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2017-2018 Annual Monitoring Network Plan for the North Carolina Division of Air Quality

Volume 2

Site Descriptions by Metropolitan Statistical Area

F. The Washington Monitoring Region

June 30, 2017

Nothing Compares℠

State of North Carolina | Department of Environmental Quality | Division of Air Quality
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F. The Washington Monitoring Region

The Washington monitoring region, shown in Figure F1, consists of five sections: (1) the Greenville metropolitan statistical area, MSA, (Pitt County), (2) the Goldsboro MSA (Wayne County), (3) the New Bern MSA (Craven, Jones and Pamlico counties) (4) the non-MSA portion of the Washington monitoring region (Beaufort, Bertie, Camden, Chowan, Dare, Greene, Hertford, Hyde, Lenoir, Martin, Pasquotank, Perquimans, Tyrrell and Washington counties) and (5) the Virginia Beach-Norfolk-Newport News MSA (Currituck and Gates counties).

Figure F1. The Washington monitoring region
The red dots show the approximate locations of most of the monitoring sites in this region.

(1) The Greenville MSA

The Greenville MSA consists of Pitt County. The principal city is Greenville. The North Carolina Division of Air Quality, DAQ, operates one monitoring site in this MSA – a collocated ozone and fine particle monitoring site at the Pitt County Agricultural Center in Greenville. Table F1 summarizes site monitoring information. Figure F2 shows the site location. Both monitors began operating April 1, 2008. Figure F3 through Figure F8 provide views of the site and views looking north, east, south and west from the site.

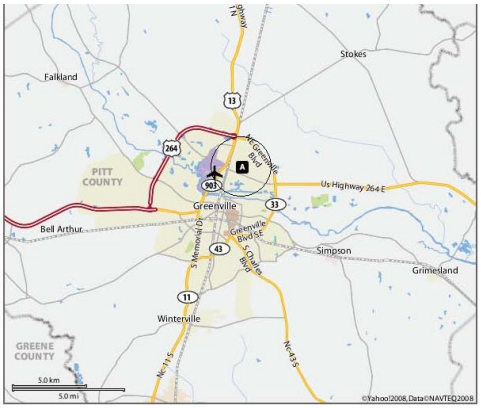


Figure F2. Locations of monitors in the Greenville MSA
A is the Pitt County Agriculture Center ozone and fine particle monitoring site. The circle represents the neighborhood scale of 4 Km.

Figure F3. Aerial view of the Pitt Co Ag Center site

Figure F4. The Pitt Co Ag Center ozone and fine particle monitoring site

Table F1. Site Table for Pitt County Agriculture Center

Site Name:	Pitt County Agriculture Center		
AQS Site Identification Number	37-147-0006		
Location:	403 Government Circle Greenville, North Carolina		
CBSA:	Greenville, NC	**CBSA #:**	24780
Latitude	35.638610	**Datum:**	WGS84
Longitude	-77.358050		
Elevation	7 meters		

Parameter Name	**Method**	**Method Reference ID**	**Sample Duration**	**Sampling Schedule**
Ozone	Instrumental With Ultra Violet Photometry (047)	EQOA-0880-047	1-Hour	Mar. 1 to Oct. 31
PM 2.5 local conditions	R & P Model 2025 PM2.5 Sequential w/WINS – Gravimetric Analysis (118)	RFPS-0498-118	24-Hour	Every Third Day, Year Round
PM 2.5 local conditions	Met One BAM-1022 Mass Monitor w/ VSCC	EQPM-1013-209	1-Hour	Year Round

Date Monitor Established:	Ozone	April 1, 2008
Date Monitor Established:	PM 2.5 local conditions	April 1, 2008
Date Monitor Established	PM 2.5 local cConditions, continuous	April 8, 2016

Nearest Road:	New Hope/Detention / Detention Drive		
Traffic Count:	None available – estimated < 3100	**Year of Count:**	2012

Parameter Name	**Distance to Road**	**Direction to Road**	**Monitor Type**	**Statement of Purpose**
Ozone	200 meters	West	SLAMS	Real-time AQI reporting. Compliance w/NAAQS.
PM 2.5 local conditions	200 meters	West	SLAMS	Compliance w/NAAQS.
PM 2.5 local conditions	200 meters	West	SPM	Real-time AQI reporting

Parameter Name	**Monitoring Objective**	**Scale**	**Suitable for Comparison to NAAQS**	**Proposal to Move or Change**
Ozone	Population Exposure	Neighborhood	Yes	None
PM 2.5 local conditions	Population Exposure	Neighborhood	Yes	May go to 1-in-6 day
PM 2.5 local conditions	Population Exposure	Neighborhood	No	None

Parameter Name	**Meets Part 58 Appendix A Requirements**	**Meets Part 58 Appendix C Requirements**	**Meets Part 58 Appendix D Requirements**	**Meets Part 58 Appendix E Requirements**
Ozone	Yes	Yes	Yes	Yes
PM 2.5 local conditions	Yes	Yes	No requirements	Yes
PM 2.5 local conditions	Yes	Yes	No requirements	Yes

Parameter Name	**Probe Height (m)**	**Distance to Support**	**Distance to Trees**	**Obstacles**
Ozone	4.5	1.5 meter	>20 meters	None
PM 2.5 local conditions	2.4	2.1 meters	>20 meters	None
PM 2.5 local conditions	2.3	2 meters	>20 meters	None

Figure F5. Pitt Co Ag Center site looking north

Figure F7. Pitt Co Ag Center site looking east

Figure F6. Pitt Co Ag Center site looking west

Figure F8. Pitt Co Ag Center site looking south

In 2016 the site was relocated on the property due to the construction of a building near the original location. For details on the relocation see Appendix F-3. Region 4 Requested Siting Information for the Pitt County Agricultural Center Site Relocation. In 2016 a continuous fine particle monitor was added to the site.

The **lead monitoring network requirements** as modified in 2016[1] do not result in any lead monitors in the Greenville MSA. The Greenville MSA does not have any permitted facilities located within its bounds that emit 0.5 ton or more per year of lead.[2] Changes to the **ozone monitoring requirements** in 2015 did not result in more monitoring in the Greenville MSA. The MSA currently has the minimum number of monitors required by 40 CFR 58 Appendix D for population exposure monitoring in urban areas. Ozone monitoring began a month earlier on March 1 instead of April 1 starting in 2017. The 2010 **nitrogen dioxide monitoring requirements**[3] did not add nitrogen dioxide monitors in the Greenville MSA because the

[1] Revisions to Ambient Monitoring Quality Assurance and Other Requirements, Federal Register, Vol. 81, No. 59, Monday, March 28, 2016, p. 17248, available on the worldwide web at https://www.gpo.gov/fdsys/pkg/FR-2016-03-28/pdf/2016-06226.pdf.

[2] United States Environmental Protection Agency. (2017). *TRI Explorer* (2015 Dataset (released March 2017)) [Internet database]. Retrieved from https://www.epa.gov/triexplorer, (May 04, 2017).

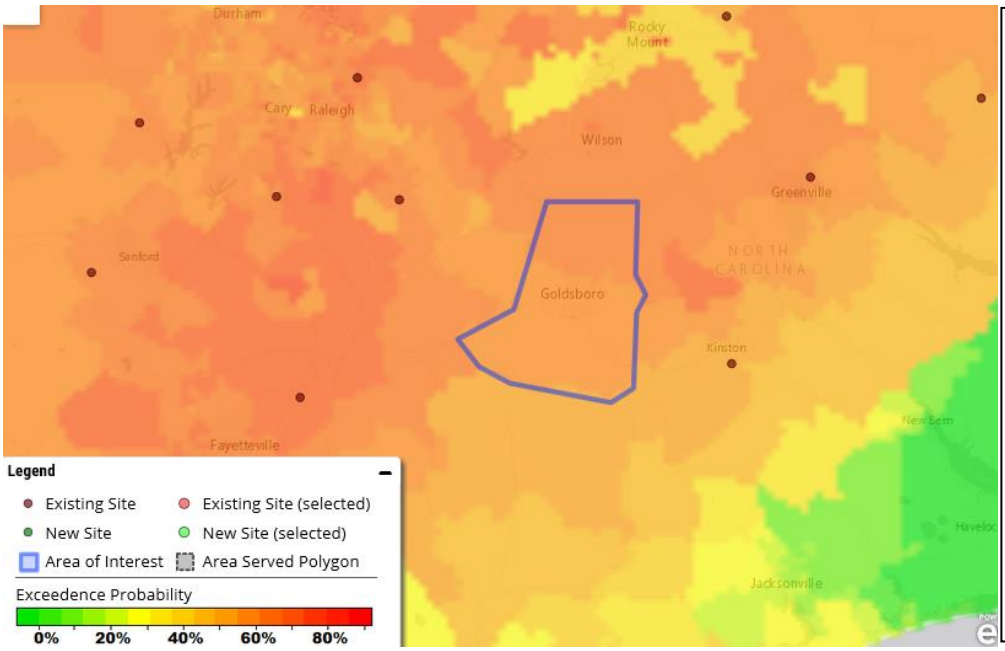
[3] Primary National Ambient Air Quality Standards for Nitrogen Dioxide, Federal Register**,** Vol. 75, No. 26, Feb. 9, 2010, available on the worldwide web at https://www3.epa.gov/ttn/naaqs/standards/nox/fr/20100209.pdf.

population is less than 500,000. The 2010 **sulfur dioxide monitoring requirements** also did not result in more monitoring in this area because there are no large sources of sulfur dioxide in the MSA. The changes to the **carbon monoxide monitoring requirements** did not result in additional monitoring in this MSA because the population is less than one million.

(2) The Goldsboro MSA

The Goldsboro MSA consists of Wayne County. The major metropolitan area is the City of Goldsboro. The DAQ does not operate any monitoring sites in the Goldsboro MSA. The fine-particle monitoring site located at Dillard Middle School was shut down on Dec. 31, 2015.

Currently, the DAQ does not monitor for ozone in Goldsboro because there are ozone monitors in the neighboring counties of Johnston and Lenoir. Figure F9 shows the locations of these monitors as well as the Leggett and Pitt County monitors in relation to the Goldsboro MSA. Modeling also indicates that the probability of there being an exceedance of the 2015 ozone standard in the Goldsboro area is only moderate, around 50 percent. The surrounding ozone monitors should adequately characterize the ozone concentrations in the Goldsboro area.



The Goldsboro MSA is outlined in blue. The West Johnston ozone monitor is to the west; the Leggett ozone monitor is to the north northeast; the Pitt Co Ag Center ozone monitor is to the northeast; the Lenoir Community College ozone monitor is to the east; the Wade ozone monitor is to the southwest of Goldsboro.

Figure F9. Ozone monitors surrounding the Goldsboro MSA and probability of exceeding the 2015 ozone standard

The **lead monitoring network** requirements, as modified in 2016,[4] did not add any lead monitors in the Goldsboro MSA. The Goldsboro MSA does not have any permitted facilities located within its bounds that emit 0.5 tons or more per year of lead.[5]

[4] Revisions to Ambient Monitoring Quality Assurance and Other Requirements, Federal Register, Vol. 81, No. 59, Monday, March 28, 2016, p. 17248, available on the worldwide web at https://www.gpo.gov/fdsys/pkg/FR-2016-03-28/pdf/2016-06226.pdf.

The 2010 **nitrogen dioxide monitoring requirements,**[6] as modified in 2016, also did not increase the number of monitors in the Goldsboro MSA because its population is less than 1,000,000. The 2010 **sulfur dioxide monitoring requirements** did not result in additional sulfur dioxide monitors because there are not enough emissions or people in the MSA to require PWEI monitoring. The 2011 changes to the **carbon monoxide monitoring requirements** also did not result in the addition of any carbon monoxide monitors because the population is less than one million.

(3) The New Bern MSA

The New Bern MSA is made up of three counties – Craven, Jones and Pamlico counties. The DAQ currently does not operate any monitoring stations in the New Bern MSA. The current monitoring regulations do not require the DAQ to operate any monitors in this area.

The **lead monitoring** network requirements, as modified in 2016,[7] do not require lead monitors in the New Bern MSA. The MSA does not have any permitted facilities located within its bounds that emit 0.5 tons or more of lead per year.[8]

The 2015 **ozone monitoring requirements** did not require adding an ozone monitor to the New Bern MSA. As shown in Figure F10, modeling indicates that the area has a low probability of exceeding the 2015 ozone standard. The DAQ operates an ozone monitor just to the west of the MSA at Lenoir Community College, which has a higher probability of exceeding the standard than anywhere in the MSA. The EPA operates a clean air status and trends network, CASTNET, monitor just to the east of the MSA. These two monitors should adequately characterize ozone concentrations in this area.

This area also did not have to add any monitors to comply with the 2010 **nitrogen dioxide monitoring** requirements because it does not have any roadways that exceed the population threshold.[9] It also did not need to add monitors for the 2010 **sulfur dioxide monitoring requirements** because there are no facilities in the MSA emitting large enough quantities of sulfur dioxide to trigger source-oriented monitoring. This area will also not need to add monitors to comply with the **changes to the carbon monoxide monitoring requirements** because the population is less than one million.

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[5] United States Environmental Protection Agency. (2017). *TRI Explorer* (2015 Dataset (released March 2017)) [Internet database]. Retrieved from https://www.epa.gov/triexplorer, (May 04, 2017).
[6] Primary National Ambient Air Quality Standards for Nitrogen Dioxide, Federal Register**,** Vol. 75, No. 26, Feb. 9, 2010, available on the worldwide web at https://www3.epa.gov/ttn/naaqs/standards/nox/fr/20100209.pdf.
[7] Revisions to Ambient Monitoring Quality Assurance and Other Requirements, Federal Register, Vol. 81, No. 59, Monday, March 28, 2016, p. 17248, available on the worldwide web at https://www.gpo.gov/fdsys/pkg/FR-2016-03-28/pdf/2016-06226.pdf.
[8] United States Environmental Protection Agency. (2017). *TRI Explorer* (2015 Dataset (released March 2017)) [Internet database]. Retrieved from https://www.epa.gov/triexplorer, (May 04, 2017).
[9] Primary National Ambient Air Quality Standards for Nitrogen Dioxide, Federal Register**,** Vol. 75, No. 26, Feb. 9, 2010, available on the worldwide web at https://www3.epa.gov/ttn/naaqs/standards/nox/fr/20100209.pdf.

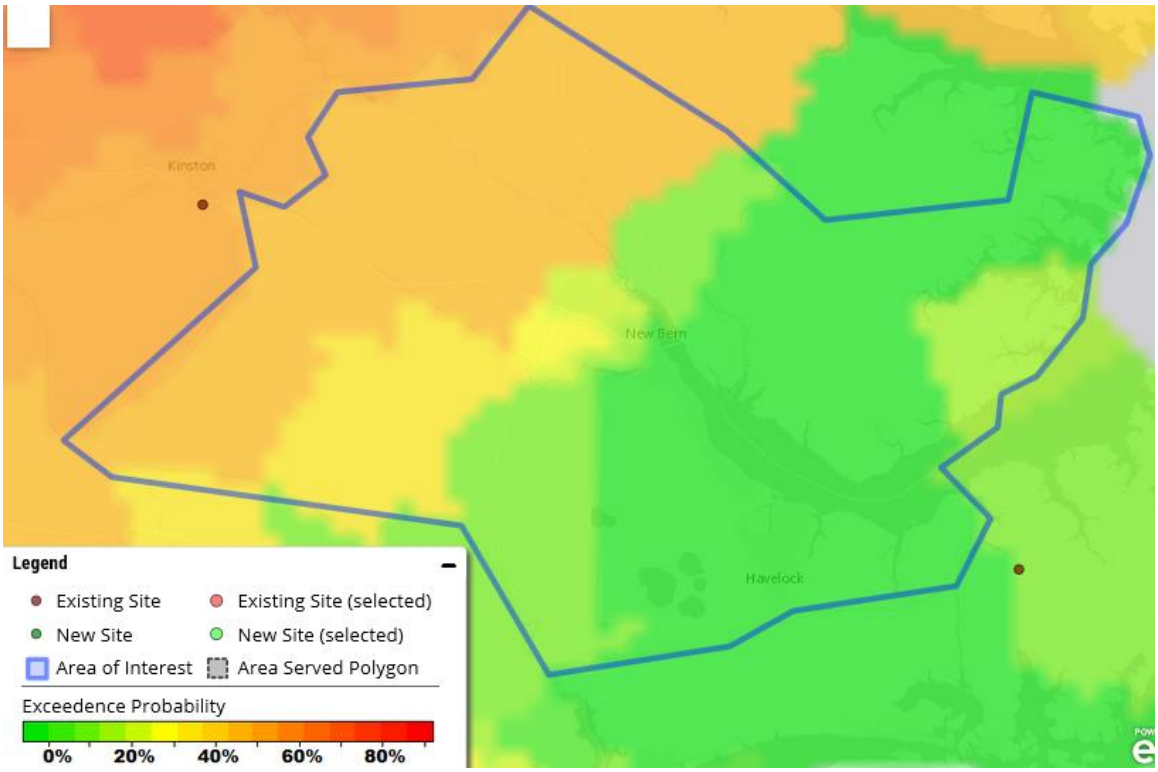

Figure F10. Map of ozone exceedance probability for the New Bern MSA

(4) The Non-MSA Portion of the Washington Monitoring Region

The non-MSA Portion of the Washington monitoring region consists of 14 counties: Beaufort, Bertie, Camden, Chowan, Dare, Greene, Hertford, Hyde, Lenoir, Martin, Pasquotank, Perquimans, Tyrrell and Washington. No MSAs are located here. The Kill Devil Hills micropolitan statistical area, MiSA, is in Dare County and the Washington MiSA is in Beaufort County. Camden, Pasquotank and Perquimans counties are included in the Elizabeth City MiSA. The Kinston MiSA is in Lenoir County. The DAQ operates three monitoring sites in this area. These sites are located at Jamesville in Martin County, at Lenoir Community College in Lenoir County and at the Bayview Ferry in Beaufort County. Figure F11 shows the location of the Jamesville monitoring site.

A is the Jamesville site. The circles approximate the scale of representation for the monitors (the ozone monitor is urban – 4 to 50 Km - inner circle; the particle monitor is regional - 50 Km plus - outer circle).

Figure F11. Location of the Jamesville monitoring site

Figure F12. Jamesville ozone, particle and sulfur dioxide monitoring site

At the **Jamesville** site, 37-117-0001, the DAQ operates a seasonal ozone monitor, a special purpose sulfur dioxide monitor that operates for 12 months every three years and a special purpose PM_{10} monitor that operates for 12 months every three years. Figure F12 through Figure F20 provide a view of the Jamesville site as well as views looking north, northeast, east, southeast, south, southwest, west and northwest from the site. The fine-particle monitors at this site were shut down on Dec. 31, 2015.

Figure F13. Looking north from the Jamesville site

Figure F15. Looking northeast from the Jamesville site

Figure F14. Looking northwest from the Jamesville site

Figure F16. Looking east from the Jamesville site

Figure F17. Looking west from the Jamesville site

Figure F18. Looking southwest from the Jamesville site

Figure F19. Looking southeast from the Jamesville site

Figure F20. Looking south from the Jamesville site

At the **Bayview** Ferry site in Beaufort County the DAQ operates a sulfur dioxide monitor. This site began operating in January 2011 to replace the Aurora sulfur dioxide monitoring site. Figure F21 shows the locations of the two sites. In 2010 the PCS Phosphate manufacturing facility started logging near the Aurora sulfur dioxide monitoring site, located on the fence-line of their manufacturing facility. Although PCS rerouted the logging trucks so they no longer went by the monitoring station and indicated the area near the monitoring site was not scheduled to be mined until sometime around 2015, the DAQ relocate the monitor across the Pamlico River to the Bayview Ferry station because more people live there and the new site is downwind of the PCS facility. Figure F22 to Figure F26 show the site and views looking north, east, south and west. This site is source-oriented, located downwind of the PCS Phosphate facility in Beaufort County.

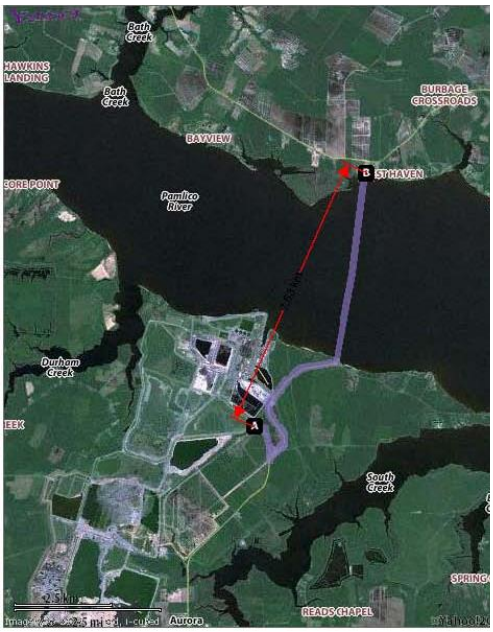

Figure F21. Location of the Bayview Ferry site (B) relative to the Aurora site (A)

Figure F22. Bayview Ferry sulfur dioxide monitoring site

Figure F23. Looking north from the Bayview Ferry site

Figure F24. Looking east from the Bayview Ferry site

Figure F25. Looking west from the Bayview Ferry site

Figure F26. Looking south from the Bayview Ferry site

At the **Lenoir Community College** site, 37-107-0004, the DAQ operates a seasonal ozone monitor and a rotating special purpose PM_{10} monitor that operates for 12 months every third year. In 2009, a screen was installed between the monitoring site and nearby baseball field to block glare from an observatory from interfering with the people playing baseball. In 2010, a large scoreboard was also installed. Thus, in 2011, the DAQ moved the site to another location on the campus. Figure F27 shows the locations of the old monitoring site and the new monitoring site to the west. The monitoring site and views looking north, east, south and west are provided in Figure F28 through Figure F32. The collocated meteorological tower measuring wind speed, wind direction, two-meter and 10-meter ambient temperature, relative humidity, solar radiation and rain fall was shut down on Nov. 3, 2014. The fine particle monitor at this site was shut down at the end of 2013.

Figure F27. New and old LCC monitoring site locations

Figure F28. Lenoir Community College ozone monitoring site

Figure F29. Looking north from the LCC site location

Figure F31. Looking east from the LCC site location

Figure F30. Looking west from the LCC site location

Figure F32. Looking south from the LCC site location

The **lead monitoring** network requirements, as modified in 2016,[10] do not require lead monitors in this area of the Washington monitoring region. The non-MSA portion of the Washington monitoring region does not have any permitted facilities located within its bounds that emit 0.5 tons or more of lead per year.[11]

2015 **ozone monitoring requirements** require monitoring to start one month earlier on March 1 instead of April 1 starting in 2017. The 2010 **nitrogen dioxide monitoring** requirements[12] did not result in additional monitoring in this area because there is not an MSA with a population of 1,000,000 or more and there are not any roadways that exceed the traffic threshold. The DAQ does not expect the 2010 **sulfur dioxide monitoring** requirements to increase the number of monitors in this area because the the existing source-oriented monitor at Bayview is adequate

[10] Revisions to Ambient Monitoring Quality Assurance and Other Requirements, Federal Register, Vol. 81, No. 59, Monday, March 28, 2016, p. 17248, available on the worldwide web at https://www.gpo.gov/fdsys/pkg/FR-2016-03-28/pdf/2016-06226.pdf.

[11] United States Environmental Protection Agency. (2017). *TRI Explorer* (2015 Dataset (released March 2017)) [Internet database]. Retrieved from https://www.epa.gov/triexplorer, (May 04, 2017).

[12] Primary National Ambient Air Quality Standards for Nitrogen Dioxide, Federal Register**,** Vol. 75, No. 26, Feb. 9, 2010, available on the worldwide web at https://www3.epa.gov/ttn/naaqs/standards/nox/fr/20100209.pdf.

and appropriately sited to serve as the required source-oriented monitor for the PCS Phosphate facility. The 2011 **changes to the carbon monoxide monitoring requirements** will not add additional monitors to the area because the population is under one million.

(5) The Virginia Beach-Norfolk-Newport News MSA

The North Carolina portion of the Virginia Beach-Norfolk-Newport News MSA is made up of two counties - Currituck and Gates. The DAQ currently does not operate any monitoring sites in these two counties. The DAQ has an agreement with Virginia that Virginia will fulfill all North Carolina's monitoring requirements for the Currituck and Gates County portion of the Virginia Beach-Norfolk-Newport News MSA.[13]

The **lead monitoring** network requirements, as modified in 2016,[14] do not require any lead monitoring in these counties. These counties do not have any permitted facilities located within their bounds that emit 0.5 tons or more of lead per year.[15]

The 2015 **ozone monitoring requirements** did not add monitors to these counties. They are part of an MSA that already meets the population exposure monitoring requirements for urban areas.

This area is not required to add monitors to comply with the 2010 **nitrogen dioxide monitoring** requirements[16] because it does not have any roadways that exceed the traffic threshold. It also is not required to monitor by the 2010 **sulfur dioxide monitoring requirements** because there are no facilities in these counties emitting large enough quantities of sulfur dioxide to trigger source-oriented monitoring. This area will also not need to monitor to meet the **carbon monoxide monitoring requirements** because those requirements will be met by Virginia.

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[13] North Carolina - Virginia Monitoring Agreement, 05/09/2016, available at http://xapps.ncdenr.org/aq/documents/DocsSearch.do?dispatch=download&documentId=7862.

[14] Revisions to Ambient Monitoring Quality Assurance and Other Requirements, Federal Register, Vol. 81, No. 59, Monday, March 28, 2016, p. 17248, available on the worldwide web at https://www.gpo.gov/fdsys/pkg/FR-2016-03-28/pdf/2016-06226.pdf.

[15] United States Environmental Protection Agency. (2017). *TRI Explorer* (2015 Dataset (released March 2017)) [Internet database]. Retrieved from https://www.epa.gov/triexplorer, (May 04, 2017).

[16] Primary National Ambient Air Quality Standards for Nitrogen Dioxide, Federal Register**,** Vol. 75, No. 26, Feb. 9, 2010, available on the worldwide web at https://www3.epa.gov/ttn/naaqs/standards/nox/fr/20100209.pdf.

Appendix F.1 Annual Network Site Review Forms for 2015

Pitt County Agricultural Center in Greenville

Jamesville

Bayview Ferry

Lenoir Community College in Kinston

Site Review Form Calendar Year 2016

Site Information

Region WARO	**Site Name** Pitt Ag	**AQS Site # 37-147-0006**
Street Address 403 Government Circle		**City** Greenville
Urban Area GREENVILLE	**Core-based Statistical Area** Greenville, NC	
Enter Exact		
Longitude -77.360126	**Latitude** 35.641276	**Method of Measuring**
In Decimal Degrees	In Decimal Degrees	**Other (explain)** **Explanation: Google Earth**
Elevation Above/below Mean Sea Level (in meters)		7.9

Name of nearest road to inlet probe New Hope Rd ADT 0 Year Choose an item 0

Comments: _____

Distance of site to nearest major road (m) 690.00 Direction from site to nearest major road WNW

Name of nearest major road HWY 33 ADT 1528 Year 2015

Comments: _____

Site located near electrical substation/high voltage power lines?	Yes ☒ No ☐
Distance of site to nearest railroad track	(m) 789 Direction to RR WNW ☐NA
OPTIONAL Distance of site to nearest power pole w/transformer	(m) ____ Direction ___
Distance between site and drip line of water tower (m) _____ Direction from site to water tower _____	☒NA

Explain any sources of potential bias; include cultivated fields, loose bulk storage, stacks, vents, railroad tracks, construction activities, fast food restaurants, and swimming pools.

Construction planed to begin in 2017, 350 meters SSW.

ANSWER ALL APPLICABLE QUESTIONS:

Parameters	Monitoring Objective	Scale	Monitor Type
☐ NA ☐ SO_2 (NAAQS) ☐ SO_2 (trace-level) ☐ NO_2 (NAAQS) ☐ $HSNO_y$ ☒ O_3 ☐ NH_3 ☐ Hydrocarbon ☐ Air Toxics ☐ CO (trace-level)	☐ General/Background_____ ☐ Highest Concentration_____ ☐ Max O3 Concentration_____ ☒ Population Exposure_____ ☐ Source Oriented_____ ☐ Transport_____ ☐ Upwind Background_____ ☐ Welfare Related Impacts _____	☐ Micro_____ ☐ Middle_____ ☒ Neighborhood_____ ☐ Urban_____ ☐ Regional_____	☒ SLAMS _____ ☐ SPM_____ **Monitor Network Affiliation** ☐ NCORE_____ ☐ Unofficial PAMS_____

Probe inlet height (from ground) 2-15 m? Yes ☒ No ☐ Give actual measured height from ground (meters) 4.50

Distance of outer edge of probe inlet from horizontal (wall) and/or vertical (roof) supporting structure > 1 m? Yes ☒ No ☐
Actual measured distance from outer edge of probe to supporting structure (meters) 1.5

Distance of outer edge of probe inlet from other monitoring probe inlets > 1 m? Yes ☒ No ☐ NA ☐

Is probe > 20 m from the nearest tree drip line? Yes ☒ *No ☐ (answer *'d questions)

*Is probe > 10 m from the nearest tree drip line? Yes ☐ *No ☐

*Distance from probe to tree (m) _____ Direction from probe to tree ___ *Height of tree (m) _____

Are there any obstacles to air flow? *Yes ☐ (answer *'d questions) No ☒

*Identify obstacle _____ Distance from probe inlet (m) _____ Direction from probe inlet to obstacle ___

*Is distance from inlet probe to obstacle at least twice the height that the obstacle protrudes above the probe? Yes ☐ No ☐

Distance of probe to nearest traffic lane (m) 236 Direction from probe to nearest traffic lane W

Site Review Form Calendar Year 2016

Parameters	Monitoring Objective	Scale	Site Type
☐ NA Air flow < 200 L/min ☒ PM2.5 FRM ☐ PM10 FRM ☐ PM10 Cont. (BAM) ☐ PM10-2.5 FRM ☐ PM10-2.5 BAM ☐ PM10 Lead (PB) ☒ PM2.5 Cont. (BAM) ☐ PM2.5 Spec. (SASS) ☐ PM2.5 Spec. (URG) ☐ PM2.5 Cont. Spec.	☐ General/Background _____ ☐ Highest Concentration _____ ☒ Population Exposure _____ ☐ Source Oriented _____ ☐ Transport _____ ☐ Welfare Related Impacts _____	☐ Micro _____ ☐ Middle _____ ☒ Neighborhood _____ ☐ Urban _____ ☐ Regional _____	☒ SLAMS _____ ☐ SPM_____ **Monitor Network Affiliation** ☐ NCORE _____ ☐ SUPPLEMENTAL SPECIATION_____ **Monitor NAAQS Exclusion** ☐ NONREGULATORY_____

Probe inlet height (from ground) ☐ < 2 m _____ ☒ 2-7m _____ ☐ 7-15 m _____ ☐ > 15 m _____
Actual measured distance from probe inlet to ground (meters) 2.4

Distance of outer edge of probe inlet from horizontal (wall) and/or vertical (platform or roof) supporting structure > 2 m?
Actual measured distance from outer edge of probe inlet to supporting structure (meters) 2.1 Yes ☒ No ☐

Distance (Y) between outer edge of probe inlets of any low volume monitor and any other low volume monitor at the site = 1 m or greater?	Yes ☒ No ☐ NA ☐
Distance (Y) between outer edge of all low volume monitor inlets and any Hi-Volume PM-10 or TSP inlet = 2 m or greater?	Yes ☐ No ☐ NA ☒

Are collocated PM2.5 Monitors (Two FRMs, FRM & BAM, FRM & TEOM, BAM & TEOM) Located at Site? *Yes ☒ (answer *'d questions) No ☐ NA ☐

* Entire inlet opening of collocated PM 2.5 samplers (X) within 2 to 4 m of each other? Yes ☒ No ☐ Give actual (meters) 2.09
*Are collocated PM2.5 sampler inlets within 1 m vertically of each other? Yes ☒ No ☐ Give actual (meters) 0.06

Is an URG 3000 monitor collocated with a SASS monitor at the site? *Yes ☐ (answer *'d questions) No ☒ NA ☐
* Entire inlet opening of collocated speciation samplers inlets (X) within 2 to 4 m of each other? Yes ☐ No ☐
Give actual (meters) _____
* Are collocated speciation sampler inlets within 1 m vertically of each other? Yes ☐ No ☐ Give actual (meters) _____

Is a low-volume PM10 monitor collocated with a PM2.5 monitor at the site to measure PM10-2.5? *Yes ☐ (answer *'d questions) No ☒ NA ☐

* Entire inlet opening of collocated PM10 and PM2.5samplers for PM10-2.5 (X) within 2 to 4 m of each other?	Yes ☐ No ☐
*Are collocated PM10 and PM2.5 sampler inlets within 1 m vertically of each other?	Yes ☐ No ☐

Is probe > 20 m from the nearest tree drip line? Yes ☒ *No ☐ (answer *'d questions)

*Is probe > 10 m from the nearest tree drip line? Yes ☐ *No ☐
*Distance from probe to tree (m) _____ Direction from probe to tree ___ *Height of tree (m) _____

Are there any obstacles to air flow? *Yes ☐ (answer *'d questions) No ☒

*Identify obstacle ____ Distance from probe inlet (m) _____Direction from probe inlet to obstacle ___
*Is distance from inlet probe to obstacle at least twice the height that the obstacle protrudes above the probe? Yes ☐ No ☐

Distance of probe to nearest traffic lane (m) 236 Direction from probe to nearest traffic lane W

RECOMMENDATIONS:

1) Maintain current site status? Yes ☒ *No ☐ (answer *'d questions)
*2) Change monitoring objective? Yes ☐ (enter new objective _____) No ☐-
*3) Change scale of representativeness? Yes ☐ (enter new scale _) No ☐
*4) Relocate site? Yes ☐ No ☐

Comments: Site was relocated 350 meters to the NNW and began sampling January 1, 2016. Collocated PM 2.5 BAM began sampling April 8, 2016.

Date of Last Site Pictures 2016 New Pictures Submitted? Yes ☐ No ☒

Reviewer _____ Date _____

Ambient Monitoring Coordinator Steven Daniels Date May 8, 2017

Site Review Form Calendar Year 2017

Site Information

Region WARO	**Site Name** Jamesville	**AQS Site # 37-117-0001**
Street Address-1210 Hayes Street		**City Jamesville**
Urban Area Not in an Urban Area	**Core-based Statistical Area** None	
Enter Exact		
Longitude -76.906249	**Latitude** 35.81066	**Method of Measuring**
In Decimal Degrees	In Decimal Degrees	___ **Explanation: Google Earth**
Elevation Above/below Mean Sea Level (in meters)		**13.25**

Name of nearest road to inlet probe Hayes Street ADT _____ Year Choose an item_____
Comments: Dead end, unpaved road (ADT not available)
Distance of site to nearest major road (m) 119.00 Direction from site to nearest major road SSW
Name of nearest major road US 64 Bypass ADT 8100 Year Choose an item2015
Comments: _____

Site located near electrical substation/high voltage power lines?	Yes ☐ No ☒
Distance of site to nearest railroad track	(m) 175 Direction to RR SSW ☐NA
OPTIONAL Distance of site to nearest power pole w/transformer	(m) 50 Direction NNE
Distance between site and drip line of water tower (m) _____ Direction from site to water tower _____	☒NA

Explain any sources of potential bias; include cultivated fields, loose bulk storage, stacks, vents, railroad tracks, construction activities, fast food restaurants, and swimming pools.

Site surrounded by cultivated fields.

ANSWER ALL APPLICABLE QUESTIONS:

Parameters	Monitoring Objective	Scale	Monitor Type
☒ Ozone (O_3)	☒General/Background ☐Highest Concentration ☐Max O3 Concentration ☐Population Exposure ☐Source Oriented ☐Transport ☐Upwind Background ☐Welfare Related Impacts	☐Micro ☐Middle ☐Neighborhood ☐Urban ☒Regional	☐SLAMS ☐SPM

Probe inlet height (from ground) 2-15 m? Yes ☒ No ☐ Give actual measured height from ground (meters) 4.50
Distance of outer edge of probe inlet from horizontal (wall) and/or vertical (roof) supporting structure > 1 m? Yes ☒ No ☐
Actual measured distance from outer edge of probe to supporting structure (meters) 1.60
Distance of outer edge of probe inlet from other gas monitoring probe inlets > 0.25 m? Yes ☒ No ☐ NA ☐

Is probe > 20 m from the nearest tree drip line? Yes ☒ *No ☐ (answer *'d questions)
*Is probe > 10 m from the nearest tree drip line? Yes ☐ *No ☐
*Distance from probe to tree (m) _____ Direction from probe to tree ___ *Height of tree (m) _____

Are there any obstacles to air flow? *Yes ☐ (answer *'d questions) No ☒
*Identify obstacle _____ Distance from probe inlet (m) _____Direction from probe inlet to obstacle ___
*Is distance from inlet probe to obstacle at least twice the height that the obstacle protrudes above the probe? Yes ☐ No ☐

Distance of probe to nearest traffic lane (m) 129 Direction from probe to nearest traffic lane SSW

Site Review Form Calendar Year 2017

OZONE MONITOR RECOMMENDATIONS:

1) Maintain current monitor status? Yes ☒ *No ☐ (answer *'d questions)

*2) Change monitoring objective? Yes ☐ (enter new objective _____) No ☐-

*3) Change scale of representativeness? Yes ☐ (enter new scale _) No ☐

*4) Relocate monitor? Yes ☐ No ☐

Comments: None.

ANSWER ALL APPLICABLE QUESTIONS:

Parameters	Monitoring Objective	Scale	Monitor Type
☐ SO_2 (DRR) ☒ SO_2 (NAAQS) ☐ SO_2 (trace-level)	☒ General/Background ☐ Highest Concentration ☐ Population Exposure ☐ Source Oriented ☐ Transport ☐ Upwind Background ☐ Welfare Related Impacts	☐ Micro ☐ Middle ☐ Neighborhood ☐ Urban ☒ Regional	☐ INDUSTRIAL ☒ SLAMS ☐ SPM

Probe inlet height (from ground) 2-15 m? Yes ☒ No ☐ Give actual measured height from ground (meters) 4.5

Distance of outer edge of probe inlet from horizontal (wall) and/or vertical (roof) supporting structure > 1 m? Yes ☒ No ☐

Actual measured distance from outer edge of probe to supporting structure (meters) 1.8

Distance of outer edge of probe inlet from other monitoring probe inlets > 1 m? Yes ☒ No ☐ NA ☐

Is probe > 20 m from the nearest tree drip line? Yes ☒ *No ☐ (answer *'d questions)

*Is probe > 10 m from the nearest tree drip line? Yes ☐ *No ☐

*Distance from probe to tree (m) _____ Direction from probe to tree ___ *Height of tree (m) _____

Are there any obstacles to air flow? *Yes ☐ (answer *'d questions) No ☒

*Identify obstacle _____ Distance from probe inlet (m) _____Direction from probe inlet to obstacle ___

*Is distance from inlet probe to obstacle at least twice the height that the obstacle protrudes above the probe? Yes ☐ No ☐

Distance of probe to nearest traffic lane (m) 129 Direction from probe to nearest traffic lane SSW

SULFUR DIOXIDE MONITOR RECOMMENDATIONS:

1) Maintain current monitor status? Yes ☒ *No ☐ (answer *'d questions)

*2) Change monitoring objective? Yes ☐ (enter new objective _____) No ☐-

*3) Change scale of representativeness? Yes ☐ (enter new scale _) No ☐

*4) Relocate monitor? Yes ☐ No ☐

Comments: JV SO2 monitor is rotational. Monitor run for one year every third year.

Date of Last Site Pictures 2012 New Pictures Submitted? Yes ☒ No ☐

Reviewer Peter Susi Date 1-6-2017

Ambient Monitoring Coordinator Steven Daniels Date May 8, 2017

Revised 2017-05-12

Site Review Form Calendar Year 2017

Site Information

Region WARO	**Site Name** Bayview	**AQS Site # 37**-013-0151
Street Address-229 Hwy 306N	**City** Bath	
Urban Area Not in an Urban Area	**Core-based Statistical Area** None	

Enter Exact		Method of Measuring	
Longitude -76.74	**Latitude** 35.428		
In Decimal Degrees	In Decimal Degrees	Other (explain)	**Explanation:** Google Earth
Elevation Above/below Mean Sea Level (in meters)		1.54	

Name of nearest road to inlet probe HWY 306N ADT 240 Year Choose one 2015

Comments: Bayview Ferry entrance

Distance of site to nearest major road (m) 377.00 Direction from site to nearest major road N

Name of nearest major road Hwy 92 ADT 1739 Year Choose one 2015

Comments: _____

Site located near electrical substation/high voltage power lines?		Yes ☐ No ☒
Distance of site to nearest railroad track	(m) _____ Direction to RR ___	☒NA
OPTIONAL Distance of site to nearest power pole w/transformer	(m) _____	Direction ___
Distance between site and drip line of water tower (m) _____ Direction from site to water tower _____		☒NA

Explain any sources of potential bias; include cultivated fields, loose bulk storage, stacks, vents, railroad tracks, construction activities, fast food restaurants, and swimming pools.

_____

ANSWER ALL APPLICABLE QUESTIONS:

Parameters	Monitoring Objective	Scale	Monitor Type
☒ SO_2 (DRR) ☐ SO_2 (NAAQS) ☐ SO_2 (trace-level)	☐ General/Background ☐ Highest Concentration ☐ Population Exposure ☒ Source Oriented ☐ Transport ☐ Upwind Background ☐ Welfare Related Impacts	☐ Micro ☐ Middle ☐ Neighborhood ☒ Urban ☐ Regional	☒ INDUSTRIAL ☐ SLAMS ☐ SPM

Probe inlet height (from ground) 2-15 m? Yes ☒ No ☐ Give actual measured height from ground (meters) 5.5

Distance of outer edge of probe inlet from horizontal (wall) and/or vertical (roof) supporting structure > 1 m? Yes ☒ No ☐
Actual measured distance from outer edge of probe to supporting structure (meters) 1.35

Distance of outer edge of probe inlet from other gas monitoring probe inlets > 0.25 m? Yes ☐ No ☐ NA ☒

Is probe > 20 m from the nearest tree drip line? Yes ☐ *No ☒ (answer *'d questions)

*Is probe > 10 m from the nearest tree drip line? Yes ☒ *No ☐

*Distance from probe to tree (m) 12 Direction from probe to tree E *Height of tree (m) _____

Are there any obstacles to air flow? *Yes ☐ (answer *'d questions) No ☒

*Identify obstacle _____ Distance from probe inlet (m) _____ Direction from probe inlet to obstacle ___

*Is distance from inlet probe to obstacle at least twice the height that the obstacle protrudes above the probe? Yes ☐ No ☐

Distance of probe to nearest traffic lane (m) 70 Direction from probe to nearest traffic lane NW

Site Review Form Calendar Year 2016

SULFUR DIOXIDE MONITOR RECOMMENDATIONS:

1) Maintain current monitor status? Yes ☒ *No ☐ (answer *'d questions)

*2) Change monitoring objective? Yes ☐ (enter new objective _____) No ☐-

*3) Change scale of representativeness? Yes ☐ (enter new scale _) No ☐

*4) Relocate monitor? Yes ☐ No ☐

Comments: Bayview Ferry Terminal is 65 meters to the west and is a SO2 source. A Title V Industrial SO2 source is 6500 meters to the SW across the Pamlico Sound.

Date of Last Site Pictures 2016 New Pictures Submitted? Yes ☐ No ☒

Reviewer _____Date_____

Ambient Monitoring Coordinator Steven Daniels Date May 8, 2017

Revised 2017-05-12

Instructions:

If the annual network review has indicated that the monitoring objectives and scale of representativeness for the site have not changed and the siting criteria still meets those monitoring objectives and that scale of representativeness and there are no other reasons to modify the site in any way, check "Yes" to the question "Maintain current site status?" and skip the rest of the recommendations section.

If the annual network review has indicated that the monitoring objectives, scale of representativeness, or siting criteria have changed for some reason or there is another reason to modify the site in some way, check "No" to the question "Maintain current site status?" and complete the rest of the recommendations section. If the monitoring objective or scale of representativeness needs to be changed, check the "Yes" box and write in the new monitoring objective or scale of representativeness on the line. Otherwise check the "No" box. If the site needs to be relocated, check the "Yes" box. If the site needs to be shut down, write "Shut down" in the comments line. Also use the comments line to explain any change requested.

Check the site picture archive to find out when the last set of site pictures were taken and write the date down on the line. If the pictures are more than five years old or if something at the site has changed in the past year, take new site pictures. Changes that require new site pictures include additions, removals, or movement of monitors at the site, growth or removal of trees and other shrubs at the site, and construction of roads or buildings at or in the vicinity of the site.

Pictures of the site should at a minimum include at least one picture showing the site itself and pictures standing at the probe or inlet or as close as possible to the probe or inlet looking in the four compass directions (north, east, south, and west). If meteorological data are collected at the site, pictures standing at the meteorological tower looking southwest and northeast should also be included. Sometimes pictures looking at the site from the four compass directions are also helpful.

Be sure to correctly identify the pictures as to which compass direction they show. This documentation may be achieved by using good notes when taking the pictures, holding a compass in front of the camera, or placing a sign with the appropriate direction indicated somewhere in the picture. Label the pictures with the name of the site using the two digit logger ID (HC, JW, *etc.*), the direction (N, NE, E, SE, S, SW, W, NW), and the date taken (YYYYMMDD) and transfer the pictures to the group drive in the appropriate Incoming/Regional Office directory.

Site Review Form Calendar Year 2017

Site Information

Region WARO	**Site Name** Lenoir Community Col	**AQS Site # 37-107-0004**
Street Address-231 HWY 58 South		**City Kinston, NC**
Urban Area KINSTON	**Core-based Statistical Area** Kinston, NC	
Enter Exact		
Longitude -77.5668	**Latitude** 35.2322	**Method of Measuring**
In Decimal Degrees	In Decimal Degrees	**Other (explain)** / **Explanation: Google Earth**
Elevation Above/below Mean Sea Level (in meters)		**15**

Name of nearest road to inlet probe College Dr ADT _____ Year _____ ____

Distance of ozone probe to nearest traffic lane (m) 194 Direction from ozone probe to nearest traffic lane NW

Comments: On campus

Name of nearest major road HWY 70 ADT 16000 Year 2015

Distance of site to nearest major road (m) 386.00 Direction from site to nearest major road N

Comments: _____

Site located near electrical substation/high voltage power lines?	Yes ☐ No ☒
Distance of site to nearest railroad track	(m) _____ Direction to RR ___ ☒NA
OPTIONAL Distance of site to nearest power pole w/transformer	(m) _____ Direction ___
Distance between site and drip line of water tower (m) _____	Direction from site to water tower _____ ☒NA

Explain any sources of potential bias; include cultivated fields, loose bulk storage, stacks, vents, railroad tracks, construction activities, fast food restaurants, and swimming pools.

_____

ANSWER ALL APPLICABLE QUESTIONS:

Parameters	Monitoring Objective	Scale	Site Type
☒ O_3	☐ General/Background ☐ Highest Concentration ☐ Max O3 Concentration ☐ Population Exposure ☐ Source Oriented ☐ Transport ☐ Upwind Background ☐ Welfare Related Impacts	☐ Micro ☐ Middle ☐ Neighborhood ☐ Urban ☐ Regional	☐ SLAMS ☐ SPM

Probe inlet height (from ground) 2-15 m? Yes ☒ No ☐

Give actual measured height from ground (meters) 3.78

Distance of outer edge of probe inlet from horizontal (wall) and/or vertical (roof) supporting structure > 1 m? Yes ☒ No ☐

Actual measured distance from outer edge of probe to supporting structure (meters) 1.02

Is probe > 20 m from the nearest tree drip line? Yes ☒ *No ☐ (answer *'d questions)

*Is probe > 10 m from the nearest tree drip line? Yes ☐ *No ☐

*Distance from probe to tree (m) _____ Direction from probe to tree ___ *Height of tree (m) _____

Are there any obstacles to air flow? *Yes ☐ (answer *'d questions) No ☒

*Identify obstacle _____ Distance from probe inlet (m) _____ Direction from probe inlet to obstacle ___

*Is distance from inlet probe to obstacle at least twice the height that the obstacle protrudes above the probe? Yes ☐ No ☐

Site Review Form Calendar Year 2017

RECOMMENDATIONS:

1) Maintain current site status? Yes ☒ *No ☐ (answer *'d questions)

*2) Change monitoring objective? Yes ☐ (enter new objective: _____) No ☐

*3) Change scale of representativeness? Yes ☐ (enter new scale:) No ☐

*4) Relocate site? Yes ☐ No ☐

Comments: A rotational PM10 monitor is scheduled for 2017

Date of Last Site Pictures: 2015 New Pictures Submitted? Yes ☐ No ☒

Reviewer _____ Date: _____

Ambient Monitoring Coordinator Steven Daniels Date: 5/8/2017

Instructions:

If the annual network review has indicated that the monitoring objectives and scale of representativeness for the site have not changed and the siting criteria still meets those monitoring objectives and that scale of representativeness and there are no other reasons to modify the site in any way, check "Yes" to the question "Maintain current site status?" and skip the rest of the recommendations section.

If the annual network review has indicated that the monitoring objectives, scale of representativeness, or siting criteria have changed for some reason or there is another reason to modify the site in some way, check "No" to the question "Maintain current site status?" and complete the rest of the recommendations section. If the monitoring objective or scale of representativeness needs to be changed, check the "Yes" box and write in the new monitoring objective or scale of representativeness on the line. Otherwise check the "No" box. If the site needs to be relocated, check the "Yes" box. If the site needs to be shut down, write "Shut down" in the comments line. Also use the comments line to explain any change requested.

Check the site picture archive to find out when the last set of site pictures were taken and write the date down on the line. If the pictures are more than five years old or if something at the site has changed in the past year, take new site pictures. Changes that require new site pictures include additions, removals, or movement of monitors at the site, growth or removal of trees and other shrubs at the site, and construction of roads or buildings at or in the vicinity of the site.

Pictures of the site should at a minimum include at least one picture showing the site itself and pictures standing at the probe or inlet or as close as possible to the probe or inlet looking in the four compass directions (north, east, south, and west). If meteorological data are collected at the site, pictures standing at the meteorological tower looking southwest and northeast should also be included. Sometimes pictures looking at the site from the four compass directions are also helpful.

Be sure to correctly identify the pictures as to which compass direction they show. This documentation may be achieved by using good notes when taking the pictures, holding a compass in front of the camera, or placing a sign with the appropriate direction indicated somewhere in the picture. Label the pictures with the name of the site using the two digit logger ID (HC, JW, *etc.*), the direction (N, NE, E, SE, S, SW, W, NW), and the date taken (YYYYMMDD) and transfer the pictures to the group drive in the appropriate Incoming/Regional Office directory.

Appendix F-2. Scale of Representativeness

Each station in the monitoring network must be described in terms of the physical dimensions of the air parcel nearest the monitoring station throughout which actual pollutant concentrations are reasonably similar. Area dimensions or scales of representativeness used in the network description are:

a) Microscale - defines the concentration in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
b) Middle scale - defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometers.
c) Neighborhood scale – defines concentrations within an extended area of a city that has relatively uniform land use with dimensions ranging from about 0.5 to 4.0 kilometers.
d) Urban scale - defines an overall citywide condition with dimensions on the order of 4 to 50 kilometers.
e) Regional Scale - defines air quality levels over areas having dimensions of 50 to hundreds of kilometers.

Closely associated with the area around the monitoring station where pollutant concentrations are reasonably similar are the basic monitoring exposures of the station.

There are six basic exposures:

a) Sites located to determine the highest concentrations expected to occur in the area covered by the network.
b) Sites located to determine representative concentrations in areas of high population density.
c) Sites located to determine the impact on ambient pollution levels of significant sources or source categories.
d) Sites located to determine general background concentration levels.
e) Sites located to determine the extent of regional pollutant transport among populated areas.
f) Sites located to measure air pollution impacts on visibility, vegetation damage or other welfare-based impacts and in support of secondary standards.

The design intent in siting stations is to correctly match the area dimensions represented by the sample of monitored air with the area dimensions most appropriate for the monitoring objective of the station. The following relationship of the six basic objectives and the scales of representativeness are appropriate when siting monitoring stations:

Table F2. Site Type Appropriate Siting Scales

1. Highest concentration	Micro, middle, neighborhood (sometimes urban or regional for secondarily formed pollutants)
2. Population oriented	Neighborhood, urban
3. Source impact	Micro, middle, neighborhood
4. General/background & regional transport	Urban, regional
5. Welfare-related impacts	Urban, regional

Appendix F-3. Region 4 Requested Siting Information for the Pitt County Agricultural Center Site Relocation

On Aug. 7, 2015, Tim Corley, with Pitt County, called the North Carolina Division of Air Quality (DAQ) about the potential leasing of the property near or on which the DAQ Pitt Ag ambient air monitoring station is in Greenville, North Carolina. Further conversations with Mr. Corley indicated that the organization leasing the property would be building a building that would create an obstruction for the current monitoring station. Thus, on Sept. 30, 2015, DAQ contacted Mr. Corley to see if the monitoring building could be relocated approximately 325 meters to the other side of the property as shown in Figure F3. Mr. Corley agreed to this location on Oct. 21, 2015.

The monitors affected by this relocation are 37-147-0006-44201-1 and 37-146-0006-88101-1. The DAQ operates these monitors to ensure that the air in the Greenville area complies with the national ambient air quality standards. The fine particle monitor is suitable for comparison to the annual fine particle national ambient air quality standard. Views from the proposed site looking north, east, south and west are shown in Figure F5 through Figure F8.

The new monitoring site is located 35 meters from the trees to the north, 55 meters from the trees to the east, 30 meters from the trees to the south and 119 meters from the trees to the west. The tallest trees are estimated to be 15 meters in height. The nearest road is New Hope/Detention Drive located approximately 200 meters to the west. This road does not have any traffic count data; however, as shown in Figure 33, N. Greene Street, located approximately 650 meters west, had an average annual daily traffic count of 8,700 in 2012. Old Creek Road, located approximately 375 meters to the south southeast, had an average annual daily traffic count of 3,100 in 2012. The probe and inlet heights for the new monitoring station are approximately the same as the probe and inlet heights for the old monitoring station, approximately 3.8 meters for ozone and 2.3 meters for fine particles.

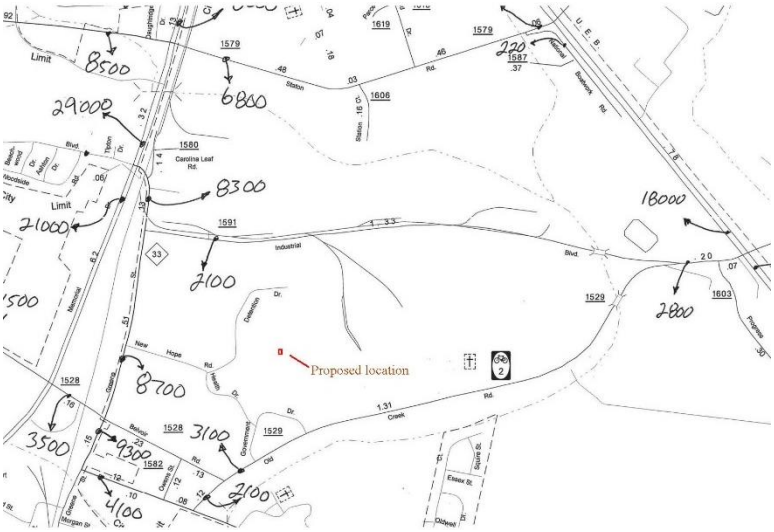

Figure 33. 2012 Traffic count map near the Pitt County Agriculture Center (from DOT)

The Air Quality System identification number and street address for the site remained the same: 37-147-0006 and 403 Government Circle, Greenville, North Carolina. The new latitude and longitude is 35.641276 and -77.360358. The sampling and analysis methods (AQS codes 047 for ozone and 145 for fine particles) and operating schedules (hourly for ozone and one-in-three day for fine particles) for both monitors remained the same. The monitoring objective for both monitors continued to be population exposure. Figure 34 shows the location of the monitoring stations relative to the population center of Greenville. Based on the wind roses in Figure 35 through Figure 39, the new monitoring station is located downwind of Greenville during springtime and summer when the ozone concentrations are the highest. The spatial scale of representativeness for both monitors is be urban based on the location of the roadways and the amount of traffic on those roads. (See Figure 40 and Table 3.)

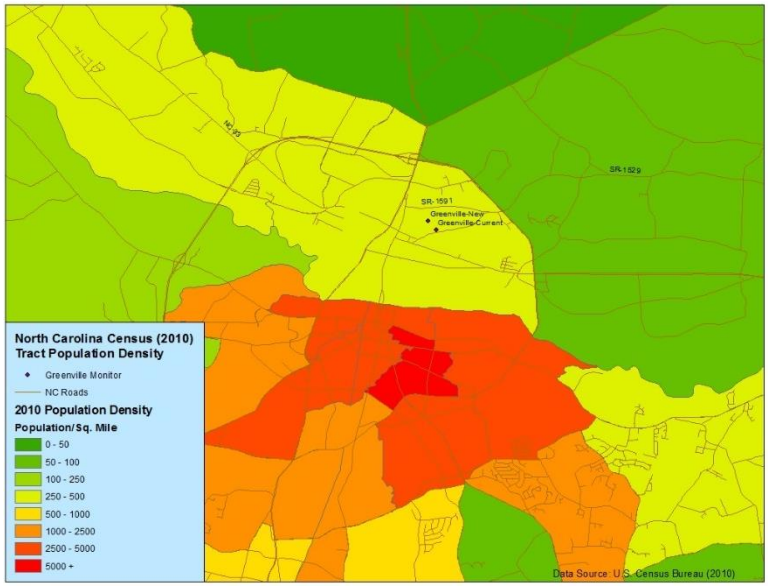

Figure 34. Location of the proposed monitoring station relative to the population of Greenville

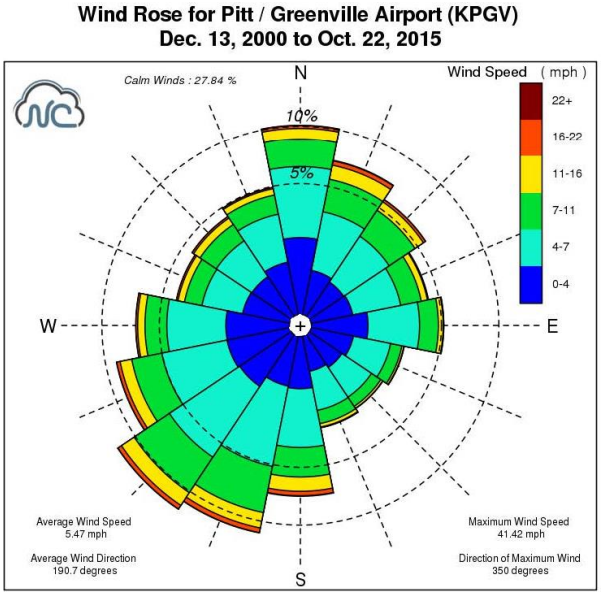

Figure 35. Windrose for Greenville using all data (from NC State Climate Office)

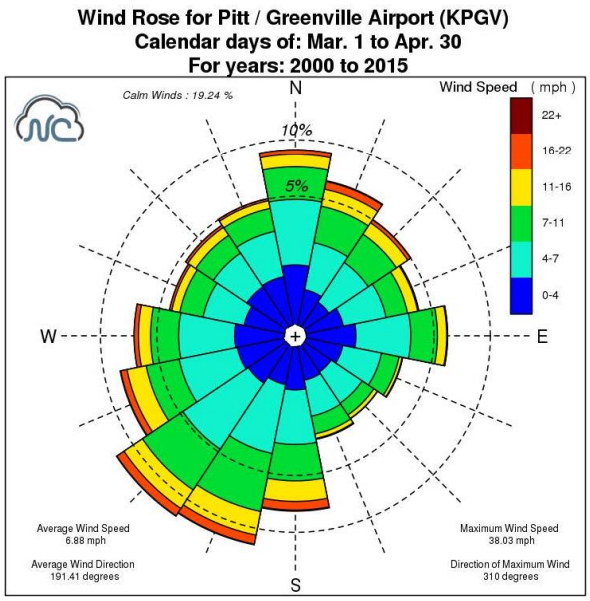

Figure 36. Greenville springtime wind rose (from NC State Climate Office)

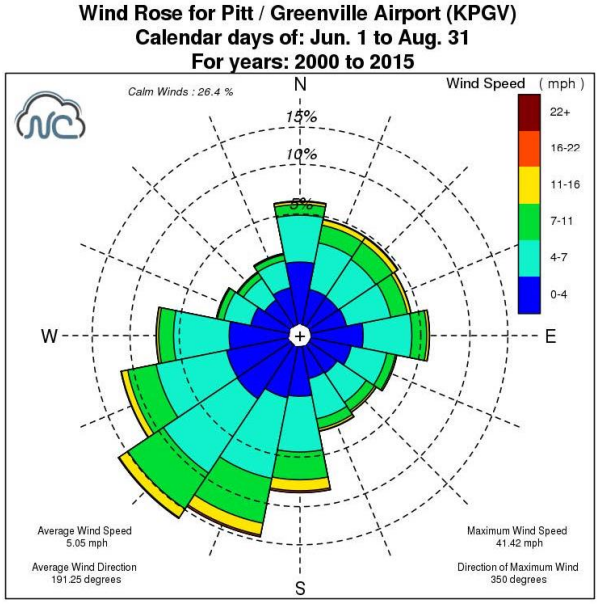

Figure 37. Greenville summertime wind rose (from NC State Climate Office)

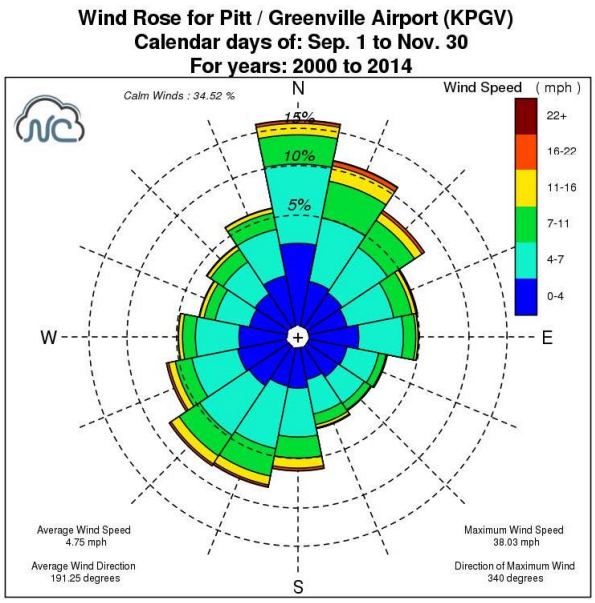

Figure 38. Greenville fall time wind rose (from NC State Climate Office)

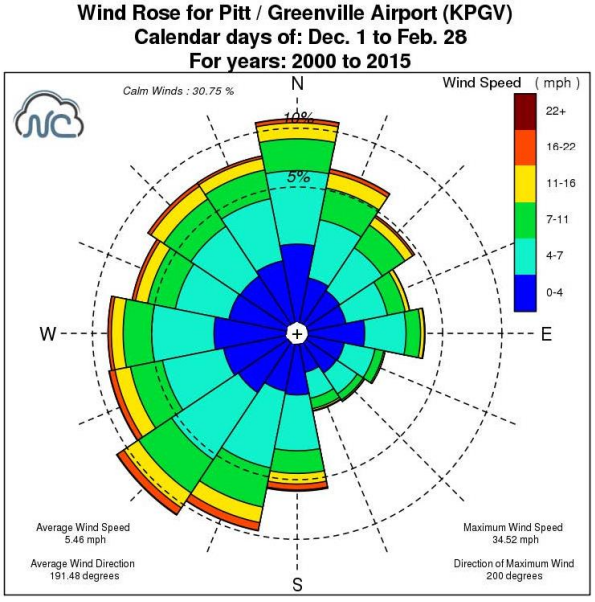

Figure 39. Greenville wintertime wind rose (from NC State Climate Office)

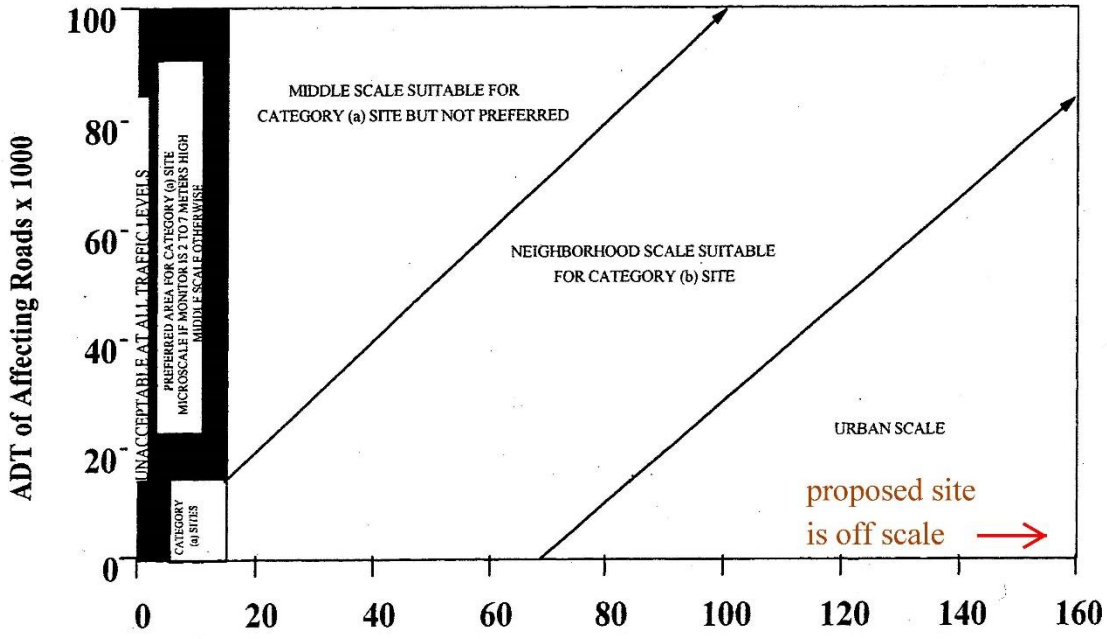

Figure E-1. Distance of PM samplers to nearest traffic lane (meters)

Figure 40. Figure E-1 from Appendix E used to determine spatial scale of representativeness for particle monitors

Table 3. TABLE E-1 OF APPENDIX E TO PART 58—MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND PROBES OR MONITORING PATHS FOR MONITORING NEIGHBORHOOD AND URBAN SCALE OZONE (O_3) AND OXIDES OF NITROGEN (NO, NO_2, NO_X, NO_Y)

Roadway average daily traffic, vehicles per day	Minimum distance[1] (meters)	Minimum distance[1 2] (meters)
≤1,000	10	10
10,000	10	20
15,000	20	30
20,000	30	40
40,000	50	60
70,000	100	100
≥110,000	250	250

[1]Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.
[2]Applicable for ozone monitors whose placement has not already been approved as of Dec. 18, 2006.

These two monitors are representative of air quality in the Greenville metropolitan statistical area.

The new monitoring site was not provided to the public for comment because the location for the monitors is on the same property. Thus, the move was not considered a significant enough change to warrant providing it to the public for comment.

Table 4 summarizes other factors DAQ evaluated when choosing the new location for the monitoring station. Location of permitted facilities are shown in Figure 41.

Table 4. Other considerations in selection of the Pitt County Agriculture Center Site

Factor	Evaluation
Long-term Site Commitment	Pitt County was willing to provide DAQ with a long-term lease agreement and does not plan to develop the current area any time in the near future
Sufficient Operating Space	300 meter by 50-meter open area free of trees and buildings
Access and Security	Current building and outdoor monitor have not been vandalized. New location is near a walking trail. The outdoor monitor will be inside a locked fence.
Safety	Appropriate electrical permits were obtained.
Power	Overhead powerlines are located 325 meters east of the site. Overhead power can be brought in from there or from the detention center parking lot approximately 50 meters to the north.
Environmental Control	The monitoring shelter was placed with the door to the north so that sunlight does not shine in through the window and warm up the building.
Exposure	The monitoring station is at least 20 meters from the driplines of trees and is not near any trees or buildings that could be an obstacle to air flow.
Distance from Nearby Emitters	There are two permitted facilities with 0.5 miles of the proposed location: **Metallix Refining, Inc.**, located at 251 Industrial Blvd, 467 meters north northwest of the monitoring station, emitted 1.5 tons of NOx, 0.1 tons of VOC and 0.2 tons of fine particles in 2011. **Attends Health Care Products, Inc.**, located at 1029 Old Creek Road, 567 meters east of the monitoring station, emitted 20.7 tons of PM10 in 2011.
Proximity to Other Measurements	The monitoring station is located about 2 kilometers from the Pitt-Greenville Airport.

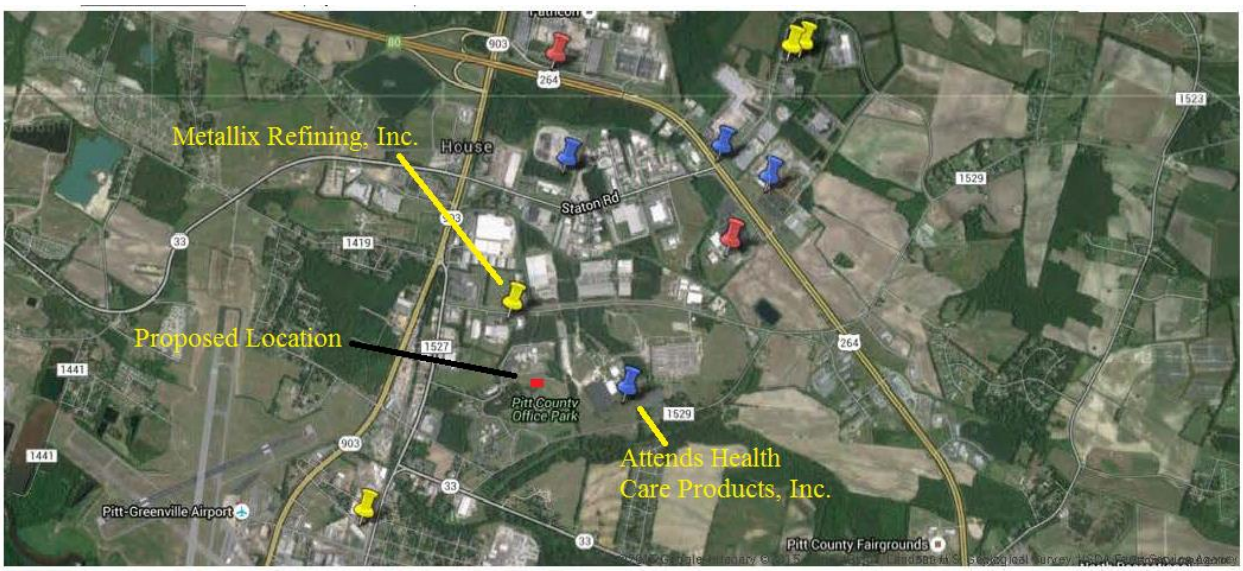

Figure 41. Location of monitoring station relative to permitted facilities
(yellow pins are small, blue pins are synthetic minor and red pins are Title V facilities)

Appendix F-4. PCS Phosphate, Inc. – Aurora Siting Analysis and Additional Site Information

Siting Analysis for the Bayview Ferry Site (PCS Phosphate -- Aurora)

SO_2 DATA REQUIREMENTS RULE MONITOR SITING ANALYSIS

PCS Phosphate Company, Inc. – Aurora Facility
Permit No. 04176T53
Facility ID No. 0700071
Aurora, North Carolina

Prepared for:

PCS Phosphate AURORA DIVISION

PCS Phosphate Company, Inc.
1530 NC Highway 306 South
Aurora, NC 27806

Prepared by:

AECOM

AECOM Technical Services of North Carolina, Inc.
1600 Perimeter Park Drive, Suite 400
Morrisville, NC 27560

April 2016

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1.0 INTRODUCTION

On June 22, 2010, the EPA revised the primary sulfur dioxide (SO_2) National Ambient Air Quality Standard (NAAQS) (75 FR 35520). The EPA promulgated a new 1-hour daily maximum primary SO_2 standard at a level of 75 parts per billion (ppb), based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

On May 13, 2014, the EPA proposed the Data Requirements Rule (DRR) for the 1-Hour SO_2 NAAQS (79 FR 27445). The final DRR was promulgated on August 21, 2015 (80 FR 51051) and requires states to gather and submit to the EPA additional information characterizing SO_2 air quality in areas with larger sources of SO_2 emissions. In the DRR, air agencies have the choice to use either monitoring or modeling to characterize SO_2 air quality in the vicinity of priority SO_2 sources, and submit the modeling and/or monitoring to the EPA on a schedule specified by the rule.

This analysis was conducted to identify a suitable 1-hour SO_2 source-oriented monitoring site location to satisfy the DRR for PCS Phosphate Company's Aurora Facility (PCS Aurora). Currently, there is an SO_2 monitor located about 6 kilometers (km) to the northeast of PCS Aurora, located at 229 NC Highway 306 North, Bath, NC. The 1-hour background monitored air concentration for this monitor, based on 2012-2014 data is 23 ppb (60.1 µg/m^3).

This report provides a summary of modeling results and associated analyses of these results using methodologies discussed in EPA's SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (Monitoring TAD) that indicates the suitability of locating a monitoring station in vicinity of the PCS Phosphate, Inc. Aurora, NC facility (PCS Aurora facility). Results of this monitor siting analysis indicate that the Bayview monitor that is currently operating near the facility and was originally sited by the North Carolina Division of Air Quality (NC DAQ) for the purposes of monitoring SO_2 concentrations in the vicinity of the PCS Aurora facility is very highly ranked in accordance with the Monitoring TAD and is suitably located to provide a reliable indication of ambient air quality in the vicinity of the PCS Aurora facility.

2.0 FACILITY INFORMATION

2.1 Facility Description and Location

The PCS Aurora facility mines phosphate ore and manufactures products including sulfuric acid, phosphoric acid, solid and liquid fertilizers, animal feed supplements, and food grade, purified phosphoric acid.

The PCS Aurora facility operates under the terms and conditions of Permit No. 04176T53 issued by NCDEQ DAQ (effective date September 24, 2015). Permitted sources of SO_2 at the PCS Aurora facility consist of three double-absorption sulfuric acid plants, one distillate oil-fired boiler, six vertical fluidized bed phosphate rock calciner units, one phosphate rock dryer, one coal/coke pulverizer and thermal dryer system, two diammonium phosphate plants, four superphosphoric acid plants, four phosphoric acid trains, two pug mills, one defluorination kiln, and one diesel-fired emergency engine.

PCS Aurora is located in Aurora, North Carolina in Beaufort County. The facility is approximately 7 km north of the town of Aurora along the shore of the Pamlico River. The NAD83 UTM Zone 18 coordinates of the facility are 338705 meters Easting and 3916240 meters Northing. Figure 2-1 shows the site location and the location of the current SO_2 monitor, known as the Bayview monitor.

3.0 MONITOR SITING ANALYSIS

3.1 Analysis Approach and Model Selection

As suggested by the Monitoring TAD, the modeling followed the recommendations of the SO_2 NAAQS Designations Modeling Technical Assistance Document (Modeling TAD). According to the Modeling TAD, given the source-oriented nature of SO_2, dispersion models are appropriate air quality modeling tools to estimate near-field concentrations. The AMS/EPA Regulatory Model (AERMOD version 15181) was used, as suggested in the Monitoring TAD. AERMOD is the preferred air dispersion model because it is capable of handling rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including, point, area, and volume sources) to address ambient impacts for the designations process.

3.1.1 Meteorological Data

AERMOD-ready meteorological data was created by processing surface data from the Marine Corps Air Station (MCAS) in Cherry Point, upper air data from the Newport, NC National Weather Service (NWS) site, and onsite meteorological data collected by PCS. The DRR requires modeling to be performed for the most recent three year period. The most recent quality-assured dataset at this time is the 2012-2014 meteorological data.

3.1.2 Receptors

The dispersion modeling receptor grids were developed following procedures outlined in the *New Source Review Workshop Manual* (October 1990), the *North Carolina PSD Modeling Guidance* (January 2012), and the Modeling TAD. A detailed discrete receptor grid system was created to assess air quality impacts in all directions from the PCS Aurora facility to a distance of up to 21.5 km from the property boundary.

Discrete receptors were placed along the property line at 100-meter intervals. A 100-meter grid spacing was used from the property line out to a distance of approximately 1 km, 250-meter grid spacing from 1 km to 3 km, 500-meter grid spacing from 3 km to 5 km, 1 km grid spacing from 5 km to 10 km. The remaining grid from 10 km to approximately 20 km used 2 km grid spacing. According to the Modeling TAD, receptors should only be placed where it is suitable for the placement of a permanent monitor; therefore receptors on PCS property and over water were removed. Figure 3-1 presents the full modeling receptor grid, while Figure 3-2 presents the near-field receptor grid along with the PCS Aurora property boundaries.

Terrain data used in the analysis was obtained from the USGS Seamless Data Server at http://viewer.nationalmap.gov/viewer/. The 1 arc-second NED data was obtained in the GeoTIFF format and used in determining receptor elevations and hill heights using AERMAP.

3.1.3 Sources

There are multiple SO_2 emissions sources present at the PCS Aurora facility, all of which were modeled as point sources.

The AERMOD model uses a steady-state Gaussian plume equation to model emissions from point sources such as stacks and vents. All point sources were modeled using actual stack exhaust parameters. The following parameters were used for modeling the point sources: emission rates (grams/sec), stack height (m), stack diameter (m), stack exit velocity (m/sec), stack exhaust temperature (K), and direction-specific building/structure dimensions (m). Building/structure locations, sizes, and orientations relative to stacks were input into BPIP-PRIME to calculate building parameters for AERMOD. Table 3-1 presents a list of the modeled facility point sources and their associated parameters. The source and building/structure layout for modeling is shown in Figure 3-3.

Table 3-1. Modeled Stack Parameters

Source ID	Source Description	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)	Normalized Emission Rate (g/s)
103SO	SA Plant No. 5	44.2	346.43	10.25	3.2004	hourly varying
104SO	SA Plant No. 6	49.99	343.37	10.66	2.9718	hourly varying
105SO	SA Plant No. 7	50.3	349.8	9.73	3.66	hourly varying
110NEW	Auxiliary Boiler	15.2	402.8	11.55	1.34	annually varying
201SO	Calciner #1	30.5	347.8	13.11	1.8288	annually varying
202SO	Calciner #2	30.5	346.5	13.13	1.8288	annually varying
203SO	Calciner #3	30.5	348.3	13.62	1.8288	annually varying
204SO	Calciner #4	30.5	347.2	14.02	1.8288	annually varying
205SO	Calciner #5	30.5	348.7	12.62	1.8288	annually varying
206SO	Calciner #6	30.5	347.9	12.83	1.8288	annually varying
210SO	Rock Dryer	30.5	336.65	15.09	1.8288	annually varying
215SO	Coal Pulverizer/Dryer Baghouses	30.5	339.98	17.89	0.7376	annually varying
302SO	DAP No.3 Plant	44.2	330.26	9.58	2.7432	annually varying
303SO	DAP No.2 Plant	41.45	341.32	13.96	2.74	annually varying
330SO	SPA #1	30.05	300.82	2.62	0.51	annually varying
331SO	SPA #2	30.05	297.15	1.52	0.51	annually varying
332SO	SPA #3/#4	30.02	296.37	1.49	0.61	annually varying
401SO	PA#1 Crossflow/Venturi Scrubber Stack	39.62	308.98	18.082	1.01	annually varying
404SO	PA#2 Crossflow Scrubber Stack	39.62	314.32	15.749	1.01	annually varying
406SO	PA#3 Crossflow Scrubber Stack	30.48	320.26	19.832	1.01	annually varying
409SO	PA#4 Crossflow Scrubber Stack	39.62	321.04	16.332	1.01	annually varying
701SO	DFP Kiln Stack	60.35	349.3	17.94	1.68	annually varying
801SO	Mill Area Generator	3.7	778.7	74.58	0.3	annually varying
802SO	Calciner Building Diesel Generator	3.7	778.7	74.58	0.3	annually varying

3.1.4 Modeled Emissions

Hourly data was available for the three Sulfuric Acid Plants (103SO, 104SO, and 105SO) from CEMS monitors. Sulfur dioxide emissions from these sources comprise over 96% of the total annual emissions from the facility. Hourly data for other sources was not available; therefore, average hourly emission rates for each source were used in the modeling. Following the example in Appendix A of the Monitoring TAD, these emission rates were normalized and used as inputs to the model (Table 3-1). Because of the linear scalability of emissions to modeled concentrations, the relative model results using normalized emissions can be used to predict the location of maximum concentration gradients. The emissions rates were normalized by dividing each source's hourly emission rate by the highest overall hourly emission rate over all stacks.

3.2 Modeling Results and Ranking Methodology

Following the guidance outlined in Appendix A of the Monitoring TAD, normalized modeled impacts were used to determine suitable locations for an SO_2 monitor near PCS Aurora. The three-year average of each year's 4th daily highest 1-hour maximum concentration (99th percentile of daily 1-hour maximum concentrations) was calculated for each receptor. This value is commonly referred to as the design value (DV). Because normalized emissions were used to calculate these values, the results are referred to as normalized design values (NDVs) in this analysis.

Figure 3-4 shows the NDVs for the receptors near PCS Aurora, totaling 12,571 receptors within the modeling domain. To better understand the relative difference between the NDVs, Figure 3-5 shows the ratio of the NDV at each receptor to that of the overall maximum NDV. In the figures, the receptors with the highest values are in the black area surrounded by the darker purple. From the NDV ratio results, 200 receptors with the highest values were selected for further analysis. The receptors having the top 200 and top 50 NDVs are shown in Figures 3-6 and 3-7, respectively. The highest NDVs in the figures are shown in black.

Figures 3-6 and 3-7 show the prioritized locations that were first evaluated to select a monitor location. The primary objective of this analysis was to find a sufficient number of feasible locations with predicted peak and/or relatively high SO_2 concentrations where a permanent monitoring site could be located. However; according to Appendix A of the Monitoring TAD, the site selection process also needed to account for the frequency in which a receptor has the daily maximum concentrations. The frequency is the number of times each receptor was estimated to have the maximum daily 1-hour concentration. Figure 3-8 shows the results of the frequency analysis.

Each receptor's frequency value was used with its NDV to create a relative prioritized list of receptor locations. This process is referred to in Appendix A of the Monitoring TAD as a scoring strategy. The list of receptors was developed through the following steps:

1. The NDVs were ranked from highest to lowest. Rank 1 means the highest NDV.
2. The frequencies for the receptors were ranked from the highest to lowest. Rank 1 means the highest number of days having the daily maximum value.

3. The NDV rank and the frequency rank were added together to obtain a score.

4. The scores were ranked from lowest to highest. The receptors with the lowest scores were identified as the most favorable locations for the monitor.

3.2.1 Ranking Results

Table 3-2 shows a summary of the ranking results for the top 20 receptors. Figure 3-9a shows the receptor locations that ranked in the top 50 (note that as shown in Table 3-2 there were some ties in rankings). Figures 3-9b, c, and d show a closer view of the three areas with the highest receptor rankings.

When selecting an adequate location for a monitor, considerations should be made regarding the availability of electrical power, security of the monitor, accessibility, proper instrument exposure, and assurance of long term use of the site.

The location of the current Bayview monitor is the highest ranking location (15 out of 12,571) to be free of concerns. Since the monitor has been operating in its current location since 2010, electrical power, security, accessibility, instrument exposure, and long term use of the site are in good standing in this location. The higher ranking locations are either in heavily forested areas, on private property, or do not have an uninhibited sight-line to the facility.

In 2010, the DAQ moved the SO_2 monitor located just off PCS property to its current location. The current site was chosen due to more people living on the north side of the river and due to the fact that the location is downwind of the PCS Phosphate facility[1].

[1] *2015-2016 Annual Monitoring Network Plan for the North Carolina Division of Air Quality*. Volume 2. July 23, 2015.

Table 3-2. Top 20 Ranking Receptors by Score

UTM Zone 17 (NAD83)		Normalized Design Value (NDV)	NDV Rank	Frequency Count	Frequency Rank	Score	Score Rank	Comments on Location	Siting Concerns
Easting (m)	Northing (m)								
334213.65	3913970.37	0.83	2	23	3	5	1	Border of PCS and private property, SE of Louden Rd.	Property owner permission; power; heavily forested area
334266.51	3914037.05	0.84	1	12	12	13	2		
334465.88	3914583.32	0.80	17	12	13	30	3		
334297.73	3914255.81	0.77	34	22	18	52	4		
340881.8	3916405.2	0.75	56	35	1	57	5	Border of PCS and NCDOT property, north of Hwy. 306	Heavily forested area, very close to the river bank.
340000	3922500	0.75	53	17	6	59	6	Private property, south of Hwy. 92	Heavily forested area
340500	3922250	0.78	29	8	31	60	7		Property owner permission; power
333966.75	3913800.31	0.81	14	5	48	62	8	Border of PCS and private property, SE of Louden Rd.	Property owner permission; power; heavily forested area
334289	3914773.78	0.77	36	9	26	62	8	Border of PCS and private property, west of Bonnerton Rd.	
343250	3921750	0.75	54	14	9	63	10	Private property, south of Hwy. 99	Property owner permission; power; trees
343000	3921750	0.76	45	10	21	66	11		
340250	3922500	0.74	62	13	10	72	12	Private property, south of Hwy. 92	Heavily forested area
340300	3921000	0.72	72	30	2	74	13	Private property, end of Gum Point Rd.	Property owner permission; power
335521.8	3909263.5	0.72	71	20	4	75	14	Border of PCS and private property, west of Hwy. 306	Property owner permission; power; near railroad tracks
342045	3921898	0.74	61	10	22	83	15	Site of Bayview Monitor	Location of current monitor
342750	3922000	0.75	51	7	34	85	16	Private property, south of Hwy. 99	Heavily forested area
334347.68	3914675.34	0.81	9	3	80	89	17	Border of PCS and private property, west of Bonnerton Rd.	Property owner permission; power
334284.47	3914856.14	0.76	50	6	39	89	17		
336245.15	3909815.98	0.72	90	15	7	97	19	On PCS property, north of Brantley Swamp Rd.	On PCS property; wetlands area
342500	3922000	0.72	74	9	27	101	20	Private property, south of Hwy. 99	Heavily forested area

Figures

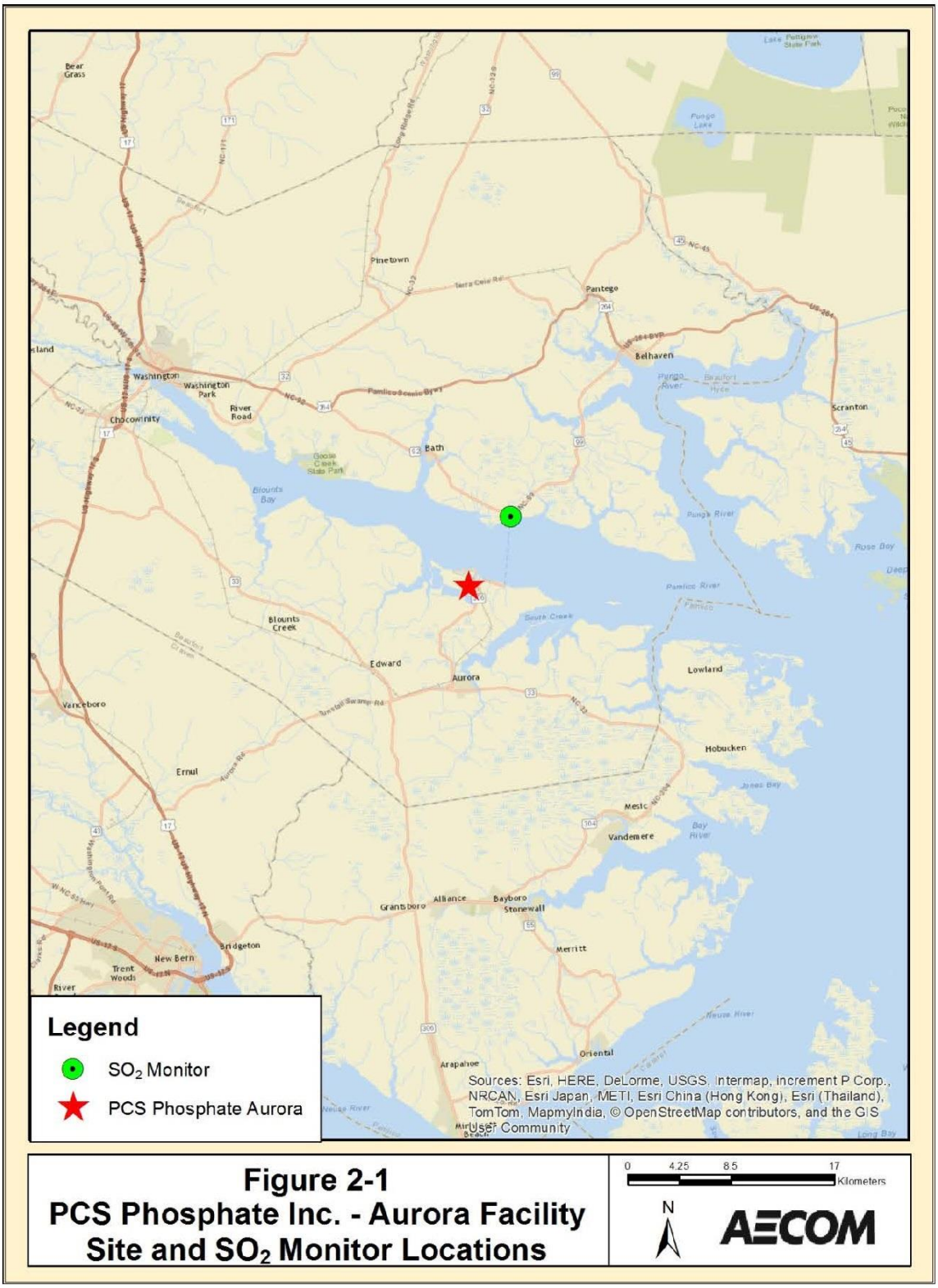

Figure 2-1
PCS Phosphate Inc. - Aurora Facility
Site and SO_2 Monitor Locations

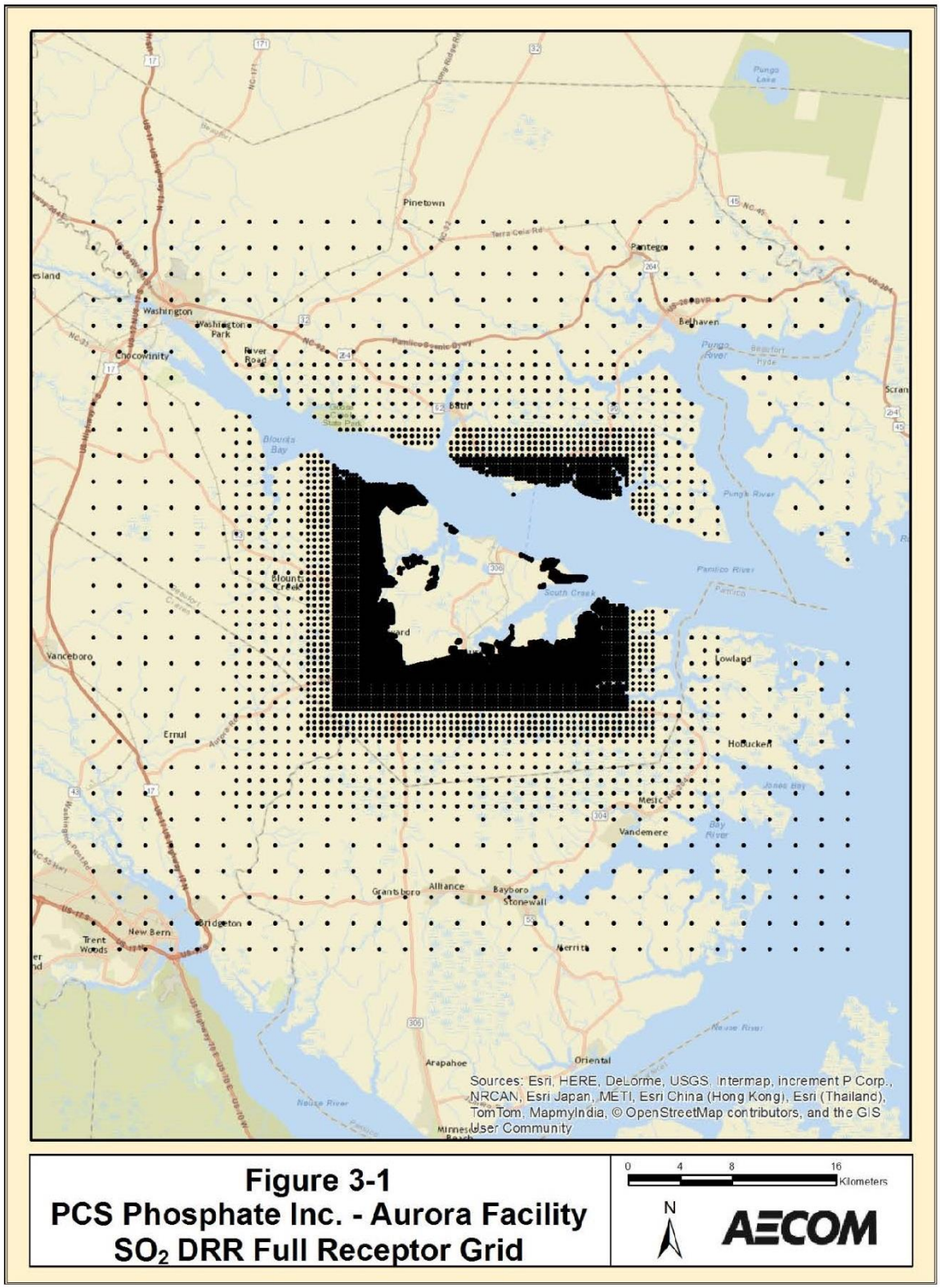

Figure 3-1
PCS Phosphate Inc. - Aurora Facility
SO_2 DRR Full Receptor Grid

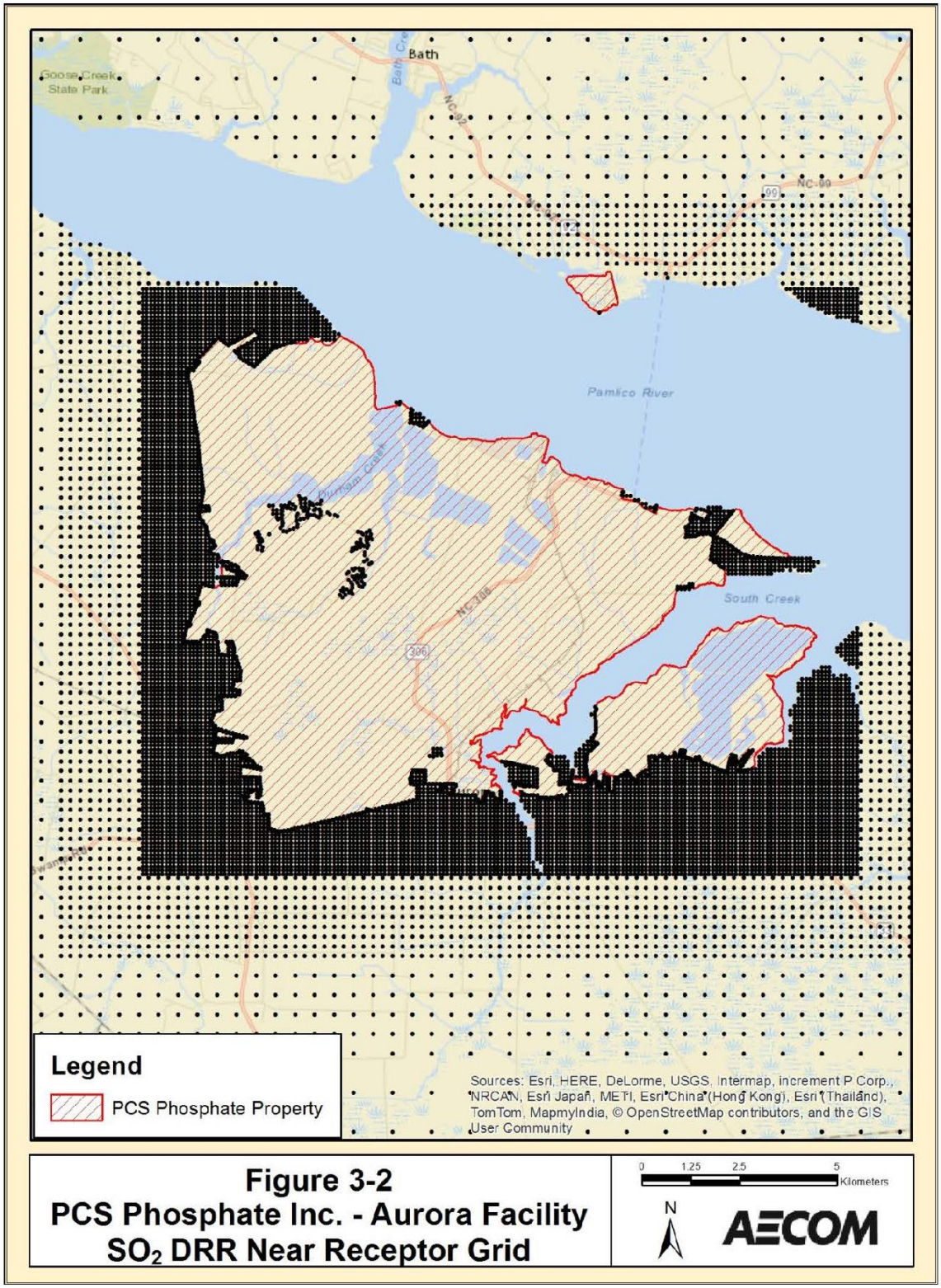

Figure 3-2
PCS Phosphate Inc. - Aurora Facility
SO_2 DRR Near Receptor Grid

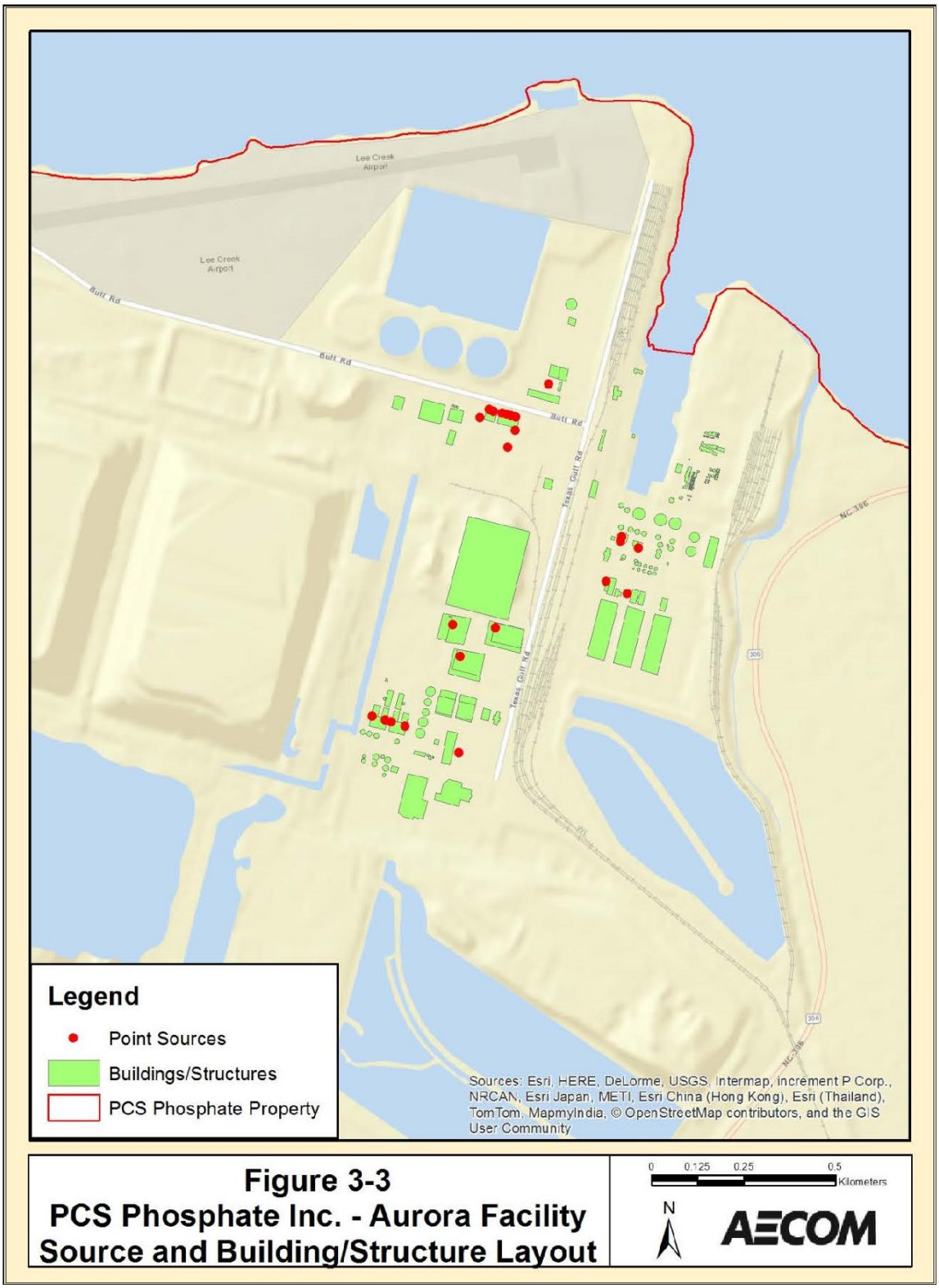

Figure 3-3
PCS Phosphate Inc. - Aurora Facility
Source and Building/Structure Layout

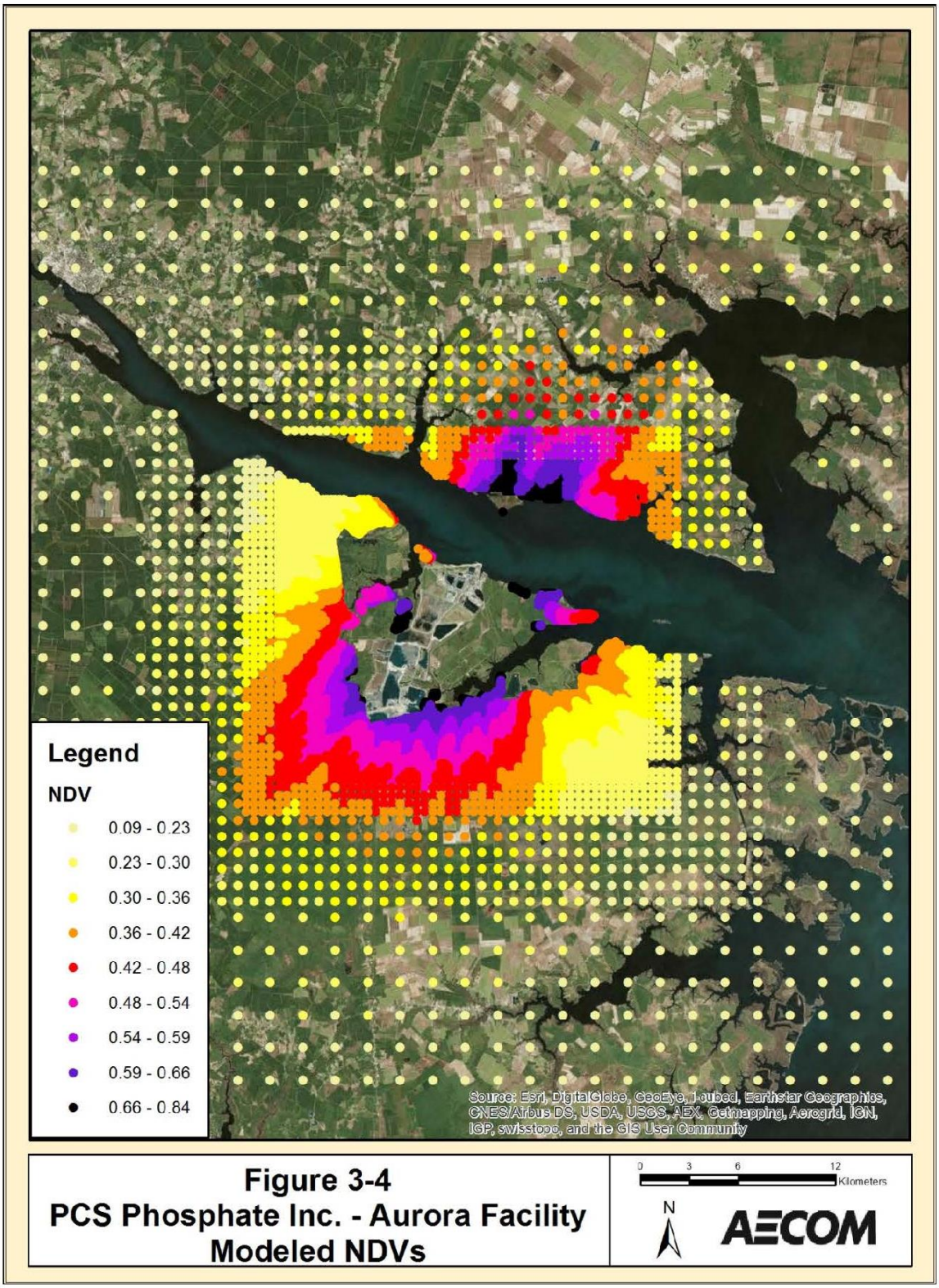

Figure 3-4
PCS Phosphate Inc. - Aurora Facility
Modeled NDVs

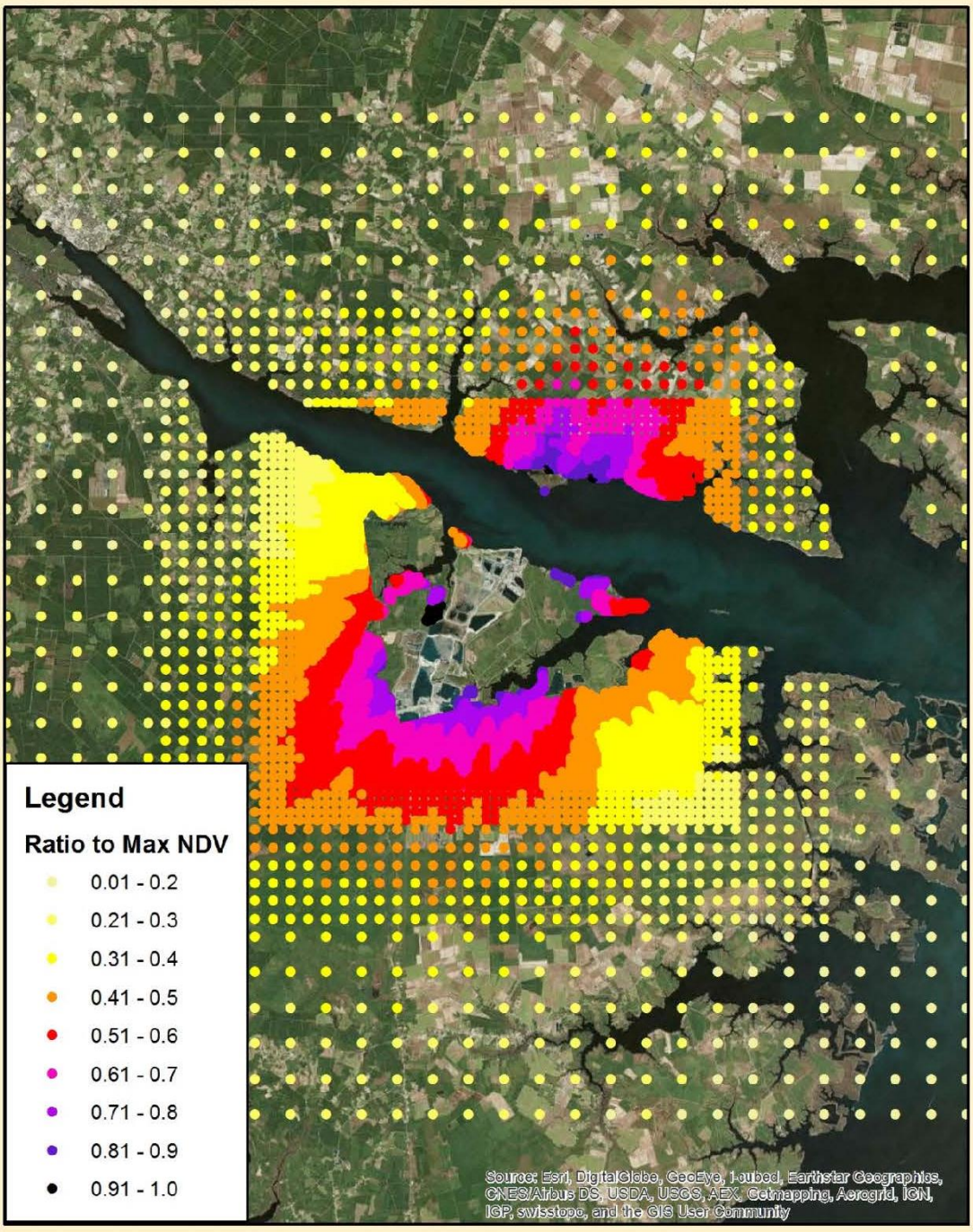

Figure 3-5
PCS Phosphate Inc. - Aurora Facility
Receptor NDV Ratio to Max NDV

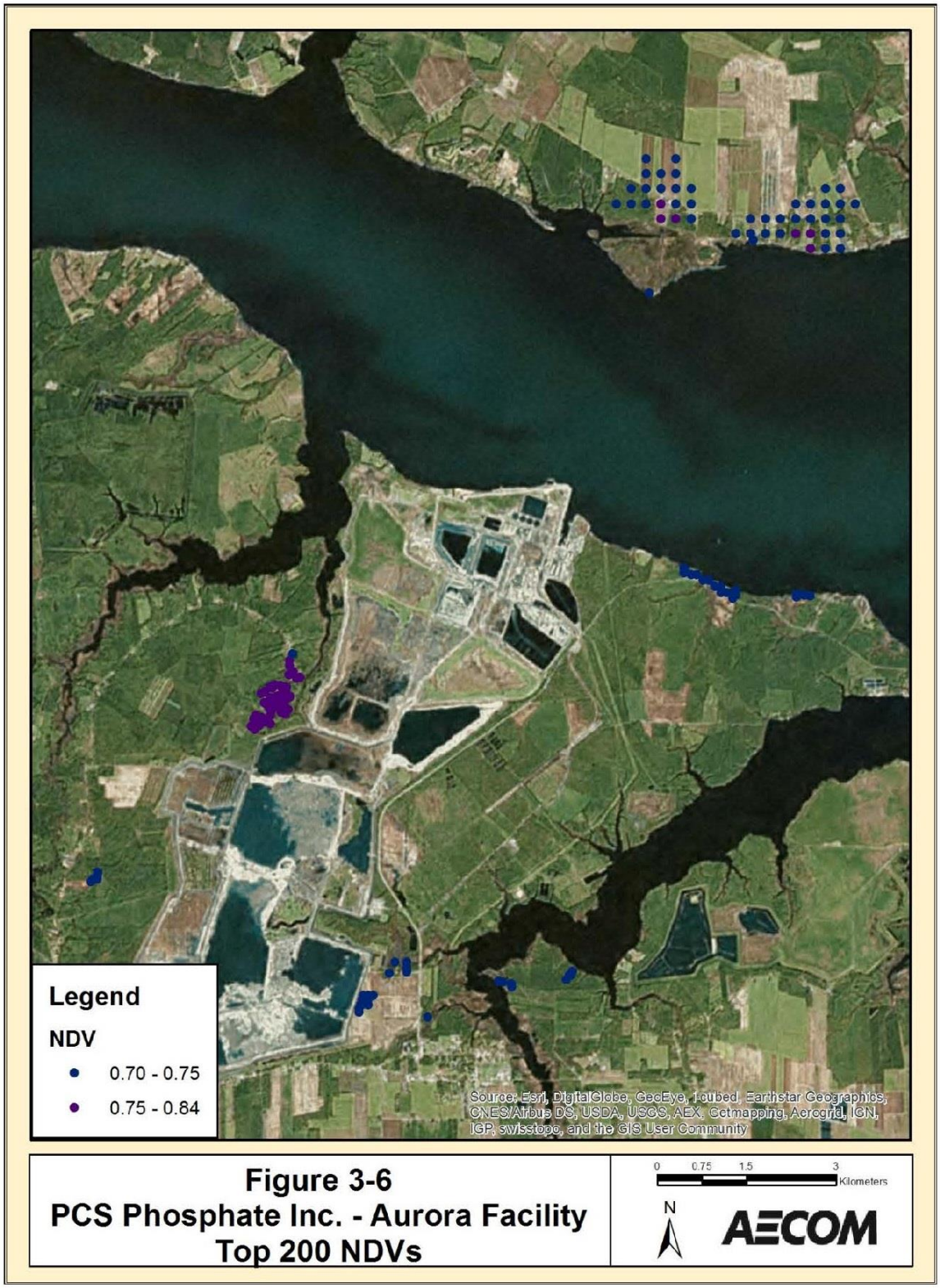

Figure 3-6
PCS Phosphate Inc. - Aurora Facility
Top 200 NDVs

Figure 3-7
PCS Phosphate Inc. - Aurora Facility
Top 50 NDVs

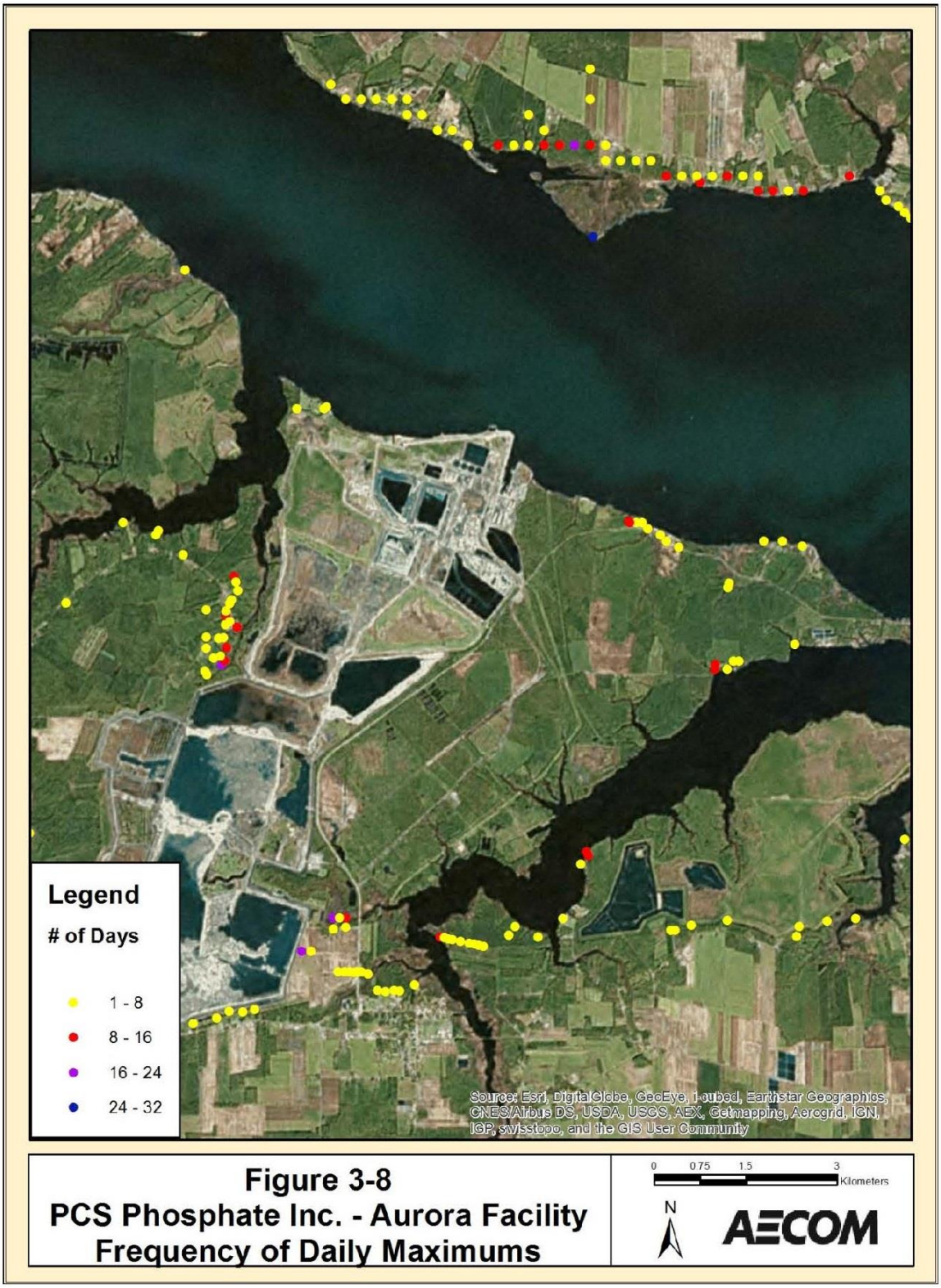

Figure 3-8
PCS Phosphate Inc. - Aurora Facility
Frequency of Daily Maximums

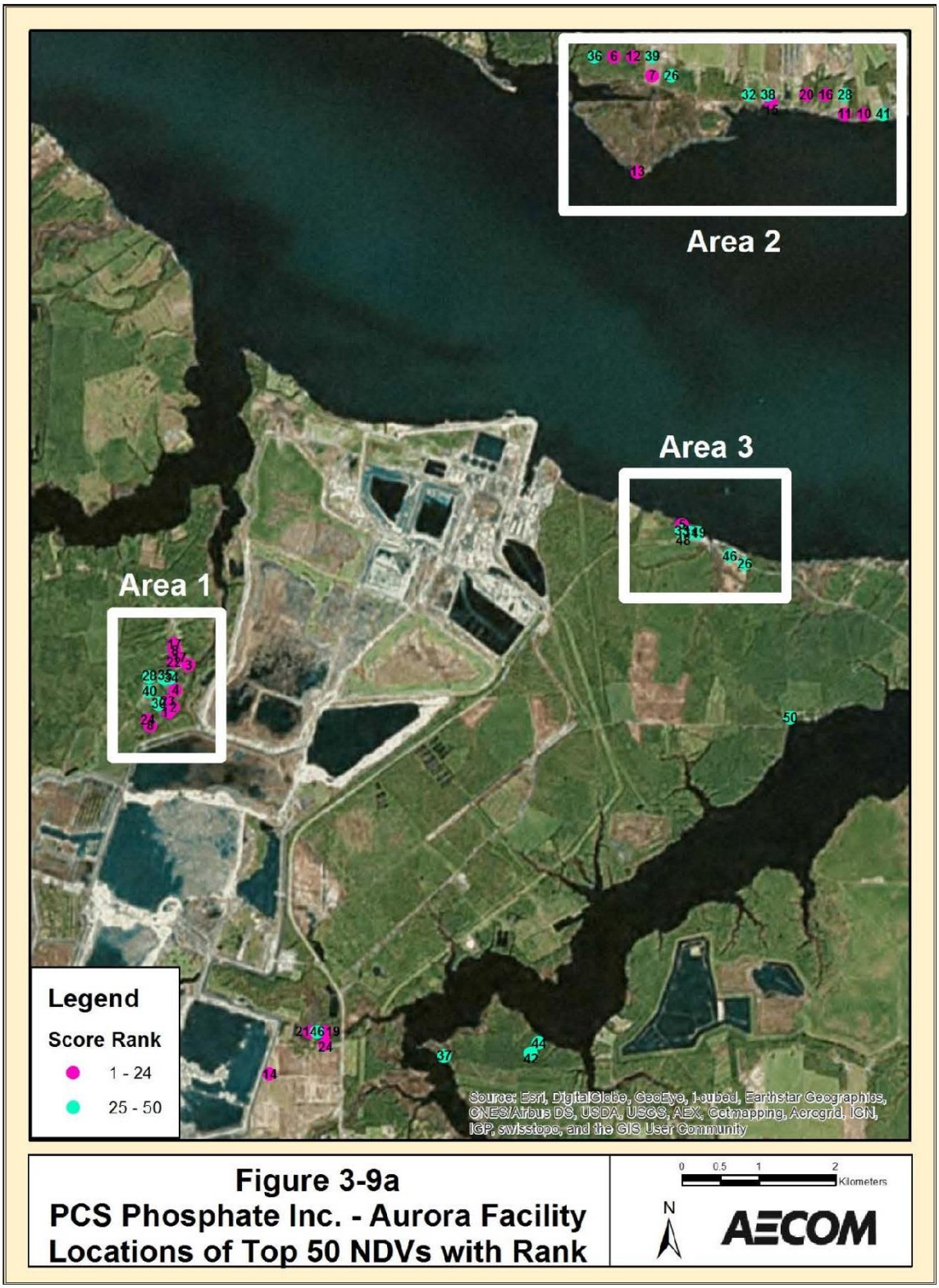

Figure 3-9a
PCS Phosphate Inc. - Aurora Facility
Locations of Top 50 NDVs with Rank

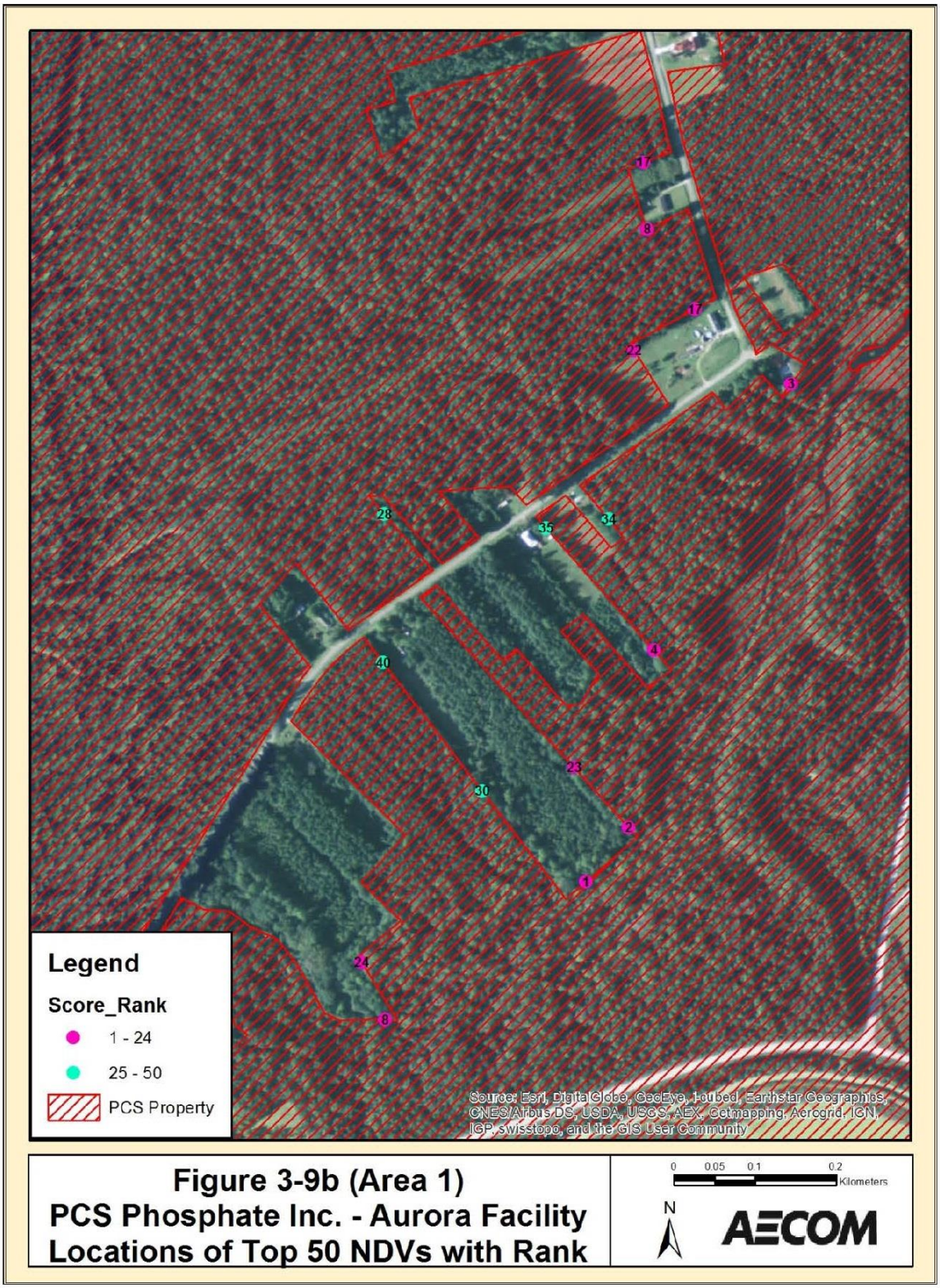

Figure 3-9b (Area 1)
PCS Phosphate Inc. - Aurora Facility
Locations of Top 50 NDVs with Rank

Figure 3-9c (Area 2)
PCS Phosphate Inc. - Aurora Facility
Locations of Top 50 NDVs with Rank

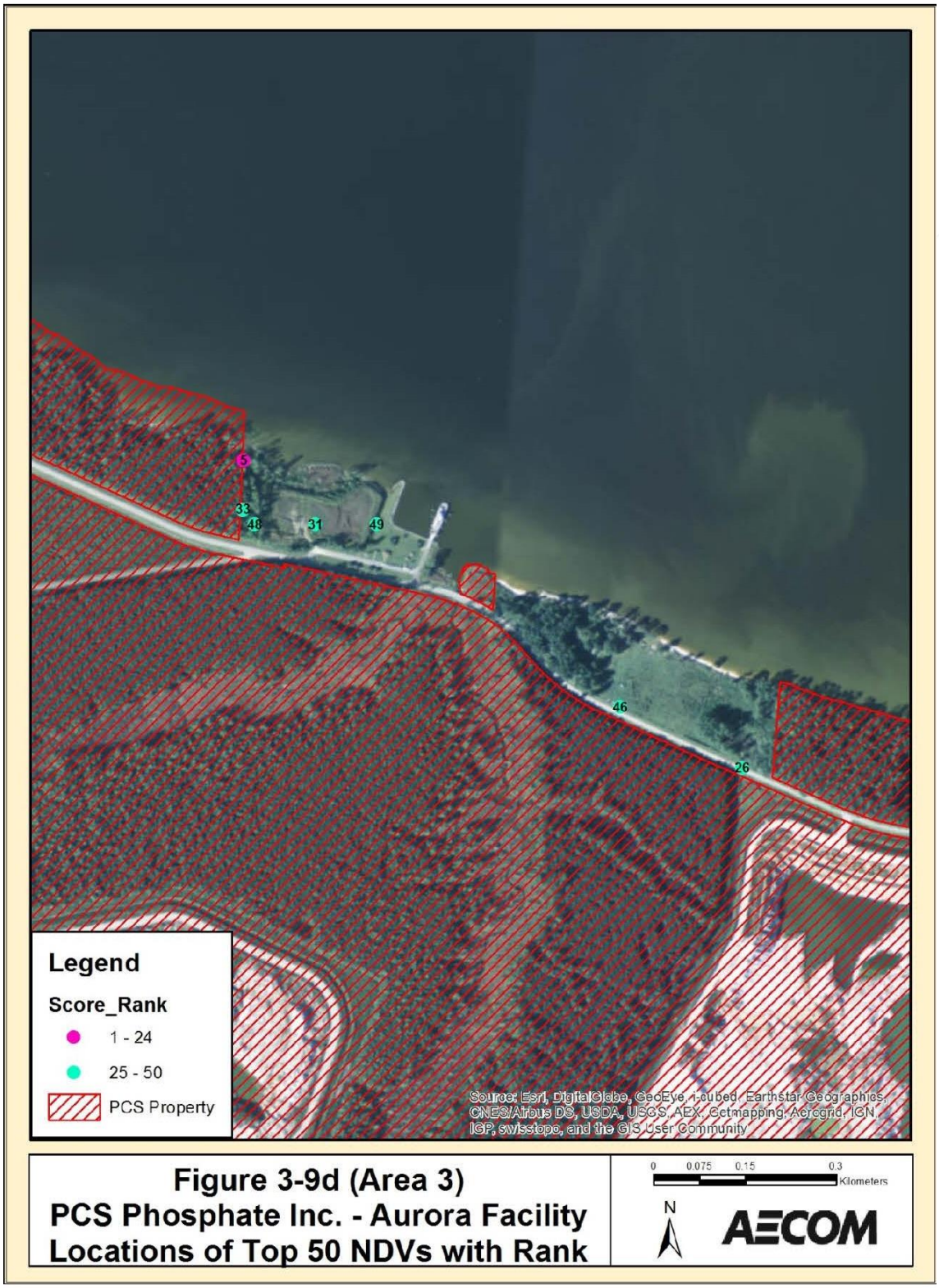

Figure 3-9d (Area 3)
PCS Phosphate Inc. - Aurora Facility
Locations of Top 50 NDVs with Rank

Region 4 Requested Information for Sites (PCS Phosphate -- Aurora)

NOTE: The SO2 DRR monitoring site for PCS Phosphate is the existing Bayview site located directly across the Pamlico River from the facility. For details on this site, refer to subsection (4) The Non-MSA Portion of the Washington Monitoring Region of this section.

The onsite wind rose and aerial photo below show the monitor to be directly downwind of the facility.