1	12,032	12,031
Delaware	7,642	2,876	5,643	1,124	21	17,306	17,285

State and County	NO_x						
	Tons Per Year						
	Point Sources	Area Sources	Onroad Mobile Sources	Nonroad Mobile Sources	Biogenics	Total	Total Anthropogenic
Montgomery	1,456	2,481	9,533	3,076	0	16,546	16,546
Philadelphia	2,568	5,815	10,201	2,480	0	21,065	21,065
Berks	3,140	2,056	7,665	1,529	15	14,404	14,389
Carbon	730	303	1,593	186	5	2,817	2,812
Lancaster	7,642	2,876	5,643	1,124	21	17,306	17,285
Lebanon	690	869	2,932	616	4	5,116	5,112
Lehigh	628	1,141	5,672	1,248	1	8,695	8,693
Monroe	88	441	4,019	679	9	5,236	5,227
Northampton	7,525	921	4,686	938	1	14,072	14,071
Pike	0	200	1,643	381	1	2,226	2,225
York	22,874	1,923	6,985	1,951	7	33,739	33,732
PA	**50,096**	**15,292**	**74,387**	**24,209**	**1,672**	**165,656**	**163,984**
Arlington	1,318	448	1,214	1,085	-	4,065	4,065
Fairfax	1	58	156	50	-	265	265
Fairfax Co.	1,789	2,316	8,221	2,904	6	15,236	15,230
FallsChurch	-	33	68	26	-	127	127
Loudon	1,919	744	2,121	2,104	5	6,893	6,888
Prince William	584	914	3,931	1,390	44	6,863	6,819
VA	**5,611**	**4,513**	**15,711**	**7,559**	**55**	**33,449**	**33,394**
TOTAL	**137,856**	**167,766**	**369,322**	**132,117**	**2,038**	**809,180**	**807,142**

Source: https://www.epa.gov/ozone-designations/ozone-designations-guidance-and-data

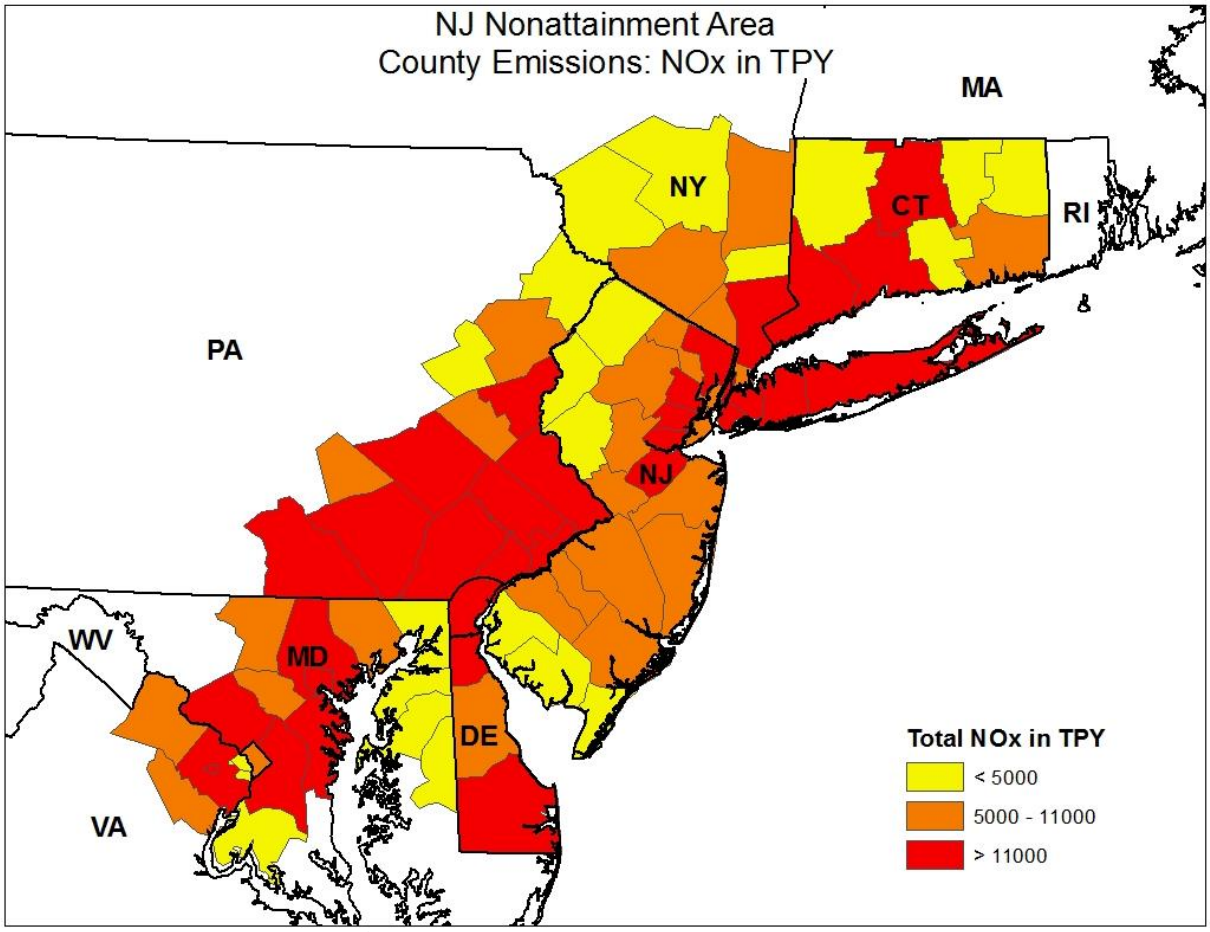
Table 4 shows that onroad mobile sources are the largest emission sources of NO_x in all the states in the recommended nonattainment area. For the point source emissions category, Pennsylvania counties contribute the largest amount. Pennsylvania county NO_x emissions were 3 times greater than New Jersey's point sources total, which represents all of the counties in the state, and twice as much as New York county emissions. The emissions from nearby counties in New York are more than the emissions from the entire state of New Jersey. The nearby counties in Pennsylvania contributed NO_x emissions that were almost as much as the emissions from the entire state of New Jersey. New York, New Jersey and Pennsylvania contribute the majority of the Total Anthropogenic NO_x emissions in the recommended nonattainment area at 203,611 tpy (25%), 169,777 tpy (21%) and 163,984 tpy (20%) respectively.

Figure 5 shows the range of county level total tons per year of NO_x emissions in the recommended nonattainment area based on 2011 emissions data.[10] As can be seen when

[10] https://www.epa.gov/ozone-designations/ozone-designations-guidance-and-data

comparing this figure to that of Figure 3, larger emissions are occurring in or next to the counties where the exceedances of the ozone NAAQS are occurring.

Figure 5: Countywide NO_x Emissions for Nonattainment Area



Factor 2-2b: Emissions from Pennsylvania Counties Included in the Current Definition of New Jersey's Combined Statistical Areas

The EPA guidance defines the default size for determining the boundaries of ozone nonattainment area as the current Combined Statistical Area (CSA).[11] This section focuses on the Pennsylvania counties included in New Jersey's current CSA because of their proximity to nonattainment monitors in New Jersey. Emissions from these counties are greater than the emissions in the adjacent New Jersey counties. In 2011, the total VOC emissions from five Pennsylvania counties (Philadelphia, Montgomery, York, Buck and Berks) range from 7,365 tons to 12,708 tons, whereas, the emissions associated with the southern New Jersey counties in

[11] Memorandum from Janet G. McCabe, Acting Assistant Administrator on "Area Designations for the 2015 Ozone National Ambient Air Quality Standards." (February 25, 2016).

the existing southern ozone nonattainment area range from 1,184 tons to 6,078 tons (see Figure 6a); the total VOC emissions from three northern Pennsylvania counties (Lehigh, Northampton and Monroe) range from 2,580 tons to 5,407 tons, whereas, the emissions associated with the northern New Jersey counties in the existing northern ozone nonattainment area range from 1,385 tons to 1,554 tons (see Figure 6b). As much as 2 times more VOC emissions are occurring in the Pennsylvania counties near New Jersey than are occurring within the New Jersey counties. Total county-wide VOC emissions are greater in five neighboring Pennsylvania counties than in any one of the 10 southern or bordering New Jersey counties.

In 2011, the total NO_x emissions from six southern Pennsylvania counties (Philadelphia, Delaware, Montgomery, Berks, Chester, and Bucks) range from 1,063 tons to 24,212 tons, whereas, the emissions associated with the southern New Jersey counties in the existing southern ozone nonattainment area range from 1,151 tons to 2,480 tons (see Figure 7a); the total NO_x emissions from three northern Pennsylvania counties (Lehigh, Northampton and Monroe) range from 113 tons to 8,104 tons, whereas, the emissions associated with the northern New Jersey counties in the existing northern ozone nonattainment area range from 452 tons to 645 tons (see Figure 7b). As much as 4.5 times more NOx emissions are occurring in the Pennsylvania counties near New Jersey than are occurring within the New Jersey counties. Total county-wide NO_x emissions are greater in six neighboring Pennsylvania counties than in any one of the 10 southern or bordering New Jersey counties.

Figure 6a: County Level VOC Emissions from the 2011 NEI, V.2 Bordering Southern New Jersey

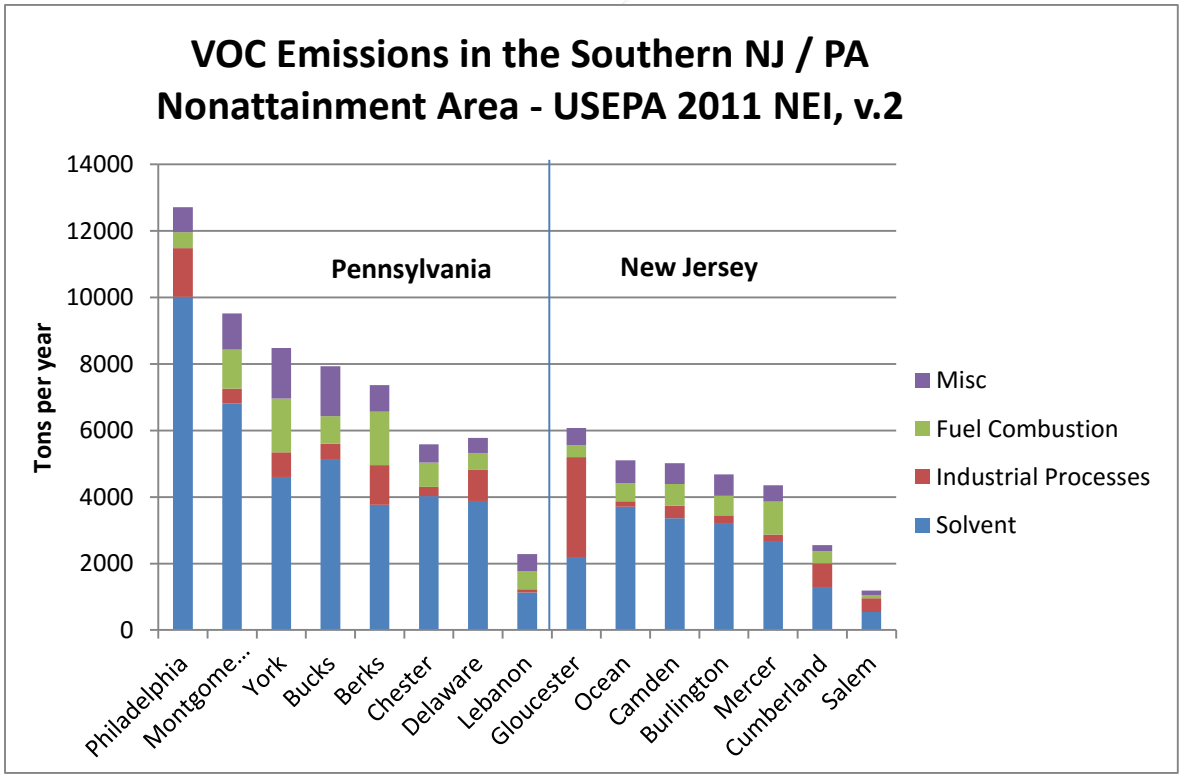


Figure 6b: County Level VOC Emissions from the 2011 NEI, V.2 Bordering Northern New Jersey

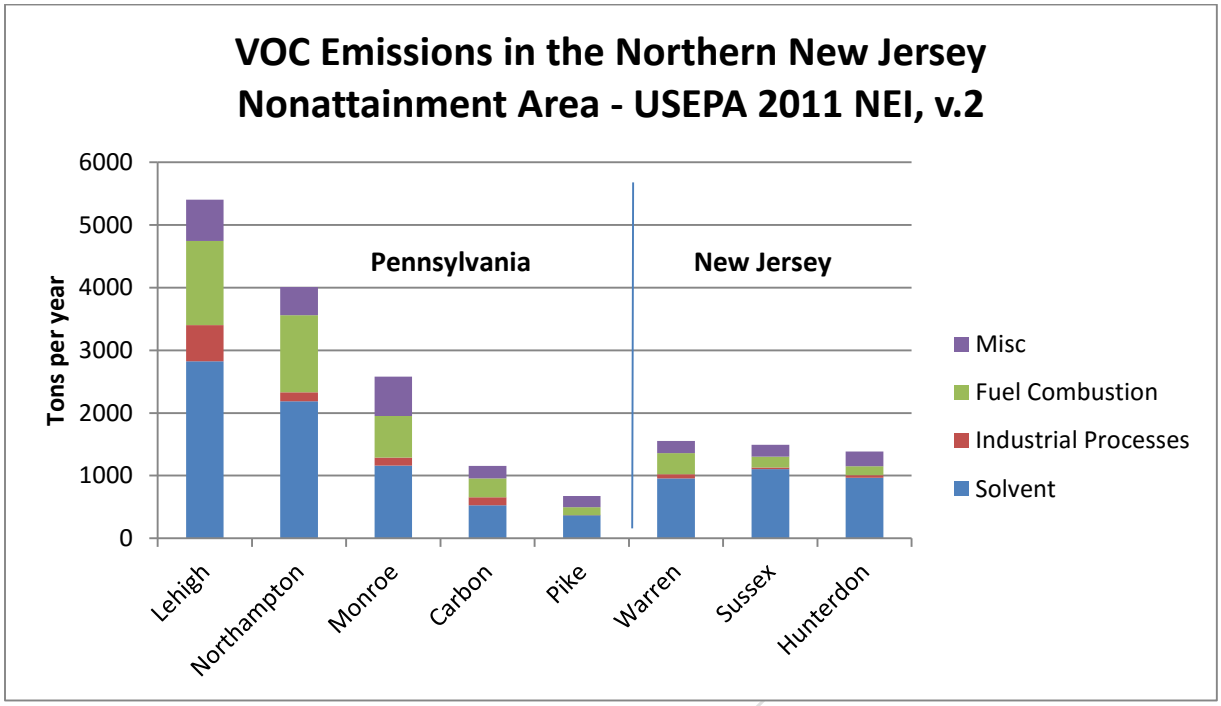


Figure 7a: County Level NO_x Emissions from the 2011 NEI, V.2 Bordering Southern New Jersey

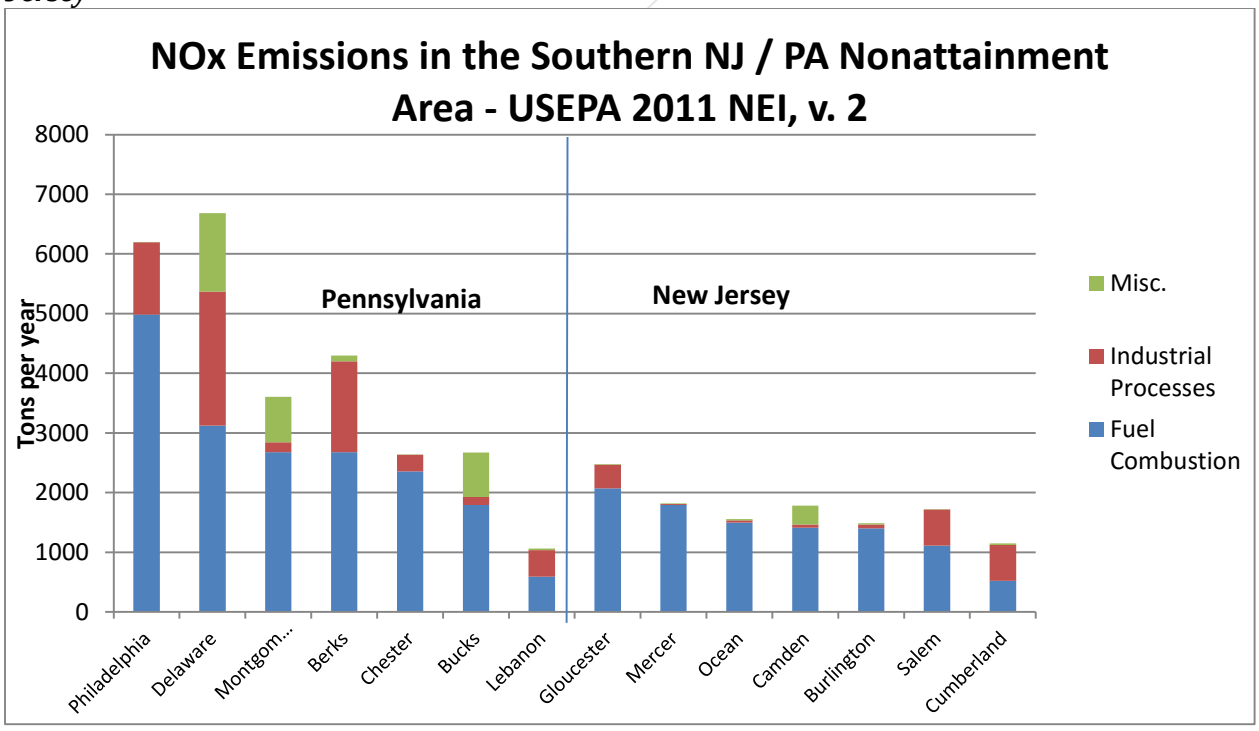
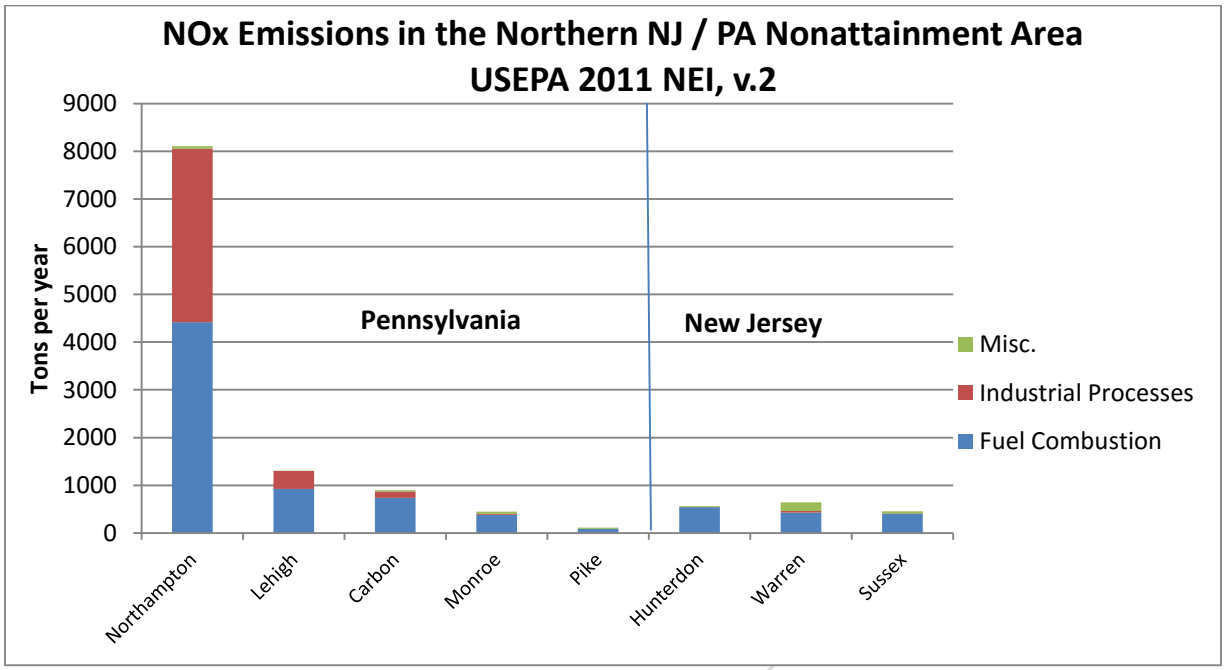


Figure 7b: County Level NO_x Emissions from the 2011 NEI, V.2 Bordering Northern New Jersey



County Level NO_x and VOC Emission Changes from 2011 to 2017

Table 5 shows the percent change in county level emissions between the 2011 and the projected 2017 emission inventories for NO_x and VOC. Overall, emissions are decreasing in most of the counties listed. For New Jersey, the projected NO_x emissions decrease from approximately 6% to 33%, and the projected VOC emissions decrease from approximately 1% to 15%. Among the other states in the recommended nonattainment area, the projected NO_x emissions decrease from approximately 10% to 45%, and the projected VOC emissions decrease from approximately 1% to 20%, when the 2011 and the projected 2017 inventories are compared.

Table 5: County Emissions in the Recommended Nonattainment Area

County	2011 NO_x (tons)	2017 NO_x (tons)	11-17 NO_x % Change	2011 VOC (tons)	2017 VOC (tons)	11-17 VOC % Change
Fairfield, CT	18,429	12,241	34%	27,282	24,133	12%
Hartford, CT	17,743	11,062	38%	26,037	23,155	11%
Litchfield, CT	3,265	2,214	32%	15,538	14,905	4%
Middlesex, CT	4,782	3,476	27%	10,456	10,050	4%
New Haven, CT	16,049	10,478	35%	24,771	22,208	10%
New London, CT	7,834	4,775	39%	16,549	15,688	5%
Tolland, CT	2,760	1,736	37%	9,333	9,061	3%

County	2011 NO_x (tons)	2017 NO_x (tons)	11-17 NO_x % Change	2011 VOC (tons)	2017 VOC (tons)	11-17 VOC % Change
Windham, CT	2,496	1,594	36%	10,951	10,835	1%
Washington, D.C.	9,418	6,042	36%	8,983	7,967	11%
Kent, DE	5,195	3,919	25%	10,933	10,588	3%
New Castle, DE	13,984	9,181	34%	14,696	12,925	12%
Sussex, DE	11,177	6,216	44%	19,985	18,245	9%
Anne Arundel, MD	20,704	14,048	32%	18,516	17,501	5%
Baltimore, MD	10,421	6,921	34%	9,933	8,749	12%
Baltimore Co., MD	22,134	13,469	39%	20,934	18,830	10%
Calvert, MD	3,017	2,521	16%	6,962	7,477	-7%
Carroll, MD	5,804	4,831	17%	7,840	7,502	4%
Cecil, MD	4,014	2,681	33%	7,393	6,932	6%
Charles, MD	4,192	4,380	-4%	12,272	12,788	-4%
Frederick, MD	6,815	4,598	33%	11,502	11,009	4%
Harford, MD	5,866	3,962	32%	10,661	10,250	4%
Kent, MD	1,173	878	25%	4,810	4,978	-3%
Montgomery, MD	18,250	10,032	45%	22,307	19,996	10%
Prince Georges, MD	21,252	12,041	43%	20,761	18,979	9%
Atlantic, NJ	5,179	3,448	33%	17,458	16,567	5%
Bergen, NJ	15,763	10,988	30%	18,979	16,209	15%
Burlington, NJ	9,242	6,639	28%	22,161	21,883	1%
Camden, NJ	9,422	6,285	33%	12,952	11,869	8%
Cape May, NJ	4,072	2,741	33%	8,987	8,115	10%
Cumberland, NJ	4,103	2,899	29%	12,237	12,960	-6%
Essex, NJ	14,172	12,255	14%	14,151	12,650	11%
Gloucester, NJ	8,046	6,997	13%	13,222	11,893	10%
Hudson, NJ	10,059	9,177	9%	9,429	8,435	11%
Hunterdon, NJ	3,837	2,827	26%	7,286	6,839	6%
Mercer, NJ	8,127	6,164	24%	10,630	9,674	9%
Middlesex, NJ	15,574	12,726	18%	19,477	17,495	10%
Monmouth, NJ	10,788	9,748	10%	18,943	17,540	7%
Morris, NJ	9,097	7,738	15%	16,147	15,327	5%
Ocean, NJ	7,940	7,431	6%	22,739	21,493	5%
Passaic, NJ	5,833	5,022	14%	11,668	10,761	8%
Salem, NJ	3,447	2,928	15%	6,312	6,069	4%
Somerset, NJ	6,365	5,004	21%	10,491	9,656	8%
Sussex, NJ	2,241	1,972	12%	11,019	10,889	1%
Union, NJ	13,636	11,195	18%	12,608	11,346	10%
Warren, NJ	2,838	2,084	27%	7,200	7,024	2%
Bronx, NY	9,911	7,063	29%	13,267	11,644	12%

County	2011 NO_x (tons)	2017 NO_x (tons)	11-17 NO_x % Change	2011 VOC (tons)	2017 VOC (tons)	11-17 VOC % Change
Dutchess, NY	5,079	3,284	35%	16,383	15,516	5%
Kings, NY	19,010	13,549	29%	24,839	21,367	14%
Nassau, NY	23,966	14,711	39%	27,621	21,973	20%
New York, NY	33,400	24,014	28%	20,467	16,575	19%
Orange, NY	8,854	4,872	45%	19,331	18,400	5%
Putnam, NY	1,972	1,238	37%	7,033	6,746	4%
Queens, NY	29,219	22,648	22%	27,768	23,474	15%
Richmond, NY	7,531	5,200	31%	7,593	6,365	16%
Rockland, NY	5,493	3,583	35%	8,848	7,763	12%
Suffolk, NY	39,132	26,405	33%	49,435	42,083	15%
Ulster, NY	3,779	2,680	29%	18,120	17,572	3%
Westchester, NY	16,262	9,870	39%	23,636	20,122	15%
Berks, PA	14,389	10,439	27%	19,891	17,879	10%
Bucks, PA	12,924	7,305	43%	20,368	17,683	13%
Carbon, PA	2,812	1,923	32%	8,572	8,476	1%
Chester, PA	12,031	7,350	39%	17,566	15,741	10%
Delaware, PA	17,285	11,619	33%	12,960	11,545	11%
Lancaster	17,285	8,047	53%	23,552	19,984	15%
Lebanon	5,112	3,299	35%	8,107	7,324	10%
Lehigh, PA	8,693	5,008	42%	12,751	10,797	15%
Monroe, PA	5,227	3,050	42%	12,751	12,396	3%
Montgomery, PA	16,546	10,849	34%	22,710	19,332	15%
Northampton, PA	14,071	8,628	39%	10,729	9,101	15%
Philadelphia, PA	21,065	14,632	31%	22,045	17,965	19%
Pike, PA	2,226	1,392	37%	11,821	11,797	0%
York, PA	33,739	29,730	12%	21,932	19,869	9%
Arlington, VA	4,065	3,237	20%	3,822	3,446	10%
Fairfax, VA	265	180	32%	1,416	1,396	1%
Fairfax Co., VA	15,236	9,080	40%	23,318	21,511	8%
Falls Church, VA	127	90	29%	1,050	1,059	-1%
Loudon, VA	6,893	6,213	10%	13,005	12,927	1%
Prince William, VA	6,863	4,678	32%	12,987	13,366	-3%

Factor 2-2c: Point Source Emissions

Electric generating units (EGUs) are among the largest point sources of NO_x in the United States. Emissions of NO_x from EGUs are regulated by New Jersey rules and federal regulations, such as

EPA's updates to the Cross State Air Pollution Rule (CSAPR).[12] Table 6 lists the post-2014 ozone season NO_x budget from the states in the recommended nonattainment area. Delaware, Connecticut and the District of Columbia do not have a NO_x budget because the EPA determined that these areas do not significantly contribute to nonattainment of the ozone standard in another state. Maryland and New York have statewide ozone season NO_x budgets for their EGUs that are approximately two (2) times higher than New Jersey's ozone season NO_x budget. Virginia has statewide ozone season NO_x budgets that are approximately 4.5 times higher than New Jersey's while Pennsylvania's ozone season NO_x budget is 9 times higher than New Jersey's. EPA has determined, through the finalization of the Cross State Air Pollution Rule (CSAPR) Update Rule that high NO_x emissions from the EGU's in these states are transported to the existing northern New Jersey nonattainment area and significantly contribute to the nonattaining ozone monitors. Although EPA's analysis for the CSAPR Update was for the 75 ppb ozone NAAQS, it is also relevant for the 70 ppb ozone NAAQS because the analysis contains the same region, emission sources, and air quality data.

Table 6: EPA CSAPR Update Rule Ozone Season NO_x State Emission Budgets (tons)

State	Final 2017 Ozone Season NO_x Budget Emissions	Number of Times Higher than NJ	
New Jersey	2,062	1	
Maryland	3,828	2	
New York	5,135	2.5	
Virginia	9,223	4.5	
Pennsylvania	17,952	9	

Factor 2-2d: Mobile Emissions

County Level Vehicle Miles Traveled for Light-Duty Vehicles

Light-duty vehicle miles travelled (VMT) can illustrate the commuting patterns and location of large amounts of motor vehicle emissions throughout the state, metropolitan area and surrounding areas. Figure 8 shows the large amount of vehicle traffic that occurs around New York City (NY), New Haven (CT), Wilmington (DE), Baltimore (MD), Washington, D.C. and Philadelphia (PA). Table 7 shows the total light-duty vehicle miles traveled for each county from largest to smallest. The top counties with the highest light-duty vehicle miles traveled are located in Virginia (Fairfax), New York (Suffolk, Queens, and Nassau), and Maryland (Prince George's) and range between approximately seven to ten billion vehicle miles traveled per county.

[12] https://www3.epa.gov/airmarkets/CSAPRU/Cross-State%20Air%20Pollution%20Rule%20Update%20for%20the%202008%20Ozone%20NAAQS%202060%20AS05%20FRM.pdf

Figure 8: Motor Vehicle Traffic Levels for Light-Duty Vehicles

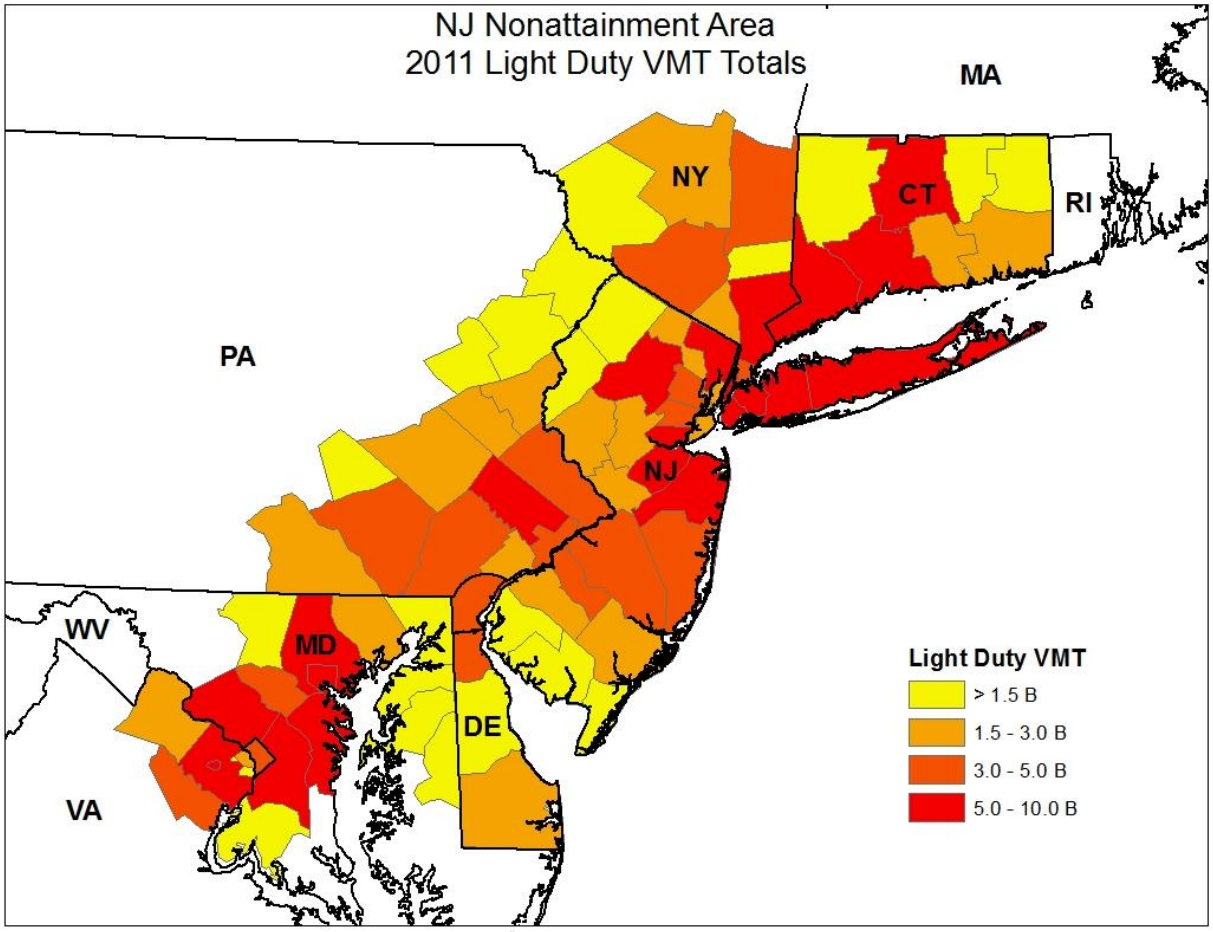


Table 7: County Level Vehicle Miles Traveled (VMT) for Light-Duty Vehicles

State	County	LD Total VMT (in billions)
VA	Fairfax	9.713
NY	Suffolk	9.705
NY	Queens	9.422
MD	Prince George's	7.972
NY	Nassau	7.836
NY	Kings	7.717
MD	Baltimore	7.458
NY	Westchester	7.154
CT	Hartford	7.084
NJ	Middlesex	6.992
NJ	Bergen	6.829

State	County	LD Total VMT (in billions)
MD	Montgomery	6.821
CT	New Haven	6.467
CT	Fairfield	6.398
PA	Montgomery	5.950
NJ	Monmouth	5.908
NY	New York	5.413
MD	Anne Arundel	5.164
NJ	Morris	5.061
NY	Bronx	4.920
PA	Philadelphia	4.789
DE	New Castle	4.752
NJ	Essex	4.454
NJ	Ocean	4.377
PA	Bucks	4.263
NJ	Union	4.147
NJ	Burlington	3.989
PA	Chester	3.842
DC	District of Columbia	3.750
PA	Lancaster	3.675
MD	Howard	3.618
NJ	Camden	3.429
NY	Orange	3.424
VA	Prince William	3.205
NY	Dutchess	3.008
PA	Delaware	2.991
NJ	Somerset	2.988
NJ	Mercer	2.963
PA	Berks	2.894
PA	York	2.833
NJ	Passaic	2.724
CT	New London	2.671
PA	Lehigh	2.670
NJ	Atlantic	2.458
NJ	Gloucester	2.417
VA	Loudoun	2.398
NY	Rockland	2.394
NY	Ulster	2.312
NY	Richmond	2.235
MD	Harford	2.140
NJ	Hudson	2.051
DE	Sussex	1.972
PA	Northampton	1.759
NJ	Hunterdon	1.654

State	County	LD Total VMT (in billions)
VA	Arlington	1.633
CT	Middlesex	1.621
PA	Monroe	1.402
DE	Kent	1.402
CT	Tolland	1.355
CT	Litchfield	1.295
NJ	Warren	1.260
MD	Cecil	1.170
MD	Carroll	1.147
NJ	Sussex	1.119
NJ	Cumberland	1.012
NY	Putnam	0.985
PA	Lebanon	0.980
NJ	Cape May	0.955
CT	Windham	0.932
NY	Sullivan	0.846
MD	Queen Anne's	0.797
VA	Alexandria city	0.756
PA	Carbon	0.694
NJ	Salem	0.682
PA	Pike	0.460
MD	Caroline	0.340
MD	Kent	0.178
VA	Charles City	0.085
VA	Falls Church	0.055

County Level Vehicle Miles Traveled for Heavy-Duty Vehicles

Heavy-duty vehicles include school buses, transit buses, garbage trucks, construction vehicles and long-haul trucks used primarily for delivering consumer goods. Heavy-duty vehicle miles traveled can represent the transport patterns of goods movement between metropolitan areas. Figure 9 shows the large amount of heavy-duty vehicle traffic that occurs in the counties surrounding New York City, Philadelphia, Washington, D.C., as well as Long Island, New York. Table 8 shows the total heavy-duty vehicle miles traveled for each county from largest to smallest. From the table, the top 10 counties with the highest vehicle miles traveled are located in the surrounding counties of the Washington, D.C., Baltimore, New York, and Philadelphia metropolitan areas. These metropolitan areas are associated with ports and goods movement along the Interstate 95 corridor.

Figure 9: Motor Vehicle Traffic Levels for Heavy-Duty Vehicles

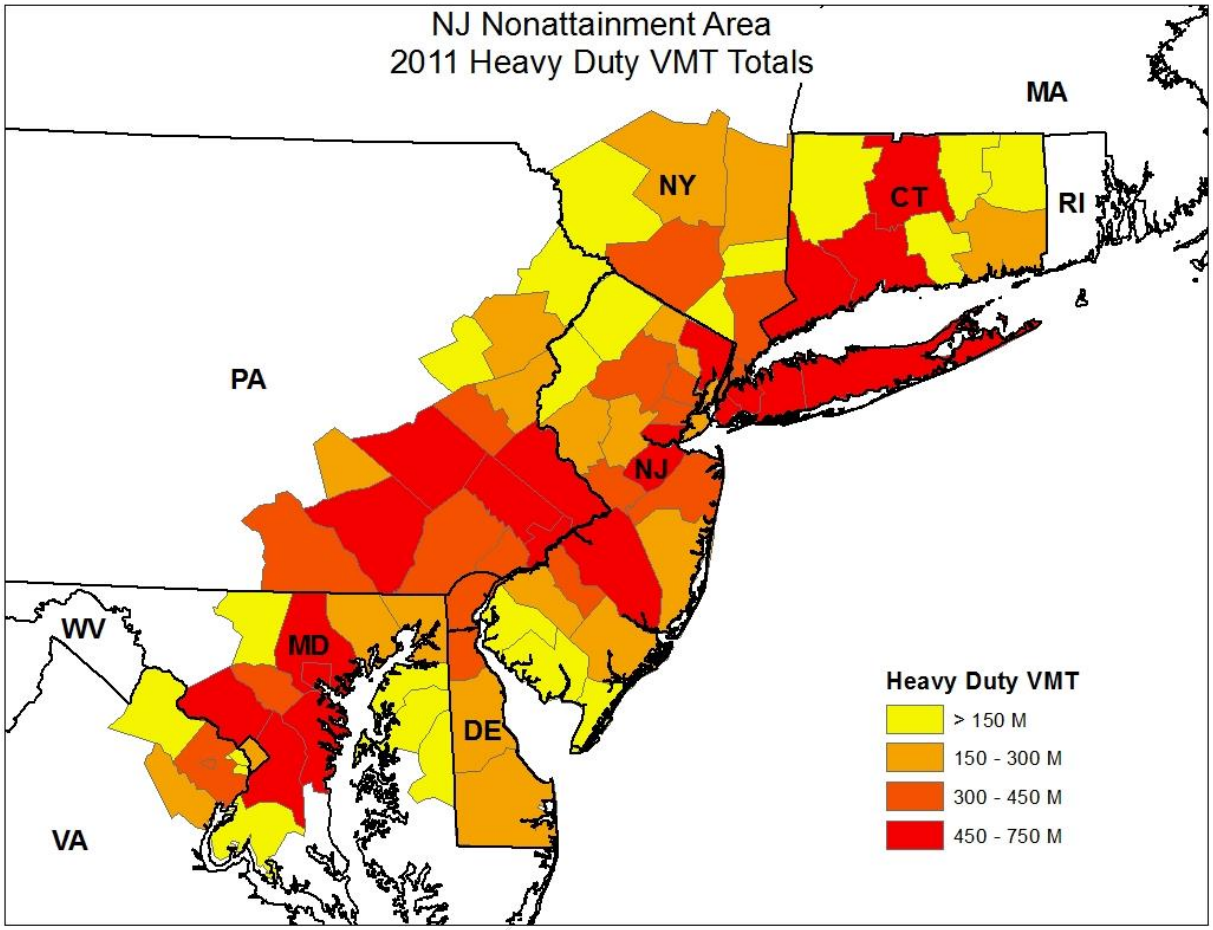


Table 8: County Level Vehicle Miles Traveled for Heavy-Duty Vehicles

State	County	HD Total VMT (in millions)
MD	Baltimore	742
MD	Prince George's	713
NY	Queens	603
NY	Kings	592
MD	Montgomery	589
PA	Philadelphia	556
PA	Montgomery	555
NY	Suffolk	553
NY	Nassau	553
CT	Hartford	551
NJ	Middlesex	545
CT	New Haven	511

State	County	HD Total VMT (in millions)
MD	Anne Arundel	504
CT	Fairfield	490
NJ	Burlington	488
PA	Berks	488
NJ	Bergen	476
PA	Lancaster	475
PA	Bucks	464
DE	New Castle	449
PA	Chester	435
NJ	Camden	420
PA	York	415
NY	Westchester	405
NY	New York	374
NJ	Mercer	363
NY	Bronx	361
NJ	Morris	359
VA	Fairfax	354
MD	Howard	352
PA	Delaware	345
NJ	Monmouth	332
NJ	Union	330
NY	Orange	320
NJ	Essex	320
PA	Lehigh	318,
NJ	Gloucester	296
PA	Northampton	287
DC	District of Columbia	287
PA	Monroe	262
NJ	Somerset	259
DE	Sussex	252
NJ	Ocean	241
NY	Dutchess	240
MD	Harford	231
NJ	Atlantic	218
CT	New London	212
NY	Ulster	201
DE	Kent	200
PA	Lebanon	199
VA	Prince William	189

State	County	HD Total VMT (in millions)
MD	Cecil	186
NJ	Passaic	176
NJ	Hunterdon	175
NY	Richmond	156
NJ	Hudson	151
NY	Rockland	147
MD	Queen Anne's	131
NJ	Warren	128
CT	Middlesex	127
MD	Carroll	119
PA	Pike	114
CT	Tolland	111
NJ	Cumberland	111
NJ	Salem	98
NY	Sullivan	94
VA	Loudoun	92
NJ	Cape May	89
CT	Litchfield	87
NY	Putnam	82
PA	Carbon	78
CT	Windham	73
NJ	Sussex	64
MD	Caroline	40
VA	Arlington	36
MD	Kent	27
VA	Alexandria	21
VA	Charles	7
VA	Falls Church	2

Factor 2-2e: Commuting Patterns

The commuting patterns between states are an important factor connecting the size of the recommended nonattainment area.[13] This factor was analyzed for the Pennsylvania counties that are included in New Jersey's CSA's. Since Cecil County, Maryland also shares a CSA with New Jersey, commuting patterns around Washington, D.C. and within the Baltimore area were also analyzed.

[13] Appendix 3, Section 2 entitled "Emissions and Emissions Related Data", "Traffic and Commuting Patterns" within the EPA Guidance entitled "Area Designations for the 2015 Ozone National Ambient Air Quality Standards."

Commuting Patterns for Counties in Pennsylvania and New York

New Jersey counties share a strong commuting pattern with its bordering states, in particular, New York and Pennsylvania. The top five counties in Pennsylvania with the most residents commuting to New Jersey are: Bucks, Philadelphia, Northampton, Monroe and Montgomery (Figure 10). In New York, the top five counties with the most residents commuting to New Jersey are: New York, Kings, Rockland, Queens and Richmond (Figure 11). Figure 12 shows that equal amounts of commuters travel between New Jersey and Pennsylvania for work while more commuters from New Jersey travel to work in New York than vice versa.

Figure 10: Number of Commuters from Pennsylvania to New Jersey

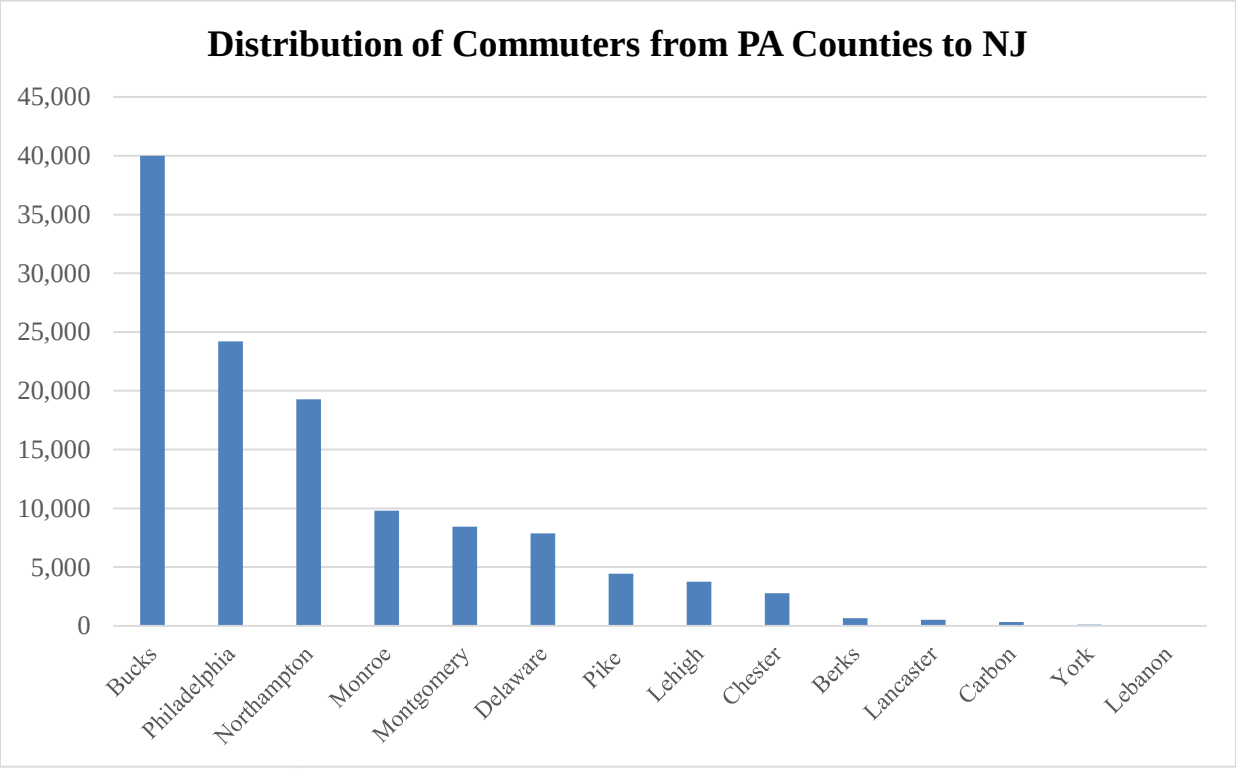


Figure 11: Number of Commuters from New York to New Jersey

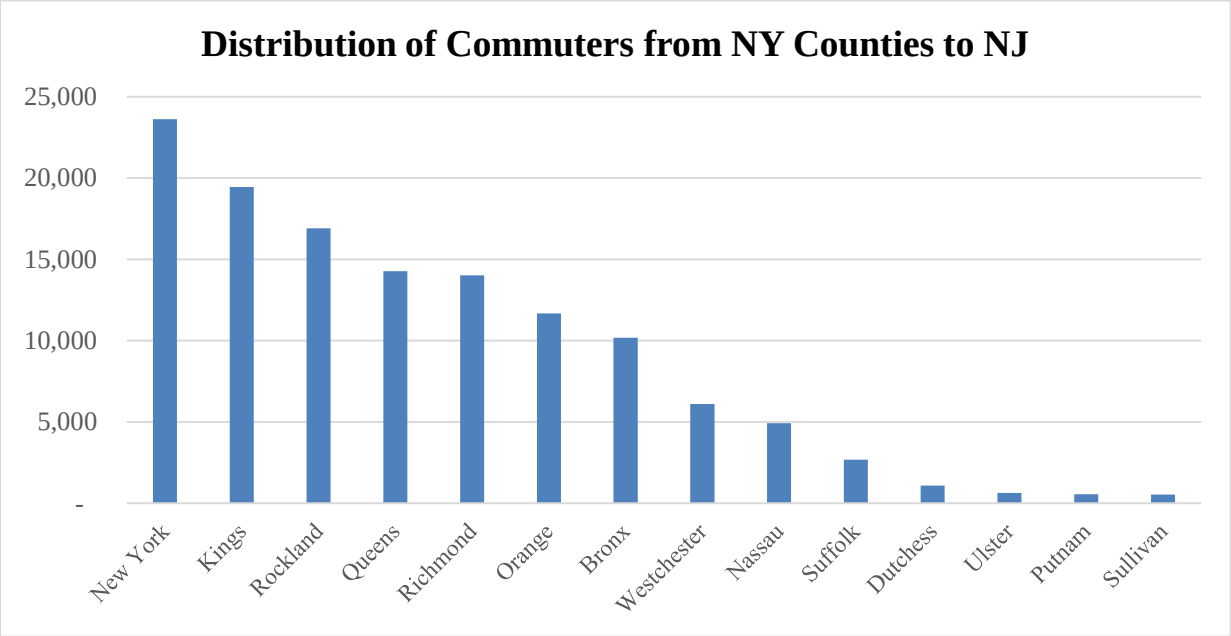
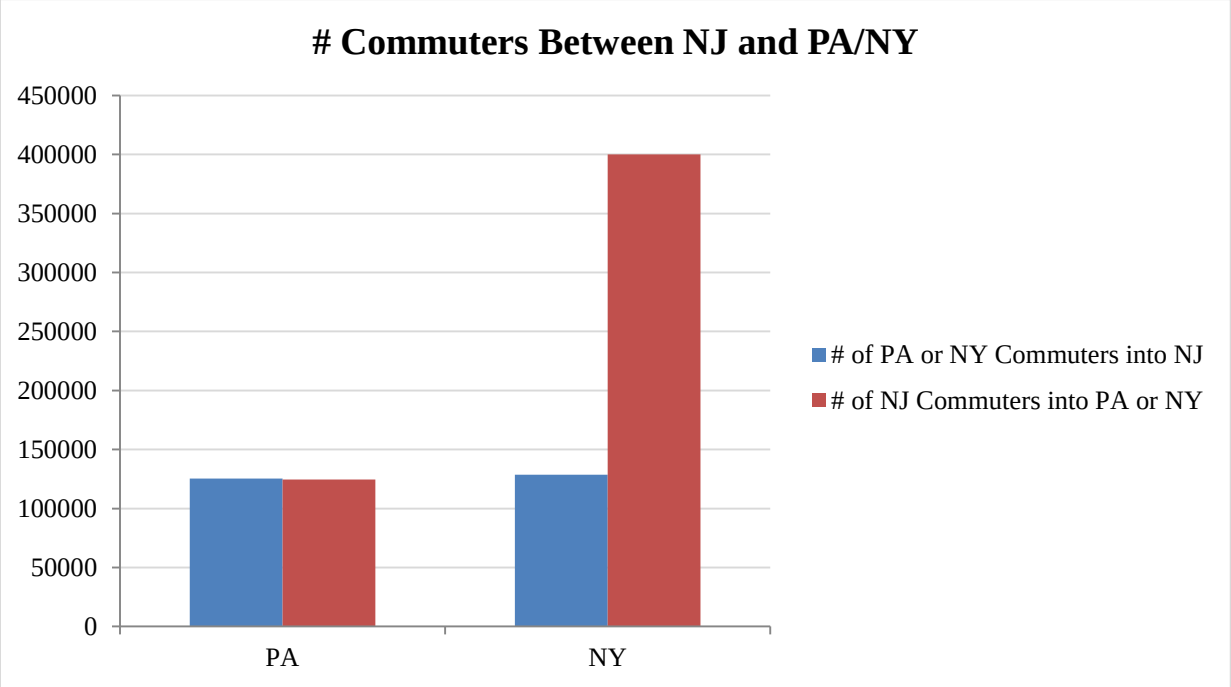


Figure 12: Comparison of Commuters Between New Jersey and Pennsylvania/New York



Commuting Patterns for Counties within Recommended Nonattainment Area

The commuting patterns into New Jersey from each county within the recommended nonattainment area were analyzed. Table 9 lists in descending order the associated vehicle miles traveled and the number of commuters from the county into New Jersey. Many of the counties with the highest number of commuters to New Jersey also have very high vehicle miles traveled. Of all the counties in Maryland, Baltimore has the greatest number of commuters to New Jersey. Cecil County, Maryland, which shares the current ozone nonattainment area with New Jersey, also has a large number of commuters into it from the Baltimore area.

Table 9: Number of Commuters from their Resident County to New Jersey

Home County	State	VMT Total (in billions)	# of Daily Commuters to NJ
Bucks	PA	4.728	40,011
Philadelphia	PA	5.345	24,212
New York	NY	5.787	23,635
Kings	NY	8.308	19,455
Northampton	PA	2.046	19,271
Rockland	NY	2.541	16,923
Queens	NY	10.026	14,281
Richmond	NY	2.392	14,019
Orange	NY	3.745	11,676
Bronx	NY	5.281	10,177
Monroe	PA	1.664	9,803
Montgomery	PA	6.505	8,452
Delaware	PA	3.336	7,864
Westchester	NY	7.559	6,107
New Castle	DE	5.201	5,402
Nassau	NY	8.389	4,920
Pike	PA	0.573	4,448
Lehigh	PA	2.988	3,745
Chester	PA	4.277	2,766
Suffolk	NY	10.258	2,687
Fairfield	CT	6.888	1,941
Duchess	NY	3.248	1,096
Berks	PA	3.382	664
New Haven	CT	6.978	657
Ulster	NY	2.513	643
Kent	DE	1.602	566
Putnam	NY	1.067	563
Sullivan	NY	0.941	546
Lancaster	PA	4.150	521

Home County	State	VMT Total (in billions)	# of Daily Commuters to NJ
Baltimore	MD	8.200	414
Carbon	PA	0.772	329
Montgomery	MD	7.410	320
Sussex	DE	2.224	289
Hartford	CT	7.635	274
Fairfax	VA	10.067	260
Cecil	MD	1.356	203
Prince George's	MD	8.685	198
Anne Arundel	MD	5.669	155
Harford	MD	2.371	121
York	PA	3.248	109
Prince William	VA	3.394	101
Litchfield	CT	1.382	96
Arlington	VA	1.669	90
New London	CT	2.883	86
Middlesex	CT	7.119	79
Frederick	MD	2.959	68
Loudon	VA	2.490	43
Queen Anne's	MD	0.928	41
Alexandria	VA	0.777	40
Lebanon	PA	1.179	39
Tolland	CT	1.467	36
Carroll	MD	1.266	36
Howard	MD	3.970	33
Kent	MD	0.205	23
Windham	CT	1.004	16
Caroline	MD	0.380	7
Charles	VA	0.093	0
Falls Church	VA	0.056	0

Factor 2-2f: Population

Greater population sizes equate to increases in air pollution. Higher levels of air pollution may be a result of increased traffic volumes (i.e.; VMT), more area source emissions, and larger use of home heating, electricity use, etc. The area source emissions of VOC, the highest sector of VOC emissions in the 2011 inventory, are directly linked to population and, therefore, are greater in areas with larger populations.

Figure 13 shows the range of population in the recommended nonattainment area by county and Table 10 shows their ranking from largest population to smallest. In Figure 13, the darkest blue counties have a population count of 600,000 to 2.6 million people. The top five counties with

the highest population in the recommended nonattainment area are: Kings, Suffolk, Queens, New York, and Philadelphia (labeled 1 to 5, respectively, in Figure 13). Figure 13 also shows a larger population around the metropolitan areas of New York City, Philadelphia, and Washington, D.C., with New York being the largest. The top three New Jersey counties with the highest population in the recommended nonattainment area are Bergen, Middlesex, and Essex.

The top three New Jersey counties with the highest population density (people per square mile) in the recommended nonattainment area are Hudson, Essex and Union. The population densities of the remaining New Jersey counties in the nonattainment area are significantly lower.

Figure 13: Recommended Nonattainment Area 2010 Population by County

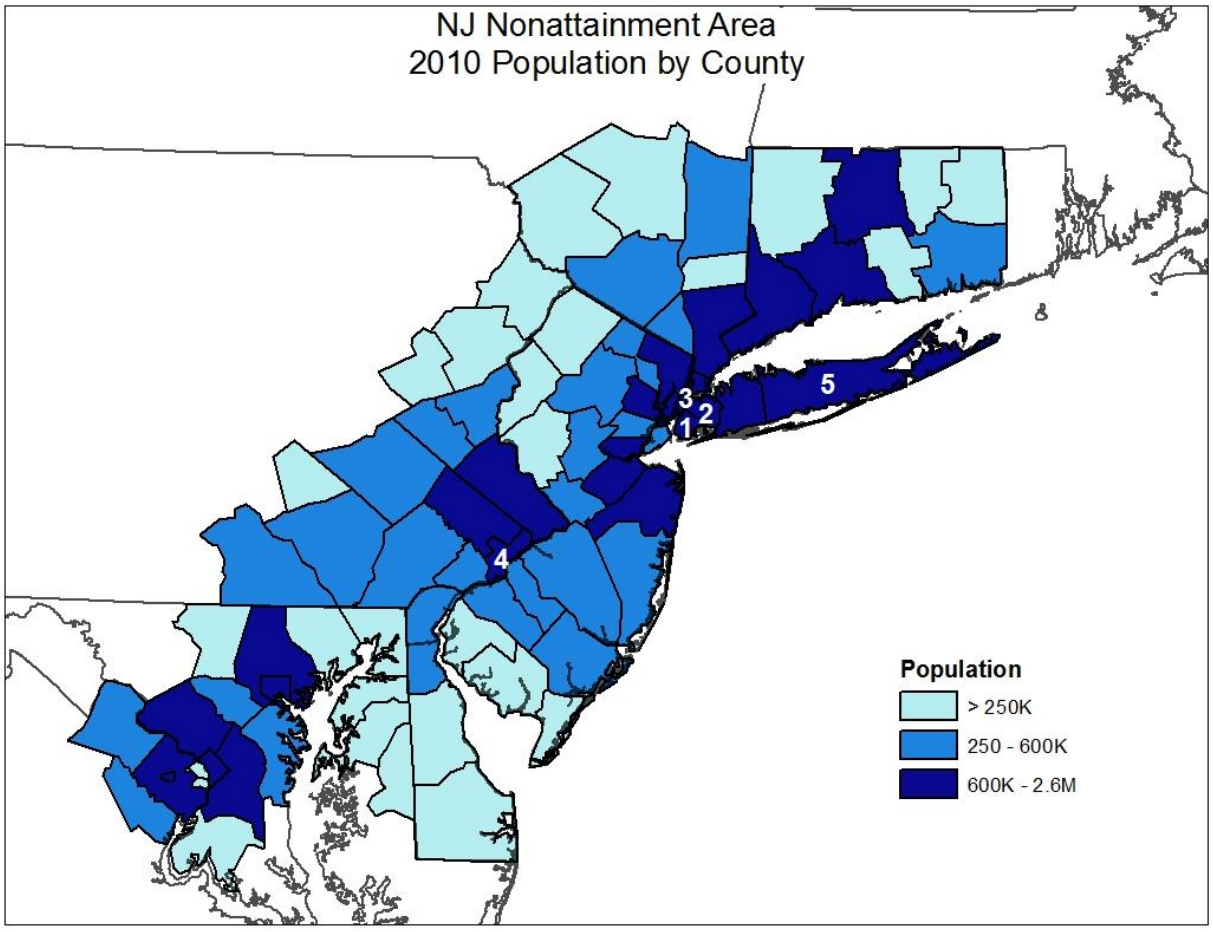


Table 10: 2010 County Population[14]

STATE/TERRITORY NAME	COUNTY NAME	2010 POPULATION
New York	Kings County	2,504,700
New York	Queens County	2,230,722
New York	New York County	1,585,873
Pennsylvania	Philadelphia County	1,526,006
New York	Suffolk County	1,493,350
New York	Bronx County	1,385,108
Maryland	Baltimore County	1,614,887
New York	Nassau County	1,339,532
Virginia	Fairfax County	1,104,291
Maryland	Montgomery County	971,777
New York	Westchester County	949,113
Connecticut	Fairfield County	916,829
New Jersey	Bergen County	905,116
Connecticut	Hartford County	894,014
Maryland	Prince George's County	863,420
Connecticut	New Haven County	862,477
New Jersey	Middlesex County	809,858
Pennsylvania	Montgomery County	799,874
New Jersey	Essex County	783,969
New Jersey	Hudson County	634,266
New Jersey	Monmouth County	630,380
Pennsylvania	Bucks County	625,249
Maryland	Baltimore city	620,961
District of Columbia	District of Columbia	601,723
New Jersey	Ocean County	576,567
Pennsylvania	Delaware County	558,979
Delaware	New Castle County	538,479
Maryland	Anne Arundel County	537,656
New Jersey	Union County	536,499
Pennsylvania	Lancaster County	519,445
New Jersey	Camden County	513,657
New Jersey	Passaic County	501,226
Pennsylvania	Chester County	498,886
New Jersey	Morris County	492,276
New York	Richmond County	468,730

[14] https://www.epa.gov/ozone-designations/ozone-designations-guidance-and-data

STATE/TERRITORY NAME	COUNTY NAME	2010 POPULATION
New Jersey	Burlington County	448,734
Pennsylvania	York County	434,972
Pennsylvania	Berks County	411,442
Virginia	Prince William County	402,002
New York	Orange County	372,813
New Jersey	Mercer County	366,513
Pennsylvania	Lehigh County	349,497
New Jersey	Somerset County	323,444
Virginia	Loudoun County	312,311
New York	Rockland County	311,687
Pennsylvania	Northampton County	297,735
New York	Dutchess County	297,488
New Jersey	Gloucester County	288,288
Maryland	Howard County	287,085
New Jersey	Atlantic County	274,549
Connecticut	New London County	274,055
Maryland	Harford County	244,826
Maryland	Frederick County	233,385
Virginia	Arlington County	207,627
Delaware	Sussex County	197,145
Connecticut	Litchfield County	189,927
New York	Ulster County	182,493
Maryland	Carroll County	167,134
Connecticut	Middlesex County	165,676
Delaware	Kent County	162,310
New Jersey	Cumberland County	156,898
Connecticut	Tolland County	152,691
New Jersey	Sussex County	149,265
Virginia	Alexandria city	139,966
Pennsylvania	Lebanon County	133,568
New Jersey	Hunterdon County	128,349
Connecticut	Windham County	118,428
New Jersey	Warren County	108,692
Maryland	Cecil County	101,108
New York	Putnam County	99,710
New Jersey	Cape May County	97,265
New York	Sullivan County	77,547
New Jersey	Salem County	66,083
Pennsylvania	Carbon County	65,249
Pennsylvania	Pike County	57,369

STATE/TERRITORY NAME	COUNTY NAME	2010 POPULATION
Maryland	Queen Anne's County	47,798
Maryland	Caroline County	33,066
Maryland	Kent County	20,197
Virginia	Falls Church city	12,332
Virginia	Charles City County	7,256

Section 2-3: Meteorology

New Jersey's recommended size for its nonattainment area captures the emissions from nearby states that are locally transported and affect ozone levels at New Jersey monitors. The 48-hour back trajectories included in this section show wind patterns on days of high ozone levels in New Jersey. The back trajectories demonstrate that the winds originated from counties included in the recommended nonattainment area where there exists high VOC and NO_x emissions, large populations, high vehicle miles traveled, and shared commuting patterns.

Factor 2-3a: Wind Trajectories

The following charts (Figures 14 to 16) show where the winds originated on the days when the 70 ppb ozone NAAQS was exceeded in New Jersey for the years 2013 to 2015. The 48-hour back trajectories were performed using the NOAA HYSPLIT model to determine the transport of emissions into New Jersey. The monitoring site in New Jersey with the maximum ozone concentration, for each day that exceeded the ozone standard in that year, was used as the starting location to produce the 48-hour back trajectory. While these charts are 48-hour back trajectories, inference can be made from these lines that winds passed over the counties within New Jersey's recommended nonattainment area within 24 hours of the day when New Jersey experienced the high ozone levels.

Figure 14: 2015 Long Range Transport Trajectories

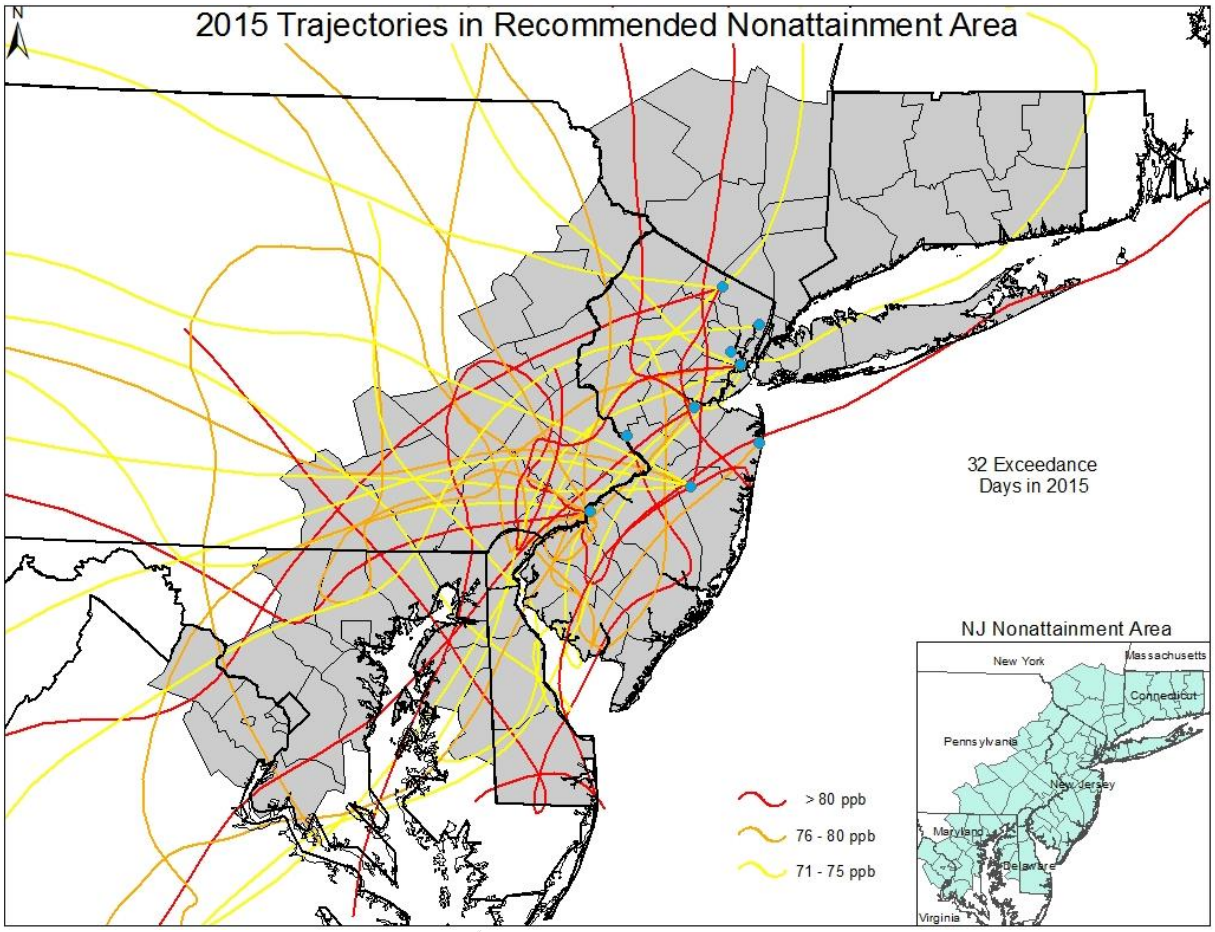


Figure 15: 2014 Long Range Transport Trajectories

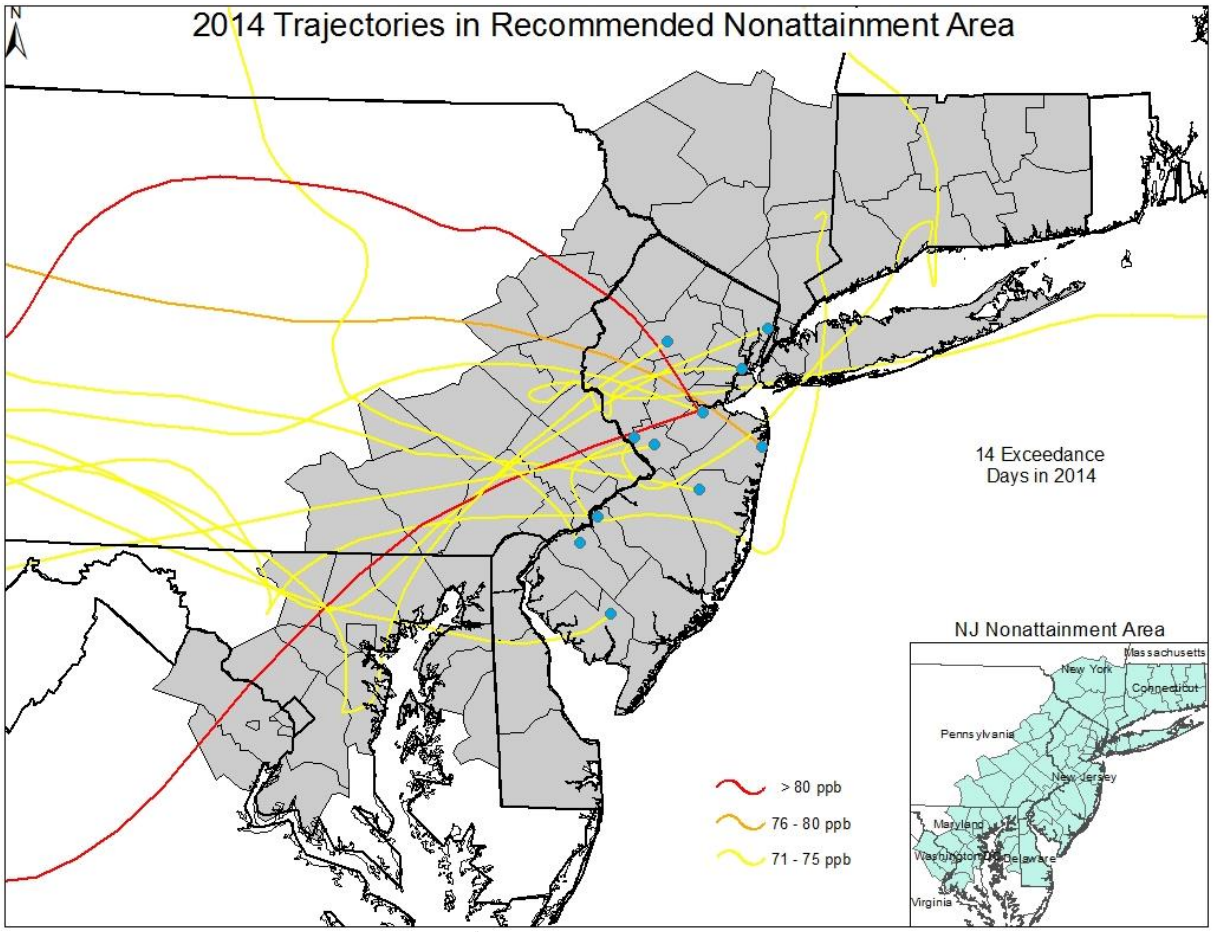
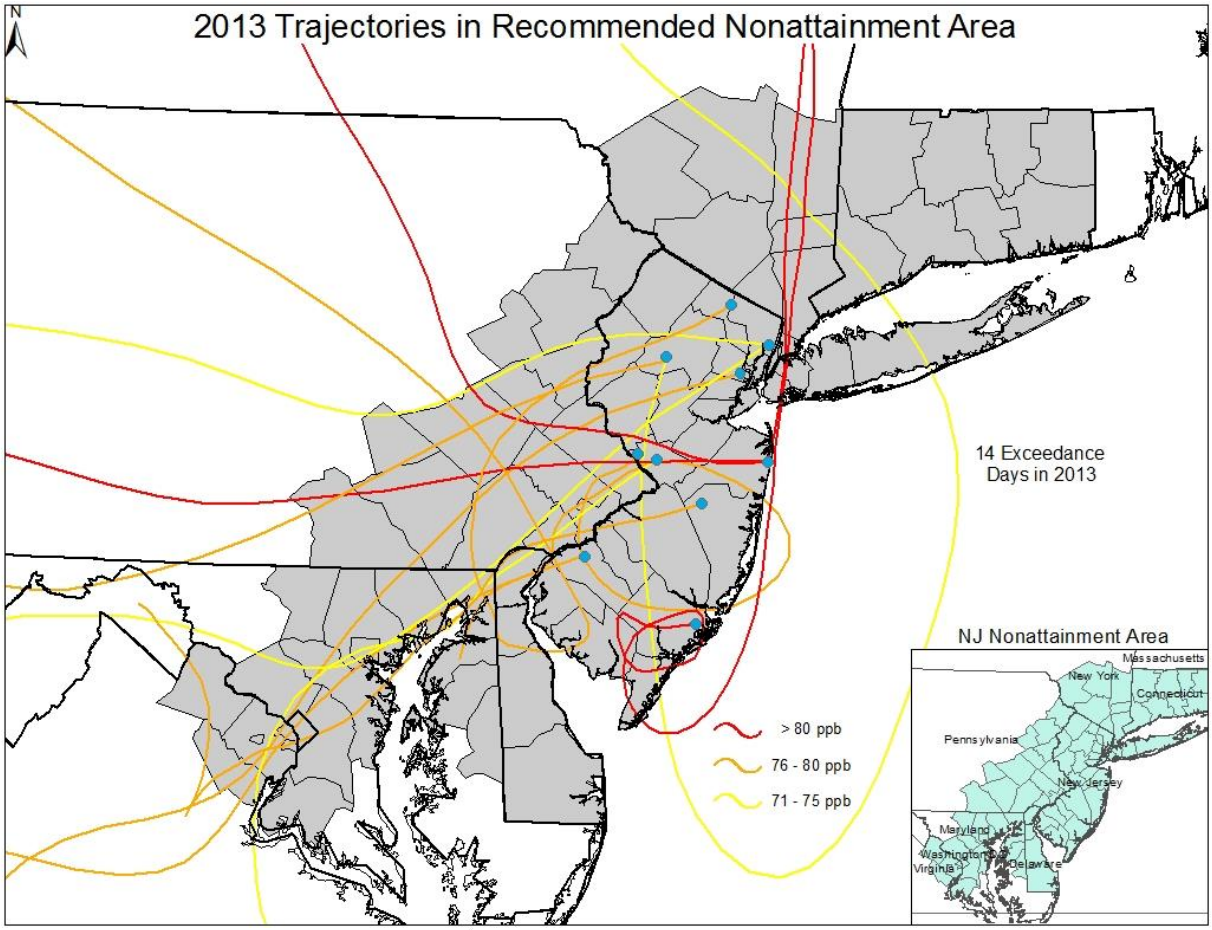


Figure 16: 2013 Long Range Transport Trajectories



As can be seen from the wind trajectories in Figures 14-16, winds travel over the counties within the recommended ozone nonattainment area on days when high ozone levels are observed in New Jersey. Emissions occurring within those counties on these days are carried by the wind and contribute to the level of ozone pollution experienced on those days.

Factor 2-3b: HYSPLIT Analysis of Wind Trajectories on High Ozone Days

The HYSPLIT trajectories were further analyzed on each high ozone day at all monitors that measured greater than 70 ppb in New Jersey from 2013-2015. The wind trajectories on these high ozone days are shown in Figure 17, which shows that winds carried emissions from the counties within the recommended nonattainment area to the violating monitor in New Jersey. Figure 18 represents the number of times any wind trajectory from Figure 17 traversed through a county in the recommended nonattainment area.

Figure 17: Wind Trajectories on High Ozone Days from 2013 – 2015 in New Jersey

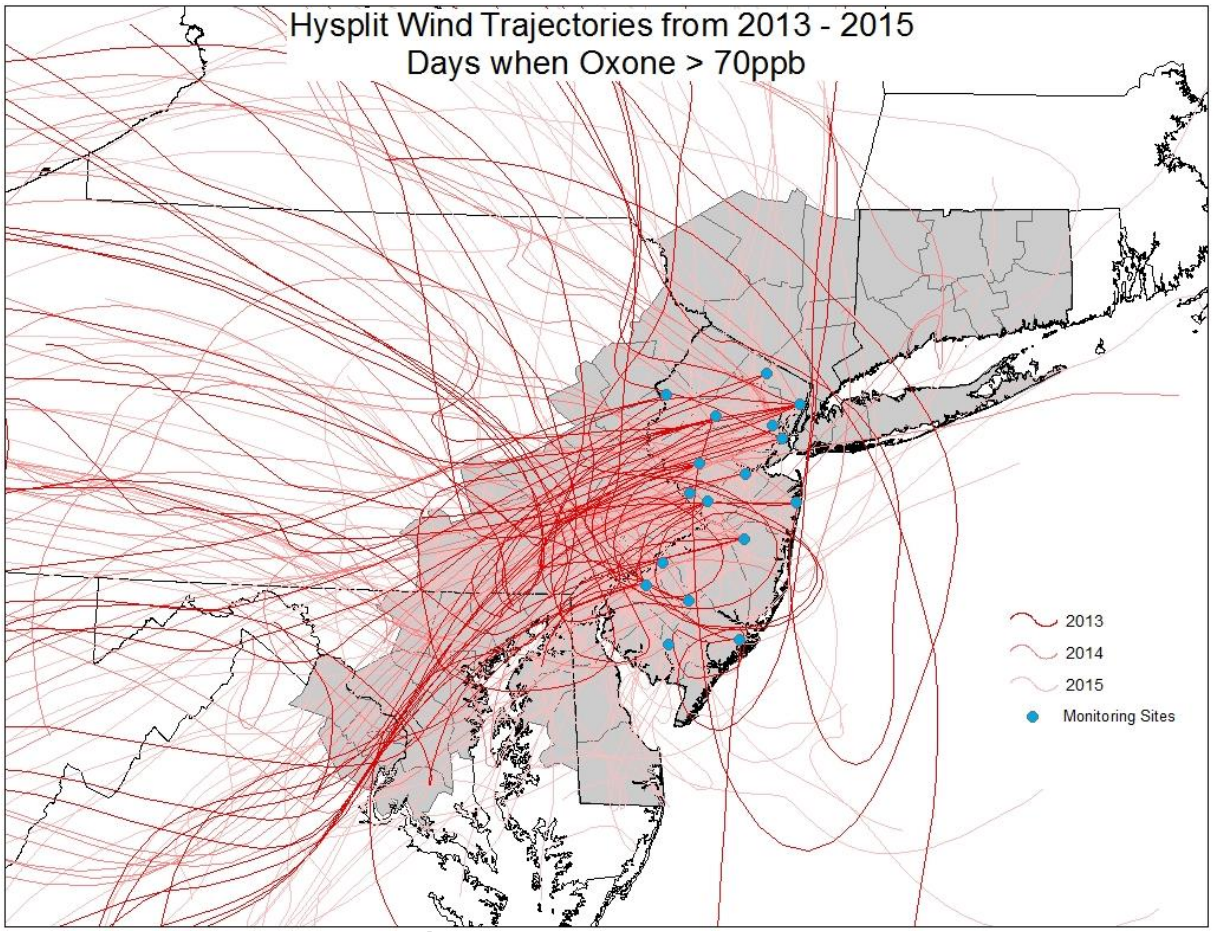


Figure 18: Count of Trajectory Passes by County on High Ozone Days from 2013 – 2015 in New Jersey

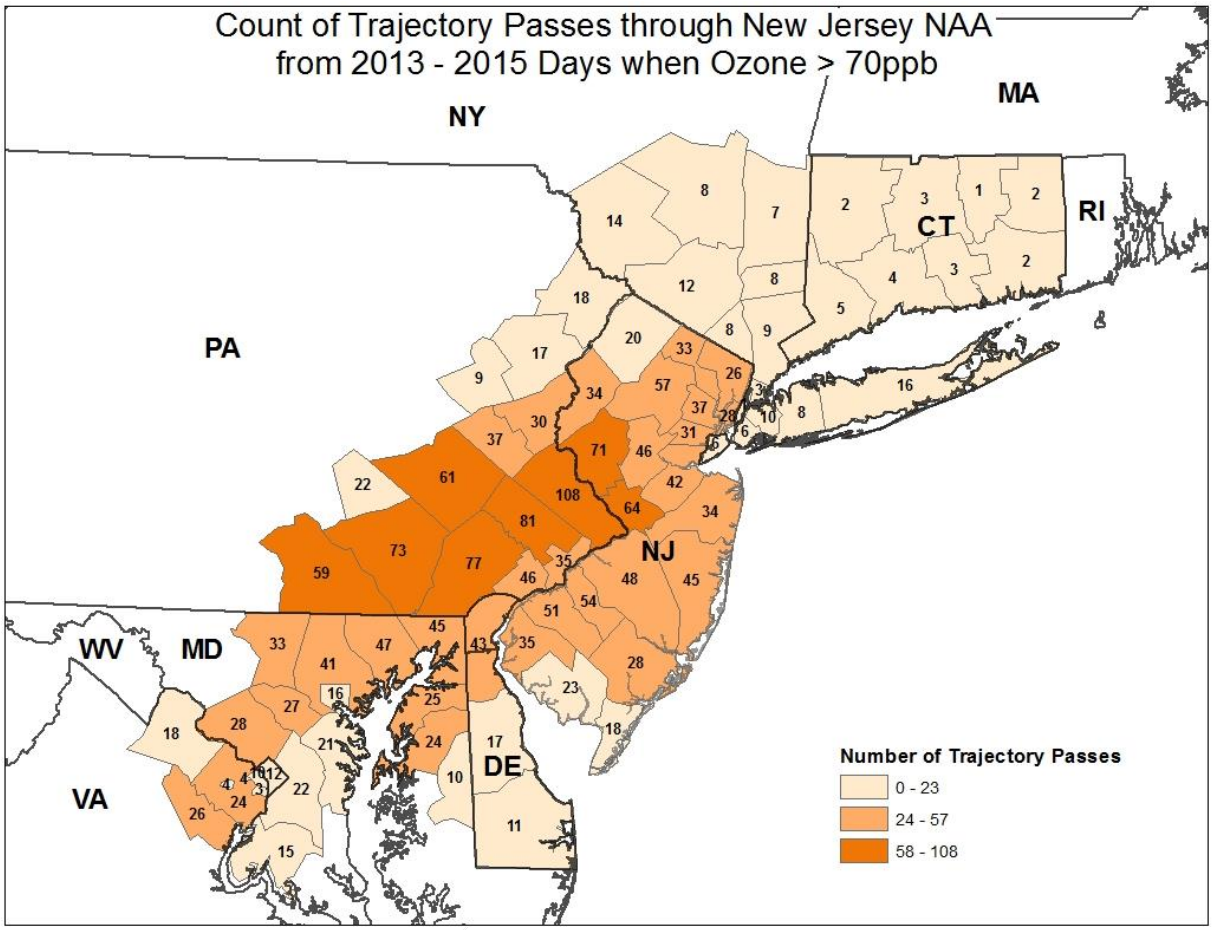


Figure 18 shows the number of trajectories that passes through each county on days when the 8-hour ozone was above 70 ppb for 2013 to 2015. Based on the count of trajectories, this map shows the influence of the Philadelphia area emissions and Washington/Baltimore corridor emissions on New Jersey. The highest numbers of trajectories are traversing through southeastern Pennsylvania and into northern New Jersey. The numbers presented in the map are consistent with the wind patterns that are typically observed on high ozone days in New Jersey.

Currently, York County, Pennsylvania is not included in the defined CSA associated with southern New Jersey. New Jersey is recommending that this county be included in the recommended nonattainment area because, as demonstrated in Figure 18, a high frequency of wind trajectories (59) travels through York County into New Jersey on days when New Jersey is measuring high ozone levels. Furthermore, York County is associated with a high level of emissions as seen in Section 2-2, Tables 3 and 4, and Figures 4, and 5.

Nonattainment Influences by Nearby Area to Cecil County, Maryland

Cecil County, Maryland is a county within the Philadelphia-Wilmington-Atlantic City (PA-NJ-DE-MD) nonattainment area that currently measures high ozone. The USEPA conducted transport modeling for the 75 ppb ozone NAAQS for use in addressing states' commitments for "Good Neighbor" transport State Implementation Plans.[15] Although the intent of the modeling is to address long range transport from one state to another state, the data can provide a general concept of nearby contribution. As shown in Table 13, the top three largest contributors of predicted ozone concentration in Cecil County for 2017 are from emissions that originate in Maryland, Pennsylvania and Virginia. New Jersey and Delaware, which share the CSA and current nonattainment area, only contribute a total of 0.27 ppb to the ozone levels in Cecil County. Therefore, the current nonattainment boundary for the PA-NJ-DE-MD nonattainment area is insufficient and fails to consider the nearby impacts of Maryland and Virginia, specifically the Washington, D.C./Baltimore metropolitan areas. The Cecil County monitor, and its shared nonattainment area with New Jersey, cannot expect to achieve attainment if these nearby areas are not part of the attainment planning process.

Table 11: Contribution to Cecil County from Other States

State	Contribution (ppb)	Percent Contribution[a]
MD	17.11	24
PA	7.63	11
VA	5.48	8
WV	3.53	5
OH	2.67	4
IN	0.98	1
KY	1.17	2
TX	0.79	1
NC	0.70	1
DC	0.67	1
NY	0.25	0
NJ	0.14	0
DE	0.13	0
CT	0.01	0

[a]The percent contribution is calculated by dividing the contribution (ppb) by the maximum design value of the Cecil County monitor (72.4 ppb per USEPA's CSAPR Update Modeling) and multiplying by 100.

[15] Final Cross-State Air Pollution Rule Update, "Data File with Ozone Design Values and Ozone Contributions." https://www.epa.gov/airmarkets/final-cross-state-air-pollution-rule-update (October 24. 2016).

Section 2-4: Factor 4 - Geography and Topography

The geography and topography of New Jersey and the other counties within its shared CSAs or CBSAs, do not play a role in causing high levels of ozone in the state. The locations of the monitoring sites in New Jersey are not in close proximity to any substantial mountains or valleys that will affect the flow of air to create or disperse ozone levels at the monitoring sites. The wind trajectories presented in the previous maps show consistent patterns in terms of the predominant wind direction at all locations.

Section 2-5: Factor 5 - Jurisdictional Boundaries

The current jurisdictional boundaries for the entire state should be considered as monitors throughout New Jersey are currently measuring violations of the 70 ppb 8-hour ozone standard. New Jersey is recommending a single jurisdictional boundary encompassing the entire state as a single nonattainment area. New Jersey believes that attainment of the 2015 standard can only be achieved by including the nearby states and their counties in this single nonattainment area. By doing so, it will ensure that the surrounding states influencing high ozone levels in New Jersey are part of the same attainment planning process, and will ensure that the all counties within the State have the same air quality planning requirements, attainment date, and air quality considerations.

Section 3 – Conclusion

New Jersey's five factor analysis to support the recommended nonattainment area presented in this document is as follows:

1) Air quality data from Washington, D.C. to the eastern edge of Connecticut show that the 70 ppb ozone NAAQS is not being attained throughout that entire region.

2) Local emissions throughout the recommended area are contributing to nonattainment of the 70 ppb ozone NAAQS in neighboring downwind counties. Emissions of VOC and NO_x from New Jersey are minimal when compared to sources in upwind, nearby states. Emissions from these states have been demonstrated through modeling to contribute to New Jersey's ozone levels.

3) The prevailing winds on high ozone days are from the Washington, D.C. corridor to Baltimore to Philadelphia and then to New Jersey. As winds follow this pattern of moving local emissions from one county to the next, the entire area is linked to its neighboring county and should constitute one nonattainment area.

4) Geography does not play a major role in the ozone contributions from one state to the next.

5) Jurisdictional boundaries of county-sized nonattainment areas were considered. It was determined that a larger, single nonattainment area is needed to achieve attainment of the 70 ppb ozone standard in New Jersey and its shared CSAs and CBSAs.