OFFICE OF THE COMMISSIONER

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NOV 28 2016

Ms. Judith A. Enck Regional Administrator U.S. Environmental Protection Agency, Region 2 290 Broadway, 26th Floor New York, New York 10007-1866

Dear Regional Administrator Enck:

The New York State Department of Environmental Conservation (DEC) is submitting a final State Implementation Plan (SIP) revision entitled "New York State Implementation Plan Infrastructure Assessment for the 2012 Annual PM_{2.5} NAAQS Pursuant to Sections 110(a)(1) and (2) of the Clean Air Act" for your approval. In developing this SIP revision, DEC applied the September 3, 2013 EPA Memorandum entitled "Guidance on Infrastructure State Implementation Plan (SIP) Elements under Clean Air Act Sections 110(a)(1) and 110(a)(2)."

DEC's Public Notice regarding this SIP dated August 10, 2016 provided for a 30 day comment period, which included the opportunity to request a public hearing. No hearing was requested during the public notice period. During the comment period, August 10, 2016 to September 12, 2016, DEC received one comment regarding an incorrect title for Appendix B. In response to the comment, the title of Appendix B was corrected. In addition, several duplications of abbreviations were removed from the original SIP. Therefore, the date of the "New York State Implementation Plan Infrastructure Assessment for the 2012 Annual PM_{2.5} NAAQS Pursuant to Sections 110(a)(1) and (2) of the Clean Air Act" has been changed to September 2016 to reflect these changes.

The enclosed SIP submittal includes the following:

- Final Revision dated September 2016 of the New York State Department of Environmental Conservation's New York State Implementation Plan Infrastructure Assessment for the 2012 Annual PM_{2.5} NAAQS Pursuant to Sections 110(a)(1) and (2) of the Clean Air Act;
- Public Notice Including Opportunity to Request a Public Hearing, the Environmental Notice Bulletin, August 10, 2016; and
- Response to comments received on the New York State Department of Environmental Conservation's New York State Implementation Plan Infrastructure Assessment for the 2012 Annual PM_{2.5} NAAQS Pursuant to Sections 110(a)(1) and (2) of the Clean Air Act.



Department of Environmental Conservation Please call me at (518) 402-8540 if you have any questions.

Sincerely, Basil Seggos Commissioner

Enclosure

c: Richard Ruvo



Department of Environmental Conservation

NEW YORK STATE IMPLEMENTATION PLAN

INFRASTRUCTURE ASSESSMENT FOR THE 2012 ANNUAL PM_{2.5} NAAQS PURSUANT TO SECTIONS 110(a)(1) AND (2) OF THE CLEAN AIR ACT

September 2016

DIVISION OF AIR RESOURCES Bureau of Air Quality Planning

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List of Abbreviations

Act	Clean Air Act Amendments of 1990	
Administrator	Administrator of the United States Environmental Protection	
	Agency	
AIM	Architectural and Industrial Maintenance	
APEP	Air Pollution Episode Procedure	
ARM	Approved Regional Method	
AQAT	Air Quality Assessment Tool	
AQI	Air Quality Index	
AQS	Air Quality System	
BAQS	Bureau of Air Quality Surveillance	
BART	Best Available Retrofit Technology	
CAA	Clean Air Act	
CAIR	Clean Air Interstate Rule	
CERR	Consolidated Emissions Regulatory Report	
CFR	Code of Federal Regulations	
CSAPR	Cross State Air Pollution Rule	
CSN	Chemical Speciation Network	
DAR	Division of Air Resources	
DEC	Department of Environmental Conservation	
DOT	Department of Transportation	
ECL	Environmental Conservation Law	
EPA	United States Environmental Protection Agency	
FEM	Federal Equivalent Method	
FEMA	Federal Emergency Management Agency	
FIP	Federal Implementation Plan	
FLM	Federal Land Manager	
FR	Federal Register	
FRM	Federal Reference Method	
I/M	Inspection/Maintenance	
m ³	Cubic meter	
MANE-VU	Mid-Atlantic/Northeast Visibility Union	
MPO	Metropolitan Planning Organization	
NAAQS	National Ambient Air Quality Standards	
NATTS	National Ambient Toxics Trend Stations	
NCore	National Core Sites	
NEI	National Emissions Inventory	
NSR	New Source Review	
NOx	Nitrogen Oxide	
NY	New York	
NYC	New York City	
NYCRR	New York Codes, Rules and Regulations	
NYS	New York State	

NYSDMV	New York State Department of Motor Vehicles	
NYS OEM	New York State Office of Emergency Management	
NYVIP	New York Vehicle Inspection Program	
O ₂	Oxygen	
OH	Ohio	
PA	Pennsylvania	
PADEP	Pennsylvania Department of Environmental Protection	
PAMS	Photochemical Assessment Monitoring Stations	
PM	Particulate Matter	
PM _{2.5}	Fine PM; Particulate Matter with aerodynamic diameter of 2.5	
	micrometers or less	
PM10	Coarse PM; Particulate Matter with aerodynamic diameter of	
	10 micrometers or less	
POL	Public Officer's Law	
PSD	Prevention of Significant Deterioration	
RACT	Reasonably Achievable Control Technology	
RPG	Reasonable Progress Goal	
SAPA	State Administrative Procedures Act	
SEQR	State Environmental Quality Review	
SHL	Significant Harm Level	
SIP	State Implementation Plan	
SLAMS	State and Local Air Monitoring Stations	
SO ₂	Sulfur dioxide	
SPM	Special Purpose Monitor(ing)	
SSM	Startup, shutdown and malfunction	
STN	Speciation Trends Network	
μg	Micrograms	
VOC	Volatile Organic Compound	

Executive Summary

On December 14, 2012, the United States Environmental Protection Agency (EPA) strengthened the annual health National Ambient Air Quality Standards (NAAQS) for fine particles ($PM_{2.5}$) to 12.0 micrograms per cubic meter (μ g/m³) and retained the 24-hour $PM_{2.5}$ NAAQS of 35 μ g/m³, which had been previously set by EPA on September 21, 2006. Fine particles are 2.5 micrometers in diameter or smaller and can be emitted directly from a variety of sources, including vehicles, smokestacks and fires. They also form when gases emitted by power plants, industrial processes, and gasoline and diesel engines react in the atmosphere. High levels of $PM_{2.5}$ are also the main cause of reduced visibility (haze) in parts of the United States, including many of our national parks and wilderness areas. EPA designated the entire State as unclassifiable/attainment on January 15, 2015.

An extensive body of scientific evidence shows that long- and short-term exposures to PM_{2.5} pollution can cause premature death and harmful effects on the cardiovascular system, including increased hospital admissions and emergency department visits for heart attacks and strokes. Scientific evidence also links particulate matter (PM) to harmful respiratory effects, including asthma attacks. People most at risk from particle pollution exposure include people with heart or lung disease (including asthma), older adults, children and people of lower socioeconomic status. Research indicates that pregnant women, newborns and people with certain health conditions, such as obesity or diabetes, also may be more susceptible to PM-related effects.

Pursuant to Clean Air Act (CAA) sections 110(a)(1) and (2), states must meet basic State Implementation Plan (SIP) requirements related to the attainment of a new or revised NAAQS. Section 110(a)(1) requires "a plan which provides for implementation, maintenance, and enforcement" of a primary and secondary NAAQS, while section 110(a)(2) lists the specific required elements. SIPs meeting the requirements of CAA sections 110(a)(1) and (2) are to be submitted within three years after promulgation of a new or revised NAAQS.

DEC has implemented enforceable emissions limitations and other control measures in order to demonstrate attainment with the 1997 Annual PM_{2.5} NAAQS and the 2006 24-hour PM_{2.5} NAAQS. This infrastructure SIP does not identify new emission limits or other new control measures. EPA has interpreted the CAA to require measures needed to attain a revised NAAQS to be on a different schedule than the infrastructure SIP requirements, pursuant to Section 110 (a)(2)(I) "Plan Revisions for Nonattainment Areas." Nevertheless, New York State is now meeting the 2012 PM_{2.5} NAAQS.

This infrastructure assessment addresses each of the required elements of CAA section 110(a)(2) as described in Table 1, and affirms that New York's SIP meets the requirements of CAA sections 110(a)(1) and (2).

Infrastructure SIP Requirements

The EPA interprets section 110(a)(1) and section 110(a)(2) in its September 13, 2013 document, "Guidance on Infrastructure State Implementation Plan (SIP) Elements Under Clean Air Act Section 110(a)(1) and 110(a)(2)" (iSIP Guidance), to require infrastructure SIP submissions to meet the elements of section 110(a)(2), as applicable. EPA has interpreted the portion of section 110(a)(2)(C) that pertains to a permitting program that applies to nonattainment NSR within nonattainment areas, and the requirements of section 110(a)(2)(I) that pertain to the specific requirements for attainment plans for designated nonattainment areas, to be outside the scope of the infrastructure SIP requirements because of the separate statutory schedules for area designations and submission of attainment plans provided elsewhere in the CAA. With respect to the remaining elements of section 110(a)(2), subsections (A) through (H) and (J) through (M), the CAA imposes an obligation on states to address those elements, as appropriate, within the 3-year infrastructure SIP submission deadline.

Element	CAA Section	Title	
Element A	110(a)(2)(A)	Emission Limits and Other Control Measures	
Element B	110(a)(2)(B)	Ambient Air Quality Monitoring/Data System	
Element C	110(a)(2)(C)	Programs for Enforcement of Control Measures and for	
		Construction or Modification of Stationary Sources	
Element D	110(a)(2)(D)	Interstate Pollution Transport/Interstate Pollution	
		Abatement and International Air Pollution	
Element E	110(a)(2)(E)	Adequate Resources and Authority, Conflict of Interest,	
		and Oversight of Local Governments and Regional	
		Agencies	
Element F	110(a)(2)(F)	Stationary Source Monitoring and Reporting	
Element G	110(a)(2)(G)	Emergency Powers	
Element H	110(a)(2)(H)	SIP Revisions	
Element I	110(a)(2)(l)	Plan Revisions for Nonattainment Areas	
Element J	110(a)(2)(J)	Consultation with Government Officials, Public	
		Notification, and PSD and Visibility Protection	
Element K	110(a)(2)(K)	Air Quality Modeling and Submission of Modeling Data	
Element L	110(a)(2)(L)	Permitting Fees	
Element M	110(a)(2)(M)	Consultation and Participation by Affected Local Entities	

Fable 1 Require	d Elements of CAA	section 110(a)(2)
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Element A- Section 110(a)(2)(A): Emission Limits and Other Control Measures

Each implementation plan shall "include enforceable emission limitations and other control measures, means, or techniques (including economic incentives such as fees, marketable permits, and auctions of emissions rights), as well as schedules and timetables for compliance, as may be necessary or appropriate to meet the applicable requirements of this Chapter."

DEC has implemented enforceable emissions limitations and other control measures in order to demonstrate attainment with the 1997 Annual $PM_{2.5}$ NAAQS and the 2006 24-hour $PM_{2.5}$ NAAQS. This infrastructure SIP does not identify new emission limits or other new control measures. EPA, in its iSIP Guidance, has interpreted the Clean Air Act to require measures needed to attain a revised NAAQS¹ to be on a different schedule than the infrastructure SIP requirements. Nevertheless, New York State is now meeting the 2012 $PM_{2.5}$ NAAQS. EPA designated the entire State as unclassifiable/attainment on January 15, 2015. If nonattainment occurs in the future, DEC will establish new emissions limits and implement other new control measures, as necessary, in order to attain the 2012 annual $PM_{2.5}$ NAAQS in accordance with the applicable provisions of the CAA.

On April 18, 2014, EPA approved the "Redesignation Request and Maintenance Plan for the 1997 Annual and 2006 24-Hour PM_{2.5} NAAQS: New York–Northern New Jersey –Long Island, NY–NJ–CT Nonattainment Area."² The 10 county nonattainment area in New York State (consisting of New York City and Nassau, Suffolk, Westchester, Rockland, and Orange counties) first demonstrated compliance with both standards in 2009 (based on 2007-2009 monitored PM_{2.5} concentrations), and more recent monitoring data continues to show improved PM_{2.5} air quality and demonstrates attainment of both the 1997 and 2006 PM_{2.5} NAAQS as well as the 2012 annual PM_{2.5} NAAQS.

The permanent and enforceable measures identified in the redesignation request and maintenance plan³ primarily resulted in emission reductions of sulfur dioxide (SO₂) and nitrogen oxide (NO_x), the pollutants that most significantly contribute to secondary PM formation. Volatile organic compounds (VOCs), to a lesser extent, also contribute to PM formation.

The control measures listed in Tables 2 and 3 below have generally been implemented since the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS were finalized and include controls for $PM_{2.5}$ and $PM_{2.5}$ precursors.

¹ Nonattainment SIP provisions for $PM_{2.5}$ are found in \$ \$ 172 and 189 of the Clean Air Act. 2 79 FR 21857 (April 18, 2014)

³ <u>http://www.dec.ny.gov/chemical/92166.html</u>

New York State was not part of EPA's SIP call for state programs that allow emission sources to exceed regulatory emission standards during periods of startup, shutdown and malfunction (SSM). DEC requires permitted emission sources to comply with regulatory emission standards at all times, including SSM periods, as stated in 6 NYCRR Subpart 201-1.4(a). In some cases, DEC has established permitted PM emission limits that specify an emission limit other than the established regulatory PM emission standard. In these cases, the emission source must demonstrate that ambient impacts of $PM_{2.5}$ remain below the NAAQS during periods of startup, shutdown and malfunction.

Regulation	Title	EPA Approved Date and
		Federal Register (FR)
6 NVCDD Dort	Architectural and Industrial	
ONTORR Part	Architectural and industrial Maintenance (AIM) Costinge	3/8/12, 77 FR 13974
	Dessenably Available Control	7/10/10: 70 ED 41046
0 NICRR	Reasonably Available Control	//12/13, 78 FR 41840
	Control of Nitrogon Ovideo for Llot Mix	7/10/10: 70 ED 41046
0 NICRR	Apphalt Draduction Diante	//12/13, 78 FR 41840
Subpart 212-4	Asphalt Production Plants	0/22/72: 27 ED 40044
215	Open Fires	9/22/72; 37 FR 19814
6 NYCRR	Portland Cement Plants	7/12/13; 78 FR 41846
Subpart 220-1		
6 NYCRR	Glass Plants	7/12/13; 78 FR 41846
Subpart 220-2		
6 NYCRR Part	Solvent Metal Cleaning Processes	1/23/04; 69 FR 3237
226		
6 NYCRR	Reasonably Available Control	7/12/13; 78 FR 41846
Subpart 227-2	Technology (RACT) for Major Facilities	
	of Oxides of Nitrogen (NO _x)	
6 NYCRR Part	Surface Coating Processes,	3/4/14; 79 FR 12082
228	Commercial and Industrial Adhesives,	
	Sealants and Primers	
6 NYCRR Part	Graphic Arts	3/8/12; 77 FR 13974
234		
6 NYCRR Part	Consumer Products	5/28/10; 75 FR 29897
235		
6 NYCRR Part	Portable Fuel Container Spillage	5/28/10; 75 FR 29897
239	Control	
6 NYCRR Part	Asphalt Pavement and Asphalt Based	3/8/12; 77 FR 13974
241	Surface Coating	
6 NYCRR Part	Best Available Retrofit Technology	8/28/12; 77 FR 51915
249	(BART)	
ECL §19-0325	Ultra-Low Sulfur Heating Oil	8/28/12; 77 FR 51915

 Table 2 EPA Approved SIP Revisions Representing PM2.5 Control Measures

Table 3 Other PM_{2.5} Control Measures

Regulation	Title	Comments
6 NYCRR Part 217	Motor Vehicle Emissions	
6 NYCRR Part 218	Emission Standards for Motor Vehicles	
	and Motor Vehicle Engines	
6 NYCRR Part 225	Fuel Composition and Use	
6 NYCRR Part 243	CSAPR NOx Ozone Season Trading	Adopted 12/13/15
	Program	
6 NYCRR Part 244	CSAPR NOx Annual Trading Program	Adopted 12/13/15
6 NYCRR Part 245	CSAPR SO2 Trading Program	Adopted 12/13/15
6 NYCRR Part 248	Use of Ultra Low Sulfur Diesel Fuel and	Implements the Diesel
	Best Available Retrofit Technology for	Emissions Reduction
-	Heavy Duty Vehicles	Act of 2006
State Program	New York Vehicle Inspection Program	DEC did not take
	(NYVIP)	credit for this program
		In I/M SIP
State Program	New York Metropolitan Area Enhanced	DEC did not take
	I/M Program	credit for this program
Federal Dula	Fadaval Tian O. Occasting Outfur Dragger	
Federal Rule	Federal Tier 2 Gasoline Sulfur Program	
Federal Rule	Federal Cleaner Diesel Fuel Program	
Federal Rule	Control of Emissions from Nonroad	
	Large Spark-Ignition Engines, and	
	Recreational Engines (Marine and	
	Land-Based)	
Federal Rule	Control of Emissions of Air Pollution	
	from Nonroad Diesel Engines and Fuel	
Federal Rule	Control of Emissions of Air Pollution	
	from Locomotive Engines and Marine	
	Compression-Ignition Engines Less	
	Than 30 Liters per Cylinder	

Element B- Section 110(a)(2)(B): Ambient Air Quality Monitoring/Data System

Each implementation plan shall "provide for establishment and operation of appropriate devices, methods, systems, and procedures necessary to (i) monitor, compile, and analyze data on ambient air quality, and (ii) upon request, make such data available to the Administrator."

40 CFR Part 53 and 40 CFR Part 58 contain requirements for Ambient Air Monitoring Reference and Equivalent Methods, and Ambient Air Quality Surveillance. DEC's Bureau of Air Quality Surveillance has established a monitoring network and protocols which are in compliance with these requirements.

This SIP was developed in accordance with State laws and rules. New York State has the necessary authority to adopt and enforce the provisions of this SIP and included rules and regulations. These are authorized by Sections 1-0101 (Declaration of policy), 3-0301 (General functions, powers and duties of the department and the commissioner), 19-0103 (Declaration of policy), 19-0105 ((Declaration of purpose (safeguard the air resources of the state from pollution)), 19-0301 ((Powers and duties (regarding codes, rules and regulations for preventing or controlling air pollution)), 19-0302 (Permits and certificates), 19-0303 (Codes, rules and regulations), 19-0305 (Commissioner; enforcement power), 19-0311 (Operating permit program for sources subject to federal Clean Air Act), 71-2103 (Enforcement of Article 19 and air pollution emergency rules and regulations, specifically Violations; civil liability for violation of air pollution control regulations), and 71-2105 (Enforcement of Article 19 and air pollution emergency rules and regulations, specifically Criminal liability for violations) of the New York State Environmental Conservation Law (ECL).

Air Quality Monitoring

DEC measures air pollutants at more than 50 sites across the state, using continuous and/or manual instrumentation, in accordance with 40 CFR Part 53 and 40 CFR Part 58. These sites are part of the federally-mandated National Core Sites (NCore) and the State and Local Air Monitoring Stations (SLAMS) Network. Three of the 50 sites are NCore sites, which is the most accurate criteria pollutant monitoring system. Real time direct reading measurements include gaseous criteria pollutants (ozone, SO₂, NO_x, carbon monoxide), PM_{2.5}, and meteorological data. Filter based PM_{2.5}, lead, and acid deposition samples are collected manually and shipped to a laboratory for analysis.

DEC also operates the Photochemical Assessment Monitoring Stations (PAMS) and the National Ambient Toxics Trend Stations (NATTS) as part of the EPA supported national networks. The PAMS network monitors volatile organic compounds as ozone precursors during the summer ozone season. All of the above monitoring is done for the purpose of determining the quality of the ambient air in the state so that programs can be developed to target the appropriate source categories for emission reductions. DEC is a partner in the EPA NATTS network, and these sites have become part of the

New York State VOC ambient monitoring network that has been in operation by the Bureau of Air Quality Surveillance since 1990. Methodologies are continually being developed nationally for other compounds of concern.

Only Federal Reference Method (FRM) data is used for determining compliance with the national health based standard. The PM_{2.5} FRM is a filter based method whereby one 24 hour sample is collected every third day, except for a few sites where daily sampling takes place. DEC also complements the FRM network with real-time direct reading hourly PM_{2.5} measurements that can be found at DEC's Current Air Quality Measurement Data web page at <u>http://www.dec.ny.gov/airmon/index.php</u>.

The near real-time data for gaseous pollutants and PM_{2.5} are used for Air Quality Index (AQI) projection, and can be accessed by interested parties on the DEC web site http://www.dec.ny.gov/chemical/34985.html. DEC also provides real-time data to EPA for AIRNow live national ozone and PM_{2.5} mapping. All ambient measurements undergo data validation and are subsequently submitted to EPA's Air Quality System (AQS) for public access. DEC commits to continue to operate an air quality monitoring network that complies with EPA requirements and to submit data to EPA's AQS, in accordance with 40 CFR 58.

Annual Monitoring Network Plan and Proposed Network Changes

As required by 40 CFR Section 58.10, as of July 1, 2007, each state agency is required to adopt and submit to the Regional Administrator an annual monitoring network plan which shall provide for the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations including FRM, Federal Equivalent Method (FEM), and Approved Regional Method (ARM) monitors that are part of SLAMS, NCore stations, Chemical Speciation Network (CSN) stations, state speciation stations, Speciation Trends Network (STN) stations, and/or, in serious, severe and extreme ozone nonattainment areas, PAMS stations, and Special Purpose Monitoring (SPM) monitoring stations.

DEC prepares an Annual Monitoring Network Plan that describes in detail the specifics of the monitoring network as part of the fulfillment of the requirements detailed above. The 2016 Annual Network Monitoring Plan, found at the following link, http://www.dec.ny.gov/chemical/33276.html, had a public review period with a written comment period that closed on June 13, 2016. The network plan was submitted to EPA on June 17, 2016 and EPA approved DEC's network plan on July 28, 2016 via an approval letter.

NYSDEC has reviewed the current ambient air monitoring network and has commenced toxics monitoring in Niagara Falls starting in the third quarter of 2016. In addition, in accordance with the Data Requirements Rule for implementing the 2010 standards for SO₂, two monitors will be established at each large source facility in St. Lawrence County (Alcoa) and Tompkins County (Cayuga) to demonstrate compliance.

Figure 1 NYS DEC 2016 Ambient Air Monitoring Network Continuous PM_{2.5} Monitoring Sites



Figure 2 NYS DEC 2016 Ambient Air Monitoring Network Manual PM_{2.5} Monitoring Sites





Figure 3 NYS DEC 2016 Air Monitoring Sites in New York City

The NAAQS for the 24-hour average and annual average is 35 and 12 μ g/m³, respectively. A review of design values from monitors located throughout New York State shows that, for all sites with complete monitoring data, there is attainment of the 2012 PM_{2.5} annual standard of 12 μ g/m³ in 2013, 2014 and 2015.

Element C- Section 110(a)(2)(C): Programs for Enforcement of Control Measures and for Construction or Modification of Stationary Sources

Each implementation plan shall "include a program to provide for the enforcement of the measures described in subparagraph (A), and regulation of the modification and construction of any stationary source within the areas covered by the plan as necessary to assure that national ambient air quality standards are achieved, including a permit program as required in parts C and D of this subchapter."

Subelement (i): Enforcement

- The SIP is a compilation of rules and regulations that have been duly promulgated by DEC in accordance with its statutory authority and consistent with the New York State Administrative Procedures Act (SAPA) (see Table 2 EPA Approved SIP Revisions Representing PM_{2.5} Control Measures). ECL Section 19-0305 authorizes the Commissioner of Environmental Conservation to enforce the codes, rules and regulations of DEC established in accordance with Articles 19 and 71.
- Enforcement of emission limits and control measures is provided for in Title 21 of the ECL, "Enforcement of Article 19 and Air Pollution Emergency Rules and Regulations."
- 6 NYCRR Part 201, "Permits and Registrations" includes enforcement provisions. Specifically, 6 NYCRR Subpart 201-1.13 gives DEC access to regulated facilities in order to determine compliance.

Subelement (ii): Regulation of Minor Sources and Minor Modifications

DEC permits minor sources of air pollution through 6 NYCRR Subpart 201-4 "Minor Facility Registration," 6 NYCRR Subpart 201-5 "State Facility Permits" and applicable Federal and State regulations to regulate emissions of the relevant NAAQS pollutants.

Subelement (iii): Preconstruction PSD Permitting of Major Sources

DEC has a SIP approved PSD/NSR program. 6 NYCRR Part 231, "New Source Review for New and Modified Facilities" became effective on March 5, 2009 and was approved by EPA on November 17, 2010 (75 FR 70142). 6 NYCRR Part 231 regulates "major sources" under NSR (when the source is located in a nonattainment area) or PSD (when the source is located in an attainment area). In 2011, DEC adopted a revision to 6 NYCRR Part 231 to implement PM_{2.5} provisions not included in the 2009 rule revision and to add greenhouse gases to the existing list of regulated contaminants. These revisions were sent to EPA for inclusion in the SIP and State Plan on October 12, 2011. This demonstrates that DEC has a complete PSD permitting program in place covering the requirements for all regulated NSR pollutants, including greenhouse gases.

New York ensures that all applicable federal PSD requirements that are included in PSD permits are incorporated into Title V operating permits, and that all federally-enforceable requirements are applied and enforced. New York therefore affirms that the current NSR and PSD permitting programs remain in effect and continue to apply to the state's major stationary sources, and that the requirements of these programs are federally enforceable.

Element D- Section 110(a)(2)(D): Interstate Pollution Transport/Interstate Pollution Abatement and International Air Pollution

Each implementation plan shall "contain adequate provisions -

- (i) prohibiting, consistent with the provisions of this title, any source or other type of emissions activity within the State from emitting any air pollutant in amounts which will – (I) contribute significantly to nonattainment in, or interfere with maintenance by, any other State with respect to any such primary or secondary ambient air quality standard, or (II) interfere with measures required to be included in the applicable implementation plan for any other State under part C of this subchapter to prevent significant deterioration of air quality or to protect visibility,
- (ii) insuring compliance with the applicable requirements of sections 126 and 115 (relating to interstate and international pollution abatement)."

CAA subsection 110(a)(2)(D)(i)(I) addresses any emissions activity in one state that contributes significantly to nonattainment, or interferes with maintenance, of the NAAQS in another state. EPA sometimes refers to these requirements as prong 1 (significant contribution to nonattainment) and prong 2 (interference with maintenance).

CAA subsection 110(a)(2) D(i)(II) requires SIPs to include provisions prohibiting any source or other type of emissions activity in one state from interfering with measures required of any other state to prevent significant deterioration of air quality or from interfering with measures required of any other state to protect visibility (referring to visibility in Class I areas). EPA sometimes refers to these requirements as prong 3 (interference with PSD) and prong 4 (interference with visibility protection).

<u>Prongs 1 and 2</u> - 6 NYCRR Section 200.6 "Acceptable ambient air quality" states "Notwithstanding the provisions of this Subchapter, no person shall allow or permit any air contamination source to emit air contaminants in quantities which alone or in combination with emissions from other air contamination sources would contravene any applicable ambient air quality standard and/or cause air pollution. In such cases where contravention occurs or may occur, the commissioner shall specify the degree and/or method of emission control required."

In order to determine if emissions from NYS contribute significantly to nonattainment or interfere with maintenance by any other state, a NYS contribution analysis methodology for annual PM_{2.5} was conducted as follows:

 According to the "Area Designations for the 2012 Annual PM_{2.5} Standard" found at the following link: <u>http://www.epa.gov/pmdesignations/2012standards/state.htm</u>, there are four states with nonattainment areas: California, Idaho, Ohio and Pennsylvania. The "Final June Revisions Rule Significant Contribution Assessment TSD (Docket ID No. EPA-HQ—OAR- 2009-0491) June 2012" for CSAPR contains the following information:
 B. Analysis of Significant Contribution and Interference with Maintenance for SO₂ Emissions from Georgia, Indiana, Kansas, Nebraska, New York, Ohio, and South Carolina Using Air Quality Assessment Tool (AQAT) for the Final June Revisions Rule.

The monitors for annual PM_{2.5} to which New York was linked in the Transportation Rule were: 390350038; 390350045; 390350060; and 390350065 located in Cuyahoga County, OH and 420030064, located in Allegheny County, PA.

- In order to determine NY's contributions to the linked monitors, specific data was reviewed. Contained as part of the Air Quality Modeling Final Rule TSD is the file entitled "Contributions of 8-hour ozone, annual PM_{2.5} and 24-hour PM_{2.5} from each state to each monitoring site."(Appendix A)
- In the contributions file, the five linked monitors for NY were broken out, along with the corresponding data for each monitor specific to NY's contribution. Appendix A contains a spreadsheet which shows that NY (highlighted results) contributes to nonattainment monitors in Cuyahoga County, OH and Allegheny County, PA 2012 Base Case Annual PM_{2.5} Average Design Values.
- DEC has reviewed information that the Pennsylvania Department of Environmental Protection (PADEP) provided to EPA on July 30, 2014 updating PADEP designation recommendations for the 2012 PM_{2.5} NAAQS. In addition, DEC also reviewed EPA's Technical Support Document for the Area Designations for the 2012 Primary Annual PM_{2.5} National Ambient Air Quality Standard for Pennsylvania (TSD).(Appendix B) These documents indicate that the PM_{2.5} exceedances in Allegheny County are a local issue, and not affected by interstate transport from NY. From page 74 of the above referenced TSD, "EPA has determined that only Allegheny County, PA contributes to the nearby violation." As a result, EPA has limited the nonattainment area related to this violation to Allegheny County, PA even though an adjacent county (Cambria County) also contains a violating monitor.
- DEC, nevertheless, performed CMAQ modeling to ascertain the projected future year PM_{2.5} levels at the violating Allegheny County monitor. The modeling results in the attached spreadsheet (Appendix C) show that this monitor will attain the 2012 PM_{2.5} NAAQS (11.84 µg/m³) in 2018.

CMAQ modeling by DEC staff also shows that the Cuyahoga County, OH monitors will not exceed the PM_{2.5} NAAQS in 2018 (390350038 – 10.65 μg/m³, 390350045 – 9.81 μg/m³, 390350060 – 10.39 μg/m³, 390350065 – 10.27 μg/m³). DEC considers CAA section 110(a)(2)(D)(i)(I) (Good Neighbor Provision) to be adequately addressed through these findings.

<u>Prong 3</u> – To satisfy section 110(a)(2)(D)(i)(II), DEC confirms that new major sources of $PM_{2.5}$ and major modifications are subject to the state's PSD program. (Because of the lack of $PM_{2.5}$ nonattainment areas in the state, nonattainment NSR does not apply.) The necessary PSD requirements are contained in 6 NYCRR Part 231, "New Source Review for New and Modified Facilities."

<u>Prong 4</u> – DEC has fulfilled its obligations under Part C through its regional haze SIP submitted on March 15, 2010 and the five-year lookback SIP submitted on June 24, 2015. New York State's Regional Haze SIP contains the emission reductions needed to achieve New York's share of emission reductions agreed upon through the regional planning process. Furthermore, New York's Regional Haze SIP ensures that emissions from the State will not interfere with the Reasonable Progress Goals (RPGs) for neighboring states' Class I areas.

In a Federal Register Notice dated August 28, 2012 (Vol.77, No. 167) EPA issued a final rule effective September 27, 2012 partially approving New York State's Regional Haze SIP and promulgated a FIP to address two sources (Danskammer Generating Station and Roseton Generating Station) where EPA disapproved New York's BART determinations. Those two sources are being addressed as separate SIP revisions. The Danskammer permit has been revised to reflect the limits included in the FIP, and was submitted to EPA on August 10, 2015 as a SIP revision. The Roseton permit will be revised to reflect the FIP limits upon renewal.

Element D(ii) is satisfied when an infrastructure SIP ensures compliance with the applicable requirements of CAA sections 126(a), 126(b) and (c) and 115. CAA Section 126(a) has been addressed through 6 NYCRR Subpart 201-6.3(b)(1) by the following: "The department shall give notice of each draft permit to any affected state on or before the time that the department provides this notice to the public under the requirements of this Part or Part 621 of this Title."

Regarding CAA sections 126(b) and 126(c), there are no outstanding petitions or findings identifying any major source or group of sources in New York State as emitting air pollution in violation of CAA section 110(a)(2)(D)(i). As shown above for prongs 1 and 2 as per CAA section 110(a)(2)(D)(i), emissions in New York do not contribute to nonattainment or interfere with maintenance of the PM_{2.5} NAAQS.

New York relies on 6 NYCRR Part 621, "Uniform Procedures," to fulfill the requirement of notifying neighboring states of potential impacts from a new or modified source, as required under CAA section 110(a)(2)(D)(ii). Paragraph 621.7(i)(4), "Public Notice and Comment," requires that notice of complete application be provided to the appropriate

groups. This includes, among others, EPA, Federal Land Managers (where applicable), and "any affected states and Indian governments for new projects, major permit modifications and permit renewals subject to air Title V facility permit requirements." New York interprets this regulatory requirement as being consistent with 40 CFR Part 51.166(q)(2)(iv).

Section 115 of the CAA "International Air Pollution" authorizes the EPA Administrator to require a state to revise its SIP under certain conditions to alleviate international transport into another country. There are no findings under section 115 of the CAA against New York State with respect to the PM_{2.5} NAAQS. The downwind areas in Ontario and Quebec, the closest Canadian provinces to New York, have PM_{2.5} design values below Canada's 24-hour standard of 30 μ g/m³. This information was obtained from the following reports:

- Air Quality in Ontario 2013 Report
- Fine Particles and Ozone in Québec Relative to the Canada-wide Standards 2009 Report

Ambient Canadian $PM_{2.5}$ levels are showing a downward trend, based on the information in the above reports. Since all of New York State is in attainment for $PM_{2.5}$ and DEC has implemented its PSD program and adopted several other regulations that will serve to keep $PM_{2.5}$ levels low, it is not expected that $PM_{2.5}$ emissions from New York will cause increased $PM_{2.5}$ emissions in Canada.

Element E- Section 110(a)(2)(E): Adequate Resources and Authority, Conflict of Interest, and Oversight of Local Governments and Regional Agencies

Each implementation plan shall "provide (i) necessary assurances that the State (or, except where the Administrator deems inappropriate, the general purpose local government or governments, or a regional agency designated by the State or general purpose local governments for such purpose) will have adequate personnel, funding, and authority under State (and, as appropriate, local) law to carry out such implementation plan (and is not prohibited by any provision of Federal or State law from carrying out such implementation plan or portion thereof),(ii) requirements that the State comply with the requirements respecting state boards under section 7428, and (iii) necessary assurances that, where the State has relied on a local or regional government, agency, or instrumentality for the implementation of any plan provision, the State has responsibility for ensuring adequate implementation of such plan provision."

Subelement (i): Personnel, Funding and Legal Authority

- The Division of Air Resources (DAR) has a staff of 212.
- Funding is in the form of both operating and capital funding.
 - Operating funds are allocated to the Division annually and are used for daily administrative expenses. These expenses include salaries, fringe benefits, indirect and non-personnel services such as travel, supply and equipment costs. Indirect costs are, in turn, allocated to other departments or divisions that support DAR activities.
 - Three sources of operating funds:
 - General Fund NYS State Purposes Account
 - Co-operative Agreements Federal grant funds usually awarded by the USEPA to DEC (i.e., EPA Section 103 and 105 grants)
 - Clean Air Fund, which is comprised of the Title V and Mobile Source accounts.
 - Title V Fee assessed on large emitters on a per tonnage basis
 - Mobile Source Fee assessed on motor vehicles by NYSDMV at time of safety inspection
 - Capital funds are allocated to DAR at the discretion of the State legislature and are used for the financing or acquisition of capital facilities and related equipment purchases such as the construction of an air monitoring site. Capital funds allocated from three sources: General Fund, Mobile Source Account and Rehabilitation and Improvement.
 - In accordance with 40 CFR Part 51 Subpart O ("Miscellaneous Plan Content Requirements"), DEC receives state and federal funding on a

yearly basis. State funding comes from the New York State Office of the Comptroller and federal funding comes in the form of grants from EPA. Resources will be acquired at the 1-, 3- and 5-year intervals from the same operating and capital funding sources detailed above.

- At the time of submission of this PM_{2.5} infrastructure SIP, the DAR operating budget is \$35 million dollars annually.
- The resources considered necessary for the next 5 years depend on negotiated labor union contracts, inflation, indirect costs and fringe benefit rates determined by the NYS office of the State Comptroller, but will be no less than \$35 million dollars annually.
- The projections regarding acquiring necessary resources depend on NYS and Federal budget processes, especially for allocation of available grant funds.
- 40 CFR Part 51 Subpart L defines the requirements for legal authority. Revisions to the SIP are authorized by Article 19 and Sections 3-0301, 19-0103, 19-0301, 19-0303 and 19-0305 of the ECL. Article 19 of the ECL was adopted to protect New York's air resources from pollution and to effectuate the policy of the State to maintain a reasonable degree of purity of the air resources, consistent with the public health and welfare and the industrial development of the State. To this end, the Legislature gave DEC specific powers and duties, including the power to promulgate regulations for preventing, controlling, or prohibiting air pollution. DEC also has the specific authority to regulate motor vehicle exhaust and approve air contaminant control systems as well as regulate fuels. Section 71-2103 provides general enforcement authority.

Subelement (ii): State Boards

- Section 110(a)(2)(E)(ii) requires that the State comply with the requirements respecting state boards under CAA section 128. New York's Public Officer's Law (POL) satisfies these requirements.
- POL Section 74(2) states "No officer or employee of a state agency, member of the legislature or legislative employee should have any interest, financial or otherwise, direct or indirect, or engage in any business or transaction or professional activity or incur any obligation of any nature, which is in substantial conflict with the proper discharge of his duties in the public interest."
- POL 74(3)(e) states "No officer or employee of a state agency, member of the legislature or legislative employee should engage in any transaction as representative or agent of the state with any business entity in which he has a direct or indirect financial interest that might reasonably tend to conflict with the proper discharge of his official duties."
- New York has mechanisms in place to enforce the provisions of the POL, including the New York State Office of the Inspector General (website <u>http://www.ig.ny.gov/</u>) and the Joint Commission on Public Ethics (website <u>http://www.jcope.ny.gov/</u>).

New York previously submitted to EPA on May 23, 2013 a copy of: New York Public Officer's Law (POL) section 73–a, "Financial disclosure," found in Appendix D-1; Title 19 of the New York Codes of Rules and Regulations (19 NYCRR) Part 937, "Access To Publicly Available Records," (Appendix D-2); a list identifying entities that received delegated responsibilities for implementing and enforcing portions of the New York SIP; and, a copy of the delegation order. Because New York submitted the required information, EPA approved New York's submittals for the 1997 8-hour ozone and 1997 and 2006 PM_{2.5} NAAQS for the following 110(a)(2) Subelements: E(ii) (state boards and conflict of interest provisions) and E(iii) (delegations). EPA approved POL section 73–a (2)(a)(i) and (ii) and 19 NYCRR Subpart 937.1(a) into the New York SIP for the limited purpose of satisfying Clean Air Act Section 128(a)(2). New York's submittals were approved by EPA on June 20, 2013.

Subelement (iii): Assignment of Legal Authority to Local Agencies

- Section 110(a)(2)(E)(iii) requires an explanation of Assignment of Legal Authority to Local Agencies. ECL Sections 19-0305, 71-2103 and 71-2105 authorize the Commissioner of Environmental Conservation to enforce the codes, rules and regulations of DEC established in accordance with Article 19 (Air Pollution Control) and Article 71 (Enforcement). Therefore, DEC has the authority to enforce all approved SIP measures, which are a compilation of the rules and regulations that are promulgated to achieve or maintain compliance with a NAAQS.
- Currently, DEC has the sole responsibility for the implementation of the SIP, but in the event that it relies on a local or regional government, agency, or instrumentality for the implementation of any SIP provision, it affirms that New York State has the responsibility for ensuring adequate implementation of such plan provision.

Element F- Section 110(a)(2)(F): Stationary Source Monitoring and Reporting

Each implementation plan shall "require, as may be prescribed by the Administrator (i) the installation, maintenance, and replacement of equipment, and the implementation of other necessary steps, by owners or operators of stationary sources to monitor emissions from such sources, (ii) periodic reports on the nature and amounts of emissions and emissions-related data from such sources, and (iii) correlation of such reports by the State agency with any emission limitations or standards established pursuant to this Act, which reports shall be available at reasonable times for public inspection."

Subelement (i): Installation, maintenance, and replacement of equipment, and the implementation of other necessary steps, by owners or operators of stationary sources to monitor emissions from such sources:

- 6 NYCRR Part 200.7 "Maintenance of equipment" states that "Any person who owns or operates an air contamination source which is equipped with an emission control device shall operate such device and keep it in a satisfactory state of maintenance and repair in accordance with ordinary and necessary practices, standards and procedures, inclusive of manufacturer's specifications, required to operate such device effectively."
- Requirements for owners of air contamination sources are contained in 6 NYCRR Subpart 202-1, "Emissions Testing, Sampling and Analytical Determinations," which requires facility owners to conduct emissions tests of the sources, notify DEC of the time and date of the test 30 days prior to the test, and requires emissions testing conducted according to acceptable procedures. It also allows DEC to conduct separate emissions tests.
- As required by 40 CFR 51.212 "Testing, inspection, enforcement, and compliance," DEC has a program in place for stationary source testing. ECL 19-0305(2) provides DEC with the authority to investigate complaints, and also conduct sampling. 6 NYCRR Subpart 201-1.13 gives DEC access to regulated facilities. DEC uses enforceable test methods as contained in 51 CFR Appendix M "Recommended Test Methods for State Implementation Plans."

Subelement (ii): Periodic reports on the nature and amounts of emissions and emissions-related data from such sources:

Authority for this provision is provided under Article 19 of the ECL. In particular, ECL Section 19-0311 (Operating Permit Program) states in subsection 3 that operating permits issued pursuant to this section shall include, among other things, "provisions for detailed monitoring, record-keeping and reporting, including requirements that records be kept for five years, and that monitoring records be submitted to the DEC at least every six months ..." This requirement is mirrored in 6 NYCRR Subpart

201-6.2(d), which requires monitoring of emissions, recordkeeping, and reporting in permit conditions that are included in all Title V permits for major stationary sources. 6 NYCRR Subpart 202-2 requires major facility owners to report annual emissions to DEC.

Subelement (iii): Correlation of such reports by the State agency with any emission limitations or standards established pursuant to this Act, which reports shall be available at reasonable times for public inspection.

DEC constructs statewide emissions inventories in order to develop control strategies for pollutants from facilities and other stationary sources. Stationary source emissions inventories are based on actual emissions data submitted by major regulated facilities through annual emission statements, and calculated emissions from minor stationary sources based on area source procedures established by EPA. PM_{2.5} emissions (along with emissions of other key pollutants) are submitted to EPA through the Consolidated Emissions Regulatory Report (CERR) for uploading to EPA's National Emissions Inventory (NEI).

DEC regulations (6 NYCRR 201-5.3) require state facility permits to contain conditions to insure compliance with state standards, identify applicable federal standards, include record-keeping and reporting requirements and ensure operation to prevent noncompliance with NAAQS. DEC regulations require Title V permits (6 NYCRR 201-6.4) include compliance assurance monitoring and require permits to incorporate all applicable federal reporting requirements including semi-annual compliance monitoring and the notification and reporting of permit deviations and incidences of non-compliance. In addition, Title V sources shall certify compliance with permit terms and conditions, including emission limits, standards or work practices.

Records will be made available for public review in accordance with 6 NYCRR Part 616, Access to Records.

https://govt.westlaw.com/nycrr/Browse/Home/NewYork/NewYorkCodesRulesandRe gulations?guid=Ifaeaa760b5a011dda0a4e17826ebc834&originationContext=docum enttoc&transitionType=Default&contextData=(sc.Default)

Element G- Section 110(a)(2)(G): Emergency Powers

Each implementation plan shall "provide for authority comparable to that in section 303 and adequate contingency plans to implement such authority."

Section 303 of the CAA provides authority to the EPA Administrator to seek a court order to restrain any source from causing or contributing to emissions that present an "imminent and substantial endangerment to public health or welfare, or the environment." The EPA, in its iSIP Guidance, has interpreted section 110(a)(2)(G) as imposing two basic requirements for purposes of an infrastructure SIP submission. The first requirement is submitting the statutory or regulatory provisions that provide the air agency with authority comparable to that of the EPA Administrator under section 303 along with a narrative explanation of how they meet the requirements of this element. New York State has comparable authority, as described below.

 Among other provisions, ECL Section 3-0301 entitled "General functions, powers and duties of the DEC and the commissioner" authorizes DEC to prevent and control air pollution emergencies, as defined in subdivision 1 of ECL Section 3. In exercising such prevention and control, DEC and the Commissioner of Environmental Conservation may limit the consumption of fuels and use of vehicles, curtail or require the cessation of industrial processes and limit or require the cessation of incineration and open burning, and take any other action he may deem necessary to prevent and/or control air pollution emergencies.

The second requirement is submitting an adequate contingency plan to implement the air agency's emergency episode authority.

- Articles 3 and 19 of the ECL provide New York State with the authority to address air pollution emergencies and are included in the SIP. To prevent and control these emergency episodes, DEC adopted 6 NYCRR Subpart 207-3, "Control Measures for Air Pollution Episode," which implements ECL section 3-0301. EPA approved this regulation as part of the New York SIP (46 FR 55690).
- In lieu of contingency plans, DEC has Air Pollution Episode Procedures (APEPs), also called "Air Pollution Episode Alert Criteria- March 2014" found at <u>http://www.dec.ny.gov/chemical/60440.html</u> and is explained below.
- In October 2009, DEC completed a comprehensive revision of its APEPs to address updated PM_{2.5} significant harm levels (SHLs) along with revised values for ozone episodes. The revision involved updating the contact information for the Bureaus of Air Quality Assurance, Stationary Sources, and Air Quality Surveillance, and the Impact Assessment and Meteorology Section, which provide important information and data-gathering services during an air pollution episode. Local-level emergency contacts were also updated. Appendix E contains a regional assignment map and regional contacts, provided by the New

York State Office of Emergency Management (NYS OEM), updated February 2016.

• New York's APEPs include air pollution episode criteria for PM_{2.5}, coarse PM (PM₁₀), ozone, carbon monoxide, SO₂, and nitrogen dioxide, based on SHLs established by EPA.

Element H- Section 110(a)(2)(H): SIP Revisions

Each implementation plan shall "provide for revision of such plan (i) from time to time as may be necessary to take account of revisions of such national primary or secondary ambient air quality standard or the availability of improved or more expeditious methods of attaining such standard, and (ii) except as provided in paragraph (3)(C), whenever the Administrator finds on the basis of information available to the Administrator that the plan is substantially inadequate to attain the national ambient air quality standard which it implements or to otherwise comply with any additional requirements established under this chapter."

This SIP was developed in accordance with State laws and rules. New York State has the necessary authority to adopt and enforce the provisions of this SIP and included rules and regulations.

These revisions are authorized by the following Sections of the ECL:

- 1-0101- Declaration of policy- conserve, improve and protect NYS natural resources and environment and to prevent, abate and control...air pollution...;
- 3-0301- General functions, powers and duties of the department and the commissioner- commissioner has power to coordinate and develop policies, planning and programs relate to the environment..., provide for prevention and abatement of all...air pollution, assess new and changing technology and development patterns to identify environmental implications, monitor the environment, prevent and control air pollution emergencies, adopt, amend or repeal environmental standards and criteria, study, monitor, control and regulate pollution from motor vehicle exhaust emissions, issue and amend guidance memoranda and similar documents of general applicability which are to be relied upon by department personnel for implementation;
- 19-0103- Declaration of policy- Maintain a reasonable degree of purity of the air resources of the state...,require the use of all available practical and reasonable methods to prevent and control air pollution in the state of New York...;
- 19-0105- Declaration of purpose- safeguard the air resources of the state from pollution;
- 19-0301- Powers and duties- regarding codes, rules and regulations for preventing or controlling air pollution;
- 19-0302- Permits and certificates;
- 19-0303- Codes, rules and regulations; public hearing requirement;
- 19-0305- Commissioner; enforcement power;
- 19-0311- Operating permit program for sources subject to federal Clean Air Act;
- 71-2103- Enforcement of article 19 and air pollution emergency rules and regulations, specifically violations; civil liability for violation of air pollution control regulations; and
- 71-2105- Enforcement of article 19 and air pollution emergency rules and regulations, specifically criminal liability for violations.

Article 19 of the ECL was adopted to protect New York's air resources from pollution and to effectuate the policy of the State to maintain a reasonable degree of purity of the air resources, consistent with the public health and welfare and the industrial development of the State. To this end, the Legislature gave DEC specific powers and duties, including the power to promulgate regulations for preventing, controlling, or prohibiting air pollution. DEC also has the specific authority to regulate motor vehicle exhaust and approve air contaminant control systems as well as regulate fuels.

Element I- Section 110(a)(2)(I): Plan Revisions for Nonattainment Areas

Each implementation plan shall "in the case of a plan or plan revision for an area designated as a nonattainment area, meet the applicable requirements of part D of this subchapter (relating to nonattainment areas)."

Pursuant to the September 13, 2013 EPA Memorandum entitled "Guidance on Infrastructure State Implementation Plan (SIP) Elements under Clean Air Act Sections 110(a)(1) and 110(a)(2)," EPA does not expect infrastructure SIP submissions to address subsection 110(a)(2)(I). The specific SIP submissions for designated nonattainment areas, as required under CAA title I part D are subject to a different submission schedule⁴ than those for a section 110 infrastructure element.

Consequently, Element I is not being addressed in this infrastructure SIP submission.

⁴ These elements are typically referred to as nonattainment SIP or nonattainment plan elements and are due by the dates prescribed under subparts 2 through 5 of part D, extending as far as 10 years following designation for some elements.

Element J- Section 110(a)(2)(J): Consultation with Government Officials, Public Notification, and PSD and Visibility Protection

Each implementation plan shall "meet the applicable requirements of section 121 (relating to consultation), section 127 (relating to public notification), and part C (relating to prevention of significant deterioration of air quality and visibility protection)..."

Subelement (i): Consultation with identified officials on certain actions:

CAA Section 121 requires States to provide a satisfactory process of consultation with general purpose local governments, designated organizations of elected officials of local governments and any Federal Land Managers (FLMs) having authority over Federal land to which the State plan applies. Though there are no Federal lands within New York State to which the SIP applies, DEC has participated in the consultation process of the Regional Haze SIP (40 CFR 51.308) with the FLMs, States and Tribes of the Mid-Atlantic/Northeast Visibility Union (MANE-VU), and other regional planning organizations where emissions from New York are reasonably anticipated to contribute to visibility impairment to Class I areas.

DEC's Regional Haze SIP was submitted to EPA on March 15, 2010. In a Federal Register Notice dated August 28, 2012 (Vol.77, No. 167) EPA issued a final rule effective September 27, 2012 partially approving New York State's Regional Haze SIP and promulgated a FIP to address two sources (Danskammer Generating Station and Roseton Generating Station) where EPA disapproved New York's BART determinations. Those two sources are being addressed as separate SIP revisions. The Danskammer permit has been revised to reflect the limits included in the FIP, and was submitted to EPA on August 10, 2015 as a SIP revision. The Roseton permit will be revised to reflect the FIP limits upon renewal.

As required by the Regional Haze Rule, the "New York State Implementation Plan for Regional Haze: Five-Year Progress Report for 2010-2015" was submitted to EPA electronically on June 24, 2015, and DEC is awaiting EPA approval of that progress report.

The next Regional Haze SIP, which is currently under development, is due to EPA on July 31, 2018.

On December 22, 2005, DEC established a SIP Coordinating Council consisting of senior policy representatives from 19 state agencies and authorities, and a SIP Task Force consisting of officials from 37 local governments and designated organizations of elected officials. The SIP Coordinating Council provides a means to keep state agencies and local governments informed of planned SIP activities and deadlines, and also provides a forum for discussion of SIP requirements and implications, such as effects on transportation planning. The SIP Task Force provides a means of facilitating local involvement at the MPO and county level. Periodic meetings of both groups were

held during the ozone and PM_{2.5} SIP development period for the 1997 NAAQS, and continue as necessary to address nonattainment of the PM_{2.5} NAAQS and other revised standards.

Subelement (ii): Public Notification:

- CAA Section 127 requires State plans to contain measures which will be effective to notify the public during any calendar year, on a regular basis, of instances or areas in which any national primary ambient air quality standard is exceeded or was exceeded during any portion of the preceding calendar year to advise the public of the health hazards associated with such pollution, and to enhance public awareness of the measures which can be taken to prevent such standards from being exceeded and the ways in which the public can participate on regulatory and other efforts to improve air quality.
- CAA section 127 and 40 CFR 51.285 require state plans to contain provisions for notifying the public of NAAQS exceedances, and for increasing public awareness of measures that can be taken to prevent an exceedance and chances for participation in regulatory efforts to improve air quality. Additionally, all ambient air concentrations captured by the state's PM_{2.5} monitoring network are submitted to AQS for public access. Municipalities also have emergency response plans recommended by the New York State Office of Emergency Management (NYS OEM) and the Federal Emergency Management Agency (FEMA) that provide for public information and notification in the case of large-scale emergencies. Appendix E contains a regional assignment map and regional contacts information, dated February 2016, provided by NYS OEM.
- DEC's website, at http://www.dec.ny.gov/chemical/34985.html, contains an AQI for reporting daily air quality to the public. It describes how clean or polluted the air is, and what associated health effects might be a concern. It was created as a way to correlate levels of different pollutants to one scale; the higher the AQI value, the greater the health concern. When levels of ozone and/or fine particles are expected to exceed an AQI value of 100, an Air Quality Health Advisory is issued alerting sensitive groups to take the necessary precautions. DEC, in cooperation with the New York State Department of Health, posts warnings on the above-referenced website if dangerous conditions are expected to occur. These warnings are also aired through the media, and are available on DEC's toll-free Air Quality Hotline at 1-800-535-1345. The Air Quality Forecast displays the predicted AQI value for eight regions in New York State. It also displays the observed values for the previous day. Air quality measurements from New York's statewide continuous monitoring network are updated hourly where available. Parameters monitored include ozone, fine particulate, carbon monoxide, sulfur dioxide, nitrogen oxides, methane/nonmethane hydrocarbons, and meteorological data. Additional ozone information to enhance public awareness is located at http://www.dec.ny.gov/chemical/8400.html.
- Emissions of PM_{2.5} come from mobile sources, stationary sources, aviation sources, wildfires and prescribed fires, open burning and woodstoves. Control measures include public education for proper burning and woodstove changeout programs to replace outdated stoves, encouraging consumers to recycle and dispose of waste safely in a landfill, implementing burn bans, using diesel retrofits and low sulfur fuel, and conducting educational outreach campaigns to encourage less driving and idling.
- The public is afforded the opportunity to participate in regulatory efforts to improve air quality (e.g., a new or revised regulation limiting PM_{2.5} emissions from a particular source type), as described in the State Administrative Procedure Act, found at <u>http://www.dos.ny.gov/info/rulemakingmanual.html</u>. For each major SIP revision, 40 CFR 51.102 requires DEC to provide appropriate notice, provide the opportunity to submit written comments, and allow the public and local entities the opportunity to request a public hearing.

Subelement (iii): Prevention of significant deterioration:

New York has a SIP-approved PSD/NSR program that covers all criteria pollutants, including PM_{2.5}. 6 NYCRR Part 231, "New Source Review for New and Modified Facilities" became effective on March 5, 2009 and was approved by EPA on November 17, 2010 (75 FR 70142). 6 NYCRR Part 231 regulates "major sources" under NSR (when the source is located in a nonattainment area) or PSD (when the source is located in an attainment area). In 2011, DEC adopted a revision to 6 NYCRR Part 231 to implement PM_{2.5} provisions not included in the 2009 rule revision and to add greenhouse gases to the existing list of regulated contaminants. These revisions were sent to EPA for inclusion in the SIP and State Plan on October 12, 2011. This demonstrates that DEC has a complete PSD permitting program in place covering the requirements for all regulated NSR pollutants, including greenhouse gases.

Subelement (iv): Visibility protection:

Pursuant to the September 13, 2013 EPA Memorandum entitled "Guidance on Infrastructure State Implementation Plan (SIP) Elements under Clean Air Act Sections 110(a)(1) and 110(a)(2)," EPA does not expect infrastructure SIP submissions to address subsection 110(a)(2)(J)(iv). Visibility protection and regional haze program requirements are contained in Part C of the CAA (under sections 169A and 169B) and are being met by DEC through separate efforts. These Part C requirements are not affected by revisions to a NAAQS. There are therefore no new applicable visibility protection obligations under section 110(a)(2)(J) resulting from the 2012 PM_{2.5} NAAQS revision. Consequently, Subelement (iv) of Element J is not being addressed in this infrastructure SIP submission.

Element K- Section 110(a)(2)(K): Air Quality Modeling and Submission of Modeling Data

Each implementation plan shall "provide for (i) the performance of such air quality modeling as the Administrator may prescribe for the purpose of predicting the effect on ambient air quality of any emissions of any air pollutant for which the Administrator has established a national ambient air quality standard, and (ii) the submission, upon request, of data related to such air quality modeling to the Administrator."

DEC certifies that the air quality modeling and analysis used in SIPs complies with EPA's draft "Guidance for PM_{2.5} Permit Modeling" (May 20, 2014) and commits to continue to use air quality models in accordance with EPA's approved modeling guidance and to submit data to the Administrator if requested. Current modeling techniques to address secondary chemical formation of PM_{2.5} and ozone pollution from precursors are incorporated in the "Guideline on Air Quality Models," also published as Appendix W of Title 40 CFR Part 51. Information regarding these air quality models are used by all major sources applying for a preconstruction PSD permit.

6 NYCRR Subpart 231-12, "Ambient Air Quality Impact Analysis," sets forth the procedures and requirements for the performance of an air quality impact analysis (also known as modeling) to determine whether a new or modified facility complies with quantified air quality levels, including air quality standards, PSD increments and monitoring *de minimus* levels, air quality related values, and significant impact levels.

DEC's regulations under 6 NYCRR Part 200.6, "Acceptable ambient air quality," dictate that "no person shall allow or permit any air contamination source to emit air contaminants in quantities which alone or in combination with emissions from other air contamination sources would contravene any applicable ambient air quality standard and/or cause air pollution." As such, when a new major source of emissions is coming online or an existing source is undertaking a modification that would lead to a significant increase in its potential to emit, DEC will use modeling as necessary to affirm that compliance with the PM_{2.5} NAAQS will be maintained.

DEC will follow the requirements of any PM_{2.5} modeling guidance that EPA may release in the future. DEC also commits to providing modeling data to the Administrator upon request.

Element L- Section 110(a)(2)(L): Permitting Fees

Each implementation plan shall "require the owner or operator of each major stationary source to pay to the permitting authority, as a condition of any permit required under this chapter, a fee sufficient to cover (i) the reasonable costs of reviewing and acting upon any application for such a permit, and (ii) if the owner or operator receives a permit for such source, the reasonable costs of implementing and enforcing the terms and conditions of any such permit (not including any court costs or other costs associated with any enforcement action), until such fee requirement is superseded with respect to such sources by the Administrator's approval of a fee program under subchapter V of this chapter."

New York has an EPA-approved fee program under CAA Title V. The following ECL and regulation citations provide for collection of permitting fees under New York's EPA-approved Title V permit program.

- ECL Section 72-0302, "State Air Quality Control Fees," states that "All persons, except those required to pay a fee under section 72-0303 of this article, who are required to obtain a permit, certificate or approval pursuant to the state air quality control program shall submit to the department a per emission point fee in an amount established as follows..."
- ECL Section 72-0303, "Operating Permit Program Fees," states that "Commencing January first, two thousand fifteen and every year thereafter, all sources of regulated air contaminants identified pursuant to subdivision one of section 19-0311 of this chapter shall submit to the department an annual base fee of two thousand five hundred dollars. This base fee shall be in addition to the fees listed below..."
- 6 NYCRR Subpart 482-2, "Operating Permit Program Fee," establishes the annual fee to be submitted by air contamination sources subject to the operating permit program for emissions of regulated air contaminants. This Subpart, with revisions effective on June 29, 2016, was adopted pursuant to the statutory authority granted to the DEC under section 72-0303 of the ECL. See http://www.dec.ny.gov/regulations/66905.html
- 6 NYCRR Paragraph 201-6.4(a)(7) states "The owner and/or operator of a stationary source shall pay fees to DEC consistent with the fee schedule authorized by Subpart 482-2 of this Title."

Element M- Section 110(a)(2)(M): Consultation and Participation by Affected Local Entities

Each implementation plan shall "provide for consultation and participation by local political subdivisions affected by the plan."

Consultation and participation by local political subdivisions are provided through a SIP Task Force consisting of officials from 37 local governments and designated organizations of elected officials. DEC utilizes the SIP Task Force as necessary for consultation on plans.

Appendix A Contributions of 8-hour ozone, annual PM_{2.5} and 24-hour PM_{2.5} from each state to each monitoring site

Appendix B EPA's Technical Support Document for the Area Designations for the 2012 Primary Annual PM2.5 National Ambient Air Quality Standard for Pennsylvania

PENNSYLVANIA: Johnstown, Delaware County, Allegheny County, Allentown, and Lebanon County Nonattainment Areas

Area Designations for the 2012 Primary Annual PM_{2.5} National Ambient Air Quality Standard Technical Support Document

1.0 Summary

In accordance with Section 107(d) of the Clean Air Act (CAA), the EPA must promulgate designations for all areas of the country. In particular, EPA must identify those areas that are violating a National Ambient Air Quality Standard (NAAQS) or contributing to a violation of the NAAQS in a nearby area. EPA must complete this process within 2 years of promulgating a new of revised NAAQS, or may do so within 3 years under circumstances not relevant to these designations.¹ This technical support document (TSD) describes the EPA's intent to designate areas in Pennsylvania as nonattainment for the 2012 primary annual fine particle NAAQS (2012 annual PM_{2.5} NAAQS).²

Under section 107(d), states are required to submit area designation recommendations to the EPA for the 2012 annual PM_{2.5} NAAQS no later than 1 year following promulgation of the standard, or by December 13, 2013. On December 10, 2013, the Commonwealth of Pennsylvania made designation recommendations for the 2012 annual PM_{2.5} NAAQS based on air quality data from 2010-2012. On July 30, 2014, Pennsylvania updated its recommendations to reflect the latest air quality data. Pennsylvania recommended that the counties and portions of counties identified in Table 1 be designated as nonattainment for the 2012 annual PM_{2.5} NAAQS, based on air quality data from 2011-2013.

After considering these recommendations and based on EPA's technical analysis as described in this TSD, the EPA intends to designate the areas listed in Table 1 as nonattainment for the 2012 annual $PM_{2.5}$ standard. EPA must designate an area nonattainment if it has an air quality monitoring site³ that is violating the standard or if it has sources of emissions that are contributing to a violation of the NAAQS in a nearby area. Legal descriptions (e.g., county boundaries, townships and ranges) of these

¹ Section 107(d) of the CAA requires the EPA to complete the initial designation process within 2 years of promulgation of a new or revised NAAQS, unless the Administrator has insufficient information to make initial designation decisions in the 2-year time frame. In such circumstances, the EPA may take up to 1 additional year to make initial area designation decisions (i.e., no later than 3 years after promulgation of the standard).

² On December 14, 2012, the EPA promulgated a revised primary annual PM_{2.5} NAAQS (78 FR 3086, January 15, 2013). In that action, the EPA revised the primary annual PM_{2.5} standard, strengthening it from 15.0 micrograms per cubic meter $(\mu g/m^3)$ to 12.0 $\mu g/m^3$.

³ In accordance with 40 CFR 50 Appendix N, $PM_{2.5}$ measurements from the primary monitor and suitable collocated $PM_{2.5}$ FRM, FEM or ARMs may be used in a "combined site data record" to establish a $PM_{2.5}$ design value to determine whether the NAAQS is met or not met at a particular $PM_{2.5}$ monitoring site.

areas are found below in the supporting technical analysis for each area. As provided in CAA section 188(a), the EPA will initially classify all nonattainment areas as "Moderate" nonattainment areas.

Pennsylvania	a's Recommended	EPA's Intended			
Nonattainment	Nonattainment	Nonattainment	Nonattainment		
Area	Counties	Area	Counties		
Cambria County	Cambria	Johnstown	Cambria and Indiana – partial (townships of West Wheatfield, Center, East Wheatfield and Armagh Borough and Homer City Borough)		
Greater Philadelphia	Delaware	Delaware County	Delaware		
Liberty-Clairton	Allegheny – partial (City of Clairton, and boroughs of Glassport, Liberty, Lincoln and Port View)	Allegheny County	Allegheny		
Northampton County	Northampton	Allentown	Northampton and Lehigh		
Lebanon County	Lebanon	Lebanon County	Lebanon		

Table 1. Pennsylvania Recommended Nonattainment Areas and EPA's Intended DesignatedNonattainment Areas for the 2012 annual PM2.5 NAAQS

In its recommendation letters, Pennsylvania recommended that EPA designate Adams, Allegheny (except for the Liberty-Clairton area), Armstrong, Beaver, Berks, Blair, Bucks, Centre, Chester, Cumberland, Dauphin, Erie, Lackawanna, Lancaster, Mercer, Monroe, Montgomery, Philadelphia, Washington Westmoreland, and York Counties as "attainment" and all other counties not identified in the Pennsylvania's Recommended Nonattainment Counties column of Table 1 as "unclassifiable/attainment."

EPA agrees with Pennsylvania's nonattainment recommendations for the Delaware County and Lebanon County Areas. As shown in Table 1, EPA's intended nonattainment designations differ from Pennsylvania's recommendations for the Cambria County (Johnstown), Liberty-Clairton (Allegheny County), and Northampton County (Allentown) Areas. EPA intends to designate the remainder of Pennsylvania as unclassifiable/attainment based on Pennsylvania's recommendations, ambient monitoring data collected during the 2011-2013 period showing compliance with the 2012 annual PM_{2.5} NAAQS, and the EPA's determination that areas within the Commonwealth are not likely contributing to nearby violations.^{4,5}

2.0 Nonattainment Area Analyses and Intended Boundary Determination

The EPA evaluated and determined the intended boundaries for each nonattainment area on a case-bycase basis considering the specific facts and circumstances unique to each area. In accordance with the CAA section 107(d), EPA intends to designate as nonattainment not only the area with the monitoring sites that violate the 2012 annual PM_{2.5} NAAQS, but also those nearby areas with emissions sources that contribute to the violation in the violating area. As described in EPA guidance⁶, after identifying each monitoring site indicating a violation of the standard in an area, EPA analyzed those areas with emissions contributing to that violating area by considering those counties in the entire metropolitan area (e.g., Core Based Statistical Area (CBSA) or Combined Statistical Area (CSA)) in which the violating monitoring sites are located. The EPA also evaluated counties adjacent to the CBSA or CSA that have emissions sources with the potential to contribute to the violations. EPA uses the CBSA or CSA as a starting point for the contribution analysis because those areas are nearby for purposes of the PM_{2.5} NAAQS. Based upon relevant facts and circumstances in each area, the designated nonattainment area could be larger or smaller that the CBSA or CSA. EPA's analytical approach is described in section 3 of this technical support document.

3.0 Technical Analysis

In this technical analysis, EPA used the latest data and information available to EPA (and to the states and tribes through the PM_{2.5} Designations Mapping Tool⁷ and the EPA PM Designations Guidance and Data web page⁸) and/or data provided to EPA by states. This technical analysis identifies the areas with monitoring sites that violate the 2012 annual PM_{2.5} standard. EPA evaluated these areas and other nearby areas with emissions sources or activities that potentially contribute to ambient fine particle

⁴ Unless a state or tribe has specifically identified jurisdictional boundaries in their area recommendations, when determining "remainder of the state," EPA will use Federal Information Processing Standard (FIPS) codes maintained by the National Institute of Standards and Technology (NIST), which are used to identify counties and county equivalents (e.g., parishes, boroughs) of the United States and its unincorporated territories (e.g., American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the US Virgin Islands). Available on EPA's Envirofacts website at *http://www.epa.gov/envirofw/html/codes/state.html*.

⁵ EPA uses a designation category of "unclassifiable/ attainment" for areas that are monitoring attainment and for areas that do not have monitoring sites but which the EPA believes are likely attainment and does not contain emissions sources that are contributing to nearby violations based on the five factor analysis and other available information.

⁶ EPA issued guidance on April 16, 2013, that identified important factors that EPA intended to evaluate, in making a recommendation for area designations and nonattainment boundaries for the 2012 annual PM_{2.5} NAAQS. Available at *http://www.epa.gov/pmdesignations/2012standards/docs/april2013guidance.pdf*.

⁷ EPA's PM_{2.5} Designations Mapping Tool can be found at *http://geoplatform2.epa.gov/PM_MAP/index.html*.

⁸ EPA's PM Designations Guidance and Data web page can be found at

http://www.epa.gov/pmdesignations/2012standards/techinfo.htm.

concentrations at the violating monitors in the area based on the weight of evidence of the five factors recommended in EPA guidance and any other relevant information.

These five factors are:

<u>Factor 1: Air Quality Data</u>. The air quality data analysis involves examining available ambient PM_{2.5} air quality monitoring data at, and in the proximity of, the violating monitoring locations. This includes reviewing the design values (DVs) calculated for each monitoring location in the area based on air quality data for the most recent complete 3 consecutive calendar years of quality-assured, certified air quality data in the EPA's Air Quality System (AQS). In general, EPA identifies violations using data from suitable Federal Reference Method (FRM), Federal Equivalent Method (FEM), and/or Approved Regional Method (ARM) monitors sited and operated in accordance with 40 CFR Part 58.⁹ Procedures for using the air quality data to determine whether a violation has occurred are given in 40 CFR part 50 Appendix N, as revised by a final action published in the Federal Register on January 15, 2013 (78 FR 3086).¹⁰ In addition to reviewing data from violating monitor sites, EPA also assesses the air quality data from other monitoring locations to help ascertain the potential contribution of sources in areas nearby to the violating monitoring sites. Examples include using chemical speciation data to help characterize contributing emissions sources and the determination of nearby contributions through analyses that differentiate local and regional source contributions.

<u>Factor 2: Emissions and emissions-related data</u>. The emissions analysis examines identified sources of direct PM_{2.5}, the major components of direct PM_{2.5} (primary organic carbon/organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (e.g., sulfur dioxide (SO₂), oxides of nitrogen (NO_X), total volatile organic compounds (VOC), and ammonia (NH₃). Emissions data are generally derived from the most recent National Emissions Inventory (NEI) (i.e., 2011 NEI version 1), and are given in tons per year. The emission estimates are based on the "2011ed" air quality modeling platform.¹¹ Although many emissions inventory components of the "2011ed" modeling platform derive from the 2011 NEIv1, there are some differences between the platform inventories and the 2011 NEIv1 emissions. There are also some differences in PM emissions between the 2011 NEI v1 and "2011ed" due to the meteorological adjustments made for certain sectors. In some cases, EPA may also evaluate emissions information from states, tribes, or other relevant sources that may not be reflected in the NEI. One example of "other information" could include an inventory or assessment of local/regional area

⁹ Suitable monitors include all FEM and/or ARMs except those specific continuous FEMs/ARMs used in the monitoring agency's network where the data are not of sufficient quality such that data are not to be compared to the NAAQS in accordance with 40 CFR part 58.10(b)(13) and approved by the EPA Regional Administrator per 40 CFR part 58.11(e).

¹⁰ As indicated in Appendix N to 40 CFR part 50, Interpretation of the National Ambient Air Quality Standards for PM_{2.5}, section 3(a) indicates "Except as otherwise provided in this appendix, all valid FRM/FEM/ARM PM_{2.5} mass concentration data produced by suitable monitors that are required to be submitted to AQS, or otherwise available to EPA, meeting the requirements of part 58 of this chapter including appendices A, C, and E shall be used in the DV (design value) calculations. Generally, EPA will only use such data if they have been certified by the reporting organization (as prescribed by § 58.15 of this chapter); however, data not certified by the reporting organization can nevertheless be used, if the deadline for certification has passed and EPA judges the data to be complete and accurate."

¹¹ http://www.epa.gov/ttn/chief/emch/2011v6/outreach/2011v6_2018base_EmisMod_TSD_26feb2014.pdf

sources that individually does not meet the current threshold for reporting to the NEI but collectively contributes to area PM_{2.5} concentrations. Emissions data indicate the potential for a source to contribute to observed violations, making it useful in assessing boundaries of nonattainment areas.

<u>Factor 3: Meteorology</u>. Evaluating meteorological data helps to determine the effect on the fate and transport of emissions contributing to PM_{2.5} concentrations and to identify areas potentially contributing to the violations at monitoring sites. The Factor 3 analysis includes assessing potential source-receptor relationships in the area identified for evaluation using summaries of air trajectories, wind speed, wind direction, and other meteorological data, as available.

<u>Factor 4: Geography/topography</u>. The geography/topography analysis includes examining the physical features of the land that might define the airshed and, therefore, affect the formation and distribution of PM_{2.5} over an area. Mountains or other physical features may influence the fate and transport of emissions and PM_{2.5} concentrations. Additional analyses may consider topographical features that cause local stagnation episodes via inversions, such as valley-type features that effectively "trap" air pollution, leading to periods of elevated PM_{2.5} concentrations.

<u>Factor 5: Jurisdictional boundaries</u>. The analysis of jurisdictional boundaries identifies the governmental planning and organizational structure of an area that may be relevant for designations purposes. These jurisdictional boundaries provide insight into how the governing air agencies conduct or might conduct air quality planning and enforcement in a potential nonattainment area. Examples of jurisdictional boundaries include counties, air districts, areas of Indian country, CBSA or CSA, metropolitan planning organizations (MPOs), and existing nonattainment areas.

3.1 Area Background and Overview - Johnstown Area

Figure 1a is a map of EPA's intended nonattainment boundary for the Johnstown Area. The map shows the location and DVs of ambient air quality monitoring locations, county and other jurisdictional boundaries including the Johnstown, PA Metropolitan Statistical Area (MSA). For purposes of the 1997 annual PM_{2.5} NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 1997 annual PM_{2.5} NAAQS included the entire county of Cambria and part of Indiana County in Pennsylvania. For purposes of the 2006 24-hour PM_{2.5} NAAQS, this area was designated nonattainment area for the 2006 24-hour PM_{2.5} NAAQS. The intended nonattainment boundary for the Johnstown Area for the 2012 annual PM_{2.5} NAAQS is the same as the designated nonattainment area boundary for the Johnstown Area for the 2012 annual PM_{2.5} NAAQS.





EPA must designate as nonattainment areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. Cambria County shows a violation of the 2012 PM_{2.5} NAAQS, therefore this county is included in the nonattainment area. The Johnstown, PA MSA is a single county MSA which consists of Cambria County, PA. As shown in Figure 1b, EPA evaluated the Johnstown, PA MSA and a ring of counties adjacent to the Johnstown, PA MSA which includes Bedford, Blair, Centre, Clearfield, Indiana, Somerset and Westmorland counties in Pennsylvania. EPA's evaluation was based on the five factors and other relevant information and, as discussed below, supports a finding that the townships of West Wheatfield, Center, East Wheatfield and Armagh Borough and Homer City Borough in Indiana County contribute to the nearby violation in Cambria County. The following sections describe this five factor analysis process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.





Factor 1: Air Quality Data

All data collected during the year are important when determining contributions to an annual standard such as the 2012 annual PM_{2.5} NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below

the level of the NAAQS. For the 2012 annual PM_{2.5} NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured PM_{2.5} concentrations. For these reasons, for the Factor 1 air quality analysis, EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of PM_{2.5} mass in the area of analysis.

In most cases, EPA assessed air quality data on a seasonal, or quarterly, basis.¹² EPA also identified the spatial extent of these high PM_{2.5} concentrations. The mass and composition at the DV location represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the DV monitoring site, EPA examined the chemical composition of the monitored PM_{2.5} concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, EPA contrasted the approximated mass composition at the DV monitoring site with data collected at IMPROVE¹³ and other monitoring locations whose data are representative of regional background.^{14,15} This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from the influence of closer

¹² Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting PM_{2.5} mass and composition. In some areas of the country where there may be noticeable month-to-month variations in average PM_{2.5}, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas. ¹³ IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

¹⁴ The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average PM_{2.5} mass and chemical components observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in PM_{2.5} mass between the violating site and the nearby CSN site(s), EPA determined material balance of the PM_{2.5} composition at the violating site by assigning the extra measured PM_{2.5} mass to the carbon components of PM_{2.5}. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local PM_{2.5} concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

¹⁵ The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.^{16,17,18}

<u>PM_{2.5} Design Values and Total Mass Measurements</u> - EPA examined ambient PM_{2.5} air quality monitoring data represented by the DVs at the violating monitoring site and at other monitors in the area of analysis. EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, EPA used data for the 2011-2013 period (i.e., the 2013 DV), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2012 annual PM_{2.5} NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter (μ g/m³) or less (e.g., 12.1 μ g/m³ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2 identifies the current DVs (i.e., the 2013 DV) and the most recent two DVs based on all monitoring sites in the area of analysis for the Johnstown Area intended nonattainment area.¹⁹

Country State	Monitor Site	State Rec	09-11 DV	10-12 DV	11-13 DV	
County, State	ID	INA:	DV	DV	DV	
Bedford, PA	N/A	No		No monitor		
Blair, PA	N/A	No	No monitor			
Cambria, PA	420210011	Yes	12.4	12.3	12.3	
Centre, PA	420270100	No	9.3 9.5 9.3		9.3	
Clearfield, PA	N/A	No	No monitor			
Indiana, PA	N/A	No	No monitor			
Somerset, PA	N/A	No	No monitor			
Westmoreland, PA	421290008	No	13.7	12.6	11.1	

Table 2. Air Quality Data collected at Regulatory Monitors (all DV levels in µg/m³)^{a,b,}

¹⁶ In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

¹⁷ Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in PM_{2.5} Speciated Aerosol Concentrations,

http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf

www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf

¹⁹ In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III PM_{2.5} FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM...."

¹⁸ US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle (PM_{2.5}) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle (PM_{2.5}) Designations, Chapter 3, Urban Excess Methodology. Available at

^aIf a county has more than one monitoring location, the county DV is indicated in bold type. ^bIf a monitor is violating, the NAAQS, the violating DV is indicated in red type.

The Figure 1a map, shown previously, identifies the intended boundaries for the Johnstown Area nonattainment area, the Johnstown, PA MSA boundary and monitoring locations with 2011-2013 violating DVs. As indicated on the map, there is one violating monitoring located in Cambria County, PA (Cambria County violating monitor).

Seasonal variation can highlight those conditions most associated with high average concentration levels of PM_{2.5}. Figure 2 shows quarterly mean PM_{2.5} concentrations for the most recent 3-year period for the highest DV monitoring sites in each county within the area of analysis. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.





As shown, in Figure 2, the Cambria County monitor does not follow a seasonal pattern with consistent peaks in the first and third quarters. The Centre County monitor does follow a seasonal pattern. The peaks in the first quarter (January – March) may be due to higher electric generating units (EGUs) emissions from increased heating use in winter season and may include emissions from home heating oil and residential wood burning stoves. In addition, there is a greater tendency for NO_x to form in the atmosphere and for FRM monitors to retain particle nitrate during the cooler months. The peaks in the third quarter (July - September) likely correspond to higher emissions from EGUs from higher air conditioning use during summer season. The Westmoreland monitor in the area of analysis somewhat follows this peaking pattern except for the beginning of 2011. Starting in the fourth quarter of 2011 the Westmoreland monitor monitored lower $PM_{2.5}$ and Table 2 shows that it began meeting the 12.0 ug/m3 standard.

<u>PM_{2.5} Composition Measurements</u> - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total PM_{2.5} to identify the chemical components over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the PM_{2.5} at the violating monitoring location, EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for the amount of PM_{2.5} mass components retained in the FRM measurement.^{20,21,22,23} In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. Figure 3a illustrates the fraction of each PM_{2.5} chemical component at the Cambria County, PA monitoring site based on annual averages for the years 2010-2012.



Figure 3a. Johnstown Area Annual Average PM_{2.5} Chemical Components (2010-2012)

²⁰ SANDWICH stands for measured Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous mass Hybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured PM_{2.5} and its non-carbon components. This characterization of PM_{2.5} mass also reflects crustal material and other minor components. The resulting characterization provides a complete mass closure for the measured FRM PM_{2.5} mass, which can be different than the data provided directly by the speciation measurements from the CSN network.

²¹ Frank, N. H., SANDWICH Material Balance Approach for PM_{2.5} Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.

²² Frank, N. H., The Chemical Composition of PM_{2.5} to support PM Implementation, EPA State /Local/Tribal Training Workshop: PM_{2.5} Final Rule Implementation and 2006 PM_{2.5} Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf*.

²³ Frank, N. H. Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities. J. Air & Waste Manage. Assoc. 2006 56:500–511.

Figure 3b shows annual and quarterly chemical composition profiles and illustrates any seasonal or episodic contributors to PM_{2.5} mass. This "increment analysis," combined with the other factor analyses, can provide additional insight as to which sources or factors may contribute at a greater level. Simply stated, this analysis can help identify nearby sources of emissions that contribute to the violation at the violating monitoring site.





^aAdjusted to FRM Total $PM_{2.5}$ indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.

The speciation data in Figures 3a and 3b for the Cambria County violating monitoring site indicate that organic mass and sulfates are the predominant species overall. Figure 3b shows that in the first quarter, the nitrate component is higher than in the second through fourth quarters. This may be due to higher EGU emissions during the winter season as well as greater particle nitrate collection during the cooler months. In all four quarters, elemental carbon and crustal are smaller PM_{2.5} components.

In addition, in Pennsylvania's December 2013 recommendation letter, Pennsylvania analyzed the speciation data from the Cambria County monitor for the 2010-2012 monitoring period (note that Pennsylvania's speciation presentation is based on measurement data which was not adjusted by the SANDWICH method.). Figure 3c displays the average distribution of measured speciated components of $PM_{2.5}$ during the entire 2010-2012 monitoring period, and similarly shows that organic carbon and sulfate are large components of $PM_{2.5}$ in the area.²⁴

²⁴ EPA notes that POM is much larger than measured OC and therefore represents a larger percentage of measured $PM_{2.5}$. Similarly, other $PM_{2.5}$ components like crustal material will represent a smaller portion of $PM_{2.5}$ when POM and other adjustments to measured components are made to represent the components of $PM_{2.5}$ using the SANDWICH approach. Crustal is a small $PM_{2.5}$ component whose average quarterly value is 0.4 to 0.6 ug/m3.



Figure 3c. Johnstown Area Speciated PM_{2.5} Data (2010-2012)

Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-4 - Cambria County Area

EPA assessed seasonal and annual average PM_{2.5} components at monitoring sites within the area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of PM_{2.5}, and the concentrations of PM_{2.5} in the area of analysis, also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figure 4a includes pie charts showing the annual and quarterly chemical mass components of the urban increment. Note that in these charts, sulfates and nitrates have been adjusted to represent their mass in measured PM_{2.5}.



Figure 4a. Johnstown Area Urban Increment Analysis for 2010-2012.





Figure 4b. Johnstown Area Average Urban Increment Analysis for 2010-2012.

The urban increment data provides further insight to the chemical composition of $PM_{2.5}$ at the Cambria County violating monitoring site. As previously stated, Figures 3a-c show that organic mass and sulfates are the predominant species overall. When accounting for the urban increment in Figure 4a and Figure 4b, the sulfate component becomes less dominant, however, there is still some remaining sulfate detected at the monitor. Figure 4a and Figure 4b clearly indicate that organic mass and elemental carbon are the major components of $PM_{2.5}$ contributing to the violation at the Cambria County monitoring site.

In Pennsylvania's December 2013 recommendation letter, Pennsylvania also included urban increment data (referred to as urban excess by Pennsylvania) for the Cambria County monitor during the 2010-2012 monitoring period. Pennsylvania compared measured PM_{2.5} at the violating monitor (referred to as the Johnstown monitor by Pennsylvania) to the Florence monitor (AIRS #42-125-5001) which is situated in Hillman State Park in northern Washington County and reflects the transport coming into western Pennsylvania from areas to the west. Pennsylvania compared the 1st and 3rd quarters in the 2010-2012 monitoring period for these two monitors. Figures 4c and 4d show the urban excess at the Johnstown monitor (note that Pennsylvania's urban increment presentation is based on measurement data which was not adjusted by the SANDWICH method.).



Figure 4c. Urban Excess for Johnstown (Cambria) vs. Florence for 2010-2012 – 1st Quarter.

Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-4 - Cambria County Area





Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-2 - Cambria County Area

Pennsylvania's urban increment analysis shows a large amount of organic carbon in the first quarter with some crustal, sulfate and elemental carbon components. In the third quarter, the crustal component is the largest with some organic carbon and ammonium. As noted, Pennsylvania's data was not adjusted using the SANDWICH method and, as stated above, EPA's urban increment analysis shows that the crustal percent of the increment is only 5-7% and that carbonaceous mass is the predominant component.

Factor 2: Emissions and emissions-related data

In this designations process, for each area with a violating monitoring site, EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to PM_{2.5} concentrations at the violating monitoring site or monitoring sites in the area under evaluation. Similar to the air quality analysis, these data were examined on a seasonal basis (see Figure 2b and Table 3c). EPA examined emissions of identified sources or source categories of direct PM_{2.5}, the major components of direct PM_{2.5} (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO₂, NO_X, total VOC, and NH₃). EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct PM_{2.5} monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to PM_{2.5} from mobile and stationary sources) and transport from neighboring areas can contribute to higher PM_{2.5} levels at the violating monitoring sites.

Emissions Data

For this factor, EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. EPA also looked at the geographic distribution of major point sources of the relevant pollutants.²⁵ Significant emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, EPA also developed a summary of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

When considered with the urban increment analysis in Factor 1, evaluating the components of direct PM_{2.5} and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted particulate organic carbon (POC) and VOCs²⁶ contribute to PM_{2.5} organic mass (POM); directly emitted elemental carbon (EC) contributes to PM_{2.5} EC; NO_X, NH₃ and directly emitted nitrate contribute to PM_{2.5} nitrate mass (PNO3); SO₂, NH₃ and directly emitted sulfate contribute to PM_{2.5} sulfate mass (PSO4); and directly emitted crustal material and metal oxides

²⁵ For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5} + NOx + SO_2 + VOC + NH_3$) are greater than 500 tons per year based on NEI 2011v1.

²⁶ As previously mentioned, nearby VOCs are presumed to be a less important contributor to POM than POC.

contribute to $PM_{2.5}$ crustal matter (Pcrustal). ^{27,28} EPA believes that the quantities of those nearby emissions as potential contributors to the $PM_{2.5}$ violating monitors are somewhat proportional to the $PM_{2.5}$ chemical components in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO₂, partially because POC emissions are already $PM_{2.5}$ whereas SO₂ must convert to $PM_{2.5}$ and not all of the emitted SO₂ undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted PM_{2.5} and precursor species in tons per year (tpy) for the county with the violating monitoring site and nearby counties considered for inclusion in the Johnstown Area. Table 3b summarizes the directly emitted components of PM_{2.5} for the same counties in the area of analysis for the Johnstown Area. Table 3c gives total emissions by quarter for the area of analysis. This information will be paired with the urban increment composition previously shown in Figures 4a and 4b.

	Total	Total	Total Direct	Total	Total	
County, State	NH ₃	NOX	PM _{2.5}	SO ₂	VOC	Total
Indiana, PA	832	35,818	3,172	98,344	5,005	143,171
Clearfield, PA	226	9,471	839	25,644	3,940	40,120
Westmoreland, PA	1,037	12,924	1,957	1,262	9,837	27,017
Cambria, PA	373	6,115	1,334	7,236	4,100	19,158
Blair, PA	1,131	4,849	1,156	4,091	3,961	15,189
Centre, PA	909	6,345	1,222	2,120	4,577	15,173
Somerset, PA	1,173	3,320	1,216	461	4,059	10,230
Bedford, PA	1,222	2,659	539	222	2,537	7,180

 Table 3a. County-Level Emissions of Directly Emitted PM2.5 and Precursors (tpy)

Table 3b. Count	v-Level Emissions	for Components	of Directly Emitte	d PM _{2.5} (tpv) ²⁹

County, State	РОМ	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Indiana, PA	547	172	247	4	870	1,333	3,172
Westmoreland, PA	962	277	101	6	206	405	1,957
Cambria, PA	678	148	48	3	158	300	1,334
Centre, PA	743	177	22	3	106	172	1,222
Somerset, PA	751	141	23	5	115	181	1,216
Blair, PA	668	141	48	2	118	180	1,156
Clearfield, PA	433	124	39	2	64	177	839

²⁷ See, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.

²⁸ USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

²⁹ Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries (*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

County, State	РОМ	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Bedford, PA	330	73	8	1	52	75	539

Table 3b breaks down the direct $PM_{2.5}$ emissions value from Table 3a into its components. These data will also be compared with the previously presented urban increment composition. As can be seen, Indiana County has the highest total emissions of directly emitted $PM_{2.5}$ and its precursors. In Table 3a, Indiana County's total emissions (143,171 tpy) are at least three times more than any other county's total emissions in the area of analysis. Indiana County's total direct $PM_{2.5}$ emissions (3,172 tpy) are also much higher than the other counties in the area of analysis. In the breakdown of direct $PM_{2.5}$ in Table 3b, a large portion of the Indiana County $PM_{2.5}$ is organic mass and crustal material. EPA's urban increment data in Figures 4a and 4b indicate that organic mass is the main component of $PM_{2.5}$ at the Cambria County violating monitor.

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 3a and 3b, EPA identified the following emissions warranting additional review: POM, EC, Pcrustal, SO₂ and VOC. EPA then looked at the contribution of these emissions from each of the counties included in the area of analysis as shown in Tables 4a-e.

	Emissions in average tpy						
County, State	POM	Pct.	Cumulative %				
Westmoreland, PA	962	19%	19%				
Somerset, PA	751	15%	34%				
Centre, PA	743	15%	48%				
Cambria, PA	678	13%	61%				
Blair, PA	668	13%	74%				
Indiana, PA	547	11%	85%				
Clearfield, PA	433	8%	94%				
Bedford, PA	330	6%	100%				

 Table 4a. County-Level POM Emissions

Table 4b. County-Level EC Emissions

	Emissions in average tpy					
County, State	EC	Pct.	Cumulative %			
Westmoreland, PA	277	22%	22%			
Centre, PA	177	14%	36%			
Indiana, PA	172	14%	50%			
Cambria, PA	148	12%	62%			
Blair, PA	141	11%	73%			
Somerset, PA	141	11%	84%			
Clearfield, PA	124	10%	94%			
Bedford, PA	73	6%	100%			

	Emissions in average tpy					
County, State	Pcrustal	Pct.	Cumulative %			
Indiana, PA	870	52%	52%			
Westmoreland, PA	206	12%	64%			
Cambria, PA	158	9%	73%			
Centre, PA	106	6%	79%			
Somerset, PA	115	7%	86%			
Blair, PA	118	7%	93%			
Clearfield, PA	64	4%	97%			
Bedford, PA	52	3%	100%			

Table 4c. County-Level Pcrustal Emissions

Table 4d. County-Level VOC Emissions

	Emissions in average tpy						
	Total						
County, State	VOC	Pct.	Cumulative %				
Westmoreland, PA	9,837	26%	26%				
Indiana, PA	5,005	13%	39%				
Centre, PA	4,577	12%	51%				
Cambria, PA	4,100	11%	62%				
Somerset, PA	4,059	11%	73%				
Blair, PA	3,961	10%	83%				
Clearfield, PA	3,940	10%	93%				
Bedford, PA	2,537	7%	100%				

Table 4e. County-Level SO2 Emissions

	Emissions in average tons/yr					
County, State	SO2	Pct.	Cumulative %			
Indiana, PA	98,344	72%	72%			
Clearfield, PA	25,644	19%	90%			
Westmoreland, PA	1,262	1%	91%			
Cambria, PA	7,236	5%	97%			
Blair, PA	4,091	3%	100%			
Somerset, PA	461	0%	100%			
Bedford, PA	222	0%	100%			

Tables 4a and 4b indicate that Westmoreland County produces the highest percentage of direct organic mass and elemental carbon emissions in the counties near the Cambria County violating monitor. In both of these Tables, the emissions of organic mass and elemental carbon appears somewhat evenly distributed between Westmoreland County and the next four highest contributing counties (totaling \sim 75%). Tables 4c and 4e indicate that Indiana County produces the highest percentage of crustal matter and directly emitted sulfate. In this case, Indiana County's emissions of crustal matter and

sulfate both account for approximately 50% of the total crustal matter and sulfate in counties near the Cambria County violating monitor.

EPA notes that while total emissions of direct $PM_{2.5}$ and its precursors are very important, the distance of and spatial distribution of these emissions are also important. To further analyze the emissions in the area of analysis EPA evaluated the spatial distribution of $PM_{2.5}$ organic mass emissions presented in Figure 4f.





As mentioned above, Westmoreland County has the highest amount of PM_{2.5} organic mass. However, the potential for transport to the violating monitor must also be considered. Figure 4f, shows that most emissions in Westmoreland are concentrated in the northwest corner near Allegheny County (darker green). Somerset County to the south of the Cambria monitor has very little PM_{2.5} organic mass. This will be discussed further in the next section on meteorology.. EPA notes, the combination of emission totals together with the other four factors will ultimately identify the areas which contribute to the violating monitor.

In addition to reviewing county-wide emissions of PM_{2.5} and PM_{2.5} precursors in the area of analysis, EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 5 provides facility-level emissions of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants (given in tons per

year) from major point sources with total emissions of 500 tpy or more located in the area of analysis for the Johnstown Area. Table 5 also shows the distance from the facility to the Cambria County violating monitor.

		Distance	NEI 2011 v1 Emissions (tpy)					
County, State	Facility Name (Facility ID)	from violating monitor (miles)	NH3	NOx	PM _{2.5}	SO ₂	VOC	Total
Indiana, PA	GenOn Wholesale Gen/Seward Gen Sta (420630002)	9	4	1,774	150	7,010	4	8,942
Indiana, PA	GenOn NE Mgmt Co/Conemaugh Plt (420630001)	9	3	17,562	335	7,190	19	25,109
Cambria, PA	Ebensburg Power Co/Ebensburg Cogeneration Plt (420210033)	13	0	308	50	1,937	4	2,299
Cambria, PA	Cambria Cogen Co/Ebensburg (420210046)	16	2	713	163	1,941	12	2,831
Cambria, PA	Inter Power Ahlcon L/Colver Power Proj (420210034)	18	2	713	20	2,883	4	3,622
Indiana, PA	Homer City Gen LP/ Center Twp (420630003)	20	90	9,026	1,355	83,596	17	94,083
Blair, PA	Appleton Papers/Spring Mill (420130010)	27	35	394	119	1,046	103	1,699
Blair, PA	Norfolk Southern Railway Co/Juniata Locomotive Shops (420130005)	32	0	114	11	484	33	642
Blair, PA	Team Ten/Tyrone Paper Mill (420130004)	44		286	2	2,181	13	2,482
Clearfield, PA	GenOn Rema LLC/Shawville Gen Sta (420330021)	60	2	3,531	77	25,198	6	28,815
Centre, PA	Pa State Univ/Univ Park Campus (420270017)	64		243	7	1,445	6	1,701
Centre, PA	Graymont Pa Inc/Pleasant Gap & Bellefonte Plts (420270003)	72	20	940	36	209	8	1,212

Table 5. NEI 2011 v1 Point Source Emissions (tpy)

Table 5 shows the major point source emissions (from the 2011 NEI in tons per year) in the area of analysis for the Johnstown Area and the relative distances of these sources from the violating monitoring location, as depicted by red dots. The actual distance from the point sources to the violating monitoring location is presented in Table 5. The distance from the violating monitoring location is presented in Table 5. The distance from the violating monitoring location is particularly important for directly emitted PM_{2.5}. The influence of directly emitted PM_{2.5} on ambient PM_{2.5} diminishes more than that of gaseous precursors as a function of distance.³⁰

³⁰ Baker, K. R. and K. M. Foley. A nonlinear regression model estimating single source concentrations of primary and secondarily formed PM_{2.5}. Atmospheric Environment. 45 (2011) 3758-3767.



Figure 5a. Major Point Source Emissions in the Area of Analysis for the Johnstown Area



Figure 5b. Close-Up of Major Point Sources Near the Cambria County Monitor

As indicated in Figures 5a and 5b, there are twelve sources with emissions over 500 tpy within the area of analysis. Six of these large point sources are located northeast and northwest of the Cambria County violating monitor. The three point sources to the northwest of this monitor are located in Indiana County and are three large EGUs. These EGUs are Homer City, with emissions of over 94,000 tpy, and two GenOn facilities, Conemaugh and Seward Generating Station, with emissions of over 25,000 tpy and almost 9,000 tpy, respectively. These three EGUs are located in or adjacent to the townships of West Wheatfield, Center, East Wheatfield and Armagh Borough and Homer City Borough in Indiana County. As indicated in Table 5, these three facilities are three of the four largest sources of directly emitted PM_{2.5} and its precursors in the area of analysis. In addition, the majority of the emissions in Indiana County are from these three facilities and, as indicated in Table 3b, the PM_{2.5} emissions in Indiana County are mostly organic mass and crustal material which are components detected at the Cambria County violating monitor. Figure 5a shows that there are no point sources south of the monitor within the area of analysis.

As part of its December 2013 designation recommendation letter Pennsylvania provided additional information regarding local sources of $PM_{2.5}$. Pennsylvania believes that the proximity of a rail yard and a warehouse with unpaved roads near the Cambria County violating monitor may contribute to the local crustal mass collected at the monitor. EPA notes that rail yards can be large emitters of EC and POM and acknowledges that this source may be among the contributing emissions to the violation at the Cambria County monitor. Figure 5c was provided by Pennsylvania in its December 2013 designation recommendation letter and shows the monitor and its proximity to the local sources described above.



Figure 5c. Cambria County Monitor (Johnstown) Location Proximity to Local Sources

Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-4 - Cambria County Area

Population density and degree of urbanization

In this part of the factor analysis, EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 6 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area.

	Population	Population	% Change	Land Area (Sq.	Population Density (per		Cumulative
County, State	2000	2010	from 2000	Miles)	Sq. Mile)	%	%
Westmoreland, PA	369,993	365,086	-1.3%	1,025	356	34%	34%
Centre, PA	135,758	154,193	13.6%	1,108	139	14%	48%
Cambria, PA	152,598	143,484	-6.0%	688	209	13%	61%
Blair, PA	129,144	127,038	-1.6%	526	242	12%	73%
Indiana, PA	89,605	88,818	-0.9%	829	107	8%	81%
Clearfield, PA	83,382	81,579	-2.2%	1,147	71	8%	88%
Somerset, PA	80,023	77,706	-2.9%	1,075	72	7%	95%
Bedford, PA	49,984	49,737	-0.5%	1,015	49	5%	100%

Table 6. Population Growth and Population Density.

Source: U.S. Census Bureau population estimates for 2000 and 2010

As the above table indicates, although Cambria County has the third highest population in the area of analysis, its population has decreased by 6% from 2000. Westmoreland County has the largest and most dense population in the area of analysis. Overall, all of the counties in the area of analysis are relatively low in population and low in population density and, except for Centre County, each county has seen a decrease in population from 2000 to 2010 with the exception of Centre County. The above data indicates that population and population density are not influential factors in determining nonattainment boundaries for the Johnstown Area.



Figure 6. 2010 County-Level Population in the Area of Analysis for the Johnstown Area.

Traffic and Vehicle Miles Travelled

High vehicle miles travelled (VMT) and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and indicates that a county with the high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area. Table 7 shows 2011 VMT while Figure 7 overlays 2011 county-level VMT with a map of the transportation arteries.

County, State	Total 2011 VMT	Percent	Cumulative %	
Westmoreland, PA	3,087,660,497	31%	31%	
Centre, PA	1,365,989,654	14%	44%	
Cambria, PA	1,007,874,393	10%	54%	
Clearfield, PA	1,003,982,533	10%	64%	
Blair, PA	993,428,318	10%	74%	
Bedford, PA	947,215,986	9%	83%	
Somerset, PA	924,890,368	9%	92%	
Indiana, PA	778,308,748	8%	100%	

Table 7. 2011 VMT for the Johnstown Area

http://www.census.gov/hhes/commuting/data/commuting.html



Figure 7. Overlay of 2011 County-level VMT with Transportation Arteries.

As the data in Table 7 illustrates, Westmoreland has the highest VMT which accounts for 31% of the total VMT in the area of analysis. Cambria County is the third highest in VMT, however, this county only accounts for 10% of the total VMT within the area of analysis. An airport to the east of the monitor in Cambria County and a few major roads near the monitor may contribute to the emissions at the Cambria County monitor. Overall, the above data indicates that VMT is not an influential factor in determining nonattainment boundaries for the Johnstown Area.
Factor 3: Meteorology

EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. EPA used two primary tools for this assessment: wind roses and kernel density estimation (KDE). When considered in combination with area PM_{2.5} composition and county-level and facility emissions source location information, wind roses and KDE can help to identify nearby areas contributing to violations at violating monitoring sites.

Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate the force of the wind and thus the distance from which those emissions are transported. EPA constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.³¹ When developing these wind roses, EPA also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 8a shows wind roses that EPA generated from data relevant in the Johnstown Area.

³¹ *ftp.ncdc.noaa.gov/pub/data/noaa* or

http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*





As shown in Figure 8a, the predominant winds near the violating monitor are from the west with some northwesterly and southwesterly components, suggesting that emission sources in the west upwind direction should be considered for analysis. These wind roses represent average wind directions throughout the year. Looking at point sources in the regional wind direction indicated in Figure 8a, there are three large EGUs in Indiana County which are northwest of the Cambria County monitor. These EGUs are Homer City, with emissions of over 94,000 tpy, and two GenOn facilities, Conemaugh and Seward Generating Station, with emissions of over 25,000 tpy and almost 9,000 tpy, respectively. As indicated in Table 5, these three facilities are three of the four largest sources of directly emitted PM_{2.5} and its precursors in the area of analysis. In addition, the majority of the emissions in Indiana County are from these three facilities and, as indicated in Table 3b, the PM_{2.5} emissions in Indiana County are mostly organic mass and crustal material which are components detected at the Cambria County violating monitor.

In its December 2013 recommendation letter, Pennsylvania included wind direction analysis when the Cambria County monitor's PM_{2.5} concentrations were relatively high but the regional monitoring concentrations were "clean," i.e. 0-12 μ g/m3. Between 2010 and 2012, Pennsylvania identified 173 days in which the Cambria County monitor was at least one standard deviation above the regional average while the regional average was at or below 12 μ g/m3 (high days). The top 25% of these high days (most extreme events) were further analyzed to determine why the Cambria County violating monitor's concentrations were high. The Cambria County monitor is collocated with a meteorological Page 31 of 177

tower which monitors wind direction and wind speed. For the top 25% of these high days (highest $PM_{2.5}$ days), Pennsylvania calculated the number of hours the wind was coming from a particular direction as well as the $PM_{2.5}$ concentrations from a particular direction. Figures 8b and 8c represent the wind direction frequency and $PM_{2.5}$ concentration distribution by wind direction, respectively, at the Cambria County monitor during its highest $PM_{2.5}$ days.



Figure 8b. Cambria County Monitor Wind Direction Frequency – Top 25% of Regionally "Clean" Days

Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-4 - Cambria County Area

Figure 8c. Cambria County Monitor PM_{2.5} Concentration Distribution by Wind Direction – Top 25% of Regionally "Clean" Days



Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-4 - Cambria County Area

As indicated in Figure 8b, wind directions on high PM_{2.5} days at the Cambria County monitor are coming from due south and from the northeast. As indicated in Figure 8c, the high PM_{2.5} concentrations are also due south and from the northeast. The wind direction on high days identified by Pennsylvania in its December 2013 recommendation letter is slightly different from the regional wind directions identified by EPA shown in Figure 8a which is predominantly from the west and a small component from the northwest and southwest. As previously discussed, there are three large point sources to the west of the violating monitor in the regional wind direction. The wind direction on high PM_{2.5} days in Pennsylvania's analysis is to the northeast and due south. Figure 5a indicates that there are three point sources in Cambria County to the northeast of the monitor however, there are not any point sources to the south of the Cambria monitor within the area of analysis As previously stated from Pennsylvania's December 2013 recommendation letter, proximity to a rail yard and warehouse with unpaved roads near the Cambria County monitor likely contributes to the local PM_{2.5} concentrations and may account for this southerly component.

In addition to wind roses, EPA also generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at

violating monitoring sites.^{32,33} These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories for days throughout a 3-year period.³⁴ Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell. Figure 9 shows a HYSPLIT KDE plot for the Johnstown Area summarized by calendar quarter for the 2010-2012 period. The HYSPLIT KDE is weighted in the westerly direction, indicating a greater frequency of trajectories passing over grid cells to the west.



Figure 9. HYSPLIT Kernel Density Estimation Plots for the Johnstown Area. First Quarter Second Quarter

³² In some past initial area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.

 ³³ HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model, *http://www.arl.noaa.gov/HYSPLIT_info.php* ³⁴ The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.



The HYSPLIT KDE plots and regional wind roses suggest the greatest potential for contribution of emissions in the area of analysis is from the Westmoreland, Somerset and Indiana counties. As discussed in the emissions section and indicated in Figure 4f, the relatively high county total emissions for Westmoreland County are located in the northwest corner of the county. In Figure 9, the northwest corner of Westmoreland County is not in a grid square with very high potential for transport (darkest blue) to the violating monitor in Cambria County. Figure 4f and Table 3a also indicate that Somerset County has relatively low emissions, therefore, although Somerset County is within the grid cells with the higher potential to transport in Figure 9, there are relatively low emissions to actually transport to the violating monitor. Lastly, the higher density KDE values do include the three EGU's in Indiana County (Homer City and two GenOn facilities, Conemaugh and Seward Generating Stations) located in the south of Indiana County for all four quarters.

Factor 4: Geography/topography

To evaluate the geography/topography factor, EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area.

For the Johnstown area, topography is an important factor, because the area is part of a river valley almost entirely surrounded by low mountains. These mountains limit transport of low-level emissions but do not limit transport of high-level emissions and PM_{2.5} formation.

Some of the highest terrain in Pennsylvania brackets the Johnstown area with the Allegheny Mountains to the east and Laurel Hills to the west. The city of Johnstown itself lies in the approximately two-mile wide flood plain formed by the junction of the Stonycreek and Little Conemaugh Rivers, and the narrow Conemaugh River Gap where water flows out of the city. The basin within which the city lies is about 300 feet below the surrounding ridgelines. These topographical features diminish the transport of low level emissions such as mobile emissions from surrounding areas but do not diminish transport of high-level emissions from sources such as the EGUs in Indiana County.



Figure 10. Topography of the Johnstown Area.

Factor 5: Jurisdictional boundaries

In defining the boundaries of the intended Johnstown Area nonattainment area, EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify the state and local governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the intended area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the intended designated areas.

The violating monitor is located in the Johnstown, PA MSA. This is a single county MSA which consists of Cambria County, PA. Pennsylvania's regional transportation planning organizations fall along county lines. Cambria, Blair and Centre counties are all single-county MPOs named Johnstown Page 36 of 177

MPO, Altoona MPO and Center MPO, respectively. Bedford, Huntingdon and Somerset Counties are part of the Southern Alleghenies Planning and Development Commission rural planning organization (RPO). Westmoreland and Indiana County are part of the larger Southwestern Pennsylvania Commission MPO.

The Johnstown Area has previously established nonattainment boundaries associated with the 1997 annual and the 2006 24-hour PM_{2.5} NAAQS. The boundary for the nonattainment area for the 1997 annual and the 2006 24-hour PM_{2.5} NAAQS included the entire county of Cambria and part of Indiana County in Pennsylvania.

The state has recommended a different boundary for the 2012 annual PM_{2.5} NAAQS by recommending only the single county of Cambria, PA. EPA's intended boundary for the 2012 annual PM_{2.5} NAAQS differs from the State's recommendation and is the same as the 1997 annual and the 2006 24-hour PM_{2.5} nonattainment boundaries, and includes the entire county of Cambria, PA, and partial county of Indiana, PA. EPA used township boundaries to determine the partial area of Indiana County which includes the townships of West Wheatfield, Center, East Wheatfield and Armagh Borough and Homer City Borough. This portion of Indiana County contains three large sources of direct PM_{2.5} and its precursors: Homer City, GenOn Conemaugh Plant, and GenOn Seward Generating Station. These three EGUs have combined emissions of over 128,000 tpy and are contributing to the violating Cambria County monitor.

Conclusion for the Johnstown Area

Based on the assessment of factors described above, both individually and in combination, EPA has preliminarily concluded that the following counties should be included as part of the Johnstown Area nonattainment area because they are either violating the 2012 annual PM_{2.5} NAAQS or contributing to a violation in a nearby area: Cambria County, PA and a portion of Indiana County, PA which includes the townships of West Wheatfield, Center, East Wheatfield and Armagh Borough and Homer City Borough.

These are the same counties that are included in the Johnstown nonattainment area for the 2006 24hour and 1997 annual PM_{2.5} NAAQS. The air quality monitoring site in Cambria County indicates violations of the 2012 annual PM_{2.5} NAAQS based on the 2013 DVs; therefore this county is included in the nonattainment area. Indiana County is a nearby county that does not have a violating monitoring site, but EPA has concluded that partial areas of Indiana County contribute to the particulate matter concentrations in violation of the 2012 annual PM_{2.5} NAAQS through emissions from point sources. Indiana County has among the highest emissions of directly emitted PM_{2.5} and/or PM_{2.5} precursors in the area and has three large point sources located in the regional westerly wind direction and near the violating monitor in Cambria County.

The speciation data for the Cambria County violating monitoring site indicate that organic mass and sulfates are the predominant species overall with an exception in the first quarter when nitrates are higher may be due to increased EGU emissions from winter heating needs and greater particle nitrate collection during the cooler months. When accounting for the urban increment, the sulfate component

becomes less dominant, however, there is still some remaining sulfate detected at the monitor. The urban increment analysis indicates that organic mass and elemental carbon are the major components of PM_{2.5} contributing to the violation at the Cambria County monitoring site

The wind roses representing average wind direction throughout the year indicate that the predominant winds near the violating monitor are from the west with some northwest and southwest components. Additional meteorological data provided by Pennsylvania indicate that wind directions on high PM_{2.5} days at the Cambria County violating monitor are coming from due south and from the northeast.

Looking at point sources in the regional wind direction, westerly with components from the northwest and southwest, there are three large EGUs in Indiana County to the northwest of the Cambria County monitor. Considering the wind direction on high PM_{2.5} days, northeast and south, there are point sources to the northeast of the monitor in Cambria County, however, there are not any point sources of PM_{2.5} south of the monitor within the area of analysis. As previously stated in Pennsylvania's December 2013 recommendation letter, proximity to a rail yard and warehouse with unpaved roads near the Cambria County monitor likely contributes to the local PM_{2.5} concentrations and may account for contributions from the south.

In addition, the HYSPLIT KDE is weighted in the westerly direction, indicating a greater frequency of trajectories passing over grid cells to the west. The three EGU's in Indiana County fall within the higher density grid cells indicated by darker blue color in Figure 9 for all four quarters. These high density values indicate a higher potential to transport from a particular grid cell.

The Johnstown area has low population density and low levels of VMT. Thus, population and VMT are generally not influential factors in this case contributing to the exceedances of the Cambria County violating monitor.

For the Johnstown area, topography is an important factor because the area is part of a river valley almost entirely surrounded by low mountains. These mountains limit transport of low-level emissions such as mobile emissions but do not limit transport of high-level emissions and PM_{2.5} formation from sources such as EGUs.

In conclusion, for the Johnstown area the five factor analysis supports EPA's intention to adopt the same boundaries for the Johnstown 2012 annual PM_{2.5} NAAQS nonattainment area as were designated for the 2006 24-hour and 1997 annual PM_{2.5} NAAQS nonattainment area. The Johnstown Area would therefore consist of Cambria County, PA and the partial county of Indiana, PA containing the townships of West Wheatfield, Center, East Wheatfield, and Armagh Borough and Homer City Borough.

3.2 Area Background and Overview - Delaware County Area

Figure 1a is a map of EPA's intended nonattainment boundary for the Delaware County Area. The map shows the location and DVs of ambient air quality monitoring locations, county and other jurisdictional boundaries, including the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA. For purposes of the 1997 annual and 2006 24-hour PM_{2.5} NAAQS, Delaware County, PA was designated nonattainment as part of the Philadelphia-Wilmington, PA-NJ-DE nonattainment area. The boundary for the nonattainment area for the 1997 annual and 2006 24-hour PM_{2.5} NAAQS included the entire counties of Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; Burlington, Camden, and Gloucester in New Jersey; and New Castle in Delaware.





EPA must designate as nonattainment areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. As discussed below, a monitor in Delaware County, PA shows a violation of the 2012 annual PM_{2.5} NAAQS. Therefore, Delaware County is included in the nonattainment area. As shown in Figure 1b, EPA evaluated each county in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA, which includes Delaware County, PA as well as New Castle County, Delaware; Cecil County, Maryland; Burlington, Camden, Gloucester, and Salem Counties in

New Jersey; and Bucks, Chester, Montgomery, and Philadelphia Counties in Pennsylvania, and a ring of counties adjacent to the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA. EPA's evaluation was based on the five factors and other relevant information. Based upon the data discussed below, EPA determined that no counties in this area of analysis, other than Delaware County, contribute to the violation at the Delaware County monitor. Note that Northampton County, PA, which shows a violation, is in the area of analysis. As discussed in section 3.4, EPA intends to designate Northampton County, along with Lehigh County, PA, in a separate nonattainment area, the Northampton County Area.

The following sections describe the five factor analysis process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.



Figure 1b. Area of Analysis for the Delaware County Intended Nonattainment Area

Factor 1: Air Quality Data

All ambient air quality data collected during the year are important when determining contributions to an annual standard, such as the 2012 annual PM_{2.5} NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. For the 2012 annual PM_{2.5} NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured PM_{2.5} concentrations. For these reasons, for the Factor 1 air quality analysis, EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then by identifying the conditions most associated with high average concentration levels of PM_{2.5} mass in the area of analysis.

In most cases, EPA assessed air quality data on a seasonal, or quarterly, basis.³⁵ EPA also identified the spatial extent of these high PM_{2.5} concentrations. The mass and composition at the DV location represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the DV monitoring site, EPA examined the chemical composition of the monitored PM_{2.5} concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, EPA contrasted the approximated mass composition at the DV monitoring site with data collected at IMPROVE³⁶ and other monitoring locations whose data are representative of regional background.^{37,38} This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from the influence of closer

³⁵ Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting PM_{2.5} mass and composition. In some areas of the country where there may be noticeable month-to-month variations in average PM_{2.5}, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas. ³⁶ IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

³⁷ The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average PM_{2.5} mass and chemical components observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in PM_{2.5} mass between the violating site and the nearby CSN site(s), EPA determined material balance of the PM_{2.5} composition at the violating site by assigning the extra measured PM_{2.5} mass to the carbon components of PM_{2.5}. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local PM_{2.5} concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

³⁸ The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.^{39,40,41}

<u>PM_{2.5} Design Values and Total Mass Measurements</u> - EPA examined ambient PM_{2.5} air quality monitoring data represented by the DVs at each violating monitoring site and at other monitors in the area of analysis. EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, EPA used data for the 2011-2013 period (i.e., the 2013 DV), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2012 annual PM_{2.5} NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter ($\mu g/m^3$) or less (e.g., 12.1 $\mu g/m^3$ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2 identifies the current DVs (i.e., the 2013 DV) and the most recent two DVs based on all monitoring sites in the area of analysis for the Delaware County Area intended nonattainment area.⁴²

County, State	Monitor Site ID	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Kent, DE	100010002	No	9.1	8.7	8.2
Kent, DE	100010003	No	9.4	9	8.4
New Castle, DE	100031003	No	9.9	9.6	9.1
New Castle, DE	100031007	No	9.6	9.1	8.4
New Castle, DE	100031012	No	10.5	10.1	9.7
New Castle, DE	100032004	No	10.7	10.4	10

Table 2. Air Quality Data collected at Regulatory Monitors (all DV levels in µg/m³)^{a,b}

³⁹ In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

 ⁴⁰ Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in PM_{2.5} Speciated Aerosol Concentrations,

http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf

⁴¹ US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle (PM_{2.5}) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle (PM_{2.5}) Designations, Chapter 3, Urban Excess Methodology. Available at

www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf

⁴² In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III PM_{2.5} FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM...."

County, State	Monitor Site ID	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Cecil, MD	240150003	No	10.4	10.4	10
Harford, MD	240251001	No	9.8	10.3	10.3
Kent, MD	N/A	No		No monitor	
Atlantic, NJ	340010006	No	8.4	8.2	7.8
Atlantic, NJ	340011006	No	9.2	8.9	8.7
Burlington, NJ	N/A	No		No monitor	
Camden, NJ	340071007	No	9.7	9.5	9.7
Cumberland, NJ	N/A	No		No monitor	
Gloucester, NJ	340150004	No	9.3	9.3	9
Hunterdon, NJ	N/A	No		No monitor	
Mercer, NJ	340210008	No	9.7	9.5	9.4
Mercer, NJ	340218001	No	8.2	8.2	8.2
Monmouth, NJ	N/A	No		No monitor	
Ocean, NJ	340292002	No	8.6	8.5	8.3
Salem, NJ	N/A	No		No monitor	
Warren, NJ	340410006	No	9.2	9.4	9.1
Berks, PA	420110011	No	10.7	10.9	11
Bucks, PA	420170012	No	10.9	10.9	10.8
Chester, PA	420290100	No	13.7	12.3	11.1
Cumberland, PA	N/A	No		No monitor	
Delaware, PA	420450002	Yes	12.9	13.1	12.4
Lancaster, PA	420710007	No	12	12.1	12
Lehigh, PA	N/A	No		No monitor	
Montgomery, PA	420910013	No	10.1	9.8	9.8
Northampton, PA	420950025	Yes (other area)	13.4	13.2	12.2
Northampton, PA	420950027	Yes (other area)		10.6	10.6
Philadelphia, PA	421010004	No	11.5	9.8	9.3
Philadelphia, PA	421010047	No	11.2	10.9	10.5

County, State	Monitor Site ID	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Philadelphia, PA	421010055	No	11.4	11	11.1
Philadelphia, PA	421010057	No	11.1	10.8	10.7

^aIf a county has more than one monitoring location, the county DV is indicated in bold type. ^bIf a monitor is violating, the NAAQS, the violating DV is indicated in red type.

The Figure 1 map, shown previously, identifies the Delaware County, PA intended nonattainment area, the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA boundary, and monitoring locations with 2011-2013 violating DVs. As indicated on the map and in Table 2, there are two violating monitoring locations in the area of analysis. One violating monitor is located in Delaware County, PA, monitor 420450002 (the "violating monitor" or the "Delaware County monitor"). The second violating monitor is located in Northampton County, PA. As discussed in Section 3.4, below, EPA conducted a separate five factor analysis for the violating monitor in Northampton County, and has determined that Northampton County, PA should be designated in a separate nonattainment area, the Northampton County Area.

Seasonal variation can highlight those conditions most associated with high average concentration levels of PM_{2.5}. Figure 2a shows quarterly mean PM_{2.5} concentrations for the most recent 3-year period for the highest DV monitoring sites in each county within the area of analysis. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Figure 2b shows quarterly mean PM_{2.5} concentrations for the most recent 3-year period for the Delaware County, PA monitoring site and for the highest DV monitor in each county in the area of analysis.



Figure 2a. Delaware County Area of Analysis PM2.5 Quarterly Means for 2011-2013 (µg/m³)



Figure 2b. Delaware County and Adjacent Counties PM_{2.5} Quarterly Means for 2011-2013 (µg/m³)

As shown, in Figure 2a, most monitors in the area of analysis show higher quarterly mean values in quarter 3 of each year, which likely corresponds to higher emissions from electric generating units (EGUs) from higher air conditioning use. These monitors also generally show higher quarterly mean values in the first quarter, which may be due to higher EGU emissions from higher heating use and possibly SO₂ emissions from home heating oil. In addition, there is a greater tendency for NO_x to form in the atmosphere and for FRM monitors to retain particle nitrate during the cooler months. However, as shown in Figure 2b, the violating Delaware County monitor does not seem to experience highs and lows in the same quarters as its neighbors. Quarterly means were relatively consistent for the Delaware County monitor starting in the first guarter in 2011 through the first guarter in 2012, with the low point in the second quarter of 2012. From the third quarter in 2012 to the second quarter in 2013, the Delaware County monitor was considerably higher than the other monitors in the area of analysis, while the surrounding monitors either drop off or remain low, suggesting an important local influence at the violating monitor relative to possible influences from elsewhere. In the third and fourth quarters of 2013, the PM_{2.5} values at the Delaware County monitor appear to track with most other monitors in the area. This suggests that the influence of the local sources was less in those quarters. Furthermore, as can be seen in Figure 2b, the Delaware monitor's quarterly means the third and fourth quarters of 2013 are below the 12 μ g/m³ level of the 2012 annual PM_{2.5} NAAQS.

<u>PM_{2.5} Composition Measurements</u> - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total PM_{2.5} to identify the chemical components over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the PM_{2.5} at the violating monitoring location, EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for

the amount of PM_{2.5} mass components retained in the FRM measurement.^{43,44,45,46} In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. The Delaware County monitoring site does not have the capability to provide speciation data. Therefore, EPA evaluated speciation data at two monitor locations near the Delaware County monitor, the monitoring site 100032004 located in New Castle County, DE and monitoring site 421010055 located in Philadelphia County, PA. Figure 3a illustrates the average fraction of each PM_{2.5} chemical component from these monitoring sites based on annual averages for the years 2010-2012. These monitoring sites were used because of their proximity to the violating monitor in Delaware County, PA, to represent the speciation data in the region.

Figure 3a. Greater Philadelphia Area 2010-2012 Annual Average PM_{2.5} Chemical Components (µg/m³)



Figure 3b shows annual and quarterly chemical composition profiles and illustrates any seasonal or episodic contributors to $PM_{2.5}$ mass at the New Castle County, DE and Philadelphia County, PA monitors, 100032004 and 421010055. This "increment analysis," combined with the other factor

⁴³ SANDWICH stands for measured Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous mass Hybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured PM_{2.5} and its non-carbon components. This characterization of PM_{2.5} mass also reflects crustal material and other minor components. The resulting characterization provides a complete mass closure for the measured FRM PM_{2.5} mass, which can be different than the data provided directly by the speciation measurements from the CSN network.

⁴⁴ Frank, N. H., SANDWICH Material Balance Approach for PM_{2.5} Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.

⁴⁵ Frank, N. H., The Chemical Composition of PM_{2.5} to support PM Implementation, EPA State /Local/Tribal Training Workshop: PM_{2.5} Final Rule Implementation and 2006 PM_{2.5} Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf*.

⁴⁶ Frank, N. H. *Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities.* J. Air & Waste Manage. Assoc. 2006 56:500–511.

analyses, can provide additional insight as to which sources or factors may contribute at a greater level. Simply stated, this analysis can help identify nearby sources of emissions that contribute to the violation at the violating monitoring site. However, as stated above, because there is no speciation data available at the violating Delaware County monitor, the analysis shown in Figure 3b gives the annual and quarterly chemical composition profiles for monitoring site 100032004 in New Castle County, DE and monitoring site 421010055 in Philadelphia County, PA.



Figure 3b. Greater Philadelphia Area 2010-2012 Annual and Quarterly Average PM_{2.5} Species $(\mu g/m^3)^{\,a}$

EPA assessed seasonal and annual average PM_{2.5} components at monitoring sites within the area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of PM_{2.5}, and the concentrations of PM_{2.5} in the area of analysis, also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions. Figure 4a includes bar charts showing the annual and quarterly chemical mass components of the urban increment at monitoring site 100032004 in New Castle County, DE and monitoring site 421010055 in Philadelphia County, PA. The quarterly bar charts correspond to the high-concentration quarters identified in Figure 2. Evaluating these high concentration quarters can help identify composition of PM_{2.5} during these times. Note that in these charts, sulfates and nitrates have been adjusted to represent their mass in measured PM_{2.5}.

^aAdjusted to FRM Total $PM_{2.5}$ indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.





These speciation and urban increment data are illuminating with respect to the chemical composition of $PM_{2.5}$ at monitoring site 100032004 in New Castle County, DE and monitoring site 421010055 in Philadelphia County, PA, and are relevant to the greater Philadelphia region. Figures 3a and 3b show large sulfate and organic mass at these monitors year round, with high nitrates in the first quarter, possibly due to EGU emissions from winter heating needs and greater particle nitrate collection during the cooler months. Figure 4a shows that organic mass and elemental carbon are a large part of the urban increment year round at these monitors, while nitrate appear in the first quarter and sulfates in both the first and second quarters. Since nitrate is limited to quarter one, mobile sources may not be a notable contributor to the urban increment.

However, EPA does not believe that the monitoring data from monitoring site 100032004 in New Castle County, DE and monitoring site 421010055 in Philadelphia County, PA is sufficiently comparable to the Delaware County monitor to draw any conclusions about the sources that contribute to a violation of that monitor. As illustrated in Figures 2a and 2b and discussed above, $PM_{2.5}$ levels at the Delaware County monitor do not track well with the rest of the area of analysis, including monitors 100032004 and 421010055. The differences in seasonal peaks at the Delaware County monitor is an indication of local influences. There is a local influence at the Delaware County monitor that is not affecting the other monitors in the Philadelphia region, which are all meeting the 2012 annual $PM_{2.5}$ NAAQS.

As stated above, the Delaware County monitor does not appear to be influenced by the same seasonal factors as the other two monitors, or the rest of the greater Philadelphia area. This is supported by the assessment that Pennsylvania provided in its December 10, 2013 designation recommendations, which compared PM_{2.5} levels at the Delaware County to other nearby monitors. Pennsylvania's analysis also supports EPA's finding that PM_{2.5} concentrations at the Delaware County monitor were relatively high and not consistent with other monitors in the region. Here are two excerpts from Pennsylvania's December 10, 2013 recommendation letter, Appendix C-1: Greater Philadelphia Area. Note that because the Delaware County monitor is located in the City of Chester, Pennsylvania refers to it as the "Chester monitor."

"The Chester monitor is the only monitor in this region with an annual average and annual DV constantly above the 2012 standard. Since 2003, annual $PM_{2.5}$ levels have been in a general decline in the Greater Philadelphia area. The Bristol monitor in Bucks County has been below the 2012 standard on an annual average since 2009 and under the annual design value since 2010. In addition, the Norristown monitor in Montgomery County has been under the 2012 standard on an annual average since 2008 and the annual design value since 2009. Over the last three years, levels at the New Garden monitor have fallen at a significant rate. If the trend continues, the New Garden monitor's 2013 design value is expected to reach attainment of the 12 μ g/m3 standard."

and

"Additional analyses were completed to determine what was contributing to the fewer number of "clean" days at the Chester monitor. The Department identified days when the Chester monitor's PM_{2.5} concentrations were relatively high but regional monitoring concentrations in the five-county Philadelphia area were "clean." Between 2010 and 2012, the Department identified 212 days in which the Chester monitor was at least one standard deviation above the five-county regional average while the regional average was at or below 12 μ g/m3."

Factor 2: Emissions and emissions-related data

In this designations process, for each area with a violating monitoring site, EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to PM_{2.5} concentrations at the violating monitoring site or monitoring sites in the area under evaluation. Similar to the air quality analysis, these data were examined on a seasonal basis. However, as discussed above, there are no discernable seasonal trends at the Delaware County monitor. Therefore, EPA is not discussing seasonal emissions in this analysis, and is only discussing annual emissions. EPA examined emissions of identified sources or source categories of direct PM_{2.5}, the major components of direct PM_{2.5} (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO₂, NO_X, total VOC, and NH₃). EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct PM_{2.5} emissions and its major carbonaceous components are generally associated with sources near violating PM_{2.5} monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to PM_{2.5} from mobile and stationary sources) and transport from neighboring areas can contribute to higher PM_{2.5} levels at the violating monitoring sites.

Emissions Data

For this factor, EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see <u>http://www.epa.gov/ttn/chief/net/2011inventory.html</u>). For each county in the area of analysis, EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. EPA also looked at the geographic

distribution of major point sources of the relevant pollutants.⁴⁷ Significant emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations. To further analyze area emissions data, EPA also developed a summary of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants, which is available at

http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx.

When considered with the urban increment analysis in Factor 1, evaluating the components of direct PM_{2.5} and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted POC and VOCs⁴⁸ contribute to POM; directly emitted EC contributes to PM_{2.5} EC; NO_X, NH₃ and directly emitted nitrate contribute to PNO3; SO₂, NH₃ and directly emitted sulfate contribute to PSO4; and directly emitted crustal material and metal oxides contribute to Pcrustal.^{49,50} EPA believes that the quantities of those nearby emissions as potential contributors to the PM_{2.5} violating monitors are somewhat proportional to the PM_{2.5} chemical components in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO₂, partially because POC emissions are already PM_{2.5} whereas SO₂ must convert to PM_{2.5} and not all of the emitted SO₂ undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted PM_{2.5} and precursor species in tons per year (tpy) for the county with the violating monitoring site and nearby counties considered for inclusion in the Delaware County Area. Table 3b summarizes the directly emitted components of PM_{2.5} for the same counties in the area of analysis for the Delaware County Area. This information will be paired with the urban increment composition previously shown in Figures 4a and 4b.

County, State	Total NH3	Total NOx	Total Direct PM2.5	Total SO ₂	Total VOC	Total
Lancaster, PA	15,772	13,794	17,361	1,799	4,441	53,166
Philadelphia, PA	801	22,379	21,286	2,956	3,346	50,768
Northampton, PA	613	14,035	7,469	20,033	3,031	45,180
Montgomery, PA	779	17,147	18,975	2,518	3,338	42,757
Berks, PA	4,097	14,317	12,734	6,136	3,606	40,891
Delaware, PA	594	17,929	11,549	6,557	3,112	39,741
New Castle, DE	1,024	16,089	12,815	1,998	2,538	34,463
Bucks, PA	1,024	13,173	15,325	2,035	2,474	34,030

Table 3a. County-Level Emissions of Directly Emitted PM_{2.5} and Precursors (tpy)

⁴⁷ For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5} + NOx + SO_2 + VOC + NH_3$) are greater than 500 tons per year based on NEI 2011v1.

⁴⁸ As previously mentioned, nearby VOCs are presumed to be a less important contributor to POM than POC.

⁴⁹ See, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.

⁵⁰ USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

County, State	Total NH3	Total NOx	Total Direct PM2.5	Total SO ₂	Total VOC	Total
Chester, PA	1,908	12,094	11,581	2,176	2,220	29,979
Monmouth, NJ	741	9,903	12,111	522	1,408	24,685
Ocean, NJ	345	7,858	13,089	482	1,559	23,333
Lehigh, PA	620	8,861	9,649	1,321	2,081	22,532
Burlington, NJ	576	8,316	9,977	530	1,616	21,014
Camden, NJ	246	8,534	8,958	611	1,872	20,221
Gloucester, NJ	362	7,918	8,762	1,376	1,172	19,590
Mercer, NJ	254	7,397	7,327	946	1,324	17,248
Kent, DE	2,463	5,808	4,254	1,665	932	15,123
Atlantic, NJ	244	4,841	6,962	425	947	13,419
Harford, MD	495	6,050	5,096	490	879	13,010
Cumberland, NJ	463	3,914	4,883	1,349	1,028	11,638
Salem, NJ	708	3,269	2,083	1,757	486	8,303
Cecil, MD	651	3,587	2,776	300	517	7,831
Hunterdon, NJ	450	3,396	3,020	328	423	7,617
Warren, NJ	711	2,585	2,918	328	508	7,049
Kent, MD	744	942	1,218	157	409	3,470

Table 3b.	County-Level	Emissions for	Components	of Directly Er	nitted PM _{2.5} (tpv) ⁵¹
	•			•	

County, State	РОМ	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Lancaster, PA	2,020	465	105.7	9	816	1024.802	4,441
Berks, PA	1,764	436	131.6	15	474	785.2966	3,606
Philadelphia, PA	1,423	568	254.2	19	448	633.553	3,346
Montgomery, PA	1,740	439	98.98	6	415	638.6036	3,338
Delaware, PA	1,131	497	325.8	21	479	658.8593	3,112
Northampton, PA	1,176	354	170	31	581	717.5565	3,031
New Castle, DE	1,374	474	97.31	12	171	408.5423	2,538
Bucks, PA	1,253	403	77.96	8	315	416.3402	2,474
Chester, PA	1,030	433	78.68	10	284	384.1008	2,220
Lehigh, PA	1,208	247	57.17	5	196	367.6977	2,081
Camden, NJ	939	227	55.99	5	88	557.8196	1,872
Burlington, NJ	1,035	266	27.17	6	108	173.9813	1,616
Ocean, NJ	1,028	223	17.68	6	108	175.4669	1,559
Monmouth, NJ	846	226	20.05	3	119	193.3016	1,408
Mercer, NJ	842	223	24.2	3	81	149.5806	1,324
Gloucester, NJ	476	173	86.15	3	172	261.9218	1,172

⁵¹ Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries

⁽*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

County, State	РОМ	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Cumberland, NJ	614	137	62	5	39	170.5686	1,028
Atlantic, NJ	659	147	9.931	3	43	86.27427	947
Kent, DE	392	165	21.88	2	174	177.2305	932
Harford, MD	412	167	17.61	2	118	161.9914	879
Cecil, MD	227	106	12.54	1	78	92.79367	517
Warren, NJ	326	74	8.081	1	30	68.20153	508
Salem, NJ	155	52	47.08	1	56	175.4625	486
Hunterdon, NJ	229	97	7.36	1	33	55.55333	423
Kent, MD	143	42	5.118	1	122	95.91961	409

Table 3b breaks down the direct $PM_{2.5}$ emissions value from Table 3a into its components. These data will also be compared with the previously presented urban increment composition. As stated previously, the urban increment composition was derived from data obtained at monitoring site 100032004 in New Castle County, DE and monitoring site 421010055 in Philadelphia County, PA, because speciation data is not available for the Delaware County monitor.

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 3a and 3b, EPA identified the following components warranting additional review: organic mass, VOCs, and elemental carbon. These components were shown to be the most common in the urban increment in the greater Philadelphia area, as shown in Figure 4a. Similar county level POM and VOC emissions are found in Delaware and the adjacent counties. Philadelphia and Delaware Counties had the highest EC. EPA then looked at the contribution of these components of interest from each of the counties included in the area of analysis as shown in Tables 4a-c.

	Emissions in average tpy					
County	РОМ	Percent (%)	Cumulative %			
Lancaster, PA	2,020	9%	9%			
Berks, PA	1,764	8%	17%			
Montgomery, PA	1,740	8%	25%			
Philadelphia, PA	1,423	6%	31%			
New Castle, DE	1,374	6%	37%			
Bucks, PA	1,253	6%	43%			
Lehigh, PA	1,208	5%	48%			
Northampton, PA	1,176	5%	53%			
Delaware, PA	1,131	5%	58%			
Burlington, NJ	1,035	5%	63%			
Chester, PA	1,030	5%	68%			
Ocean, NJ	1,028	5%	72%			
Camden, NJ	939	4%	76%			
Monmouth, NJ	846	4%	80%			
Mercer, NJ	842	4%	84%			

Table 4a. County-Level POM Emission

Atlantic, NJ	659	3%	87%
Cumberland, NJ	614	3%	89%
Gloucester, NJ	476	2%	92%
Harford, MD	412	2%	93%
Kent, DE	392	2%	95%
Warren, NJ	326	1%	97%
Hunterdon, NJ	229	1%	98%
Cecil, MD	227	1%	99%
Salem, NJ	155	1%	99%
Kent, MD	143	1%	100%
Total	22,444		

Table 4b. County-Level EC Emissions

County	Emissions in average tpy						
County	EC	Percent (%)	Cumulative %				
Philadelphia, PA	568	9%	9%				
Delaware, PA	497	7%	16%				
New Castle, DE	474	7%	23%				
Lancaster, PA	465	7%	30%				
Montgomery, PA	439	7%	37%				
Berks, PA	436	7%	43%				
Chester, PA	433	7%	50%				
Bucks, PA	403	6%	56%				
Northampton, PA	354	5%	61%				
Burlington, NJ	266	4%	65%				
Lehigh, PA	247	4%	69%				
Camden, NJ	227	3%	72%				
Monmouth, NJ	226	3%	76%				
Mercer, NJ	223	3%	79%				
Ocean, NJ	223	3%	83%				
Gloucester, NJ	173	3%	85%				
Harford, MD	167	3%	88%				
Kent, DE	165	2%	90%				
Atlantic, NJ	147	2%	92%				
Cumberland, NJ	137	2%	94%				
Cecil, MD	106	2%	96%				
Hunterdon, NJ	97	1%	97%				
Warren, NJ	74	1%	99%				
Salem, NJ	52	1%	99%				
Kent, MD	42	1%	100%				
Total	6,643	·					

County	Emissions in average tpy					
	VOC	Percent (%)	Cumulative %			
Lancaster, PA	4,441	9.81%	9.81%			
Berks, PA	3,606	7.97%	18%			
Philadelphia, PA	3,346	7.39%	25%			
Montgomery, PA	3,338	7.37%	33%			
Delaware, PA	3,112	6.88%	39%			
Northampton, PA	3,031	6.69%	46%			
New Castle, DE	2,538	5.61%	52%			
Bucks, PA	2,474	5.46%	57%			
Chester, PA	2,220	4.90%	62%			
Lehigh, PA	2,081	4.60%	67%			
Camden, NJ	1,872	4.14%	71%			
Burlington, NJ	1,616	3.57%	74%			
Ocean, NJ	1,559	3.44%	78%			
Monmouth, NJ	1,408	3.11%	81%			
Mercer, NJ	1,324	2.92%	84%			
Gloucester, NJ	1,172	2.59%	86%			
Cumberland, NJ	1,028	2.27%	89%			
Atlantic, NJ	947	2.09%	91%			
Kent, DE	932	2.06%	93%			
Harford, MD	879	1.94%	95%			
Cecil, MD	517	1.14%	96%			
Warren, NJ	508	1.12%	97%			
Salem, NJ	486	1.07%	98%			
Hunterdon, NJ	423	0.94%	99%			
Kent, MD	409	0.90%	100%			
Total	45,267					

Table 4c. County-Level VOC Emissions

In addition to reviewing county-wide emissions of PM_{2.5} and PM_{2.5} precursors in the area of analysis, EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 5a provides facility-level emissions of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants (given in tons per year) from major point sources with total emissions of 500 tpy or more located in the area of analysis for the Delaware County area. Table 5a also shows the distance from the facility to the violating monitor in Delaware County.

		Distance		NEI 2	2011 v1 l	Emission	s (tpy)				
County, State	Facility Name (Facility ID)	violating monitor (miles)	NH3	NOx	PM2.5	SO ₂	VOC	Total			
Delaware, PA	Kimberly Clark Pa LLC/Chester Opr (420450016)	1	2	240	17	1,265	26	1,550			
Delaware, PA	Covanta Delaware Valley LP/Delaware Valley Res Rec (420450059)	1		1,260	182	242	6	1,689			
Delaware, PA	Monroe Energy LLC/Trainer (420450030)	2	6	656	228	142	241	1,273			
Delaware, PA	Sunoco Inc (R&M)/Marcus Hook Refinery (420450025)	3	6	1,490	674	2,044	331	4,545			
Gloucester, NJ	Logan Generating Plant, L.P. (55834)	4	2	656	17	600	6	1,280			
Delaware, PA	Exelon Generation Co/Eddystone (420450014)	4	6	830	77	940	11	1,863			
Gloucester, NJ	Paulsboro Refining Company LLC (55829)	6	5	655	238	77	308	1,283			
Delaware, PA	Philadelphia Intl	7		2,246	53	254	318	2,871			
New Castle, DE	Hay Road Energy Center (1000300388)	10	53	602	106	11	33	805			
Philadelphia, PA	Sunoco Inc/ Phila Refinery R&M (4210101501)	11	4	1,315	722	297	749	3,088			
Salem, NJ	Carneys Point Generating Plant (65498)	11	2	752	39	1,157	3	1,953			
Camden, NJ	Camden County Municipal Utilities Authority (50163)	14	2	14	521	0	26	562			
Montgomery, PA	Covanta Plymouth Renewable Energy/ Plymouth (420910295)	18	1	735	8	25	2	771			
Chester, PA	Transcontinental Gas/Frazer Sta 200 (420290047)	18	0	595	248	1	49	893			
Salem, NJ	Anchor Glass Container Corporation (65499)	19	1	509	67	90	9	676			
New Castle, DE	Delaware City Refinery (1000300016)	22	7	1,072	281	333	139	1,832			
Chester, PA	Exelon Gen Co/Cromby Gen Sta (420290023)	23	2	493	38	826	2	1,360			
Chester, PA	Arcelormittal Plate LLC/Coatesville (420290024)	26	4	255	72	111	133	575			
Bucks, PA	Wheelabrator Falls Inc/Falls Twp (420170469)	39	3	731	9	122	2	867			
Bucks, PA	Fairless Energy LLC/Falls Twp (420170131)	40	170	201	196	18	25	609			

 Table 5a.
 NEI 2011 v1 Point Source Emissions (tpy)

		Distance		NEI 2	2011 v1 I	Emission	s (tpy)	
County, State	Facility Name (Facility ID)	from violating monitor (miles)	NH3	NOx	PM2.5	SO ₂	VOC	Total
Mercer, NJ	PSEG Fossil LLC Mercer Generating Station (61057)	41	1	430	56	573	18	1,078
Berks, PA	Genon Rema LLC/Titus Gen Sta (420110045)	43	0	683	43	4,087	5	4,818
Kent, DE	Nrg Energy Center Dover LLC (1000100127)	48	0	273	71	1,274	2	1,621
Berks, PA	Cryovac Inc/Cryovac Rigid Packaging (420110093)	50			0		556	556
Berks, PA	Lehigh Cement Co LLC/Evansville Cement Plt & Quarry (420110039)	52	41	1,225	134	200	12	1,611
Lehigh, PA	Lafarge Corp/Whitehall Plt (420770019)	59	14	368	36	331	7	754
Northampton, PA	Northampton Gen Co/Northampton (420950536)	59	2	441	44	546	2	1,034
Northampton, PA	Keystone Portland Cement/East Allen (420950012)	61	2	828	57	984	7	1,878
Northampton, PA	Essroc/Nazareth Lower Cement Plt 1 (420950045)	62	68	1,804	522	722	62	3,177
Northampton, PA	Hercules Cement Co LP/Stockertown (420950006)	63	3	989	29	1,420	20	2,462
Northampton, PA	PPL Martins Creek LLC/Martins Creek (420950010)	68	13	943	37	274	30	1,297
Lancaster, PA	Lancaster Cnty Rrf/ Lancaster (420710145)	69		577	4	12	4	597
Northampton, PA	GenOn Rema LLC/Portland Generating Sta (420950011)	76	0	1,977	67	15,148	14	17,206

Figure 5a shows the major point source emissions (from the 2011 NEI in tons per year) in the area of analysis for the Delaware County Area and the relative distances of these sources from the violating monitoring location, as depicted by red dots. The actual distance from the point sources to the violating monitoring location is presented in Table 5a. The distance from the violating monitoring location is particularly important for directly emitted PM_{2.5}. The influence of directly emitted PM_{2.5} on ambient PM_{2.5} diminishes more than that of gaseous precursors as a function of distance.⁵²

The Delaware County monitor is located in a heavily industrialized area. As indicated in Table 5a and Figure 5a, there are thirty-three sources with emissions of at least 500 tpy within the area of analysis. Six of these sources are in Delaware County and quite close to the violating monitor, as shown in Figure 5b.

⁵² Baker, K. R. and K. M. Foley. A nonlinear regression model estimating single source concentrations of primary and secondarily formed PM_{2.5}. Atmospheric Environment. 45 (2011) 3758-3767.



Figure 5a. Major Point Sources in the Area of Analysis for the Delaware County Area

Figure 5b. Close-up of Major Point Sources Near the Delaware County Monitor.



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In addition, the Delaware County monitor is located adjacent, and actually within the fenceline of a small (less than 100 tpy) source, called Evonik. However, EPA has approved PA's monitoring plan, which states that the Chester monitor (i.e. Delaware County monitor) is suitable to represent urban scale $PM_{2.5}$ population exposure.⁵³ Urban scale monitors are designed to represent air quality within an area of 4 to 50 kilometers.

Table 5b shows emissions from the Evonik facility. Figures 5c and 5d show the location of the monitor relative to this source. As discussed below in factor 3, regarding meteorology, the Evonik facility is upwind of the violating Delaware County monitor when its PM_{2.5} levels are highest, indicating that this source is contributing to the violation.

County State	Facility Name	Distance from	NEI 2011 v1 Emissions (tpy)						
County, State	(Facility ID)	monitor (miles)	NH ₃	NOx	PM2.5	SO ₂	VOC	Total	
Delaware, PA	Evonik Corp/Chester (94723811)	0	0.4168	10.7063	2.9734	1.447	2.7619	18.3054	

Table 5b. Evonik Facility Emissions (tpy)

Figure 5c. Close-up of the Delaware County Monitor.



Source: Google Maps, at http://maps.google.com

⁵³ Commonwealth of Pennsylvania Department of Environmental Protection 2013 Annual Ambient Air Monitoring Network Plan, dated July 2013.



Figure 5c. Close-up of the Delaware County Monitor and Evonik facility

Source: Google Maps, at http://maps.google.com

Monitors in the nearby vicinity to the east in Gloucester County, NJ, to the north in Philadelphia County, PA, and to the south, New Castle County, DE, are not violating the NAAQS, indicating limited contribution from these areas relative to the contribution from local sources. The monitors to the east and south, are well below the NAAQS, despite their relative proximity to point sources listed in Table 5a. For example, the Gloucester County, NJ monitor is about 1.5 miles west of the Paulsboro Refining Company LLC facility, yet its 2011-2013 DV is 9.0 μ g/m³, indicating that the refinery may have limited contribution to the violation at the Delaware County monitoring site. The Hay Road Energy Center in New Castle County, DE is about 1.5 miles southwest of the New Castle County monitor, 100031003. The New Castle monitor has a 2011-2013 DV of 9.1 μ g/m³, again indicating that this major point source may have limited contribution to the violation from has a 2011-2013 DV of 9.1 μ g/m³, again indicating that this major point source may have limited contribution to the violation from has a 2011-2013 DV of 9.1 μ g/m³, again indicating that this major point source may have limited contribution to the violation at the Delaware County of 9.1 μ g/m³, again indicating that this major point source may have limited contribution to the violation at the Delaware County monitoring site compared with the contribution from local sources.

The sources in the nearby New Jersey counties are generally well controlled. For example, there are three NJ based coal fired generating stations: Logan Generating in Gloucester, PSEG Mercer in Mercer, and Carney's Point in Salem. PSEG Mercer is northeast of the monitor (not in a predominant wind direction). The other power plants are southwest of the monitor. All three power facilities are well-controlled with scrubbers, selective catalytic reduction (SCR), and baghouses. New Jersey's EGU rule (EGU-Coal, Oil, and Gas Fired Boilers: NJAC 7:27-4.2, 10.2, 19.4), has stringent NOx limits (1.5 pounds per megawatt hour) and SO₂ (0.150 pounds per Million British Thermal Units (MBTU) for a 30 day rolling average , and 0.0250 pounds per MBTU for a 24-hour average)for coal-fired units that required compliance by December 2012. New Jersey's sulfur in fuels regulation (Low Sulfur Distillate and Residual Fuel Strategies: NJAC 7:27-9, 7:27-27.9), covering residential, industrial, commercial, and electric power requires distillate to meet 500 parts per million (ppm) by 2014, and 15 ppm by 2016, as well as requiring residual fuel to meet 5,000 ppm by 2014, likely has further reduced SO₂ emissions from New Jersey counties. New Jersey also has stringent RACT limits (NJAC 7:27-16,19). The Paulsboro Refining Company, which is east of the Delaware monitor, is

under a Consent Decree and Administrative Consent Order with EPA and New Jersey⁵⁴, requiring reduction from major refinery processes including fluid catalytic cracking units (FCCU), boiler and process heaters, flare gas recovery, and leak detection and repair, to be completed by December 2011.

Sources in New Castle County, DE are also well controlled through measures in its federally approved State Implementation Plan (SIP). Here is an excerpt from Delaware's November 21, 2013 designation recommendation letter to EPA:

"...total 2012 emissions of direct $PM_{2.5}$ and its precursors from New Castle County's largest point sources⁵⁵ decreased 87% between 2002 and 2012. This included a massive 99% reduction in SO₂, followed by a 65% reduction in direct $PM_{2.5}$, and a 52% decrease of NOx. VOC reductions of 54% have taken place since the early 1990s due to Delaware's ozone nonattainment issues over the years. NH₃ emissions have been reduced 52%, even though New Castle County emissions of ammonia in 2002 from these largest point sources were only 82 tons per year (tpy)."

Delaware's November 21, 2013 designation recommendation letter included a list of top point sources emitters in New Castle County, with their 2002 and 2012 emissions. That information is summarized in Table 5c.

New Castle Top Emitting	NE	I3	N	Ox	S	D ₂	PM	2.5	VC)C	Sum of rela	PM _{2.5}
Facilities	2002	2012	2002	2012	2002	2012	2002	2012	2002	2012	2002	2012
Calpine Edge Moor	30	16	3,138	463	9,854	48	517	4	36	33	13,575	564
Calpine Hay Road	0	1	566	696	11	13	3	142	10	45	590	897
DE City Refinery	43	12	3,555	2,083	34,096	304	905	312	829	208	39,428	2,919
DuPont Edgemoor	1	1	35	29	92	21	27	1	83	98	239	150
DuPont Experimental	3	3	208	176	593	226	37	18	8	11	849	434
Evraz Steel	0	0	125	227	11	40	45	59	67	67	248	393
Formosa	4	6	31	31	0	1	35	15	124	69	194	122
TOTALS	82	39	7,658	3,705	44,658	653	1,569	551	1,157	531	57,126	7,491
2002-2012 % Reduction	529	%	52	%	99	%	65	%	54	%	879	%

Table 5c New Castle County - Top Point Source Emitters in 2002 and 2012

Source: Delaware's November 21, 2013 designation recommendation letter.

⁵⁴ United States of America, Plaintiff, and the States of Colorado, Louisiana, New Jersey, Oklahoma and Texas, Plaintiff-Interveners, v. Valero Refining Company, et al, and Tesoro Refining and Marketing Corporation, Defendants, Civil Action No. SA05CA0569, filed June 16, 2005.

⁵⁵ 2012 emissions \geq 50 tpy for any PM_{2.5}-related pollutant

In summary, EPA's analysis of relevant county-level emissions and the geographic locations of the relevant pollutants shows that several of the counties within the area of analysis have relatively high emissions. Philadelphia County has the highest NO_X and direct $PM_{2.5}$, while Northampton County has the highest SO_2 emissions, and Lancaster County has the highest NH_3 and VOC emissions. Delaware County ranks second in both NO_X and SO_2 emissions. Furthermore, there are six facilities in Delaware County with emissions of 500 tpy or more that are quite close to the violating monitor, as can be seen in Figure 5b, including the Sunoco Marcus Hook Refinery which has total emissions of 4,545 tpy, and 674 tpy of direct $PM_{2.5}$. Large point sources in Philadelphia, Northampton, and Lancaster Counties are all farther away from the Delaware County monitor, as shown in Table 5a.

Population density and degree of urbanization

In this part of the factor analysis, EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 6 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area.

County, State	Population 2000	Population 2010	% Change from 2000	Land Area (square miles)	Population Density (per square mile)	% of Area of Analysis	Cumulative %
Philadelphia, PA	1,517,550	1,528,458	0.7%	135	11,314	15%	15%
Montgomery, PA	750,097	801,134	6.8%	483	1,658	8%	23%
Monmouth, NJ	615,301	630,821	2.5%	472	1,337	6%	29%
Bucks, PA	597,635	625,505	4.7%	607	1,030	6%	35%
Ocean, NJ	510,916	577,697	13.1%	636	908	6%	41%
Delaware, PA	550,864	559,373	1.5%	184	3,037	5%	46%
New Castle, DE	500,265	538,951	7.7%	426	1,264	5%	51%
Lancaster, PA	470,658	520,344	10.6%	949	548	5%	57%
Camden, NJ	508,932	513,744	0.9%	222	2,311	5%	62%
Chester, PA	433,501	499,739	15.3%	756	661	5%	66%
Burlington, NJ	423,394	449,320	6.1%	805	558	4%	71%
Berks, PA	373,638	411,791	10.2%	859	479	4%	75%
Mercer, NJ	350,761	367,093	4.7%	226	1,625	4%	78%
Lehigh, PA	312,090	350,093	12.2%	347	1,010	3%	82%
Northampton, PA	267,066	298,065	11.6%	374	797	3%	85%
Gloucester, NJ	254,673	288,618	13.3%	325	889	3%	88%
Atlantic, NJ	252,552	274,715	8.8%	561	490	3%	90%
Harford, MD	218,590	245,243	12.2%	440	557	2%	93%
Kent, DE	126,697	162,973	28.6%	590	276	2%	94%
Cumberland, NJ	146,438	157,053	7.2%	489	321	2%	96%
Hunterdon, NJ	121,989	128,357	5.2%	430	299	1%	97%
Warren, NJ	102,437	108,693	6.1%	358	304	1%	98%
Cecil, MD	85,951	101,175	17.7%	348	291	1%	99%
Salem, NJ	64,285	66,008	2.7%	338	195	1%	100%

 Table 6. Population Growth and Population Density.

County, State	Population 2000	Population 2010	% Change from 2000	Land Area (square miles)	Population Density (per square mile)	% of Area of Analysis	Cumulative %
Kent, MD	19,197	20,184	5.1%	279	72	0%	100%
Total	9,575,477	10,225,147					

Source: U.S. Census Bureau population estimates for 2000 and 2010

The greater Philadelphia area is densely populated. Philadelphia County has both population and population density much larger than every other county in the area of analysis. Delaware County experienced 1.5 percent population growth between 2000 and 2010. Delaware County has the second highest population density, and ranks sixth in population in the 25 county area of analysis. Because EPA has determined the other factors indicate much less contribution to the Delaware County monitor from emissions in other counties relative to local emissions from Delaware County, population and population density are not influential factors in determining nonattainment boundaries for the Delaware County Area.



Figure 6. 2010 County-Level Population in the Area of Analysis for the Delaware County Area.

Traffic and Vehicle Miles Travelled

High VMT and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and

indicates that a county with the high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area. Table 7 shows 2011 VMT while Figure 7 overlays 2011 county-level VMT with a map of the transportation arteries. This VMT data was obtained from the Federal Highway Administration.

County, State	Total 2011 VMT	Percent	Cumulative %
Montgomery, PA	6,505,446,421	8%	8%
Monmouth, NJ	6,240,551,588	8%	16%
Philadelphia, PA	5,344,508,760	7%	22%
New Castle, DE	5,201,246,605	6%	29%
Bucks, PA	4,727,709,143	6%	35%
Ocean, NJ	4,617,759,793	6%	41%
Burlington, NJ	4,477,567,355	6%	46%
Chester, PA	4,277,236,066	5%	51%
Lancaster, PA	4,150,294,150	5%	57%
Camden, NJ	3,848,560,437	5%	61%
Berks, PA	3,381,679,887	4%	66%
Delaware, PA	3,336,446,326	4%	70%
Mercer, NJ	3,325,914,191	4%	74%
Lehigh, PA	2,988,094,564	4%	78%
Gloucester, NJ	2,713,227,986	3%	81%
Atlantic, NJ	2,676,389,714	3%	84%
Harford, MD	2,370,983,706	3%	87%
Northampton, PA	2,046,097,907	3%	90%
Hunterdon, NJ	1,828,353,779	2%	92%
Kent, DE	1,601,985,389	2%	94%
Warren, NJ	1,387,779,166	2%	96%
Cecil, MD	1,356,020,045	2%	97%
Cumberland, NJ	1,122,284,008	1%	99%
Salem, NJ	779,668,486	1%	100%
Kent, MD	205,005,588	0%	100%
Total	80,510,811,059		

 Table 7. 2011 VMT for the Delaware County Area.

http://www.census.gov/hhes/commuting/data/commuting.html

VMT varies greatly within the area of analysis, with Delaware County ranked twelfth out of twentysix counties. Delaware County's VMT is about half that of the highest county, Montgomery County, PA, and sixteen times higher than the lowest county, Kent County, MD. As seen in Figure 7, numerous large highways run through the area of analysis. Interstate 95 runs near the Delaware County monitor, as well as numerous non-violating monitors in the area.

EPA also considered "journey to work" data submitted by New Jersey and Delaware as part of their analysis in their February 24, 2014 and November 21, 2013 respective designation recommendation letters. New Jersey presented Journey to Work data from the US Census Bureau for the 2000 calendar year, since that was available at the time. The Census Bureau website also has a more recent five year average (2006 -2010 average) that differs slightly from the data presented by New Jersey.

The tables below show that the commuters to Delaware County, PA are mostly from Pennsylvania; relatively few are from New Jersey counties or New Castle County, DE.

Table 8a: Number of Commuters in Penns	ylvania and New Jersey to Delaware County,
Pennsylvania for the 2000 calendar year	

Home County State	#Commuters to
Home County, State	Delaware County, PA
Philadelphia, PA	21,802
Delaware, PA	137,988
Montgomery, PA	11,758
Chester, PA	17,870
Bucks, PA	2,754
Berks, PA	505
Six county PA total commuting	
to Delaware County, PA	192,677
Gloucester, NJ	3,179
Camden, NJ	3,232
Burlington, NJ	1,771
Cumberland, NJ	105
Salem, NJ	486
Five county NJ commuting to	
Delaware County, PA	8,773

Source www.census.gov/population/www/cen2000/commuting/index.html

Table ob. Number of Commuters to Delaware County, remissivania for 2000-201	Table 8b.	Number of	Commuters to	Delaware	County,	Pennsylvania	a for 2006-201
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Number	Margin of error	Residence State	Residence County, State	Workplace County	
137,303	2,156	Pennsylvania	Delaware, PA	Delaware County	
18,907	1,009	Pennsylvania	Chester, PA	Delaware County	
17,732	1,234	Pennsylvania	Philadelphia, PA	Delaware County	
12,113	791	Pennsylvania	Montgomery County, PA	Delaware County	
9,097	838	Delaware	New Castle County, DE	Delaware County	
3,303	408	New Jersey	Gloucester County	Delaware County	
2,274	338	Pennsylvania	Bucks County, PA	Delaware County	
2,208	248	New Jersey	Camden County, NJ	Delaware County	
1,178	221	New Jersey	Burlington County, NJ	Delaware County	
700	200	Pennsylvania	Berks County, PA	Delaware County	
625	149	Pennsylvania	Lancaster County, PA	Delaware County	
501	129	New Jersey	Salem County, NJ	Delaware County	
316	110	Maryland	Cecil County, MD	Delaware County	
237	88	Pennsylvania	Lehigh County, PA	Delaware County	
181	93	New Jersey	Atlantic County, NJ	Delaware County	
178	110	New Jersey	Mercer County, NJ	Delaware County	
156	69	Delaware	Kent County, DE	Delaware County	
127	56	New Jersey	Cumberland County, NJ	Delaware County	

Number	Number Margin Residence Residence Coun of error State		Residence County, State	Workplace County
89	81	New Jersey	Middlesex County, NJ	Delaware County
67	44	New Jersey	Ocean County, NJ	Delaware County
64	63	Maryland	Harford County, MD	Delaware County
45	34	Pennsylvania	York County, PA	Delaware County
42	34	Pennsylvania	Northampton County, PA	Delaware County
35	33	New Jersey	Monmouth County, NJ	Delaware County
20	17	Maryland	Kent County, MD	Delaware County
3	5	New Jersey	Hunterdon County, NJ	Delaware County

Source www.census.gov/population/www/cen2000/commuting/index.html





Factor 3: Meteorology

EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. EPA used two primary tools for this assessment: wind roses and kernel density estimation (KDE). When considered in combination with area PM_{2.5} composition and county-level and facility emissions source location information, wind roses and KDE can help to identify nearby areas contributing to violations at violating monitoring sites.
Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate the force of the wind and thus the distance from which those emissions are transported. EPA constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.⁵⁶ When developing these wind roses, EPA also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 8 shows wind roses that EPA generated from data relevant in the Delaware County Area.

These wind roses represent average wind directions throughout the year. As can be seen in Figure 8a, the predominant wind direction in the area of analysis is westerly, with winds also coming from the southwest and northwest. There are also strong northerly and southerly components. These wind roses suggest potential emission sources in these directions should be considered for analysis. In its December 2013 recommendation letter, Pennsylvania included wind direction analysis at "high PM_{2.5} days" at the Delaware County monitor. Specifically, Pennsylvania identified 212 days during the 2010 to 2012 monitoring period where PM_{2.5} at the Delaware County monitor was at least one standard deviation above the five county Pennsylvania portion of the greater Philadelphia area. Pennsylvania analyzed the wind directions for the highest of those days, the top twenty-five percent. For these highest days, Pennsylvania calculated the number of hours the wind was coming from a particular direction as well as the concentrations coming from a particular direction, using data from a meteorological station collocated with the Delaware County monitor. Figures 8b and 8c represents the wind direction frequency and concentration distribution by wind direction, respectively, at the Delaware County monitor during the high PM_{2.5} days.

As can be seen in Figures 8b and 8c, wind directions on high $PM_{2.5}$ days at the Delaware County monitor are predominantly from the east, with a northeast component and a lesser southwest component. This is contrary to the dominant wind direction in the region, which is westerly. This suggests local, rather than regional, sources are responsible for the high $PM_{2.5}$ days at the Delaware County monitor.

There are numerous sources in Delaware County, upwind of and very close to the violating monitor. The small Evonik facility is located directly east of the violating monitor, which, as illustrated above in Figure 5c, is within the fenceline of the facility. The Kimberly Clark Pa LLC facility is approximately one mile northeast of the monitor. The Covanta Delaware Valley facility is approximately one mile southwest of the monitor. Monroe Energy LLC/Trainer and Sunoco Inc (R&M)/Marcus Hook Refinery are both southwest of the monitor, two and three miles, away respectively. The Exelon Generation Co/Eddystone and the Philadelphia International Airport are northeast of the facility, four and seven miles away, respectively.

⁵⁶ *ftp.ncdc.noaa.gov/pub/data/noaa* or

http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*



Figure 8a. Wind Roses in the Area of Analysis for the Delaware County Area.

Figure 8b. Wind Direction Frequency on High PM2.5 Days at the Delaware County Monitor



Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-1- Greater Philadelphia Area

Figure 8c. Concentration Distribution by Wind Direction on High PM_{2.5} Days at the Delaware County Monitor



Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-1- Greater Philadelphia Area

In addition to wind roses, EPA also generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at violating monitoring sites.^{57,58} These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories.⁵⁹ Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell.

Figure 9 shows HYSPLIT KDE plots for the Delaware County Area summarized by calendar quarter for the 2010-2012 period. The HYSPLIT KDE plots are weighted in the westerly direction, indicating a greater frequency of trajectories passing over grid cells to the west of the Delaware County monitor. The first and third quarter plots show a strong northwesterly component, while the fourth quarter plot shows a southwesterly component.

The highest kernel density in the plots is found in Delaware County, indicating that Delaware County has the highest potential to contribute to the violating monitor. As seen in Figure 9, the kernel density

⁵⁷ In some past initial area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.

 ⁵⁸ HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model, *http://www.arl.noaa.gov/HYSPLIT_info.php* ⁵⁹ The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.

in Lancaster County, which has the highest emissions in the area of analysis, is low, indicating less potential for contribution to the violating monitor in Delaware County. Similarly, the kernel density in most of Philadelphia County, which has the second highest emission in the area of analysis, is also relatively not high. High kernel density is found in portions of Chester, New Castle, Gloucester and Camden Counties. However, these counties have relatively low emissions, and therefore low potential for impacting the violating monitor.



Figure 9. HYSPLIT Kernel Density Estimation Plots for the Delaware County Area. First Quarter Second Quarter

7000 E 20 M

Factor 4: Geography/topography

To evaluate the geography/topography factor, EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area. The Delaware County Area does not have any geographical or topographical barriers significantly limiting or directing air pollution transport within its air shed. Therefore, this factor did not play a significant role in this evaluation.

Factor 5: Jurisdictional boundaries

In defining the boundaries of the intended Delaware County nonattainment area, EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify state and local governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the intended area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the intended designated areas.

The violating monitor is located in Delaware County, PA, which is part of the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA. The Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA includes as New Castle County, Delaware; Cecil County, Maryland; Burlington, Camden, Gloucester, and Salem Counties in New Jersey; and Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties in Pennsylvania. The major jurisdictional boundaries in the Philadelphia-Camden-Wilmington area are the state lines between Pennsylvania, Delaware, and New Jersey. Each state is responsible for its own air quality planning. In addition, the Philadelphia Air Management Services is responsible for certain air quality planning tasks in the City of Philadelphia.

The Delaware Valley Regional Planning Commission (DVRPC), the MPO in the Philadelphia area, serves Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties in Pennsylvania, and Burlington, Camden, Gloucester, and Mercer Counties in New Jersey. New Castle County, DE is in a separate MPO, the Wilmington Area Planning Council (WILMAPCO). WILMAPCO is the Metropolitan Planning Organization for New Castle County, Delaware and Cecil County, Maryland.

Delaware County, PA was designated as part of the Philadelphia-Wilmington, PA-NJ-DE nonattainment area for the 1997 annual and 2006 24-hour PM_{2.5} NAAQS. The boundary for the nonattainment area for the 1997 and 2006 PM_{2.5} NAAQS included the entire counties of Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; Burlington, Camden, and Gloucester in New Jersey; and New Castle in Delaware. EPA has redesignated to attainment the New Jersey and Delaware portions of the Philadelphia-Wilmington, PA-NJ-DE nonattainment area for the 1997 and 2006 PM_{2.5} NAAQS (78 FR 54396) and (79 FR 45350), respectively. These redesignations to attainment indicate that air quality has improved in the Philadelphia region.

The states have recommended different boundaries for the 2012 annual PM_{2.5} NAAQS. Both Delaware and New Jersey have recommended that no counties in their respective states should be part of a nonattainment area in the greater Philadelphia area. Pennsylvania recommended that Delaware County be designated as nonattainment, based on 2011-2013 ambient air quality monitoring data. EPA's intended nonattainment area boundary differs from the previously designated Philadelphia-Wilmington, PA-NJ-DE nonattainment area for the 1997 annual and 2006 24-hour PM_{2.5} NAAQS, because the data discussed above supports the finding that the violation in Delaware County is due to local, rather than regional emissions.

Conclusion for Delaware County Area

Based on the assessment of factors described above, both individually and in combination, EPA has preliminarily concluded that, within the Philadelphia-Camden-Wilmington MSA, Delaware County, PA should be the only county designated as nonattainment, because it is violating the 2012 annual PM_{2.5} NAAQS and is contributing to the monitored violation. EPA's intended boundary is different from the Philadelphia-Wilmington, PA-NJ-DE nonattainment area for the 1997 annual and 2006 24-hour PM_{2.5} NAAQS. All other monitors in Philadelphia-Wilmington, PA-NJ-DE area are meeting the 2012 annual PM_{2.5} NAAQS based on the 2013 DVs. Furthermore, available data does not support a finding that the other counties in the Philadelphia-Wilmington, PA-NJ-DE area are contributing to the monitored violation in Delaware County.

As stated above, starting in 2011, quarterly mean PM_{2.5} levels at the Delaware County monitor are consistently high, while the surrounding monitors either drop off or remain low, suggesting notable local influence at the violating monitor. Most monitors in the area of analysis show higher quarterly mean PM_{2.5} values in the third calendar quarter, which corresponds to higher EGU emissions from higher air conditioning use. These monitors also generally show higher quarterly mean values in the first calendar quarter, which may be due to higher EGU emissions from higher heating use, including home heating oil and from greater collection of particle nitrate during the cooler months. However, the violating Delaware County monitor does not seem to experience highs and lows in the same quarters as its neighbors.

Quarterly means were relatively consistent for the Delaware County monitor starting in the first quarter in 2011 through the first quarter in 2012, with the low point in the second quarter of 2012. From the third quarter in 2012 to the second quarter in 2013, the Delaware County monitor was considerably higher than the other monitors in the area of analysis, while the surrounding monitors either drop off or remain low, suggesting an important local influence at the violating monitor. In the third and fourth quarters of 2013, the PM_{2.5} values at the Delaware County monitor appear to track with most other monitors in the area, and are below the 12 μ g/m³ level of the 2012 annual PM_{2.5} NAAQS. This suggests that the influence of the local sources was less important in those quarters.

The greater Philadelphia area is densely populated. Delaware County has the second highest population density, and ranks sixth in total population in the 25 county area of analysis. Delaware County's VMT is about half that of the highest county, Montgomery County, PA, and sixteen times higher than the lowest county, Kent County, MD. Numerous large highways run through the area of analysis. Interstate 95 runs near the Delaware County monitor.

The Delaware County monitor is located in a heavily industrialized area, and is sited adjacent to a small industrial source. In the area of analysis, Delaware County ranks second in EC, NO_X and SO₂

emissions. Furthermore, there are six facilities in Delaware County with emissions of 500 tpy or more, located within seven miles of the violating monitor, including the Sunoco Marcus Hook Refinery with total emissions of 4,545 tpy, and 674 tpy of direct $PM_{2.5}$. In addition, the small Evonik site is located adjacent to and directly east of the violating monitor. EPA and the Commonwealth both believe that the high density of emission sources in close proximity to the monitor are the contributor to the $PM_{2.5}$ violation and further emphasize the impacts on the Delaware County monitor is a local contribution rather than a regional one from the surrounding counties.

The predominant wind direction in the area of analysis is westerly, with winds also coming from the southwest and northwest. Wind directions on high $PM_{2.5}$ days at the Delaware County monitor are predominantly from the east, with a northeast component and a lesser southwest component. This is contrary to the dominant wind direction in the region, which is westerly. This suggests local, rather than regional, sources are responsible for the high $PM_{2.5}$ days at the Delaware County monitor.

There are numerous sources in Delaware County, upwind of and very close to the violating monitor. The small Evonik facility is located directly east of, and therefore upwind of, the violating monitor, which, as illustrated above in Figure 5c, is within the fenceline of the facility. The Kimberly Clark Pa LLC facility is approximately one mile northeast of the monitor. The Covanta Delaware Valley facility is approximately one mile southwest of the monitor. Monroe Energy LLC/Trainer and Sunoco Inc (R&M)/Marcus Hook Refinery are both southwest of the monitor, two and three miles, away respectively. The Exelon Generation Co/Eddystone and the Philadelphia International Airport are northeast of the facility, four and seven miles away, respectively.

The HYSPLIT KDE plots for the Delaware County violating monitor are weighted in the westerly direction, indicating a greater frequency of trajectories passing over grid cells to the west of the Delaware County monitor. The first and third quarter plots show a strong northwesterly component, while the fourth quarter plot shows a southwesterly component. The highest kernel density in the plots is found in Delaware County, indicating that Delaware County has the highest potential to contribute to the violating monitor. As seen in Figure 9, the kernel density in Lancaster County, which has the highest emissions in the area of analysis, is low, indicating less potential for contribution to the violating monitor in Delaware County. Similarly, the kernel density in most of Philadelphia County, which has the second highest emission in the area of analysis, is also not high. High kernel density is found in portions of Chester, New Castle, Gloucester and Camden Counties. However, these counties have relatively low emissions, and therefore low potential for impacting the violating monitor.

3.3 Area Background and Overview – Allegheny County Area

Figure A is a map of EPA's intended nonattainment boundary for the Allegheny County Area. The map shows the location and DVs of ambient air quality monitoring locations, county and other jurisdictional boundaries, including the Pittsburgh, PA MSA and existing nonattainment area boundaries for the 1997 annual and/or 2006 24-hour PM_{2.5} NAAQS.

For purposes of the 1997 annual and 2006 24-hour PM_{2.5} NAAQS, this area was designated nonattainment. Part of Allegheny County was designated nonattainment as the Liberty-Clairton Area for the 1997 annual and 2006 24-hour PM_{2.5} NAAQS. The Liberty-Clairton Area includes the City of Clairton and the Boroughs of Glassport, Liberty, Lincoln, and Port Vue in Allegheny County, PA. For purposes of the 1997 annual and 2006 24-hour PM_{2.5}, the remainder of Allegheny County was designated in the Pittsburg-Beaver Valley nonattainment area, along with the, Beaver, Butler Washington, and Westmoreland Counties and portions of Armstrong Greene, and Lawrence Counties. Pennsylvania recommended that only the five municipalities in the Liberty-Clairton Area be designated as nonattainment for the 2012 annual PM_{2.5} NAAQS. However, EPA intends to designate all of Allegheny County as the Allegheny County nonattainment area for the 2012 annual PM_{2.5} NAAQS.





EPA must designate as nonattainment areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. A monitor in Liberty Borough in Allegheny County, PA shows a

violation of the 2012 annual PM_{2.5} NAAQS. Therefore, this county is included in the nonattainment area. As shown in Figure B, EPA evaluated each county in the Pittsburgh, MSA, which includes Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland Counties in Pennsylvania, and a ring of counties adjacent to the Pittsburgh, PA MSA. EPA's evaluation was based on the five factors and other relevant information. EPA has determined that only Allegheny County, PA contributes to the nearby violation. Note that Cambria County, PA, which is in the area of analysis, also shows a violation. As discussed in Section 3.1, EPA intends to designate Cambria County and a portion of Indiana County, PA as nonattainment in a separate nonattainment area, the Johnstown Area. The following sections describe this five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.





Factor 1: Air Quality Data

All ambient air quality data collected during the year are important when determining contributions to an annual standard such as the 2012 annual PM_{2.5} NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. For the 2012 annual PM_{2.5} NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured PM_{2.5} concentrations. For these reasons, for the Factor 1 air quality analysis, EPA assessed and characterized air quality at, and in the

proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of $PM_{2.5}$ mass in the area of analysis.

In most cases, EPA assessed air quality data on a seasonal, or quarterly, basis.⁶⁰ EPA also identified the spatial extent of these high PM_{2.5} concentrations. The mass and composition at the DV location represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the DV monitoring site, EPA examined the chemical composition of the monitored PM_{2.5} concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, EPA contrasted the approximated mass composition at the DV monitoring site with data collected at IMPROVE⁶¹ and other monitoring locations whose data are representative of regional background.^{62,63} This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from the influence of closer

⁶⁰ Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting PM_{2.5} mass and composition. In some areas of the country where there may be noticeable month-to-month variations in average PM_{2.5}, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas. ⁶¹ IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

⁶² The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average PM_{2.5} mass and chemical components observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in PM_{2.5} mass between the violating site and the nearby CSN site(s), EPA determined material balance of the PM_{2.5} composition at the violating site by assigning the extra measured PM_{2.5} mass to the carbon components of PM_{2.5}. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local PM_{2.5} concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

⁶³ The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.^{64,65,66}

<u>PM_{2.5} Design Values and Total Mass Measurements</u> - EPA examined ambient PM_{2.5} air quality monitoring data represented by the DVs at each violating monitoring site and at other monitors in the area of analysis. EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, EPA used data for the 2011-2013 period (i.e., the 2013 DV), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2012 annual PM_{2.5} NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter (μ g/m³) or less (e.g., 12.1 μ g/m³ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied. See 40 CFR part 50 Appendix N. Table 2 identifies the current DVs (i.e., the 2013 DV) and the most recent two DVs based on all monitoring sites in the area of analysis for the Allegheny County intended nonattainment area.⁶⁷

County, State	Monitor Site ID	State Rec NA?	09-11 DV 10-12 DV		11-13 DV		
Garrett, MD	240230002	No	10.7 °	10.0 °	10.0 °		
Columbiana, OH	N/A	No	No monitor				
Allegheny, PA	420030064	Yes (partial)	15	14.8	13.4		
Allegheny, PA	420031301	Yes (partial)	12.7	12.5	11.7		
Allegheny, PA	420030008	Yes (partial)	11.6	11.1	10.3		
Allegheny, PA	420030067	Yes (partial)	11	10.5	9.6		
Allegheny, PA	420030093	Yes (partial)	9.7	9.4	8.8		
Allegheny, PA	420033007	Yes (partial)	11.5 °	10.9 °	9.8 °		
Allegheny, PA	420030002	Yes (partial)	14.7°	13.4	11.4		

Table 1. Air Quality Data collected at Regulatory Monitors (all DV levels in µg/m³)^{a,b}

⁶⁴ In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

⁶⁵ Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in PM_{2.5} Speciated Aerosol Concentrations,

http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf

⁶⁶ US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle (PM_{2.5}) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle (PM_{2.5}) Designations, Chapter 3, Urban Excess Methodology. Available at

www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf

⁶⁷ In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III PM_{2.5} FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM...."

County, State	Monitor Site ID	State Rec NA?	09-11 DV	10-12 DV	11-13 DV		
Allegheny, PA	420031008	Yes (partial)	12.4 ^c	11.7	10.6		
Armstrong, PA	420050001	No	12.1°	11.7	10.8		
Beaver, PA	420070014	No	12.4	12	11.6		
Butler, PA	N/A	No		No monito	r		
Cambria, PA	420210011	Yes (other area)	12.4	12.3	12.3		
Clarion, PA	N/A	No		No monitor	r		
Fayette, PA	N/A	No		No monitor	r		
Greene, PA	N/A	No		No monitor	r		
Indiana, PA	N/A	No	No monitor				
Jefferson, PA	N/A	No	No monitor				
Lawrence, PA	N/A	No	No monitor				
Mercer, PA	420850100	No	10.5	10.6	10.3		
Somerset, PA	N/A	No		No monitor	r		
Venango, PA	N/A	No		No monito	r		
Washington, PA	421250200	No	11.3	11.1	10.3		
Washington, PA	421255001	No	9	7.2	7.2		
Westmoreland, PA	421290008	No	13.7	12.6	11.1		
Brooke, WV	540090005	No	13	12.7	11.6		
Hancock, WV	540291004	No	11.7 11.3		10.5		
Monongalia, WV	540610003	No	10.9	9.5			
Ohio, WV	540690010	No	11.9 11.6 10.6				
Preston, WV	N/A	No		No monito	r		

^aIf a county has more than one monitoring location, the county DV is indicated in bold type.

^bIf a monitor is violating, the NAAQS, the violating DV is indicated in red type.

^cIncomplete data.

The Figure A map, shown previously, identifies the Allegheny County intended nonattainment area, the Pittsburgh MSA boundary, and monitoring locations with 2011-2013 violating DVs in the area of analysis. Note that Figure A only shows monitors with valid DVs. Therefore, monitors in the area of analysis that did not meet the minimum data capture requirements as defined in 40 CFR 50, Appendix N, are not shown in Figure A. However, EPA has included these "incomplete data" monitors in Table 1.

As indicated on the map in Figures A and B and Table 1, there are 2 violating monitoring locations in the area of analysis. One violating monitor is located in Liberty Borough in Allegheny County, PA ("the Liberty monitor" or "the violating monitor"). The second violating monitor is located in Cambria County, PA. As discussed in Section 3.1, EPA conducted a five factor analysis for the violating monitor in Cambria County, and has determined that Cambria County, PA should be designated in a separate nonattainment area, the Johnstown nonattainment area.

As listed in Table 1, there are eight air quality monitors in Allegheny County. The PM_{2.5} DVs at seven of the eight monitors correlate well. However, the PM_{2.5} DV at the Liberty monitor is considerably higher. The large local sources plus the unique topographical features in this location result in substantially higher PM_{2.5} monitored values at the Liberty monitor than the other monitors in

Allegheny County. This point is demonstrated dramatically in Figure C, where Liberty monitor's 13.4 μ g/m³ DV is contrasted with that of the Clairton monitor (420033007), 9.8 μ g/m^{3.68} The Clairton monitor is two miles southwest of the Liberty monitor (420030064), and less than a mile southwest of the U.S. Steel Clairton Cokes Works (Clairton Coke Works).





Seasonal variation can highlight those conditions most associated with high average concentration levels of PM_{2.5}. Figure 1a shows quarterly mean PM_{2.5} concentrations for the most recent 3-year period for the highest DV monitoring sites in each county within the area of analysis. Figure 1b reflects the same information, for the eight monitors in Allegheny County. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.

 $^{^{68}}$ Although this DV is based on incomplete data and is not valid in accordance with Appendix N to 40 CFR 50, its data serves to illustrate the spatial variability of PM_{2.5} in the proximity of the violating monitor. This contrast is further illustrated in Figure 1b.

⁶⁹ The Clairton monitor (420033007) has incomplete data for the 2011-2013 monitoring period.



Figure 1a. Allegheny County Area of Analysis PM2.5 Quarterly Means for 2011-2013

Figure 1b. Allegheny County PM2.5 Quarterly Means for 2011-2013



As shown, in Figures 1a and 1b, most monitors in the area of analysis show higher quarterly mean values in third quarter (July-September) of each year. This is typical in the eastern half of the United States, when sulfates are more readily formed from SO₂ emissions from EGUs due to higher air conditioning use. As shown in Figure 1c, below, SO₂ emissions in the area of analysis spike in the third quarter, as expected given this seasonal pattern. The violating Liberty monitor in Allegheny County follows this general pattern, but monitored PM_{2.5} levels that are consistently higher than the rest of the monitors in the area, including the nearby Clairton monitor in the Borough, until the second

quarter of 2013. This indicates that the Liberty monitor is influenced by the same seasonal emissions patterns as the rest of the area, but there is an additional local component causing $PM_{2.5}$ levels to be higher than the rest of the area. Note that the recent improvement in air quality at the Liberty monitor coincide with control measures implemented at the Clairton Coke Works, as explained in factor 5, below. This suggests that air quality at the Liberty monitor benefits from emission controls at the Clairton Coke Works.

Additionally, in the fourth quarter (October-December) of 2011, $PM_{2.5}$ levels at the Liberty monitor peaked, when the other monitors in the area of analysis monitored relatively low $PM_{2.5}$ levels, The high fourth quarter in 2011 was possibly caused by strong temperature inversions in the vicinity of the violating monitor in later months of the year.⁷⁰ The effects of temperature inversions are discussed in factor 4 regarding geography and topography, below.





<u>PM_{2.5} Composition Measurements</u> - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total PM_{2.5} to identify the chemical components over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the PM_{2.5} at the violating monitoring location, EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for

⁷⁰ "PM_{2.5} Chemical Speciation Analysis for the Liberty-Clairton Area, 2005-2009," Allegheny County Health Department, December 2012.

the amount of PM_{2.5} mass components retained in the FRM measurement.^{71,72,73,74} In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. Figure 1d illustrates the fraction of each PM_{2.5} chemical component at the violating Liberty monitoring site in Allegheny County based on annual averages for the years 2011-2013. Figure 1e gives speciation data as provided in Pennsylvania's December 2013 recommendation letter. Note that Pennsylvania's speciation data is the raw data from the speciation monitor at the Liberty monitoring site. Pennsylvania did not adjust this data using the SANDWICH approach. In particular, the organic component is not presented as organic mass and thus significantly understates its contribution to PM_{2.5} mass. Because the Liberty monitor speciation data was not complete for the entire 3-year period, EPA constructed the speciation profile using other speciation monitors and adjusted the final profile to match the PM_{2.5} mass at violating monitor DV. Therefore, the EPA and PA composition profiles are different.

In its December 2013 letter, Pennsylvania identified 252 days in the 2010 to 2012 monitoring period, when the Liberty monitor's $PM_{2.5}$ concentrations were at least one standard deviation above the regional concentrations in the Pittsburgh MSA, and regional average was at or below 12 μ g/m³, i.e., "clean." Pennsylvania further analyzed the most extreme events during the 252 days, the top 25% high PM_{2.5} days. Figure 1f shows the average chemical component at the violating Liberty monitoring during the top 25% days high PM_{2.5} days.

⁷¹ SANDWICH stands for measured Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous mass Hybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured PM_{2.5} and its non-carbon components. This characterization of PM_{2.5} mass also reflects crustal material and other minor components. The resulting characterization provides a complete mass closure for the measured FRM PM_{2.5} mass, which can be different than the data provided directly by the speciation measurements from the CSN network.

⁷² Frank, N. H., SANDWICH Material Balance Approach for PM_{2.5} Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.

⁷³ Frank, N. H., The Chemical Composition of PM_{2.5} to support PM Implementation, EPA State /Local/Tribal Training Workshop: PM_{2.5} Final Rule Implementation and 2006 PM_{2.5} Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf*.

⁷⁴ Frank, N. H. *Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities.* J. Air & Waste Manage. Assoc. 2006 56:500–511.



Figure 1d. Liberty Monitor Annual Average PM_{2.5} Chemical Components (2010-2012)





Source: Pennsylvania's December 10, 2013 recommendation lettr, Appendix C-6 - Liberty-Clairton Area

Figure 1f. Liberty Monitor Average PM_{2.5} Chemical Components on the top 25% High PM_{2,5} Days (2010-2012)



Source: Pennsylvania's December 10, 2013 recommendation lettr, Appendix C-6 - Liberty-Clairton Area

Figure 1g shows annual and quarterly chemical composition profiles and illustrates any seasonal or episodic contributors to PM_{2.5} mass. This "increment analysis," combined with the other factor analyses, can provide additional insight as to which sources or factors may contribute at a greater level. Simply stated, this analysis can help identify nearby sources of emissions that contribute to the violation at the violating monitoring site.



Figure 1g. Liberty Monitor Annual and Quarterly Average PM2.5 Species (2010-2012)^a

^a*Adjusted to FRM Total PM*_{2.5} indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.

EPA assessed seasonal and annual average $PM_{2.5}$ components at monitoring sites within the area of analysis relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of $PM_{2.5}$, and the concentrations of $PM_{2.5}$ in the area of analysis,

also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figures 1h and 1j includes pie charts showing the annual and quarterly chemical mass components of the urban increment. The quarterly pie charts correspond to the high-concentration quarters identified in Figures 1a and 1b. Figure 1i presents first and third quarter urban increment data provide by Pennsylvania in its December 2011 designation recommendation letter. Evaluating these high concentration quarters can help identify composition of $PM_{2.5}$ during these times. Note that in these charts, sulfates and nitrates have been adjusted to represent their mass in measured $PM_{2.5}$.













Figure 1j. Allegheny County Area Quarterly Average Urban Increment Analysis for 2010-2012.



Both EPA's and PADEP's urban increment data shows high organic mass and elemental carbon. EPA's data shows high first quarter nitrates, while PADEP's shows high first quarter nitrates and sulfates. High first quarter nitrate concentrations are likely due to the greater tendency for NO_x to form in the atmosphere and for FRM monitors to retain particle nitrate during the cooler months. PADEP's data also shows chlorine at 7% in the first quarter. The organic and elemental carbon and chlorine signify contributions from local industrial sources. Note that Pennsylvania's speciation data is the raw data from the speciation monitor at the Liberty monitoring site. Pennsylvania did not adjust this data using the SANDWICH approach. In particular, the organic component is not presented as organic mass and thus significantly understates its contribution to PM_{2.5} mass.

Factor 2: Emissions and emissions-related data

In this designations process, for each area with a violating monitoring site, EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to PM_{2.5} concentrations at the violating monitoring site or monitoring sites in the area under evaluation. Similar to the air quality analysis, these data were examined on a seasonal basis. EPA examined emissions of identified sources or source categories of direct PM_{2.5}, the major components of direct PM_{2.5} (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO₂, NO_X, total VOC, and NH₃). EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct PM_{2.5} emissions and its major carbonaceous components are generally associated with sources near violating PM_{2.5} monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to PM_{2.5} from mobile and stationary sources) and transport from neighboring areas can contribute to higher PM_{2.5} levels at the violating monitoring sites.

Emissions Data

For this factor, EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. EPA also looked at the geographic distribution of major point sources of the relevant pollutants.⁷⁵ Significant emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, EPA also developed a summary of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

When considered with the urban increment analysis discussed in Factor 1, evaluating the components of direct PM_{2.5} and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and, thus, assist in identifying appropriate area boundaries. In general, directly emitted POC and VOCs⁷⁶ contribute to POM; directly emitted EC contributes to PM_{2.5} EC; NO_X, NH₃ and directly emitted nitrate contribute to PNO3; SO₂, NH₃ and directly emitted sulfate contribute to PSO4; and directly emitted crustal material and metal oxides contribute to Pcrustal.^{77,78} EPA believes that the quantities of those nearby emissions as potential contributors to the PM_{2.5} violating monitors are somewhat proportional to the PM_{2.5} chemical components in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO₂, partially because POC emissions are already PM_{2.5} whereas SO₂ must convert to PM_{2.5} and not all of the emitted SO₂ undergoes this conversion.

Table 2a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted PM_{2.5} and precursor species in tpy for each county in the area of analysis for the Allegheny County Area. Table 2b breaks down the direct PM_{2.5} emissions value from Table 2a into its components, This information will be paired with the urban increment composition previously shown in Figures 1g-1i. Table 2c gives total emissions of directly emitted PM_{2.5} and precursor species by quarter for the area of analysis.

⁷⁵ For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5} + NOx + SO_2 + VOC + NH_3$) are greater than 500 tpy based on NEI 2011v1.

⁷⁶ As previously mentioned, nearby VOCs are presumed to be a less important contributor to POM than POC.

⁷⁷ See, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.

⁷⁸ USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

			Total Direct			
County	Total NH3	Total NOX	PM _{2.5}	Total SO ₂	Total VOC	Total
Indiana, PA	832	35,818	3,172	98,344	5,005	143,171
Armstrong, PA	402	29,321	1,310	72,548	3,602	107,183
Allegheny, PA	1,255	36,427	6,417	15,085	24,456	83,640
Beaver, PA	566	21,266	2,396	26,986	4,110	55,324
Greene, PA	250	30,737	2,638	2,477	2,579	38,680
Monongalia, WV	154	16,941	1,738	8,101	3,716	30,650
Westmoreland, PA	1,037	12,924	1,957	1,262	9,837	27,017
Washington, PA	591	9,748	1,456	1,873	6,252	19,920
Cambria, PA	373	6,115	1,334	7,236	4,100	19,158
Lawrence, PA	575	4,328	736	7,757	2,769	16,165
Butler, PA	651	6,523	1,563	1,096	5,879	15,711
Mercer, PA	934	6,348	1,171	451	5,322	14,226
Fayette, PA	450	5,538	1,008	486	5,256	12,738
Preston, WV	249	2,451	510	6,578	1,321	11,108
Columbiana, OH	2,024	4,160	677	173	3,963	10,996
Somerset, PA	1,173	3,320	1,216	461	4,059	10,230
Jefferson, PA	248	5,273	770	691	2,821	9,804
Venango, PA	223	3,672	615	2,313	2,968	9,791
Clarion, PA	330	3,828	479	1,641	2,669	8,947
Garrett, MD	414	1,923	353	277	1,583	4,550
Brooke, WV	47	1,822	320	880	1,142	4,211
Ohio, WV	91	1,343	274	130	1,521	3,360
Hancock, WV	32	1,290	158	288	993	2,760

Table 2a. County-Level Emissions of Directly Emitted PM_{2.5} and Precursors (tpy)

Table 2b. County-Level Emissions for Components of Directly Emitted PM2.5 (tpy)

County, State	РОМ	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Allegheny, PA	2,501	929	408	23	1,014	1,540	6,417
Indiana, PA	547	172	247	4	870	1,333	3,172
Greene, PA	290	163	200	3	850	1,132	2,638
Beaver, PA	478	178	192	3	493	1,052	2,396
Westmoreland, PA	962	277	101	6	206	405	1,957
Monongalia, WV	359	134	106	2	476	661	1,738
Butler, PA	707	190	74	5	236	351	1,563
Washington, PA	691	183	72	31	154	325	1,456
Cambria, PA	678	148	48	3	158	300	1,334
Armstrong, PA	303	99	113	3	293	499	1,310

⁷⁹ Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries

⁽*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html*#2011 (accessed 02/26/14).

County, State	РОМ	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Somerset, PA	751	141	23	5	115	181	1,216
Mercer, PA	602	156	57	3	107	246	1,171
Fayette, PA	559	185	41	6	46	172	1,008
Jefferson, PA	300	102	120	2	35	211	770
Lawrence, PA	424	93	21	2	81	114	736
Columbiana, OH	328	124	12	2	88	123	677
Venango, PA	327	73	24	1	63	126	615
Preston, WV	169	55	25	1	105	155	510
Clarion, PA	265	73	20	1	26	94	479
Garrett, MD	184	66	11	1	16	75	353
Brooke, WV	90	35	19	1	58	116	320
Ohio, WV	163	47	5	1	18	40	274
Hancock, WV	84	31	6	1	11	26	158

Table 2c.	Quarterly Emiss	ions of Directly	Emitted PM	2.5 and Pre	cursors in th	e Allegheny
County A	rea of Analysis (t	py)				

Pollutant	1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter
SO ₂	75854.16	73232.87	92059.14	69266.51
PM _{2.5}	11082.82	8112.798	8299.623	9274.499
NO _X	66934.62	65104.02	67248.11	63715.25
VOC	27627.55	24528.25	25252.56	26630.03
NH ₃	2218.393	4343.374	3672.554	2151.167

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 2a and 2b, EPA identified the following components warranting additional review: organic mass, VOC, SO₂, PSO4, elemental carbon, NH₃, NOx and PNO3. These components were shown to be the most common in the urban increment in the Allegheny County Area, as shown in Figures 1g-1i. EPA then looked at the contribution of these components of interest from each of the counties included in the area of analysis as shown in Tables 2d-g.

Table 2d. County-Level POM and VOC Emissions

	Emiss	sions in :	average tpy			Emissions in average tpy			
County, State	РОМ	Pct.	Cumulative %		County, State	VOC	Pct.	Cumulative %	
Allegheny, PA	2,501	21%	21%		Allegheny, PA	24,456	23%	23%	
Westmoreland, PA	962	8%	29%		Westmoreland, PA	9,837	9%	32%	
Somerset, PA	751	6%	36%		Washington, PA	6,252	6%	38%	
Butler, PA	707	6%	42%		Butler, PA	5,879	6%	44%	
Washington, PA	691	6%	48%		Mercer, PA	5,322	5%	49%	
Cambria, PA	678	6%	53%		Fayette, PA	5,256	5%	54%	
Mercer, PA	602	5%	59%		Indiana, PA	5,005	5%	59%	
Fayette, PA	559	5%	63%		Beaver, PA	4,110	4%	62%	

Indiana, PA	547	5%	68%	Cambria, PA	4,100	4%	66%
Beaver, PA	478	4%	72%	Somerset, PA	4,059	4%	70%
Lawrence, PA	424	4%	76%	Columbiana, OH	3,963	4%	74%
Monongalia, WV	359	3%	79%	Monongalia, WV	3,716	4%	77%
Columbiana, OH	328	3%	82%	Armstrong, PA	3,602	3%	81%
Venango, PA	327	3%	84%	Venango, PA	2,968	3%	84%
Armstrong, PA	303	3%	87%	Jefferson, PA	2,821	3%	86%
Jefferson, PA	300	3%	89%	Lawrence, PA	2,769	3%	89%
Greene, PA	290	2%	92%	Clarion, PA	2,669	3%	91%
Clarion, PA	265	2%	94%	Greene, PA	2,579	2%	94%
Garrett, MD	184	2%	96%	Garrett, MD	1,583	1.5%	95%
Preston, WV	169	1%	97%	Ohio, WV	1,521	1.4%	97%
Ohio, WV	163	1%	99%	Preston, WV	1,321	1.2%	98%
Brooke, WV	90	1%	99%	Brooke, WV	1,142	1.1%	99%
Hancock, WV	84	1%	100%	Hancock, WV	993	0.9%	100%
Total	11,763				105,925		

Table 2e. County-Level SO2 and PSO4 Emissions

	Emissi	ions in a	verage tpy		Emissions in average		average tpy
County, State	SO ₂	Pct.	Cumulative %	County, State	PSO4	Pct.	Cumulative %
Indiana, PA	98,344	38%	38%	Allegheny, PA	408	21%	21%
Armstrong, PA	72,548	28%	66%	Indiana, PA	247	13%	34%
Beaver, PA	26,986	10%	77%	Greene, PA	200	10%	44%
Allegheny, PA	15,085	6%	83%	Beaver, PA	192	10%	54%
Monongalia, WV	8,101	3%	86%	Jefferson, PA	120	6%	60%
Lawrence, PA	7,757	3%	89%	Armstrong, PA	113	6%	66%
Cambria, PA	7,236	3%	92%	Monongalia, WV	106	5%	71%
Preston, WV	6,578	3%	94%	Westmoreland, PA	101	5%	76%
Greene, PA	2,477	1.0%	95%	Butler, PA	74	4%	80%
Venango, PA	2,313	0.9%	96%	Washington, PA	72	4%	84%
Washington, PA	1,873	0.7%	97%	Mercer, PA	57	3%	87%
Clarion, PA	1,641	0.6%	98%	Cambria, PA	48	2%	89%
Westmoreland, PA	1,262	0.5%	98%	Fayette, PA	41	2%	91%
Butler, PA	1,096	0.4%	99%	Preston, WV	25	1.3%	93%
Brooke, WV	880	0.3%	99%	Venango, PA	24	1.2%	94%
Jefferson, PA	691	0.3%	99%	Somerset, PA	23	1.2%	95%
Fayette, PA	486	0.2%	99%	Lawrence, PA	21	1.1%	96%
Somerset, PA	461	0.2%	99%	Clarion, PA	20	1.0%	97%
Mercer, PA	451	0.2%	100%	Brooke, WV	19	1.0%	98%
Hancock, WV	288	0.1%	100%	Columbiana, OH	12	0.6%	99%
Garrett, MD	277	0.1%	100%	Garrett, MD	11	0.5%	99%
Columbiana, OH	173	0.1%	100%	Hancock, WV	6	0.3%	100%

Ohio, WV	130	0.1%	100%	Ohio, WV	5	0.3%	100%
	257,134				1,945		

	Emissio	ns in av	erage tpy	County, State	Emiss	ions in a	verage tpy
			Cumulative				Cumulative
County, State	EC	Pct.	%		NH ₃	Pct.	%
Allegheny, PA	929	25%	25%	Columbiana, OH	2,024	16%	16%
Westmoreland, PA	277	8%	33%	Allegheny, PA	1,255	10%	25%
Butler, PA	190	5%	38%	Somerset, PA	1,173	9%	35%
Fayette, PA	185	5%	43%	Westmoreland, PA	1,037	8%	43%
Washington, PA	183	5%	48%	Mercer, PA	934	7%	50%
Beaver, PA	178	5%	53%	Indiana, PA	832	6%	56%
Indiana, PA	172	5%	58%	Butler, PA	651	5%	61%
Greene, PA	163	4%	62%	Washington, PA	591	5%	66%
Mercer, PA	156	4%	67%	Lawrence, PA	575	4%	70%
Cambria, PA	148	4%	71%	Beaver, PA	566	4%	75%
Somerset, PA	141	4%	75%	Fayette, PA	450	3%	78%
Monongalia, WV	134	4%	78%	Garrett, MD	414	3%	81%
Columbiana, OH	124	3%	82%	Armstrong, PA	402	3%	85%
Jefferson, PA	102	3%	84%	Cambria, PA	373	3%	87%
Armstrong, PA	99	3%	87%	Clarion, PA	330	3%	90%
Lawrence, PA	93	3%	90%	Greene, PA	250	2%	92%
Clarion, PA	73	2%	92%	Preston, WV	249	2%	94%
Venango, PA	73	2%	94%	Jefferson, PA	248	2%	96%
Garrett, MD	66	2%	95%	Venango, PA	223	2%	97%
Preston, WV	55	1%	97%	Monongalia, WV	154	1.2%	99%
Ohio, WV	47	1%	98%	Ohio, WV	91	0.7%	99%
Brooke, WV	35	1%	99%	Brooke, WV	47	0.4%	100%
Hancock, WV	31	1%	100%	Hancock, WV	32	0.2%	100%
Total	3,654				12,899		

Table 2f. County-Level EC and NH₃ Emissions

Table 2g. County-Level NOx and PNO3 Emissions (tpy)

	Emissions in average tpy						
County, State	Total NOX	Pct.	Cumulative %				
Allegheny, PA	36,427	15%	15%				
Indiana, PA	35,818	14%	29%				
Greene, PA	30,737	12%	41%				
Armstrong, PA	29,321	12%	53%				
Beaver, PA	21,266	8%	61%				
Monongalia, WV	16,941	7%	68%				
Westmoreland, PA	12,924	5%	73%				
Washington, PA	9,748	4%	77%				

County, State	Emis	Emissions in average tpy							
	PNO3	Pct.	Cumulative %						
Washington, PA	31	28%	28%						
Allegheny, PA	23	21%	50%						
Westmoreland, PA	6	5%	55%						
Fayette, PA	6	5%	60%						
Butler, PA	5	5%	65%						
Somerset, PA	5	5%	69%						
Indiana, PA	4	3%	73%						
Mercer, PA	3	3%	76%						

Butler, PA	6,523	3%	80%	Beaver, PA	3	3%	78%
Mercer, PA	6,348	3%	82%	Cambria, PA		3%	81%
Cambria, PA	6,115	2%	84%	Armstrong, PA		2%	83%
Fayette, PA	5,538	2%	87%	Greene, PA	3	2%	86%
Jefferson, PA	5,273	2%	89%	Jefferson, PA	2	2%	88%
Lawrence, PA	4,328	2%	91%	Lawrence, PA	2	2%	90%
Columbiana, OH	4,160	2%	92%	Monongalia, WV	2	2%	92%
Clarion, PA	3,828	2%	94%	Columbiana, OH	2	1%	93%
Venango, PA	3,672	1%	95%	Venango, PA	1	1%	94%
Somerset, PA	3,320	1%	96%	Preston, WV	1	1%	96%
Preston, WV	2,451	1%	97%	Clarion, PA	1	1%	97%
Garrett, MD	1,923	1%	98%	Garrett, MD	1	1%	98%
Brooke, WV	1,822	1%	99%	Brooke, WV	1	1%	99%
Ohio, WV	1,343	1%	99%	Ohio, WV	1	1%	99%
Hancock, WV	1,290	1%	100%	Hancock, WV		1%	100%
Total	251,115			Total	110		

As can be seen in Tables 2a-g, Indiana County has the highest emissions in the area of analysis, due to several large sources of SO₂. As further discussed in Section 3.1, EPA has determined that the portions of Indiana County that contain the large SO₂ sources should be designated as part of the Johnstown, PA nonattainment area. Furthermore, as discussed in factor 3 regarding meteorology, because the dominant wind direction in the area of analysis is southwest, Indiana County is not upwind of the violating Liberty monitor, and therefore not likely to be contributing to the violation there.

Allegheny County, which includes the City of Pittsburgh, has the highest NOx, EC, direct PM_{2.5}, PSO4, POM, and VOC emissions in the area of analysis. It also has the second highest PNO3 and NH₃ emissions, and the fourth highest SO₂ emissions in the area of analysis.

In addition to reviewing county-wide emissions of PM_{2.5} and PM_{2.5} precursors in the area of analysis, EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 2h provides facilitylevel emissions of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants (given in tpy) from major point sources with total emissions of 500 tpy or more located in the area of analysis for the Allegheny County Area. Table 2h also shows the distance from the facility to the violating Liberty monitor.

		Distance	NEI 2011 v1 Emissions (tpy)						
County, State	Facility Name (Facility ID)	violating monitor (miles)	NH3	NOx	PM _{2.5}	SO ₂	VOC	Total	
Allegheny, PA	USS/Clairton Coke Works (4200300032)	1	123	3,075	500	1,468	336	5,502	
Allegheny, PA	Us Steel Corp/Irvin Plt (4200300203)	2	4	762	72	419	61	1,318	

Table 2h. NEI 2011 v1 Point Source Emissions (#	tpy)
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		Distance	e NEI 2011 v1 Emissions (tpy)					
County, State	Facility Name (Facility ID)	violating monitor (miles)	NH3	NOx	PM2.5	SO ₂	VOC	Total
Allegheny, PA	USS Corp/Edgar Thomson Works (4200300202)	5	22	275	633	1,279	41	2,251
Allegheny, PA	Guardian Ind Corp/Jefferson Hills (4200300342)	5	0	978	22	73	19	1,093
Washington, PA	Genon Power Midwest LP/Elrama Power Plt (421250024)	6	0	561	24	428	4	1,017
Washington, PA	Allegheny Energy Supply Co/Mitchell Power Sta (421250014)	9	0	1,305	85	863	11	2,264
Allegheny, PA	Bay Valley Foods LLC/Pgh (4200300024)	11		212	20	313	1	546
Allegheny, PA	Genon Energy Inc/Cheswick Sta (4200300157)	15	3	3,294	498	9,290	10	13,096
Allegheny, PA	Shenango Inc/Shenango Coke Plt (4200300022)	16	3	427	97	372	100	999
Allegheny, PA	Allegheny Ludlum LLC/Brackenridge (4200300093)	21	4	255	223	33	62	576
Allegheny, PA	Pittsburgh International	23		550	17	68	94	729
Beaver, PA	Conway	31	0	545	16	5	41	608
Greene, PA	Allegheny Energy Supply Co/Hatfields Ferry Power Sta (420590006)	32	66	26,032	1,707	1,931	66	29,802
Beaver, PA	AES Beaver Valley LLC/Beaver Valley LLC (420070042)	34	0	2,705	156	3,170	17	6,050
Beaver, PA	Horsehead Corp/Monaca Smelter (420070032)	34	3	908	804	2,015	77	3,808
Butler, PA	Armstrong Cement & Supply/Winfield (420190024)	34		260	13	289	2	564
Butler, PA	AK Steel Corp/Butler Works (420190007)	35	7	310	156	54	63	589
Armstrong, PA	Genon Ne Mgmt Co/Keystone Sta (420050012)	36	2	20,797	438	46,467	29	67,732
Beaver, PA	Firstenergy Gen LLC/Bruce Mansfield Plt (420070005)	36	14	11,550	270	21,196	2	33,032
Beaver, PA	Jewel Acquisition/Midland Fac (420070043)	38	1	300	57	162	41	561
Greene, PA	Consol Pa Coal Co LLC/Bailey Prep Plt (420590008)	38		299	56	434	239	1,028
Indiana, PA	Homer City Gen LP/ Center Twp (420630003)	38	90	9,026	1,355	83,596	17	94,083
Brooke, WV	Mountain State Carbon, LLC (0002)	39	13	965	127	697	222	2,024

		Distance		Emissions	ions (tpy)			
County, State	Facility Name (Facility ID)	from violating monitor (miles)	NH3	NOx	PM2.5	SO ₂	VOC	Total
Monongalia, WV	Monongahela Power Co Fort Martin Power (0001)	42	43	11,144	752	3,964	93	15,995
Indiana, PA	Genon Ne Mgmt Co/Conemaugh Plt (420630001)	43	3	17,562	335	7,190	19	25,109
Monongalia, WV	Longview Power (0134)	43		340	55	364	16	775
Indiana, PA	Genon Wholesale Gen/Seward Gen Sta (420630002)	44	4	1,774	150	7,010	4	8,942
Armstrong, PA	Allegheny Energy Supply Co/Armstrong Power Sta (420050001)	47	10	3,109	116	25,739	21	28,994
Monongalia, WV	Morgantown Energy Associates (0027)	48	0	819	106	1,024	4	1,953
Lawrence, PA	Genon Power Midwest LP/New Castle Power Plt (420730025)	50	0	1,310	8	7,510	8	8,837
Cambria, PA	Inter Power Ahlcon L/Colver Power Proj (420210034)	58	2	713	20	2,883	4	3,622
Preston, WV	Monongahela Power Co - Albright P.S. (0001)	59	3	920	206	6,454	7	7,590
Cambria, PA	Ebensburg Power Co/Ebensburg Cogeneration Plt (420210033)	60	0	308	50	1,937	4	2,299
Cambria, PA	Cambria Cogen Co/Ebensburg (420210046)	62	2	713	163	1,941	12	2,831
Clarion, PA	Piney Creek LP/Piney Creek Power Plt (420310406)	63	0	270	8	1,477	0	1,755
Venango, PA	Scrubgrass Generating Co LP/Kennerdell Plt (421210013)	65	2	693	46	1,862	6	2,608
Jefferson, PA	Owens Brockway Glass Container Inc/Crenshaw Plt 19 (420650007)	87	1	410	107	180	23	722

Figure 2a shows the major point sources with emissions of at least 500 tpy (from the 2011 NEI in tpy) in the area of analysis for the Allegheny County Area and the relative distances of these sources from the violating monitoring location, as depicted by red dots. The actual distance from the point sources to the violating Liberty monitoring location is presented in Table 5. The distance from the violating Liberty monitoring location is particularly important for directly emitted PM_{2.5}. The influence of directly emitted PM_{2.5} on ambient PM_{2.5} diminishes more than that of gaseous precursors as a function of distance.⁸⁰

As indicated in Table 2h and Figure 2a, there are 37 point sources with emissions of at least 500 tpy located in the area of analysis. Nine of those sources are in Allegheny County. Figure 2b shows the point sources closest to the violating Liberty monitor.

⁸⁰ Baker, K. R. and K. M. Foley. A nonlinear regression model estimating single source concentrations of primary and secondarily formed *PM*_{2.5}. Atmospheric Environment. 45 (2011) 3758-3767.



Figure 2a. Major Point Source Emissions in the Area of Analysis for the Allegheny County Area.



Figure 2b. Close Up of Major Point Source Emissions in the Area of Analysis for the Allegheny County Area.

The spatial distribution of selected emissions throughout the area of analysis also provides useful information. POM and EC are the largest components of the urban increment at the Liberty monitor. Figures 2b2 and 2b3 shows that POM and EC are high throughout Allegheny County, including several 12 km grid squares immediately to the north and west of the Liberty monitor. POM and EC are lower in the surrounding counties. This suggests that POM and EC from the Pittsburgh urban area in Allegheny County, to the north and west of the Liberty monitor, have a relatively high potential to influence PM_{2.5} values at the violating monitor.









While the area around the Liberty monitor is influenced by the nearby urban area, i.e., the City of Pittsburgh, there is a very strong localized component to the air quality problem in this area. This was depicted by the spatial gradient in PM_{2.5} presented earlier. The Liberty monitor is located in the Monongahela River Valley, known as the Mon Valley. The Mon Valley is historically an industrial area. Emissions in the area near the Liberty monitor are dominated by the Clairton Coke Works. Clairton Coke Works is located approximately 20 miles south of Pittsburgh in Clairton, PA, and sits along the west bank of the Monongahela River. The Clairton Coke Works is the country's largest coking operation, with 816 ovens grouped into 12 batteries, and annual capability of 4.7 million tons. Coke is made by heating coal to extremely high temperatures (1100°C) in an oxygen deficient atmosphere. This concentrates the carbon and removes any impurities. The coke produced is subsequently used as fuel in iron and steel production because it generates very high heat with less smoke than coal. The production of the coke itself, however, produces significant amounts of emissions that affect ambient PM_{2.5} levels in this area.

The Allegheny County Health Department's (ACDH's) December 13, 2011 report, "Allegheny County PM_{2.5} Source Apportionment Results using the Positive Matrix Factorization Model (PMF Version 3.0) and Conditional Probability Function (CPF), Model Timeframe: January 2005 through December 2010," ("ACHD's December 13, 2011 report") explores the local sources contributing to PM_{2.5} levels at the Liberty monitor. ACHD entered data from the Liberty speciation monitor into the Positive Matrix Factorization Model (PFM) to calculate source factors. ACHD then matched the source factors to possible actual emission sources types. ACHD then used wind directions to apply "Conditional Probability Function (CFP)" to each source factor to show the frequency of wind directions for each factor during the factor's highest contributing days.

Figure 2c illustrates the twelve source factors found for the Liberty monitor. Some factors are quite small, such as "coal combustion or glass manufacturing" and "metal processing." Several of these factors are commonly found in Southwestern Pennsylvania ("SW PA"), such as "secondary ammonium sulfates and gasoline vehicles." As stated in ACHD's December 13, 2011 report, contributions of secondary ammonium sulfates and gasoline vehicle are "highest in summer, when sulfates are most prevalent. Sulfates exist as secondary PM_{2.5} throughout SW PA, formed by upwind SO₂ from sources such as coal-fired power plants. This factor also contains carbons that are peaking concurrently with sulfate, possibly from light-duty vehicle exhaust. Factor 7 is the largest factor by percentage of total (37%)."

A discussion of several key factors from ACDH's December 13, 2011 report follows.





The organic industrial carbons factor ("Factor 2" in the report) is composed of organic and elemental carbons as well as arsenic. The Clairton Coke Works is a major contributor to this factor. As stated ACHD's December 13, 2011 report:

"Weekday/weekend contributions are similar, indicating continuous activity. Yearly contributions are the lowest in 2009, with an increase in 2010, which may be attributed to industrial facilities with low production levels in 2009. Factor 2 is a significant factor (12% of total) and is strongly affected by inversions. Organic carbons may be primary or secondary in nature, possibly from coke production, chemical processing, and/or other sources. Arsenic may be attributed to coal combustion, coking, or wood burning. Smaller concentrations of other species are also grouped with this factor."

The ACHD report also explains that high days for organic industrial carbons correspond with days during which the dominant winds from the southwest. This correlation shows that the Clairton Coke Works is directly upwind of the monitor during high contributing days for organic industrial carbons.

Source: ACDH's December 13, 2011 report.

felder/ astman/Sany

Figure 2d. Wind Direction Frequency at the Liberty Monitor on High Organic Industrial Carbons Days

Source: ACDH's December 13, 2011 report.

The Clairton Coke Works is a major contributor to the elemental industrial carbons and localized sulfates factor ("Factor 6" in the report). As stated ACHD's December 13, 2011 report:

"Factor 6 shows high amounts of elemental carbon, organic carbon, and ammonium sulfates (primary or secondary), along with several trace elements. The factor is continuous with little day of the week differences and is best attributed to a "mix" of continuous industrial activity in the Monongahela River valley. This may include coke production, mobile diesel use (trucks, railroads, tug boats), and/or electric power generation. This factor makes up 18% of the total PM_{2.5} and, along with Factor 2, represents the majority of the excess PM_{2.5} at Liberty in comparison to other SW PA sites. Factor 6 shows the highest levels during inversions, although at lesser extremes in contributions than other factors. High percentages of lead and zinc are also present, which can be due to tire wear or incinerators."

The report also explains that high days for elemental industrial carbons and localized sulfates correspond to days when the dominant winds are from the south and southwest. This correlation shows that the Clairton Coke Works is directly upwind of the monitor during high contributing days for elemental industrial carbons and localized sulfates.





Source: ACDH's December 13, 2011 report.

The coal/coke dust factor ("Factor 8" in the report) consists of silicon and elemental carbon. As stated ACHD's December 13, 2011 report:

"Factor 8 shows a high amount of silicon and elemental carbon, which can be associated with coal and coke dust. It is a small factor overall (4% of total) and shows the highest contributions during inversions.
As with source factors 2 and 6, discussed above, high days for coal/coke dust again correspond to days when the dominant winds are from the south and southwest. Again, this correlation shows that the Clairton Coke Works is directly upwind of the monitor during high contributing days for coal/coke dust





Source: ACDH's December 13, 2011 report.

Source factor 10 for the Liberty monitor in ACDH's December 13, 2011 report is chlorine. As stated above, in factor 1 regarding air quality data, the urban increment speciation data at the Liberty monitor presented by PADEP shows seven percent chlorine in the first quarter. As stated in ACDH's December 13, 2011:

"Contributions from this factor are specific, usually appearing as very large peaks during coolweather inversions. Unlike the road salt factor for Lawrenceville, this factor is present in fall and spring and at much higher concentrations than road salt. Although road salt may be contributing a portion of the chlorine on winter days, the majority of this factor likely due to industrial activity that is emitting or utilizing chlorine. Sodium chloride and magnesium chloride are used for de-icing at the Liberty site, but no sodium is present with the factor (magnesium was not modeled due to low signal strength)."

The report also explains that high days for chlorine correspond to days when the dominant winds area from the south and southwest. This correlation shows that the Clairton Coke Works is directly upwind of the monitor during high contributing days for chlorine.



Figure 2g. Wind Direction Frequency at the Liberty Monitor on High Chlorine Days

Source: ACDH's December 13, 2011 report.

ACDH's December 13, 2011 report included the same type of analysis for the Lawrenceville monitor (420030008), which is an urban monitor in the Pittsburgh area. As illustrated in Table 1, the Lawrenceville monitor is attaining the 2012 annual PM_{2.5} NAAQS. Figure 2h compares the modeled source factors for the two monitors, and shows that the Lawrenceville monitor has large mobile source, light industry, burning and cooking components, typical of urban PM_{2.5}. The Liberty monitor shows localized heavy industry. ACDH's December 13, 2011 report also emphasizes that the Liberty monitor is heavily influenced by meteorological conditions, i.e. temperature inversions.



Figure 2h. Modeled Common Source Factors at the Liberty & Lawrenceville Monitors.

Source: ACDH's December 13, 2011 report.





The emissions data discussed above illustrates the strong influence of local industrialized sources on PM_{2.5} levels recorded at the Liberty monitor. Source apportionment work by ACHD shows that when organic industrial carbons; elemental industrial carbons and localized sulfates; and coal/coke dust are high at the Liberty monitor, winds are from the southwest and south, indicating that the Clairton Coke Works is the likely upwind source. ACHD's December 13, 2011 report supports a finding that Clairton Coke Works is a major contributor to PM_{2,5} levels at the Liberty monitor on days when PM_{2.5} levels are highest at the site. However, other local industrial sources, shown in Figures 2d-2g, are also southwest of the Liberty monitor, and therefore also likely contribute to the high concentration days. Furthermore, as will be discussed in the next section on meteorology, PM_{2.5}-related emissions may be locally transported from other directions and therefore other parts of Allegheny county.

Population density and degree of urbanization

In this part of the factor analysis, EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 2i shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area of analysis.

_	Population	Population	% Change	Land Area	Population Density (per		Cumulativa
County, State	2000	2010	from 2000	(square miles)	square mile)	%	%
Allegheny, PA	1,281,666	1,223,840	-4.5%	730	1,676	36%	36%
Westmoreland, PA	369,993	365,086	-1.3%	1,025	356	11%	46%
Washington, PA	202,897	207,882	2.5%	857	243	6%	53%
Butler, PA	174,083	184,053	5.7%	789	233	5%	58%
Beaver, PA	181,412	170,595	-6.0%	434	393	5%	63%
Cambria, PA	152,598	143,484	-6.0%	688	209	4%	67%
Fayette, PA	148,644	136,507	-8.2%	790	173	4%	71%
Mercer, PA	120,293	116,541	-3.1%	672	173	3%	74%
Columbiana, OH	112,075	107,820	-3.8%	532	202	3%	78%
Monongalia, WV	81,866	96,774	18.2%	361	268	3%	80%
Lawrence, PA	94,643	90,964	-3.9%	360	252	3%	83%
Indiana, PA	89,605	88,818	-0.9%	829	107	3%	86%
Somerset, PA	80,023	77,706	-2.9%	1,075	72	2%	88%
Armstrong, PA	72,392	68,864	-4.9%	654	105	2%	90%
Venango, PA	57,565	54,940	-4.6%	675	81	2%	92%
Jefferson, PA	45,932	45,224	-1.5%	655	69	1%	93%
Ohio, WV	47,427	44,447	-6.3%	106	419	1%	94%
Clarion, PA	41,765	39,934	-4.4%	602	66	1%	95%
Greene, PA	40,672	38,623	-5.0%	576	67	1%	97%
Preston, WV	29,334	33,534	14.3%	648	52	1%	98%
Hancock, WV	32,667	30,638	-6.2%	83	370	1%	98%
Garrett, MD	29,846	30,075	0.8%	648	46	1%	99%
Brooke, WV	25,447	24,000	-5.7%	89	270	1%	100%
Total	3,512,845	3,420,349					

 Table 2i. Population Growth and Population Density.

Source: U.S. Census Bureau population estimates for 2000 and 2010

This data presented in Table 2i and Figure 2j clearly shows that Allegheny County has the highest population and population density in the area of analysis. Allegheny County accounts for 36 percent of the population in this 23 county area of analysis. Allegheny County's population density is four times higher than Ohio County, WV, which has the second highest population density in the area of analysis.



Figure 2j. 2010 County-Level Population in the Area of Analysis for the Allegheny County Area.

Traffic and Vehicle Miles Travelled

High VMT and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and indicates that a county with high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area of analysis. Table 2j shows 2011 VMT, while Figure 2k overlays 2011 county-level VMT with a map of the transportation arteries.

Table 2j. 2011 VMT	for the Allegheny	County Area.
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County, State	VMT	Percent	Cumulative %	
Allegheny, PA	8,276,513,524	29%	29%	
Westmoreland, PA	3,087,660,497	11%	40%	
Butler, PA	1,765,361,166	6%	46%	

	Total 2011		
County, State	VMT	Percent	Cumulative %
Washington, PA	1,745,736,088	6%	53%
Mercer, PA	1,346,517,193	5%	57%
Beaver, PA	1,320,804,012	5%	62%
Columbiana, OH	1,092,970,892	4%	66%
Cambria, PA	1,007,874,393	4%	69%
Fayette, PA	948,403,446	3%	73%
Somerset, PA	924,890,368	3%	76%
Monongalia, WV	862,449,234	3%	79%
Indiana, PA	778,308,748	3%	82%
Lawrence, PA	700,366,617	2%	84%
Jefferson, PA	608,222,065	2%	86%
Clarion, PA	583,315,329	2%	89%
Armstrong, PA	582,533,913	2%	91%
Venango, PA	574,609,872	2%	93%
Garrett, MD	536,008,855	2%	95%
Ohio, WV	435,221,104	2%	96%
Greene, PA	421,356,837	1%	98%
Preston, WV	339,402,952	1%	99%
Brooke, WV	203,137,567	1%	99%
Hancock, WV	154,774,599	1%	100%
Total	28.296.439.271		

http://www.census.gov/hhes/commuting/data/commuting.html

As shown in Table 2j and Figure 2k, Allegheny County has by far the highest VMT in the area of analysis. Allegheny County accounts for 29 percent of the population in this 23 county area of analysis. Allegheny County's VMT is more than 2.5 times higher than Westmoreland County, which has the second highest VMT in the area of analysis.



Figure 2k. Overlay of 2011 County-level VMT with Transportation Arteries.

Pittsburgh is a densely populated city, with a population of 1.2 million and VMT of over 8 billion. As explained in factor 3, regarding meteorology, the wind rose closest to the Liberty monitor has a northwesterly component, indicating that at least some of the time, Pittsburgh is directly upwind of the violating Liberty monitor. Therefore, emissions from this highly urbanized area in Allegheny County, just northwest of the violating Liberty monitor, have a high potential to contribute to PM_{2.5} levels at the Liberty monitor.

Factor 3: Meteorology

EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. EPA used two primary tools for this assessment: wind roses and kernel density estimation (KDE). When considered in combination with area PM_{2.5} composition and county-level and facility emissions source location information, wind roses and KDE can help to identify nearby areas contributing to violations at violating monitoring sites.

Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate

the force of the wind and, thus, the distance from which those emissions are transported. EPA constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.⁸¹ When developing these wind roses, EPA also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 3a shows wind roses that EPA generated from data relevant in the Allegheny County area. Figure 3b gives a close up of wind roses near the violating Liberty monitor.

As can be seen in Figures 3a and 3b, the dominant wind direction in the area of analysis this southwest, with a large westerly component. The wind rose closest to the Liberty monitor, seen more clearly in Figure 3b, shows strong southerly and westerly components, with southwesterly and northwesterly components. The northwesterly component indicates that the highly urbanized Pittsburgh area is upwind of, and therefore contributing to, the Liberty monitor.

Indiana County, which has the highest emissions in the area of analysis due to several large sources of SO₂, is east of the Allegheny County and therefore east of the violating monitor. Armstrong County, which has the second highest emissions in the area of analysis is northeast of Allegheny County, and therefore northeast of the violating monitor. Because the dominant wind direction in the area of analysis is southwest, Indiana and Armstrong Counties are not upwind of the violating Liberty monitor, and therefore not contributing to the violation there.

Washington County is to the southwest of the violating monitor. However, emissions in Washington County are relatively low, less than a quarter of Allegheny County's emissions. Furthermore, POM and EC, the largest components of the urban increment at the violating monitor, are low in Washington County, as can be seen in Figures 2b2 and 2b3. Washington County also has relatively low population, population density, and VMT. There are two point sources with emissions of greater than 500 tpy in Washington County. However, as seen in Table 2h, these sources have very low direct PM_{2.5} and VOC emissions, which indicates that any potential contribution to the POM and EC in the urban increment at the Liberty monitor is relatively low. Furthermore, as shown in factor 5 regarding topography, the area of analysis is dominated by high terrain. As can be seen in Figure 4a, that terrain limits transport of emissions from Washington County to the Liberty monitor.

⁸¹ *ftp.ncdc.noaa.gov/pub/data/noaa* or

http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*



Figure 3a. Wind Roses in the Area of Analysis for Allegheny County Area.



Figure 3b. Wind Roses Close to the Violating Liberty Monitor.

In its December 2013 recommendation letter, Pennsylvania included wind direction analysis at high $PM_{2.5}$ days at the Liberty monitor. As stated above, Pennsylvania identified 252 days in the 2010 to 2012 monitoring period where $PM_{2.5}$ at the Liberty monitor was at least one standard deviation above the Pittsburgh MSA. Pennsylvania analyzed the wind directions for the highest of those days, the top twenty-five percent (the "high $PM_{2.5}$ days"). For these high $PM_{2.5}$ days, Pennsylvania calculated the number of hours the wind was coming from a particular direction as well as the concentrations coming from a particular direction, using data from a meteorological station collocated with the Liberty monitor. Figures 3c and 3d represents the wind direction frequency and concentration distribution by wind direction, respectively, at the Liberty monitor during its high $PM_{2.5}$ days.

As can be seen in Figures 3c and 3d, wind direction on the high $PM_{2.5}$ days at the Liberty monitor is almost completely from the southwest. This wind direction shows that on high $PM_{2.5}$ days, the Clairton Coke Works is directly upwind of the Liberty monitor. It should be noted that the Clairton monitor, which is attaining the 2012 annual $PM_{2.5}$ NAAQS, is directly southwest, i.e., upwind, of the Clairton Coke Works, as illustrated in Figure C.



Figure 3c. Wind Direction Frequency on High PM2.5 Days at the Liberty Monitor

Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-6 - Liberty-Clairton Area

Figure 3d. Concentration Distribution by Wind Direction on High PM_{2.5} Days at the Liberty Monitor



Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-6 - Liberty-Clairton Area

While the Liberty montor is a population-based monitor, ACHD and the owner and operator of the Clairton Coke Works, US Steel, have acknowlenged that it is uniquely situated to monitor emissions from the Clairton Coke Works. As stated in ACHD's 2013 monitoring plan:

"This site is population oriented but is also about 3 km downwind of the US Steel Clairton Coke Works, which is a major source of particulate matter and precursor gases as well as sulfur dioxide and air toxics. The area around this monitoring site has a long history of higher than average levels of $PM_{2.5}$, PM_{10} and sulfur dioxide. Significant ambient levels of benzene have also been measured and documented at this site. Liberty is a core $PM_{2.5}$ site that is used to determine compliance with national standards.

At the request of US Steel, telemetry devices have been installed on the PM_{10} , $PM_{2.5}$, SO_2 , H_2S monitors that transmit continuous readings via radio signals to a location within the US Steel facility. Other transmitters are also in use at Lincoln PM_{10} and $PM_{2.5}$ monitors (site # 8.3), Glassport High Street PM_{10} monitor (site # 8.4) and North Braddock SO_2 monitor and sonic anemometer. This real-time data allows US Steel to minimize fugitive emissions and to adjust production levels to keep particulate levels and gaseous emissions within allowable ambient levels in downwind communities."

In addition to wind roses, EPA also generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at violating monitoring sites.^{82,83} These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories.⁸⁴ Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell. Figure 3e shows a HYSPLIT KDE plot for the Allegheny County Area summarized by calendar quarter for the 2010-2012 period. The HYSPLIT KDE is weighted in the southwesterly direction, indicating a greater frequency of trajectories passing over grid cells to the southwest. However, the darker blue colors also cover most of Allegheny County, including the area to the north and northwest of the county, i.e the highly urbanized Pittsburgh area, that contains high density of POM and EC emissions.

⁸² In some past initial area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.

 ⁸³ HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model, *http://www.arl.noaa.gov/HYSPLIT_info.php* ⁸⁴ The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.



Figure 3e. HYSPLIT Kernel Density Estimation Plots for the Allegheny County Area. First Quarter Second Quarter

Factor 4: Geography/topography

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To evaluate the geography/topography factor, EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area.

The Clairton Coke Works is at the base of the Mon Valley, approximately 750 feet above mean sea level (MSL). The facility sits on the west bank of the Monongahela River. On the east bank, the terrain rises sharply reaching elevations more than 300 feet above the coke works within a thousand feet of the plant. The Liberty monitor is about 1100 feet above MSL, to the northeast of the coke works.



Figure 4a. Topography of Liberty Monitor and Surrounding Area.

Figure 4b. Satellite Imagery of the Clairton Coke Works and Surroundings



121-190

County Boundaries

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Southwestern Pennsylvania has relatively high terrain cut by numerous river valleys, which tend to trap local emissions. This tendency to trap local emissions, combined with large local emissions, would explain why the monitored values at the Liberty monitor are so much higher than at the other monitors in the Pittsburgh area, which are all attaining the 2012 annual PM_{2.5} NAAQS.

Furthermore, in its October 20, 2008 letter to EPA regarding boundary recommendations for the 2006 PM_{2.5} NAAQS, PADEP stated that the Clairton Coke Works facility has stack heights that are lower than normal power plant stacks. This means that the effects of a source like the coke works would impact the ground at a much closer location locally than a power plant. PADEP's October 20, 2008 letter also explained that the highest PM2.5 concentrations occur at the Liberty monitor when there are south-southwesterly winds along with a morning inversion. A morning inversion occurs when air at the ground is cooler than the air above it; normally at night, the area is under the control of high pressure and clear skies. With the warmer air being above the cooler air, vertical mixing is at a minimum. Therefore, with an inversion in place, PM_{2.5} and precursor emissions in the boundary layer will remain trapped in that layer. For example, as the Clairton Coke Works' low level stacks emit emissions, the plume of emissions will only rise to the top of the inversion layer. At that point, the pollution is spread out horizontally. These inversions usually set up only a few hundred feet above the surface. Therefore, fine particulate levels can become very high near the surface. In this case, such a plume impacts the hillside across the river as well; the plume is actually not traveling long distances. This is evident from the speciation data from two monitoring sites, Liberty and Lawrenceville. (For more information on speciation data, see Factor 2, above.)

Factor 5: Jurisdictional boundaries

In defining the boundaries of the intended Allegheny County nonattainment area, EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify the state, local, or tribal governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the intended area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the intended designated areas.

There are no jurisdiction issues in the Allegheny County Area. The PM_{2.5} planning for Allegheny County is under the purview of the Allegheny County Health Department. The Pennsylvania Department of Environmental Protection does the planning for the Pittsburgh-Beaver Valley nonattainment areas for the 1997 annual and 2006 24-hour PM_{2.5} NAAQS. However, these two agencies have a long history of cooperation.

ACHD has a long history of air quality planning for the area surrounding the Liberty monitor. The City of Clairton and the Boroughs of Glassport, Liberty, Lincoln, and Port Vue Clairton Area were designated as the Liberty-Clairton nonattainment area for the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. The same five municipalities were designated nonattainment for the 1987 PM_{10} NAAQS by operation of law on November 15, 1990. The nonattainment designation and classification as a moderate PM_{10} area was codified in 40 CFR part 81 on November 6, 1991 (56 FR 56694). The area

attained the PM₁₀ NAAQS through ACHD's state implementation plan (SIP) approved measures, and was redesignated to attainment in 2003 (68 FR 53515).

As seen in Table 5, air quality in the area has improved markedly over time. This improvement is due to emission reduction measures taken at the Clairton Coke works. Recent measures include⁸⁵:

- 2009 Batteries 7-9 were permanently shut down
- 2010 Battery B rebuild completed
- 2012 25 heating walls on Battery 19 replaced
- 2013 Construction of new low emission quench towers, Quench Towers 5A and 7A, for Batteries 13-15 and Batteries 19-20. The older Quench Towers 5 and 7 will serve as auxiliary quench towers.

Table 5. Annual PM _{2.5} DVs at the Liberty Monitor (µg/m ³)										
2001-	2002-	2003-	2004-	2005-	2006-	2007-	2008-	2009-	2010-	Preliminary
2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2011-2013
21.2	20.4	20.8	20.4	19.8	18.3	17.0	16.0	15.0	14.8	13.4

In addition, on October 25, 2013 (78 FR 63881), effective November 25, 2013, EPA determined that the Liberty-Clairton area has air quality data that meets the 1997 annual PM_{2.5} NAAQS, and that the area attained that NAAQS by its attainment date. EPA believes that the same locally focused planning will bring the area into attainment for the 2012 annual PM_{2.5} NAAQS.

Conclusion for the Allegheny County Area

Based on the assessment of factors described above, both individually and in combination, EPA has preliminarily concluded that Allegheny County should be designated as nonattainment for the 2012 annual $PM_{2.5}$ NAAQS. EPA has determined that there are strong local influences throughout Allegheny County that are contributing to its nonattainment. The detailed technical analysis, set forth in Factors 1 - 4 supports a finding that this area presents local air quality problems that differentiate this county from the surrounding counties. Therefore, EPA has determined that it is appropriate to designate Allegheny County, and no other counties in the Pittsburgh MSA, as nonattainment.

The Liberty monitor is located in the industrialized Mon Valley, which is dominated by the U.S. Steel Clairton Cokes Works. The Clairton Coke Works is a large and complex facility that emits a combination of particulates, sulfur dioxide, ammonia, and hundreds of volatile organic chemicals. Although the coke plant has numerous existing emission controls, the combination of a large amount of low-level emissions in a narrow river valley creates a local air quality problem which is uniquely different from the remainder of the area. DVs for 2011-2013 at seven monitors in Allegheny County are below the 12 μ g/m³ standard. However, the 2011-2013 DV at the Liberty monitor is 13.4 μ g/m³. In its December 2013 letter, Pennsylvania identified 252 days in the 2010 to 2012 monitoring period

⁸⁵ Page 15 of the "Proposed Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan, Attainment Demonstration for the Liberty-Clairton PM_{2.5} Nonattainment Area 2006 Standards," by ACHD Air Quality Program, dated May 10, 2013,

when the violating Liberty monitor's $PM_{2.5}$ concentrations were at least one standard deviation above the regional concentrations in the Pittsburgh MSA, and regional average was at or below 12 μ g/m³.

As discussed in factor 3 regarding meteorology, while Indiana and Armstrong Counties have the first and second highest emissions in the area of analysis the dominant wind directions in the area indicate that Indiana and Armstrong Counties do not contribute to the violation at the Liberty monitor. Furthermore, as discussed in Section 3.1, EPA has determined that the portions of Indiana County that contain the large SO₂ sources should be designated as part of the Johnstown, PA nonattainment area.

Washington County is to the southwest of the violating monitor. However, total emissions, as well as emissions of POM and EC, the largest components of the urban increment at the violating monitor, are relatively low in Washington County. Washington County also has relatively low population, population density, and VMT. There are two point sources with emissions of greater than 500 tpy in Washington County. However, these sources have very low direct PM_{2.5} and VOC emissions, which indicates that any potential contribution to the POM and EC in the urban increment at the Liberty monitor is relatively low. Furthermore, terrain limits transport of emissions from Washington County to the Liberty monitor.

Wind roses provided by PADEP show that wind directions on high PM_{2.5} days at the Liberty monitor are almost completely from the southwest. This wind direction shows that on high PM_{2.5} days, the Clairton Coke Works is directly upwind of the violating Liberty monitor. Furthermore, source apportionment work by ACHD shows that when organic industrial carbons; elemental industrial carbons and localized sulfates; coal/coke dust; and chlorine are high at the Liberty monitor, winds are from the southwest and south, indicating that the Clairton Works is the likely upwind source. ACDH's December 13, 2011 report included the same type of analysis for the Lawrenceville monitor (420030008), which is an urban monitor in the Pittsburgh area that is meeting the 2012 annual PM_{2.5} NAAQS. Figure 2h compares the modeled source factors for the two monitors, and shows that the Lawrenceville monitor has large mobile source, light industry, burning and cooking components typical of urban PM_{2.5}. The Liberty monitor shows impacts from localized heavy industry. ACDH's December 13, 2011 report emphasizes that the Liberty monitor is heavily influenced by meteorological conditions, i.e. temperature inversions.

As discussed in factor 4 regarding geography/topography, southwestern Pennsylvania is dominated by high terrain cut by numerous river valleys. The Clairton Coke Works is located in one of these river valleys, the Mon Valley. The fact that this type of terrain tends to trap local emissions, combined with large local emissions, explains why the monitored values at the Liberty Borough monitor are so much higher than at the other seven monitors in the Pittsburgh area. Furthermore, the Clairton Coke Works facility has stack heights that are lower than normal power plant stacks. This would mean that the effects of a source like the coke works would impact the ground at a much closer location locally than a power plant. The highest PM_{2.5} concentrations happen at the Liberty monitor when there are south-southwesterly winds along with a morning inversion. A morning inversion occurs when air at the ground is cooler than the air above it; normally at night, the area is under the control of high pressure and clear skies. With the warmer air being above the cooler air, vertical mixing is at a minimum. Therefore, PM_{2.5} and precursor emissions in the boundary layer with an inversion in place will remain trapped in that layer.

As shown, in Figures 1a and 1b, most monitors in the area of analysis, including the violating Liberty monitor, show higher quarterly mean values in third quarter (July-September) of each year. However,

 $PM_{2.5}$ levels at the violating Liberty monitor are consistently higher than the rest of the monitors in the area. This indicates that the Liberty monitor is influenced by the same seasonal emissions patterns as the rest of the area, but there is an additional local component causing $PM_{2.5}$ levels to be higher than the rest of the area.

Pennsylvania has recommended that only the five municipalities in the Liberty-Clairton nonattainment area for the 1997 annual and 2006 24-hour PM_{2.5} NAAQS be designated as nonattainment for the 2012 annual PM_{2.5} NAAQS. While there is a very strong local contribution to the violation at the Liberty monitor from the Clairton Coke Works, EPA has concluded that other sources in the remainder of Allegheny County also contributes to the violation at the Liberty monitor. Allegheny County, which includes the City of Pittsburgh, has the highest NOx, EC, direct PM_{2.5}, PSO4, POM, and VOC emissions in the area of analysis. It also has the second highest PNO3 and NH₃ emissions, and the fourth highest SO₂ emissions in the area of analysis. There are nine major sources with emissions of 500 tpy or more in Allegheny County, four of which are within five miles of the violating monitor.

The spatial distribution of selected emissions throughout the area of analysis also provides useful information. POM and EC, the largest components of the urban increment at the Liberty monitor, are high throughout Allegheny County, including several 12 km grid squares immediately to the north and west of the Liberty monitor. POM and EC are lower in the surrounding counties. This suggests that POM and EC from the Pittsburgh urban area in Allegheny County, to the north and west of the Liberty monitor, have a high potential to influence PM_{2.5} values at the violating monitor.

Pittsburgh is a densely populated city, with a population of 1.2 million and VMT of over 8 billion. As explained in factor 3, regarding meteorology, the wind rose closest to the Liberty monitor has a northwesterly component, indicating that at least some of the time, Pittsburgh is directly upwind of the violating Liberty monitor. Therefore, emissions from this highly urbanized area in Allegheny County, just northwest of the violating Liberty monitor, have a high potential to contribute to PM_{2.5} levels at the Liberty monitor. Therefore, EPA has concluded that all of Allegheny County should be designated as nonattainment for the 2012 annual PM_{2.5} area, as the Allegheny County Area.

Attachments

ACDH's December 13, 2011 report, "Allegheny County PM_{2.5} Source Apportionment Results using the Positive Matrix Factorization Model (PMF Version 3.0) and Conditional Probability Function (CPF), Model Timeframe: January 2005 through December 2010"

ACHD Air Quality Program "2013 Air Monitoring Network Review," dated July 1, 2013

Letter dated October 20, 2008 from the PADEP to EPA regarding boundary recommendations for the 2006 $PM_{2.5}$ NAAQS

"Proposed Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan, Attainment Demonstration for the Liberty-Clairton PM_{2.5} Nonattainment Area 2006 Standards," by ACHD Air Quality Program, dated May 10, 2013

3.4 Area Background and Overview - Allentown Area

Figure 1a is a map of EPA's intended nonattainment boundary for the Allentown Area. The map shows the location and DVs of ambient air quality monitoring locations, county and other jurisdictional boundaries including the Allentown-Bethlehem-Easton, PA-NJ MSA. For purposes of the 2006 24-hour PM_{2.5} NAAQS, a portion of this area was designated nonattainment. The boundary for the Allentown nonattainment area for the 2006 24-hour PM_{2.5} NAAQS included the entire counties of Lehigh and Northampton counties in Pennsylvania. The boundary for the intended 2012 annual PM_{2.5} NAAQS is the same as the boundary for the 2006 24-hour PM_{2.5} NAAQS.



Figure 1a. EPA's Intended Nonattainment Boundaries for the Allentown Area

EPA must designate, as nonattainment, areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. A monitor in Northampton County, PA shows a violation of the 2012 annual PM_{2.5} NAAQS, therefore this county is included in the nonattainment area. As shown in Figure 1b, EPA evaluated each county in the Allentown-Bethlehem-Easton MSA, which includes Northampton County, PA as well as Carbon County and Lehigh County in Pennsylvania; Warren County, New Jersey, and a ring of counties adjacent to the Allentown-Bethlehem-Easton, PA-NJ MSA. EPA's evaluation was based on the five factors and other relevant information. In addition to Northampton County, EPA has determined that Lehigh County also contributes to the nearby violation at the Northampton County violating monitor. The following sections describe this five factor analysis

process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.



Figure 1b. Area of Analysis for the Allentown Intended Nonattainment Area

Factor 1: Air Quality Data

All data collected during the year are important when determining contributions to an annual standard such as the 2012 annual PM_{2.5} NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. For the 2012 annual PM_{2.5} NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured PM_{2.5} concentrations. For these reasons, for the Factor 1 air quality analysis, EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of PM_{2.5} mass in the area of analysis.

In most cases, EPA assessed air quality data on a seasonal, or quarterly, basis.⁸⁶ EPA also identified the spatial extent of these high PM_{2.5} concentrations. The mass and composition at the DV location represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the DV monitoring site, EPA examined the chemical composition of the monitored PM_{2.5} concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, EPA contrasted the approximated mass composition at the DV monitoring site with data collected at IMPROVE⁸⁷ and other monitoring locations whose data are representative of regional background.^{88,89} This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from the influence of closer emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.^{90,91,92}

http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf

⁹² US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle (PM_{2.5}) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle (PM_{2.5})

⁸⁶ Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting PM_{2.5} mass and composition. In some areas of the country where there may be noticeable month-to-month variations in average PM_{2.5}, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas. ⁸⁷ IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

⁸⁸ The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average PM_{2.5} mass and chemical components observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in PM_{2.5} mass between the violating site and the nearby CSN site(s), EPA determined material balance of the PM_{2.5} composition at the violating site by assigning the extra measured PM_{2.5} mass to the carbon components of PM_{2.5}. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local PM_{2.5} concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

⁸⁹ The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

⁹⁰ In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

⁹¹ Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in PM_{2.5} Speciated Aerosol Concentrations,

<u>PM_{2.5} Design Values and Total Mass Measurements</u> - EPA examined ambient PM_{2.5} air quality monitoring data represented by the DVs at the violating monitoring site and at other monitors in the area of analysis. EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, EPA used data for the 2011-2013 period (i.e., the 2013 DV), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2012 annual PM_{2.5} NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter (μ g/m³) or less (e.g., 12.1 μ g/m³ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2 identifies the current DVs (i.e., the 2013 DV) and the most recent two DVs based on all monitoring sites in the area of analysis for the Allentown intended nonattainment area.⁹³

			09-11	10-12	11-13
County, State	Monitor Site ID	State Rec NA?	DV	DV	DV
Berks, PA	420110011	No	10.7	10.9	11
Bucks, PA	420170012	No	10.9	10.9	10.8
Lehigh, PA	N/A	No		No monitor	
Luzerne, PA	N/A	No		No monitor	
Monroe, PA	N/A	No	8	8	7.9
Montgomery, PA	420910013	No	10.1	9.8	9.8
Northampton, PA	420950025	Yes	13.4	13.2	12.2
Northampton, PA	420950027	Yes		10.6	10.6
Schuylkill, PA	N/A	No		No monitor	
Hunterdon, NJ	N/A	No		No monitor	
Morris, NJ	340270004	No	8.5	8.4	8.4
Morris, NJ	340273001	No	7.6	7.6	7.5
Sussex, NJ	N/A	No	No monitor		
Warren, NJ	340410006	No	9.2	9.4	9.1

Table 2. Air Quality Data collected at Regulatory Monitors (all DV levels in µg/m³)^{a,b}

^aIf a county has more than one monitoring location, the county DV is indicated in bold type.

^bIf a monitor is violating, the NAAQS, the violating DV is indicated in red type.

Designations, Chapter 3, Urban Excess Methodology. Available at

www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf

⁹³ In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III PM_{2.5} FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and te monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM...."

The Figure 1a map, shown previously, identifies the Northampton County, PA intended nonattainment area, the Allentown-Bethlehem-Easton, PA-NJ MSA boundary and monitoring locations with 2011-2013 violating DVs. As indicated on the map, there is one violating monitoring located in Northampton County, PA (Northampton County violating monitor). Northwest of the violating monitor there is a non-violating monitor also located in Northampton County (Northampton County non-violating monitor).

Seasonal variation can highlight those conditions most associated with high average concentration levels of PM_{2.5}. Figure 2 shows quarterly mean PM_{2.5} concentrations for the most recent 3-year period for the highest DV monitoring sites in each county within the area of analysis. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.





As shown, in Figure 2, most monitors in the area of analysis show higher quarterly mean values in quarter 1 and quarter 3. Higher quarterly mean values in quarter 3 correspond to higher emissions from electric generating units (EGUs) from higher air conditioning use. Higher quarterly mean values in quarter 1 may be due to higher EGU emissions from increased heating use, and may include emissions from home heating oil and residential wood burning stoves. In addition, there is a greater tendency for NO_x to form in the atmosphere and for FRM monitors to retain particle nitrate during the cooler months. However, the Northampton County violating monitor does not have a clear seasonal pattern similar to other monitors in the area of analysis, indicating local influences at the monitor.

 $\underline{PM_{2.5} \text{ Composition Measurements}}$ - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total $PM_{2.5}$ to

identify the chemical components over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the PM_{2.5} at the violating monitoring location, EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for the amount of PM_{2.5} mass components retained in the FRM measurement.^{94,95,96,97} In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. Figure 3a illustrates the fraction of each PM_{2.5} chemical component at the violating monitoring site (420950025) located in Northampton County, PA based on annual averages for the years 2010-2012.



Figure 3a. Allentown Area Annual Average PM2.5 Chemical Components (2010-2012)

Figure 3b shows annual and quarterly chemical composition profiles and illustrates any seasonal or episodic contributors to PM_{2.5} mass. This "increment analysis," combined with the other factor analyses, can provide additional insight as to which sources or factors may contribute at a greater

⁹⁴ SANDWICH stands for measured Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous mass Hybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured PM_{2.5} and its non-carbon components. This characterization of PM_{2.5} mass also reflects crustal material and other minor components. The resulting characterization provides a complete mass closure for the measured FRM PM_{2.5} mass, which can be different than the data provided directly by the speciation measurements from the CSN network.

⁹⁵ Frank, N. H., SANDWICH Material Balance Approach for PM_{2.5} Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.

⁹⁶ Frank, N. H., The Chemical Composition of PM_{2.5} to support PM Implementation, EPA State /Local/Tribal Training Workshop: PM_{2.5} Final Rule Implementation and 2006 PM_{2.5} Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf*.

⁹⁷ Frank, N. H. Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities. J. Air & Waste Manage. Assoc. 2006 56:500–511.

level. Simply stated, this analysis can help identify nearby sources of emissions that contribute to the violation at the violating monitoring site.





^aAdjusted to FRM Total $PM_{2.5}$ indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.

The speciation data in Figures 3a and 3b for the Northampton County violating monitoring site indicate that organic mass and sulfates are the predominant species overall. Figure 3b also illustrates that during the first quarter the percentage of nitrates is higher than the other quarters, which may be due to increased EGU emissions from winter heating needs and greater particle nitrate collection during the cooler months. In all four quarters, elemental carbon and crustal are smaller $PM_{2.5}$ components.

In Pennsylvania's December 2013 recommendation letter, Pennsylvania also included speciation data for the 2010-2012 monitoring period (note that Pennsylvania's speciation presentation is based on measurement data which was not adjusted by the SANDWICH method. One consequence is that their POC portion of PM_{2.5} is less than EPA's POM portion). Pennsylvania also included speciation data for days when the Northampton monitor's PM_{2.5} concentrations were relatively high but the regional monitoring concentrations were "clean," i.e. 0-12 µg/m³. Pennsylvania considered regional monitoring concentrations to be those from the following monitoring sites: Swiftwater (Monroe County), Lehigh Valley (Northampton County) and Reading Airport (Berks County). Specifically, Pennsylvania identified 344 days in the 2010 to 2012 monitoring period where PM_{2.5} at the Northampton County violating monitor was at least one standard deviation above the Allentown-Bethlehem-Easton MSA regional average (high days). The top 25% of these high days (highest PM_{2.5} days) were further analyzed to determine why the Northampton County violating monitor's concentrations were high. During the highest PM_{2.5} days, Pennsylvania analyzed the days when the Northampton County monitor collected speciation data. Of the 86 days which were in the top 25% (highest PM_{2.5} days), speciated data was collected on nine days. Figure 3c displays the distribution of

the speciated components of $PM_{2.5}$ during the entire 2010-2012 monitoring period and, similar to EPA's speciation analysis, shows that organic carbon and sulfate are large components of $PM_{2.5}$. Figure 3d displays the distribution of the speciated components of $PM_{2.5}$ during the nine days in the top 25% of high days. On these highest $PM_{2.5}$ days, organic carbon, sulfate and crustal material are large components of the $PM_{2.5}$.





Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-2 - Northampton County Area

 $^{^{98}}$ EPA notes that POM is much larger than measured OC and therefore represents a larger percentage of measured PM_{2.5}. Similarly, other PM_{2.5} components like crustal material will represent a smaller portion of PM_{2.5} when POM and other adjustments to measured components are made to represent the components of PM_{2.5} using the SANDWICH approach.

Figure 3d. Northampton County Monitor PM_{2.5} Speciation Data 2010-2012 for Top 25% of Regionally "Clean" Days



Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-2 - Northampton County Area

EPA assessed seasonal and annual average PM_{2.5} components at monitoring sites within the area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of PM_{2.5}, and the concentrations of PM_{2.5} in the area of analysis, also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figure 4a includes pie charts showing the annual and quarterly chemical mass components of the urban increment. Note that in these charts, sulfates and nitrates have been adjusted to represent their mass in measured PM_{2.5}.



Figure 4a. Allentown Urban Increment Analysis for 2010-2012.





The urban increment data provides further insight to the chemical composition of PM_{2.5} at the Northampton County monitoring site. As previously stated, Figures 3a-d show that organic mass and sulfates are the predominant species overall. When accounting for the urban increment illustrated in Figure 4a and Figure 4b, the sulfate component becomes less dominant, however, there is still some remaining sulfate detected at the monitor. Figure 4a and Figure 4b clearly indicate that organic mass and elemental carbon are the main components of the average urban increment of PM_{2.5} at the Northampton County monitoring site. These components suggests that the sources of PM_{2.5} are local in nature and could result from mobile, area or local industrial sources in the Allentown-Easton-Bethlehem urban area.

In Pennsylvania's December 2013 recommendation letter, Pennsylvania also included urban increment data (referred to as urban excess by Pennsylvania) for the 2010-2012 monitoring period. Pennsylvania compared the violating monitor (referred to as Freemansburg) to the Arendtsville monitor (AIRS # 42-001-0001, Adams County) which is located in a rural area for the 1st and 3rd quarters in the 2010-2012 monitoring period. Figures 4c and 4d show the urban excess at the Freemansburg monitor and, similar to EPA's analysis, indicate that organic carbon, elemental carbon and crustal material are the main components at the violating monitor. (Note that Pennsylvania's urban excess presentation is based on measurement data which was not adjusted by the SANDWICH method.) Below is an excerpt from Pennsylvania's 2013 recommendation letter further explaining the analysis.

"In the case of Freemansburg and Arendtsville, the sulfates and ammonium portion of the speciated PM2.5 were higher in Arendtsville than Freemansburg. This strengthens the argument that the PM2.5 problem at Freemansburg is a local issue. The excess organic carbon, elemental carbon and crustal material (and to some extent nitrate) at the Freemansburg monitor links closely with sources of dust and secondary nitrate formation, such as traffic, suggesting that Freemansburg's emissions are local in nature."

Figure 4c. Urban Excess for Freemansburg (Northampton) vs. Arendtsville for 2010-2012 – 1st Quarter



Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-2 - Northampton County Area





Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-2 - Northampton County Area

Factor 2: Emissions and emissions-related data

In this designations process, for each area with a violating monitoring site, EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to PM_{2.5} concentrations at the violating monitoring site or monitoring sites in the area under evaluation. Similar to the air quality analysis, these data were examined on a seasonal basis. However, as discussed in Factor 1, there are no discernable seasonal trends at the Northampton County violating monitor. Therefore, seasonal emissions will not be further discussed in this analysis. EPA examined emissions of identified sources or source categories of direct PM_{2.5}, the major components of direct PM_{2.5} (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO₂, NO_X, total VOC, and NH₃). EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct PM_{2.5} emissions and its major carbonaceous components are generally associated with sources near violating PM_{2.5} monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to PM_{2.5} from mobile and stationary sources) and transport from neighboring areas can contribute to higher PM_{2.5} levels at the violating monitoring sites.

Emissions Data

For this factor, EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. EPA also looked at the geographic distribution of major point sources of the relevant pollutants.⁹⁹ Significant emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, EPA also developed a summary of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

When considered with the urban increment analysis discussed in Factor 1, evaluating the components of direct PM_{2.5} and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted POC and VOCs¹⁰⁰ contribute to POM; directly emitted EC contributes to PM_{2.5} EC; NO_X, NH₃ and directly emitted nitrate contribute to PNO3; SO₂, NH₃ and directly emitted sulfate contribute to PSO4; and directly emitted crustal material and metal oxides

⁹⁹ For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5} + NOx + SO_2 + VOC + NH_3$) are greater than 500 tons per year based on NEI 2011v1.

¹⁰⁰ As previously mentioned, nearby VOCs are presumed to be a less important contributor to POM than POC.

contribute to Pcrustal. 101,102 EPA believes that the quantities of those nearby emissions as potential contributors to the PM_{2.5} violating monitors are somewhat proportional to the PM_{2.5} chemical components in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO₂, partially because POC emissions are already PM_{2.5} whereas SO₂ must convert to PM_{2.5} and not all of the emitted SO₂ undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted $PM_{2.5}$ and precursor species for the county with the violating monitoring site and nearby counties considered for inclusion in the Allentown Area. Table 3b summarizes the directly emitted components of $PM_{2.5}$ for the same counties in the area of analysis for the Allentown Area. This information will be paired with the urban increment composition previously shown in Figures 4a and 4b.

	Total	Total	Total Direct	Total	Total	
County, State	NH ₃	NOx	PM _{2.5}	SO ₂	VOC	Total
Northampton, PA	613	14,035	3,031	20,033	7,469	45,180
Montgomery, PA	779	17,147	3,338	2,518	18,975	42,757
Berks, PA	4,097	14,317	3,606	6,136	12,734	40,891
Bucks, PA	1,024	13,173	2,474	2,035	15,325	34,030
Lehigh, PA	620	8,861	2,081	1,321	9,649	22,532
Luzerne, PA	391	9,001	1,804	1,113	9,350	21,659
Morris, NJ	313	8,468	1,164	649	10,466	21,060
Schuylkill, PA	1,655	6,016	1,409	5,481	5,935	20,496
Monroe, PA	212	5,253	1,164	428	6,003	13,060
Hunterdon, NJ	450	3,396	423	328	3,020	7,617
Warren, NJ	711	2,585	508	328	2,918	7,049
Carbon, PA	97	2,819	553	1,042	2,490	7,000
Sussex, NJ	333	2,097	385	499	3,448	6,761

Table 3a. County-Level Emissions of Directly Emitted PM2.5 and Precursors (tpy)

Table 3a indicates that Northampton County has the highest total emissions of directly emitted $PM_{2.5}$ and precursors. The SO₂ emissions in Northampton County are significantly higher than in any other county in the area of analysis. In Table 5 and Figures 5a and 5b, the GenOn Rema Portland Generating Station is the largest source of SO₂ (15,148 tpy) in the area of analysis. This facility is located in Northampton County and to the northeast of the Northampton County violating monitor. Northampton County has high levels of NO_x and VOC emissions as well. As mentioned above, directly emitted VOC contributes to POM. Montgomery, Berks and Bucks counties have the next

¹⁰¹ See, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.

¹⁰² USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

highest emissions. As discussed in Factors 3 and 4 below, topography and wind direction indicate that Montgomery, Berks and Bucks counties are less likely to contribute to the Northampton County violating monitor. Among the five counties bordering Northampton, Bucks and Lehigh Co. PA have the highest emissions of most of the listed pollutants. Lehigh County has high levels of NO_x and VOC. It is also worth noting that the violating monitor is near the border with Lehigh County.

County, State	РОМ	EC	PSO4	PNO3	Pcrustal	Residual	Total Direct
Berks, PA	1,764	436	132	15	474	785	3,606
Montgomery, PA	1,740	439	99	6	415	639	3,338
Northampton, PA	1,176	354	170	31	581	718	3,031
Bucks, PA	1,253	403	78	8	315	416	2,474
Lehigh, PA	1,208	247	57	5	196	368	2,081
Luzerne, PA	1,161	252	39	4	149	200	1,804
Schuylkill, PA	750	170	44	4	159	284	1,409
Monroe, PA	785	176	20	3	49	131	1,164
Morris, NJ	733	208	19	4	66	134	1,164
Carbon, PA	352	64	14	1	30	92	553
Warren, NJ	326	74	8	1	30	68	508
Hunterdon, NJ	229	97	7	1	33	56	423
Sussex, NJ	235	61	8	1	26	54	385

Table 3b. County-Level Emissions for Components of Directly Emitted PM_{2.5} (tpy)¹⁰³

Table 3b breaks down the direct $PM_{2.5}$ emissions value from Table 3a into its components. These data will also be compared with the previously presented Urban Increment composition. Table 3b shows that organic mass is the largest component of direct $PM_{2.5}$ emissions in the area of analysis and organic mass is a significant component of the urban increment. Northampton and Lehigh counties both have high amounts of organic mass. As previously mentioned, and further discussed in Factors 3 and 4, Montgomery, Berks and Bucks counties are less likely to contribute to the Northampton County violating monitor due to wind direction and topography. Luzerne County is also less likely to contribute to the Northampton County violating monitor as a result of the topography.

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 3a and 3b, EPA identified the following components warranting additional review: organic mass, elemental carbon, crustal material and VOC. EPA then looked at the contribution of these components of interest from each of the counties included in the area of analysis as shown in Tables 4a-d.

¹⁰³ Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries (*ttp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

	Emissions in average tons/yr						
County, State	POM	Pct.	Cumulative %				
Berks, PA	1,764	15%	15%				
Montgomery, PA	1,740	15%	30%				
Bucks, PA	1,253	11%	51%				
Lehigh, PA	1,208	10%	61%				
Northampton, PA	1,176	10%	40%				
Luzerne, PA	1,161	10%	71%				
Monroe, PA	785	7%	84%				
Schuylkill, PA	750	6%	77%				
Morris, NJ	733	6%	90%				
Carbon, PA	352	3%	93%				
Warren, NJ	326	3%	96%				
Hunterdon, NJ	229	2%	98%				
Sussex, NJ	235	2%	100%				

Table 4a. County-Level POM Emissions

Table 4b. County-Level EC Emissions

	Emissions in average tons/yr							
County, State	EC	Pct.	Cumulative %					
Montgomery, PA	439	15%	15%					
Berks, PA	436	15%	29%					
Bucks, PA	403	14%	43%					
Northampton, PA	354	12%	55%					
Luzerne, PA	252	8%	63%					
Lehigh, PA	247	8%	72%					
Morris, NJ	208	7%	84%					
Monroe, PA	176	6%	77%					
Schuylkill, PA	170	6%	90%					
Hunterdon, NJ	97	3%	93%					
Warren, NJ	74	2%	96%					
Carbon, PA	64	2%	98%					
Sussex, NJ	61	2%	100%					

Table 4c. County-Level Pcrustal Emissions

	Emissions in average tons/yr							
County	Pcrustal	Pct.	Cumulative %					
Northampton, PA	581	23%	23%					
Berks, PA	474	19%	42%					
Montgomery, PA	415	16%	58%					
Bucks, PA	315	12%	71%					
Lehigh, PA	196	8%	79%					
Schuylkill, PA	159	6%	85%					

	Emissions in average tons/yr				
County	Pcrustal	Pct.	Cumulative %		
Luzerne, PA	149	6%	91%		
Morris, NJ	66	3%	93%		
Monroe, PA	49	2%	95%		
Hunterdon, NJ	33	1%	97%		
Carbon, PA	30	1%	98%		
Warren, NJ	30	1%	99%		
Sussex, NJ	26	1%	100%		

Table 4d. County-Level VOC Emission	Table 4d.	County-I	Level Y	VOC	Emission	IS
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	Emissions in average tons/yr				
County	VOC	Pct.	Cumulative %		
Montgomery, PA	18,975	18%	18%		
Bucks, PA	15,325	14%	32%		
Berks, PA	12,734	12%	44%		
Morris, NJ	10,466	10%	53%		
Lehigh, PA	9,649	9%	62%		
Luzerne, PA	9,350	9%	71%		
Northampton, PA	7,469	7%	78%		
Monroe, PA	6,003	6%	83%		
Schuylkill, PA	5,935	6%	89%		
Sussex, NJ	3,448	3%	92%		
Hunterdon, NJ	3,020	3%	95%		
Warren, NJ	2,918	3%	98%		
Carbon, PA	2,490	2%	100%		

In Figure 4a, the emissions of organic mass appear somewhat evenly distributed between the top six contributing counties (totaling ~71%). Lehigh County and Northampton County are among the top six counties and contribute similar amounts of the total organic mass component of direct PM_{2.5}. As discussed in Factors 3 and 4 below, topography and wind direction indicate that Montgomery, Berks and Bucks counties are less likely to contribute to the Northampton County violating monitor. As seen in Figure 4c, Northampton County contributes the largest amount of the crustal matter component of direct PM_{2.5}. In Figure 4d, Lehigh County contributes more VOC than Northampton County. As discussed above, VOCs contribute to PM_{2.5} organic mass and organic mass is a main component of the urban increment at the Northampton County violating monitor. As mentioned, Montgomery, Berks and Bucks, PA are less likely to contribute to the Northampton County monitor due to wind direction and topography. Morris, NJ is also not in the regional wind direction thus less likely to contribute to the Northampton County wollating monitor.

In addition to reviewing county-wide emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors in the area of analysis, EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 5 provides facility-level
emissions of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants (given in tons per year) from major point sources located in the area of analysis for the Allentown Area. Table 5 also shows the distance from the facility to the Northampton County violating monitor.

		Distance	NEI 2011 v1 Emissions (tpy)					
County, State	Facility Name (Facility ID)	violating monitor (miles)	NH3	NOx	PM _{2.5}	SO ₂	VOC	Total
Northampton, PA	Keystone Portland Cement/East Allen (420950012)	7	2	828	57	984	7	1,878
Northampton, PA	Essroc/Nazareth Lower Cement Plt 1 (420950045)	7	68	1,804	522	722	62	3,177
Northampton, PA	Northampton Gen Co/Northampton (420950536)	9	2	441	44	546	2	1,034
Northampton, PA	Hercules Cement Co Lp/Stockertown (420950006)	9	3	989	29	1,420	20	2,462
Lehigh, PA	Lafarge Corp/Whitehall Plt (420770019)	10	14	368	36	331	7	754
Northampton, PA	Ppl Martins Creek Llc/Martins Creek (420950010)	17	13	943	37	274	30	1,297
Northampton, PA	Genon Rema Llc/Portland Generating Sta (420950011)	24	0	1,977	67	15,148	14	17,206
Berks, PA	Lehigh Cement Co Llc/Evansville Cement Plt & Quarry (420110039)	31	41	1,225	134	200	12	1,611
Carbon, PA	Panther Creek Partners/Nesquehoning Plt (420250023)	32	1	551	16	571	4	1,143
Berks, PA	Cryovac Inc/Cryovac Rigid Packaging (420110093)	35			0		556	556
Montgomery, PA	Covanta Plymouth Renewable Energy/ Plymouth (420910295)	37	1	735	8	25	2	771
Berks, PA	Genon Rema Llc/Titus Gen Sta (420110045)	37	0	683	43	4,087	5	4,818
Schuylkill, PA	Northeastern Power Co/Mcadoo Cogen (421070054)	38	0	104	16	706	20	846
Bucks, PA	Wheelabrator Falls Inc/Falls Twp (420170469)	44	3	731	9	122	2	867
Schuylkill, PA	Wheelabrator Frackville/Morea Plt (421070022)	45	0	443	19	468	9	938
Schuylkill, PA	Schuylkill Energy Res/St Nicholas Cogen (421070024)	46	1	273	27	1,883	25	2,208
Bucks, PA	Fairless Energy Llc/Falls Twp (420170131)	46	170	201	196	18	25	609
Schuylkill, PA	Gilberton Power Co/John B Rich Mem Power Sta (421070025)	46	0	211	39	1,314	28	1,591
Schuylkill, PA	Wps Westwood Gen Llc/Gen Sta (421070023)	58	0	220	5	268	13	506

Table 5. NEI 2011 v1 Point Source Emissions (tpy)

Figure 5a shows the major point source emissions (from the 2011 NEI in tons per year) in the area of analysis for the Allentown Area and the relative distances of these sources from the violating monitoring location, as depicted by a red dot. The actual distance from the point sources to the DV monitoring location is presented in Table 5. The distance from the violating monitoring location is particularly important for directly emitted PM_{2.5}. The influence of directly emitted PM_{2.5} on ambient PM_{2.5} diminishes more than that of gaseous precursors as a function of distance.¹⁰⁴ Figure 5b illustrates the location of major point sources listed in Table 5 which are near the Northampton County violating monitor.





¹⁰⁴ Baker, K. R. and K. M. Foley. A nonlinear regression model estimating single source concentrations of primary and secondarily formed PM_{2.5}. Atmospheric Environment. 45 (2011) 3758-3767.



Figure 5b. Close up of Major Point Sources Near the Northampton County violating monitor

As indicated in Figures 5a and 5b, there are nineteen sources with emissions over 500 tpy within the area of analysis. Seven of these large point sources are located north and northeast of the Northampton County violating monitor. Eight point sources are further west and southwest of the Northampton County violating monitor. Mountains run between the sources which are further west in Schuylkill County and the violating monitor. No major point sources exist south of the monitor in the area of analysis except the Covanta facility in southern Montgomery County. The Covanta facility is relatively low in emissions and, as discussed in Factors 3 and 4, emissions from Montgomery County are not in the regional wind direction and are limited by hills to the south of the monitor. Pennsylvania provided additional information in its December 2013 designation recommendation regarding local influences of PM_{2.5} Below is an excerpt from Pennsylvania's December 2013 recommendation letter, Appendix C-2 Northampton County Area. Figure 5c below was provided in support of the following excerpt. In this excerpt the Northampton County violating monitor is referred to as the Freemansburg monitor.

"The additional crustal material illustrates the local nature of the problem at the Freemansburg monitor. Iron, which is a factor of the crustal calculation along with aluminum, calcium, silicon, and titanium, is abnormally high on several of the nine days. The iron, which can be found in dust associated with construction activities, often reached levels 10 to 20% of the total

mass measured from the daily speciated sample. The high iron contribution to the PM_{2.5}, coupled with the strong southerly signal outlined in Figure C-2.3 and Figure C-2.4, could be attributed to the recent disturbing of soil at the former Bethlehem Steel Corporation industrial site (which lies just to the south of Freemansburg). The Bethlehem Steel site produced 2,500 to 3,000 tons of iron a day to manufacture steel. The Bethlehem Steel plant at the site closed down in 2003. The western portion of the Bethlehem Steel site, which is south-southwest of the Freemansburg monitor, has transformed into the Sands Casino, with a casino, hotel, and outlet shopping center. Also, the area just east of the Sands Casino, an area downwind of the Freemansburg monitor, appears to have been developed over the last three to four years, according to time lapse photos on Google Maps. Construction, disturbance of ground, and truck traffic on unpaved roads in this area are likely to cause dust particles to leave the premises. With a southerly wind, this explains some of the crustal portion of the speciated data recorded at the Freemansburg monitor."

Figure 5c. Northampton County Monitor (Freemansburg) Location and Former Bethlehem Steel Site Map



Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-2 - Northampton County Area

Population density and degree of urbanization

In this part of the five factor analysis, EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 6 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area of analysis.

County, State	Population 2000	Population 2010	% Change from 2000	Land Area (square miles)	Population Density (per square mile)	% of Area of Analysis	Cumulative %
Montgomery, PA	750,097	801,134	6.8%	483	1,658	20%	20%
Bucks, PA	597,635	625,505	4.7%	607	1,030	15%	35%
Morris, NJ	470,212	492,899	4.8%	469	1,051	12%	47%
Berks, PA	373,638	411,791	10.2%	859	479	10%	57%
Lehigh, PA	312,090	350,093	12.2%	347	1,010	9%	66%
Luzerne, PA	319,250	320,925	0.5%	891	360	8%	74%
Northampton, PA	267,066	298,065	11.6%	374	797	7%	81%
Monroe, PA	138,687	169,981	22.6%	609	279	4%	85%
Sussex, NJ	144,166	149,221	3.5%	521	286	4%	89%
Schuylkill, PA	150,336	148,199	-1.4%	778	190	4%	93%
Hunterdon, NJ	121,989	128,357	5.2%	430	299	3%	96%
Warren, NJ	102,437	108,693	6.1%	358	304	3%	98%
Carbon, PA	58,802	65,204	10.9%	381	171	2%	100%
Total	3,806,405	4,070,067					

Source: U.S. Census Bureau population estimates for 2000 and 2010



Figure 6. 2010 County-Level Population in the Area of Analysis for the Allentown Area.

As Table 6 illustrates, Montgomery County has the largest and most dense population than the other counties in the area of analysis. As previously mentioned, Montgomery County emissions are less likely to contribute to the Northampton County violating monitor due to topography and regional wind direction. Northampton County has a moderately sized population, which has increased by 11.6% during 2000 to 2010. Northampton County ranks seventh in population and fifth in population density in the thirteen county area of analysis. Lehigh County has a similar sized population and population density as Northampton County. Lehigh County ranks fifth in population and fourth in population density in the thirteen county area of analysis. A majority of the population in Northampton and Lehigh counties are in the cities of Allentown, Bethlehem and Easton which span the county borders and are located in the Lehigh River Valley.

Traffic and Vehicle Miles Travelled

High VMT and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source

emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and indicates that a county with the high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area. Table 7 shows 2011 VMT while Figure 7 overlays 2011 county-level VMT with a map of the transportation arteries. This VMT data was obtained from the Federal Highway Administration.

County State	Total 2011 VMT	Porcont	Cumulative				
County, State		Tercent	/0				
Montgomery, PA	6,505,446,421	18%	18%				
Morris, NJ	5,419,112,025	15%	33%				
Bucks, PA	4,727,709,143	13%	46%				
Berks, PA	3,381,679,887	9%	56%				
Lehigh, PA	2,988,094,564	8%	64%				
Luzerne, PA	2,769,808,578	8%	72%				
Northampton, PA	2,046,097,907	6%	77%				
Hunterdon, NJ	1,828,353,779	5%	82%				
Monroe, PA	1,664,133,702	5%	87%				
Warren, NJ	1,387,779,166	4%	91%				
Schuylkill, PA	1,373,853,518	4%	95%				
Sussex, NJ	1,182,572,750	3%	98%				
Carbon, PA	772,100,374	2%	100%				
Total	36,046,741,815						
http://www.census.gov/hhes/commuting/data/commuting.html							

Table 7. 2011 VMT for the Allentown Area.



Figure 7. Overlay of 2011 County-level VMT with Transportation Arteries.

As Table 7 and Figure 7 illustrate, VMT varies within the area of analysis. For vehicle miles traveled, Lehigh County ranks fifth and Northampton County ranks seventh out of the thirteen counties in the area of analysis. The population in Allentown, Bethlehem and Easton and the two interstates that run east to west across these two counties most likely contribute to the emissions impacting the violating monitors. Montgomery County has the most VMT, which is approximately three times higher than the VMT in Northampton County. As previously mentioned, Montgomery County emissions most likely do not contribute to the Northampton County violating monitor due to topography and regional wind direction.

Factor 3: Meteorology

EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. EPA used two primary tools for this assessment: wind roses and kernel density estimation (KDE). When considered in combination with area PM_{2.5} composition and county-level and facility emissions source location information, wind roses and KDE can help to identify nearby areas contributing to violations at violating monitoring sites.

Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate the force of the wind and thus the distance from which those emissions are transported. EPA constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.¹⁰⁵ When developing these wind roses, EPA also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 8 shows wind roses that EPA generated from data relevant in the Northampton County Area.





¹⁰⁵ ftp.ncdc.noaa.gov/pub/data/noaa or

http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*



Figure 8b. Close up of Wind Roses for Allentown Area

As shown in Figures 8a and 8b, the predominant winds near the Northampton County violating monitor are from the west and the southwest, with some northwesterly, and northeasterly components. These wind roses represent average wind directions throughout the year. Lehigh County is to the west and southwest of the violating monitor and is situated in the Lehigh River Valley with Northampton County. Lehigh County emissions are high in POM which is a main component of the urban increment at the Northampton County violating monitor. As seen in Figures 5a and 5b, there are major point sources in Northampton County to the northwest and northeast of the Northampton County violating monitor. Montgomery and Bucks counties are to the south and southeast of the Northampton County violating monitor which is not in the regional wind direction. Berks County is further southwest of the monitor and emissions are less likely to contribute to the Northampton violating monitor due to hills running between the emission sources and the monitor (see Factor 4).

In its December 2013 recommendation letter, Pennsylvania included wind direction analysis at high PM_{2.5} days at the Northampton County violating monitor. As stated previously, Pennsylvania identified 344 days in the 2010 to 2012 monitoring period where PM_{2.5} at the Northampton County violating monitor was at least one standard deviation above the Allentown-Bethlehem-Easton MSA regional average (high days). The top 25% (highest PM_{2.5} days) were further analyzed to determine why the Northampton County violating monitor's concentrations were high. The Northampton County violating monitor is collocated with a meteorological tower which monitors wind direction and

wind speed. For the highest $PM_{2.5}$ days, Pennsylvania calculated the number of hours the wind was coming from a particular direction as well as the concentrations from a particular direction. Figures 8c and 8d represent the wind direction frequency and concentration distribution by wind direction, respectively, at the Northampton County violating monitor during its highest $PM_{2.5}$ days.



Figure 8c. Northampton County Monitor Wind Direction Frequency – Top 25% of Regionally "Clean" Days

Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-2 - Northampton County Area

Figure 8d. Northampton County Monitor PM_{2.5} Concentration Distribution by Wind Direction – Top 25% of Regionally "Clean" Days



Source: Pennsylvania's December 10, 2013 recommendation letter, Appendix C-2 - Northampton County Area

As can be seen in Figure 8c, wind directions on highest PM_{2.5} days at the Northampton County violating monitor are coming predominantly from due south and the northeast. The high PM_{2.5} concentrations in Figure 8d follow the same pattern. This is slightly different from the regional wind directions shown in Figures 8a and 8b which are predominantly from the west and from the southwest with northwesterly and northeasterly components. As discussed above, Table 5 and Figures 5a and 5b list and illustrate the major point sources located in the area of analysis. There are several point sources to the northeast of the violating monitor in Lehigh River Valley corresponding to the wind direction on highest PM_{2.5} days, however, there are not any major point sources of PM_{2.5} to the south likely to contribute to the Northampton County violating monitor. Figure 5c illustrates that the former Bethlehem Steel site is located south and southwest of the Northampton County violating monitor. As Pennsylvania suggested in its December 2013 recommendation letter, heavy construction just south of the monitor at the former Bethlehem Steel Site likely contributed to the high concentration of PM_{2.5} at this monitor.

In addition to wind roses, EPA also generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at violating monitoring sites.^{106,107} These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories.¹⁰⁸ Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell. Figure 9 shows a HYSPLIT KDE plot for the Northampton County Area summarized by calendar quarter for the 2010-2012 period. The HYSPLIT KDE is weighted in the southwesterly direction, indicating a greater frequency of trajectories passing over grid cells to the southwest. Lehigh County is southwest of the violating monitor. Lehigh County and Northampton County fall within the higher density values indicated by darker blue color in all four quarters. The higher density values indicate a greater frequency of observed trajectory endpoints within a particular grid cell. The higher density grid cells do cover the edges of Montgomery, Bucks and Berks counties at times, however as discussed below in Factor 4, hills between the monitor and the emissions in these counties most likely prevent contribution to the Northampton County violating monitor.

Figure 9. HYSPLIT Kernel Density Estimation Plots for the Allentown Area.First QuarterSecond Quarter



¹⁰⁷ HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model,

http://www.arl.noaa.gov/HYSPLIT_info.php

¹⁰⁸ The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.

¹⁰⁶ In some past initial area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.

Third Quarter

Fourth Quarter



Factor 4: Geography/topography

To evaluate the geography/topography factor, EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area. As seen in Figure 10, the mountain range north of the Northampton County violating monitor runs southwest to northeast and lower hills to the south of the violating monitor also run southwest to northeast. This mountain range provides a physical barrier between Monroe, Carbon and Schuylkill counties and the Northampton County violating monitor. The hills to the south of the violating monitor provide a barrier between this monitor and emissions in Berks, Montgomery, and Bucks counties. The Lehigh River Valley runs between these mountains and hills and connects Lehigh and Northampton counties. A majority of the population and VMT in Northampton and Lehigh counties are in the cities of Allentown, Bethlehem and Easton which are located in the Lehigh River Valley. EPA believes that these topographical barriers significantly affect the formation and distribution of $PM_{2.5}$ concentrations in the area of analysis.



Figure 10. Topography for the Allentown Area

Factor 5: Jurisdictional boundaries

In defining the boundaries of the intended Northampton County nonattainment area, EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify state and local governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the intended area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the intended designated areas.

The violating monitor is located in Northampton County, PA, which is located in the Allentown-Bethlehem-Easton MSA. The Allentown-Bethlehem-Easton MSA includes Northampton County, PA as well as Carbon County and Lehigh County in Pennsylvania, and Warren County, New Jersey. The Lehigh Valley Planning Commission is the MPO for Lehigh and Northampton Counties. Carbon County is part of the Northeastern Pennsylvania Alliance Rural Planning Organization. The MPO for Warren County, NJ is the North Jersey Transportation Planning Authority.

The Allentown, PA area has previously established nonattainment boundaries associated with the 2006 24-hour PM_{2.5} NAAQS. The boundary for the Allentown, PA nonattainment area for the 2006 24-hour PM_{2.5} NAAQS included the entire counties of Lehigh and Northampton in Pennsylvania. The state has recommended a different boundary for the 2012 annual PM_{2.5} NAAQS. Pennsylvania has recommended only the single county of Northampton, PA as the intended nonattainment area for 2012 annual PM_{2.5} NAAQS. EPA's analysis of the five factors supports a finding that Lehigh and Northampton counties contribute to the Northampton County violating monitor. Therefore, EPA's intended nonattainment boundaries for the 2012 annual PM_{2.5} NAAQS are the same as the 2006 24-hour PM_{2.5} NAAQS and include the entire counties of Lehigh County and Northampton County in Pennsylvania.

Conclusion for the Allentown Area

Based on the assessment of factors described above, both individually and in combination, EPA has preliminarily concluded that the following counties should be included as part of the Allentown nonattainment area because they are either violating the 2012 annual PM_{2.5} NAAQS or contributing to a violation in a nearby area: Northampton County, PA and Lehigh County, PA. These are the same counties that are included in the Allentown, PA nonattainment area for the 2006 24-hour PM_{2.5} NAAQS. The air quality monitoring site in Northampton County, PA indicates a violation of the 2012 annual PM_{2.5} NAAQS based on the 2013 DVs; therefore this county is included in the nonattainment area. Lehigh County, PA is a nearby county that does not have a monitoring site, but EPA has concluded that this area contributes to the particulate matter concentrations in violation of the 2012 annual PM_{2.5} NAAQS through emissions from non-point sources (e.g., area sources), and from mobile source emissions.

Seasonal variation can highlight those conditions most associated with high average concentration levels of $PM_{2.5}$. The Northampton County violating monitor does not follow the seasonal pattern seen at the other monitors in the area of analysis.

The speciation data for the Northampton County violating monitoring site indicate that organic mass and sulfates are the predominant species overall with small amount of nitrates in the first and 4th calendar quarters, which may be due to EGU emissions from winter heating needs and greater particle nitrate collection during the cooler months. When accounting for the urban increment, the sulfate component becomes less dominant, however, there is still some remaining sulfate detected at the monitor. The urban increment data clearly indicates that organic mass and elemental carbon are the main components of PM_{2.5} at the Northampton County violating monitoring site. Additional speciation data provided by Pennsylvania for the top 25% of high PM_{2.5} days also indicate that crustal material is a major component of PM_{2.5} along with organic mass and elemental carbon. These components (organic mass, elemental carbon and crustal material) suggest that the sources of PM_{2.5} at the Northampton County violating monitor are local in nature and could result from mobile, area or local industrial sources. Montgomery, Bucks, Berks, Northampton and Lehigh counties have the highest emissions of directly emitted PM_{2.5} and precursors in the thirteen county area of analysis. These same five counties also have high amounts of organic mass, crustal matter and elemental carbon components of directly emitted PM_{2.5}.

Northampton County and Lehigh County have similar, moderately sized population and population density. A majority of the population in Northampton and Lehigh counties are in the cities of Allentown, Bethlehem and Easton which span the county borders and are located in the Lehigh River Valley. The population in these three cities and the two interstates that run east to west across these counties most likely contribute to the emissions at the Northampton County violating monitor.

Topography is an important factor when evaluating the formation and distribution of PM_{2.5} in the area of analysis. The mountain range north of the Northampton County violating monitor runs southwest to northeast and lower hills to the south of the violating monitor also run southwest to northeast. The mountain range provides a physical barrier between Monroe, Carbon and Schuylkill counties and the Northampton County violating monitor. The hills to the south of the violating monitor provide a barrier between this monitor and Berks, Montgomery and Bucks counties. The Lehigh River Valley runs between these mountains and hills and connects Lehigh and Northampton counties. These topographical barriers suggest that emissions from Lehigh County and Northampton County are most likely impacting the Northampton County violating monitor.

The wind roses representing average wind direction throughout the year indicate that the predominant winds near the violating monitor are from the west and the southwest with northwesterly and northeasterly components. Emissions from Northampton and Lehigh counties are upwind and closest to the violating monitor; therefore they are most likely to impact the violating site. The HYSPLIT KDEs also indicate that Lehigh County and Northampton County fall within the higher density values indicated by darker blue color for all four quarters. The higher density values indicate a greater frequency of observed trajectory endpoints within a particular grid cell.

Additional meteorological data provided by Pennsylvania indicate that wind directions on highest PM_{2.5} days at the Northampton County violating monitor are coming from due south and from the northeast. There are point sources in Northampton County to the northeast and upwind of the violating monitor. There are not any point sources of PM_{2.5} south of the Northampton monitor which most likely contribute to the violation. As Pennsylvania suggested in their December 2013 recommendation letter, heavy construction just south of the monitor at the former Bethlehem Steel Site corresponds to the wind direction on the top 25% of high days.

In conclusion, the five factor analysis supports EPA's finding that Lehigh and Northampton counties contribute to the violation at the Northampton County violating monitor. Therefore, EPA's intended nonattainment boundaries for the 2012 annual PM_{2.5} NAAQS include the entire counties of Lehigh County and Northampton County, PA.

3.5 Area Background and Overview - Lebanon County

Figure 1a is a map of EPA's intended nonattainment boundary for the Lebanon County. The map shows the location and DVs of ambient air quality monitoring locations, county and other jurisdictional boundaries including the Lebanon, PA MSA. For purposes of the 1997 annual PM_{2.5} NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 1997 annual PM_{2.5} NAAQS included the entire counties of Cumberland, Dauphin and Lebanon in Pennsylvania. For purposes of the 2006 24-hour PM_{2.5} NAAQS, this area was designated nonattainment area for the 2006 24-hour PM_{2.5} NAAQS included the entire counties of the 2006 24-hour PM_{2.5} NAAQS included the entire counties of Cumberland, Dauphin, Lebanon and York in Pennsylvania. The boundary for the intended 2012 annual PM_{2.5} NAAQS is different than the boundary for the 1997 annual and the 2006 24-hour PM_{2.5} NAAQS. EPA is recommending the single county of Lebanon, PA as the boundary for the nonattainment area for the 2012 annual PM_{2.5} NAAQS.



Figure 1a. EPA's Intended Nonattainment Boundaries for the Lebanon County

EPA must designate as nonattainment areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. Lebanon County shows a violation of the 2012 PM_{2.5} NAAQS, therefore this county is included in the nonattainment area. The Lebanon, PA MSA is a single county MSA which consists of Lebanon County, PA. As shown in Figure 1b, EPA evaluated the Lebanon, PA MSA and a ring of counties adjacent to the Lebanon, PA MSA, including Berks, Dauphin, Lancaster and Schuylkill Counties in Pennsylvania. EPA's evaluation was based on the five factors and other Page 155 of 177

relevant information. The following sections describe this five factor analysis process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.



Figure 1b. Area of Analysis for the Lebanon County

Factor 1: Air Quality Data

All data collected during the year are important when determining contributions to an annual standard such as the 2012 annual PM_{2.5} NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. For the 2012 annual PM_{2.5} NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured PM_{2.5} concentrations. For these reasons, for the Factor 1 air quality analysis, EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of PM_{2.5} mass in the area of analysis.

In most cases, EPA assessed air quality data on a seasonal, or quarterly, basis.¹⁰⁹ EPA also identified the spatial extent of these high PM_{2.5} concentrations. The mass and composition at the DV location represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the DV monitoring site, EPA examined the chemical composition of the monitored PM_{2.5} concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, EPA contrasted the approximated mass composition at the DV monitoring site with data collected at IMPROVE¹¹⁰ and other monitoring locations whose data are representative of regional background.^{111,112} This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from the influence of closer emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.^{113,114,115}

http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf

¹¹⁵ US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle (PM_{2.5}) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle (PM_{2.5})

¹⁰⁹ Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting PM_{2.5} mass and composition. In some areas of the country where there may be noticeable month-to-month variations in average PM_{2.5}, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas. ¹¹⁰ IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

¹¹¹ The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average PM_{2.5} mass and chemical components observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in PM_{2.5} mass between the violating site and the nearby CSN site(s), EPA determined material balance of the PM_{2.5} composition at the violating site by assigning the extra measured PM_{2.5} mass to the carbon components of PM_{2.5}. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local PM_{2.5} concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

¹¹² The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

¹¹³ In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

 ¹¹⁴ Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United
 States: Report V, June 2011. Chapter 7 – Urban Excess in PM_{2.5} Speciated Aerosol Concentrations,

<u>PM_{2.5} Design Values and Total Mass Measurements</u> - EPA examined ambient PM_{2.5} air quality monitoring data represented by the DVs at the violating monitoring site and at other monitors in the area of analysis. EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, EPA used data for the 2011-2013 period (i.e., the 2013 DV), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2012 annual PM_{2.5} NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter (μ g/m³) or less (e.g., 12.1 μ g/m³ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2 identifies the current DVs (i.e., the 2013 DV) and the most recent two DVs based on all monitoring sites in the area of analysis for the Lebanon County intended nonattainment area.¹¹⁶

County, State	Monitor Site ID	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Berks, PA	420110011	No	10.7	10.9	11
Dauphin, PA	420430401	No	12.1	11.9	11.9
Lancaster, PA	420710007	No	12	12.1	12
Lebanon, PA	420750100	Yes	11.4	12.8	12.3
Schuylkill, PA	N/A	No		No monitor	

Table 2. Air Quality Data collected at Regulatory Monitors (all DV levels in µg/m³)^{a,b,}

^aIf a county has more than one monitoring location, the county DV is indicated in bold type.

^bIf a monitor is violating, the NAAQS, the violating DV is indicated in red type.

The Figure 1a map, shown previously, identifies the Lebanon County intended nonattainment area, the Lebanon, PA MSA boundary and monitoring locations with 2011-2013 violating DVs. As indicated on the map, there is one violating monitoring, monitor 420750100, located in Lebanon County, PA (the "Lebanon County monitor" or the "violating monitor").

Seasonal variation can highlight those conditions most associated with high average concentration levels of PM_{2.5}. Figure 2 shows quarterly mean PM_{2.5} concentrations for the most recent 3-year period for the highest DV monitoring sites in each county within the area of analysis. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, because, as previously stated, the annual mean is calculated as the

Designations, Chapter 3, Urban Excess Methodology. Available at

www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf

¹¹⁶ In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III PM_{2.5} FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM...."

mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.



Figure 2. Lebanon County PM2.5 Quarterly Means for 2011-2013

As shown, in Figure 2, the Lebanon County monitor does not follow a similar pattern to any of the other monitors in the area of analysis. The other three monitors in Berks, Dauphin and Lancaster counties tend to track together, with higher third quarters. All the monitors in the area, including the Lebanon County monitor had a high fourth quarter in 2012. The Lebanon County monitor does not have a clear seasonal pattern, indicating local influences at the violating monitor. However, staring in the second quarter of 2013, the PM_{2.5} values at the Lebanon County monitor appear to track with most other monitors in the area. This suggests that the influence of the local sources was less in those quarters. Furthermore, as can be seen in Figure 2, the Lebanon monitor's quarterly means the second and third quarters of 2013 are below the 12 μ g/m³ level of the 2012 annual PM_{2.5} NAAQS.

<u>PM_{2.5} Composition Measurements</u> - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total PM_{2.5} to identify the chemical components over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the PM_{2.5} at the violating monitoring location, EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for

the amount of PM_{2.5} mass components retained in the FRM measurement.^{117,118,119,120} In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. Figure 3a illustrates the fraction of each PM_{2.5} chemical component at the Lebanon County, PA monitoring site based on annual averages for the years 2010-2012. Please note that speciation data is not available at the Lebanon County monitor. Therefore, EPA used speciation data representative of the northeastern United States and adjusted it to match the PM_{2.5} mass recorded at the Lebanon monitoring site.





Figure 3b shows annual and quarterly chemical composition profiles and illustrates any seasonal or episodic contributors to $PM_{2.5}$ mass. This "increment analysis," combined with the other factor analyses, can provide additional insight as to which sources or factors may contribute at a greater

¹¹⁷ SANDWICH stands for measured Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous mass Hybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured PM_{2.5} and its non-carbon components. This characterization of PM_{2.5} mass also reflects crustal material and other minor components. The resulting characterization provides a complete mass closure for the measured FRM PM_{2.5} mass, which can be different than the data provided directly by the speciation measurements from the CSN network.

¹¹⁸ Frank, N. H., SANDWICH Material Balance Approach for PM_{2.5} Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.

¹¹⁹ Frank, N. H., The Chemical Composition of PM_{2.5} to support PM Implementation, EPA State /Local/Tribal Training Workshop: PM_{2.5} Final Rule Implementation and 2006 PM_{2.5} Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf*.

¹²⁰ Frank, N. H. Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities. J. Air & Waste Manage. Assoc. 2006 56:500–511.

level. Simply stated, this analysis can help identify nearby sources of emissions that contribute to the violation at the violating monitoring site.





^aAdjusted to FRM Total $PM_{2.5}$ indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.

The speciation data in Figures 3a and 3b for the Lebanon County violating monitoring site indicate that organic mass and sulfates are the predominant species overall with a smaller component of elemental carbon and crustal matter in each quarter. Figure 3b shows that in the first quarter, nitrates are higher, which corresponds to higher EGU emissions from increased heating needs during the winter and greater particle nitrate collection during the cooler months.

EPA assessed seasonal and annual average PM_{2.5} components at monitoring sites within the area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of PM_{2.5}, and the concentrations of PM_{2.5} in the area of analysis, also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figure 4a includes pie charts showing the annual and quarterly chemical mass components of the urban increment. The quarterly pie charts correspond to the high-concentration quarters identified in Figure 2. Evaluating these high concentration quarters can help identify composition of PM_{2.5} during these times. Note that in these charts, sulfates and nitrates have been adjusted to represent their mass in measured PM_{2.5}.







Figure 4b. Lebanon County Average Urban Increment Analysis for 2010-2012.

The urban increment data provides further insight to the chemical composition of $PM_{2.5}$ at the Lebanon County violating monitoring site. As previously stated, Figures 3a and 3b show that organic mass and sulfates are the predominant species overall. When accounting for the urban increment in Figure 4a and Figure 4b, the sulfate component becomes less dominant. However, there is still some remaining sulfate detected at the monitor. Figure 4a and Figure 4b clearly indicate that organic mass and elemental carbon are the major components of $PM_{2.5}$ contributing to the Lebanon County monitor. These components suggests that the sources of $PM_{2.5}$ are local in nature and could result from mobile, area or local industrial sources.

Factor 2: Emissions and emissions-related data

In this designations process, for each area with a violating monitoring site, EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to PM_{2.5} concentrations at the violating monitoring site or monitoring sites in the area under evaluation. Similar to the air quality analysis, these data were examined on a seasonal basis. Similar to the air quality analysis, these data were examined on a seasonal basis. However, as discussed above, there are no discernable seasonal trends at the Lebanon County monitor. Therefore, EPA is not discussing seasonal emissions in this analysis. EPA examined emissions of identified sources or source categories of direct PM_{2.5}, the major components of direct PM_{2.5} (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO₂, NO_X, total VOC, and NH₃). EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct PM_{2.5} emissions and its major carbonaceous components are generally associated with sources near violating PM_{2.5} monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to PM_{2.5} from mobile and stationary sources) and transport from neighboring areas can contribute to higher PM_{2.5} levels at the violating monitoring sites.

Emissions Data

For this factor, EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. EPA also looked at the geographic distribution of major point sources of the relevant pollutants.¹²¹ Significant emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, EPA also developed a summary of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

When considered with the urban increment analysis in Factor 1, evaluating the components of direct PM_{2.5} and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted POC and VOCs¹²² contribute to POM; directly emitted EC contributes to PM_{2.5} EC; NO_X, NH₃ and directly emitted nitrate contribute to PNO3; SO₂, NH₃ and directly emitted sulfate contribute to PSO4; and directly emitted crustal material and metal oxides contribute to Pcrustal. ^{123,124} EPA believes that the quantities of those nearby emissions as potential contributors to the PM_{2.5} violating monitors are somewhat proportional to the PM_{2.5} chemical components in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO₂, partially because POC emissions are already PM_{2.5} whereas SO₂ must convert to PM_{2.5} and not all of the emitted SO₂ undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted $PM_{2.5}$ and precursor species in tons per year (tpy) for the county with the violating monitoring site and nearby counties considered for inclusion in the Lebanon County. Table 3b summarizes the directly emitted components of $PM_{2.5}$ for the same counties in the area of analysis for the Lebanon County. This information will be paired with the urban increment composition previously shown in Figures 4a and 4b.

¹²¹ For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5} + NOx + SO_2 + VOC + NH_3$) are greater than 500 tons per year based on NEI 2011v1.

¹²² As previously mentioned, nearby VOCs are presumed to be a less important contributor to POM than OC.

¹²³ See, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.

¹²⁴ USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

	Total	Total	Total Direct	Total	Total	
County, State	NH ₃	NOX	PM _{2.5}	SO ₂	VOC	Total
Lancaster, PA	15,772	13,794	4,441	1,799	17,361	53,166
Berks, PA	4,097	14,317	3,606	6,136	12,734	40,891
Dauphin, PA	1,576	9,595	1,923	810	9,378	23,283
Schuylkill, PA	1,655	6,016	1,409	5,481	5,935	20,496
Lebanon, PA	3,917	5,024	1,151	814	4,252	15,158

Table 3a. County-Level Emissions of Direct	ly Emitted PM _{2.5} and	Precursors (tpy)
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Table 3h Count	v-Level Emission	s for Component	s of Directly E	mitted PM ₂₅	(tnv) ¹²⁵
Table SD. Count	y-Levei Liiiissiuii	s ior Component	S OI DII CUIY L	milleu I Mi2.5	(այ

							Total
County, State	POM	EC	PSO4	PNO3	Pcrustal	Residual	Direct
Lancaster, PA	2,020	465	106	9	816	1,025	4,441
Berks, PA	1,764	436	132	15	474	785	3,606
Dauphin, PA	1,241	279	32	7	147	216	1,923
Schuylkill, PA	750	170	44	4	159	284	1,409
Lebanon, PA	582	165	27	3	182	193	1,151

As can be seen in Table 3a, Lancaster County has the highest total emissions of directly emitted PM_{2.5} and its precursors, however, as discussed in Factor 3, emissions from Lancaster County are less likely to contribute to the Lebanon County monitor due to the regional wind direction being from the west. Berks and Schuylkill Counties are also not in the regional wind direction. The PM_{2.5} emissions in Lebanon and Dauphin Counties are mainly NO_X and VOC. Lebanon County also has a high level of NH₃ emissions. Table 3b breaks down the direct PM_{2.5} emissions value from Table 3a into its components. These data will also be compared with the previously presented urban increment composition Table 3b shows that throughout the area of analysis organic matter is the largest component of directly emitted PM_{2.5}.

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 3a and 3b, EPA identified the following components warranting additional review: organic mass, elemental carbon and VOC. EPA then looked at the contribution of these components of interest from each of the counties included in the area of analysis as shown in Tables 4a-e.

	Emissions in average tons/yr					
County, State	POM	Pct.	Cumulative %			
Lancaster, PA	2,020	32%	32%			
Berks, PA	1,764	28%	60%			
Dauphin, PA	1,241	20%	79%			
Schuylkill, PA	750	12%	91%			
Lebanon, PA	582	9%	100%			

Table 4a. County-Level POM Emissions

¹²⁵ Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries

⁽*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

	Emissions in average tons/yr					
County, State	EC	Pct.	Cumulative %			
Lancaster, PA	465	31%	31%			
Berks, PA	436	29%	59%			
Dauphin, PA	279	18%	78%			
Schuylkill, PA	170	11%	89%			
Lebanon, PA	165	11%	100%			

Table 4b. County-Level EC Emissions

	Emissions in average tons/yr					
County, State	Total VOC	Pct.	Cumulative %			
Lancaster, PA	17,361	35%	35%			
Berks, PA	12,734	26%	61%			
Dauphin, PA	9,378	19%	79%			
Schuylkill, PA	5,935	12%	91%			
Lebanon, PA	4,252	9%	100%			

Table 4c. County-Level VOC Emissions

In Tables 4a - 4c, Lancaster and Berks counties have high POM, EC and VOC emissions. As previously mentioned, Lancaster and Berks counties are less likely to contribute to the Lebanon County violating monitor due to wind direction. Dauphin, Schuylkill and Lebanon counties have similar levels of POM, EC and VOC emissions.

In addition to reviewing county-wide emissions of PM_{2.5} and PM_{2.5} precursors in the area of analysis, EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 5 provides facility-level emissions of direct PM_{2.5}, components of direct PM_{2.5}, and precursor pollutants (given in tons per year) from major point sources with total emissions of 500 tpy or more located in the area of analysis for the Lebanon County. Table 5 also shows the distance from the facility to the Lebanon County.

		Distance	NEI 2011 v1 Emissions (tpy)					
County, State	Facility Name (Facility ID)	from violating monitor (miles)	NH ₃	NOx	PM _{2.5}	SO ₂	VOC	Total
Lebanon, PA	Carmeuse Lime Inc/Millard Lime Plt (420750016)	9	0	444	14	262	4	724
Schuylkill, PA	WPS Westwood Gen LLC/Gen Sta (421070023)	20	0	220	5	268	13	506
Lancaster, PA	Lancaster Cnty RRF/ Lancaster (420710145)	23		577	4	12	4	597
Berks, PA	Cryovac Inc/Cryovac Rigid Packaging (420110093)	23			0		556	556
Berks, PA	Genon Rema LLC/Titus Gen Sta (420110045)	25	0	683	43	4087	5	4818
Berks, PA	Lehigh Cement Co LLC/Evansville Cement Plt & Quarry (420110039)	27	41	1225	134	200	12	1611
Schuylkill, PA	Wheelabrator Frackville/Morea Plt (421070022)	33	0	443	19	468	9	938
Schuylkill, PA	Gilberton Power Co/John B Rich Mem Power Sta (421070025)	33	0	211	39	1314	28	1591
Schuylkill, PA	Schuylkill Energy Res/St Nicholas Cogen (421070024)	35	1	273	27	1883	25	2208
Schuylkill, PA	Northeastern Power Co/Mcadoo Cogen (421070054)	42	0	104	16	706	20	846

 Table 5. NEI 2011 v1 Point Source Emissions (tpy)

Table 5 shows the major point source emissions (from the 2011 NEI in tons per year) in the area of analysis for the Lebanon County and the relative distances of these sources from the violating monitoring location, as depicted by red dots. The actual distance from the point sources to the Lebanon County monitoring location is presented in Table 5. The distance from the violating monitoring location is particularly important for directly emitted PM_{2.5}. The influence of directly emitted PM_{2.5} on ambient PM_{2.5} diminishes more than that of gaseous precursors as a function of distance.¹²⁶

¹²⁶ Baker, K. R. and K. M. Foley. A nonlinear regression model estimating single source concentrations of primary and secondarily formed PM_{2.5}. Atmospheric Environment. 45 (2011) 3758-3767.





As indicated in Table 5 and Figure 5, there are ten sources with emissions over 500 tpy within the area of analysis. One source (Carmeuse Lime) is 9 miles west of the Lebanon County monitor. The largest point sources in the area of analysis are located in Schuylkill and Berks counties. Five point sources are located in Schuylkill County, to the northeast of the Lebanon County monitor. Three point sources are to the east of the Lebanon County monitor in Berks County. As previously mentioned, Schuylkill and Berks counties are not in the regional wind direction (see Factor 3). There are no major point sources with emissions of 500 tpy or more in Dauphin County.

Population density and degree of urbanization

In this part of the factor analysis, EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 6 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area.

County. State	Population 2000	Population 2010	% Change from 2000	Land Area (Sq. Miles)	Population Density (per Sq. Mile)	%	Cumulative %
Lancaster, PA	470,658	520,344	10.6%	949	548	35%	35%
Berks, PA	373,638	411,791	10.2%	859	479	28%	63%
Dauphin, PA	251,798	268,281	6.5%	525	511	18%	81%
Schuylkill, PA	150,336	148,199	-1.4%	778	190	10%	91%
Lebanon, PA	120,327	133,717	11.1%	362	370	9%	100%
Total	1,246,430	1,482,332		(

Table 6. Population Growth and Population Density.

Source: U.S. Census Bureau population estimates for 2000 and 2010



Figure 6. 2010 County-Level Population in the Area of Analysis for the Lebanon County Area.

As indicated in Table 6, Lebanon County has low population but has increased in population by 11.1% from 2000. Lancaster County has the largest and most dense population in the area of analysis. Overall, all of the counties in the area of analysis have seen an increase in population from 2000 to 2010 with the exception of Schuylkill County. The above data indicates that population and population density are not influential factors in determining nonattainment boundaries for the Lebanon County.

Traffic and Vehicle Miles Travelled

High VMT and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and indicates that a county with the high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area. Table 7 shows 2011 VMT while Figure 7 overlays 2011 county-level VMT with a map of the transportation arteries.

Tuble 77 2011 VIII for the Lebunon County						
County, State	Total 2011 VMT	Percent	Cumulative %			
Lancaster, PA	4,150,294,150	32%	32%			
Berks, PA	3,381,679,887	26%	58%			
Dauphin, PA	2,800,543,986	22%	80%			
Schuylkill, PA	1,373,853,518	11%	91%			
Lebanon, PA	1,179,030,237	9%	100%			
Total	12,885,401,778					

Table 7. 2011 VMT for the Lebanon County

http://www.census.gov/hhes/commuting/data/commuting.html



Figure 7. Overlay of 2011 County-level VMT with Transportation Arteries.

As the data in Table 7 illustrates, Lebanon County has the lowest VMT in the area of analysis. Lancaster and Berks counties together account for 58% of the total VMT in the area of analysis. As previously mentioned, Lancaster and Berks counties are not in the regional wind direction. Dauphin County has the next highest VMT, but as further discussed in Factor 4, transport of emissions from mobile sources is limited by topography.

Factor 3: Meteorology

EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. EPA used two primary tools for this assessment: wind roses and kernel density estimation (KDE). When considered in combination with area PM_{2.5} composition and county-level and facility emissions source location information, wind roses and KDE can help to identify nearby areas contributing to violations at violating monitoring sites.

Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate the force of the wind and thus the distance from which those emissions are transported. EPA

constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.¹²⁷ When developing these wind roses, EPA also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 8 shows wind roses that EPA generated from data relevant in the Lebanon County.





As shown in Figure 8, the predominant winds near the violating monitor are from the west with some northwesterly components. These wind roses represent average wind directions throughout the year. According to Table 3a, Lancaster and Berks counties have high PM_{2.5} emissions, however, they are south and east, respectively, of the Lebanon County monitor. Dauphin County is to the west of the Lebanon monitor. Dauphin County does not have any major point sources with emissions of 500 tpy or more, but does have some population and VMT. However, as discussed in Factor 4 below, topography limits transport of low level emissions, such as mobile emissions, from Dauphin County.

¹²⁷ ftp.ncdc.noaa.gov/pub/data/noaa or

http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*

In addition to wind roses, EPA also generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at violating monitoring sites.^{128,129} These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories.¹³⁰ Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell. Figure 9 shows HYSPLIT KDE plots for the Lebanon County summarized by calendar quarter for the 2010-2012 period. The HYSPLIT KDE plots are weighted in the northwesterly and westerly directions, indicating a greater frequency of trajectories passing over grid cells to the west and northwest.





¹²⁹ HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model,

http://www.arl.noaa.gov/HYSPLIT_info.php

¹³⁰ The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.

¹²⁸ In some past initial area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual PM_{2.5} NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.
Third Quarter

Fourth Quarter



Both the wind roses and HYSPLIT KDE plots indicate that prevailing winds in the Lebanon County area are westerly. The counties with the highest emissions in the area of analysis, Lancaster and Berks, therefore are not upwind of the violating monitor. Lancaster County is south of the violating monitor, and Berks County is to the east. Lebanon County falls in the higher density grid cells which indicate a very high potential for transport (darkest blue) in all four quarters. The Carmeuse Lime facility in Lebanon County is 9 miles west of the Lebanon County monitor. Parts of Dauphin County also fall in the higher density grid cells. There are no major sources in Dauphin County and, as discussed in Factor 4 below, mountains to the north and west of the monitor may limit transport of low level emissions, such as mobile emissions, from Dauphin County.

Factor 4: Geography/topography

To evaluate the geography/topography factor, EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of PM_{2.5} concentrations over the area.

Topography is an important factor, as Lebanon County is in a river valley almost entirely surrounded by low mountains. The mountains to the north of the Lebanon County monitor run from the southwest to the northeast and provide a physical barrier between Schuylkill and Dauphin counties and the violating monitor. These mountains limit transport of low-level emissions, such as mobile emissions, and impact meteorology and PM_{2.5} formation.





Factor 5: Jurisdictional boundaries

In defining the boundaries of the intended Lebanon County nonattainment area, EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify the state and local governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the intended area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the intended designated areas.

The violating monitor is located in the Lebanon, PA MSA. This is a single county MSA which consists of Lebanon County, PA. The Lebanon, PA MSA is served by the Lebanon County Metropolitan Planning organization.

The Lebanon County has previously established nonattainment boundaries associated with the 1997 annual and the 2006 24-hour PM_{2.5} NAAQS. Lebanon County is part of the Harrisburg-Lebanon-Carlisle nonattainment area for the 1997 annual PM_{2.5} NAAQS. That area consists of Cumberland, Dauphin, Lebanon Counties. For the 2006 24-hour PM_{2.5} NAAQS, Lebanon County is part of the Harrisburg-Lebanon-Carlisle-York nonattainment area, which also includes Cumberland, Dauphin, and York Counties. EPA does not believe that the counties included in those nonattainment areas, Cumberland, Dauphin, and York Counties, contribute to the violation at the Lebanon County monitor.

Conclusion for the Lebanon County

Based on the assessment of factors described above, both individually and in combination, EPA has preliminarily concluded that only Lebanon County should be included in the Lebanon County nonattainment area because it is violating the 2012 annual PM_{2.5} NAAQS. EPA does not believe that the other counties in the area of analysis contribute to the violation in Lebanon County.

Seasonal variation can highlight those conditions most associated with high average concentration levels of PM_{2.5}. The Lebanon County monitor does not follow the seasonal pattern seen at the other monitors in the area of analysis. The other three monitors in Berks, Dauphin and Lancaster counties tend to track together, with higher first and third quarters, but the Lebanon County monitor does not have a clear seasonal pattern, indicating local influences at the violating monitor.

Organic mass and elemental carbon are the major components of the urban increment at the Lebanon County monitor. These components suggests that the sources of $PM_{2.5}$ are local in nature and could result from mobile, area or local industrial sources.

Lancaster County has the highest total emissions of directly emitted $PM_{2.5}$ and its precursors in the area of analysis. The $PM_{2.5}$ emissions in Lebanon and Dauphin counties are mainly NO_X and VOC emissions. Lebanon County also has a high level of NH₃ emissions. Looking at the components of $PM_{2.5}$, Lancaster and Berks counties have high POM, EC and VOC emissions, however, Lancaster and Berks counties are less likely to contribute to the Lebanon County violating monitor due to wind direction. Dauphin, Schuylkill and Lebanon counties have similar levels of POM, EC and VOC emissions.

There are large point sources (over 500 tpy) to the northeast and east of the violating Lebanon monitor in Schuylkill County and Berks County, respectively. There is one point source in Lebanon County and there are no point sources in Dauphin County. Dauphin County does have a moderate size population and amount of VMT which likely indicate mobile or area sources of emissions.

Both the wind roses and HYSPLIT KDE plots indicate that prevailing winds in the Lebanon County area are westerly. The counties with the highest emissions in the area of analysis, Lancaster and Berks, therefore are not upwind of the violating monitor. Lancaster County is south of the violating monitor, and Berks County is to the east. Sources to the north in Schuylkill County are also not in the regional wind direction and therefore less likely to contribute to the Lebanon County monitor.

Topography is an important factor, as Lebanon County is in a river valley almost entirely surrounded by low mountains. The mountains to the north of the Lebanon County monitor run from the southwest to the northeast and provide a physical barrier between Schuylkill and Dauphin Counties and the violating monitor. These mountains limit transport of low-level emissions from these counties, such as mobile emissions, and impact meteorology and PM_{2.5} formation.

Lebanon County is in a single county MSA, served by a single county MPO. Lebanon County is in a river valley almost entirely surrounded by low mountains. These mountains limit transport of low-level emissions and impact meteorology and PM_{2.5} formation.

The Lebanon County has previously established nonattainment boundaries associated with the 1997 annual and the 2006 24-hour PM_{2.5} NAAQS. However, EPA does not believe that the counties included in those nonattainment areas, Cumberland, Dauphin, and York Counties, contribute to the violation at the Lebanon County monitor.

Appendix C Current (2011) and Projected (2018) Annual PM2.5 Design Values

_id	t	уре	_STATE_NAME	_COUNTY_NAME	monitor_lat	monitor_long	b_pm25_ann_DV	f_pm25_ann_DV
4	120030064 FR	RM I	Pennsylvania	Allegheny	40.323768	-79.868062	14.4	11.84
4	120030002 FR	RM I	Pennsylvania	Allegheny	40.499767	-80.071337	13.19	10.84
Э	390610014 FF	RM (Ohio	Hamilton	39.19433	-84.47898	13.17	10.43
1	L31210039 FR	RM (Georgia	Fulton	33.80233	-84.435576	13.08	11.06
3	390610042 FR	RM (Ohio	Hamilton	39.10492	-84.55117	13.06	10.33
1	L80190006 FF	RM I	ndiana	Clark	38.277675	-85.740153	12.91	10.61
4	120950025 FR	RM I	Pennsylvania	Northampton	40.628056	-75.341111	12.9	11.66
3	391510017 FR	RM (Ohio	Stark	40.786878	-81.394186	12.85	10.7
3	390350038 FR	RM (Ohio	Cuyahoga	41.477011	-81.682383	12.82	10.65
4	120450002 FR	RM I	Pennsylvania	Delaware	39.835556	-75.3725	12.81	11.31
3	390350060 FR	RM (Ohio	Cuyahoga	41.492117	-81.678449	12.79	10.39
1	L30210007 FR	RM (Georgia	Bibb	32.777455	-83.641096	12.78	10.96
Z	121290008 FF	RM I	Pennsylvania	Westmoreland	40.304694	-79.505667	12.63	10.85
	10730023 FR	RM A	Alabama	Jefferson	33.553056	-86.815	12.59	11
Z	120031301 FF	RM I	Pennsylvania	Allegheny	40.402328	-79.860973	12.59	10.27
1	L32150001 FR	RM (Georgia	Muscogee	32.483543	-84.980977	12.58	10.93
1	L80970081 FF	RM I	ndiana	Marion	39.788903	-86.214628	12.57	10.22
Z	120750100 FF	RM I	Pennsylvania	Lebanon	40.337328	-76.383447	12.56	11.08
3	390350065 FR	RM (Ohio	Cuyahoga	41.446682	-81.662419	12.49	10.27
5	540511002 FF	RM N	West Virginia	Marshall	39.915961	-80.733858	12.46	10.72
5	540090005 FR	RM V	West Virginia	Brooke	40.341023	-80.596635	12.41	9.92
3	390170003 FF	RM (Ohio	Butler	39.4938	-84.3543	12.39	9.94
2	211110067 FR	RM I	Kentucky	Jefferson	38.22876	-85.65452	12.38	9.98
1	L80970083 FF	RM I	ndiana	Marion	39.774979	-86.12202	12.37	10.05
Z	120210011 FR	RM I	Pennsylvania	Cambria	40.309722	-78.915	12.34	10.42
Z	120290100 FF	RM I	Pennsylvania	Chester	39.834461	-75.768242	12.33	10.81
1	L80970084 FF	RM I	ndiana	Marion	39.758855	-86.115415	12.29	9.96
1	L33190001 FR	RM (Georgia	Wilkinson	32.881829	-83.333775	12.27	10.51
1	L80372001 FR	RM I	ndiana	Dubois	38.391443	-86.92916	12.23	10.27
2	210290006 FF	RM I	Kentucky	Bullitt	37.98629	-85.71192	12.18	10.01
3	390170016 FF	RM (Ohio	Butler	39.33839	-84.5666	12.16	9.63
1	L91390015 FF	RM I	owa	Muscatine	41.400968	-91.067957	12.1	10.54
Э	390810017 FF	RM (Ohio	Jefferson	40.36644	-80.61558	12.07	9.59
1	L81630016 FR	RM I	ndiana	Vanderburgh	37.974436	-87.532289	12.06	10.38
3	391130032 FR	RM (Ohio	Montgomery	39.760659	-84.187678	12.06	9.55
1	L30950007 FR	RM (Georgia	Dougherty	31.576917	-84.100194	12.05	10.67
1	L32450091 FF	RM (Georgia	Richmond	33.433349	-82.022217	12.05	10.18

Year

Year							
_id	_type	_STATE_NAME	_COUNTY_NAME	monitor_lat	monitor_long	b_pm25_ann_DV	f_pm25_ann_DV
180890031	FRM	Indiana	Lake	41.598505	-87.342991	12.04	10.19
51191008	FRM	Arkansas	Pulaski	34.681343	-92.328697	12.01	11.11
420710007	FRM	Pennsylvania	Lancaster	40.046667	-76.283333	12.01	10.52
420070014	FRM	Pennsylvania	Beaver	40.747796	-80.316442	12	10.28
390350045	FRM	Ohio	Cuyahoga	41.471782	-81.656792	11.99	9.81
420430401	FRM	Pennsylvania	Dauphin	40.246992	-76.846988	11.97	10.53
130630091	FRM	Georgia	Clayton	33.609867	-84.391028	11.97	9.81
390610040	FRM	Ohio	Hamilton	39.12886	-84.50404	11.92	9.33
360050080	FRM	New York	Bronx	40.83606	-73.92009	11.91	10.14
420130801	FRM	Pennsylvania	Blair	40.535278	-78.370833	11.89	9.93
11130001	FRM	Alabama	Russell	32.476781	-84.99911	11.87	10.32
391530017	FRM	Ohio	Summit	41.063526	-81.468956	11.85	9.47
390230005	FRM	Ohio	Clark	39.92882	-83.80949	11.83	9.48
181470009	FRM	Indiana	Spencer	38.167523	-86.983214	11.82	9.94
421250005	FRM	Pennsylvania	Washington	40.146667	-79.902222	11.81	9.65
181670018	FRM	Indiana	Vigo	39.48615	-87.401398	11.8	9.8
180970078	FRM	Indiana	Marion	39.811097	-86.114469	11.79	9.48
181630021	FRM	Indiana	Vanderburgh	38.013248	-87.577856	11.78	10.1
540391005	FRM	West Virginia	Kanawha	38.366183	-81.693717	11.76	9.54
360610128	FRM	New York	New York	40.73	-73.98446	11.75	10.17
210590005	FRM	Kentucky	Daviess	37.780776	-87.075307	11.73	9.88
131150003	FRM	Georgia	Floyd	34.26054	-85.32333	11.72	9.78
10732003	FRM	Alabama	Jefferson	33.499722	-86.924167	11.71	10.3
180830004	FRM	Indiana	Knox	38.740882	-87.484733	11.7	9.88
280670002	FRM	Mississippi	Jones	31.688638	-89.135115	11.67	10.42
132450005	FRM	Georgia	Richmond	33.469164	-81.991426	11.65	9.87
391510020	FRM	Ohio	Stark	40.800729	-81.373008	11.64	9.56
390490024	FRM	Ohio	Franklin	39.99875	-82.99344	11.63	9.25
295100085	FRM	Missouri	St. Louis City	38.656498	-90.198646	11.61	9.83
180670003	FRM	Indiana	Howard	40.485479	-86.132879	11.61	9.75
51190007	FRM	Arkansas	Pulaski	34.756189	-92.281296	11.6	10.65
420490003	FRM	Pennsylvania	Erie	42.14175	-80.038611	11.6	10.27
191390018	FRM	lowa	Muscatine	41.414388	-91.062605	11.6	10.06
420050001	FRM	Pennsylvania	Armstrong	40.814183	-79.56475	11.6	9.94
180431004	FRM	Indiana	Floyd	38.308056	-85.834167	11.6	9.37
390811001	FRM	Ohio	Jefferson	40.32207	-80.6063	11.55	9.02
391650007	FRM	Ohio	Warren	39.42689	-84.20077	11.54	9.08

Year							
_id	_type	_STATE_NAME	_COUNTY_NAME	monitor_lat	monitor_long	b_pm25_ann_DV	f_pm25_ann_DV
191390020	FRM	lowa	Muscatine	41.4069	-91.0616	11.52	9.95
180890027	FRM	Indiana	Lake	41.546593	-87.426481	11.52	9.71
541071002	FRM	West Virginia	Wood	39.323533	-81.552367	11.51	9.53
220170008	FRM	Louisiana	Caddo	32.471666	-93.794999	11.5	10.93
51191004	FRM	Arkansas	Pulaski	34.729603	-92.243587	11.49	10.6
420010001	FRM	Pennsylvania	Adams	39.92002	-77.30968	11.49	10.06
421330008	FRM	Pennsylvania	York	39.965278	-76.699444	11.48	10.07
420031008	FRM	Pennsylvania	Allegheny	40.617488	-79.727664	11.48	9.58
390610006	FRM	Ohio	Hamilton	39.2787	-84.36612	11.48	8.9
261630033	FRM	Michigan	Wayne	42.306674	-83.148754	11.47	9.71
180510012	FRM	Indiana	Gibson	38.322931	-87.318789	11.43	9.65
390490025	FRM	Ohio	Franklin	39.92845	-82.98104	11.43	9.09
191630019	FRM	Iowa	Scott	41.517772	-90.618755	11.42	9.81
10731010	FRM	Alabama	Jefferson	33.545278	-86.549167	11.4	9.66
540030003	FRM	West Virginia	Berkeley	39.448006	-77.964125	11.38	9.8
180890006	FRM	Indiana	Lake	41.636127	-87.440843	11.36	9.55
540110006	FRM	West Virginia	Cabell	38.424133	-82.4259	11.36	9.34
540690010	FRM	West Virginia	Ohio	40.114876	-80.700972	11.35	9.05
51150003	FRM	Arkansas	Роре	35.259775	-93.10005	11.34	10.71
190450019	FRM	Iowa	Clinton	41.823283	-90.211982	11.34	9.79
540490006	FRM	West Virginia	Marion	39.481483	-80.134667	11.34	9.5
390250022	FRM	Ohio	Clermont	39.0828	-84.1441	11.34	8.7
360610134	FRM	New York	New York	40.71436	-73.99518	11.32	9.78
130890002	FRM	Georgia	DeKalb	33.68797	-84.29048	11.31	9.22
191630020	FRM	lowa	Scott	41.512077	-90.624044	11.27	9.62
51450001	FRM	Arkansas	White	35.24894	-91.715596	11.26	10.54
551330027	FRM	Wisconsin	Waukesha	43.020075	-88.21507	11.26	9.66
340390004	FRM	New Jersey	Union	40.64144	-74.208365	11.24	9.67
211010014	FRM	Kentucky	Henderson	37.8712	-87.46375	11.22	9.55
390570005	FRM	Ohio	Greene	39.80834	-83.88705	11.18	8.75
540291004	FRM	West Virginia	Hancock	40.421539	-80.580717	11.17	8.98
295100007	FRM	Missouri	St. Louis City	38.542551	-90.263711	11.16	9.52
421010055	FRM	Pennsylvania	Philadelphia	39.922867	-75.186921	11.15	9.61
191110008	FRM	lowa	Lee	40.400959	-91.391012	11.14	9.93
390990014	FRM	Ohio	Mahoning	41.095938	-80.658516	11.14	9.17
390990005	FRM	Ohio	Mahoning	41.111126	-80.645062	11.13	9.16
180892004	FRM	Indiana	Lake	41.585496	-87.474486	11.11	9.32

Year							
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340172002	FRM	New Jersey	Hudson	40.772793	-74.031718	11.1	9.53
180390008	FRM	Indiana	Elkhart	41.656905	-85.968372	11.1	9.36
130670004	FRM	Georgia	Cobb	33.89932	-84.661514	11.1	9.29
10732006	FRM	Alabama	Jefferson	33.386389	-86.816667	11.08	9.62
210930006	FRM	Kentucky	Hardin	37.705612	-85.852629	11.08	8.9
391530023	FRM	Ohio	Summit	41.087956	-81.541611	11.08	8.79
51390006	FRM	Arkansas	Union	33.220274	-92.669619	11.07	10.45
180892010	FRM	Indiana	Lake	41.678349	-87.508345	11.07	9.31
11210002	FRM	Alabama	Talladega	33.279747	-86.349438	11.05	9.15
212270008	FRM	Kentucky	Warren	37.035438	-86.250628	11.03	9.16
191630018	FRM	lowa	Scott	41.550005	-90.600115	11.02	9.43
420030008	FRM	Pennsylvania	Allegheny	40.46542	-79.960757	11.01	9.13
420410101	FRM	Pennsylvania	Cumberland	40.246528	-77.18675	11	9.52
10731005	FRM	Alabama	Jefferson	33.331111	-87.003611	11	9.49
245100040	FRM	Maryland	Baltimore (City)	39.297733	-76.604603	10.97	9.55
390870012	FRM	Ohio	Lawrence	38.508114	-82.659301	10.97	8.97
480370004	FRM	Texas	Bowie	33.425758	-94.070802	10.94	10.24
50350005	FRM	Arkansas	Crittenden	35.197288	-90.193141	10.94	9.56
191390016	FRM	lowa	Muscatine	41.419429	-91.070975	10.94	9.47
421250200	FRM	Pennsylvania	Washington	40.170556	-80.261389	10.93	8.97
240430009	FRM	Maryland	Washington	39.564178	-77.720244	10.89	9.34
291893001	FRM	Missouri	Saint Louis	38.650259	-90.350463	10.89	9.11
450630008	FRM	South Carolina	Lexington	34.051017	-81.15495	10.89	9.04
390950028	FRM	Ohio	Lucas	41.662567	-83.478333	10.89	9.02
420170012	FRM	Pennsylvania	Bucks	40.107222	-74.882222	10.88	9.68
11011002	FRM	Alabama	Montgomery	32.40712	-86.256367	10.88	9.58
420110011	FRM	Pennsylvania	Berks	40.38335	-75.9686	10.88	9.46
280750003	FRM	Mississippi	Lauderdale	32.364565	-88.731491	10.86	9.6
421010057	FRM	Pennsylvania	Philadelphia	39.960061	-75.142224	10.85	9.4
191630015	FRM	lowa	Scott	41.530011	-90.587611	10.85	9.25
211451004	FRM	Kentucky	McCracken	37.06636	-88.63774	10.84	9.36
11270002	FRM	Alabama	Walker	33.832778	-87.2725	10.84	9.35
280490010	FRM	Mississippi	Hinds	32.385731	-90.1412	10.83	9.68
210130002	FRM	Kentucky	Bell	36.60843	-83.73694	10.83	9.1
261630015	FRM	Michigan	Wayne	42.302786	-83.10653	10.83	8.94
550790010	FRM	Wisconsin	Milwaukee	43.016667	-87.933333	10.82	9.24
390490081	FRM	Ohio	Franklin	40.0877	-82.959773	10.82	8.47

Year							
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421010047	FRM	Pennsylvania	Philadelphia	39.944651	-75.165206	10.81	9.32
180190008	FRM	Indiana	Clark	38.393833	-85.664167	10.8	8.58
240053001	FRM	Maryland	Baltimore	39.310833	-76.474444	10.79	9.42
470650031	FRM	Tennessee	Hamilton	34.99438	-85.24293	10.79	8.89
280810005	FRM	Mississippi	Lee	34.264917	-88.766222	10.77	9.39
370570002	FRM	North Carolina	Davidson	35.814444	-80.2625	10.77	8.93
50450002	FRM	Arkansas	Faulkner	35.105193	-92.427859	10.76	10.03
50510003	FRM	Arkansas	Garland	34.469441	-93.000178	10.75	10.08
240330025	FRM	Maryland	Prince George's	38.94121	-76.93219	10.75	9.18
515100009	FRM	Virginia	Alexandria City	38.810403	-77.04435	10.74	9.16
180350006	FRM	Indiana	Delaware	40.201141	-85.387999	10.74	8.95
450450009	FRM	South Carolina	Greenville	34.899141	-82.31307	10.74	8.79
181270024	FRM	Indiana	Porter	41.617558	-87.199248	10.73	8.98
130510017	FRM	Georgia	Chatham	32.092957	-81.14399	10.7	9.15
10550010	FRM	Alabama	Etowah	33.993749	-85.991072	10.7	9.01
450450015	FRM	South Carolina	Greenville	34.843895	-82.414585	10.68	8.78
470651011	FRM	Tennessee	Hamilton	35.233476	-85.181581	10.68	8.75
51430005	FRM	Arkansas	Washington	36.1797	-94.116827	10.67	10.13
51130002	FRM	Arkansas	Polk	34.583699	-94.226234	10.67	10.11
51070001	FRM	Arkansas	Phillips	34.529766	-90.586049	10.67	9.71
470654002	FRM	Tennessee	Hamilton	35.050918	-85.293019	10.67	8.65
391351001	FRM	Ohio	Preble	39.83562	-84.72049	10.66	8.78
482030002	FRM	Texas	Harrison	32.668987	-94.167457	10.65	10.34
371190042	FRM	North Carolina	Mecklenburg	35.151283	-80.866983	10.65	8.77
190130008	FRM	lowa	Black Hawk	42.493056	-92.343889	10.63	9.43
210670012	FRM	Kentucky	Fayette	38.06503	-84.49761	10.59	8.42
420950027	FRM	Pennsylvania	Northampton	40.645889	-75.404397	10.58	9.37
130510091	FRM	Georgia	Chatham	32.110759	-81.161847	10.58	9
390950026	FRM	Ohio	Lucas	41.620633	-83.64225	10.58	8.82
390950024	FRM	Ohio	Lucas	41.644067	-83.54625	10.57	8.75
391550005	FRM	Ohio	Trumbull	41.231167	-80.801914	10.57	8.59
190450021	FRM	lowa	Clinton	41.874999	-90.177574	10.56	9.07
10735002	FRM	Alabama	Jefferson	33.704722	-86.669167	10.55	8.93
181410015	FRM	Indiana	St. Joseph	41.696692	-86.214683	10.54	8.88
240031003	FRM	Maryland	Anne Arundel	39.169533	-76.627933	10.53	9.16
240330030	FRM	Maryland	Prince George's	39.055277	-76.878333	10.53	9.15
450830011	FRM	South Carolina	Spartanburg	34.955566	-81.924797	10.53	8.67

Year							
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210373002	FRM	Kentucky	Campbell	39.021881	-84.47445	10.53	7.91
50010011	FRM	Arkansas	Arkansas	34.518515	-91.55896	10.51	9.82
210470006	FRM	Kentucky	Christian	36.91171	-87.323337	10.51	8.73
181570008	FRM	Indiana	Tippecanoe	40.431639	-86.8525	10.51	8.71
180030004	FRM	Indiana	Allen	41.094965	-85.101816	10.51	8.69
540390010	FRM	West Virginia	Kanawha	38.3456	-81.628317	10.49	8.36
290390001	FRM	Missouri	Cedar	37.69	-94.035	10.48	9.79
50030005	FRM	Arkansas	Ashley	33.136862	-91.950377	10.48	9.51
10890014	FRM	Alabama	Madison	34.68767	-86.58637	10.48	9.21
131530001	FRM	Georgia	Houston	32.6056	-83.597907	10.45	8.84
420850100	FRM	Pennsylvania	Mercer	41.215014	-80.484779	10.44	8.62
210190017	FRM	Kentucky	Boyd	38.45934	-82.64041	10.44	8.52
180650003	FRM	Indiana	Henry	40.009525	-85.523455	10.43	8.57
10491003	FRM	Alabama	DeKalb	34.287627	-85.968298	10.41	8.72
450790019	FRM	South Carolina	Richland	33.991509	-81.024141	10.41	8.64
245100008	FRM	Maryland	Baltimore (City)	39.28777	-76.546861	10.4	8.98
10735003	FRM	Alabama	Jefferson	33.801667	-86.9425	10.39	8.82
391450013	FRM	Ohio	Scioto	38.754595	-82.917	10.37	8.39
390351002	FRM	Ohio	Cuyahoga	41.39629	-81.818667	10.36	8.35
100032004	FRM	Delaware	New Castle	39.739444	-75.558056	10.35	8.93
130590002	FRM	Georgia	Clarke	33.918067	-83.344495	10.35	8.34
420030067	FRM	Pennsylvania	Allegheny	40.375644	-80.169943	10.34	8.42
371190041	FRM	North Carolina	Mecklenburg	35.2401	-80.785683	10.3	8.43
191032001	FRM	lowa	Johnson	41.657232	-91.503478	10.29	9.03
110010041	FRM	District Of Columbia	District of Columbia	38.895572	-76.958072	10.29	8.72
190130009	FRM	lowa	Black Hawk	42.501543	-92.316017	10.28	9.08
240150003	FRM	Maryland	Cecil	39.701444	-75.860051	10.27	8.78
450410003	FRM	South Carolina	Florence	34.214263	-79.767347	10.26	8.58
261630001	FRM	Michigan	Wayne	42.22862	-83.2082	10.26	8.48
391330002	FRM	Ohio	Portage	41.1644	-81.2352	10.26	8.08
261630038	FRM	Michigan	Wayne	42.335008	-83.109563	10.23	8.45
131390003	FRM	Georgia	Hall	34.30008	-83.81217	10.22	8.33
11250004	FRM	Alabama	Tuscaloosa	33.18935	-87.484217	10.21	8.99
540610003	FRM	West Virginia	Monongalia	39.649367	-79.920867	10.2	8.27
191130040	FRM	lowa	Linn	41.97677	-91.68766	10.19	8.99
550790026	FRM	Wisconsin	Milwaukee	43.060975	-87.913504	10.18	8.66
240290002	FRM	Maryland	Kent	39.305021	-75.797317	10.16	8.78

Year							
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261630039	FRM	Michigan	Wayne	42.323341	-83.068473	10.16	8.35
132950002	FRM	Georgia	Walker	34.97889	-85.30098	10.16	8.34
290770032	FRM	Missouri	Greene	37.199541	-93.284874	10.15	9.42
340171003	FRM	New Jersey	Hudson	40.725454	-74.05229	10.15	8.68
240313001	FRM	Maryland	Montgomery	39.114313	-77.106876	10.14	8.73
370350004	FRM	North Carolina	Catawba	35.728889	-81.365556	10.14	8.31
181050003	FRM	Indiana	Monroe	39.159383	-86.504762	10.14	8.16
240251001	FRM	Maryland	Harford	39.410191	-76.296946	10.11	8.71
100031012	FRM	Delaware	New Castle	39.691962	-75.761299	10.08	8.58
180950011	FRM	Indiana	Madison	40.125703	-85.652184	10.08	8.24
550250047	FRM	Wisconsin	Dane	43.0733	-89.4358	10.07	8.71
110010042	FRM	District Of Columbia	District of Columbia	38.876255	-77.034059	10.06	8.51
450790007	FRM	South Carolina	Richland	34.093959	-80.962304	10.06	8.27
290990019	FRM	Missouri	Jefferson	38.448633	-90.39854	10.05	8.58
550430009	FRM	Wisconsin	Grant	42.693	-90.698	10.04	8.76
510690010	FRM	Virginia	Frederick	39.28102	-78.08157	10.04	8.52
110010043	FRM	District Of Columbia	District of Columbia	38.921847	-77.013178	10.04	8.46
11030011	FRM	Alabama	Morgan	34.518735	-86.976939	10.02	8.81
390350034	FRM	Ohio	Cuyahoga	41.55523	-81.575256	10.02	8
245100006	FRM	Maryland	Baltimore (City)	39.340556	-76.582222	10.01	8.58
50670001	FRM	Arkansas	Jackson	35.638169	-91.189506	10	9.25
370710016	FRM	North Carolina	Gaston	35.253056	-81.153333	10	8.08
360470122	FRM	New York	Kings	40.71961	-73.94771	9.98	8.49
10731009	FRM	Alabama	Jefferson	33.459722	-87.305556	9.97	8.57
371830014	FRM	North Carolina	Wake	35.856111	-78.574167	9.97	8.34
371590021	FRM	North Carolina	Rowan	35.551868	-80.395039	9.97	8.24
180910011	FRM	Indiana	LaPorte	41.707212	-86.891216	9.96	8.25
130210012	FRM	Georgia	Bibb	32.805408	-83.543521	9.93	8.34
191130037	FRM	lowa	Linn	42.00508	-91.6793	9.91	8.66
420910013	FRM	Pennsylvania	Montgomery	40.112222	-75.309167	9.9	8.59
261630016	FRM	Michigan	Wayne	42.357808	-83.096033	9.9	8.16
180550001	FRM	Indiana	Greene	38.985578	-86.99012	9.89	8.01
250250043	FRM	Massachusetts	Suffolk	42.3631	-71.0543	9.87	8.79
271230868	FRM	Minnesota	Ramsey	44.95072	-93.09827	9.86	9.05
517700015	FRM	Virginia	Roanoke City	37.297167	-79.955733	9.85	8.25
371190043	FRM	North Carolina	Mecklenburg	35.3041	-80.88865	9.81	7.94
245100007	FRM	Maryland	Baltimore (City)	39.34465	-76.68538	9.79	8.34

Year							
_id	_type	_STATE_NAME	_COUNTY_NAME	monitor_lat	monitor_long	b_pm25_ann_DV	f_pm25_ann_DV
360050133	FRM	New York	Bronx	40.8679	-73.87809	9.78	8.2
360610079	FRM	New York	New York	40.7997	-73.93432	9.78	8.18
370510009	FRM	North Carolina	Cumberland	35.041416	-78.953112	9.78	8.07
280330002	FRM	Mississippi	DeSoto	34.82166	-89.98783	9.76	8.54
11170006	FRM	Alabama	Shelby	33.312927	-86.821104	9.75	8.33
450370001	FRM	South Carolina	Edgefield	33.739963	-81.853635	9.75	8.08
10270001	FRM	Alabama	Clay	33.281261	-85.802182	9.74	8.02
261150005	FRM	Michigan	Monroe	41.763889	-83.471944	9.72	7.91
421010004	FRM	Pennsylvania	Philadelphia	40.008889	-75.09778	9.71	8.61
10331002	FRM	Alabama	Colbert	34.758781	-87.650562	9.7	8.46
261630019	FRM	Michigan	Wayne	42.43084	-83.000138	9.67	7.95
511650003	FRM	Virginia	Rockingham	38.47753	-78.81952	9.66	8.28
340392003	FRM	New Jersey	Union	40.603943	-74.276174	9.66	8.24
450450016	FRM	South Carolina	Greenville	34.751848	-82.256701	9.66	7.78
370870012	FRM	North Carolina	Haywood	35.50575	-82.97918	9.65	8.17
390933002	FRM	Ohio	Lorain	41.463071	-82.114261	9.64	7.98
10690003	FRM	Alabama	Houston	31.226359	-85.390768	9.62	8.28
181830003	FRM	Indiana	Whitley	41.169646	-85.629292	9.61	7.94
421011002	FRM	Pennsylvania	Philadelphia	40.035985	-75.002405	9.6	8.49
517750011	FRM	Virginia	Salem City	37.297883	-80.081017	9.59	7.97
240051007	FRM	Maryland	Baltimore	39.462029	-76.631673	9.58	8.1
515200006	FRM	Virginia	Bristol City	36.608	-82.1641	9.58	7.92
550090005	FRM	Wisconsin	Brown	44.50729	-87.99344	9.57	8.53
100031003	FRM	Delaware	New Castle	39.761111	-75.491944	9.56	8.14
371550005	FRM	North Carolina	Robeson	34.645	-78.99028	9.56	7.88
340390006	FRM	New Jersey	Union	40.673406	-74.213889	9.55	8.11
340210008	FRM	New Jersey	Mercer	40.222411	-74.763167	9.54	8.36
510410003	FRM	Virginia	Chesterfield	37.43467	-77.45118	9.54	7.91
390850007	FRM	Ohio	Lake	41.726811	-81.242156	9.54	7.58
260810007	FRM	Michigan	Kent	42.956117	-85.679117	9.53	8
370670022	FRM	North Carolina	Forsyth	36.110556	-80.226667	9.53	7.74
370010002	FRM	North Carolina	Alamance	36.089004	-79.407821	9.53	7.72
191530030	FRM	lowa	Polk	41.603159	-93.643118	9.52	8.36
340071007	FRM	New Jersey	Camden	39.989036	-75.050008	9.51	8.17
371910005	FRM	North Carolina	Wayne	35.369214	-77.993893	9.51	7.9
500210002	FRM	Vermont	Rutland	43.608056	-72.982778	9.49	9.1
190550001	FRM	lowa	Delaware	42.600834	-91.538493	9.49	8.15

Year							
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371110004	FRM	North Carolina	McDowell	35.687406	-81.993808	9.48	7.79
360850055	FRM	New York	Richmond	40.63307	-74.13719	9.47	8.03
191532510	FRM	lowa	Polk	41.603517	-93.7479	9.46	8.33
370670030	FRM	North Carolina	Forsyth	36.026	-80.342	9.46	7.68
90091123	FRM	Connecticut	New Haven	41.310833	-72.916944	9.45	8.31
340130003	FRM	New Jersey	Essex	40.720989	-74.192892	9.45	8.16
550790099	FRM	Wisconsin	Milwaukee	43.041	-87.925	9.45	8
360290005	FRM	New York	Erie	42.876907	-78.809526	9.43	7.98
211950002	FRM	Kentucky	Pike	37.4826	-82.53532	9.42	7.67
280430001	FRM	Mississippi	Grenada	33.834444	-89.792778	9.41	8.15
191770006	FRM	lowa	Van Buren	40.695078	-92.006318	9.4	8.33
440070026	FRM	Rhode Island	Providence	41.874668	-71.379971	9.38	8.36
550250041	FRM	Wisconsin	Dane	43.100838	-89.357298	9.37	8.02
261630025	FRM	Michigan	Wayne	42.423063	-83.426263	9.37	7.63
211510003	FRM	Kentucky	Madison	37.738458	-84.284952	9.37	7.36
420270100	FRM	Pennsylvania	Centre	40.811389	-77.877028	9.36	7.86
371730002	FRM	North Carolina	Swain	35.434767	-83.442133	9.36	7.82
90010010	FRM	Connecticut	Fairfield	41.170833	-73.194722	9.35	8.13
261610008	FRM	Michigan	Washtenaw	42.240565	-83.599602	9.35	7.68
260810020	FRM	Michigan	Kent	42.984173	-85.671339	9.34	7.83
550590019	FRM	Wisconsin	Kenosha	42.504722	-87.8093	9.33	7.83
340310005	FRM	New Jersey	Passaic	40.918381	-74.168092	9.32	7.93
340150004	FRM	New Jersey	Gloucester	39.830806	-75.284723	9.3	<mark>7.8</mark> 4
370810014	FRM	North Carolina	Guilford	36.06866	-80.00705	9.29	7.54
420030093	FRM	Pennsylvania	Allegheny	40.606624	-80.021669	9.28	7.54
330050007	FRM	New Hampshire	Cheshire	42.930472	-72.272389	9.27	8.89
511071005	FRM	Virginia	Loudoun	39.02473	-77.48925	9.27	7.86
340410006	FRM	New Jersey	Warren	40.699207	-75.180525	9.24	8.04
510590030	FRM	Virginia	Fairfax	38.77335	-77.10468	9.23	7.74
261250001	FRM	Michigan	Oakland	42.463063	-83.183199	9.23	7.54
250130016	FRM	Massachusetts	Hampden	42.108992	-72.590803	9.22	8.35
550870009	FRM	Wisconsin	Outagamie	44.30738	-88.395134	9.22	8.24
90090027	FRM	Connecticut	New Haven	41.3014	-72.902871	9.22	8.0 <mark>5</mark>
510870014	FRM	Virginia	Henrico	37.55652	-77.40027	9.22	7.65
271630448	FRM	Minnesota	Washington	45.02124	-92.77525	9.21	8.4
90013005	FRM	Connecticut	Fairfield	41.1125	-73.407222	9.21	7.91
517100024	FRM	Virginia	Norfolk City	36.85555	-76.30135	9.2	7.69

Year							
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90092123	FRM	Connecticut	New Haven	41.550556	-73.043611	9.18	8.19
261630036	FRM	Michigan	Wayne	42.187289	-83.153905	9.18	7.51
340030003	FRM	New Jersey	Bergen	40.852256	-73.973314	9.17	7.67
420692006	FRM	Pennsylvania	Lackawanna	41.442778	-75.623056	9.16	7.99
260770008	FRM	Michigan	Kalamazoo	42.278067	-85.54189	9.16	7.58
371830020	FRM	North Carolina	Wake	35.7288	-78.6802	9.16	7.53
271230871	FRM	Minnesota	Ramsey	44.95939	-93.03587	9.15	8.37
450250001	FRM	South Carolina	Chesterfield	34.615367	-80.198787	9.15	7.5
220730004	FRM	Louisiana	Ouachita	32.509713	-92.046093	9.14	8.52
370810013	FRM	North Carolina	Guilford	36.109167	-79.801111	9.14	7.38
261470005	FRM	Michigan	St. Clair	42.953336	-82.456229	9.13	7.89
260910007	FRM	Michigan	Lenawee	41.995568	-83.946559	9.13	7.6
370630015	FRM	North Carolina	Durham	36.032944	-78.905417	9.12	7.45
518100008	FRM	Virginia	Virginia Beach City	36.841883	-76.181233	9.11	7.59
361191002	FRM	New York	Westchester	40.93149	-73.76575	9.09	7.6
360810124	FRM	New York	Queens	40.73614	-73.82153	9.08	7.65
370210034	FRM	North Carolina	Buncombe	35.6075	-82.583333	9.07	7.26
540810002	FRM	West Virginia	Raleigh	37.807767	-81.197433	9.06	7.18
100031007	FRM	Delaware	New Castle	39.5513	-75.732	9.03	7.57
550890009	FRM	Wisconsin	Ozaukee	43.49806	-87.81	9.02	7.76
250250002	FRM	Massachusetts	Suffolk	42.348873	-71.097163	9.01	7.96
90011123	FRM	Connecticut	Fairfield	41.399167	-73.443056	8.99	7.89
550270001	FRM	Wisconsin	Dodge	43.466111	-88.621111	8.99	7.85
261390005	FRM	Michigan	Ottawa	42.894451	-85.852734	8.99	7.48
550630012	FRM	Wisconsin	La Crosse	43.7775	-91.2269	8.98	8.08
100051002	FRM	Delaware	Sussex	38.6539	-75.6106	8.97	7.58
271095008	FRM	Minnesota	Olmsted	43.996908	-92.450366	8.96	8.07
370990006	FRM	North Carolina	Jackson	35.466667	-83.278056	8.96	7.45
270530963	FRM	Minnesota	Hennepin	44.95366	-93.25821	8.94	8.2
371210001	FRM	North Carolina	Mitchell	35.915278	-82.073333	8.94	7.4
100010003	FRM	Delaware	Kent	39.155	-75.518056	8.93	7.59
240230002	FRM	Maryland	Garrett	39.70595	-79.012	8.93	7.47
340011006	FRM	New Jersey	Atlantic	39.36326	-74.431	8.91	7.67
270370470	FRM	Minnesota	Dakota	44.73846	-93.23725	8.89	8.14
450190048	FRM	South Carolina	Charleston	32.980254	-80.06501	8.89	7.38
360590008	FRM	New York	Nassau	40.63103	-73.73388	8.88	7.49
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390090003	FRM	Ohio	Athens	39.442165	-81.908827	8.8	6.89
511390004	FRM	Virginia	Page	38.66373	-78.50442	8.79	7.44
90032006	FRM	Connecticut	Hartford	41.7425	-72.634444	8.78	7.9
250132009	FRM	Massachusetts	Hampden	42.105792	-72.597133	8.77	7.91
371010002	FRM	North Carolina	Johnston	35.590833	-78.461944	8.76	7.13
450190049	FRM	South Carolina	Charleston	32.790984	-79.958694	8.75	7.29
260990009	FRM	Michigan	Macomb	42.731394	-82.793463	8.73	7.18
370650004	FRM	North Carolina	Edgecombe	35.93355	-77.75007	8.73	7.1
510870015	FRM	Virginia	Henrico	37.67132	-77.5664	8.72	7.17
250270023	FRM	Massachusetts	Worcester	42.263955	-71.794322	8.71	7.81
210430500	FRM	Kentucky	Carter	38.23887	-82.9881	8.71	6.92
240338003	FRM	Maryland	Prince George's	38.81194	-76.74417	8.7	7.21
90019003	FRM	Connecticut	Fairfield	41.118333	-73.336667	8.69	7.44
250035001	FRM	Massachusetts	Berkshire	42.448009	-73.254108	8.68	7.85
100010002	FRM	Delaware	Kent	38.986672	-75.5568	8.66	7.3
260210014	FRM	Michigan	Berrien	42.19779	-86.309694	8.66	7.17
370330001	FRM	North Carolina	Caswell	36.307033	-79.467417	8.66	6.95
260650012	FRM	Michigan	Ingham	42.738618	-84.534633	8.65	7.21
271390505	FRM	Minnesota	Scott	44.791437	-93.512534	8.62	7.91
510360002	FRM	Virginia	Charles	37.34438	-77.25925	8.61	7.03
370610002	FRM	North Carolina	Duplin	34.954823	-77.960781	8.57	6.97
340410007	FRM	New Jersey	Warren	40.92458	-75.067815	8.55	7.42
360850067	FRM	New York	Richmond	40.59664	-74.12525	8.51	7.15
330131006	FRM	New Hampshire	Merrimack	43.13244	-71.458306	8.48	7.97
340292002	FRM	New Jersey	Ocean	39.994908	-74.170447	8.48	7.3
261210040	FRM	Michigan	Muskegon	43.233061	-86.23858	8.48	7.06
271630447	FRM	Minnesota	Washington	45.02862	-92.78336	8.47	7.69
270031002	FRM	Minnesota	Anoka	45.13768	-93.207615	8.44	7.74
260050003	FRM	Michigan	Allegan	42.767786	-86.148577	8.42	6.96
510030001	FRM	Virginia	Albemarle	38.07657	-78.50397	8.4	6.95
516800015	FRM	Virginia	Lynchburg City	37.332706	-79.215011	8.4	6.91
340270004	FRM	New Jersey	Morris	40.801211	-74.483433	8.39	7.2
230050015	FRM	Maine	Cumberland	43.677994	-70.256178	8.37	7.88
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371170001	FRM	North Carolina	Martin	35.81066	-76.906249	8.3	6.7
250250042	FRM	Massachusetts	Suffolk	42.3295	-71.0826	8.28	7.24
371470006	FRM	North Carolina	Pitt	35.63861	-77.35805	8.27	6.69
230172011	FRM	Maine	Oxford	44.551419	-70.546319	8.2	7.79
250270016	FRM	Massachusetts	Worcester	42.260102	-71.798375	8.19	7.3
90113002	FRM	Connecticut	New London	41.524167	-72.076667	8.19	7.26
230050029	FRM	Maine	Cumberland	43.660246	-70.268965	8.17	7.72
340218001	FRM	New Jersey	Mercer	40.31239	-74.87266	8.17	6.99
340010006	FRM	New Jersey	Atlantic	39.464872	-74.448736	8.14	6.86
440070028	FRM	Rhode Island	Providence	41.809235	-71.40743	8.12	7.06
370370004	FRM	North Carolina	Chatham	35.757222	-79.159722	8.08	6.49
440071010	FRM	Rhode Island	Providence	41.841573	-71.36077	8.06	7.07
90031003	FRM	Connecticut	Hartford	41.784722	-72.631667	8.05	7.18
360010005	FRM	New York	Albany	42.64225	-73.75464	8.05	7.01
360710002	FRM	New York	Orange	41.49916	-74.00885	8.04	6.9
340230006	FRM	New Jersey	Middlesex	40.472825	-74.422403	8.01	6.92
371890003	FRM	North Carolina	Watauga	36.221944	-81.663056	7.99	6.47
440070022	FRM	Rhode Island	Providence	41.807776	-71.415105	7.94	6.89
250096001	FRM	Massachusetts	Essex	42.698215	-71.164413	7.91	7.14
420890002	FRM	Pennsylvania	Monroe	41.08306	-75.32328	7.9	6.71
250230004	FRM	Massachusetts	Plymouth	42.081936	-71.014739	7.85	6.84
516500008	FRM	Virginia	Hampton City	37.103733	-76.387017	7.85	6.38
260170014	FRM	Michigan	Вау	43.571391	-83.890721	7.81	6.64
421255001	FRM	Pennsylvania	Washington	40.445278	-80.420833	7.79	6.14
330111015	FRM	New Hampshire	Hillsborough	42.762056	-71.444583	7.78	7.13
371290002	FRM	North Carolina	New Hanover	34.364167	-77.838611	7.77	6.22
250130008	FRM	Massachusetts	Hampden	42.19438	-72.555112	7.64	6.76
551198001	FRM	Wisconsin	Taylor	45.2066	-90.5972	7.62	6.91
250051004	FRM	Massachusetts	Bristol	41.685707	-71.169235	7.58	6.55
340273001	FRM	New Jersey	Morris	40.787628	-74.676301	7.55	6.49
360671015	FRM	New York	Onondaga	43.05235	-76.05921	7.52	6.44
230010011	FRM	Maine	Androscoggin	44.089406	-70.214219	7.5	7.07
330150014	FRM	New Hampshire	Rockingham	43.075333	-70.748	7.49	6.97
250170009	FRM	Massachusetts	Middlesex	42.62668	-71.362068	7.49	6.66
360130011	FRM	New York	Chautauqua	42.29071	-79.58961	7.43	6.15

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230110016	FRM	Maine	Kennebec	44.312319	-69.786717	7.16	6.76
360010012	FRM	New York	Albany	42.68075	-73.75733	7.16	6.13
500070012	FRM	Vermont	Chittenden	44.480278	-73.214444	7.12	6.52
361010003	FRM	New York	Steuben	42.09142	-77.20978	6.85	5.76
500030004	FRM	Vermont	Bennington	42.88759	-73.24984	6.83	6.23
330090010	FRM	New Hampshire	Grafton	43.629611	-72.309583	6.75	6.35
271377551	FRM	Minnesota	Saint Louis	46.76643	-92.13354	6.59	6.24
261010922	FRM	Michigan	Manistee	44.307	-86.242649	6.58	5.67
230031011	FRM	Maine	Aroostook	46.682299	-68.016195	6.53	6.28
260330901	FRM	Michigan	Chippewa	46.493611	-84.364167	6.23	5.88
440030002	FRM	Rhode Island	Kent	41.615237	-71.72	6.15	5.27
261130001	FRM	Michigan	Missaukee	44.310555	-84.891865	5.96	5.26
330012004	FRM	New Hampshire	Belknap	43.566111	-71.496361	5.91	5.41
551250001	FRM	Wisconsin	Vilas	46.052	-89.653	5.76	5.14
271377550	FRM	Minnesota	Saint Louis	46.81826	-92.08936	5.63	5.25
90050005	FRM	Connecticut	Litchfield	41.821342	-73.297257	5.63	4.83
271377554	FRM	Minnesota	Saint Louis	46.743657	-92.165998	5.62	5.24
271377001	FRM	Minnesota	Saint Louis	47.523355	-92.536305	5.61	5.35
550410007	FRM	Wisconsin	Forest	45.563	-88.8088	5.57	4.86
550030010	FRM	Wisconsin	Ashland	46.602	-90.656	5.32	4.87
500070007	FRM	Vermont	Chittenden	44.52839	-72.86884	5.08	4.57
230090103	FRM	Maine	Hancock	44.37705	-68.2609	4.59	4.33
360310003	FRM	New York	Essex	44.39308	-73.8589	4.33	3.72

Appendix D-1 New York Public Officer's Law (POL) section 73–a, "Financial disclosure"

Appendix D-2 Title 19 of the New York Codes of Rules and Regulations (19 NYCRR) Part 937, "Access to Publicly Available Records"

Appendix D-3 Copy of Delegation Order M3-5001-09 which includes entities that received delegated responsibilities for implementing and enforcing portions of the New York SIP

Public Officers

§ 73-a.

2. (a) Every statewide elected official, state officer or employee, member of the legislature, legislative employee and political party chairman and every candidate for statewide elected office or for member of the legislature shall file an annual statement of financial disclosure containing the information and in the form set forth in subdivision three of this section. On or before the fifteenth day of May with respect to the preceding calendar year: (1) every member of the legislature, every candidate for member of the legislature and legislative employee shall file such statement with the legislative ethics commission which shall provide such statement along with any requests for exemptions or deletions to the joint commission on public ethics for filing and rulings with respect to such requests for exemptions or deletions, on or before the thirtieth day of June; and (2) all other individuals required to file such statement shall file it with the joint commission on public ethics, except that:

(i) a person who is subject to the reporting requirements of this subdivision and who timely filed with the internal revenue service an application for automatic extension of time in which to file his or her individual income tax return for the immediately preceding calendar or fiscal year shall be required to file such financial disclosure statement on or before May fifteenth but may, without being subjected to any civil penalty on account of a deficient statement, indicate with respect to any item of the disclosure statement that information with respect thereto is lacking but will be supplied in a supplementary statement of financial disclosure, which shall be filed on or before the seventh day after the expiration of the period of such automatic extension of time within which to file such individual income tax return, provided that failure to file or to timely file such supplementary statement of financial disclosure or the filing of an incomplete or deficient supplementary statement of financial disclosure shall be subject to the notice and penalty provisions of this section respecting annual statements of financial disclosure as if such supplementary statement were an annual statement;

(ii) a person who is required to file an annual financial disclosure statement with the joint commission on public ethics, and who is granted an additional period of time within which to file such statement due to justifiable cause or undue hardship, in accordance with required rules and regulations on the subject adopted pursuant to paragraph c of subdivision nine of section ninety-four of the executive law shall file such statement within the additional period of time granted; and the legislative ethics commission shall notify the joint commission on public ethics of any extension granted pursuant to this paragraph;

(iii) candidates for statewide office who receive a party designation for nomination by a state committee pursuant to section 6-104 of the election law shall file such statement within ten days after the date of the meeting at which they are so designated;

(iv) candidates for statewide office who receive twenty-five percent or more of the vote cast at the meeting of the state committee held pursuant to section 6-104 of the election law and who demand to have their names placed on the primary ballot and who do not withdraw within fourteen days after such meeting shall file such statement within ten days after the last day to withdraw their names in accordance with the provisions of such section of the election law;

(v) candidates for statewide office and candidates for member of the legislature who file party designating petitions for nomination at a primary election shall file such statement within ten days after the last day allowed by law for the filing of party designating petitions naming them as candidates for the next succeeding primary election;

(vi) candidates for independent nomination who have not been designated by a party to receive a nomination shall file such statement within ten days after the last day allowed by law for the filing of independent nominating petitions naming them as candidates in the next succeeding general or special election;

(vii) candidates who receive the nomination of a party for a special election shall file such statement within ten days after the date of the meeting of the party committee at which they are nominated;

(viii) a candidate substituted for another candidate, who fills a vacancy in a party designation or in an independent nomination, caused by declination, shall file such statement within ten days after the last day allowed by law to file a certificate to fill a vacancy in such party designation or independent nomination;

(ix) with respect to all candidates for member of the legislature, the legislative ethics commission shall within five days of receipt provide the joint commission on public ethics the statement filed pursuant to subparagraphs (v), (vi), (vii) and (viii) of this paragraph.

Source:

http://public.leginfo.state.ny.us/LAWSSEAF.cgi?QUERYTYPE=LAWS+&QUERYDATA=\$\$PB 073-A\$\$@TXPB0073-A+&LIST=SEA1+&BROWSER=EXPLORER+&TOKEN=35760758+&TARGET=VIEW OFFICIAL COMPILATION OF CODES, RULES AND REGULATIONS OF THE STATE OF NEW YORK

TITLE 19. DEPARTMENT OF STATE

CHAPTER XX. JOINT COMMISSION ON PUBLIC ETHICS PART 937

ACCESS TO PUBLICLY AVAILABLE RECORDS

937.1 Scope and purpose

These regulations provide information concerning the procedures by which records of the Joint Commission on Public Ethics ("Commission") shall be available for public inspection and copying. Pursuant to Executive Law section 94(19)(a) the only records of the Commission which shall be available for public inspection and copying are set forth below:

*(a) The information set forth in an annual statement of financial disclosure filed pursuant to section 73-a of the Public Officers Law except the categories of value or amount, which shall remain confidential, and any other item of information deleted pursuant to Section 94 (9)(h) of the Executive Law. *effective until January 1, 2013;

**(a) The information set forth in an annual statement of financial disclosure filed pursuant to section 73-a of the Public Officers Law except information deleted pursuant to section 94(9)(h) of the Executive Law. **effective January 1, 2013;

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION

RECEIVED MAR 1 9 2009 BUREAU OF STATIONARY SOURCES

In the Matter of the Delegation of the Gasoline Dispensing Facility Program under The Environmental Conservation Law Article 19 to the

DELEGATION ORDER M3-5001-09

Х

THE COUNTY OF WESTCHESTER and THE WESTCHESTER COUNTY DEPARTMENT OF HEALTH X

WHEREAS, the Air Pollution Control Law (Article 19 of the Environmental Conservation Law ("ECL")), expresses the policy of the Legislature to protect the resources of the State of New York from contamination due to air pollution from gasoline dispensing sites and transport vehicles;

WHEREAS, pursuant to the Air Pollution Control Law, the New York State Department of Environmental Conservation ("Department") promulgated Title 6 of New York's Code of Rules and Regulations (NYCRR) Part 230, "Gasoline Dispensing Sites and Transport Vehicles Program" governing such facilities;

WHEREAS, the Air Pollution Control Law and NYCRR Part 201 allow the Commissioner of the Department ("Commissioner") to approve local programs regulating gasoline dispensing sites and transport vehicles for any county which desires to administer its own gasoline dispensing sites and transport vehicles program within its jurisdiction in accordance with the criteria set forth in ECL 19-0709 and 6 NYCRR Part 201-1.9;

WHEREAS, Westchester County ("County") authorizes the Westchester County Department of Health Commissioner ("Health Commissioner") to administer the Department's gasoline dispensing sites and transport vehicle program set forth in the foregoing regulations;

WHEREAS, on December 20, 2007, the Westchester County Department of Health ("Health Department") submitted an application requesting delegation of the Department's gasoline dispensing sites and transport vehicles program set forth in the foregoing regulations; WHEREAS, the Westchester County Board of Health, on November 20, 2008, adopted Westchester County Sanitary Code, Article XXVI entitled "Gasoline Dispensing Sites and Transport Vehicles;"

WHEREAS, the Department has determined that the Health Department's gasoline dispensing sites and transport vehicles program, as implemented in accordance with this Order, will provide environmental protection equal to or greater than the regulatory requirements of ECL Article 19 and 6 NYCRR Part 230;

WHEREAS, by copy of this Order, the Commissioner has approved the Health Department's application;

WHEREAS, the Commissioner and the Health Commissioner wish to set forth the procedures and arrangements for the administration of the Department's gasoline dispensing facility program;

NOW, THEREFORE, after considering the foregoing, I do order as follows:

Section 1- DELEGATION OF AUTHORITY

Section 1.1 Pursuant to the authority given me under ECL 3-0301.2(p) and 6 NYCRR Part 201-1.9, and subject to the conditions set forth herein, the Health Department's authority to administer the gasoline dispensing sites and transport vehicles program described herein is approved. Westchester County Sanitary Code, Article XXVI, is incorporated herein by reference, and is made a part of this Order.

Section 1.2 Section 1.2 The Health Commissioner shall have primary responsibility for the registration of gasoline dispensing sites (as defined in 6 NYCRR Parts 230.1(b)(4)) within Westchester County. The Department retains its authority over any gasoline dispensing sites at facilities subject to Title V permitting under 6 NYCRR Subpart 201-6.

Section 1.3 The Health Commissioner shall have primary responsibility for the

administration of the gasoline dispensing sites and transport vehicles program within Westchester County, including, but not limited to, inspections, test report reviews, and data retention.

Section 2 - REGULATIONS

Section 2.1 The Department shall provide a written copy of all regulatory interpretations to the Health Department within thirty (30) days of making such regulatory interpretations. The Health Department shall not act in a manner inconsistent with any regulatory interpretations provided by the Department.

Section 2.2 The Health Department shall notify the Department of any proposed changes to Westchester County Sanitary Code, Article XXVI and the regulations to be adopted there under. Any revision to the Westchester County Sanitary Code, Article XXVI will be subject to approval by the Department prior to becoming effective.

Section 2.3 The Department shall notify the Health Department of any changes to ECL Article 19 or 6 NYCRR Part 230 with respect to the dispensing or transport of gasoline. The Health Department agrees that if the Department amends either Article 19 or 6 NYCRR Part 230, the Health Department shall have six (6) months to amend any corresponding provisions of Westchester County Sanitary Code, Article XXVI. Any such amendment to the Westchester County Sanitary Code, Article XXVI shall he submitted to the Department for review prior to being adopted by the Health Department as set forth above.

Section 2.4 Should the Health Department fail to make appropriate amendments to Westchester County Sanitary Code, Article XXVI and any regulations adopted there under, within six (6) months of any such amendment, the Commissioner may rescind this Delegation Order pursuant to the provisions set forth in Section 12 of this Order.

Section 3 - VARIANCES

Section 3.1 The Health Commissioner shall provide the Department with a copy of all

applications for variances received by the Health Commissioner along with a notice of the Health Department's intent to grant or deny the variance Both the application and notice shall be sent to the Department's Central Office Division of Air Resources Enforcement Section Chief and the Region 3 Air Pollution Control Engineer. Nothing in this section shall restrict the Health Department's ability to deny a variance.

Section 3.2 Nothing contained in this Order shall authorize the Health Department to grant a variance unless the Department has authorized such a variance in writing.

Section 4 - STAFFING AND TRAINING

Section 4.1 The County and the Health Commissioner shall maintain staffing levels necessary to effectively carry out the requirements of this Order and implement the gasoline dispensing sites and transport vehicles program. The Health Commissioner shall maintain a minimum of five (5) trained staff dedicated to the implementation of this program. The Department shall be notified thirty (30) days prior to any decision to reduce staffing below such levels. A reduction in the level of staffing resulting in the Health Department's inability to effectively inspect all gasoline dispensing facilities within Westchester County on an average of once every three years shall be grounds for rescission of this Delegation Order.

Section 4.2 By copy of this Order, the Department approves the Health Department's Attachment A, Personnel Training, submitted as part of the Health Department's application for the delegation of 6 NYCRR Part 230 which provides a plan for training field staff' in enforcement of the Health Department's gasoline dispensing sites and transport vehicles program. The Health Department's training plan covers requirements relating to the dispensing of gasoline imposed by Westehester County Sanitary Code, Article XXVI, and the regulations adopted there under, including: Stage I and Stage II vapor recovery equipment, Stage II vapor recovery system testing requirements, submerged fill requirements, owner/operator requirements, transport vehicle requirements, record keeping and reporting requirements, registrations, enforcement procedures,

database management, and program management. The Health Department shall notify the Department of any proposed changes to its personnel training plan. Any such changes will be subject to approval by the Department prior to becoming effective.

Section 4.3 All new Health Department employees assigned to the Health Department's gasoline dispensing and transport vehicles program shall receive training before performing independent facility inspections. This training shall be provided by the Health Department in accordance with Attachment A, Personnel Training.

Section 5 - OUTREACH

Section 5.1 The Health Department shall provide information to the regulated public within the County on the requirements and interpretations of the Health Department's gasoline dispensing and transport vehicles program and ways to comply with this program ("Outreach Information"). This information may be made available at seminars, in written format or on the internet. The Health Department shall provide the Department with copies of any and all outreach information provided and shall notify the Department in advance of any proposed outreach being conducted.

Section 5.2 As requested by the Department, the Health Department will participate in any gasoline dispensing sites and transport vehicles program outreach within the County that the Department may decide to undertake.

Section 5.3 The Health Department will provide notification to gasoline dispensing facility (GDF) owners within the County at least forty-five (45) days prior to a registration renewal or a Stage II vapor recovery test being due.

Section 6 - APPLICATION REVIEW

Section 6.1 The Health Department shall undertake a program for verifying compliance with the Health Department's gasoline dispensing sites and transport vehicles program at a facility

prior to processing a registration for that facility in accordance with Westchester County Sanitary Code, Article XXVI.

Section 6.2 This review shall include an evaluation of the registration data submitted and all inspection and test reports.

Section 6.3 If the owner cannot document that the facility is in compliance with the applicable gasoline dispensing sites and transport vehicles requirements, appropriate enforcement action shall be taken.

Section 7 - COMPLIANCE STRATEGY PLAN

Section 7.1 By copy of this Order, the Department approves the Health Department's Attachment B, Compliance Strategy, submitted as part of the Health Department's application for the delegation of 6 NYCRR Part 230 which provides a compliance strategy plan outlining how the Health Department plans to inspect GDFs and educate the regulated community within Westchester County. The Health Department shall notify the Department of any proposed changes to its compliance strategy plan. Any such changes will be subject to approval by the Department prior to becoming effective.

Section 7.2 The Health Department shall conduct inspections and monitor compliance in accordance with Westchester County Sanitary Code, Article XXVI, and any regulations there under, as well as in accordance with the compliance strategy plan outlined in Attachment B. All GDFs within the County shall be inspected at least once every three years.

Section 7.3 The Health Department shall maintain all records of facility inspections, test results, and other reports for at least five (5) years. These records shall be provided to the Department upon request. This requirement shall not apply to records maintained by the Health Department within the GDF database.

Section 8 – ENFORCEMENT

Section 8.1 By copy of this Order, the Department approves the Health Department's Attachment C, Enforcement Procedures, submitted as part of the Health Department's application for the delegation of 6 NYCRR Part 230 outlining how the Health Department intends to enforce Westchester County Sanitary Code, Article XXVI, and any regulations adopted there under. This plan includes a discussion of enforcement procedures and penalties related to specific violations. The Health Department shall notify the Department of any proposed changes to its enforcement procedures plan. Any such changes will be subject to approval by the Department prior to becoming effective.

Section 8.2 Whenever the Health Department has reason to believe that any person is in violation of any provision of Westchester County Sanitary Code, Article XXVI, or any regulations adopted there under, the Health Department shall commence an appropriate enforcement action to compel compliance and seek appropriate remedies, including penalties where appropriate. In addition, where allowed by law, the Health Department shall take appropriate enforcement action whenever there are violations of orders issued pursuant to any of the foregoing provisions, regardless of whether such orders have been issued by the Department, the County, the Health Department or a court of competent jurisdiction. Any penalties collected by the Health Department shall be retained by the Health Department.

Section 8.3 Whenever, on the basis of information available to the Department, there is reason to believe that any facility within the County is in violation of any provision of ECL, Article 19 or of 6 NYCRR Part 230, the Department may notify the Health Department of such finding and may refer the matter to the Health Department for enforcement. If the Health Department is notified and the Health Department does not take appropriate enforcement action within thirty (30) days of the receipt of such notification, the Department may initiate an action to compel compliance and seek appropriate remedies, including penalties.

Section 8.4 Nothing in this Order shall restrict or diminish the authority of the Department to initiate or cause to be initiated enforcement action for violations of an environmental regulation, including but not limited to ECL Article 19 or 6 NYCRR Part 230.

Section 8.5 Whenever the Department initiates an enforcement action, the Health Department shall be precluded from pursuing a separate enforcement action for the same violations. The Department shall notify the Health Department of any such enforcement action and the results thereof. The Health Department shall provide reasonable assistance to the Department in the Department's enforcement action, including technical assistance, upon written request to the Health Commissioner.

Section 8.6 By mutual agreement between the Department and the Health Department, the Health Department may refer enforcement actions to the Department. In these cases, the Health Department shall provide full documentation of the alleged violations to the Department including, but not limited to, the notice of violation, photographs, and any other supporting documentation. If requested, the Health Department inspector who observed the violation(s) shall attend the conference convened by the Department with the facility owner/operator for the purpose of describing the observed violation and answering relevant questions.

Section 8.7 Any enforcement action initiated by the Health Department and resulting in a probable exceedance of the \$1,000 per day per violation limitation must be referred to the Department.

Section 9 - DATABASE MANAGEMENT

Section 9.1 The Health Department shall maintain an up-to-date computerized GDF database containing all of the data fields listed in Section 9.2 of this Order. An electronic copy of the GDF database shall be provided to the Department by March 31, June 30, September 30, and December 31 of each year. The Health Department will make changes to their database upon the request of the Department within thirty (30) days of such request. Failure by the Health Department to maintain their GDF database, as stated above, shall lead to a written warning of potential

rescission. If the non-compliance is not corrected in ninety (90) days, the Department may consider this grounds for rescission of the delegation of authority made herein pursuant to the provisions of Section 12 of this Delegation Order.

Section 9.2 The Health Department shall maintain the GDF database consistent with the following information:

- (a) facility name and address including street, city, and zip code;
- (b) facility phone number;
- (c) facility operator name and address including street, city, and zip code;
- (d) operator phone number;
- (e) facility owner name and address including street, city, and zip code [Note: If the owner is a corporation, the information must match an active corporation in the NYS Department of State database. If it is a DBA or partnership, one or more partners, or responsible officials of the DBA, must be listed];
- (f) owner phone number;
- (g) facility operating status (i.e. operating, shutdown, etc...)
- (h) latest inspection date;
- (i) latest regulatory citations violated;
- (j) DEC ID (as supplied by the Department);
- (k) PBS ID;
- (I) latest Stage II test date, including the Dry/Wet test date and Pressure Decay
 (P/D) test date; and
- (m) associated Stage II test pass /fail designations.

Section 10 - REPORTING

Section 10.1 The Health Department shall provide the Department with an annual report of the status of their gasoline dispensing sites and transport vehicles program. Such report shall be

submitted to the Chief of the Air Enforcement Section in the Department's Central Office and the Region 3 Air Pollution Control Engineer on or before February 1 for the immediate preceding calendar year. The annual report shall contain the following elements:

- Program summary and update, including but not limited to, an overview of the Health Department's enforcement presence and GDF owners/operators response;
- (b) Summary of program achievements, including but not limited to the number of inspections achieved, number of violations discovered, amount of penalties collected, and documented corrections to non-compliance;
- (c) Summary of any program improvement initiatives that are ongoing or planned for the coming year including: regulations, staffing, training, outreach, registrations/applications, inspections, enforcement, and data management; and
- (d) Problem areas and how they are being addressed.

Section 11 - PROGRAM REVIEW, COORDINATION, AND MANAGEMENT

Section 11.1 The Department shall meet periodically with the Health Department for the purpose of program coordination and management, and to review the Health Department's implementation of the gasoline dispensing sites and transport vehicles program. Such meetings shall occur at least annually, but may be held more frequently at the discretion of the Department.

Section 11.2 Any submission made by the Health Department pursuant to this Order which is intended to be accepted and approved by the Department becomes part of and enforceable under this Order. Section 11.3 As an adjunct to the training provided by the Department and to ensure that Health Department personnel continue to perform facility inspections in a manner consistent with Department inspectors, Health Department and Department personnel shall jointly undertake one to two inspections annually of GDFs within Westchester County. The facilities to be inspected shall be selected by the Department.

Section 11.4 In addition, the Department will annually review a representative sample of inspection data generated by the Health Department to ensure that effective inspections are being conducted. The Department may choose to reinspect certain facilities to verify the Health Department's inspection findings. If discrepancies are found, the Health Department will be notified and given a chance to respond.

Section 12 - RESCISSION

Section 12.1 If the Department determines that the Health Department has failed to comply with any of the terms or conditions of this Order, the Department shall notify the Health Department in writing of such a determination. The Health Department shall have 90 days from receipt of such notification to respond to the determination and comply with the terms and conditions of this Order. If the Health Department fails to take such action, or the Health Department's action is deemed to be insufficient by the Department, the Department's sole remedy shall be rescission of this Order.

Section 13 - TERM OF THIS ORDER

Section 13.1 This Order shall remain in full force and in effect for a period of five (5) years following the effective date of this Order. The Health Department may submit a renewal application up to one year, but no later than one hundred eighty (180) days prior to the expiration date of this Order, to which the Department shall respond within one hundred eighty (180) days of receipt of the application. If, prior to the expiration date of this Order, the Department fails to respond, this Order shall remain in effect until such time that the Department responds.

Section 13.2 At any time at least one hurdred and eighty (180) days after written notice, the Department, the County, or the Health Department may terminate this Order whenever it is deemed to be in the best interest of either party.

Section 14 – NOTICE

Section 14.1 Unless otherwise specified, all notices required or permitted for herein shall be in writing and sent by certified mail, postage prepaid, or by hand, or by overnight mail, or by telecopy confirmed by either of the previous methods, addressed to the parties as shown below or at such other addresses as the parties may designate in writing from time to time:

NYSDEC Enforcement Section Chief Division of Air Resources Bureau of Stationary Sources 625 Broadway Alhany, New York 12233

NYSDEC Region 3 Air Pollution Control Engineer Division of Air Resources 21 South Putt Corners Road New Paltz, New York 12561

Commissioner Westchester County Department of Health 145 Huguenot Street New Rochelle, New York 10801

County Executive Westchester County 148 Martine Avenue White Plains, New York 10601

Section 15 – EFFECTIVE DATE

Section 15.1 This Order shall take effect upon execution by the Department, the County,

and the Department of Health; and approved by the Westchester County Attorney's Office.
DATED;

Albany, New York 18 May ____, 2009 NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Alexander B. Grannis Commissioner

COUNTY OF WESTCHESTER

Andrew Spano/ County Executive

WESTCHESTER COUNTY DEPARTMENT OF HEALTH

Jóshua Lipsman, M.D., J.D., M.P.H. Commissioner

Approved by the Westchester County Board of Acquisition and Contract on the _19th_day of _February_, 2009

Approved as to form and manner of execution

3/12/09

5K Assistant County Attorney

MUNICIPALITY'S ACKNOWLEDGMENT

STATE OF NEW YORK) ss.: COUNTY OF WESTCHESTER)

On this _4th ____ day of ____March_____ 2009__, before me, the undersigned, personally appeared __Patsy Yang _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she is the _First Deputy Commissioner

of Westchester County Department of Health____, the municipal corporation described in and which executed the within instrument, who being by me duly swom did depose and say that he/she executed the same in his/her capacity, and that by his/her signature(s) on the instrument, the municipal corporation executed the instrument.

n Jelijia Notary Public Co County



JOHN LETIZIA Public, State of New York No. 01LE5063774

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Appendix E NYS OEM Regional Assignment Map and Regional Contacts



Department of Environmental Conservation

ENB - Statewide Notices 8/10/2016

Public Notice

The New York State Department of Environmental Conservation (NYS DEC) has finalized guidance on safe harbor. This Safe Harbor Guidance is intended to guide commercial fishing vessels in need of safe harbor for one of the following reasons: mechanical breakdown; unsafe weather conditions; loss of essential equipment; and significant medical emergency. Under one of these conditions, which are defined in the guidance, a seagoing commercial fishing vessel who cannot legally enter New York waters, will be allowed to do so. Commercial seagoing vessels seeking safe harbor must obtain prior permission from New York State and comply with the protocol established in the Safe Harbor Guidance.

The Safe Harbor Guidance will become effective 30 days after this publication in the ENB. Full text of the Safe Harbor Guidance can be obtained at http://www.dec.ny.gov/regulations/2379.html or by contacting Monica Kreshik, NYS DEC, 625 Broadway, Albany, NY 12233-1500, Phone: (518) 402-8555.

Contact: Monica Kreshik, NYS DEC, 625 Broadway, Albany, NY 12233-1500, Phone: (518) 402-8555.

Release of Updated New York State Standards and Specifications for Erosion and Sediment Control

The New York State Department of Environmental Conservation (NYS DEC) has finalized updates to the New York State Standards and Specifications for Erosion and Sediment Control (Blue Book). The final document is dated July 2016.

The Blue Book provides standards and specifications for the selection, design and implementation of erosion and sediment control practices for the development of Erosion and Sediment Control Plans for the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (CGP). The Blue Book is also referenced in the SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4 GP) as the technical standard used for local programs to control construction activity (Minimum Control Measure 4). The standards and specifications in the Blue Book provide criteria on minimizing erosion and sediment impacts from construction activity involving soil disturbance.

The previous Blue Book (2005 version) was over ten years old and in need of updating to address United States Environmental Protection Agency's (US EPA) Effluent Limitation Guidelines (ELGs') published on December 1, 2009, advancements in technology, and issues that had been identified by stakeholders (e.g. private sector consultants, other governmental agencies, etc.) that use the document.

A draft of the Blue Book was Public Noticed on February 24, 2016 for 30 days with 22 sets of comments received. The majority of changes made to the draft in response to comments relate to clarifications of the existing criteria in the Blue Book.

The final document will be available for download on the following webpages. The 2005 version will also be available for download until the CGP is modified.

http://www.dec.ny.gov/chemical/8694.html http://www.dec.ny.gov/chemical/29066.html

If you have any questions, please contact: Dave Gasper, NYS DEC - Division of Water, 625 Broadway, 4th Floor, Albany, NY 12233-3505, E-mail: <u>Stormwater_info@dec.ny.gov</u>.

New York State Implementation Plan: Infrastructure Assessment for the 2012 Annual PM_{2.5} National Ambient Air Quality Standard Pursuant to Sections 110(A)(1) and (2) of the Clean Air Act

Notice is hereby given that the New York State Department of Environmental Conservation (NYS DEC) plans to submit a State Implementation Plan (SIP) to the United States Environmental Protection Agency (US EPA) entitled "New York State Implementation Plan: Infrastructure Assessment for the 2012 Annual PM_{2.5} National Ambient Air Quality Standard Pursuant to sections 110(a)(1) and (2) of the Clean Air Act". This "infrastructure" assessment demonstrates that New York's air program addresses basic SIP requirements related to the attainment of the 2012 Annual PM_{2.5} National Ambient Air Quality Standard pursuant PM_{2.5} National Ambient Air Quality Standard including ambient air quality monitoring and data systems, programs for enforcement of control measures, adequate authority and resources to implement the plan.

NYS DEC is providing a 30 day period for the public to comment on the PM_{2.5} Infrastructure SIP or to request a hearing. The public can inspect a copy of the proposed SIP by (1) visiting the NYS DEC website at: http://www.dec.ny.gov/chemical/8403.html or (2) contacting Diana L. Rivenburgh, NYS DEC - Division of Air Resources, 625 Broadway, 11th Floor, Albany, NY 12233-3251, or (3) e-mailing your request to: dar.sips@dec.ny.gov. Written comments or request for a public hearing should be submitted by 5:00 p.m. on September 12, 2016 to: Diana L. Rivenburgh, NYS DEC - Division of Air Resources, 625 Broadway, 11th Floor, Albany, NY 12233-3251, or by e-mail to: dar.sips@dec.ny.gov. Ms. Rivenburgh can be reached at (518) 402-8396 with any questions regarding this SIP.

Contact: Diana L. Rivenburgh, NYS DEC - Division of Air Resources, 625 Broadway, 11th Floor, Albany, NY 12233-3251, Phone: (518) 402-8396, E-mail: dar.sips@dec.ny.gov.

Notice of Legislative Public Hearings

Applicant:

Dominion Transmission Inc.

Project Title:

New Market Project

Permit and Application Numbers:

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Application ID: 4-2730-00038/00001 - Air State Facility - Brookman Corners Compressor Station
Application ID: 7-2530-00033/00001 - Air State Facility - Sheds Compressor Station
Application ID: 8-0740-00081/00001 - Air State Facility - Horseheads Compressor Station
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Project Description:

Dominion Transmission Inc., filed an application for a Certificate of Public Convenience and Necessity (Certificate) with the Federal Regulatory Commission (FERC) on June 2, 2014 to construct and operate the New Market Project which involves the expansion of its existing pipeline systems located in New York. The New Market Project includes the construction of two new compressor stations (Horseheads Compressor Station and Sheds Compressor Station) and the modification of an existing compressor station of the existing compressor station of the existing compressor station and the modification of the existing compressor station of the existing compressor station of the existing compressor station below.

The project also involves modifications of two existing compressor stations (Borger Compressor Station and Utica Compressor Station) and a metering station (West Schenectady Meter Station). The modifications at these facilities include adding gas coolers and other upgrades that do not require approval from the Department.

The purpose of the proposed project is to provide an additional 112,000 dekatherms per day (Dth/d) of firm pipeline capacity to deliver natural gas to customers along the Dominion Pipeline in New York State.

Review History

New York State Department of Environmental Conservation (NYS DEC) issued a Notice of Complete Application on July 6, 2016 requesting written public comments on the above referenced applications on or before August 5, 2016: http://www.dec.ny.gov/enb/20160706_not0.html. On August 3, 2016 NYS DEC issued a Supplemental Notice indicating the comment deadline for submitting written comments was extended until September 12, 2016: http://www.dec.ny.gov/enb/20160803_not0.html. This Supplemental Notice includes reference to Public Statement Hearings (Dates, times and locations provided below).

Legislative Hearings

Pursuant to 6 NYCRR 621.8, legislative public hearings for the receipt of public comments on the permit applications and Air State Facility draft permits will be held on August 29, August 30 and September 1, 2016 at the three locations listed below. Each public hearing will commence at 6:00 p.m. All persons, organizations, corporations, or government agencies which may be affected by the proposed project are invited to attend the hearing and to submit oral or written comments. It is not necessary to notify NYS DEC in advance to speak at the legislative hearing. Equal weight will be afforded to both oral and written statements. Lengthy statements should be in writing and summarized for oral presentation.

The presiding Administrative Law Judge (ALJ) may set reasonable time limits for each speaker to afford everyone an opportunity to be heard. The hearings are fully accessible to persons with a mobility impairment. Interpreter services will be made available to the hearing impaired at no charge upon written request to the NYS DEC contact person named below, no less than one week prior to the hearing.

The Legislative Public Hearings are scheduled as follows:

Date: Monday, August 29, 2016 Time: 6:00 p.m. Location: Morrisville State College Crawford Hall Room #107 80 Eaton Street Morrisville, NY 13408 Date: Tuesday, August 30, 2016 Time: 6:00 p.m. Location: Corning Community College Triangle Lounge 1 Academic Drive Corning, NY 14830

Date: Thursday, September 1, 2016 Time: 6:00 p.m. Location: Canajoharie Central School District High School Auditorium 136 Scholastic Way Canajoharie, NY 13317

Parties may also file written comments to the NYS DEC representative listed below. All written comments must be postmarked or submitted electronically by fax or email no later than Monday, September 12, 2016.

Public Hearing and Comment

Written comments submitted to NYS DEC during this comment period and oral comments given at the Legislative Hearing are considered part of NYS DEC's record for the pending applications. At the conclusion of the public comment period NYS DEC will determine pursuant to 6 NYCRR §621.8 whether substantive or significant issues regarding the pending applications have been raised in the public comments or legislative hearing to warrant an Adjudicatory Hearing, or whether the permits should be issued without any further review. If no issues are raised as to the pending applications to warrant further adjudication, NYS DEC will proceed to develop a response to comments, provide public notice of the approval of the permits and issue the requested permits.

Contact: Christopher M. Hogan, NYS DEC - Division of Environmental Permits, 625 Broadway, 4th Floor, Albany, NY 12233-1750, Phone: (518) 402-9151, Fax: (518) 402-9168, E-mail: NewMarketProject@dec.ny.gov.

Assessment of Public Comments

"New York State Implementation Plan Infrastructure Assessment for the 2012 Annual PM_{2.5} NAAQS Pursuant to Sections 110(a)(1) and (2) of the Clean Air Act"

Comments Received from August 10, 2016 to September 12, 2016

1 <u>Comment:</u> Appendix B appears to contain the wrong information. Instead of a discussion of CMAQ modeling, it has a 5 factor analysis for establishing a nonattainament area. (1)

<u>Response</u>: The title of Appendix B was corrected to reflect the original intent of including the Technical Support Document in Appendix B. The correct title for Appendix B is "EPA's Technical Support Document for the Area Designations for the 2012 Primary Annual PM_{2.5} National Ambient Air Quality Standard for Pennsylvania."

LIST OF COMMENTORS THAT SUBMITTED COMMENTS DURING THE COMMENT PERIOD

Commentor No. Commentor

1 NICHOLAS WITCRAFT, NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF AIR QUALITY