State of North Carolina's Recommendation on Boundaries For the 2010 1-Hour Sulfur Dioxide National Ambient Air Quality Standard

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Table of Contents

1. Purpose

The purpose of this document is to provide the State of North Carolina's recommendation on boundaries for the 2010 1-hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS) for all areas except those for which new monitors have been established.

2. Background

On June 22, 2010, the United States Environmental Protection Agency (EPA) promulgated a new 1-hour primary SO_2 standard of 75 parts per billion (ppb), measured as a three-year average of the annual 99th percentile of 1-hour daily maximum concentrations (40 CFR 50.17). The EPA also revoked the primary annual and 24-hour SO_2 NAAQS. On August 5, 2013, EPA promulgated the first round of nonattainment designations in 16 states where existing monitoring data from 2009-2011 indicated violations of the 1-hour SO_2 standard (78 FR 47191). All five air quality monitors in North Carolina were measuring attainment, but EPA deferred designations for North Carolina to a later date.

On March 2, 2015, the U.S. District Court for the Northern District of California ordered EPA to complete designations for the 2010 SO_2 standard for all remaining areas in the country in up to three additional rounds.

1. *Round 2, By July 2, 2016 – areas that have monitored violations of the 2010* SO_2 *standard based on 2013-2015 air quality data; and areas that contain any stationary sources not announced for retirement that emitted more than 16,000 tons of* SO_2 *in 2012 or emitted more than 2,600 tons of* SO_2 *and had an emission rate of at least 0.45 pound (lb)* SO_2 */million British thermal units (MMBtu) in 2012 will be designated.*

   In North Carolina, CPI Southport in Brunswick County was identified as being subject to the criteria established in the Court Order. On September 18, 2015, the State of North Carolina submitted a boundary recommendation based on air quality

modeling analysis.[1] On April 19, 2016, an updated boundary recommendation was submitted which utilized the most current emissions data for CPI Southport.[2]

After reviewing North Carolina's information related to CPI Southport, EPA designated Brunswick County as "unclassifiable."[3]

2. *Round 3, By December 31, 2017 – areas where states have not installed and begun operating a new* SO_2 *monitoring network will be designated.*

On August 21, 2015, EPA issued the final SO_2 Data Requirements Rule (DRR) which required air agencies to characterize air quality using either modeling of actual facility-wide emissions or using appropriately sited ambient air quality monitors.[4] By January 15, 2016, each air agency was required to submit a final list identifying facilities with greater than 2,000 tpy emissions of SO_2 in the state around which air quality is to be characterized. For emission sources that an air agency decides to evaluate through air quality modeling, a site-specific modeling protocol and modeling analysis were to be submitted to EPA by July 1, 2016 and January 13, 2017, respectively.

Source-Oriented Modeling

Table 1 lists four SO_2 facilities for which North Carolina submitted modeling protocols and modeling analysis. The modeling analysis was performed according to the Draft SO_2 NAAQS Designations Modeling Technical Assistance Document.[5] North Carolina's analysis shows that SO_2 concentrations within the modeling domain of each facility will be below the 2010 1-hour SO_2 NAAQS. Complete documentation of the modeling demonstration showing compliance with the standard

[1] http://deq.nc.gov/divisions/air-quality/air-quality-planning/attainment/designation-history/sulfur-dioxide-nonattainment-areas/north-carolina-so2-boundary-recommendations-brunswick-county-and-new-hanover-county (accessed January 3, 2017).
[2] https://ncdenr.s3.amazonaws.com/s3fs-public/Air%20Quality/planning/so2/SO2_Boundary_Recommendation_Sec_van_der_Vaart_to_RA_Toney_04192016.pdf (accessed January 3, 2017).
[3] 81 FR 45039 (July 12, 2016), Air Quality Designations for the 2010 Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard – Round 2, Final Rule.
[4] 80 FR 51052 (August 21, 2015),
Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS), Final Rule.
[5] SO2 NAAQS Designations Modeling Technical Assistance Document, US EPA Office of Air and Radiation, Office of Air Quality Planning and Standards, Air Quality Assessment Division, February 2016, Draft.

was submitted to EPA on January 13, 2017. All documents related to the modeling analysis are posted on the North Carolina Department of Environmental Quality (DEQ), Division of Air Quality website.[6]

Section 3.2 discusses the approach North Carolina is using to recommend designations for the four modeled facilities.

Table 1. North Carolina Facilities Characterized Through Air Quality Modeling

Facility Name	County	2015 Actual SO_2 Emissions (tpy)	Analysis Approach**
Duke Energy Progress, LLC – Mayo Facility	Person	2,484	Modeling
Duke Energy Carolinas, LLC – Belews Creek Steam Station	Stokes	6,780	Modeling
Duke Energy Carolinas, LLC – Marshall Steam Station	Catawba	4,624	Modeling
Duke Energy Carolinas, LLC – Allen Steam Station*	Gaston	1,128	Modeling

*Emissions are below the 2,000 tpy EPA threshold; however, North Carolina elected to characterize air quality surrounding this facility because third-party modeling was submitted to the agency.
**Modeling protocols are posted at http://deq.nc.gov/about/divisions/air-quality/air-quality-planning/attainment/designation-history/sulfur-dioxide-nonattainment-areas
Note: Although the DEQ website shows a modeling protocol for Duke Energy Progress – Asheville Steam Electric Plant in Buncombe County, characterization of the air quality near this plant was changed from modeling to monitoring per DEQ to EPA on December 28, 2016.

Source-Oriented Monitoring

Under the DRR, North Carolina elected to evaluate four facilities through monitoring, and submitted relevant information to EPA as part of its annual monitoring network plan.[7] All monitoring procedures and data collection efforts are to be conducted in accordance with EPA's monitoring requirements specified in 40 CFR Part 58. Table 2 lists the SO_2 facilities being monitored. With the exception of PCS Phosphate, which already has three years of certified SO_2 monitoring data, ambient monitoring for the remaining three sites was initiated on January 1, 2017.

[6] http://deq.nc.gov/about/divisions/air-quality/air-quality-planning/attainment/designation-history/sulfur-dioxide-nonattainment-areas (accessed January 3, 2017).
[7] http://deq.nc.gov/about/divisions/air-quality/air-quality-data/annual-network-plan (accessed January 3, 2017).

Table 2. North Carolina Facilities Characterized Through Ambient Monitoring

Facility Name	County	2015 Actual SO_2 Emissions (tpy)	Monitor Name	Analysis Approach
PCS Phosphate Company, Inc. – Aurora	Beaufort	4,403	Bayview	Monitoring (2013-2015 data certified)
Evergreen Packaging – Canton Mill	Haywood	7,811	Canton	Monitoring (2017-2020 data to be collected)
Duke Energy Progress, LLC – Roxboro Plant	Person	10,544	Roxboro	Monitoring (2017-2020 data to be collected)
Duke Energy Progress, Inc. – Asheville Steam Electric Plant*	Buncombe	1,068	Skyland	Monitoring (2017-2020 data to be collected)
CPI USA North Carolina – Southport Plant	Brunswick	4,774	Southport	Permit Limit/Monitoring Brunswick County was designated Unclassifiable on July 12, 2016 as part of EPA's Round 2 action (81 FR 45039).

*Emissions are below the 2,000 tpy EPA threshold; however, North Carolina elected to characterize air quality surrounding this facility because third-party modeling was submitted to the agency.

In this boundary recommendation package, North Carolina is using the most recent three years of certified air quality monitoring data for PCS Phosphate to characterize air quality surrounding this facility. Section 3.3 presents the ambient monitoring data, the 2013-2015 design value, and the State's recommendation for designations for PCS Phosphate.

Non-Source Oriented Ambient Monitors

In addition to the source oriented monitors listed in Table 2, North Carolina has been operating a network of ambient SO_2 monitors in areas where large SO_2 facilities with

emissions (≥ 2,000 tpy) do not exist. Table 3 lists the ambient air quality monitors. In this boundary recommendation package, North Carolina is using the most recent three years of certified monitoring data to characterize air quality surrounding these ambient monitors. Section 3.3 presents the ambient monitoring data, the 2013-2015 design values, and the State's recommendation for designations for areas surrounding these ambient monitors.

Table 3. Non-Source Oriented Ambient Monitors

Monitoring Site ID	Monitor Name	County
37-063-0015	Durham Armory	Durham
37-067-0022	Hattie Ave.	Forsyth
37-119-0041	Garinger	Mecklenburg
37-129-0006	Castle Hayne	New Hanover
37-183-0014	Millbrook	Wake

3. *Round 4, By December 31, 2020 – all remaining areas will be designated.*

Source-oriented monitoring for two facilities (Evergreen Packaging and Duke Energy Progress' Roxboro Plant) began on January 1, 2017. Monitoring for Duke Energy Progress' Asheville Plant began on January 5, 2017 due to difficulties getting power connected at the site. Regardless, complete data is anticipated for the quarter. North Carolina intends to submit boundary recommendation for these facilities in the future after 2017-2019 ambient SO_2 data are collected and certified. Designations for the three monitoring sites will be part of EPA's Round 4 action.

3. Boundary Recommendation

Figure 1 illustrates a state-wide map of the four modeled facilities and the extent of their modeling domains. The figure also shows the locations of source-oriented monitors and other ambient monitors. North Carolina's analyses of: (1) source-oriented modeling, (2) source-oriented monitoring for the PCS Phosphate site, and (3) non-source oriented ambient air quality monitoring show that 1-hour SO_2 concentrations are below the 2010 SO_2 NAAQS and do not contribute to a violation of the standard. For this reason, the State is recommending that all townships within all counties where modeled and monitored concentrations are below the 2010 1-hour SO_2 NAAQS be designated attainment (see Attachment A).

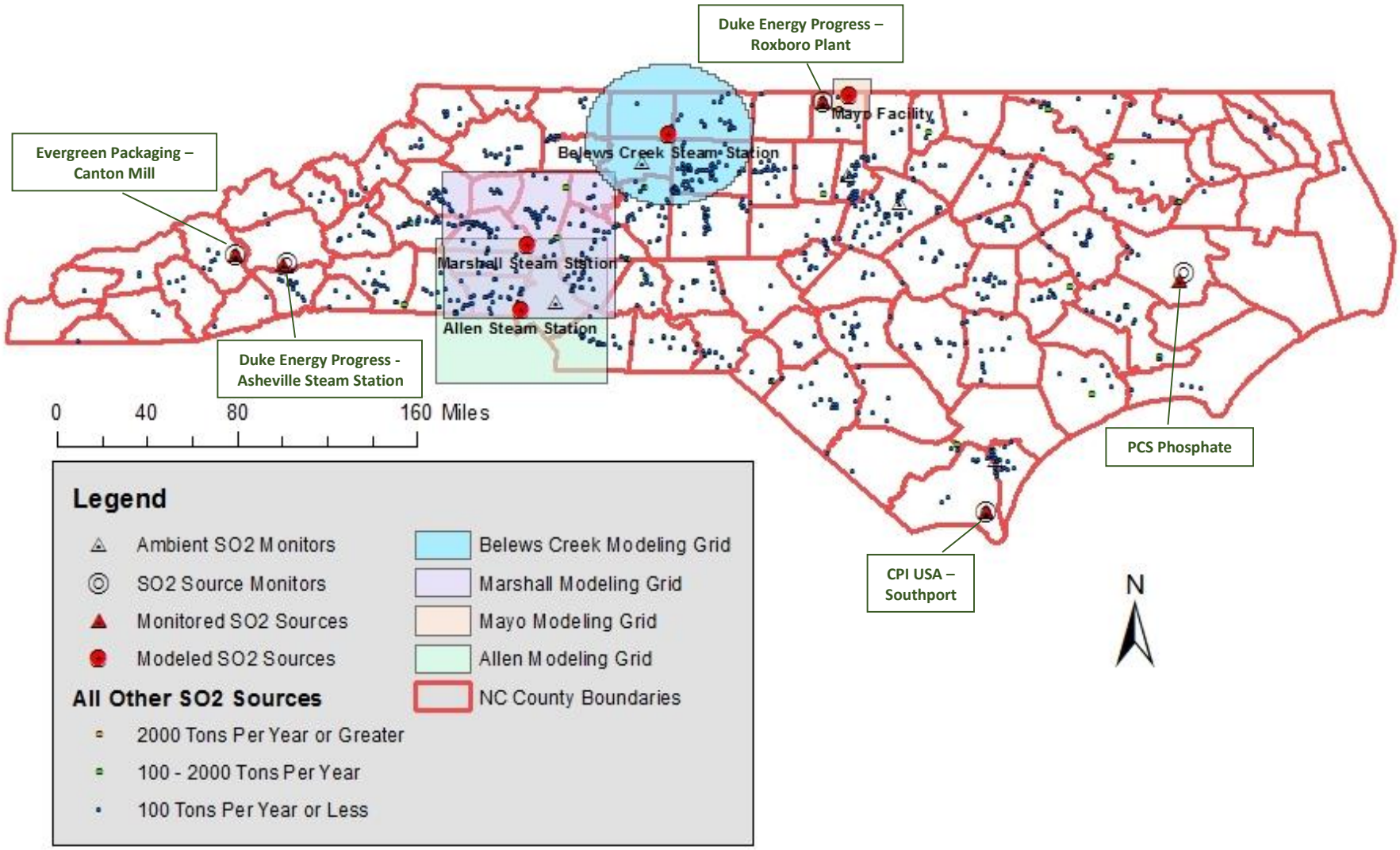

Figure 1. SO_2 Modeled and Monitored Areas in North Carolina

In developing this recommendation, North Carolina utilized *EPA's Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide NAAQS*[8], and conducted an evaluation of five factors specified in the guidance. The five factors required to be considered are: 1) ambient air quality data or dispersion modeling, 2) emissions related data, 3) meteorology, 4) geography and topography, and 5) jurisdictional boundaries. The results of EPA's five factor analyses are discussed below in Sections 3.1 through 3.5.

3.1 Jurisdictional Boundary

The EPA guidance requests clearly defined legal boundaries for carrying out the air quality planning and enforcement functions. Due to the 1-hour averaging time of the 2010 SO_2 NAAQS, North Carolina is recommending attainment designations at the township level.

3.2 Source-Oriented Dispersion Modeling

As discussed earlier, North Carolina has submitted a detailed air quality modeling analysis for each of the four modeled facilities (Mayo, Belews Creek, Marshall and Allen). The modeling analysis for each facility demonstrates that the SO_2 1-hour NAAQS of 75 ppb (196 micrograms per cubic meter) is met in the area surrounding each facility and no violations of the standard exist within the modeling domains. The detailed dispersion modeling approach is not repeated here, but can be referred to in the State's January 13, 2017 submittal.

Attachment B, Figure B1 illustrates the modeling domain for the Mayo facility. The SO_2 concentrations for all receptors within this modeling domain are below the SO_2 NAAQS; therefore, all townships contained within the domain (Holloway, Oak Hill, Woodsdale, Cunnigham, Roxboro, Allensville and Walnut Grove) are recommended for designation as attainment. The modeling also shows that the Mayo facility will not violate the SO_2 standard in the areas modeled in Virginia. The SO_2 rate for CPI Roxboro in the township of Roxboro was less than 2,000 tpy at the time of dispersion modeling. Its emissions are not expected to significantly impact air quality surrounding the Mayo facility. The few less than 100 tpy SO2 facilities located within the townships of Holloway and Woodsdale are also not expected to impact air quality. Based on this source-specific modeling analyses, North Carolina is concluding that the area illustrated in Figure B1 meets the SO_2 NAAQS, and no other sources cause or contribute to a NAAQS violation in the vicinity of the Mayo facility.

[8] http://epa.gov/airquality/sulfurdioxide/pdfs/20150320SO2designations.pdf

This same approach is followed to recommend areas within the modeling domains of the three remaining modeled facilities. Attachment B, Figure B2 illustrates the modeling domains for the Belews Creek facility and Figure B3 illustrates the domain for the Marshall and Allen facilities. As shown in Figures B2 and B3, the modeling domains overlap in a few townships. Each facility's modeling analysis demonstrates compliance with the SO_2 NAAQS; therefore, it is recommended that all townships within the Belews Creek, Marshall and Allen facilities modeling domains be designated attainment. This conclusion is further supported by the fact that both the Hattie Avenue ambient monitor (located within the Belews Creek modeling domain) and the Garinger ambient monitor (located within the Marshall and Allen modeling domains) are measuring SO_2 concentrations well below the standard (discussed later in Section 3.3).

Attachment A summarizes county and township-level recommendation for the four modeled facilities, along with a five-factor analysis justification (where applicable).

3.3 Source-Oriented and Ambient Air Quality Monitoring

Table 4 shows the most recent (2013-2015) annual concentrations (99^{th} percentile) and three-year design value recorded at the PCS Phosphate Bayview monitoring site in Beaufort County. Attachment C, Figure C1 shows the location of the monitoring site and the facility. There are no other major SO_2 facilities located in Beaufort County. Based on the clean monitoring data, North Carolina is recommending that all townships within Beaufort County be designated attainment.

In addition to PCS Phosphate, three additional SO_2 facilities will be monitored beginning January 1, 2017. The three facilities are: Evergreen Packaging, Duke Energy Progress Asheville Steam Plant, and Duke Energy Progress Roxboro Plant, illustrated in Attachment C, Figures C2, C3 and C4, respectively. Per the flexibility granted in the DRR, North Carolina is deferring boundary recommendation for the townships in which the source-oriented monitors and the SO_2 facilities are located until three years of measurement data are collected and certified.

Table 4 also shows the 2013-2015 annual SO_2 data and three-year design values for the non-source oriented ambient monitoring sites. Each site is measuring well below the 2010 1-hour SO_2 NAAQS. Note that the Hattie Avenue and Garinger monitors are located within the

modeling domains of Belews Creek, Marshall, and Allen plants which further supports the recommendation made in Section 3.2.

Attachment D, Figures D1, D2 and D3 illustrate the location of the Castle Hayne, Durham Armory and Millbrook ambient monitors. There are no other major (≥ 2,000 tpy) SO_2 facilities located in the vicinity of these monitors. North Carolina is recommending that all townships in the counties where the monitors are located be designated attainment since the most current design values are in compliance with the 2010 SO_2 NAAQS.

Attachment A summarizes county and township-level recommendation for monitored areas, along with a five-factor analysis justification (where applicable).

Table 4. Source-Oriented and Ambient Air SO_2 Monitoring Data (2013 – 2015)

Monitoring Site ID	Monitor Name	County	99th Percentile (ppb)			3-yr. Design Value (2013-2015)
			2013	2014	2015	
Source Oriented Monitor						
37-013-0151	PCS Phosphate Bayview	Beaufort	22	22	19	21
Ambient Air Quality Monitors						
37-063-0015	Durham Armory	Durham	6	7	10	8
37-067-0022	Hattie Ave.	Forsyth	5	13	8	9
37-119-0041	Garinger	Mecklenburg	8	6	6	7
37-129-0006	Castle Hayne	New Hanover	45	3	4	17
37-183-0014	Millbrook	Wake	6	6	5	6

3.4 Emissions Related Data

The air quality impact analyses discussed above addressed high emitting modeled and monitored facilities that are capable of affecting downwind SO_2 concentrations. North Carolina has reviewed the size and location of SO_2 facilities in the remaining counties, where emissions for majority of the facilities are less than 100 tpy of SO_2. North Carolina also reviewed clusters of facilities located within a 10 kilometer radius of each facility with emissions below 2,000 tpy SO2, and determined that a cluster with collective emissions above 2,000 tpy was not present. The State concludes that the low emissions levels will not interfere with the attainment of 1-hour SO_2 NAAQS, and recommends that all such areas be designated attainment.

Attachment E shows the 2015 SO_2 emission rates for all permitted facilities.

3.5 Meteorology, Topography and Geography

Meteorology and geography were addressed in the dispersion modeling analyses. Topography does not play a role in the dispersion characteristics at the modeled sites.

4.0 Conclusions

North Carolina's five factor analysis using EPA guidance determined the following:

1. Air dispersion modeling of the Mayo, Belews Creek, Marshall and Allen Plants demonstrate no violation of the 2010 1-hour SO_2 NAAQS. The modeling shows that the 75 ppb SO_2 standard will be met within the modeling domains of each facility. All townships located within the modeling domains are recommended to be designated attainment.

2. Source-oriented monitoring at the PCS Phosphate's Bayview site shows that the 2013-2015 SO_2 design value is well below the 2010 SO_2 NAAQS. All townships within Beaufort County are recommended to be designated attainment.

3. The 2013-2015 SO_2 design values for the Castle Hayne, Durham Armory, and Millbrook ambient monitors are well below the 2010 SO_2 NAAQS. All townships within New Hanover County, Durham County and Wake County are recommended to be designated attainment.

4. The Hattie Avenue and Garinger ambient monitoring sites in Forsyth County and Mecklenburg County, respectively, are located within the modeling domains of the Belews Creek, Marshall and Allen plants. The design values for these monitoring sites are also below the 2010 SO_2 NAAQS which further supports the attainment recommendation made above for the modeled sites.

5. All remaining townships outside of the modeled and monitored areas are recommended to be designated attainment due to the presence of no SO_2 emitting facilities or facilities with emissions less than 2,000 tpy threshold established in DRR. Further characterization of air quality around these smaller sources is not needed.