pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Enclosure 1

The Commonwealth of Pennsylvania's Response to the U.S. Environmental Protection Agency's Proposed Designation of an Allegheny County Nonattainment Area for the 2012 Annual $PM_{2.5}$ National Ambient Air Quality Standard

Bureau of Air Quality
Department of Environmental Protection

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The U.S. Environmental Protection Agency (EPA) promulgated the annual fine particulate matter ($PM_{2.5}$) National Ambient Air Quality Standard (NAAQS) on December 14, 2012; the standard was lowered to 12.0 micrograms per cubic meter (78 FR 3086; January 15, 2013). The Commonwealth of Pennsylvania submitted its recommendations to EPA, in accordance with Section 107 of the Clean Air Act, 42 U.S.C.A. § 7407, on December 10, 2013, and updated the recommendation on July 30, 2014, based on 2011-2013 ambient air monitoring data.

In its August 19, 2014, letter to Governor Corbett, EPA noted that its intended designations concur with the DEP's recommendations for Delaware and Lebanon County nonattainment areas. According to the August 19th letter, EPA intends to modify Pennsylvania's recommended boundaries for the Cambria County (Johnstown), Liberty-Clairton (Allegheny County), and Northampton County (Allentown) areas. Specifically, EPA intends to modify Pennsylvania's designation recommendations by adding a portion of Indiana County to the Cambria County Area (referred to by EPA as the Johnstown Area), adding Lehigh County to the Northampton County Area (referred to by EPA as the Allentown Area), and expanding the Liberty-Clairton Area to include all, not just part, of Allegheny County. EPA also proposed to designate all other areas of the Commonwealth as unclassifiable/attainment areas.

In December 2013, Pennsylvania recommended a partial county Liberty-Clairton nonattainment area for the 2012 $PM_{2.5}$ NAAQS consistent with the existing boundaries promulgated by EPA for the 1997 and 2006 $PM_{2.5}$ NAAQS. The existing nonattainment boundaries for the Liberty-Clairton Area consist of the following municipalities in southeastern Allegheny County: the City of Clairton, Borough of Glassport, Liberty Borough, Borough of Lincoln and Port Vue Borough. EPA concluded that the Commonwealth's documentation support "a separate, distinctively local-source impacted, nonattainment area, within the Pittsburgh nonattainment area."[1]

In its August 19, 2014, letter to Governor Corbett, EPA proposed to expand the existing Liberty-Clairton nonattainment area to include all of Allegheny County for the 2012 annual $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS). However, an expansion of the boundaries of the existing Liberty-Clairton nonattainment areas for the 1997 and 2006 $PM_{2.5}$ NAAQS is unwarranted.

The Pennsylvania Department of Environmental Protection (DEP) has conducted a comprehensive evaluation of EPA's proposed designations for the 2012 annual $PM_{2.5}$ NAAQS. Based on a further review and analysis of available data by DEP and the Allegheny County Health Department (ACHD), Pennsylvania disagrees with EPA's enlargement of the proposed nonattainment area. The existing 1997 and 2006 $PM_{2.5}$ NAAQS nonattainment boundaries for the Liberty-Clairton area should be retained for the 2012 annual $PM_{2.5}$ standard.

The DEP worked in coordination with the ACHD to develop the supporting analysis in that justifies the partial county $PM_{2.5}$ nonattainment area for the Liberty-Clairton Area. DEP recommends that EPA designate five municipalities in southeastern Allegheny County, the City of Clairton, the City of McKeesport and the Boroughs of Glassport, Liberty, Lincoln and Port

[1] 2006 24-Hour $PM_{2.5}$ Standards – EPA response to Pennsylvania's recommendations. Addendum 2 - "EPA Technical Analysis for Liberty-Clairton Area".
http://www.epa.gov/airquality/particlepollution/designations/2006standards/rec/letters/03_PA_EPAMOD3.pdf

Vue as a partial county nonattainment area. The remainder of Allegheny County should be designated as an unclassifiable/attainment area. The information contained in this enclosure supplements the information DEP submitted to EPA on December 10, 2013, and July 30, 2014.

BACKGROUND AND OVERVIEW

On July 1, 1987, EPA revised the NAAQS for particulate matter, replacing total suspended particulates as the indicator for particulate matter with a new indicator called PM_{10}, or particles having a diameter less than or equal to 10 micrometers ($\mu g/m^3$).[2] The EPA divided the country into three categories, Groups I, II and III, based on their probability of violating the new NAAQS. On August 7, 1987, EPA classified Allegheny County as a Group II area.[3] Later, the ACHD recommended a smaller Group II area consisting of the City of Clairton, the City of McKeesport and the Boroughs of Glassport, Liberty, Lincoln and Port Vue. EPA clarified the area as the City of Clairton and Boroughs of Glassport, Liberty, Lincoln and Port Vue.[4] EPA later referred to the same area as the "Clairton & 4 Boroughs area" or the "Liberty-Clairton area." The City of McKeesport was not included in the Group II area for the 1987 PM_{10} NAAQS. Pursuant to Section 107(d)(4)(B) and 188(a) of the Clean Air Act, areas which had monitored violations of the PM_{10} NAAQS prior to January 1, 1989, were, by operation of law, upon enactment of the 1990 CAA amendments on November 15, 1990, designated nonattainment and classified as moderate for PM_{10}.

On July 18, 1997, EPA published annual and 24-hour primary and secondary standards for fine particulate matter ($PM_{2.5}$). In February 2004, DEP submitted a letter to EPA with area recommendations for the 1997 annual $PM_{2.5}$ NAAQS, which included the recommendation that all of Allegheny County be included as part of the Pittsburgh-Beaver Valley nonattainment area. In August 2004, after further analysis and the issuance of new EPA guidance, DEP submitted a revised recommendation that EPA designate two separate partial county nonattainment areas within Allegheny County: the Liberty-Clairton Area and a separate North Braddock Area. The Liberty-Clairton Area included the City of Clairton and the Boroughs of Glassport, Liberty, Lincoln, and Port Vue. The proposed North Braddock nonattainment area included Braddock Borough and North Braddock Borough. The separate area for Liberty-Clairton was justified by DEP as being necessary because it would take Liberty-Clairton Area longer to come into compliance than the rest of Allegheny County due to the localized influences of industry emissions, meteorology, and topography.

On January 5, 2005, EPA published a final rule that included the designation of the Liberty-Clairton Area as a separate partial county nonattainment area for the 1997 standard.[5] EPA also established a separate nonattainment area for the Pittsburgh-Beaver Valley Area including Beaver, Butler, Washington and Westmoreland Counties and portions of Armstrong, Green and Lawrence Counties. The recommended North Braddock area was also included within the larger Pittsburgh-Beaver Valley Area.

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[2] 52 *FR* 24,634; July 1, 1987
[3] 52 *FR* 29,383; August 7, 1987
[4] 55 *FR* 45,799; October 31, 1990
[5] 70 *FR* 944; January 5, 2005. Effective April 5, 2005.

On October 17, 2006, EPA lowered the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. On December 28, 2007, DEP submitted designation recommendations to EPA for the 2006 24-hour $PM_{2.5}$ NAAQS. These recommendations included a recommendation for the same partial county Liberty-Clairton nonattainment area for the 2006 $PM_{2.5}$ NAAQS. As supporting factors for a separate Liberty-Clairton nonattainment area, DEP specifically noted in that submittal:

> Annual and 24-hour PM2.5 design values are much higher, particularly at the Liberty monitor, than the surrounding areas. There are significant differences between the two monitors within the PM2.5 nonattainment area with the Liberty monitor being significantly over the annual standard and the Clairton monitor recently just meeting the annual standard… Twenty-four hour PM2.5 concentrations are also significantly different (~30 $\mu g/m^3$). This steep gradient between these two nearby monitors suggests a local source with enhancements from local topography is contributing to the nonattainment area's relatively high 24-hour and annual PM2.5 design values. A smaller nonattainment area is therefore justified.

EPA's technical support document (TSD) analysis for the 2006 24-hour $PM_{2.5}$ NAAQS for the Liberty-Clairton area notes on page 2 that,

> For the designations for the 1997 PM2.5 NAAQS, the Commonwealth of Pennsylvania provided extensive documentation to support a recommendation that a separate, distinctively local-source impacted, nonattainment area be designated within the Pittsburgh nonattainment area. The recommended Liberty-Clairton area was specified as the five municipalities which comprise the area in the vicinity of the Clairton Coke Works which were previously designated nonattainment for PM-10 standard as the "Clairton & 4 Boroughs area."
>
> The Clairton Coke Works is a large and complex facility that emits a combination of particulates, sulfur dioxide, ammonia, and hundreds of volatile organic chemicals. Although the coke plant has numerous existing emission controls, the combination of a large amount of low-level emissions in a narrow river valley creates a local air quality problem which is uniquely different from the remainder of the area.

On page 3 of the EPA TSD analysis, the agency stated that monitors in Allegheny County correlate well, except for the Liberty monitor. EPA indicated that concentrations of carbon at the Liberty monitor far exceed those at other monitors in the area.

On October 20, 2008, DEP submitted a response to EPA's proposed designations for the 2006 24-hour $PM_{2.5}$ NAAQS stating in part that,

> DEP has demonstrated in the past that fine particle levels at the Liberty monitor do not correlate well with the monitors in the surrounding nonattainment area [the Pittsburgh-Beaver Valley nonattainment area] due to local source influences. The Liberty-Clairton nonattainment area was created to allow DEP and the Allegheny County Health Department to address the local impacts that contribute to this area's nonattainment.

On November 13, 2009, EPA published a final rule designating the same Liberty-Clairton Area as a separate nonattainment area for the 2006 24-hour $PM_{2.5}$ NAAQS, with the remainder of Allegheny County again being included in the Pittsburgh-Beaver Valley Area (along with the Beaver, Butler, Washington and Westmoreland Counties and portions of Armstrong, Green and Lawrence Counties).[6]

On December 13, 2012, EPA promulgated a primary annual $PM_{2.5}$ NAAQS of 12.0 $\mu g/m^3$. On December 10, 2013, DEP recommended that the Liberty-Clairton Area be designated as nonattainment for the 2012 annual $PM_{2.5}$ NAAQS, based primarily on 2010-2012 air quality data. The DEP recommended that the remainder of Allegheny County, as well as Westmoreland County, establish boundaries for a Greater Pittsburgh nonattainment area, because this area contained three monitors that exceeded the new $PM_{2.5}$ standard of 12.0 $\mu g/m^3$. These monitors included Avalon and North Braddock in Allegheny County and Greensburg in Westmoreland County. The remainder of the former Pittsburgh-Beaver Valley Area (Beaver, Butler, Washington Counties and portions of Armstrong, Green and Lawrence Counties) was recommended as either attainment or unclassifiable/attainment areas because the monitors recorded $PM_{2.5}$ concentrations below the standard. DEP determined that these areas were not contributing to exceedances in a nonattainment area.

On July 30, 2014, DEP provided EPA with updated area recommendations for the 2012 $PM_{2.5}$ NAAQS following the review of 2011-2013 air quality data. The 2013 design values for monitors in Allegheny County (except for the Liberty-Clairton Area) and Westmoreland County are below 12.0 $\mu g/m^3$. Therefore, DEP recommended that EPA designate these areas attainment areas.

On August 19, 2014, EPA sent Governor Corbett a 120-day letter and technical support document indicating the intent to modify Pennsylvania's recommended area boundaries for the Liberty-Clairton Area, among others. EPA noted its intention to designate all of Allegheny County as the Allegheny County nonattainment area, expanding the existing partial county Liberty-Clairton nonattainment area to include the entire county.

For the 1997 annual and 2006 24-hour standards, the Liberty-Clairton area is a separate nonattainment area from the remainder of Allegheny County. As explained above, the remainder of Allegheny County is part of a separate Pittsburgh-Beaver Valley nonattainment area. EPA agreed with the DEP recommendation for separate partial county nonattainment areas because the Liberty monitor did not correlate well with the other monitors in the area. As expected, due to localized impacts and topography, the Liberty monitor is not attaining the 2006 or 2012 $PM_{2.5}$ standards – the other monitors in Allegheny County are attaining the 1997, 2006 and 2012 $PM_{2.5}$ standards. With the monitors in the Pittsburgh-Beaver Valley nonattainment area attaining the standards, including seven monitors in Allegheny County (the lone exception being the Liberty monitor), now is not the time for EPA to depart from its current designations for the Liberty-Clairton Area, which are "separate and distinct from the Pittsburgh-Beaver Valley $PM_{2.5}$ nonattainment area."

[6] 74 *FR* 58,688; November 13, 2009. Effective December 14, 2009.

1. AIR QUALITY DATA

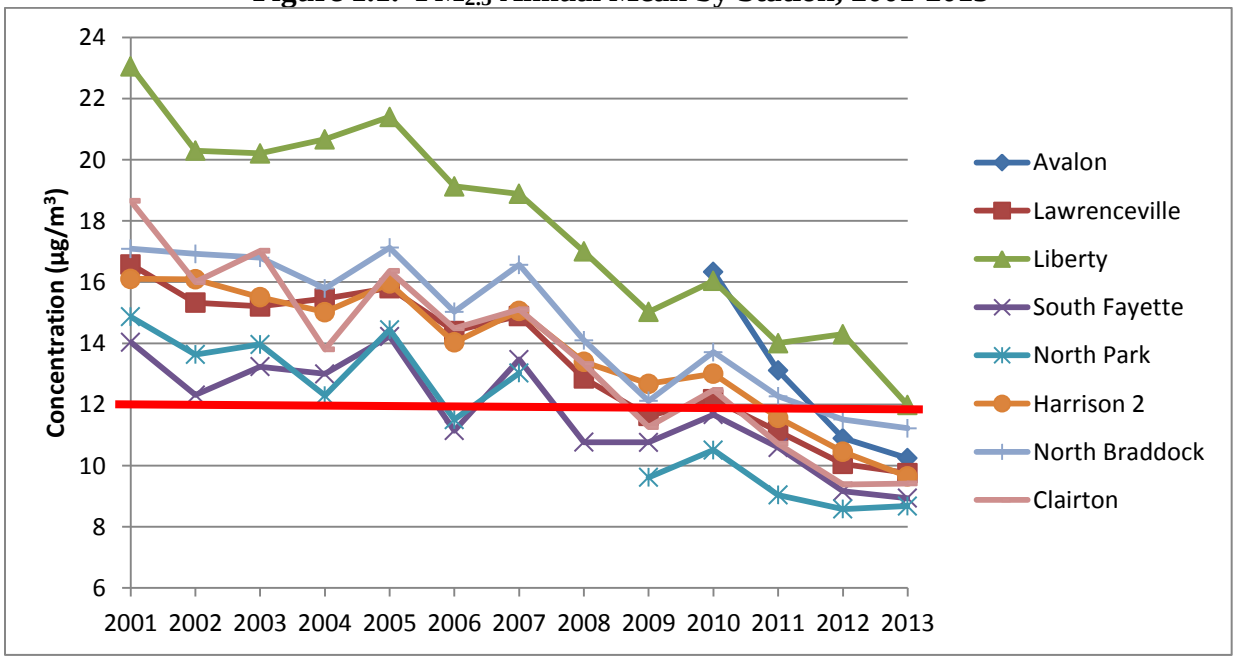
1.1. $PM_{2.5}$ Annual Mean and Design Value Data

Table 1.1 and Figure 1.1 of this analysis show the downward trend for annual $PM_{2.5}$ mean values monitored in Allegheny County, with the Liberty monitor constantly at a higher value than the rest of the monitors in the region. In 2012, the only monitor with an annual mean above 12.0 µg/m^3 was the Liberty monitor. It should be noted that 2013 was the first year that all monitors within Allegheny County, except the Liberty monitor were below the 2012 annual $PM_{2.5}$ NAAQS. This downward trend is expected to continue due to significant reductions in $PM_{2.5}$ and precursor emissions including sulfur dioxide emissions. The data represents Federal Reference Method (FRM) monitored results, except for Federal Equivalent Method (FEM) monitored data at Avalon over the timeframe January 2010-May 2011.

Table 1.1. $PM_{2.5}$ Annual Mean (in µg/m^3) by Station, 2010-2013

Station	AQS Code	2010	2011	2012	2013
Avalon	42-003-0002	16.34	13.11	10.89	10.24
Lawrenceville	42-003-0008	12.16	11.11	10.05	9.76
Liberty	**42-003-0064**	**16.04**	**14.00**	**14.29**	**11.98**
South Fayette	42-003-0067	11.67	10.59	9.16	8.93
North Park	42-003-0093	10.51	9.04	8.58	8.68
Harrison 2	42-003-1008	13.01	11.57	10.45	9.65
North Braddock	42-003-1301	13.71	12.27	11.51	11.22
Clairton	42-003-3007	12.47	10.72	9.39	9.41

Figure 1.1. $PM_{2.5}$ Annual Mean by Station, 2001-2013



*Please note: The Avalon monitor was deployed in 2010; North Park monitor did not run in 2008.

Table 1.2 and Figure 1.2 show the downward trend for annual $PM_{2.5}$ design values monitored in Allegheny County, with the Liberty monitor consistently at a higher value than the rest of the monitors in the area. Only two monitoring sites, in addition to Liberty, were above 12.0 µg/m³ based on 2010-2012 data. In 2013, the only monitor with an annual $PM_{2.5}$ design value (DV) above 12.0 µg/m^3 was the Liberty monitor. Several sites have shown consecutive years of attainment of the 2012 annual $PM_{2.5}$ NAAQS (discussed further in Section 1.2).

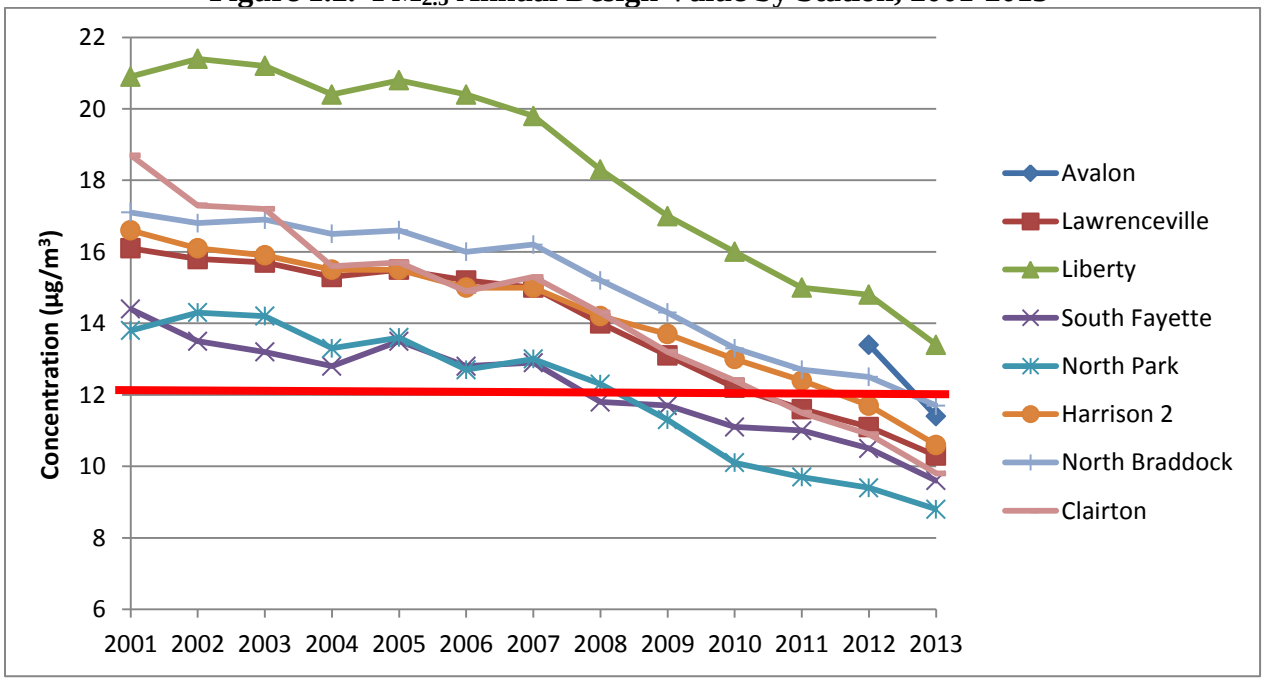
As the EPA TSD analysis points out,

> The $PM_{2.5}$ DVs at seven of the eight monitors correlate well. However, the $PM_{2.5}$ DV at the Liberty monitor is considerably higher. The large local sources plus the unique topographical features in this location result in substantially higher $PM_{2.5}$ monitored values at the Liberty monitor than the other monitors in Allegheny County.

Table 1.2. $PM_{2.5}$ Annual Design Value (in µg/m^3) by Station, 2010-2013

Station	AQS Code	2010	2011	2012	2013
Avalon	42-003-0002	N/A	N/A	13.4	11.4
Lawrenceville	42-003-0008	12.2	11.6	11.1	10.3
Liberty	**42-003-0064**	**16.0**	**15.0**	**14.8**	**13.4**
South Fayette	42-003-0067	11.1	11.0	10.5	9.6
North Park	42-003-0093	10.1	9.7	9.4	8.8
Harrison 2	42-003-1008	13.0	12.4	11.7	10.6
North Braddock	42-003-1301	13.3	12.7	12.5	11.7
Clairton	42-003-3007	12.4	11.5	10.9	9.8

Figure 1.2. $PM_{2.5}$ Annual Design Value by Station, 2001-2013



*Please note: The Avalon monitor was deployed in 2010; North Park monitor did not run in 2008.

It is likely that the Liberty-Clairton Area could come into attainment in the near future, particularly since the higher annual $PM_{2.5}$ mean values of 14.00 µg/m^3 in 2011 and 14.29 µg/m^3 in 2012 will drop off of the 2015 design value calculation (the 2015 DV will be the 3- year average of the 2013, 2014 and 2015 annual mean). For the first time, in 2013, the Liberty-Clairton annual mean value was below the 2012 standard of 12.0 µg/m^3, with a value of 11.98 µg/m^3.

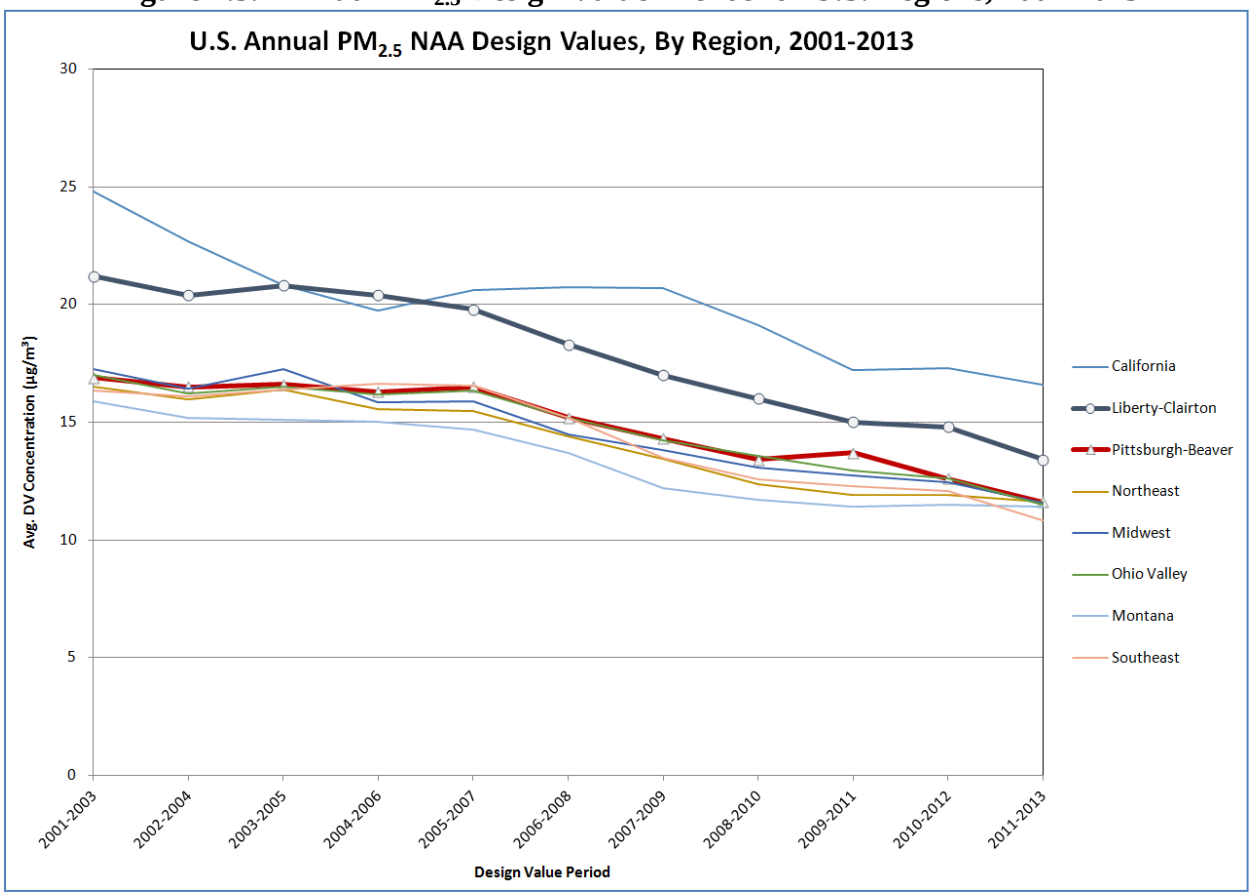
Table 1.3 provides quarterly $PM_{2.5}$ emissions for Allegheny County in 2014 through the second quarter. Again, the data shows that the Liberty monitor is consistently higher than the rest of the monitors in Allegheny County. This data should be viewed with caution, as one or two quarterly averages above 12.0 µg/m^3 does not equate to a violation of the standard. This information is only being provided to show the most recent monitoring data trends and to point out that the Liberty monitor is consistently monitoring $PM_{2.5}$ concentrations above all other monitors in Allegheny County.

Table 1.3. Allegheny County $PM_{2.5}$ Monitoring Station Data
2014 Quarterly Averages to Date

Station	AQS Code	1st Quarter Average (µg/m^3)	2nd Quarter Average (µg/m^3)
Avalon	42-003-0002	11.97	10.17
Lawrenceville	42-003-0008	11.03	9.93
Liberty	42-003-0064	14.73	12.50
South Fayette	42-003-0067	8.91	8.71
North Park	42-003-0093	8.91	8.75
Harrison 2	42-003-1008	10.17	10.25
North Braddock	42-003-1301	12.46	11.88
Clairton	42-003-3007	12.29	9.51

The Liberty monitor, in fact, shows noticeably higher $PM_{2.5}$ concentrations than most of the design value monitors throughout the U.S. Figure 1.3 is a chart of annual $PM_{2.5}$ design values for 2001-2013, averaged by region, comparing $PM_{2.5}$ design values for Liberty-Clairton to other previously designated nonattainment areas.

Figure 1.3. Annual $PM_{2.5}$ Design Value Trends for U.S. Regions, 2001-2013



Data taken from http://www.epa.gov/airtrends/pdfs/PM25_DesignValues_20112013_FINAL_08_28_14.xlsx

Region	States Included in Areas	Region	States Included in Areas
California	CA	***Midwest***	OH,IL,IN,MI
Liberty-Clairton	PA	***Ohio Valley***	IN,KY,MO,OH,WV
Pittsburgh-Beaver	PA	***Montana***	MT
Northeast	CT,DE,MD,NY,NJ,PA	***Southeast***	AL,GA,NC

The Liberty-Clairton Area (driven by data from the Liberty monitor) shows historical and current $PM_{2.5}$ design values that are above the rest of the country, with the exception of California; all other areas show similar design values, including the Pittsburgh-Beaver Valley area.

1.2. $PM_{2.5}$ Monitor Network by Site

While $PM_{2.5}$ concentrations at each site are used for comparison to the 2012 $PM_{2.5}$ NAAQS, the individual site details should also be considered in making area designations. Details include factors such as monitor type, measurement scale, and dominant source(s) for each monitor. All

monitors are sited according to EPA criteria and located in residential communities for the objective of population exposure.

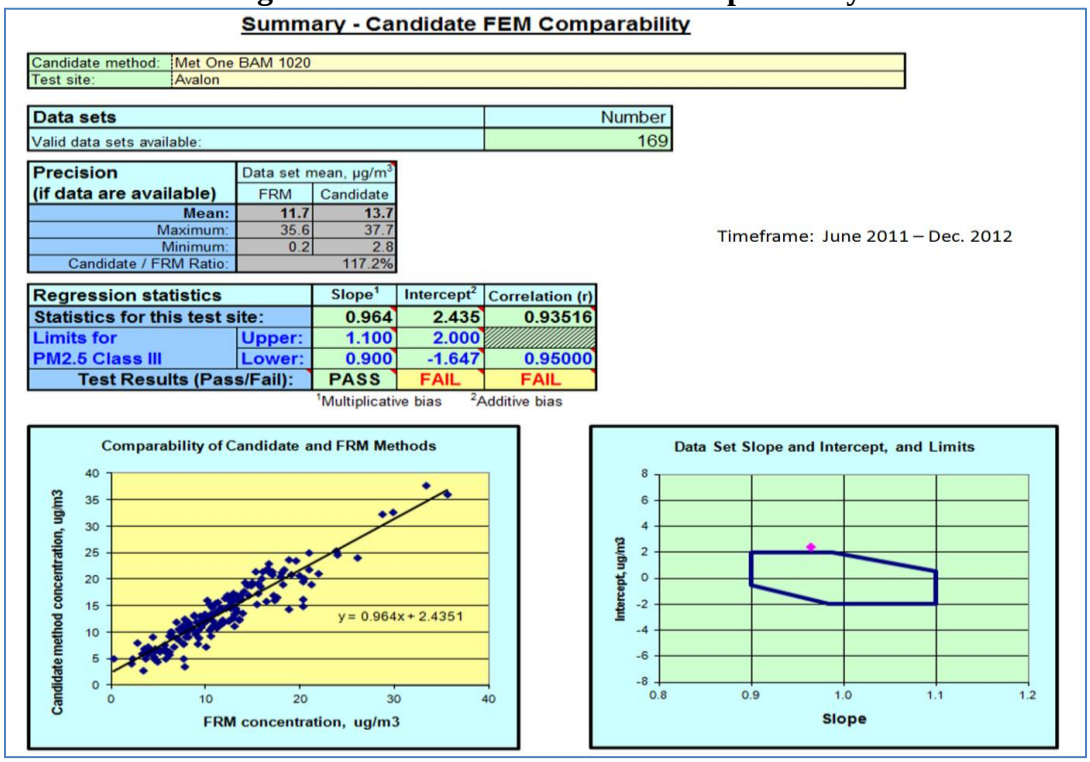
Avalon $PM_{2.5}$ Monitor (42-003-0002):

The Avalon $PM_{2.5}$ monitor is located in a developed medium-intensity (by National Land Cover Database (NLCD) 2006 classification) suburb, downwind of the Neville Island industrial area, 8.7 kilometers (km) to the northwest of downtown Pittsburgh. This monitor can be affected on a neighborhood scale (0.5-4.0 km) by industrial emissions from the DTE Energy Shenango plant, which is currently under a consent agreement with ACHD for emissions violations.

The Avalon $PM_{2.5}$ monitor was one of two monitors other than Liberty that exceeded the 2012 annual $PM_{2.5}$ NAAQS based on 2010-2012 data. However, data for 2010 through May 2011 are biased by beta-attenuation monitor (BAM) data that was submitted prior to installation of the FRM monitor in June 2011. Although the BAM monitor is an equivalent method, concurrent BAM and FRM comparisons after June 2011 were found to be non-equivalent.

The FEM comparability results for the Avalon BAM, matched to FRM data from June 2011-December 2012, are shown in Figure 1.3.

Figure 1.3. Avalon BAM/FRM Comparability



As a result, only the FRM data has been submitted since June 2011. While the BAM data is official data for January 2010-May 2011 with no collocated FRM for comparison, the Avalon BAM likely represents non-equivalent data to the FRM. DEP contends that the 2011-2013

design value is the most appropriate design value for comparison to the 2012 annual $PM_{2.5}$ NAAQS compared to previous 3-year periods.

North Braddock $PM_{2.5}$ Monitor (42-003-1301):

The North Braddock $PM_{2.5}$ Monitor is located in a developed medium-intensity suburb, 12.5 km to the east-southeast of downtown Pittsburgh, near the U.S. Steel Edgar Thomson Plant. This monitor can be affected on a neighborhood scale by industrial emissions from Edgar Thomson, and North Braddock was one of the two monitors aside from Liberty that exceeded the 2012 annual $PM_{2.5}$ NAAQS based on 2010-2012 data. U.S. Steel is currently under a Consent Order and Agreement with ACHD for emissions violations, which has contributed to a lower 2012 $PM_{2.5}$ design value at North Braddock below 12.0 $\mu g/m^3$, based on 2011-2013 data.

Harrison $PM_{2.5}$ Monitor (42-003-1008):

The Harrison $PM_{2.5}$ Monitor is located in a developed medium-intensity suburb, 30.1 km to the northeast of downtown Pittsburgh, and may have been affected previously by the nearby Allegheny Ludlum facility on a neighborhood scale. Allegheny Ludlum performed major modifications to reduce emissions from the facility. Based on 2013 design values, the Harrison monitor shows attainment of $PM_{2.5}$ NAAQS including the 2012 $PM_{2.5}$ annual standard.

Clairton $PM_{2.5}$ Monitor (42-003-3007):

The Clairton $PM_{2.5}$ Monitor is located in a developed medium-intensity suburb, 18.8 km to the south-southeast of downtown Pittsburgh. This monitor is located within the Liberty-Clairton area, adjacent to the U. S. Steel Clairton Plant on a neighborhood scale. This site lies upwind of the Clairton Plant, however, and is not affected by nearby emissions in the same manner as Liberty. Based on 2011-2013 data, the current design value for the Clairton monitor is 9.8 $\mu g/m^3$ – substantially lower than the 2012 $PM_{2.5}$ NAAQS. Large differences between Clairton and Liberty (only 3.5 km away) on concurrent sample days indicate the extremely localized nature of $PM_{2.5}$ at the Liberty monitor.

South Fayette $PM_{2.5}$ Monitor (42-003-0067):

The South Fayette $PM_{2.5}$ monitor is located in a developed low-intensity suburb, 16.1 km to the southwest of downtown Pittsburgh. South Fayette is a high-elevation site, considered to be representative of regional-scale background concentrations. This monitor has attained the 2012 annual $PM_{2.5}$ NAAQS. The monitor also meets the 1997 and 2006 standards.

North Park $PM_{2.5}$ Monitor (42-003-0093):

The North Park $PM_{2.5}$ monitor is located in a developed low-intensity suburb, 18.5 km to the north of downtown Pittsburgh. The $PM_{2.5}$ concentrations for North Park are representative of northern suburb concentrations on a neighborhood scale, mostly from area and mobile source emissions. Based on a 2011-2013 design value of 8.8 $\mu g/m^3$, this monitor has attained the 2012 annual $PM_{2.5}$ NAAQS.

Lawrenceville $PM_{2.5}$ Monitor (42-003-0008):

The Lawrenceville $PM_{2.5}$ monitor is located in a developed high-intensity district of the City of Pittsburgh, the only $PM_{2.5}$ site within the city limits, 4.2 km from downtown Pittsburgh. It has been classified by EPA as an urban National Core (NCore) Monitoring site, with multiple pollutant monitors. It is the best representative monitor of urbanized emissions in Pittsburgh from mobile, area, and light industrial sources on an urban scale (4-50 km). Based on 2011-2013 data, Lawrenceville is monitoring attainment (of 10.3 µg/m) of the 2012 annual $PM_{2.5}$ NAAQS.

Liberty $PM_{2.5}$ Monitor (42-003-0064):

The Liberty $PM_{2.5}$ monitor is located in a developed low-intensity suburb, 17.1 km to the south-southeast of downtown Pittsburgh. It is the driving design monitor within the Liberty-Clairton area, immediately downwind of the Clairton Coke Works Plant.

Concentrations are strongly affected by temperature inversions and complex river valley terrain, and $PM_{2.5}$ concentrations for the Liberty can differ greatly from any other monitor in the county on concurrent sample dates. As seen in Table 1.4, the Liberty monitor shows the highest standard deviation in concentrations of the monitor network due to these higher values.

Table 1.4. $PM_{2.5}$ Concentration Averages and Standard Deviations

Site	Average Concentration 2011-2013	Standard Deviation 2011-2013
Liberty	13.4	8.6
North Braddock	11.6	6.5
Avalon	11.1	5.7
Harrison	10.5	5.4
Lawrenceville	10.3	5.1
South Fayette	9.6	5.1
Clairton	9.8	4.7
North Park	8.8	4.6

The Liberty monitor is essentially a statistical outlier for $PM_{2.5}$ compared to the rest of the monitoring network.

1.3. $PM_{2.5}$ Monitor Network Assessment

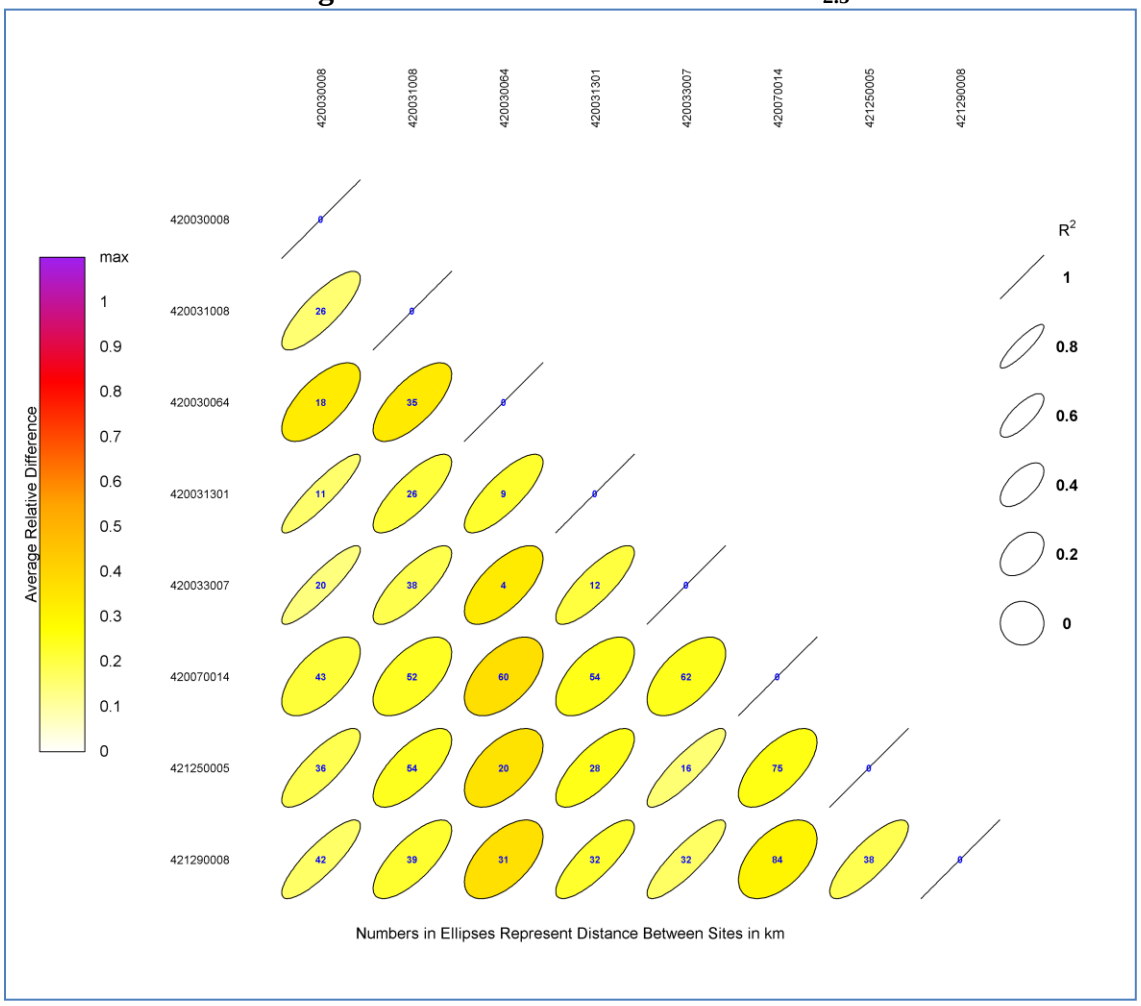
As required by amended 40 CFR Part 58, a Monitor Network Assessment was completed for the Allegheny County $PM_{2.5}$ network in July 2010. Although this assessment is now somewhat outdated, with the next assessment due July 2015, analyses provided in the assessment may still be relevant for the network. (Note that, at this time, the PC-based EPA network assessment tools cannot be updated by the user with more recent data.)

Correlation Matrix:

Correlation matrices were utilized in the network assessment to examine consistency and correlation of monitors with the network. Figure 1.5 shows the correlation matrix for $PM_{2.5}$ FRM monitors based on 2006-2008 averages.

$PM_{2.5}$ monitors from Beaver, Washington, and Westmoreland Counties (420070014, 421250005, 421290008) were included to examine consistency throughout the Pittsburgh MSA. (Note: North Park and South Fayette were excluded from the EPA correlation matrix tool due to low data recovery in one or more calendar quarters.)

Figure 1.5. Correlation Matrix for $PM_{2.5}$



The 2006-2008 matrices showed that the Lawrenceville $PM_{2.5}$ monitor had the best overall correlation and lowest relative difference compared to other southwestern Pennsylvania (SWPA) monitors, indicating consistency and representativeness within the network. The Liberty monitor shows the lowest correlation and highest relative difference to the rest of the network, indicating

inconsistency with the network and supporting the appropriateness of a separate Liberty-Clairton nonattainment area.

Network Rankings:

Rankings values were compiled for the network assessment based on design values, site objectives, population densities, and other factors.

Rankings from the 2010 Network Assessment are shown in Table 1.5.

Table 1.5. $PM_{2.5}$ FRM Rankings

PM2.5 (FRM) Ranking Values by Criteria

Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 24-Hour Average ($\mu g/m^3$)	2006-2008 Design Value Annual Average ($\mu g/m^3$)	Site Objective	Population (people/mi^2)	Closest Site (km)
Liberty	2	11	54	18.3	Population Exposure	1857	4
Lawrenceville	4	10	35	15.0	Population Exposure	4117	11
South Fayette	3	11	32	12.9	Population Exposure	1179	12
Harrison	2	11	37	15.0	Population Exposure	724	25
North Braddock	1	11	39	15.2	Population Exposure	2622	9
Clairton	1	9	35	15.3	Population Exposure	1424	4
North Park	0	10	35	12.3	Population Exposure	929	17

PM2.5 (FRM) Score and Rank

Site	Number of Other Pollutants at Site	Number of Years in Operation	2006-2008 Design Value 24-Hour Average	2006-2008 Design Value Annual Average	Site Objective	Population	Closest Site	Score	Rank
Liberty	2	0.50	5.4	4.58	1	0.25	0.00	13.7	**1**
Lawrenceville	3	0.25	3.5	3.75	1	1.00	0.50	13.0	**2**
South Fayette	3	0.50	3.2	3.23	1	0.25	0.50	11.7	**3**
Harrison	2	0.50	3.7	3.75	1	0.00	1.00	11.0	**4**
North Braddock	1	0.50	3.9	3.80	1	0.50	0.25	11.0	**4**
Clairton	1	0.25	3.5	3.83	1	0.25	0.00	9.8	**6**
North Park	0	0.25	3.5	3.08	1	0.00	0.75	7.6	**7**

Based on 2006-2008 factors, many of which are the same for 2011-2013 data, the Liberty $PM_{2.5}$ monitor showed the highest rank for Allegheny County, mostly due to the highest design value. The Lawrenceville monitor was second in rank based on its importance to the network, including representativeness of the urban Pittsburgh area based on population density.

1.4. Multi-Pollutant Comparisons

$PM_{2.5}$ shows a source-based relationship to SO_2 at the Liberty monitor which is not seen at the Lawrenceville monitor. Elevated levels of $PM_{2.5}$ often accompany SO_2 exceedances at Liberty during poor dispersion conditions. Additionally, $PM_{2.5}$ and SO_2 exhibit different hourly behavior at Liberty compared to other sites.

Figures 1.6 and 1.7 are scatter plots for the Liberty and Lawrenceville monitors, SO_2 vs. $PM_{2.5}$, daily maximum 1-hour values, for 2011-2013. Hourly data for $PM_{2.5}$ is measured by tapered element oscillating microbalance (TEOM) $PM_{2.5}$ monitors at both Liberty and Lawrenceville.

Figure 1.6. SO_2 vs. $PM_{2.5}$ TEOM Daily Maximums, Liberty, 2011-2013

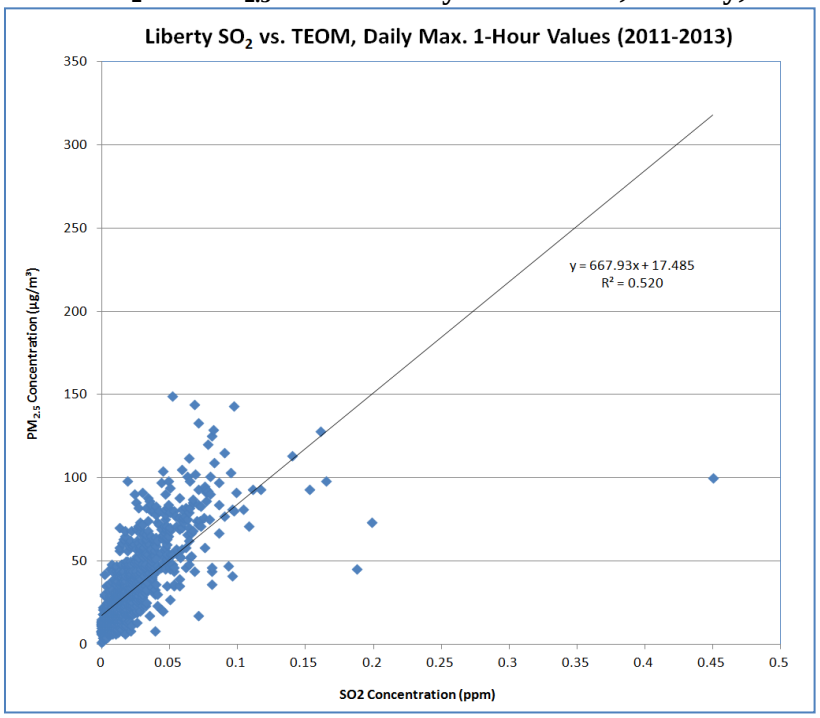
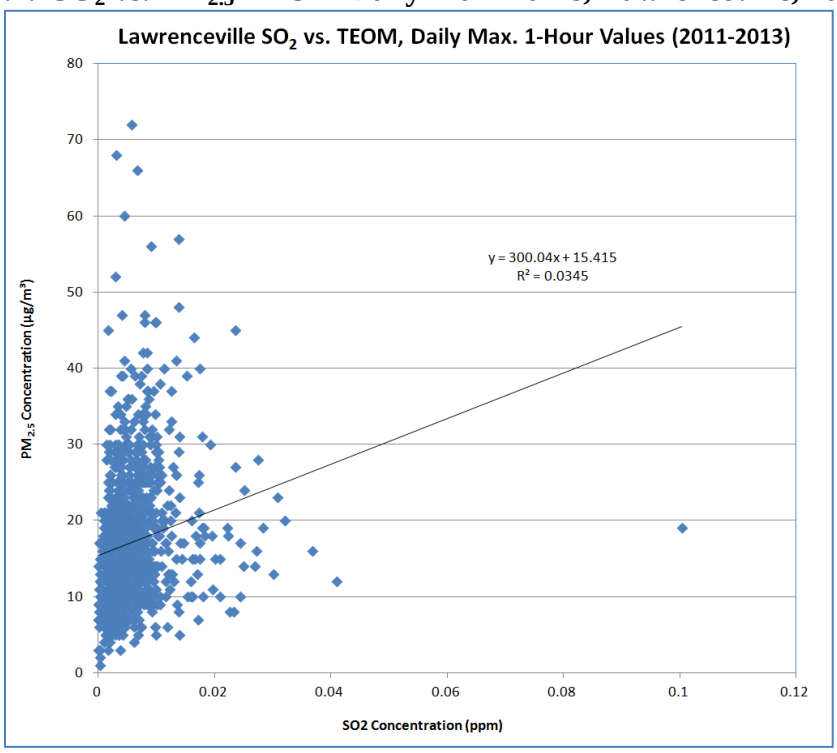


Figure 1.7. SO_2 vs. $PM_{2.5}$ TEOM Daily Maximums, Lawrenceville, 2011-2013



It should be noted that 'r' is the correlation coefficient, and 'r^2' is the coefficient of determination. The correlation coefficient between two variables is measured by the strength and direction of a linear relationship. The coefficient of determination is indicative of how well the regression line represents the data. If the regression line would pass through each data point on a scatter plot, then this would explain all of the variation. The further away the line is from each of the points, the less that it is able to be explained.[7]

The Liberty monitoring site shows a "high positive correlation," where r=0.72 (r2=0.52 in Figure 1.6) for SO_2 and $PM_{2.5}$, while samplers at the Lawrenceville monitoring site show a "negligible correlation" of r=0.19 (r2=0.0345 in Figure 1.7) between the two pollutants. At the Liberty monitoring site, for every increase in SO_2 concentration, there is an increase in $PM_{2.5}$ by 667.93 times the value of SO_2 plus 17.485 µg/m^3.[8]

Of the 37 exceedances of the SO_2 daily maximum 2010 1-hour NAAQS at Liberty during 2011-2013, over 80% occurred when the FRM 24-hour value was above 20 µg/m^3, as shown below in Table 1-6.

[7] http://mathbits.com/MathBits/TISection/Statistics2/correlation.htm
[8] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3576830/table/T1/

Table 1.6. FRM Ranges and SO_2 Exceedances

FRM Range	Number of SO_2 Exceedance Days
> 40 µg/m³	9
30-40 µg/m³	13
20-30 µg/m³	8
10-20 µg/m³	7

Figures 1.8 and 1.9 are hourly average charts for SO_2 sites and continuous $PM_{2.5}$ sites in Allegheny County.

Figure 1.8. Hourly Average SO_2, Allegheny County Sites, 2011-2013

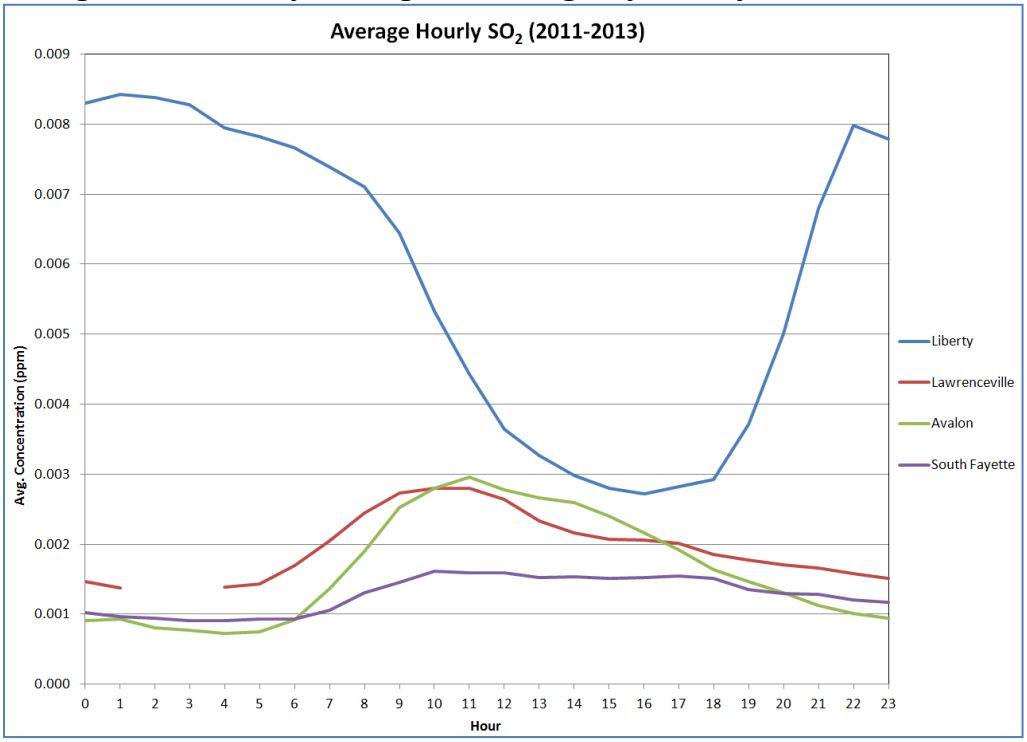
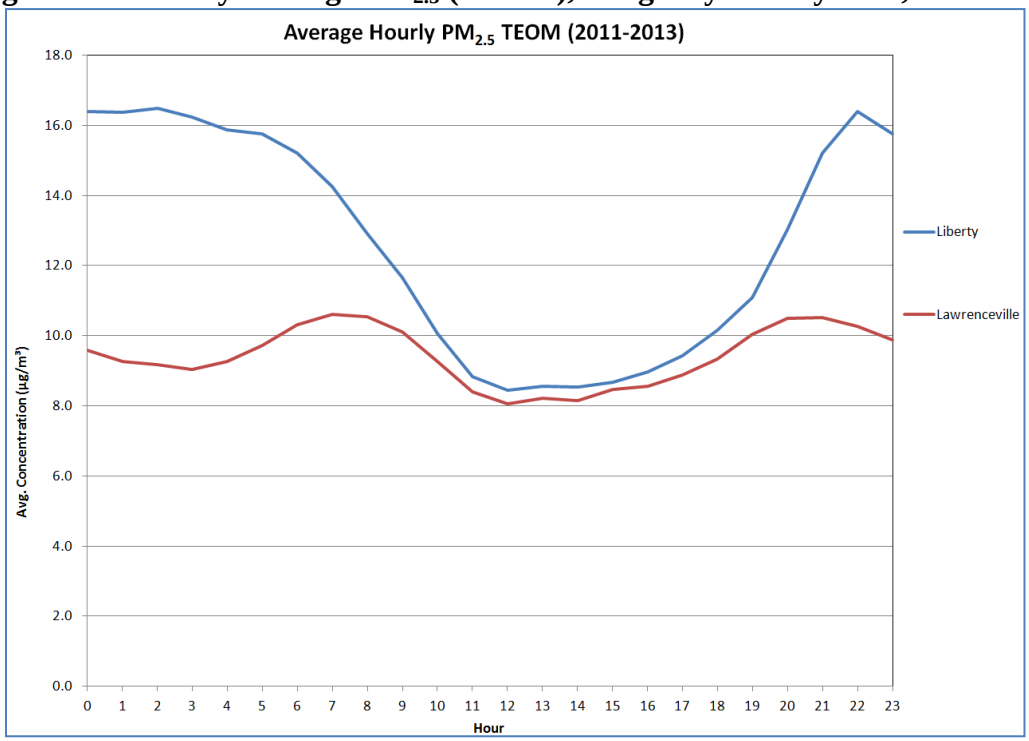


Figure 1.9. Hourly Average $PM_{2.5}$ (TEOM), Allegheny County Sites, 2011-2013



The Liberty monitoring site shows nearly identical diurnal behavior on an hourly basis, with elevated levels occurring at night for both SO_2 and $PM_{2.5}$. This diurnal trend is unique to Liberty, as the other sites show peaks only during rush hour or daytime conditions.

1.5. Speciation Data

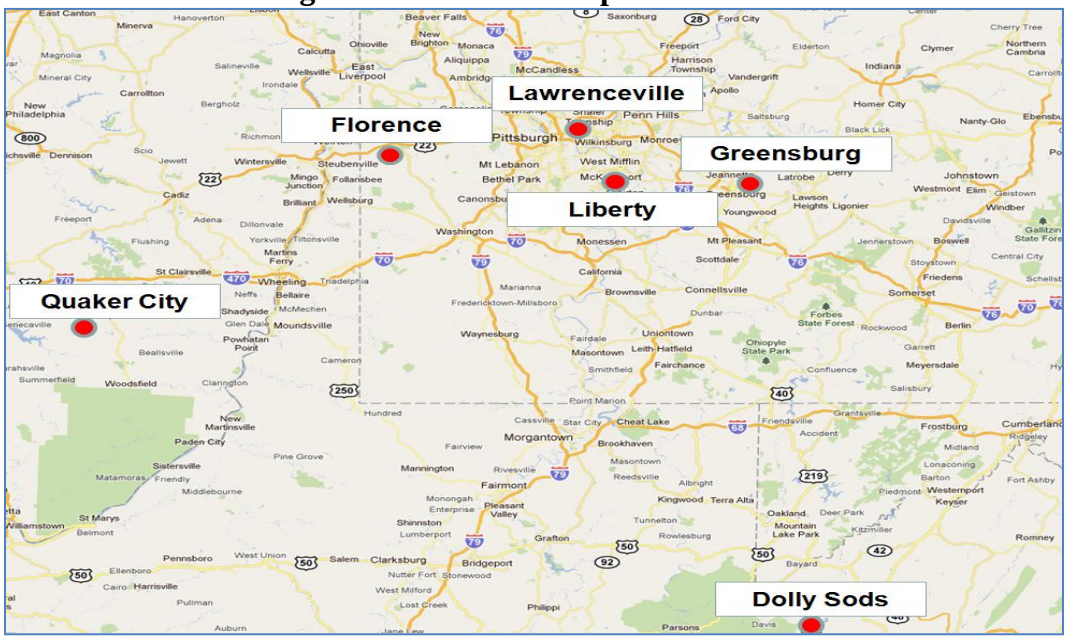
Raw speciation data was examined for tri-state monitoring sites for the period 2011-2013. These sites include Lawrenceville and Liberty in Allegheny County, Florence and Greensburg within the surrounding Pittsburgh MSA in PA, and rural federal sites at Quaker City, OH and Dolly Sods, WV.

The Florence (Washington Co.) and Greensburg (Westmoreland Co.) monitoring sites reside upwind and downwind of Allegheny County, respectively. These sites are 1-in-6 sites, operated by DEP.

The Quaker City monitoring site is a 1-in-3 CASTNET site operated by EPA, and Dolly Sods is a 1-in-3 IMPROVE site operated by the U.S. Forest Service. The Quaker City and Dolly Sods sites have been used by EPA as background speciation sites for the Pittsburgh area.

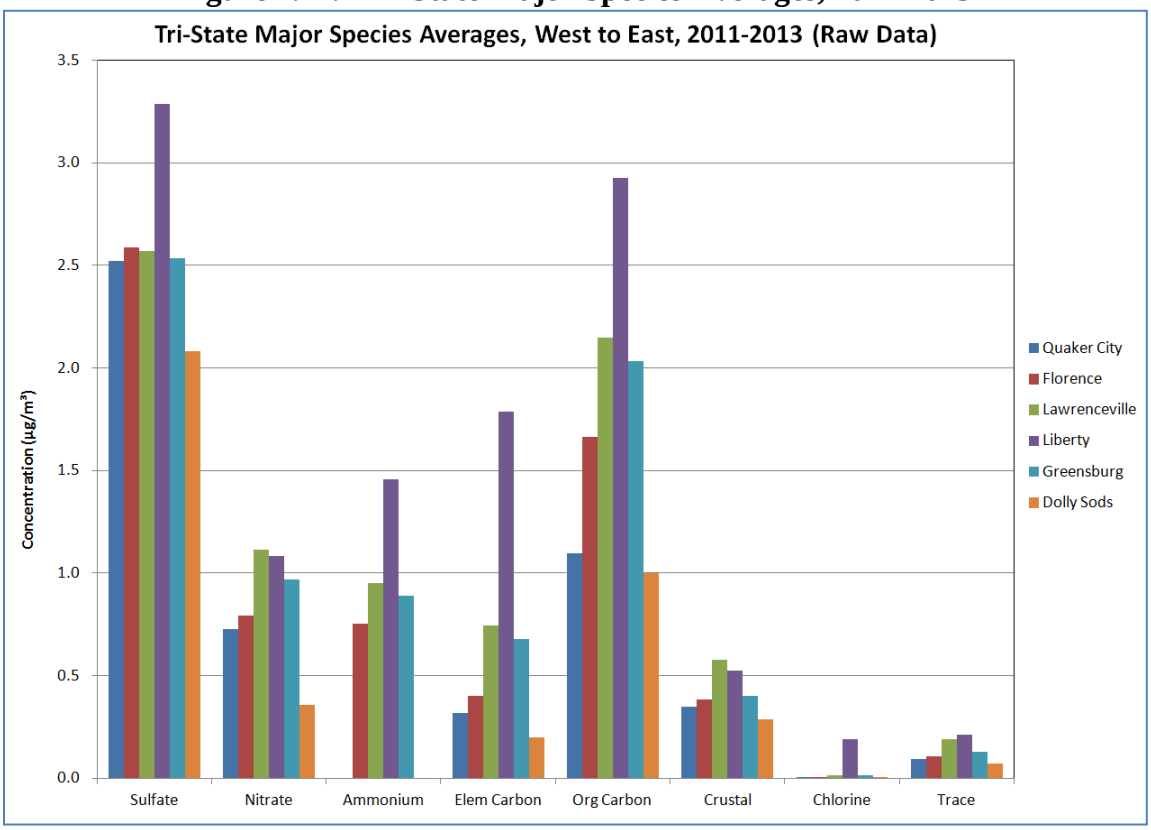
The Lawrenceville monitoring site is a 1-in-3 site, while Liberty is a 1-in-6 site. For sites with higher sampling frequencies (1-in-3), long-term averages represent a larger array of values. Figure 1.10 shows a map of these sites in Ohio, Pennsylvania and West Virginia.

Figure 1.10. Tri-State Speciation Sites



Long-term averages of the raw major species data for the tri-state sites are shown in cluster columns in Figure 1.11.

Figure 1.11. Tri-State Major Species Averages, 2011-2013



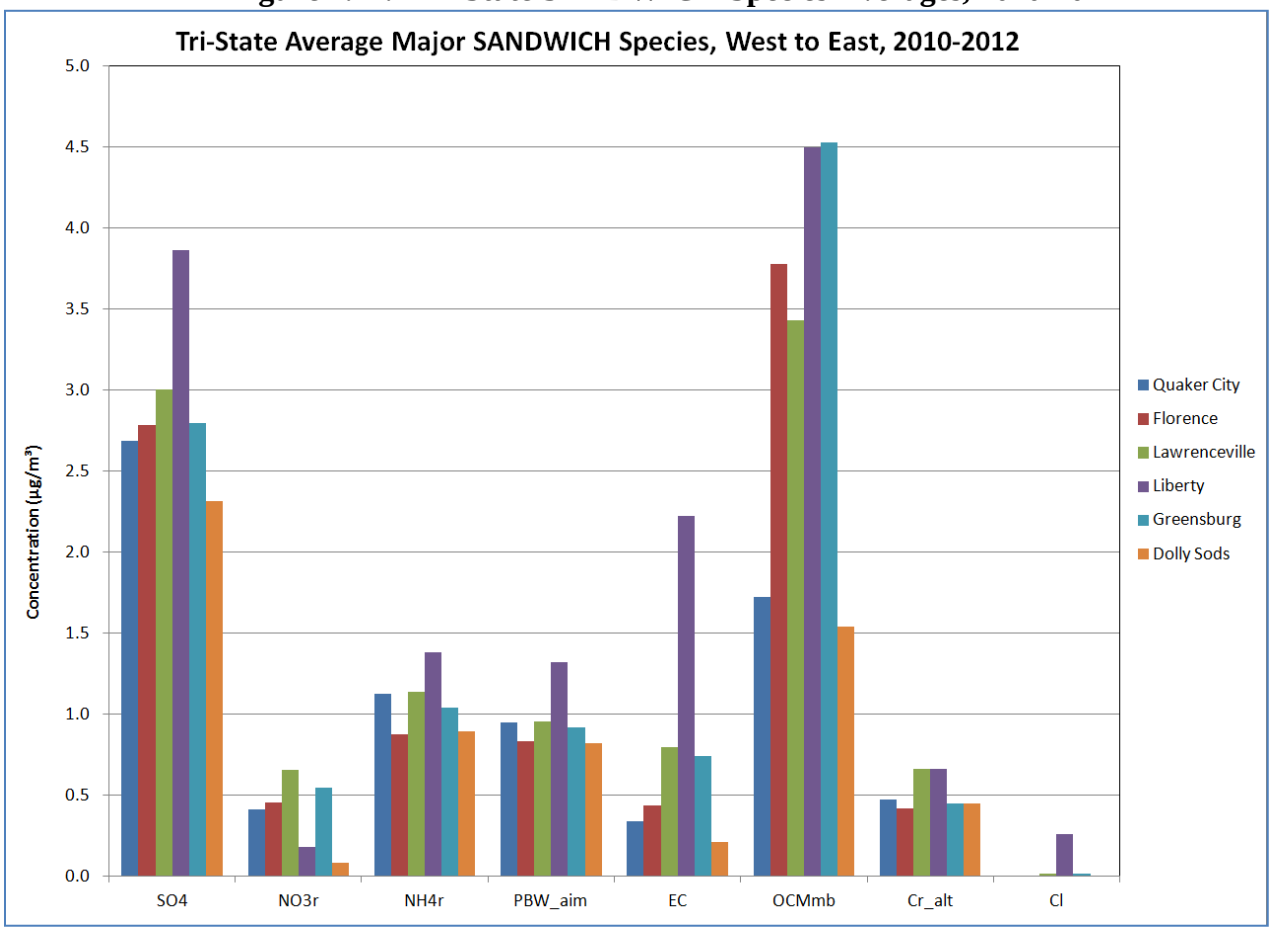
$PM_{2.5}$ speciation data shows specific composition at the Liberty monitoring station that is not consistent with other SWPA (or tri-state) speciation monitors. Specific species such as sulfate show homogeneity throughout the MSA.

The raw data for speciation monitors are based on different analytical methods and can include some amount of error between the measurements. To relate the speciation monitor data to FRM data, EPA's SANDWICH (Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbon Hybrid) method was used to adjust the major species. The 2010-2012 timeframe was used for the SANDWICH data, since it was the most recent 3-year period available from EPA. (See EPA $PM_{2.5}$ SANDWICH data at http://epa.gov/ttn/analysis/sandwich.htm)

Figure 1.12 shows the average tri-state species for 2010-2012 by SANDWICH method. Note that several assumptions are built into the SANDWICH technique:

- Retained nitrate (NO_3r) is calculated by EPA from temperature, relative humidity, and dissociation constants;
- OCMmb is organic carbonaceous material by mass balance (total minus other species);
- Ammonium is calculated indirectly from sulfate and nitrate and degree of neutralization;
- Without measured ammonium at federal sites, ammonium is derived as fully neutralized sulfate;
- For cases where no FRM value is present, STN mass is used.

Figure 1.12. Tri-State SANDWICH Species Averages, 2010-2012



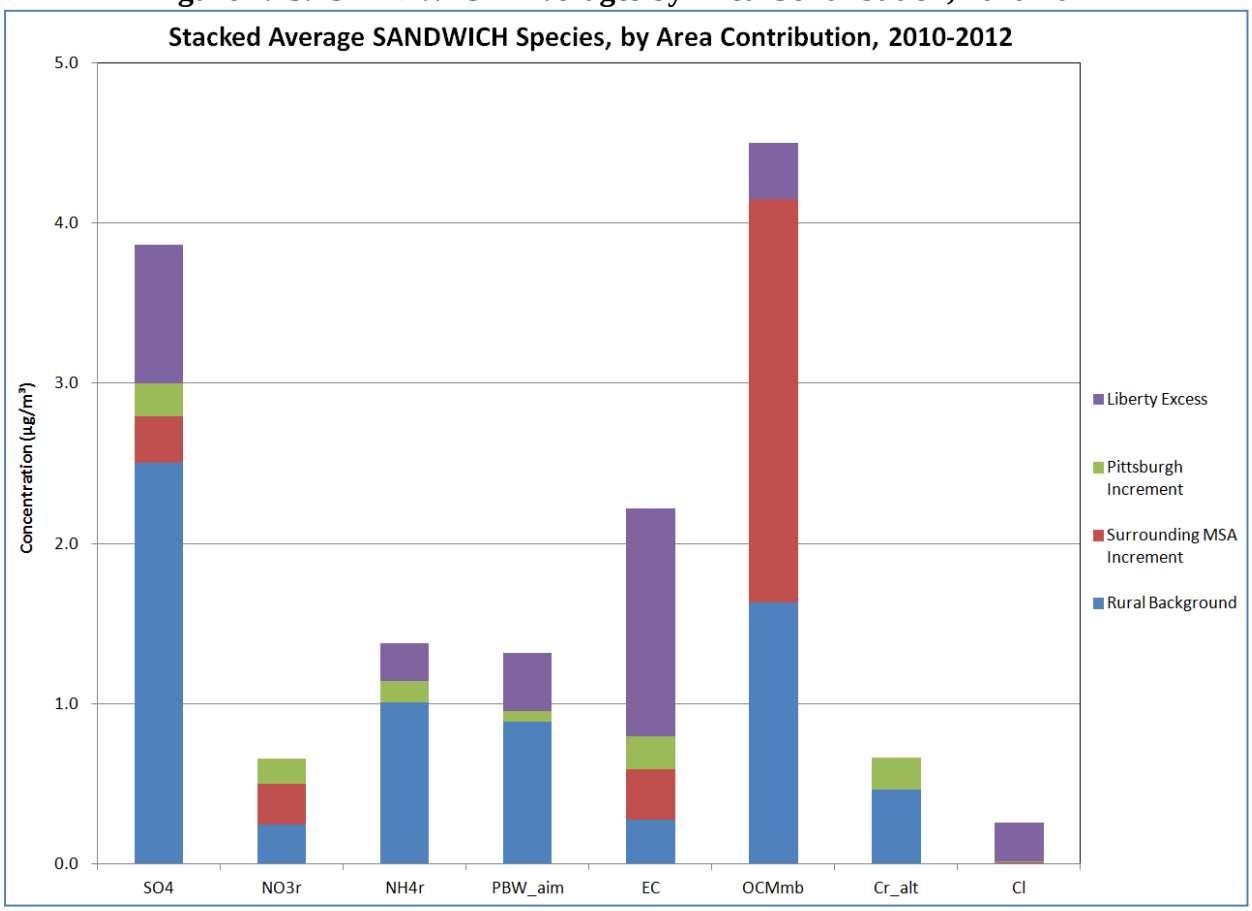
Legend: ***SO_4*** = sulfate ion; ***NO_3r*** = retained nitrate ion; ***NH_4r*** = retained ammonium ion (associated with sulfate and nitrate);
PBW_aim = particle-bound water (associated with sulfate and nitrate), calculated from the AIM model;
EC = elemental carbon; ***OCMmb*** = organic carbonaceous material by mass balance (FRM mass minus all other species);
Cr_alt = crustal material calculated from Ca, Fe, Si, Ti; ***Cl*** = elemental chlorine

The SANDWICH method transforms the species compositions into more probable components based on the FRM data. The Liberty monitor shows higher data than other sites for sulfate and elemental carbon, while other species such as organic carbonaceous material by mass balance are normalized throughout the Pittsburgh MSA by the SANDWICH calculations.

Assuming spatial homogeneity throughout the tri-state region, the SANDWICH data can also be lumped into average area contributions for each species. For this analysis, rural transported background is considered to be the average of the rural federal sites (Quaker City, OH and Dolly Sods, WV), surrounding MSA increment is the average of surrounding Pittsburgh MSA sites (Florence and Greensburg), Lawrenceville is the urban increment monitor for Allegheny County, and Liberty is a localized industrial excess monitor.

SANDWICH concentrations by area contribution/excess are shown in the stacked column chart in Figure 1.13.

Figure 1.13. SANDWICH Averages by Area Contribution, 2010-2012



Example calculation: Liberty Excess SO_4 = Liberty SO_4 – Lawrenceville SO_4 – Avg(Florence SO_4 + Greensburg SO_4) – Avg (Quaker City SO_4+ Dolly Sods SO_4)

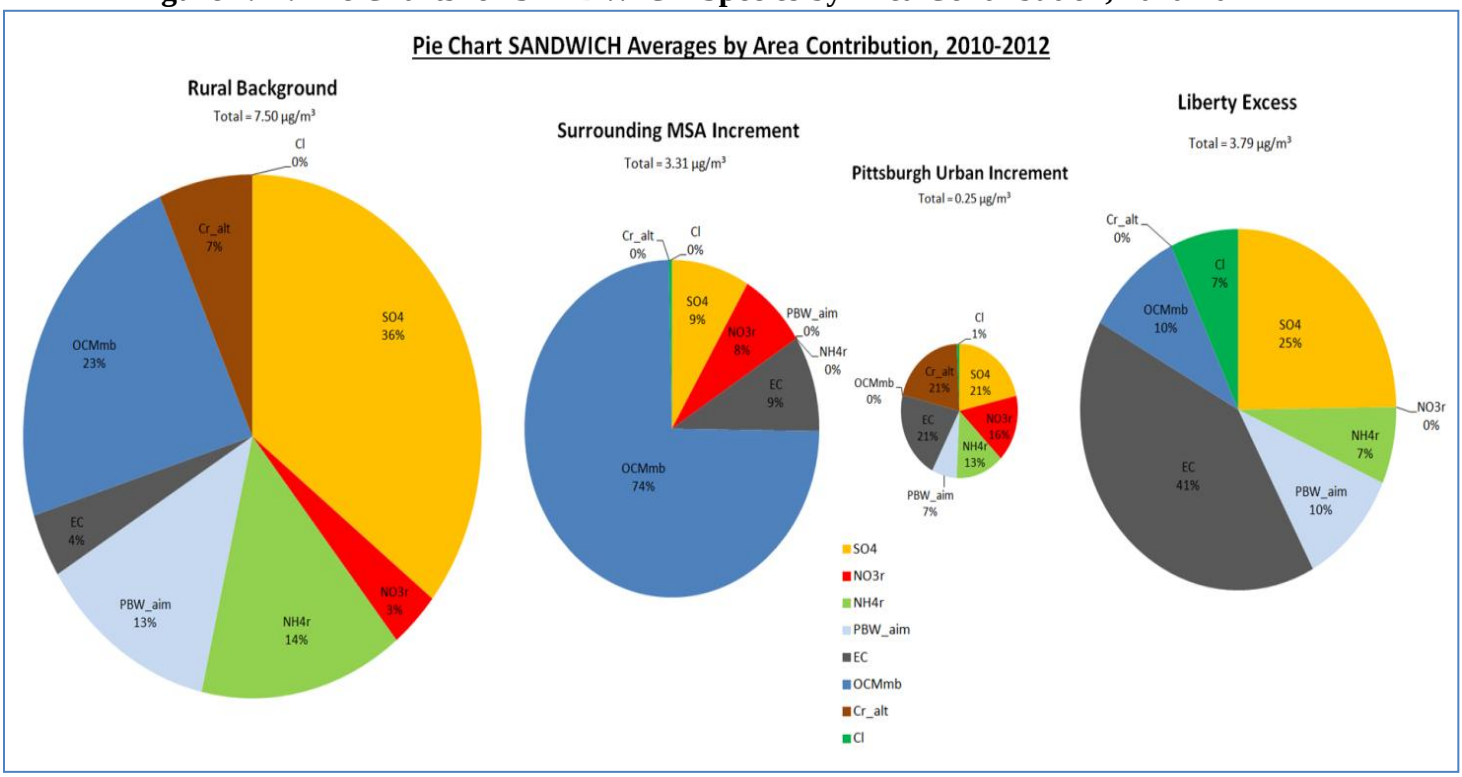
Figure 1.13 indicates that Liberty monitoring site shows excess contributions of carbons and sulfate for the tri-state area, as well as the only source of excess elemental chlorine. These compounds are very specific to local source contributions.

The surrounding MSA shows a large increment of organic carbonaceous material, indicating that the larger metropolitan area contributes significant wide-spread area, mobile, and point source emissions. The rural background sites show large contributions for sulfate, nitrates, as well as a portion of the organic carbonaceous material, indicating a regionally transported nature for these species.

The City of Pittsburgh contributes only small amounts of urban increment for species, showing that Allegheny County is contributing minimal urban influence for $PM_{2.5}$ in comparison to the surrounding area.

This can also be demonstrated by showing the area contributions by scaled pie charts, shown in Figure 1.14.

Figure 1.14. Pie Charts for SANDWICH Species by Area Contribution, 2010-2012

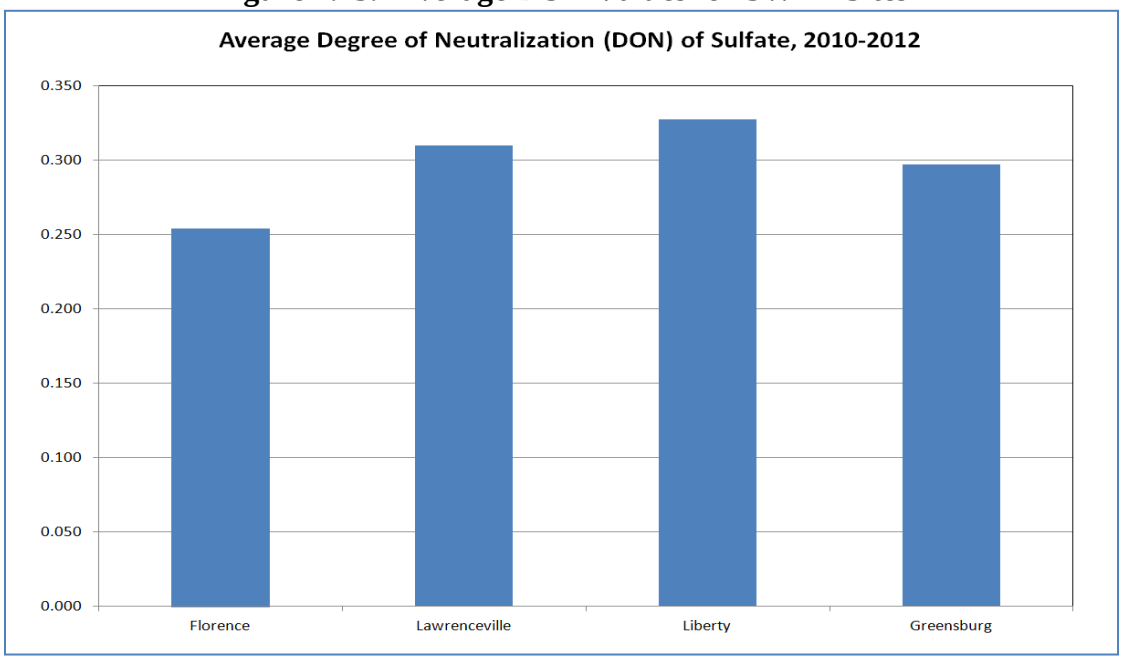


Pittsburgh urban increment is a minor component of $PM_{2.5}$ in SWPA that is not contributing to exceedance levels of $PM_{2.5}$. Other area components contribute significantly larger amounts and in varying overall composition.

Additionally, the amount of excess ammonium sulfate at the Lawrenceville site may not be due to additional contributions from Allegheny County, but rather the neutralization of upwind incoming sulfuric acid into the area.

The degree of neutralization (DON) is a measure of the amount of ammonium associated with sulfate, up to 0.375 (complete neutralization to $(NH_4)_2SO_4$, based on molar ratios). Figure 1.15 shows the average DON for SWPA sites.

Figure 1.15. Average DON Values for SWPA Sites



The increasing DON ratios from west to east indicate that more acidic conditions are present with incoming air in the Pittsburgh region. Transported sulfuric acid (H_2SO_4) may be fresher or limited by NH_3 and partially neutralizing to ammonium bisulfate (NH_4HSO_4). Sulfate may be higher at Lawrenceville due to the time and distance required to neutralize sulfur compounds from outside of the county.

2. EMISSIONS AND EMISSIONS-RELATED DATA

2.1. Allegheny County Emissions Inventory

The EPA TSD analysis on emissions data was based on the 2011 National Emissions Inventory (NEI). Table 2h on page 92 of EPA's TSD analysis indicated major point source emissions from version 1 of the 2011 NEI, in tons per year. Table 2h listed facilities and facility-level emissions in the area of analysis for the Allegheny County area. In this table, EPA documented nine major facilities in Allegheny County (in addition to facilities outside of the county) with emissions of direct $PM_{2.5}$, components of direct $PM_{2.5}$ and precursor pollutants. Table 2.1 shows the 2011 NEI data for the nine Allegheny County facilities.

Table 2.1. Allegheny County Facilities Over 500 Tons of Emissions in 2011 NEI

Facility Name (Facility ID)	Distance from violating monitor (miles)	NH_3	NO_X	$PM_{2.5}$	SO_2	VOC	Total
USS/Clairton Coke Works (4200300032)	1	123	3,075	500	1,468	336	5,502
Us Steel Corp/Irvin Plant (4200300203)	2	4	762	72	419	61	1,318
USS Corp/Edgar Thomson Works (4200300202)	5	22	275	633	1,279	41	2,250
Guardian Ind Corp /Jefferson Hills (4200300342)	5	0	978	22	73	19	1,092
Bay Valley Foods LLC /Pgh (4200300024)	11	0	212	20	313	1	546
Genon Energy Inc /Cheswick Sta (4200300157)	15	3	3,294	498	9,290	10	13,095
Shenango Inc /Shenango Coke Plant (4200300022)	16	3	427	97	372	100	999
Allegheny Ludlum LLC /Brackenridge (4200300093)	21	4	255	223	33	62	577
*Pittsburgh International**	*23*	*0*	*13*	*3*	*0*	*28*	*44*
	TOTAL	159	9,291	2,068	13,247	658	**25,423**

**Pittsburgh International was altered in the 2011 NEI from what PA submitted, which was 44 total tons for 2011. EPA's TSD, Table 2h, listed Pittsburgh International as emitting 729 total tons per year.*

The DEP reviewed these same nine facilities in its Air Information Management System (AIMS) database for the 2013 calendar year. The 2013 emissions for each of the nine Allegheny County facilities are provided below in Table 2.2.

Table 2.2. Facilities in Allegheny County with Emissions in Tons in 2013 Identified in PA DEP's AIMS Database

Facility Name (Facility ID)	Distance from violating monitor (miles)	NH_3	NO_X	$PM_{2.5}$	SO_2	VOC	Total
USS/Clairton Coke Works (4200300032)	1	145	3,761	327	1,637	307	6,177
Us Steel Corp/Irvin Plant (4200300203)	2	3	754	43	507	70	1,377
USS Corp/Edgar Thomson Works (4200300202)	5	22	320	43	1,454	40	1,879
Guardian Ind Corp /Jefferson Hills (4200300342)	5	0	470	21	70	12	573
Bay Valley Foods LLC /Pgh (4200300024)	11	1	145	2	209	2	359
Genon Energy Inc /Cheswick Sta (4200300157)	15	1	5,333	88	1,686	11	7,119
Shenango Inc /Shenango Coke Plant (4200300022)	16	3	392	35	285	93	808
Allegheny Ludlum LLC /Brackenridge (4200300093)	21	4	222	93	31	57	407
Pittsburgh International	23	0	10	3	0	21	34
	TOTAL	179	11,407	655	5,879	613	**18,733**

Emission totals for the nine facilities in Allegheny County are compared between 2011 and 2013 in Table 2.3.

Table 2.3. Emission Differences Between 2011 and 2013 for Facilities in Allegheny County

Facility Name (Facility ID)	2011 Totals	2013 Totals	Difference	Percent Change
USS/Clairton Coke Works (4200300032)	5,502	6,177	675	12.3%
Us Steel Corp/Irvin Plant (4200300203)	1,318	1,377	59	4.5%
USS Corp/Edgar Thomson Works (4200300202)	2,250	1,879	-371	-16.5%
Guardian Ind Corp/Jefferson Hills (4200300342)	1,092	573	-519	-47.5%
Bay Valley Foods LLC/Pgh (4200300024)	546	359	-187	-34.2%
Genon Energy Inc/Cheswick Sta (4200300157)	13,095	7,119	-5,976	-45.6%
Shenango Inc/Shenango Coke Plant (4200300022)	999	808	-191	-19.1%
Allegheny Ludlum LLC/Brackenridge (4200300093)	577	407	-170	-29.5%
Pittsburgh International*	44*	34*	-10*	-22.7%
GRAND TOTAL	***25,423***	***18,733***	***-6,690***	***-26.3%***

**Based on DEP databases. EPA adjusted the emission numbers submitted by PA for the 2011 NEI for Pittsburgh International. EPA's calculation for 2013 would show a downward trend in emissions at the Pittsburgh International Airport.*

As shown in Table 2.3, seven of the nine sources have decreased emissions 16.5% to 47.5% between 2011 and 2013, while the whole county had reduced emissions by more than 26% during the same time. Only two facilities increased emissions during the same period of time – U.S. Steel Clairton Coke Works and U.S. Steel Irvin Plant. The Clairton Coke Works facility, the country's largest coking operation, increased emissions by 675 tons, an increase of 12.3%.

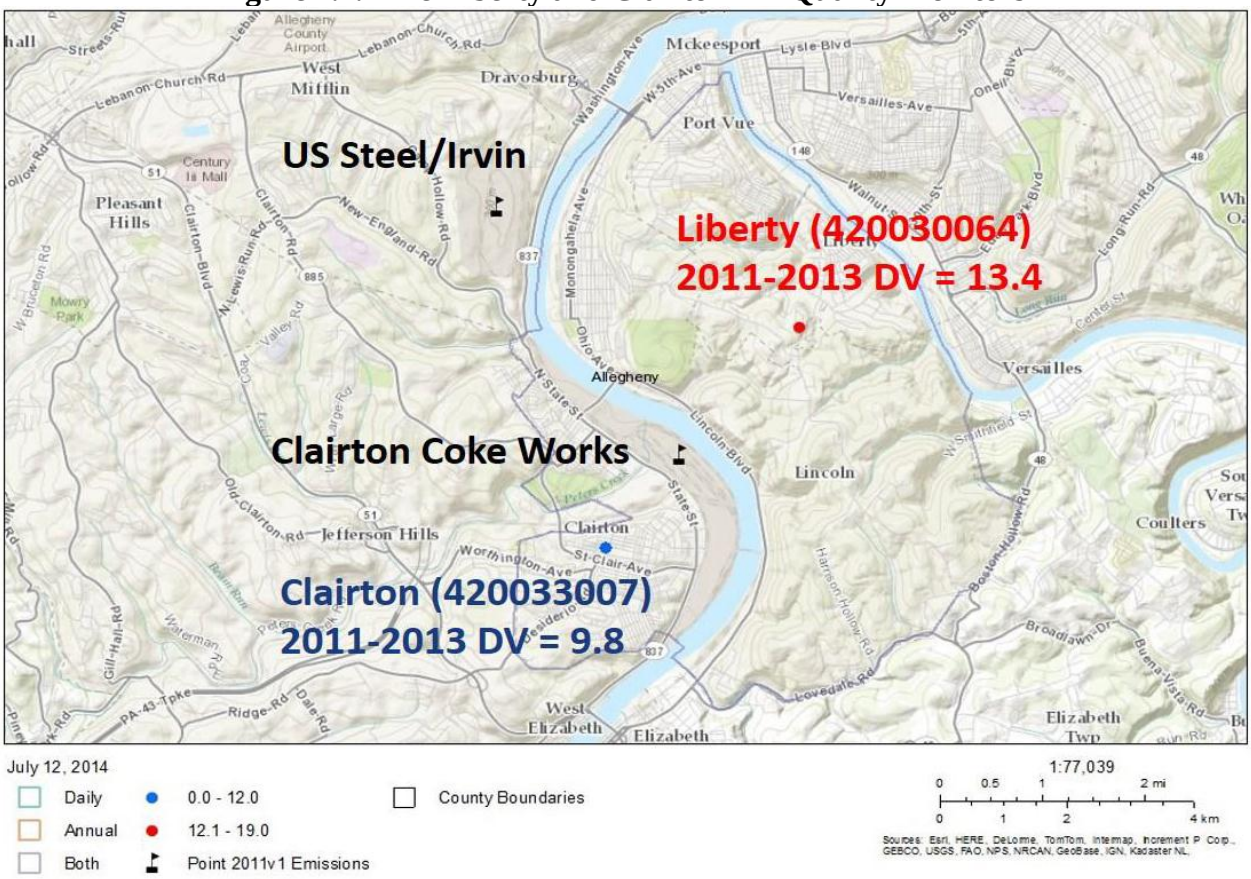
The Cheswick Power Plant, the largest emissions source in Allegheny County (several kilometers away from either the City of Pittsburgh or Liberty-Clairton and downwind relative to prevailing wind directions) has decreased sulfur dioxide emissions significantly since 2009, due to the installation of a flue gas desulfurization (FGD) system. Sources outside of the Liberty-Clairton area, including the Cheswick plant and others, will be subject to controls required to meet the 2010 1-hour SO_2 NAAQS.

It should be pointed out that the emission numbers Pennsylvania submitted for the 2011 NEI for Pittsburgh International Airport was later changed by EPA. Tables 2.1-2.3 include Pittsburgh International data as submitted by Pennsylvania for the 2011 NEI and in DEP's AIMS database for 2013. Regardless of whether EPA's adjusted numbers or Pennsylvania's database numbers are used, both would should a downward trend between 2011 and 2013 at the Pittsburgh International Airport.

As noted in Figure C on page 78 of EPA's TSD, the Clairton Coke Works facility is in the Monongahela Valley, in the area of Liberty-Clairton. This source is also the closest of the nine sources to the Liberty monitor, at a distance of one mile. Clairton Coke Works is located to the southwest of the Liberty monitor, where the emissions are frequently coming from. The US

Steel Irvin Plant is the second closest of the nine sources, located two miles to the west/northwest of the Liberty monitor. The location of these sources in relation to the monitors in the Monongahela Valley can be seen in Figure 2.1.

Figure 2.1. The Liberty and Clairton Air Quality Monitors



Source: EPA's August 19, 2014 intended designations letter, TSD Section 3.3, Allegheny County.

Additionally, several power plants outside of Allegheny County, which were included in the EPA TSD analysis, have deactivated since 2011:

- Washington County, PA – NRG Elrama (October 2012);
- Washington County, PA – Allegheny Energy Mitchell (October 2013);
- Greene County, PA – Allegheny Energy Hatfield's Ferry (October 2013);
- Armstrong, PA – Allegheny Energy Armstrong (September 2012);
- Preston County, WV – Monongahela Power Albright (September 2012).

Additionally, the owner of the Homer City power plant in Indiana County is in the process of installing a desulfurization system, which is expected to come online in 2016; this system will significantly decrease sulfur dioxide emissions. The Homer City plant is located within the partial Indiana County area that is included in EPA's intended Johnstown nonattainment area, which also includes all of Cambria County.

The urbanized area of Allegheny County (which is primarily the City of Pittsburgh) does not affect Liberty-Clairton, and vice-versa. Liberty shows extremely localized behavior and composition for $PM_{2.5}$. This is also evident with the Clairton monitor, only a few kilometers away from Liberty, which can show much lower concentrations than Liberty as well as Lawrenceville. The urbanized area of Pittsburgh is well-characterized by population, modeling demonstrations, and other factors. It is best defined as the City of Pittsburgh extending into a few immediately adjacent municipalities and portions of the interstate parkway corridors. The Lawrenceville monitor is the best monitor to represent urbanized Pittsburgh. The Lawrenceville monitor is influenced by urban emissions, but shows attainment of the 2012 annual $PM_{2.5}$ NAAQS. The Liberty monitor is influenced by extreme localized industrial emissions, causing nonattainment. The remaining Allegheny County sites, while showing uniqueness on a neighborhood scale, are similar to other sites within the larger Pittsburgh MSA and are showing attainment.

The EPA TSD analysis attempted to relate emissions from Pittsburgh as an urban increment that can influence the violating monitor. EPA cited Pittsburgh International Airport as well as a few stationary sources as additional sources that could influence the Liberty monitor, despite the prevailing winds coming from the southwest. If EPA designates all of Allegheny County as a nonattainment area, as opposed to the Liberty-Clairton Area, this would result in making all of the sources subject to Reasonable Further Progress (RFP). The baseline for the RFP would be increased if this happened, resulting in a greater emission reduction required to meet the RFP. Since the ACHD does not have authority to control emissions from airports, there are no remaining CAA measures to implement for transportation emissions. In addition, most of the stationary sources are well controlled, resulting in few attainable RFP goals. Designating all of Allegheny County as a single nonattainment area could cause the area to fail to meet RFP. When finalizing a nonattainment designation, the potential for control is an important consideration that must be applied to sources of emissions.

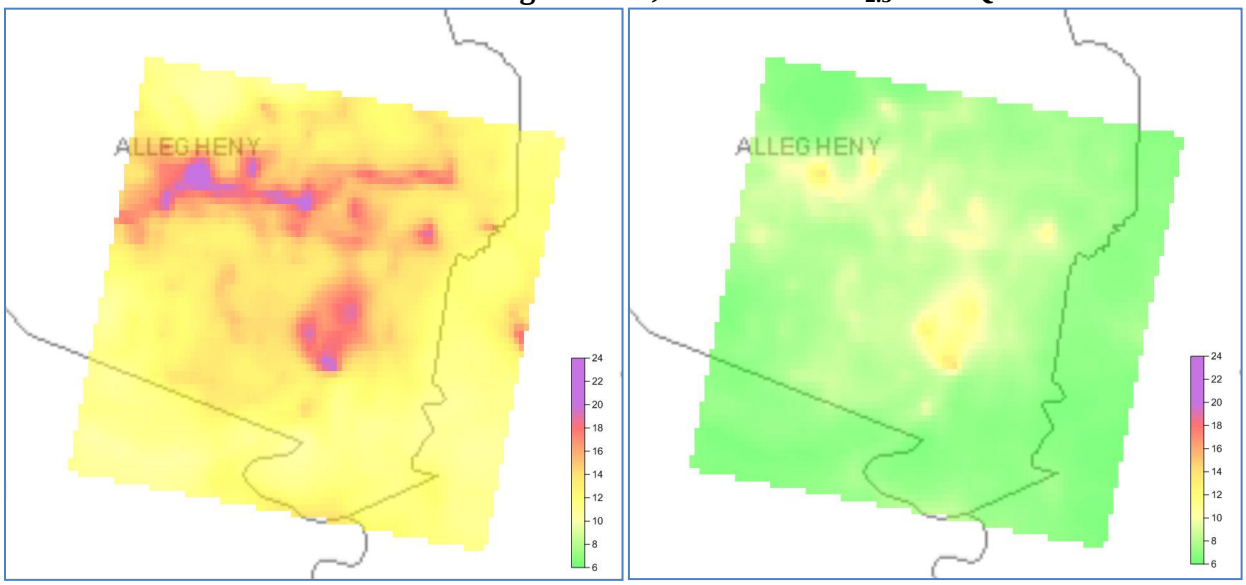
In the past, EPA and DEP both agreed that this is a local problem, specific to the Monongahela Valley. All counties and municipalities surrounding the Liberty-Clairton area have attained the $PM_{2.5}$ standards, and Liberty-Clairton lags behind, as was expected when EPA designated the 1997 and 2006 $PM_{2.5}$ nonattainment areas.

2.2. $PM_{2.5}$ SIP Modeling

CAMx modeling and Modeled Attainment Test Software (MATS) unmonitored area tests performed for the 2006 24-hour $PM_{2.5}$ NAAQS SIP shows much more refined gridded modeling results than shown in the EPA TSD analysis for the 2012 annual $PM_{2.5}$ NAAQS.

Unmonitored area $PM_{2.5}$ impacts are shown in Figure 2.2 for baseline year 2007 to future projected 2014 (see DEP's June 21, 2013 State Implementation Plan (SIP) revision submittal pertaining to the attainment demonstration of the 2006 $PM_{2.5}$ NAAQS for the Liberty-Clairton nonattainment area; herein referred to as the June 2013 SIP) at 0.8 km and 4 km resolution.

Figure 2.2. MATS Spatial $PM_{2.5}$ Analysis, Baseline 2007 (left) and Projected 2014 (right), 0.8 km Gridded Modeling Domain, from 2006 $PM_{2.5}$ NAAQS SIP



These results show distinct borders for the extent of urban impacts compared to Liberty-Clairton area impacts. Furthermore, areas influenced by urban emissions are not showing county-wide modeled impacts. Urbanized $PM_{2.5}$ emissions are highest at the urban core, extending into the parkway corridors of Interstates 279 and 376 (Note that near-road $PM_{2.5}$ monitored results are not part of the current 2012 annual $PM_{2.5}$ NAAQS designations.).

CAMx modeling performed for the June 2013 SIP revision also showed impacts by both local and regional contribution. The CAMx Particulate Matter Source Apportioning Technology (PSAT) tracked local source emissions in the model separately from regional impacts. The largest sources (>50 tons summed emissions) tracked locally are shown in Table 2.4.

Table 2.4. Local Sources Tracked by PSAT in CAMx, with Emissions (tons/year)

2007 Baseline						
Facility	**SO_2**	**NO_X**	**CO**	**VOC**	**NH_3**	**$PM_{2.5}$**
EASTMAN CHEMICAL RESINS, INC.	4.4	73.2	29.8	177.7	0.1	17.6
GUARDIAN INDUSTRIES CORP. FLOREFFE	82.4	686.6	10.3	13.9	0.0	20.0
US STEEL CORP - EDGAR THOMSON PLANT	1868.6	318.1	1300.9	68.6	0.5	803.3
US STEEL CORP - IRVIN PLANT	456.0	694.5	194.0	71.8	0.7	51.1
US STEEL CORP - CLAIRTON PLANT	1739.9	4807.4	3559.3	570.6	18.4	929.2
ALLEGHENYENERGYSUPPLYCO/MITCHELL	637.9	1495.6	31.4	11.7	0.0	79.9
ORIONPOWERMIDWEST/ELRAMA	4267.4	6027.5	230.9	22.4	6.9	512.8
2014 Projected						
Facility	**SO_2**	**NO_X**	**CO**	**VOC**	**NH_3**	**$PM_{2.5}$**
EASTMAN CHEMICAL RESINS, INC.	4.4	73.2	29.8	177.7	0.1	17.6
GUARDIAN INDUSTRIES CORP. FLOREFFE	82.4	686.6	10.3	13.9	0.0	20.0
US STEEL CORP - EDGAR THOMSON PLANT	1868.6	318.1	1300.9	68.6	0.5	803.3
US STEEL CORP - IRVIN PLANT	456.0	694.5	194.0	71.8	0.7	51.1
US STEEL CORP - CLAIRTON PLANT	1717.6	4312.8	4197.7	443.5	17.6	645.1
ALLEGHENYENERGYSUPPLYCO/MITCHELL	948.1	1335.0	44.1	17.3	0.0	102.1
ORIONPOWERMIDWEST/ELRAMA	1846.0	1943.0	99.7	9.7	3.0	221.5

Modeled impacts at Liberty from the June 2013 SIP are shown in Table 2.5, split into local and regional contributions. Local sources were those within a 20 km domain surrounding the Liberty monitor.

Table 2.5. Modeled CAMx Impacts, Local and Regional, Baseline 2007 and Projected 2014

Local CAMx Impacts at Liberty								
	SO_4	**NO_3**	**NH_4**	**POA**	**SOA**	**EC**	**OTHER**	**TOTAL**
2007	0.442	0.010	0.137	0.219	0.000	0.282	2.274	3.363
2014	0.361	0.014	0.109	0.204	0.000	0.269	1.789	2.746
Regional CAMx Impacts at Liberty								
	SO_4	**NO_3**	**NH_4**	**POA**	**SOA**	**EC**	**OTHER**	**TOTAL**
2007	4.517	1.031	1.346	2.287	0.036	1.192	3.189	13.597
2014	2.256	0.876	0.984	1.777	0.030	0.499	2.755	9.175

Legend: SO_4 = sulfate ion; NO_3 = nitrate ion; NH_4 = ammonium ion; POA = primary organic aerosol; SOA = secondary organic aerosol; EC = elemental carbon; OTHER = unspeciated $PM_{2.5}$.

CAMx modeling from the June 2013 SIP showed little transformation locally at Liberty, indicating that secondary compounds are not readily formed from precursor emissions from

immediately upwind sources such as Eastman, Guardian, Elrama, or Mitchell. Most of the local impacts were from direct PM emissions (OTHER, POA, EC), while secondary components (SOA, NO_3) contributed minimally to impacts at Liberty. It should be noted that Elrama and Mitchell were modeled at Cross-State Air Pollution Rule (CSAPR) emission levels for future case 2014. Both of these power plants are currently deactivated.

Local sulfate can be apportioned to either primary or secondary $PM_{2.5}$, depending on the Standard Classification Code (SCC) code of the modeled source. Stack tests have shown significant amounts of primary sulfate for local sources near Liberty (Note: ammonium is mostly associated with sulfate in the model.).

It should also be noted that modeled impacts for the $PM_{2.5}$ SIP were used in a relative sense for future design value calculations (See $PM_{2.5}$ modeling guidance, April 2007.). When applied to monitored data, the modeling projected future case annual values for 2014 (5-year weighted basis) below 12.0 $\mu g/m^3$ for Liberty.

2.3. PMF Source Apportionment

Positive Matrix Factorization (PMF) source apportionment receptor modeling referenced in the EPA TSD (based on 2005-2010 speciation data) represented a "best-guess" scenario of probable source factors. For many source factors, there is a mix of components that cannot be resolved by the model, and there is considerable uncertainty associated with the results. The PMF results should be considered "ballpark" estimates, with the importance lying in the factor types and the associated wind directions for each factor at Lawrenceville and Liberty. Subsequent modeling, control strategies, and past/current monitored data have shown that Clairton Coke Works is the main source contributing to exceedances at Liberty.

Updated PMF modeling (using PMF v5.0) was performed using more recent speciation data for 2011-2013, including modeling for the additional tri-state sites (see Air Quality Data section). For this analysis, samples with missing species or exceptional outliers are removed from the model to provide a better fit.

Modeled source factor profiles from PMF are shown in Figures 2.3 and 2.4 for Lawrenceville and Liberty, respectively.

Figure 2.3. Lawrenceville Source Factor Profiles

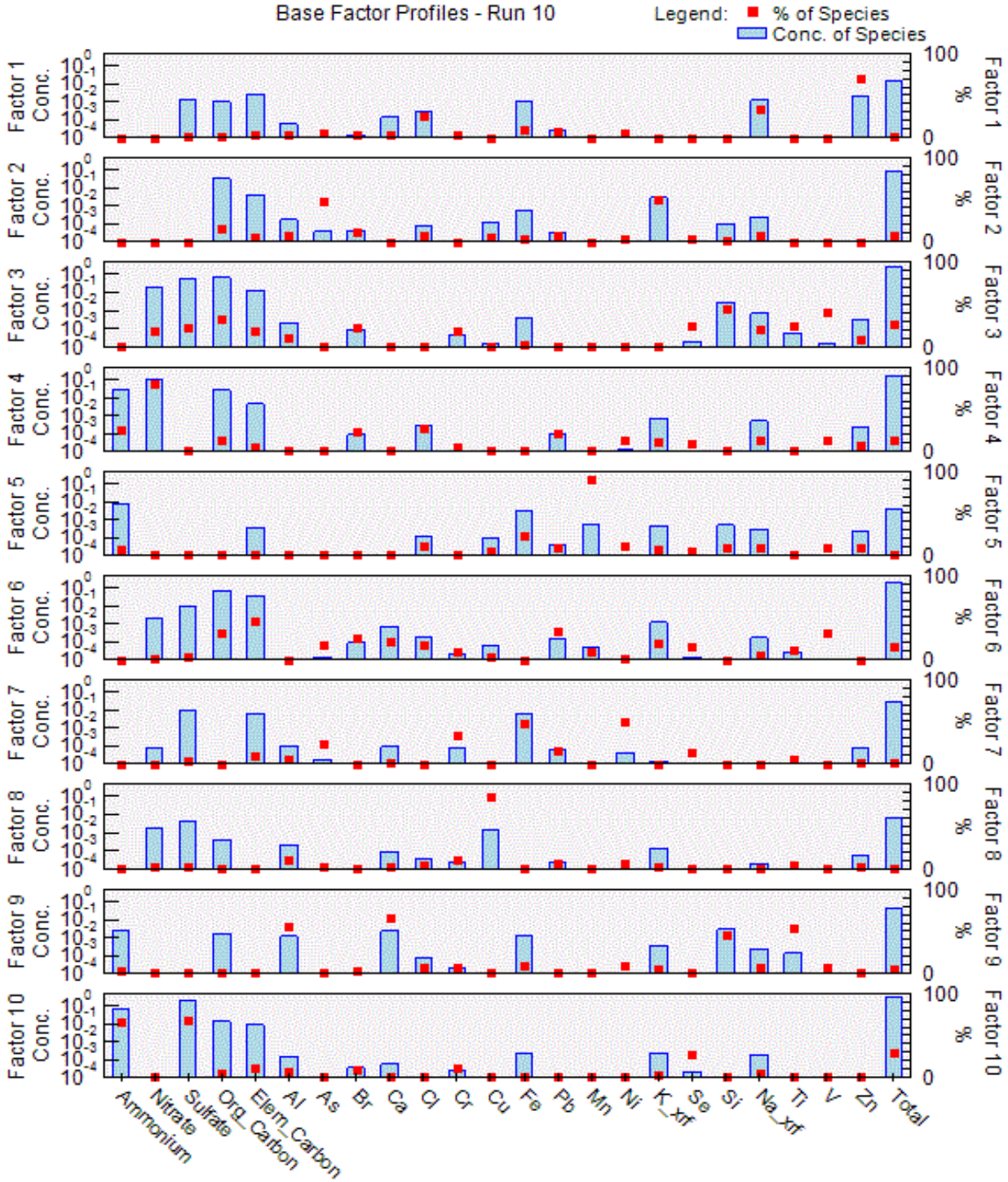
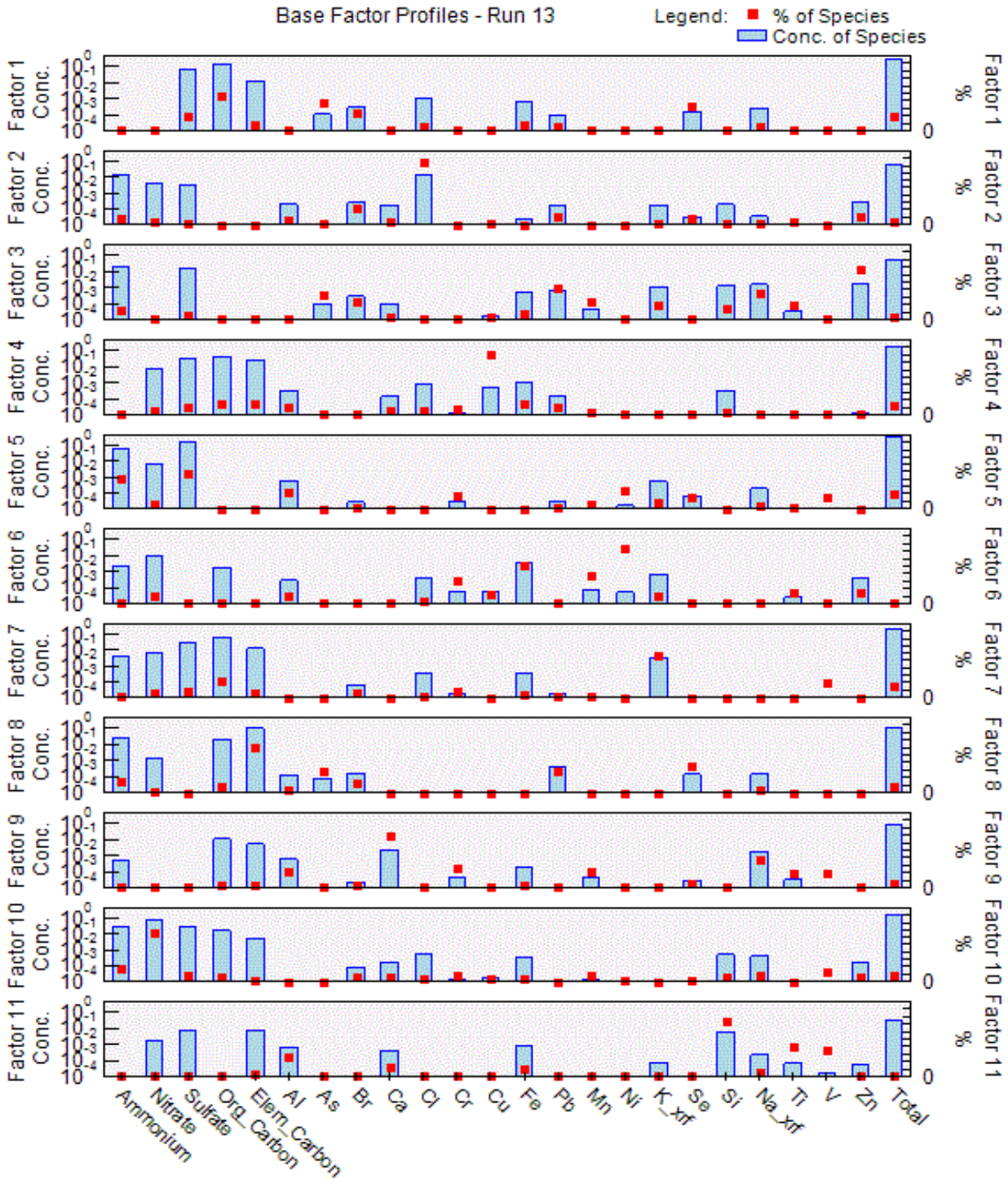


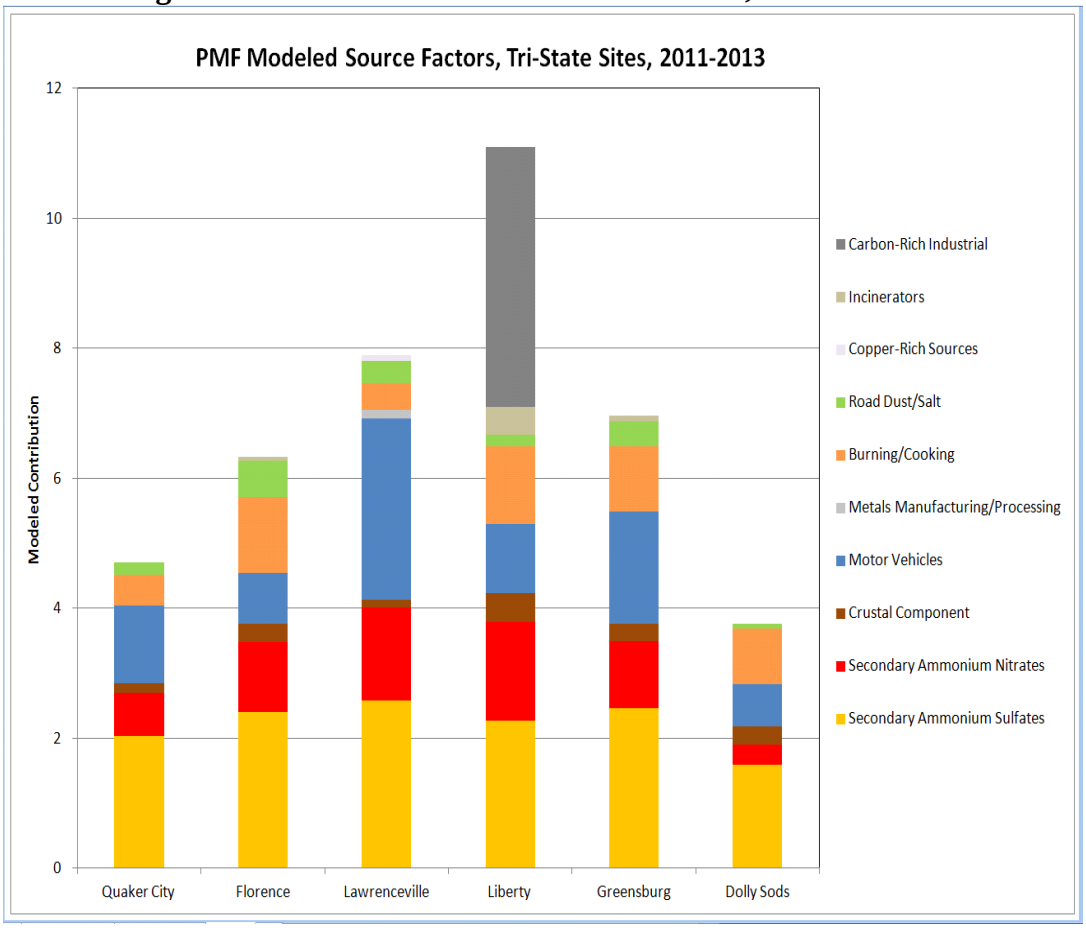
Figure 2.4. Liberty Source Factor Profiles



Figures 2.3 and 2.4 show some common factors between Lawrenceville and Liberty, with some distinct larger industrial source factors only evident at Liberty.

A comparison of source factors between the tri-state sites are given in Figure 2.6. Some of these factors are combinations of one or more profiles originating from similar sources for better comparison between sites (Note: source factors are assigned according to most prevalent indicator species for each source factor, but factors can contain amounts of other species.).

Figure 2.5. Stacked Common Source Factors, Tri-State Sites



The modeled source factors show consistency with the speciation analysis (see Air Quality Data section). Contributions from regional components such as ammonium sulfate and crustal component are fairly consistent through the tri-state area. Motor vehicles show higher contributions at more population sites such as Lawrenceville and Greensburg. Liberty shows a large contribution from carbon-rich industrial sources – not present at the other sites – that contribute carbons, primary sulfate, chlorine, and several trace elements.

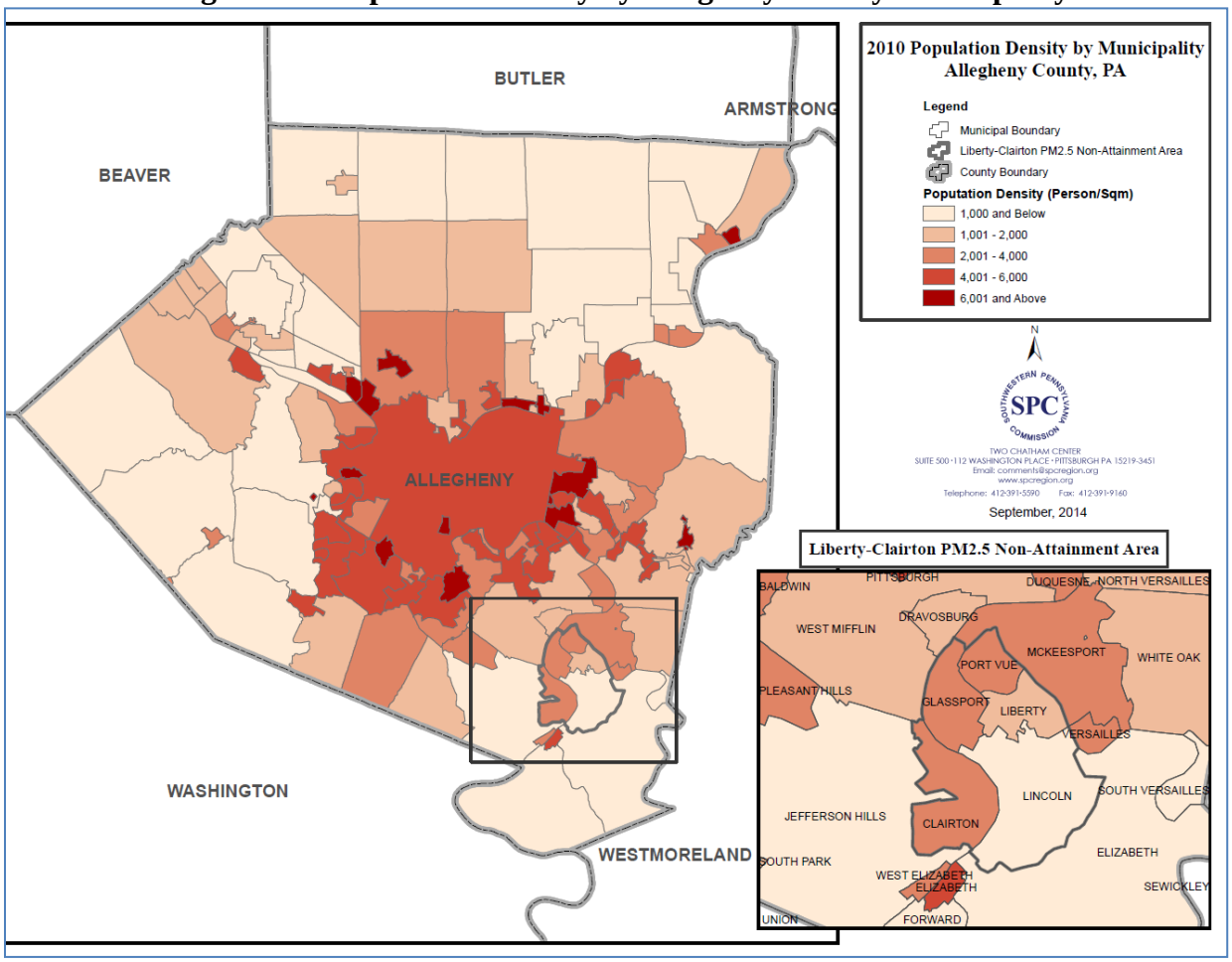
Modeling and source apportionment analysis indicate that sources immediately upwind of the Liberty-Clairton area are showing minimal impacts on the area. Additionally, the two largest upwind sources within 15 km of Liberty (Elrama and Mitchell plants) have deactivated in 2012-2013 (in addition to other nearby sources), while Liberty continues to exceed the annual NAAQS.

Additional ACHD speciation and PMF analysis can be found at www.achd.net/air/reports.html.

2.4. Allegheny County Population Data

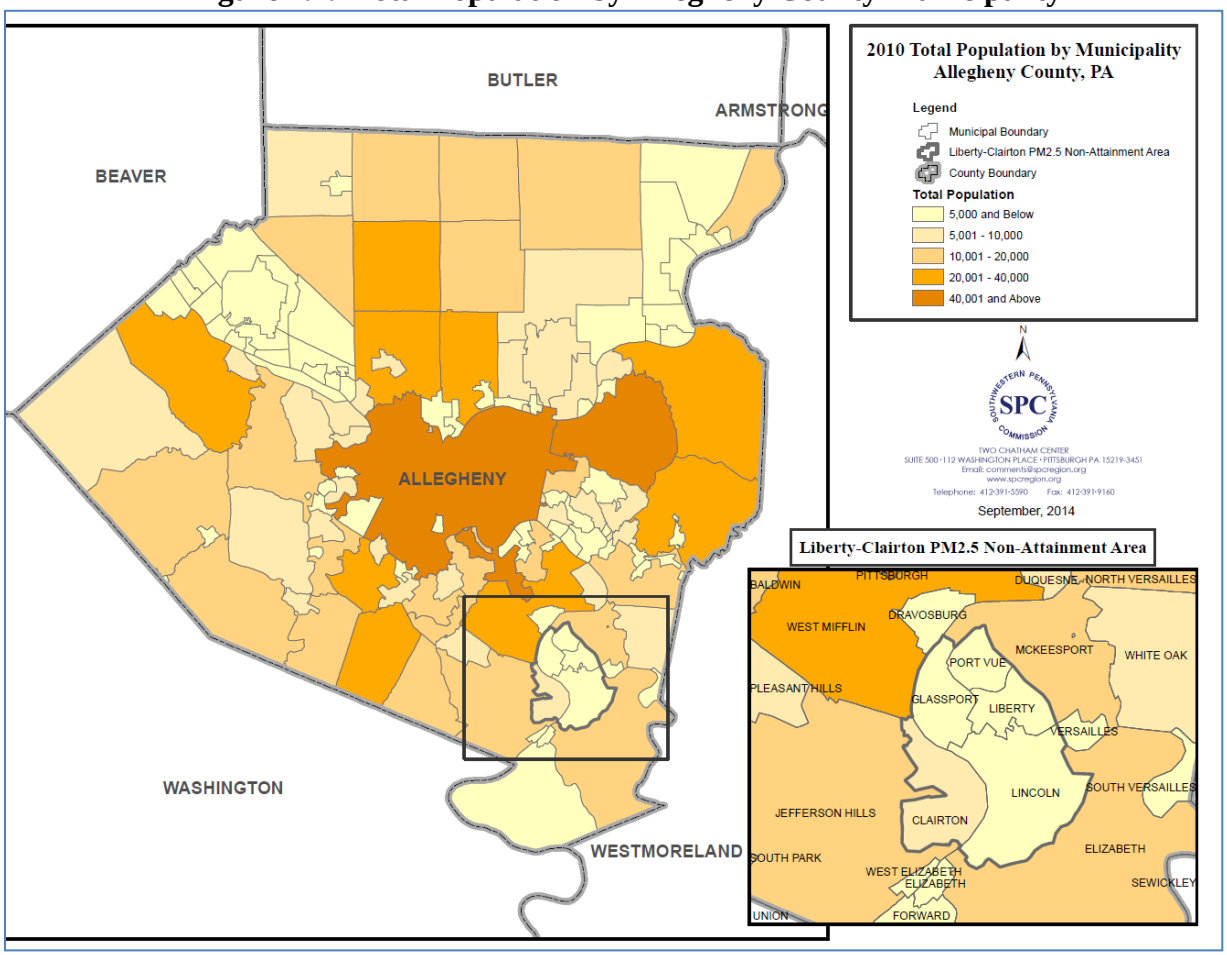
Allegheny County population data, based on 2010 census data was examined for the extent of the urban Pittsburgh area. Figures 2.6 and 2.7 show population density and total population, respectively, by municipality. The City of Pittsburgh (in the middle of the maps) is the largest municipality by area.

Figure 2.6. Population Density by Allegheny County Municipality



Population density shows that the Pittsburgh urban core is best defined as the City of Pittsburgh along with a few immediately adjacent municipalities. The Greater Pittsburgh area is best defined as the Pittsburgh MSA.

Figure 2.7. Total Population by Allegheny County Municipality



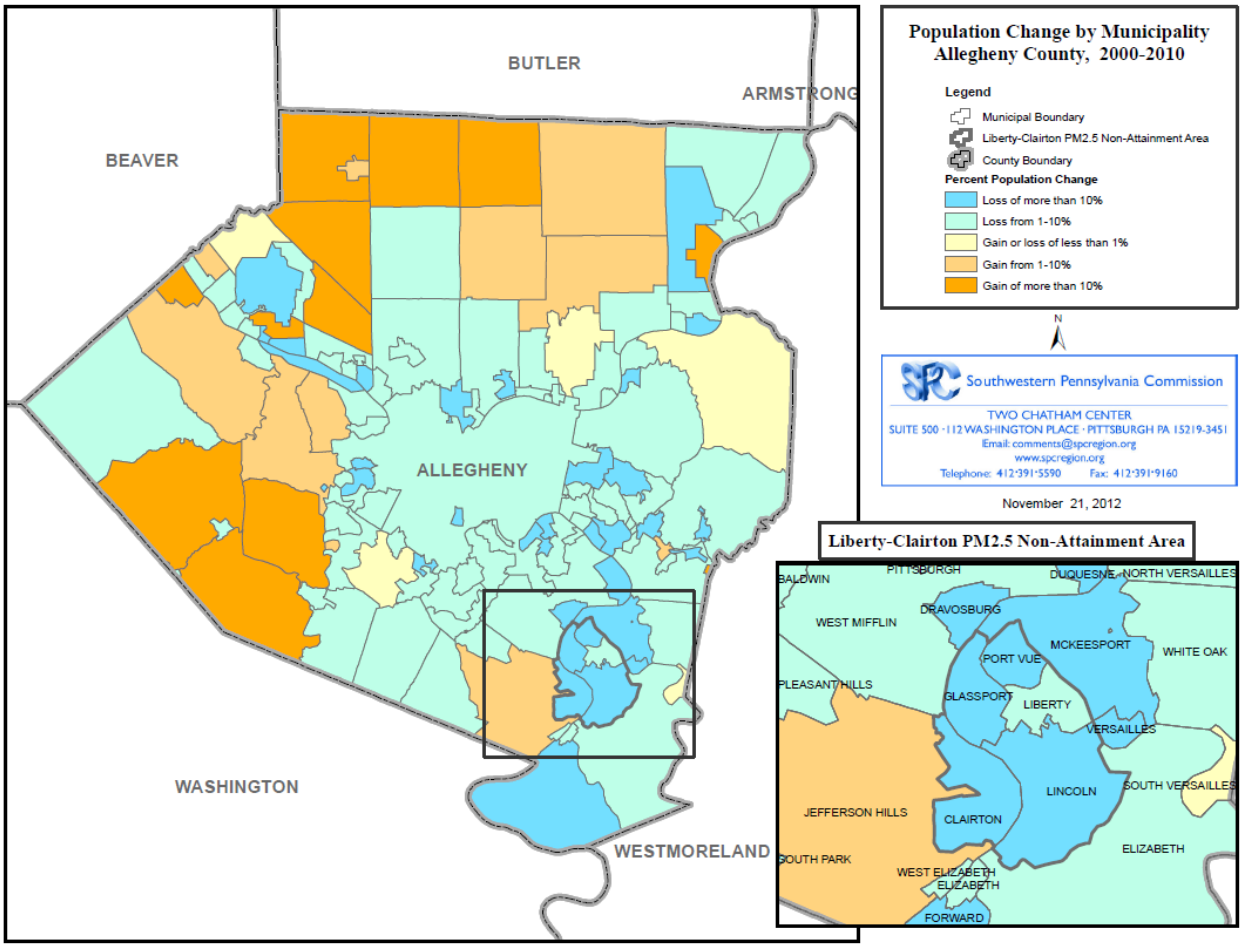
Total population shows similar results to population density, indicating the city of Pittsburgh as the most urbanized area.

The EPA TSD analysis showed population growth and population density in terms of a full-county, Allegheny County, area. While the information was accurate, this data was not broken down any further than the county level, and a trend in the Liberty-Clairton area was not discussed.

On July 25, 2014, DEP submitted a revision to the June 21, 2013, SIP submittal, which was a supplement to the attainment demonstration for the Liberty-Clairton $PM_{2.5}$ Nonattainment Area 2006 Standards. In Section 2.7 of the revision, it was pointed out that according to the U.S. Census Bureau, the five municipalities of the Liberty-Clairton area have decreased in population. From 2000 to 2010, the City of Clairton had a decrease in population of about 20%, the largest population decrease in the Liberty-Clairton nonattainment area. The other municipalities saw population decreases as follows: Borough of Glassport -10.2%; Liberty Borough -4.5%; Borough of Lincoln -12.0%, and Port Vue Borough -10.2%. In total, the nonattainment area had a decrease in population of 2,900 people, or a decrease of 13.4% from 2000 to 2010. Due to a reduction of population, it would signal a reduction of the use of cars,

school buses and other diesel-engine vehicles. Figure 2.8 shows the Allegheny County population trend from the July 25, 2014, submittal.

Figure 2.8. Population Trends - Liberty-Clairton Area and Allegheny County, 2000-2010



Source: Allegheny County Health Department's proposed SIP revision to the June 21, 2013 SIP, as submitted by DEP on July 25, 2014.

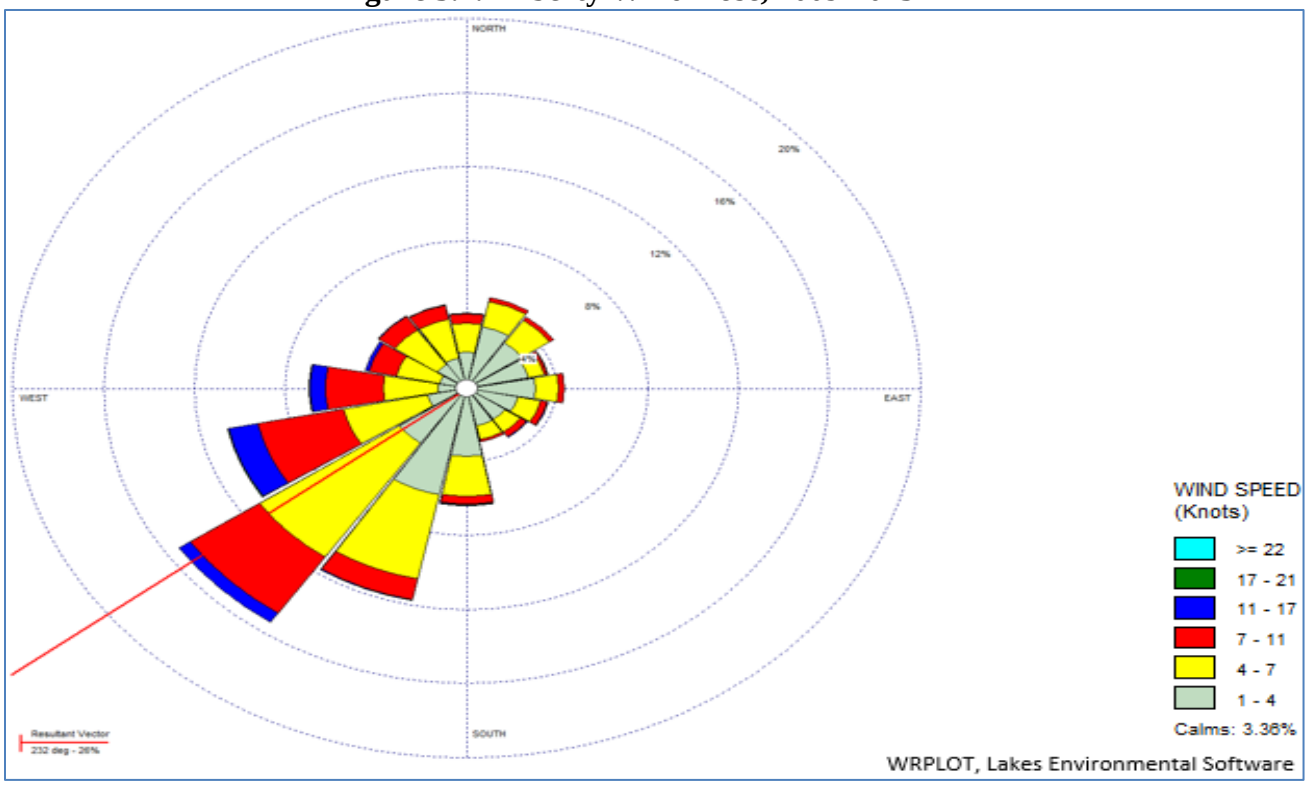
While EPA's TSD analysis for the 2006 24-hour and 2012 $PM_{2.5}$ annual standards both evaluated the Allegheny County population as a full-county, the analysis for the 2006 standard indicated that "because of the unique nature of the Liberty-Clairton area, with its local source and topography issues, this factor does not weigh heavily in this technical analysis." The EPA TSD analysis for the 2012 $PM_{2.5}$ annual standard did not include a similar statement, even though the factor of population was comparable and the local source and topography issues remained the same.

3. METEOROLOGY

3.1. Wind Rose Analysis

The EPA TSD analysis excluded local meteorological sites from the analysis, only looking at airport data. Figure 3.1 shows the Liberty wind rose for 2009-2013 which clearly demonstrates the preponderance of winds from the south through west, especially southwest, at the Liberty Borough site.

Figure 3.1. Liberty Wind Rose, 2009-2013



3.2. Temperature Inversions

The EPA TSD states on page 109 that for Allegheny County,

> EPA evaluated available meteorological data to determine how meteorological conditions, including but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis.

However, there is no evidence in EPA's assessment that stagnation conditions were directly evaluated. Inversion statistics for 2009-2013 are shown in Table 3.1.

Table 3.1. Total Days of Inversions: 2009-2013, Derived from PIT NWS Soundings*

Month	2009	2010	2011	2012	2013	2009-2013
JAN	7 (23)	5 (16)	5 (16)	9 (29)	8 (26)	34 (22)
FEB	8 (30)	8 (30)	10 (36)	10 (36)	6 (21)	42 (30)
MAR	12 (43)	17 (55)	7 (23)	11 (35)	6 (19)	53 (35)
APR	11 (37)	20 (67)	6 (20)	12 (40)	10 (33)	59 (39)
MAY	18 (64)	16 (52)	13 (43)	14 (45)	9 (29)	70 (46)
JUN	14 (61)	14 (47)	8 (28)	13 (43)	13 (43)	62 (44)
JUL	16 (52)	17 (55)	18 (60)	15 (48)	9 (29)	75 (49)
AUG	16 (52)	15 (48)	21 (68)	19 (61)	16 (53)	87 (56)
SEP	15 (50)	20 (67)	12 (40)	14 (47)	14 (47)	75 (50)
OCT	15 (48)	16 (52)	11 (35)	15 (48)	18 (60)	75 (49)
NOV	14 (47)	17 (57)	12 (40)	17 (57)	10 (33)	70 (47)
DEC	8 (26)	6 (19)	11 (35)	9 (29)	8 (27)	42 (27)
Annual	**154 (44)**	**171 (47)**	**134 (37)**	**158 (43)**	**127 (35)**	**744 (41)**

* For morning (12Z) surface inversions of at least 1.0 °C in strength (shallow isothermal and/or unstable conditions may also be present below or within ground inversion). Percent based on available days of data is given in parenthesis.

As indicated by this Pittsburgh National Weather Service (PIT NWS) data obtained from sounding balloons released at more than 1170 feet mean sea level (MSL), Allegheny County experiences frequent surface temperature inversions. Yet, in the numerous low-lying river valleys within the county, inversion frequency is likely greater than that observed at PIT NWS. So, couple the high frequency of surface inversions with light winds typical of overnight conditions, and atmospheric mixing is expected to be quite limited on about half or more of the mornings in the county. Additionally, since much of the county's large $PM_{2.5}$ emitters are located in valleys, high concentrations are expected from local sources during times with substantial temperature inversions and light winds.

3.3. Back Trajectories

As stated on page 5 of the EPA TSD analysis,

> Evaluating 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 the violations at monitoring sites. The factor 3 analysis includes assessing potential source-receptor relationships in the area identified for evaluation using summaries of air trajectories, wind speed, wind direction and other meteorological data as available.

In addition, a description of factor 3 on EPA's website regarding "Area Designations for the 2012 Annual Fine Particle ($PM_{2.5}$) Standard -- Designations Guidance and Data," states: "*A more sophisticated assessment involves modeling air parcel trajectories.*"[9]

[9] http://www.epa.gov/pmdesignations/2012standards/techinfo.htm#F3

Figures 3.2a – 3.2j provide a HYSPLIT model back-trajectory analysis with the top ten $PM_{2.5}$ concentration days for 2011-2013 at Liberty Borough. The trajectory end point is at Allegheny County Airport. Surface temperature inversion conditions as observed by the 12Z and 00Z Pittsburgh National Weather Service soundings for the max days are included. During each of the days, substantial inversions existed (indicative of poor dispersion conditions) in the morning (12Z) while most of the ten days also recorded small evening (00Z) inversions. Note that the ending time, 0500 UTC, is midnight for the indicated day.

Figure 3.2a. 24-hr $PM_{2.5}$ = 59.0 µg/m^3
(11/07/11 12Z Sfc. Inv. = 8.2°C, 251 m; 11/08/11 00Z Sfc. Inv. = 0.8°C, 77 m)

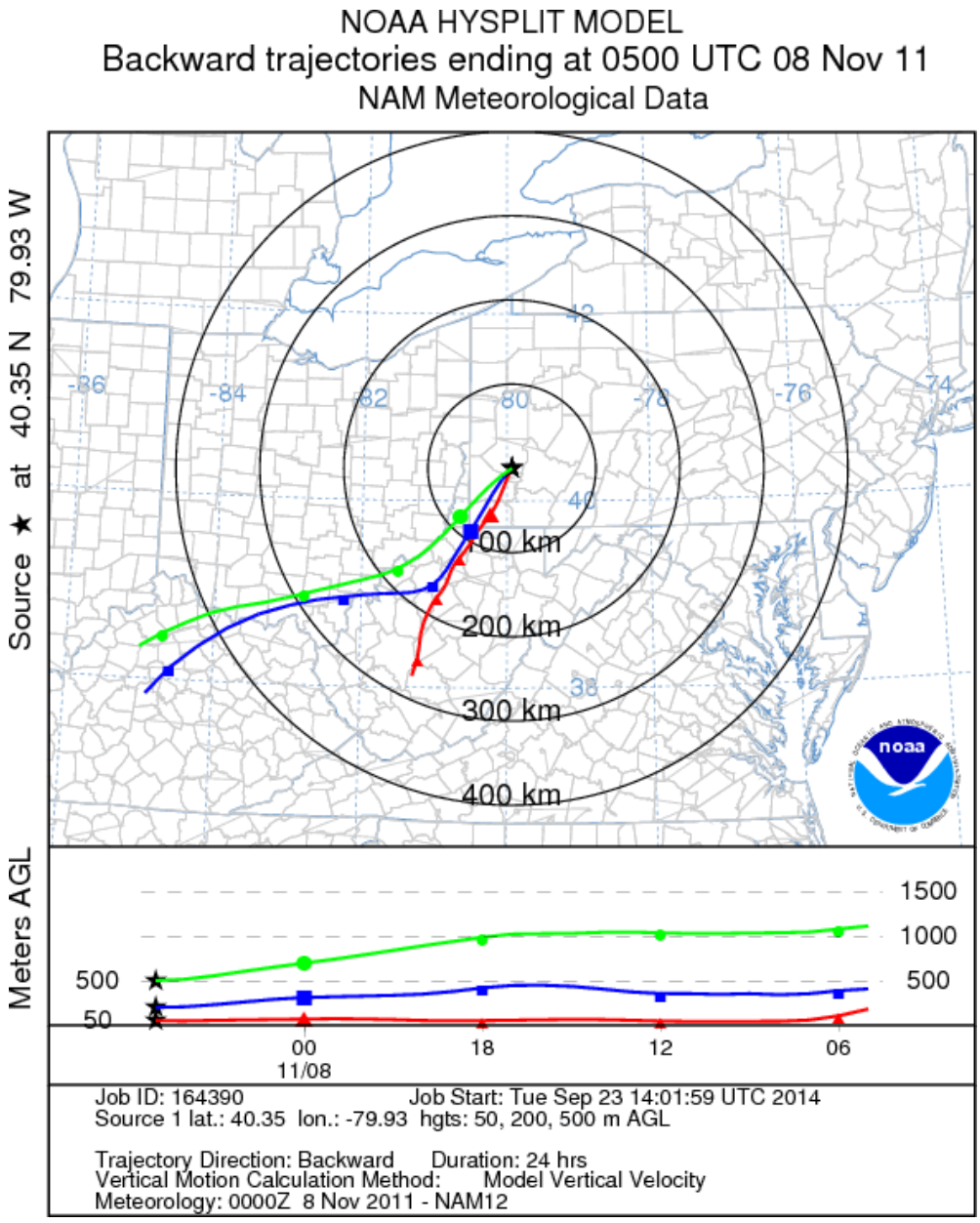


Figure 3.2b. 24-hr $PM_{2.5}$ = 57.0 µg/m^3
(12/13/11 12Z Sfc. Inv. = 5.9°C, 162 m; 12/14/11 00Z Sfc. Inv. = None)

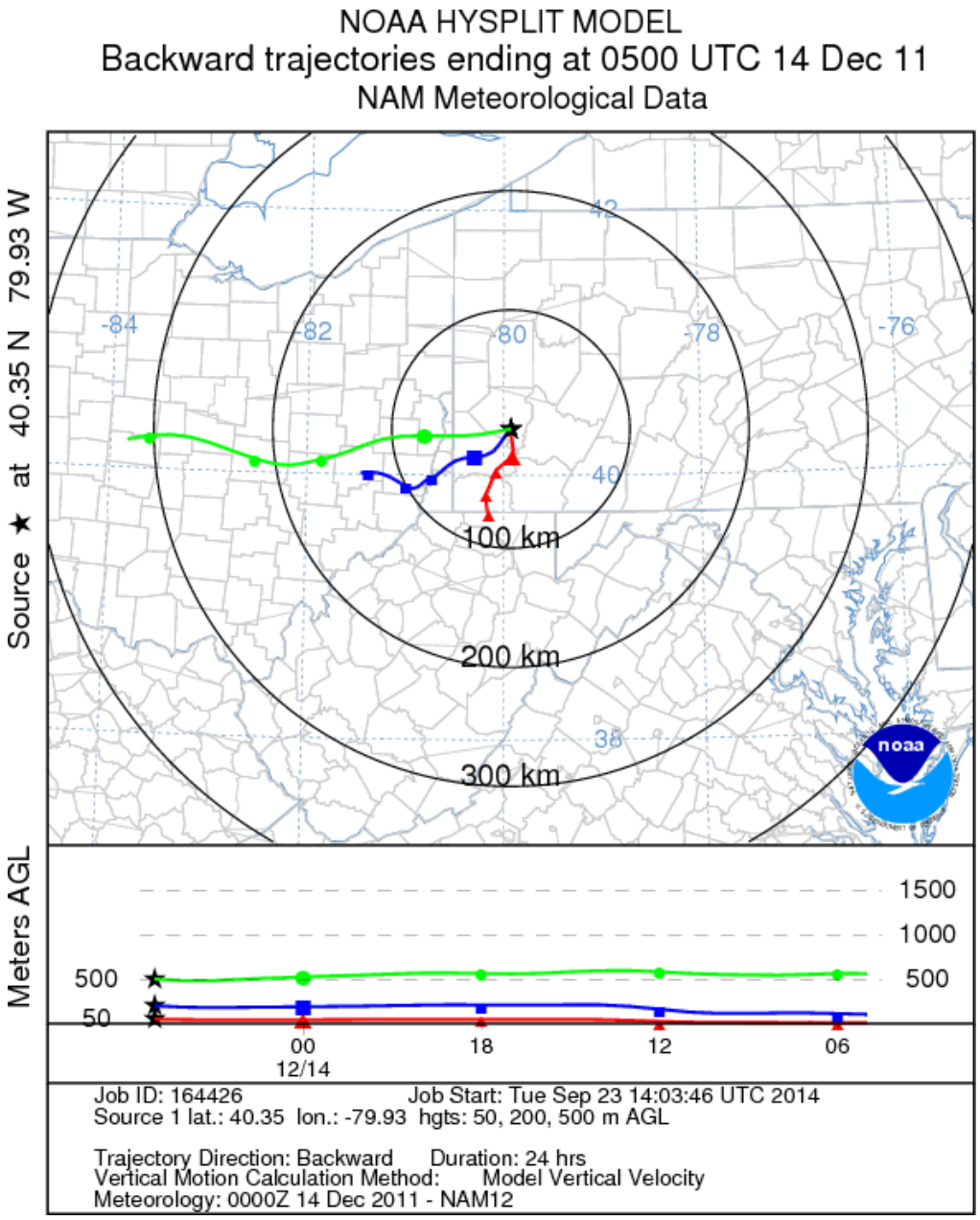


Figure 3.2c. 24-hr $PM_{2.5}$ = 54.7 µg/m^3
(11/22/12 12Z Sfc. Inv. = 10.9°C, 194 m; 11/23/12 00Z Sfc. Inv. = 1.0°C, 68 m)

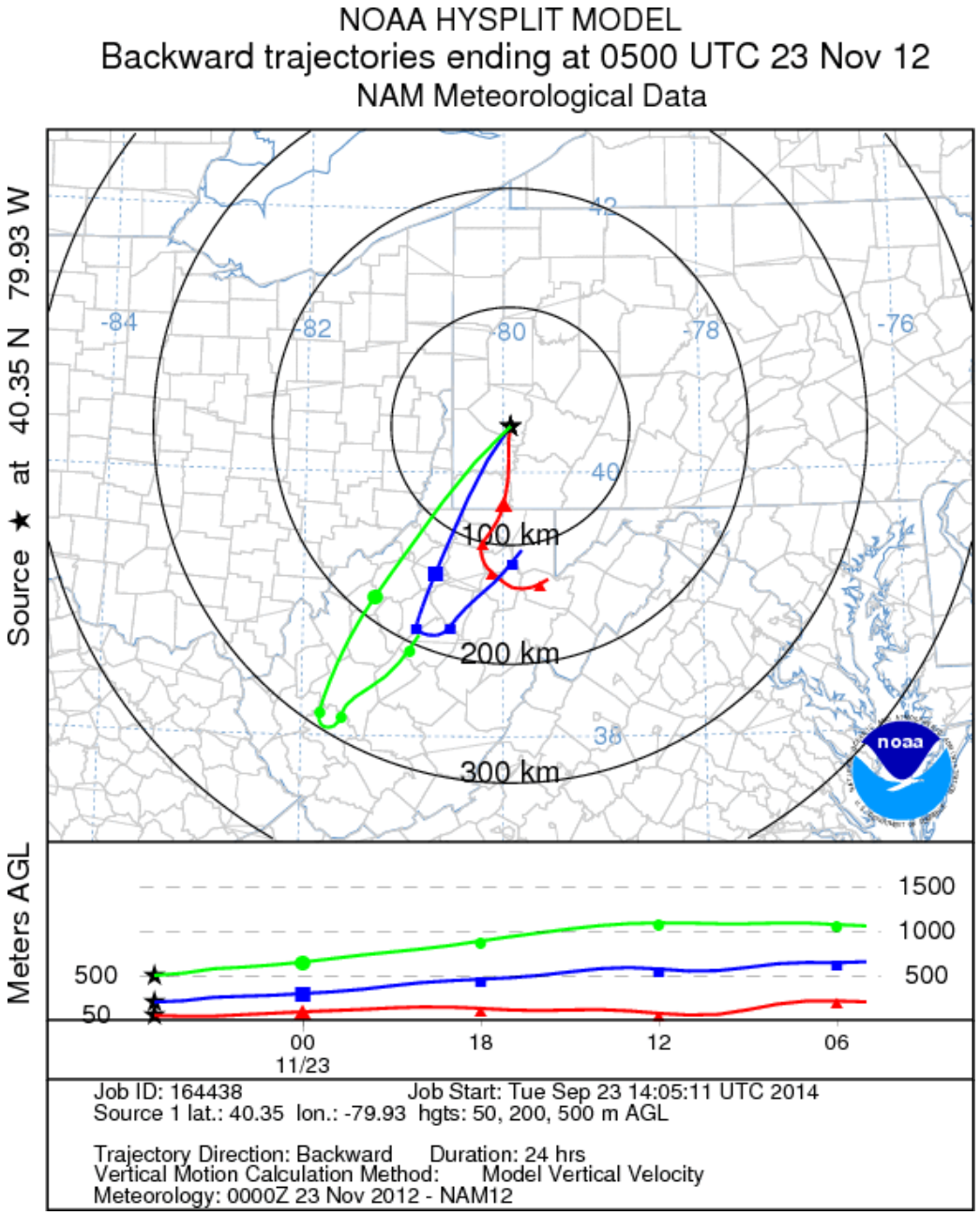


Figure 3.2d. 24-hr $PM_{2.5}$ = 54.3 µg/m^3
(03/11/12 12Z Sfc. Inv. = 7.6°C, 530 m; 03/12/12 00Z Sfc. Inv. = None)

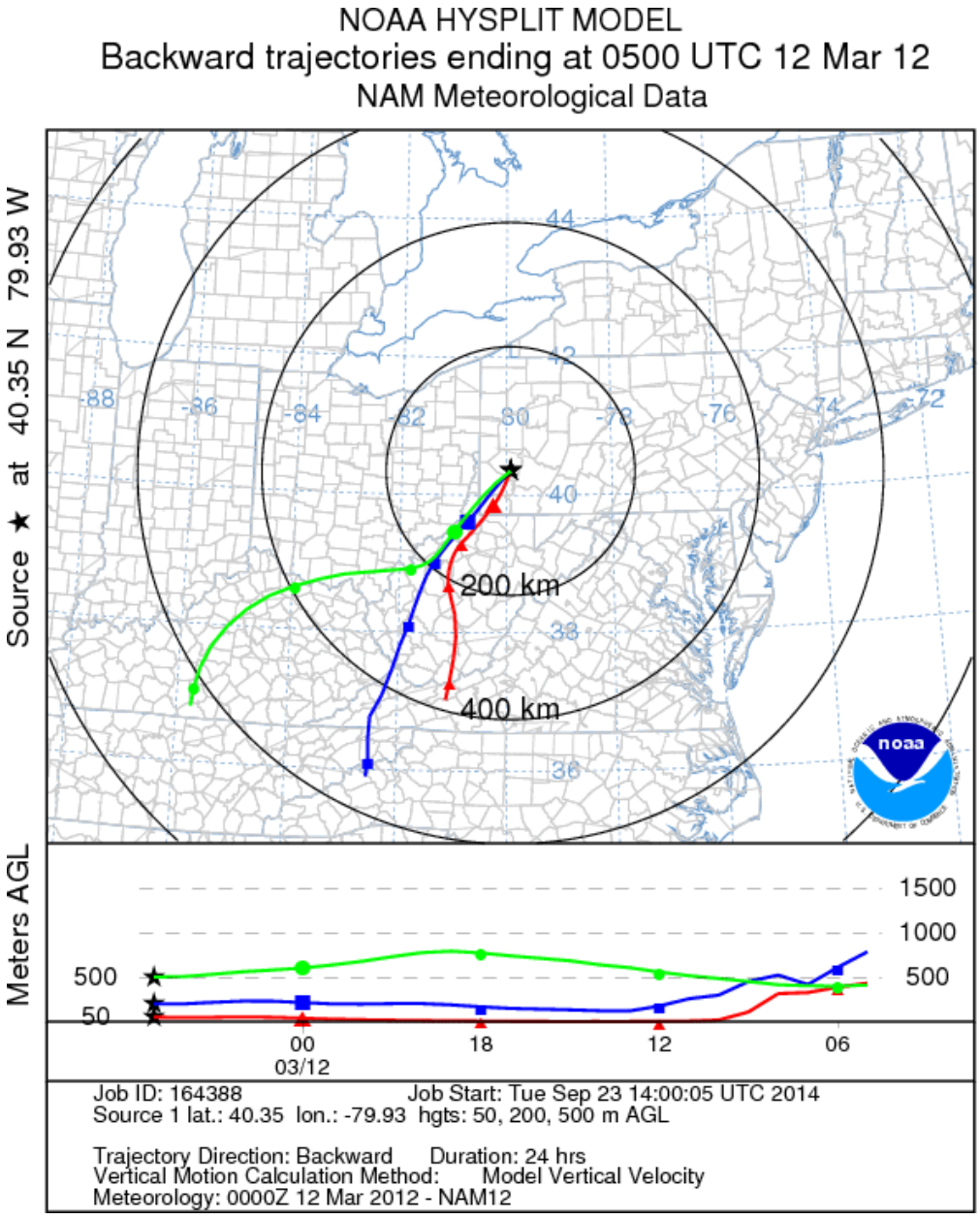


Figure 3.2e. 24-hr $PM_{2.5}$ = 48.9 µg/m^3
(12/14/12 12Z Sfc. Inv. = 6.1°C, 388 m; 12/15/12 00Z Sfc. Inv. = 1.8°C, 82 m)

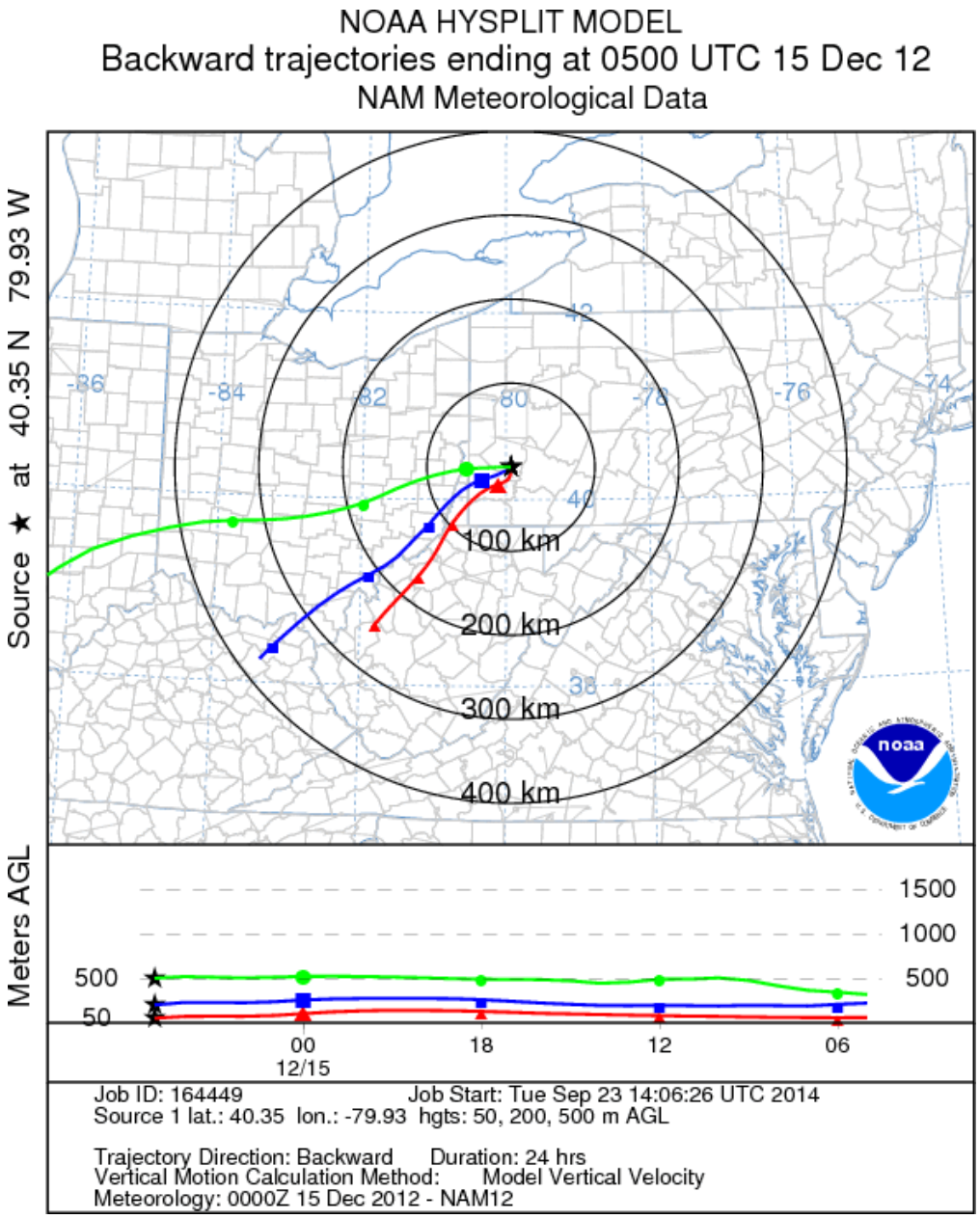


Figure 3.2f. 24-hr $PM_{2.5}$ = 48.6 µg/m^3
(03/15/12 12Z Sfc. Inv. = 5.4°C, 222 m; 03/16/12 00Z Sfc. Inv. = None)

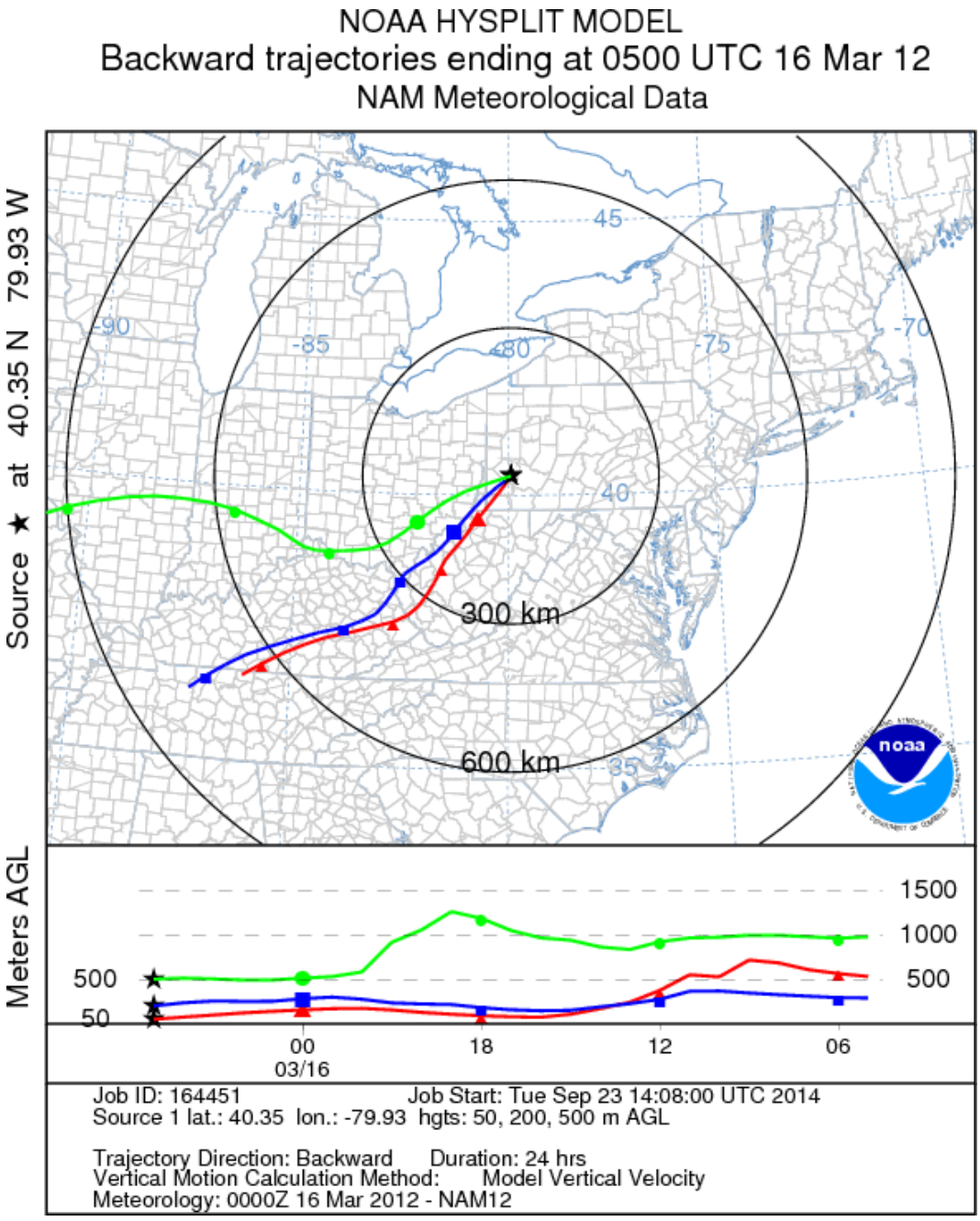


Figure 3.2g. 24-hr $PM_{2.5}$ = 48.1 µg/m^3
(11/26/11 12Z Sfc. Inv. = 1.4°C, 195 m; 11/27/11 00Z Sfc. Inv. = 0.4°C, 189 m)

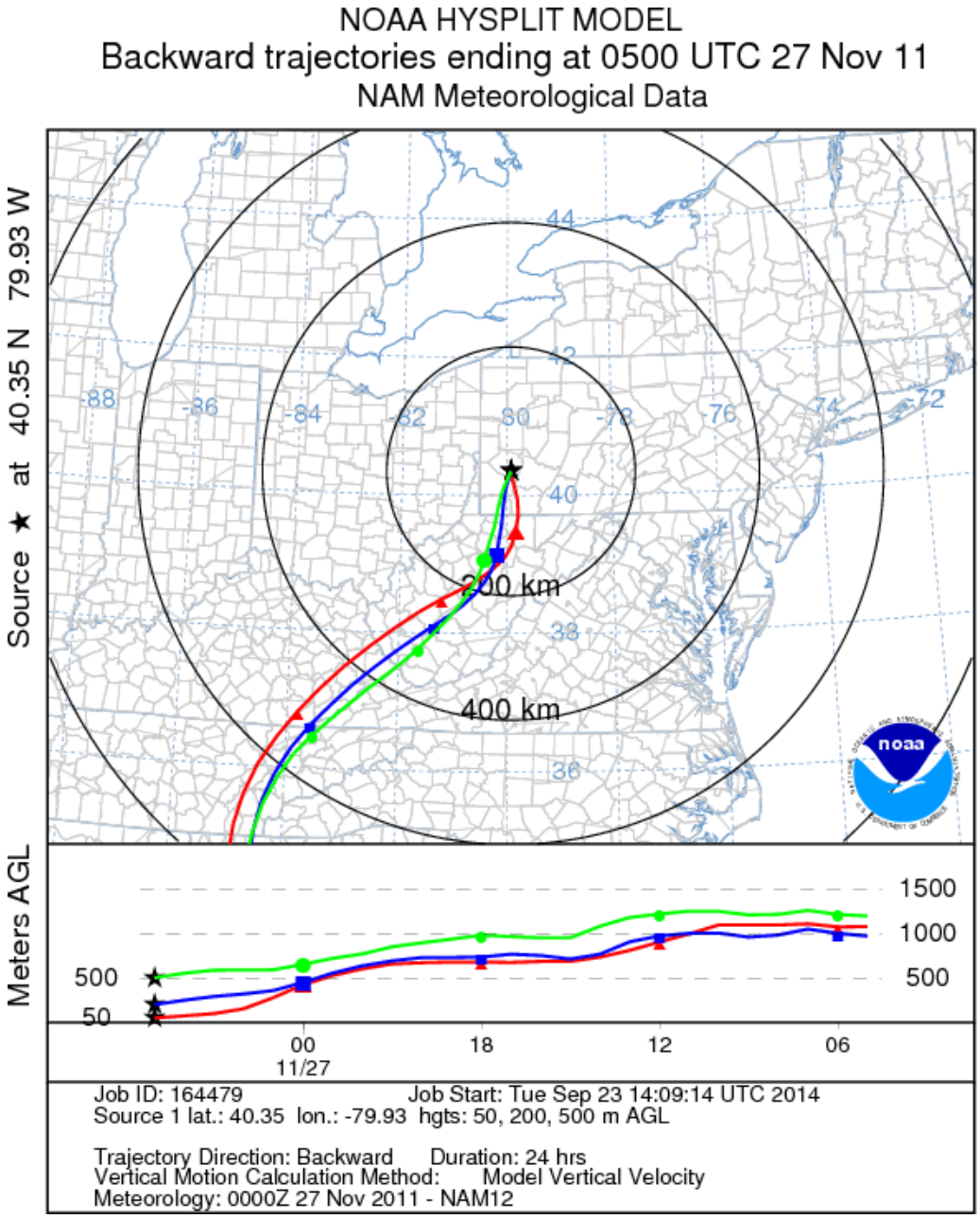


Figure 3.2h. 24-hr $PM_{2.5}$ = 47.1 µg/m^3
(11/29/12 12Z Sfc. Inv. = 2.3°C, 121 m; 11/30/12 00Z Sfc. Inv. = 0.2°C, 116 m)

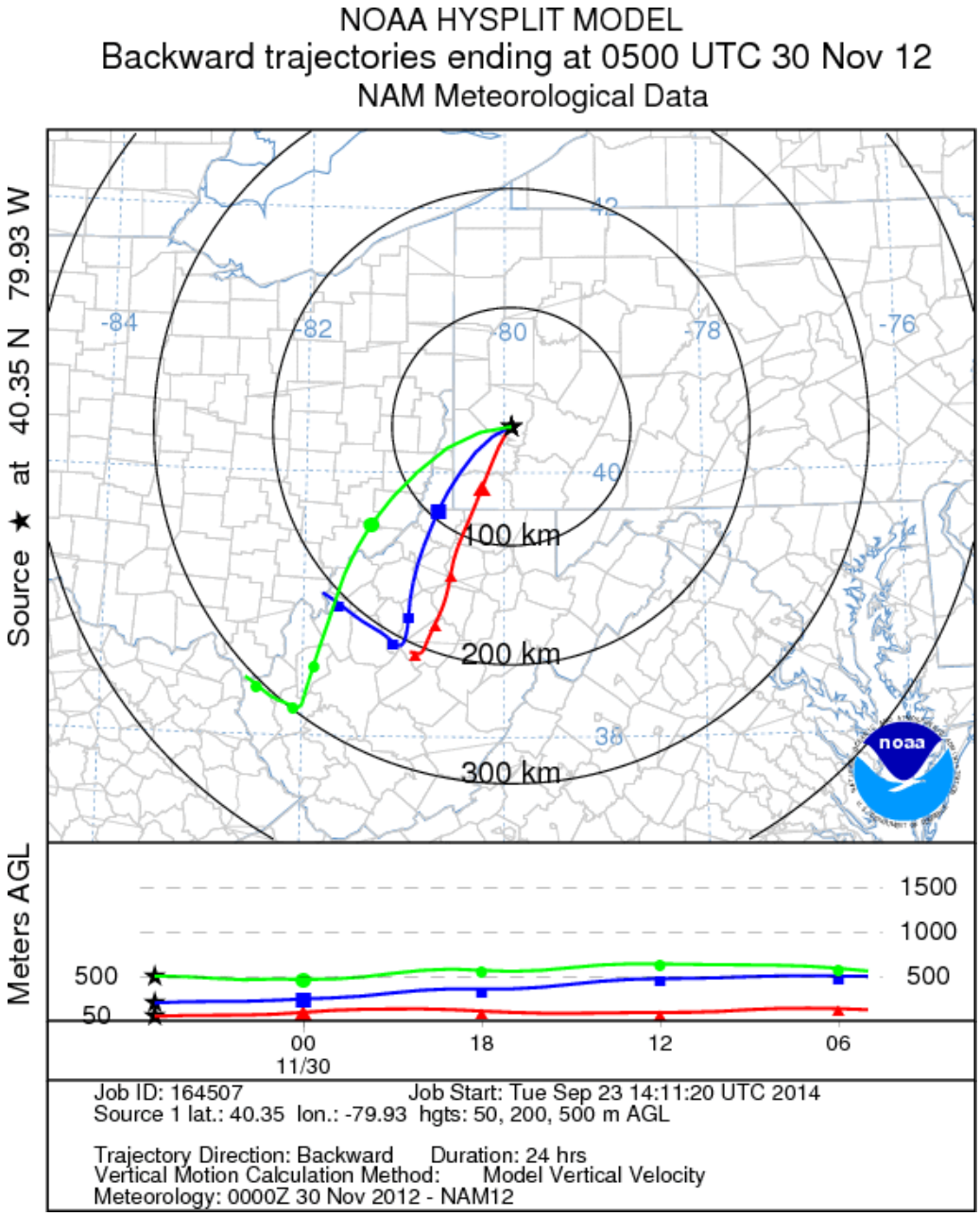


Figure 3.2i. 24-hr $PM_{2.5}$ = 46.7 µg/m^3
(12/12/11 12Z Sfc. Inv. = 8.5°C, 195 m; 12/13/11 00Z Sfc. Inv. = 0.6°C, 64 m)

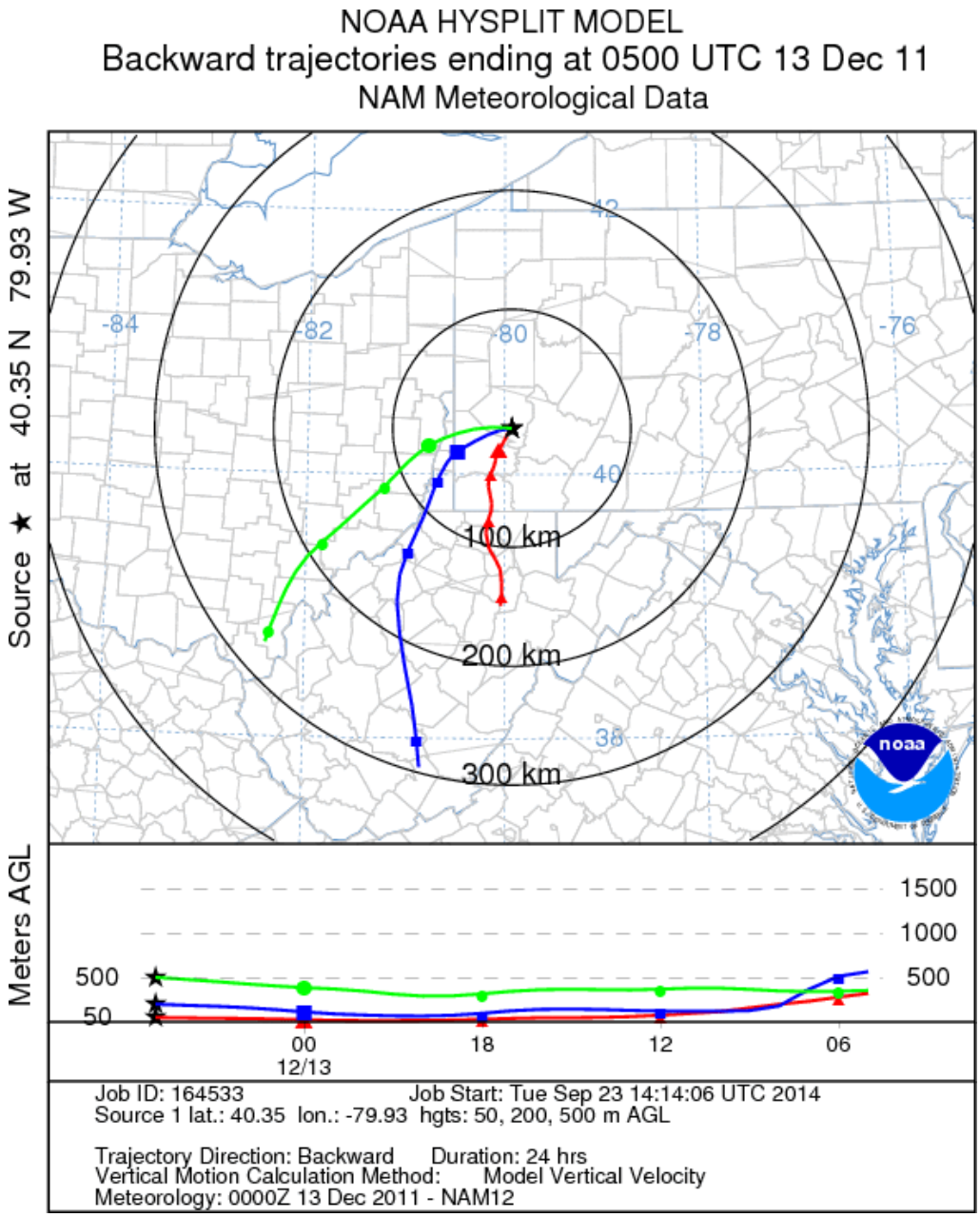
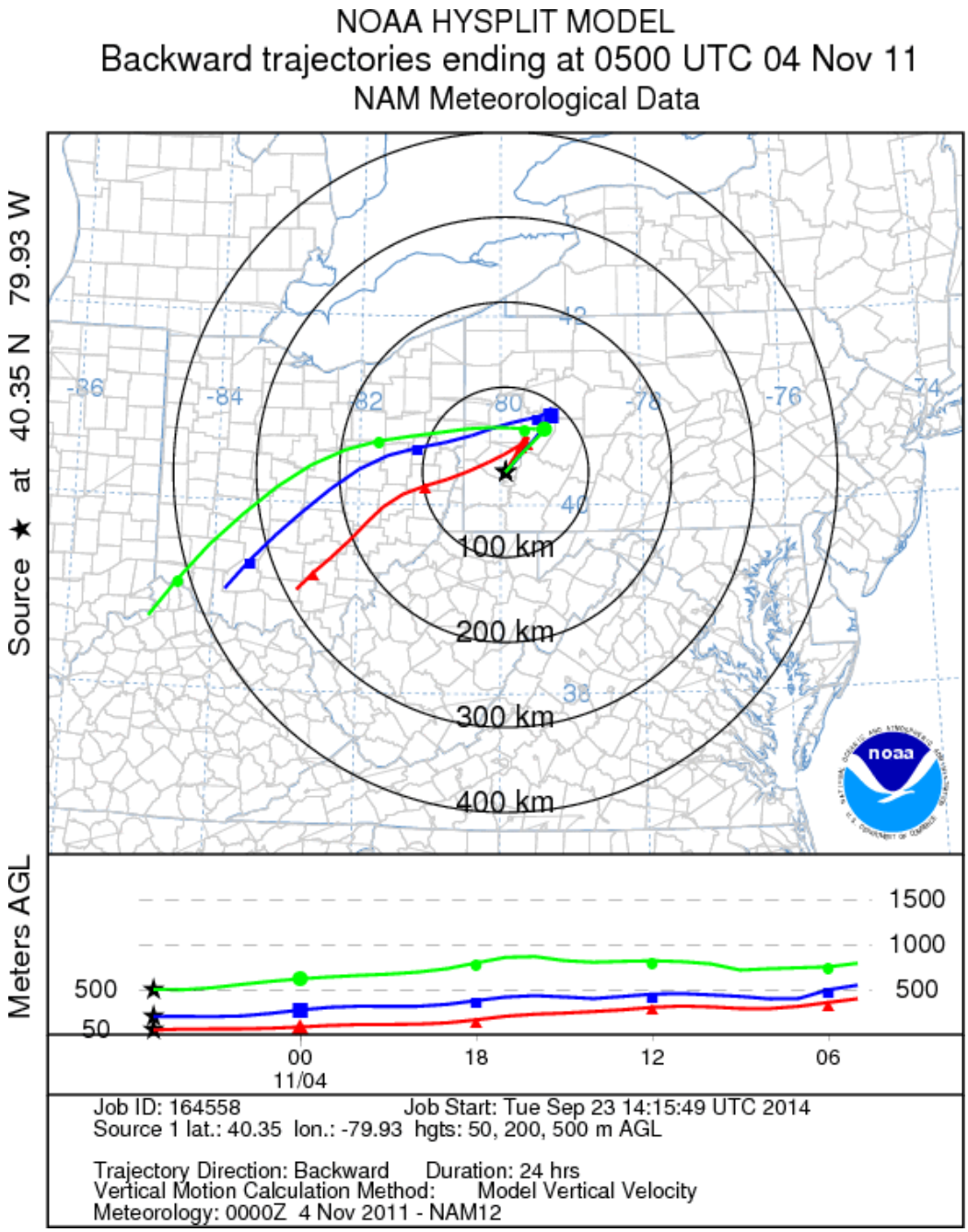


Figure 3.2j. 24-hr $PM_{2.5}$ = 44.8 µg/m^3
(11/03/11 12Z Sfc. Inv. = 3.8°C, 411 m; 11/04/11 00Z Sfc. Inv. = 0.4°C, 157 m)



Furthermore, ENVIRON International, the $PM_{2.5}$ modeling contractor for ACHD, performed extensive sophisticated air modeling for the June 2013 SIP revision that supports the claim that only locales in and around the Liberty Borough monitoring site should be included in the nonattainment area (see modeling analysis provided with June 2013 SIP).

3.4. Additional Information on Meteorology in Allegheny County

Meteorology is complex throughout all of Allegheny County. Wind roses can show very different results at sites only a few kilometers from one another and temperature inversions play a key role to elevated $PM_{2.5}$ levels at Liberty. The strongest wind rose signals measured near the Liberty monitor indicate that the winds are primarily from the southwest. DEP's analysis included in the designation recommendations showed that on the high days of $PM_{2.5}$, that the wind signal comes from the southwest, with a lack of northwesterly winds from the city of Pittsburgh. The EPA TSD analysis included HYSPLIT data that is also weighted heavily in the southwesterly direction.

The EPA TSD analysis for Allegheny County appears to give contradictory information relating to emissions transport and meteorology. On the bottom of page 110, EPA talks about how terrain limits the transport of emissions, while earlier on the same page EPA claims that "northwesterly component [of the wind as indicated by the AGC sensor] indicates that the highly urbanized Pittsburgh area" contributes to $PM_{2.5}$ concentrations at the Liberty monitor. The EPA TSD analysis used complex terrain to exclude sources with stack emissions in Washington County, yet did not use complex terrain to exclude ground-level emissions from Pittsburgh (which is further away from the Liberty monitor) in an attempt to link urban emissions to the Liberty monitor. In addition, figures 2d through 2g, 3c and 3d argue against large contributions from the direction of Pittsburgh. On page 112, EPA observes that "wind direction on the high $PM_{2.5}$ days at the Liberty monitor is almost completely from the southwest."

4. GEOGRAPHY/TOPOGRAPHY

4.1. Topography

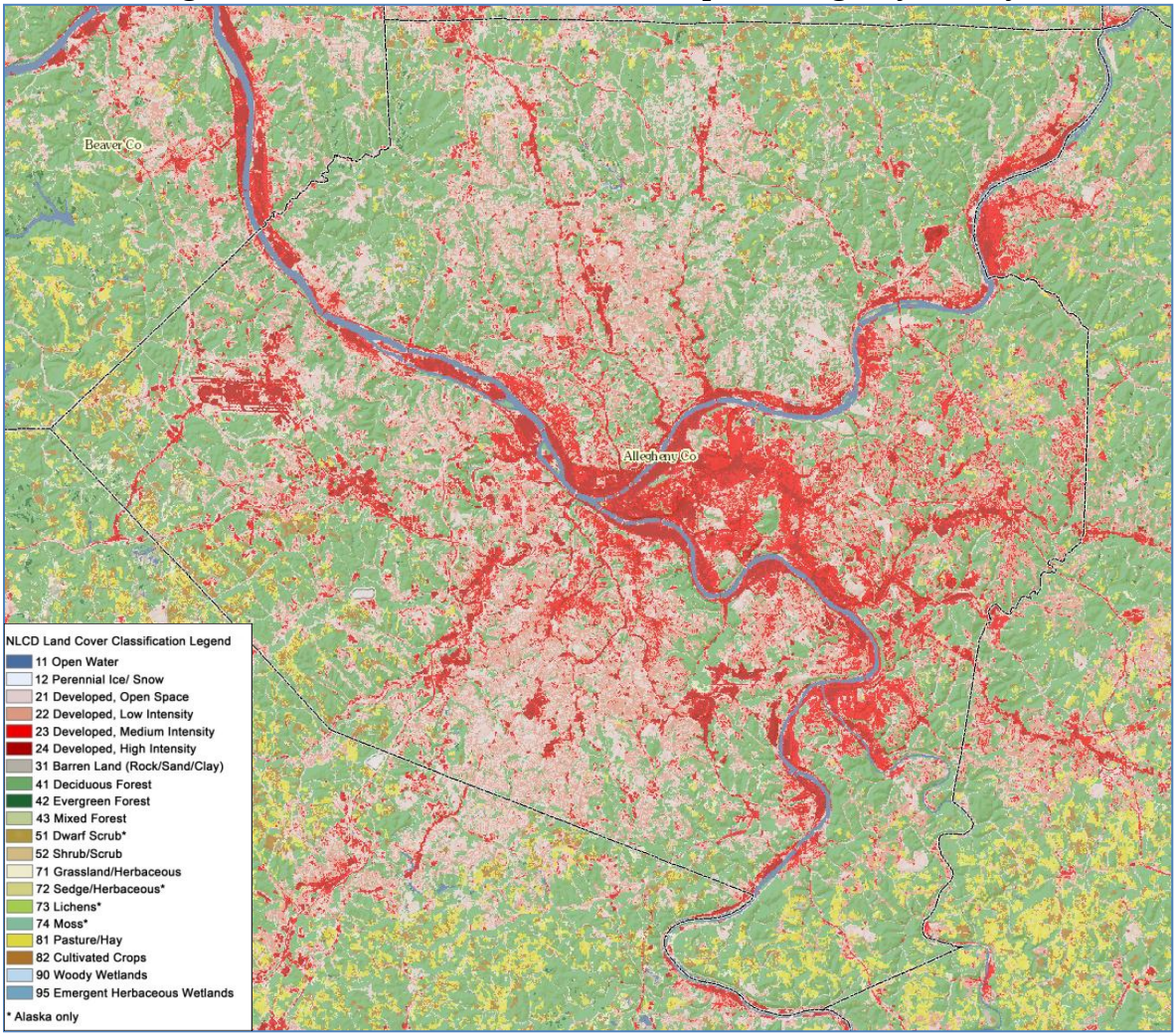
Figure 4.1 shows a shaded relief map from the U.S. Geological Survey (USGS) with elevation contours for Allegheny County.

Figure 4.1. USGS Relief and Contour Map for Allegheny County

Topographical analysis reveals complex terrain throughout Allegheny County, which can act as natural barriers for low-level $PM_{2.5}$ emissions. Direct $PM_{2.5}$ from low level sources in river valleys have been the cause of localized exceedances at the Liberty monitor, as the terrain forms a "bowl" that traps pollutants during poor dispersion conditions. Taller stacks from sources, such as power plants, contribute to Allegheny County on a regional scale for secondary $PM_{2.5}$. Emissions from area sources and mobile source emissions affect the county only in large volumes (i.e., closest to the City of Pittsburgh).

Figure 4.2 shows the National Land Cover Database's (NLCD) land cover classifications map for Allegheny County in 2011.

Figure 4.2. NLCD 2011 Land Cover Map for Allegheny County



Land use analysis shows that the most concentrated areas of developed high-intensity classification are nearest the City of Pittsburgh. Classifications of medium to high intensity in river valleys are mostly representative of industrial areas.

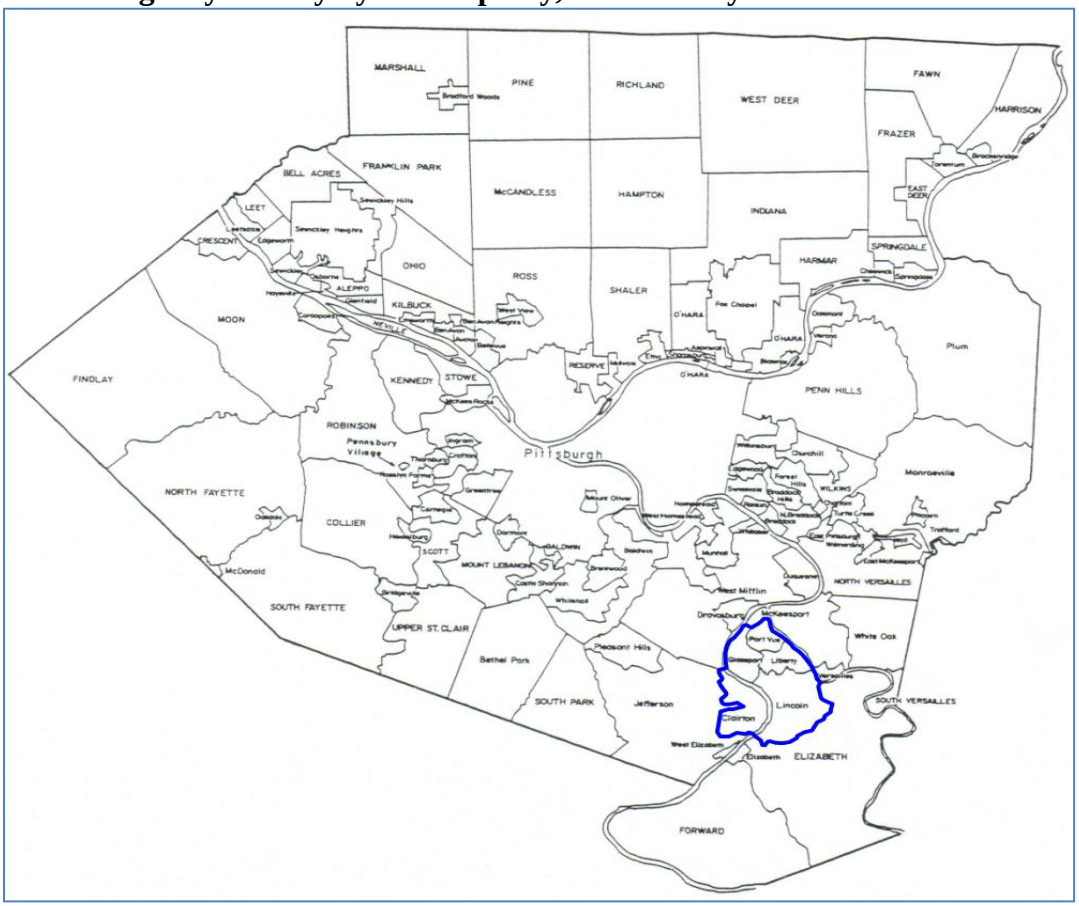
5. JURISDICTIONAL BOUNDARIES

While DEP is responsible for overseeing air quality throughout the Commonwealth, ACHD is authorized by DEP to administer and enforce the local air quality management program in Allegheny County.

In EPA's TSD analysis on page 118, it was indicated that based on a review of jurisdictional boundaries, "the same locally focused planning will bring the area into attainment for the 2012 annual $PM_{2.5}$ NAAQS." DEP agrees. Maintaining the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS boundaries will allow for the continuity of planning. This preservation of the continuity of planning allows for DEP and ACHD to continue their strong working relationship in the partial county, Liberty-Clairton area to achieve and maintain the 1997, 2006 and 2012 $PM_{2.5}$ NAAQS. A partial county designation for the Liberty-Clairton should be applicable and appropriate for the consistent implementation of the standards.

The DEP proposes the same partial county designation within Allegheny County, the Liberty-Clairton nonattainment area, as seen in Figure 5.1. This five-municipal area was previously designated as nonattainment for PM_{10} and $PM_{2.5}$, as explained in the background section.

Figure 5-1. Allegheny County by Municipality, with Liberty-Clairton Nonattainment Area



CONCLUSION

After considering the facts as described above, DEP, in coordination with ACHD, is recommending the reduction of EPA's proposed Allegheny County nonattainment area to a partial county Liberty-Clairton Area, consisting of the City of Clairton, Borough of Glassport, Liberty Borough, Borough of Lincoln and Port Vue Borough. This approach is consistent with existing nonattainment boundaries for the 1997 and 2006 $PM_{2.5}$ NAAQS. The analysis supports the conclusion that the size of the 2012 annual $PM_{2.5}$ nonattainment area should be reduced from EPA's proposed designation of Allegheny County, to a partial county designation for the Liberty-Clairton Area. The remainder of Allegheny County should be designated as attainment for the 2012 $PM_{2.5}$ NAAQS.