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# **Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan**

**Attainment Demonstration for the  
Allegheny County, PA PM<sub>2.5</sub>  
Nonattainment Area, 2012 NAAQS**

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**Allegheny County Health Department  
Air Quality Program**

**September 12, 2019**

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## ACRONYMS AND ABBREVIATIONS

ACHD	Allegheny County Health Department
AEO	Annual Energy Outlook
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AERR	Air Emissions Reporting Requirements
AGC	Allegheny County Airport (KAGC)
ARP	Acid Rain Program
AQS	EPA Air Quality System
BART	Best Available Retrofit Technology
BACT	Best Available Control Technology
BEIS	Biogenic Emission Inventory System
BFG	Blast Furnace Gas
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CAMD	Clean Air Markets Division
CAMx	Comprehensive Air quality Model with extensions
CEMS	Continuous Emission Monitoring System
CENSARA	Central States Air Resource Agencies Association
CO	Carbon Monoxide
Cond	Condensable fraction of PM <sub>2.5</sub>
CONUS	Continental United States
COG	Coke Oven Gas
CFR	Code of Federal Regulations
CPP	Clean Power Plan
CSAPR	Cross-State Air Pollution Rule
CSN	Chemical Speciation Network
d01	WRF/CAMx 36 km modeling domain for the continental U.S. (CONUS)
d02	WRF/CAMx 12 km modeling domain for the northeastern U.S. (NEUS)
d03	WRF/CAMx 4 km modeling domain for Pennsylvania (PA)
d04	WRF/CAMx 1.33 km modeling domain for Allegheny County
d05	WRF 0.444 km modeling domain for the Monongahela Valley
DON	Degree of Neutralization (of sulfate)
DSI	Dry Sorbent Injection
EC	Elemental Carbon
EGU	Electric Generating Unit
EIA	Energy Information Administration
EPA	United States Environmental Protection Agency
ERC	Emission Reduction Credit
ERTAC	Eastern Regional Technical Advisory Committee
ESP	Electrostatic Precipitator
EST	Eastern Standard Time
FEM	Federal Equivalent Method
FGD	Flue Gas Desulfurization
FGR	Flue Gas Recirculation

Filt	Filterable fraction of PM <sub>2.5</sub>
FMVCP	Federal Motor Vehicle Control Program
FR	Federal Register
FRM	Federal Reference Method
H <sub>2</sub> S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
HEPA	High Efficiency Particulate Air
I/M	Inspection and Maintenance
IP	Installation Permit
IPM	Integrated Planning Model
LAA	Local Area Analysis
LADCO	Lake Michigan Air Directors Consortium
LEQT	Low-Emission Quench Tower
LNB	Low-NO <sub>x</sub> Burner
LPM	Local Primary Material
MACT	Maximum Achievable Control Technology
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MARAMA	Mid-Atlantic Regional Air Management Association, Inc.
MATS	Modeled Attainment Test Software or Mercury Air Toxics Standards
MMIF	Mesoscale Meteorological Interface Program
MOVES	Motor Vehicle Emission Simulator model
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MVEB	Motor Vehicle Emissions Budget
MW	Megawatt
µg/m <sup>3</sup>	Microgram per cubic meter
µm	Micrometer, or micron
MP	Modeling Platform
NAAQS	National Ambient Air Quality Standard
NAA	Nonattainment Area
NAICS	North American Industry Classification System
NEI	National Emission Inventory
NEUS	Northeastern United States
NG	Natural Gas
NH <sub>3</sub>	Ammonia
NH <sub>4</sub>	Ammonium Ion
NO <sub>3</sub>	Nitrate Ion
NO <sub>x</sub>	Oxides of Nitrogen (generally NO or NO <sub>2</sub> )
NNSR	Nonattainment New Source Review
NSR	New Source Review
OC	Organic Carbon
OCMmb	Organic Carbonaceous Mass by Mass Balance
OFA	Overfire Air
OH	Ohio
OP	Operating Permit
OTC	Ozone Transport Commission

OWB	Outdoor Wood-Fired Boiler
PA	Pennsylvania
PA DEP	Pennsylvania Department of Environmental Protection
PBW	Particle Bound Water
PEC	Pushing Emission Control
PennDot	Pennsylvania Department of Transportation
PGM	Photochemical Grid Model
PiG	Plume-in-Grid model
PIT	Pittsburgh International Airport (KPIT)
PM	Particulate Matter (airborne) of any size
PM <sub>2.5</sub>	PM less than or equal to a nominal 2.5 microns in aerodynamic diameter, also referred to as fine particulates
PM <sub>10</sub>	PM less than or equal to a nominal 10 microns in aerodynamic diameter
PMF	Positive Matrix Factorization model
PSAT	Particulate Source Apportionment Technology
PTE	Potential-to-Emit (emissions)
RACM	Reasonably Available Control Measure
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
RPO	Regional Pennsylvania Organization
RRF	Relative Response Factor
SANDWICH	Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous Material Balance Approach
SCC	Source Classification Code
SCR	Selective Catalytic Reduction
SESARM	Southeastern Air Pollution Control Agencies
SIP	State Implementation Plan
SMAT-CE	Software for the Modeled Attainment Test – Community Edition
SMOKE	Sparse Matrix Operator Kernel Emissions System
SO <sub>2</sub>	Sulfur Dioxide
SO <sub>4</sub>	Sulfate Ion
SPAQP	Southwest Pennsylvania Air Quality Partnership
SPC	Southwestern Planning Commission
TPY	Tons per Year (or Tons/Year) of pollutant emissions
TSD	Technical Support Document
ULNB	Ultra-Low NO <sub>x</sub> Burner
UPMC	University of Pittsburgh Medical Center
USGS	United States Geological Survey
USS	United States Steel Corporation
VMT	Vehicle Miles Traveled
VE	Visible Emissions
VOC	Volatile Organic Compound
WOE	Weight of Evidence
WRF	Weather Research and Forecasting model
WV	West Virginia

# 1 Executive Summary

Particulate matter is a mixture of microscopic solids and liquid droplets suspended in air that includes: inorganic salts (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mold spores). Fine particle pollution or PM<sub>2.5</sub> describes particulate matter that is less than or equal to 2.5 micrometer (µm, or micron) in diameter, approximately 1/30<sup>th</sup> the diameter of a human hair.

Health studies have shown a significant association between exposure to fine particles and premature death from heart or lung disease. Fine particles can aggravate heart and lung diseases and have been linked to effects such as cardiovascular symptoms, cardiac arrhythmias, heart attacks, respiratory symptoms, asthma attacks, and bronchitis. These effects can result in increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days. Individuals that may be particularly sensitive to fine particle exposure include people with heart or lung disease, older adults, and children.

In 1997, the United States Environmental Protection Agency (EPA) promulgated PM<sub>2.5</sub> National Ambient Air Quality Standards (NAAQS) of 15.0 µg/m<sup>3</sup> on an annual basis and 65 µg/m<sup>3</sup> on a 24-hour basis. The annual standard is based on a long-term average of concentrations, while the 24-hour standard is based on 98<sup>th</sup>-percentile values of maximum daily concentrations.<sup>1</sup> On December 18, 2006, a revised 24-hour PM<sub>2.5</sub> NAAQS became effective.

Most of the Pittsburgh Metropolitan Statistical Area (MSA) was designated as a multi-county nonattainment area called the Pittsburgh-Beaver Valley area for both the 1997 and 2006 NAAQS. A portion of southeastern Allegheny County, the Liberty-Clairton area, was designated as a separate nonattainment area within the larger Pittsburgh-Beaver Valley area for both NAAQS. Liberty monitored data and other designation factors indicated that a more focused strategy for emission control was required for this particular area. Determinations of attainment suspended several State Implementation Plan (SIP) requirements for these areas for the 1997 and 2006 NAAQS.<sup>2</sup>

EPA set forth a revised annual PM<sub>2.5</sub> NAAQS on December 14, 2012. The revised standard lowered the previous 15.0 µg/m<sup>3</sup> annual standard to 12.0 µg/m<sup>3</sup>. On April 15, 2015, EPA designated all of Allegheny County (named the “Allegheny County, PA” area) as a PM<sub>2.5</sub> moderate nonattainment area for the 2012 NAAQS, based on 2011-2013 monitored data.

This present SIP developed by the Allegheny County Health Department (ACHD) demonstrates that, by December 31, 2021, all of Allegheny County will be in attainment of the 2012 PM<sub>2.5</sub> NAAQS for both the annual and 24-hours standards. While the entire county was designated as nonattainment, the Liberty area continued to be the “worst case” part of the county. Based on 2011-2013 monitored data, PM<sub>2.5</sub> design values for Liberty were 13.4 µg/m<sup>3</sup> on an annual basis and 37 µg/m<sup>3</sup> on a 24-hour basis. Air quality modeling for this SIP shows attainment of the 12.0

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<sup>1</sup> EPA NAAQS table: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

<sup>2</sup> Status of U.S. designated areas: [https://www3.epa.gov/airquality/urbanair/sipstatus/reports/map\\_s.html](https://www3.epa.gov/airquality/urbanair/sipstatus/reports/map_s.html)

$\mu\text{g}/\text{m}^3$  and  $35 \mu\text{g}/\text{m}^3$  standards at Liberty as well as all other sites in Allegheny County for future case year 2021.

The principal control measures that enable Allegheny County to demonstrate attainment of the  $\text{PM}_{2.5}$  NAAQS include upgrades/modifications and permanent shutdowns of local major industrial sources within the county. Additional regional controls such as federal and state rules were incorporated into the Mid-Atlantic Regional Air Management Association, Inc (MARAMA) emissions inventories that were used for the demonstration.

The modeled attainment demonstration was performed using the Comprehensive Air quality Model with extensions (CAMx) for regional primary and secondary impacts along with the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) for local primary  $\text{PM}_{2.5}$  impacts in the Liberty area. Procedures for modeling and attainment tests were followed according to EPA guidance documents and ACHD modeling protocols. Modeled results from a base year (baseline) case 2011 to a projected (attainment) future year case 2021 were used to scale actual monitored species concentrations over a weighted 2009-2013 timeframe.

Results from the attainment demonstration showed an overall reduction of primary and secondary  $\text{PM}_{2.5}$  species concentrations throughout Allegheny County. Future projected design values for the Liberty site, the location of the maximum  $\text{PM}_{2.5}$  annual and 24-hour concentrations in Allegheny County, are given below:

Projected Annual Design Value by 2021 (NAAQS =  $12.0 \mu\text{g}/\text{m}^3$ )  
Liberty =  $12.0 \mu\text{g}/\text{m}^3$

Projected 24-Hour Design Value by 2021 (NAAQS =  $35 \mu\text{g}/\text{m}^3$ )  
Liberty =  $35 \mu\text{g}/\text{m}^3$

Other controls affecting Allegheny County that have not been used as part of the modeled demonstration of attainment have been included as “weight of evidence,” supporting the case that the county will achieve emission reductions by the attainment date.

This SIP contains several additional elements required by the Clean Air Act (CAA) for  $\text{PM}_{2.5}$  nonattainment areas.<sup>3</sup> In particular, CAA Title I, Part D Subpart 1 addresses nonattainment area requirements in general, while Subpart 4 contains additional provisions for  $\text{PM}_{2.5}$  nonattainment areas. Conformance to these CAA requirements and the EPA  $\text{PM}_{2.5}$  Implementation Rule<sup>4</sup> is addressed within this SIP, summarized as follows:

- Reasonably Available Control Measures (RACM) and Technology (RACT) analysis shows that no additional controls would advance the attainment date by one year.
- Reasonable Further Progress (RFP) shows that incremental progress will be made toward attaining the NAAQS in the years prior to the attainment date.

<sup>3</sup> <https://www.epa.gov/air-quality-implementation-plans/sip-requirements-clean-air-act>

<sup>4</sup> <https://www.govinfo.gov/content/pkg/FR-2016-08-24/pdf/2016-18768.pdf>

- Should Allegheny County fail to attain the NAAQS by the attainment date, a contingency plan will provide for measures to achieve attainment as expeditiously as practicable.
- A Nonattainment New Source Review (NNSR) program will be in place for new sources or major source modifications pertaining to PM<sub>2.5</sub> and precursors.<sup>5</sup>

Last, several accompanying appendices contain more detailed information to support the analyses and conclusions included in this SIP. Additional material, including modeling files and spreadsheets used for the attainment demonstration, are available upon request to ACHD.

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<sup>5</sup> Precursors of PM<sub>2.5</sub> are sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOC), and ammonia (NH<sub>3</sub>).

## 2 Problem Statement

### 2.1 Introduction

The CAA requires that a SIP be devised for any area designated nonattainment for the annual PM<sub>2.5</sub> pollution standard of 12.0 µg/m<sup>3</sup> and/or for the daily PM<sub>2.5</sub> pollution standard of 35 µg/m<sup>3</sup>. On December 14, 2012, the EPA “promulgated a revised primary annual PM<sub>2.5</sub> NAAQS to provide increased protection of public health and welfare from fine particle pollution” (78 FR 3086; January 15, 2013). In that action, the EPA revised the annual PM<sub>2.5</sub> standard, strengthening it from 15.0 µg/m<sup>3</sup> to 12.0 µg/m<sup>3</sup>, which is attained when the 3-year average of the annual arithmetic means does not exceed 12.0 µg/m<sup>3</sup>.

EPA designated all of Allegheny County, PA as a PM<sub>2.5</sub> moderate nonattainment area (NAA) of the 2012 NAAQS on April 15, 2015, with attainment to be achieved by the end of the 6<sup>th</sup> calendar year following designation (December 31, 2021). The area was so designated as a result of EPA’s consideration of local emission sources with meteorology and topography along with jurisdictional boundary conditions.

The base year for a PM<sub>2.5</sub> demonstration must include one of the three monitored data years used for the designation (2011-2013). Year 2011 was selected as the base year due to the availability of emissions and modeling inventory resources, and it was also found to be an appropriate year for monitored concentrations and meteorological data over a five-year (2009-2013) weighted timeframe.

### 2.2 Location and Topography

The PM<sub>2.5</sub> NAA area consists of the entirety of Allegheny County, located in southwestern Pennsylvania, as shown in Figure 2-1. The county includes rural land, densely populated residential areas, and industrial facilities. The present population of Allegheny County is 1,218,452.<sup>6</sup>

The county is made up of complex river valley terrain. Within the county, some river valleys lie at less than 720 feet in elevation above mean sea level (MSL), while adjacent hilltops can be greater than 1250 feet. Large differences in temperature can be observed between the hilltop and valley floor (e.g. 2 to 7 °F) during clear, light-wind, nighttime conditions. Strong nighttime drainage flows can cause differences of up to 180 degrees in wind direction with 3 to 4 miles per hour (mph) downward flows. Spikes in localized PM<sub>2.5</sub> concentrations have coincided with temperature inversions.

Allegheny County is home to several industrial sources of PM<sub>2.5</sub> pollution, including several major (CAA Title V) sources and numerous minor sources. The Monongahela River Valley (or “Mon Valley”) contains the Liberty PM<sub>2.5</sub> monitor site and industrial facilities such as the United

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<sup>6</sup> U.S. Census Bureau data, as of July 1, 2018:  
<https://www.census.gov/quickfacts/alleghenycountypennsylvania>

This is a detailed topographic map of the Pittsburgh, Pennsylvania area. The map shows the city of Pittsburgh and its surrounding suburbs, including areas like Allegheny, Butler, and Westmoreland. Major roads, such as I-19, I-26, and I-70, are clearly marked. The map also displays various geographical features, including the Allegheny River, Monongahela River, and several lakes. Numerous place names are labeled, such as Pittsburgh, Allegheny, Butler, and Westmoreland. A red shaded area highlights the city of Pittsburgh. An inset map in the bottom left corner shows the location of Pittsburgh within the state of Pennsylvania. The map is powered by Esri.

<sup>7</sup> Maps of designated areas:  
<https://epa.maps.arcgis.com/apps/MapJournal/index.html?appid=a76e14f777de49baa5d32f5544c8e20b&webmap=fc297672dd074e4ab5b208aeb21fa52>

## 2.3 Meteorology

Meteorology plays a crucial role in PM<sub>2.5</sub> concentrations throughout the county. For example, temperature inversions contribute to elevated levels of PM<sub>2.5</sub>. A temperature inversion occurs when the air at the surface becomes cooler than the air above it, that is, the rate of cooling of the air is greater at ground level versus at elevated levels. The cooler, heavier air then becomes trapped at the lower elevation. As pollution sources emit PM<sub>2.5</sub> and the lower, cooler air becomes buoyantly stable, the PM<sub>2.5</sub> is limited in its upward movement to disperse into the regional flow.

Typically, upon the dissipation of an inversion, local PM<sub>2.5</sub> is released into the upper atmospheric flow. Observations have shown that after this break, the Liberty monitor, which typically records the highest PM<sub>2.5</sub> concentrations in Allegheny County, returns to a level comparable to or less than the concentrations measured at surrounding monitors.

Upper-atmospheric conditions that may indicate the presence of temperature inversions are measured at least twice daily – once in the morning and once in the evening – by balloon-borne sensors sent into the atmosphere by the National Weather Service (NWS) forecasting office near the Pittsburgh International Airport (PIT). The data from these measurements are assumed to represent stability conditions all across the county. However, the many low-lying river valleys throughout the county are more likely to experience a greater frequency of inversions than recorded at the higher elevation PIT NWS location.

Appendix B (Meteorological Analysis) contains documentation of meteorological conditions affecting Allegheny County in general – and the Liberty Borough area in particular – for 2009 through 2013, with a focus on 2011, the base year modeled for the attainment demonstration. Analysis involved review of inversions, winds, temperature, and precipitation in general and for appropriateness for the modeling demonstration.

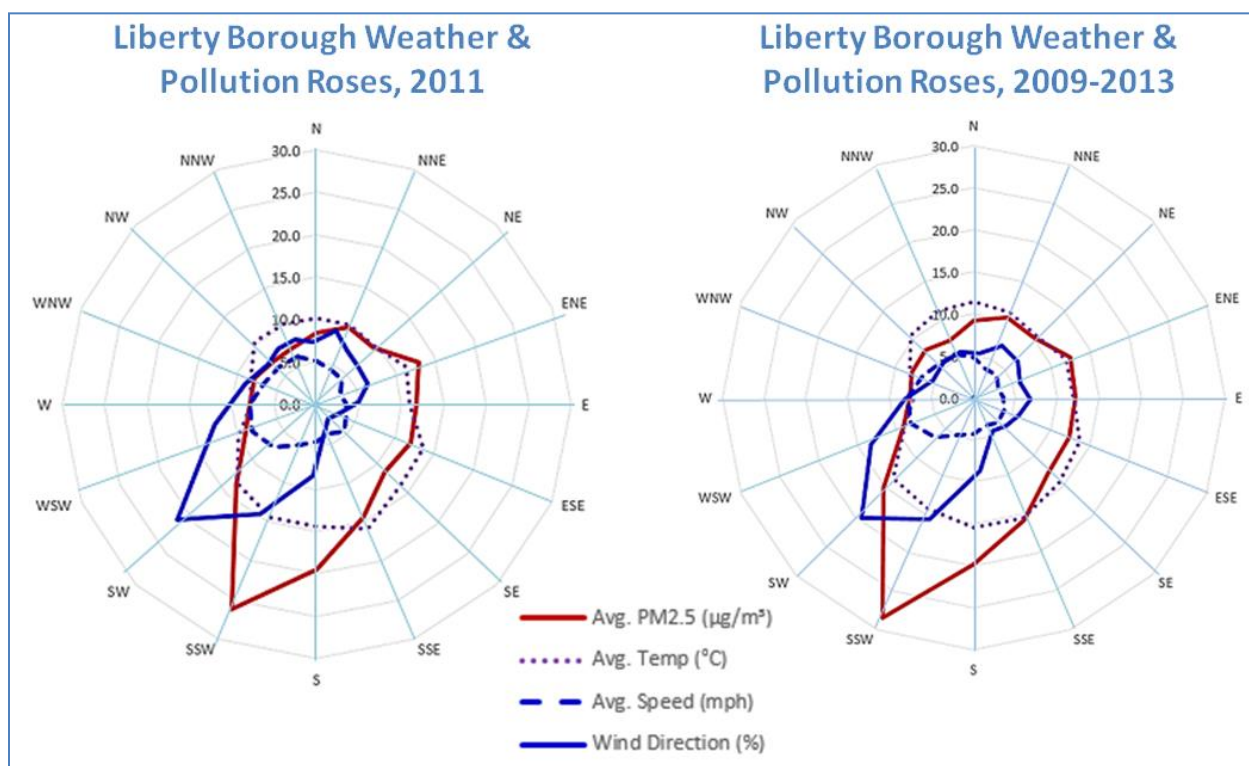
The five-year 2009-2013 period was characterized by 41% of mornings experiencing, on average, moderately strong surface inversions of 3.8 °C, with an average height above ground of 237 meters and an estimated break time at PIT NWS of about 9:30 a.m. EST. The modeled base year, 2011, was characterized by 37% of mornings with moderate surface inversions of 3.7 °C and an average height of 246 m, with an estimated break time at PIT NWS of about 9:30 a.m. EST.

Temperature data for 2009-2013 Pennsylvania annual average temperatures ranged from below normal to much above normal. Precipitation records from the period show Pennsylvania annual total precipitation amounts ranging from near normal to much above normal. Within Allegheny County, annual average temperature and total precipitation conditions observed at the airports (PIT and AGC) indicate that temperatures at both locations were generally above normal, while precipitation at both locations ranged across the normal level. For 2011, the modeled base year, PIT and AGC average temperature and total precipitation were above normal.

PIT and AGC wind roses for 2009 through 2013 indicate that air generally flows from the southwest through west across the county, except for the preponderance of winds from the south

at AGC. Low wind speeds, which occur frequently overnight and often during temperature inversions, can lead to increased PM<sub>2.5</sub> levels, especially in the many river valleys throughout Allegheny County.

At the Liberty monitor – the location of the county’s traditionally highest PM<sub>2.5</sub> concentrations – Figure 2-2 shows wind frequency and speed, PM<sub>2.5</sub> concentration, and temperature roses for 2011 and for 2009-2013. For 2011 in particular and for 2009 through 2013 in general, the most frequent wind direction was south-southwest through west-southwest, the fastest wind speed on average was from the southwest through west, the highest average temperature was from the south-southeast through southwest, and the highest concentration of PM<sub>2.5</sub> on average came from the south-southwest.



**Figure 2-2. Wind Frequency and Speed, PM<sub>2.5</sub> Concentration, and Temperature Roses for the Liberty Monitoring Site, 2011 and 2009-2013**

Overall, the meteorological analysis in Appendix B (Meteorological Analysis) shows that the modeled base year of 2011 is rather suitable to represent typical conditions of the period. Exceptions include one month, October 2011, recording the largest inversion strength of any month during the five-year period, as well as substantially higher than normal precipitation for southwestern Pennsylvania and Allegheny County during the full year. More recent years have recorded above normal average temperatures along with precipitation amounts substantially above normal; therefore, the 2011 base year may well represent these more current conditions.

## 2.4 Monitored Data

PM<sub>2.5</sub> Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitors for population exposure are currently located at eight different monitoring locations throughout Allegheny County.<sup>8</sup> (These locations were also in operation during the designation.) All monitors in Allegheny County are located within the seven-county Pittsburgh Metropolitan Statistical Area (MSA). Chemical Speciation Network (CSN) monitors are also located at two of these sites: Lawrenceville and Liberty.<sup>9</sup>

The Lawrenceville monitor, located roughly two miles northeast of downtown Pittsburgh, is generally used to define urban or regional concentrations of PM<sub>2.5</sub>. The Liberty monitor, located at a high elevation in Liberty Borough, shows the highest concentrations of PM<sub>2.5</sub> in the NAA.

Appendix A (Monitored Data) contains monitored data details, including design values and EPA Air Quality System (AQS)<sup>10</sup> reports over the timeframe of 2000 (the start year for most sites) through 2018 (the most recent year of monitored data).<sup>11</sup> Figure 2-3 below shows the locations of the PM<sub>2.5</sub> monitor sites. Design values are 3-year averages of the annual weighted means and 24-hour 98<sup>th</sup> percentiles at each site.

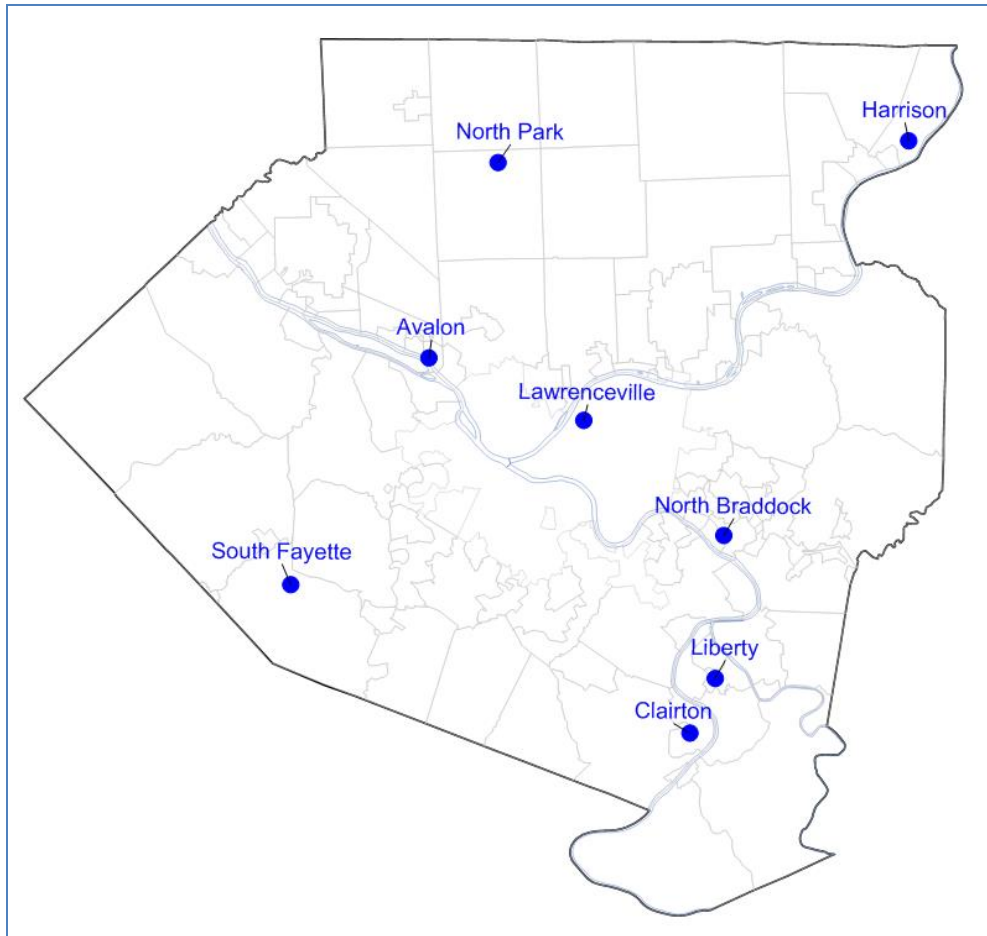
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<sup>8</sup> An additional FEM monitor was deployed in 2016 at the Parkway East site for near-road surveillance purposes. It is not used for official comparison to the NAAQS and has been excluded from this SIP analysis. However, its preliminary design values are showing values below the NAAQS.

<sup>9</sup> Information on EPA monitor networks are available at the following web site:  
<https://www.epa.gov/amtic/amtic-ambient-air-monitoring-networks>

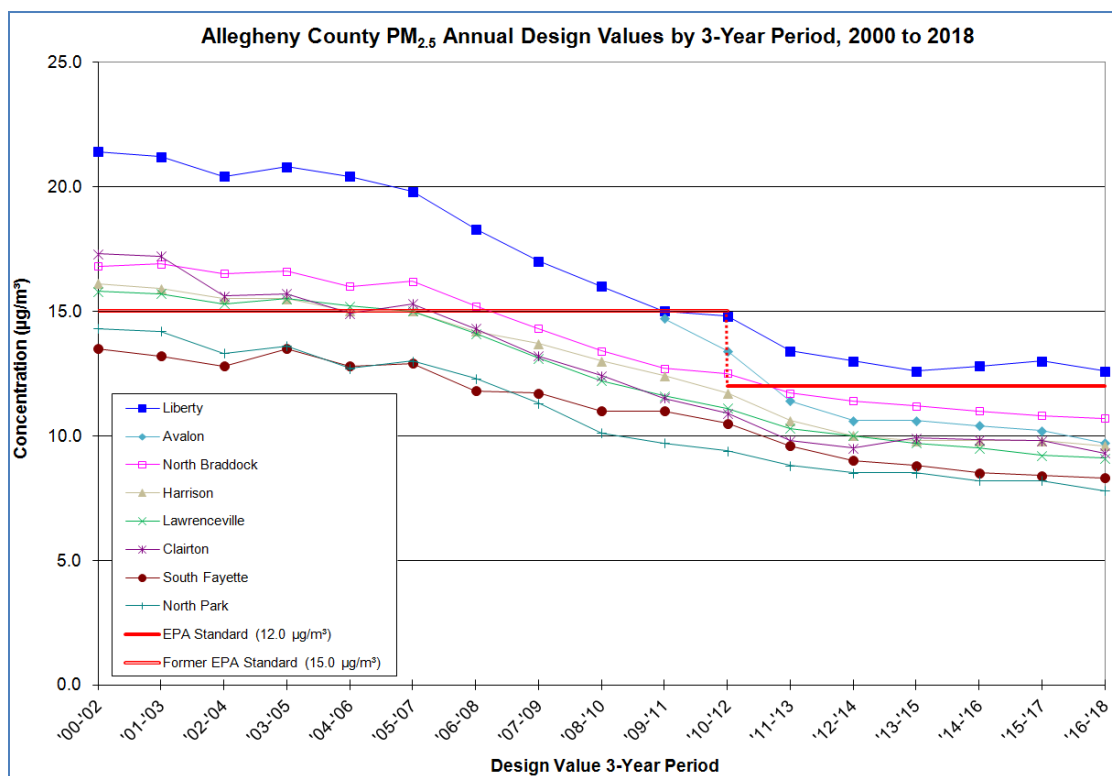
<sup>10</sup> Information on AQS is available at the following web site: <https://www.epa.gov/aqs>

<sup>11</sup> At the time of this SIP, monitored results for 2018 were fully validated and quality-assured by ACHD but not yet certified by EPA. ACHD requested certification of 2018 data on Apr. 16, 2019.

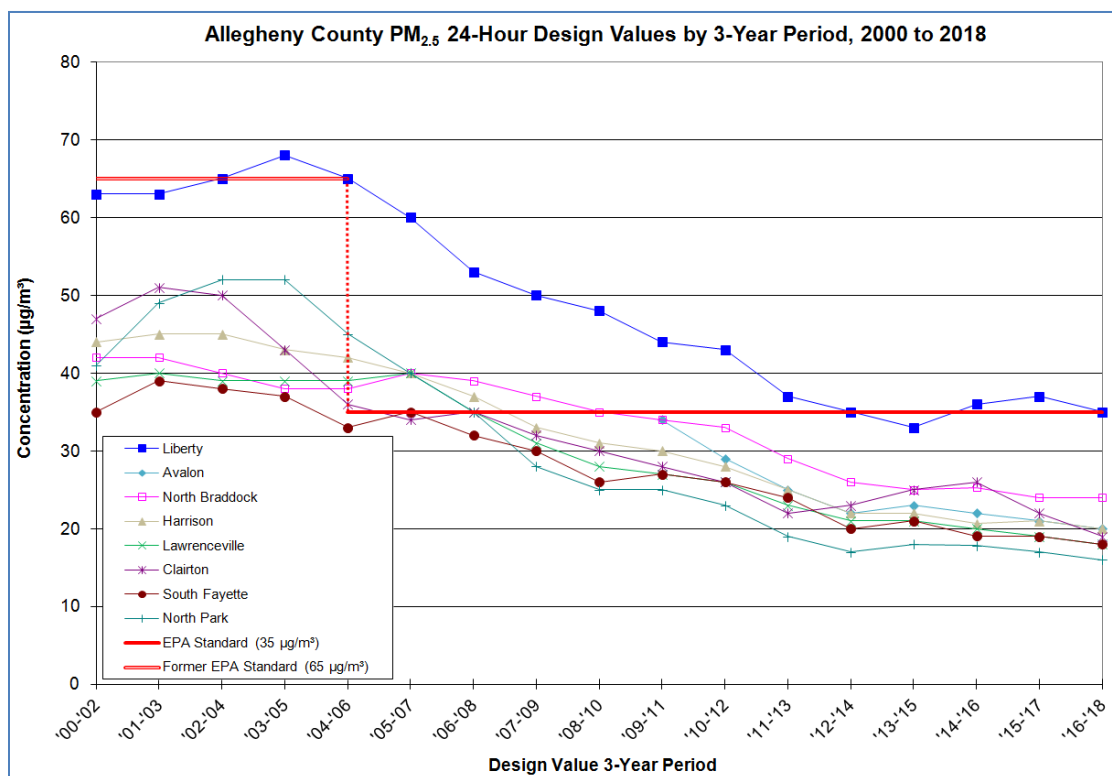


**Figure 2-3. PM<sub>2.5</sub> Monitor Locations in Allegheny County**

Allegheny County PM<sub>2.5</sub> annual and 24-hour design values for the timeframe 2000-2018 are shown in Figures 2-4 and 2-5, respectively. All averages shown are for FRM results except for Avalon, which was a Federal Equivalent Method (FEM) for 2010 and early 2011. (FEM data can also be substituted at Lawrenceville and Liberty for missing FRM samples.) The Liberty monitor shows concentrations that are higher than the rest of the Allegheny County network. (Note the figures include some 3-year periods with low recovery quarters – i.e., less than 75% valid data per quarter – as noted in Appendix A (Monitored Data).)

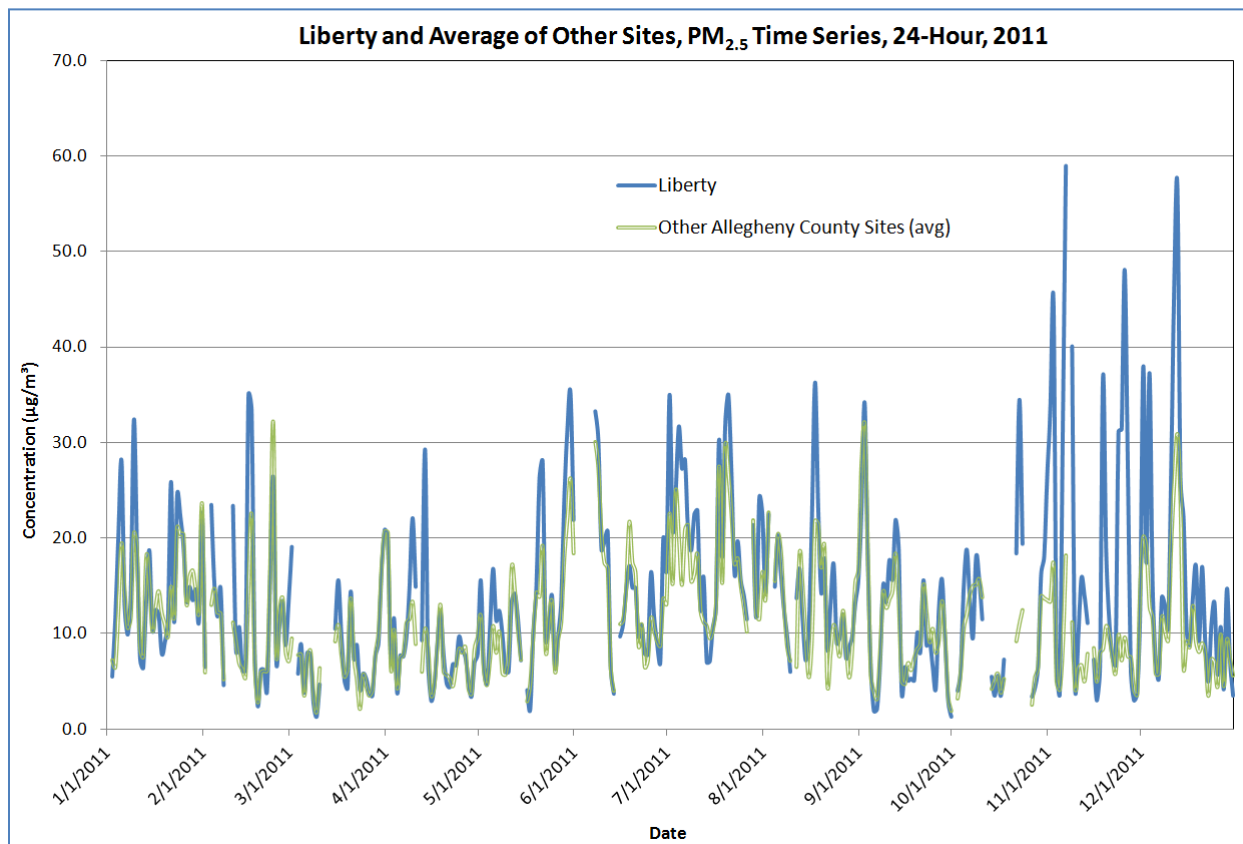


**Figure 2-4. PM<sub>2.5</sub> Annual Design Values, Allegheny County Sites, 2000-2018**



**Figure 2-5. PM<sub>2.5</sub> 24-Hour Design Values, Allegheny County Sites, 2000-2018**

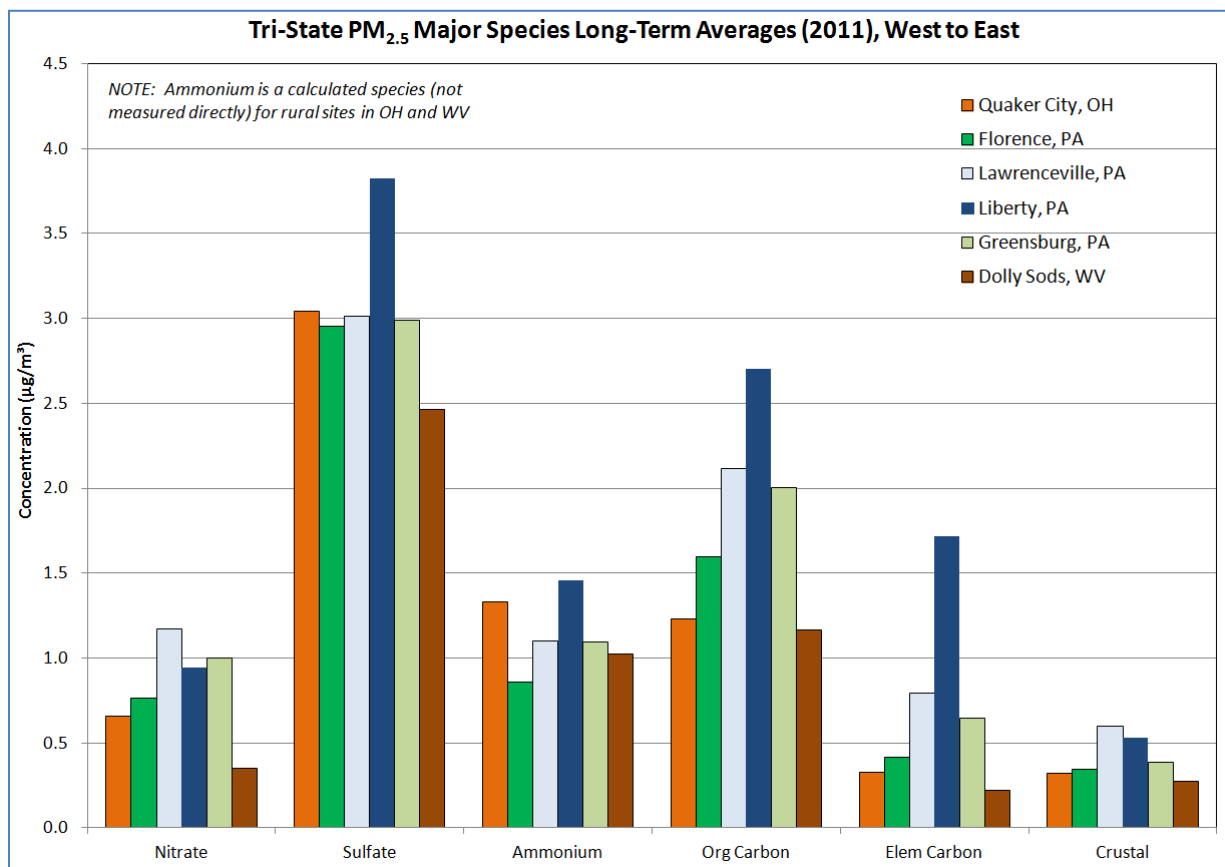
Figure 2-6 shows concurrent 24-hour  $PM_{2.5}$  concentrations at Liberty compared to the average of other Allegheny County sites on a 1-in-3 day sampling schedule for year 2011 (the base case year for the modeling demonstration). Although the Liberty monitor shows concentrations similar to other sites at times, it also shows recurring peak days that are higher than the rest of Allegheny County. These high days lead to an excess of monitored  $PM_{2.5}$  at Liberty on both long-term and short-term bases.



**Figure 2-6. 24-Hour  $PM_{2.5}$  Concentrations, 2011 Base Year, Liberty and Other Allegheny County Sites**

Speciation data are used to examine  $PM_{2.5}$  at the component level, specifically the compositions of the different source contributions. A significant portion of the ambient  $PM_{2.5}$  concentrations in the MSA can be attributable to upwind sources in Ohio, West Virginia, and other states. Urban activity additionally contributes to concentrations within the Pittsburgh MSA, compounded by localized concentrations in the Liberty area. Liberty is therefore impacted by a diverse combination of regional and local  $PM_{2.5}$  sources.

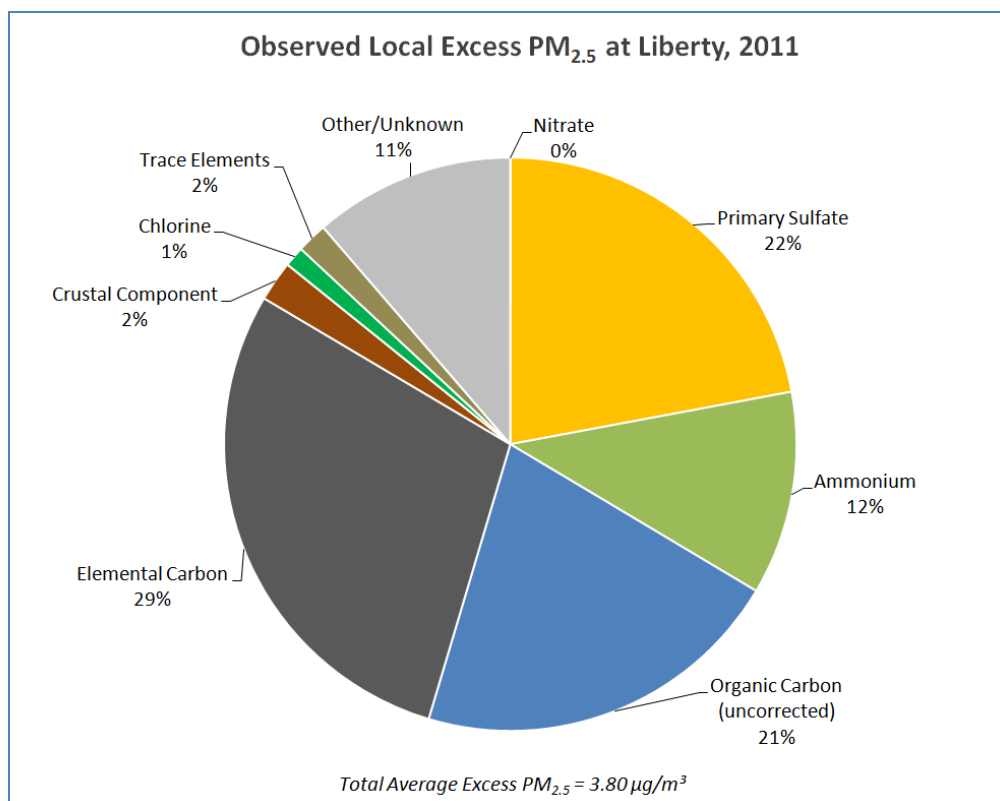
A comparison of regional and local concentrations shows species differences in the Liberty area with respect to the surrounding area. Lawrenceville, Florence, and Greensburg are part of the regional MSA portion of regional  $PM_{2.5}$ . (Quaker City, OH and Dolly Sods, WV are also shown as the rural/transport portion of regional  $PM_{2.5}$ .) Figure 2-7 shows long-term major species averages for 2011, from west to east through the tri-state region.



**Figure 2-7. Tri-State Major PM<sub>2.5</sub> Species Concentrations (µg/m<sup>3</sup>), 2011**

Concentrations of major species at speciation sites show increasing averages from west to east through the Pittsburgh MSA, with lower averages at Dolly Sods to the southeast of the MSA. Liberty shows peaks for specific species, indicative of air composition that is not common throughout the greater tri-state region.

Figure 2-8 shows a pie chart of the average observed (monitored) excess PM<sub>2.5</sub> species at Liberty compared to the regional MSA component for 2011 (i.e., Liberty minus the average of Lawrenceville, Florence, and Greensburg, by species). These local excess species are the focus of the modeling effort, since they are driving the Liberty-specific concentrations.



**Figure 2-8. Localized PM<sub>2.5</sub> Excess at Liberty, by Species Composition, 2011**

Note: EPA’s reconstruction method for the official design values adjusts or calculates some species, including retained nitrates, organic carbon by mass balance, and indirect ammonium. “Other/Unknown” in the observed data can represent particle-bound water, unmeasured/unknown species, or differences due to analytical testing methods used for the speciation data.

More in-depth analysis of speciation data, as well as source apportionment results from the Positive Matrix Factorization (PMF) model, for the SIP timeframe of 2009-2013 and more recent years are given in Appendix C (Speciation and Source Apportionment Analysis).

### 3 Control Strategy

This section describes the control strategy implemented in order to reduce levels of PM<sub>2.5</sub> and precursors in the Allegheny County NAA, with a focus on the Liberty portion of the area. These controls have been incorporated in the future case 2021 emissions and modeling inventories for this SIP. Source modifications are federally enforceable through ACHD installation permits (IPs) and operating permits (OPs). Where indicated, the applicable IP or OP number has been provided, and these permits are publicly available. Redacted pages from the permits, showing conditions pertaining to the control strategy, have been included in Appendix L (Permit Conditions).

All sources in Allegheny County require an operating permit in order to conduct operations and an installation permit in order to install new equipment or to expand processes. These permits are federally enforceable via 40 CFR<sup>12</sup> §52.2020, regarding EPA-approved ACHD regulations. Conditions of installation permits and all other applicable regulations are incorporated into operating permits, and all operating permits must be renewed every five years.

Summaries of the base case 2011 and future case 2021 emissions inventories for Allegheny County used in this demonstration are given in Section 4 (Emissions Inventories), with detailed inventories by process given in Appendix D (Emissions Inventories).

#### 3.1 Local Source Modifications

- A. U. S. Steel Mon Valley Works Clairton Plant: The USS Clairton coking plant is one of the largest stationary industrial sources of PM<sub>2.5</sub> in Allegheny County. The Clairton Plant is located in the City of Clairton on the west bank of the Monongahela River, upwind of the Liberty monitor site. The Clairton Plant is the largest industrial source of primary PM<sub>2.5</sub> emissions near the Liberty monitor.

In 2013, USS installed new Low-Emission Quench Towers (LEQT) 5A and 7A as the main quench towers for Batteries 13-15 and Batteries 19-20, respectively, with the older Quench Towers 5 and 7 serving as auxiliary/backup quench towers. This installation is enforceable by IP 0052-I014. The Clairton Quench Towers are the largest modeled contributors of PM<sub>2.5</sub> in the Liberty area (see Appendix I.2 (Liberty Local Area Analysis) for more details). Additional requirements for baffle washing and maintenance at the other quench towers (1 and B) have been incorporated into the 2012 operating permit (OP 0052) for the Clairton Plant.

USS also installed a new battery (C Battery, IP 0052-I011) at the Clairton Plant in 2012 (with a LEQT), with increases in emissions of other source types such as underfiring and battery fugitives. As a result, reductions for the Clairton Plant as a whole do not reflect large decreases in PM<sub>2.5</sub> (only a net decrease of 34.6 tons/year of primary PM<sub>2.5</sub>). However, the quenching processes, the largest modeled contributors of PM<sub>2.5</sub> impacts,

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<sup>12</sup> Title 40 of the U.S. Code of Federal Regulations: <https://www.epa.gov/laws-regulations/regulations>

have been controlled for the area, with a reduction of 93.6 tons/year of primary PM<sub>2.5</sub> from the 2011 inventory to the projected 2021 inventory.

As part of the C Battery permit, older batteries (Batteries 7-9) were permanently retired in April 2009. While not explicitly part of the control strategy for this SIP (with a base year of 2011), the effect of this shutdown on ambient concentrations is inherently included in the 2009-2013 weighted timeframe of monitored data.

It should also be noted that precursor emissions show little transformation from the Clairton Plant to the Liberty monitor, based on modeled and speciation data results. Localized excess sulfate at the Liberty monitor is primary in nature at the Liberty site. Additionally, VOC and NH<sub>3</sub> have been found to be insignificant precursors for the entire NAA. Section 5 (Modeling Demonstration) provides more details on the modeled results and precursor emissions.

- B. GenOn Cheswick: The GenOn (formerly NRG) Cheswick plant in Springdale Borough is the only coal-fired power plant in Allegheny County, and one of the largest of sources of PM<sub>2.5</sub> and precursors. A flue gas desulfurization system was installed at Cheswick (IP 0054-I004) in 2010, with full operation of the system starting in mid-2011. This system has lowered Cheswick's annual SO<sub>2</sub> emissions by an average of 75% (6968 tons/year) from base case 2011.<sup>13</sup> Requirements for NO<sub>x</sub> emissions from Cheswick are also required by OP 0054. For the projected 2021 case, reductions of 6951.3 tons/year of SO<sub>2</sub> and 2128.4 tons/year of NO<sub>x</sub> from 2011 base case were used for the emissions inventory and for modeling.
- C. ATI Flat Rolled Products (Allegheny Ludlum): The ATI Allegheny Ludlum specialty steel-making facility in Harrison Township installed a new Hot Rolling Processing Facility (HRPF) at the plant (IP 0062-I008) in 2013, along with a consolidation of melt shops in 2011 (IP 0062-I007). These projects led to the shutdown of older furnaces, hot rolling mills, grinders, and torch cutters, for reductions of 46.7 tons/year of primary PM<sub>2.5</sub> and 36.6 tons/year of PM<sub>2.5</sub> precursors from the 2011 inventory to the projected 2021 inventory.
- D. McConway & Torley: The McConway & Torley steel foundry in the City of Pittsburgh manufactures steel railcar products and mining castings. Since 2011, a number of installations have modified the plant configuration and reduced emissions, including a new electric arc furnace, new baghouses, and new ladle preheater burners (IPs 0275-I007, I008, I011, I013). These modifications represent a reduction of 77.9 tons/year of primary PM<sub>2.5</sub> from the 2011 inventory to the projected 2021 inventory.
- E. Bay Valley (Riverbend): The Bay Valley food manufacturing facility in the City of Pittsburgh permanently switched from coal to natural gas as fuel for all boilers in 2015 (IP 0079-I005). This fuel switch represents reductions of 16.8 tons/year of primary PM<sub>2.5</sub>

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<sup>13</sup> Based on reported CAMD SO<sub>2</sub> emissions from Cheswick from 2012 through 2017.

and 469.7 tons/year of PM<sub>2.5</sub> precursors from the 2011 inventory to the projected 2021 inventory.

### 3.2 Local Source Shutdowns

The following facilities in Allegheny County have been permanently retired, with all emissions removed from the future case 2021 inventory and modeling. These sources no longer have a permit to operate in Allegheny County, and any future operation at the source properties would require a new permit application and new source review (NSR). ACHD enforcement staff conducts regular follow-up inspections at these sources to ensure continued inactivity and/or demolition at these properties. Additionally, there are no emissions reduction credits (ERCs) for these sources available in the PA Department of Environmental Protection (PA DEP) registry.<sup>14</sup>

- Shenango: The Shenango coke plant in Neville Township ceased operations in 2016. Shenango was the only coking facility in Allegheny County other than the USS Clairton Plant. This shutdown represents reductions of 97.3 tons/year of primary PM<sub>2.5</sub> and 901.6 tons/year of PM<sub>2.5</sub> precursors from the 2011 inventory.
- Guardian: The Guardian glass plant in Jefferson Hills Borough was retired in 2015, for reductions of 21.6 tons/year of primary PM<sub>2.5</sub> and 1071.2 tons/year of PM<sub>2.5</sub> precursors from the 2011 inventory.
- GE Bridgeville: The General Electric (GE) Bridgeville glass plant in Collier Township closed in 2017, for reductions of 12.5 tons/year of primary PM<sub>2.5</sub> and 33.7 tons/year of PM<sub>2.5</sub> precursors from the 2011 inventory.
- Allegheny Aggregates: Allegheny Aggregates in Harrison Township closed in 2015, for reductions of 1.5 tons/year of primary PM<sub>2.5</sub> and 11.3 tons/year of PM<sub>2.5</sub> precursors from the 2011 inventory.
- ACN: ACN (formerly Bakerstown Container) in Richland Township closed in 2013, for reductions of 9.4 tons/year of primary PM<sub>2.5</sub> and 42.3 tons/year of PM<sub>2.5</sub> precursors from the 2011 inventory.
- VA Highland: The Veterans Administration (VA) Highland facility in the City of Pittsburgh closed in 2017, for reductions of 1.7 tons/year of primary PM<sub>2.5</sub> and 8.2 tons/year of PM<sub>2.5</sub> precursors from the 2011 inventory.

Additionally, the Kosmos (Cemex) cement facility in Neville Township was reclassified as a minor source in 2012. For consistency with the inventories, this source was also removed from the future case inventory, for a small reduction of primary PM<sub>2.5</sub> only (1.3 tons) from 2011.

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<sup>14</sup> As of the April 12, 2019 version of the registry:

[http://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/Permits/erc/ERC\\_PA\\_Report.pdf](http://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/Permits/erc/ERC_PA_Report.pdf)

### 3.3 Regional Controls

Several federal and state rules and programs have been incorporated into the MARAMA<sup>15</sup> inventories used for the future case inventories and modeling. The MARAMA inventories were developed from the EPA 2011 Version 6.2 Modeling Platform<sup>16</sup> (U.S. EPA, 2015). These rules and programs have reduced emissions from several emissions sectors – in addition to the reductions to point source emissions mentioned above – and are reflected in the emissions inventories from 2011 to 2021 in Section 4 (Emissions Inventories). Controls used in the future case regional emissions include, but are not limited to, the following:

- Federal tier 3 vehicle emissions and fuel standards (2014)
- Federal emissions and fuel efficiencies for medium and heavy-duty vehicles (2011, 2016)
- Federal emissions and fuel economy standards for light-duty vehicles (2012)
- Federal rules for locomotive and marine compression-ignition engines (2008)
- Federal maximum achievable control technology (MACT) rules for industrial, commercial, and institutional boilers (2013)
- Federal standards for reciprocating internal combustion engines (RICE) (2013)
- Federal standards for commercial and industrial solid waste incinerators (CISWI) (2013)
- Federal standards for nonroad spark ignition equipment (2008)
- Federal clean air nonroad diesel rule (2004)
- Federal standards for residential wood heaters (2011)
- PA sulfur limits for commercial fuel oil (2016)
- PA VOC limits for adhesives and sealants (2012)

Documentation for the MARAMA inventory development is given in Appendix E.1 (MARAMA Alpha2 Technical Support Document). Permanent facility closures in PA and surrounding MARAMA states through 2015 were also included in the MARAMA inventories. Projected emission reductions that are not federally enforceable were used for modeling purposes only.

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<sup>15</sup> MARAMA is the Regional Planning Organization (RPO) for the Mid-Atlantic U.S. states. Inventories are available at the following web site: <http://www.marama.org/technical-center/emissions-inventory/2011-inventory-and-projections>

<sup>16</sup> Available at the following web site: <https://www.epa.gov/air-emissions-modeling/2011-version-6-air-emissions-modeling-platforms>

## 4 Emissions Inventories

Section 51.1008 of 40 CFR Part 51 requires an emissions inventory for base and projected attainment years, based on the requirements of Section 172(c)(3) of the CAA, for any PM<sub>2.5</sub> NAA. As specified by the EPA PM<sub>2.5</sub> Implementation Rule (U.S. EPA, 2016a), pollutants inventoried for the Allegheny County PM<sub>2.5</sub> NAA include primary (direct) PM<sub>2.5</sub> along with precursors SO<sub>2</sub>, NO<sub>x</sub>, VOC, and NH<sub>3</sub>. Many particulate emissions are also transported into the area from surrounding counties in southwestern Pennsylvania and from surrounding and upwind states. The EPA Emissions Inventory Guidance for PM<sub>2.5</sub> (U.S. EPA, 2017b) also specifies that PM<sub>10</sub> should be included because PM<sub>10</sub> emissions are often used as the basis for calculating PM<sub>2.5</sub>.

The emissions inventories were compiled for all major and some minor sources within Allegheny County. Sources in the emissions inventories include stationary point sources, area sources, nonroad mobile sources, and onroad mobile sources. Fire and biogenic emissions are also included in the inventory. All emissions used for the emissions inventories for Allegheny County match those used in the modeling demonstration.

The year 2011 was used for base case emissions inventory, projected to a future case attainment year of 2021. Local projections were focused on PM<sub>2.5</sub> and precursor reductions from stationary point source emissions, while regional projections were based on reductions from all sectors as incorporated into the MARAMA inventories. Emissions are given in actual values based on pollutant emission factors and throughputs or capacities of each emission source. Emissions do not represent permitted or maximum allowable limits.

Source categories used for the emissions inventories are described below. The inventory listings by process are included in Appendix D (Emissions Inventories), including a summary of specific local source revisions and projections. Documentation of the regional inventory development is included in Appendix E (Emissions Inventory Documentation), and emissions inputs used for the modeling are described in Section 5 (Modeling Demonstration) and Appendix F (Modeling Protocols).

- Stationary point (“point”) sources are industrial or commercial sources for which ACHD collects individual annual emissions-related information. These include major and minor sources with the potential to emit 25 tons/year or more of any criteria pollutant. Revisions for some 2011 point source emissions were made by ACHD based on newer estimates since development of the 2011 inventory. Note: The point source inventory also includes airport and helipad emissions, as developed for the 2011 NEI.<sup>17</sup>
- Area (or “nonpoint”) sources are industrial, commercial, and residential sources that are too small or too numerous to be inventoried individually. Examples include commercial and residential fuel combustion, solvent utilization, on-shore oil and gas production, agricultural activity, and other sources. Commercial diesel marine vessels and railroad

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<sup>17</sup> EPA’s National Emission Inventory, compiled every three years for U.S. emissions. (<https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei>)

locomotives have also been included in the area source inventory (sometimes listed separately or as part of the nonroad mobile sector).

- Nonroad mobile (or “nonroad”) sources encompass a diverse collection of off-highway engines, including (but not limited to) outdoor power equipment, recreational vehicles, farm and construction machinery, lawn and garden equipment, industrial equipment, and other sources.
- Onroad mobile (or “onroad”) sources include passenger cars, light-duty trucks, heavy-duty trucks, buses, and motorcycles. The Motor Vehicle Emissions Simulator (MOVES) model was utilized to generate emissions based on traffic counts, vehicle speeds, vehicle population growth, and other factors.
- Fire and biogenic emissions are included in the inventories as additional sources. Fire emissions from inadvertent (wildfire) or intentional (prescribed) biomass burning are as estimated by EPA’s FIRES inventory. Biogenic (non-anthropogenic) emissions from vegetation and soils are estimated by the Biogenic Emission Inventory System (BEIS) model. These emissions are held constant from base case to future case. (In Appendix D.3 (Area Sources), fire and biogenic emissions are included at the end of the area source inventories.)

Airborne sea salt and NO<sub>x</sub> from lightning, as estimated by the CAMx model, were also included as additional emissions for the modeling but not for the inventory (see Appendix F.2 (CAMx Modeling Protocol).)

Emissions inventory summaries for base and future projected cases are shown in Tables 4-1 and 4-2<sup>18</sup> by sector for Allegheny County.

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<sup>18</sup> Note: Due to the rounding to whole tons, the sum of the sectors in Tables 4-1 and 4-2 may not add up to the totals. Detailed emissions by process/category in Appendix D (Emissions Inventories) are given in thousandths of a ton (three decimal places).

**Table 4-1. Base Case 2011 Emissions by Sector (tons/year)**

<b>Allegheny County (2011)</b>	<b>PM<sub>2.5</sub></b>	<b>PM<sub>2.5</sub> (filt)</b>	<b>PM<sub>2.5</sub> (cond)</b>	<b>PM<sub>10</sub></b>	<b>SO<sub>2</sub></b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>NH<sub>3</sub></b>
Point Sources	2,503	1,338	1,164	2,987	13,460	11,128	1,669	207
Area Sources	2,491	2,011	480	4,683	1,528	6,979	11,200	621
Nonroad Mobile Sources	361	361	0	378	11	3,921	3,780	5
Onroad Mobile Sources	450	450	0	984	78	13,259	7,383	304
Fires	24	24	0	29	2	5	64	4
Biogenics	0	0	0	0	0	166	5,876	0
<b>Total</b>	<b>5,829</b>	<b>4,185</b>	<b>1,644</b>	<b>9,061</b>	<b>15,080</b>	<b>35,460</b>	<b>29,972</b>	<b>1,141</b>

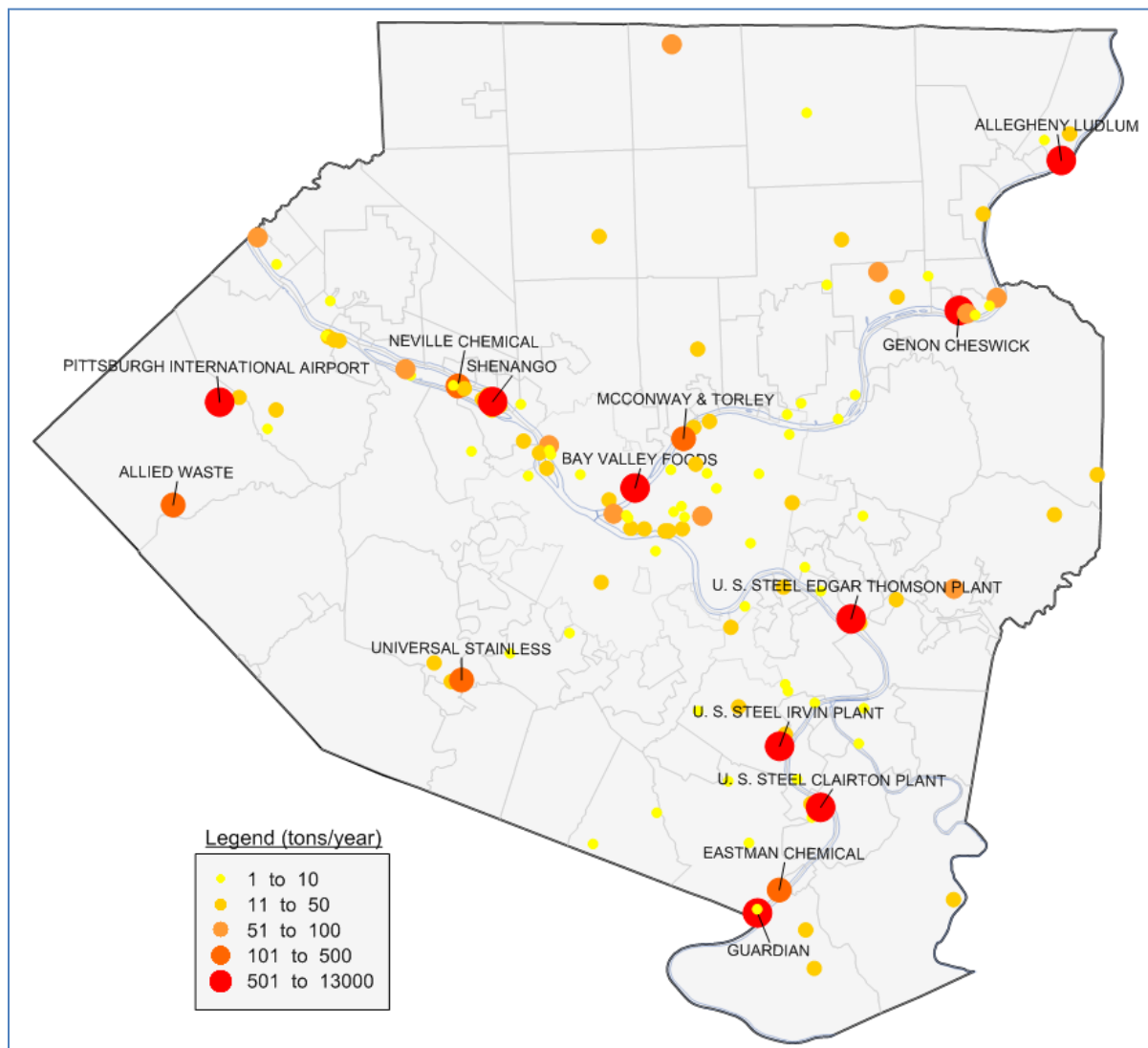
**Table 4-2. Future Case Projected 2021 Emissions by Sector (tons/year)**

<b>Allegheny County (2021)</b>	<b>PM<sub>2.5</sub></b>	<b>PM<sub>2.5</sub> (filt)</b>	<b>PM<sub>2.5</sub> (cond)</b>	<b>PM<sub>10</sub></b>	<b>SO<sub>2</sub></b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>NH<sub>3</sub></b>
Point Sources	2,256	1,256	999	2,722	5,921	7,928	1,534	202
Area Sources	2,708	2,226	472	5,486	1,079	6,664	10,221	615
Nonroad Mobile Sources	234	234	0	248	5	2,212	2,752	6
Onroad Mobile Sources	266	266	0	722	31	5,708	3,479	209
Fires	24	24	0	29	2	5	64	4
Biogenics	0	0	0	0	0	166	5,876	0
<b>Total</b>	<b>5,488</b>	<b>4,007</b>	<b>1,471</b>	<b>9,207</b>	<b>7,039</b>	<b>22,684</b>	<b>23,926</b>	<b>1,037</b>

Note: For the emissions inventories in Tables 4-1 and 4-2 and in Appendix D (Emissions Inventories), primary PM<sub>2.5</sub> emissions are also separated into filterable and condensable fractions for point and area sources. If not reported as individual fractions, PM<sub>2.5</sub> emissions are assumed to be composed of filterable component only, with the condensable component equal to zero. For concentrations, total PM<sub>2.5</sub> (and PM<sub>10</sub>) includes both primary (released into the air as a particle) and secondary (chemically transformed from precursors) components.

Additionally, PM<sub>10</sub> by definition includes all PM<sub>2.5</sub> plus PM<sub>coarse</sub> (particles greater than 2.5 µm in diameter but less than or equal to 10 µm). The condensable component of particulate matter is considered to exist entirely in the 2.5 µm fraction.

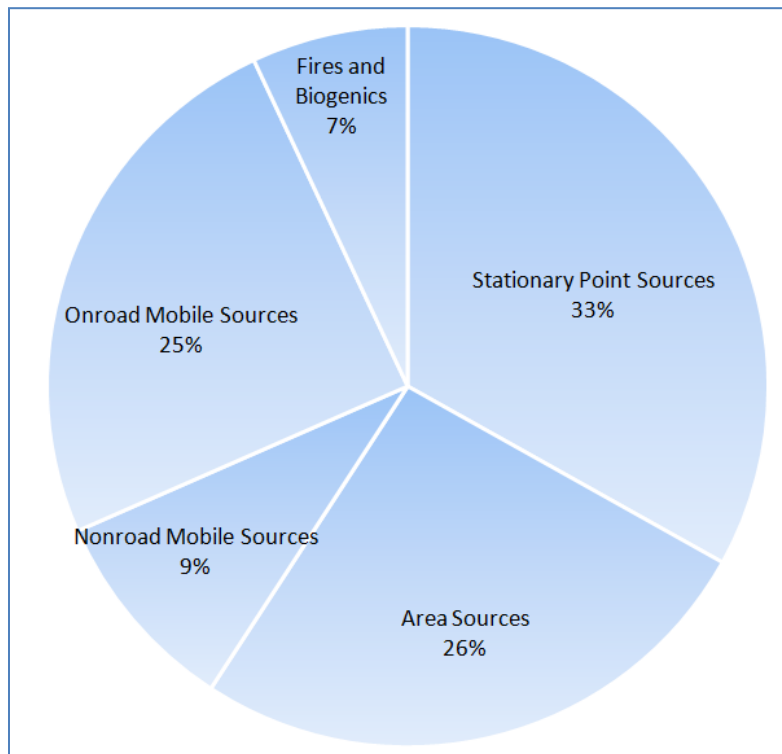
Allegheny County point source locations are shown in the map in Figure 4-1, with total PM<sub>2.5</sub> and precursor emissions (i.e., the sum of primary PM<sub>2.5</sub> and all PM<sub>2.5</sub> precursors) for 2011 indicated by classed icons (from smallest to largest emissions, yellow to red). Facilities with greater than 100 tons/year of total PM<sub>2.5</sub> and precursors include labels. The largest facilities were the focus of the local control strategy and RACT.



**Figure 4-1. Map of Allegheny County Point Sources, with PM<sub>2.5</sub> and Precursor Emissions (tons/year), 2011**

Point source emissions are emitted mainly by large facilities located in industrial river valleys in Allegheny County, with smaller sources of PM<sub>2.5</sub> and precursors spread throughout the county. Reductions in point source emissions from 2011 to 2021 totaled 11,127 tons/year of PM<sub>2.5</sub> and precursors for this demonstration.

Looking at emissions from all sectors, Figure 4-2 shows a pie chart of the percentages of total  $PM_{2.5}$  and precursor emissions by sector in Allegheny County for 2011.



**Figure 4-2. Allegheny County Total  $PM_{2.5}$  and Precursor Emissions, Percentages by Sector, 2011**

Figure 4-2 shows that while point sources are the largest overall contributors of  $PM_{2.5}$  and precursors (33%), other sectors such as area and onroad mobile sources are also considerable contributors. Overall emissions from all sectors were reduced by 27,308 tons/year of  $PM_{2.5}$  and precursors from 2011 to 2021 in Allegheny County in this demonstration.

## 5 Modeling Demonstration

### 5.1 Design/Overview

A modeling demonstration for a SIP shows that an area can attain the NAAQS by a future projected date. Modeling for the Allegheny County, PA NAA was focused on the simulation of regional impacts from PM<sub>2.5</sub> precursors and localized impacts from primary PM<sub>2.5</sub> sources. The photochemical model CAMx with plume-tracking options was utilized at fine grid resolution to model both long-range transport and near-field impacts of most sources. AERMOD (U.S. EPA, 2017a) was utilized for localized primary PM<sub>2.5</sub> impacts at the Liberty monitor only.

### 5.2 Emissions/Modeling Assistance

For assistance with the modeling effort, ACHD contracted Ramboll Environ US Corporation (Ramboll) of Novato, CA (ACHD contract title *Allegheny County Reactive PM<sub>2.5</sub> Pollutant Modeling*, Specification No. 7581). Ramboll is a highly qualified consulting firm that provided advanced computer modeling for a realistic representation of PM<sub>2.5</sub> impacts in Allegheny County.

As part of the contract, Ramboll developed the following:

- Sparse Matrix Operator Kernel Emissions System (SMOKE)<sup>19</sup> emissions modeling inputs from the inventory databases
- Weather Research and Forecasting (WRF)<sup>20</sup> meteorological modeling for base year 2011
- Comprehensive Air quality Model with extensions (CAMx)<sup>21</sup> modeling for base and projected years
- Mesoscale Meteorological Interface Program (MMIF)<sup>22</sup> inputs for AERMOD

Large- and fine- mesh grids at numerous vertical levels were employed to simulate atmospheric conditions across Allegheny County. In addition, the Plume-in-Grid (PiG) model was used to simulate fine particulate matter impacts for sources near monitor sites.

### 5.3 CAMx Modeling

CAMx was used for photochemical grid model (PGM) results for the modeling demonstration with WRF meteorological simulation for 2011. Ramboll followed modeling procedures outlined in Appendix F.1 (WRF Modeling Protocol), Appendix F.2 (CAMx Modeling Protocol), and EPA Modeling Guidance (U.S. EPA, 2014, 2018b). Modeling included use of the PiG and Particulate Source Apportionment Technology (PSAT) modules for local source tracking.

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<sup>19</sup> <https://www.cmascenter.org/smoke/>

<sup>20</sup> <https://www.mmm.ucar.edu/weather-research-and-forecasting-model>

<sup>21</sup> <http://www.camx.com/>

<sup>22</sup> <https://www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs>

### 5.3.1 Model Configuration

CAMx version 6.30 (Ramboll, 2016) was used by Ramboll for the modeling of the Allegheny County, PA NAA. The model was designed to include both regional and localized PM<sub>2.5</sub> impacts formed by both primary and secondary mechanisms. CAMx includes several features that were deemed important for PM<sub>2.5</sub> modeling of Allegheny County, in particular:

- Two-way grid nesting to allow regional- and local-scale impacts within the same simulation
- Subgrid-scale PiG module to sample the puffs for the contributions of local sources
- CB6 chemical mechanism that represents the latest understanding of photochemistry
- PSAT, important for obtaining the separate contributions from local sources

Since PM<sub>2.5</sub> is composed of both primary and secondary components, emission inputs for CAMx included all PM<sub>2.5</sub> precursor pollutants (SO<sub>2</sub>, NO<sub>x</sub>, VOCs, NH<sub>3</sub>) along with primary PM<sub>2.5</sub>.

Meteorological inputs for CAMx were generated using WRF version 3.7.1 (NCAR, 2016). The WRF grids followed the same grid resolutions as the CAMx, creating several vertical layers of meteorological data for each modeled grid cell.

#### Local Source Treatment

To account for significant individual emission sources in an area of interest, the PiG option incorporates a puff/plume model within the CAMx grid cells. Additionally, the PSAT option was used to track contributions from a selected group of local sources. This technique enables the results of separate regional and local impacts to be used for modeling and attainment tests.

The local point sources selected for PiG and PSAT handling were based on amount of emissions, release heights, and proximity to monitors. Sources selected for local source treatment are given in Table 5-1 below, along with their base year 2011 primary PM<sub>2.5</sub> emissions, in tons/year.

**Table 5-1. Local Sources for PiG and PSAT Treatment**

<b>Facility</b>	<b>2011 Primary PM<sub>2.5</sub> (tons/year)</b>	<b>Closest PM<sub>2.5</sub> Monitor Site</b>
USS Clairton	588.7	Liberty
USS Edgar Thomson	633.2	North Braddock
USS Irvin	71.4	Liberty
ATI Allegheny Ludlum	222.5	Harrison
McConway & Torley	88.9	Lawrenceville
Shenango	97.3	Avalon

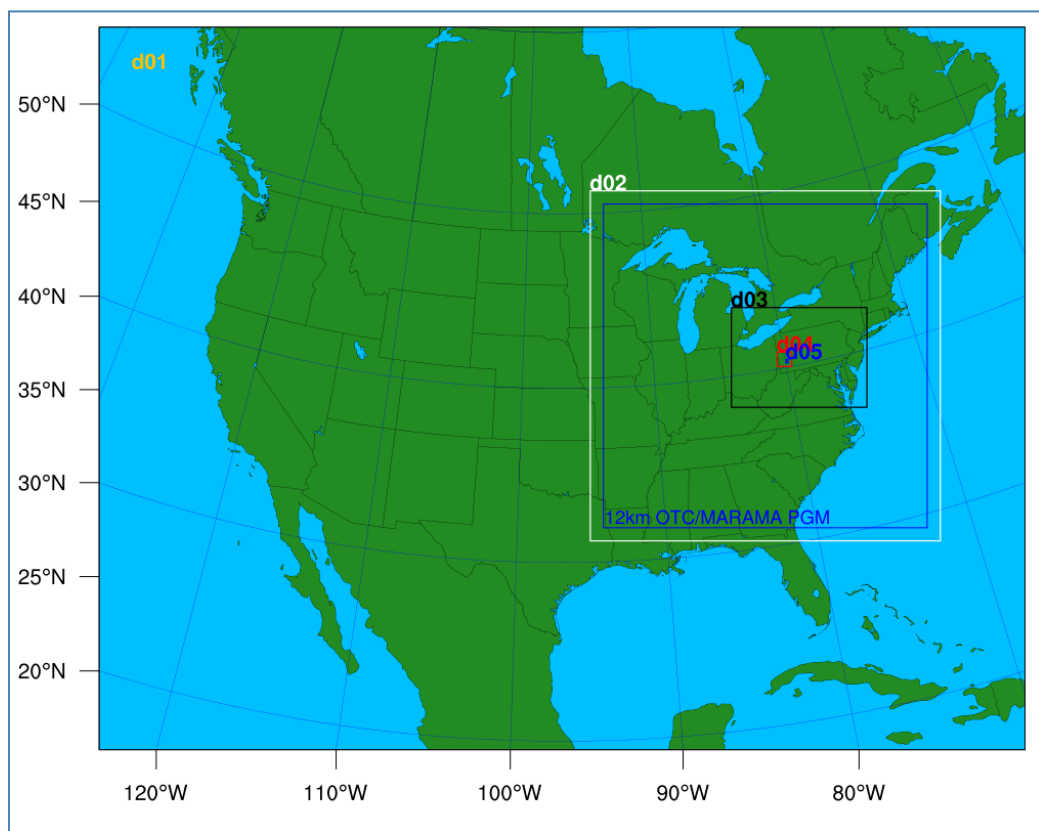
The use of PiG allows for specialized treatment of plumes from these sources (similar to refined dispersion modeling), and PSAT allows for separate accounting of impacts from these sources.

### 5.3.2 Modeling Domains

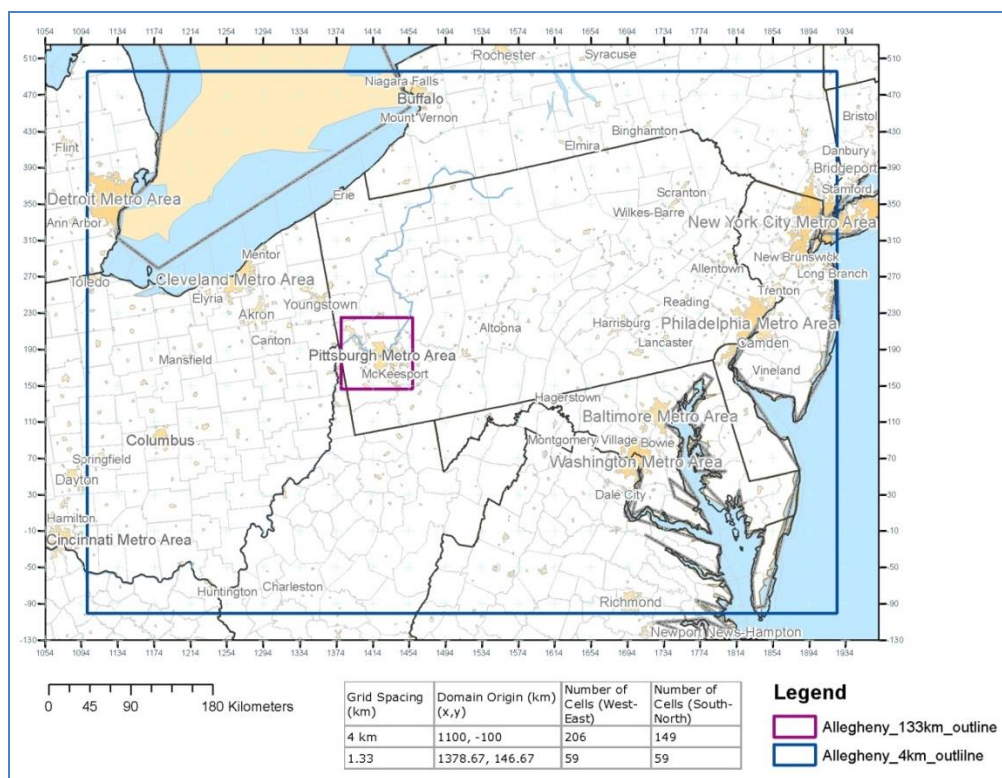
WRF and CAMx were run for a 36/12/4/1.33 km domain structure, as well as an additional WRF domain at 0.444 km resolution for MMIF only, defined as follows:

- d01: A continental U.S. (CONUS) domain at 36 km resolution is defined to be the standard RPO CONUS domain.
- d02: A northeastern U.S. (NEUS) domain at 12 km resolution, identical to the NEUS domain used by the Ozone Transport Commission (OTC) 12 km domain that is also used by MARAMA.
- d03: A nested domain at 4 km resolution that covers all of Pennsylvania (PA) and adjacent areas in surrounding states.
- d04: A nested domain at 1.33 km resolution for Allegheny County and portions of adjacent counties.
- d05: A nested domain at 0.444 km resolution for MMIF data in the Monongahela Valley, to be used with AERMOD only.

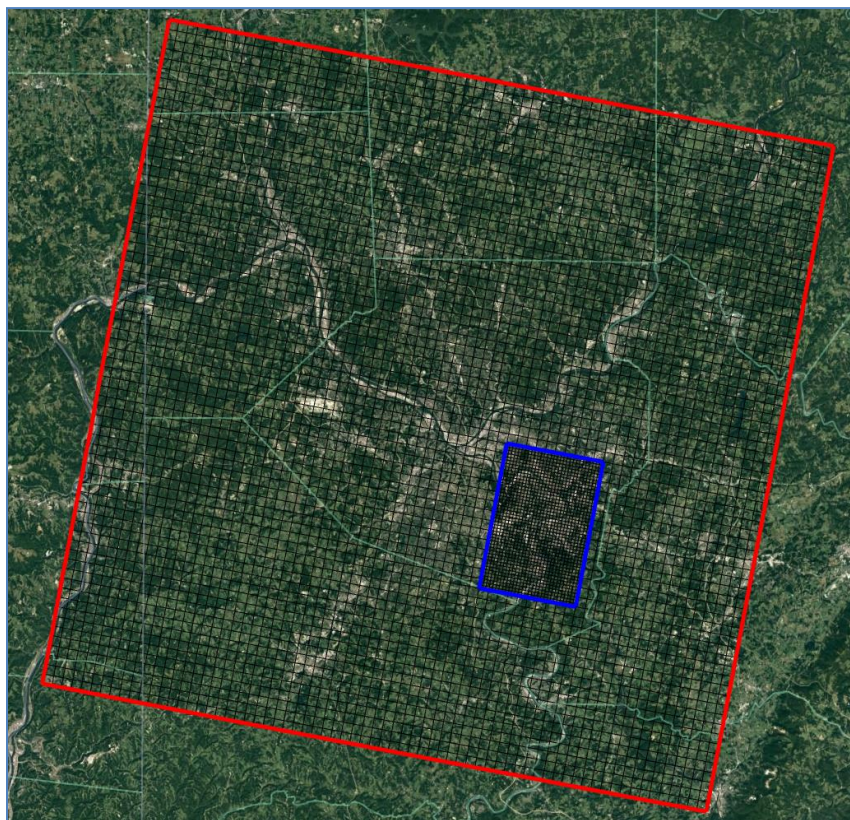
Figures 5-1 through 5-3 show maps of the modeled domains.



**Figure 5-1. WRF/CAMx Modeling Domains, Continental U.S.**



**Figure 5-2. 4 km and 1.33 km Modeling Domains**



**Figure 5-3. Close-Up of 1.33 km (red) and 0.444 km (blue) Modeling Domains**

### 5.3.3 Modeling Inventories

Emissions inventories for the base year modeling were based on MARAMA and EPA inventories and modeling platforms (MPs). Revisions were made by ACHD to Allegheny County sources, based on updated stack test data and corrections to emissions or stack parameters. Details of the inventory development are given in Appendix D (Emissions Inventories), Appendix E (Emissions Inventory Documentation), and Appendix F (Modeling Protocols). Table 5-2 below shows the 2011 modeled inventory databases by U.S. region.

**Table 5-2. 2011 Base Case Modeling Inventory Databases by Region/Domain**

<b>Source Sector</b>	<b>Allegheny County (1.33 km Domain)</b>	<b>Mid-Atlantic States (4 km Domain)</b>	<b>Eastern U.S. (12 km Domain)</b>	<b>Continental U.S. (36 km Domain)</b>
<b>Point</b>	ACHD Local + MARAMA 2011 Alpha2	MARAMA 2011 Alpha2	EPA 2011 v6.2 MP	EPA 2011 v6.2 MP
<b>EGU Point</b>	EPA 2011 v6.2 MP 2011 w/CAMD CEMS	EPA 2011 v6.2 MP 2011 w/CAMD CEMS	EPA 2011 v6.2 MP 2011 w/CAMD CEMS	EPA 2011 v6.2 MP
<b>Area</b>	MARAMA 2011 Alpha2	MARAMA 2011 Alpha2	EPA 2011 v6.2 MP	EPA 2011 v6.2 MP
<b>Nonroad Mobile</b>	MARAMA 2011 Alpha2	MARAMA 2011 Alpha2	EPA 2011 v6.2 MP	EPA 2011 v6.2 MP
<b>Onroad Mobile</b>	MARAMA 2011 Alpha2	MARAMA 2011 Alpha2	EPA 2011 v6.2 MP	EPA 2011 v6.2 MP
<b>Fires</b>	EPA 2011 v6.2 FIRES	EPA 2011 v6.2 FIRES	EPA 2011 v6.2 FIRES	EPA 2011 v6.2 FIRES
<b>Biogenics</b>	EPA 2011 NEIv2 BEIS	EPA 2011 NEIv2 BEIS	EPA 2011 NEIv2 BEIS	EPA 2011 NEIv2 BEIS

Notes:

- MARAMA Alpha2 and EPA v6.2 MP are developed from 2011 NEIv2
- Point sources include non-EGUs and small EGUs
- EGU emissions include Clean Air Markets Division (CAMD) continuous emission monitoring system (CEMS) data for the SO<sub>2</sub> and NO<sub>x</sub> temporal profiles, with EPA 2011 (annualized) emissions for other pollutants
- ACHD Local is corrected MARAMA inventory for emissions, stack parameters, coordinates, etc.
- 36/12 km domains are used to develop boundary conditions for 4/1.33 km domains

Emissions inventories for the future year modeling were based on MARAMA, EPA, and Eastern Regional Technical Advisory Committee (ERTAC) EGU inventories and modeling platforms. Similar to the base case, revisions were made by ACHD to Allegheny County sources for 2021 for known modifications, shutdowns, projected growth, and new sources (see Appendix D.1 (Summary of Inventories and Revisions)). Table 5-3 below shows the 2021 modeled inventory databases by U.S. region. Since MARAMA Alpha2 inventories were projected to years 2018 and 2028, many sectors for the future case year 2021 were based on interpolations.

**Table 5-3. 2021 Future Case Modeling Inventory Databases by Region/Domain**

<b>Source Sector</b>	<b>Allegheny County (1.33 km Domain)</b>	<b>Mid-Atlantic States (4 km Domain)</b>	<b>Eastern U.S. (12 km Domain)</b>	<b>Continental U.S. (36 km Domain)</b>
<b>Point</b>	ACHD Local + MARAMA Alpha2 Interpolated 2018/2028	MARAMA Alpha2 Interpolated 2018/2028	EPA v6.2 MP Interpolated 2017/2025	EPA v6.2 MP Interpolated 2017/2025
<b>EGU Point</b>	ERTAC v2.4L2 2021	ERTAC v2.4L2 2021	ERTAC v2.4L2 2021	EPA v6.2 MP Interpolated 2017/2025
<b>Area</b>	MARAMA Alpha2 Interpolated 2018/2028	MARAMA Alpha2 Interpolated 2018/2028	EPA v6.2 MP Interpolated 2017/2025	EPA v6.2 MP Interpolated 2017/2025
<b>Nonroad Mobile</b>	EPA v6.2 MP Interpolated 2017/2025	EPA v6.2 MP Interpolated 2017/2025	EPA v6.2 MP Interpolated 2017/2025	EPA v6.2 MP Interpolated 2017/2025
<b>Onroad Mobile</b>	MARAMA Alpha2 2018	MARAMA Alpha2 2018	EPA v6.2 MP 2017	EPA v6.2 MP 2017
<b>Fires</b>	EPA 2011 v6.2 FIRES	EPA 2011 v6.2 FIRES	EPA 2011 v6.2 FIRES	EPA 2011 v6.2 FIRES
<b>Biogenics</b>	EPA 2011 NEIv2 BEIS	EPA 2011 NEIv2 BEIS	EPA 2011 NEIv2 BEIS	EPA 2011 NEIv2 BEIS

Notes:

- MARAMA Alpha2 and EPA v6.2 MP are developed from NEIv2 w/projections
- For the onroad mobile sector, 2018/2017 are used as conservative estimates for future case 2021
- For the nonroad mobile sector in the 1.33 and 4 km domains, EPA interpolations were used due to issues with the MARAMA 2018/2028 files
- ERTAC 2.4L2 2021 is based on projected EGU emissions for OTC, LADCO, SESARM, and CENSARA regions
- Fire and biogenic emissions are held constant for future case
- ACHD Local is projected based on known modifications/shutdowns (with other sources held constant)

The ERTAC EGU Emissions Projection tool<sup>23</sup> has been used in place of EPA interstate rules and Integrated Planning Model (IPM) projections as a best-available approach for these sources. ERTAC version 2.4L2 was used for the future case 2021 emissions for the 12 km and higher resolution (4 km and 1.33 km) domains. ERTAC v2.4L2 is a modified version of ERTAC v2.4, developed by the Lake Michigan Air Directors Consortium (LADCO)<sup>24</sup> in 2015 for Ohio EPA's Cleveland Area PM<sub>2.5</sub> SIP.<sup>25</sup>

ERTAC 2.4L2 contains emissions information for EGUs in the continental U.S. based on information from state regulators, industry representatives, and RPO members. Growth and control factors are based on Annual Energy Outlook (AEO) 2015,<sup>26</sup> and information on changes such as new units, modifications to control technology, fuel changes, and shutdowns are included in the inventory.

For the ERTAC 2.4L2 2021 emission projections, focus was placed on permanent changes while maintaining a consistent inventory-wide generation capacity from base case to future case. The ERTAC-projected 2021 emissions take into account only enforceable control measures (as of July 2015), fuel changes, and operational status changes (including shutdowns). As a result, some uncontrolled plants were assigned increased emissions from base case in order to account for losses in overall generating capacity due to shutdowns and operational changes. Projected EGU emissions associated with ongoing regulatory actions (e.g., Clean Power Plan (CPP), Cross-State Air Pollution Rule (CSAPR), and Mercury Air Toxics Standards (MATS)) are not included in the projection from base year 2011 to 2021.

More information on the ERTAC 2.4L2 emissions used in the demonstration is included in Appendix K (EGU Analysis).

#### 5.3.4 CAMx Modeled Results

The CAMx modeling produced base year and future year predictions of PM<sub>2.5</sub> species at each grid cell location in the modeling domains. Figure 5-4 shows the absolute<sup>27</sup> modeled total PM<sub>2.5</sub> (sum of all species) for base case 2011 and future case 2021 for the 1.33 domain. Reductions in modeled impacts are evident throughout most of Allegheny County, with highest impacts for both cases in the Mon Valley.

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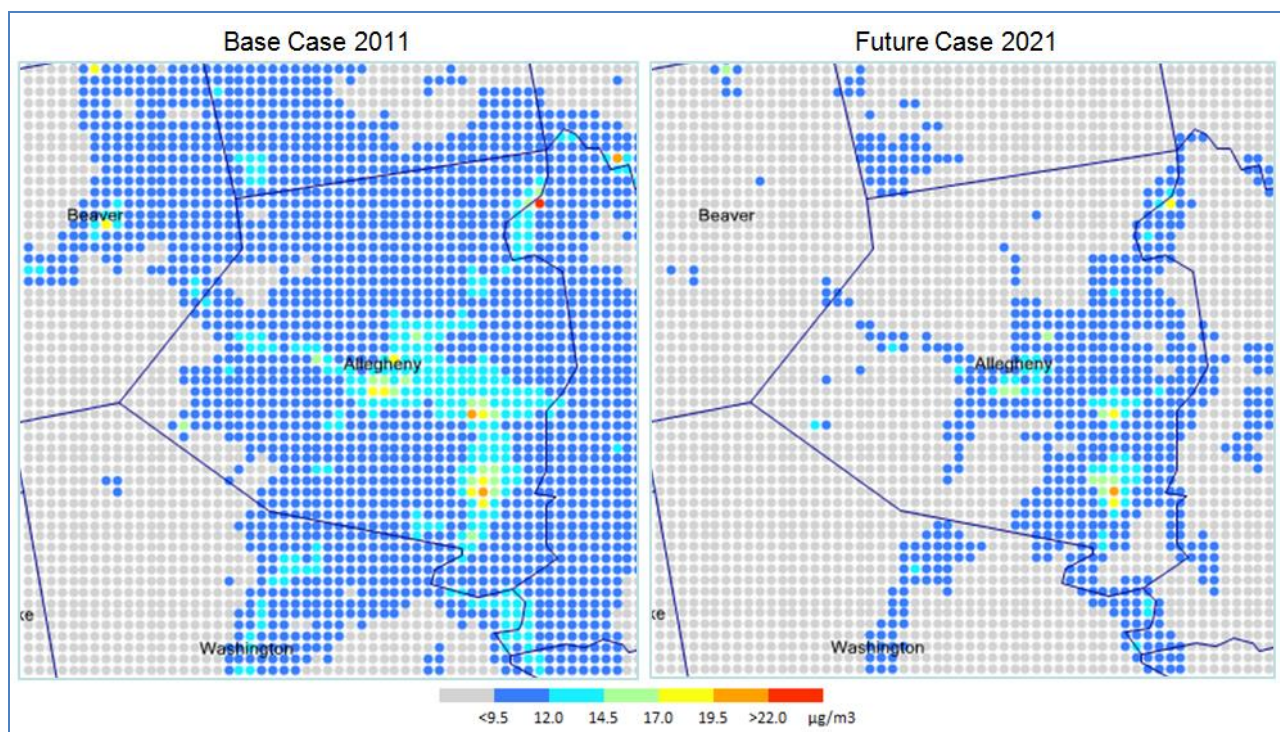
<sup>23</sup> <https://www.epa.gov/air-emissions-inventories/eastern-regional-technical-advisory-committee-ertac-electricity-generating>

<sup>24</sup> LADCO is the RPO for the Midwestern U.S. states. (<https://www.ladco.org/>)

<sup>25</sup> Available at the following web site: <https://www.epa.ohio.gov/dapc/sip/2013>

<sup>26</sup> Prepared by the U.S. Energy Information Administration (EIA). (<https://www.eia.gov/>)

<sup>27</sup> In modeling, “absolute” represents the actual concentration generated by the model. For PM<sub>2.5</sub> modeling, absolute impacts are not used directly. Instead, impacts are used in a relative sense, with ratios of future case impacts to base case impacts (or relative response factors, RRFs) scaling monitored concentrations from base case levels to future case levels.



**Figure 5-4. Modeled Absolute Annual Total PM<sub>2.5</sub> (µg/m<sup>3</sup>) for the 1.33 km Domain, Base (left) and Future (right) Cases**

Modeled impacts are used on a relative basis (ratio of future-to-before), by species, to project the monitored concentrations from the weighted 2009-2013 timeframe to the future case 2021.

### 5.3.5 MATS Attainment Test Results

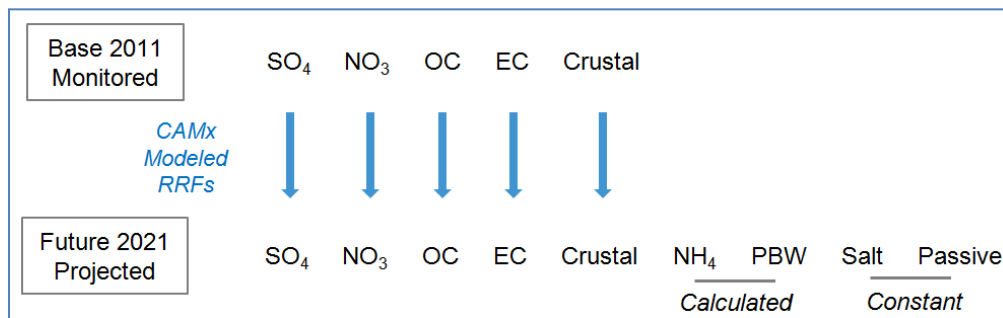
Modeled impacts are used to scale the monitored data over the 2009-2013 timeframe for each monitor site using EPA's Modeled Attainment Test Software (MATS) version 2.6.1<sup>28</sup> (Abt Associates, 2014). The MATS software combines modeled relative response factors (RRFs) with monitored species data for each site on annual and 24-hour bases. MATS also adjusts and reconstructs monitored data according to the SANDWICH method (outlined in the EPA Modeling Guidance), which better represents speciation data when used in combination with FRM masses.

The following assumptions were used for the MATS settings:

<sup>28</sup> Software for the Modeled Attainment Test - Community Edition (SMAT-CE) Version 1.2 has been released as a replacement to MATS 2.6.1, and some maps shown in this SIP and appendices were generated by SMAT-CE. However, testing of the software revealed issues with the monitor (point) design value calculations. Therefore, the official design values were generated with the MATS 2.6.1 software. Software for both SMAT-CE and MATS is available at the following web site: <https://www.epa.gov/scram/photochemical-modeling-tools>

- Nitrate (NO<sub>3</sub>) is based on retained portion (calculated by EPA, included with MATS software)
- Organic carbon (OC) is calculated by mass balance from all other species
- Ammonium (NH<sub>4</sub>) is calculated from sulfate, nitrate, and degree of neutralization (DON)
- Particle bound water (PBW) is calculated from sulfate, nitrate, and ammonium values
- Monitored sulfate (SO<sub>4</sub>), elemental carbon (EC), and crustal component are used directly for the calculations
- Salt and passive (blank) component are held constant from base to future case

Figure 5-5 shows a simplified diagram of the combination of modeled results and monitored data using the SANDWICH approach and the MATS software to project future case concentrations.



**Figure 5-5. Combination of Modeled and Monitored Species using MATS**

The resulting attainment test results from MATS showed future case design values that are attaining the NAAQS, both annual and 24-hour bases, for all sites in Allegheny County except Liberty. Base and future case design values (DVs) for these sites are shown in Table 5-4. Full results of CAMx and MATS are given in Appendix I.1 (Air Quality Technical Support Document).

**Table 5-4. Base and Future Design Values (µg/m<sup>3</sup>) for Allegheny County Sites, Except Liberty**

Site	AQS Code	Base Annual DV	Future Annual DV	Base 24-Hr DV	Future 24-Hr DV
Avalon	42-003-0002	12.4	10.0	27	21
Lawrenceville	42-003-0008	11.0	9.0	25	20
S. Fayette	42-003-0067	10.3	8.5	26	18
N. Park	42-003-0093	9.3	7.6	22	17
Harrison	42-003-1008	11.5	9.4	28	21
N. Braddock	42-003-1301	12.3	10.0	32	23
Clairton	42-003-3007	10.7	9.2	25	21

Note: Based on NAAQS rounding conventions, annual design values are rounded to the nearest tenth of a µg/m<sup>3</sup> and 24-hour design values to the nearest integer.

A review of the CAMx modeling and MATS attainment test results showed that the analysis was inadequate to demonstrate attainment for the Liberty site for the following reasons:

- The ERTAC 2.4L2 projections used in the CAMx modeling were very conservative for 2021 EGU emissions. Compared to recent actual CAMD emissions, future SO<sub>2</sub> and NO<sub>x</sub> emissions were overestimated considerably in the Midwest and Mid-Atlantic region. Overestimates of SO<sub>2</sub> and NO<sub>x</sub> caused overprediction of future case modeled ammonium sulfates/nitrates as well as particle-bound water with the CAMx impacts.
- Some local primary PM<sub>2.5</sub> emissions were overestimated with the inventory used for the CAMx modeling. More recent stack tests for primary PM<sub>2.5</sub> could be used for more accurate model inputs.
- The spatial resolution of 1.33 km CAMx gridded cells, used for all locations in Allegheny County, was likely too large to properly simulate localized impacts at Liberty. Impacts are averaged throughout a grid cell, potentially smoothing over concentration gradients (high or low) near the Liberty monitor site.
- Source characterization with CAMx was likely not fully representative of some sources near Liberty, specifically for some processes at the USS Clairton Plant. All local stationary sources were configured in CAMx as point sources, with constant emissions and fixed stack parameters. Refined modeling with AERMOD can more accurately account for many processes with the use of different source types (volumes, lines, etc.), building parameters (for downwash), and varying release heights (buoyant volumes). This is especially important for USS Clairton, since some source types have been controlled while other sources types have been added as new sources.
- Based on analysis of monitored speciation data in comparison to CAMx modeled species, species are not being properly apportioned by the modeled results and the EPA SANDWICH reconstruction method used by MATS. Modeled primary excess PM<sub>2.5</sub> does not directly translate into monitored primary excess by species, and localized impacts in this case are better accounted for when modeling a local primary component separately from the regional components.

It was also observed with the CAMx modeling that there is little chemical transformation of precursors from the Clairton Plant to the Liberty monitor. In addition to the tracking of local and regional impacts, the CAMx model configuration allowed for the tracking of primary and secondary impacts from local point source impacts. For base case 2011, modeled results showed that only 4% of the modeled localized excess was composed of secondary ammonium sulfate and nitrate. The modeled excess PM<sub>2.5</sub> at Liberty is overwhelmingly primary in nature, with secondary impacts from precursors showing negligible contributions.

Attainment for the Liberty monitor was demonstrated by the use of enhanced local modeling in combination with CAMx impacts, as described in the next section.

## 5.4 AERMOD Modeling

The CAMx model configuration was designed to allow for additional local source modeling, with impacts separated by regional and local major source impacts. A local area analysis (LAA) was developed for refined modeling of the Liberty area using the AERMOD<sup>29</sup> model in combination with the CAMx regional results.

### 5.4.1 Liberty LAA Methodology

The refined modeling for the Liberty LAA used the AERMOD modeling system version 18081 (U.S. EPA, 2018a) for major local source impacts combined with the regional CAMx impacts. The monitored data timeframe was based on 2009-2013 for the base case calculations, projected to a future case year 2021 using modeled RRFs. This methodology is identical to that used for the other sites, except that the MATS software was not used for the calculations since it is not capable of such combination of impacts.

The sources modeled with AERMOD for the Liberty LAA included the following:

- Near-field sources: USS Clairton, USS Irvin, USS Edgar Thomson
- Distant sources: Shenango, Allegheny Ludlum, McConway & Torley

These sources are the same sources that were modeled as PiG sources and tracked with PSAT in CAMx. Primary PM<sub>2.5</sub> impacts from these sources were subtracted from the regional contributions of the CAMx impacts. The refined LAA modeling lumped the AERMOD impacts from these sources into a new component called local primary material (LPM), to be summed with the CAMx regional impacts (i.e., without LPM) according to the SANDWICH reconstruction methodology to generate the final design values at Liberty.

The CAMx regional results included secondary impacts (formed from precursor emissions) from all sources and sectors, as well as primary PM<sub>2.5</sub> impacts from all sources/sectors other than the LPM sources. The LPM results included only impacts from primary PM<sub>2.5</sub> (filterable and condensable) emissions from the six sources identified above.

### 5.4.2 Model Configuration

The AERMOD modeling was performed according to procedures outlined in Appendix F.3 (AERMOD Modeling Protocol).

Source types were as follows:

- Stacks/towers: point sources, including building parameters for sources with downwash
- Ambient-temperature process fugitives: volume sources
- Pile erosion sources: area sources

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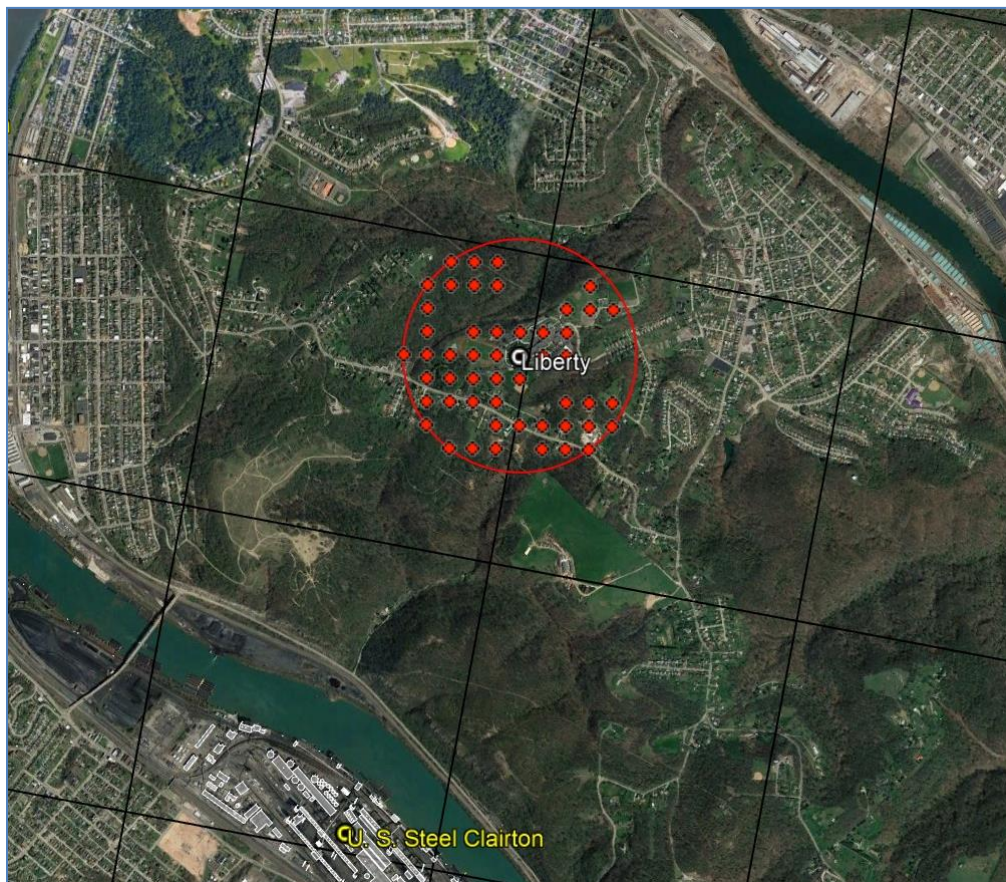
<sup>29</sup> American Meteorological Society/Environmental Protection Agency Regulatory Model (<https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models>)

- Coke oven (buoyant) battery fugitives: line volume sources with a BLP<sup>30</sup>/AERMOD hybrid approach

The BLP/AERMOD hybrid approach for buoyant line sources was approved for use by the EPA Region 3 regional office as an alternative model on August 16, 2018 (see Appendix H (Alternative Modeling Demonstration for Buoyant Fugitives)).

Meteorological inputs were based on 2011 MMIF version 3.4 (Brashers and Emery, 2018) prognostic site-specific data extracted from WRF at each source location.

An expanded-scale receptor grid was used for Liberty, with several receptors placed near the monitor location within a 500-m radius of Liberty and within 50 ft elevation of the flagpole height of the FRM monitor. Figure 5-6 shows the locations of the Liberty receptors used for the AERMOD LPM impacts.



**Figure 5-6. Liberty Area Receptors in AERMOD**

<sup>30</sup> Buoyant Line and Point Source dispersion model  
(<https://www3.epa.gov/ttn/scram/userg/regmod/blpug.pdf>)

The CAMx grid cells corresponding with the Liberty monitor were used for the non-LPM component of PM<sub>2.5</sub> at Liberty. Figure 5-7 shows the numbered CAMx 1.33 km resolution grid cells containing or adjacent to the Liberty site. Since Liberty falls near the border of two CAMx grid cells (18042 and 18043),<sup>31</sup> the average results from the two grid cells were used in combination with the AERMOD impacts.



**Figure 5-7. CAMx 1.33 km Grid Cells in Liberty Area**

Modeled species were averaged by major species on a daily (24-hour calendar day) basis. Modeled RRFs from the AERMOD base and future case model runs were then applied to the monitored LPM component, and the CAMx modeled RRFs were applied to the regional components for Liberty.

#### 5.4.3 Liberty Attainment Test Results

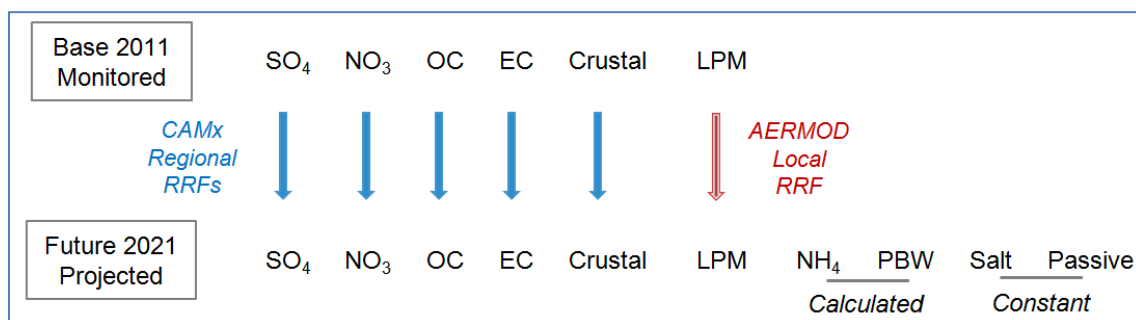
In order to combine the impacts from two different models, the monitored data was first “split” into the localized Liberty LPM component and the regional component. This was done by first calculating the average species compositions of the surrounding speciation sites in the Pittsburgh MSA.<sup>32</sup> The Liberty monitored local excess component was then determined from a series of

<sup>31</sup> CAMx grid cells were numbered according to geographic x-y coordinates used by the model.

<sup>32</sup> The Lawrenceville, Florence, and the Greensburg CSN monitor sites.

calculations that subtracted the average quarterly regional species concentrations from the Liberty quarterly concentrations, on both annual and 24-hour high-day bases. (See Appendix I.2 (Liberty Local Area Analysis) for the calculations.)

Design values are then calculated in the same manner as the MATS software, applying the modeled RRFs to the monitored species data. Figure 5-8 shows the simplified diagram of the combination of modeled and monitored data as used for the LAA, with the species split into regional and LPM components for Liberty.



**Figure 5-8. Combination of Modeled and Monitored Species for the Liberty LAA**

After the more specific combination of the regional and local components, Table 5-5 below shows the final design values for Liberty from the refined LAA modeling. (See Appendix F (Modeling Protocols) and Appendix I (Modeling Demonstration and Analyses) for more details on the combination of regional and local impacts.)

**Table 5-5. Base and Future Design Values ( $\mu\text{g}/\text{m}^3$ ), Liberty**

Site	AQS Code	Base Annual DV	Future Annual DV	Base 24-Hr DV	Future 24-Hr DV
Liberty	42-003-0064	14.4	12.0	41	35

## 5.5 Model Performance

Model performance review provides a method to examine modeled data in comparison to actual monitored data for the same timeframe. For the base 2011 case, model performance for the Allegheny County, PA NAA was examined by Ramboll and ACHD. Detailed model evaluations for the WRF, CAMx, and AERMOD modeling results are provided in Appendix G (Model Performance Evaluations). Results overall showed good performance in comparison to monitored data and to model benchmarks for photochemical modeling.

EPA Modeling Guidance recommends performance statistics for use in operational evaluation of the modeled results, used to test the accuracy of the modeled results compared to the monitored data. “Goal” benchmarks are considered to be the best performance that a model can achieve,

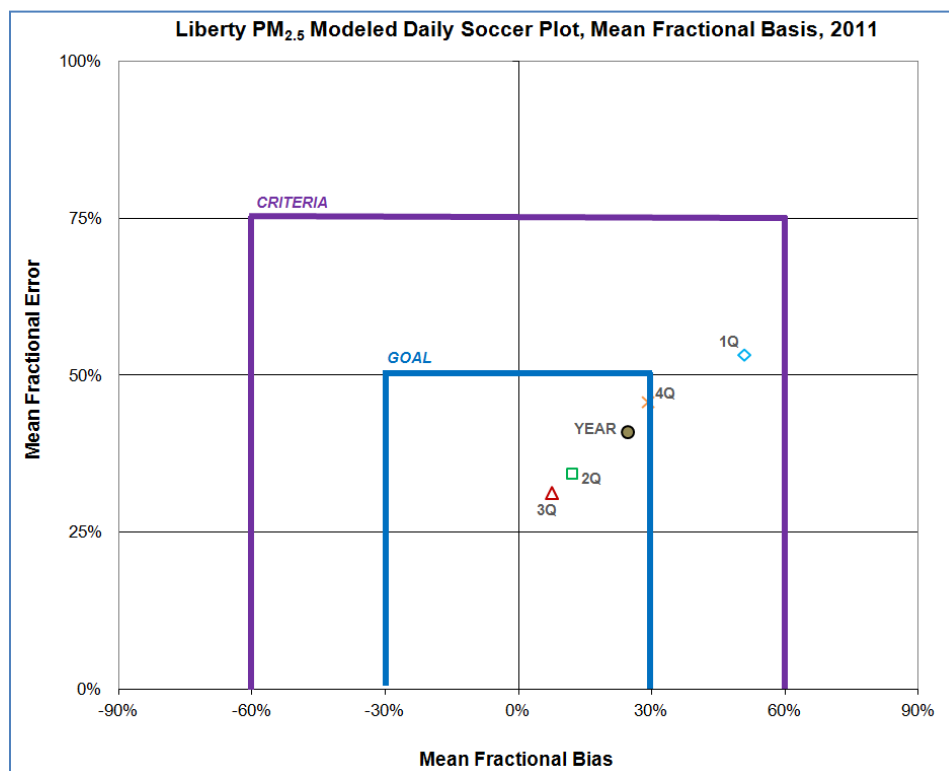
while “criteria” benchmarks are considered to be average or reasonable performance. Statistics shown below in Table 5-6 were generated for total daily PM<sub>2.5</sub> from the AERMOD modeling at Liberty in combination with CAMx regional impacts.

**Table 5-6. Liberty 24-Hour Modeled Statistics and Benchmarks, Quarterly and Yearly, 2011**

Metric	Goal	Criteria	1Q	2Q	3Q	4Q	Yearly
Mean Fractional Bias (FB)	<±30%	<±60%	50.8%	12.0%	7.5%	29.2%	24.6%
Mean Fractional Error (FE)	<50%	<75%	53.3%	34.3%	31.2%	45.7%	41.0%
Correlation Coefficient (r)	>0.70	>0.40	0.76	0.69	0.67	0.78	0.68

For year-round concentrations, modeled fractional bias and error are within the goal benchmarks. On a quarterly basis, 2<sup>nd</sup> and 3<sup>rd</sup> quarters show the best performance for bias and error, falling well within the goal benchmarks. Correlation coefficient falls just below goal on a year-round basis but well above criteria for all quarters.

Figure 5-9 shows a “soccer plot” that visually displays fractional bias and error of the data points within the goal and criteria ranges (blue and purple boxes, respectively).



**Figure 5-9. Liberty Daily Soccer Plot, Mean Fractional Bias and Error, 2011**

The soccer plot shows good performance year-round for the modeling, with 3<sup>rd</sup> quarter showing the best performance by quarter. The 1<sup>st</sup> quarter shows reasonable performance, falling in the criteria range.

## 5.6 Unmonitored Area Analysis

Based on EPA Modeling Guidance, an unmonitored area analysis (UAA) can be performed for gridded model demonstrations to examine predicted concentrations within an entire domain. UAA is a supplemental analysis intended as a means for identifying potentially high PM<sub>2.5</sub> concentrations in unmonitored locations within a NAA but not for direct comparison to the NAAQS. The most recent ACHD five-year monitor network assessment (ACHD, 2015) found that the current monitor network is appropriate for PM<sub>2.5</sub> monitoring requirements, with sufficient coverage for population exposure in areas of concern.

UAA was performed for the Allegheny County, PA NAA based on gradient-adjusted spatial fields calculated from CAMx modeled results and monitored results within the 1.33 km domain. The analysis showed that spatial-field projections for 2021 are below the annual PM<sub>2.5</sub> standard across the vast majority of Allegheny County, with projections exceeding the standard in a few areas without PM<sub>2.5</sub> monitors that can be attributed to large modeled concentration gradients associated with major facilities within grid cells, sub-optimal characterization of low-level area sources, and difficulty modeling micro-scale features (PM<sub>2.5</sub> emissions, meteorology) in urban core locations.

Conclusions from the UAA are that the current monitors are located in areas adequate to demonstrate attainment of the PM<sub>2.5</sub> NAAQS for Allegheny County. More details on the UAA can be found in Appendix I.3 (Unmonitored Area Analysis).

## 5.7 Insignificance of Precursors

Based on the EPA Precursor Demonstration Guidance (U.S. EPA, 2016b), the effect of a precursor can be demonstrated through a modeled sensitivity analysis. The significance of a precursor can be determined by changes in design values at monitored sites within the NAA due to reduced anthropogenic emissions of that precursor. If changes due to the reductions are equal to or less than the recommended significant contribution thresholds (0.2 µg/m<sup>3</sup> on an annual basis, 1.3 µg/m<sup>3</sup> on a 24-hour basis), that precursor can be deemed insignificant to the attainment plan.

Ramboll performed additional CAMx runs to determine the significance of VOC and NH<sub>3</sub> as precursors in the Allegheny County, PA NAA. For the sensitivity model runs, precursor emissions in Allegheny County were reduced as follows, with all other emissions held constant:

1. One CAMx model run with 50% reduction of anthropogenic VOC emissions within Allegheny County
2. One CAMx model run with 50% reduction of anthropogenic NH<sub>3</sub> emissions within Allegheny County

The EPA MATS software was used to generate design values with and without the precursor reductions for monitor sites in the NAA. MATS settings were identical to those described in Appendix I.1 (Air Quality Technical Support Document).

Tables 5-7 and 5-8 show the annual and 24-hour reductions in design values (DVs) for the sensitivity cases at each monitor site.

**Table 5-7. Sensitivity Test Reductions in Design Values, Annual Basis (µg/m<sup>3</sup>)**

Site	AQS ID	Reduction in DV w/50% less VOC (µg/m <sup>3</sup> )	Reduction in DV w/50% less NH <sub>3</sub> (µg/m <sup>3</sup> )
Avalon	42-003-0002	0.0	0.2
Lawrenceville	42-003-0008	0.0	0.2
Liberty	42-003-0064	0.0	0.2
South Fayette	42-003-0067	0.0	0.1
North Park	42-003-0093	0.0	0.2
Harrison	42-003-1008	0.0	0.1
North Braddock	42-003-1301	0.0	0.2
Clairton	42-003-3007	0.0	0.1

**Table 5-8. Sensitivity Test Reductions in Design Values, 24-Hour Basis (µg/m<sup>3</sup>)**

Site	AQS ID	Reduction in DV w/50% less VOC (µg/m <sup>3</sup> )	Reduction in DV w/50% less NH <sub>3</sub> (µg/m <sup>3</sup> )
Avalon	42-003-0002	0.0	0.1
Lawrenceville	42-003-0008	0.0	0.0
Liberty	42-003-0064	0.0	0.8
South Fayette	42-003-0067	0.0	0.1
North Park	42-003-0093	0.1	0.9
Harrison	42-003-1008	0.0	0.0
North Braddock	42-003-1301	0.0	0.4
Clairton	42-003-3007	0.0	0.0

All reductions in design values were below the significant contribution thresholds; therefore, VOC and NH<sub>3</sub> were deemed to be insignificant contributors to nonattainment in Allegheny County. These precursors were excluded from the additional analysis required for this SIP.

More details of the precursor sensitivity modeling can be found in Appendix I.4 (Precursor Insignificance Demonstration).

Note that precursor sensitivity analyses were not performed for NNSR requirements for this SIP. For new source review, all precursors are deemed to be significant for the NAA unless an insignificance finding can be demonstrated for one or more precursor.

## 6 Reasonably Available Control Measures and Technology

Sections 172(c)(1) and 189(a)(1)(C) of the CAA requires the implementation of Reasonably Available Control Measures (RACM), including Reasonably Available Control Technology (RACT) for stationary point sources, as expeditiously as practicable but no later than four years after designation for a moderate NAA.

As further explained in the PM<sub>2.5</sub> Implementation Rule, RACM/RACT are defined as technologically and economically feasible measures or technology that could be implemented if needed to demonstrate attainment or if such measures would advance the attainment date by one year or more. If the area is able to show attainment through the modeling demonstration, and if it can be demonstrated that reasonable measures would not advance the attainment date for the area, such measures or additional control measures do not need to be adopted for the SIP. Additional control measures are those that could be implemented after four years of designation but within the attainment date (six years after designation).

Therefore, the purpose of this RACM/RACT analysis is to determine if reasonable or additional controls are available – with consideration of technical and economic feasibility – that could collectively advance attainment date by one year or more. Options for the control of primary PM<sub>2.5</sub> and precursors SO<sub>2</sub> and NO<sub>x</sub> were the focus of the RACM/RACT analysis. Based on the insignificance findings for VOC and NH<sub>3</sub> (see Section 5 (Modeling Demonstration)), control options for VOC and NH<sub>3</sub> were not considered. Summaries of the RACM/RACT findings are included in this section, with further details of the analyses found in Appendix J (RACM/RACT Analysis).

### 6.1 RACM Summary

Several RACM options were examined for Allegheny County area and mobile sources (nonroad and onroad), along with some small point source categories. Current controls or programs in place and RACM alternatives that were evaluated are summarized by source category group in Table 6-1, with detailed analyses by source category group given in Appendix J.1 (RACM Analysis).

For each source category group, the following steps were taken to evaluate the RACM alternatives:

1. Examine source category emissions in the NAA, with priority given to categories with the largest emissions of primary PM<sub>2.5</sub> and precursors SO<sub>2</sub> and NO<sub>x</sub>.
2. Determine technologically feasible control technologies or measures for each source category group.
3. For each technologically feasible emission control technology/measure, examine:
  - a. The control efficiency by pollutant.
  - b. The possible emission reductions by pollutant.
  - c. The estimated cost per ton of pollutant reduced.
  - d. The date by which the technology or measure could be reasonably implemented.

**Table 6-1. Current Controls and RACM Alternatives Evaluated for Allegheny County**

Source Category Group	Existing Controls/Programs	RACM Alternative(s)	Remarks
Agriculture	None.	None identified.	Few sources in Allegheny County, emissions are mostly NH <sub>3</sub> , which is an insignificant precursor in the NAA.
Commercial Cooking	None.	1) Charbroiler catalytic oxidizers for chain-driven broilers. 2) HEPA filters for under-fired broilers.	Small reductions county-wide for Option 1. Full implementation could take five years for Option 2.
Cremation	None.	None identified.	Small source of emissions county-wide; permit restrictions are BACT.
Fuel Combustion (Industrial and Commercial)	Federal standards for boilers and engines.	Low-NO <sub>x</sub> burners.	Full implementation could take five years.
Fuel Combustion (Residential)	Sulfur limit for home heating oil.	None identified.	Small sources compared to commercial and industrial fuel combustion.
Fuel Combustion (Residential Wood)	Fireplace insert program; non-Phase 2 outdoor wood-fired boilers (OWBs) are prohibited; no outdoor burning on Air Quality Action Days. Wood stove change-out program in past years.	1) Additional wood stove change-out program. 2) Education & outreach on clean burning. 3) Replacement of old stoves when homes are sold. 4) OWB compliance for pre-2011 units.	Options 1 and 4 do not generate significant reductions. Options 2 and 3 are difficult to quantify for reductions and/or costs.
Fugitive Dust	Dust suppressants at various sources.	Paving of unpaved road, with no unpaved roads allowed.	Relatively small reduction county-wide.
Oil and Gas Exploration and Production	None.	None identified.	None.
Petroleum Storage	None.	None identified.	VOC emissions only, insignificant in NAA.
Solvent Utilization	ACHD regulations.	None identified.	VOC emissions only, insignificant in NAA.
Surface Coatings	ACHD regulations.	None identified.	VOC emissions only, insignificant in NAA.

Source Category Group	Existing Controls/Programs	RACM Alternative(s)	Remarks
Marine	Federal standards. A towboat repowering project was implemented in past years.	1) Vessel repowering from Tier 0 to newer engines. 2) Retrofit tugboats with diesel particulate filters. 3) Control idling. 4) Pleasure craft controls.	High costs for Option 1. Small reductions for Option 2. Options 3 and 4 not quantified, with negligible potential reductions.
Railroad	Federal standards.	Replacement of older engines to newer engines.	High costs relative to reductions.
Off-Highway Equipment (Gasoline)	Rebate program for gasoline-fueled equipment exchange.	Additional gas-for-electric exchange programs.	Reductions not quantified, likely not substantial reductions county-wide.
Off-Highway Equipment (Diesel)	Federal standards for specific source types, idling restrictions in effect.	Retrofit construction equipment with a diesel particulate filter (DPF).	Small reductions county-wide.
Off-Highway Equipment (Other)	None.	None identified	None.
Gasoline Refueling	Stage II vapor recovery systems.	None identified.	VOC emissions only, insignificant in NAA.
Gasoline Vehicles (Light-Duty)	Federal emission standards, I/M program.	Ridesharing program.	Reductions not quantified. Light duty gasoline vehicles show large reductions through 2021 from controls in place.
Gasoline Vehicles (Heavy-Duty)	Federal emission standards, idling restrictions.	None identified.	Small portion of the onroad mobile source inventory; options better identified for diesel vehicles.
Diesel Refueling	None.	None identified.	VOC emissions only, insignificant in NAA.
Diesel Vehicles (Light-Duty)	Federal emission standards, idling restrictions.	None identified.	Small portion of the onroad mobile source inventory; options better identified for gasoline vehicles.
Diesel Vehicles (Heavy-Duty)	Federal emission standards, idling restrictions.	1) Additional diesel engine retrofits. 2) Replacement of public or private fleets ahead of normal schedule. 3) Additional compliance with idling law.	Small reductions county-wide for Options 1 and 2. Option 3 not quantified.

<b>Source Category Group</b>	<b>Existing Controls/Programs</b>	<b>RACM Alternative(s)</b>	<b>Remarks</b>
CNG Vehicles (Heavy Duty)	None.	None identified.	Clean vehicles, small portion of onroad mobile source inventory.
Ethanol E-85 Vehicles (Light Duty)	None.	None identified.	Clean vehicles, small portion of onroad mobile source inventory.
Aggregate Processing	Rules in effect for stone, sand, and gravel operations.	Requires water sprays, dust suppressants, telescopic chutes, and baghouse/cyclone dust collectors.	None.

## 6.2 RACT Summary

As part of RACM, a RACT evaluation identifies controls and reasonable alternative technology for the major stationary point sources in the NAA. RACT evaluations are required for different analyses in Allegheny County, including evaluations for other NAAQS designations and permitting projects; the RACT analysis provided in this SIP should not be used to satisfy any requirements for other current or future RACT evaluations.

The methodology used for the RACT analysis for this SIP is as follows:

1. Identify all current major stationary point sources in the NAA. Source that are major for PM<sub>2.5</sub>, SO<sub>2</sub>, or NO<sub>x</sub> were included in the RACT evaluation. Major sources that are classified as major for other reasons were excluded from the analysis.
2. Identify the different processes (or process groups) for the applicable major source facilities and the current controls for the processes.
3. Identify potential RACT alternatives for the process groups, with emphasis on the largest processes/groups.
4. Evaluate the technological and economic feasibility of any potential RACT alternatives.

Appendix J.2 (RACT Analysis) contains more information on the methodology and the results of the RACT analysis. Table 6-2 below summarizes the identified facilities and the corresponding findings.

**Table 6-2. Sources Identified for RACT and Summary of Evaluations**

<b>Facility</b>	<b>Summary of Facility/Controls</b>	<b>RACT Findings</b>
Allegheny Energy Springdale (now Springdale Energy)	Combined-cycle turbine EGU, natural gas (NG) or fuel oil. Controls: low-NO <sub>x</sub> burners (LNB), selective catalytic reduction (SCR). Production has increased since base case due to electrical grid demand.	Meets RACT requirements.
ATI Allegheny Ludlum	Specialty steel facility. Controls: baghouses, ultra-low NO <sub>x</sub> burners (ULNB), mist eliminators.	Meets RACT requirements.
Bay Valley (now Riverbend)	Food manufacturing facility. Controls: LNB, flue gas recirculation (FGR). Switched from coal to natural gas as fuel for all units since base case 2011.	Meets RACT requirements.
Bellefield Boiler	Steam generation facility. Controls: LNB, FGR.	Meets RACT requirements.
Energy Center Pittsburgh (North Shore)	District heating and cooling plant. Controls: LNB, drift eliminators.	Meets RACT requirements.
GenOn Brunot Island	Combined-cycle turbine EGU, NG or fuel oil. Controls: water injection with SCR, mist eliminators.	Meets RACT requirements.
GenOn Cheswick	Coal-fired EGU. Controls: FGD, LNB with overfire air (OFA), SCR, ESP.	Meets RACT requirements.
Pittsburgh Allegheny County Thermal (PACT)	Steam generation facility. Controls: NO <sub>x</sub> limits.	Meets RACT requirements.
Universal Stainless	Specialty steel facility. Controls: LNB, baghouses.	Meets RACT requirements.
University of Pittsburgh (Main Campus)	Public university. Controls: ULNB, FGR, very low sulfur fuel oil.	Meets RACT requirements.
USS Clairton	Metallurgical coke and by-products facility. Controls: baghouses, baffles (quench towers), coke oven gas (COG) grain limits, afterburners, visible emission (VE) restrictions.	Meets RACT requirements.
USS Edgar Thomson	Iron and steel making facility. Controls: baghouses, COG grain limits, scrubbers, drift eliminators.	Meets RACT requirements.
USS Irvin	Secondary steel processing facility. Controls: COG grain limits, scrubbers, mist eliminators.	Meets RACT requirements.

### 6.3 Findings

The finding of RACM/RACT analysis is that no feasible controls (or combination thereof) in Allegheny County would advance the attainment date by one year or more, including “additional control measures” that could be implemented after four years but before the attainment date. The RACT analysis for the major point sources shows that implemented controls represent reasonably available (or better) control technology.

As demonstrated in Section 5 (Modeling Demonstration), the NAA can attain the 2012 annual PM<sub>2.5</sub> standard by December 31, 2021 via the control strategy described in Section 3 (Control Strategy). Therefore, this SIP satisfies RACM/RACT requirements for the NAA.

## 7 Reasonable Further Progress and Quantitative Milestones

Sections 172(c) and 171(1) of the CAA requires Reasonable Further Progress (RFP) for a PM<sub>2.5</sub> NAA in order to assure attainment of the NAAQS by the applicable date through annual incremental reductions, with Section 189 of the CAA requiring quantitative milestones to be achieved toward RFP until the area is redesignated to attainment.

As explained in the PM<sub>2.5</sub> Implementation Rule, RFP and quantitative milestones should include the following components for a moderate nonattainment area:

- An implementation schedule for control measures, including RACM/RACT
- RFP emissions inventories by pollutant and sector that includes milestone years
- A demonstration of progress toward attainment between the base and future years
- Identification of quantitative milestones to ensure that progress is achieved by the milestone years

Since all control measures for this SIP have already been implemented, and since there are no identified RACM/RACT or “additional control measures” to be implemented (see the previous section), a schedule for implementation of controls is not applicable to this SIP. The additional RFP and quantitative milestone components are provided in the sections below.

### 7.1 RFP Inventories

RFP emissions inventories were compiled for the milestone years of 2019 and 2022 based on the base and projected inventories used in the attainment demonstration. Milestone years are based on a schedule of 4.5 and 7.5 years after designation (years 2019 and 2022, respectively),<sup>33</sup> as outlined in the PM<sub>2.5</sub> Implementation Rule for a moderate PM<sub>2.5</sub> NAA.

Emissions were compiled for milestone years 2019 and 2022 for PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>x</sub>, since VOC and NH<sub>3</sub> were shown to be insignificant precursors for this SIP. Year 2019 emissions were calculated by linearly interpolating base year 2011 and projected case 2021 emissions. Year 2022 emissions were held constant from the projected 2021 case, as a conservative approach beyond the expected attainment timeframe.

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<sup>33</sup> Milestone years occur every three years starting from the due date of the SIP (i.e., 18 months after designation), which equate to 4.5 years and 7.5 after the designation in 2015. The second milestone of 7.5 years, although beyond the attainment date for a moderate area, is included in case of reclassification from moderate to serious for the nonattainment area.

Tables 7-1 through 7-3 show the RFP emissions inventories by sector for base year 2011, projected year 2021, and milestone years 2019 and 2022, for PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>x</sub>, respectively.

**Table 7-1. PM<sub>2.5</sub> RFP Emissions Inventory (tons/year)**

Year	Base 2011			Milestone 2019			Projected 2021			Milestone 2022		
Allegheny County	PM <sub>2.5</sub>	PM <sub>2.5</sub> (filt)	PM <sub>2.5</sub> (cond)	PM <sub>2.5</sub>	PM <sub>2.5</sub> (filt)	PM <sub>2.5</sub> (cond)	PM <sub>2.5</sub>	PM <sub>2.5</sub> (filt)	PM <sub>2.5</sub> (cond)	PM <sub>2.5</sub>	PM <sub>2.5</sub> (filt)	PM <sub>2.5</sub> (cond)
Point Sources	2,503	1,338	1,164	2,305	1,272	1,032	2,256	1,256	999	2,256	1,256	999
Area Sources	2,491	2,011	480	2,665	2,183	473	2,708	2,226	472	2,708	2,226	472
Nonroad Mobile Sources	361	361	0	259	259	0	234	234	0	234	234	0
Onroad Mobile Sources	450	450	0	303	303	0	266	266	0	266	266	0
Fires	24	24	0	24	24	0	24	24	0	24	24	0
Biogenics	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>5,829</b>	<b>4,185</b>	<b>1,644</b>	<b>5,556</b>	<b>4,042</b>	<b>1,505</b>	<b>5,488</b>	<b>4,007</b>	<b>1,471</b>	<b>5,488</b>	<b>4,007</b>	<b>1,471</b>

**Table 7-2. SO<sub>2</sub> RFP Emissions Inventory (tons/year)**

Year	Base 2011	Milestone 2019	Projected 2021	Milestone 2022
Allegheny County	SO <sub>2</sub>	SO <sub>2</sub>	SO <sub>2</sub>	SO <sub>2</sub>
Stationary Point Sources	13,460	7,429	5,921	5,921
Area Sources	1,528	1,169	1,079	1,079
Nonroad Mobile Sources	11	6	5	5
Onroad Mobile Sources	78	41	31	31
Fires	2	2	2	2
Biogenics	0	0	0	0
<b>Total</b>	<b>15,080</b>	<b>8,647</b>	<b>7,039</b>	<b>7,039</b>

**Table 7-3. NO<sub>x</sub> RFP Emissions Inventory (tons/year)**

Year	Base 2011	Milestone 2019	Projected 2021	Milestone 2022
<b>Allegheny County</b>	<b>NO<sub>x</sub></b>	<b>NO<sub>x</sub></b>	<b>NO<sub>x</sub></b>	<b>NO<sub>x</sub></b>
Stationary Point Sources	11,128	8,568	7,928	7,928
Area Sources	6,979	6,727	6,664	6,664
Nonroad Mobile Sources	3,921	2,554	2,212	2,212
Onroad Mobile Sources	13,259	7,218	5,708	5,708
Fires	5	5	5	5
Biogenics	166	166	166	166
<b>Total</b>	<b>35,460</b>	<b>25,239</b>	<b>22,684</b>	<b>22,684</b>

For comparison to the milestone year 2019 inventory, a composite “current” inventory can be compiled from the most recently available inventories, shown in Table 7-4. For point source emissions, 2017 is the most recently available year.<sup>34</sup> For area and mobile sources, 2014 is the most recently available year from NEI.<sup>35</sup> (Note: fire and biogenic emissions were held constant, similar to the methodology used for the 2011 to 2021 timeframe.)

**Table 7-4. Composite Current Emissions Inventory (tons/year)**

Allegheny County	PM <sub>2.5</sub>	PM <sub>2.5</sub> (filt)	PM <sub>2.5</sub> (cond)	SO <sub>2</sub>	NO <sub>x</sub>
Point Sources (2017)	1,305	775	530	4,712	6,148
Area Sources (2014)	2,646	2,174	473	481	8,687
Nonroad Mobile Sources (2014)	315	315	0	8	3,183
Onroad Mobile Sources (2014)	389	389	0	76	11,754
Fires (2011)	24	24	0	2	5
Biogenics (2011)	0	0	0	0	166
<b>Total</b>	<b>4,679</b>	<b>3,677</b>	<b>1,003</b>	<b>5,279</b>	<b>29,943</b>

<sup>34</sup> Available at the following web site: <https://www.dep.pa.gov/DataandTools/Reports/Pages/Air-Quality-Reports.aspx>

<sup>35</sup> Available at the following web site: <https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data>

The totals in Table 7-4 show that Allegheny County emissions, based on the combination of 2017 and 2014 inventory years,<sup>36</sup> are already lower than year 2019 emissions for PM<sub>2.5</sub> and SO<sub>2</sub>, with NO<sub>x</sub> still above the 2019 emissions primarily due to the 2014 NEI onroad mobile source emissions. The onroad mobile source sector is expected to show substantial decreases in more recent years.

Based on EPA Air Emissions Reporting Requirements (AERR),<sup>37</sup> EPA requirements, yearly inventories for large point sources are required to be reported within 12 months of the end of a calendar year (e.g., for year 2019, the inventory is required by Dec. 31, 2020). Additionally, emissions for area and mobile sources are required on a triennial basis, coinciding with NEI years. The NEI generally requires at least two years for development, with the next NEI year (2017) still under development. Since these databases will not be available for year 2019, a composite inventory will not be used as a quantitative milestone for 2019 (see Section 7.3 below), and the composite current inventory is provided here as supporting information only.

## 7.2 Linear Progress

RFP includes a demonstration of progress made toward attainment in the years between the base and future case, with “generally linear reductions” indicative of progress. Linear reductions have been examined for Allegheny County monitored and point source emissions data from the base year through the most recently available data. Linear regressions have been added to indicate the progress achieved on an annual basis.

Monitored concentrations given in Tables 7-5 and 7-6 show the annual and 24-hour design values, respectively, for each Allegheny County site for years 2011 through 2018. Monitors are shown ranked high-to-low (in both tables) according to 2011 design values.

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<sup>36</sup> For consistency with the 2011 and 2021 inventories, point source airport/helipad emissions from 2014 NEI (not tabulated by state/local agencies) were added to the 2017 point source inventory. Additionally, 2014 NEI waste disposal emissions from open burning (SCC codes: 2610000500 and 2610030000) were excluded, since this activity is prohibited in Allegheny County and were not included in the 2011 and 2021 inventories. Last, some 2014 NEI construction dust and mining area source emissions (SCC codes: 2311020000, 3250000000) were excluded since they were not included in the 2011 and 2021 inventories.

<sup>37</sup> <https://www.epa.gov/air-emissions-inventories/air-emissions-reporting-requirements-aerr>

**Table 7-5. Monitored Annual PM<sub>2.5</sub> Design Values (µg/m<sup>3</sup>), with Linear Progress Rates**

Allegheny County Site	Monitored Annual Design Value (µg/m <sup>3</sup> )								Linear Progress
	2011	2012	2013	2014	2015	2016	2017	2018	Yearly Rate
Liberty	15.0	14.8	13.4	13.0	12.6	12.8	13.0	12.6	-0.33
Avalon	14.7	13.4	11.4	10.6	10.6	10.4	10.2	9.7	-0.64
North Braddock	12.7	12.5	11.7	11.4	11.2	11.0	10.8	10.7	-0.30
Harrison	12.4	11.7	10.6	10.0	9.8	9.8	9.8	9.6	-0.38
Lawrenceville	11.6	11.1	10.3	10.0	9.7	9.5	9.2	9.1	-0.35
Clairton	11.5	10.9	9.8	9.5	9.9	9.8	9.8	9.3	-0.24
South Fayette	11.0	10.5	9.6	9.0	8.8	8.5	8.4	8.3	-0.39
North Park	9.7	9.4	8.8	8.5	8.5	8.2	8.2	7.8	-0.25

**Table 7-6. Monitored 24-Hour PM<sub>2.5</sub> Design Values (µg/m<sup>3</sup>), with Linear Progress Rates**

Allegheny County Site	Monitored 24-Hour Design Value (µg/m <sup>3</sup> )								Linear Progress
	2011	2012	2013	2014	2015	2016	2017	2018	Yearly Rate
Liberty	44	43	37	35	33	36	37	35	-1.2
Avalon	34	29	25	22	23	22	21	20	-1.7
North Braddock	34	33	29	26	25	25	24	24	-1.5
Harrison	30	28	25	22	22	21	21	20	-1.4
Clairton	28	26	22	23	25	26	22	19	-0.8
Lawrenceville	27	26	23	21	21	20	19	18	-1.3
South Fayette	27	26	24	20	21	19	19	18	-1.3
North Park	25	23	19	17	18	18	17	16	-1.1

All sites are showing yearly linear progress (reductions) in monitored design values from base case through current data.<sup>38</sup> Additionally, all sites are already below the NAAQS on both annual and 24-hour bases, except for Liberty on an annual basis. Based on the linear yearly rate of -0.33 µg/m<sup>3</sup> for annual design values, Liberty should be expected to achieve the annual standard by 2021. Based on the linear yearly rate of -1.2 µg/m<sup>3</sup> for 24-hour design values, Liberty is expected to continue to achieve the 24-hour standard.

<sup>38</sup> Note: Monitored results for 2018 have been fully validated and quality-assured by ACHD but not yet certified by EPA. ACHD requested certification of 2018 data on Apr. 16, 2019.

Table 7-7 shows the yearly point source emissions for Allegheny County for 2011-2017 for PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>x</sub>. Similar to the RFP inventories, airport/helipad point source emissions have been added to the point source inventories<sup>39</sup> for consistency with the other inventories provided in this SIP.

**Table 7-7. Annual Point Source Emissions (tons/year), with Linear Progress Rates**

Pollutant	Point Source Emissions (tons/year)							Linear Progress
	2011	2012	2013	2014	2015	2016	2017	Yearly Rate
PM <sub>2.5</sub>	2,503	1,725	1,822	2,127	1,511	1,373	1,305	-165
SO <sub>2</sub>	13,460	6,542	6,032	8,593	5,279	4,864	4,712	-1,084
NO <sub>x</sub>	11,128	11,881	13,073	13,715	10,278	8,560	6,148	-871

Similar to the concentration data, point source emissions are showing linear progress from the base case through the most recently data available. Considerable yearly reductions have been achieved over the timeframe. (Note: area and mobile sources emissions have not been examined for linear progress since they are only available on a triennial basis, and only 2014 data are available since 2011.)

### 7.3 Quantitative Milestones

Quantitative milestones must to be reported to EPA for the milestone years 2019 and, if applicable, 2022. The milestone report for year 2019 is due by Jan. 14, 2020, which is 90 days after the first milestone date of Oct. 15, 2019. If the 2022 milestone would be required, following reclassification to a serious area, or if attainment is not achieved by the end of 2021, the milestone report for 2022 would be due by Jan. 14, 2023, which is 90 days after the second milestone date of Oct. 15, 2022.

Air quality concentrations will be used to satisfy the milestone reporting requirement. Since Liberty is the only current nonattainment monitor for the area, concentration data for this site will be used as milestones.

<sup>39</sup> For years 2012-2013, airport/helipad emissions from 2011 NEI were added to the point source emissions. For 2015-2017, airport/helipad emissions from 2014 NEI were added to the point source emissions.

Table 7-8 shows the annual and 24-hour base and projected year design values for Liberty, along with the expected milestone year concentrations. For year 2019, the expected concentrations are based on the linear reduction rates over the 10-year timeframe (calculated by linear regression), used to interpolate the design value concentrations. For 2022, the expected design values were held constant from year 2021.

**Table 7-8. Liberty Air Quality Concentration Milestones ( $\mu\text{g}/\text{m}^3$ )**

Liberty Design Value	Base Year	Projected Year	Linear Rate	Milestone Year	Milestone Year
	2011	2021	Yearly Rate	2019	2022
Annual	15.0	12.0	-0.3	12.6	12.0
24-Hour	44	35	-0.9	37	35

Since fully processed 2019 FRM/FEM combined site records for Liberty will not be available by the Jan. 14, 2020 milestone report date, 2018 monitored data will be used to satisfy the milestone requirement. Based on the design values in Tables 7-1 and 7-2, Liberty is already meeting the 2019 milestone.

By the required reporting dates, ACHD will submit the following information to EPA Region III to demonstrate compliance with the milestones for year 2019 (and, if necessary, 2022):

- The most recently available versions of the following reports for the Liberty monitor from the EPA AQS database:
  - AMP480 (Design Value)
  - AMP450 (Quicklook Criteria)
  - AMP350 (Raw Data)
- If available for the same timeframe as the design values used for milestones, design value information from the EPA PM<sub>2.5</sub> Design Value spreadsheets<sup>40</sup> for the Liberty monitor and the Allegheny County, PA nonattainment area.

<sup>40</sup> Available for download at the following web site: <https://www.epa.gov/air-trends/air-quality-design-values>

## 8 Contingency Measures

Section 172(c)(9) of the CAA requires contingency measures to be implemented in the event that a nonattainment area fails to meet RFP or fails to attain the NAAQS by the attainment date.

This attainment demonstration is based on a base year of 2011, with an attainment year of 2021. Thus, the time period for the projected reductions is 10 years. EPA's PM<sub>2.5</sub> Implementation Rule recommends that contingency measures provide for additional reductions which are approximately equivalent to one year's worth of linear reductions achieved over the attainment timeframe. Based on the emissions given in Section 4 (Emissions Inventory), reductions per year by pollutant (for all sectors) in Allegheny County are given in Table 8-1 below.

**Table 8-1. Primary PM<sub>2.5</sub> and Precursor Yearly Reduction Rate (tons/year), 2011-2021**

<b>Allegheny County (2011-2021)</b>	<b>PM<sub>2.5</sub></b>	<b>SO<sub>2</sub></b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>NH<sub>3</sub></b>
Yearly Reduction Rate (tons/year)	-34	-804	-1,278	-605	-10

However, the implementation of one year's worth of additional reductions of primary PM<sub>2.5</sub> or PM<sub>2.5</sub> precursors from all sectors within the full NAA may or may not help mitigate nonattainment factors, specifically at Liberty. Localized primary PM<sub>2.5</sub> is more important to attainment at Liberty than PM<sub>2.5</sub> precursors, due to the time and distance required for transformation of precursors into the particle phase. Also, as shown in Section 5 (Modeling Demonstration), VOC and NH<sub>3</sub> are insignificant contributors to nonattainment in the NAA in general.

The determining monitor for nonattainment in Allegheny County since 2013 has been the Liberty monitor, with all other sites attaining and expected to continue to attain the NAAQS. Therefore, the focus of the contingency measures for this SIP is the additional control of primary PM<sub>2.5</sub> in the Liberty area if attainment is not achieved by the end of 2021.<sup>41</sup>

Reductions that are pertinent to projected attainment at Liberty are decreases of localized primary PM<sub>2.5</sub> emissions from the USS Clairton Plant over the 2011 through 2021 timeframe. For a more specific look at linear reductions for the Liberty area, based on the reduction of 93.6 tons/year of primary PM<sub>2.5</sub> from base case to future case for the Clairton Plant (as given in the Control Strategy in Section 3), a yearly reduction of 9.4 tons/year can be derived. Additionally, the corresponding yearly decrease in modeled impacts from the emissions reduction can also be examined. The relationship between emissions and impacts can be used to evaluate potential contingency measures.

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<sup>41</sup> Based on the RFP analysis in the previous section, it assumed that RFP requirements have already been met by the 2019 milestone date.

Yearly reduction rates for localized primary PM<sub>2.5</sub> and absolute modeled impacts<sup>42</sup> at Liberty are shown in Table 8-2.

**Table 8-2. Primary PM<sub>2.5</sub> Yearly Reduction Rate in Localized Emissions (tons/year) and Modeled Impacts (µg/m<sup>3</sup>) in the Liberty Area, 2011-2021**

<b>Localized Emissions or Impacts (2011-2021)</b>	<b>Primary PM<sub>2.5</sub> Emissions (tons/year)</b>	<b>Annual Modeled PM<sub>2.5</sub> Impacts (µg/m<sup>3</sup>)</b>	<b>Emissions/Impact Ratio (tons/µg/m<sup>3</sup>)</b>
Yearly Reduction Rate	-9.4	-0.09	104:1

The above reductions may not be completely applicable to future case scenarios beyond 2021, as source types and emissions have changed and will continue to change at the USS Clairton Plant as well as at surrounding sources. However, an approximate reduction of 9.4 tons/year of primary PM<sub>2.5</sub> emissions or a reduction 0.09 µg/m<sup>3</sup> of annual modeled impacts should be adequate for the determination of contingency measures.

A recent settlement agreement and order (#19060) was entered into on July 27, 2019 between ACHD and U. S. Steel. Several actions for the mitigation of primary PM<sub>2.5</sub> from the USS Clairton Plant have been included in this federally enforceable agreement, including quantifiable and/or physical controls. In the event that the Liberty monitor violate the 2012 PM<sub>2.5</sub> NAAQS by the end of 2021, the following measures will be fully implemented at the USS Clairton Plant within 60 days of notification by EPA to ACHD of failure to attain the NAAQS.<sup>43</sup>

- A cover and/or air curtains will be installed at the south side of the B Battery shed by May 1, 2020. This control is estimated by ACHD to reduce primary PM<sub>2.5</sub> emissions by 5.21 tons/year from the projected future case for the B Battery PEC system fugitives. This measure will be in place for permanent, continuous capture of fugitive emissions from the B Battery.
- A new combustion (underfiring) stack will be installed for Battery 15 by Nov. 1, 2021 to replace the existing stack. The new stack will be 35 feet taller than the current stack and with a higher exit velocity than the current stack (based on the corresponding IP 0052-I018). While emission reductions are not included with this physical control, the improved dispersion from the new stack will lead to lesser impacts at Liberty. Battery 15 combustion/underfiring emissions will be permanently rerouted to this new stack.

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<sup>42</sup> As mentioned previously in this document, modeled results are used in a relative sense, scaling the monitored concentrations by species. A decrease in modeled impacts cannot be directly compared to a decrease in monitored concentrations at Liberty.

<sup>43</sup> A violation of the NAAQS would be determined by EPA Region III from fully validated and quality-assured monitored results as submitted to EPA by ACHD. Data may or may not be fully certified at the time of the notification, due to the time required for certification.

Additional modeling by ACHD, using the same configuration as described in Section 5 (Modeling Demonstration), shows that the above contingency measures would lead to a reduction in absolute annual modeled impacts of  $0.10 \mu\text{g}/\text{m}^3$  at Liberty, which is higher than the approximate reduction rate given in Table 8-2 above. Using these reductions for attainment tests in a hypothetical scenario for 2022, with all other emissions held constant from 2021, the resulting annual design value for Liberty for 2022 would be lowered by  $0.07 \mu\text{g}/\text{m}^3$ .

The identified contingency measures should therefore be sufficient to provide lower  $\text{PM}_{2.5}$  concentrations at Liberty if needed beyond the attainment date. As mentioned in other sections of this document, it is expected that Liberty will attain the NAAQS by 2021 due to controls already in place and will continue to attain the NAAQS beyond 2021.

## 9 Transportation Conformity

Section 176 of the CAA provides a mechanism by which federally funded or approved highway and transit plans, programs, and projects are determined not to produce new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS or delay any interim milestones. EPA regulations in 40 CFR Part 93 pertaining to transportation conformity set forth policy, criteria, and procedures for demonstrating and assuring conformity of transportation plans, programs, and projects which are developed, funded, or approved by Metropolitan Planning Organizations (MPOs) or other recipients of funds under title 23 of the United States Code (U.S.C.) or the Federal Transit Laws, to an applicable implementation plan developed pursuant to Section 110 and Part D of the CAA.

In the Pittsburgh area, the Southwestern Pennsylvania Commission (SPC) is the designated MPO responsible for making timely transportation conformity determinations under federal transportation planning requirements for a 10-county region in southwestern PA.

40 CFR 93.102 requires conformity determinations to be applicable to primary emissions of PM<sub>2.5</sub> and to emissions of NO<sub>x</sub>, unless the EPA Regional Administrator and the director of the state air agency have made a determination that transportation-related emissions of NO<sub>x</sub> within the NAA are not a significant contributor to the PM<sub>2.5</sub> nonattainment problem. Emissions of SO<sub>2</sub>, VOC, and NH<sub>3</sub> are applicable only if the Administrator or state air agency has made a finding that transportation-related emissions of any of these precursors are significant contributors to the PM<sub>2.5</sub> nonattainment problem or if an applicable SIP establishes an approved or adequate motor vehicle emissions budget (MVEB) as part of a reasonable further progress, attainment, or maintenance strategy.

There have been no determinations of transportation-related insignificance for NO<sub>x</sub> or transportation-related significance for SO<sub>2</sub>, VOC, and NH<sub>3</sub> in Allegheny County, and there is no established budget for SO<sub>2</sub>, VOC, and NH<sub>3</sub>. (Additionally, as shown by the insignificance determination in Section 5 (Modeling Demonstration), VOC and NH<sub>3</sub> are not significant precursors for the attainment demonstration.) Therefore, transportation conformity requirements are applicable to PM<sub>2.5</sub> and NO<sub>x</sub> for Allegheny County.

On October 2, 2015 EPA approved a maintenance plan for the Pittsburgh-Beaver Valley NAA for the 1997 and 2006 PM<sub>2.5</sub> NAAQS.<sup>44</sup> This maintenance plan included MVEBs for 2017 and 2025, for the larger Pittsburgh-Beaver Valley NAA. Pursuant to 40 CFR 93.109(c)(2)(ii), since a MVEB has not been established for Allegheny County, the approved MVEB for the larger Pittsburgh-Beaver Valley NAA was examined for conformity analysis. Through an interagency consultation process, values for the Allegheny County, PA NAA were developed from the MVEBs for the larger Pittsburgh-Beaver Valley PM<sub>2.5</sub> NAA.

Conformity determinations for transportation plans and programs under the PM<sub>2.5</sub> air quality standards are based, as appropriate, on “build/no-build” analyses, comparisons to an emissions

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<sup>44</sup> The Pittsburgh-Beaver Valley NAA included all of Allegheny County except for the Liberty-Clairton NAA.

budget, and/or comparison to emissions levels from a base year. The appropriate conformity test for this SIP is a comparison of future year emissions in Allegheny County to Allegheny County's portion of the MVEBs (including allocated safety margin) established for the larger Pittsburgh-Beaver Valley PM<sub>2.5</sub> NAA in that area's 1997/2006 PM<sub>2.5</sub> maintenance plan. This analysis should demonstrate lower emissions in a future year (i.e., under the "build" condition) when compared with the Allegheny County portion of the MVEBs established for the larger Pittsburgh-Beaver Valley PM<sub>2.5</sub> NAA in that area's 1997/2006 PM<sub>2.5</sub> maintenance plan.

SPC's July 2018 Air Quality Conformity Determination provides information and results for the analysis. (The Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA) approved the Conformity Determination by letter dated September 25, 2018. The letter confirms that FTA and FHWA, in concurrence with the EPA, determined that, "the Conformity Determination for the federal fiscal year 2019-2022 TIPs in all nonattainment and maintenance areas of the Commonwealth, adequately address and meet the requirements as specified in the November 1993 Federal Conformity Rule and subsequent amendments.") PM<sub>2.5</sub> and NO<sub>x</sub> emission factors from the MOVES model, in combination with the highway and transit assignment results from different scenarios, were used to develop the future year emissions under the build condition for the Allegheny County NAA. The total annual vehicle miles traveled (VMT) and PM<sub>2.5</sub> and NO<sub>x</sub> emission estimates and inventory values from SPC's Air Quality Conformity Determination are presented in Table 9-1 for each analysis year. The estimated future year emissions under the build condition and Allegheny County's portion of the MVEBs established for the larger Pittsburgh-Beaver Valley PM<sub>2.5</sub> NAA in that area's 1997/2006 PM<sub>2.5</sub> maintenance plan are plotted on Figures 9-1 and 9-2.

**Table 9-1. Conformity Assessment Summary for Allegheny County**

<b>Conformity Assessment</b> <b>Allegheny County PM<sub>2.5</sub> Nonattainment Area</b> <b>Annual VMT and Emissions (Tons/Year)</b>					
<b>Entire Nonattainment Area</b>					
	2020	2022	2025	2035	2040
Annual VMT	8,360,280,869	8,410,667,514	8,506,669,696	8,658,720,051	8,895,038,410
PM 2.5 MVEB	364	364	278	278	278
PM 2.5	257	225	192	132	122
NO <sub>x</sub> MVEB	8,748	8,748	5,239	5,239	5,239
NO <sub>x</sub>	5,315	4,263	3,093	1,536	1,408

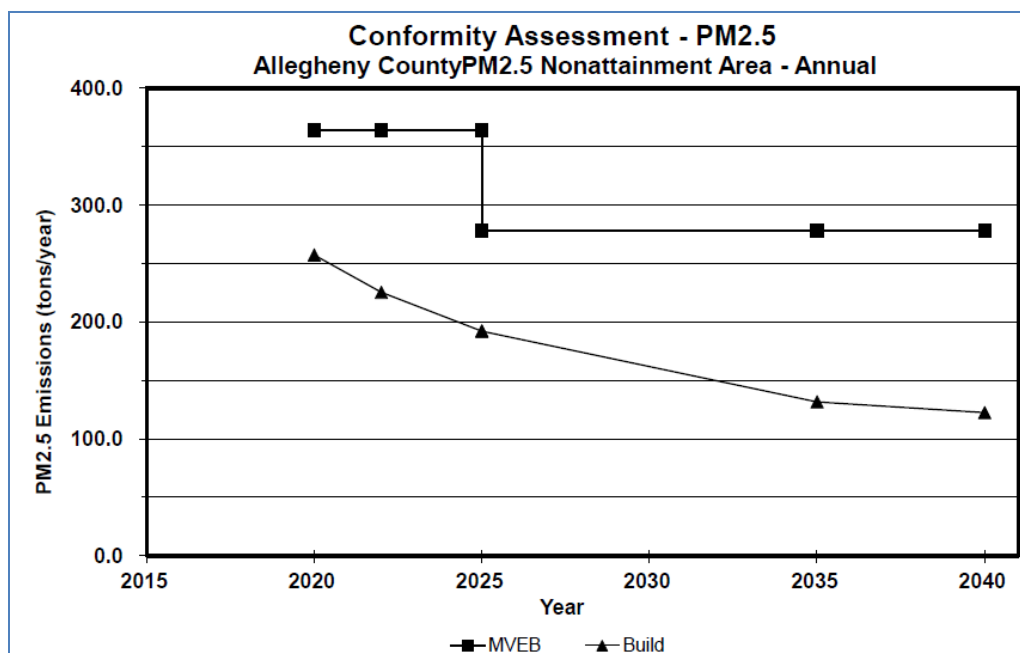


Figure 9-1. Conformity Emissions Estimates (tons/year), 2015-2040, PM<sub>2.5</sub>

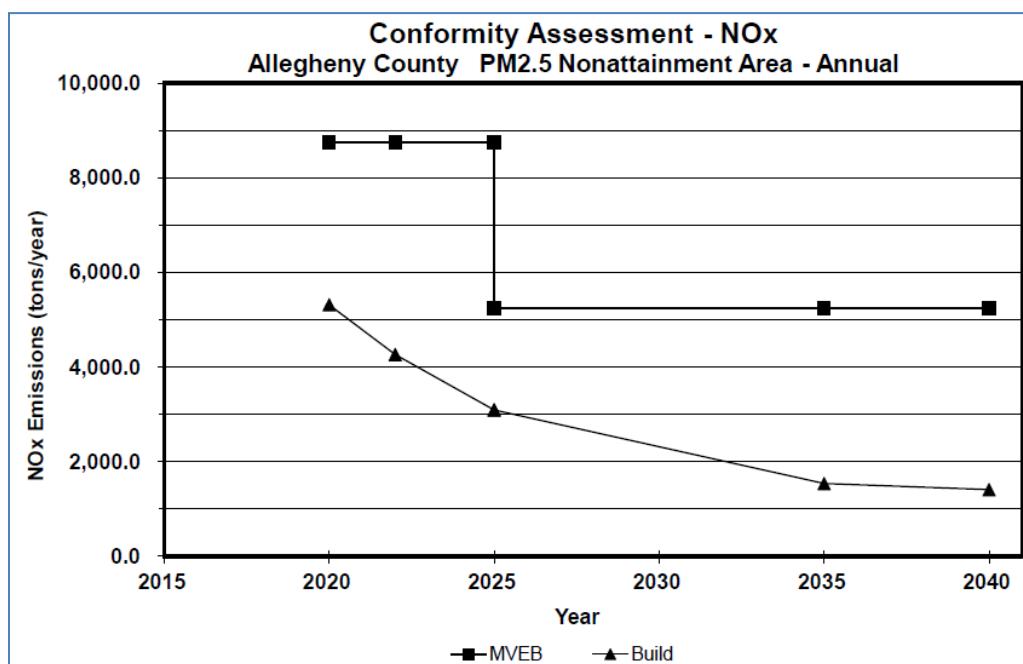


Figure 9-2. Conformity Emissions Estimates (tons/year), 2015-2040, NO<sub>x</sub>

Conformity for the Allegheny County, PA NAA under the 2012 NAAQS is demonstrated if future annual emissions under the “build” condition are less than Allegheny County’s portion of the MVEBs established for the larger Pittsburgh-Beaver Valley PM<sub>2.5</sub> NAA in that area’s 1997/2006 PM<sub>2.5</sub> maintenance plan. As can be seen in Figures 9-1 and 9-2, in all analysis years,

future annual emissions are less than Allegheny County's portion of the MVEBs established for the larger Pittsburgh-Beaver Valley PM<sub>2.5</sub> NAA in that area's 1997/2006 PM<sub>2.5</sub> maintenance plan. The analysis shows that the criteria for transportation conformity under the 2012 PM<sub>2.5</sub> NAAQs have been satisfied. No goals, directives, recommendations, or projects identified in the SPC analysis contradict in a negative manner any specific requirements or commitments of the applicable SIP, and there are no transportation control measures in the applicable SIP.

## 10 Nonattainment New Source Review

Title I, Part D, Subpart 1, §172(c)(5) of the CAA requires that a nonattainment plan includes provisions that shall require permits for the construction and operation of new or modified major stationary sources anywhere in the NAA to be in accordance with §173. This is referred to as Nonattainment New Source Review (NNSR).

In Allegheny County, the procedures and conditions for NNSR are stipulated in Article XXI §2102.06, “Major Sources Locating in or Impacting a Nonattainment Area,” and §2101.20, “Definitions.” §2102.06 incorporates by reference applicable portions of the PA DEP’s New Source Review (NSR) regulations codified at 25 Pa. Code Chapter 127.<sup>45</sup>

Revisions for the PA DEP NNSR regulations have been proposed to address the requirements of the 2012 PM<sub>2.5</sub> NAAQS (81 FR 58010, August 24, 2016) including the addition of new PM<sub>2.5</sub> precursors. ACHD simultaneously proposed similar regulations as a separate SIP revision in accordance with the PM<sub>2.5</sub> requirements. These NNSR regulations have been enacted by County Council as a county ordinance signed by the County Chief Executive and have been made effective March 3, 2019.

Revisions to the NNSR regulations include the following:

- VOC and NH<sub>3</sub> added as regulated precursor pollutants of PM<sub>2.5</sub>
- Significant emission rates of 40 tons/year for VOC and 40 tons/year for NH<sub>3</sub>
- Significant air quality impact levels (SILs) for PM<sub>2.5</sub>
  - 0.2 µg/m<sup>3</sup>, annual basis
  - 1.2 µg/m<sup>3</sup>, 24-hour basis
- Offset ratios of 1:1 for VOC and ammonia

These regulation changes have been submitted as a separate revision to the Allegheny County portion of the Pennsylvania State Implementation Plan.

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<sup>45</sup> <http://www.pacode.com/secure/data/025/chapter127/subchapter127.html>

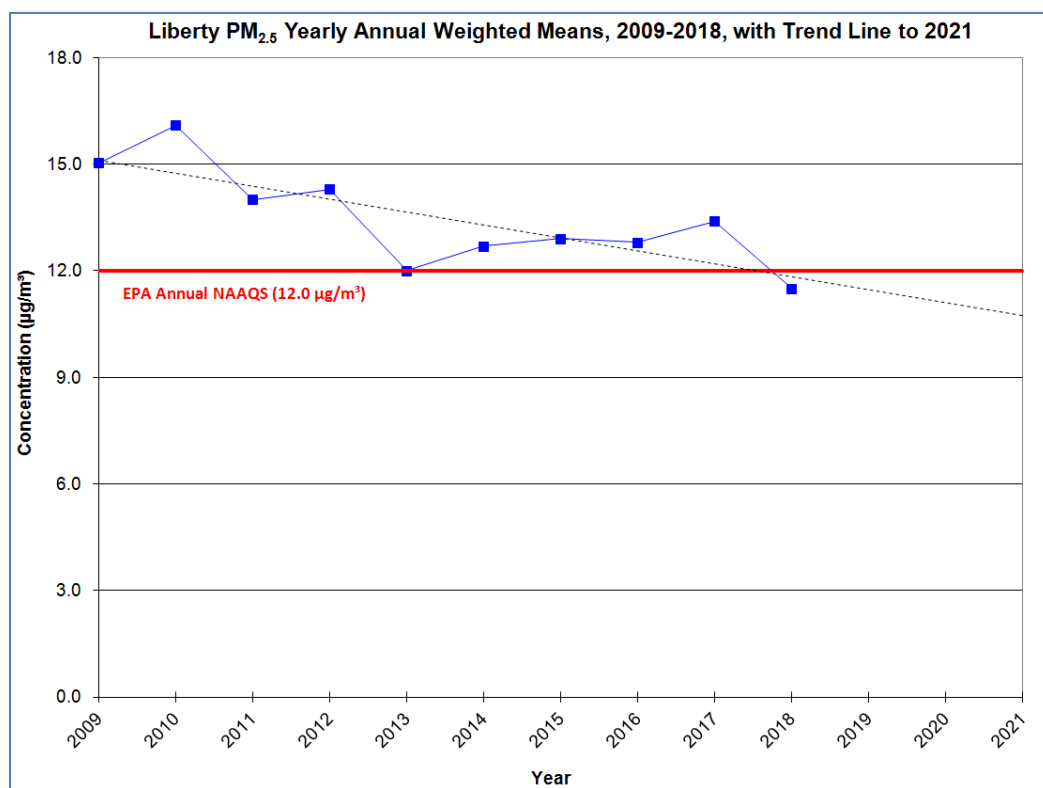
## 11 Weight of Evidence

EPA Modeling Guidance encourages the use of corroboratory analyses to support the attainment demonstration. These analyses, collectively referred to as “weight of evidence” (WOE), help bolster the assertions that an area will achieve attainment in the allotted time. Controls or programs mentioned in this section have not been included or quantified for the modeled attainment demonstration or the contingency measures for this SIP.

### 11.1 Monitored Data Trends

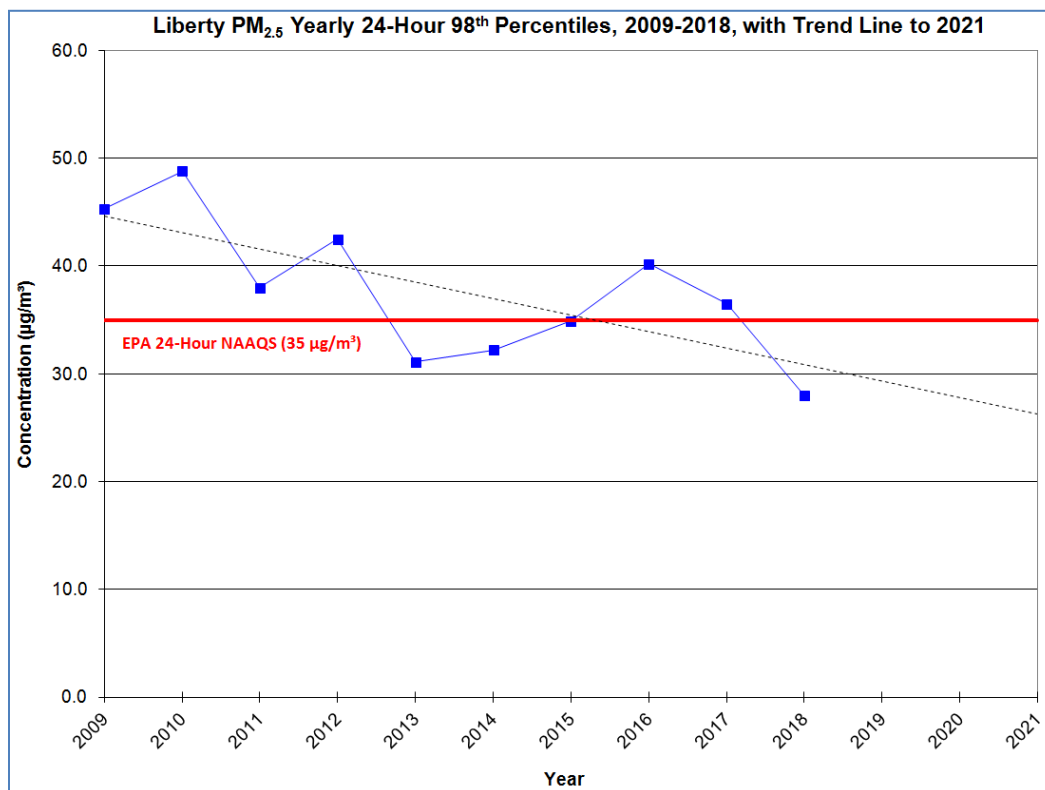
All Allegheny County sites have shown decreasing trends for PM<sub>2.5</sub> since 2000, and all sites except Liberty have shown continued attainment of the NAAQS since 2013 (see monitored data in Section 2 (Problem Statement), Section 7 (Reasonable Further Progress), and Appendix A (Monitored Data)). Liberty is also showing trends toward attainment by 2021, including more than one individual year at or below the NAAQS on annual and 24-hour bases.

Figures 11-1 and 11-2 show the yearly Liberty annual weighted means and 24-hour 98<sup>th</sup> percentiles over a 10-year timeframe (2009-2018), with 2009 as the first year of the weighted base case timeframe and 2018<sup>46</sup> as the most recent year of monitored results. Linear regression is also included in each chart, showing trend lines to the future attainment year 2021.



**Figure 11-1. Liberty Annual Weighted Means, 2009-2018, with Linear Trend Line to 2021**

<sup>46</sup> Note: Monitored results for 2018 have been fully validated and quality-assured but not yet certified.



**Figure 11-2. Liberty 24-Hour 98th Percentiles, 2009-2018, with Linear Trend Line to 2021**

Years 2013 and 2018 show values that are below both the annual and 24-hour NAAQS, with 2014 and 2015 as additional years below the 24-hour NAAQS only. The 2018 values are the lowest ever recorded at the Liberty site, with an annual mean of  $11.5 \mu\text{g}/\text{m}^3$  and a 24-hour 98<sup>th</sup> percentile of  $28.0 \mu\text{g}/\text{m}^3$ , well below the modeled design values for 2021. Similar results are expected to continue through 2021 and beyond. Based on monitored trends alone,  $\text{PM}_{2.5}$  values for Liberty are expected to lead to 3-year averages (design values) that are below the NAAQS.

## 11.2 Additional Local Source Modifications/Shutdowns

Source modifications that were not included in the modeling demonstration will lead to additional reductions of primary  $\text{PM}_{2.5}$  and precursor emissions within the NAA. These modifications include the following:

- USS Mon Valley Works: Settlement agreement and order #19060 (July 2019) includes several repairs, upgrades, and enhanced work practices that will further reduce  $\text{PM}_{2.5}$  and precursor emissions through the attainment date. Reductions have not been quantified for this SIP.
- Eastman Chemical Resins, Inc.: In December 2011, Eastman entered into a consent decree and agreement with the U.S. Department of Justice, EPA, and ACHD to install

VOC control equipment at its Jefferson Hills plant. Estimates of pollutant reductions due to these controls were not available for the modeling demonstration.

- Koppers Clairton Plant: The Koppers tar refining facility, located adjacent to the USS Clairton Plant, ceased operations in 2016. This source no longer has a permit to operate, and any future operation at these locations would require a new permit and new source review (NSR). As a conservative approach, emissions from Koppers were kept in the future case modeling inventory. Structures at this facility have since been demolished, with no future tar refining operations at this site.
- Bay Valley (Riverbend): The Bay Valley food manufacturing facility, a major source for NO<sub>x</sub>, announced plans to cease operations at its facility by Aug. 2019. Emissions reductions from this closure (if permanent) were not used in the SIP.

### 11.3 SO<sub>2</sub> Reductions from the 2010 NAAQS

EPA's implementation of the 2010 SO<sub>2</sub> NAAQS included determination of nonattainment areas in several rounds,<sup>47</sup> involving potential controls of SO<sub>2</sub> that were not implemented at the time of the development of this SIP. Therefore, reductions due to several SO<sub>2</sub> plans in PA and surrounding states for the 2010 NAAQS have not been included in this SIP, including estimated reductions of actual emissions due to the Allegheny, PA (Mon Valley) SO<sub>2</sub> SIP. In addition to acting as a precursor to PM<sub>2.5</sub> over larger areas, SO<sub>2</sub> emissions can also be associated with primary sulfate emissions as a direct component of PM<sub>2.5</sub> for localized areas.

### 11.4 Expected EGU Deactivations

Several additional EGU deactivations in PA and surrounding states have been announced after the development of the ERTAC 2.4L2 projections in 2015. These deactivations were not included in the modeled projections and will lead to further reductions of precursor emissions that potentially contribute to PM<sub>2.5</sub> in Allegheny County.

Expected EGU deactivations from 2016 through 2021 within the PJM Interconnection territory<sup>48</sup> are listed below in Table 11-1, with a map of the PJM Interconnection territory shown in Figure 11-3. Table 11-1 does not include deactivations announced for 2022 and beyond, which will further reduce precursor emissions beyond the attainment date of this SIP.

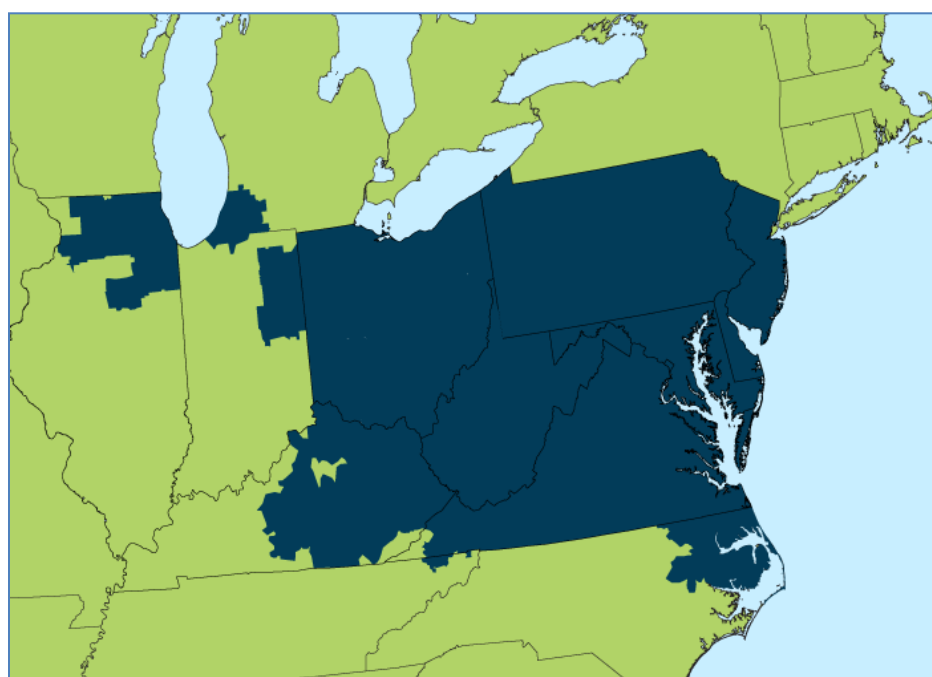
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<sup>47</sup> <https://www.epa.gov/sulfur-dioxide-designations>

<sup>48</sup> PJM Interconnection LLC is the electric regional transmission organization for the PA and surrounding states. Expected deactivations are current as of Dec. 2018. Note that the electric grid capacity can be modified by PJM, and deactivations do not always constitute permanent retirements.

**Table 11-1. EGU Deactivations in PA and Surrounding States, 2016-2021**

<b>Plant</b>	<b>State</b>	<b>Capacity (MW)</b>
Avon Lake	Ohio	95
BL England	New Jersey	155
Bruce Mansfield	Pennsylvania	2490
Buggs (Mecklenberg)	Virginia	138
Chesterfield	Virginia	262
Colver	Pennsylvania	110
Conesville	Ohio	810
Crane	Maryland	385
Dale	Kentucky	147
Edgecomb	North Carolina	116
Elmer Smith	Kentucky	100
Hopewell James River	Virginia	92
Hudson	New Jersey	618
Killen	Ohio	600
Mercer	New Jersey	641
Northeastern Power	Pennsylvania	51
Roanoke Valley	North Carolina	209
Sammis	Ohio	669
Spruance	Virginia	202
Stuart	Ohio	2318
Wagner	Maryland	135
Yorktown	Virginia	324



**Figure 11-3. PJM Interconnection Territory**

The U.S. EIA expects that total U.S. coal consumption in 2018 will be the lowest since 1979 (U.S. EIA, 2018) due to plant retirements and increased competition from natural gas and renewable energy sources.

A detailed analysis of EGU emissions over the SIP timeframe of 2011-2021 is given in Appendix K (EGU Analysis).

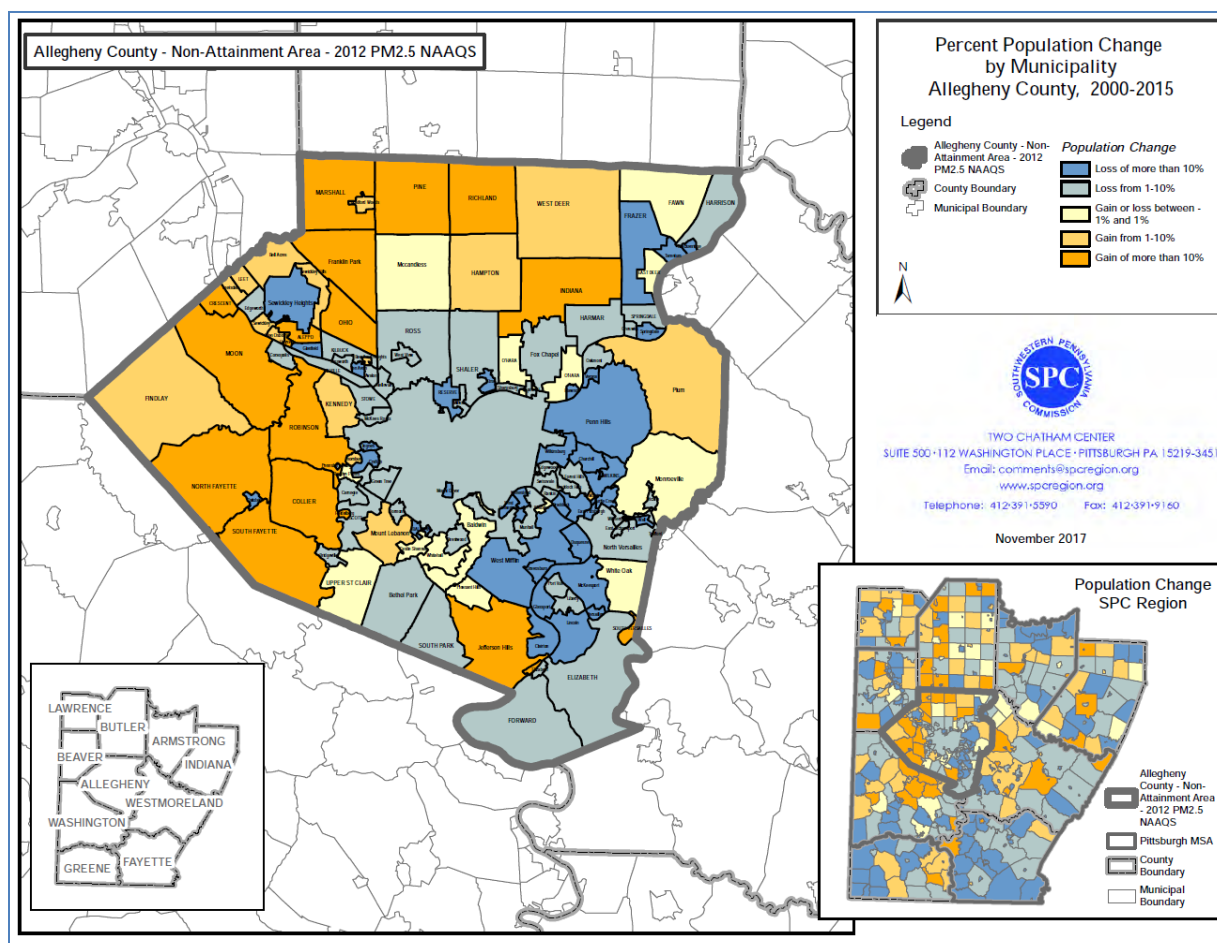
## 11.5 Population Trends

Allegheny County and the Pittsburgh MSA are unique in comparison to other U.S. metropolitan areas in the fact that population has been declining over the recent years. Based on U.S. Census Bureau estimates for 2000 through 2018, Allegheny County showed a decrease of 63,214 in population, and the Pittsburgh MSA showed a decrease of 106,344. The overall decrease in population should lead to less anthropogenic emissions from vehicles, wood burning, power consumption, and other sources of PM<sub>2.5</sub> and precursors.

Figure 11-4 shows the percent change in population by municipality for Allegheny County and the surrounding region for 2000-2015.<sup>49</sup>

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<sup>49</sup> Data provided by the Southwestern Pennsylvania Commission (SPC). The Pittsburgh, PA MSA consists of the Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland Counties. The SPC region additionally includes Indiana, Lawrence, and Greene Counties.



**Figure 11-4. Population Change in NAA, by Percent, 2000-2015**

Population growth is occurring in some suburban municipalities, while the City of Pittsburgh and industrial river valley areas show the largest decreases in population.

Population projections by SPC and the Pennsylvania Legislature<sup>50</sup> estimate population growth of about 0.2 to 0.5% per year for 2020 through 2040, which are small increases that should not counteract pollution decreases in the region beyond the attainment timeframe.

## 11.6 Local County Programs

### Wood Burning

Several programs in Allegheny County address the reduction of PM<sub>2.5</sub> from wood burning activities and have not been included in the modeling demonstration. These include local regulations for wood burning and wood burning equipment, voluntary programs for county residents, and educational campaigns conducted by ACHD.

<sup>50</sup> [http://www.rural.palegislature.us/documents/reports/Population\\_Projections\\_Report.pdf](http://www.rural.palegislature.us/documents/reports/Population_Projections_Report.pdf)

From 2005 to 2007, ACHD participated in a wood stove change-out program, replacing older non-EPA certified wood stoves in southwestern Pennsylvania with new, cleaner burning “EPA-certified” units. The exchange of 20 wood stoves results in a net reduction of up to 1 ton of particulate matter (PM) pollution. From 2013 to 2015, ACHD conducted a wood stove “bounty” program, providing cash payments to residents who turned in their old, uncertified wood stoves. In 2018 and 2019, ACHD conducted (and continues to conduct) a fireplace conversion program that provides rebates to county residents to encourage them to convert their open-hearth fireplace to natural gas-fueled gas log sets or gas stove inserts.

Outdoor wood-fired boilers (OWBs) have been regulated in Allegheny County. Over recent years, a voluntary federal program in 2007, a state regulation in 2010, and county ordinances since 2012 have been established in order to help control OWB generated pollution. In addition to the newer OWB regulations, Article XXI §2104.01 “Visible Emissions” and §2104.04 “Odor Emissions” are in place which are useful enforcement tools for managing wood burning stoves and boilers.

Article XXI §2105.50 “Open Burning” prohibits outdoor wood burning in Allegheny County on Air Quality Action Days. An Air Quality Action Day is declared when a forecast has been issued by PA DEP, ACHD, or the Southwest Pennsylvania Air Quality Partnership (SPAQP), indicating that ambient concentrations of PM<sub>2.5</sub> or other criteria pollutants might reach unhealthful levels or exceed the NAAQS.

Additionally, ACHD educational campaigns, covering the health effects and environmental impact of wood smoke, are ongoing. These include campaigns to inform municipalities about pollution from wood stoves, and their ability to curtail it, the availability of cleaner units, and encouraging clean burning practices among those who already own and operate wood stoves. The clean-burning educational campaigns ongoing at ACHD encourage all Allegheny County residents to consider how and what they burn and how it impacts their health and environment.

### Idling Regulations

Idling regulations are currently in place at the state and county levels. The Pennsylvania Diesel-Powered Motor Vehicle Idling Act, effective in 2009, prohibits the owners and drivers of any commercial diesel-powered onroad motor vehicle with a gross weight of greater than 10,001 pounds from idling for more than five minutes in any 60-minute period (with exemptions for the operator’s safety and the comfort of passengers in high or low temperatures). Extensive signage requirements in the law have been integral in spreading the news of this regulation across the state. All truck docks and other places where diesel trucks may park or idle are required to post signs regarding the regulation.

In 2010, Allegheny County enacted Article XXI §2105.93, “In-Use Off-Road Diesel Powered Mobile Equipment Engine Idling,” which prohibits idling of off-road vehicles for more than five consecutive minutes, unless exempt. Operators of such vehicles can be reported to ACHD and can be fined up to \$500 if they are found in non-compliance. The County regulation primarily

affects construction vehicles, which can operate as a nuisance point source at construction sites in highly populated areas.

### City Legislation & Industry Initiatives

In 2011, The City of Pittsburgh passed its Clean Air Act of 2011, which required certain publicly subsidized construction projects in Pittsburgh to utilize clean diesel equipment. This legislation will help to reduce diesel particulate pollution from construction projects in the city, both by the direct requirement for retrofitted equipment, and the incentives construction companies now have to retrofit their equipment in advance of securing a contract for a publicly subsidized project, so as to remain competitive.

Other similar efforts to address diesel particulate pollution from construction sources have been taken up by local businesses and other organizations. In 2011, The University of Pittsburgh Medical Center (UPMC) established language for all future contracts that requires all construction equipment used at any UPMC construction site to meet Tier 4 standards. This requirement went into effect in the spring of 2011, three years before EPA will require Tier 4 standards on all newly manufactured equipment. UPMC currently has several hospitals and other health facilities throughout Allegheny County.

### ACHD Clean Air Fund

ACHD offers funding for air quality projects through its Clean Air Fund, a restricted fund where penalties from emission violations are deposited. Since 2011, several million dollars have been awarded to projects involving diesel retrofits, rebates for renewable energy equipment, pollution prevention activities, air quality educational efforts, specialized scientific studies, and other efforts. Expenditures from the Clean Air Fund will continue to improve air quality within the NAA.

## 12 Emergency Episodes

Subpart H of 40 CFR part 51 specifies requirements for SIPs to address emergency air pollution episodes in order to prevent air pollutant levels from reaching levels determined to cause significant harm to the health of persons. No levels are currently recommended by EPA for PM<sub>2.5</sub> emergency episodes. However, Article XXI §2106.03, “Episode Criteria,” which defines the procedures for emergency air pollution episodes as well as the values for air pollutants, includes PM<sub>10</sub> levels. ACHD will use the levels for PM<sub>10</sub> as levels for PM<sub>2.5</sub>.

ACHD assumes that, by definition, 1.0 µg/m<sup>3</sup> of PM<sub>2.5</sub> is equal to at least 1.0 µg/m<sup>3</sup> of PM<sub>10</sub>. Therefore, if any PM<sub>2.5</sub> monitor exceeds any of the emergency episode levels listed for PM<sub>10</sub>, it will be assumed that the PM<sub>10</sub> emergency episode levels have been exceeded, and appropriate action will be taken according to the predetermined actions in Article XXI §2106.04, “Episode Actions.”

## 13 Legal Documents


### 13.1 Notice of Public Hearing and Comment Period


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NOTICE OF PUBLIC HEARING ON TH... 

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NOTICE of Public Hearing on the Proposed Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan -- Attainment Demonstration for the Allegheny, PA PM2.5 Nonattainment Area for the 2012 Standards.



The Allegheny County Board of Health will hold a public hearing on Tuesday, June 11, 2019, at 6:00 PM at the Allegheny County Health Department, Clack Health Center Bldg. 7, 301 39th St., Pittsburgh, PA 15201 to take testimony on the proposed revision to Allegheny County's portion of the State Implementation Plan (SIP) for PM2.5.

The SIP revision demonstrates that the Allegheny County, PA area will attain the 2012 PM2.5 National Ambient Air Quality Standards (NAAQS) by December 31, 2021, based on pollutant emission reductions within Allegheny County. This revision will be submitted to EPA for approval as a SIP revision.

Copies of the proposed SIP revision may be examined beginning Friday, May 10, 2019, at the Allegheny County Health Department, Clack Health Center Bldg. 7, Document Control Room, from 8:30 AM until 4:00 PM, Monday through Friday, and on the Allegheny County Health Department web site:  
<https://www.alleghenycounty.us/Health-Department/Programs/Air-Quality/Regulations-and-SIPs.aspx>

Oral testimony must be pre-scheduled by calling 412-578-8120 no less than 24 hours in advance of the public hearing. Speakers will be limited to five minutes and should bring a written copy of their comments to the hearing.

The Board will accept written testimony beginning Friday, May 10, 2019, and concluding 11:59 PM on Tuesday, June 11, 2019, by mail to ACHD Air Program, 301 39th Street, Bldg #7, Pittsburgh, PA 15201-1811, by email to [aqcomments@alleghenycounty.us](mailto:aqcomments@alleghenycounty.us), or by fax to 412-578-8144.

 Viewed 147 times  Posted May 09, 2019

## 13.2 Transmittals of Public Hearing Notice to PA DEP and EPA Region III



May 7, 2019

Mr. Krishnan Ramamurthy, Director  
Bureau of Air Quality  
Department of Environmental Protection  
Rachel Carson Building  
400 Market Street  
P O Box 8468  
Harrisburg, PA 17105-8468

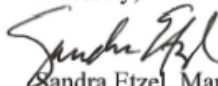
Dear Mr. *Krish* Ramamurthy:

Enclosed is a Notice of Public Hearing for a proposed revision to the Allegheny County portion of the Pennsylvania State Implementation Plan regarding the Attainment Demonstration for the Allegheny County, PA PM<sub>2.5</sub> Nonattainment Area for the 2012 Standards. The SIP revision and appendices are available for download at: <https://www.alleghenycounty.us/Health-Department/Programs/Air-Quality/Regulations-and-SIPs.aspx>.

The SIP revision demonstrates that the Allegheny County, PA area will attain the 2012 PM<sub>2.5</sub> National Ambient Air Quality Standards (NAAQS) by December 31, 2021, based on pollutant emission reductions within Allegheny County.

This revision will be submitted to EPA for approval as a SIP revision and is being tracked under our internal Revision Tracking Number 90. The public comment period begins May 10, 2019 and concludes June 11, 2019 at 11:59 PM. Your comments are welcome.

Sincerely,



Sandra Etzel, Manager  
Planning and Data Analysis Section

cc: Kirit Dalal, PA DEP  
Steve Hepler, PA DEP

Enclosures

- Public Hearing Notice
- Proposed SIP Revision 90 (w/o Appendices)
- DVD of Modeling and Supporting Files

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ALLEGHENY COUNTY HEALTH DEPARTMENT • AIR QUALITY PROGRAM  
301 39<sup>TH</sup> STREET BUILDING #7 • PITTSBURGH, PA 15201-1811  
PHONE (412) 578-8103 • FAX (412) 578-8144



May 7, 2019

Ms. Christina Fernandez, Director  
Air Protection Division  
Region III (3AP00)  
U.S. Environmental Protection Agency  
1650 Arch Street  
Philadelphia, PA 19103-2029

Dear Ms. Fernandez:

Enclosed is a Notice of Public Hearing for a proposed revision to the Allegheny County portion of the Pennsylvania State Implementation Plan regarding the Attainment Demonstration for the Allegheny County, PA PM<sub>2.5</sub> Nonattainment Area for the 2012 Standards. The SIP revision and appendices are available for download at: <https://www.alleghenycounty.us/Health-Department/Programs/Air-Quality/Regulations-and-SIPs.aspx>.

The SIP revision demonstrates that the Allegheny County, PA area will attain the 2012 PM<sub>2.5</sub> National Ambient Air Quality Standards (NAAQS) by December 31, 2021, based on pollutant emission reductions within Allegheny County.

This revision will be submitted to EPA for approval as a SIP revision and is being tracked under our internal Revision Tracking Number 90. The public comment period begins May 10, 2019 and concludes June 11, 2019 at 11:59 PM. Your comments are welcome.

Sincerely,

Sandra Etzel, Manager  
Planning and Data Analysis Section

cc: Susan Spielberger, EPA Region III  
Maria Pino, EPA Region III  
Tim Leon Guerrero, EPA Region III

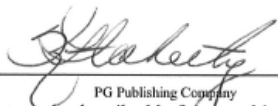

Enclosures

- Public Hearing Notice
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**ALLEGHENY COUNTY HEALTH DEPARTMENT • AIR QUALITY PROGRAM**  
301 39<sup>TH</sup> STREET BUILDING #7 • PITTSBURGH, PA 15201-1811  
PHONE (412) 578-8103 • FAX (412) 578-8144

### 13.3 Proof of Publication of Notice

<p style="text-align: right;">No. _____ Term, _____</p> <p style="text-align: center;"><b>Proof of Publication of Notice in Pittsburgh Post-Gazette</b></p> <p style="text-align: center;">Under Act No 587, Approved May 16, 1929, PL 1784, as last amended by Act No 409 of September 29, 1951</p> <p>Commonwealth of Pennsylvania, County of Allegheny, ss <u>K. Flaherty</u>, being duly sworn, deposes and says that the Pittsburgh Post-Gazette, a newspaper of general circulation published in the City of Pittsburgh, County and Commonwealth aforesaid, was established in 1993 by the merging of the Pittsburgh Post-Gazette and Sun-Telegraph and The Pittsburgh Press and the Pittsburgh Post-Gazette and Sun-Telegraph was established in 1960 and the Pittsburgh Post-Gazette was established in 1927 by the merging of the Pittsburgh Gazette established in 1786 and the Pittsburgh Post, established in 1842, since which date the said Pittsburgh Post-Gazette has been regularly issued in said County and that a copy of said printed notice or publication is attached hereto exactly as the same was printed and published in the <u>regular</u> editions and issues of the said Pittsburgh Post-Gazette a newspaper of general circulation on the following dates, viz:</p> <p><b>09 of May, 2019</b></p> <p>Affiant further deposes that he/she is an agent for the PG Publishing Company, a corporation and publisher of the Pittsburgh Post-Gazette, that, as such agent, affiant is duly authorized to verify the foregoing statement under oath, that affiant is not interested in the subject matter of the afore said notice or publication, and that all allegations in the foregoing statement as to time, place and character of publication are true.</p> <div style="text-align: center; margin-top: 20px;"> _____ PG Publishing Company Sworn to and subscribed before me this day of: May 09, 2019</div> <div style="text-align: center; margin-top: 20px;"> _____ Commonwealth of Pennsylvania - Notary Seal Elizabeth R. Chmura, Notary Public Allegheny County My commission expires February 8, 2022 Commission number 1326781 Member, Pennsylvania Association of Notaries</div> <p style="text-align: center; margin-top: 20px;"><b>STATEMENT OF ADVERTISING COSTS</b> ALLEGHENY CO HEALTH DEPT-LEGAL 542 4TH AVENUE PITTSBURGH PA 15219</p> <p style="text-align: center; margin-top: 20px;">To PG Publishing Company</p> <p style="text-align: right; margin-top: 20px;">Total ----- \$71.40</p> <p style="text-align: center; margin-top: 20px;"><b>Publisher's Receipt for Advertising Costs</b></p> <p>PG PUBLISHING COMPANY, publisher of the Pittsburgh Post-Gazette, a newspaper of general circulation, hereby acknowledges receipt of the aforesaid advertising and publication costs and certifies that the same have been fully paid.</p> <table style="width: 100%; margin-top: 20px;"><tr><td style="width: 50%; vertical-align: top;">Office 2201 Sweeney Drive CLINTON, PA 15026 Phone 412-263-1338</td><td style="width: 50%; vertical-align: top;">PG Publishing Company, a Corporation, Publisher of Pittsburgh Post-Gazette, a Newspaper of General Circulation  By _____</td></tr></table> <p>I hereby certify that the foregoing is the original Proof of Publication and receipt for the Advertising costs in the subject matter of said notice.</p> <p style="text-align: center; margin-top: 20px;">_____ Attorney For</p>	Office 2201 Sweeney Drive CLINTON, PA 15026 Phone 412-263-1338	PG Publishing Company, a Corporation, Publisher of Pittsburgh Post-Gazette, a Newspaper of General Circulation  By _____	<p><b>COPY OF NOTICE OR PUBLICATION</b></p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"><p>NOTICE of Public Hearing on the Proposed Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan - Attainment Demonstration for the Allegheny PA PM2.5 Nonattainment Area for the 2012 Standards.</p><p>The Allegheny County Board of Health will hold a public hearing on Tuesday, June 11, 2019, at 6:00 PM at the Allegheny County Health Department, Clack Health Center Bldg 7, 301 39th St., Pittsburgh, PA 15201 to take testimony on the proposed revision to Allegheny County's portion of the State Implementation Plan (SIP) for PM2.5.</p><p>The SIP revision demonstrates that the Allegheny County PA area will attain the 2012 PM2.5 National Ambient Air Quality Standards (NAAQS) by December 31, 2021, based on pollutant emission reductions within Allegheny County. This revision will be submitted to EPA for approval as a SIP revision.</p><p>Copies of the proposed SIP revision may be examined beginning Friday, May 10, 2019, at the Allegheny County Health Department, Clack Health Center Bldg 7, Document Control Room, from 8:30 AM until 4:00 PM, Monday through Friday, and on the Allegheny County Health Department web site: <a href="https://www.alleghenycounty.us/Health-Department/Programs/Air-Quality/Regulations-and-SIPs.aspx">https://www.alleghenycounty.us/Health-Department/Programs/Air-Quality/Regulations-and-SIPs.aspx</a></p><p>Oral testimony must be pre-scheduled by calling 412-578-8120 no less than 24 hours in advance of the public hearing. Speakers will be limited to five minutes and should bring a written copy of their comments to the hearing.</p><p>The Board will accept written testimony beginning Friday, May 10, 2019, and concluding 11:59 PM on Tuesday, June 11, 2019, by mail to ACHO Air Program, 301 39th Street, Bldg #7, Pittsburgh, PA 15201-1811, by email to <a href="mailto:agcomments@alleghenycountypa.us">agcomments@alleghenycountypa.us</a>, or by fax to 412-578-8144.</p></div>
Office 2201 Sweeney Drive CLINTON, PA 15026 Phone 412-263-1338	PG Publishing Company, a Corporation, Publisher of Pittsburgh Post-Gazette, a Newspaper of General Circulation  By _____		


## 13.4 Certification of Public Hearing

Revision 90

Attainment Demonstration for the Allegheny County, PA PM<sub>2.5</sub> Nonattainment Area,  
2012 NAAQS

### Certification of Hearing

Jason Maranche deposes and says that he is an Air Quality Engineer in the Air Quality Program of the Allegheny County Health Department and hereby certifies that a Public Hearing was held on June 11, 2019 on the proposed Attainment Demonstration for the Allegheny County, PA PM<sub>2.5</sub> Nonattainment Area for the 2012 NAAQS; that these changes are to be incorporated as a change to Allegheny County's Portion of the Pennsylvania State Implementation Plan for the Attainment and Maintenance of National Ambient Air Quality Standards; that the opportunity for written comments was given in accordance with the requirements of 40 CFR 51.102; that notice of such hearing was given by publication in a newspaper of general circulation on May 9, 2019; and to the best of his knowledge, belief, and understanding, such proceedings were in full compliance with all applicable State and Federal laws, regulations, and other requirements.

 6/12/19  
Date

Jason M. Maranche  
Air Quality Engineer  
Allegheny County Health Department  
Air Quality Program

## 13.5 Summary of Public Comments and Responses

A summary of submitted public comments and corresponding ACHD responses is provided in Appendix M (Summary of Comments and Responses).

The version of the SIP provided for public comment was dated April 22, 2019. Notice of the opportunity for public comment appeared in the legal section of the Pittsburgh Post-Gazette on May 9, 2019. The public comment period started on May 10, 2019 and ended on June 11, 2019, with a public hearing held on the final day of the comment period.

There were 243 pages of submitted written comments, summarized as 72 distinct comments along with responses from ACHD. Commenters included residents of Allegheny County or Southwestern PA, environmental groups, and governmental agencies. There were nine speakers that provided oral testimony at the public hearing on June 11, 2019. Submitted comments and a transcript of the hearing are available upon request.

All comments were taken into full consideration prior to this final version of the PM<sub>2.5</sub> SIP. Revisions were made to the control strategy, RACT, RFP, and contingency measures portions of the SIP following the public comment period. Appendix L was added to include conditions from installation and operating permits pertaining to the control strategy.

## 13.6 Certification of Adoption

### CERTIFICATION of ADOPTION

To the best of my knowledge, information, and belief, I the undersigned hereby certify that the revision to the County's Portion of the Pennsylvania State Implementation Plan for the Attainment and Maintenance of the National Ambient Air Quality Standards for particulate matter 2.5 microns or less (PM<sub>2.5</sub>) was adopted by the Allegheny County Board of Health on September 11, 2019, was duly and properly enacted as prescribed by the Local Health Administration Law and the Allegheny County Home Rule Charter, and as such, is fully and legally enforceable by the Allegheny County Health Department and the County of Allegheny as provided for by the within authority.



Jeffrey Bailey, Esq.  
Assistant Solicitor  
Allegheny County Health Department

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF ALLEGHENY

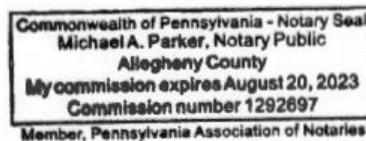
On the 12<sup>th</sup> day of SEPTEMBER, 2019,

Jeffrey R. Bailey personally appeared before me, the undersigned authority, satisfactorily proven to me to be the person whose name appears above, and did in my presence execute the above certification for the purposes contained therein.

WHEREFORE, I have hereunto set my hand and official seal the 12<sup>th</sup> day of SEPTEMBER, 2019.



Michael A. Parker  
Notary Public  
Allegheny County Health Department



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*Prepared with assistance from:*

**Ramboll**  
Environment and Health  
Novato, CA | Lynnwood, WA



<http://www.ramboll.com/environment-and-health>

**Allegheny County Health Department**  
Air Quality Program



301 39<sup>th</sup> Street, Building 7  
Pittsburgh, PA 15201

412-687-ACHD

<https://www.alleghenycounty.us/healthdepartment/index.aspx>

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