

Appendix C-2 GREATER PHILADELPHIA AREA

PADEP reviewed the Philadelphia Metropolitan Statistical Area (MSA) in Pennsylvania (consisting of Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties) to determine its designation recommendations for the 2024 annual PM_{2.5} National Ambient Air Quality Standard (NAAQS). Based on the analysis below, PADEP recommends a nonattainment area limited to Delaware, Montgomery, and Philadelphia Counties and outlines the reason for recommending a larger nonattainment area to the nonattainment area EPA designated for the 2012 PM_{2.5} standard (only Delaware County), but smaller than the nonattainment areas EPA designated for the 2006 and 1997 PM_{2.5} standards (Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties).

Analysis of the Ambient PM_{2.5} Data – A Design Value Contribution Analysis

Based on EPA-certified 2023 PM_{2.5} valid design values (EPA AQS AMP480 Report), three monitors in the Philadelphia MSA in Pennsylvania are violating the 2024 PM_{2.5} annual standard of 9.0 µg/m³. The monitors and their design values are Torresdale (AQS ID # 42-101-0075) at 10.0 µg/m³ (in Philadelphia County), Northeast Waste (AQS ID #42-101-0048) at 9.7 µg/m³ (in Philadelphia County), and Ritner (AQS ID # 42-101-0055) at 9.3 µg/m³ (in Philadelphia County). Figure C-2.1 is a map showing the location of these monitors, along with monitors in attainment, in the Philadelphia MSA in Pennsylvania. Note: Philadelphia Air Management Services (AMS) operates the monitors within Philadelphia County.

Figure C-2.1: Philadelphia MSA in Pennsylvania PM_{2.5} Monitoring Map



PADEP has completed a design value contribution analysis for all of the PM_{2.5} monitors in the Philadelphia MSA in Pennsylvania with valid 2023 PM_{2.5} design values. The analysis attempts to determine the daily contribution of PM_{2.5} concentrations to the annual PM_{2.5} design value. EPA-certified daily PM_{2.5} measurements (EPA AQS AMP355 Report) were grouped into different PM_{2.5} concentration ranges. An analysis of each range's contribution was then conducted to determine which measurements are contributing to the monitor's design value. These measurements were then further analyzed to determine if some specific meteorological conditions or sources are adversely impacting the monitor's design value.

Results from the design value contribution analysis for the Philadelphia MSA in Pennsylvania are summarized in Table C-2.1. Ultimately, the type of contribution a given monitor's daily value had on the 3-year design value (by comparing this value to 9.0 µg/m³) was determined. The daily value for each day a monitor measured PM_{2.5} levels was placed in one of the ten categories.

For example, on January 1, 2021, the Torresdale monitor's 24-hour PM_{2.5} average was 10.0 µg/m³. Since this value falls in the 9.0-13.5 µg/m³ category in Table C-2.1, the calculated daily

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

contribution to the design value was placed in this category. In the first quarter of 2021 (January 1 to March 31), the Torresdale monitor recorded 90 measurements. PADEP determined that the January 1, 2021, contribution assessment to the 2023 design value was 0.000926 $\mu\text{g}/\text{m}^3$. The 0.000926 $\mu\text{g}/\text{m}^3$ was calculated by subtracting the standard of 9.0 $\mu\text{g}/\text{m}^3$ from the average daily value of 10.0 $\mu\text{g}/\text{m}^3$ and then dividing this by the number of measurements for the quarter (90) times 12 (there are a total of 12 quarters in a 3-year design value period). This type of analysis was completed for every day of measurements from January 1, 2021, through December 31, 2023. In Table C-2.1, the sum of the categorical breakdowns for the Torresdale monitor equals 1.0558 $\mu\text{g}/\text{m}^3$, which demonstrates that the design value is 1.0558 $\mu\text{g}/\text{m}^3$ above the annual standard of 9.0 $\mu\text{g}/\text{m}^3$.

Figures C-2.2.1 – C-2.2.15 show the design value contribution and category breakdown for the seven monitors and summary.

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

***Table C-2.1: Philadelphia MSA in Pennsylvania
2023 PM_{2.5} Annual Design Value Contribution Analysis***

Site Name	Site ID	Owner	0 - 4.5	4.5 - 9.0	9.0 - 13.5	13.5 - 18.0	18.0 - 22.5	22.5 - 27.0	27.0 - 31.5	31.5 - 36.0	36.0 - 40.5	40.5 - 45.0	SUM
Monitors Attaining 2024 PM_{2.5} Standard													
Chester	420450002	PADEP	-0.9130	-1.2617	0.4185	0.4053	0.2901	0.1049	0.0588	0.0000	0.0560	0.3456	-0.4955
Montgomery	421010076	Philadelphia AMS	-1.1428	-1.3115	0.3701	0.4533	0.3048	0.1674	0.0541	0.0217	0.0280	0.5271	-0.5279
Norristown	420910013	PADEP	-1.2920	-1.3209	0.3291	0.3643	0.2665	0.1677	0.0567	0.0000	0.0283	0.5168	-0.8835
New Garden	420290100	PADEP	-1.1664	-1.3380	0.3384	0.3985	0.2223	0.0764	0.0390	0.0729	0.0000	0.4591	-0.8978
Monitors Not Attaining 2024 PM_{2.5} Standard													
Torresdale	421010075	Philadelphia AMS	-0.6708	-1.0194	0.4321	0.7215	0.3452	0.3962	0.1084	0.0931	0.1051	0.5444	1.0558
Northeast Waste	421010048	Philadelphia AMS	-0.7947	-1.0409	0.4646	0.7122	0.3822	0.2577	0.1659	0.0000	0.0555	0.4678	0.6704
Ritner	421010055	Philadelphia AMS	-1.0081	-1.0510	0.3845	0.5685	0.3454	0.3158	0.0749	0.0872	0.0256	0.5295	0.2723
Philadelphia MSA in Pennsylvania Average			-0.9983	-1.1919	0.3910	0.5177	0.3081	0.2123	0.0797	0.0393	0.0426	0.4843	-0.1152

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.2.1: Torresdale PM_{2.5} Design Value Contribution (µg/m³)

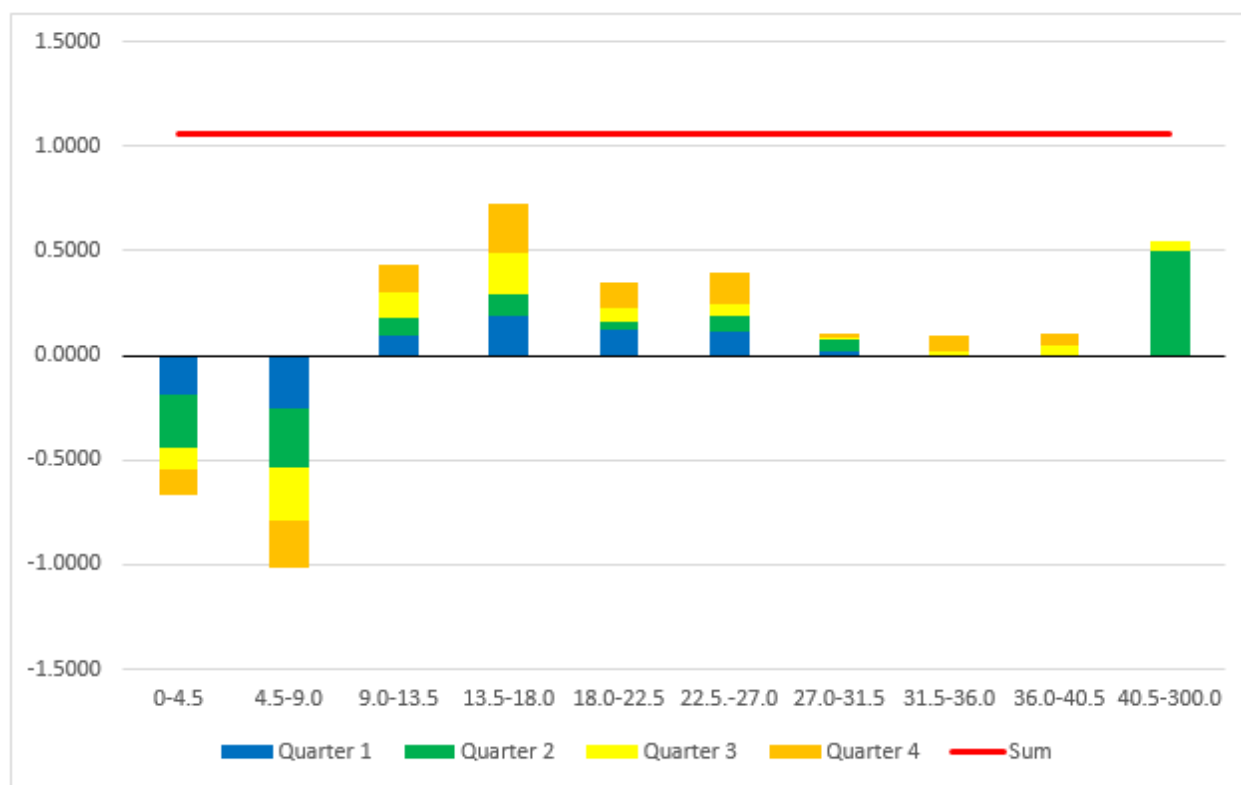
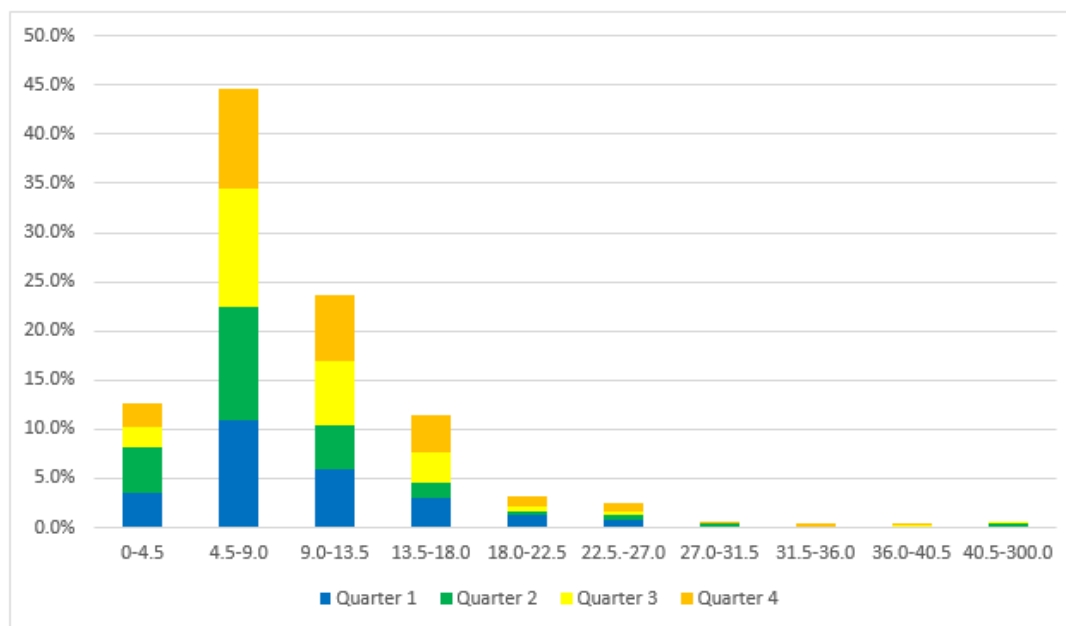


Figure C-2.2.2: Torresdale PM_{2.5} Design Value Category Breakdown



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.2.3: Northeast Waste PM_{2.5} Design Value Contribution (µg/m³)

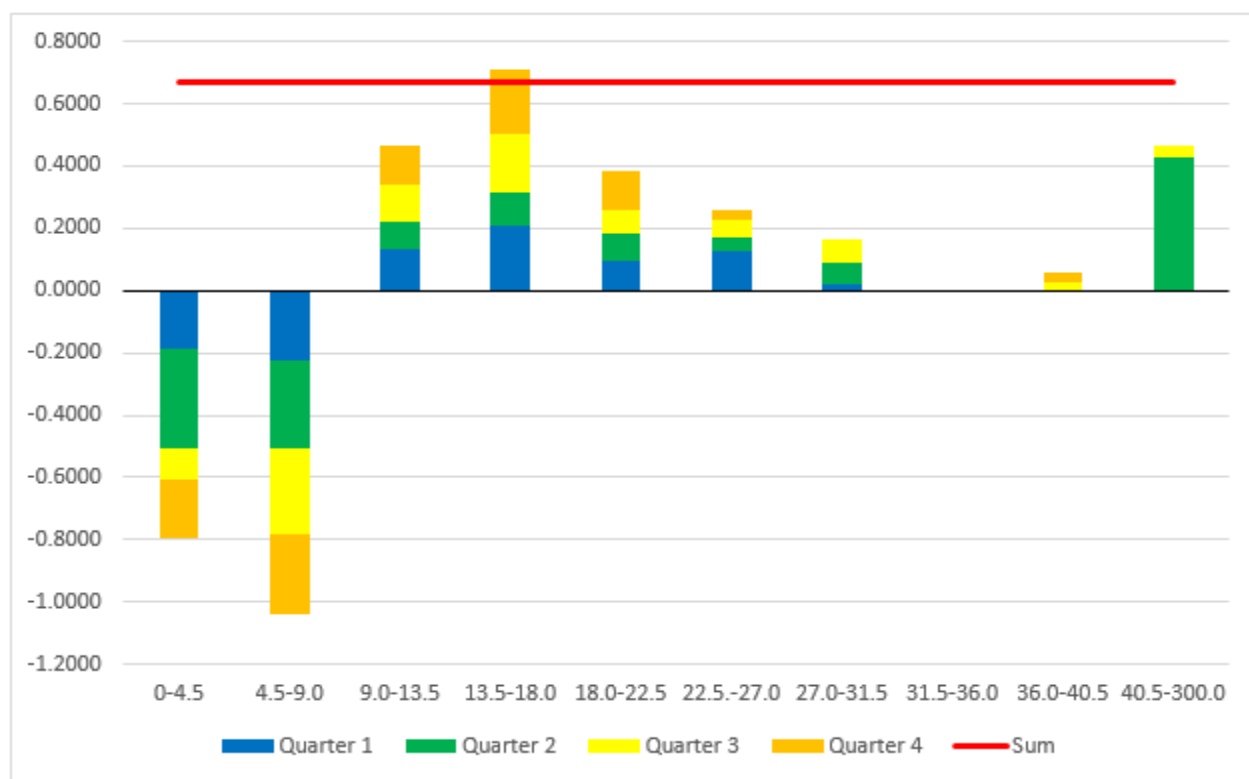
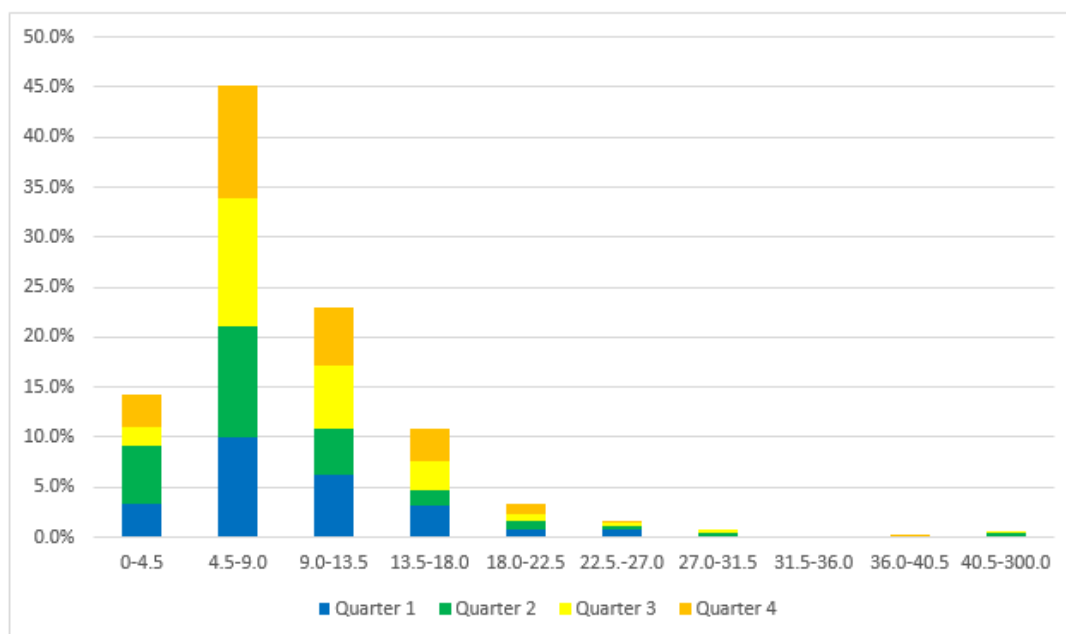


Figure C-2.2.4: Northeast Waste PM_{2.5} Design Value Category Breakdown



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.2.5: Ritner PM_{2.5} Design Value Contribution (µg/m³)

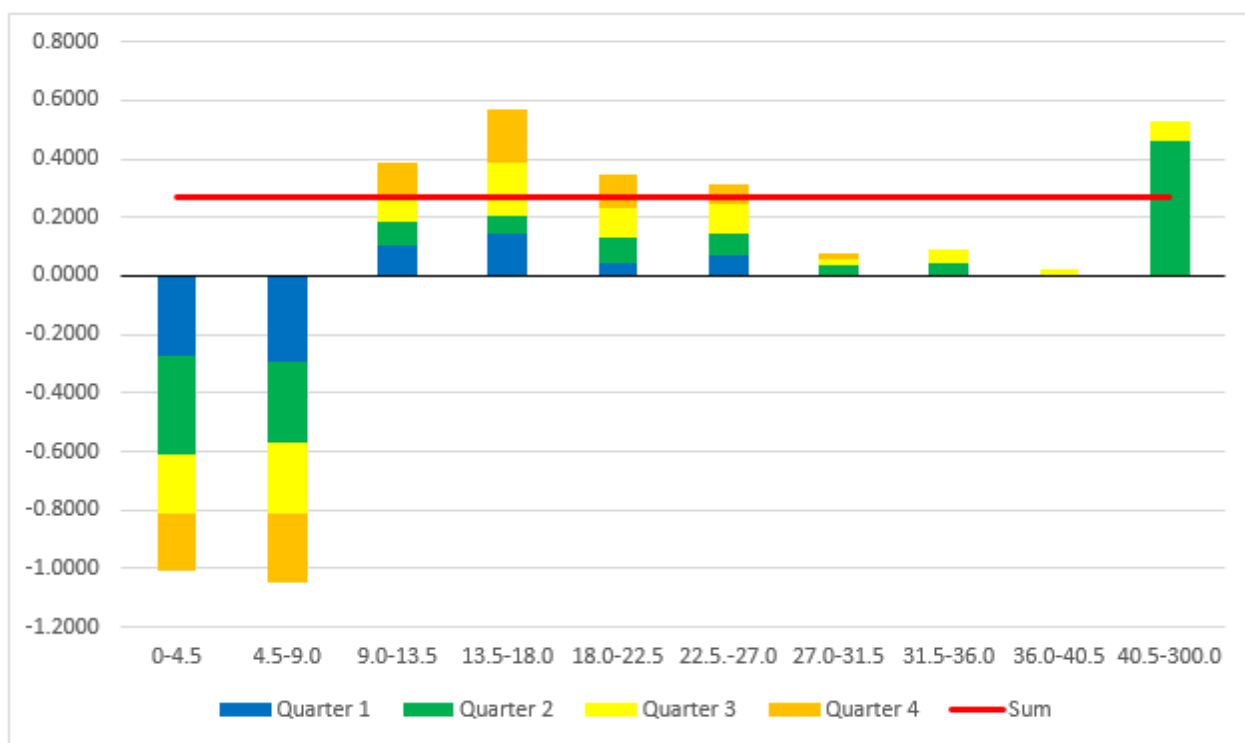
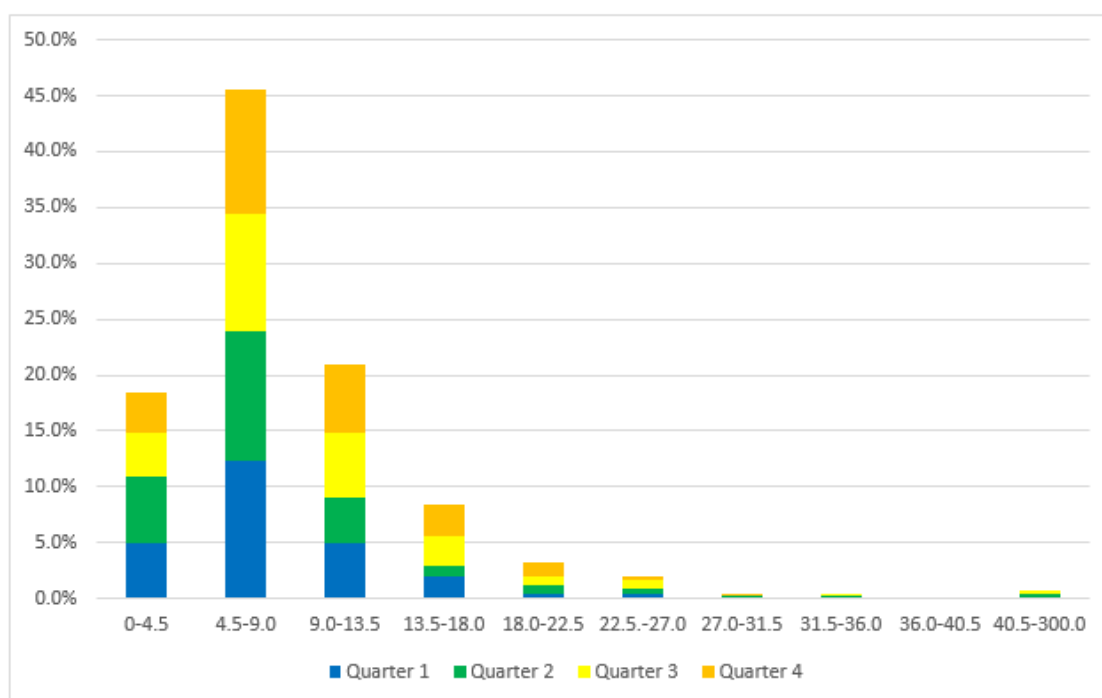


Figure C-2.2.6: Ritner PM_{2.5} Design Value Category Breakdown



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.2.7: Chester PM_{2.5} Design Value Contribution (µg/m³)

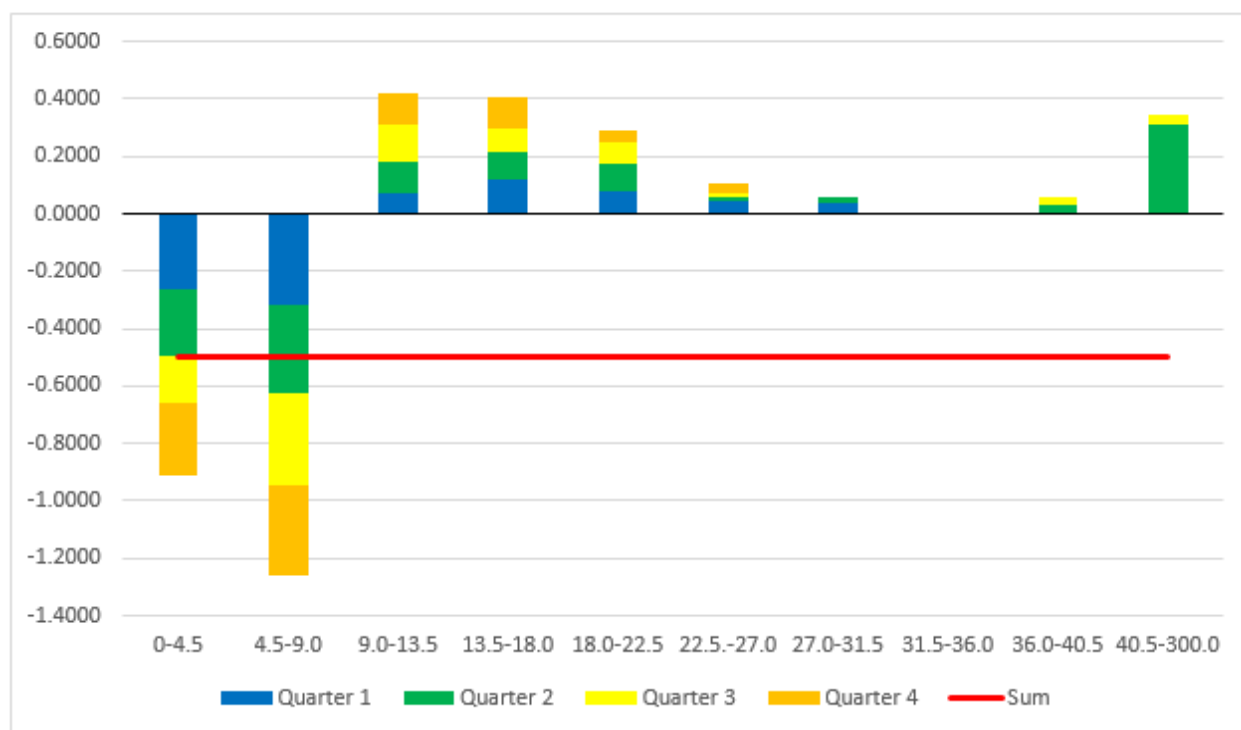
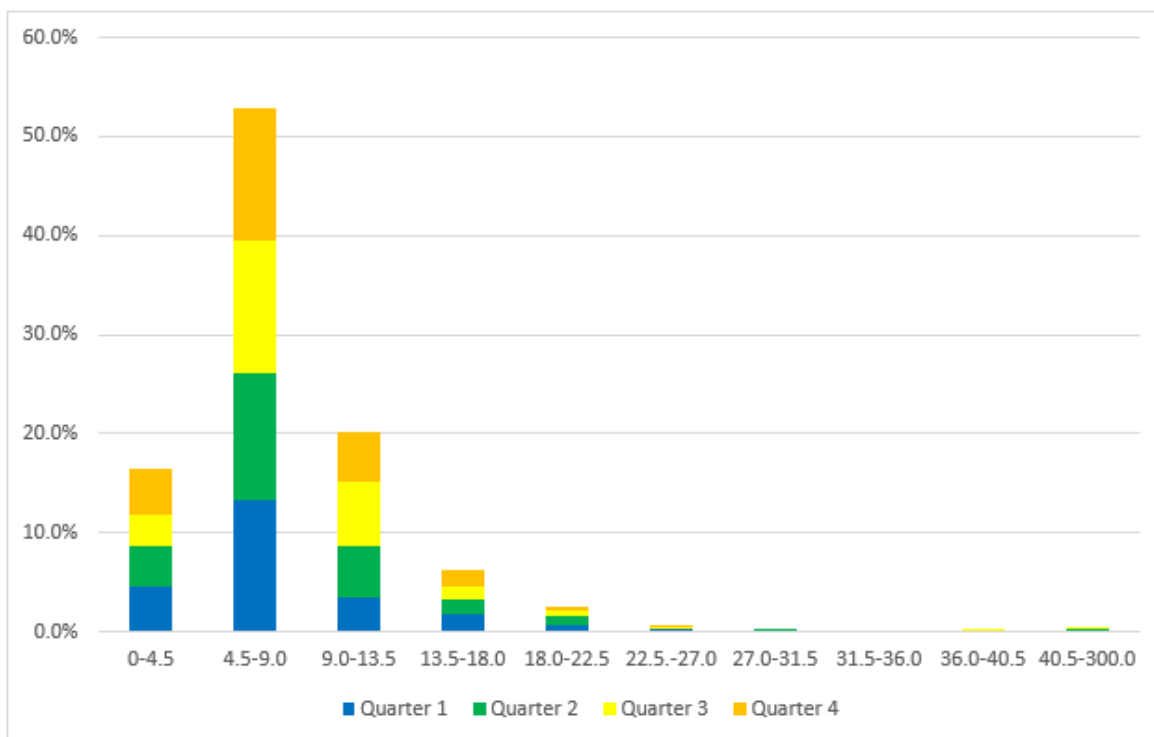


Figure C-2.2.8: Chester PM_{2.5} Design Value Category Breakdown



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.2.9: Montgomery PM_{2.5} Design Value Contribution (µg/m³)

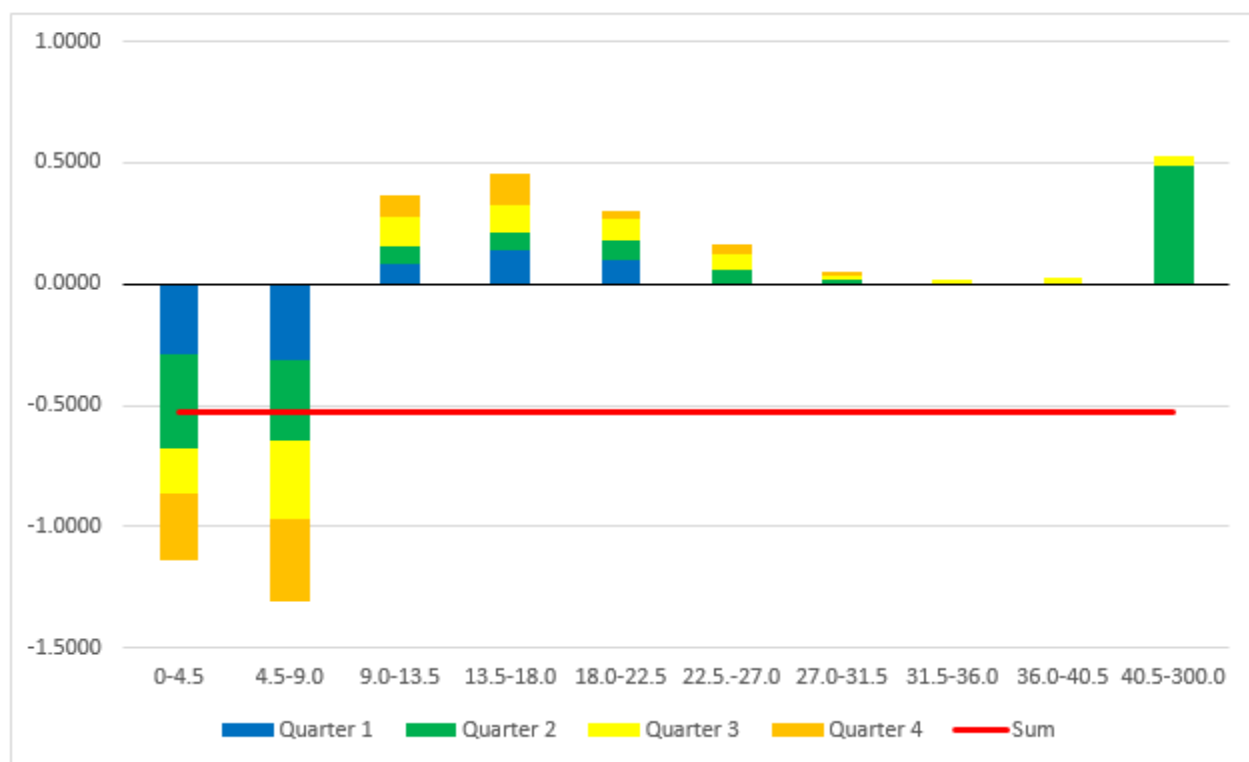
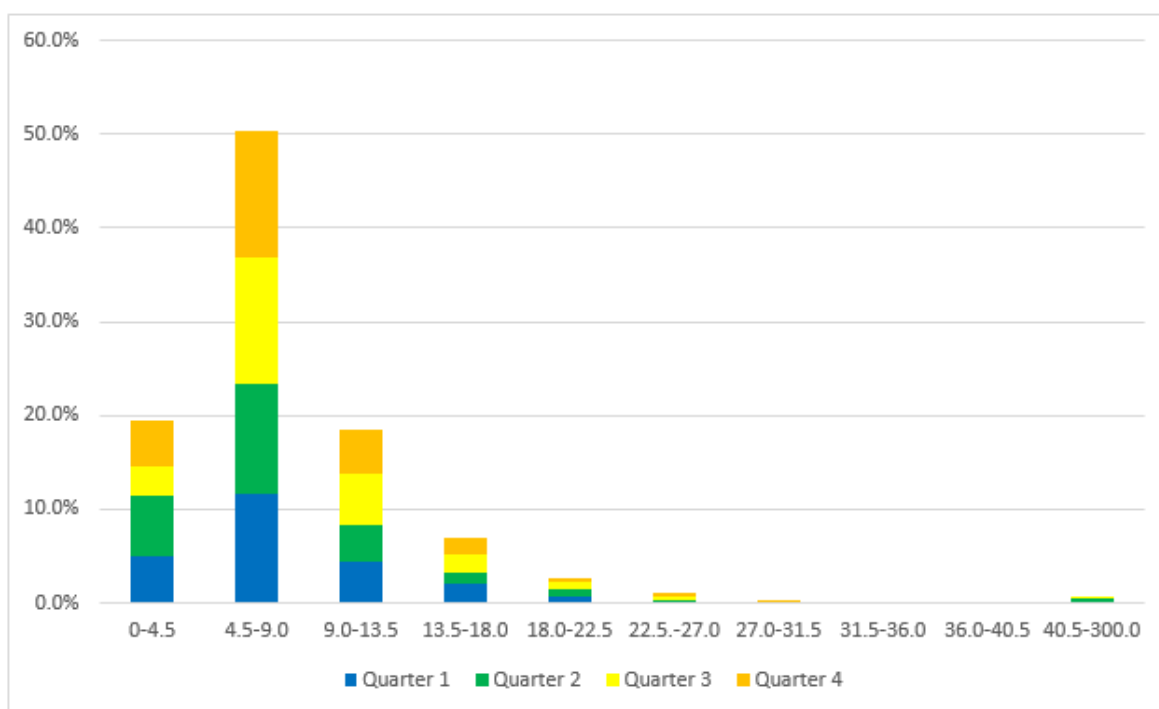


Figure C-2.2.10: Montgomery PM_{2.5} Design Value Category Breakdown



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.2.11: New Garden PM_{2.5} Design Value Contribution (µg/m³)

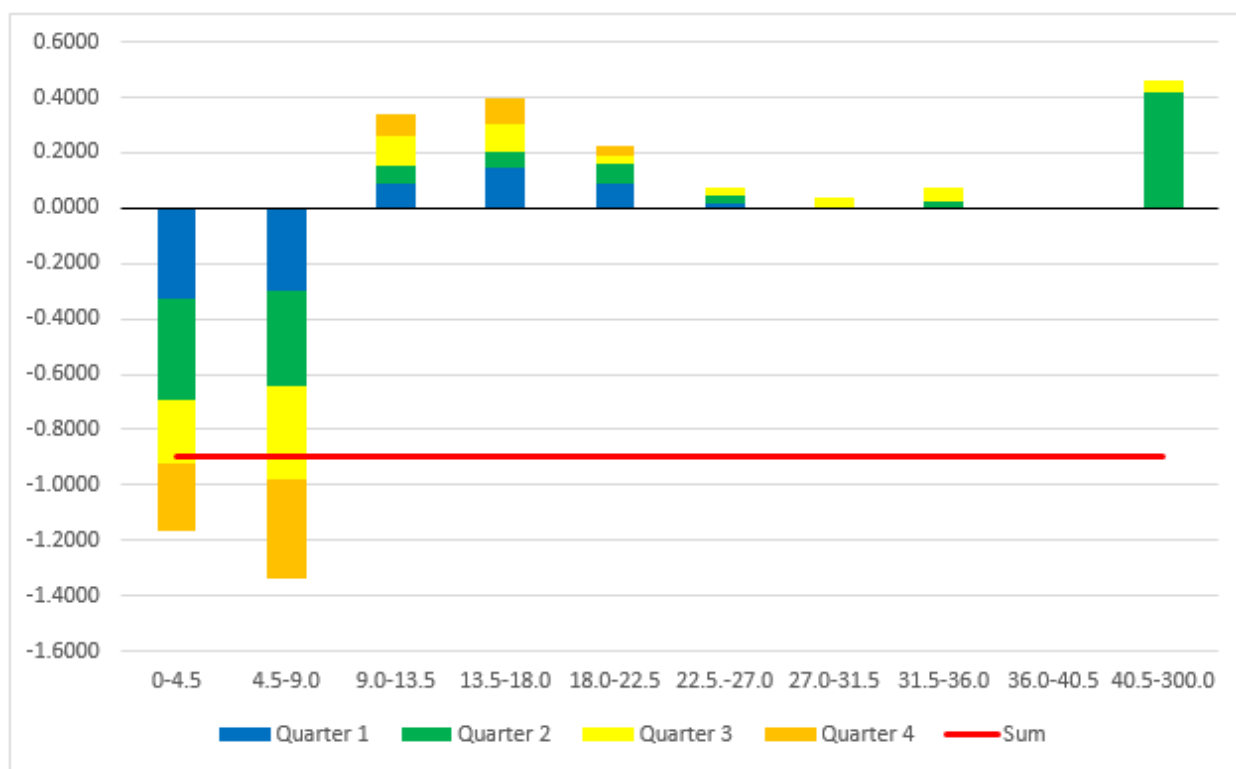


Figure C-2.2.12: New Garden PM_{2.5} Design Value Category Breakdown

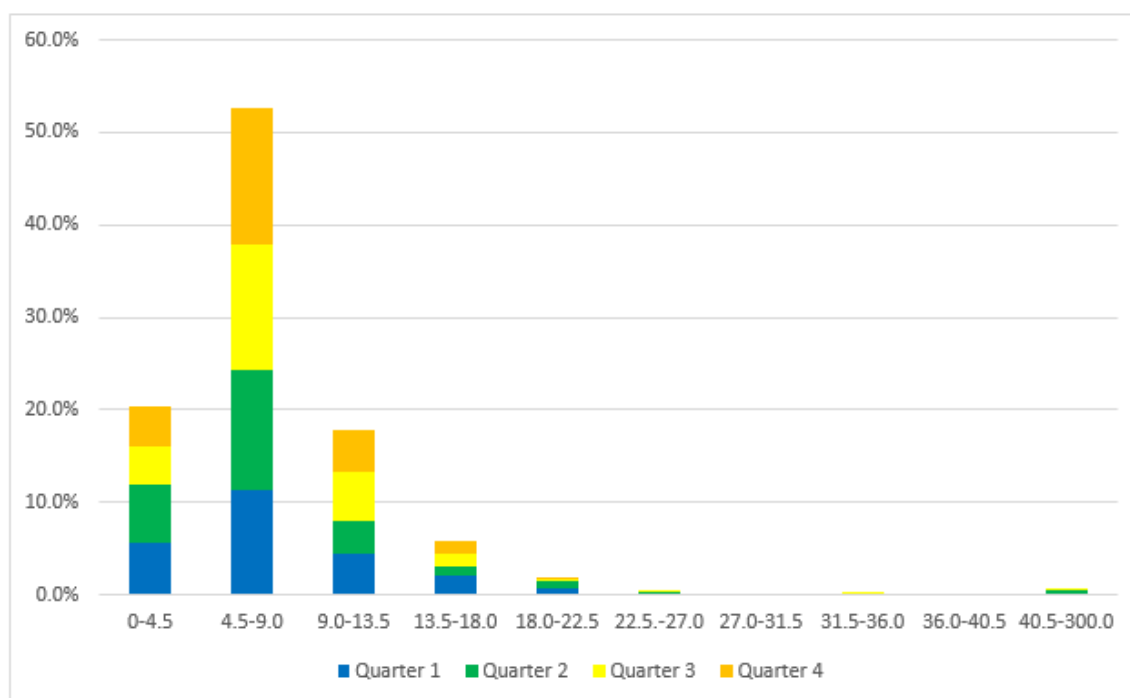


Figure C-2.2.13: Norristown PM_{2.5} Design Value Contribution (µg/m³)

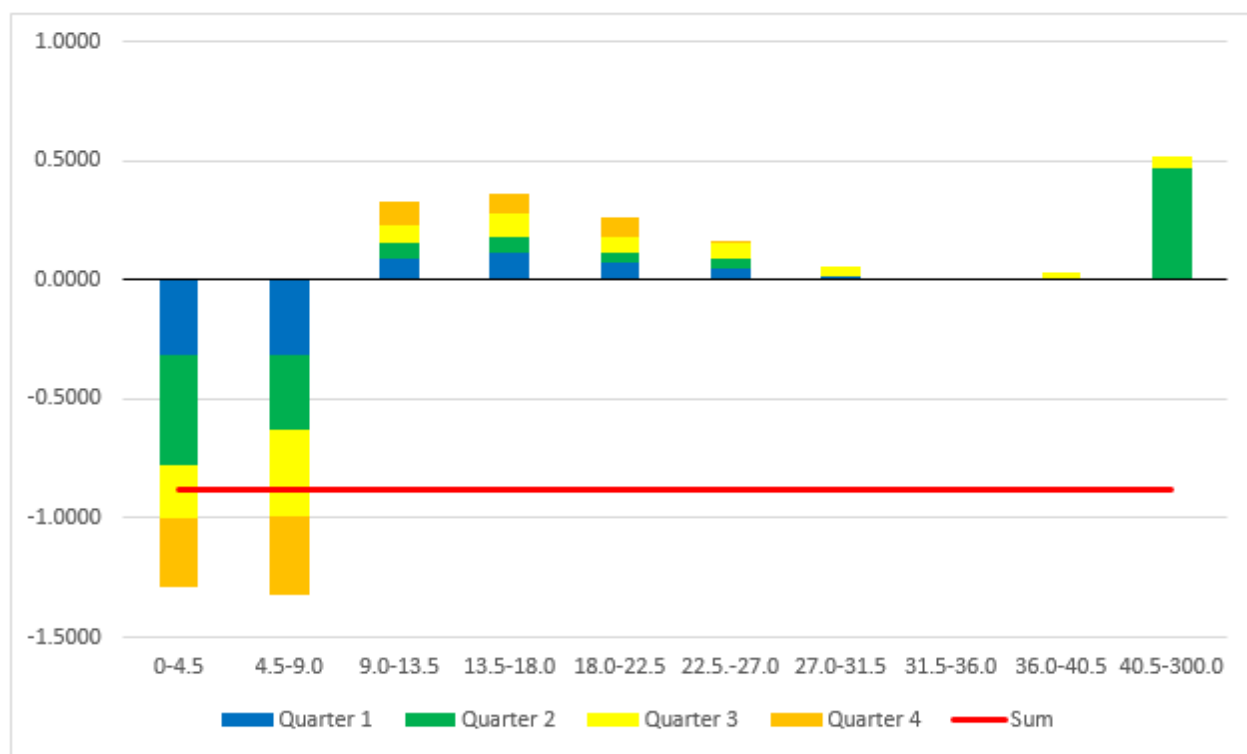
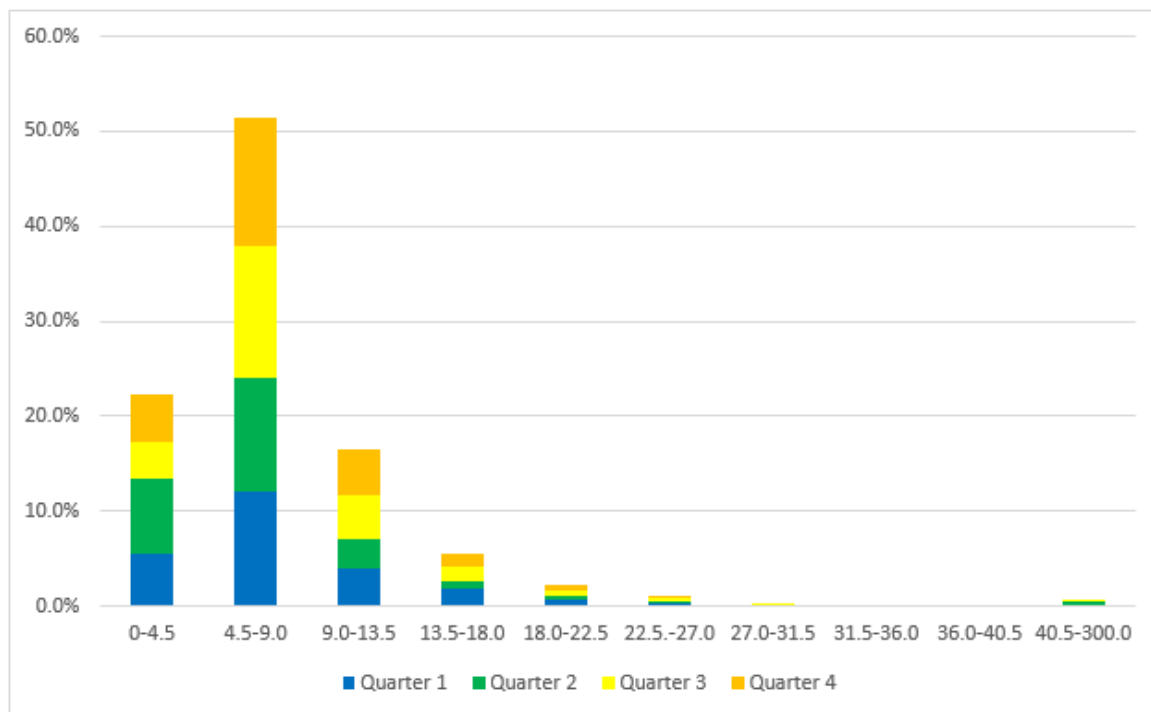
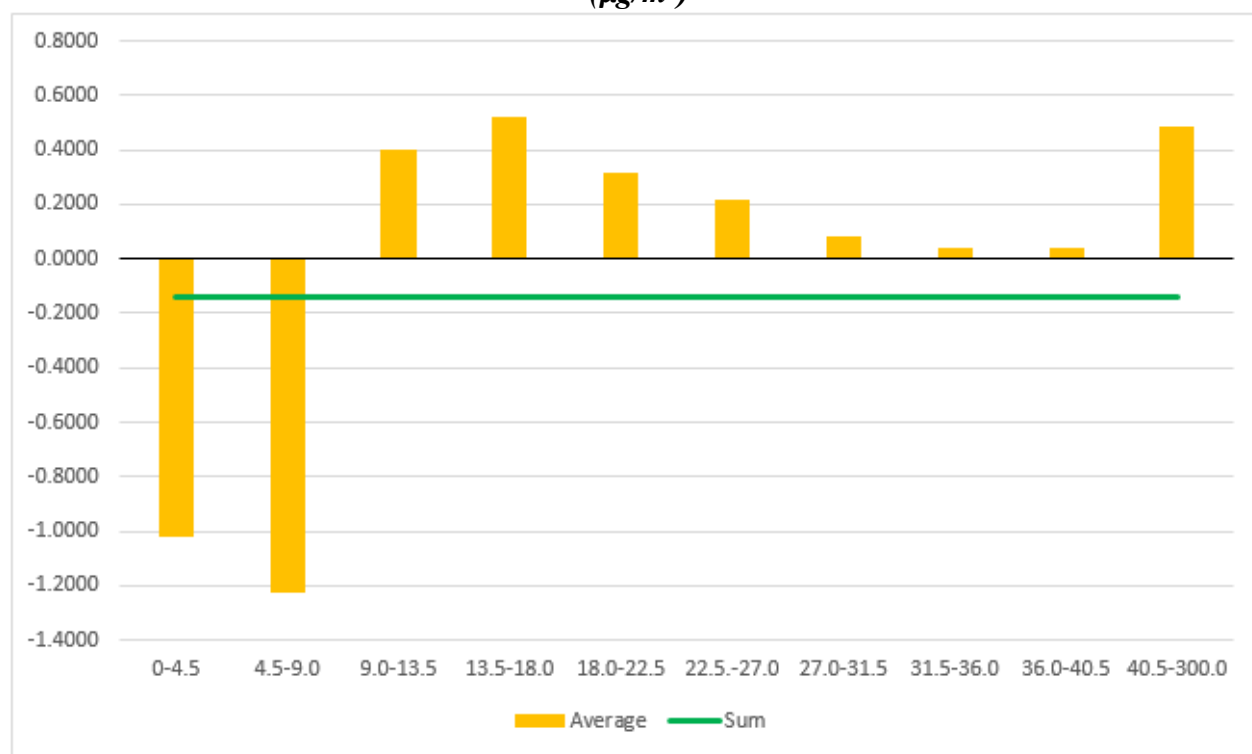


Figure C-2.2.14: Norristown PM_{2.5} Design Value Category Breakdown



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.2.15: Philadelphia MSA in Pennsylvania PM_{2.5} Annual Design Value Contribution (µg/m³)



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Table C-2.1 and Figures C-2.2.1 – C-2.2.15 illustrate the differences between the monitors that are attaining the 2024 PM_{2.5} annual standard and the monitors that are not attaining the 2024 PM_{2.5} annual standard. The monitors that are not attaining the standard have relatively fewer "clean" days (0-9.0 µg/m³) than the monitors that are attaining the standard. For example, the Torresdale monitor's PM_{2.5} contribution to the design value in the 0-9.0 µg/m³ range was 0.6 µg/m³ lower than the Philadelphia MSA in Pennsylvania average.

The analysis described in the remainder of this Appendix focuses on the violating monitors in Philadelphia County (Torresdale, Northeast Waste, and Ritner) and surrounding Delaware and Montgomery Counties. Figure C-2.3.1 illustrates the trend of annual averages while Figure C-2.3.2 illustrates the trend of annual design values for monitors in the Philadelphia MSA in Pennsylvania with valid 2023 PM_{2.5} design values. The Torresdale, Northeast Waste, and Ritner monitors have both a 2023 annual average and design value above the 2024 standard. Since 2014, annual PM_{2.5} levels have been in a general decline in the Philadelphia MSA in Pennsylvania. Except for 2023, the Montgomery monitor in Philadelphia County has always been below the 2024 standard on an annual average and under the annual design value, the Norristown monitor in Montgomery County has been below the 2024 standard on an annual average since 2018 and under the annual design value since 2019, the Chester monitor in Delaware County has been below the 2024 standard on an annual average since 2019 and under the annual design value since 2021, and the New Garden monitor in Chester County has been below the 2024 standard on an annual average in 2022 and 2020 and under the annual design value in those years as well.

It is important to note that 2023 was an extremely active year for Canadian wildfires, leading to an excessive amount of smoke transported into southeastern PA. Fire-related request for exclusion qualifier codes were included in AQS for all Philadelphia MSA in Pennsylvania PM_{2.5} data on June 6-8 and June 27-July 1, 2023, along with fire-related informational only qualifier codes on 24 sample days. Days with smoke impacts showed elevated concentrations (beyond what might have been expected), along with several exceedances of the 24-hour NAAQS. With an exceptional event analysis submitted to EPA, exclusion of select days would lead to lower concentrations at all sites and per EPA's PM_{2.5} Tiering Tool at: <https://www.epa.gov/air-quality-analysis/pm25-tiering-tool-exceptional-events-analysis>, Ritner's 2023 PM_{2.5} annual design value would be 8.8 µg/m³ as seen in Figure C-2.3.3. However, since two monitors in Philadelphia County would still be violating the 2024 standard even with many days excluded, an exceptional event exclusion analysis has not been prepared for any of the Philadelphia MSA in Pennsylvania sites at the time of this analysis.

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.3.1: Philadelphia MSA in Pennsylvania PM_{2.5} Valid Annual Averages (µg/m³)

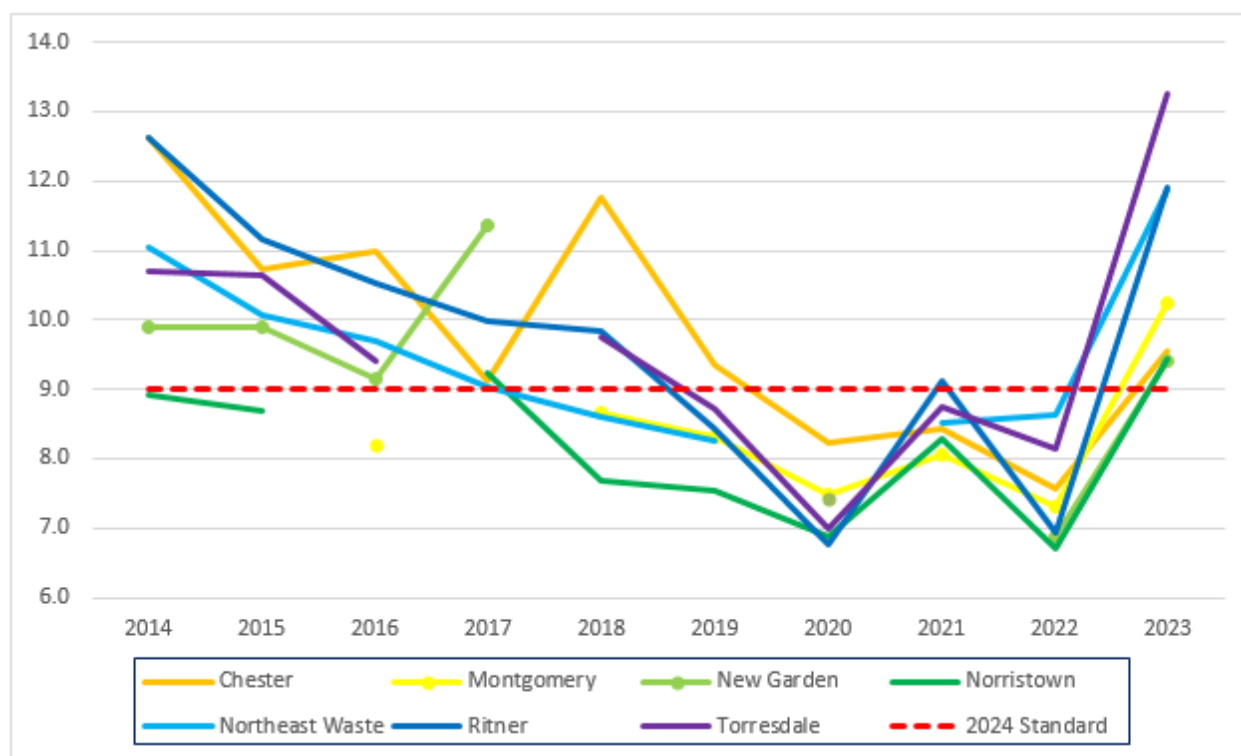


Figure C-2.3.2: Philadelphia MSA in Pennsylvania PM_{2.5} Valid Annual Design Values (µg/m³)

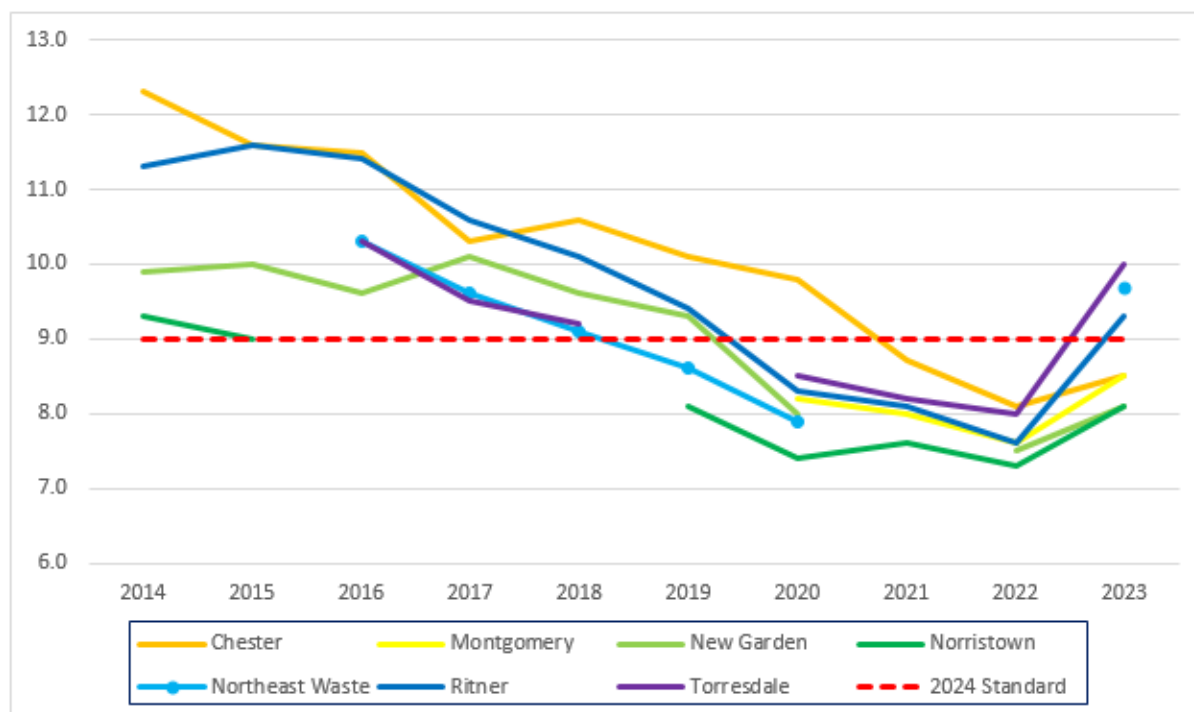
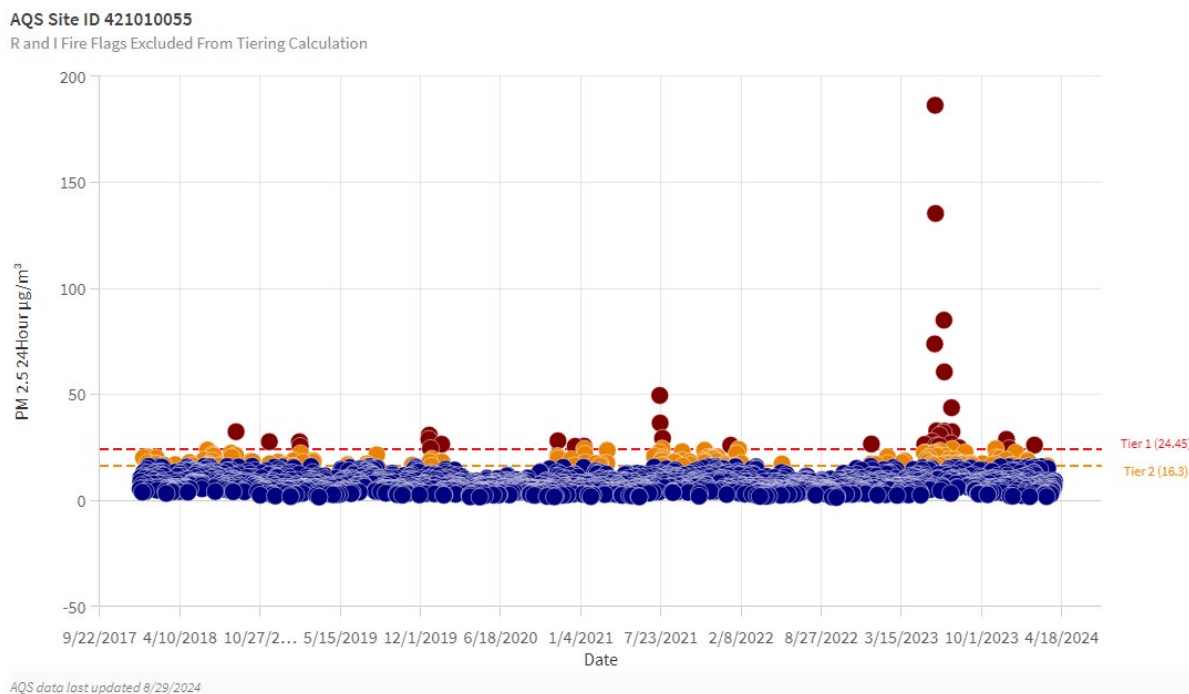


Figure C-2.3.3: Ritner Scatter Plot with Request Exclusion and Fire-Related Informational Flags Excluded from Tiering Calculation



Additional analyses were completed to determine what was contributing to the fewer number of “clean” days at the Torresdale, Northeast Waste, and Ritner monitors. PADEP identified days when these monitor’s PM_{2.5} concentrations were relatively high but regional monitoring concentrations in the Philadelphia MSA in Pennsylvania were “clean.” Between 2021 and 2023, PADEP identified 151 days in which the Torresdale monitor was at least one standard deviation above the Philadelphia MSA in Pennsylvania average while the Philadelphia MSA in Pennsylvania average was at or below 9.0 $\mu\text{g}/\text{m}^3$, 150 days in which the Northeast Waste monitor was at least one standard deviation above the Philadelphia MSA in Pennsylvania average while the Philadelphia MSA in Pennsylvania average was at or below 9.0 $\mu\text{g}/\text{m}^3$, and 93 days in which the Ritner monitor was at least one standard deviation above the Philadelphia MSA in Pennsylvania average while the Philadelphia MSA in Pennsylvania average was at or below 9.0 $\mu\text{g}/\text{m}^3$.

Meteorological Conditions Impacting High PM_{2.5} Days at the Torresdale, Northeast Waste, and Ritner Monitors

The Philadelphia MSA in Pennsylvania includes the following air basins per Appendix B, Figure B-27: Southeast Pennsylvania Inner and Southeast Pennsylvania Outer, with a dense area of population, and the greatest amount of industry along the Delaware River. The terrain transitions from the urban flatlands of Philadelphia and flat areas of Eastern Bucks and Delaware Counties near the Delaware River to more rural, hilly landscapes as you move outward to Northern Montgomery, Chester, and Bucks Counties. Elevations vary from 0 to 1,000 feet. Wind patterns are generally influenced by weather systems moving from the west. The urban areas, particularly in Philadelphia, can experience poor air quality due to stagnant days.

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.4.1 illustrates the sources within the immediate proximity of the Torresdale, Northeast Waste, and Ritner monitors. Using the meteorological station at the Philadelphia International Airport (KPHL), Figure C-2.4.2 illustrates the frequency of wind distribution coming from a particular direction.

Figure C-2.4.1: Philadelphia MSA in Pennsylvania
Major Sources (Over 100 Tons Per Year) Based on PADEP 2022 Emission Inventory

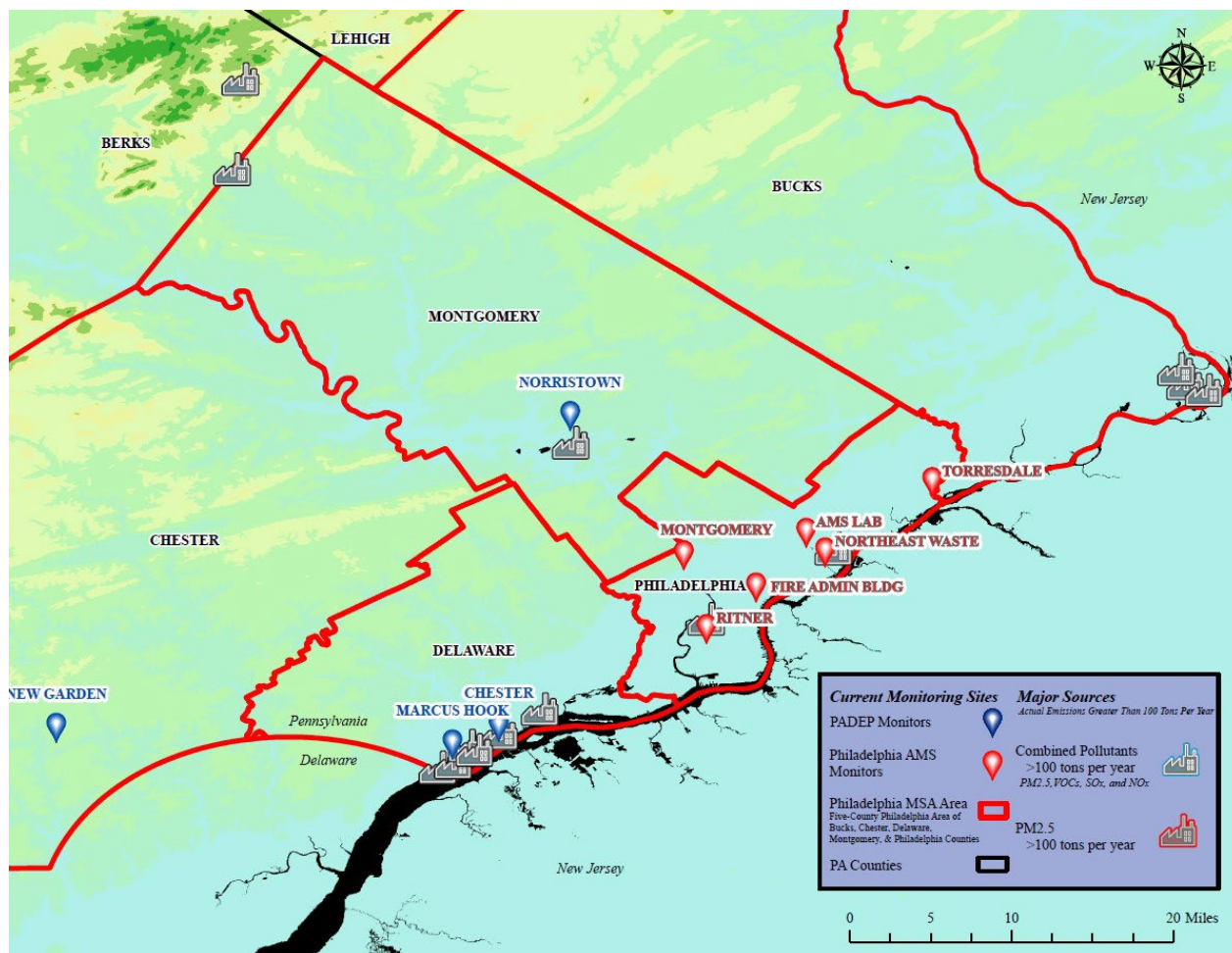


Figure C-2.4.1 shows that there are multiple major sources of SO₂ and NO_x within the Philadelphia MSA in Pennsylvania near the Torresdale, Northeast Waste, and Ritner monitors in Philadelphia County, with the largest sources along the I-95 corridor into Delaware County. Delaware County has the highest NO_x and VOC precursor point source emissions as seen in Appendix B, Figures B-23 – B-24. Per Appendix B, Figure B-2, the greatest PM_{2.5} point source emission density is in Delaware County, followed by Philadelphia County. Most PM_{2.5}, SO₂ precursor, NO_x precursor, and VOC precursor point source emissions are in Philadelphia, Delaware, and Montgomery Counties, with substantially less emissions in Chester and Bucks Counties as seen in Appendix B, Figures B-21 – B-24. Per Appendix B, Figure B-5, the greatest VOC precursor point

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

source emission density is in Delaware and Montgomery Counties. Per Appendix B, Figures B-6 – B-8, the greatest PM_{2.5}, SO₂ precursor and NO_x precursor area source emission density is in Philadelphia County, followed by Delaware and Montgomery Counties. Per Appendix B, Figure B-9, the greatest VOC precursor area source emission density is in Philadelphia County, followed by Delaware County. Figures B-11 – B-20 in Appendix B show that on-road and non-road source emissions are also greatest in Delaware, Montgomery, and Philadelphia Counties.

**Figure C-2.4.2: Philadelphia MSA in Pennsylvania
Philadelphia International Airport (KPHL) Wind Rose**

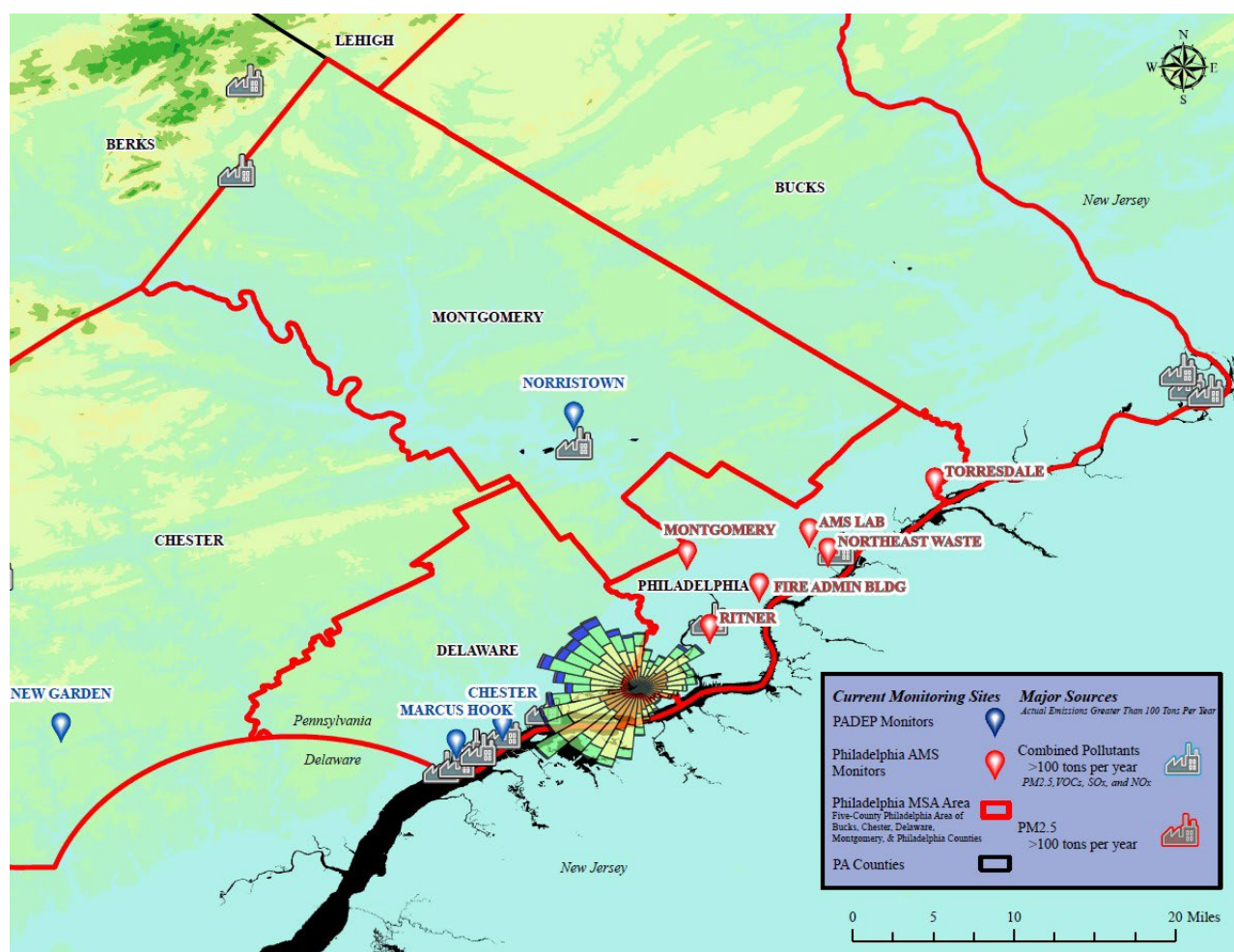


Figure C-2.4.2 shows that, based on the KPHL wind data from 2021-2023, the predominant winds travel directly over these sources, northeast. This analysis indicates the local nature of the problem near these monitors.

The Change in the Composition of the PM_{2.5}

Within the Philadelphia MSA in Pennsylvania, Philadelphia AMS operates speciation monitors at Northeast Waste and Ritner and PADEP operates speciation monitors at Chester and New Garden. PADEP also operates a speciation monitor at Arendtsville (AQS ID# 42-001-0001), in a rural location in Adams County. The Arendtsville monitor does not have a major SO₂ or NO_x source within 12 kilometers of the monitor. For that reason, the Arendtsville monitor best reflects the transport that is coming into eastern Pennsylvania from areas to the west (prevailing wind flow is from west to east across Pennsylvania). The other speciation monitors can be examined in comparison to Arendtsville for urban (or localized) excess or by source influences within the Philadelphia MSA in Pennsylvania.

Figures C-2.5.1 - C-2.5.2, C-2.5.4 - C-2.5.5, C-2.5.7 - C-2.5.8, and C-2.5.10 - C-2.5.11 outline the main speciated components of PM_{2.5} during each quarter: ammonium, nitrate, sulfate, organic carbon (OC), elemental carbon (EC), soil, and elements. Figures C-2.5.3, C-2.5.6, C-2.5.9, and C-2.5.12 illustrate the difference in the main speciated components of PM_{2.5} from the 2016 to 2018 period to the 2021 to 2023 period.

Figure C-2.5.1: 2016-2018 Quarter 1 PM_{2.5} Average Speciation Concentrations (µg/m³)

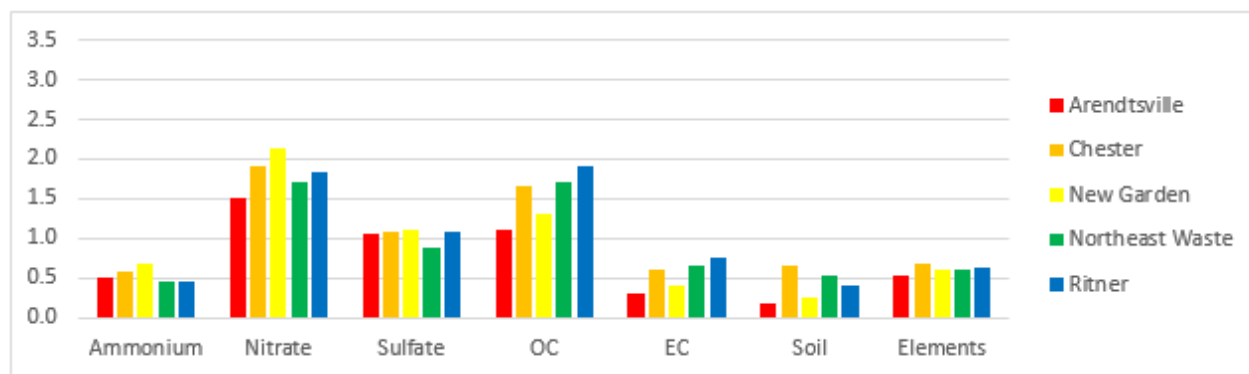
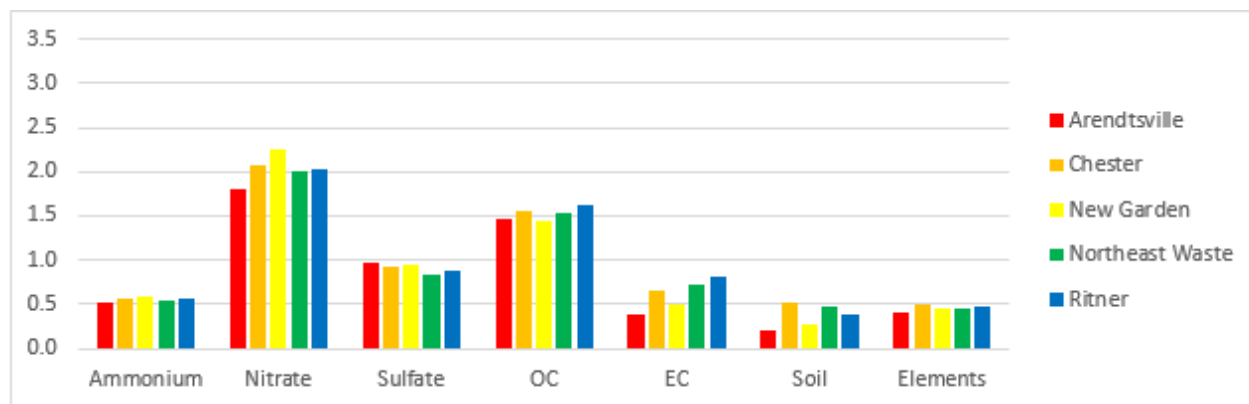


Figure C-2.5.2: 2021-2023 Quarter 1 PM_{2.5} Average Speciation Concentrations (µg/m³)



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.5.3: Comparison of Quarter 1 PM_{2.5} Average Speciation Concentrations (µg/m³) 2021-2023 minus 2016-2018

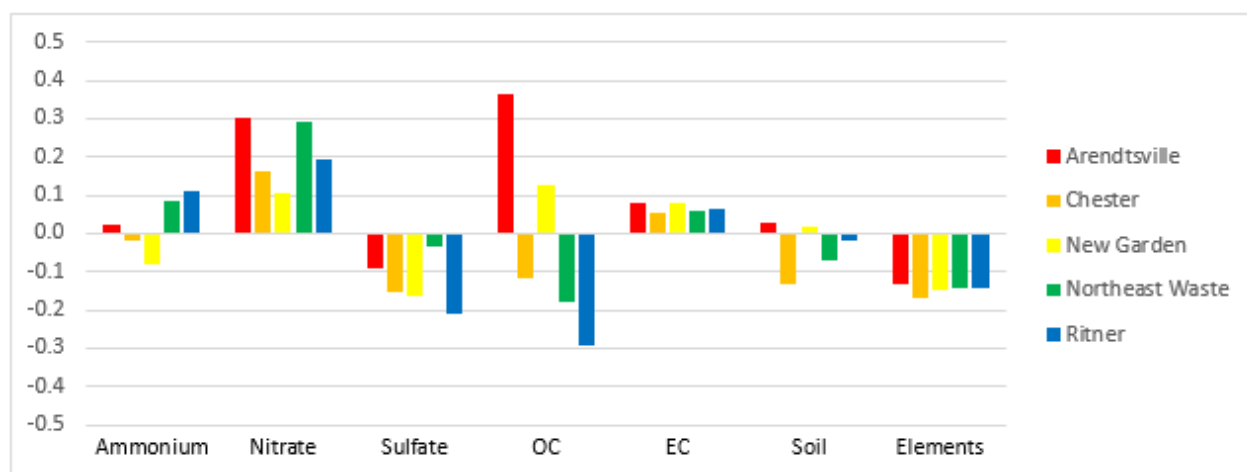


Figure C-2.5.4: 2016-2018 Quarter 2 PM_{2.5} Average Speciation Concentrations (µg/m³)

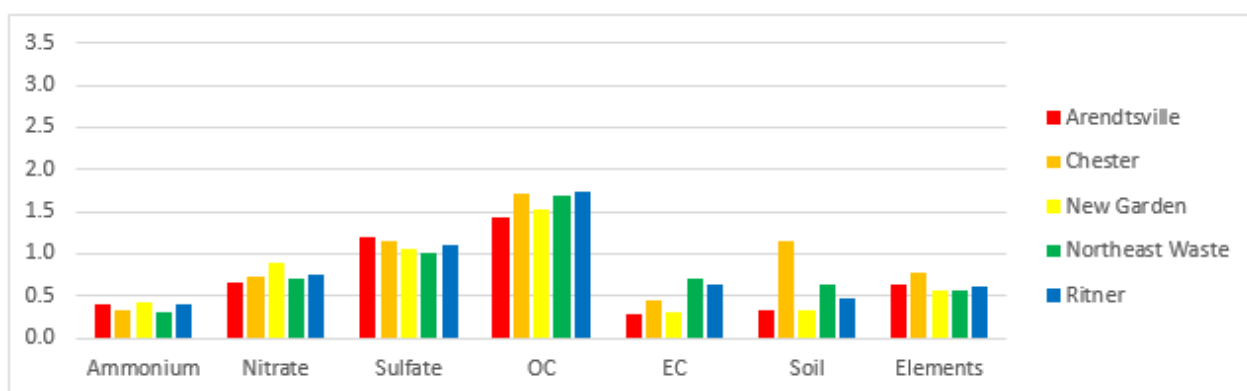
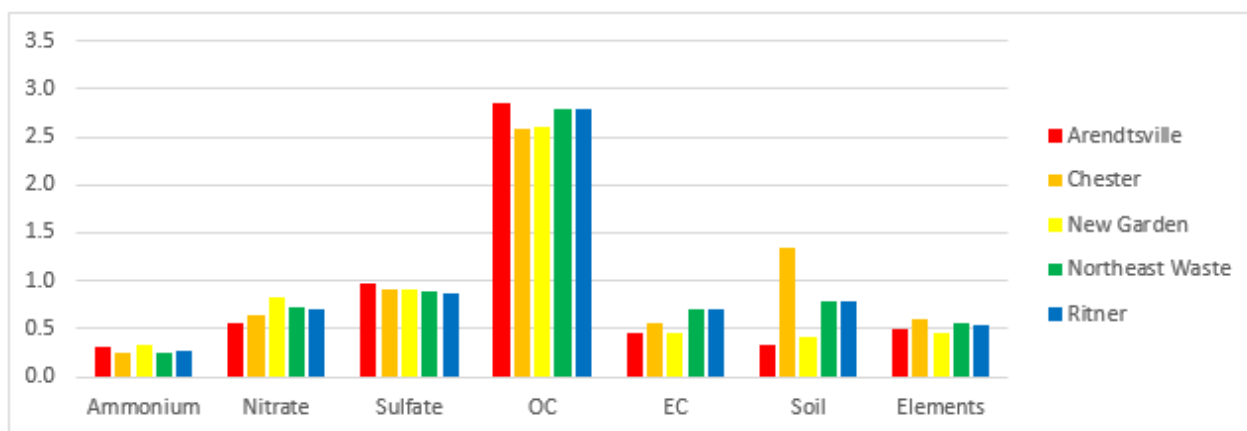


Figure C-2.5.5: 2021-2023 Quarter 2 PM_{2.5} Average Speciation Concentrations (µg/m³)



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.5.6: Comparison of Quarter 2 PM_{2.5} Average Speciation Concentrations (µg/m³) 2021-2023 minus 2016-2018

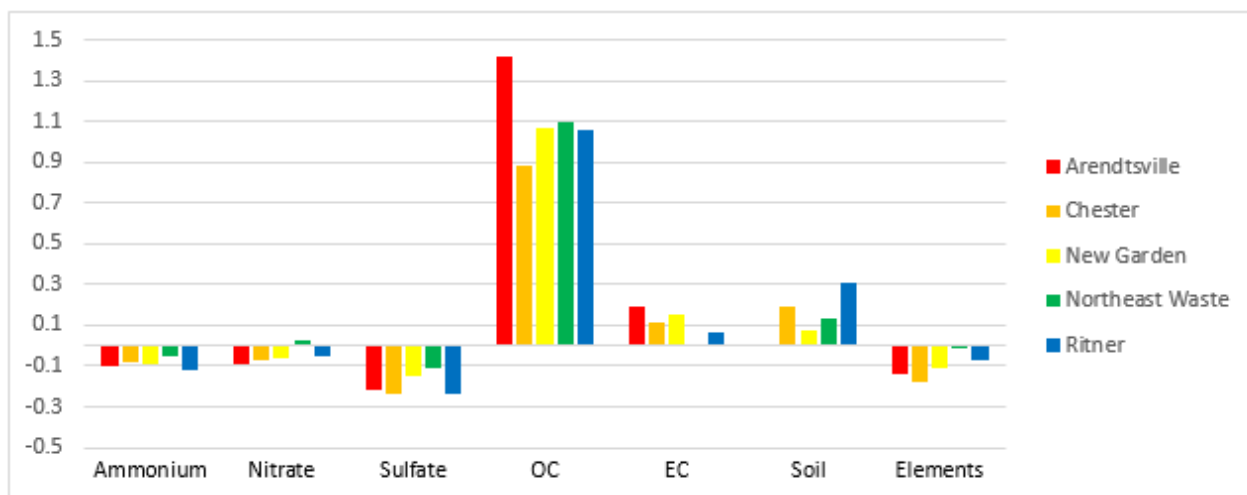


Figure C-2.5.7: 2016-2018 Quarter 3 PM_{2.5} Average Speciation Concentrations (µg/m³)

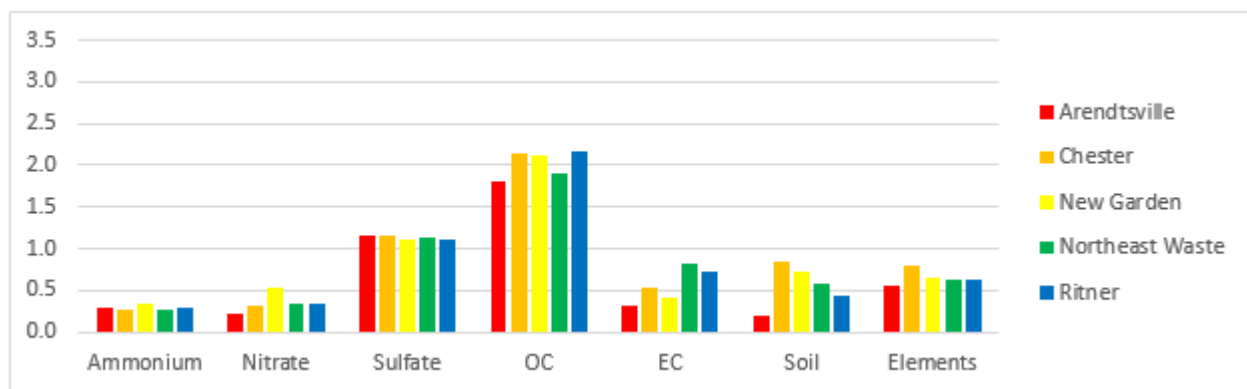
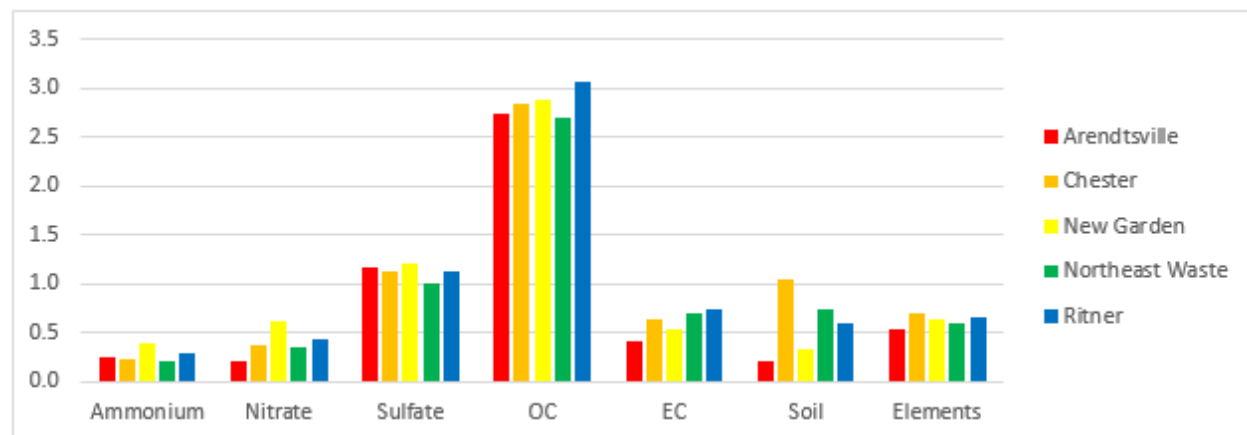


Figure C-2.5.8: 2021-2023 Quarter 3 PM_{2.5} Average Speciation Concentrations (µg/m³)



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.5.9: Comparison of Quarter 3 PM_{2.5} Average Speciation Concentrations (µg/m³) 2021-2023 minus 2016-2018

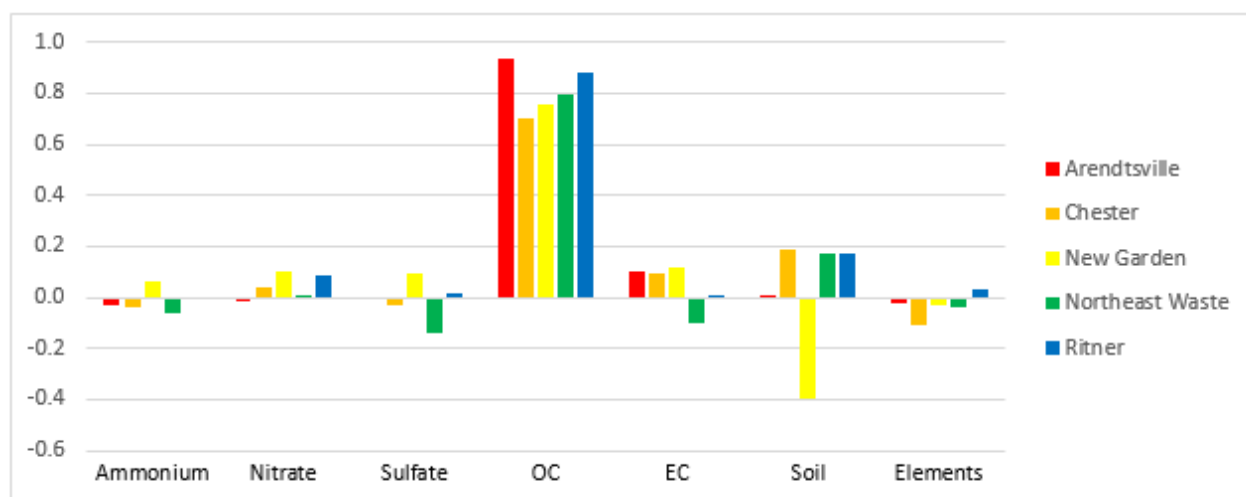


Figure C-2.5.10: 2016-2018 Quarter 4 PM_{2.5} Average Speciation Concentrations (µg/m³)

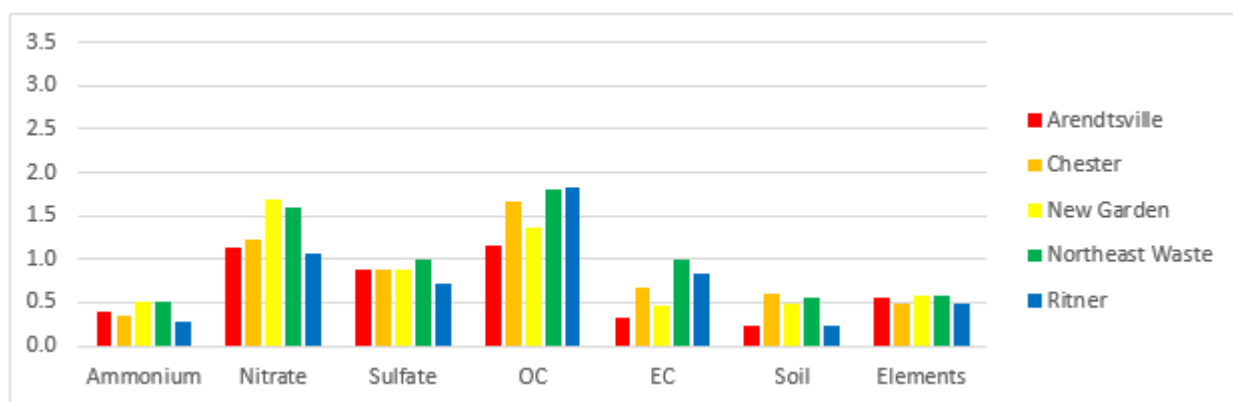


Figure C-2.5.11: 2021-2023 Quarter 4 PM_{2.5} Average Speciation Concentrations (µg/m³)

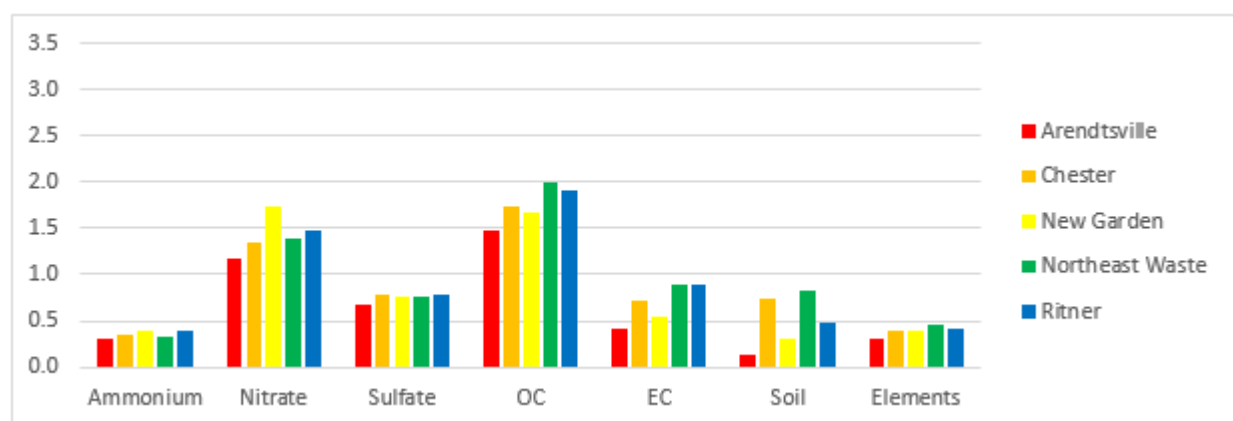
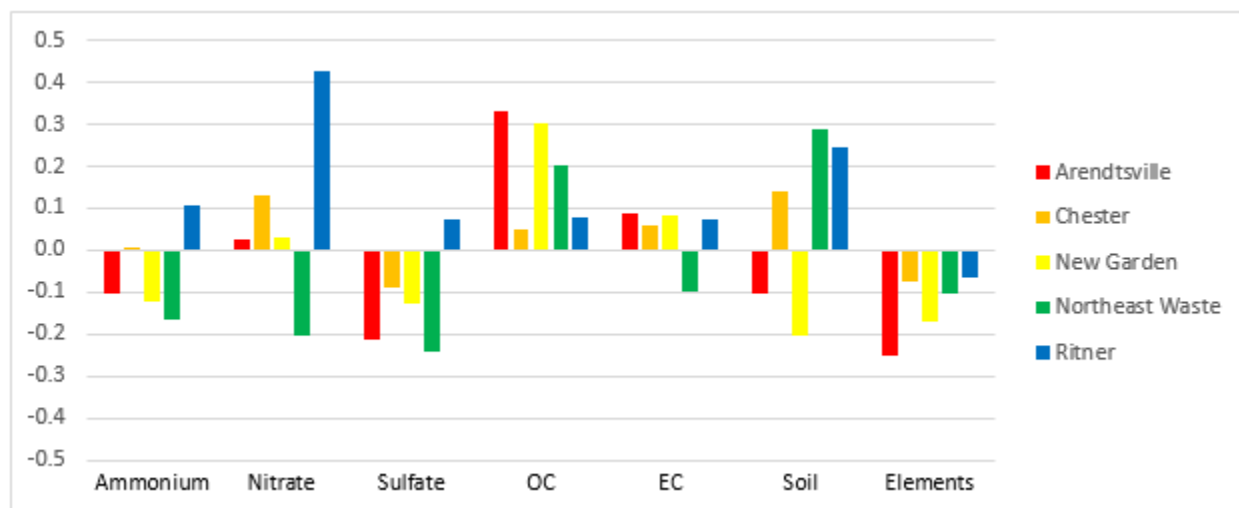


Figure C-2.5.12: Comparison of Quarter 4 PM_{2.5} Average Speciation Concentrations (µg/m³) 2021-2023 minus 2016-2018



During Quarter 1, there have been reductions in sulfate and trace elements across the sites with reductions in ammonium at Chester and New Garden, and reductions in OC and soil at Chester, Northeast Waste, and Ritner. During Quarter 2, there have been reductions in ammonium, nitrate, sulfate, and trace elements across the sites. During Quarter 3, there have been reductions in ammonium at Chester, Northeast Waste, and Ritner, reductions in sulfate at Chester and Northeast Waste, reductions in EC at Northeast Waste, reductions in soil at New Garden, and reductions in trace elements at Chester, New Garden and Northeast Waste. During Quarter 4, there have been reductions in sulfate (except at Ritner) and trace elements across the sites with reductions in ammonium at New Garden and Northeast Waste, reductions in nitrate and EC at Northeast Waste, and reductions in soil at New Garden.

The reductions at Arendtsville are more representative of the reductions observed in eastern Pennsylvania due to emission control strategies of various sources across western Pennsylvania into the Ohio Valley. The data indicates that there have been reductions at the Arendtsville monitor during Quarter 1 for sulfate and trace elements, during Quarter 2 for ammonium, nitrate, sulfate, and trace elements, Quarter 3 for ammonium, nitrate, sulfate, and trace elements, and Quarter 4 for ammonium, sulfate, soil, and trace elements.

Positive Matrix Factorization (PMF) receptor modeling can be applied to the PM_{2.5} speciation data collected from 2021-2023 to quantify the contribution of sources to the measured PM_{2.5} concentration. This analysis serves as supporting and underlying data for the attainment demonstration in the PM_{2.5} 2024 NAAQS State Implementation Plan (SIP) for the Pennsylvania nonattainment area. Understanding PM_{2.5} sources will help to develop effective emission reduction strategies.

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.6.1: PM_{2.5} Urban Excess, Northeast Waste vs. Arendtsville, 2021-23 by Quarter

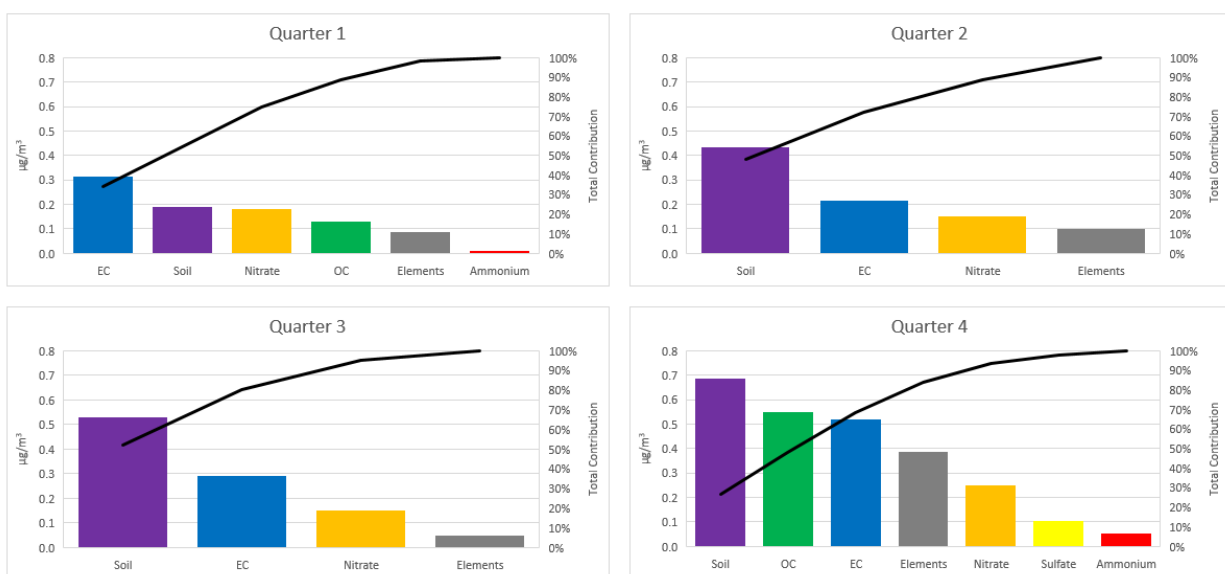
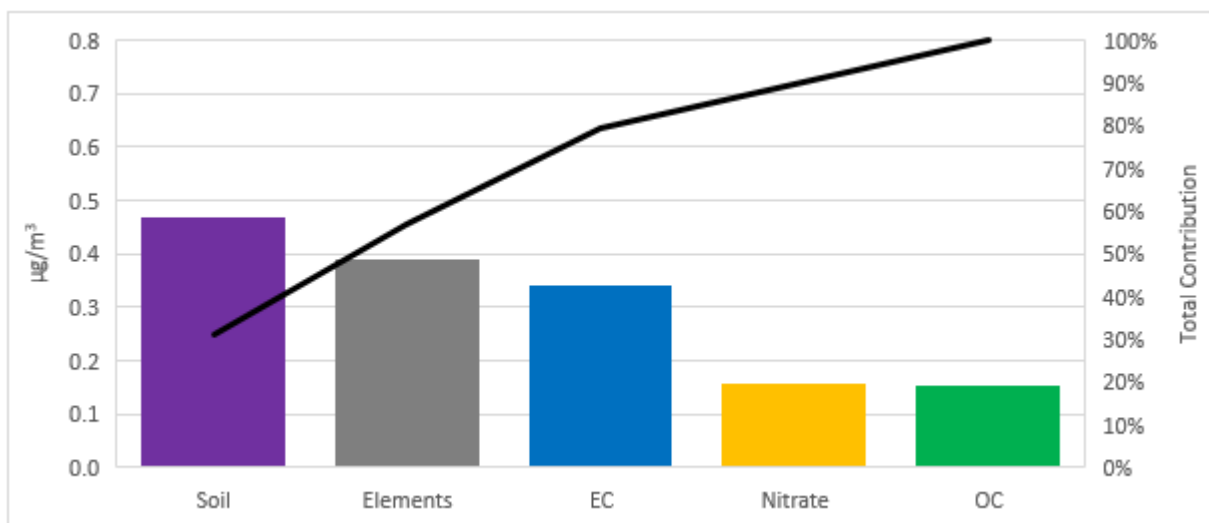


Figure C-2.6.2: PM_{2.5} Urban Excess, Northeast Waste vs. Arendtsville, 2021-23



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.6.3: PM_{2.5} Urban Excess, Ritner vs. Arendtsville, 2021-23 by Quarter

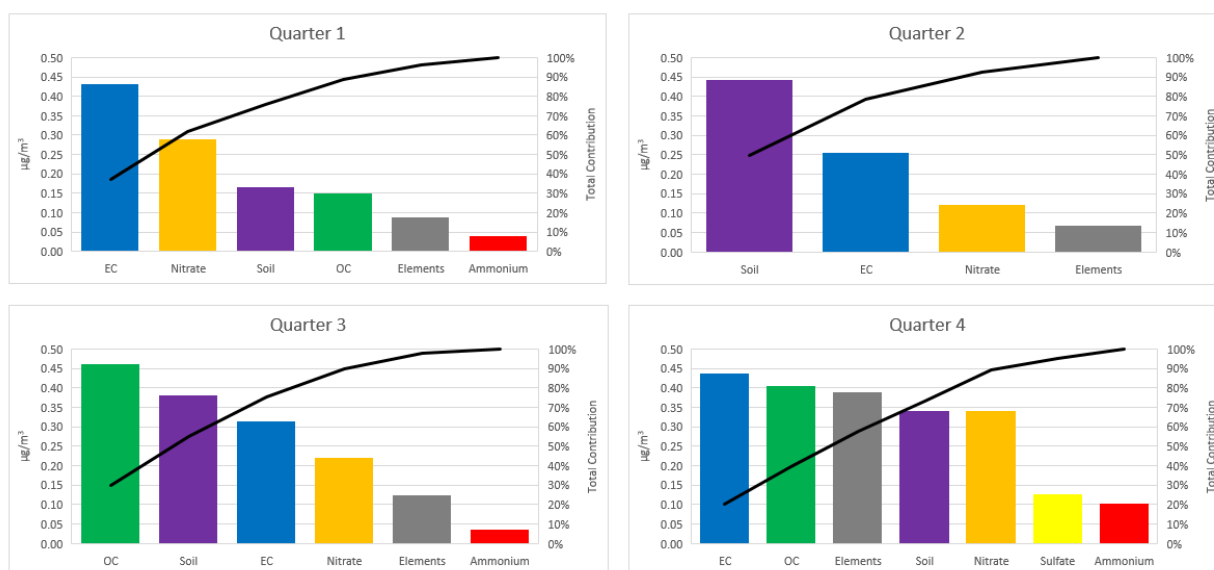
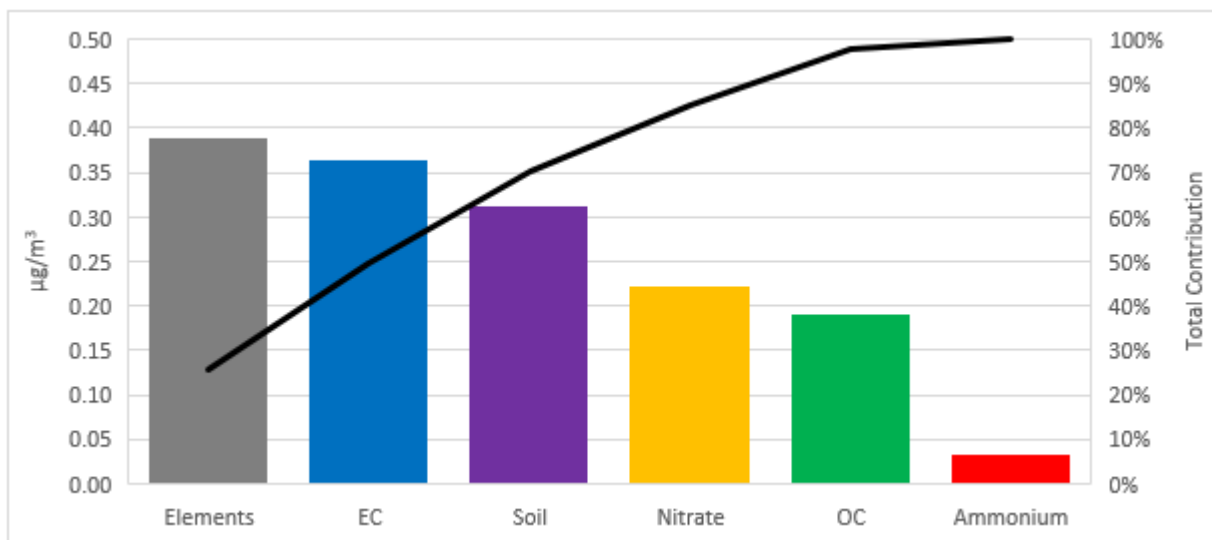


Figure C-2.6.4: PM_{2.5} Urban Excess, Ritner vs. Arendtsville, 2021-23



PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.6.5: PM_{2.5} Urban Excess, Chester vs. Arendtsville, 2021-23 by Quarter

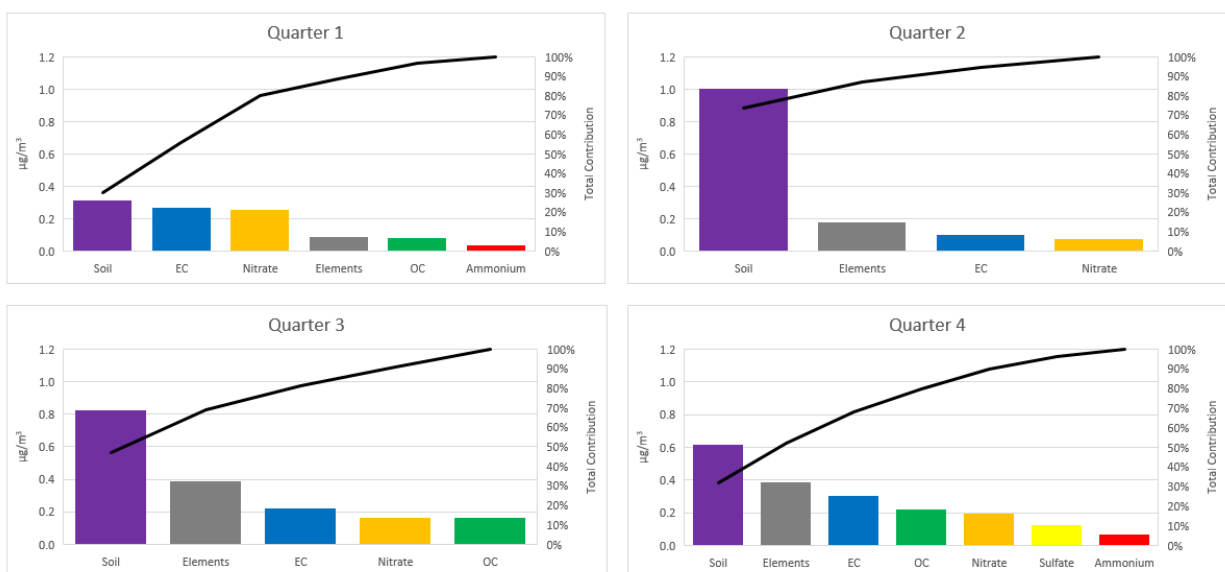


Figure C-2.6.6: PM_{2.5} Urban Excess, Chester vs. Arendtsville, 2021-23

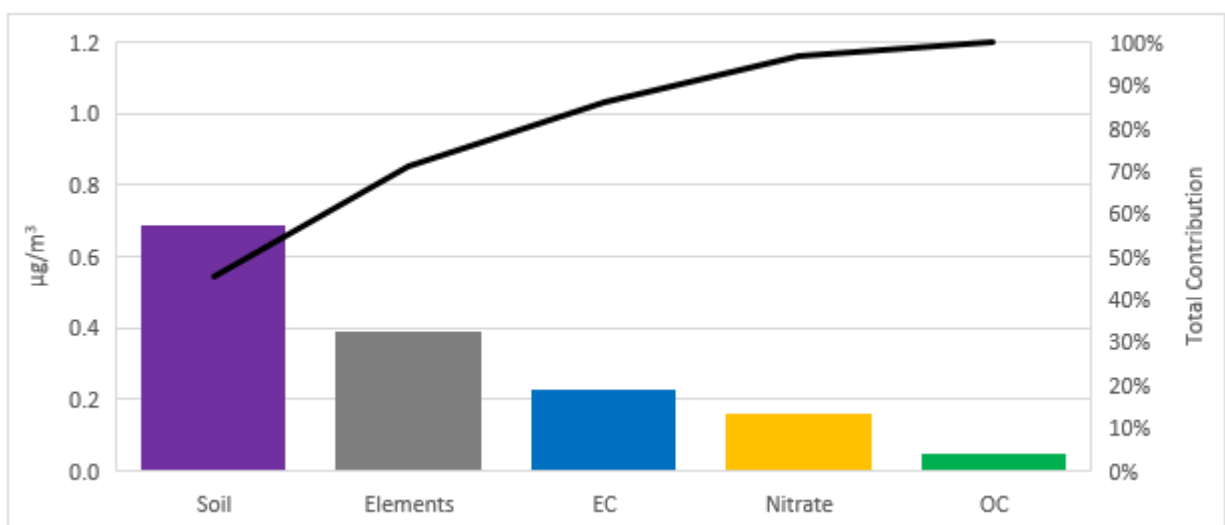


Figure C-2.6.7: PM_{2.5} Urban Excess, New Garden vs. Arendtsville, 2021-23 by Quarter

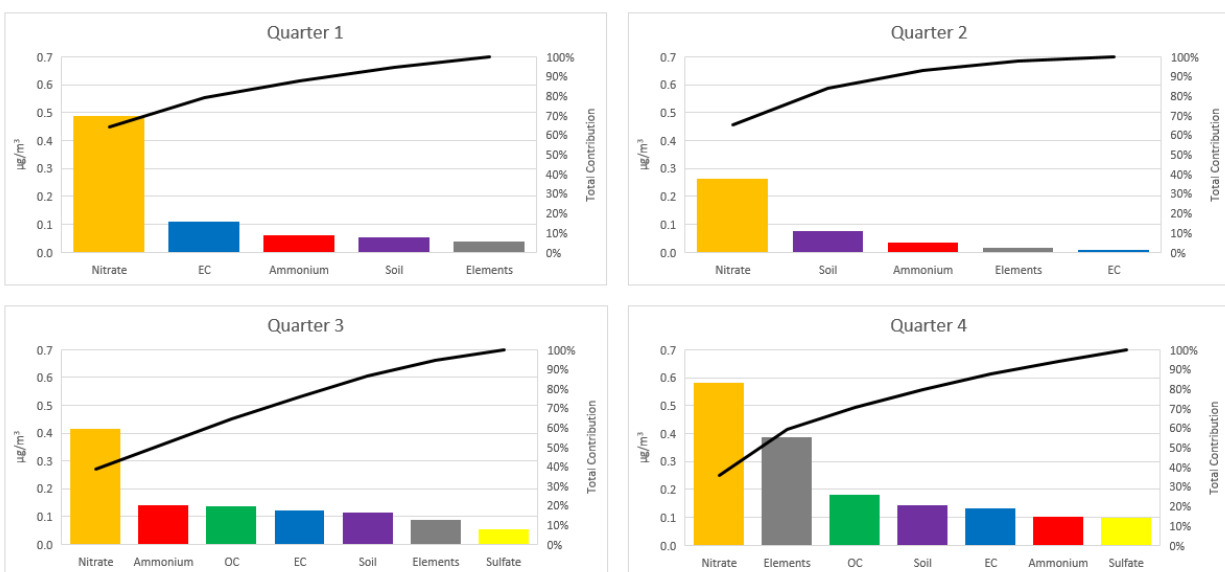
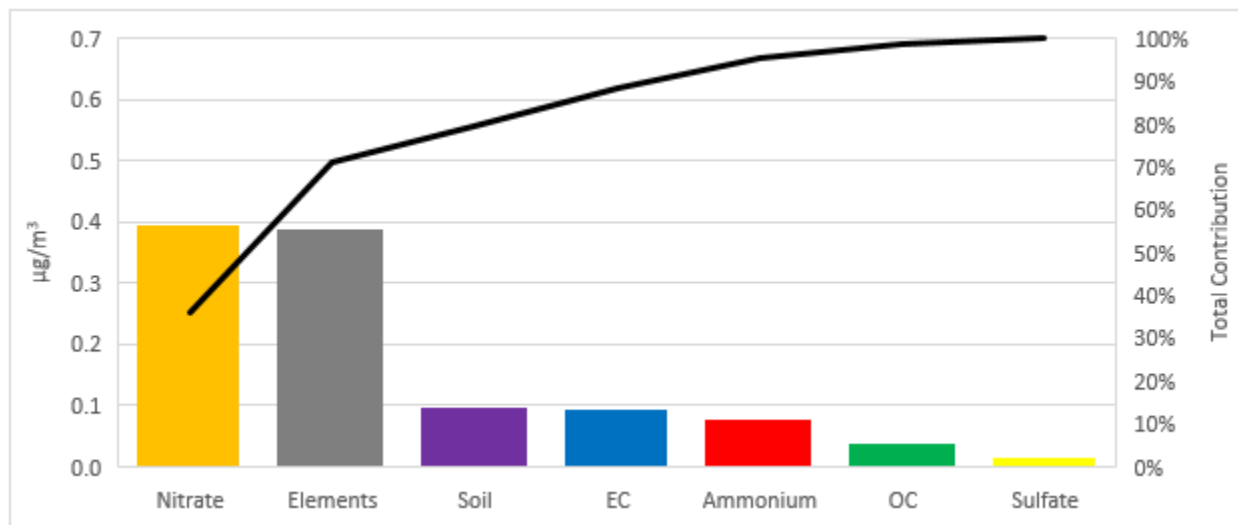


Figure C-2.6.8: PM_{2.5} Urban Excess, New Garden vs. Arendtsville, 2021-23



Figures C-2.6.1 - C-2.6.8 display the major constituents of PM_{2.5} at the Philadelphia MSA in Pennsylvania monitors compared to Arendtsville. In Quarters 1 and 4, Northeast Waste, Ritner, and Chester have excess ammonium, nitrate, OC, EC, soil, and trace elements compared to Arendtsville, suggesting emissions are local in nature. In Quarter 2, Northeast Waste, Ritner, and Chester have excess nitrate, EC, soil, and trace emissions compared to Arendtsville. In Quarter 3, Northeast Waste has excess nitrate, EC, soil, and trace elements emissions compared to Arendtsville, Ritner has excess ammonium, nitrate, OC, EC, soil, and trace elements emissions compared to Arendtsville, and Chester has excess nitrate, OC, EC, soil, and trace elements

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

compared to Arendtsville. Sulfate levels in all quarters, which are indicative of regional emissions from sources such as coal-fired electric generation units, were higher at Arendtsville.

Summary

PADEP's analysis illustrates the need for a three-county nonattainment area in southeastern Pennsylvania, consisting of Delaware, Montgomery, and Philadelphia Counties. An analysis of the PM_{2.5} data monitored at the Torresdale, Northeast Waste, and Ritner monitors in Philadelphia County illustrates that these monitors see greater concentrations in the 9-27 µg/m³ than the regional concentrations in the same range. Looking further, the largest sources along the I-95 corridor move from Philadelphia County into Delaware County. Delaware County has the highest NO_x and VOC precursor point source emissions and PM_{2.5} point source emission density followed by Philadelphia County. Most PM_{2.5}, SO₂ precursor, NO_x precursor, and VOC precursor point source emissions are in Philadelphia, Delaware, and Montgomery Counties, with substantially less emissions in Chester and Bucks Counties, with the greatest VOC precursor point source emission density in Delaware and Montgomery Counties. The greatest PM_{2.5}, SO₂ precursor and NO_x precursor area source emission density is in Philadelphia County, followed by Delaware and Montgomery Counties. The greatest VOC precursor area source emission density is in Philadelphia County, followed by Delaware County. Further examination demonstrates that the predominant winds travel directly over local point sources, northeast. An analysis of the speciated data at the Philadelphia MSA in Pennsylvania and Arendtsville monitors illustrates the excess major constituents of PM_{2.5} emissions to be local in nature, attributed to industrial influences, during worst-case meteorological or poor dispersion conditions. Therefore, PADEP is recommending Delaware, Montgomery, and Philadelphia Counties in the Philadelphia MSA in Pennsylvania be designated nonattainment for the 2024 annual PM_{2.5} NAAQS. A map of the proposed nonattainment area is provided in Figure C-2.7.

PADEP'S DESIGNATION RECOMMENDATIONS FOR THE 2024 PRIMARY ANNUAL FINE PARTICULATE MATTER (PM_{2.5}) NATIONAL AMBIENT AIR QUALITY STANDARD

Figure C-2.7: Recommended Greater Philadelphia PM_{2.5} Nonattainment Area

