Designation Request

2024 Revised National Ambient Air Quality Standards for Fine Particulate

Connecticut Department of Energy and Environmental Protection

January 2025

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Acronyms and Abbreviations

CAA	Clean Air Act
CBSA	Core Based Statistical Area
CFR	Code of Federal Regulations
CSA	Combined Statistical Area
CTDOT	Connecticut Department of Transportation
DEEP	Department of Energy and Environmental Protection
EPA	U.S. Environmental Protection Agency
FR	Federal Register
$\mu g/m^3$	Micrograms per cubic meter
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventory
NH_3	Ammonia
NO_x	Nitrogen Oxides
PM_{10}	Particulate Matter < 10 microns
$PM_{2.5}$	Particulate Matter < 2.5 microns
SO_2	Sulfur Dioxide
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

1 Introduction and Background

1.1 Purpose

On February 7, 2024, the US Environmental Protection Agency (EPA) promulgated a revision to the primary annual National Ambient Air Quality Standard (NAAQS) for particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), or fine particulate.[1] Subsequent to promulgation of a new or revised NAAQS, States are required under Section 107 of the Clean Air Act (CAA) to submit recommendations to EPA regarding the State's attainment and nonattainment boundaries and designations for the standard. This document presents the Connecticut Department of Energy and Environmental Protection's (DEEP's) analysis of data relevant to the $PM_{2.5}$ NAAQS both monitoring air quality levels within, and surrounding the State, and recommends that EPA designate the entire State of Connecticut attainment for the 2024 $PM_{2.5}$ NAAQS.

1.2 Regulatory Background

EPA sets primary and secondary NAAQS designed to be protective of public health and welfare, respectively. Effective May 6, 2024, based on an integrated assessment of new scientific evidence, which strengthened the EPA's body of knowledge regarding $PM_{2.5}$-related health effects, the primary $PM_{2.5}$ NAAQS was strengthened from 12.0 micrograms per cubic meter ($\mu g/m^3$) to 9.0 $\mu g/m^3$.[2] The EPA made no changes to the primary 24-hour standards for $PM_{2.5}$ and PM_{10}. EPA also did not change the secondary annual and 24-hour particulate standards. The full list of current NAAQS can be found on EPA's website.

Under section 107(d) of the Clean Air Act (CAA), states are required to submit designation recommendations to EPA, no later than 1 year after promulgation of a NAAQS. Therefore, states are required to provide designation recommendations to EPA by February 7, 2025, for the revised annual $PM_{2.5}$ NAAQS. If EPA intends to promulgate a designation that deviates from the state recommendation, EPA must notify the state at least 120 days prior to promulgating the modified designation, and EPA must provide the state an opportunity to comment on the potential modification. The Clean Air Act requires completion of the designation process within two years of promulgation (i.e., by February 7, 2026) unless the Administrator finds that additional information is needed to make these decisions. In such a case, EPA may take up to an additional year to make the designations (i.e., by February 7, 2027).

In a memo dated February 7, 2024, EPA describes the five-factor framework it intends to use to determine area boundaries and designations.[3] The first factor considered is air quality levels measured at fourteen monitoring stations located around the state. This is discussed in more detail as part of the discussion of DEEP's analysis of the five factors analyzed in making recommendations. Based on the monitored data, Connecticut is measuring air quality levels that comply with the revised federal standard for $PM_{2.5}$. DEEP addresses each of the five factors in this document and concludes that the entire state should be designated attainment for the 2024 PM2.5 NAAQS.

[1] https://www.epa.gov/particle-pollution-designations/particle-pollution-designations-memorandum-and-data-2024-revised
[2] Reconsideration of the National Ambient Air Quality Standard for Particulate Matter, 89 FR 16202 16202 (March 6, 2024)
[3] https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-designations-memo_2.7.2024-_-jg-signed.pdf

2 Five Factor Analysis

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 $PM_{2.5}$ monitor or group of monitors that indicate violations of the standard, EPA indicated their intent to determine the appropriate nearby areas to include within the nonattainment area boundary based on that area's emissions contribution to the monitored violations. Areas that meet the standard and do not contribute to nearby nonattainment should be designated as attainment, and areas with insufficient data should be designated unclassifiable.

To determine what constitutes an area, EPA will consider entire metropolitan areas, and adjacent counties, as being nearby and having the potential to contribute to the nonattainment monitor(s). Metropolitan areas are officially delineated as Core Based Statistical Areas (CBSAs) or Combined Statistical Areas (CSAs) as shown regionally in Figure 2-1.[4]

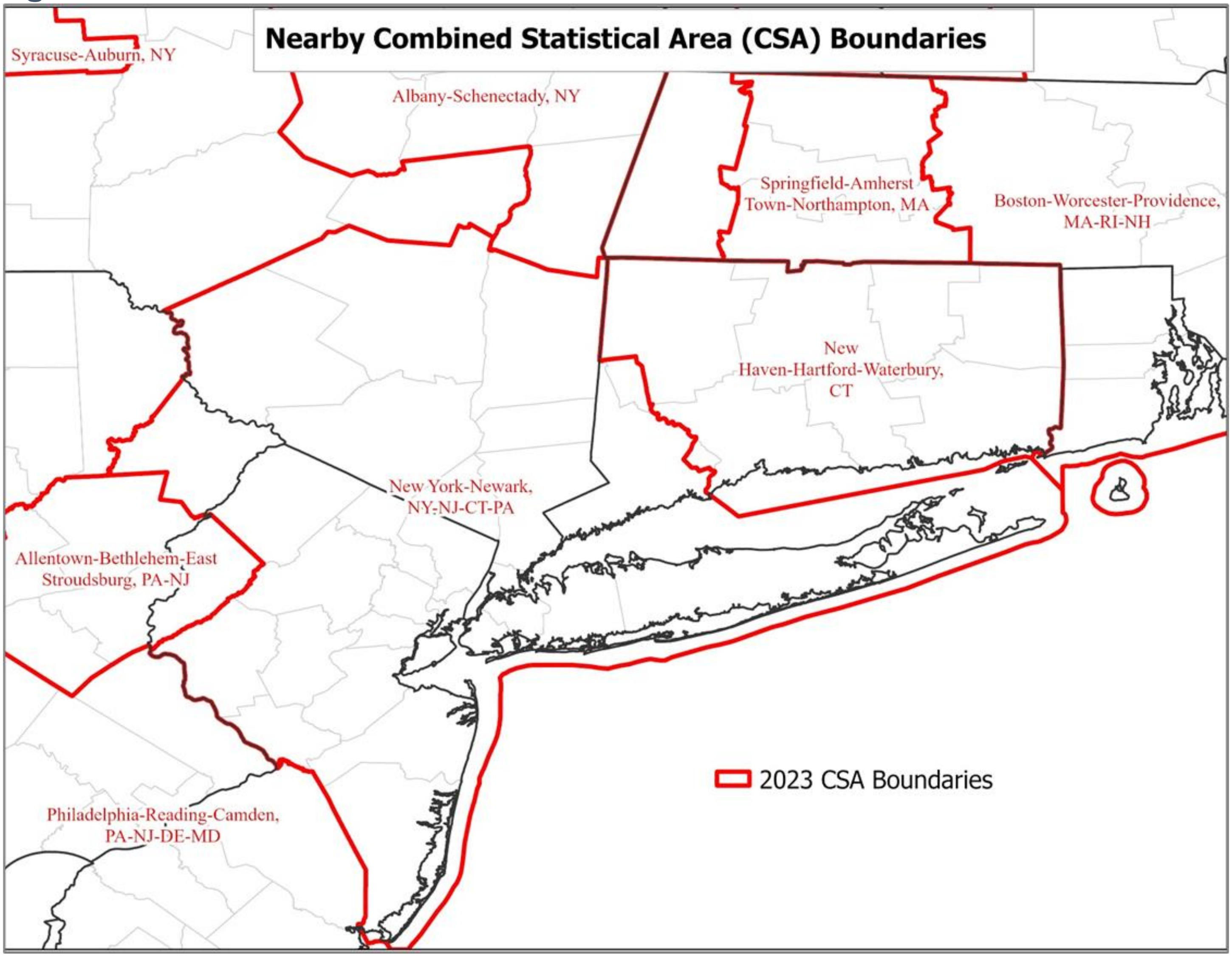
EPA guidance recommends identifying each monitor in an area and identifying nonattainment monitors. Recommendations for an area designation should then be based on consideration of the following five factors:

1) air quality,
2) emissions and emissions-related data,
3) meteorology,
4) geography/topography, and
5) jurisdictional boundaries.

The factors are intended to inform EPA's analysis of the statutory definition of a nonattainment area, which is to include "any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet)" the $PM_{2.5}$ NAAQS.[5]

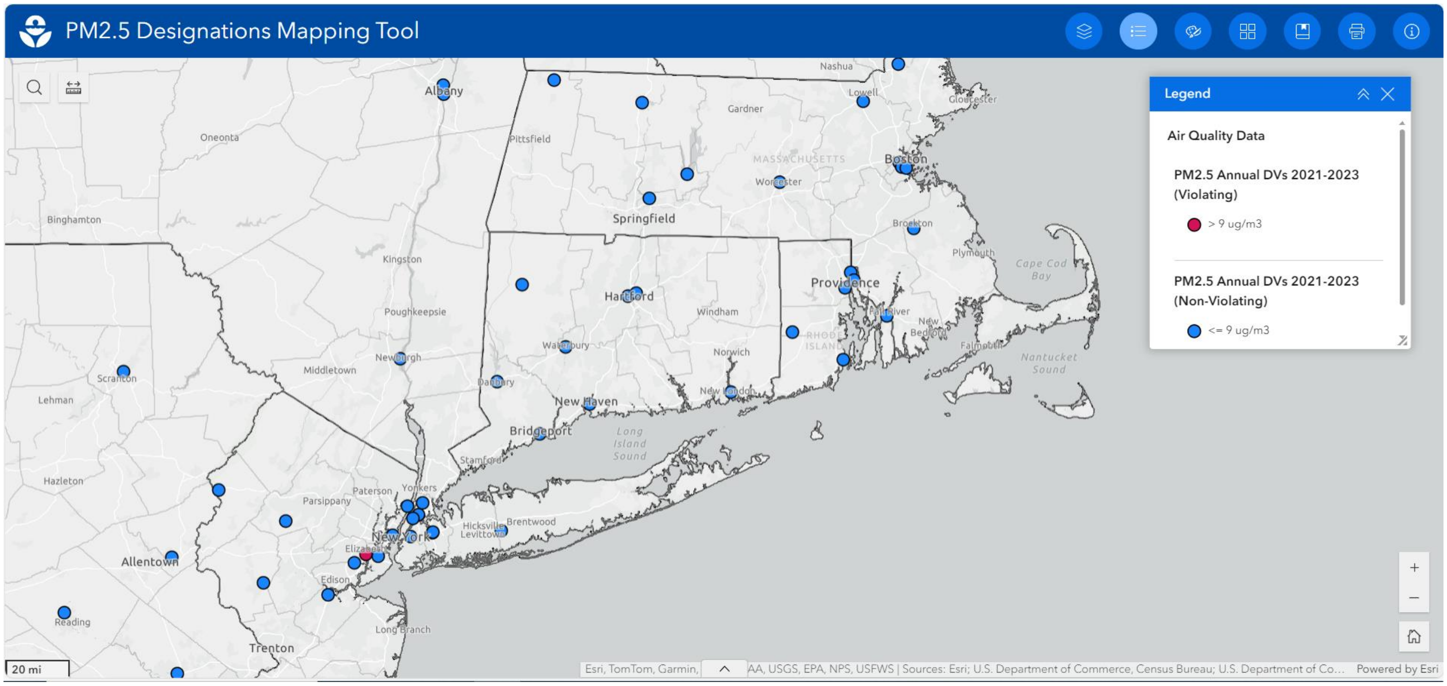
[4] Combined Statistical Area Map (July 2023)
[5] CAA Sections 107(d)(4)(A)(v)

Figure 2-1. Combined Statistical Area boundaries in and near Connecticut.



DEEP used [EPA's $PM_{2.5}$ Designations Mapping Tool] to determine nonattainment monitors within and nearby areas adjacent to Connecticut. As shown in Figure 2-2, all monitors in areas near and adjacent to Connecticut are in attainment with the new $PM_{2.5}$ annual standard except for one monitor. That one monitor is the Elizabeth Lab monitor in the city of Elizabeth, Union County, New Jersey. There are a significant number of attaining monitors in the area between Connecticut and the Elizabeth Lab monitor indicating it is unlikely that Connecticut contributes to nonattainment at the distant Elizabeth Lab monitor. Nevertheless, portions of Connecticut are within the same CSA as the Elizabeth Lab monitor. Therefore, consistent with EPA guidance, the remainder of this document focuses on the five factors relative to Connecticut and this monitor.

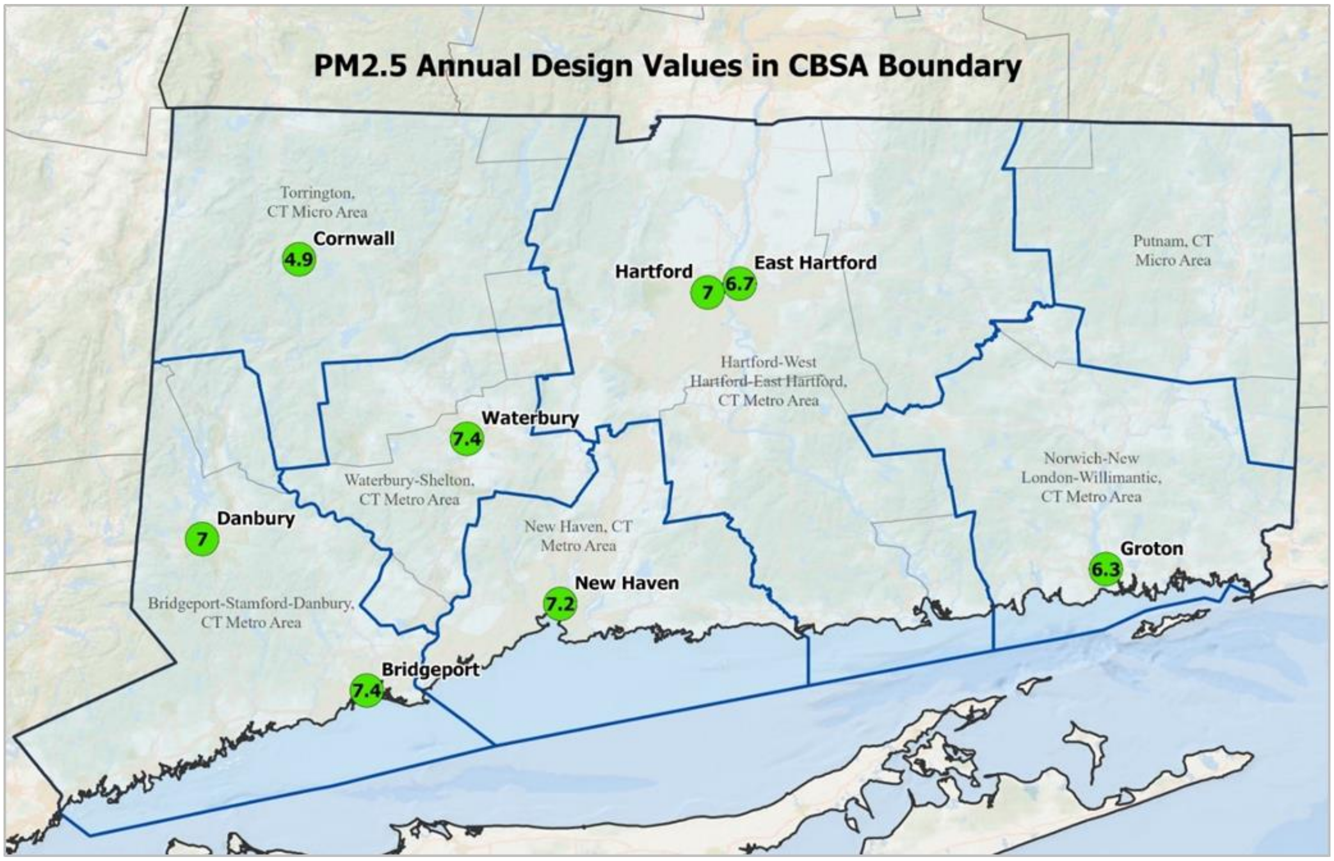
Figure 2-2. Attainment (blue) and nonattainment (red) $PM_{2.5}$ monitors in and adjacent to Connecticut.



2.1 Factor 1: Air Quality

DEEP maintains a comprehensive network of eight $PM_{2.5}$ air quality monitors throughout the state with the primary objective of determining compliance with the $PM_{2.5}$ NAAQS and submits network plans to EPA Region 1 annually to demonstrate that air monitoring operations meet or surpass all applicable federal requirements. Figure 2-3 shows 2023 annual PM2.5 design values at each of the monitors and their respective locations within their CBSAs. Design values represent monitored data in the proper averaging time and form such that it can be compared to the level of the standard. Connecticut's design values are all well below the 9.0 µg/m³ $PM_{2.5}$ standard.

Figure 2-3. $PM_{2.5}$ design values for 2023 shown for each Connecticut monitor location along with Core Based Statistical Area boundaries.



Recent trends in design values, shown in Table 2-1 for both the 24-hour and annual standards, show that Connecticut's maximum values have been steady over the past five years with a slight increase in 2023. The increase in 2023 is likely due to extraordinary smoke events from widespread wildfires affecting regional monitors that year.[6]

Table 2-1. Maximum 24-hour and annual $PM_{2.5}$ design values for each year from 2019 - 2023.

Maximum 24-hour and Annual Design Values at Connecticut Monitors					
Year	**2019**	**2020**	**2021**	**2022**	**2023**
24-Hour Design Value NAAQS = 35 (μg/m³)	20	20	20	20	21
Annual Design Value NAAQS = 9 (μg/m³)	7.2	7.2	7.2	7.1	7.4

Longer term design value trends are shown for the 24-hour and annual standard for each of Connecticut's monitors in Figure 2-4 and Figure 2-5, respectively. The impact of the 2023 smoke events is perhaps most evident in the 24-hour trend at the rural Cornwall site, which shows an increase from 12 μg/m³ in 2022 to 16 μg/m³ in 2023. Future design values are expected to remain below the standards, consistent with trends prior to 2023.

[6] https://portal.ct.gov/deep/air/planning/ozone/2023-exceptional-events

Figure 2-4. Long-term trends in $PM_{2.5}$ 24-hour design values at each of Connecticut's monitors shown in relation to the standard.

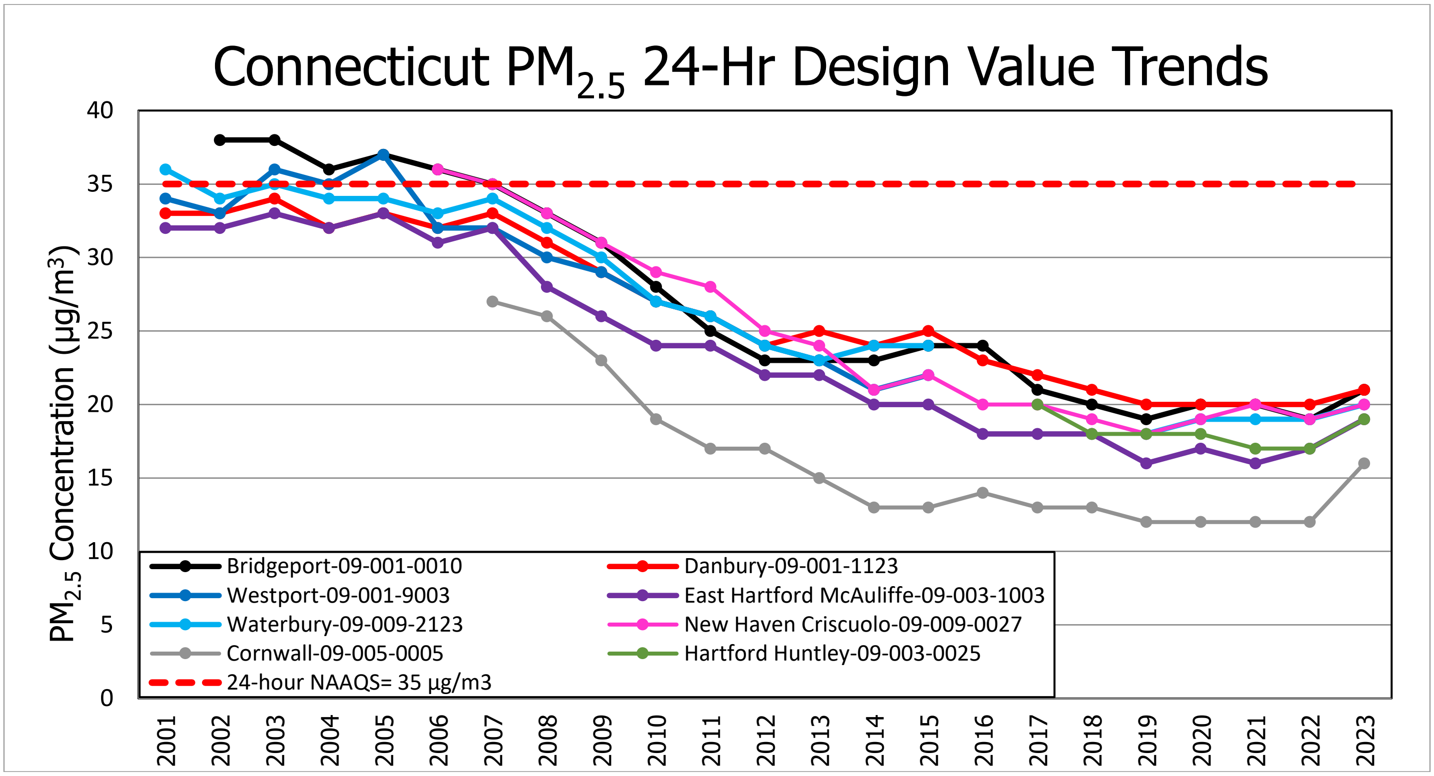


Figure 2-5. Long-term trends in $PM_{2.5}$ annual design values at each of Connecticut's monitors shown in relation to the standard.

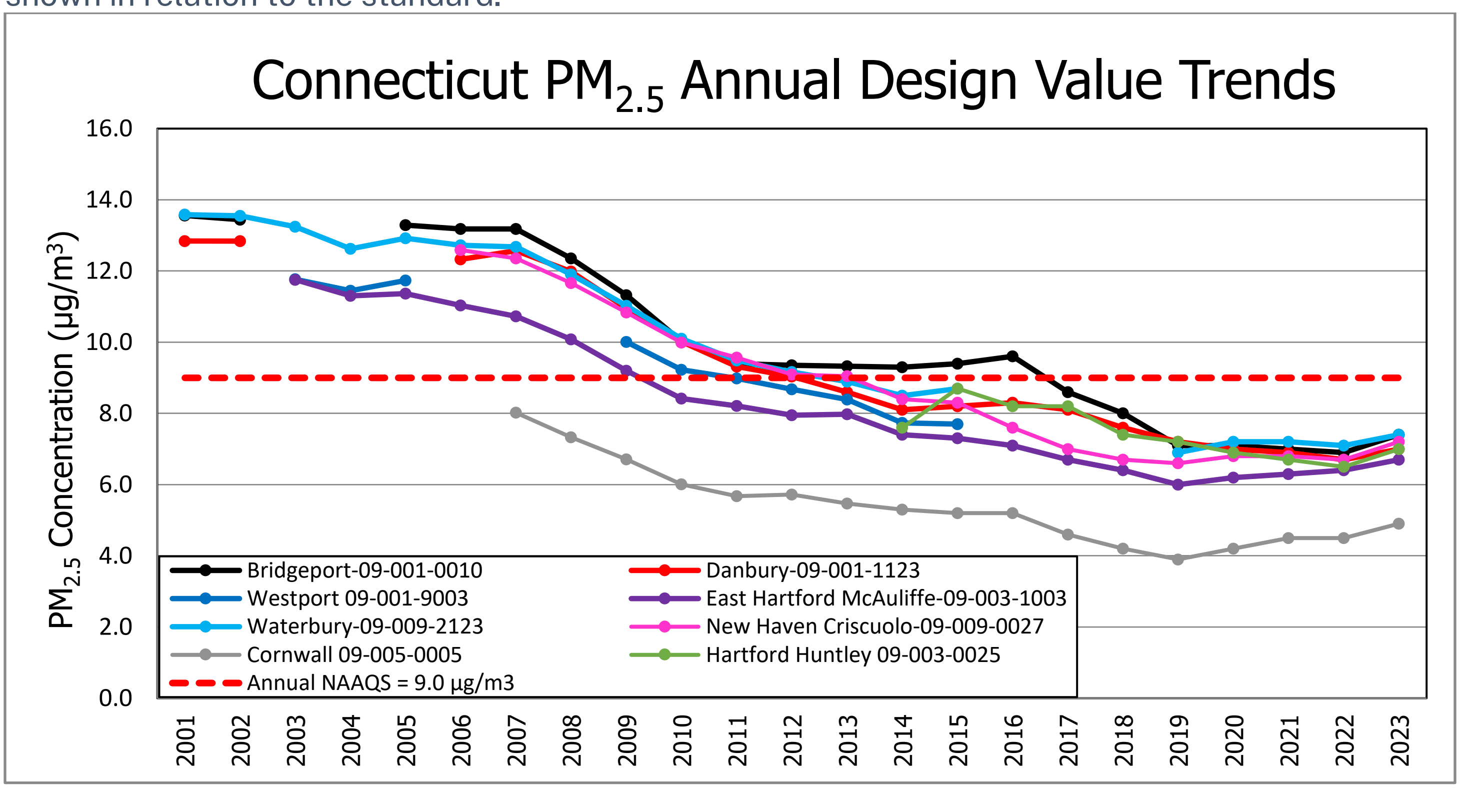
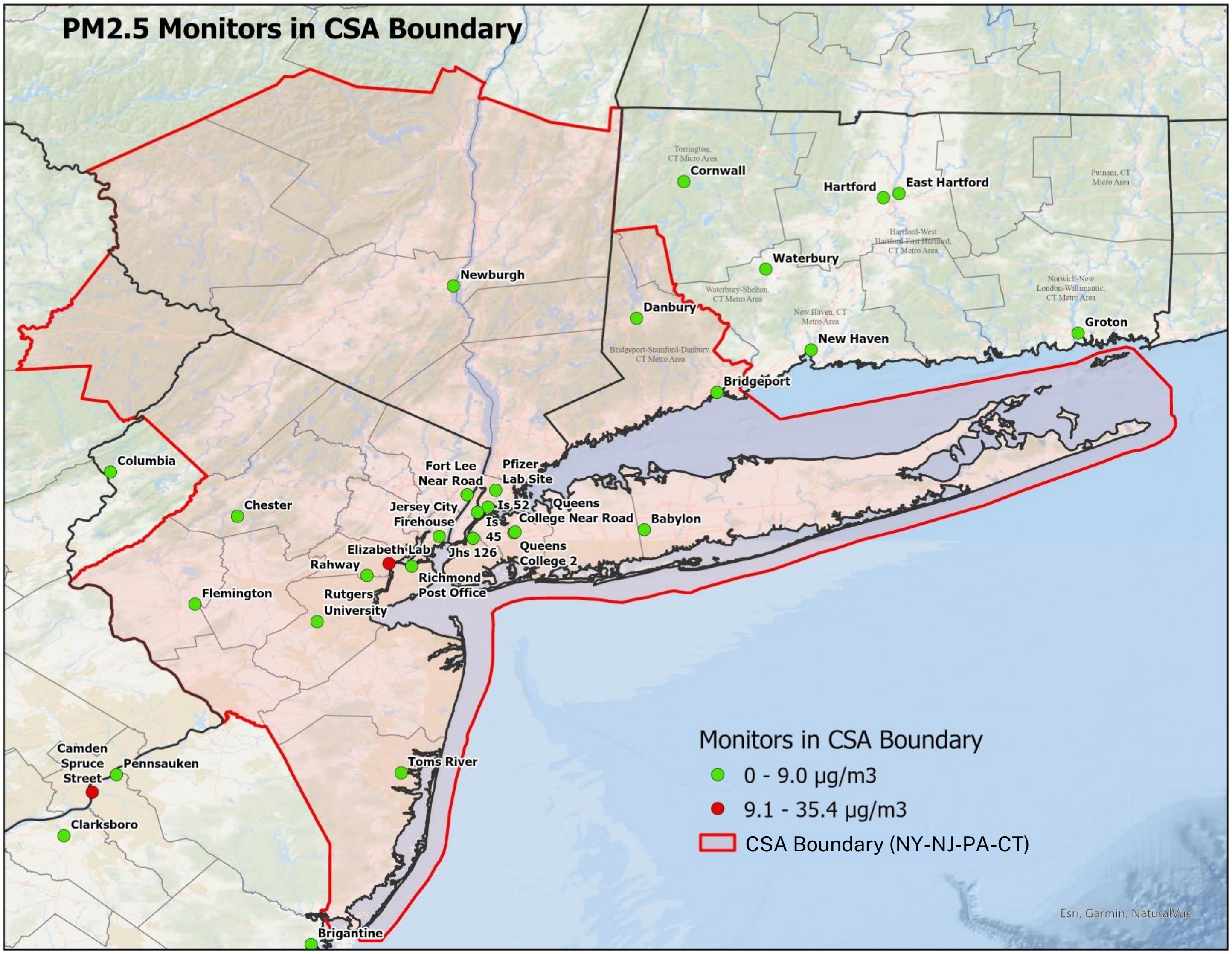


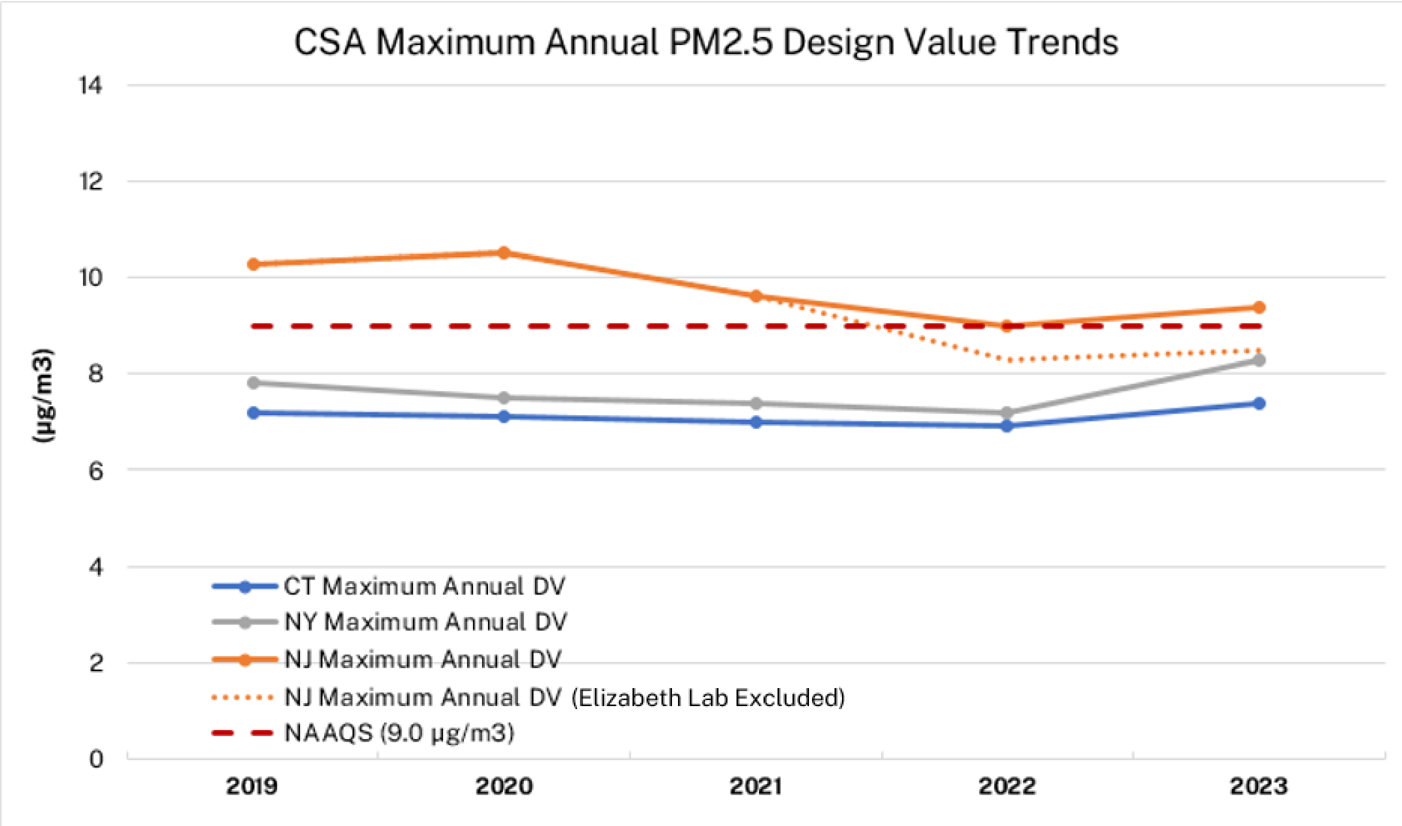
Figure 2-6 shows the locations of $PM_{2.5}$ monitors within the New York-Newark (NY-NJ-PA-CT) CSA with indication of their current attainment status. The Elizabeth Lab site, near the center of the CSA, is the only site that exceeds the standard. The 27 other monitor sites in the CSA attain the standard and many of these are located between the Elizabeth Lab site and Connecticut's borders.

Figure 2-6. Attainment (green) and nonattainment (red) monitors shown within the New York - Newark (NY-NJ-PA-CT) CSA.



Maximum design value trends from monitors in the CSA, by state, are charted in Figure 2-7. Note that Pennsylvania has no $PM_{2.5}$ monitors located in the CSA. Prior to the extraordinary smoke impacts from wildfires in 2023, all trends were downward. The trend for New Jersey, with the exclusion of Elizabeth Lab site, is also shown and would indicate attainment with an approximate ten percent drop in the design value for sites in the New Jersey portion of the CSA.

Figure 2-7. Maximum annual design value (DV) trend of each state's monitors within the CSA.



The Elizabeth Lab Monitor

The Elizabeth Lab (monitor number 34-039-0004) in Union County, New Jersey is located within an industrial area close to the New Jersey Turnpike and Interstate-278 (Figure 2-8).[7] Annual $PM_{2.5}$ design values for the site are plotted in Figure 2-9 and show a downward trend from 2014 through 2020. The trend levels off near the standard between 2020 and 2023, only rising above the standard in 2023.

[7] New Jersey Air Monitoring Site Description (nj.gov)

Figure 2-8. Aerial image showing the location of the Elizabeth Lab monitor.

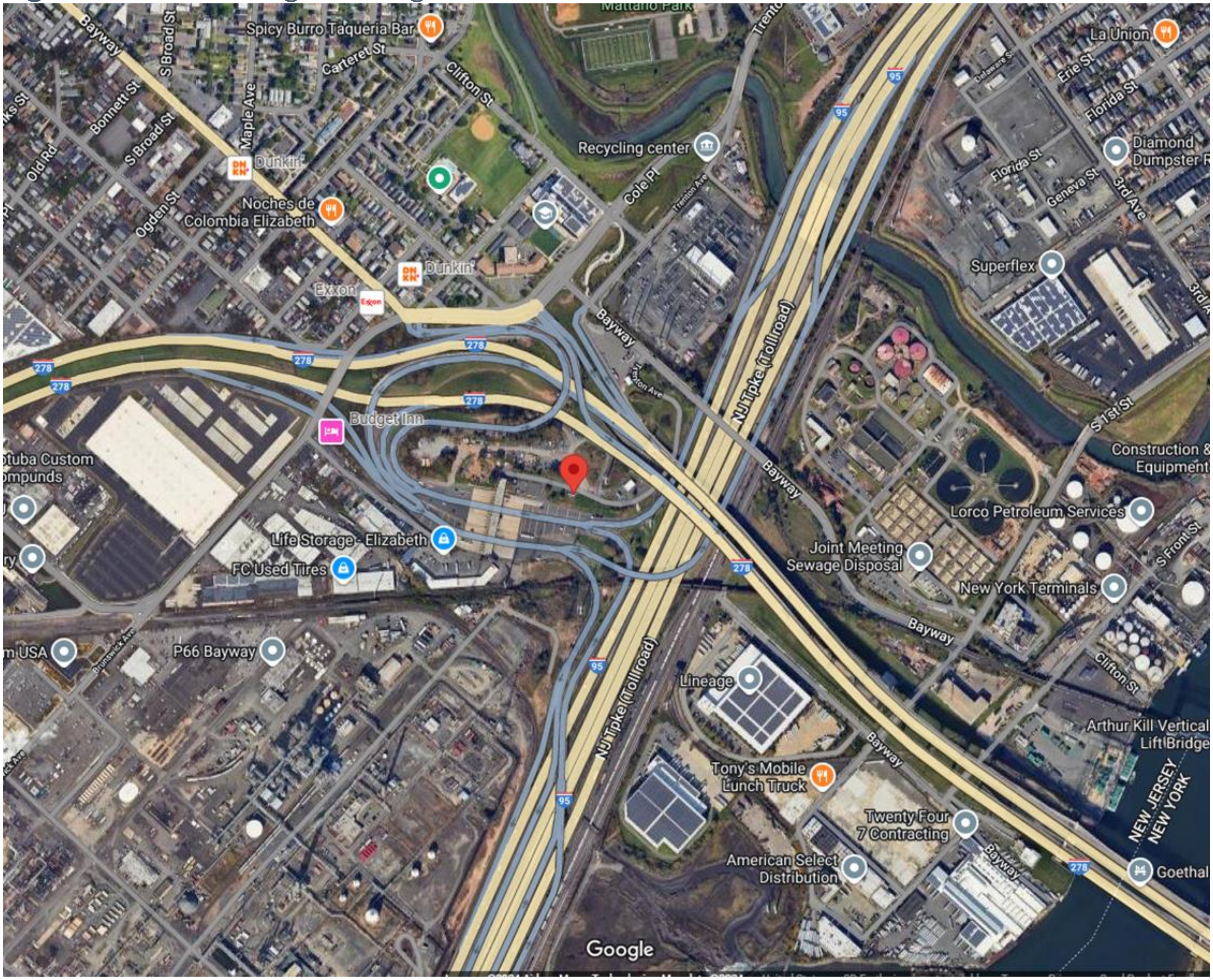
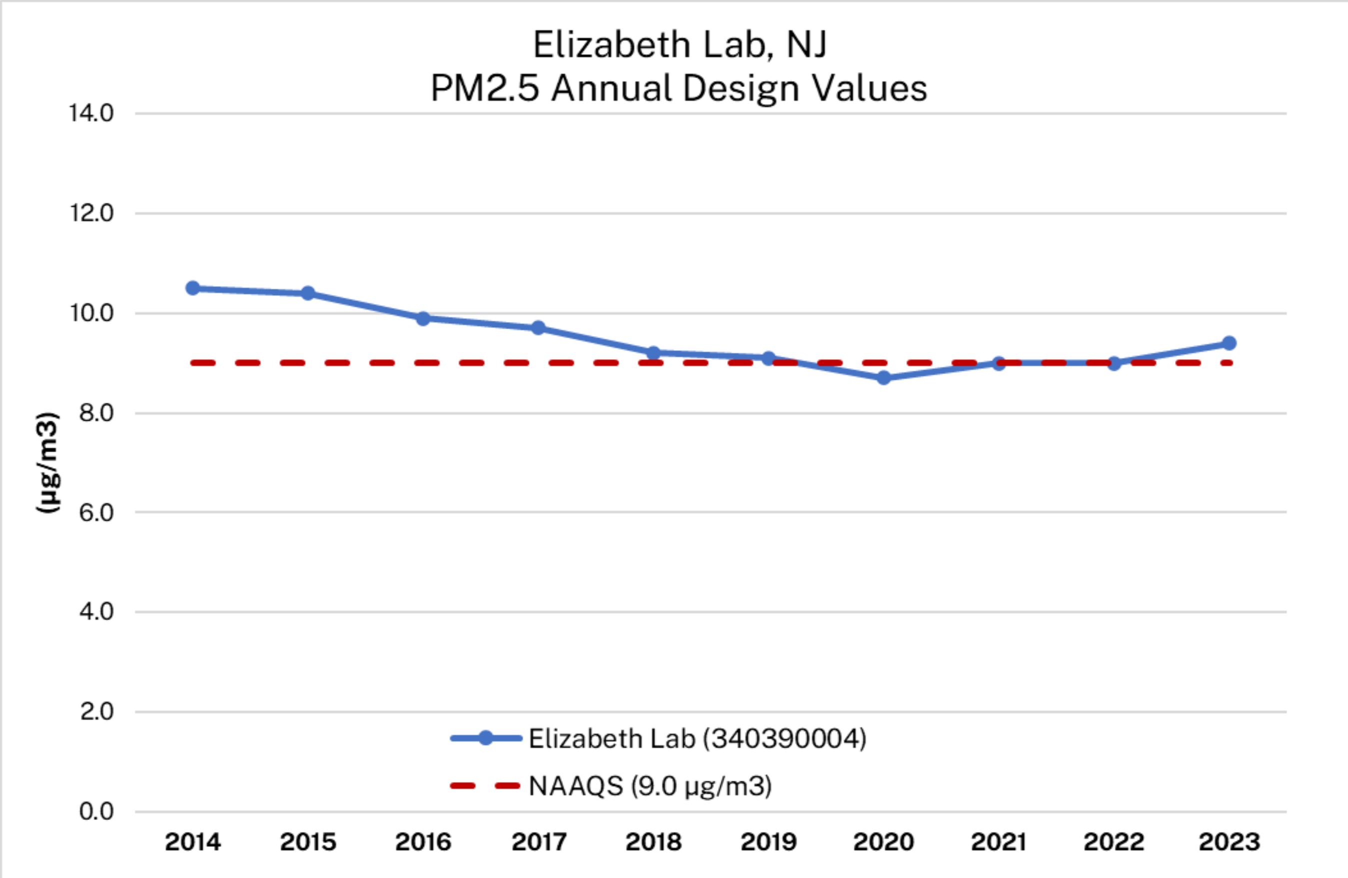


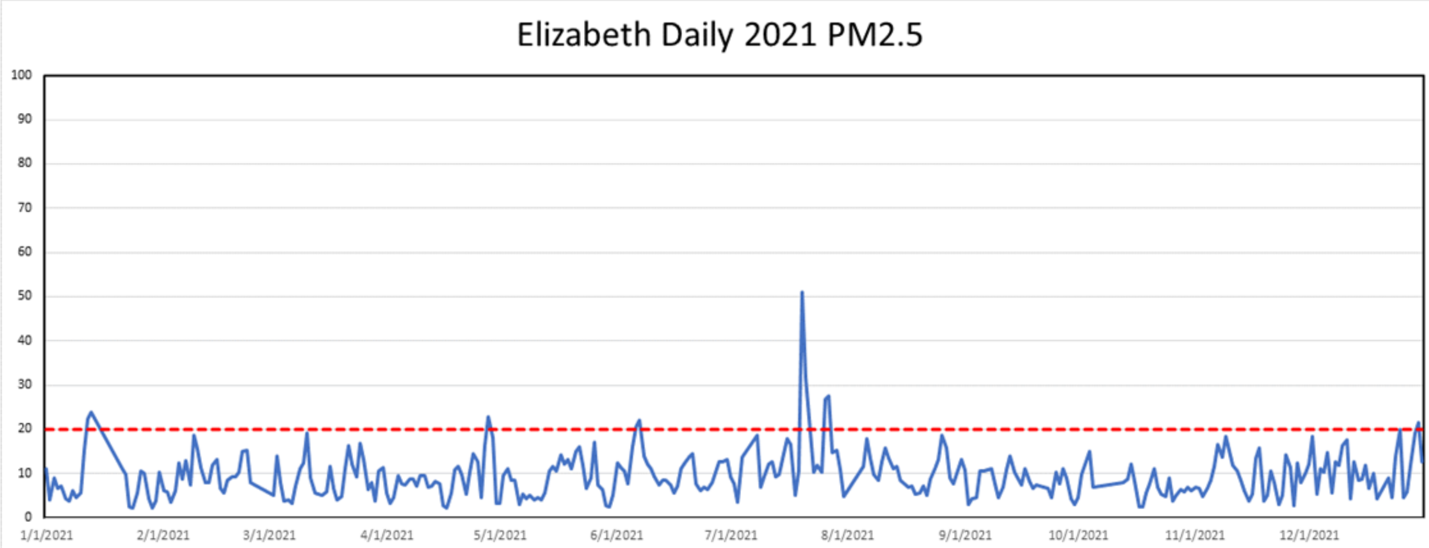
Figure 2-9. Annual $PM_{2.5}$ design values at Elizabeth Lab (2014-2023).



Daily $PM_{2.5}$ values at Elizabeth Lab

Daily $PM_{2.5}$ values were plotted from 2021-2023 for the Elizabeth Lab monitor to further understand the increased annual design value at the site. The arithmetic mean for each day was used in the following graphics showing daily 24-hour values. The data was obtained from EPA's Air Data website. Other than a few spikes, values in 2021 (Figure 2-10) remained mostly under the arithmetic mean. A major smoke event occurred throughout the region on July 20, 2021, and was the likely cause of the peak spike shown for the year.

Figure 2-10. Daily average $PM_{2.5}$ values for 2021 at the Elizabeth, NJ monitor.



$PM_{2.5}$ 24-hour values in 2022 (Figure 2-11) show a slightly decreasing trend. Again, certain peaks can be attributed to smoke and smoke from small fires located near the monitor (Figure 2-12) was evident on April 13, 2022. Regardless of the localized fires and sources, the annual design value was 9.0 µg/m³, making this year compliant with the revised standard.

Figure 2-11. Daily average $PM_{2.5}$ values for 2022 at the Elizabeth, NJ monitor.

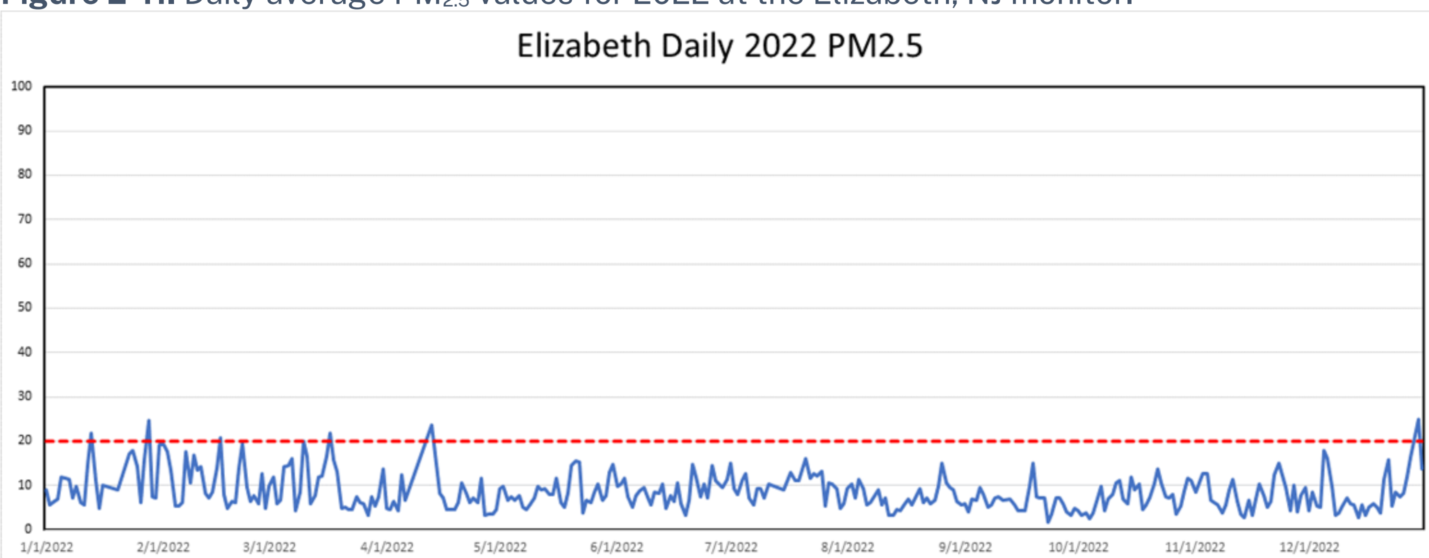
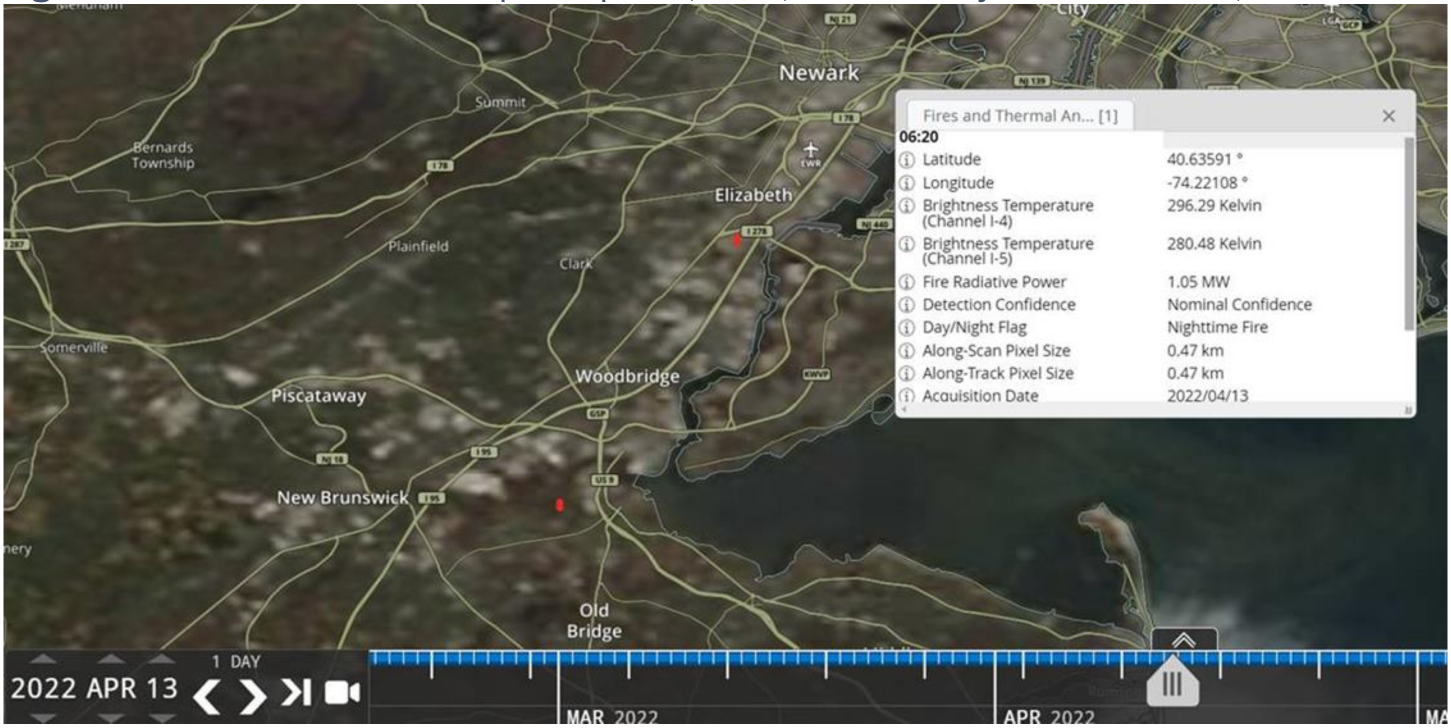
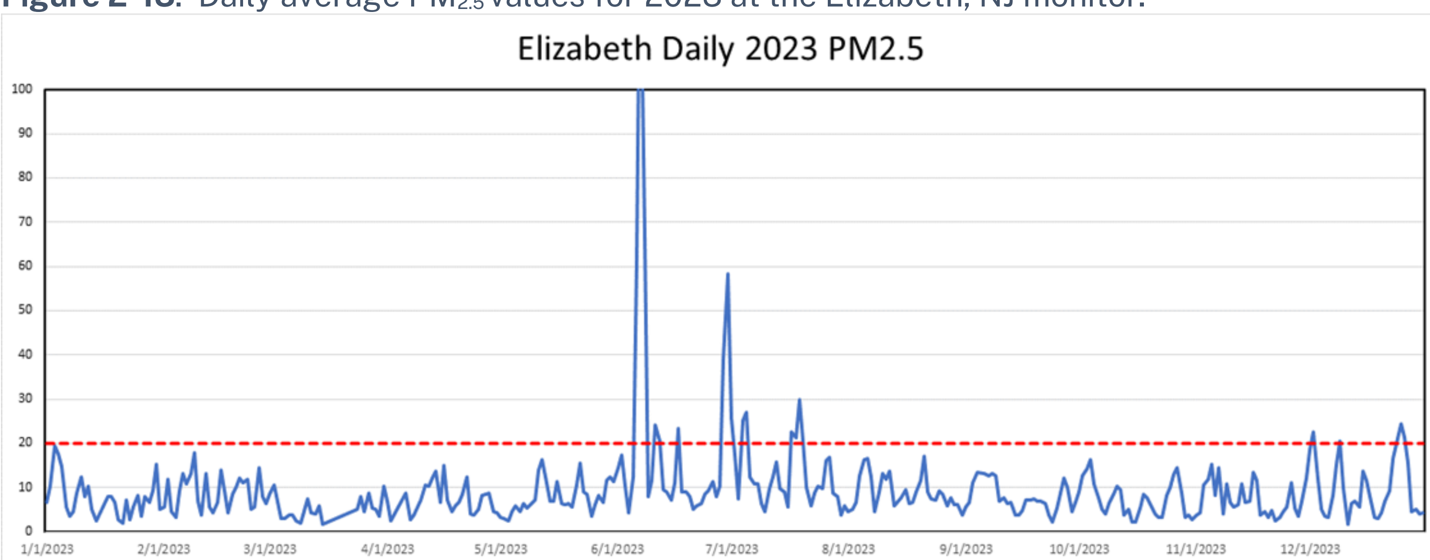


Figure 2-12. Fire and thermal map for April 13, 2022, in the vicinity of the Elizabeth, NJ monitor.



Wildfire smoke was present throughout the summer of 2023 causing a few severely elevated $PM_{2.5}$ 24-hour values (Figure 2-13). These extreme spikes are evidently larger than any seen in the previous two-year graphics, with the highest value being 138.8 µg/m^3 on June 7, 2023. The smoke events of 2023 were extreme, and it is likely that Elizabeth Lab design values will trend lower as the influence of these outliers is diminished.

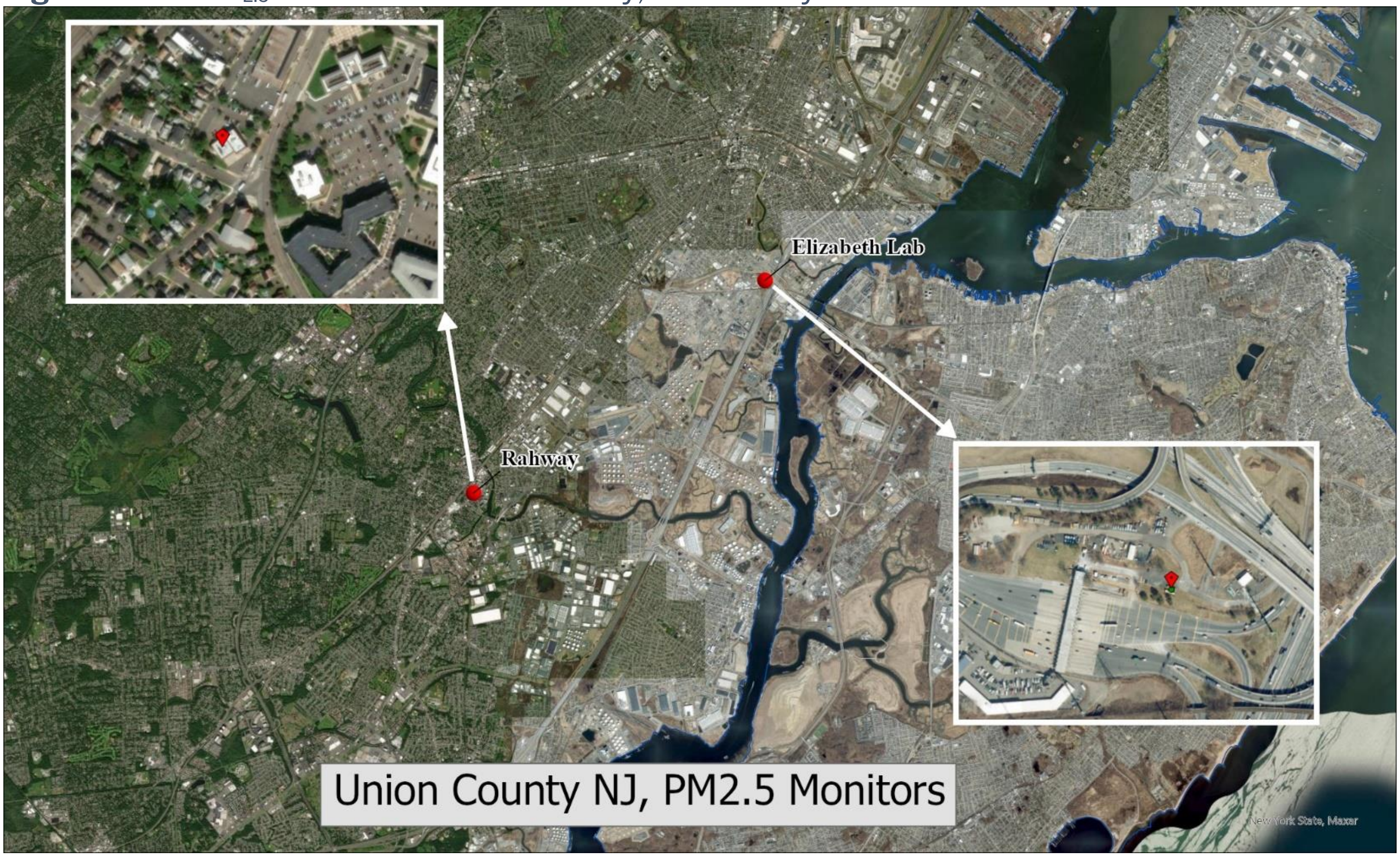
Figure 2-13. Daily average $PM_{2.5}$ values for 2023 at the Elizabeth, NJ monitor.



The Rahway monitor compared to Elizabeth Lab.

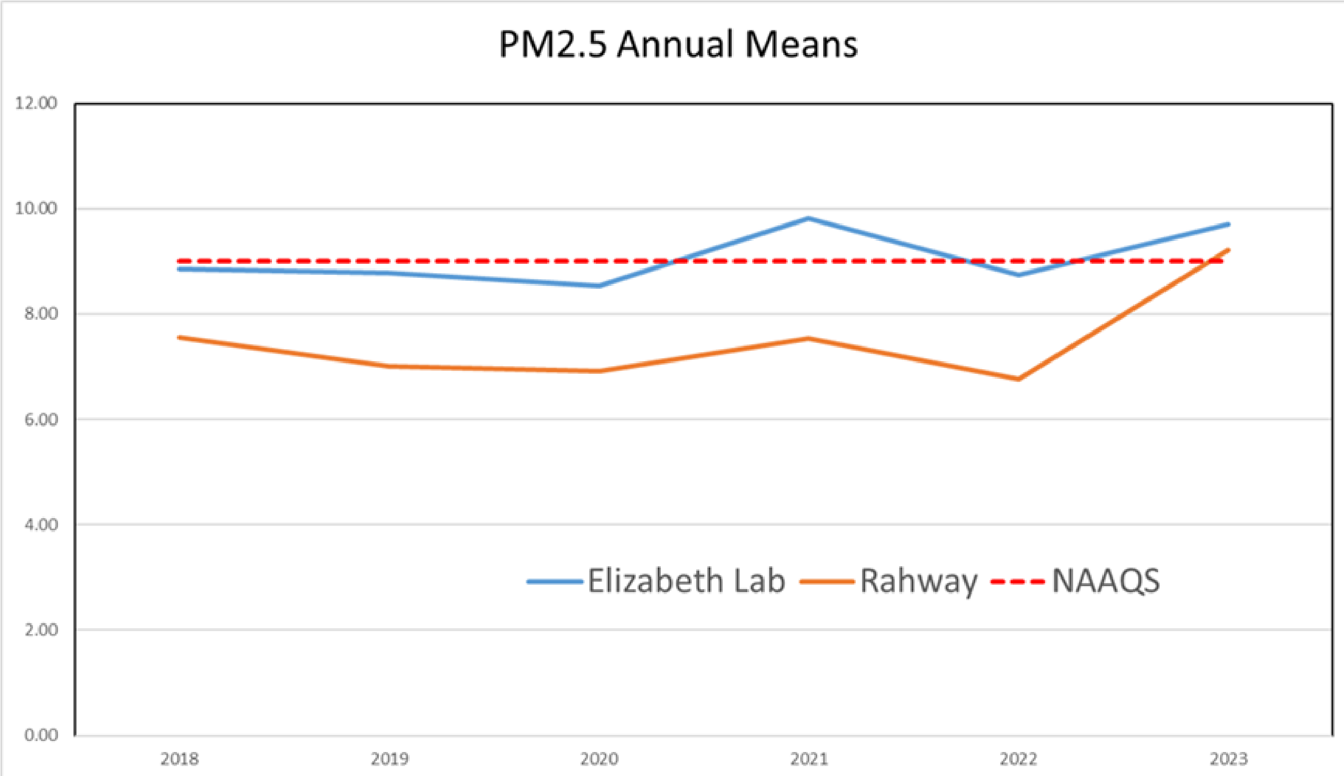
The New Jersey Department of Environmental Protection operates a continuous $PM_{2.5}$ monitor 5.7 miles from the Elizabeth Lab site in the City of Rahway. The relative location of these two monitors can be seen in Figure 2-14.

Figure 2-14. $PM_{2.5}$ monitors in Union County, New Jersey.



Trends in annual $PM_{2.5}$ design values for the two monitors are plotted from 2018 through 2023 in Figure 2-15. The trends are similar with the exception that the Elizabeth Lab monitor trends approximately two µg/m^3 above the Rahway site. The difference is likely due to local $PM_{2.5}$ emissions influencing the Elizabeth Lab site.

Figure 2-15. Trends in annual $PM_{2.5}$ design values (µg/m^3) for the Rahway and Elizabeth Lab sites (2018-2023).



2.2 Factor 2: Emissions and Emissions Related Data

The National Emissions Inventory (NEI) is an EPA compendium of emissions reported every three years.[8] Emissions data from the NEI was assessed for the 2011, 2014, 2017, and 2020 inventory years.[9]

Table 2-2 shows the anthropogenic $PM_{2.5}$ and related precursor pollutant emissions totals for Connecticut. Emissions are shown for primary $PM_{2.5}$ and precursor species: ammonia (NH_3), nitrogen oxides (NO_x), sulfur dioxide (SO_2) and volatile organic compounds (VOC). The largest reductions were due to low sulfur fuel standards reducing SO_2 emissions followed by ozone reduction strategies to reduce NO_x and VOC emissions. NH_3 and $PM_{2.5}$ emissions fluctuate due, in part, to improvements in emission calculations and methods, but $PM_{2.5}$ reductions are also attributable to cleaner fuels and improved emissions standards. Emission trends are generally consistent with the downward trend in monitored data for pollutants in the state.

[8] https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
[9] National Emissions Inventory (NEI) | US EPA

Table 2-2. Emission trends for Connecticut taken from the National Emissions Inventory.

Connecticut $PM_{2.5}$ NEI Emission Trends (tons/year)				
Pollutant	**2011 emissions**	**2014 emissions**	**2017 emissions**	**2020 emissions**
$PM_{2.5}$	16,595	13,155	11,868	13,739
NH_3	5,204	4,206	5,324	5,385
NO_X	73,371	63,596	46,903	33,115
SO_2	15,339	12,452	2,666	438
VOC	141,043	143,168	125,317	116,776

Similar trends in emissions for the New York, New Jersey, and Pennsylvania counties included in the CSA are shown in Table 2-3, Table 2-4 , and Table 2-5, respectively. Emissions from the CSA counties for New York and New Jersey significantly exceed Connecticut's statewide emissions of these pollutants.

Table 2-3. Emission trends for the New York counties in the CSA as taken from the National Emissions Inventory.

New York $PM_{2.5}$ CSA Counties NEI Emission Trends (tons/year)				
Pollutant	**2011 emissions**	**2014 emissions**	**2017 emissions**	**2020 emissions**
$PM_{2.5}$	30,439	28,247	25,147	36,443
NH_3	6,024	7,492	5,331	9,565
NO_X	198,151	165,497	124,620	82,921
SO_2	33,491	11,265	6,203	1,881
VOC	271,532	282,961	206,275	190,842

Table 2-4. Emission trends for the New Jersey counties in the CSA as taken from the National Emissions Inventory.

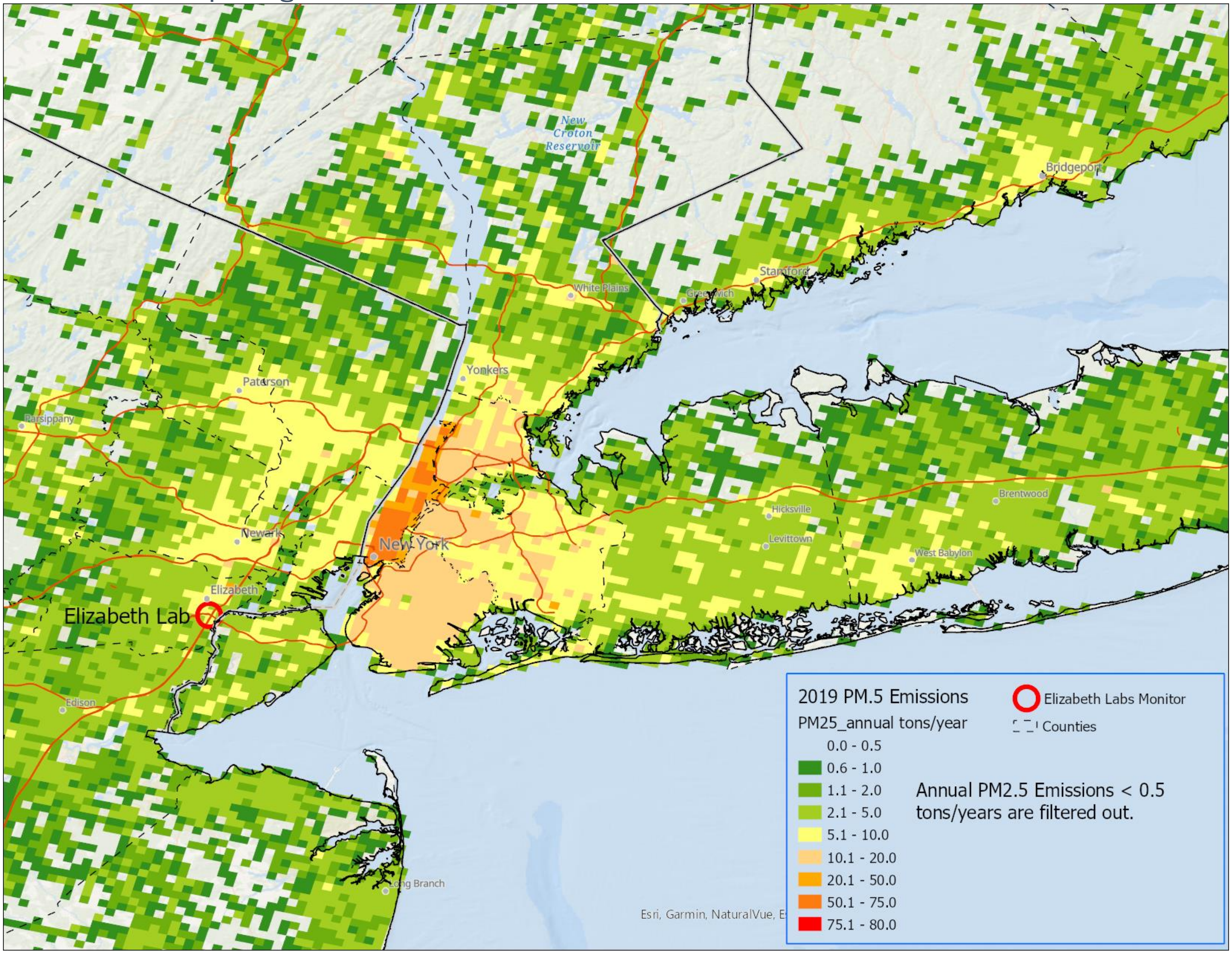
New Jersey $PM_{2.5}$ CSA Counties NEI Emission Trends (tons/year)				
Pollutant	**2011 emissions**	**2014 emissions**	**2017 emissions**	**2020 emissions**
$PM_{2.5}$	18,012	19,033	16,800	18,787
NH_3	4,937	11,328	4,542	4,471
NO_X	123,492	118,054	101,423	59,575
SO_2	10,272	6,988	1,989	588
VOC	185,174	172,661	149,477	142,233

Table 2-5. Emission trends for the Pennsylvania counties in the CSA as taken from the National Emissions Inventory.

Pennsylvania $PM_{2.5}$ CSA Counties NEI Emission Trends (tons/year)				
Pollutant	**2011 emissions**	**2014 emissions**	**2017 emissions**	**2020 emissions**
$PM_{2.5}$	530	921	497	812
NH_3	42	115	153	333
NO_X	2,226	2,282	1,411	931
SO_2	77	120	35	31
VOC	11,826	13,014	9,504	9,229

The geographical distribution of $PM_{2.5}$ emissions for 2019 is shown in Figure 2-16. Emissions are at their highest on Manhattan and western Long Island. As shown earlier in Figure 2-6, multiple monitors within the densest area of emissions attain the standard. Comparatively, the Elizabeth Lab monitor lies in an area of moderate emissions indicating that its nonattainment status is likely due to local influence.

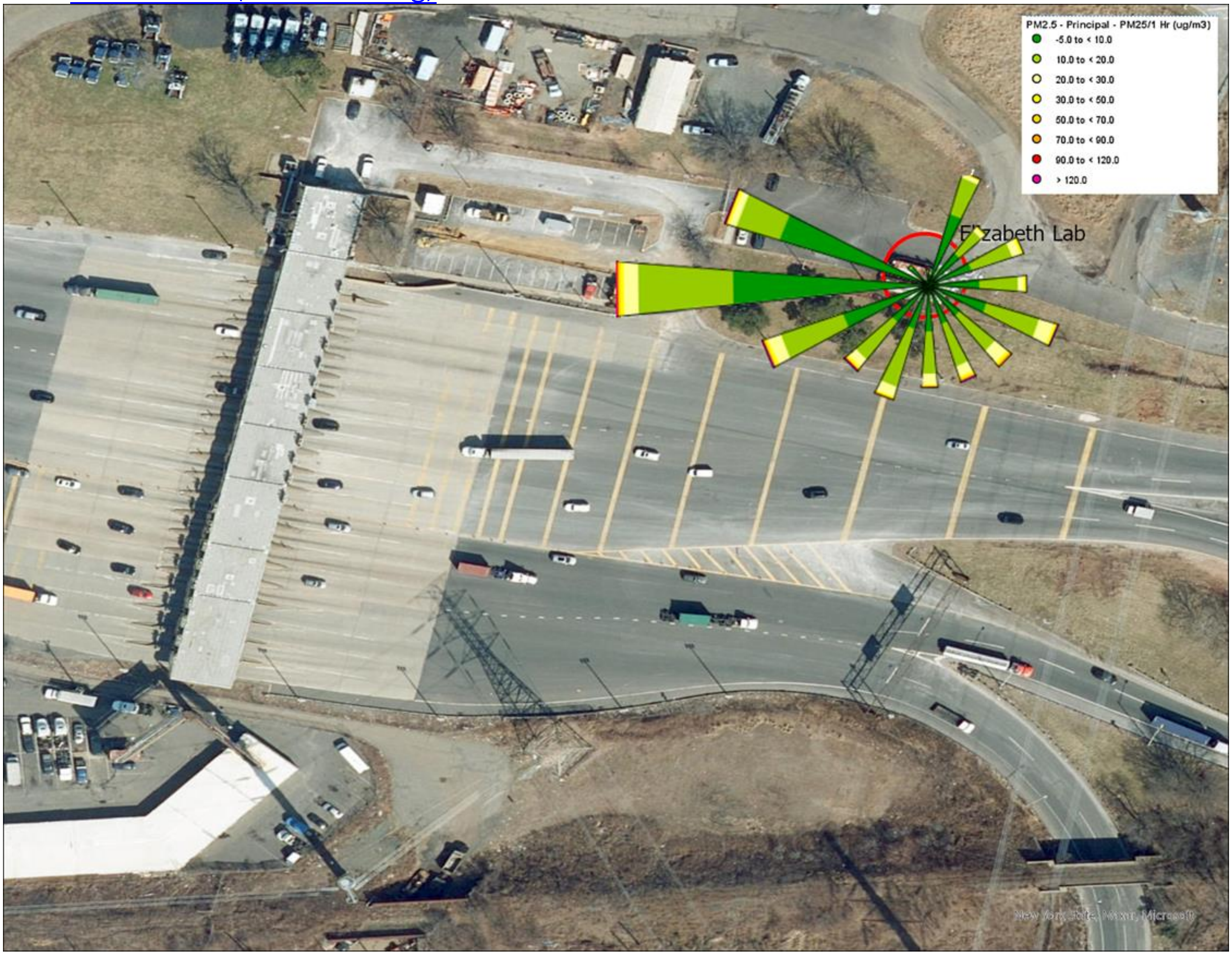
Figure 2-16. High resolution emissions density map for $PM_{2.5}$ in the New York Metropolitan area showing the location of the Elizabeth Lab monitor. Data is presented for 2019 and apportioned to 1-kilometer square grids.



Source: Ma, Siqi & Tong, Daniel. (2022). Neighborhood Emission Mapping Operation (NEMO): A 1-km anthropogenic emission dataset in the United States. Scientific Data. 9. 10.1038/s41597-022-01790-9.

A closer look at the Elizabeth Lab site confirms the likelihood that it is influenced by local sources. In the image shown in Figure 2-17, the area around the site shows road salt and exposed dirt on the road and lots near the monitor. $PM_{2.5}$ wind rose data for 2023 obtained from AirNow-Tech (airnowtech.org) shows the predominant winds with the highest $PM_{2.5}$ levels coming from the vicinity of the toll booths which may also result in higher $PM_{2.5}$ levels from vehicle exhaust.

Figure 2-17. Close up aerial view of the Elizabeth Lab monitor with 2023 $PM_{2.5}$ wind rose data from [*AirNow-Tech (airnowtech.org)*](https://airnowtech.org) overlaid on the monitor site.



Population Growth Rates and Patterns

EPA recommends that population density analyses examine the location and, when available, trends in population growth as potential indicators of the probable location and magnitude of emissions sources that may contribute to $PM_{2.5}$ concentrations in a given nonattainment area.

Table 2-6 summarizes population growth estimates for 2020-2040 as projected by the Connecticut Data Center.[10] Overall population growth in Connecticut during this period is estimated at 1.37 percent. Fairfield, Litchfield, Middlesex, New London, and Tolland Counties' population rates are estimated to decline, with the lowest being Litchfield County with an estimated -8.74 percent growth rate (8.74% population decline). The projected fastest growing county (on a percentage basis) is Windham County, located in rural northeast Connecticut.

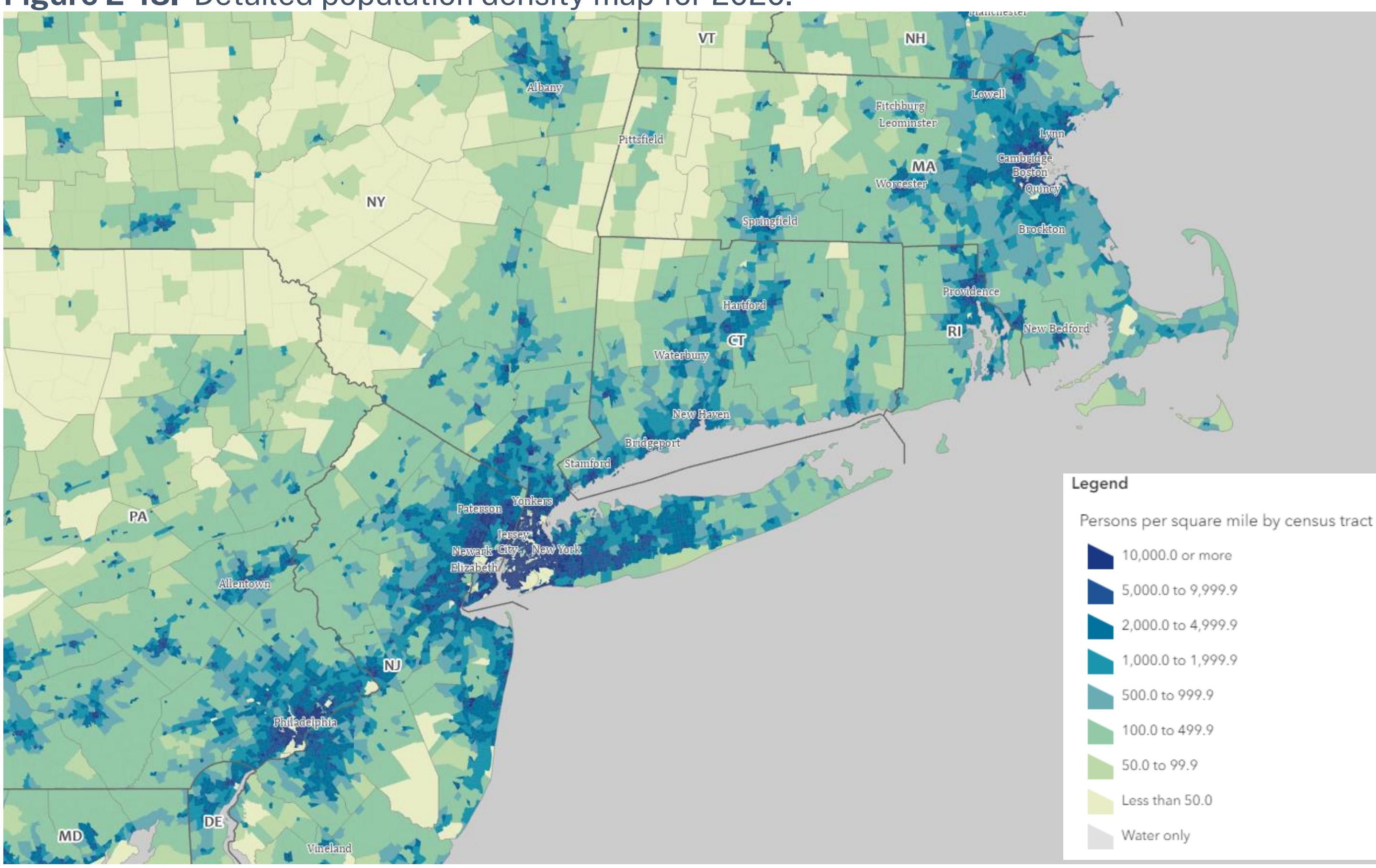
[10] https://www.ctdata.org/

Table 2-6. Population growth estimates by county for Connecticut.

County	2020 Total	2025 Total	2030 Total	2035 Total	2040 Total	Area (Square Miles)	Population Density 2020	2040-2020 %Change
Fairfield	907,603	900,662	897,553	899,423	905,219	624.9	1,452.4	**-0.26%**
Hartford	909,671	920,241	930,629	9397,54	948,876	735.1	1,237.5	**4.31%**
Litchfield	186,611	184,190	180,866	176,170	170,303	920.6	202.7	**-8.74%**
Middlesex	167,213	166,827	166,533	165,033	163,365	369.3	452.8	**-2.30%**
New Haven	873,659	882,552	891,371	897,492	900,635	604.5	1,445.3	**3.09%**
New London	278,756	280,497	280,847	279,403	276,187	664.9	419.2	**-0.92%**
Tolland	156,588	156,249	155,697	155,266	154,560	410.2	381.7	**-1.30%**
Windham	124,498	127,547	130,497	132,818	134,876	512.9	242.7	**8.34%**
State Total	**3,604,599**	**3,618,765**	**3,633,993**	**3,645,359**	**3,654,021**	**4,842.4**	**744.4**	**1.37%**

Population density was assessed for the CSA using data from the 2020 Census Demographic Data Map Viewer.[11] Connecticut's population density is highest along Interstate-91 through New Haven and Hartford counties and along the coastal Interstate-95 corridor between New York and Rhode Island (Figure 2-18).

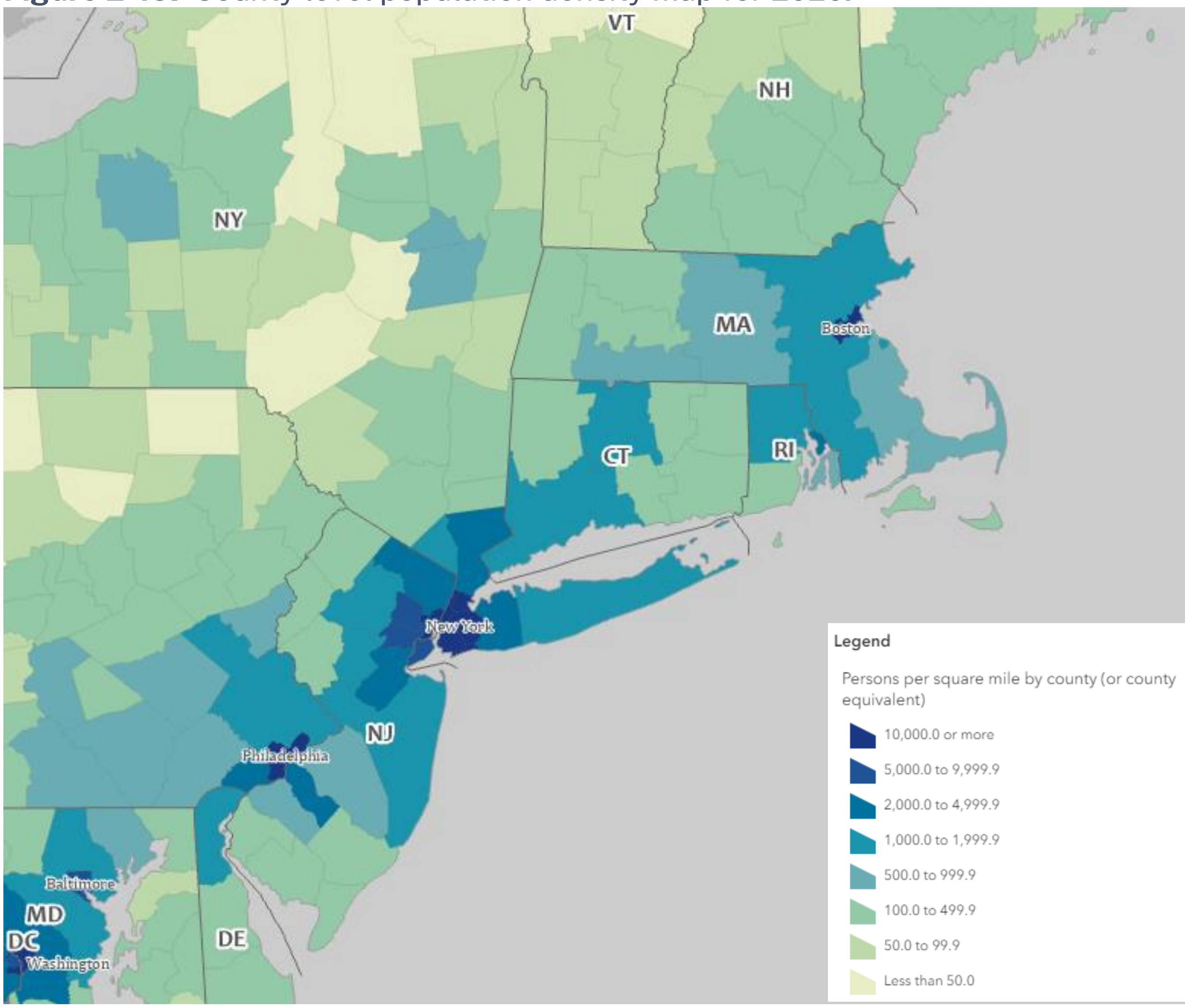
Figure 2-18. Detailed population density map for 2020.



[11] 2020 Census Demographic Data Map Viewer

Population density by county is presented in Figure 2-19. Fairfield county has 1,000-1,999 persons per square mile, while New York's highest county within the CSA has a population density of 10,000 or more persons per square mile. New Jersey's most populous county within the CSA has a population density of 5,000-9,999 persons per square mile. The highest population densities are in the counties surrounding the nonattainment monitor and it is unlikely that population in Connecticut is relevant to nonattainment at the Elizabeth Lab monitor.

Figure 2-19. County level population density map for 2020.



Traffic and Commuting

Though secondary to emissions, EPA recommends particular assessment of the potential impact of traffic and commuting on monitored levels. Five year commuting flows were obtained from census data to compare commutes into New Jersey from states with counties in the the CSA.[12] The 2016-2020 five year average number of commuters from Connecticut to New Jersey are insignificant when compared to the commuters from Pennsylvania or New York (Table 2-7). It is

[12] 2016-2020 5-Year ACS Commuting Flows (census.gov)

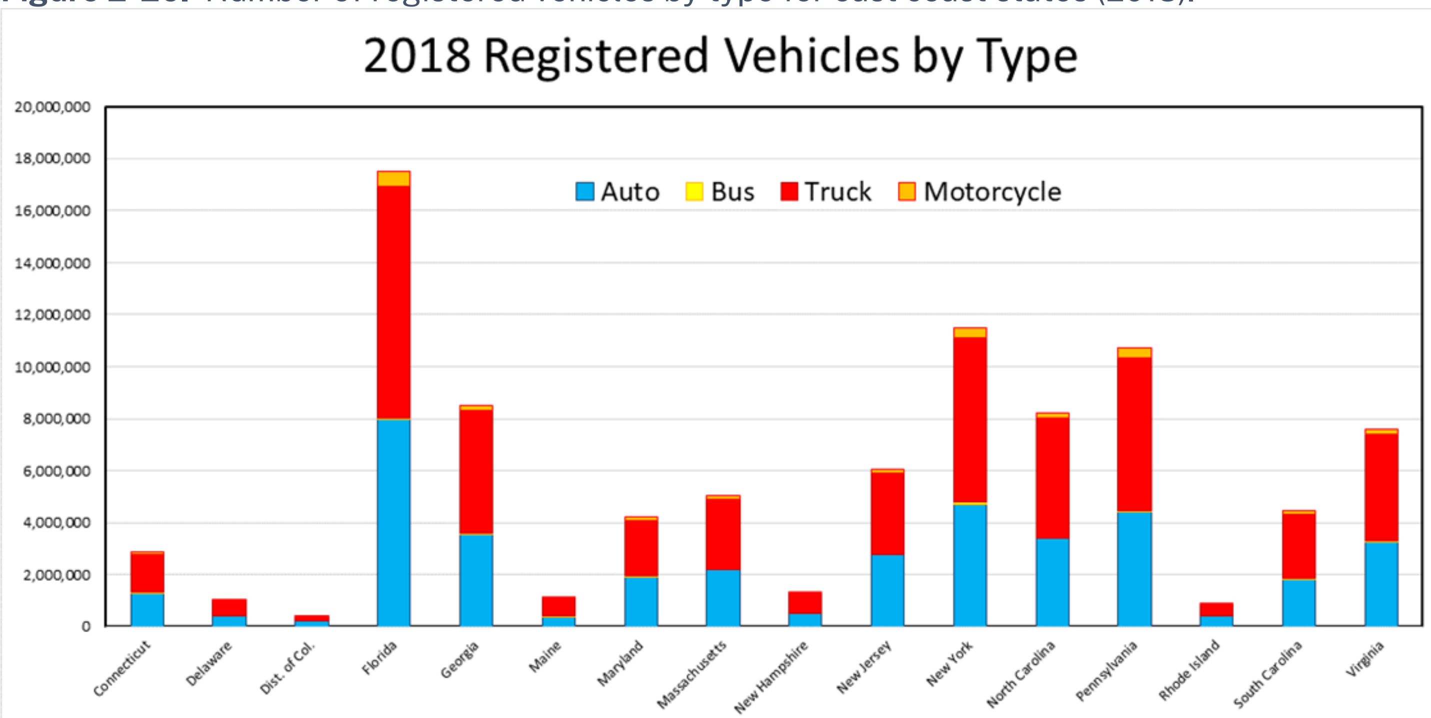
therefore unlilkey that commuting traffic from Connecticut affects the nonattainment status of the Elizabeth Lab monitor.

Table 2-7. 2016-2020 Five-year average annual commuting flow into New Jersey from adjacent states in the CSA.

2016-2020 Origin and Number of Workers Commuting into New Jersey	
Connecticut	**3,358**
New York	**112,925**
Pennsylvania	**121,093**

As the Elizabeth Lab monitor is located near two Interstate highway systems, it is likely that long distance traffic would influence its $PM_{2.5}$ levels. The US Departmet of Transportation provides data for vehicles registered by type for each state.[13] The data for east coast states is charted in Figure 2-20 and indicates little liklihood that vehicles from Connecticut would have a significant impact on the Elizabeth Lab monitor.

Figure 2-20. Number of registered vehicles by type for east coast states (2018).



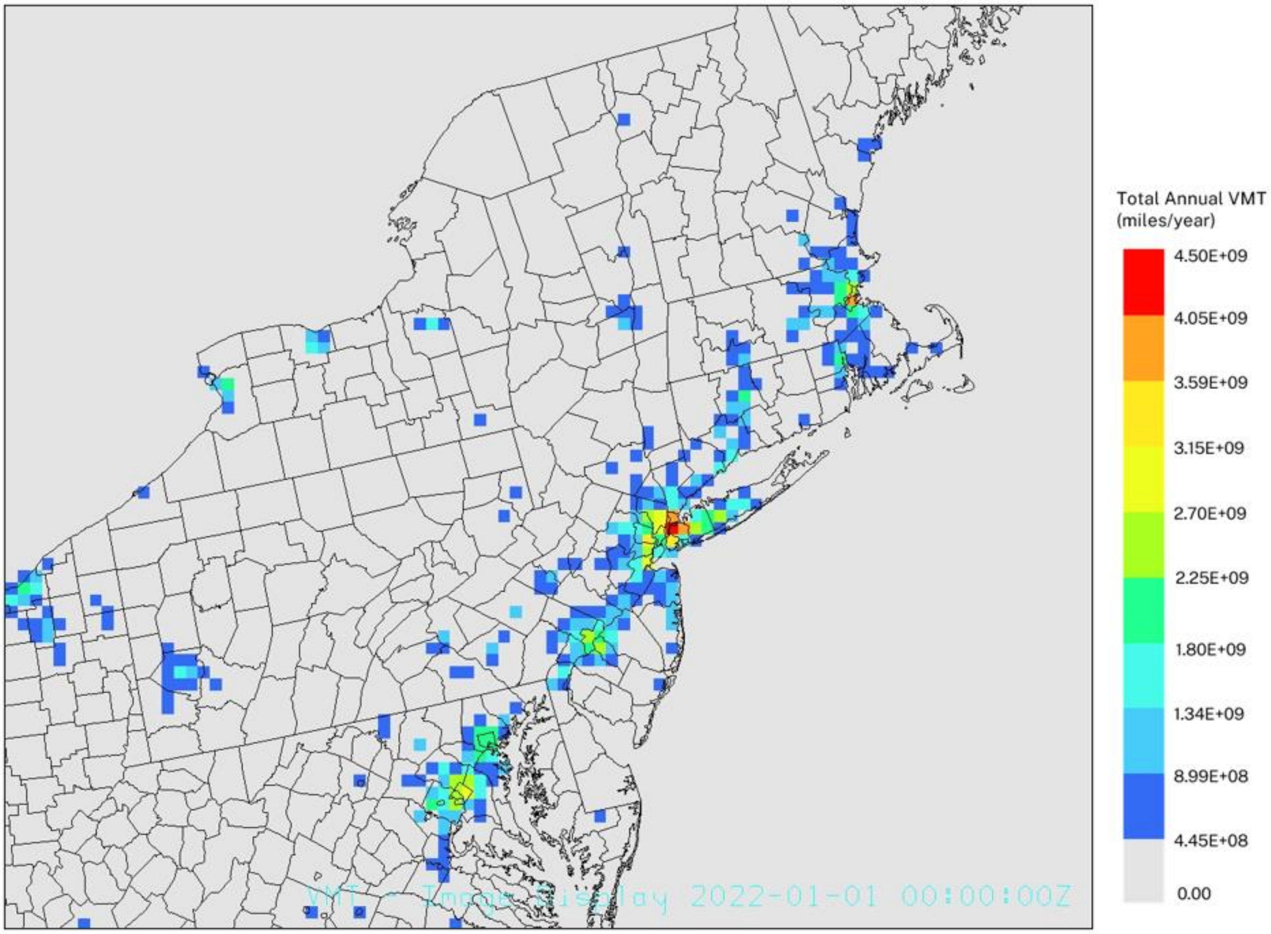
Assessment of vehicle miles traveled (VMT) is way to characterize potential vehicle emissions that may bear on area boundaries. Gridded VMT data was provided by EPA for the 2022 emission modeling platform and downloaded from EPA's modeling inventory website.[14] Figure 2-21 below is a gridded plot of EPA's 2022 annual VMT data for the northeastern region of the United States. In Connecticut, the highest VMT are seen following Interstate-91 from Hartford to New Haven, then along Interstate-95 into New York City. However, the greatest VMT in the

[13] Motor Vehicle Registrations, by vehicle type and state | USDOT Open Data (transportation.gov)

[14] File name: "2022hc_emissions_VMT_23jul2024.zip"

region is found in and around New York City, along western Long Island, and in Northern New Jersey.

Figure 2-21. Gridded 2022 Vehicle Miles Traveled Data (miles/year) from the 2022v1 Emissions Modeling Platform.



Connecticut Department of Transportation (CTDOT) projects a 1.3% annual growth rate in VMT under a business-as-usual scenario. However, under Executive Order 21-3, the Governor has directed CTDOT to set and plan for a VMT reduction target to be achieved by 2030. As a result, CTDOT proposed to reduce per person VMT by 5 percent from the 2019 baseline. This amounts to a reduction of 433.17 per person VMT each year by 2030 as compared to the baseline.[15]

Given the distribution of VMT and expected negative VMT growth in Connecticut, vehicle emissions in Connecticut are unlikely to interfere with attainment in New Jersey.

2.3 Factor 3: Meteorology

The evaluation of meteorological data helps to determine the effect on the fate and transport of emissions contributing to $PM_{2.5}$ concentrations and to identify areas potentially contributing to

[15] https://portal.ct.gov/-/media/dot/documents/dpolicy/vmt-reduction-target.pdf

the monitored violations. One basic meteorological analysis involves assessing potential source-receptor relationships in the area using summaries of emissions, wind speed, and wind direction data.

A simple approach is to use wind data from the Connecticut monitoring sites to create wind roses. Instead of producing these with the traditional ‘blowing from’ direction, these wind roses are shown as ‘blowing to,’ to better visualize the direction that emissions from these areas may be heading (Figure 2-22). The monitor closest to New Jersey (Greenwich), shows its predominant wind sector blowing toward Elizabeth Lab, but the large majority of winds blow away from that site and into Connecticut or New York. Predominant winds from the remaining sites shown indicate little likelihood that emissions from sources in Connecticut would reach the Elizabeth Lab site.

Figure 2-22. Wind roses depicting the direction wind blows from various monitor location in Connecticut. An arrow indicates the predominate direction for each location, and the location of Elizabeth Lab is shown. Data is from DEEP air monitoring sites for 2023.

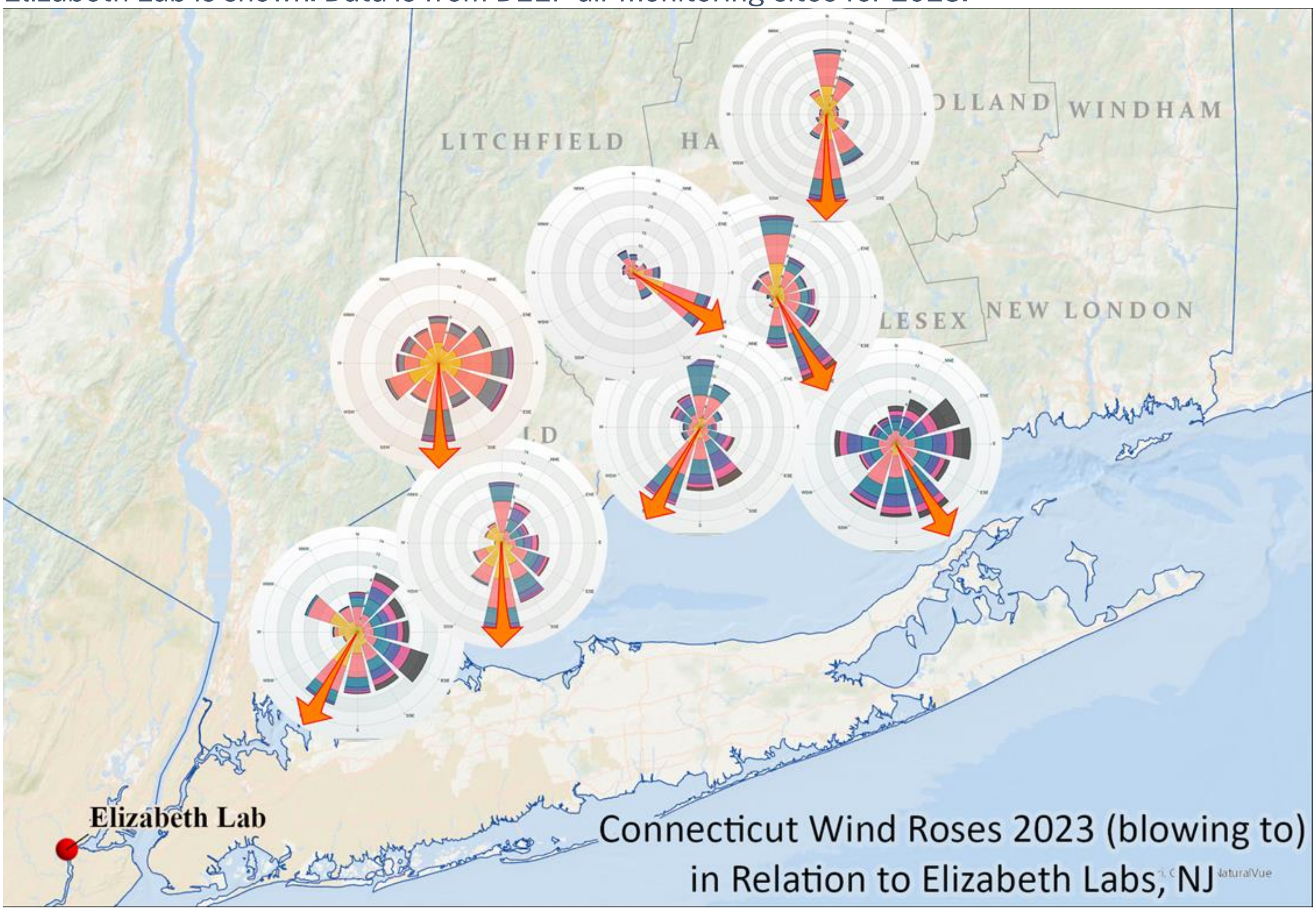
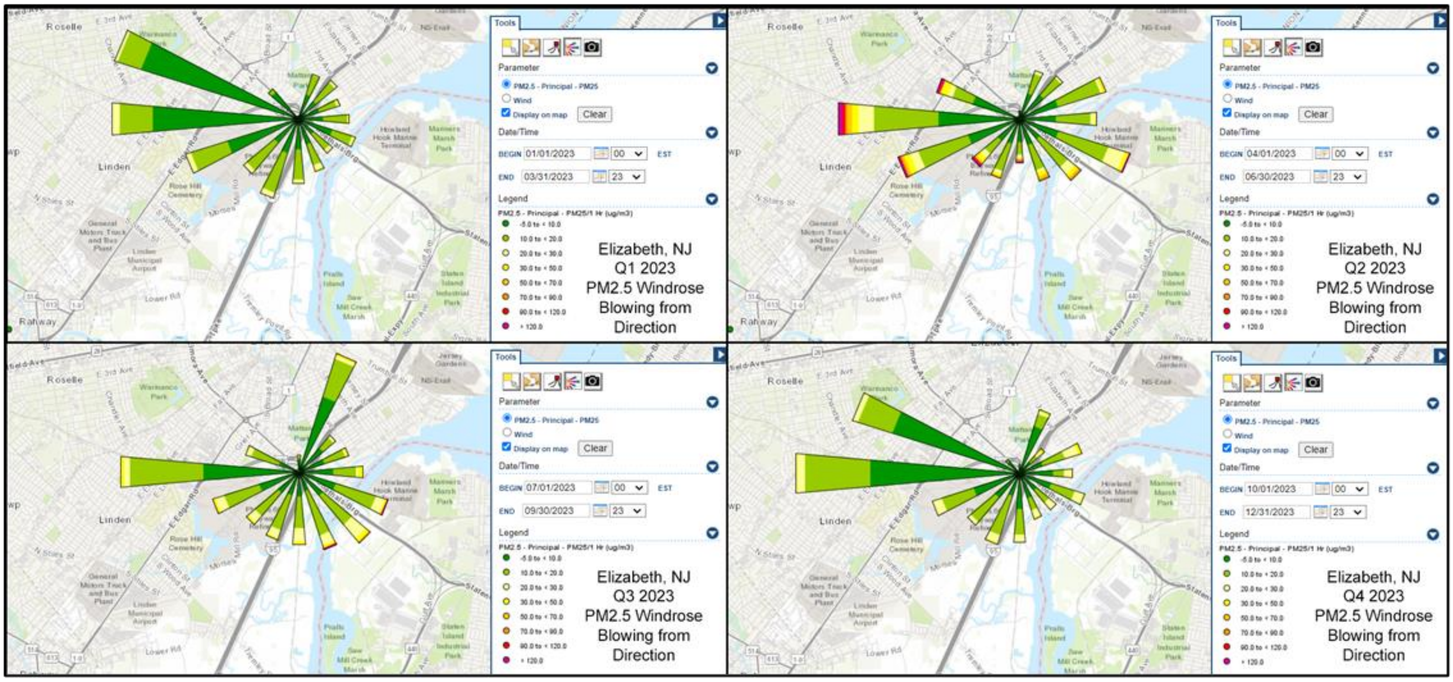


Figure 2-23 shows the 2023 quarterly $PM_{2.5}$ wind roses for the Elizabeth Lab site. Wildfire episodes, particularly in June, were responsible for excessive $PM_{2.5}$ levels at this and many other sites across the region. The effect of smoke is evident in the wind rose for the second quarter.

Higher $PM_{2.5}$ levels come from the south and west of the monitor indicating some influence from the toll booths and associated traffic conditions.

Figure 2-23. Elizabeth Lab 2023 quarterly $PM_{2.5}$ wind roses showing $PM_{2.5}$ concentrations from each wind direction sector.



These wind roses clearly illustrate that in 2023, emissions from Connecticut did not influence $PM_{2.5}$ levels at this monitor.

2.4 Factor 4: Geography/Topography

Connecticut is a small state geographically, with topographical features that do not have a significant effect on air shed boundaries. Long Island Sound plays a role in ozone production but is insignificant regarding $PM_{2.5}$ attainment area boundaries.

2.5 Factor 5: Jurisdictional Boundaries

Two counties in Connecticut, New Haven and Fairfield, are currently in a $PM_{2.5}$ maintenance area that includes counties in New York and New Jersey.[16] The maintenance area includes Union County, New Jersey where the Elizabeth Lab monitor is located, but does not match the current New York-Newark (NY-NJ-PA-CT) CSA. As no other monitor in the CSA is nonattainment, a significantly smaller nonattainment area should be considered.

[16] See Figure 1-1 of https://portal.ct.gov/-/media/deep/air/particulate_matter/pm25planning/certification-of-public-review-process/pm25-lmp----final.pdf

Additionally, the Rahway monitor, in the same county as the Elizabeth Lab monitor, shows attainment. Therefore, DEEP considers it appropriate to limit the nonattainment area to boundaries within the jurisdiction of the City of Elizabeth.

3 Summary and Conclusions

The analyses presented above demonstrate that all monitors in Connecticut attain the 2024 annual $PM_{2.5}$ NAAQS. Furthermore, in all areas adjacent to Connecticut there is only one monitor, Elizabeth Lab in New Jersey, that violates the standard.

The Elizabeth Lab monitor is located approximately 40 miles southwest of Connecticut's nearest border. Data presented in sections 2.2 and 2.3 of this report show that Connecticut sources do not influence the monitor. Furthermore, in the intervening 40 miles, there are several monitors which attain the standard. Other compelling data, including a nearby attaining monitor in Union County (Rahway), and the location of the Elizabeth Lab monitor near a major interstate exchange indicate that it is impacted from local sources. Design values at the site from 2020 to 2022 were at or just below the standard, and there are indications that wildfire smoke was a factor in the exceedance for 2023. It is therefore likely that the Elizabeth Lab monitor will again attain the standard in the near future, making a nonattainment designation unnecessary. Therefore, in accordance with CAA Section 107(d)(1), DEEP recommends that EPA designate the entire state of Connecticut as attainment for the 2024 annual $PM_{2.5}$ NAAQS.

Figure 3-1. Google maps image, dated 2024, showing the area west of, and including, the Elizabeth Lab monitor.