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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Air Quality

New Potential PM2.5 NAAQS Revision

Air Quality Technical Advisory Committee

January 11, 2024

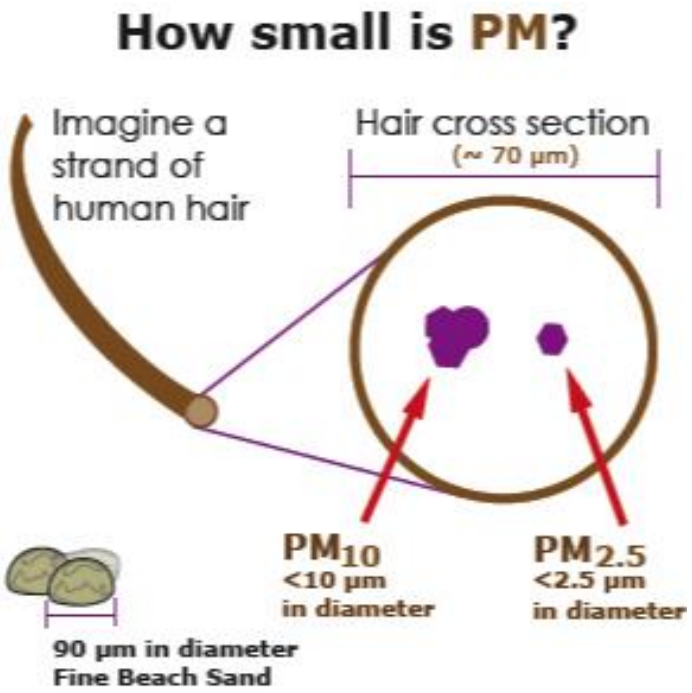
Josh Shapiro, Governor

Jessica Shirley, Interim Acting Secretary

PM2.5 NAAQS

The Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) for criteria pollutants including particulate matter with a diameter of 2.5 micrometers or smaller (PM2.5) also known as fine particulate matter, based solely on public health and welfare protection with no consideration for implementation costs.

- Current primary annual standard – 12.0 $\mu g/m^3$
  annual mean, averaged over three years, since 2012
- Current primary 24-hour standard – 35 $\mu g/m^3$
  98th percentile, averaged over three years, since 2006



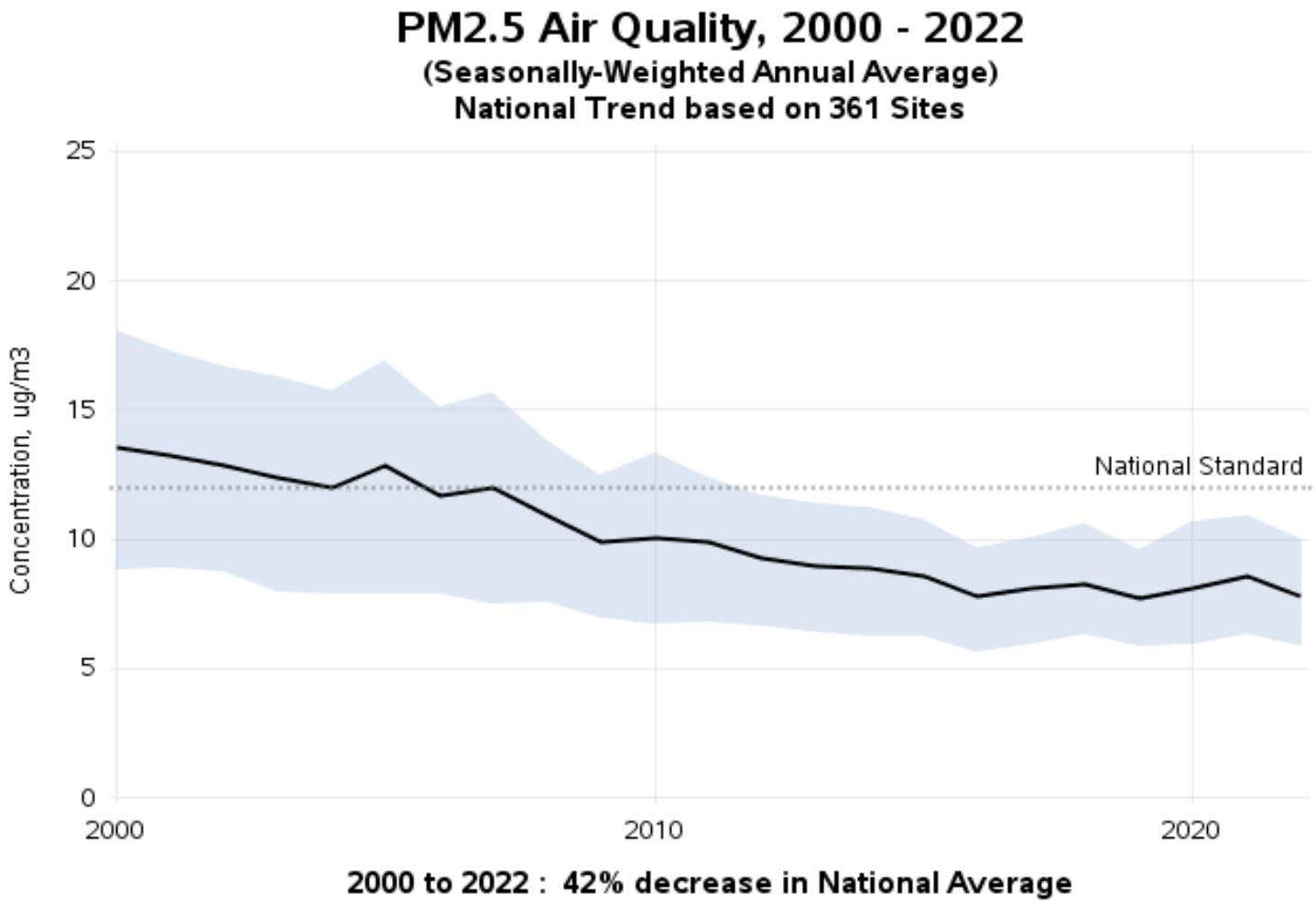
https://www.downwindersatrisk.org/2012/11/pm-pollution-decreases-brain-function-in-over-50-population/

PM2.5 National Trends

Federal Reference Methods (FRM) and Federal Equivalent Methods (FEM) are standardized methods to ensure air quality monitoring is conducted accurately all over the United States.

Teledyne API Model T640 FEM
Real-Time Continuous PM2.5 Mass Monitor

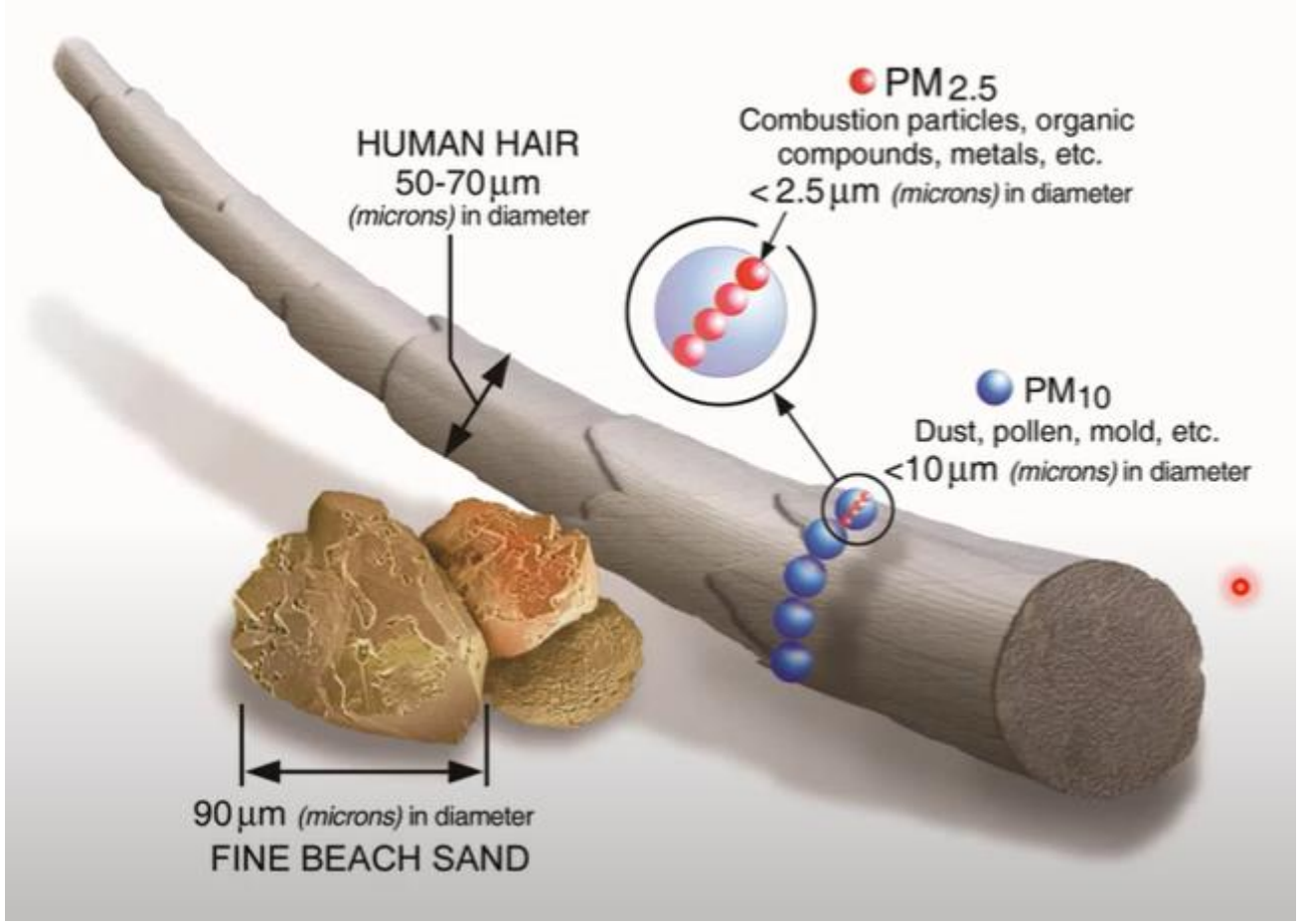
https://www.teledyne-api.com/prod/Downloads/08354D%20T640%20USER%20MANUAL.pdf



https://www.epa.gov/air-trends/particulate-matter-pm25-trends

What is PM2.5?

- PM refers to all suspended solids and droplets in the air.
- Sources include vehicles, factories, power plants, construction sites, wildfires, and residential heating.
- Smaller particles, like PM2.5 penetrate deeper into the lungs and pose a greater health risk than larger particles.



https://www.epa.gov/pm-pollution/particulate-matter-pm-basics

PM2.5 NAAQS Review

- Section 109 of the Clean Air Act requires that EPA review the NAAQS every five years to ensure their adequacy based on the latest science.
- In December 2020, EPA issued the 2020 PM NAAQS rule retaining the 2015 NAAQS for PM.
- In June 2021, EPA began the process of reconsidering the 2020 PM NAAQS due to available scientific evidence that the current standards may not be adequate to protect public health and welfare.

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EPA to Reexamine Health Standards for PM2.5

"The strong body of scientific evidence shows that long- and short-term exposures to PM2.5 can harm people's health, leading to heart attacks, asthma attacks, and premature death. Large segments of the U.S. population, including children, people with heart or lung conditions, and people of color, are at risk of health effects from PM2.5. In addition, a number of recent studies have examined relationships between COVID and air pollutants, including PM, and potential health implications."

EPA Press Office – June 10, 2021

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PM2.5 NAAQS Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 50, 53, and 58

[EPA–HQ–OAR–2015–0072; FRL–8635–01–OAR]

RIN 2060–AV52

Reconsideration of the National Ambient Air Quality Standards for Particulate Matter

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: Based on the Environmental Protection Agency's (EPA's) reconsideration of the air quality criteria and the national ambient air quality standards (NAAQS) for particulate matter (PM), the EPA proposes to revise the primary annual $PM_{2.5}$ standard by lowering the level. The Agency proposes to retain the current primary 24-hour $PM_{2.5}$ standard and the primary 24-hour PM_{10} standard. The Agency also proposes not to change the secondary 24-hour $PM_{2.5}$ standard, secondary annual $PM_{2.5}$ standard, and secondary 24-hour PM_{10} standard at this time. The EPA also proposes revisions to other key aspects related to the PM NAAQS, including revisions to the Air Quality Index (AQI) and monitoring requirements for the PM NAAQS.

On January 27, 2023, EPA published its proposed rule, opening it for public comment until March 28, 2023, that would retain the current primary 24-hour PM2.5 standard of 35 µg/m^3 without revision and revise the primary annual standard from 12.0 µg/m^3 to within the range of 9.0 to 10.0 µg/m^3.

(It is noted, EPA did solicit comments on a primary 24-hour standard as low as 25 µg/m^3 and a primary annual standard down to 8.0 µg/m^3 and up to 11.0 µg/m^3 as well.)

PM2.5 NAAQS Rule – Latest News

- October 25, 2023 – Rule is undergoing interagency review in the White House Office of Management and Budget (OMB). EPA anticipates signature and publication of the final rule in late 2023/early 2024. Sources suggest EPA favors an annual limit of 9.0 µg/m^3 and an unchanged 24-hour limit.

- November 14, 2023 – House GOP urges EPA to scrap the PM2.5 NAAQS rule on cost grounds. Industry groups argue that the ban on considering costs applies only to the five-year reviews of NAAQS, and not during voluntary reconsiderations.

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PM2.5 Design Value Calculations

PM2.5 design values are described in 40 CFR Part 50 Appendix N.

- The design value for the 24-hour PM2.5 standard is the three-year average of the annual 98th percentile values measured at a monitoring site. For example, if you have 365 valid days, the 98th percentile is the 8th highest value. If you have 61 valid days, the 98th percentile is the 2nd highest value.

- The design value for the annual PM2.5 standard is the three-year average of the annual averages measured at a monitoring site. The annual average is the mean of the quarterly averages.

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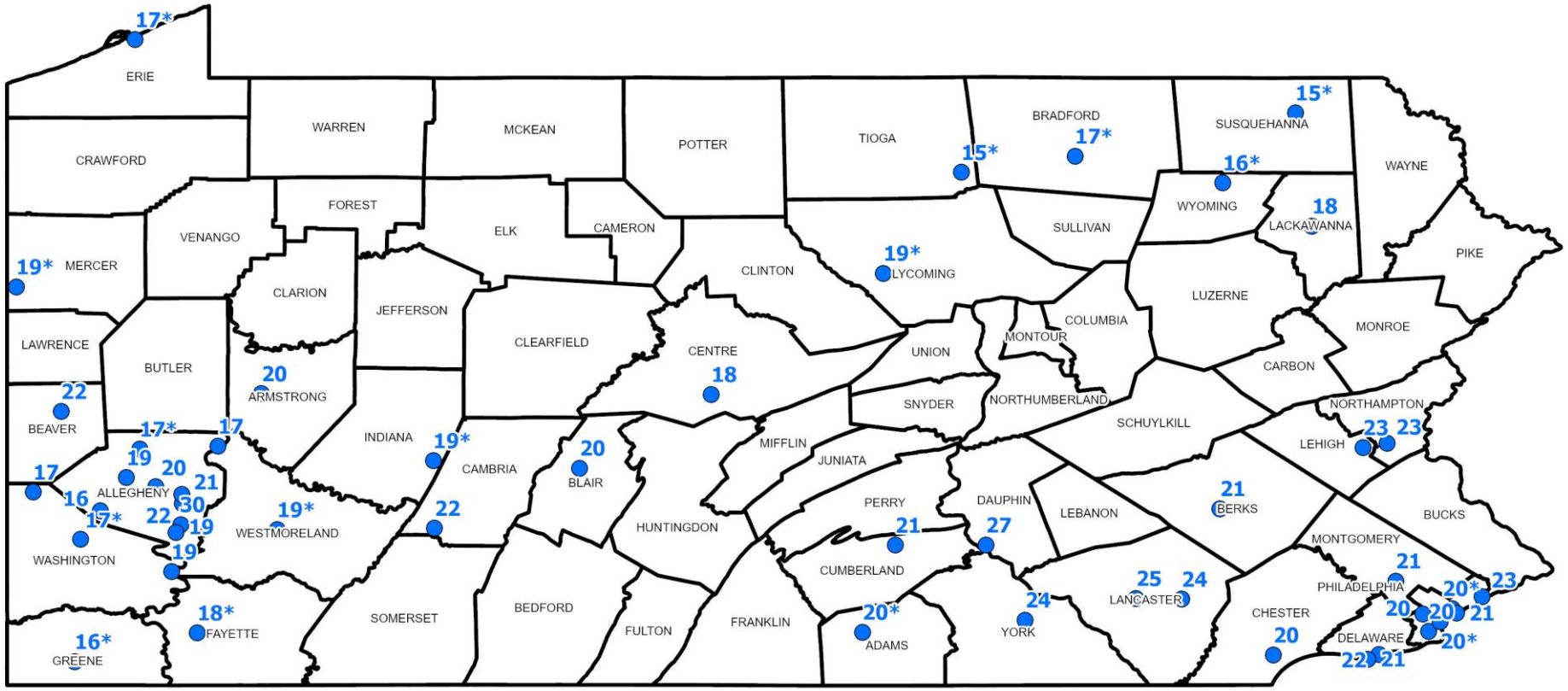
2022 24-Hour PM2.5 Design Values – 35 µg/m^3

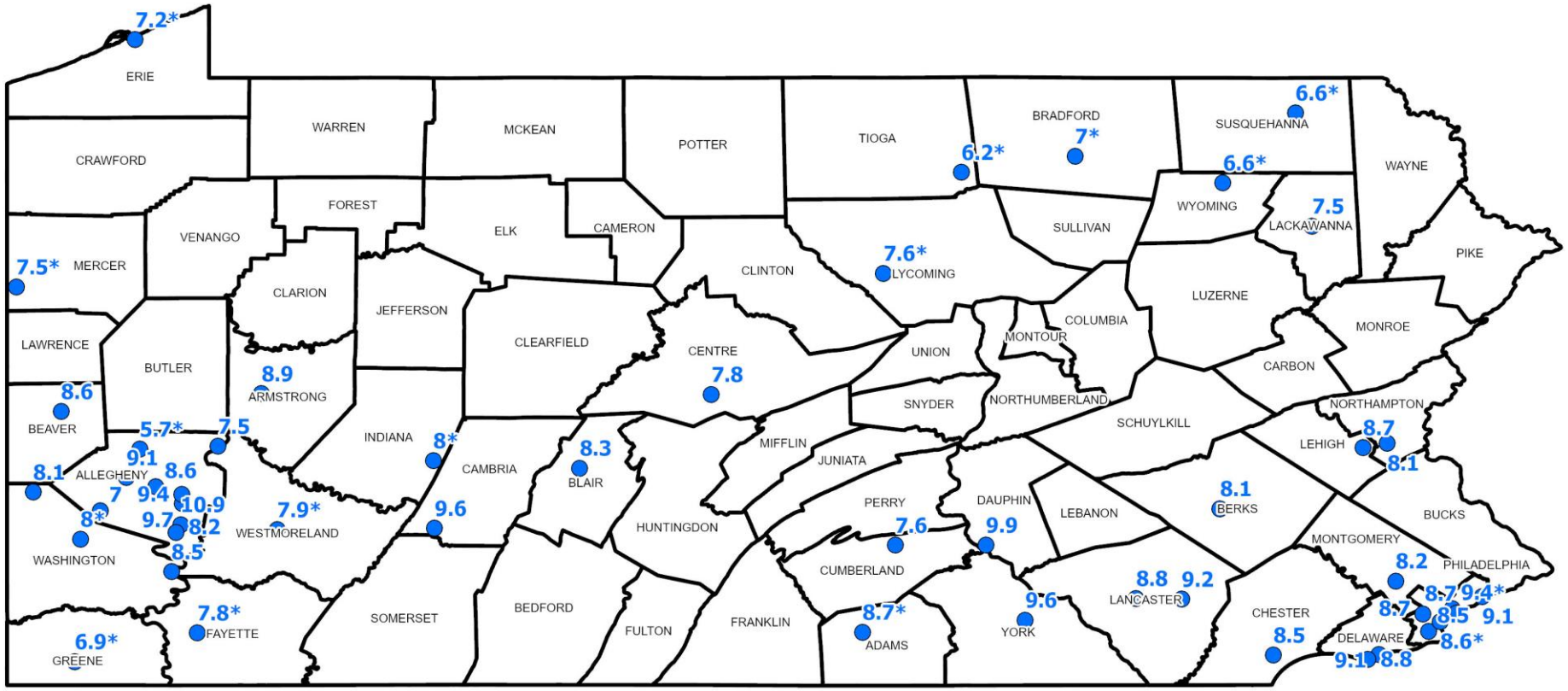


Appearing in Red – 2022 24-hour PM2.5 design value above 35 µg/m^3 (2006 PM2.5 Standard)

Appearing in Blue – 2022 24-hour PM2.5 design value at or below 35 µg/m^3 (2006 PM2.5 Standard)

Asterisk (*) appearing behind the design value means the data is incomplete during 3-year period.

2022 Annual PM2.5 Design Values – 12.0 µg/m³

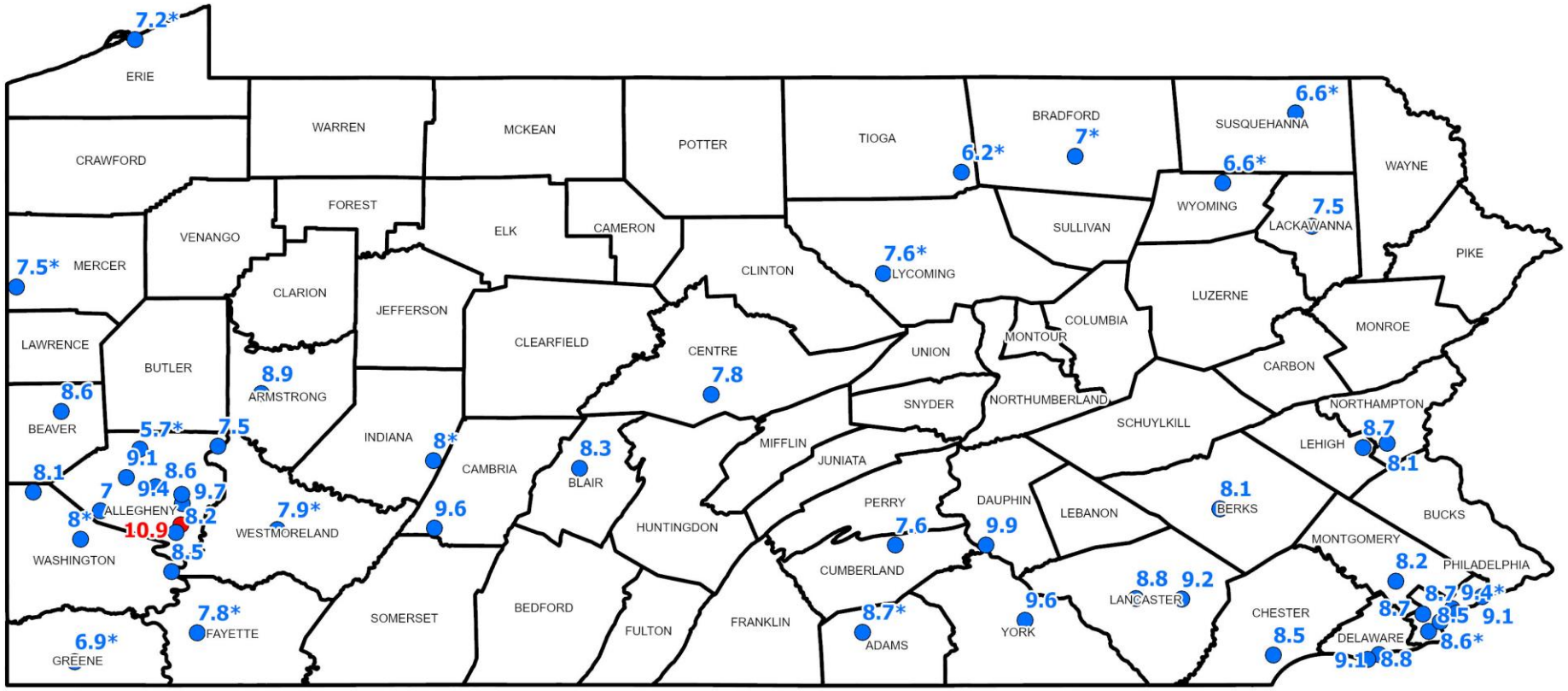


Appearing in Red – 2022 annual PM2.5 design value above 12.0 µg/m³ (2012 PM2.5 Standard)

Appearing in Blue – 2022 annual PM2.5 design value at or below 12.0 µg/m³ (2012 PM2.5 Standard)

Asterisk (*) appearing behind the design value means the data is incomplete during 3-year period.

2022 Annual PM2.5 Design Values – 10.0 µg/m³

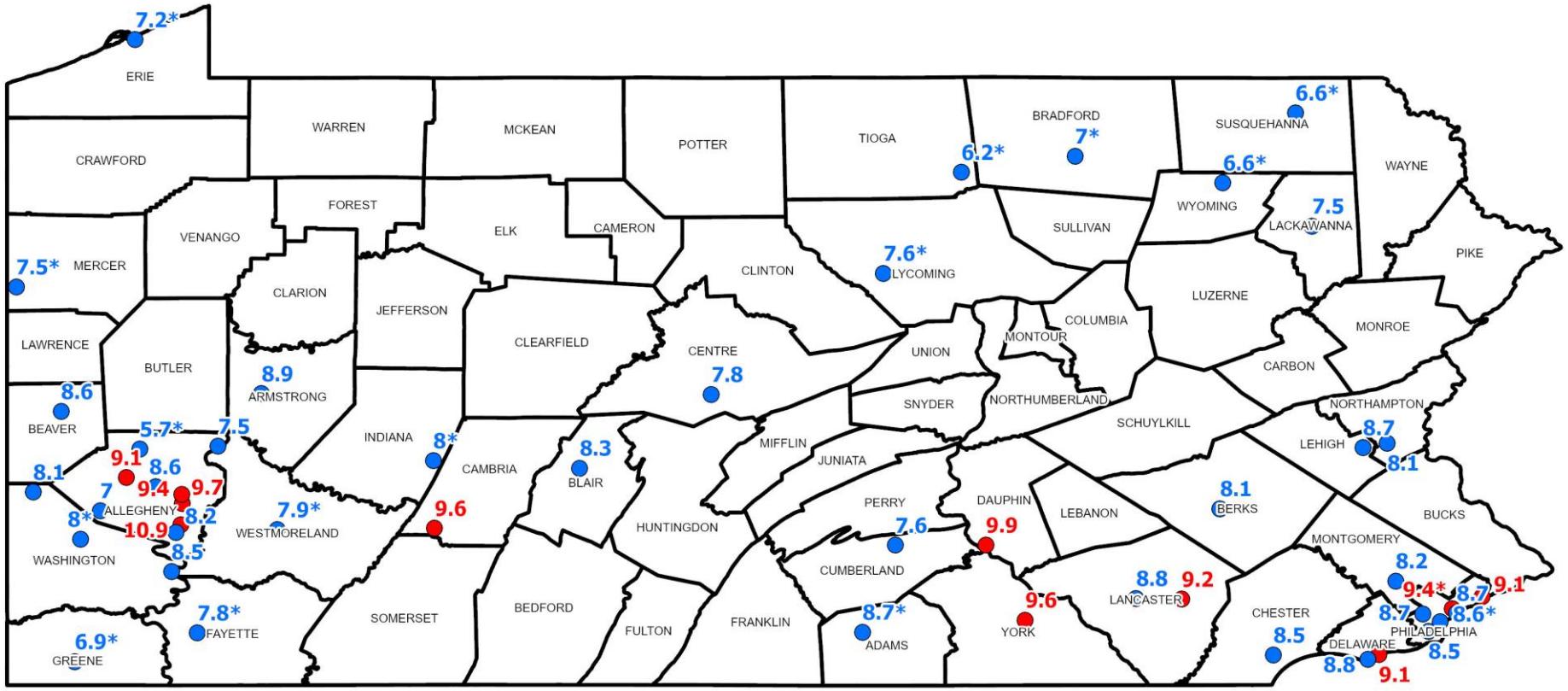


Appearing in Red – 2022 annual PM2.5 design value above 10.0 µg/m³ (Proposed New PM2.5 Standard)

Appearing in Blue – 2022 annual PM2.5 design value at or below 10.0 µg/m³ (Proposed New PM2.5 Standard)

Asterisk (*) appearing behind the design value means the data is incomplete during 3-year period.

2022 Annual PM2.5 Design Values – 9.0 µg/m³



Appearing in Red – 2022 annual PM2.5 design value above 9.0 µg/m³ (Proposed New PM2.5 Standard)

Appearing in Blue – 2022 annual PM2.5 design value at or below 9.0 µg/m³ (Proposed New PM2.5 Standard)

Asterisk (*) appearing behind the design value means the data is incomplete during 3-year period.

PM2.5 Speciation

PM2.5 speciation data tells us about the particle composition and can assist us with:

- The assessment of trends of PM2.5 constituents.
- The development of effective State Implementation Plans (SIPs) and determination of regulatory compliance.
- The development of emission control strategies and tracking progress of control programs.
- Characterizing annual and seasonal spatial variation of aerosols.

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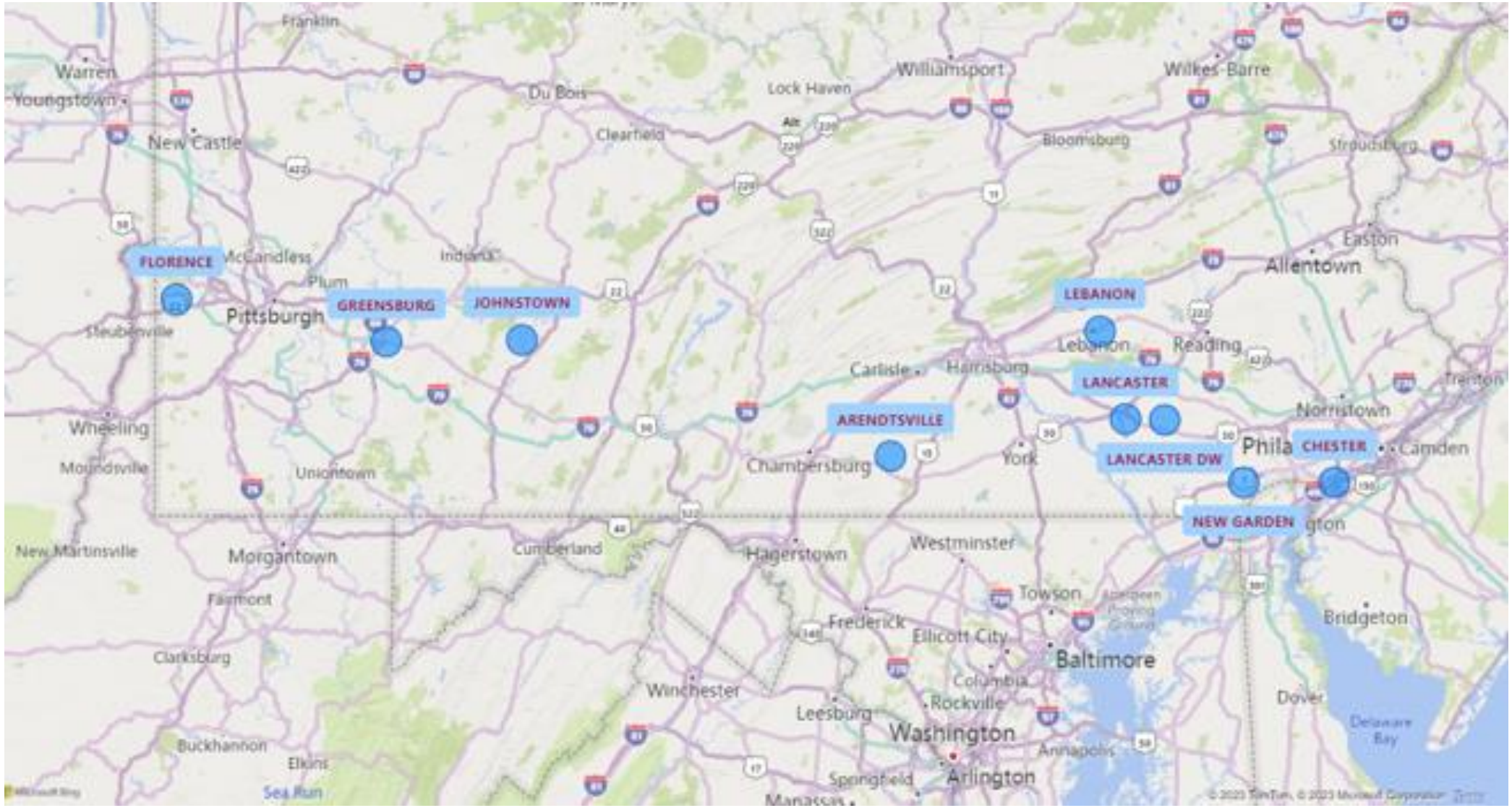
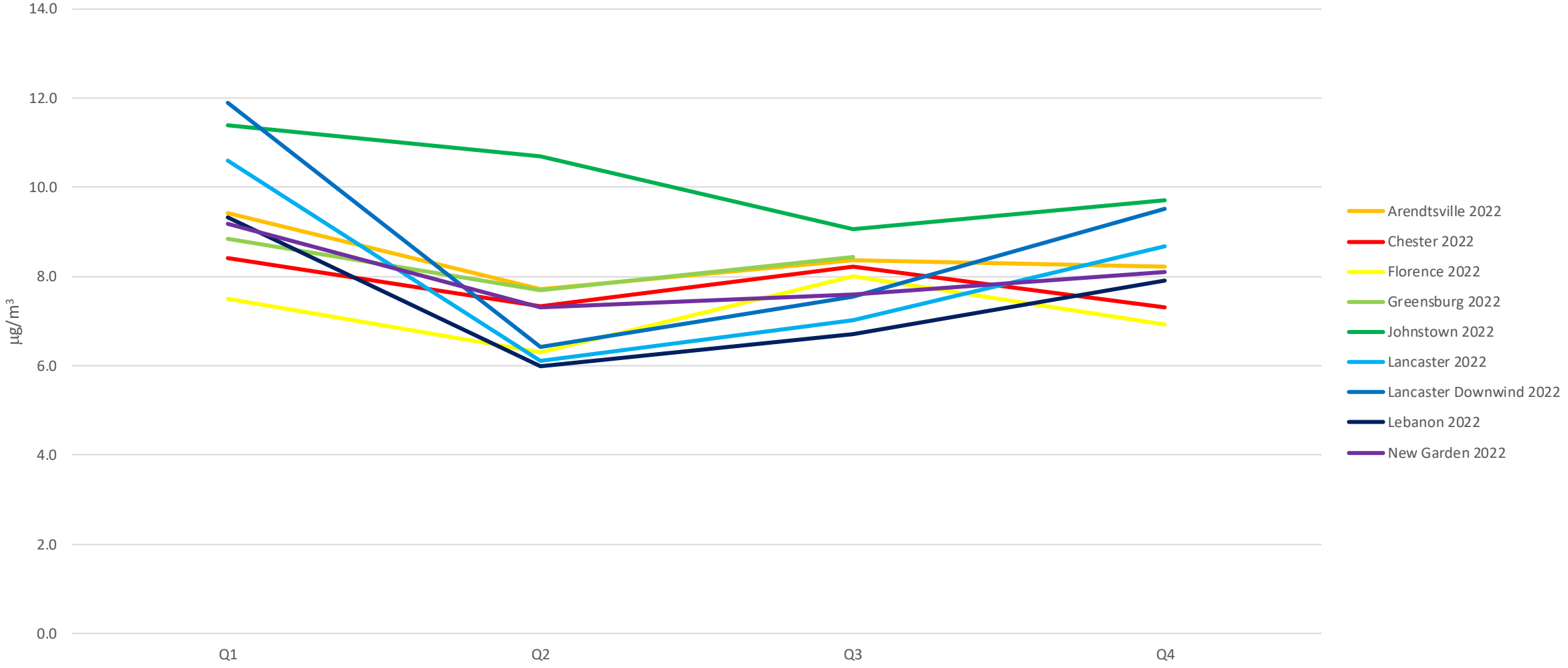
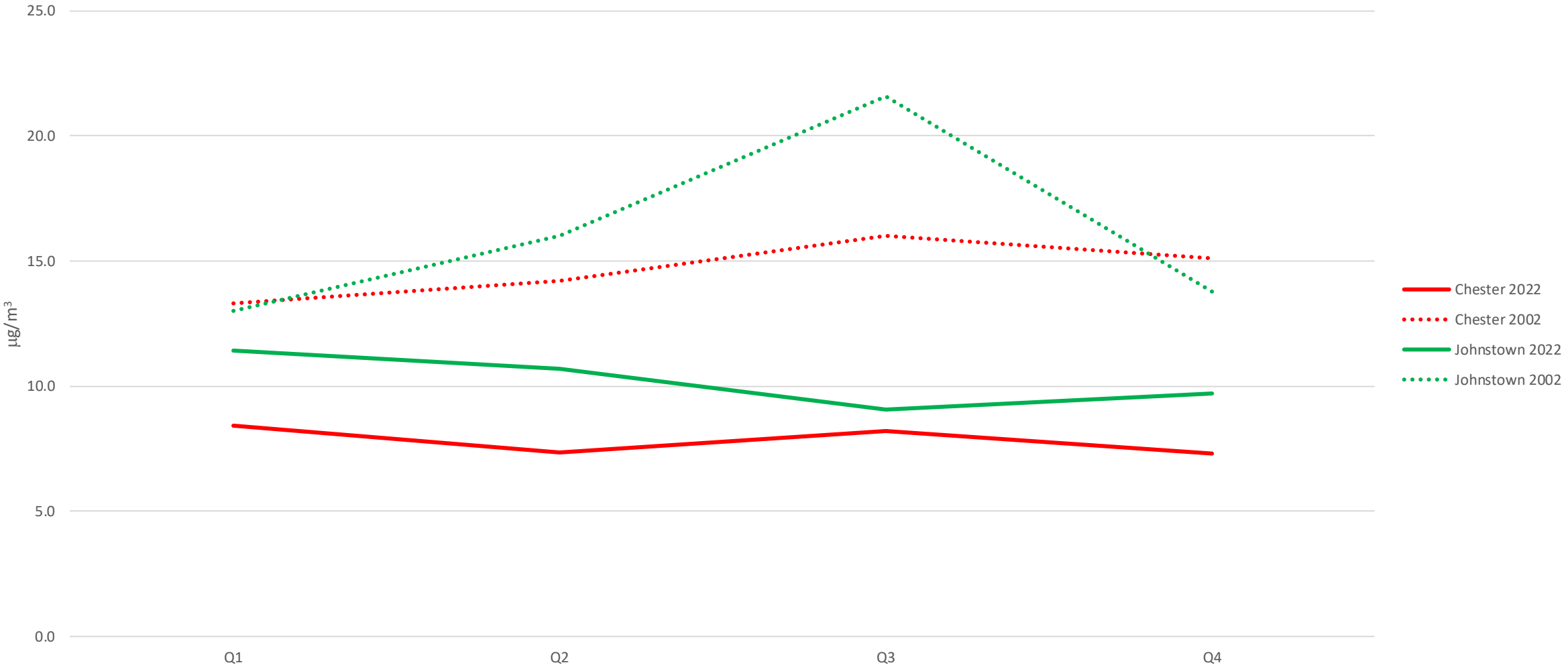
2022 PADEP PM2.5 Speciation Monitors Map



2022 PM2.5 Quarterly Concentrations

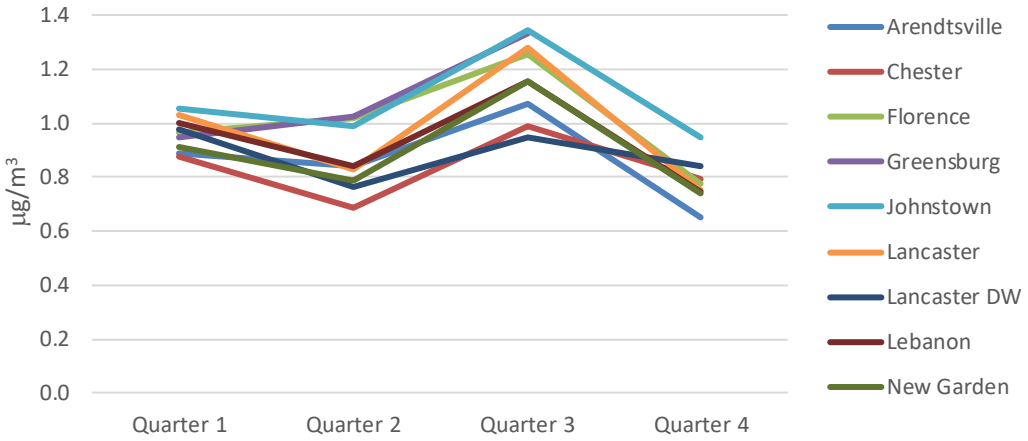


2002 vs. 2022 PM2.5 Quarterly Concentrations

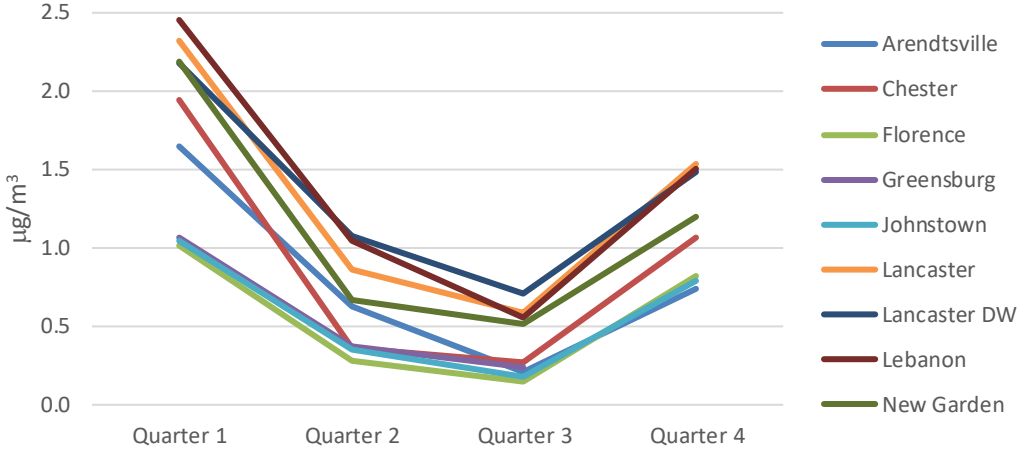


2022 PM2.5 Speciation Quarterly Data Trends

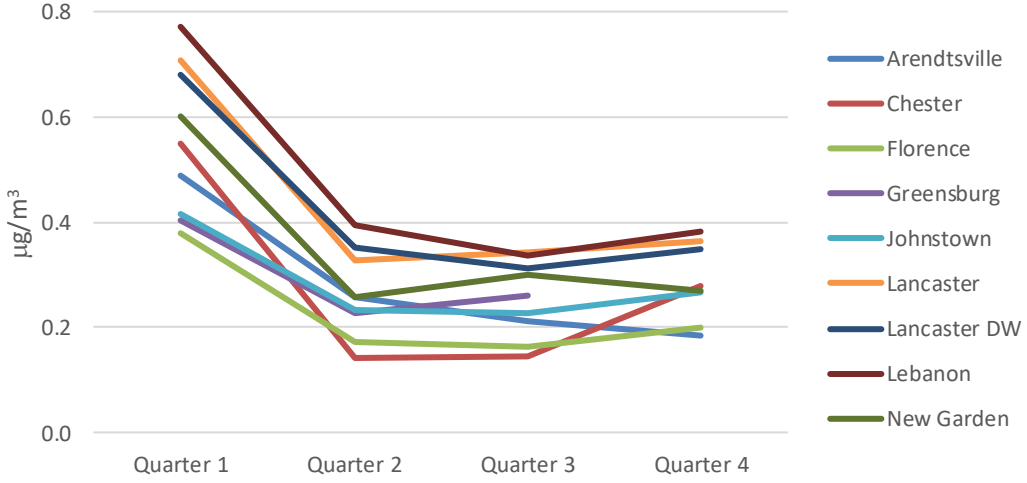
Sulfate



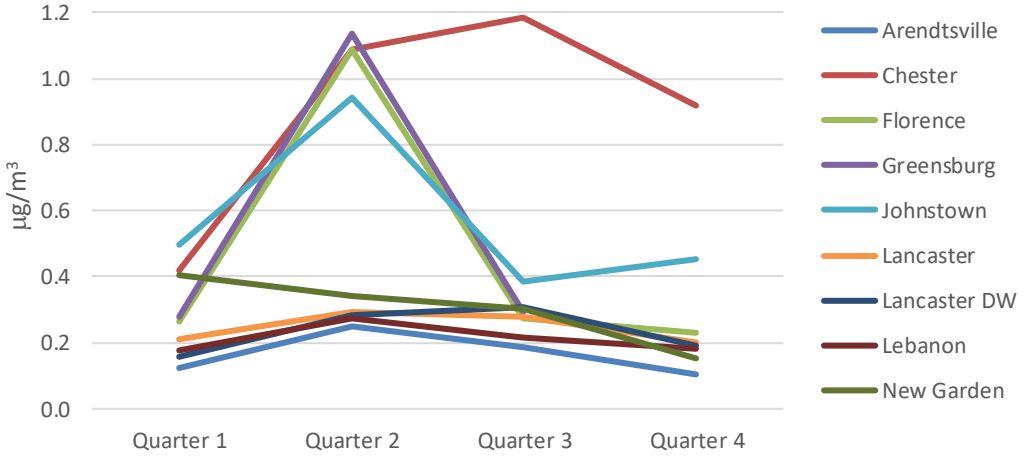
Total Nitrate



Ammonium Ion

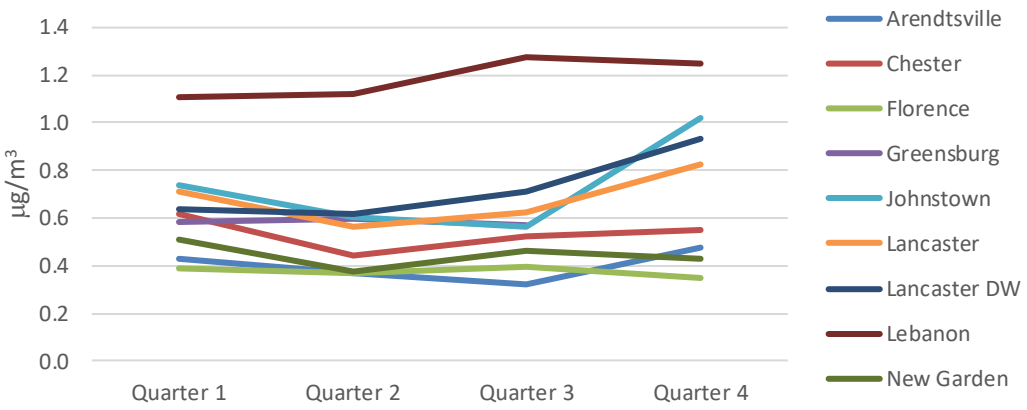


Soil

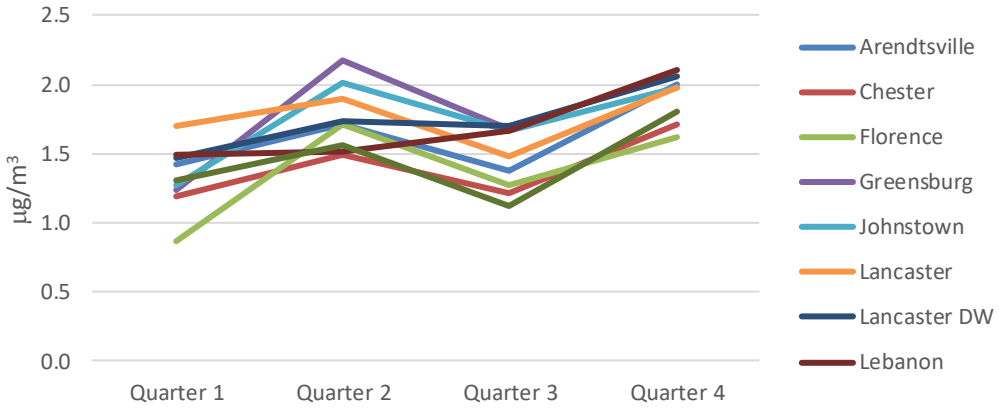


2022 PM2.5 Speciation Quarterly Data Trends

Elemental Carbon



Organic Carbon



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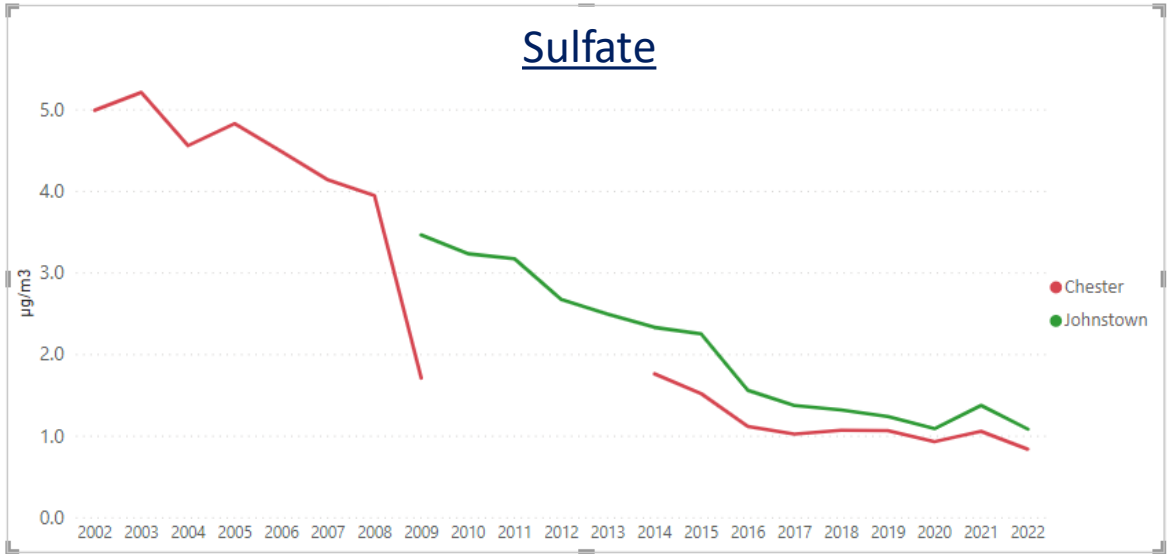
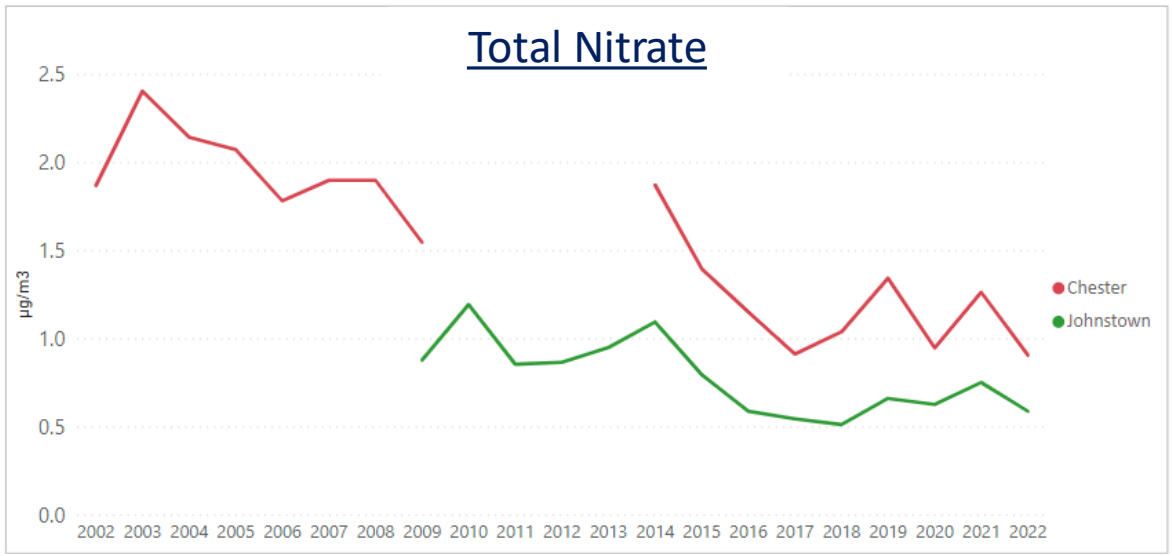
2002-2022 PM2.5 Speciation Data Trends

Sulfate

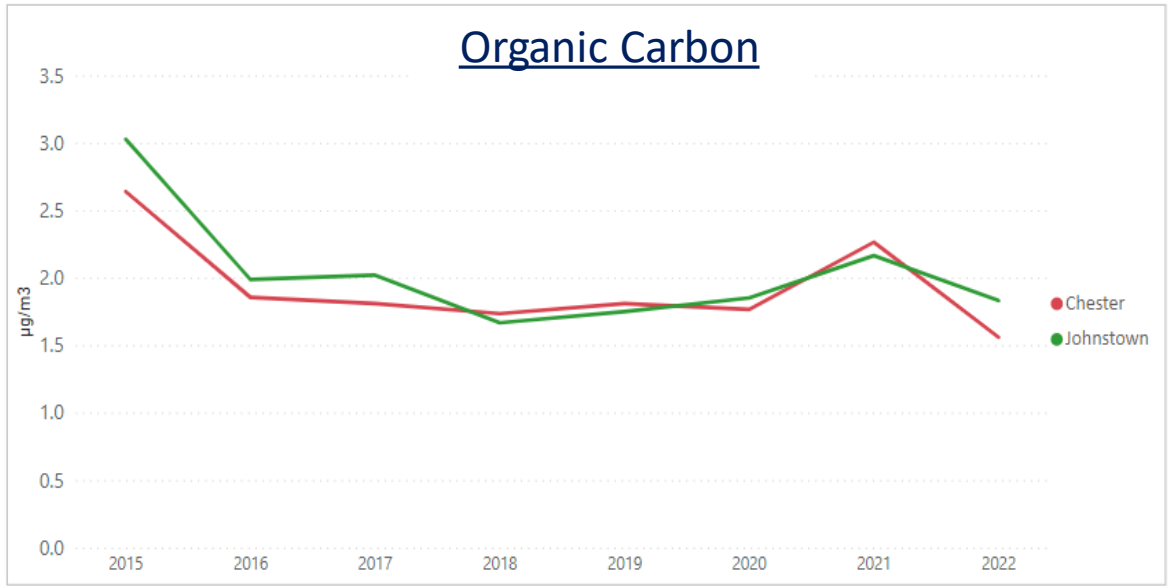


Total Nitrate



Ammonium Ion

Organic Carbon



2022 PM2.5 Speciation Trends

Typical seasonal trends were seen across monitoring sites and among PM2.5 species:

- On average, concentrations tended to be higher for ammonium, nitrate, sulfate, elemental carbon, and organic carbon as compared to other parameters.

- When looking across quarters, concentrations varied by season with higher nitrate and ammonium concentrations observed in the winter months and higher sulfate concentrations observed in the summer months.

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2022 PM2.5 Speciation Trends

- The highest ammonium, nitrate, and elemental carbon concentrations were observed at Lancaster DW, Lancaster, and Lebanon.
- The highest calculated soil (which includes silicon) concentrations were observed at Chester and in the 2nd quarter at Florence, Greensburg, and Johnstown.
- The highest sulfate concentrations were observed at Greensburg and Johnstown.

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