REVISED AIR DISPERSION MODELING PROTOCOL

As-Designed West Virginia Steel Mill

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TABLE OF CONTENTS

1. INTRODUCTION

Nucor Steel West Virginia, LLC (Nucor) in association with our air quality contractor, Trinity Consultants (Trinity), is pleased to submit this dispersion modeling protocol for the "as-designed" steel mill in the city of Apple Grove, West Virginia (NSWV mill). The original Prevention of Significant Deterioration (PSD) application for this greenfield steel mill was submitted to the West Virginia Department of Environmental Protection (WVDEP) in January 2022. A revision to the application was submitted in March 2022 and the resulting permit was issued May 5, 2022.

Nucor is submitting this modeling protocol as part of an as-designed air permitting reconciliation effort to ensure the air permit basis is fully reflective of the final engineering design of buildings, purchased equipment, utilities, and site layout and configuration being constructed in Apple Grove. As part of the as-designed reconciliation permit application, the original dispersion modeling analyses will be updated to account for any relevant source, building, or other site layout changes and final emissions calculations.

Like the original modeling, the estimated as-designed potential emissions are anticipated to exceed the PSD major thresholds for particulate matter (PM), particulate matter with an aerodynamic diameter of 10 microns (PM_{10}), particulate matter with an aerodynamic diameter of 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOC), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NO_X), lead, fluorides, and greenhouse gases (GHGs). The WVDEP has codified the federal PSD permitting requirements in Title 45 of the West Virginia Code of State Rules (45 CSR) Section 14 and has full authority to implement this program through its United States Environmental Protection Agency (U.S. EPA) authorized State Implementation Plan (SIP).

This modeling protocol outlines the methodologies that will be used to conduct the air dispersion modeling analysis required under PSD permitting for the NSWV mill consistent with 45 CSR 14-10. Air dispersion modeling is relied upon to demonstrate that the NSWV mill complies with the applicable NAAQS and PSD Class II Increments for the pollutant(s) subject to PSD review.[1]

With the submittal of the as-designed New Source Review 45 CSR14 (R14) application for this project, Nucor will provide electronic files associated with the PSD air dispersion modeling analysis of the NSWV mill. Nucor will include those files associated with importing terrain elevations, building downwash, meteorological data, and AERMOD. Nucor will also provide to WVDEP a PSD air dispersion modeling report that includes plots indicating the location of the facility fence line and facility layout.

1.1 Background

The NSWV mill is located in Mason County, which is designated by U.S. EPA as "unclassifiable" and/or "attainment" for the National Ambient Air Quality Standards (NAAQS) for ozone, CO, SO_2, PM_{10}, $PM_{2.5}$, and NO_2.[2] To demonstrate compliance with the NAAQS, Nucor is proposing to conduct air quality dispersion modeling for these pollutants. Note that since there are no NAAQS standards for PM, VOC, and GHGs, modeling of these pollutants is not required.

[1] If a PSD Class I Increment analysis is required, a modeling protocol will be submitted under separate cover to WVDEP and the Federal Land Managers (FLMs) for the respective Class I areas.

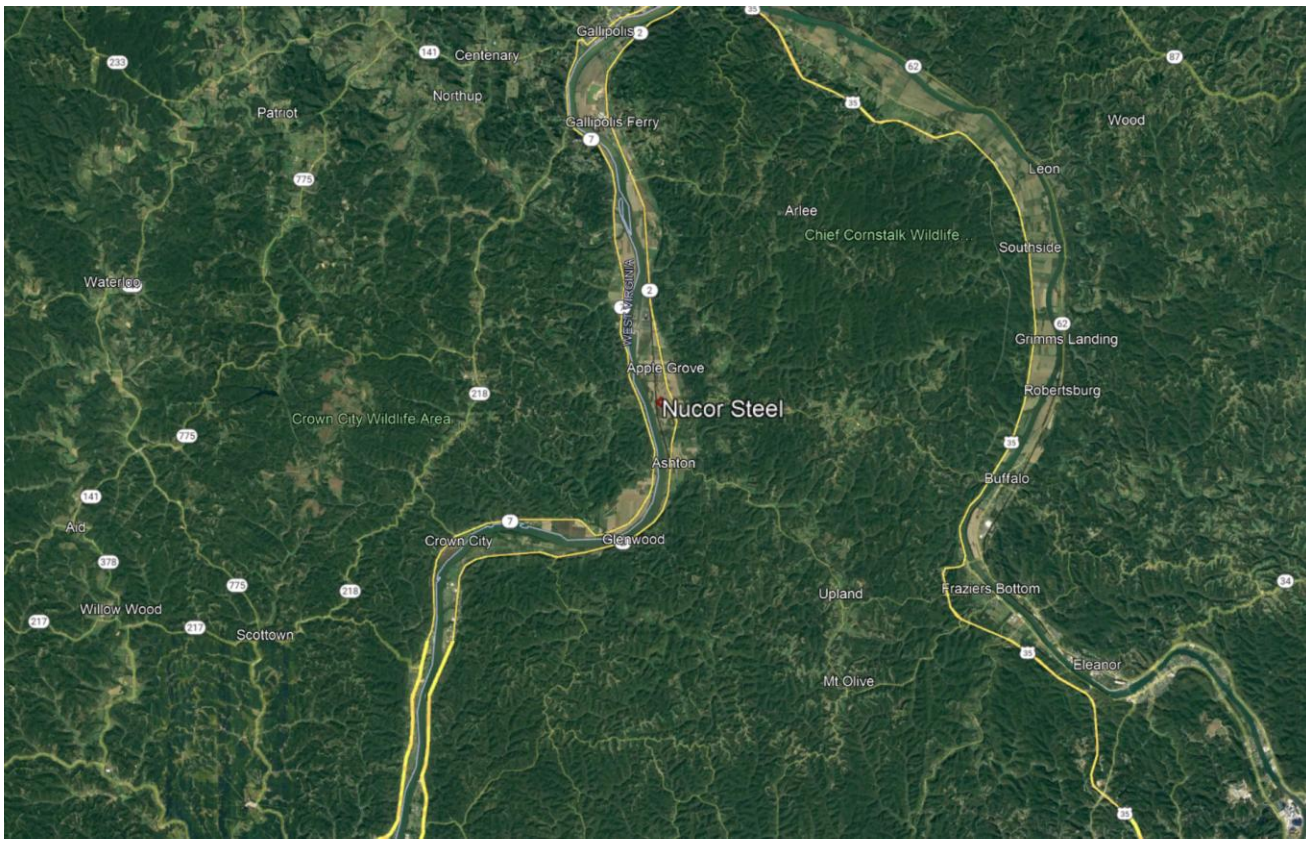
[2] 40 CFR §81.349.

Figure 1-1 provides a general map of the facility location, showing roads and general boundaries of towns and other nearby municipalities. As can be seen from this figure, the land use near the facility is generally rural.

This overall protocol primarily relates to the requirements for Class II air quality areas. The area immediately surrounding the NSWV mill and within the general ambient air quality airshed in which nearfield modeling is conducted (within 50 kilometers (km)) are designated as Class II areas. With regard to Class II impacts, this protocol describes the modeling that will be performed for each PSD triggering pollutant.

With respect to potential air quality impacts on Class I areas, Otter Creek Wilderness area is the closest Class I area to the NSWV mill, located over 200 km from the site. Because the distance from the facility to the Class I area exceeds 50 km, Nucor plans to use screening methodologies to demonstrate the NSWV mill will not result in adverse impacts at Class I areas. A more robust regional modeling approach will be followed if required by the results of the screening analysis.

Figure 1-1. Area Map Showing NSWV Mill Location



2. CLASS II DISPERSION MODELING REQUIREMENTS

Because sources and emissions at the NSWV mill are subject to the ambient air quality assessment requirements of the PSD program, modeling is required to meet specific objectives. Modeling will be used to demonstrate that emissions of CO, SO_2, NO_2, PM_{10}, $PM_{2.5}$, lead, and fluorides pollutants from the NSWV mill will not:

1) cause or significantly contribute to a violation of the NAAQS,

2) cause or significantly contribute to ambient concentrations that are greater than allowable PSD Increments, or

3) cause any other additional adverse impacts to the surrounding area (i.e., impairment to visibility, soils and vegetation and air quality impacts from general commercial, residential, industrial, and other growth associated with the facility).

To facilitate this analysis (and allow it to be commensurate with the requirements to which the WVDEP adheres), dispersion modeling methodologies will be followed that are consistent with U.S. EPA procedures specified in the *Guideline on Air Quality Models (Guideline)*.[3] The purpose of this protocol is to provide an overview of the proposed techniques and models to be used and review the modeling objectives for each required element of the PSD air quality analysis.

Nucor will complete all dispersion modeling and air impact assessments required under the regulations for PSD. This will include all Class II area modeling analyses as required. The Class I area modeling analysis that is proposed is expected to demonstrate that more detailed regional scale modeling will not be needed and that only screening modeling will need to be considered. Class I area screening techniques to be implemented include the use of the so-called Q/D analysis for the Air Quality Related Value (AQRV) demonstrations, and an AERMOD analysis with receptors positioned at the extent of the nearfield analysis (50 km) for the Class I PSD Increment demonstration. In the event that more robust Class I modeling is required, a detailed Class I modeling approach will be submitted for approval.

For the Class II analysis the various stages of modeling that will be performed will be dependent on compliance at each step. To allow the WVDEP to evaluate the various levels of proposed modeling methodologies, this protocol outlines each stage of modeling in the sequence as if each would be used. The modeling steps will include the following steps if required:

- Step 1 - Determine if ambient air quality impacts of the NSWV mill are greater than or less than the Significant Impact Levels (SIL) on a per pollutant and per averaging time basis. Table 2-1 shows the applicable SILs and other important criteria pollutant thresholds for CO, SO_2, NO_2, PM_{10}, $PM_{2.5}$, lead, and fluorides. Please note that Nucor does not anticipate modeling any alternative operating or start-up/shutdown scenarios.

[3] 40 CFR 51, Appendix W, *Guideline on Air Quality Models*, and 45 CSR 14-10

Table 2-1. Significant Impact Levels, NAAQS, PSD Class II Increments, and Significant Monitoring Concentrations for Applicable Criteria Air Pollutants

Pollutant	Averaging Period	PSD SIL ($\mu g/m^3$)	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)	Class II PSD Increment[1] ($\mu g/m^3$)	Significant Monitoring Concentration ($\mu g/m^3$)
CO	1-hour	2,000	40,000 (35 ppm)[2]	--	--	--
	8-hour	500	10,000 (9 ppm)[2]	--	--	575
SO_2	1-hour	7.8	196 (75 ppb)	--	--	--
	3-hour	25	--	--	512	--
	24-hour	5	--	--	91	13
	Annual	1	--	26(10 ppb)	20	--
NO_2	1-hour	7.5[3]	188 (100 ppb)[4]	--	--	--
	Annual	1	100 (53 ppb)[5]	100 (53 ppb)	25	14
PM_{10}	24-hour	5	150[6]	150	30	10
	Annual	--	--[7]	--	17[7]	--
$PM_{2.5}$	24-hour	1.2[8]	35[9]	35	9	4[11]
	Annual	0.13[8]	9[10]	15[10]	4	--
Lead	3-month rolling	--	0.15	0.15	--	0.1
Fluorides	24-hour	--	--	--	--	0.25

1. All short-term PSD Increments are not to be exceeded more than once per year.
2. Only a primary standard, not to be exceeded more than once per year.
3. No 1-hour NO_2 SIL has been promulgated by U.S. EPA. An interim SIL of 7.5 $\mu g/m^3$ (4 ppb) was selected based on the U.S. EPA Office of Air Quality Planning and Standards Memorandum from Ms. Anna Marie Wood to Regional Air Division Directors titled *General Guidance for Implementing the 1-hour NO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO_2 Significant Impact Level* (June 28, 2010).[4]
4. Only a primary standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average concentrations.
5. Annual arithmetic average.
6. Not to be exceeded more than three times in 3 consecutive years.
7. The U.S. EPA revoked the annual PM_{10} NAAQS in 2006, but the annual PM_{10} Class II PSD Increment remains in effect.
8. U.S. EPA Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program, April 2024.
9. The 3-year average of the 98th percentile 24-hour average concentrations.
10. U.S. EPA published a final rule (89 FR 16202), with an effective date of May 6, 2024, that reduced the primary annual $PM_{2.5}$ NAAQS from 12 $\mu g/m^3$ to 9 $\mu g/m^3$ and retained the secondary annual $PM_{2.5}$ NAAQS at 15 $\mu g/m^3$. Both the primary and secondary standards are expressed as the 3-year average of the annual arithmetic average concentration.
11. On January 22, 2013, the U.S. DC Court of Appeals vacated the $PM_{2.5}$ SMC of 4 $\mu g/m^3$.

[4] https://www.epa.gov/sites/default/files/2015-07/documents/appwno2.pdf

- Step 2 - Perform NAAQS dispersion modeling if air modeling impacts are greater than the SILs (in Step 1) to estimate the NAAQS impacts of the new project sources and regional inventory sources on a combined basis. The screening distance for assessing nearby regional inventory sources will be based on the distances to project's maximum concentrations and the expected decrease in concentrations as a function of distance (what U.S. EPA terms the gradient of impact). Background concentrations from nearby representative ambient monitors will also be added to the total impacts of all sources.

- Step 3 - Perform PSD increment modeling if air modeling impacts are greater than the SILs (in Step 1) to estimate the PSD increment impacts of the new project sources as well as any regional inventory sources. The screening distance for assessing regional PSD increment consuming or expanding sources will also be based on the distances to Nucor's maximum concentrations and the expected area with the highest concentration gradient from Nucor's modeled sources.

- Step 4 – Prepare an "additional air impacts" analysis. This analysis will use the results of the Significance Analysis modeling in Step 1 to compare ambient impacts to the secondary NAAQS. Incremental air quality impacts due to growth in the local infrastructure that may result from added employees and attendant industries will be qualitatively evaluated. Finally, Class II area visibility impacts will be evaluated on a screening basis using U.S. EPA's VISCREEN model.[5]

- Step 5 – Address the ozone and secondary $PM_{2.5}$ ambient impact analysis requirements by conducting a quantitative assessment of potential ozone impacts from the NSWV mill. The quantitative assessment will rely solely on the approach outlined in U.S. EPA's *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool*, published April 2019, and revised in U.S. EPA's *Clarification on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM2.5 under the PSD Permitting Program*, published April 2024.[6]

The remainder of this protocol provides the tools and methods that will be employed to conduct the Class II dispersion modeling along with a short overview of the Class I screening methodology.

2.1 Model Selection

For Class II area modeling, a number of modeling guidelines are available to facilitate and provide detail on the methodologies required for conducting dispersion modeling for the NSWV mill. In general, the air dispersion modeling analyses to be conducted will be in accordance with applicable U.S. EPA guidance documents, including the following:

- U.S. EPA's *Guideline on Air Quality Models,* 40 CFR Part 51, Appendix W (Published November 20, 2024), which West Virginia cites by reference in Section 10 of 45 CSR 14.[7]
- U.S. EPA's *AERMOD Implementation Guide* (November 2024)[8]

[5] Note that CO and GHGs are not visibility affecting pollutants; therefore, the Class II area visibility analysis will only address project emissions increase for NO_X and PM.

[6] https://www.epa.gov/sites/default/files/2019-05/documents/merps2019.pdf; https://www.epa.gov/sites/default/files/2020-09/documents/epa-454_r-19-003.pdf

[7] 40 CFR 51, Appendix W, Guideline on Air Quality Models

[8] U.S. EPA, *AERMOD Implementation Guide*, November 2024, available at https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_implementation_guide.pdf

- U.S. EPA's User's Guide for the AMS/EPA Regulatory Model – AERMOD (November 2024)[9]
- U.S. EPA's *New Source Review Workshop Manual* (Draft, October 1990)[10]

Given these guidance documents and typical modeling practices, Nucor will use the U.S. EPA-recommended AERMOD Model in its most recent Version 24142 released in November 2024. AERMOD is a refined, steady-state (both emissions and meteorology vary over a one hour time step), multiple source, dispersion model and was promulgated by U.S. EPA in December 2005 as the preferred model to use for industrial sources in this type of air quality analysis.[11] AERMOD will be used to model each stack, horizontal vent, and any other type of source at the facility. Nucor plans to apply AERMOD using the regulatory default options in all cases.

2.2 Tiered NO_2 Dispersion Modeling Methodology

In the "Models for Nitrogen Dioxide" section of the *Guideline* (Section 4.2.3.4), U.S. EPA recommends a tiered screening approach for estimating annual NO_2 impacts from point sources in PSD modeling analyses. Use of the tiered approach to NO_2 modeling for the 1-hour and annual NO_2 standards (SIL, NAAQS, and PSD Increment) will be considered. The approach used in each of the three tiers is described briefly below.

1. Under the initial and most conservative Tier 1 screening level, all NO_X emitted is modeled as NO_2 which assumes total conversion of NO (main chemical form of NO_X) to NO_2.
2. For the Tier 2 screening level, U.S. EPA recommends multiplying the Tier 1 results by the Ambient Ratio Method 2 (ARM2), which provides estimates of representative equilibrium ratios of NO_2/NO_X based on ambient levels of NO_2 and NO_X derived from national data from the U.S. EPA's Air Quality System (AQS). The ARM2 function, which is a default option within the latest version of AERMOD, will be used to complete this multiplication. The default minimum ambient NO_2/NO_X ratio of 0.5 and maximum ambient ratio of 0.9 will be used for this methodology.
3. Since the impact of an individual NO_X source on ambient NO_2 depends on the chemical environment into which the source's plume is emitted, modeling techniques that account for this atmospheric chemistry such as the Ozone Limiting Method (OLM), the Plume Volume Molar Ratio Method (PVMRM), or Generic Reaction Set Method (GRSM) can be considered under the most accurate and refined Tier 3 approach identified by U.S. EPA. Additional model inputs required for the use of OLM, PVMRM, or GRSM could include source-specific in-stack NO_2/NO_X ratios, ambient equilibrium NO_2/NO_X ratios, background ozone concentrations, and background NO_X/NO_2 concentrations.

Nucor intends to use a Tier 2 NO_2 modeling approach using the regulatory-approved U.S. EPA default settings. Nucor reserves the right to modify this methodology at a future date and will submit a revised modeling protocol for WVDEP approval prior to final modeling should a Tier 3 approach be required.

2.3 Rural/Urban Option Selection in AERMOD

For any dispersion modeling exercise, the "urban" or "rural" determination of the area surrounding the subject source is important in determining the applicable atmospheric boundary layer characteristics that

[9] *User's Guide for the AMS/EPA Regulatory Model (AERMOD)*, EPA-454/B-24-007, EPA, OAQPS, Research Triangle Park, NC, November 2024.

[10] U.S. EPA, *New Source Review Workshop Manual*, Draft October 1990, available at https://www.epa.gov/sites/default/files/2015-07/documents/1990wman.pdf

[11] 40 CFR 51, Appendix W–*Guideline on Air Quality Models*, Appendix A.1– AMS/EPA Regulatory Model (AERMOD).

affect a model's calculation of ambient concentrations. Thus, a determination will need to be made of whether the area around the facility is urban or rural.

The first method discussed in Section 5.1 of the *AERMOD Implementation Guide* (also referring therein to Section 7.2.3c of the Guideline on Air Quality Models, Appendix W) is called the "land use" technique because it examines the various land use within 3 km of a source and quantifies the percentage of area in various land use categories. If greater than 50% of the land use in the prescribed area is considered urban, then the urban option should be used in AERMOD. However, U.S. EPA cautions against the use of the "land use" technique for sources close to a body of water because the water body may result in a predominately rural land use classification despite being located in an urban area. If necessary, the second recommended urban/rural classification method in Appendix W Section 7.2.1.1.b is the Population Density Procedure. This technique evaluates the total population density within 3 km of a source. If the population density is greater than 750 people per square kilometer, then U.S. EPA recommends the use of urban dispersion coefficients.

Based on aerial imagery of the area surrounding the NSWV mill location in Apple Grove, nearby land use is overwhelmingly rural. Nucor plans to confirm this conclusion using the aforementioned techniques recommend by U.S. EPA, the results of which will be provided in the modeling report.

2.4 Building Downwash

The *Guideline* requires the evaluation of the potential for physical structures to affect the dispersion of emissions from stack sources. The exhaust from stacks that are located within specified distances of buildings may be subject to "aerodynamic building downwash" under certain meteorological conditions. This determination is made by comparing actual stack height to the Good Engineering Practice (GEP) stack height. The modeled emission units will be evaluated in terms of their proximity to nearby structures.

In accordance with recent AERMOD updates, an emission point is assumed to be subject to the effects of downwash at all release heights even if the stack height is above the U.S. EPA formula height, which is defined by the following formula:

$$H_{GEP} = H + 1.5L, \text{ where:}$$

where,

H_{GEP} = GEP stack height,

H = structure height, and

L = lesser dimension of the structure (height or maximum projected width).

This equation is limited to stacks located within 5L of a structure. Stacks located at a distance greater than 5L are not subject to the wake effects of the structure.

Direction-specific equivalent building dimensions used as input to the AERMOD model to simulate the impacts of downwash will be calculated using the U.S. EPA-sanctioned Building Profile Input Program (BPIP-PRIME), version 04274 and used in the AERMOD Model.[12] BPIP-PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash

[12] Earth Tech, Inc., Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model, November 1997, http://www.epa.gov/scram001/7thconf/iscprime/useguide.pdf.

Guidance document, and other related documents and has been adapted to incorporate the PRIME downwash algorithms.[13]

A GEP analysis of all modeled point sources in relation to each building will be performed to evaluate which building has the greatest influence on the dispersion of each stack's emissions. The GEP height for each stack calculated using the dominant structure's height and maximum projected width will also be determined. According to U.S. EPA dispersion modeling guidance, stacks with actual heights greater than either 65 meters or the calculated GEP height, whichever is greater, generally cannot take credit for their full stack height in a PSD modeling analysis. All modeled source stacks are less than 65 meters tall and therefore meet the requirements of GEP and credit for the entire actual height of each stack is used in this modeling analysis.

2.5 Elevated Terrain

Terrain elevations will be considered in the modeling analysis. The elevations of receptors, buildings, and sources will refine the modeling impacts between the sources at one elevation and receptor locations at various other elevations at the fence line and beyond. This will be accomplished through the use of the AERMOD terrain preprocessor called AERMAP (latest version 24142), which generates base elevations above mean sea level of sources, buildings, and/or receptors as specified by the user. For this analysis, AERMAP will not be used for the vast majority of source and building base elevations as common base elevations equivalent to the Nucor final grade levels will be used. For all receptors, AERMAP will determine the base elevation of each and an effective hill height scale that determines the magnitude of each source plume-elevated terrain feature interaction. AERMOD uses both of these receptor-related values to calculate the effect of terrain on each plume. Base elevations for select sources and buildings, terrain elevations for receptors, and other regional source base elevations (if required in the NAAQS modeling analysis) input to the model will be read and interpolated from 1/3 arc second (approximately 10 meter resolution) National Elevation Dataset (NED) data obtained from the U.S. Geological Survey (USGS).[14] The NED data will extend well beyond the extent of the modeled receptor grids to properly calculate the receptor elevations and hill-height scales.

2.6 Meteorological Data

For performing the Class II modeling in AERMOD, meteorological data must be preprocessed to put it into a format that AERMOD can use. This will be accomplished using the AERMET processor (Version 24142) along with nearby sets of National Weather Service (NWS) data from surface and upper air stations. The AERSURFACE program (Version 24142) was used to generate the three critical parameters used in AERMET, namely, albedo, Bowen Ratio (ratio of sensible heat to latent heat), and the surface roughness. Values for those land use parameters were tabulated for both the meteorological data site and NSWV mill to confirm that the airport NWS stations are reasonably representative of the project site.

For the NSWV mill, the closest surface meteorological data station is the Huntington Tri-State Airport (KHTS, WBAN #3860) located about 46 km to the southeast. Given the location of the project site, there are very

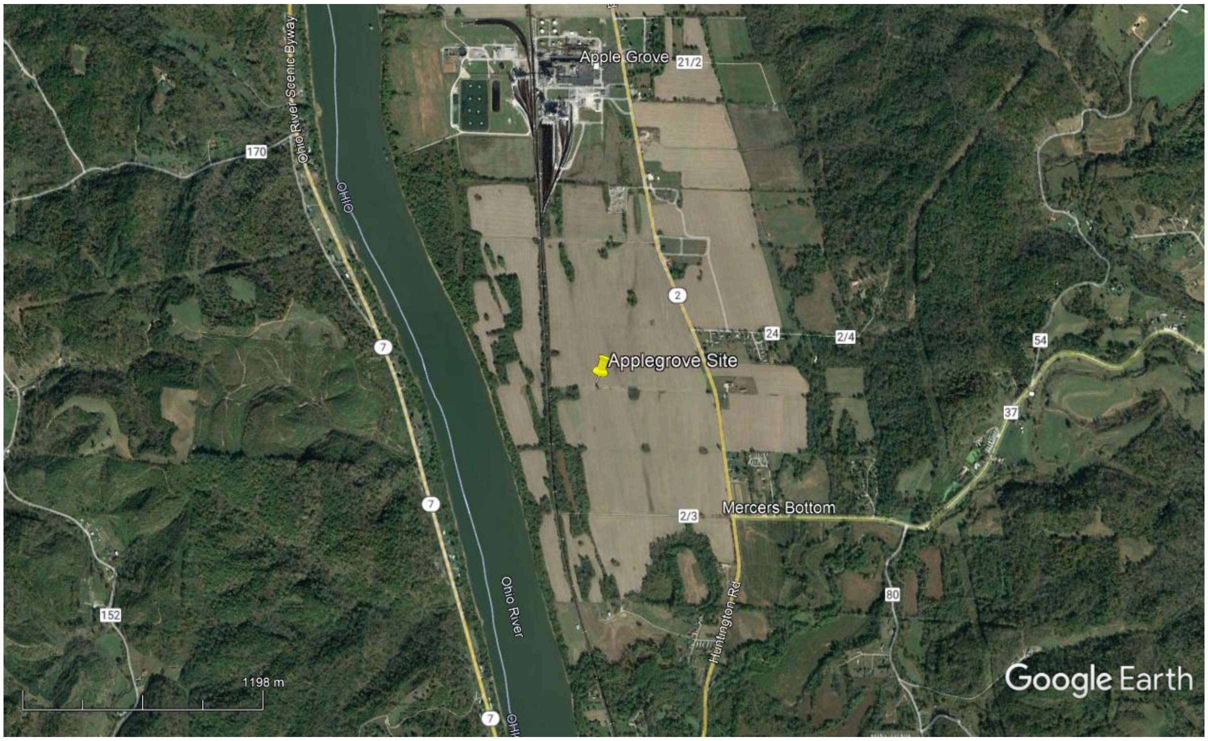
[13] U.S. EPA, Office of Air Quality Planning and Standards, *Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised),* Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

[14] U.S. Geological Survey, USGS 3D Elevation Program (3DEP), accessed March 13, 2024 at https://apps.nationalmap.gov/downloader/#/

few representative meteorological data options available. Figures 2-1 and 2-2 present aerial images of the immediate area surrounding the airport station and project locations, respectively.

Figure 2-1. Aerial Image of Huntington Airport

Figure 2-2. Aerial Image of NSWV Mill Location



As shown, both sites are located in rural areas in rolling terrain. Table 2-2 presents a comparison of the albedo, Bowen ratio and surface roughness for each location.

Table 2-2. Comparison of Land Use Parameters – Huntington vs. NSWV Mill

	Huntington Airport			Nucor WV Mill			Percent Difference[1]		
Sector (degrees)	Albedo (unitless)	Bowen Ratio (unitless)	Surface Roughness (m)	Albedo (unitless)	Bowen Ratio (unitless)	Surface Roughness (m)	Albedo (%)	Bowen Ratio (%)	Surface Roughness (%)
0-30	0.160	0.690	0.130	0.160	0.630	0.111	0%	-10%	-17%
30-60	0.160	0.690	0.301	0.160	0.630	0.112	0%	-10%	-169%
60-90	0.160	0.690	0.157	0.160	0.630	0.104	0%	-10%	-51%
90-120	0.160	0.690	0.157	0.160	0.630	0.109	0%	-10%	-44%
120-150	0.160	0.690	0.451	0.160	0.630	0.115	0%	-10%	-292%
150-180	0.160	0.690	0.368	0.160	0.630	0.121	0%	-10%	-204%
180-210	0.160	0.690	0.153	0.160	0.630	0.108	0%	-10%	-42%
210-240	0.160	0.690	0.235	0.160	0.630	0.026	0%	-10%	-804%
240-270	0.160	0.690	0.265	0.160	0.630	0.024	0%	-10%	-1004%
270-300	0.160	0.690	0.133	0.160	0.630	0.028	0%	-10%	-375%
300-330	0.160	0.690	0.074	0.160	0.630	0.146	0%	-10%	49%
330-360	0.160	0.690	0.099	0.160	0.630	0.109	0%	-10%	9%
All	**0.160**	**0.690**	**0.210**	**0.160**	**0.630**	**0.093**	**0%**	**-10%**	**-245%**

[1] Percent Difference [(Facility-NWS)/Facility] compares the average of the overall albedo, Bowen ratio, and surface roughness values for the Huntington Airport to the NSWV mill.

The albedo and Bowen ratio are very comparable at both sites. There are some sectors where the surface roughness varies between the two locations, which is almost always the case when comparing greenfield industrial sites to airports. The Huntington airport has forested areas within the 1-km surface roughness evaluation radius which is driving the average values up. In the case of the NSWV mill, the surface roughness based on the 2021 National Land Cover Data (NLCD) data is an underestimate since the as-built site will have numerous buildings and roughness elements. Once constructed, the site will have surface roughness even more similar to Huntington airport.

In order to evaluate the potential impact of post-construction land use changes, Nucor used the ARCVIEW GIS program to modify the land use cells in the 2021 NLCD to reflect as-built land use types. The latest version of AERSURFACE utilizes three (3) types of land use files (land cover, impervious surface, and tree canopy). Nucor revised these files to reflect the post-construction land use parameters and then ran AERSURFACE again, using the modified land use files. Table 2-3 presents the surface characteristic comparison after construction of the NSWV mill.

Table 2-3. Comparison of Land Use Parameters – Huntington vs. Modified NSWV Mill

	Huntington Airport			Nucor WV Mill			Percent Difference[1]		
Sector	**Albedo**	**Bowen Ratio**	**Surface Roughness**	**Albedo**	**Bowen Ratio**	**Surface Roughness**	**Albedo**	**Bowen Ratio**	**Surface Roughness**
(degrees)	**(unitless)**	**(unitless)**	**(m)**	**(unitless)**	**(unitless)**	**(m)**	**(%)**	**(%)**	**(%)**
0-30	0.160	0.690	0.130	0.160	0.630	0.213	0%	-10%	39%
30-60	0.160	0.690	0.301	0.160	0.630	0.183	0%	-10%	-64%
60-90	0.160	0.690	0.157	0.160	0.630	0.185	0%	-10%	15%
90-120	0.160	0.690	0.157	0.160	0.630	0.158	0%	-10%	1%
120-150	0.160	0.690	0.451	0.160	0.630	0.230	0%	-10%	-96%
150-180	0.160	0.690	0.368	0.160	0.630	0.172	0%	-10%	-114%
180-210	0.160	0.690	0.153	0.160	0.630	0.108	0%	-10%	-42%
210-240	0.160	0.690	0.235	0.160	0.630	0.026	0%	-10%	-804%
240-270	0.160	0.690	0.265	0.160	0.630	0.024	0%	-10%	-1004%
270-300	0.160	0.690	0.133	0.160	0.630	0.031	0%	-10%	-329%
300-330	0.160	0.690	0.074	0.160	0.630	0.148	0%	-10%	50%
330-360	0.160	0.690	0.099	0.160	0.630	0.205	0%	-10%	52%
All	**0.160**	**0.690**	**0.210**	**0.160**	**0.630**	**0.140**	**0%**	**-10%**	**-191%**

[1] Percent Difference [(Facility-NWS)/Facility] compares the average of the overall albedo, Bowen ratio, and surface roughness values for the Huntington Airport to the NSWV mill.

As shown in Table 2-3, the land use characteristics at the airport and facility will be more comparable when considering the changes due to construction, with the surface roughness values differing by 191% on average. Based on the above land use comparisons, Nucor believes the meteorological conditions at Huntington Tri-State Airport are representative of those expected at the NSWV mill location.

To further supplement these land use comparisons, Nucor will conduct a sensitivity analysis as referenced in Section 3.1.1 of the *AERMOD Implementation Guide*. The analysis will include two sets of meteorological data for the site, the first incorporating the land use parameters for the NSWV mill and the second using the land use parameters for the representative airport location. Using these sets of meteorological data, Nucor will model representative emission sources (i.e., a volume source, a point source, an elevated point source) from the NSWV mill for both short term and long-term averaging periods. Nucor will compare these results to determine the significance of the differences in concentrations resulting from differences in the surface characteristics between the NSWV mill location and the nearby airport. Nucor will validate the sensitivity analysis with WVDEP prior to conducting significance modeling and the results will be provided in the final modeling report.

The most recent, readily available full five years of meteorological data for both sites is 2020-2024. These years will be used in the air quality modeling analysis. The latest version of AERMET (version 24142) will be used to incorporate 1-minute and 5-minute ASOS wind data using U.S. EPA's AERMINUTE (version 15272) meteorological data preprocessor. The 1-minute and 5-minute wind speed and wind direction data for KHTS were downloaded from the National Centers for Environmental Information (NCEI) databases[15]. Standard surface NWS data will be obtained from the index of published data sets available from the National Climatic Data Center (NCDC) for the appropriate years[16]. The NSWV mill model will utilize upper air data from Pittsburgh International Airport (KPIT, WBAN #94823). Those upper air data will be obtained from the NCEI Integrated Global Radiosonde Archive (IGRA) Database[17].

For unknown reasons, ASOS 1-minute and 5-minute meteorological data was unavailable at the KHTS station during the period of January 2020 through March 2020. However, the KHTS station continued to report Integrated Surface Hourly Data (ISHD) over the same period. Despite the significant number of missing 1-minute and 5-minute data points, the overall data availability over the 5-year modeling period (2020-2024) was over 97% and as such the KHTS station remains the most representative station for the NSWV mill modeling analyses.

Because the meteorology generated by AERMET relies on the land surface in the vicinity of the NWS surface site, land cover/land use data (NLCD) will be determined from that available from the USGS through the MRLC Consortium viewer platform[18]. The AERSURFACE program (Version 24142) will be used to generate the three critical parameters used in AERMET, namely, albedo, Bowen Ratio (ratio of sensible heat to latent heat), and the surface roughness parameter. These will be based on wet, dry, and average moisture conditions as determined by comparing the annual rainfall amounts to the 30-year averages and using the upper and lower 30th percentiles of average rainfall based on 1995-2024 data for the nearest recording NWS site. In the AERSURFACE program there are two processing options called ARID and SNOW. These options can be used when the meteorological data station is located in an arid region and/or when there is continuous snow cover at a meteorological data station, respectively. The KHTS station is located in an ecoregion described by U.S. EPA as "Appalachian Forest" and thus the ARID option was not used in AERSURFACE. To assess snow cover, snow depth data was retrieved from the KHTS station for 2020-2024. During that period, the maximum number of days with more than trace amounts of snow was 10 during a calendar month. Specifically, this maximum number of days occurred in January 2022. As such, there were no calendar months with snow cover greater than 50% of the time during the modeled period and the SNOW option in AERSURFACE was not used.[19]

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[15] https://www.ncei.noaa.gov/data/automated-surface-observing-system-one-minute-pg1/access/
https://www.ncei.noaa.gov/data/automated-surface-observing-system-five-minute/access/

[16] https://www1.ncdc.noaa.gov/pub/data/noaa/

[17] https://www.ncei.noaa.gov/pub/data/igra/data/data-por/

[18] http://www.mrlc.gov/viewerjs/

[19] Refer to Section 3.2.8 of the *User's Guide for AERSURFACE Tool, EPA-454/B-24-003*, U.S. EPA, Research Triangle Park, NC, November 2024

A minimum threshold wind speed of 0.5 m/s (the lowest wind speed that will be allowed in the generated meteorological data set) will be implemented in AERMET, as suggested in Section 4.6.2.2 of the latest *AERMET User's Guide*.[20] All hours with wind speeds below this value will be treated as "calm" in AERMOD.

2.7 Coordinate System

In all modeling analyses conducted by Nucor, the location of emission sources, structures, and receptors will be represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central 500 km meridian of each UTM zone, where the world is divided into 36 north-south zones). The datum for the Nucor modeling analysis is based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all reside within UTM Zone 17 which will serve as the reference point for all data as well as all regional receptors and sources.

2.8 Receptor Grids

For the Class II air dispersion modeling analyses, ground-level concentrations will be calculated from the fence line out to either 20 km for the 1-hour CO, 8-hour CO, 3-hour SO_2, 24-hour SO_2, annual SO_2, annual NO_2, annual PM_{10}, 24-hour PM_{10}, annual $PM_{2.5}$, 24-hour $PM_{2.5}$, 3-month rolling lead, and 24-hour fluoride analyses or 50 km for the 1-hour NO_2 and 1-hour SO_2 analyses using a series of nested receptor grids. These receptors will be used in the Significance analysis, in the PSD increment modeling, and in the overall NAAQS modeling. The following nested grids will be used to determine the extent of significance:

- **Fence Line Grid:** "Fence line" grid consisting of evenly-spaced receptors 50 meters apart placed along the main property boundary of the facility,
- **Fine Cartesian Grid:** A "fine" grid containing 100-meter spaced receptors extending approximately 3 km from the center of the property and beyond the fence line,
- **Medium Cartesian Grid:** A "medium" grid containing 500-meter spaced receptors extending from 3 km to 10 km from the center of the facility, exclusive of receptors on the fine grid,
- **Coarse Cartesian Grid:** A "coarse grid" containing 1,000-meter spaced receptors extending from 10 km to 30 km from the center of the facility, exclusive of receptors on the fine and medium grids, and
- **Very Coarse Cartesian Grid:** A "very coarse grid" containing 2,500-meter spaced receptors extending from 30 km to 50 km from the center of the facility, exclusive of receptors on the fine, medium, and coarse grids.

This configuration and extent will capture the area of maximum modeled concentrations. If maximum modeled concentrations are located in an area with less than 100-meter receptor density, then the receptor density will be increased accordingly. Similarly, if maximum impacts are identified near the extents of the receptor grid, then the receptor grid will be expanded to ensure the maximum modeled concentrations are appropriately captured. Concentration plots depicting the maximum modeled concentrations and surrounding impacts will be provided in the final modeling report to provide confidence that the maximum impact is identified.

[20] U.S. EPA, *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*, EPA-454/B-24-004, U.S. EPA, Research Triangle Park, NC, November 2024.

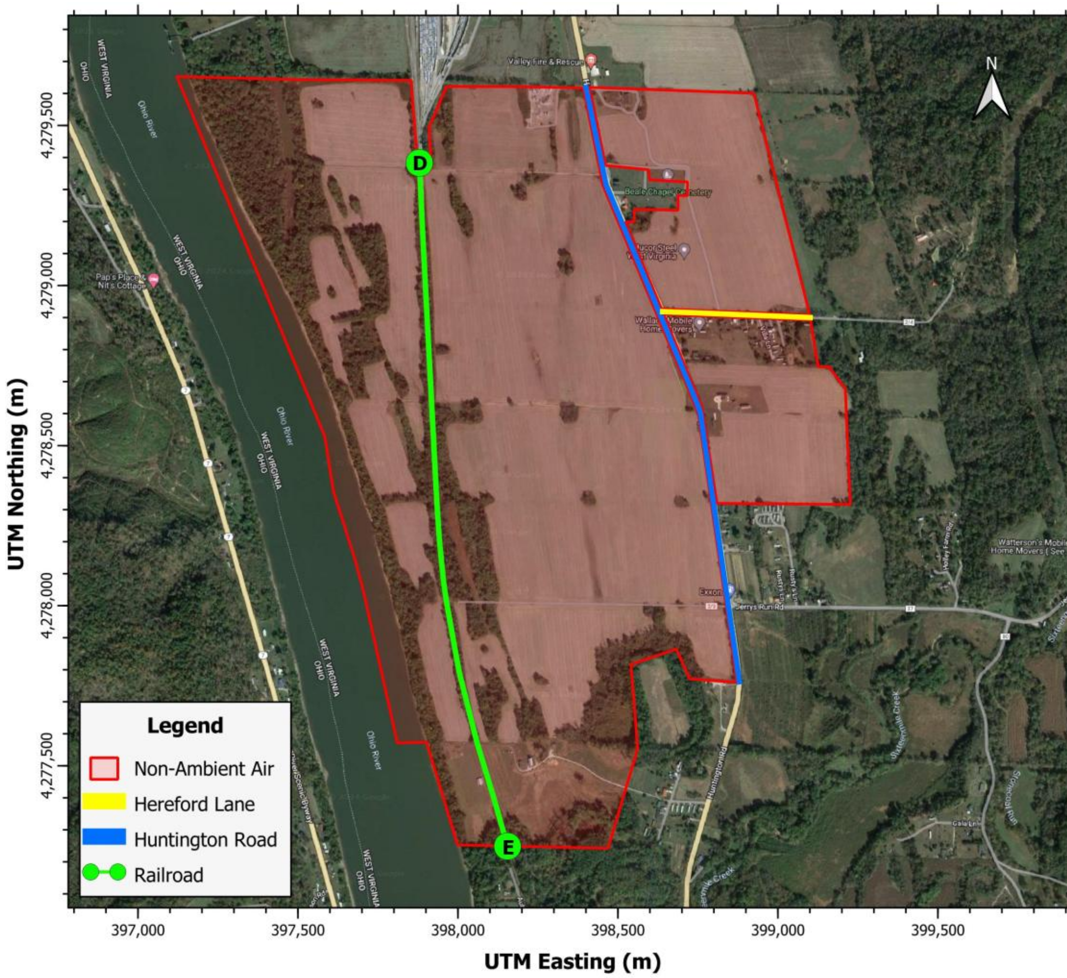
The full NAAQS and PSD increment analyses will be conducted using only receptor locations at which impacts calculated for the facility sources exceed the SIL for the respective pollutant and averaging time. As compliance with the PSD increment analysis and NAAQS is only required in areas regulated as "ambient air," in developing the receptor grid for the modeling analysis, Nucor will exclude all company owned property to which general public access is restricted because it is fenced or access is otherwise restricted, and thus, will not be considered "ambient air."

Figure 2-3 displays the ambient air boundaries for the NSWV mill modeling analyses. At the NSWV mill, a main railroad line (entry/exit points labeled "D" and "E") passes through the center of the property. Nucor notes that railroad tracks and rights-of-way are private property and access by the general public is considered trespassing per W. Va. Code § 61-3B-3. This rule states, "It is an unlawful trespass for any person to knowingly, and without being authorized, licensed or invited, to enter or remain on any property, other than a structure or conveyance, as to which notice against entering or remaining is either given by actual communication to such person or by posting, fencing or cultivation."

Nucor will restrict general public access via signage at all entry and exit points, remote monitoring (e.g., 24-hour video surveillance), and on-site security staffing. All areas east of Huntington Road (as indicated in Figure 2-3) will have fencing installed to ensure public access is restricted, while a mix of fencing and natural barriers (e.g., river) will be relied upon to help ensure public access is precluded on the main property west of Huntington Road. Additionally, remote monitoring will allow constant surveillance of all facility access points, and Nucor will respond immediately to any potential trespassing incidents. Furthermore, Nucor intends to establish routine security patrols to allow passageway to authorized personnel while monitoring and further deterring unauthorized general public access at all entry and exit points. Through these security measures, Nucor will preclude general public access and minimize all transient access to the NSWV mill property. Therefore, Nucor will exclude receptors from the industrial plant roadways and main line railroads that cross the facility property.

Of note, both the electrical substation on the north side of the property and the water treatment and future wastewater treatment facilities on the south side of the of the property are owned and operated by other parties (i.e., Appalachian Power and the Mason County Public Service District, respectively). However, these are unmanned properties where workers will only be needed in the event of routine maintenance or emergency repairs. Both of these areas will be restricted to public access via fencing. Additionally, Nucor plans to reach agreements with both parties such that Nucor will control access to the properties. As such, Nucor plans to include these properties in the non-ambient air boundary as depicted in Figure 2-3.

Figure 2-3. Proposed Ambient Air Boundary for NSWV Mill



All coordinates shown in UTM Coordinates,
UTM Zone 17, NAD 83 Datum

2.9 Emission Sources with Multiple Operating Modes

The fans for the EAF Baghouses will utilize multi-speed or variable speed drive units. The fans are each expected to operate at different flow rates during EAF "tapping" (i.e., when molten steel is tapped from the EAF to the ladle) and during EAF "melting" (i.e., when the scrap/charge in the EAF is being melted). Particulate matter emissions from the baghouses are based on the flow rate (baghouse particulate matter emissions are based on grains/dscf) and particulate matter emission rates will decrease as the flow rate decreases. The emissions of all other pollutants are constant and not affected by baghouse flow rate. Because $PM_{10}/PM_{2.5}$ air dispersion modeling impacts can be affected by flow rate/exhaust velocity, the modeling evaluation will be completed utilizing the maximum hourly baghouse flow rate/exhaust velocity and the corresponding maximum emission rate, which have been determined to yield the highest $PM_{10}/PM_{2.5}$ impacts.

2.10 Emergency/Intermittent Sources

Several emergency units (emergency generators) are operated at the NSWV mill. These units will be excluded from the 1-hr NO_2 and 1-hr SO_2 modeling analyses, because the frequency of maintenance and readiness testing for these emergency engines will be intermittent. However, the emergency units will be included within the CO, $PM_{2.5}$, and PM_{10} modeling analyses. Although Nucor anticipates the emergency units to generally be operated no more than one hour per day for maintenance purposes, Nucor will conservatively model the emergency units at their peak hourly emission rate for all short-term (1-hr, 8-hr, 24-hr) averaging periods of the CO, $PM_{2.5}$, and PM_{10} modeling analyses. Annual emission rates will take into consideration that operation for readiness testing and maintenance checks will be limited to less than 100 hr/yr pursuant to the emergency engine operating requirements under applicable federal air regulations (e.g., 40 CFR 60 Subpart JJJJ).

Available modeling guidance (e.g. March 1, 2011 Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hr NO_2 National Ambient Air Quality Standard) indicates that it would be inappropriate to model intermittent sources continuously. Given the short term and intermittent nature of operation of the emergency units, modeling of these units would have an inappropriate influence on modeling design concentrations for the 1-hr NO_2 and 1-hr SO_2 NAAQS, given their actual limited use and operations. Therefore, the emergency units will not be included in any 1-hr NO_2 or 1-hr SO_2 modeling analyses for the NSWV mill.

2.11 Regional Source Inventories

Dispersion modeling for the significance analysis will be conducted for all new sources using hourly or annual potential CO, SO_2, NO_X, PM_{10}, $PM_{2.5}$, lead, and fluoride emission rates, where applicable, based on the averaging period of the underlying NAAQS or PSD Increment standard. As per PSD modeling requirements, for any off-site air concentration impact calculated that is greater than the SIL for a given pollutant, the radius of the significant impact area (SIA) will be determined based on the extent to where the farthest receptor is located at which the SIL is exceeded. Thus, the SIA will encompass a circle centered on the facility with a radius extending out to either (1) the farthest location where the emissions of a pollutant causes a significant ambient impact [i.e., modeled impact above the SIL on a high-first-high (HFH) basis] or (2) a maximum distance of 50 km, whichever is less.[21] Under U.S. EPA's previous guidance in Section IV.C.1 of the draft *New Source Review Manual* applicable to "deterministic" NAAQS, all sources within the SIA no matter how small or distant would be included in the regional inventory, and the remaining sources outside of the SIA but within 50 km would be assumed to potentially contribute to ground-level concentrations within the SIA and would be evaluated for possible inclusion in the NAAQS analysis.[22] An applicant would determine the SIA for each pollutant and averaging period and would use these calculations to determine which regional sources needed to be included in the NAAQS analysis. Sources in the raw inventories provided by state agencies would first be screened to remove sources located outside of the radius of impact (ROI) [i.e., the significant impact area (SIA) plus 50 km]. The remaining sources within the ROI would then be screened based on an emissions (Q) over distance (d) screening technique such as the "20D" procedure to identify small and distant sources that could be excluded from the

[21] This is the maximum extent of the applicability of the AERMOD Model as per the *Guideline on Air Quality Models*.

[22] U.S. EPA, *New Source Review Workshop Manual*, Draft October 1990, available at https://www.epa.gov/sites/default/files/2015-07/documents/1990wman.pdf

NAAQS analysis because they were not anticipated to impact receptors in the SIA.[23] For deterministic NAAQS like the annual NO_2 standard, this procedure is generally still valid and will be used if modeled impacts from the Significance Analysis exceed the SIL.

For short-term probabilistic NAAQS like the 1-hour NO_2 standard, this procedure often produces an inordinately large number of regional inventory sources due to larger SIA distances caused by peak hourly impacts during certain low frequency meteorological events. Recognizing the limitations of the NSR Manual procedure developed at a time when no probabilistic 1-hour NAAQS were in effect, U.S. EPA now recommends a different regional inventory screening procedure focusing primarily on the concentration gradient of the source and professional judgement by the dispersion modeler. As indicated in Appendix W, U.S. EPA states that "the number of nearby sources to be explicitly modeled in the air quality analysis is expected to be few except in unusual situations [and] in most cases, the few nearby sources will be located within the first 10 to 20 km from the source(s) under consideration." As such, Nucor will employ a subjective screening analysis in addition to the quantitative methods described above. Justification for inclusion or exclusion of specific regional sources will be included in the final modeling report.

As needed, CO, SO_2, NO_2, PM_{10}, $PM_{2.5}$, and lead regional source inventories will be compiled for the NAAQS and PSD Increment analyses. Source locations, stack parameters, annual operating hours, and potential emissions data will be obtained from WVDEP, Ohio EPA (OEPA), Pennsylvania DEP (PADEP), and/or file reviews of specific facilities.

The first screening step in the regional inventory screening process will be to apply the objective procedure outlined in the NSR Manual which U.S. EPA still considers to "generally be acceptable as the basis for permitting decisions, contingent on an appropriate accounting for the monitored contribution."[24] All sources within the SIA for the specific averaging period will be retained for further consideration in the remaining screening steps of the analysis, and any sources beyond the SIA but within this ROI will be screened using the "20D" procedure. Under this Q/d-based screening procedure, sources outside the SIA will be excluded from the inventories for short-term averaging periods if the entire facility's emissions (tpy) are less than 20 times the distance (km) from the facility to Nucor, and sources outside the SIA will be excluded from the inventories for annual averaging periods if the entire facility's emissions (tpy) are less than 20 times the distance (km) from the facility to the nearest edge of the SIA. In addition, the locations of the included and excluded regional sources based on the results of the "20D" screening analysis will be plotted in maps presented as part of an appendix to the modeling report. These plots will be reviewed to determine if any sources eliminated by the "20D" rule were in close enough proximity to one another that they could be considered a "cluster." The combined Q/d value for each identified cluster will be calculated using GIS software. If the aggregate Q/d for a cluster exceeds 20, the sources within the cluster excluded from the inventory on the basis of their individual facility Q/d value will be further evaluated for possible inclusion in the NAAQS/PSD Increment analyses. For each step in the regional inventory screening process, Excel spreadsheets and associated regional inventory summary tables will be included as an appendix to the modeling report to provide documentation of each emission unit removed from the inventory and each unit retained for inclusion in the NAAQS and PSD Increment analyses.

After completing the screening analysis, the remaining inventory sources will then be evaluated to determine whether any refinements to the data set are warranted or if the source could be removed from the inventory based on site-specific considerations. The two main problems expected to be encountered in

[23] 57 FR 8079, March 6, 1992.

[24] U.S. EPA Memorandum from Tyler Fox, *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO_2 National Ambient Air Quality Standard*, March 1, 2011.

finalizing the model input parameters for the remaining inventory sources are: 1) missing/non-representative stack parameters, and 2) overestimated potential emission rates due to overlapping process designations in the emissions inventory premised on continuous annual operation in multiple operating modes (i.e., one process ID for a boiler designating 8,760 hr/yr of operation at the maximum burner rating when firing natural gas and a second process ID designating 8,760 hr/yr of fuel oil firing). Missing/non-representative stack parameters for point sources will be filled based on the best available data for the source in question. To aid in the WVDEP's review of the model input parameters assigned to regional sources, all of the assumptions and resources used for filling or correcting stack parameters will be documented through highlighting and embedded comments in the regional inventory spreadsheets. These modified parameters will be further documented through footnotes to the regional inventory model input parameter summary tables. Nucor will work with WVDEP to validate these model input parameters and finalize any required regional inventories.

If a modeled exceedance is observed on property of a nearby source, then the so-called "Mitsubishi Method" may be employed to demonstrate compliance at those on-property receptor locations.[25] Specifically, Nucor and the nearby sources will be modeled to obtain total concentrations at all receptor locations. Where a receptor is located on a nearby source's non-ambient air property, the contribution from that specific nearby source may be subtracted from the total concentrations.

2.12 Ambient Monitoring Requirements

Under current U.S. EPA policies, the maximum impacts attributable to the emissions increases from a project must be assessed against monitoring de minimis levels to determine whether pre-construction monitoring should be considered. A pre-construction air quality analysis using continuous monitoring data can be required for pollutants subject to PSD review per 40 CFR § 52.21(m). The monitoring *de minimis* levels are provided in 40 CFR § 52.21(i)(5)(i) and are listed in Table 2-1. If either the predicted modeled impact from the NSWV mill or the existing ambient concentration is less than the monitoring *de minimis* concentration, the permitting agency has the discretionary authority to exempt an applicant from pre-construction ambient monitoring.

When not exempt, an applicant may provide existing data representative of ambient air quality in the affected area or, if such data are not available, collect background air quality data. However, this requirement can be waived if representative background data have been collected and are available. To satisfy the PSD pre-construction monitoring requirements, Nucor proposes that existing monitoring data provide reasonable estimates of the background pollutant concentrations for the pollutants of concern. The representativeness of existing monitoring data is outlined further in Section 2.13. For this reason, Nucor believes that pre-construction monitoring will not be required for this project.

2.13 Background Concentrations

Ambient background monitoring concentrations are necessary for any required full NAAQS analysis for the NSWV mill. Nearby ambient background monitoring stations were reviewed, and nominations for candidate monitors for CO, SO_2, NO_2, PM_{10}, $PM_{2.5}$, lead, and ozone concentrations will be made on the basis of monitor sites with data for the required pollutants, proximity, and representativeness (based on similar land use and geographical setting). Monitored pollutant concentration data for the 2021-2023 period were considered for candidate monitor selection and will be used in determining background concentrations. The following

[25] U.S. EPA Memorandum from Robert D. Bauman (Chief SO2/Particulate Matter Programs Branch) to Gerald Fontenot (Chief Air Programs Branch, Region VI), *Ambient Air,* October 17, 1989

stations were chosen as appropriately representative ambient background monitoring stations for the pollutants indicated. The monitors selected are:

- NSWV Mill Location
  - $PM_{2.5}$ – Athens Site (AQS Site ID 39-009-0003)
  - Ozone – Huntington Site (AQS Site ID 54-011-0007)
  - PM_{10} – Ironton Site (AQS Site ID 39-087-0012)
  - NO_2 – Ashland Site (AQS Site ID 21-019-0017)
  - SO_2 – Lakin DRR Site (AQS Site ID 54-053-0001)
  - CO – Charleston Site (AQS Site ID 54-039-0020)
  - Lead – None

For $PM_{2.5}$ consideration, candidate monitoring stations were evaluated within a 100-km radius of the NSWV mill. Most of the monitors nearest to the NSWV mill are located in a Core Based Statistical Area (CBSA). These monitors are located in or near urban areas, which means the monitors would capture many smaller sources of $PM_{2.5}$ emissions. Additionally, most are also located within close proximity (<15 km) to significant $PM_{2.5}$ emissions sources (Steel Dynamics, Hanging Rock Energy, John E Amos Power Plant, and/or Catlettsburg Refinery). For these reasons, these monitors would not be representative of the rural area around the NSWV mill, in which there are little to no $PM_{2.5}$ emission sources within 15-km radius other than the APG Polytech facility, which will be explicitly modeled as a nearby source in the $PM_{2.5}$ modeling analyses. A summary table of the candidate $PM_{2.5}$ monitoring stations is provided as Appendix A along with a map illustrating locations of the candidate stations, nearby emission sources, and the NSWV mill. The summary table includes information on monitor objectives, instrumentation/methods, design values, nearby source emissions, and notes on the reasoning behind exclusion of certain monitors as candidate monitoring stations.

Based on an assessment of the many factors affecting the candidate monitoring stations, Nucor is proposing to use the Athens, OH (Gifford) monitoring station (AQS Site ID 39-009-0003). The overall monitoring objective of the Athens monitoring station is regional scale background, which is appropriate for the rural area surrounding the NSWV mill where all significant nearby sources (<15 km) are being explicitly modeled. Nearly every other candidate monitoring station has the objective of measuring population exposure or source oriented at an urban or neighborhood scale, which is more appropriate for determining background concentrations in those specific areas. Moreover, if the total emissions at varying distances (0 to 30 km) from Nucor are compared to the total emissions at varying distances from each candidate monitoring station, the most similar monitoring station is the Athens station. Therefore, the Athens $PM_{2.5}$ monitoring station is the most representative of the NSWV mill. Consistent with recent U.S. EPA guidance, Nucor plans to exclude atypical smoke events from the $PM_{2.5}$ design value calculations using U.S. EPA's Exceptional Events Design Value Tool.[26,27] Specifically, Nucor is proposing to exclude all monitoring data flagged with wildfire, prescribed fire, structural fire, or fireworks data flags. There are no regularly occurring agricultural fires (e.g., sugarcane burning) that occur within a close enough proximity to the Athens monitor that would be expected to significantly impact monitored concentrations. As such, all smoke events near the Athens monitor would be expected to be "atypical" and not appropriate for inclusion in a background concentration, which should be representative of typical ambient air quality for the area. By excluding these smoke events,

[26] U.S. EPA's Guidance on Developing Background Concentrations for Use in Modeling Demonstrations, November 2024, available at https://www.epa.gov/system/files/documents/2024-11/background-concentrations.pdf

[27] EPA's Exceptional Events Design Value Tool, https://www.epa.gov/air-quality-analysis/exceptional-events-design-value-tool

the annual $PM_{2.5}$ design value concentration would change from 6.1 µg/m^3 to 5.9 µg/m^3, and the 24-hour $PM_{2.5}$ design value concentration would change from 16 µg/m^3 to 15 µg/m^3.

The Huntington site was chosen for ozone consideration due to its proximity, about 35 km southwest, and similar geographic location to the NSWV mill. It is the closest monitor to the NSWV mill. For PM_{10} consideration, the Ironton monitor was chosen, as again it is the closest monitor to the facility, about 45 km southwest, and has a similar geographic location adjacent to the Ohio River.

For SO_2 consideration, the nearest monitors to the NSWV mill are located in the CBSA of Point Pleasant, WV, between 27 and 35 km north of the facility and within the vicinity of the Kyger Creek, Mountaineer, and Gavin Power Plants. The Lakin monitor (AQS Site ID 54-053-0001) is the most distant of the four SO_2 monitors located in the Point Pleasant CBSA. However, the Lakin monitor is a Data Requirements Rule (DRR) monitor, located to capture the maximum impacts from Gavin and Kyger Power Plants. The Lakin monitor is also the closest monitor to the Mountaineer Power Plant. Therefore, selection of the Lakin monitor as the SO_2 background monitor would more than adequately capture any potential SO_2 impacts from these power plants in the NSWV mill SO_2 modeling analysis. Nucor is proposing to exclude Kyger Creek, Mountaineer, and Gavin Power Plants from the SO_2 modeling analyses and to use a background concentration from the Lakin monitor to ensure the SO_2 modeling analysis remains conservative.

For NO_2 consideration, the Ashland, KY monitor is the closest NO_2 monitor to the NSWV mill, approximately 46 km southwest. Therefore, Nucor is proposing to use the Ashland monitoring station for NO_2 background concentrations.

For CO, the only ambient monitoring station within 150 km of the NSWV mill is the Charleston monitor (AQS Site ID 54-039-0020) which is located in Kanawha County, WV. The Charleston monitor is located approximately 58 km southeast of the NSWV mill in a suburb adjacent to downtown Charleston, WV. As such, the monitor is expected to be impacted by urban sources of CO emissions including mobile sources, residential heating, and nearby industrial facilities. Based on the 2020 National Emissions Inventory (NEI), Kanawha County reported annual CO emissions of 34,101 tons in 2020, and by comparison Mason County reported 5,708 tons of CO emissions in 2020. As such, selection of the Charleston monitor to establish a CO background concentration for the NSWV mill is conservative.

For lead background, the nearest monitors to the NSWV mill are located in Marietta, OH (AQS Site ID 39-167-0008) and Columbus, OH (AQS Site ID 39-049-0040) approximately 104 km and 160 km away from the NSWV mill, respectively. The design values for the Marietta monitor and Columbus monitor are 0.01 and 0.0 µg/m^3, respectively. Non-negligible lead emissions only occur from relatively few types of sources. Therefore, to account for the background concentration, Nucor plans to include relatively distant regional sources of lead in the NAAQS model in lieu of adding a background concentration. Nucor will include in the lead NAAQS analysis the regional sources that will be included for the $PM_{2.5}$ 24-hr and annual NAAQS analysis. More specifically, the Gavin Power Plant and Kyger Creek Power Plant which both emit lead will be included in the lead NAAQS analysis.

For pollutants where diurnal and seasonal patterns of monitored concentrations are frequently present (i.e., 1-hour NO_2, 1-hour SO_2, and 24-hour $PM_{2.5}$), Nucor will first evaluate the design values for each pollutant and averaging period for use in the modeling. Should those values be overly conservative, Nucor intends to rely upon refined background concentrations in accordance with U.S. EPA guidance. For these pollutants, more refined "second tier" background concentrations are expected to be used. Concentration values that vary by season and hour of day are intended for use for 1-hour NO_2 and SO_2 and concentrations values that vary by season are intended for use for 24-hr $PM_{2.5}$. The temporarily varying concentration values will be developed based on recommendations in current U.S. EPA guidance.[28,29] For any season and hour of day combinations for which there are insufficient quality assured data, Nucor plans to substitute these values with the maximum of the adjacent hours in the same season. For example, if a daily calibration occurs at 2AM each day such that there is insufficient data to determine a season and hour of day value for 2AM, then the maximum between the 1AM and 3AM values for the given season will be substituted for the 2AM value. If any additional data substitution techniques are deemed necessary to adequately fill-in the season and hour of day background values, then those techniques will be detailed in the final modeling report.

All raw data and calculations used to determine background concentrations for the NAAQS analyses will be provided to WVDEP as electronic files with the modeling report. These electronic files will include documentation for the seasonal-hour-of-day background determination as well as data substitution techniques.

[28] https://www.epa.gov/sites/default/files/2015-07/documents/appwno2_2.pdf

[29] U.S. EPA's Guidance for Ozone and Fine Particulate Matter Permit Modeling, available at https://www.epa.gov/system/files/documents/2022-07/Guidance_for_O3_PM25_Permit_Modeling.pdf

3. CLASS I AREA DISPERSION MODELING ANALYSIS

There are two Class I areas within 300 km of the NSWV mill, Otter Creek Wilderness and Dolly Sods Wilderness. Shenandoah National Park and James River Face Wilderness are located outside the 300 km screening range. The closest Class I area is Otter Creek Wilderness, approximately 200 km from the NSWV mill (east of Apple Grove). Class I areas are federally protected areas for which more stringent air quality standards apply to protect unique natural, cultural, recreational, and/or historic values. The Federal Land Managers (FLM) of these Class I areas have the authority to protect AQRV and to consider, in consultation with the permitting authority, whether a proposed major emitting facility will have an adverse impact on such values. AQRVs for which PSD modeling is typically conducted include visibility and surface deposition of sulfur and nitrogen.

Table 3-1. Class I Q/D Analysis

Class I Area	Distance to Apple Grove	FLAG 2010 Q/D (Apple Grove)[1]
Otter Creek Wilderness	220	9.93
Dolly Sods Wilderness	240	9.10
James River Face Wilderness	262	8.34
Shenandoah National Park	302	7.23

[1] As-Designed emissions are based on hourly emission rates, in consideration of batch operations which are inherently restricted and cannot routinely achieve peak hourly emission rates on a daily basis.

Based on estimates of project emission increases for pollutants that would be considered in the AQRV analysis, the ratio (Q/D) of the project emissions changes to the distance of the nearest Class I area, is approximately 9.9 for Apple Grove. The FLM's AQRV Work Group (FLAG) guidance states that a Q/D value of ten (10) or less indicates that AQRV analyses will generally not be required.[30] Therefore, it is unlikely the NSWV mill will lead to adverse impacts at any of the Class I areas listed in Table 3-1. Based on these initial calculations, Nucor presumes that the FLMs for all Class I areas within 300 km of the facility will not require a full AQRV analysis for this project. To confirm this assumption, Nucor will provide the final Q/D analysis and contact the FLMs in consultation with the WVDEP to seek formal concurrence that a Class I area AQRV analysis is not warranted.

In addition to the AQRV analysis, Nucor is required to assess PSD Increment consumption at the affected Class I areas. Nucor proposes to perform this evaluation using a screening methodology that is commonly applied. This methodology relies on the same Significance analysis model input parameters applied for the Class II area assessments. Modeling in AERMOD will be performed by placing an arc of receptors at a distance of 50 km in the direction each Class I area within 300 km, to demonstrate that impacts are below the Class I SILs. This Class I increment screening procedure was originally proposed by U.S. EPA Region 4 and has been used in several recent PSD applications to fulfill the Class I increment modeling requirements.

[30] National Park Service, U.S. Department of the Interior, Federal Land Mangers' Air Quality Related Values Work Group (FLAG), Phase I Report–Revised (2010), National Resource Report NPS/NRPC/NRR_2010/232, October 2010.

The Class I SILs for the pollutants expected to exceed their respective SERs and for which there is a SIL are presented in Table 3-1. Nucor assumes the $PM_{2.5}$ Class I Area SIL contained in U.S. EPA's "Updates to the Guidance for Ozone and Fine Particulate Matter Permit Modeling" (April 2024) will be accepted for this PSD air quality analysis.

Table 3-1. Class I PSD SILs

Pollutant	Averaging Period	Class I SIL ($\mu g/m^3$)
NO_2	1-Hour	NA
	Annual	0.10
PM_{10}	24-Hour	0.32
	Annual	0.16
$PM_{2.5}$	24-Hour	0.27
	Annual	0.03
SO_2	1-Hour	NA
	3-hour	1.00
	24-Hour	0.20
	Annual	0.10

Given the stringency of the PM_{10} and $PM_{2.5}$ Class I SILs, the AERMOD screening approach is often overly conservative especially for Class I areas beyond 100km distances. If necessary to demonstrate compliance with the PM_{10} and/or $PM_{2.5}$ Class I SILs, Nucor will additionally perform a second level assessment outlined in EPA's latest MERPs guidance document.[31] Table 3-2 below (taken from Table 1 of that guidance document), provides primary $PM_{2.5}$ impacts using the hypothetical source photochemical modeling that was originally used in support of the secondary $PM_{2.5}$ MERP framework. This approach is considered conservative since the primary $PM_{2.5}$ modeling was conducted without any plume-depleting processes enabled in the photochemical model.

Table 3-2 only provides emission rates and modeled concentrations for primary $PM_{2.5}$. However, due to particle size, PM_{10} emissions will deposit from the atmosphere at a higher rate than $PM_{2.5}$. As such, even if EPA's hypothetical source modeling had considered plume depletion, it remains conservative to apply the same Table 3-2 data to PM_{10} emissions from the NSWV mill.

[31] https://www.epa.gov/sites/default/files/2020-09/documents/epa-454_r-19-003.pdf

Table 3-2. Primary $PM_{2.5}$ Impacts for Hypothetical Source Photochemical Modeling

		Tall Stack		Surface Release	
Emission Rate (tpy)	**Distance From Source** (km)	**Highest Daily Average Concentration** (µg/m³)	**Highest Annual Average Concentration** (µg/m³)	**Highest Daily Average Concentration** (µg/m³)	**Highest Annual Average Concentration** (µg/m³)
100	300	0.0117	0.0008	0.0123	0.0009
100	200	0.0223	0.0016	0.0212	0.0015
100	100	0.0537	0.0070	0.0445	0.0049
150	300	0.0180	0.0012	0.0184	0.0013
150	200	0.0328	0.0024	0.0311	0.0022
150	100	0.0807	0.0102	0.0632	0.0073
500	300	0.0610	0.0044	0.0625	0.0045
500	200	0.1167	0.0087	0.1095	0.0078
500	100	0.2717	0.0379	0.2536	0.0238
1000	300	0.1186	0.0087	0.1217	0.0089
1000	200	0.2300	0.0175	0.2161	0.0157
1000	100	0.5445	0.0731	0.5009	0.0477

Nucor confirmed that the values tabulated in Table 3-2 above conservatively represent the worst-case impacts from any of the modeled hypothetical sources.[32] For this analysis, the NSWV mill emissions will be multiplied by the ratio of the modeled hypothetical source concentrations to the modeled hypothetical source emission rates to estimate primary PM_{10}/$PM_{2.5}$ concentrations at the nearest Class I area.

If the above screening analyses are unable to demonstrate compliance with the Class I SILs, Nucor will proceed with full scale long-range transport modeling using U.S. EPA's recommended CALPUFF model for that pollutant/averaging period. Based on preliminary Class I Significance Analysis results, Nucor expects modeled concentrations to fall well below the applicable Class SILs, and thus no further refined modeling is expected to be required and a separate Class I modeling protocol for long range transport modeling will not be necessary.

[32] Email from George Bridgers (USEPA) to Jonathan Hill (Trinity) on December 12, 2024. Refer to email communication provided in Appendix B.

4. ADDITIONAL IMPACTS ANALYSIS

Three additional impacts analyses will be performed as part of the PSD permitting action. These are: 1) a growth analysis, 2) a soil and vegetation analysis, and 3) a visibility analysis.

4.1 Growth Analysis

The purpose of the growth analysis is to quantify project associated growth; that is, to predict how much new growth is likely to occur in order to support the source or modification under review, and then to estimate the air quality impacts from this growth. Accordingly, Nucor will include a discussion of impacts resulting from residential and commercial growth driven by the NSWV mill in the PSD permit application.

4.2 Soils and Vegetation Analysis

The U.S. EPA developed the secondary NAAQS to protect certain air quality related values (i.e., soil and vegetation) that may not be sufficiently protected by the primary NAAQS. The secondary NAAQS, shown in Table 2-1 represent levels that provide protection for public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. As a general rule, if ambient concentrations from a PSD project are found to be less than the secondary NAAQS, emissions from that project will not result in harmful effects to either soil or vegetation.[33] Therefore, maximum impacts from the NAAQS analysis will be assessed against applicable secondary standards, to determine impacts to soils, vegetation, and endangered species.

4.3 Visibility Analysis

To provide a demonstration that local visibility impairment will not result from the project, Nucor will utilize the U.S. EPA's VISCREEN model following the guidelines published in the *Workbook for Plume Visual Impact Screening and Analysis* to assess potential plume impairment.[34] The primary variables that affect whether a plume is visible or not at a certain location are (1) quantity of emissions, (2) types of emissions, (3) relative location of source and observer, and (4) the background visibility range. The VISCREEN model is designed to determine whether a plume from a facility may be visible from a given vantage point. Nucor has determined the nearest potentially sensitive Class II area for consideration in the VISCREEN modeling is Beech Fork State Park located about 40 km south southwest of the NSWV mill. Level-1 screening techniques are expected to adequately demonstrate plume impairment values below screening thresholds. Regardless, Level-2 and subsequently Level-3 screening techniques will be applied if necessary.

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[33] U.S. EPA, *New Source Review Workshop Manual*, Draft October 1990, available at https://www.epa.gov/sites/default/files/2015-07/documents/1990wman.pdf

[34] U.S. EPA, *Workbook for Plume Visual Impact Screening and Analysis*, EPA-450/4-88-015, 1988.

5. OZONE AMBIENT IMPACT ANALYSIS

The latest revisions to the *Guideline*, which was recently published in the Federal Register on November 20, 2024, recommend the use of Model Emissions Rate for Precursors (MERPs)[35] to evaluate a proposed project's impact on ozone levels in the surrounding airshed. The *Guideline* establishes a two-tiered demonstration approach for addressing single-source impacts on ozone. Tier 1 demonstrations involve use of technically credible relationships between emissions and ambient impacts based on existing modeling studies deemed sufficient for evaluating a project source's impacts. Tier 2 demonstrations involve case-specific application of chemical transport modeling (e.g., with an Eulerian grid or Lagrangian model). MERPs are a type of Tier 1 demonstration that represent a level of increased precursor emissions that is not expected to contribute to significant levels of ozone. In other words, project emissions are compared against MERPs values to determine the project emissions impact on ozone levels. To derive a MERPs value, a model predicted relationship between precursor emissions from hypothetical sources and their downwind maximum impacts is combined using a predefined equation. Nucor will use pre-established MERPs values based on prior photochemical grid modeling as the primary indicator that the project is not expected to cause or contribute to a violation of the ozone NAAQS.

Initially, Nucor plans to rely upon the lowest MERPs values (most conservative) for the Ohio Valley climate zone from Table 4-1 of U.S. EPA's 2019 MERPs guidance. As an alternative, Nucor may use location-specific MERPs from U.S. EPA's MERPs Qlik website.[36] If location-specific MERPs value are used, Nucor will provide additional justification for the specific location and source parameters (i.e., emission rate and release height) chosen for use.

[35] *Clarification on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program*, available via: https://www.epa.gov/sites/default/files/2020-09/documents/epa-454_r-19-003.pdf

[36] https://www.epa.gov/scram/merps-view-qlik

6. SECONDARY $PM_{2.5}$ IMPACT ASSESSMENT

$PM_{2.5}$ precursor pollutants (e.g., NO_X, SO_2) can undergo photochemical reactions with ambient gases such as NH_3 or VOC resulting in the formation of secondary $PM_{2.5}$ downwind of a stationary industrial source. The creation of $PM_{2.5}$ by secondary mechanisms increases the total concentration by adding to the direct emissions of $PM_{2.5}$ from a facility. Two of the largest constituents of secondarily-formed $PM_{2.5}$ are sulfates (SO_4) and nitrates (NO_3), both of which are formed from their respective precursor pollutants (SO_2 for SO_4 and NO_X for NO_3).

The current guideline model for Class II Area air dispersion modeling, AERMOD, does not account for many of the complex atmospheric physical and chemical mechanisms that influence $PM_{2.5}$ formation. For example, when run in the regulatory default mode, AERMOD does not account for the size or mass of particulate emissions and, therefore, does not account for the difference in gravitational settling and deposition rates that occur for different particle sizes. No chemical transformation schemes are implemented in AERMOD which could predict secondary $PM_{2.5}$ formation from atmospheric processes.

Based on the MERPs guidance offered by U.S. EPA, Nucor will prepare a site-specific secondary $PM_{2.5}$ impact assessment to comprehensively demonstrate precursor emissions from the NSWV mill will not cause or contribute to a violation of the $PM_{2.5}$ NAAQS or PSD increment standards.

Initially, Nucor plans to rely upon the lowest MERPs values (most conservative) for the Ohio Valley climate zone from Table 4-1 of U.S. EPA's 2019 MERPs guidance. As an alternative, Nucor may use location-specific MERPs from U.S. EPA's MERPs Qlik website.[37] If location-specific MERPs value are used, Nucor will provide additional justification for the specific location and source parameters (i.e., emission rate and release height) chosen for use. Additionally, Nucor may use distance-dependent MERPs values for the Class I SIL analyses, since the Class I areas are more than 50km distant.

[37] https://www.epa.gov/scram/merps-view-qlik

APPENDIX A. CANDIDATE $PM_{2.5}$ MONITOR STATION TABLE & MAP

PM2.5 Candidate Background Monitor Summary Table

AQS Site ID	Monitor Distance to Nucor (km)	CBSA Name	Local Site Name	State	County	Population (persons)	Land Area (mile^2)	Population Density (persons/ mile^2)	Mobile Source NOX Emissions (tpy)	Mobile Source NOX Emissions Density (tpy/mile^2)
54-011-0007	35	Huntington-Ashland, WV-KY-OH	--	WV	Cabell	92,730	281.0	330.0	1,102.6	3.9
39-087-0012	46	Huntington-Ashland, WV-KY-OH	Odot Ironton	OH	Lawrence	56,653	453.4	125.0	599.8	1.3
21-019-0017	46	Huntington-Ashland, WV-KY-OH	Ashland Primary (Fivco)	KY	Boyd	48,110	159.9	300.9	567.6	3.6
54-039-1005	52	Charleston, WV	--	WV	Kanawha	175,515	901.7	194.6	2,702.1	3.0
39-145-0015	56	Portsmouth, OH	East Haverhill	OH	Scioto	72,194	610.1	118.3	969.9	1.6
54-039-0020	58	Charleston, WV	Dixie St.	WV	Kanawha	175,515	901.7	194.6	2,702.1	3.0
39-145-0013	66	Portsmouth, OH	Portsmouth Wtp	OH	Scioto	72,194	610.1	118.3	969.9	1.6
21-043-0500	85	--	Grayson Lake	KY	Carter	26,395	409.5	64.5	479.1	1.2
39-009-0003	91	Athens, OH	Gifford	OH	Athens	58,979	503.6	117.1	513.8	1.0
54-107-1002	92	Parkersburg-Vienna, WV	Neale Elementary School	WV	Wood	83,340	366.5	227.4	846.6	2.3
			Nucor Apple Grove Facility	WV	Mason	25,000	430.8	58.0	497.1	1.2

PM2.5 Candidate Background Monitor Summary Table

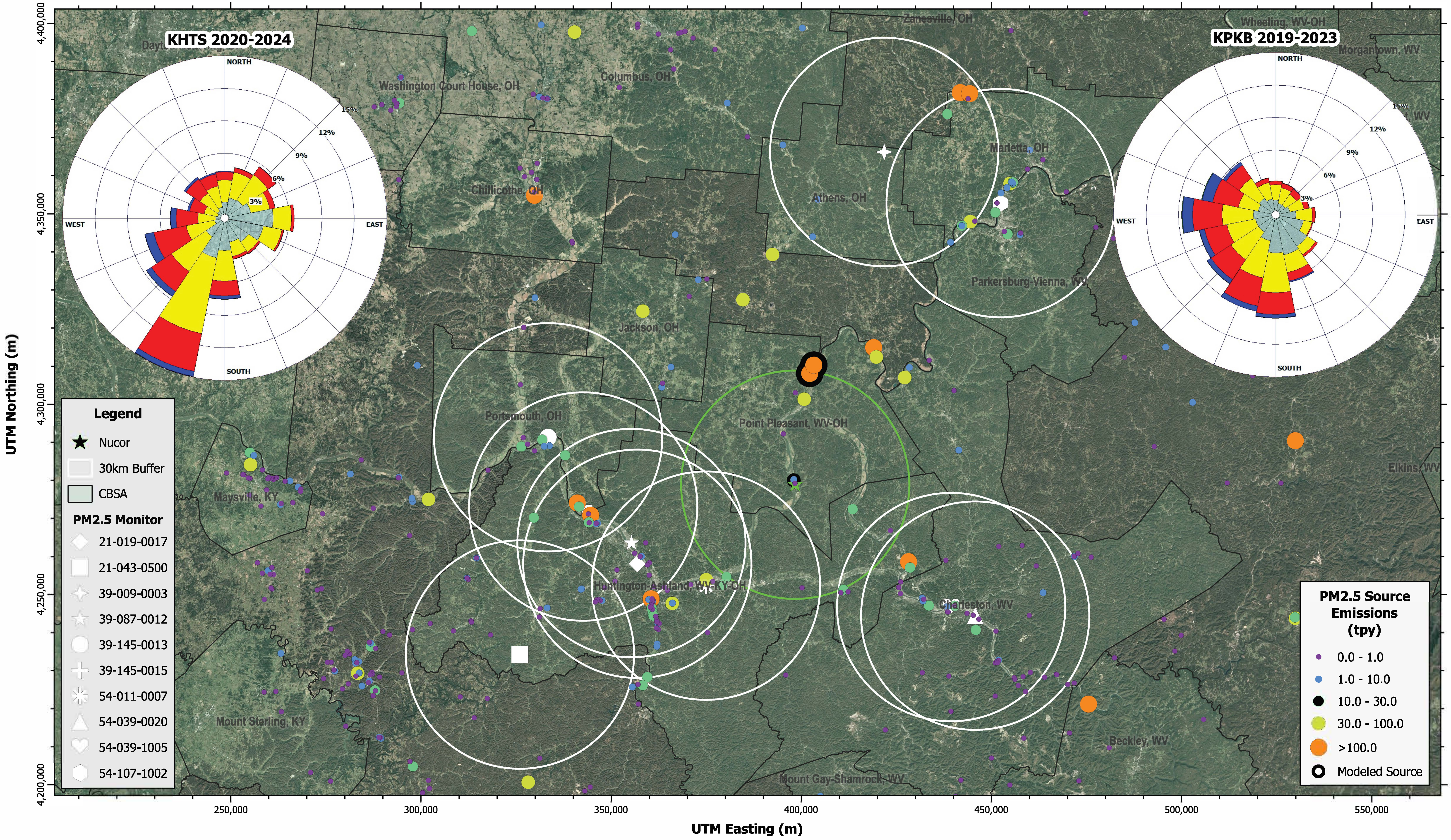
AQS Site ID	Monitor Distance to Nucor (km)	CBSA Name	Local Site Name	Monitor Type	Measurement Scale	Monitoring Objective	Instrument	Method Code	Latitude	Longitude
54-011-0007	35	Huntington-Ashland, WV-KY-OH	--	SLAMS	URBAN SCALE	POPULATION EXPOSURE	R & P Model 2025	145	38.4102	-82.4324
39-087-0012	46	Huntington-Ashland, WV-KY-OH	Odot Ironton	SLAMS	NEIGHBORHOOD	POPULATION EXPOSURE	R & P Model 2025	145	38.5081	-82.6592
21-019-0017	46	Huntington-Ashland, WV-KY-OH	Ashland Primary (Fivco)	SLAMS	NEIGHBORHOOD	POPULATION EXPOSURE	Teledyne T640 at 5.0 LPM	236	38.4593	-82.6404
54-039-1005	52	Charleston, WV	--	SLAMS	URBAN SCALE	POPULATION EXPOSURE	R & P Model 2025	145	38.3662	-81.6937
39-145-0015	56	Portsmouth, OH	East Haverhill	SLAMS	NEIGHBORHOOD	SOURCE ORIENTED	BGI Model PQ200-VSCC	142	38.5925	-82.8068
54-039-0020	58	Charleston, WV	Dixie St.	SLAMS	URBAN SCALE	POPULATION EXPOSURE	R & P Model 2025	145	38.3463	-81.6212
39-145-0013	66	Portsmouth, OH	Portsmouth Wtp	SLAMS	MIDDLE SCALE	POPULATION EXPOSURE	R & P Model 2025	145	38.7546	-82.9170
21-043-0500	85	--	Grayson Lake	SLAMS	URBAN SCALE	GENERAL/ BACKGROUN D	Teledyne T640 at 5.0 LPM	236	38.2389	-82.9881
39-009-0003	91	Athens, OH	Gifford	SLAMS	REGIONAL SCALE	GENERAL/ BACKGROUN D	R & P Model 2025	145	39.4422	-81.9088
54-107-1002	92	Parkersburg-Vienna, WV	Neale Elementary School	SLAMS	URBAN SCALE	POPULATION EXPOSURE	R & P Model 2025	145	39.3235	-81.5524

Nucor Apple Grove Facility

PM2.5 Candidate Background Monitor Summary Table

AQS Site ID	Monitor Distance to Nucor (km)	CBSA Name	Local Site Name	PM2.5 Annual Design Value, 2021-2023 (µg/m³)	Valid/ Invalid	2021 Annual Mean (µg/m³)	2022 Annual Mean (µg/m³)	2023 Annual Mean (µg/m³)	Regional Source Reported PM2.5 Emissions (Tons/Yr)[2021-2023, Most Recent 2-Yr Average] Distance from Monitor (< km): 5	10	15	20	25	30	Notes
54-011-0007	35	Huntington-Ashland, WV-KY-OH	--	7.6	Valid	7.78	6.81	8.22	70.38	88.83	291.92	349.37	352.85	371.11	Subject to Huntington-Ashland CBSA 1.6km from Steel Dynamics (46 tpy)
39-087-0012	46	Huntington-Ashland, WV-KY-OH	Odot Ironton	7.9	Valid	8.16	7.13	8.54	6.56	6.97	213.43	693.10	741.03	829.12	Subject to Huntington-Ashland CBSA 13.0km from Hanging Rock Energy (185 tpy)
21-019-0017	46	Huntington-Ashland, WV-KY-OH	Ashland Primary (Fivco)	7.5	Valid	7.60	6.67	8.26	6.61	178.22	267.30	528.16	784.84	831.63	Subject to Huntington-Ashland CBSA 9.8km from Catlettsburg Refinery (167 tpy)
54-039-1005	52	Charleston, WV	--	8.1	Valid	8.16	7.32	8.83	17.85	61.16	77.03	311.43	313.07	326.74	Subject to Charleston, WV CBSA 16.0km from John E Amos Power Plant (225 tpy)
39-145-0015	56	Portsmouth, OH	East Haverhill	7.7	Valid	7.10	7.14	8.80	413.58	419.07	455.89	465.96	522.23	537.31	1.8km from Haverhill Coke Co. (190 tpy)
54-039-0020	58	Charleston, WV	Dixie St.	7.7	Valid	8.18	7.10	7.74	10.74	28.59	70.46	72.09	313.07	313.07	Subject to Charleston, WV CBSA Numerous Small (~30 tpy) Nearby Sources Urban Scale Monitor
39-145-0013	66	Portsmouth, OH	Portsmouth Wtp	7.6	Valid	7.13	6.81	8.74	24.83	61.78	61.78	274.79	500.37	506.71	Numerous (~60 tpy) Nearby Sources
21-043-0500	85	--	Grayson Lake	6.3	Valid	6.31	5.72	6.80	0.00	0.04	7.54	8.68	21.10	33.99	Urban Scale Monitor
39-009-0003	91	Athens, OH	Gifford	6.1	Valid	6.16	5.45	6.78	0.00	0.00	0.00	23.68	25.98	564.93	Large Sources ~30km Northeast Emissions Most Similar to Nucor (0-15km) Monitoring Objective is Regional Background
54-107-1002	92	Parkersburg-Vienna, WV	Neale Elementary School	8.1	Valid	7.93	7.44	8.93	30.54	201.00	253.83	261.67	261.67	386.80	Subject to Parkersburg-Vienna CBSA 5.8km from Eramet Marietta, Inc. (82 tpy)
			Nucor Apple Grove Facility					**NUCOR** (w/ modeled sources)	7.94	7.94	7.94	30.12	86.59	699.57	Asphalt Plant (56 tpy) located 23km away has low-level releases not expected to significantly impact modeled concentrations
								NUCOR (w/o modeled sources)	0.00	0.00	0.00	22.18	78.65	93.38	Modeled sources include: APG Polytech, Kyger Creek Station, and Gavin Power Plant (33 km away)

Figure 1. PM2.5 Monitor Selection Map for Nucor Apple Grove Facility Modeling Analysis



All coordinates shown in UTM Coordinates,
UTM Zone 17, NAD 83 Datum

APPENDIX B. EPA COMMUNICATION ON PRIMARY $PM_{2.5}$ MERP

From: Bridgers, George (he/him/his) <Bridgers.George@epa.gov>
Sent: Tuesday, December 17, 2024 12:09 PM
To: Jon Hill
Subject: RE: MERP/Primary PM2.5 Question

Thanks Jon for your patience as I corral a better response from within our office.

For starters, let me preface that the language in the updated MERPs guidance or the supplement that we issued this year following the PM2.5 SILs updates, "where agreed to by the appropriate reviewing authority may provide relevant information to support Tier 1 PSD Class I increment demonstrations." I'm already guessing that you were suspecting that some part of my response would include "case specific" and "pending consultation with the appropriate reviewing authority." So, there… got the caveats out of the way.

Now, yes… you were correct that this would be a novel approach at this point… albeit spelled out in the guidance supplement. To date and as noted, we have only seen applicants go the route of using CALPUFF in a screening mode to assess Class I increment (and NAAQS) impacts. The use of the photochemical modeling output for direct PM2.5 just hasn't been used for permitting, yet.

Having said that… there is some "there, there." The intercomparisons that Kirk did prior to the release of the guidance supplement does make a case that a comparable level of conservativeness and performance was demonstrated between the photochemical and Lagrangian (okay, CALPUFF) models. At 150+km distance, I personally would put more faith in the photochemical approach. The key here will be whether or not the specific reviewing authority will also agree. So, we're back to case-specific.

Closing this infinite do-loop… the best approach is to engage with the reviewing authority and highlight the language in the MERPs guidance supplement that opens this door. If they are comfortable with accepting this at face value… great… there shouldn't' be significant push back from the RO or us… maybe just some internal questions (again, it's novel as of Dev 17th). If the reviewing authority is more suspect give the language in the *Guideline* Section 4.2, then the request should be for a joint conference call with the RO and EPA HQ… for all of us to get on the same page.

Honestly, I feel that there will be degrees of freedom here depending on the Class I area in question… how close… and the type / size of source. While this new approach has sound footing, the level of justification to satisfy potential adverse comments will depend on the overall situation and the degree that the increment or NAAQS might be threatened… if that makes sense.

-George

PS – I don't have more info on getting more specific ranges (say every 20km) of primary PM2.5 impacts from the modeling… what is presented is the maximum impact at that range or beyond… consistent with the distance info for the secondary impacts (which is every 20km). If you get to a point of more specific application / acceptance… you can engage with Kirk Baker directly on getting more resolve info… should you need it.

George M. Bridgers, CPM
Model Clearinghouse Director | Air Quality Modeling Group | Air Quality Assessment Division | Office of Air Quality Planning & Standards | U.S. Environmental Protection Agency | Room C431B - Mail Drop C439-01 | 109 T.W. Alexander Drive | P.O. Box 12055 | Research Triangle Park, NC 27711 | Desk: 919-541-5563

From: Jon Hill <JHill@trinityconsultants.com>
Sent: Sunday, December 15, 2024 12:53 PM
To: Bridgers, George (he/him/his) <Bridgers.George@epa.gov>
Subject: RE: MERP/Primary PM2.5 Question

Caution: This email originated from outside EPA, please exercise additional caution when deciding whether to open attachments or click on provided links.

Thanks George…let me know what you hear back from Kirk/others are the primary side of this!

Best Regards,

Jon

Jonathan Hill
Managing Consultant/Meteorologist

Trinity Consultants Celebrating 50 Years 1974 2024

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Office: 919-462-9693 x3402
Direct: 984-257-8582
Fax: 919-578-3690

Email: jhill@trinityconsultants.com

From: Bridgers, George (he/him/his) <Bridgers.George@epa.gov>
Sent: Thursday, December 12, 2024 4:23 PM
To: Jon Hill <JHill@trinityconsultants.com>
Subject: RE: MERP/Primary PM2.5 Question

Jon,

I'm glad that you messaged back earlier today, because I certainly did confuse your message and not appropriately respond. I was doing too many things at the same time and mentally focused on the secondary formation aspects. You clearly were focused on and asking with respect to the primary impacts beyond 50km… my bad.

You are correct that we've not seen many using the photochemical modeling response for the primary component of PM. Actually, I'm not familiar with anyone doing that approach… honestly somewhat had forgotten that we even discussed it in the guidance. For the most part, we've seen applicants / reviewing authorities using CALPUFF (with chemistry turned off) for the primary PM at greater distances… thought I'll note just for the single-source… not cumulative. To that, the MERPs based secondary impact is added. I'm guessing that this is what you've seen too.

So far as the information in Table 1 for the primary impacts, it is my understanding that Kirk tabulated those impacts as the worst-case primary impacts. I can/will check with Kirk. Also, I doubt that anyone has compared the numbers in the table to any CALPUFF (or SCIPUFF) results… at least, I haven't seen any intercomparisons. I'm not suggesting that this would be necessary, but this wasn't the main focus when we were developing the MERPs Guidance… can't immediately say how conservative or not the Table 1 numbers would be from similar CALPUFF based impacts. I certainly would not put a lot of faith in near-field primary PM2.5 impacts from a 12km photochemical modeling run, but at 50+km distances, it would be more reasonable than AERMOD given the conservative nature of Gaussian models at extended distances and time.

Let me confirm that our assumptions are correct on the worse-case numbers being in Table 1. Also, I'm not sure if there is better distance aggregated data available other than these large distance bins. We have things for the secondary formation at 20km spacing… maybe it exists and is just not posted for the primary.

-George

George M. Bridgers, CPM
Model Clearinghouse Director | Air Quality Modeling Group | Air Quality Assessment Division | Office of Air Quality Planning & Standards | U.S. Environmental Protection Agency | Room C431B - Mail Drop C439-01 | 109 T.W. Alexander Drive | P.O. Box 12055 | Research Triangle Park, NC 27711 | Desk: 919-541-5563

From: Jon Hill <JHill@trinityconsultants.com>
Sent: Thursday, December 12, 2024 3:59 PM
To: Bridgers, George (he/him/his) <Bridgers.George@epa.gov>
Subject: RE: MERP/Primary PM2.5 Question

Building on my earlier email, are the hypothetical source impacts for **PRIMARY** PM2.5 tabulated anywhere? I am interpreting those Table 1 values to be the worst-case PRIMARY impacts across the modeled hypothetical sources for the specified emissions/release type, but correct me if that's wrong to.

Best Regards,

Jon

Jonathan Hill
Managing Consultant/Meteorologist

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Email: jhill@trinityconsultants.com

From: Jon Hill <JHill@trinityconsultants.com>
Sent: Thursday, December 12, 2024 11:41 AM
To: Bridgers, George (he/him/his) <Bridgers.George@epa.gov>
Subject: RE: MERP/Primary PM2.5 Question

Sorry – I might have been confusing. I am quite familiar with the distance-dependent MERP approach. I'm asking today about Table 1 which pertains to PRIMARY PM2.5 as an alternative approach to using 50km screen in AERMOD. So if I have a Class I area that's 130km away, I would use those primary results in Table 1 (based on emissions, release type) at 100km, and then add the distance-dependent MERP piece to include secondary.

Best Regards,

Jon

Jonathan Hill
Managing Consultant/Meteorologist

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Email: jhill@trinityconsultants.com

From: Bridgers, George (he/him/his) <Bridgers.George@epa.gov>
Sent: Thursday, December 12, 2024 11:26 AM
To: Jon Hill <JHill@trinityconsultants.com>
Subject: RE: MERP/Primary PM2.5 Question

Jon,

Yes… I have some "use or loose" time built up and have to take / burn some time here at the end of the year. This is my normal MO… skimp on using vacation until the end of the year such that I can take a few weeks off across Christmas and New Years. It also works out considering that we were able to get the Appendix W / AERMOD final rule out a few weeks back… take our victory lap and give the various final briefings… and now relax before things shake up with the next Administration coming in next month.

On the distance based MERPs approach, it is actually something that we've seen in a handful of permits over the past few years. So, it's not completely novel. While the easiest route is to demonstration that you don't have impacts over the Class I SIL at 50km, the Class I SIL is also an impossibly (not sure if I should say it that way) number to stay under with most larger facilities. Absent embarking on a cumulative exercise or using photochemical modeling, the distance binned MERPS is the best option… and our recommendation in most cases.

While Table 1 in the MERPs Guidance provides some basic information / illustrative, I would direct you to the more refined distance based MERPs information in the online MERPs Qlik Tool that we have on SCRAM (https://www.epa.gov/scram/merps-view-qlik). There are 2 tools or databases through this link… look to the second or bottom portion of the page. There you will find the distance based MERPs with 20km divisions… such that you can more appropriately pick the distance from your source to the Class I area.

The Regional Offices should be up-to-speed on this, but they'll pull us in directly where they need clarification / assistance. So, I'd definitely recommend that you reach out to the appropriate RO through whatever State/Local once this gets more project specific.

Cheers,
George

George M. Bridgers, CPM
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From: Jon Hill <JHill@trinityconsultants.com>
Sent: Thursday, December 12, 2024 7:48 AM
To: Bridgers, George (he/him/his) <Bridgers.George@epa.gov>
Subject: MERP/Primary PM2.5 Question

George,

I hope you are doing well and will be able to take some time off over the Christmas holiday! Until then…quick question regarding this section of the MERP guidance:

The screening approach for the primary $PM_{2.5}$ component of a PSD Class I area demonstration beyond 50 km could include AERMOD estimates at or about 50 km from the project source (Section 4.2.c.i of the *Guideline*) or a second level assessment based on modeling primary $PM_{2.5}$ that does not include plume-depleting processes to ensure a conservative estimate (Section 4.2.c.ii of the *Guideline*). The *Guideline* suggests a Lagrangian or comparable modeling system would be appropriate for a second level assessment. Photochemical grid models have been shown to demonstrate similar skill to Lagrangian models for long range pollutant transport when compared to measurements made from multiple mesoscale field experiments (ENVIRON, 2012; U.S. Environmental Protection Agency, 2016a). EPA modeled a subset of the hypothetical sources shown in Figure 3-2 with tracking of primary $PM_{2.5}$ contribution (N=36) using the CAMx model applied without chemistry. A table of maximum daily average and maximum annual average primary $PM_{2.5}$ impacts by emission rate are shown in Table 1. This table is intended to provide illustrative information about peak downwind primary $PM_{2.5}$ impacts at distances beyond 50 km and where agreed to by the appropriate reviewing authority may provide relevant information to support Tier 1 PSD Class I increment demonstrations.

This has not been a procedure that has been utilized much (if at all yet) but am I reading this right that when addressing Class I PSD increment in my application, I can levera e the Table 1 data to estimate the primary PM2.5 impacts based on

my emissions and distance to Class I area, rather than relying on a 50km value from AERMOD that I then add MERP contributions to. Its unclear to me where the data in Table 1 came from…are those the maximum impacts across all the hypothetical sources? Feel free to pass this on to somebody if you are not aware/not involved is this area.

Table 1. Maximum daily average and maximum annual average primary $PM_{2.5}$ impacts at 100, 200, and 300 km from modeled hypothetical source.

Emission Rate (tpy)	Distance from source (km)	Highest Daily Average Concentration (μg/m³) - tall stack	Highest Daily Average Concentration (μg/m³) - surface release	Highest Annual Average Concentration (μg/m³) - tall stack	Highest Annual Average Concentration (μg/m³) - surface release
100	300	0.0117	0.0123	0.0008	0.0009
100	200	0.0223	0.0212	0.0016	0.0015
100	100	0.0537	0.0445	0.0070	0.0049
150	300	0.0180	0.0184	0.0012	0.0013
150	200	0.0328	0.0311	0.0024	0.0022
150	100	0.0807	0.0632	0.0102	0.0073
500	300	0.0610	0.0625	0.0044	0.0045
500	200	0.1167	0.1095	0.0087	0.0078
500	100	0.2717	0.2536	0.0379	0.0238
1000	300	0.1186	0.1217	0.0087	0.0089
1000	200	0.2300	0.2161	0.0175	0.0157
1000	100	0.5445	0.5009	0.0731	0.0477

Thanks as always!

Jon

Jonathan Hill
Managing Consultant/Meteorologist

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