Annual Ambient Air Monitoring Network Plan

2016

COMMONWEALTH OF VIRGINIA

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

AIR DIVISION – OFFICE OF AIR QUALITY MONITORING

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INTRODUCTION

40 CFR Part 58 Paragraph 10 states as follows:

§58.10 Annual monitoring network plan and periodic network assessment.
(a)(1) Beginning July 1, 2007, the state, or where applicable local, agency shall submit to the Regional Administrator an annual monitoring network plan which shall provide for the documentation of the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations that can include FRM, FEM, and ARM monitors that are part of SLAMS, NCore, CSN, PAMS, and SPM stations. The plan shall include a statement of whether the operation of each monitor meets the requirements of appendices A, B, C, D, and E of this part, where applicable. The Regional Administrator may require additional information in support of this statement. The annual monitoring network plan must be made available for public inspection and comment for at least 30 days prior to submission to the EPA and the submitted plan shall include and address, as appropriate, any received comments.

This document is intended to address this regulatory requirement for an annual air monitoring network plan for the Commonwealth of Virginia. The requirements for the components of the annual monitoring network plan are contained in §58.10 paragraphs (2) through (13).

NETWORK DESIGN

The monitoring program for the Virginia Department of Environmental Quality operates the ambient air monitoring network of both gaseous and particulate pollutant monitors required in 42 US Code §7410 (a) (2) (B) (i) which requires that the Commonwealth of Virginia:

> ***(B)*** *provide for establishment and operation of appropriate devices, methods, systems, and procedures necessary to—*
> ***(i)*** *monitor, compile, and analyze data on ambient air quality,*

The implementation and operating requirements of the ambient monitoring network are contained in 40 CFR Part 58 as defined below in §58.2 as follows:

> *(1) Quality assurance procedures for monitor operation and data handling.*
> *(2) Methodology used in monitoring stations.*
> *(3) Operating schedule.*
> *(4) Siting parameters for instruments or instrument probes.*
> *(5) Minimum ambient air quality monitoring network requirements used to provide support to the State implementation plans (SIP), national air quality assessments, and policy decisions. These minimums are described as part of the network design requirements, including minimum numbers and placement of monitors of each type.*

Table 1 below shows the number of monitors and types of pollutants monitored and how they are distributed throughout the Commonwealth by Air Quality Control Region and Metropolitan Statistical Area. This table demonstrates air monitor distribution and pollutant measurement consistent with Part 58 Appendix D. In addition to the MSA/CBSA based pollutant monitoring, Virginia maintains additional monitoring sites to meet additional federal and state based monitoring programs. These programs are listed below.

Table 1 Air Monitoring Sites active in the Commonwealth of Virginia

MSA/CBSA(a)	Pollutant Monitored						
	Ozone	PM2.5	NO2	SO2	CO	PM10	Lead (Pb)
Kingsport-Bristol-Bristol, TN-VA		1					
Winchester, VA-WV	1	1				1	
Harrisonburg, VA	1	1	1	1			
Roanoke, VA	1	2	1	1	1		1
Lynchburg, VA		1					1
Charlottesville, VA	1	1					
Richmond, VA	4	4 FRM, 1 FEM	3	2	2	3	
Virginia Beach-Norfolk-Newport News, VA-NC	3	3	2	2	2	2	
Washington-Arlington-Alexandria, DC-VA-MD-WV	6	3 FRM, 1 FEM	4	1	2	3	
Total – MSA/CBSA	17	19	11	7	7	9	2
Total- all sites(b)	21	21	11	7	7	9	2

(a) Metropolitan Statistical Areas/Core based statistical areas

(b) Includes sites not incorporated into an MSA or CBSA i.e. Shenandoah National Park, Rockbridge County, Carroll County, and Wythe County.

Urban Air Toxics Programs – The Department of Environmental Quality maintains three urban air toxics sites at: 51-059-0030 Fairfax County Lee District Park; 51-670-0010 Hopewell City Woodson Middle School, and 51-810-0008 Virginia Beach City Virginia Beach DEQ Tidewater Regional Office.

NCore, the National Core Monitoring Network – The National Core Monitoring Network was installed and began operating prior to the January 1, 2011 regulatory requirement. The Design Criteria for the NCore site in Virginia is defined in Appendix D of Part 58 of 40 CFR. The NCore site maintained by DEQ is located at 51-087-0014 Henrico County MathScience Center.

National Air Toxics Trend Site – DEQ maintains a NATTS site located at 51-087-0014 Henrico County MathScience Center. In addition to the suite of pollutants measured in the Urban Air Toxics Program, NATTS also monitors for Poly Aromatic Hydrocarbons and Chrome.

Near Road Monitoring – DEQ will install three near road monitoring sites consistent with the design requirements contained in Appendix D. DEQ currently has two operating sites located at 51-760-0025 Richmond City Joseph Bryan Park and 51-059-0031 located in Springfield at the Backlick Road park and ride. The third site will be located in the Virginia Beach-Norfolk-Newport News VA-NC is described in the Virginia Network Changes section.

AIR QUALITY MONITORING NETWORK CHANGES

MONITORING SITE CHANGES SINCE LAST REVIEW
JULY 1, 2015 to JUNE 30, 2016

51-139-0004, 29-D, Luray Caverns Airport Site, Page County, AQCR2

The Page County Air Quality monitoring site was shutdown effective November 1, 2015. This shutdown was made necessary due to projected construction that is planned for the airport in 2016. The site was installed in 1999 and was originally placed at this location as an upwind site for the Shenandoah National Park. The site contained an Ozone Monitor and a PM2.5 FRM. The site is scheduled to be relocated but this is likely to occur later than the date frame of this report.

Figure 1 – Page County/Luray Caverns Airport Air Monitoring Site

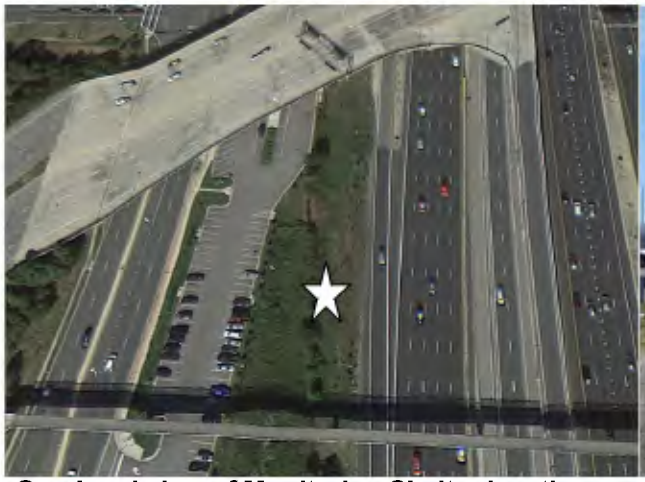
Near Road Monitoring Sites

51-059-0031, Springfield Near Road Site, Fairfax County, AQCR7

In addition to the Richmond Area Near Road Monitoring site at Bryan Park, the Northern Virginia area is also required to have a Near Road site installed i.e. this is a phase I near road monitoring site. The location of this site is at the Backlick Road Park and Ride along interstate 95 in Fairfax County. This location was the best site along the highest fleet adjusted annual average daily road segment that was accessible. The site began operation on April 5, 2016. At this site DEQ monitors for Nitrogen Dioxide (NO2), Carbon Monoxide (CO), and Particulate Matter (PM2.5). The PM2.5 monitor is a continuous federal equivalent monitoring (FEM) method that uses Beta-attenuation technology as the monitoring methodology. The CO and NOx hourly information is posted on the DEQ public web page at the following citation:

http://vadeq.tx.sutron.com/cgi-bin/daily_summary.pl?cams=39.

Figure 2 below provides various views of the site and the area surrounding the site.



Overhead view of Monitoring Shelter location

View of Monitoring Shelter looking South

View looking South along I-95

View looking North-Northeast along I-95

Figure 2 – Springfield Near Road site located along Backlick Road, Fairfax County

51-510-0021, L-126-i, Alexandria Transportation Colvin Street, City of Alexandria AQCR7

As a result of the installation and operation of the Springfield Near Road Monitoring Site, the Carbon Monoxide (CO) and Nitrogen Dioxide (NO2) monitoring performed at the Colvin Street site became redundant. The implementation information from EPA regarding near road sites is that the monitoring can be performed by relocating existing monitors rather than creating a new monitoring requirement. Both CO and NO2 monitoring are being performed at the near road site. The Colvin Street site was established September 1, 2013. Prior to the monitoring performed at the Colvin Street site, the City of Alexandria performed monitoring at Alexandria City Health Department building on N. Saint Asaph Street. The Alexandria site was shutdown effective May 1, 2016.

51-510-0022, 126-J, Stevenson Park Site, City of Alexandria, AQCR7

This site was required by a line item in the Virginia Appropriations act of 2014 and was not installed to meet any federal regulatory or air quality requirement. This was always intended to be a temporary installation which is being operated to monitor air quality near a Virginia Department of Transportation traffic reduction project. This site was not included in the list of network monitoring sites in the Virginia Site listing and is expected to be removed by July 1, 2016.

Figure 3 - Stevenson Park Temporary Air Monitoring Site

INSTRUMENT CHANGES SINCE LAST REVIEW
JULY 1, 2015 through JUNE 30, 2016

51-087-0014, 72-M, MathScience Innovation Center site, Henrico County, AQCR5

Beginning in June 2013, the MSIC has been the location of the PAMS program instrumentation. Included in the suite of instruments is the Perkin-Elmer Automated Gas Chromatograph. The Auto GC experienced a catastrophic failure during the PAMS season (June 1 through August 31) and is no longer operable. The Manufacturer no longer supports the equipment so there is no way that repairs can be performed to get the system operating again. No hourly VOC data will be gathered at the MSIC until this instrument is replaced. MSIC is also the NCore location for the Commonwealth of Virginia so a replacement will have to be installed and operational by June 1, 2019.

51-059-0030, 46-B9, Lee District Park site, Fairfax County, AQCR7

Beginning in May, 2015 VA DEQ installed an additional Particulate Monitor (PM10) at the Lee District Park location in Fairfax County. This monitor was added to the suite of pollutants monitored at that site due to concerns relative to the PM10 Monitor located at Tucker Elementary School (EPA I.D. 51-510-0020) in the City of Alexandria. The existing PM10 monitor at Tucker Elementary School was originally sited at this location at the request of the City of Alexandria to support a requirement in the conditional use permit issued by the City to a paving operation located in the immediate area. By adding the additional PM10 monitor DEQ can gather PM10 data that is not impacted by any specific source.

51-087-0014, MSIC NCore Lead Monitor, Henrico County, AQCR5

40 CFR Part 58 Appendix A revisions were finalized on April 27, 2016. Included with these changes were changes to Appendix D contained as described in EPA presentation "Overview to Final Rule: Revisions to Ambient Monitoring QA and Other Requirements". Page 15 of this presentation contained the following:

Element	CFR Cite	FR Page #
Removed requirement for urban NCore sites to measure Lead (Pb). Monitors eligible to be discontinued after collecting 3 years of data per approval by Regional Office and showing compliance with 58.14(c).	§ 58 Appendix D Section 4.5(b) and 4.5(c)	17258-17259

In response to the changes described above, the NCore Lead monitor located at the MSIC in Henrico County will be shutdown effective May 1, 2016. The AQS Design value report for this monitor for the most recent three year period (2013 – 2015) indicates that the design value for this site is .00 µg/m3.

ANTICIPATED SITE CHANGES
JULY 1, 2016 through JUNE 30, 2017

51-810-XXXX Hampton Roads Near Road Site, Along I-264, Virginia Beach, AQCR6

In addition to Richmond and Northern Virginia, the Hampton Roads area will also require installation of a near road monitoring site. In Tidewater, I-264 from the I-264/I-64 interchange to the Independence Boulevard exit in Virginia Beach have been determined to be the target road segments for this program. The Office of Air Quality Monitoring (AQM) has evaluated these road segments and has determined that the best possible location for the monitoring shelter is at the north side of the Cambria Apartments at the end of Alicia Drive at the utility easement adjacent to I-264 as shown in the figure below. The GPS coordinates of this location are 36° 50.05833' N latitude and 76° 8.5633' W longitude. This will put the site approximately 10 meters from the edge of I-264. The area is currently covered with grass and is in close proximity to a potential source of power for the site. This site also has good accessibility in that there is a nearby parking area for the site operator that will allow access to this site with few safety concerns that can often accompany sites placed in near road proximity. The Hampton Roads site is scheduled to be in place and operational by December 31, 2016.

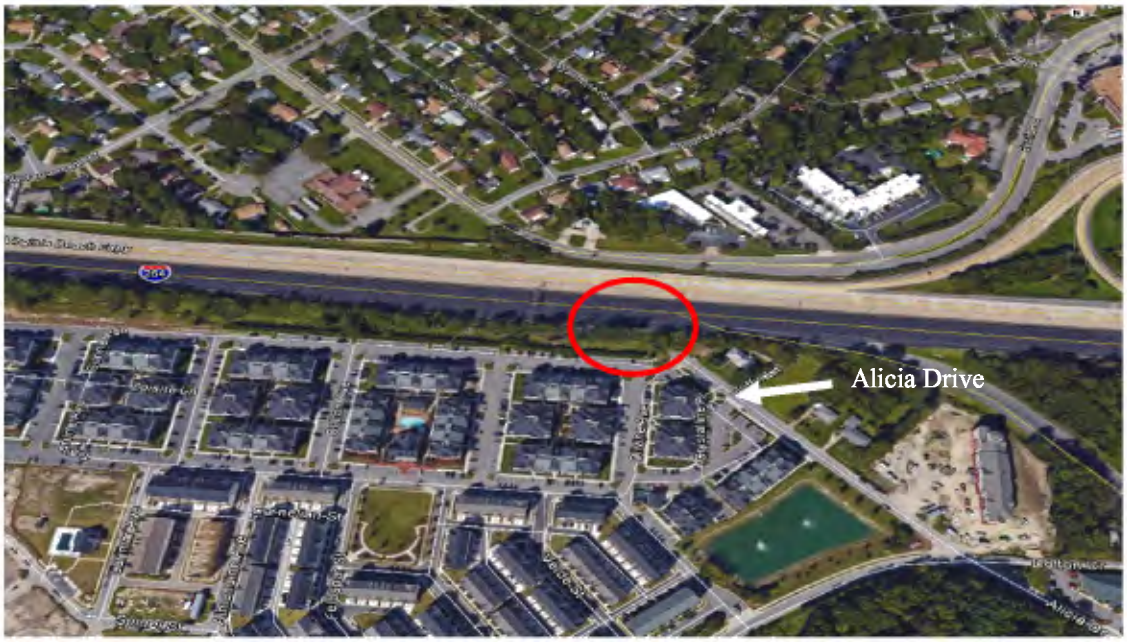


Figure 4 - Proposed Near Road Site Virginia Beach, Interstate I-264

51-009-0007, 53-G, Madison Heights Source-specific Lead Monitor, Amherst County, AQCR3

On April 18, 2016 Virginia DEQ submitted a Lead monitoring waiver request for the Madison Heights site located in Amherst County. The request for the monitoring waiver is based on the most recent design value calculation for this site. The AQS AMP 480 Design Value Report for design value years 2012 -2014 indicates that the design value for this monitor is .01 which is less than 50% of the NAAQS. Paragraph 4.5(a)(ii) of Appendix D to 40 CFR part 58 establishes less than 50% as the criteria for granting a waiver from the source specific lead monitoring requirements. The site began operation on October 1, 2010 and the monitor has never exceeded the standard at this location. A copy of the Lead Monitoring waiver request package is provided in Appendix A to this Network Review.

Figure 5 - Madison Heights Lead Monitoring Site, Amherst County

51-121-XXXX, Radford Army Arsenal Plant Pb-TSP monitor, Radford City, AQCR2

The 2008 revised Lead NAAQS standard was reviewed and retained in 2015. As a result of the review of Lead sources in Virginia associated with the proposed retention of the standard it was determined that the emissions levels at the Radford Army Arsenal Plant (Federal ID in Radford, VA met the applicability threshold. As a result of this determination, VA DEQ has begun the process of installing a site specific lead monitoring site near the plant. A location has been selected at the Stroubles Creek Waste Water Treatment Plant property and approval from the facility has been received. The spatial scale will be middle scale consistent with 40 CFR Part 58 Appendix D, paragraph 4.5(d). This site will also be installed with a collocated Lead-TSP monitor. The projected operational date is August 1, 2016.

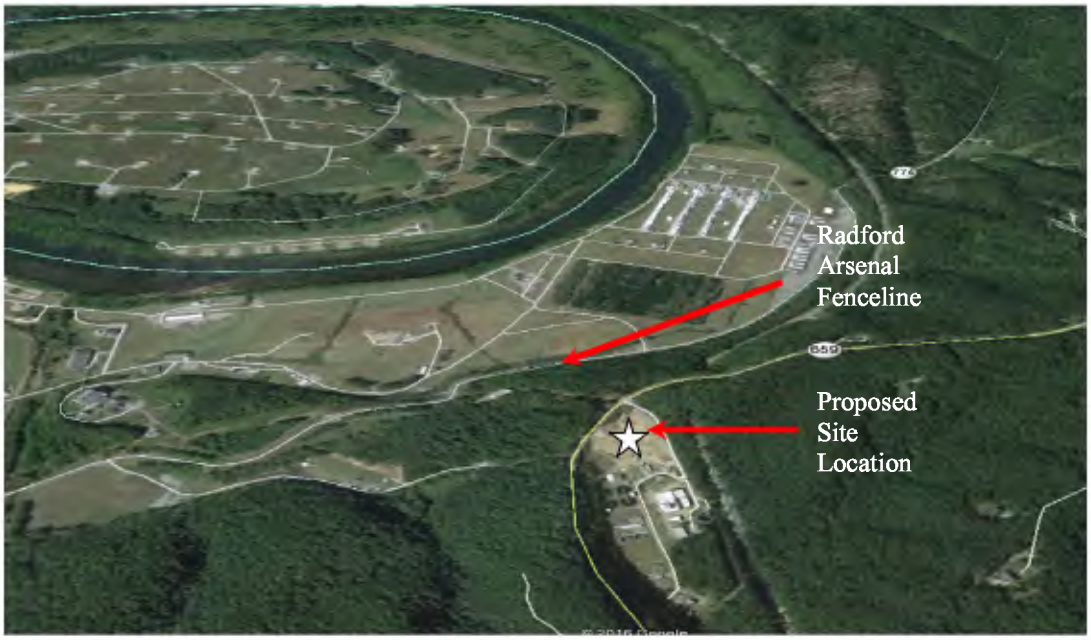


Figure 6 - Proposed Siting, Radford Army Arsenal Source Specific Lead Site

ANTICIPATED INSTRUMENTATION CHANGES
JULY 1, 2016 through JUNE 30, 2017

51-003-0001, 33-A, Albemarle HS TEOM PM2.5 Monitor, Albemarle County, AQCR4

As part of the VA DEQ PM2.5 Network Review, the Office of Air Quality Monitoring is planning to make several changes to the locations and monitoring method at several sites within the network. At the Albemarle Monitoring site the current TEOM continuous PM2.5 Monitor will be changed out and replaced by a continuous Beta Attenuation PM2.5 monitor that has been designated a federal equivalent method (FEM). The Albemarle site currently has a PM2.5 FRM filter based monitor in place. Once the FEM continuous monitor is in place the Albemarle site will have collocated FEM and FRM monitors.

51-041-0003, 71-D, Bensley Armory PM2.5 FRM, Chesterfield County, AQCR5

The current Bensley Armory site access has become problematic; The monitor is located on the property of the U. S. Defense Supply Center in southeast Chesterfield County. The level of security needed to enter the property has steadily increased consistent with the level of awareness and attention to security matters generally. This has created significant delays and persistent difficulty in accessing the monitor to perform even routine and consistent tasks needed to ensure the monitor will run properly with the appropriate level of data capture. To address this need, AQM will relocate the PM2.5 FRM monitor currently located at the Bensley Armory to the Beach Road site (51-041-0004) also located in Chesterfield County, a site that is less than 10 miles from the current Bensley Armory and has the same designated monitoring objective and spatial scale.

51-710-0024, 181-A, NOAA Storage Facility, Norfolk City, AQCR6

Currently the NOAA facility has collocated PM2.5 FRM monitors. As part of the Appendix A changes finalized on April 27, 2016, AQM reviewed the design value data for all PM2.5 FRM sites throughout the Commonwealth. AQM proposes to relocate the existing collocated PM2.5 monitor from the existing NOAA Storage Facility site to the monitoring site located in Frederick County (EPA ID 51-069-0010). This change is being made to address 40 CFR 58 Appendix A paragraph 3.2.3.4 (b) which states "If an organization has no sites with annual average or daily concentrations within ±20 percent of the annual NAAQS or 24-hour NAAQS, 50 percent of the collocated quality control monitors should be deployed at those sites with the annual mean concentrations or 24-hour concentrations among the highest for all sites in the network and the remainder at the PQAOs discretion."

51-101-003, 82-C, West Point Elementary School, King William County, AQCR4

The PM10 monitor in West Point will be shut down effective July 1, 2016. This change is being made because the monitor is not needed to meet the PM10 monitoring requirements for the Richmond MSA and the data from the monitor is well below the standard with the 2015 second high being 24 micrograms per cubic meter. The monitor has become increasingly difficult to gain access to due to the location.

ANTICIPATED TOXICS SITE ACTIVITIES
JULY 1, 2016 to JUNE 30, 2017

In FFY 2014 EPA removed Hexavalent Chrome as a mandatory pollutant as part of the NATTS suite of pollutants. VA DEQ maintained the Chrome analysis as part of the suite of NATTS pollutants due to the location of the NATTS site relative to related industrial and commercial activity within a 5 mile radius of the site. AQM has been evaluating the data and has determined that the Hexavalent Chrome results remain at de minimus levels such that the expenditure for Chrome analysis is no longer justified. Hexavalent Chrome analysis will be removed from the NATTS suite of pollutants beginning July 1, 2016.

ATTACHMENT 1 - VA SO2 DATA REQUIREMENTS RULE MONITORING

1. Introduction

On August 10, 2015, the U.S. Environmental Protection Agency finalized requirements to monitor or model ambient sulfur dioxide (SO2) levels in areas with large sources of SO2 emissions to help implement the 1-hour SO2 National Air Ambient Quality Standard (NAAQS). This rule is known as the Data Requirements Rule or the SO2 DRR. The final rule establishes that states, local and tribal agencies must characterize air quality around sources that emit 2,000 tons per year (tpy) or more of SO2. Sources may avoid the requirement for air quality characterization near a source by adopting enforceable emission limits that ensure that the source will not emit more than 2,000 tpy of SO2. The final rule gives agencies and sources the flexibility to characterize air quality using either modeling of actual source emissions or using appropriately sited ambient air quality monitors. Modeling and monitoring are both appropriate ways to assess local SO2 concentrations, and this flexibility allows agencies to work with the sources to select a cost-effective approach that adequately characterizes each required area.

The rule also establishes a timeline for implementation of both the monitoring and modeling approaches. By **January 15, 2016**, each air agency is required to submit to the relevant EPA Regional Administrator a final list identifying the sources in the state around which SO2 air quality is to be characterized. The list must include sources with emissions above 2,000 tpy of SO2. On January 12, 2016 VA DEQ submitted to EPA RIII a letter listing all applicable facilities within the Commonwealth of Virginia. By **July 1, 2016**, each air agency is required to identify, for each source area on the list, the approach (ambient monitoring or air quality modeling) it will use to characterize air quality. In lieu of characterizing areas around listed 2,000 tpy or larger sources, air agencies may indicate by July 1, 2016 that they will adopt enforceable emissions limitations that will limit those sources' emissions to below 2,000 tpy. For source areas that are to be evaluated through ambient monitoring, the air agency must submit relevant information concerning monitoring sites to the EPA Regional Administrator by July 1, 2016, as part of this annual monitoring network plan and in accordance with the EPA's monitoring requirements specified in 40 CFR part 58.

Three sources within the Commonwealth of Virginia have elected to install monitoring sites as a means of demonstrating compliance with the 1-hour SO2 National Ambient Air Quality Standard. These sources are listed below:

Table 1 – Facilities that have proposed monitoring to demonstrate compliance

Federal ID	Facility	2014 Annual SO2 Emissions (tpy)
VA000005158000003	MeadWestvaco Packaging Resource Group	5,558
VA000005102300003	Roanoke Cement Company	2,398
VA000005107100001	Lhoist North America – Kimballton Plant	6,294

This portion of the VA DEQ Annual Monitoring Network Plan describes the proposed monitoring locations for each of the above facilities and briefly explains the modeling basis for those locations.

2. Primary Quality Assurance Organization and Data Quality Review

To implement the SO2 DRR and to ensure that the data collected, reviewed, validated and certified is consistent with the requirements of 40 CFR Part 58 Appendix A, VA DEQ and the facilities collecting the

data will have to properly define and structure the relationship between DEQ's Office of Air Quality Monitoring, the facilities' management and environmental infrastructure, the monitoring data collection personnel and the data quality certifying procedures employed by the facilities. These proposed monitoring sites will be part of the Virginia DEQ Air Quality Monitoring Network for a minimum of 3 years beyond the regulatorily required January 1, 2017 start date so all monitoring, storing, evaluating, reporting, validating and certifying procedures associated with these sites must meet the same regulatory regimen as all other sites in the Virginia Network and must be described in and consistent with the Virginia DEQ SO2 Air Monitoring Quality Assurance Project Plan. These monitoring sites will essentially be operated as SLAMS monitors and to this end DEQ defines the functional requirements of the Quality System for these monitors as follows:

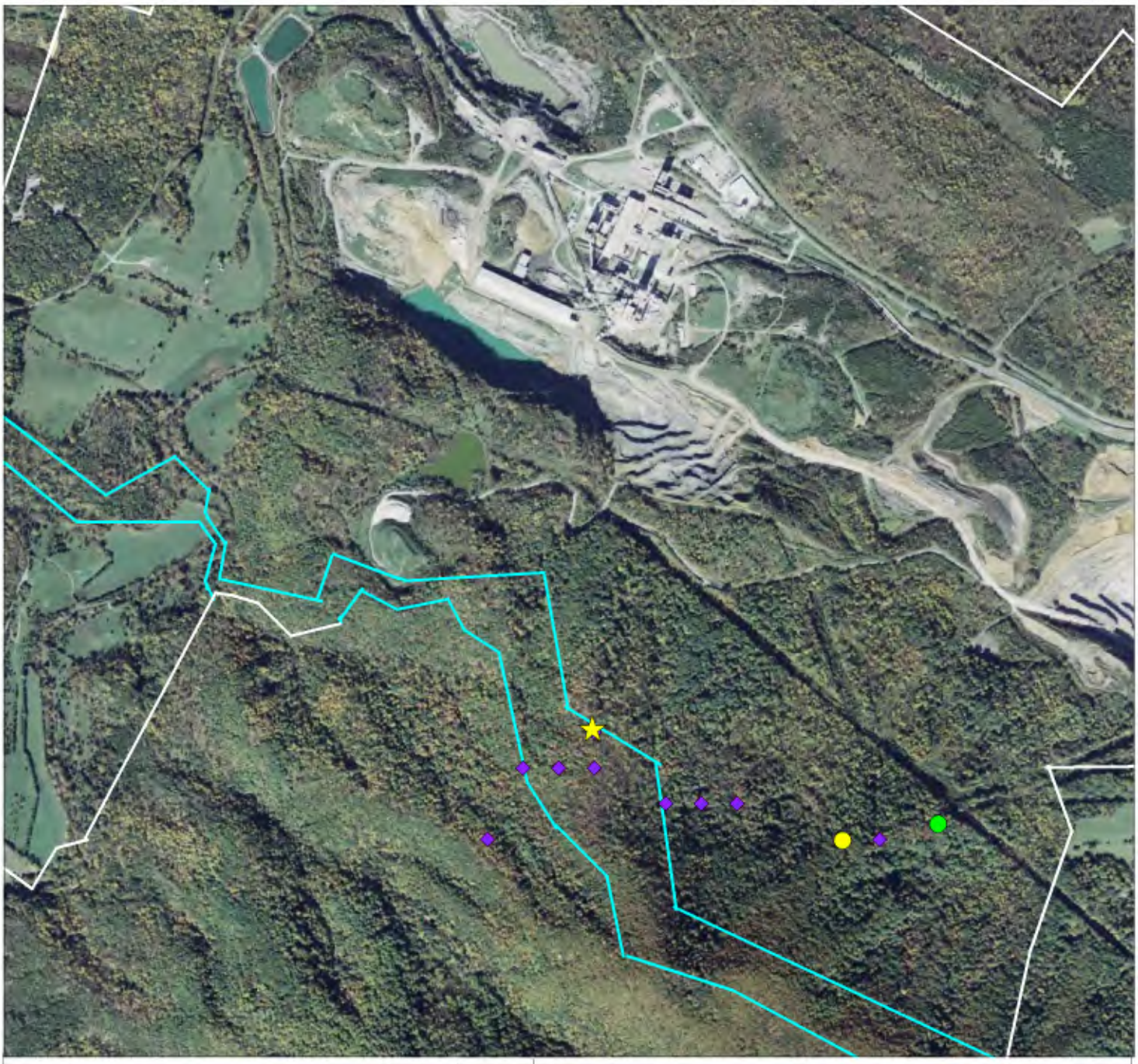
Primary Quality Assurance Organization – Virginia DEQ will be the Primary Quality Assurance Organization for these monitoring sites as they are for the Virginia Air Monitoring Network in general. 40 CFR Part 58 Appendix A paragraph 1.2 states that the PQAO is "responsible for a set of stations that monitors the same pollutant and for which data quality assessments will be pooled. Each criteria pollutant sampler/monitor must be associated with only one PQAO." Each site installed to meet the monitoring requirements of the SO2 DRR will be included in the Virginia DEQ SO2 QAPP. AQM will provide oversight in the form of performance evaluations and will work with EPA to perform the necessary Technical Systems Audits and ensure that each site is included in the EPA TTP audit program. AQM will also include the data generated from these sites in the data certification submitted to EPA annually.

Monitoring Organization – Each facility will be deemed the monitoring organization for purposes of establishing responsibility for operating the monitoring site. Each monitoring organization will collect, review, report, validate and certify their data and submit to DEQ verification that the data was properly certified. Each monitoring organization will be required to report the raw data to the PQAO (DEQ) on a periodic basis for review and approval. The Monitoring Organization will also be required to perform, record, store and report all quality assurance activities performed. The QA activities will be outlined in an independent QAPP document that will be submitted by the Monitoring Organization and incorporated into the AQM SO2 QAPP document. The Monitoring Organization will be expected to operate the monitoring site, perform all maintenance, perform routine QA procedures, perform calibrations and performance evaluations. As a Monitoring Organization reporting to the PQAO each facility is expected to be the certifying organization and the reporting organization for the data generated at their respective sites.

3. Monitoring Proposals and Siting

The following sections contain the detailed proposals and justification for the monitor siting decisions.

Section 3.1 Roanoke Cement Corporation



Receptor Rank Legend

- Top Ranked Receptor
- 2nd Highest Ranked Receptor
- Proposed Monitor Location
- Top 10 Receptor Locations (Locations 3 - 10)

N

0 0.5 1

kilometers

Roanoke Cement Company LLC
Troutville, VA

Figure 5-2
Sulfur Dioxide (SO2)
Data Requirements Rule (DRR)
Monitor Siting Evaluation
Roanoke Airport Meteorological Data

4. AIR QUALITY MODELING APPROACH AND TECHNICAL INFORMATION

This section of the report outlines information on the technical approach that was followed in the air quality modeling evaluation to identify the potential monitoring site. Based on RCC's understanding, U.S. EPA has identified/stressed two (2) important monitoring objectives as part of the SO_2 DRR:

1. Characterize peak air quality concentrations in areas around the source, and
2. Characterize air quality in populated areas, representing ambient concentrations to which people are exposed (see 80 FR 51052).

These key objectives guide RCC's analysis and recommendations. The air dispersion model selection is discussed as well as the model options that were used. The supporting information, including land use determinations, building downwash analyses, meteorological data, and terrain data, that was used in the air quality modeling analysis is presented. Whenever possible, the guidance provided in 40 CFR Part 51 Appendix W "Guideline on Air Quality Models" (U.S. EPA 2005) and U.S. EPA's Draft Modeling TAD (U.S. EPA 2013) was used to conduct the air quality modeling analyses. Additional guidance provided by DEQ was incorporated as needed.

4.1 AIR DISPERSION MODEL SELECTION

The AERMOD (**AER**MIC **MOD**el) air dispersion model was used to predict ambient air concentrations from the Facility. It is an Appendix W air dispersion model approved for regulatory modeling applications. The current regulatory version of AERMOD is 15181.

The AERMOD modeling system consists of two (2) pre-processors and the dispersion model. AERMAP (Version 11103) is the terrain pre-processor component and AERMET (Version 15181) is the meteorological pre-processor component. The AERMAP pre-processor characterizes the surrounding terrain and generates receptor elevations. The AERMET pre-processor is used to generate an hourly profile of the atmosphere and uses a pre-processor,

AERSURFACE (Version 13016), to process land use data for determining micrometeorological variables that are inputs to AERMET.

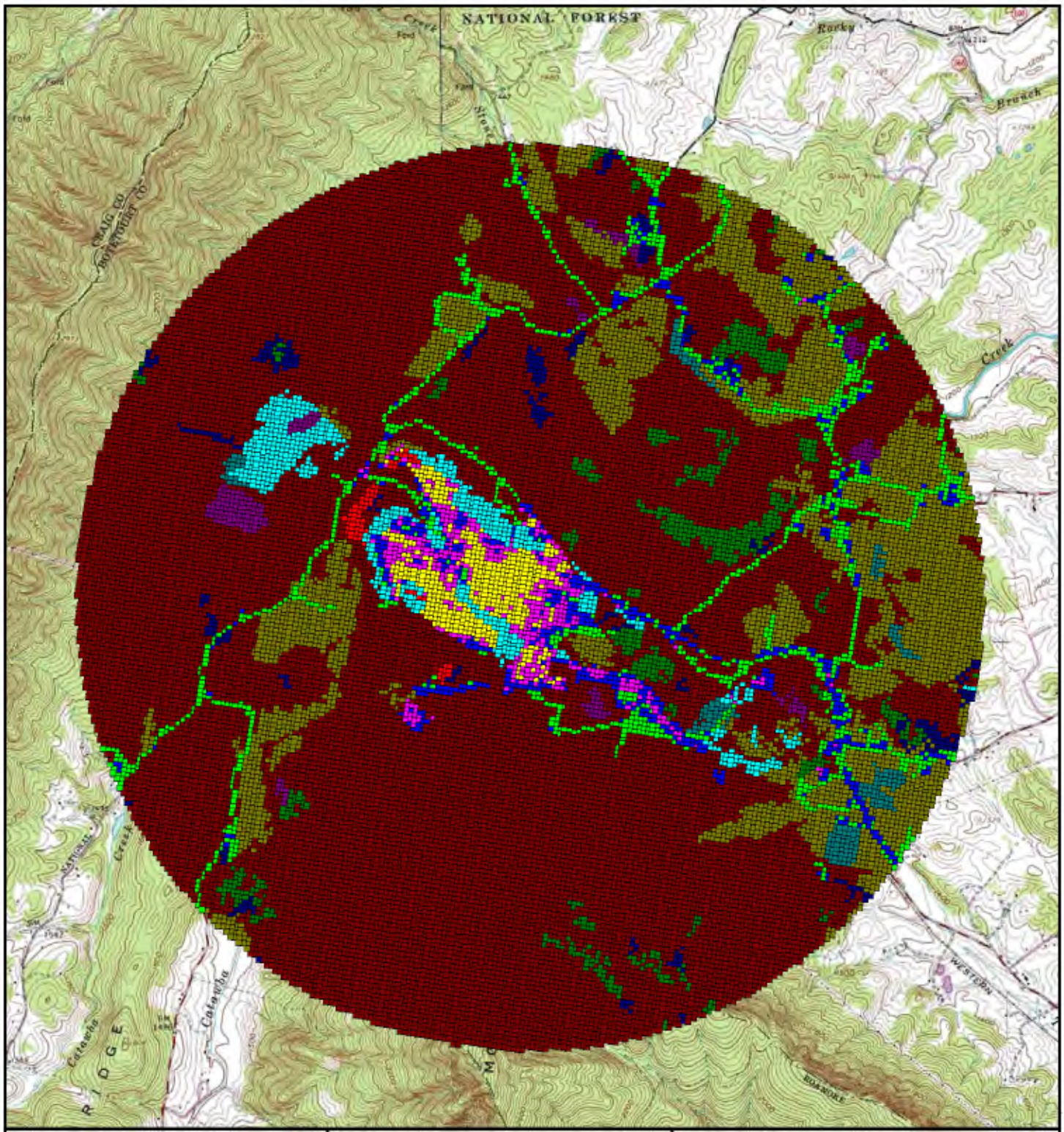
The AERMOD air dispersion model has various user selectable options that must be considered. U.S. EPA has recommended that certain options be selected when performing air quality modeling studies for regulatory purposes. The following regulatory default options were used in the AERMOD air quality modeling study:

- Stack-Tip Downwash,
- Model Accounts for Elevated Terrain Effects,
- Calms Processing Routine Used,
- No Exponential Decay for Rural Mode, and
- Missing Data Processing.

4.2 LAND USE ANALYSIS

A land use analysis for the area surrounding the Facility was compiled. The land use analysis was based on United States Geological Survey (USGS) electronic land use data for the area. Following U.S. EPA guidance (U.S. EPA 2005), the land use designation was based on the land use typing scheme developed by Auer (Auer 1978). Using the Auer land use classifications, industrial, commercial, and residential areas are classified as urban land use while agricultural, undeveloped, and common residential areas are considered to be rural land use. If more than 50% of the land use within a three (3) km radius of the Facility is rural, then a rural designation should be used in the air dispersion model.

To perform the land use analysis, geographical information system (GIS) software was used to summarize the various land use types contained in the USGS electronic land use dataset. Based on the GIS summary, the land use within a three (3) km radius of the Facility is overwhelmingly rural. Approximately 97% of the land use is rural with the remaining percentage of land use being urban. Therefore, the urban option was not selected in the AERMOD air dispersion model. The three (3) km radius land use summary for the area surrounding the Facility is shown in Figure 4-1.



approximate quadrangle location

N

0 0.5 1

kilometers

Based on USGS 1:24,000 topographical map for Catawba, VA 1974 and Daleville, VA 1978.

Figure 4-1
Roanoke Cement Company
3-km Land Use Analysis

Roanoke Cement Company LLC
Troutville, VA

2011 National Land Cover Dataset

- 21 - Developed, Open Space (4%)
- 22 - Developed, Low Intensity (2%)
- 23 - Developed, Medium Intensity (1%)
- 24 - Developed, High Intensity (2%)
- 31 - Barren Land (2%)
- 41 - Deciduous Forest (69%)
- 42 - Evergreen Forest (3%)
- 43 - Mixed Forest (1%)
- 71 - Grassland/Herbaceous (1%)
- 81 - Pasture/Hay (14%)
- 82 - Cultivated Crops (1%)

4.3 RECEPTOR GRID

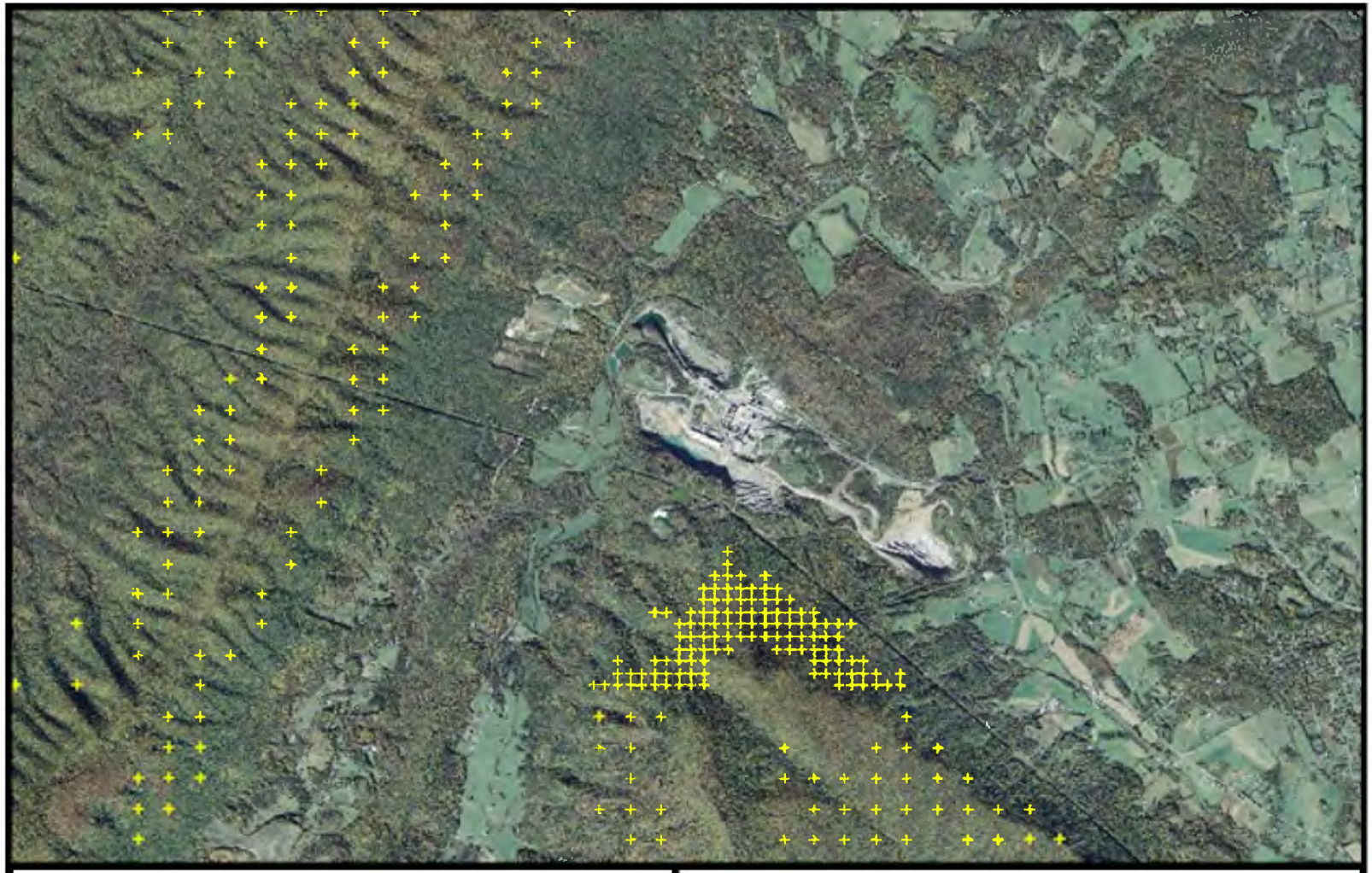
A receptor grid for the AERMOD analysis was developed to cover a 20-by-20 km square area centered on the Facility. All receptors were referenced to the UTM coordinate system, Zone 17, using NAD 83 datum. Rectangular coordinates were used to identify each receptor location. The rectangular receptor grid was centered on 589,007 m easting and 4,146,361 m northing and had the following grid spacing:

- 100 m out to ± 2 km,
- 250 m out to ± 5 km,
- 500 m out to ± 7 km, and
- 1,000 m out to ± 10 km.

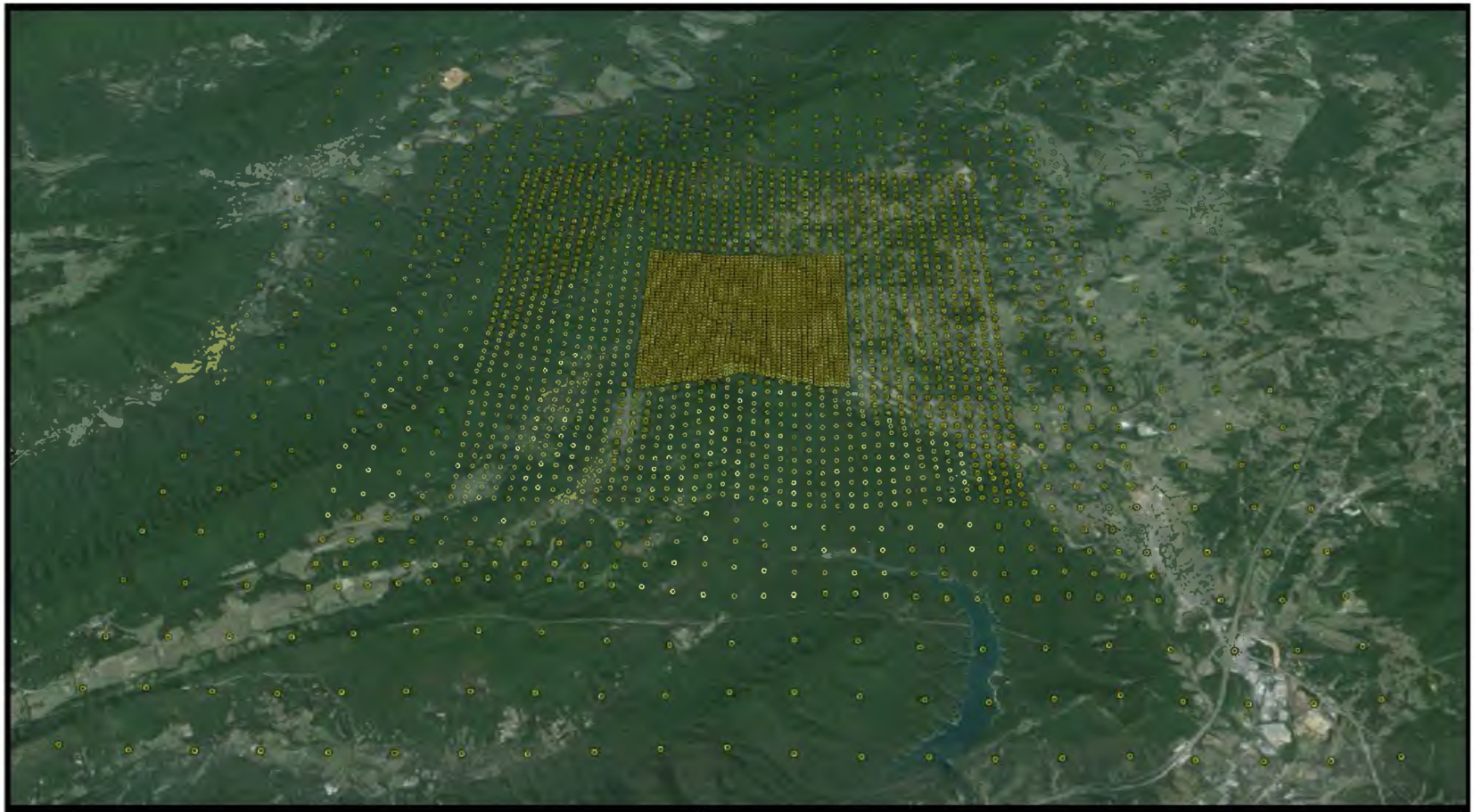
While following the receptor ranking process detailed in the Monitoring TAD, RCC determined that the receptor grid detailed above generated an amount of data beyond the limits of Microsoft Excel. Based on discussions with DEQ, RCC reduced the receptor grid size, which resulted in a manageable amount of data. This was done by first running AERMOD using the receptor grid detailed above to generate a plot file [which includes the 99th percentile maximum daily SO_2 concentration (i.e., in the form of the NAAQS) for each receptor]. Then, any receptor with a concentration less than 10% of the maximum (i.e., the concentration of the highest ranked receptor), was removed from the receptor grid.

For both receptor grids, terrain elevations were assigned to all receptors. The AERMAP terrain pre-processor (Version 11103) and 1/3 arc second NED files were used to determine representative terrain elevations for all of the receptors. The horizontal resolution of the NED data is every 10 m.

A plot of the inner portion of the modeled receptor grid is shown in Figure 4-2. A plot of the full receptor grid discussed above is shown in Figure 4-3.



Roanoke Cement Company, LLC Troutville, VA	Figure 4-2 Inner Portion of Receptor Grid



Roanoke Cement Company, LLC Troutville, VA	Figure 4-3 Full Receptor Grid

4.4 METEOROLOGICAL DATA

The meteorological data for the air quality modeling study consists of three (3) years of processed meteorological data provided by DEQ. The surface and upper air (UA) data were collected from the Roanoke-Blacksburg Regional Airport (ROA) National Weather Service (NWS) station (Meteorological Station ID 13741; UA Station ID 53829). The Facility obtained the meteorological data from DEQ for January 1, 2012 through December 31, 2014.

A meteorological data representativeness analysis is attached in Appendix A. This document analyzes the representativeness of the data collected at the ROA meteorological station to be used as meteorological data in this air quality modeling analysis. The following micro-meteorological variables were analyzed for each of the two (2) locations: albedo, Bowen ratio, and surface roughness length. Roanoke concluded that the data from the ROA meteorological station are representative of the Facility, and can be used for the air quality modeling analysis.

4.5 GOOD ENGINEERING PRACTICE (GEP) STACK HEIGHT ANALYSIS

An analysis was conducted to determine the potential for building downwash at the Facility. Guidance contained in the U.S. EPA "Guideline for Determination of Good Engineering Practice (GEP) Stack Height (Revised)" (U.S. EPA 1985) and the U.S. EPA Building Profile Input Program Plume Rise Model Enhancements (BPIP-PRIME) (Version 04274) was followed. To perform the building downwash analysis, a Facility plot plan showing the Facility buildings, structures, and stacks was digitized using GIS software. For this analysis, the Facility did not cap the main stack height in the model at GEP (the calculated GEP for this stack is 144.81 m); the actual stack height was used. This approach is consistent with the requirements in the SO_2 DRR and the Modeling TAD. The GIS digitization of the Facility is presented in Figure 4-4.

4.6 BACKGROUND AMBIENT AIR DATA

No background ambient air data were included in the air quality modeling evaluation because the purpose of the analysis is to identify potential monitoring sites based on the locations of maximum modeled concentrations in the vicinity of the Facility. Ambient background

concentrations would not impact the decision making relative to possible monitor locations because the current ambient background is expected to be uniform across the region.

4.7 LOCAL SOURCE DATA

As part of this evaluation, RCC considered local sources of SO_2 in order to determine if they had any impact on the modeled concentrations. DEQ provided a copy of Virginia's 2014 emissions inventory for this purpose. Based on discussions with DEQ, RCC considered SO_2-emitting sources within 25 km of the Facility. The three (3) following local sources meet these criteria:

- Western Virginia Water Authority: Roanoke Regional Water Pollution Control Plant (WPCP) – Roanoke, VA
- Steel Dynamics Inc.: Roanoke Bar Division – Roanoke, VA
- Old Virginia Brick Company Inc. – Salem, VA

The emissions inventory provided by DEQ included actual emissions, as well as stack location, elevation, height, diameter, exit velocity, and temperature. A summary of these parameters for the three (3) local sources is included in Table 4-1. RCC included each of the three (3) aforementioned facilities as a single point source in the SO_2 DRR modeling evaluation, with the exception of Steel Dynamics Inc., which has six (6) stacks that emit SO_2.

Roanoke Cement Company, LLC Troutville, VA	Figure 4-4 Building Downwash Image

Table 4-1
Summary of Modeled Local Source Parameters

Model Parameter	Roanoke Regional WPCP	Steel Dynamics						Old Virginia Brick Company
		1	2	3	4	5	6	
Actual Emissions (lb/hr)	2.421	0.041	0.002	0.013	13.723	0.002	2.402	2.199
X Coordinate (m)	596,600	588,790	588,790	588,790	588,790	588,790	588,780	579,690
Y Coordinate (m)	4,124,700	4,125,390	4,125,390	4,125,390	4,125,390	4,125,390	4,125,380	4,126,500
Elevation (m)	295.7	301.8	301.8	301.8	301.8	301.8	301.8	320.0
Stack Exit Temperature (K)	519.3	483.2	360.9	360.9	360.9	360.9	352.6	466.5
Stack Exit Velocity (m/s)	10.3	17.2	17.8	17.8	10.4	17.8	20.2	19.1
Stack Height (m)	6.40	30.48	45.72	45.72	45.72	45.72	30.48	10.36
Stack Diameter (m)	0.51	1.68	3.35	3.35	6.71	3.35	1.22	0.94

5. AIR QUALITY MODELING CONCLUSIONS

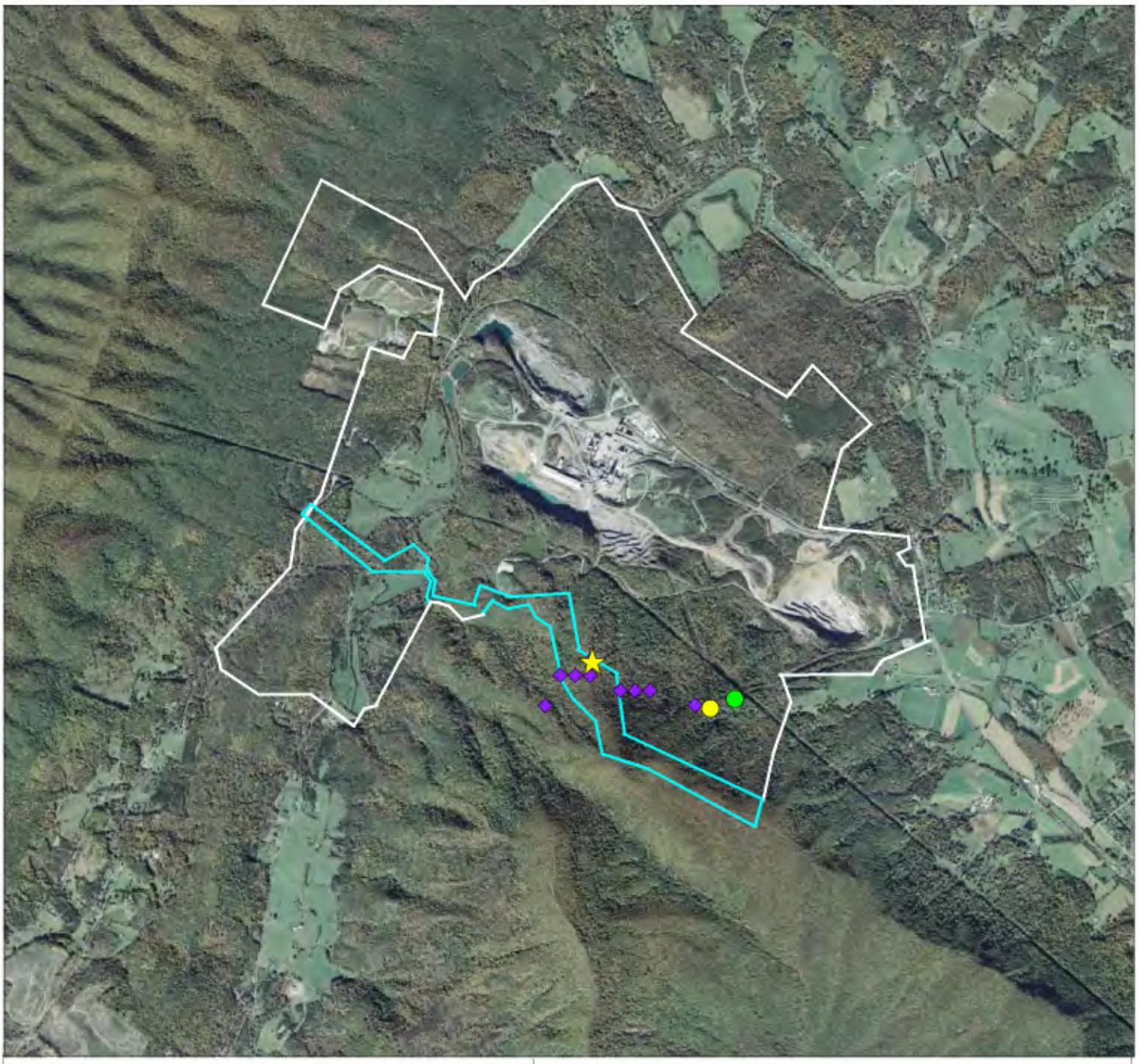
This section of the report discusses how the air quality modeling analyses were evaluated and RCC's conclusions. The information presented herein provides preliminary information on the potential monitoring site in and around the area of the Facility.

5.1 MODELING RESULTS

RCC evaluated the air dispersion modeling results to determine where the maximum ground-level concentrations occur as a result of the SO_2 emissions from RCC operations and local sources in a location that is reasonably accessible. As described in Section 4.7, the inclusion of local sources in the modeling evaluation did not have any impact on the results. The modeling results demonstrate that the maximum impact from RCC operations is considerably greater on the Blue Ridge Mountains to the south of the Facility than anywhere else in the modeled receptor grid, supporting the need for one (1) ambient monitor.

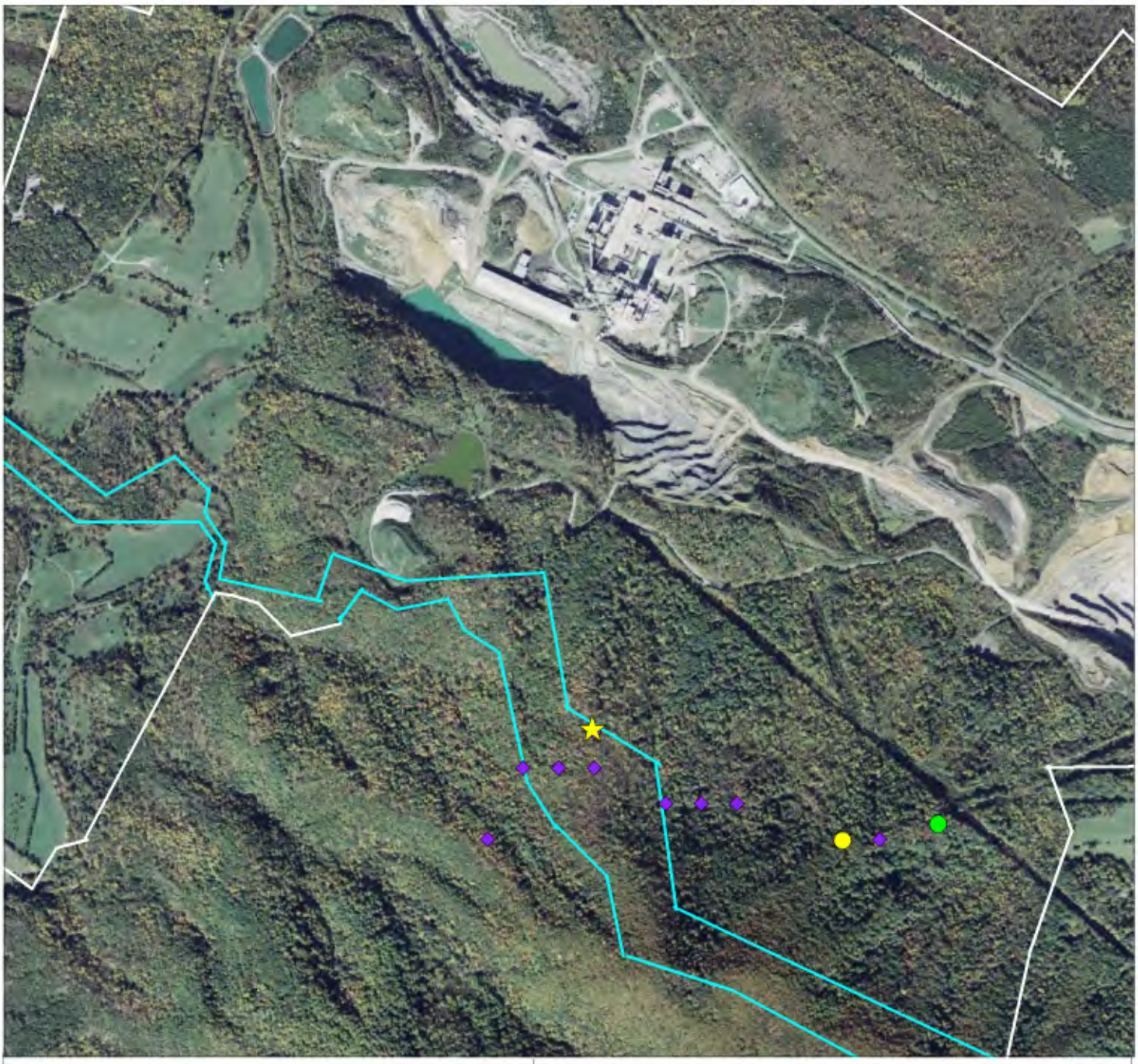
Figure 5-1 and Figure 5-2 depict the results of the SO_2 modeling evaluation for the Facility in detail. The maps each identify the following:

- The Facility property boundary in a white line;
- The boundary of the Appalachian Trail Protective Easement in a teal line (which includes the southern boundary of the Facility);
- A map scale for reference;
- A yellow star, which represents the top ranked receptor location (as discussed in Section 5.2);
- A yellow circle, which represents the No. 2 ranked receptor overall (as discussed in Section 5.2);
- Purple diamonds that represent the No. 3 through 10 ranked receptors overall (as discussed in Section 5.2);
- A green circle, which represents the recommended location RCC is considering for installing an SO_2 monitor (as discussed in Section 5.2).



Roanoke Cement Company LLC
Troutville, VA

Figure 5-1
Sulfur Dioxide (SO2)
Data Requirements Rule (DRR)
Monitor Siting Evaluation
Roanoke Airport Meteorological Data



Receptor Rank Legend

- Top Ranked Receptor
- 2nd Highest Ranked Receptor
- Proposed Monitor Location
- Top 10 Receptor Locations (Locations 3 - 10)

N

0 0.5 1

kilometers

Roanoke Cement Company LLC
Troutville, VA

Figure 5-2
Sulfur Dioxide (SO2)
Data Requirements Rule (DRR)
Monitor Siting Evaluation
Roanoke Airport Meteorological Data

5.2 RECEPTOR RANKING PROCEDURE

U.S. EPA outlines an example of the approach that could be used to identify a suitable ambient monitor location using dispersion modeling in the Monitoring TAD. RCC followed U.S. EPA's approach, which calls for ranking each modeled receptor by the following parameters:

- By the three (3) year average of the 99th percentile maximum daily concentrations: the receptor with the highest 99th percentile concentration is given a ranking of one (1), the receptor with the second highest 99th percentile concentration is given a ranking of two (2), and so on.
- By the number of calendar days during which the maximum hourly concentration across the entire modeled grid occurs at a receptor. The receptor at which the highest hourly concentration occurs during the highest number of calendar days is given a ranking of one (1).

The two (2) rankings evaluated above were added together to obtain a combined ranking as described in the Monitoring TAD. If a receptor has the highest modeled 99th percentile concentrations [ranking of one (1)] and has the highest hourly concentration for the highest number of calendar days [ranking of one (1)], the total ranking score of that receptor would be two (2). In U.S. EPA's example, the receptor with the lowest combined ranking score was selected as the location for the ambient monitor.

Per the Monitoring TAD when performing modeling to inform monitor site placement, it is unnecessary to consider receptors located in areas or locations prohibitive to establishing fixed monitor sites such as a water body. RCC did not screen out any receptors in the modeling run that are prohibitive to establishing a fixed monitor site. Instead, RCC has included these locations in the receptor ranking and provided further justification below for their removal from consideration as the recommended monitor location.

The area surrounding the Facility consists of dense forests and elevated, mountainous terrain that is home to numerous major hiking trails including the Andy Layne Trail and the Appalachian Trail. Hikers routinely visit the area for the picturesque views and landscape. The model run includes a number of receptors (including the highest ranked receptor) on the Blue Ridge Mountains that are part of the scenic vista that can be viewed when looking out from the Andy

Layne and Appalachian Trail systems. This area is currently inaccessible for the purposes of establishing a fixed monitor site as no road or vehicle trail exists to access the ridgeline. To access these locations, it would require expansive environmental destruction consisting of major tree clearing of a mountain side, effectively destroying the picturesque landscape that makes the area desirable to hikers and residents.

The mountainous terrain and elevation change of 500 feet from the existing road to the area that includes the highest ranked receptor would require major construction of a switch-back road to provide access to the potential monitor site. Per the U.S. Department of Agriculture document "A Landowner's Guide to Building Forest Access Roads," a road grade greater than 12 percent over 300 feet is problematic and an alternative route should be considered. In addition, good road conditions have a road grade less than 8 percent. The conservative grade of the terrain to access the highest ranked receptor is approximately 20% with some stretches of terrain having a grade of upwards of 35% grade for approximately 500 feet. These steep grades indicate the need for numerous switch-backs in order to construct a safe road to access the monitor site. More switch-backs would increase the road length from approximately 1,400 feet to 3,168 feet, requiring more tree clearing and possible land moving and significantly more cost to construct an access road (upwards of $2 million), destroying the environmental landscape of the mountainside.

Similar to U.S. EPA's example of a receptor placed on a water body as a location prohibitive to establishing a fixed monitor site, the top ranked receptor that falls in dense forests and elevated, mountainous terrain of the Blue Ridge Mountain is not reasonably accessible. Therefore, RCC has excluded the highest ranked receptor from consideration for the placement of an ambient monitor.

After removing the top ranked receptor from consideration for the placement of an ambient SO_2 monitor, RCC evaluated the second highest ranked receptor. The second highest ranked receptor is also located on the Blue Ridge Mountains to the south of the facility at a similar elevation to the top ranked receptor. The location of this receptor is as follows:

- UTM Easting (m): 589,607
- UTM Northing (m): 4,144,861
- Elevation (m): 637

Because this location is still within a relatively steep and heavily wooded area, the actual monitor site will be located as follows:

- UTM Easting (m): 589,771
- UTM Northing (m): 4,144,904
- Elevation (m): 612

This location is ideal for the installation of a monitor because the proximity to the power line easement makes the location more readily accessible. This location will require less tree clearing and also a shorter access road (RCC will improve an existing road to access the monitor site), both of which will limit the visibility of the monitor site to the community and Andy Layne and Appalachian Trail hikers. In addition, this location has a similar elevation to the second highest receptor location. Peak predicted concentrations in the dispersion modeling are being driven by the complex terrain of the area, therefore potential monitor sites with similar elevations (along a similar elevation contour) in close proximity to each other is adequate for characterizing air quality in the vicinity of peak predicted modeled concentrations.

Therefore because of the comparable characteristics of the proposed monitor site to the location of the second highest ranked receptor, RCC considers the proposed monitor site to be a suitable location for the installation of an ambient SO_2 monitor to satisfy the SO_2 DRR.

The spreadsheet used to rank the receptors is included in the Electronic Appendix.

5.3 CONCLUSIONS/RECOMMENDATIONS

The Facility has the following observations relative to the DRR evaluation in support of the conclusion that one (1) ambient monitor would meet the requirements of the DRR.

1. ***The Facility's and the local source's 99^{th} percentile modeled ground-level concentrations do not overlap or influence ambient monitoring decisions.***

2. ***Maximum modeled concentrations resulting from the Facility's operations occur on the Blue Ridge Mountains to the south of the Facility.***

3. ***U.S. EPA's example approach for selecting a monitor location from the Monitoring TAD (detailed in Section 5.2) supports the need for only one (1) ambient monitor.***

4. ***The accessible location that meets the DRR obligations and that is protective of the 1-hour NAAQS is the following location:***

    - ***UTM Easting (m): 589,771***
    - ***UTM Northing (m): 4,144,904***

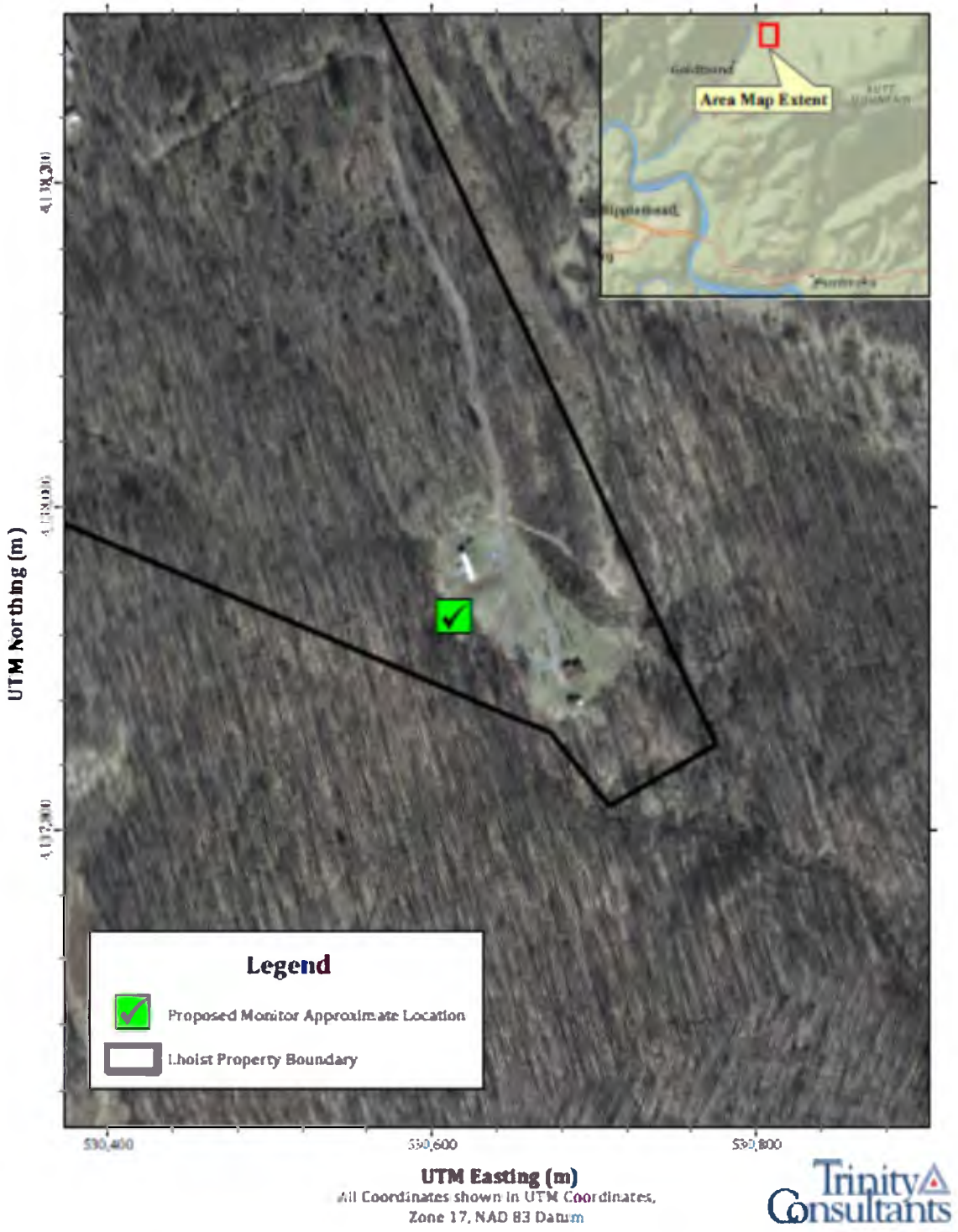
5.4 AIR QUALITY MODELING FILES AND EMISSIONS INVENTORY

An electronic copy of the air quality modeling input and output files, as well as supporting files (e.g., meteorological data), are included as an electronic appendix to this report. Specifically, the following files are included:

- Model input file,
- Model output file,
- Building downwash (BPIP-PRIME) output file,
- Fourth high plot (contour) file for all sources,
- Daily maximum contribution file for all sources,
- Two (2) meteorological data files,
- Hourly normalized emissions file (including hourly stack exhaust flow rate and temperature data),
- AERSURFACE files, and
- Preliminary receptor ranking spreadsheet.

Section 3.2 Lhoist North America – Kimballton Plant

Figure A.1 Location of Proposed Lhoist North America Kimballton SO_2 Monitoring Station



3.1. MODELING RESULTS ANALYSIS

The SO_2 1-hour concentrations are evaluated in the form of the NAAQS standard, i.e. the 99th percentile is calculated for each receptor. As recommended in the modeling *Guidelines*, the 99th percentile is best represented by the 4th highest daily maximum 1-hour concentrations; therefore, the 4th highest values at each receptor are processed to obtain the design values. As stated in the previous section the normalized emission rates are used in the modeling; therefore, the resulting concentrations are the Normalized Design Values (NDV) rather than the actual predicted concentrations, which is in agreement with recommendations published in the Monitoring TAD.

Air dispersion is highly dependent on the prevailing winds. Based on Figure 2-2, approximately 80% of wind direction is northeast or southwest, i.e. six of the sixteen possible directions. A more detailed frequency distribution of wind direction is listed below (ranked from highest to lowest).

- South-Southwest to West-Southwest: 42.0%
- North-Northeast to East-Northeast: 39.5%
- North: 5.5%
- South: 4.5%
- South-Southeast to East: 4.5%
- North-Northwest to West: 4.0%

Consistent with the prevailing winds and clearly influenced by the complex terrain, the spatial distribution of the NDVs forms a pattern of modeled impacts shown on Figure 3-1, on which areas of higher impacts can be distinguished and can be seen in more detail in Figure 3-2 and 3-3. These areas with higher impacts are identified as West Area, Olean Area, Northeast Area and South Area. Separately, LNA had previously evaluated the area around the facility for potential locations to site a monitor and had identified the Northeast Area as well as another area, the Church Area. These areas are shown on Figures 3-2 and 3-3.

It is important to note that, as a Gaussian model, AERMOD has some computational limitations and caution and critical thinking are required when interpreting the modeled maximum impacts. The terrain around the plant is extremely steep, such that AERMOD cannot accurately consider terrain-induced impacts on wind flow and resulting ambient concentrations. For example, as evidenced by Figures 1-2, 1-3, 2-5 and 3-1, the model predicts relatively high impacts on the backside (facing away from plant) of ridges at the same elevation as on the frontside (facing plant), with lesser impacts at the ridgeline – the only explanation for the model to predict those results is that it cannot "see" the ridgeline and is instead calculating impacts as if the plume passes through the ridge.[5] The terrain around Kimballton is truly steep to a degree that is uncommon for a manufacturing facility, and the accuracy of AERMOD in predicting impacts at this location is not a given, especially in a quantitative manner.

[5] One example of AERMOD ignoring the ridge can be seen in Figure 3-2, where higher impacts (as shown by the purple square) are seen north of the peak of Fork Ridge on the downslope; another is see with two higher impact receptors shown along Olean Road to the east. On a larger scale, a similar case occurs just across the West Virginia state line on the downslope of Peters Mountain. For a model like AERMOD that calculates impacts via a straight-line approach, these predicted high impacts in the "shadow" of terrain are nonsense.

Figure 3-1. NDVs across the Full Receptor Grid

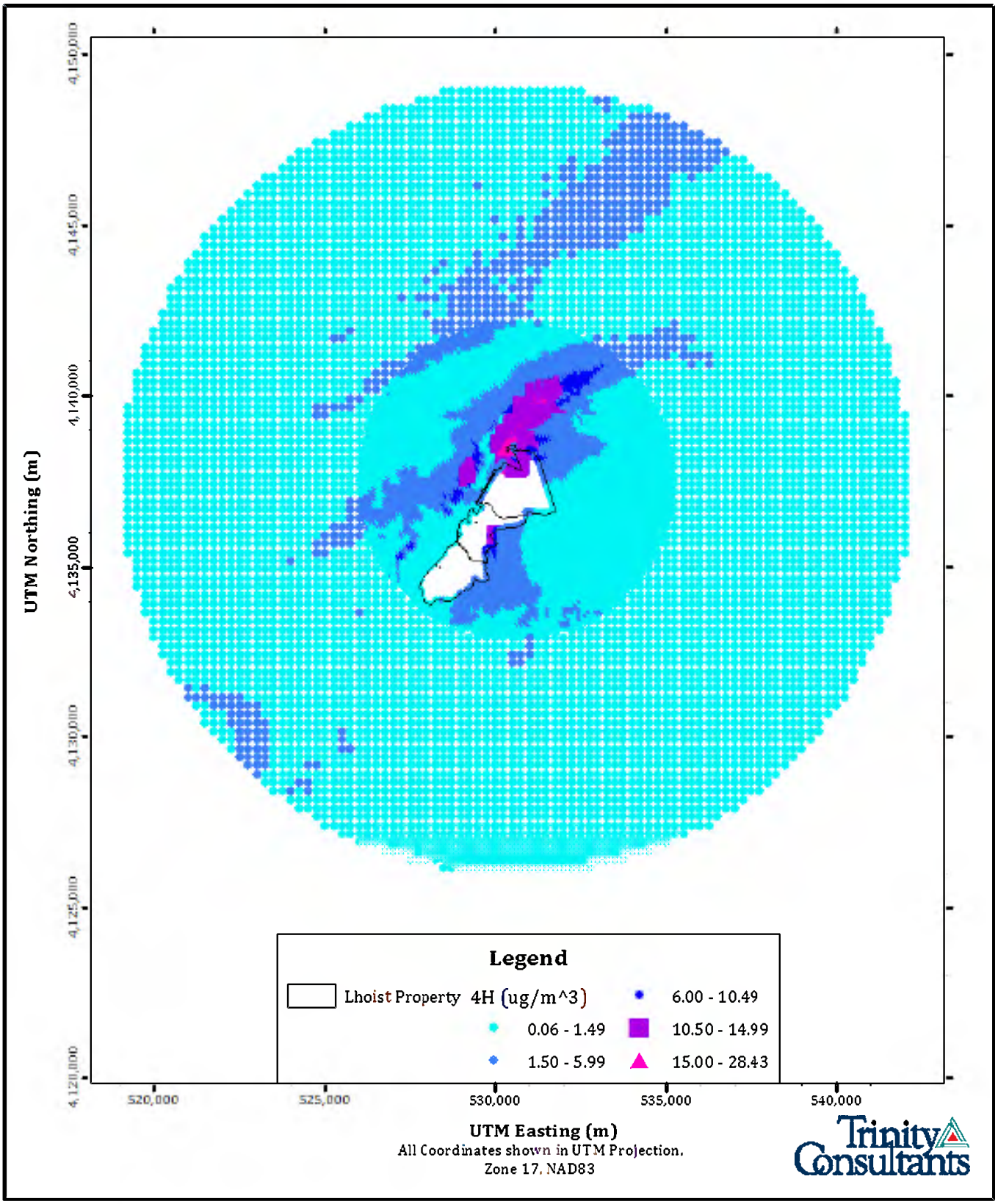


Figure 3-2. NDVs near the Kimballton Facility, on a Topographic Map

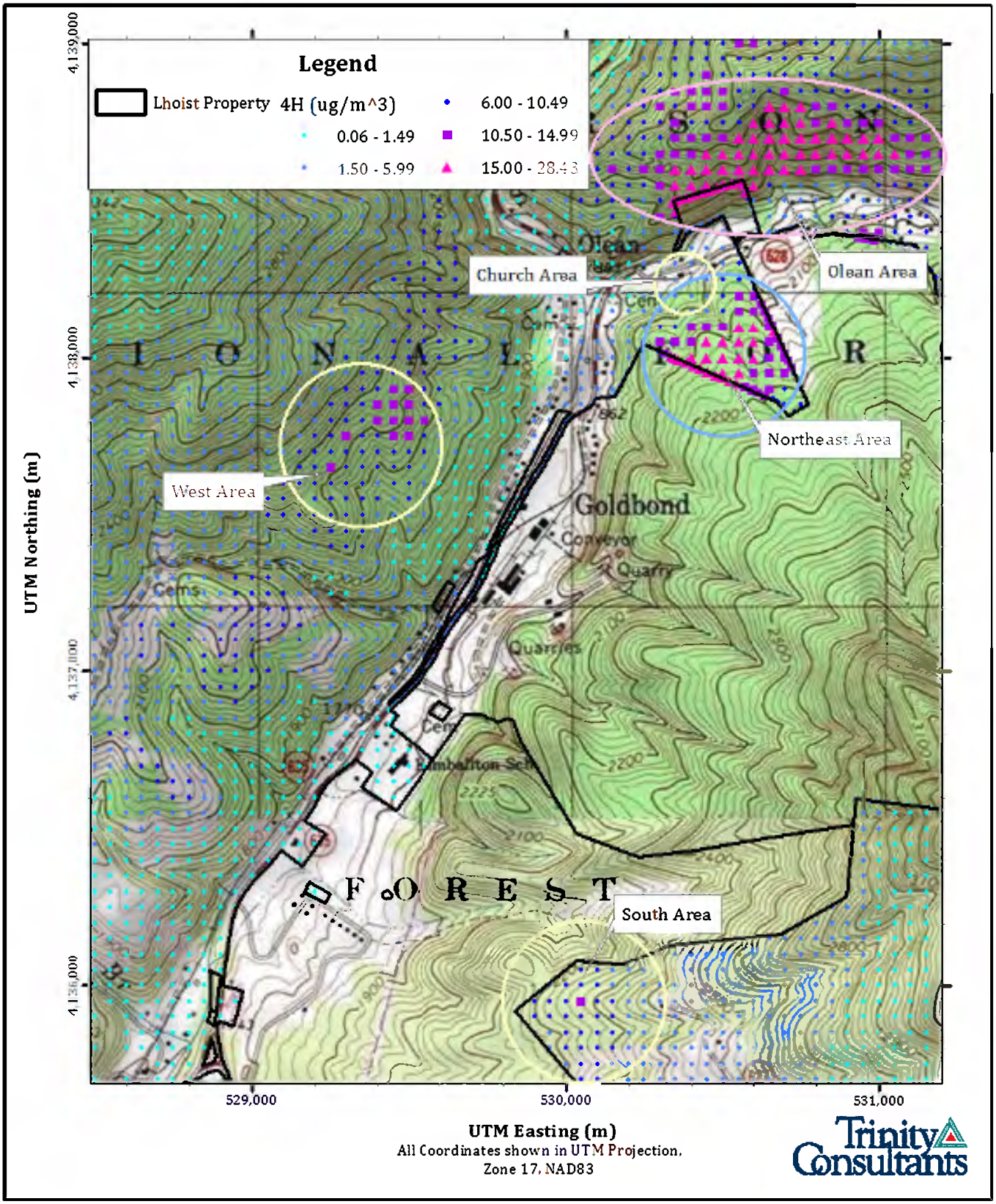
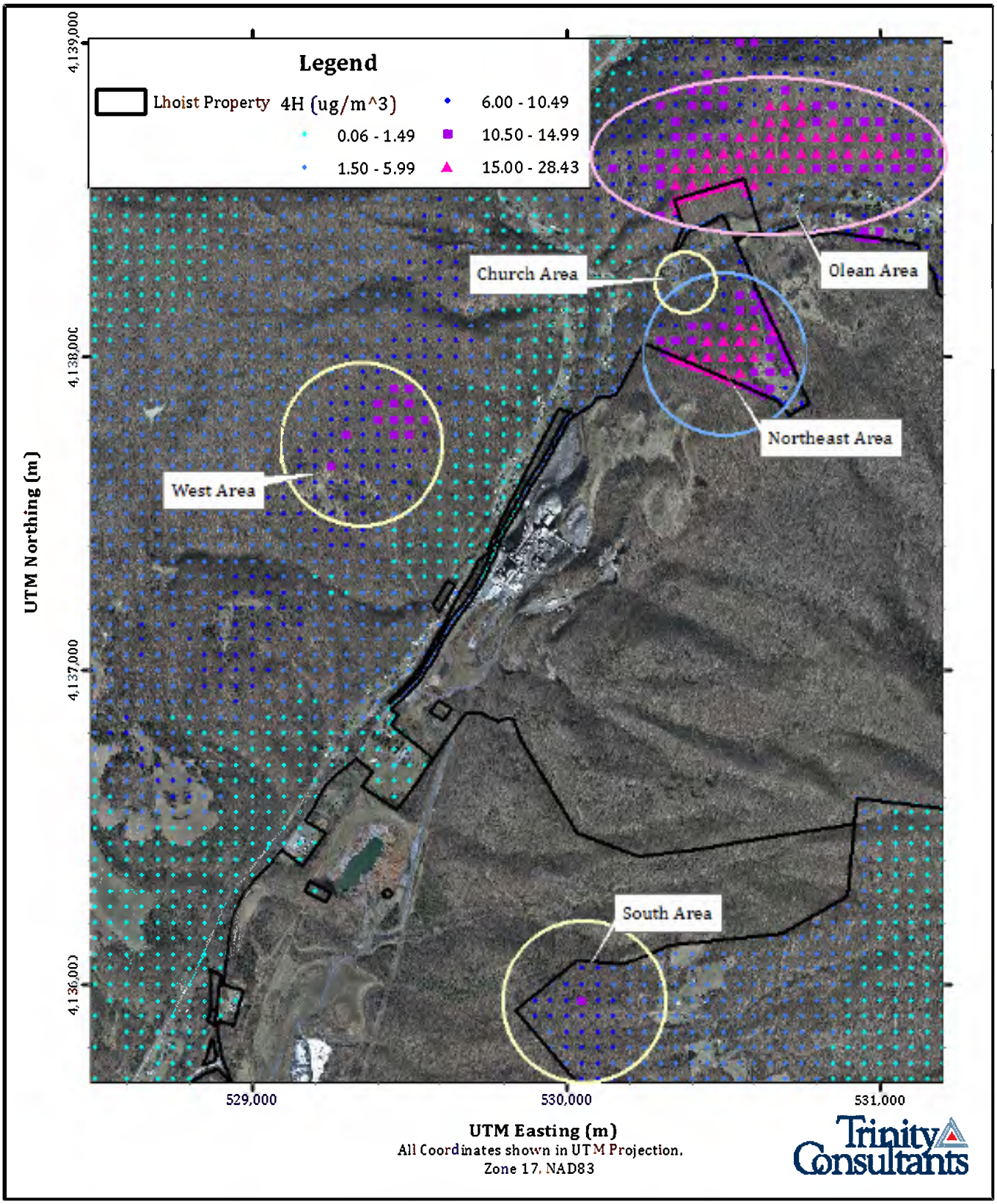


Figure 3-3. NDVs near the Kimballton Facility, on an Aerial Image



3.2. AREAS TO EXCLUDE

The ideal when siting an ambient monitor is to place the monitor at the location of expected peak concentrations, where such a location can be identified with the assistance of air dispersion modeling. However, in addition to consideration of predicted model impacts, secondary factors must be considered in selection of a monitor location. For instance, the Monitoring TAD states that, if a locations is identified to consider for monitoring due to the location of expected peak concentration, that location may not be "available due to logistical considerations." The Monitoring TAD goes on to elaborate that, "when modeling to inform monitor site placement, it would be unnecessary to have receptors located in area or locations prohibitive to establishing fixed monitoring sites, such as open water, etc."

Of the areas identified as having higher modeled concentrations, the Olean Area clearly meets the TAD criteria of a location that is prohibitive to establishing a fixed monitoring site. The reasons to exclude this area (and potentially any others like it) are many but can be distilled down to two major points.

First, the area is not accessible by car or by foot. Both Figure 3-2 and 3-3 show the area as inaccessible by any pre-existing road or foot trail. In addition, between the area and Olean Road is a small ravine due to Laurel Branch, which is a creek that spans approximately 30 feet across and lacks any pre-existing bridges.

Second, the area has terrain that is too steep not only to install a monitor but also to periodically maintain and audit. During a field visit to the area on March 1, 2016, photos, a video, and measurements were taken to demonstrate the severe steepness of this area; these photos and video are included in the electronic files with this submittal and include a description for each image. Slope of the terrain was measured in degrees; the measured slope from the area of high impact down to Laurel Branch is an average of 39°, but other portions of the area had recorded measurements in excess of 45°. Climbing to higher impact location was difficult and required handholds in numerous places. To be able to stand to take pictures required support from a tree or other structure, as the slope was too steep to stand normally. Moreover, descending back to Laurel Branch was more difficult and required traversing the slope some distance to a small ravine and descending that ravine with a mix of handholds and sliding. The area was accessed on a dry day in ideal conditions and was borderline dangerous without ropes for support, and would be more difficult in poor conditions.

LNA evaluated a range of potential engineering strategies to installing a monitoring unit at the Olean Area, including such possibilities as a helicopter lowering the monitoring station and even using a burro to carry equipment to the site for quarterly audits. However, that site is simply too steep – even cutting a hiking only trail across that slope would be very difficult, let alone something wider. In addition to being inaccessible for a monitoring station, the Olean Area of high impact is not reasonably accessible under any circumstances, and has low likelihood of ever having a person in that area. The Olean Area is rejected from consideration consistent with the Modeling TAD as an area which is prohibitive to establish a fixed monitoring site.

3.3. ANALYSIS OF POTENTIAL MONITOR SITES

As shown in Figures 3-2 and 3-3, after excluding the Olean site, there are four potential monitor sites that remain: West Area, Church Area, Northeast Area, and South Area. These areas are considered via an additional analysis, which consists of selecting and evaluating a smaller number of receptors and including each local potential monitor location peak NDV concentration. Each of the receptor clusters consists of four receptors, which are evaluated in two aspects – concentration magnitude (on a H1H maximum daily) and frequency of "hit", where "hit" is used as a term to describe the event of one receptor having the maximum hourly concentration at a particular day. To generate the frequency of occurrence of the maximum daily 1-hr impact at each receptor, another model run in AERMOD is set to output the maximum daily 1-hr concentrations from the set of receptors using the MAXDAILY output option. The clusters of receptors evaluated are shown in Figure 3-4. The modeling results for the receptors of interest are reviewed and ranked, based on both the frequency of occurrence of the maximum daily impact at that receptor location, as well as the maximum impact (NDV) ranking at that receptor. Table 3-1 and Table 3-2 provide a summary of that ranking for each receptor and for each area, respectively. For rank, a lower value indicates a more desirable monitoring location based on predicted impacts.

Figure 3-4. 4-Receptor Clusters for Consideration of Monitor Placement, on an Aerial Image

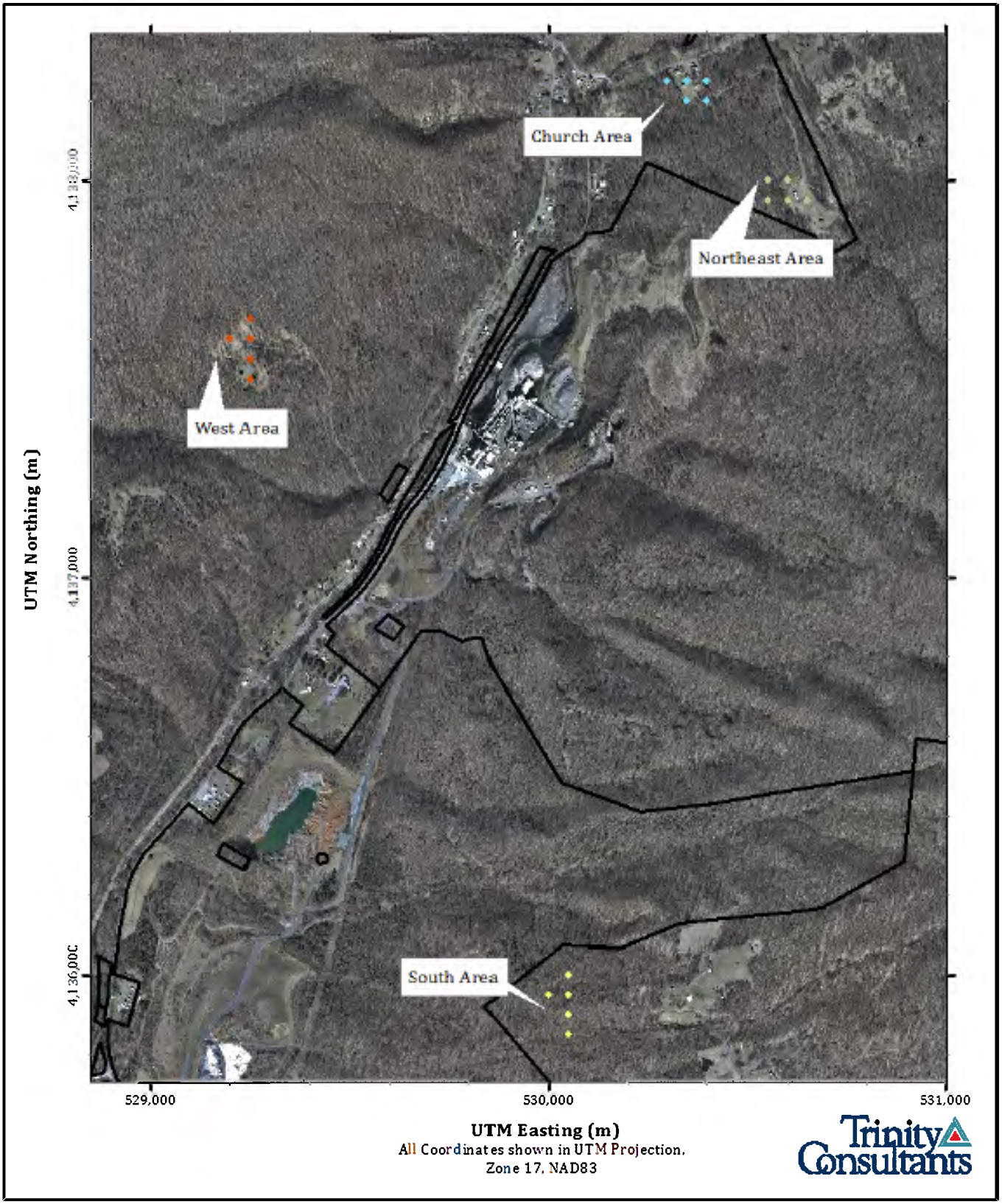


Table 3-1. Ranking of Individual Receptors by NDV Magnitude and Daily Maximum Frequency

	UTM Easting (m)	UTM Northing (m)	Normalized Design Value (NDV)	NDV Rank	Number of Days the Max Receptor	Number of Days Rank	Receptor Score	Scoring Rank*
Northeast	530,550	4,137,950	18.37	1	115	1	2	1
Northeast	530,550	4,138,000	17.25	2	22	7	9	2
Northeast	530,600	4,137,950	14.16	4	2	14	18	10
Northeast	530,600	4,138,000	17.12	3	2	14	17	8
Northeast	530,650	4,137,950	13.02	5	30	4	9	2
South	530,000	4,135,950	9.05	13	33	3	16	7
South	530,050	4,135,850	9.27	11	0	18	29	14
South	530,050	4,135,900	10.32	8	0	18	26	13
South	530,050	4,135,950	11.00	6	24	6	12	4
South	530,050	4,136,000	10.31	9	6	11	20	11
West	529,200	4,137,600	9.70	10	29	5	15	5
West	529,250	4,137,500	7.72	15	62	2	17	8
West	529,250	4,137,550	8.97	14	1	17	31	18
West	529,250	4,137,600	9.11	12	9	9	21	12
West	529,250	4,137,650	10.63	7	13	8	15	5
Church	530,300	4,138,250	1.72	20	7	10	30	16
Church	530,350	4,138,200	2.25	16	2	14	30	16
Church	530,350	4,138,250	2.00	18	0	18	36	20
Church	530,400	4,138,200	2.05	17	5	12	29	14
Church	530,400	4,138,250	1.93	19	3	13	32	19

*Lower rank is higher impact

Table 3-2. Ranking of Individual Areas by NDV Magnitude and Daily Maximum Frequency

	Number of Receptors	Average NDV	Sum of Max Days	Average Rank*
Northeast	5	16.0	171	4.6
South	5	10.0	63	9.6
West	5	9.2	114	9.8
Church	5	2.0	17	17.0

*Lower rank is higher impact

As can be seen from Tables 3-1 and 3-2, not only are the NDV's at the Church Area lower than those at the other areas, but also the daily maximum occurs less often than at either other area. The Church Area is identified as a potential monitoring location that is close to the sources, at an elevation close to stack height, and that is reasonably reachable via a road that is passable in inclement weather, and would be the preferred location for access and management of an ambient monitoring station. However, placing an ambient monitor in the Church Area would not meet the monitoring objectives, even though the Church Area is likely the only site accessible during all weather conditions.

Of the remaining areas, the South Area and West Area have similar NDVs, while the Northeast Area is appreciably higher. The daily maximum occurs infrequently at the South Area, more frequently at the West Area, and most frequently at the Northeast Area, which is consistent with the prevailing wind patterns as noted in Figure 2-2. Even without a modeling analysis, based on the orientation of the surrounding terrain, wind flows consistent with the windrose would be expected, and those wind flows would be more likely to impact the Northeast Area rather than the other areas; the ranking analysis shown in Table 3-2 and the qualitative analysis both identify the Northeast Area as the preferred monitoring location, and the Northeast Area is the default choice for locating an ambient monitor.

3.4. NON-MODELING FACTORS

LNA has considered other aspects regarding the Northeast Area and West Area that could be relevant to selecting a monitoring location. Each of these areas was also inspected during a field visit to the area on March 1, 2016; photos were taken at each site, a video was taken at the Northeast Area, and angle measurements were made at the West Area. All documentation from the field visits is included in the electronic files along with a description of each image. Given its lower ranking the South Area was not visited.

- Accessing Sites
  - The Northeast Area is accessed by a rough four-wheel drive only driveway – the road climbs steeply initially to the east through a badly rutted area before turning south on a more moderate grade. Road improvements would be needed to access the site across a range of weather conditions and the driveway would still likely require four-wheel drive, but should be accessible under inclement weather except for after appreciable snowfall.
  - The West Area is accessed by a newer gravel driveway that is in good condition but is extremely steep for a gravel road – measurements during onsite field inspection showed the driveway climbing at 12.5 degrees (equivalent to a 28% grade), which is steeper than allowable by USFS guidelines for driveway or access road construction – for example, FSH 7709.56 – ROAD PRECONSTRUCTION HANDBOOK, CHAPTER 40 – DESIGN, specifies that for four-wheel drive vehicles a maximum 18% grade is acceptable. Based on tracks on the West Area driveway, it appears most access to the site is achieved by small all-terrain vehicles.
  - Overall, the Northeast Area has more obtainable access
- Usage of Sites
  - The Northeast Area has an occupied single family residence on the southern edge of the clearing.
  - The West Area has a basic cabin that is owned by a person who resides along Stony Creek adjacent to the lime plant – it is not clear whether the cabin has water hookups that could accommodate longer term usage, and the site does not have electrical hookups – based on site review it is clear that the site is not a residence.
  - Overall, the potential for human exposure is greater at the Northeast Area.
- Connectivity
  - The Northeast Area has electrical power and communications due to the family residing there.
  - The West area does not have either electrical power or communications at the site; further the landowner will not allow above-ground electrical poles and the electrical provider (AEP) has been resistant to installing buried lines at the site.
- Ownership
  - The landowner for the Northeast Area is amenable to LNA installing an ambient monitoring site on that property and to LNA having access to the property to maintain the monitoring station.
  - LNA may be able to obtain permission to access the West site, but obtaining power may not be possible. The owner has also stated that visits to the station must include his accompanying any visitors to the site.

In summary, all non-modeling factors also point to the Northeast Area as the preferred monitoring location.

3.5. CONCLUSIONS

Based on all aspects of the analysis, LNA has concluded that that the Northeast Area is the appropriate location for monitor placement, based on the results of the modeling analysis conducted and the non-modeling factors considered.

4. ELECTRONIC FILES

Included in electronic form are all of the input and output data files used to generate the results from the air quality analyses presented in Sections 2 and 3 of this report. The following provides a summary of the contents of each folder submitted to DEQ.

AERMAP

- Here are included the AERMAP input and output files for the 1-hour SO_2 full modeling grid. In addition, the folder contains the one third arc-second NED (.tif) file that is used in the AERMAP run.

BPIP

- The folder contains the input, output, and summary files from the building downwash analysis. This analysis includes all modeled sources and significant structures at the facility.

GIS Shape Files

- The folder contains the ESRI GIS shape (.shp) files of the buildings, fenceline, and property boundary.

AERMET

- The folder contains the surface (.sfc) and profile (.pfl) meteorological data files that were used in the analysis. Also contained are the input and output data files for each stage of AERMET.

AERSURFACE

- Included are the NCDC precipitation data file at the Roanoke airport and the AERSURFACE output files per surface moisture condition for the Kimballton facility onsite meteorological towers.

AERMOD

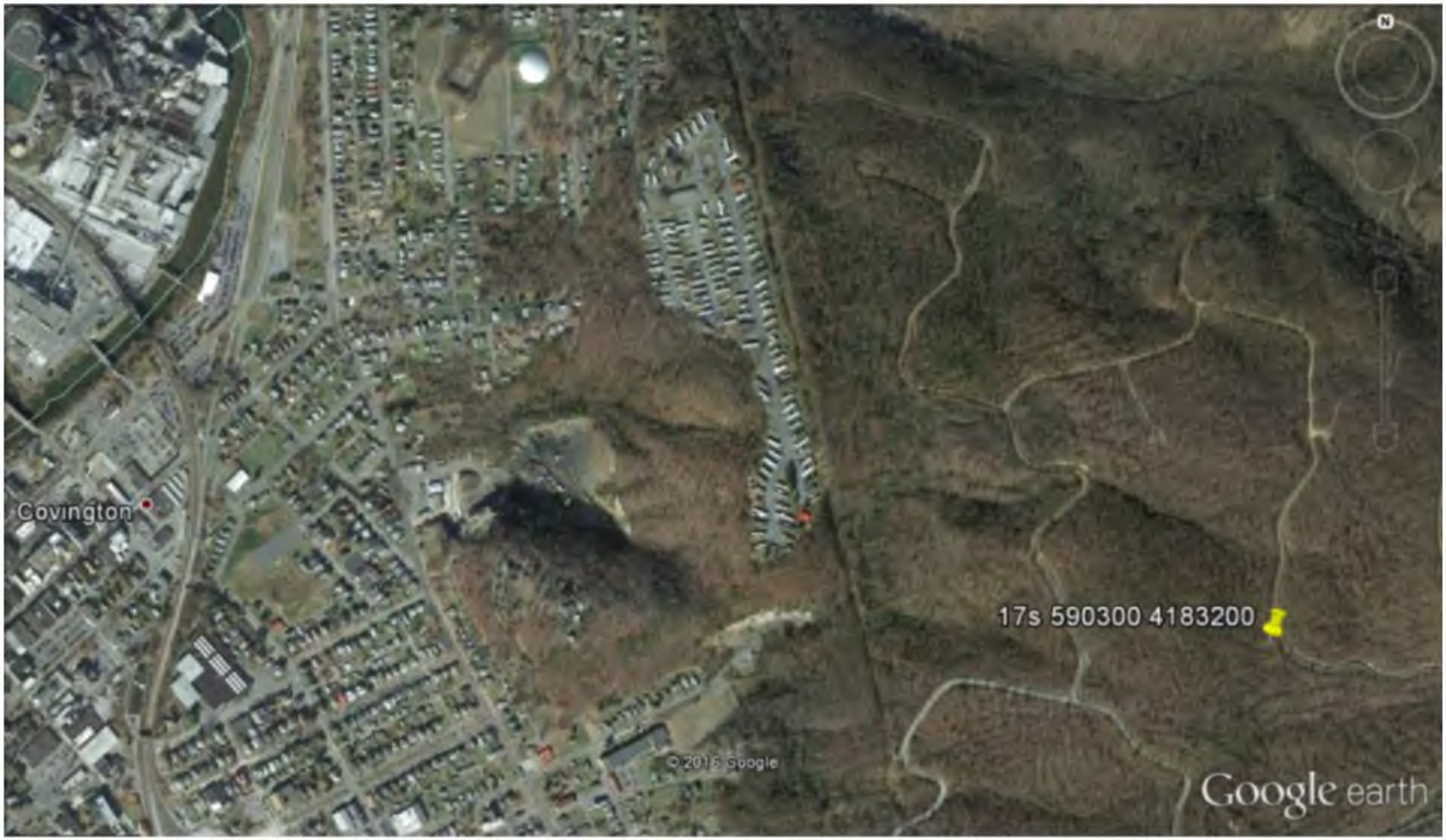
- The folder contains the AERMOD input (.ami), output (.aml and .mxd) and plot (.plt) files from the 1-hour SO_2 NAAQS ambient monitor placement analyses for the full grid and for the three areas to potentially site the monitor.

2016-03-01 Field Inspections

- There are three sub-folders for each of the higher impact areas that were visited in the field (West, Northeast, Olean)
- Each folder includes photographs along with a description of each photo
- The Northeast and Olean folder also include a video at those sites

Section 3.3 Westrock f/k/a MeadWestvaco Packaging Resource Group

Figure 1: Location of the Candidate SO_2 Monitoring Site



Note: pin mark denotes proposed monitor location in accordance with Appendix B.

Results of Preliminary Modeling Analysis to Support the Location of Candidate Ambient SO_2 Monitor Location for the WestRock Covington Mill

This memo provides the results of a preliminary modeling analysis that may be used to support the selection of a candidate ambient SO_2 monitor location in the vicinity of the WestRock Covington Mill located on the northwest side of the town of Covington, Virginia, along the Jackson River in Alleghany County. . The site location proposed is preliminary and subject to change based on remodeling with final approved model options. There is currently an Appendix W alternative model request that is pending approval with EPA.

Otherwise, the modeling analysis review that is summarized below includes the following steps:

- Based upon initial modeling, the AERMOD model was run on a reduced receptor grid that included areas most likely to be among the highest impacted areas.
- The model output was analyzed following the steps outlined in Appendix A of the USEPA monitoring TAD[2]. These steps focus upon first identifying the "top 200 receptors" based upon peak daily 1-hour maximum predicted concentrations. Then these candidate receptors are given a score based upon the magnitude and frequency of peak daily 1-hour maximum concentrations.
- The analyses provided below include an evaluation of modeled design value (DV[3]) spatial distributions in combination with the frequency of 1-hour daily maxima predicted by AERMOD using the MAXDAILY output option.

The sections below describe the steps followed to obtain a prioritized list of receptor locations for consideration of a monitoring site using modeled receptor DVs and frequency of receptors having the 1-hour daily maximum concentration among the top 200 DV receptors. This analysis does not evaluate whether the potential monitoring locations are logistically feasible based on local topography, availability of line power and land ownership. Final justification for preferred monitoring locations will require ground reconnaissance review of candidate sites.

The modeling procedures generally follow the procedures outlined in the draft modeling protocol submitted to Virginia Department of Environmental Quality (DEQ) on February 29, 2016. Some of the difference between the procedures used for this analysis and those outlined in the protocol include (1) actual hourly emissions were used to model Boilers 6-9 (as opposed to a new future allowable emission rate) and (2) AERMET and AERMOD were both run with default model options as the non-default options desired for use have not been formally approved by EPA..

The electronic modeling files to support this analysis are provided as Attachment F.

Step 1: Determining and Ranking Maximum Design Value Locations

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[2] http://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2MonitoringTAD.pdf.

[3] The design value is the 99th percentile peak daily 1-hour maximum concentration averaged over the years modeled, computed at each model receptor.

The AERMOD model (Version 15181) was run with default options for all receptors shown in Figure 1 and Figure 2. The actual hourly emissions for years 2013-2015 were modeled for Recovery Furnaces Nos. 1 and 2 and Boiler 6-9 (the largest SO_2 sources at the Mill). Allowable emissions were modeled for other Mill sources. The first step in the monitor siting process was to account for the location of receptors with the highest magnitude of impacts. The receptors with the maximum design values (DVs, the 99th percentile peak daily 1-hour maximum concentrations averaged over the years modeled) over the entire modeling domain were ranked. Table 1 shows the top 10 DV receptors ranked from highest (highest DV = rank 1) to lowest (lowest DV = rank 10). To prioritize the receptors to be evaluated for potentially establishing the location of an ambient SO_2 monitor, the top 200 DV receptors identified from this step and shown in Figures 3 and 4 were ranked and analyzed, as recommended by the Monitoring TAD, Appendix A.

Step 2: Determining Frequency of Occurrence of Concentration Maxima

The next step in the analysis is designed to account for the frequency in which the top 200 DV receptors identified in Step 1 have daily maximum 1-hour SO_2 concentrations. To assess the frequency of occurrence of concentration maxima at the top 200 DV receptors, the MAXDAILY option in AERMOD was used, which outputs the maximum 1-hour concentration for each receptor for each day of the model simulation (three years from 2013 to 2015). This output was used to determine the number of days for which each of the top 200 DV receptors was the overall highest 1-hour concentration for the day for the three modeled years. Table 2 shows the top 10 receptors' frequency of days ranked from highest (highest number of days = rank 1) to lowest (lowest number of days frequency = rank 10).

Step 3: Scoring of Maximum DVs and Frequency of Occurrence of Concentration Maxima

The final step in the analysis consisted of creating a prioritized list of receptor locations for consideration of a new ambient SO_2 monitoring site by using the receptor-by-receptor DVs and frequency of having the 1-hour daily maximum concentration among the top 200 DV receptors.

Table 3 provides the top 10 results of the score ranking used to generate a list of receptor locations, ranked in general order of desirability with regard to potential new ambient SO_2 monitor(s). Figure 4 shows the receptors ranked by "Score", reflecting rankings of maximum DV and frequency of having the 1-hour daily maxima amongst the top 200 DV receptors. Lower numerical values of "Score1" indicate higher probabilities of experiencing peak 1-hour SO_2 concentrations. The top receptor with the lowest score is located just over 1.5 kilometers south east of the Mill. Note that the lowest score means the best location in terms of a combined consideration of concentration magnitude and frequency of impact.

Study Conclusions

This preliminary analysis of monitor locations likely to be most impacted by the Covington Mill has been conducted using AERMOD, consistent with guidance provided in EPA's SO_2 monitoring TAD. The modeling involved the most recent 3 years (2013-2015) with a mix of normalized actual hourly emissions and normalized allowable emissions along with concurrent on-site meteorological data.

The procedures recommended by the monitoring TAD involved the identification of the top 200 receptors according to the predicted design values. These receptors were then ranked according to the magnitudes and the frequencies of the predicted concentrations. Recall, there is currently an Appendix W alternative model request that is pending approval with EPA and WestRock is still in the process of determining land ownership in the general vicinity of the proposed monitor location. Therefore, the site location proposed is preliminary and subject to change based land access and remodeling with final approved model options.

Table B-10: Top 10 Ranked Design Value Receptors (2013-2015)

UTM_E[1]	UTM_N[1]	Normalized Concentration	DV_Rank
590300	4183200	73.3	1
590200	4184500	71.9	2
590200	4184600	71.3	3
590200	4184800	70.7	4
590200	4184900	68.9	5
590400	4183200	68.4	6
590500	4183000	68.2	7
590200	4184700	67.1	8
590200	4183200	66.2	9
590100	4185100	66.1	10

[1] Zone 17, NAD83

Where:
DV_Rank = the rank with regard to DV (highest DV is rank 1)

Table B-11: Top 10 Receptors, Ranked by Frequency of 1-Hour Daily Maxima (2013-2015)

UTM_E[1]	UTM_N[1]	nDays	nDays_Rank
591800	4181600	74	1
590400	4185200	72	2
590600	4183400	68	3
590300	4183200	50	4
590200	4184500	42	5
590300	4184900	39	6
590200	4182800	34	7
591200	4184100	32	8
590600	4183300	29	9
590500	4183400	26	10

[1] Zone 17, NAD83

Where:
nDays = the number of days that the receptor is the highest concentration for the day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)

Table B-12: Receptor Ranking by Design Value and Frequency 1-Hour Daily Maxima (2013-2015)

UTM_E[1]	UTM_N[1]	DV_Rank	nDays	nDays_Rank	Score	Score_Rank
590300	4183200	1	50	4	5	1
590200	4184500	2	42	5	7	2
590500	4183000	7	25	12	19	3
590200	4184600	3	19	21	24	4
590200	4183200	9	18	24	33	5
590100	4184800	15	18	23	38	6
590100	4184500	23	21	16	39	7
590100	4185000	12	15	34	46	8
590200	4184700	8	14	42	50	9
590300	4183500	16	15	36	52	10

[1] Zone 17, NAD83

Where:
DV_Rank = the rank with regard to DV (highest DV is rank 1)
nDays =the number of days that the receptor is the highest concentration for that day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)
Score = is the sum of DV_Rank and nDays + Rank for each receptor
Score_Rank = the rank of the scores [lowest total score ("Score" of 20) is rank 1].

Figure B-3: Far-Field Receptor Grid

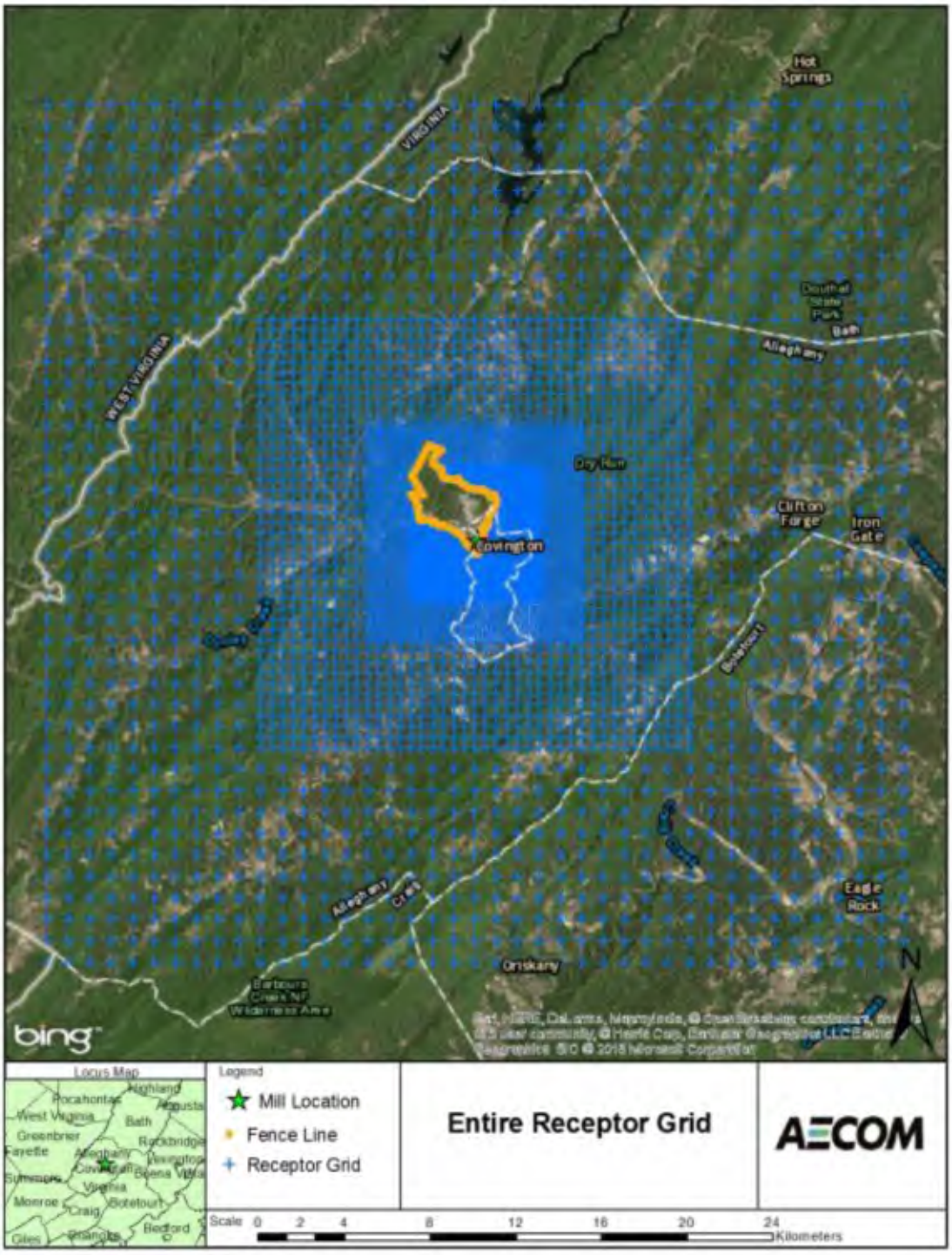


Figure B-4: Near-Field Receptor Grid

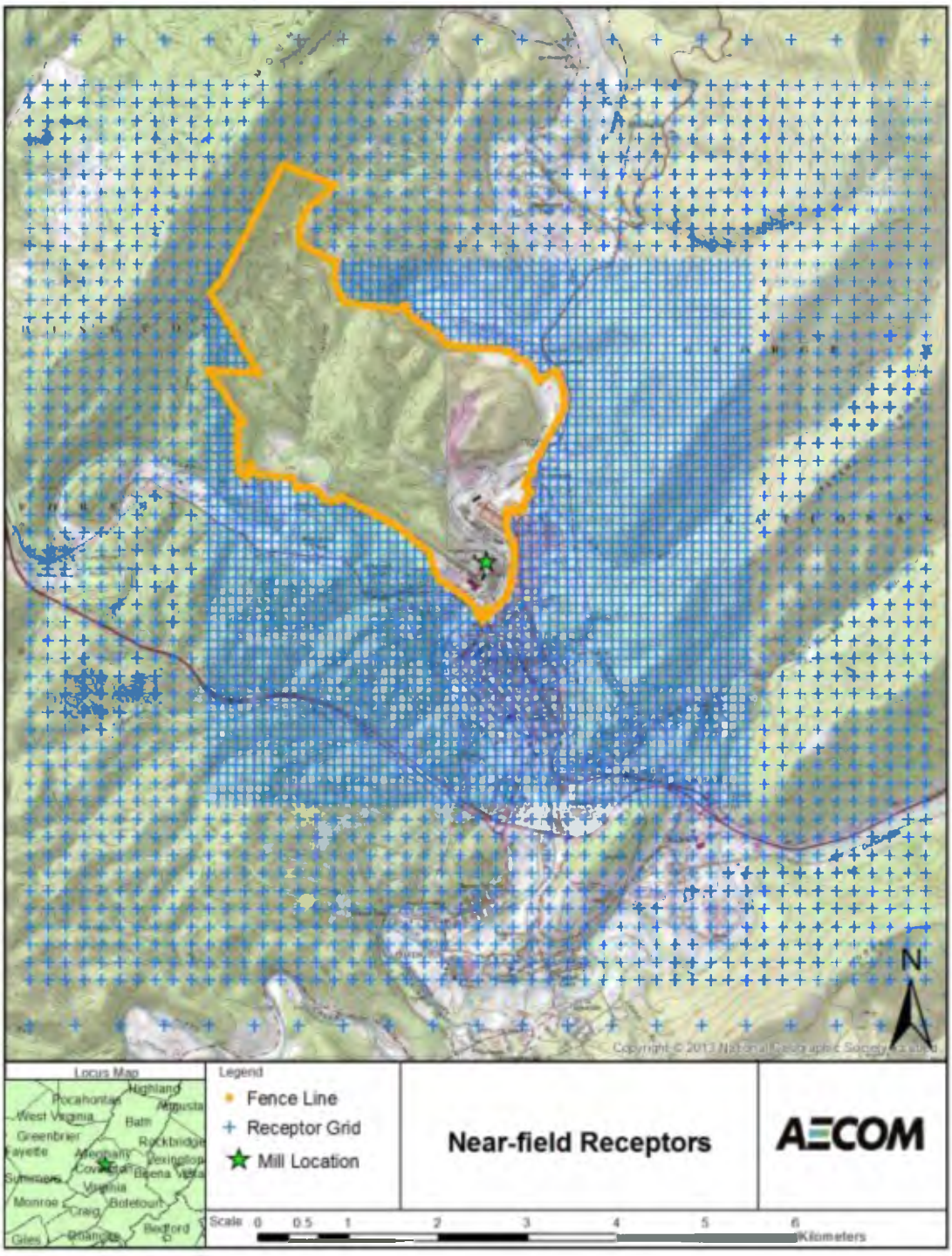


Figure B-5: Locations and Ranking of Maximum 1-Hour SO_2 Design Value Receptors (Top 200)

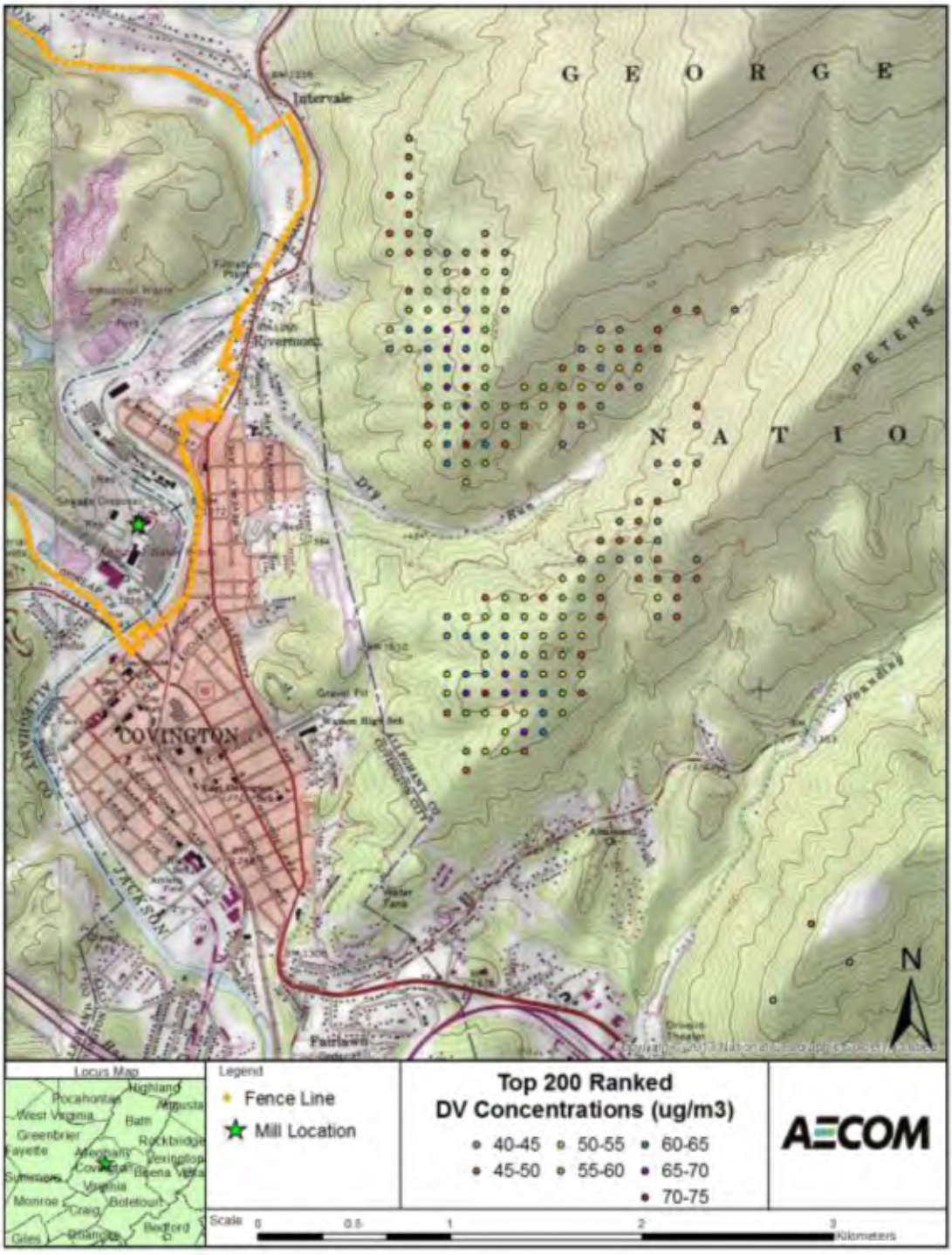


Figure B-6: Locations of the Top 10 and 200 1-Hour SO_2 Design Value Receptors

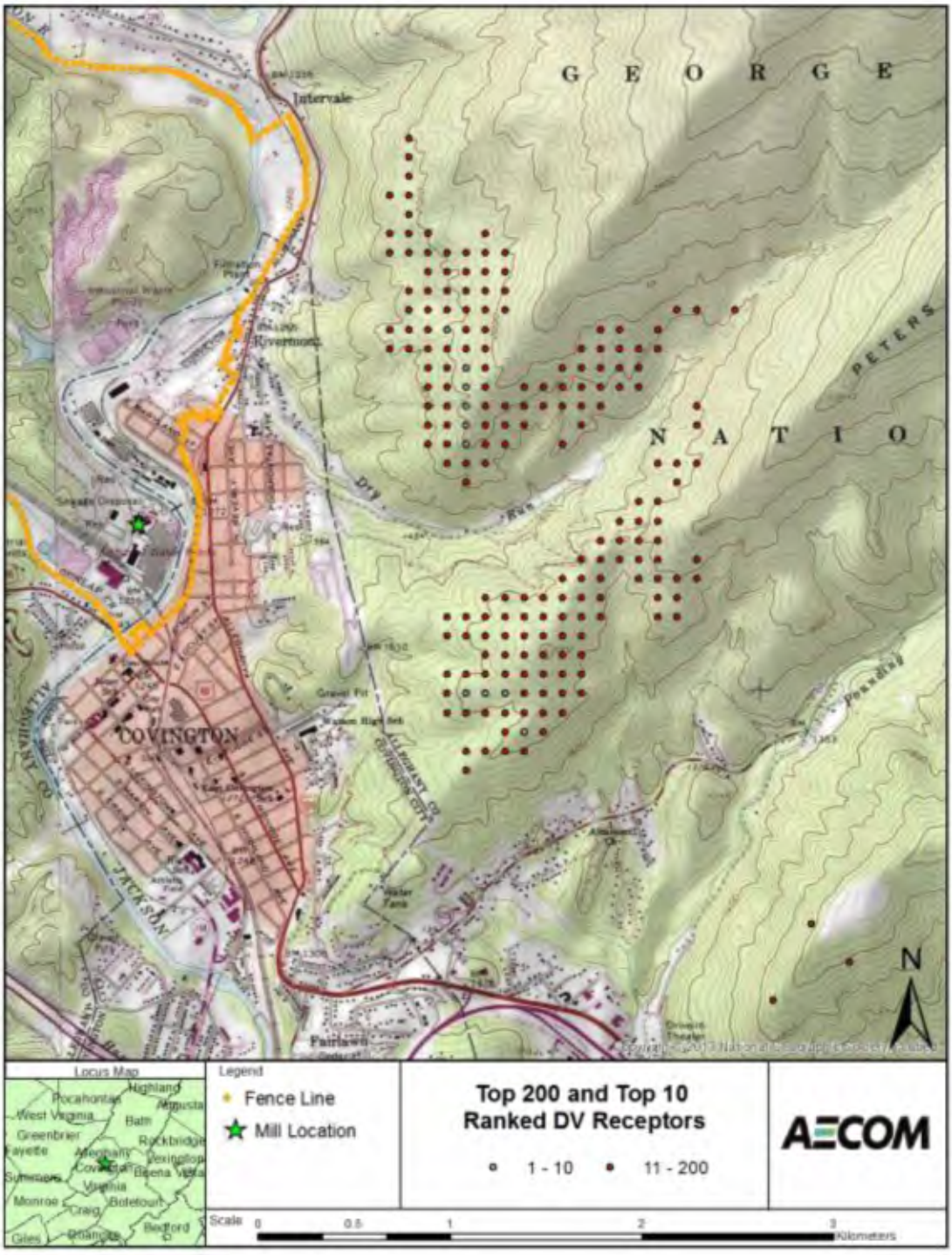
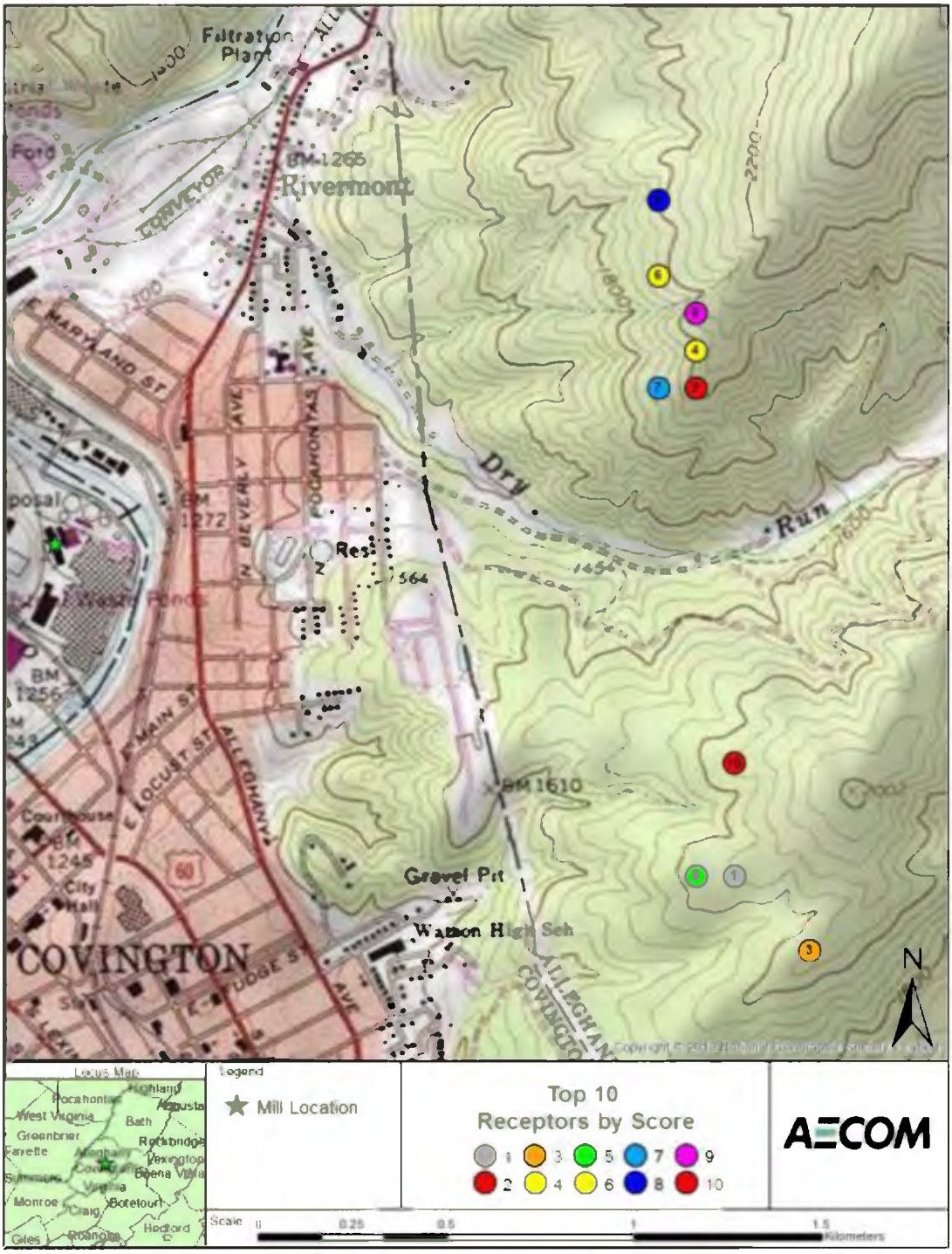


Figure B-5: Receptors by Score Calculated from Ranked Design Value and Frequency of 1-Hour Daily Maxima



Attachment 2
Virginia Site Listing

Virginia Monitoring Network Minimum Monitoring requirements

Ozone Monitors

MSA	Population	Monitors	monitors	Sites
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,582,170	3	51-013-0020	Arlington County
			51-059-0030	Fairfax County
			51-107-1005	Loudon County
			51-153-0009	Prince William Co.
Virginia Beach-Norfolk-Newport News, VA-NC	1,671,683	2	51-650-0008	Hampton City
			51-800-0004	Suffolk City
			51-800-0005	Suffolk City
Richmond, VA	1,258,251	2	51-036-0002	Charles City County
			51-041-0004	Chesterfield County
			51-085-0003	Hanover County
			51-087-0014	Henrico County
Roanoke, VA	308,707	1	51-161-1004	Roanoke County

Virginia Monitoring Network Minimum Monitoring requirements (continued)

PM2.5 Monitors

MSA	Population	Monitors	monitors	Sites
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,582,170	2	51-013-0020	Arlington County
			51-059-0030	Fairfax County
			51-107-1005	Loudon County
Virginia Beach-Norfolk-Newport News, VA-NC	1,671,683	2	51-650-0008	Hampton City
			51-710-0024	Norfolk City
			51-810-0008	Virginia Beach City
Richmond, VA	1,258,251	2	51-036-0002	Charles City County
			51-041-0003	Chesterfield County
			51-087-0015	Henrico County
			51-087-0014	Henrico County
Roanoke, VA	308,707	0	51-161-1004	Roanoke County

VA DEQ, AQCR I SOUTHWEST VIRGINIA, July 1, 2016

SITE I.D.	POLLUTANT MEASURED	METHOD OR INSTRUMENT	SAMPLING INTERVAL	MONITORING OBJECTIVE	SCALE	BEGINNING DATE	MONITOR NETWORK	MONITOR TYPE	LOCATION	LONGITUDE	LATITUDE	CBSAs/ MSAs	
51-035-0001 (23-A)	PM-10 (81102)	SSI HI VOL	1/6	Population	Neighborhood	5/28/89		SLAMS	Carroll Co. - Gladeville Elem. School	-80.8798	36.7007	None	
51-197-0002 (16-B)	O3 (44201)	UV Absorption	Continuous	Population	Regional	4/1/90		SLAMS	Rural Retreat - Wythe County Sewage Treatment Plant	-81.2542	36.8912	None	
51-520-0006 (101-E)	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	1/1/99		SLAMS	Bristol - Highland View Elem. Sch.	-82.1641	36.6080	28700/	Kingsport-Bristol-Bristol, TN-VA

There are no collocated monitors in AQCR I

VA DEQ, AQCR II VALLEY OF VIRGINIA, July 1, 2016

SITE I.D.	POLLUTANT MEASURED	METHOD OR INSTRUMENT	SAMPLING INTERVAL	MONITORING OBJECTIVE	SCALE	BEGINNING DATE	MONITOR NETWORK	MONITOR TYPE	LOCATION	LONGITUDE	LATITUDE	CBSAs/ MSAs	
51-069-0010	O3(44201)	UV Absorption	Continuous	Population	Urban	4/1/91		SLAMS	Rest, Frederick County -	-78.0816	39.2810	49020/	Winchester, VA-WV
(28-J)	PM2.5 FRM* (88101)	Sequential	1/3	Population	Urban	1/1/08		SLAMS	Lester Buildings				
	PM2.5 (88501)	TEOM	Continuous	Background	Urban	1/1/08		OTHER					
51-840-0002	PM-10 (81102)	SSI HI VOL	1/6	Population	Neighborhood	9/13/89		SLAMS	Winchester -	-78.1631	39.1840	49020/	Winchester, VA-WV
(134-C)									Courts Bldg.				
51-113-0003	O3(44201)	UV Absorption	Continuous	Population	Regional		CASTNET	EPA	Madison County -	-78.4347	38.5231	None	
(N-35-A)	PM2.5 (88502)	IMPROVE	1/3	Background	Regional		IMPROVE		Shenandoah Nat'l Park				
	PM2.5 (88501)	TEOM	Continuous	Background	Regional	5/04		OTHER	Big Meadows				
51-161-1004	NO2 (42602)	Chemiluminescence	Continuous	Population	Neighborhood	1/1/81		SLAMS	Vinton - Roanoke Co.	-79.8845	37.2834	40220/	Roanoke, VA
(19-A6)	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	8/81		SLAMS	Herman Horn ES				
	SO2 (42401)	Fluorescence	Continuous	Population	Neighborhood	1/29/87		SLAMS					
	CO (42101)	Gas Filter Corr.	Continuous	Population	Neighborhood	4/04		SLAMS					
	PM2.5 FRM* (88101)	Sequential	Daily	Population	Neighborhood	4/1/08		SLAMS					
	PM2.5 (88501)	TEOM	Continuous	Background	Neighborhood	4/1/08		OTHER					
51-163-0003	O3(44201)	UV Absorption	Continuous	Background	Regional	4/8/99		SLAMS	Rockbridge Co. -	-79.5126	37.6267	None	
(21-C)	PM2.5 (88502)	IMPROVE	Continuous	Background	Regional		IMPROVE		Natural Bridge Station				
51-165-0003	SO2 (42401)	Fluorescence	Continuous	Population	Neighborhood	9/22/97		SLAMS	Rockingham Co. -	-78.8195	38.4775	25500/	Harrisonburg, VA
(26-F)	NO2 (42602)	Chemiluminescence	Continuous	Population	Neighborhood	4/04		SLAMS	VDOT				
	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	1/1/07		SLAMS					
	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	4/1/07		SLAMS					
51-775-0011	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	9/8/09		SLAMS	Salem -	-80.0810	37.2979	40220/	Roanoke, VA
(110-C)									Salem High School				
51-770-0011	TSP-Lead (14129)	Tisch Hi-Vol	1/6	Source	Neighborhood	11/1/14		SLAMS	Roanoke City	-79.9857	37.2749	40220/	Roanoke, VA
(109-N)		TSP Sampler		Oriented					Mario Industries				
									2502 Patterson Ave. SW				

There are no collocated monitors in AQCR II

VA DEQ, AQCR III CENTRAL VIRGINIA, July 1, 2016

SITE I.D.	POLLUTANT MEASURED	METHOD OR INSTRUMENT	SAMPLING INTERVAL	MONITORING OBJECTIVE	SCALE	BEGINNING DATE	MONITOR NETWORK	MONITOR TYPE	LOCATION	LONGITUDE	LATITUDE	CBSAs/ MSAs	
51-680-0015 (155-Q)	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	4/1/03		SLAMS	Lynchburg - Water Tank	-79.2150	37.3327	31340/	Lynchburg, VA
51-009-007 (53-G)	TSP-Lead (14129)	Tisch Hi-Vol TSP Sampler	1/6	Source Oriented	Neighborhood	11/1/10		SLAMS	CVTC, Madisor Heights Amherst Co.	-79.1162	37.4122	31340/	Lynchburg, VA

There is one collocated monitor in AQCR3. A collocated Hi-Vol TSP-lead monitor is located at 53-G Madison Heights and is designated H-53-G.

VA DEQ, AQCR IV NORTHEAST VIRGINIA, July 1, 2016

SITE I.D.	POLLUTANT MEASURED	METHOD OR INSTRUMENT	SAMPLING INTERVAL	MONITORING OBJECTIVE	SCALE	BEGINNING DATE	MONITOR NETWORK	MONITOR TYPE	LOCATION	LONGITUDE	LATITUDE	CBSAs/ MSAs	
51-033-0001	O3(44201)	UV Absorption	Continuous	Background	Regional	4/1/93		SLAMS	Caroline Co. -	-77.3774	38.2009	40060/	Richmond, VA
(48-A)	Meteorological	Wind Speed, Humidity	Continuous	Population	Neighborhood	6/1/02		SPECIAL	USGS Geomagnetic				
	Instrumentation	Temp., Wind direction						PURPOSE	Center				
		Barometric Pressure											
51-061-0002	O3(44201)	UV Absorption	Continuous	Background	Regional	9/1/81		SLAMS	Fauquier Co. -	-77.7677	38.4737	47900/	Washington-Arlington-Alexandria, DC-VA-MD-W
(37-B)									Phelps Wildlife				
									Area				
51-179-0001	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	9/1/92		SLAMS	Stafford Co. -	-77.3704	38.4812	47900/	Washington-Arlington-Alexandria, DC-VA-MD-W
(44-A)									Widewater				
									Elem. School				
51-003-0001	O3(44201)	UV Absorption	Continuous	Population	Regional	4/1/08		SLAMS	Albemarle Co. -	- 78.5040	38.0766	16820/	Charlottesville, VA
33-A	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	4/1/08		SLAMS	Albemarle High				
	PM2.5 (88501)	TEOM	Continuous	Background	Neighborhood	4/1/08		OTHER	School				
51-630-0004	PM-10 (81102)	SSI HI VOL	1/6	Population	Neighborhood	11/12/89		SLAMS	Fredericksburg -	-77.4871	38.3023	47900/	Washington-Arlington-Alexandria, DC-VA-MD-W
(130-E)									Mercer				
									Elem. School				

There are no collocated monitors in AQCR IV

VA DEQ, AQCR V STATE CAPITOL, July 1, 2016

SITE I.D. SITE I.D.	POLLUTANT MEASURED	METHOD OR INSTRUMENT	SAMPLING INTERVAL	MONITORING OBJECTIVE	SCALE	BEGINNING DATE	MONITOR NETWORK	MONITOR TYPE	LOCATION	LONGITUDE	LATITUDE	CBSAs/ MSAs	
51-036-0002	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	3/29/88		SLAMS	Charles City Co. -	-77.2593	37.3444	40060/	Richmond, VA
(75-B)	SO2 (42401)	Pulsed Fluorescence	Continuous	Highest Concentration	Neighborhood	1/1/92		SLAMS	Route #608 Shirley Plantation				
	NO2 (42602)	Chemiluminescence	Continuous	Population	Neighborhood	3/9/93		SLAMS					
	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	1/1/99		SLAMS					
51-041-0003	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	1/1/99		SLAMS	Chesterfield Co. -	-77.4512	37.4347	40060/	Richmond, VA
(71-D)									Bensley Armory				
51-041-0004	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	4/80		SLAMS	Chesterfield Co. -	-77.5936	37.3575	40060/	Richmond, VA
(71-H)									Beach Rd. VDOT				
51-085-0003	O3(44201)	UV Absorption	Continuous	Highest Concentration	Urban	4/1/01		SLAMS	Hanover Co. -	-77.2188	37.6061	40060/	Richmond, VA
(73-E)									McClellan Road				
51-087-0014	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	6/12/81		SLAMS	Henrico Co. -	-77.4003	37.5565	40060/	Richmond, VA
(72-M)	Trace CO (42101)	Gas Filter Correlation	Continuous	Population	Neighborhood	4/1/81	Ncore	SLAMS	MathScience Center				
	Trace SO2 (42401)	Pulsed Fluorescence	Continuous	Population	Neighborhood	8/29/13	Ncore	SLAMS					
	PM2.5 FRM* (88101)	Sequential	Daily	Population	Neighborhood	1/1/99		SLAMS					
	PM2.5 (88501)	TEOM	Continuous	Population	Neighborhood	7/18/00		OTHER					
	PM2.5 (88502)	Speciation	1/3 Mini-Trends	Population	Neighborhood	1/1/04	CSN	EPA					
	PM2.5	Carbon	1/3 Mini-Trends	Population	Neighborhood	1/1/10	CSN	EPA					
	PM-10 (81102)	SSI HI VOL	1/6	Population	Neighborhood	11/1/08		SLAMS					
	PM10-2.5 (86101)	Sequential	1/3	Population	Neighborhood	10/8/09	NCore						
	Metals	PM-10 HI VOL	1/6	Background	Neighborhood	11/1/08	NATTS						
	Carbonyl	TO-11A	1/6	Background	Neighborhood	11/1/08	NATTS						
	VOCs	TO-15	1/6	Background	Neighborhood	11/1/08	NATTS						
	PAH	TSP	1/6	Background	Neighborhood	11/1/08	NATTS						
	Noy (42600)	Chemiluminescence	Continuous	Population	Neighborhood	5/1/05	NCore						
	NO2 Trace (42602)	Chemiluminescence	Continuous	Vulnerable and Susceptible Population	Neighborhood	5/1/05	Ncore						
	Meteorological Instrumentation	Wind Speed, Humidity Temp., Wind direction Barometric Pressure	Continuous	Population	Neighborhood	7/1/10	NCore						
	VOC - PAMS	Automated GC	Continuous	Background	Regional	5/1/13	PAMS						
	VOC - PAMS episodic	TO-12	eight 3 hr. canisters	Background	Regional	5/1/13	PAMS						
51-087-0015	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	1/1/99		SLAMS	Henrico Co. -	-77.5666	37.6712	40060/	Richmond, VA
(72-N)									Piedmont DEQ				
51-670-0010	PM-10 (81102)	PM10 SSI HI VOL	1/6	Population	Neighborhood	11/1/08		SLAMS	Hopewell -	-77.2918	37.2896	40060/	Richmond, VA
(154-M)	Metals	TSP/ICPMS	1/6	Population	Neighborhood	11/1/08		UATM	Carter G. Woodson				
	VOCs	TO-15	1/6	Population	Neighborhood	11/1/08		UATM	Middle School				
	Carbonyl	TO-11	1/6	Population	Neighborhood	11/1/08		UATM					
51-760-0025	NO2 (42602)	Chemiluminescence	Continuous	Near Road	Microscale	10/1/13	NEAR ROAD	SLAMS	City of Richmond -	77.4692	37.5911	40060/	Richmond, VA
(158-X)	CO (42101)	Gas Filter Correlation	Continuous	Near Road	Microscale	10/1/13	NEAR ROAD	SLAMS	Joseph Bryan Park				
	PM2.5 FEM (88101)	Beta Attenuation	Continuous	Near Road	Microscale	10/1/14	NEAR ROAD	Special Purpose					

There are 3 collocated monitors in AQCR V. At Station 72-M, 510870014 - collocated PM2.5 FRM and Collocated Hi Vol PM10; Station 154-M Collocated VOC sampler

VA DEQ, AQCR VI HAMPTON ROADS, July 1, 2016

SITE I.D.	POLLUTANT MEASURED	METHOD OR INSTRUMENT	SAMPLING INTERVAL	MONITORING OBJECTIVE	SCALE	BEGINNING DATE	MONITOR NETWORK	MONITOR TYPE	LOCATION	LONGITUDE	LATITUDE	CBSAs/ MSAs	
51-650-0008	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	7/1/10		SLAMS	Hampton City -	-76.3870	37.1037	47260/	Virginia Beach-Norfolk-Newport News, VA-NC
(179-K)	SO2 (42401)	Fluorescence	Continuous	Population	Neighborhood	7/1/10		SLAMS	NASA Langley				
	NO2 (42602)	Chemiluminescence	Continuous	Population	Neighborhood	7/1/10		SLAMS	CAPABLE Site				
	CO (42101)	Gas Filter Corr.	Continuous	Population	Neighborhood	7/1/10		SLAMS					
	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	7/1/10		SLAMS					
	PM2.5 (88501)	TEOM	Continuous	Population	Neighborhood	7/1/10		OTHER					
	PM10 (81102)	SSI HI VOL	1/6	Population	Neighborhood	7/1/10		SLAMS					
51-710-0024	SO2 (42401)	Pulsed Fluorescence	Continuous	Population	Neighborhood	1/7/10		SLAMS	Norfolk City -	-76.3014	36.8556	47260/	Virginia Beach-Norfolk-Newport News, VA-NC
(181-A1)	NO2 (42602)	Chemiluminescence	Continuous	Population	Neighborhood	1/7/10		SLAMS	NOAA Storage				
	CO (42101)	Gas Filter Corr.	Continuous	Population	Neighborhood	12/22/09		SLAMS	Facility				
	PM10 (81102)	SSI HI VOL	1/6	Population	Neighborhood	6/21/97		SLAMS					
	PM2.5 FRM* (88101)	Sequential	1/3	Population	Neighborhood	1/1/99		SLAMS					
51-800-0004	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	4/1/87		SLAMS	Suffolk City -	-76.4381	36.9012	47260/	Virginia Beach-Norfolk-Newport News, VA-NC
(183-E)									Tidewater Community College				
51-800-0005	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	4/1/91		SLAMS	Suffolk City -	-76.7304	36.6653	47260/	Virginia Beach-Norfolk-Newport News, VA-NC
(183-F)									Tidewater Research Station, Holland				
51-810-0008	PM2.5 FRM* (88101)	Sequential	Daily	Population	Neighborhood	1/1/99		SLAMS	VA Beach City -	-76.1812	36.8419	47260/	Virginia Beach-Norfolk-Newport News, VA-NC
(184-J)	VOC	TO-15	1/6	Background	Neighborhood	7/1/05		UATM	VA Beach DEQ Office				
	Carbonyl	TO-11A	1/6	Background	Neighborhood	7/1/05		UATM					
	Metals	TSP	1/6	Background	Neighborhood	8/2/05		UATM					

There are two collocated monitors in AQCR VI. Collocated PM10 and PM2.5 FRM are both at 181-A1, 517100024, the NOAA Storage Facility in Norfolk.

VA DEQ, AQCR VII NORTHERN VIRGINIA, July 1, 2016

SITE I.D.	POLLUTANT MEASURED	METHOD OR INSTRUMENT	SAMPLING INTERVAL	MONITORING OBJECTIVE	SCALE	BEGINNING DATE	MONITOR NETWORK	MONITOR TYPE	LOCATION	LONGITUDE	LATITUDE	CBSAs/ MSAs	
51-013-0020	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	8/1/79		SLAMS	Arlington -	-77.0592	38.8577	47900/	Washington-Arlington-
(47-T)	NO2 (42602)	Chemiluminescence	Continuous	Population	Neighborhood	8/1/79		SLAMS	Aurora Hills				Alexandria, DC-VA-MD-WV
	CO (42101)	Gas Filter Correlation	Continuous	Population	Neighborhood	4/1/81		SLAMS	Visitors Center				
	PM2.5 FRM* (88101	Sequential	1/3	Population	Neighborhood	1/1/99		SLAMS					
51-059-0030	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	7/1/98		SLAMS	Fairfax -	-77.1047	38.7734	47900/	Washington-Arlington-
(46-B9)	SO2 (42401)	Pulsed Fluorescence	Continuous	Population	Neighborhood	8/29/13		SLAMS	Lee District park				Alexandria, DC-VA-MD-WV
	PM2.5 FRM* (88101	Sequential	Daily	Population	Neighborhood	1/1/99		SLAMS					
	PM2.5 (88501)	TEOM	Continuous	Population	Neighborhood	7/1/10		OTHER					
	VOC	TO-15	1/6	Population	Neighborhood	6/1/02		UATM					
	Carbonyl	TO-11A	1/6	Population	Neighborhood	6/1/02		UATM					
	Metals	TSP	1/6	Population	Neighborhood	6/1/02		UATM					
	PM10 (81102)	SSI HI VOL	1/3	Population	Neighborhood	5/1/15		SLAMS					
51-107-1005	O3(44201)	UV Absorption	Continuous	Population	Neighborhood	4/4/98		SLAMS	Loudoun Co. -	-77.4925	39.0247	47900/	Washington-Arlington-
(38-I)	NO2 (42602)	Chemiluminescence	Continuous	Population	Neighborhood	4/4/98		SLAMS	Broad Run H.S.				Alexandria, DC-VA-MD-WV
	PM2.5 FRM* (88101	Sequential	1/3	Population	Neighborhood	1/1/99		SLAMS					
51-153-0009	O3(44201)	UV Absorption	Continuous	Population	Urban	4/1/91		SLAMS	Prince Wm. Co.	-77.6346	38.8529	47900/	Washington-Arlington-
(45-L)	NO2 (42602)	Chemiluminescence	Continuous	Population	Urban	4/1/94		SLAMS	Long Park				Alexandria, DC-VA-MD-WV
51-510-0020	PM10 (81102)	SSI HI VOL	1/3	Population	Neighborhood	6/4/06		SPECIAL PURPOS	Alexandria -	-77.1268	38.8050	47900/	Washington-Arlington-
(L-126-H)									Tucker Elem. Sch.				Alexandria, DC-VA-MD-WV
51-059-0031	NO2 (42602)	Chemiluminescence	Continuous	Near Road	Microscale	4/7/16	NEAR ROAD	SLAMS	Fairfax County	77.1835	38.7684	47900/	Washington-Arlington-
(46-C2)	CO (42101)	Gas Filter Correlation	Continuous	Near Road	Microscale	4/7/16	NEAR ROAD	SLAMS	Backlick Rd. Park				Alexandria, DC-VA-MD-WV
	PM2.5 FEM (88101)	Beta Attenuation	Continuous	Near Road	Microscale	4/7/16	NEAR ROAD	SPECIAL PURPOS	and Ride				

There are 2 collocated monitors in AQCR VII.
A collocated PM2.5 FRM is located at Station 47-T, 510130020, Aurora Hills Visitor Center, Arlington and TSP Metals located at station 46-B9, 510590030, Lee District Park, Fairfax.

VA DEQ, AQCR VII NORTHERN VIRGINIA, July 1, 2016

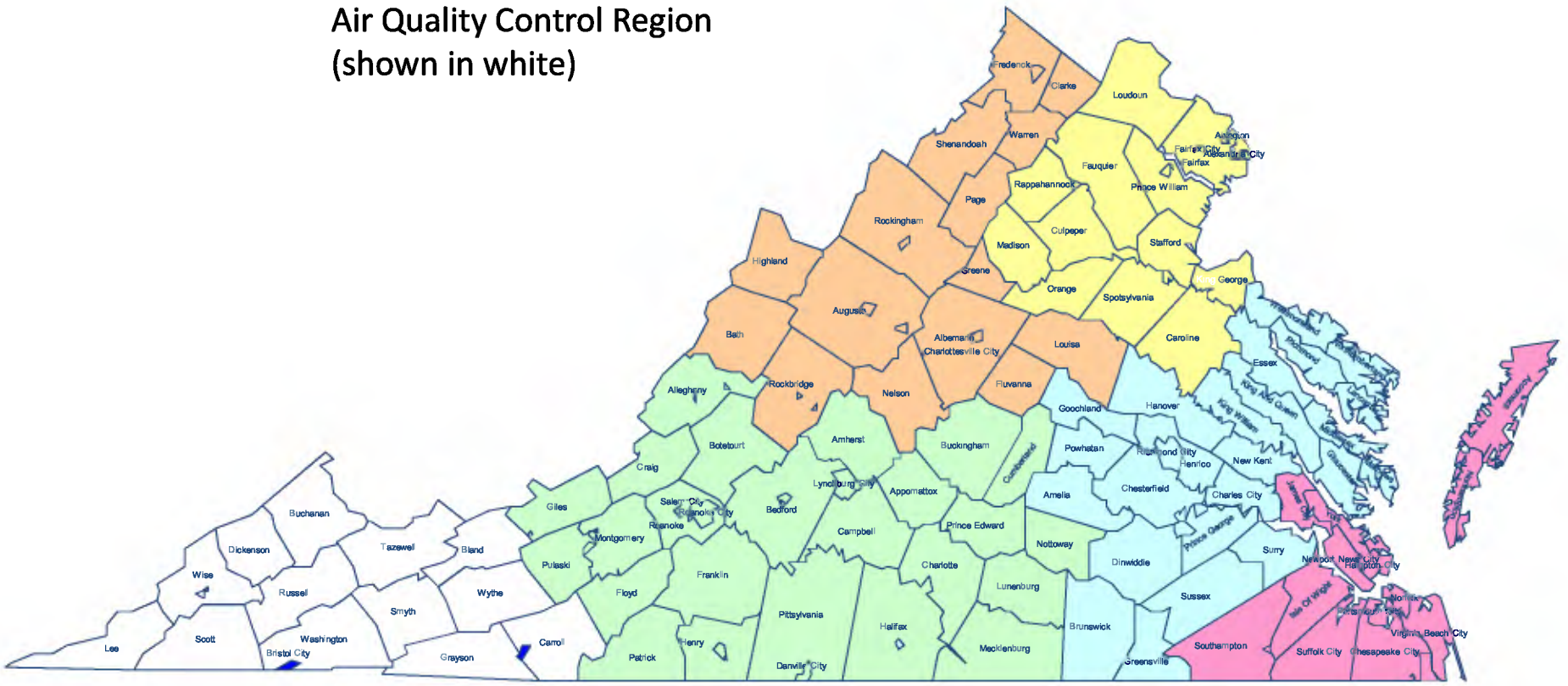
SITE I.D.	POLLUTANT MEASURED	METHOD OR INSTRUMENT	SAMPLING INTERVAL	MONITORING OBJECTIVE	SCALE	BEGINNING DATE	MONITOR NETWORK	MONITOR TYPE	LOCATION	LONGITUDE	LATITUDE	CBSAs/ MSAs
51-147-9991 PED108	O3(44201)	UV Adsorption (047)	Continuous	Highest Concentration	Regional	1/1/2011	CASTNET	EPA	Prince Edward Gallion State Forest Burkeville VA	-78.307067	37.165222	NA
51-071-9991 VPI120	O3(44201)	UV Adsorption (047)	Continious	Highest Concentration	Regional	4/1/2011	CASTNET	EPA	Giles County 1856 Horton Lane Newport, VA	-80.55751	37.329832	Blacksburg-Christiansburg-Radford, VA

ATTACHMENT 3
OVERHEAD VIEWS OF MONITORING SITES WITH IDENTIFYING ADDRESS INFORMATION

Each overhead view contains a brief discussion of the original purpose for the site being located where it is. In some cases the current reason for the siting has changed.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

AQCR 1 – Eastern Tennessee-Southwest Virginia
Air Quality Control Region
(shown in white)



Counties: Bland, Buchanan, Carroll, Dickenson, Grayson, Lee, Russell, Scott, Smyth, Tazewell, Washington, Wise, Wythe

Cities: Bristol, Galax, Norton

CBSA/MSA: 28700 – Kingsport-Bristol-Bristol, TN-VA

Gladeville Elementary School, Galax, 23-A
TSP was installed in June 1983 as a replacement site for a close by monitoring location that was unduly influenced by a nearby source. The TSP was removed January 1989 and a PM10 was installed in its place.

Rural Retreat, Wythe County, 16-B

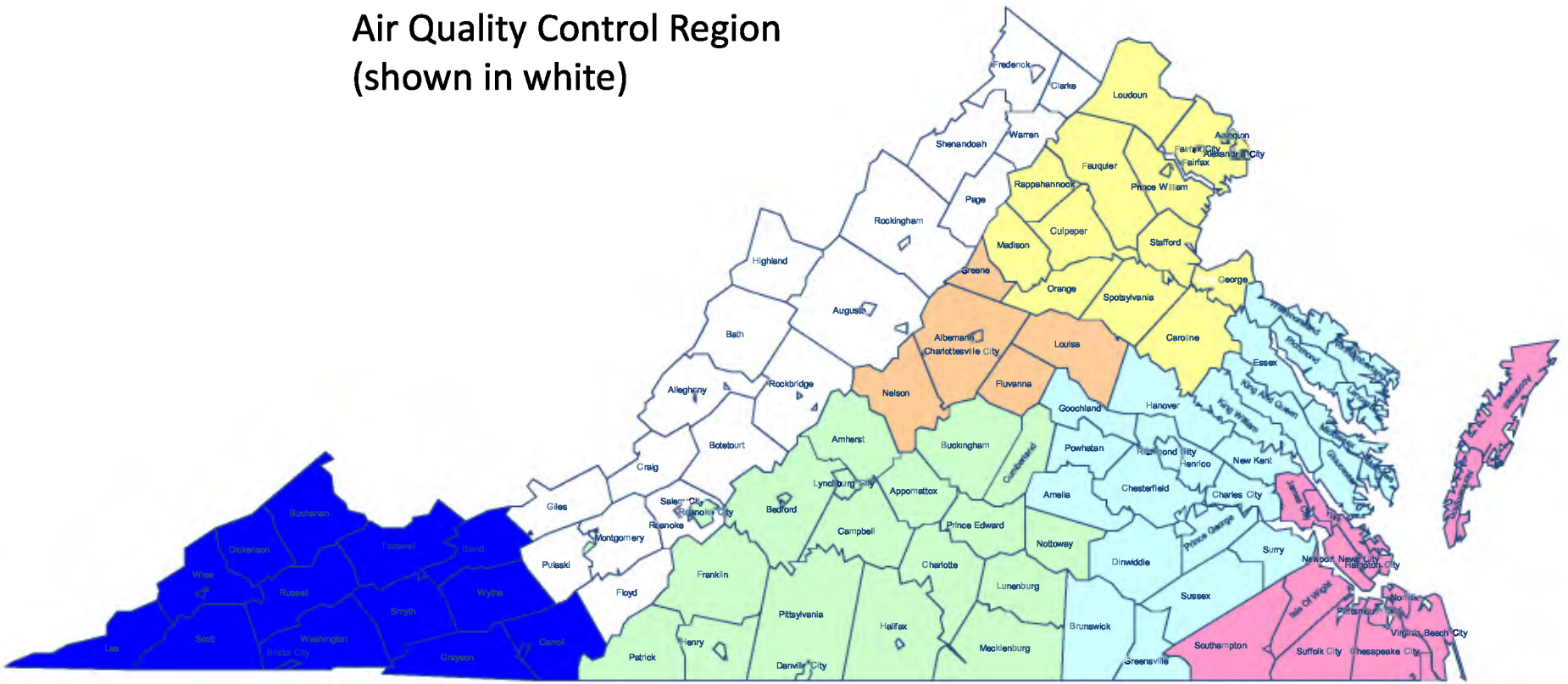
This site began in April 1990 as a replacement site for the Marion, VA ozone site. This site is downwind of the VOC sources and more representative of the area than was The Marion site was too close to the local VOC sources to determine their impact. The Rural Retreat site is farther downwind.

Highland View Elementary School, Bristol, 101-E

This PM2.5 site was established in 1999 to meet the requirements of EPA to establish population oriented PM2.5 monitoring sites throughout Virginia. This site was chosen because of its openness, security, and neighborhood setting.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

AQCR 2 – Valley of Virginia Intrastate
Air Quality Control Region
(shown in white)



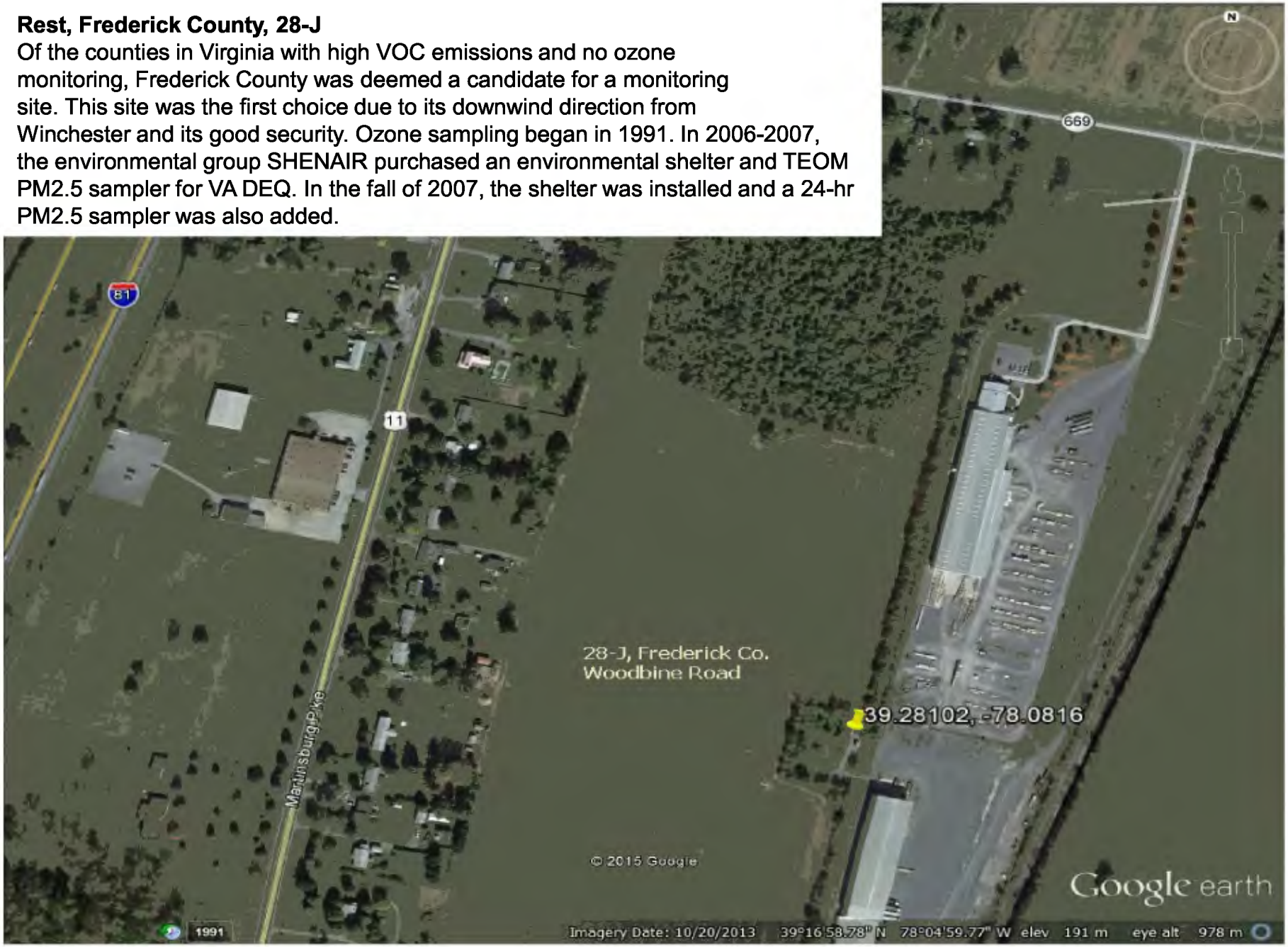
Counties: Alleghany, Augusta, Bath, Botetourt, Clarke, Craig, Floyd, Frederick, Giles, Highland, Montgomery, Page, Pulaski, Roanoke, Rockbridge, Rockingham, Shenandoah, Warren

Cities: Buena Vista, Clifton Forge, Covington, Harrisonburg, Lexington, Radford, Roanoke, Salem, Staunton, Waynesboro, Winchester

CBSA/MSA: 49020 – Winchester VA-WV; 40220 – Roanoke, VA; 25500 – Harrisonburg, VA

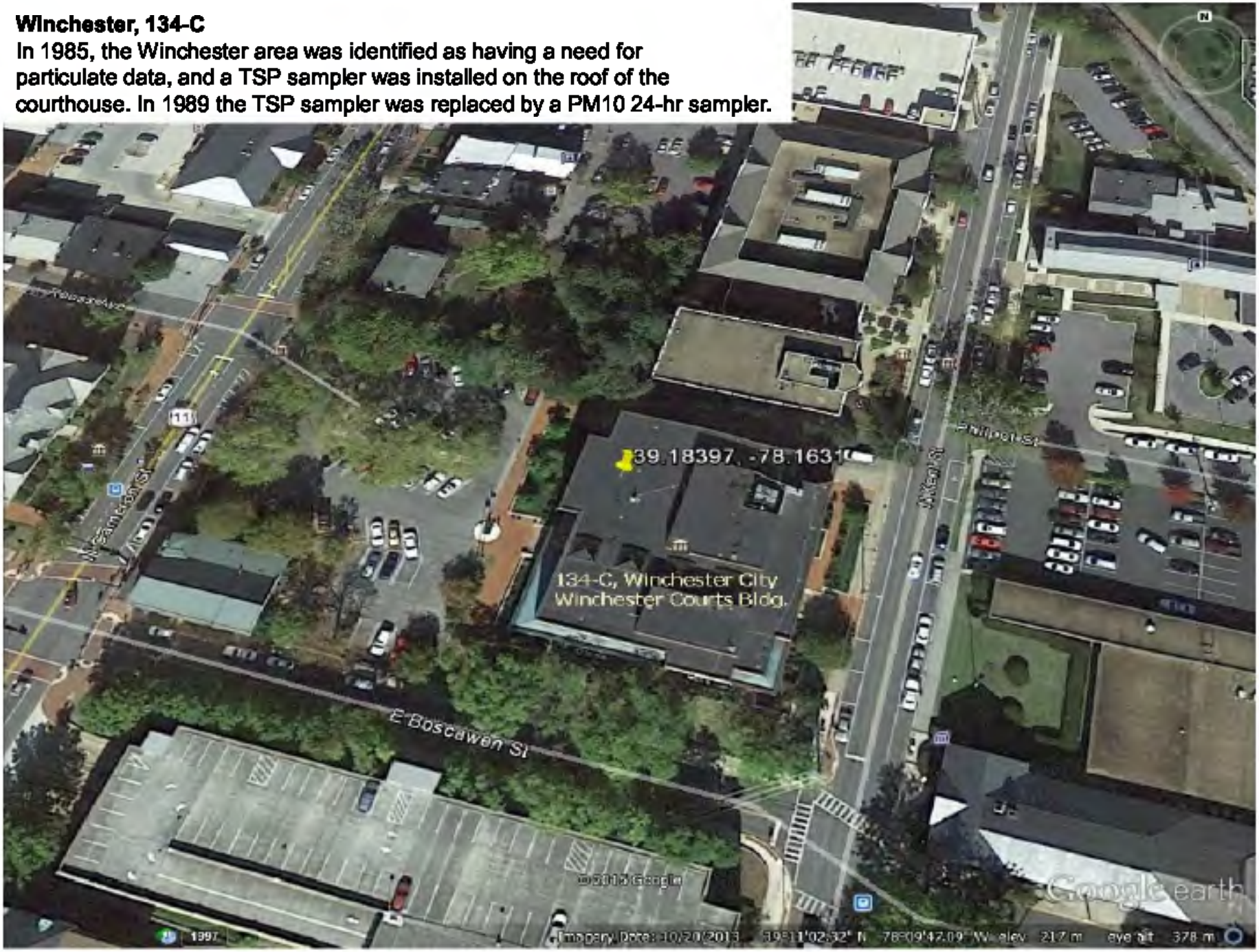
Rest, Frederick County, 28-J

Of the counties in Virginia with high VOC emissions and no ozone monitoring, Frederick County was deemed a candidate for a monitoring site. This site was the first choice due to its downwind direction from Winchester and its good security. Ozone sampling began in 1991. In 2006-2007, the environmental group SHENAIR purchased an environmental shelter and TEOM PM2.5 sampler for VA DEQ. In the fall of 2007, the shelter was installed and a 24-hr PM2.5 sampler was also added.



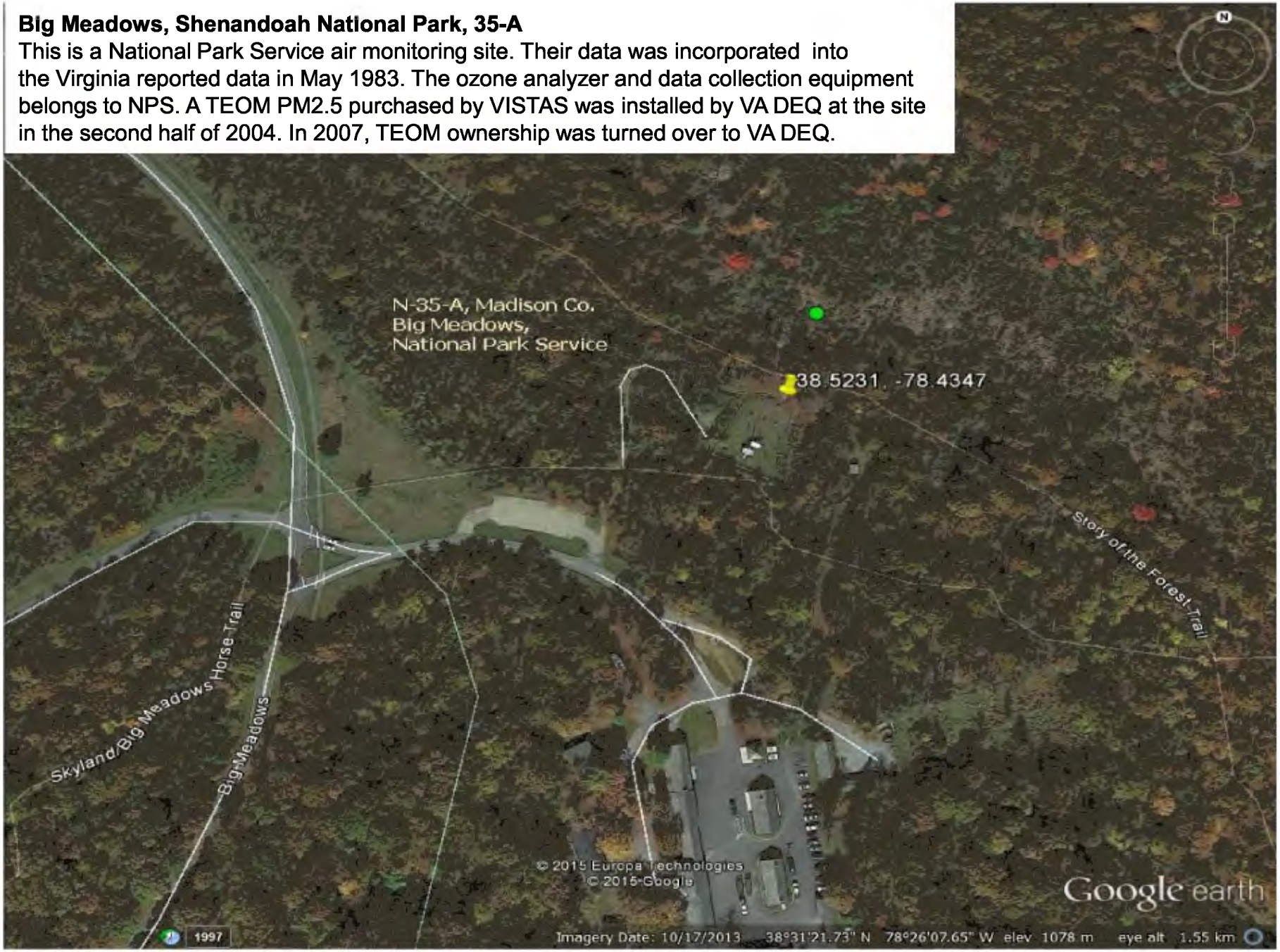
Winchester, 134-C

In 1985, the Winchester area was identified as having a need for particulate data, and a TSP sampler was installed on the roof of the courthouse. In 1989 the TSP sampler was replaced by a PM10 24-hr sampler.



Big Meadows, Shenandoah National Park, 35-A

This is a National Park Service air monitoring site. Their data was incorporated into the Virginia reported data in May 1983. The ozone analyzer and data collection equipment belongs to NPS. A TEOM PM2.5 purchased by VISTAS was installed by VA DEQ at the site in the second half of 2004. In 2007, TEOM ownership was turned over to VA DEQ.

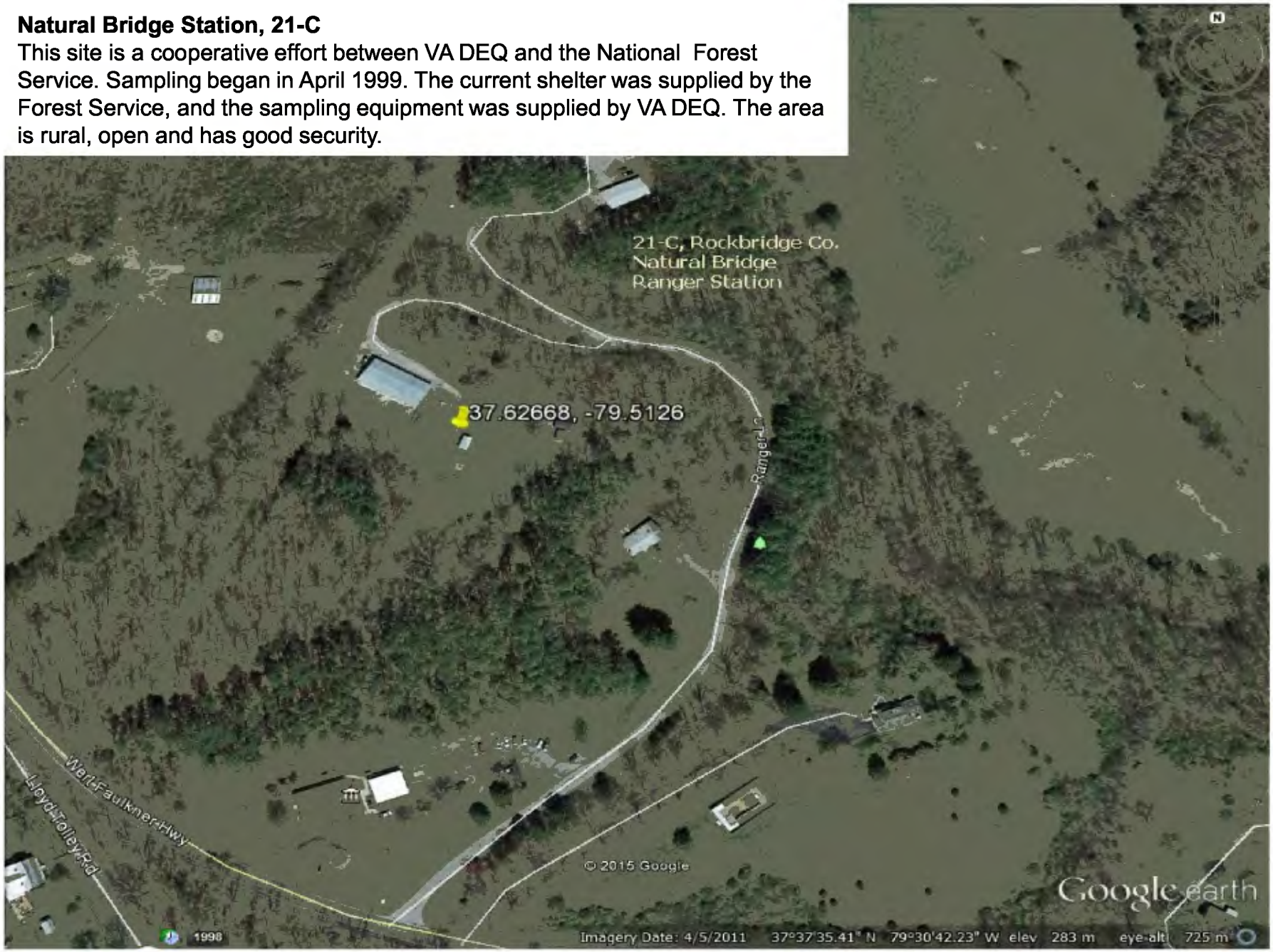


Herman Horn Elem. School, Vinton, 19-A6

This site was installed at the request of locality (Roanoke County Health Department). NO2 sampling began in December 1980 and TSP added in January 1981and Ozone in August 1981. In January 1987, SO2 and CO analyzers added in effort to consolidate monitoring efforts in the Roanoke area. There was verbal approval from the EPA III and EPA RTP Offices. In 2013, PM2.5 24-hr and continuous samplers were added.

Natural Bridge Station, 21-C

This site is a cooperative effort between VA DEQ and the National Forest Service. Sampling began in April 1999. The current shelter was supplied by the Forest Service, and the sampling equipment was supplied by VA DEQ. The area is rural, open and has good security.



VDOT, Rockingham County, 26-F

This site was established as a replacement for a monitoring site to the south of the city of Harrisonburg. This site is ten miles north of the city and began in April 2004. On the property of the VDOT it is situated between Route 11 and I-81, with open air flow and good security.

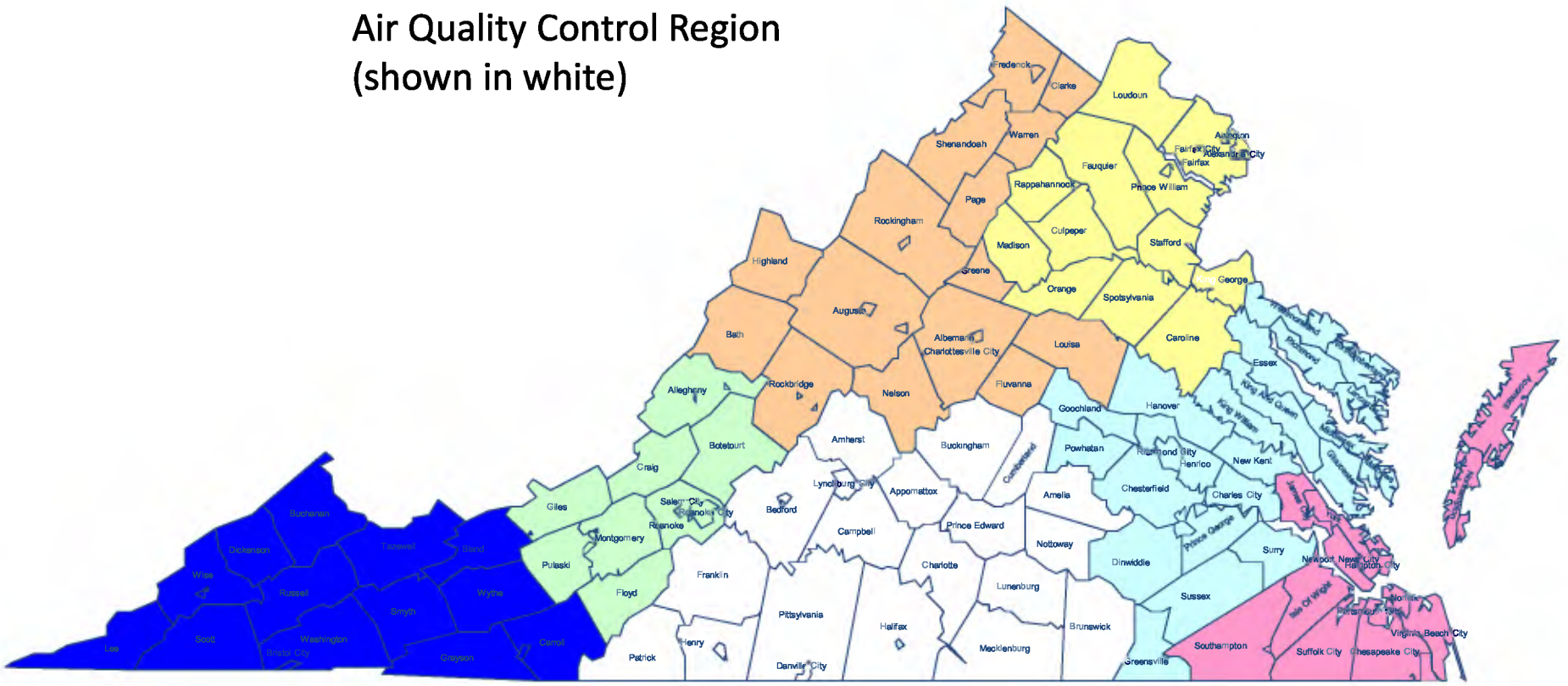
Salem High School, Salem, 110-C

PM2.5 sampling on the roof of the Salem Fire Department stopped in 2006 when roof repairs and construction reconfigured the roof making sampling at this location untenable. After a long search, an exceptional spot at Salem High School was found that offered free air flow, good accessibility and very good security. The site was installed and began operation in late 2008.

Mario Industries, Roanoke, 109-N
Lead sampler was installed in late 2014 as a replacement to the Lead monitoring site at Cherry Hill Circle, Roanoke. Site is situated in Roanoke River valley to pick up emissions from multiple sources.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

AQCR 3 – Central Virginia Intrastate
Air Quality Control Region
(shown in white)



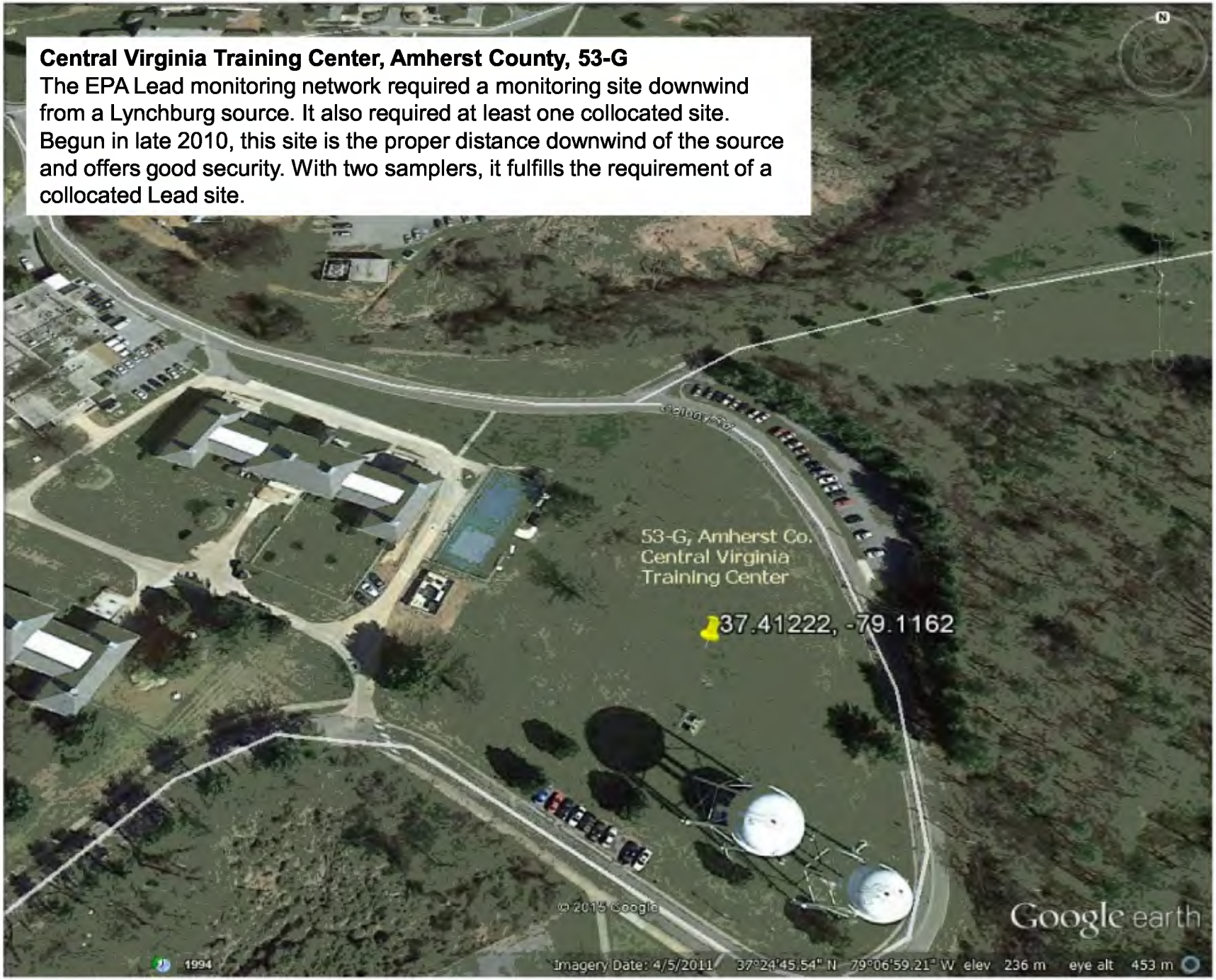
Counties: Amelia, Amherst, Appomattox, Bedford, Brunswick, Buckingham, Campbell, Charlotte, Cumberland, Franklin, Halifax, Henry, Lunenburg, Mecklenburg, Nottoway, Patrick, Pittsylvania, Prince Edward

Cities: Bedford, Danville, Lynchburg, Martinsville, South Boston

CBSA/MSA: 31340 – Lynchburg, VA

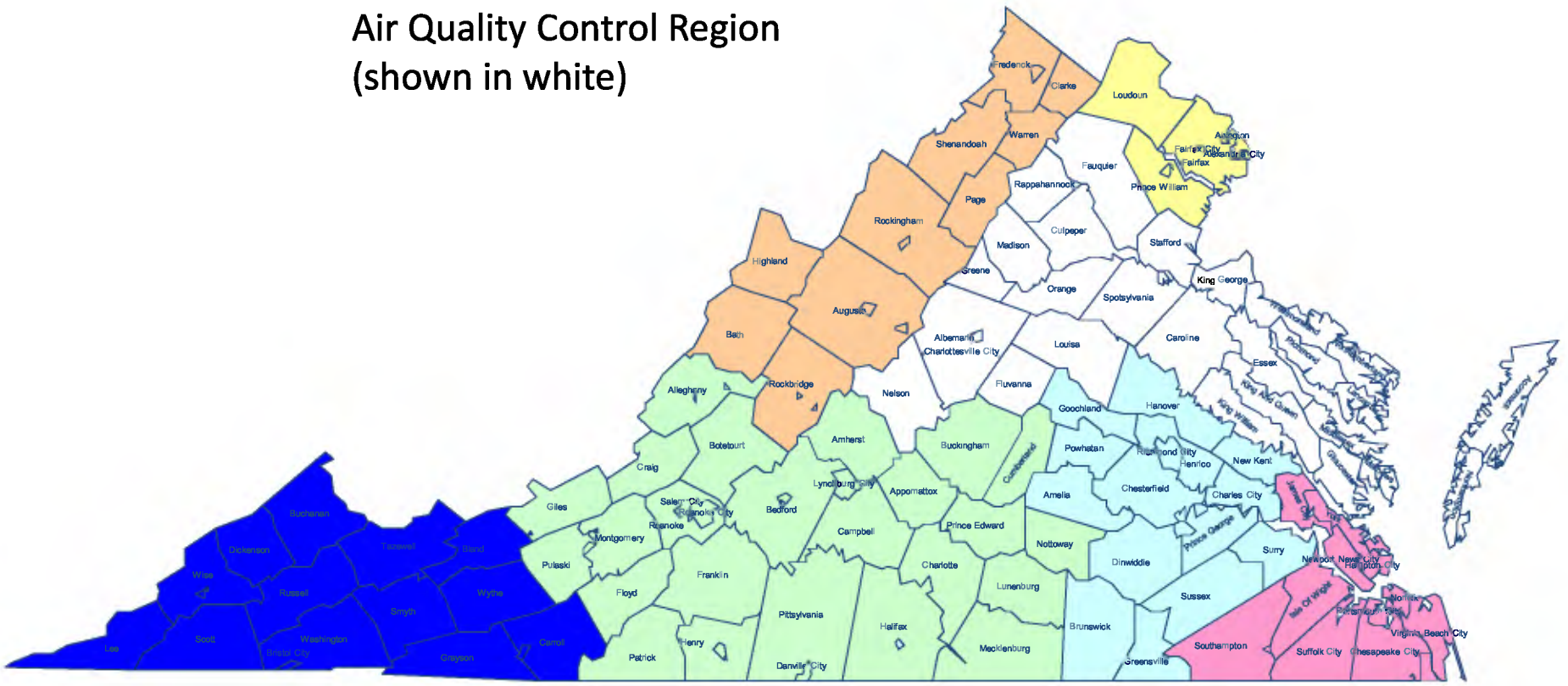
Leesville Road Water Tower, Lynchburg, 155-Q

When the PM2.5 network was put together, it was determined a sampler was needed in Lynchburg. A sampler was installed but it was found that the site had electrical problems that could not be resolved. A secure location was found on city property and the PM2.5 sampler began operation at this site in April 2003.


Central Virginia Training Center, Amherst County, 53-G
The EPA Lead monitoring network required a monitoring site downwind from a Lynchburg source. It also required at least one collocated site. Begun in late 2010, this site is the proper distance downwind of the source and offers good security. With two samplers, it fulfills the requirement of a collocated Lead site.
53-G, Amherst Co.
Central Virginia
Training Center
37.41222, -79.1162
© 2015 Google
Google earth
1994
Imagery Date: 4/5/2011 37°24'45.54" N 79°06'59.21" W elev 236 m eye alt 453 m

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

AQCR 4 – Northeast Virginia Intrastate
Air Quality Control Region
(shown in white)



Counties: Accomack, Albemarle, Caroline, Culpeper, Essex, Fauquier, Fluvanna, Gloucester, Greene, King and Queen, King George, King William, Lancaster, Louisa, Madison, Mathews, Middlesex, Nelson, Northampton, Northumberland, Orange, Rappahannock, Richmond, Spotsylvania, Stafford, Westmoreland

Cities: Charlottesville, Fredericksburg

CBSA/MSA: 40060 – Richmond, VA; 16820 – Charlottesville, VA; 47900 – Washington-Arlington-Alexandria, DC-VA-MD-WV

Corbin, Caroline County, 48-A

This site was established in June 1993 as the required "PAMS Type 1 upwind monitoring site to measure background pollutant concentrations of the air mass entering the Washington area on days conducive to ozone formation".

Sumerduck, Fauquier County, 37-B

This ozone monitoring site was established in 1981 as an upwind site for the Washington DC metropolitan area. It is situated in the correct upwind quadrant, the proper distance away, and on state property.

Widewater Elementary School, Stafford County, 44-A

The Ozone monitoring site at Widewater Elementary School was established to characterize ambient ozone concentrations in Stafford County. Ozone sampling began in September 1992,

Albemarle High School, Albemarle County, 33-A

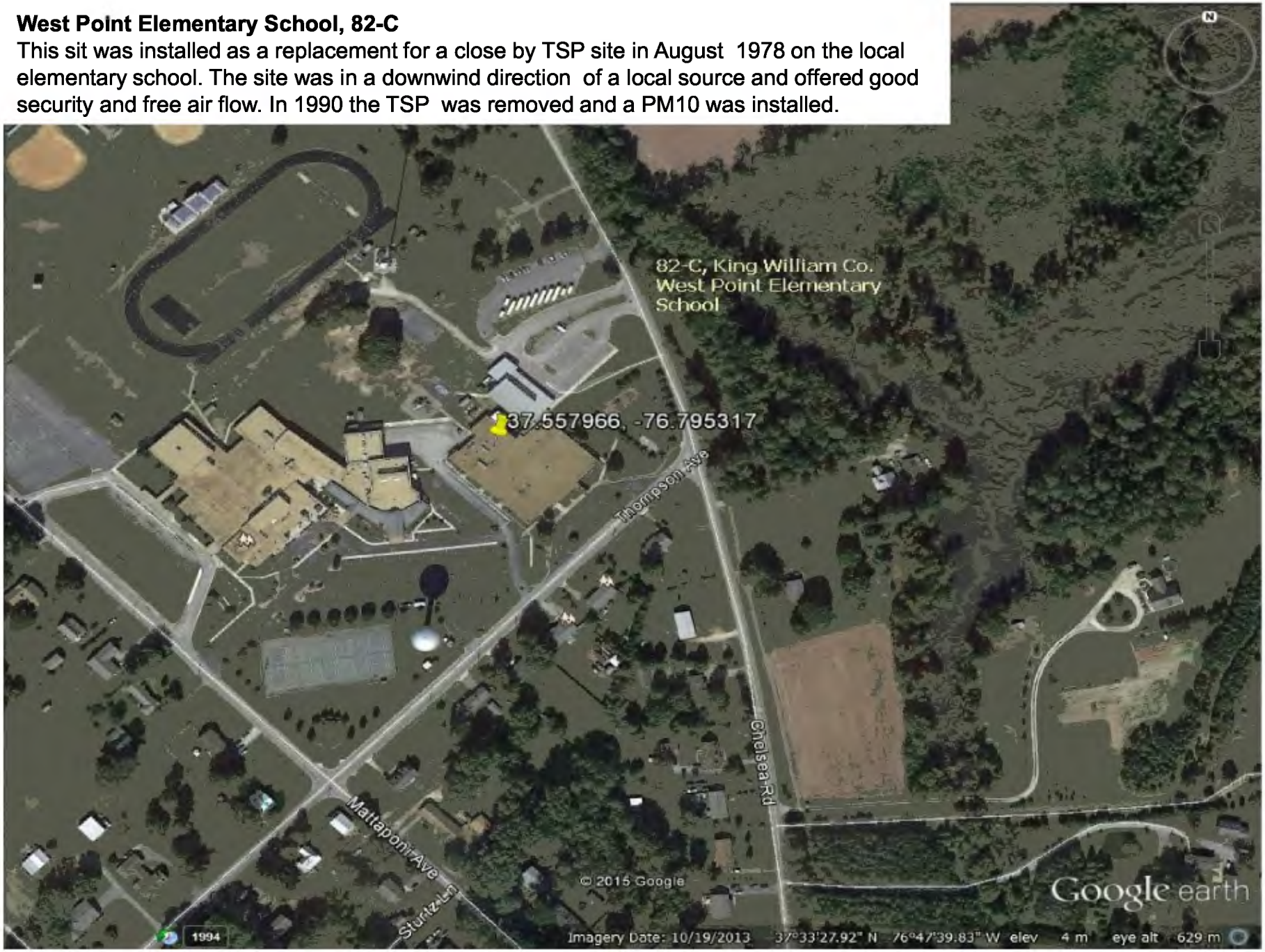
Since 2002, the Charlottesville area had been designated as a priority for Ozone and PM2.5 sampling. Four years of on again – off again searches for a representative monitoring site proved fruitless. A monitoring site at Albemarle High School was finally found and eventually approved by the School Board. Inspected by EPA III, it was determined to be representative of the Charlottesville area.

Hugh Mercer Elementary School, Fredericksburg, 130-E

This location was established as a TSP replacement site in 1980. The desire was to keep the TSP sampler within the city limits of Fredericksburg. The location on the roof of the elementary school offered good security, free air flow and a sampling site representative of a large area. A PM10 sampler later replaced the TSP sampler.

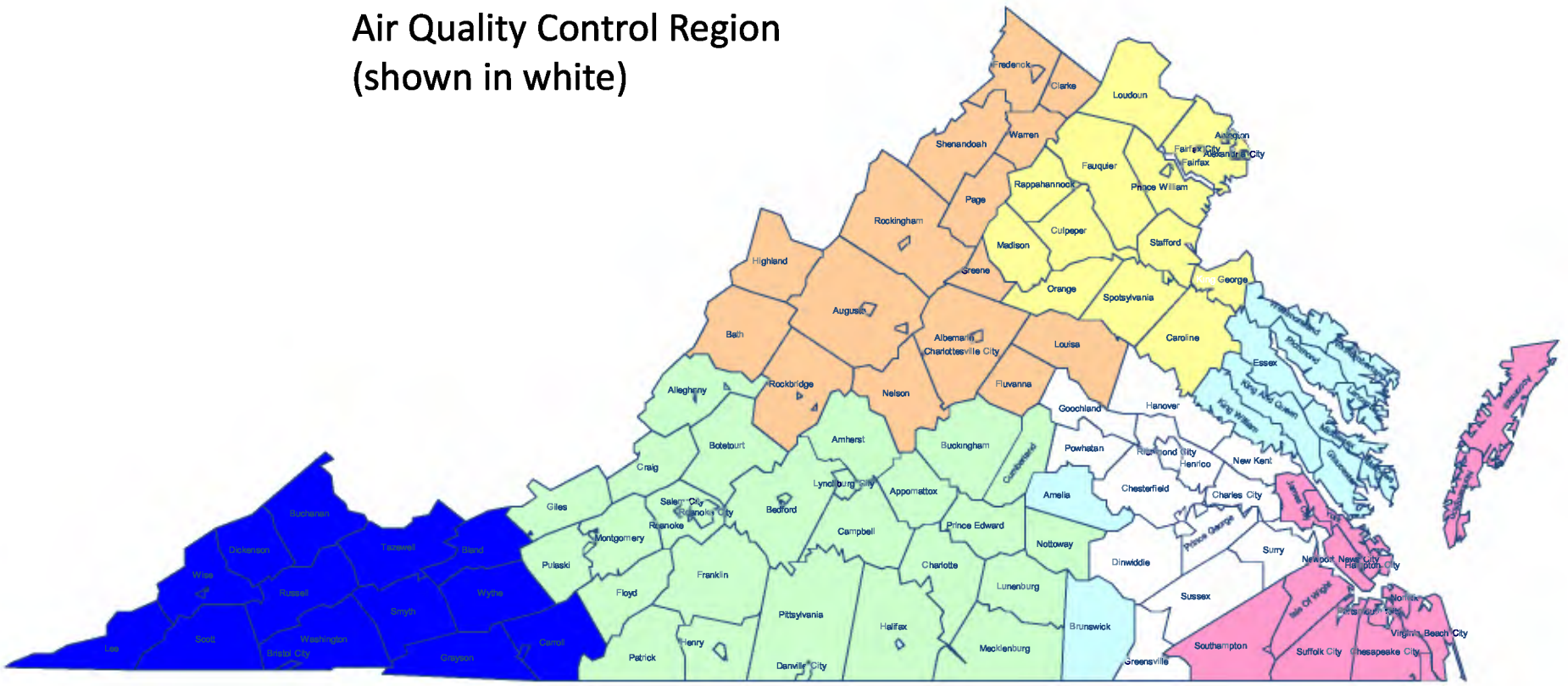
West Point Elementary School, 82-C

This sit was installed as a replacement for a close by TSP site in August 1978 on the local elementary school. The site was in a downwind direction of a local source and offered good security and free air flow. In 1990 the TSP was removed and a PM10 was installed.



VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

AQCR 5 – State Capital Intrastate
Air Quality Control Region
(shown in white)



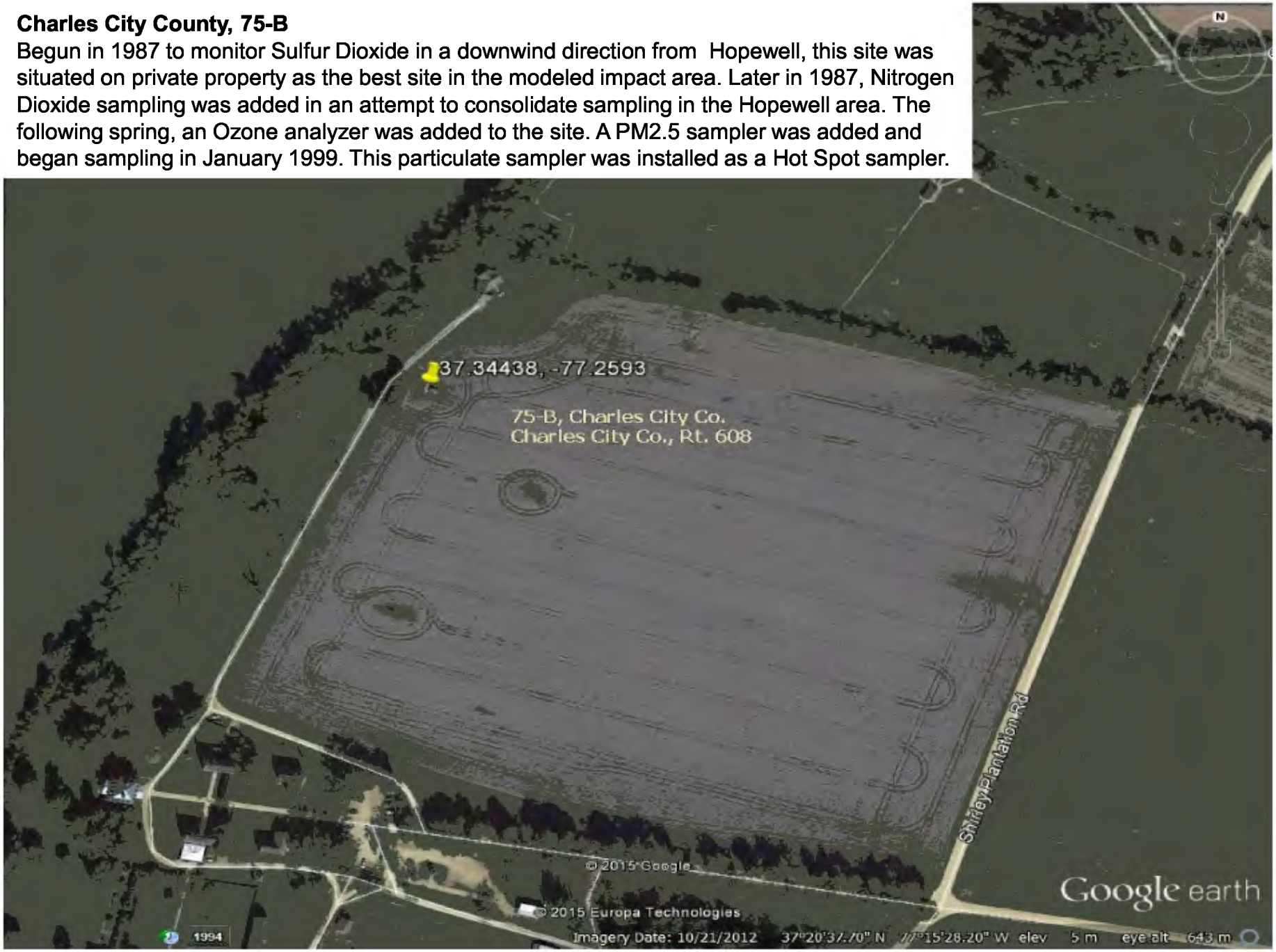
Counties: Charles City, Chesterfield, Dinwiddie, Goochland, Greensville, Hanover, Henrico, New Kent, Powhatan, Prince George, Surry, Sussex

Cities: Colonial Heights, Emporia, Hopewell, Petersburg, Richmond

CBSA/MSA: 40060 – Richmond, VA

Charles City County, 75-B

Begun in 1987 to monitor Sulfur Dioxide in a downwind direction from Hopewell, this site was situated on private property as the best site in the modeled impact area. Later in 1987, Nitrogen Dioxide sampling was added in an attempt to consolidate sampling in the Hopewell area. The following spring, an Ozone analyzer was added to the site. A PM2.5 sampler was added and began sampling in January 1999. This particulate sampler was installed as a Hot Spot sampler.



Bensley Armory, Chesterfield County, 71-D

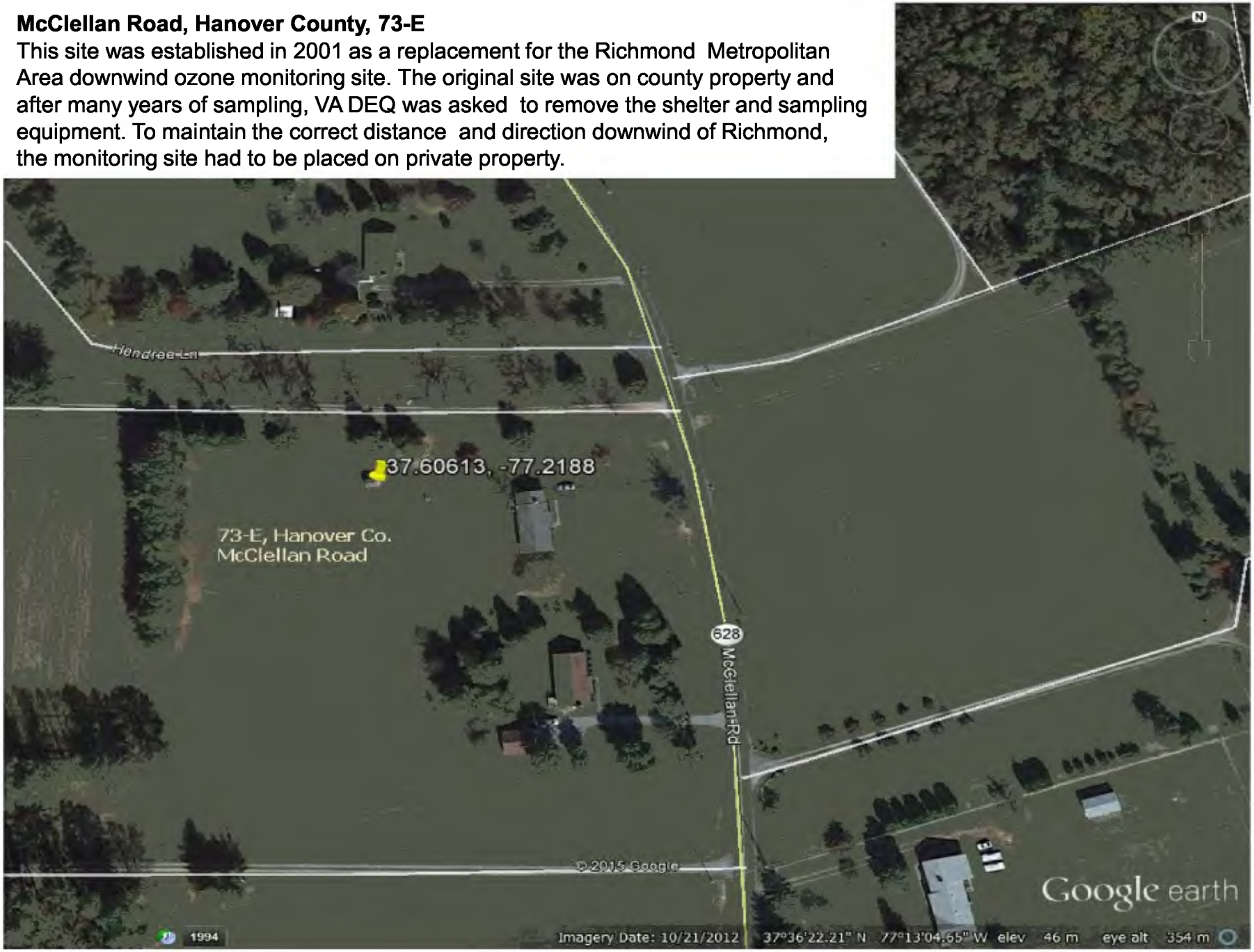
Particulate sampling has been ongoing at this site since 1976. Having to move from a close-by site, this site was picked to continue this population oriented sampling in the area. Because it is a Federal facility, it offered excellent security. The initial TSP sampler was replaced with a PM10 sampler in 1989, and that was replaced by a PM2.5 sampler in 1999.

Beach Road, Chesterfield, 71-H

Air monitoring began in April 1980 at the Beach Road VDOT shop in Chesterfield County. Because of its location and security, this site was picked as the upwind Ozone site for the Richmond metropolitan area.

McClellan Road, Hanover County, 73-E

This site was established in 2001 as a replacement for the Richmond Metropolitan Area downwind ozone monitoring site. The original site was on county property and after many years of sampling, VA DEQ was asked to remove the shelter and sampling equipment. To maintain the correct distance and direction downwind of Richmond, the monitoring site had to be placed on private property.

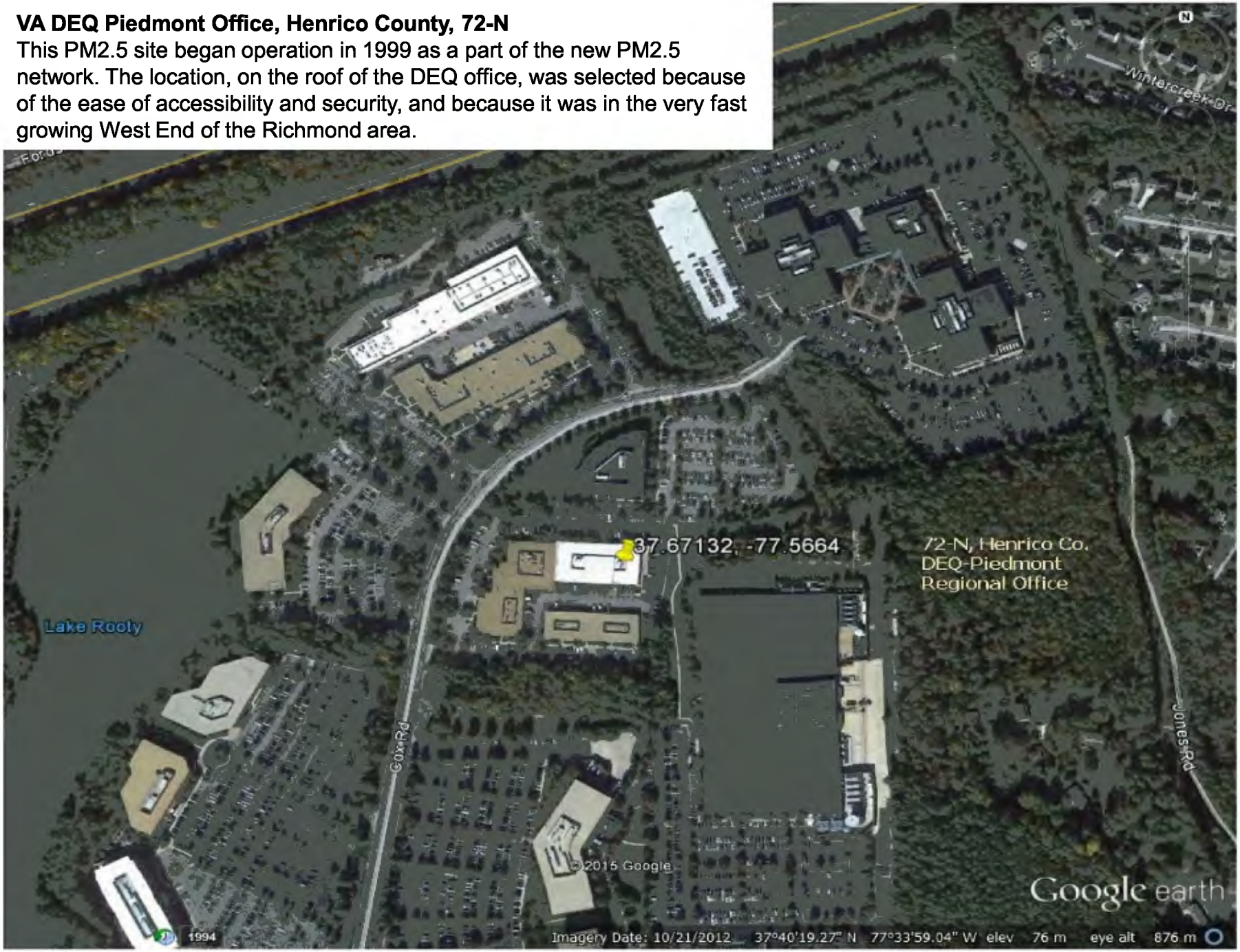


MathScience Innovation Center, Henrico County, 72-M

This site began in 1981 as a replacement monitoring location for sites lost in the city of Richmond. Ozone and SO2 were located in a storage room with a probe support extending above the roof. A shelter was later added as was more instrumentation. In 2008 the MathScience Center site became a National Air Toxics Trend Site. In 2011 this also became the NCore location for DEQ as well.

VA DEQ Piedmont Office, Henrico County, 72-N

This PM2.5 site began operation in 1999 as a part of the new PM2.5 network. The location, on the roof of the DEQ office, was selected because of the ease of accessibility and security, and because it was in the very fast growing West End of the Richmond area.



Woodson Middle School, Hopewell, 154-M

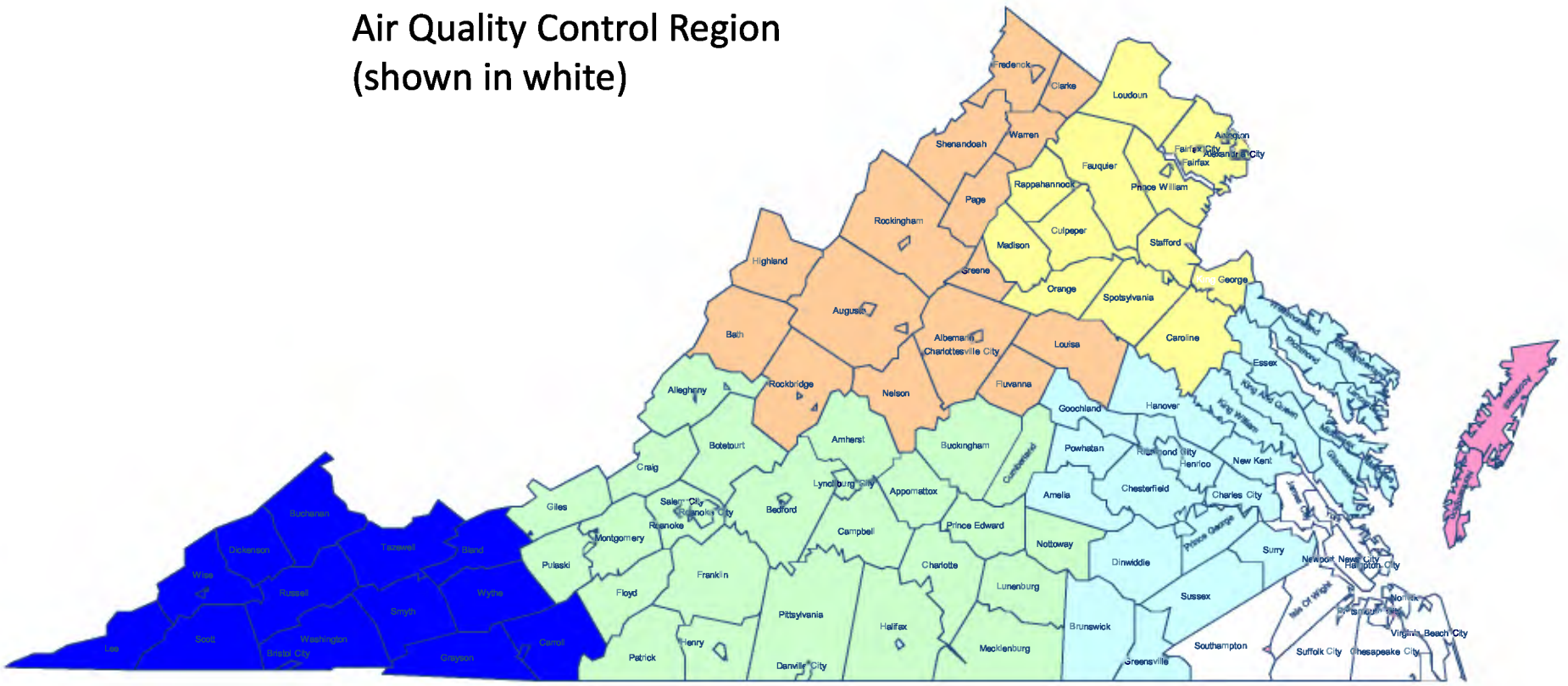
The Woodson Middle School site is currently one of three Urban Air Toxics Sites in Virginia. The site was originally established as part of the Hopewell Community Air Toxics Study which began in 2009. When the Study was completed, the site was retained for further sampling in the Hopewell area and was designated the Urban Air Toxics Site due to the existence of a NATTS site in the Richmond area at the MathScience Center site.

Bryan Park, Richmond, 158-X

Established in mid-2013 as part of the EPA mandated Near Road Monitoring program, this site is in Bryan Park alongside I-95 at its highest traffic volume stretch in the Richmond area.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

AQCR 6 – Hampton Roads Intrastate
Air Quality Control Region
(shown in white)



Counties: Isle of Wight, James City, Southampton, York

Cities: Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, Williamsburg

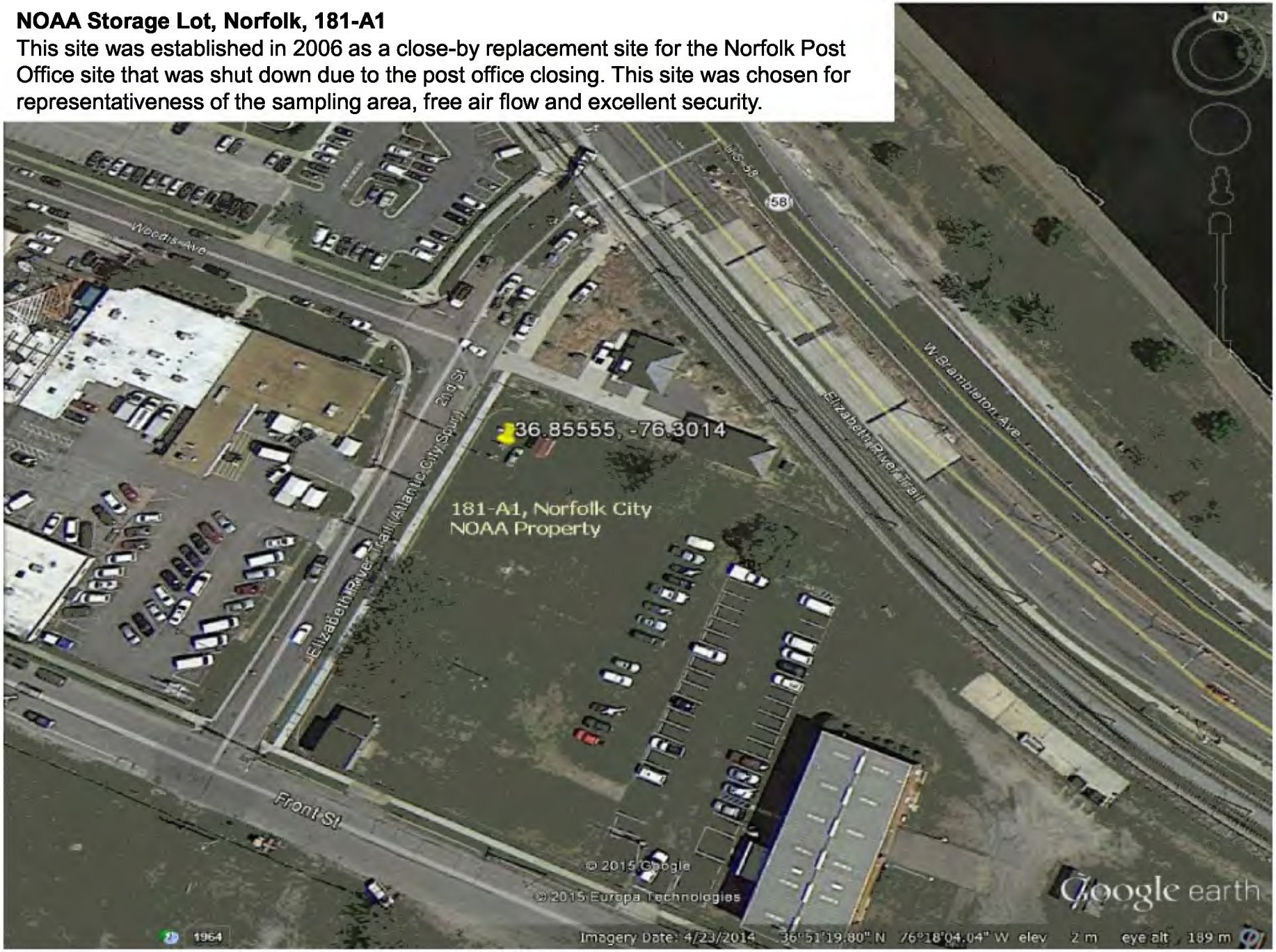
CBSA/MSA: 47260 – Virginia Beach-Norfolk-Newport News, VA-NC

NASA Langley Research Center, Hampton, 179-K

Sampling began in 2010 at this site. This location was a replacement site for the VA School in Hampton that had operated since 1972. The location on the northern portion of the NASA Langley Research Center property has free air flow and excellent security.

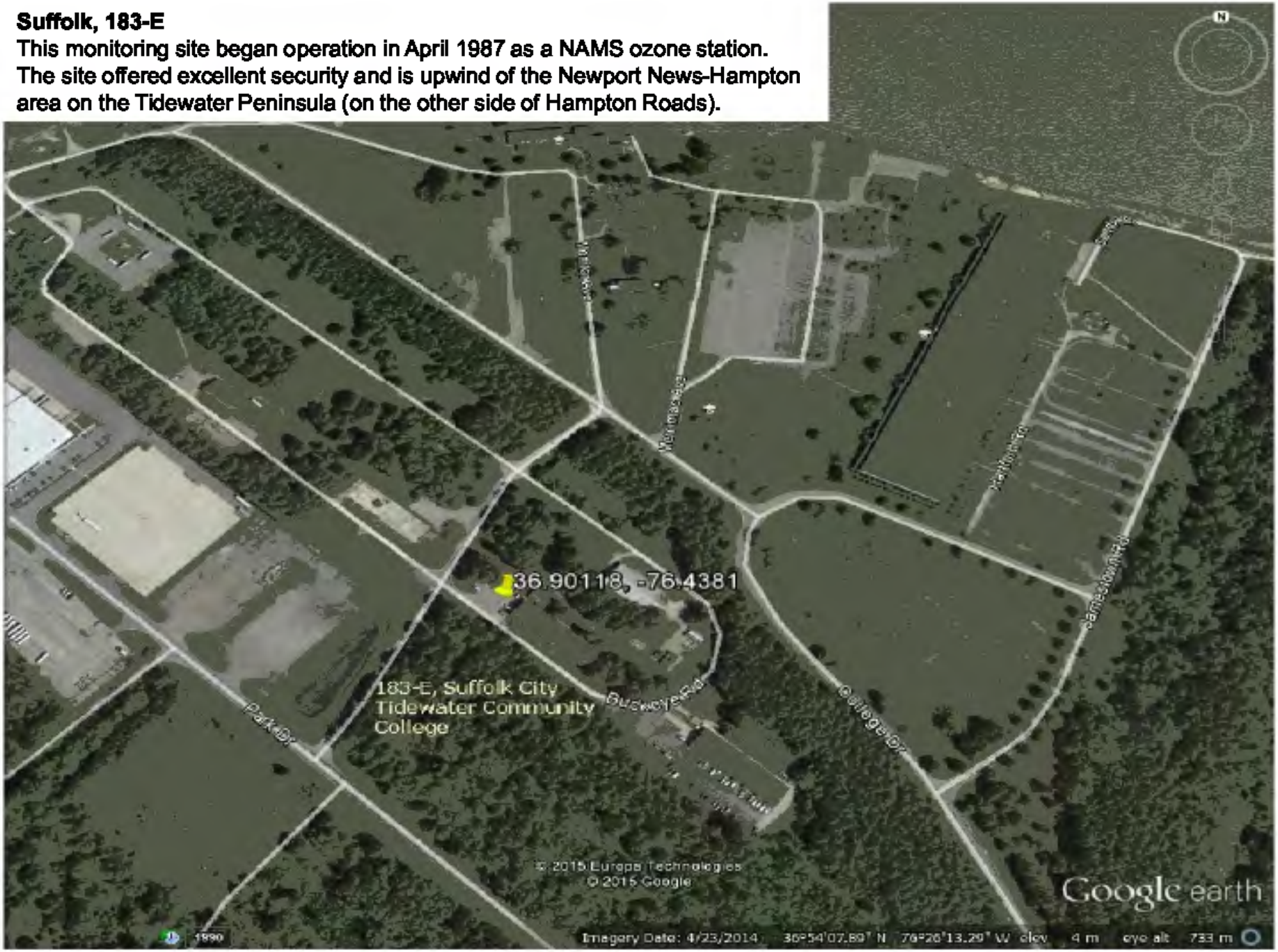
NOAA Storage Lot, Norfolk, 181-A1

This site was established in 2006 as a close-by replacement site for the Norfolk Post Office site that was shut down due to the post office closing. This site was chosen for representativeness of the sampling area, free air flow and excellent security.



Suffolk, 183-E

This monitoring site began operation in April 1987 as a NAMS ozone station. The site offered excellent security and is upwind of the Newport News-Hampton area on the Tidewater Peninsula (on the other side of Hampton Roads).



Suffolk, 183-F

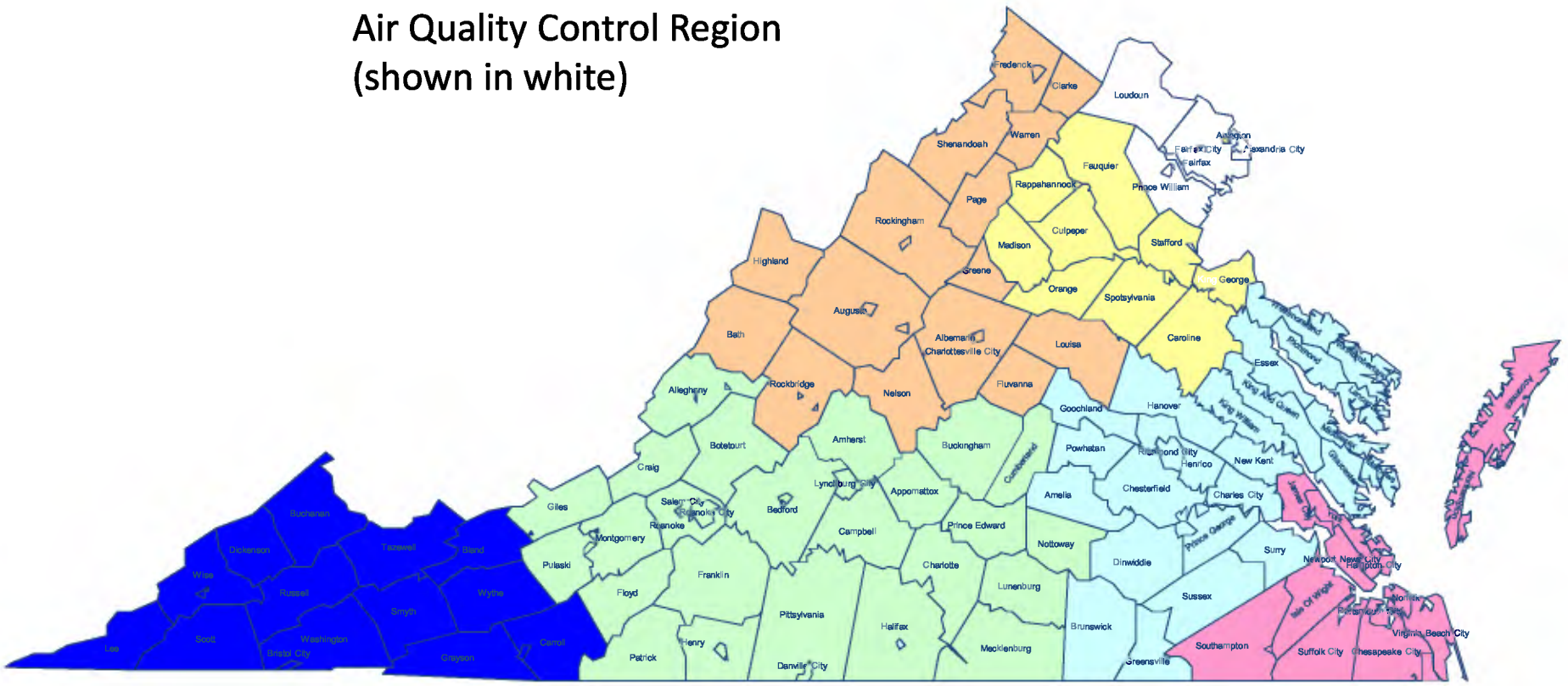
This monitoring site was established in 1991as an EPA required replacement for the terminated NAMS ozone monitoring site at the Cheriton Post Office on the eastern shore of Virginia.

Tidewater DEQ Office, VA Beach, 184-J

This monitoring site was established in 1999 as part of PM2.5 monitoring network. In the side yard of the DEQ regional office, it offered convenience and good security, while monitoring neighborhood and light commercial areas.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

AQCR 7 – National Capital Interstate
Air Quality Control Region
(shown in white)



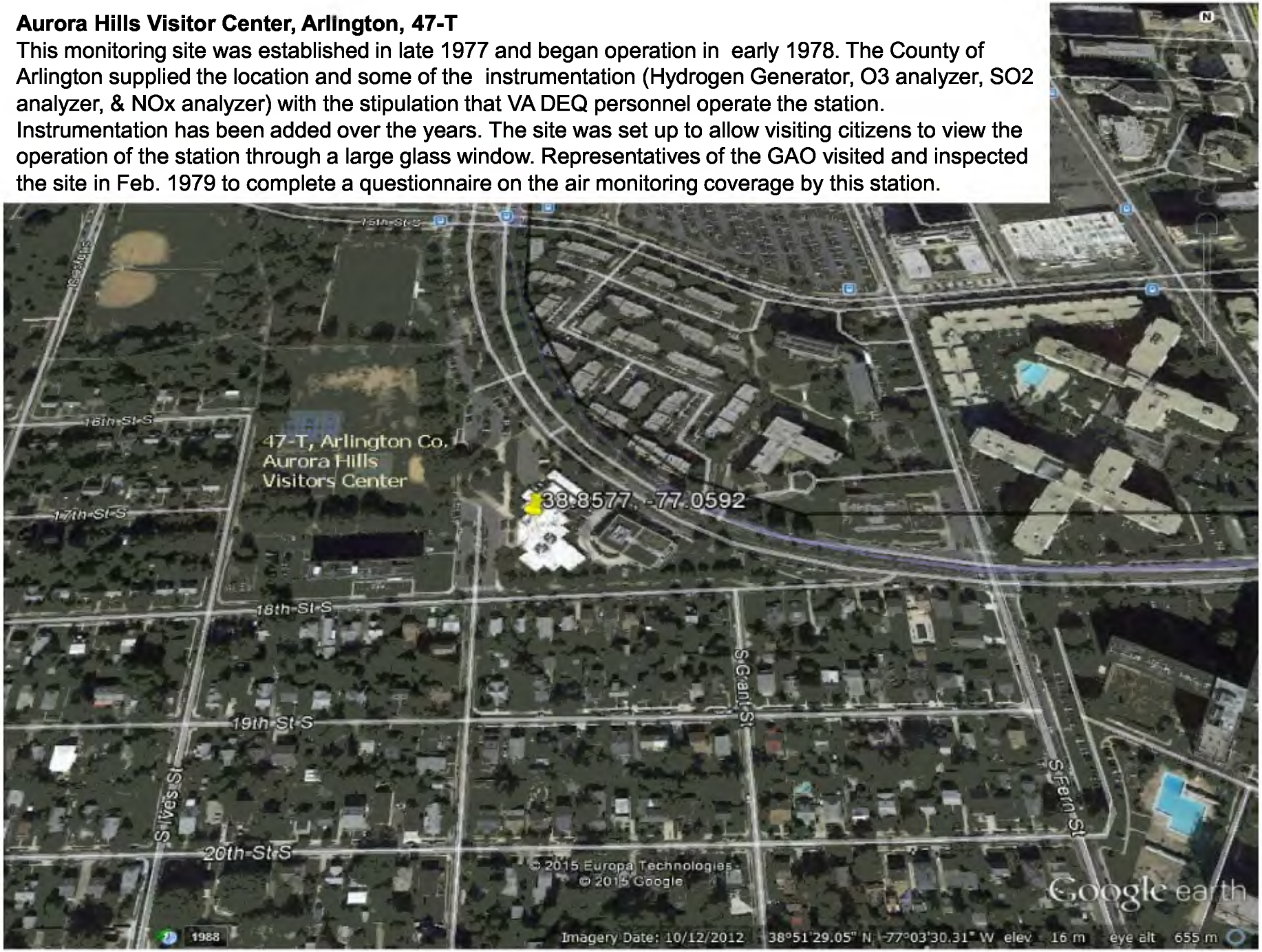
Counties: Arlington, Fairfax, Loudoun, Prince William

Cities: Alexandria, Fairfax, Falls Church, Manassas, Manassas Park

CBSA/MSA: 47900 – Washington-Arlington-Alexandria, DC-VA-MD-WV

Aurora Hills Visitor Center, Arlington, 47-T

This monitoring site was established in late 1977 and began operation in early 1978. The County of Arlington supplied the location and some of the instrumentation (Hydrogen Generator, O3 analyzer, SO2 analyzer, & NOx analyzer) with the stipulation that VA DEQ personnel operate the station. Instrumentation has been added over the years. The site was set up to allow visiting citizens to view the operation of the station through a large glass window. Representatives of the GAO visited and inspected the site in Feb. 1979 to complete a questionnaire on the air monitoring coverage by this station.



Lee District Park, Fairfax County, 46-B9

"The EPA required the Virginia DEQ to establish a PAMS in the secondary downwind direction from the area of maximum ozone precursor emissions for days when higher ozone concentrations were likely to occur." Lee District Park was in a good location for the establishment of this site, a PAMS Type II. Sampling began in July 1998.

Broad Run High School, Ashburn, Loudoun County, 38-I

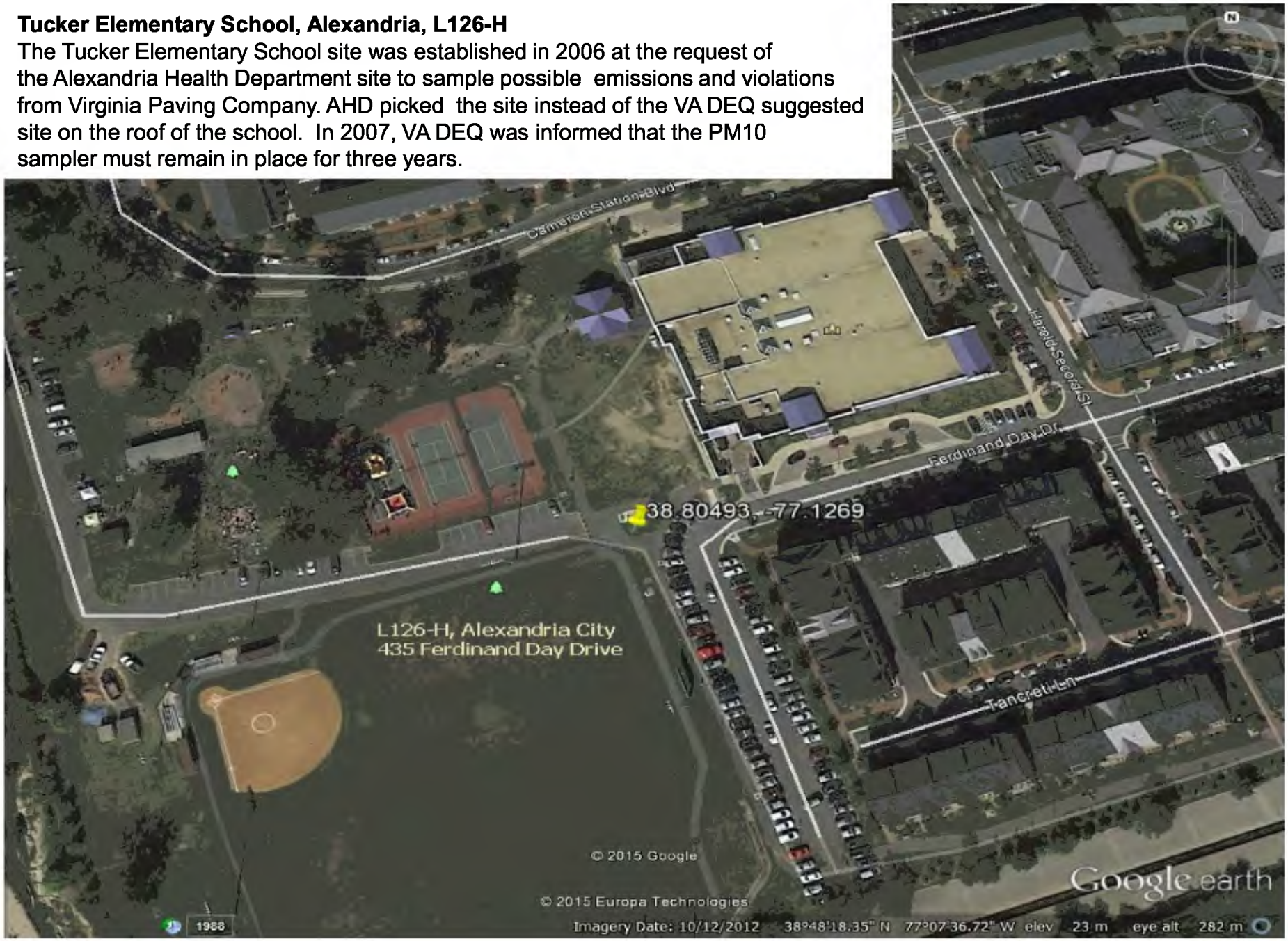
In 1997 VA DEQ was looking for a suitable site in Loudoun County to monitor Ozone, Nitrogen Dioxide and Particulate Matter to address citizen concerns. The site at Broad Run High School was deemed acceptable and sampling began in April 1998.

Long Park, Prince William County, 45-L

The agency Strategic Plan of 1990 identified Prince William County as an area requiring ozone monitoring. A suitable location in the James Long Park was selected and ozone sampling began in April 1991. In 1994, NOx sampling at this site began.

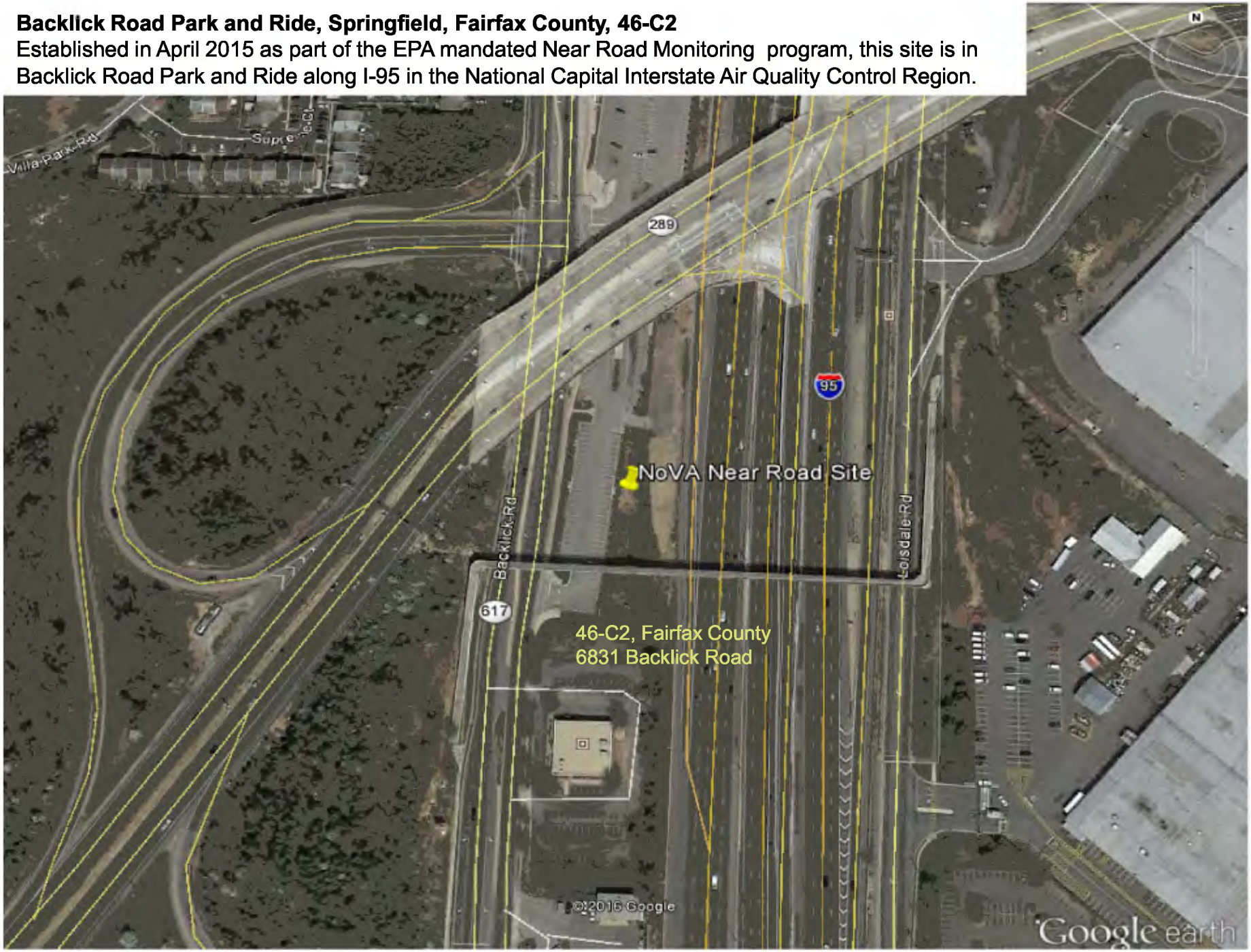
Tucker Elementary School, Alexandria, L126-H

The Tucker Elementary School site was established in 2006 at the request of the Alexandria Health Department site to sample possible emissions and violations from Virginia Paving Company. AHD picked the site instead of the VA DEQ suggested site on the roof of the school. In 2007, VA DEQ was informed that the PM10 sampler must remain in place for three years.



Backlick Road Park and Ride, Springfield, Fairfax County, 46-C2

Established in April 2015 as part of the EPA mandated Near Road Monitoring program, this site is in Backlick Road Park and Ride along I-95 in the National Capital Interstate Air Quality Control Region.

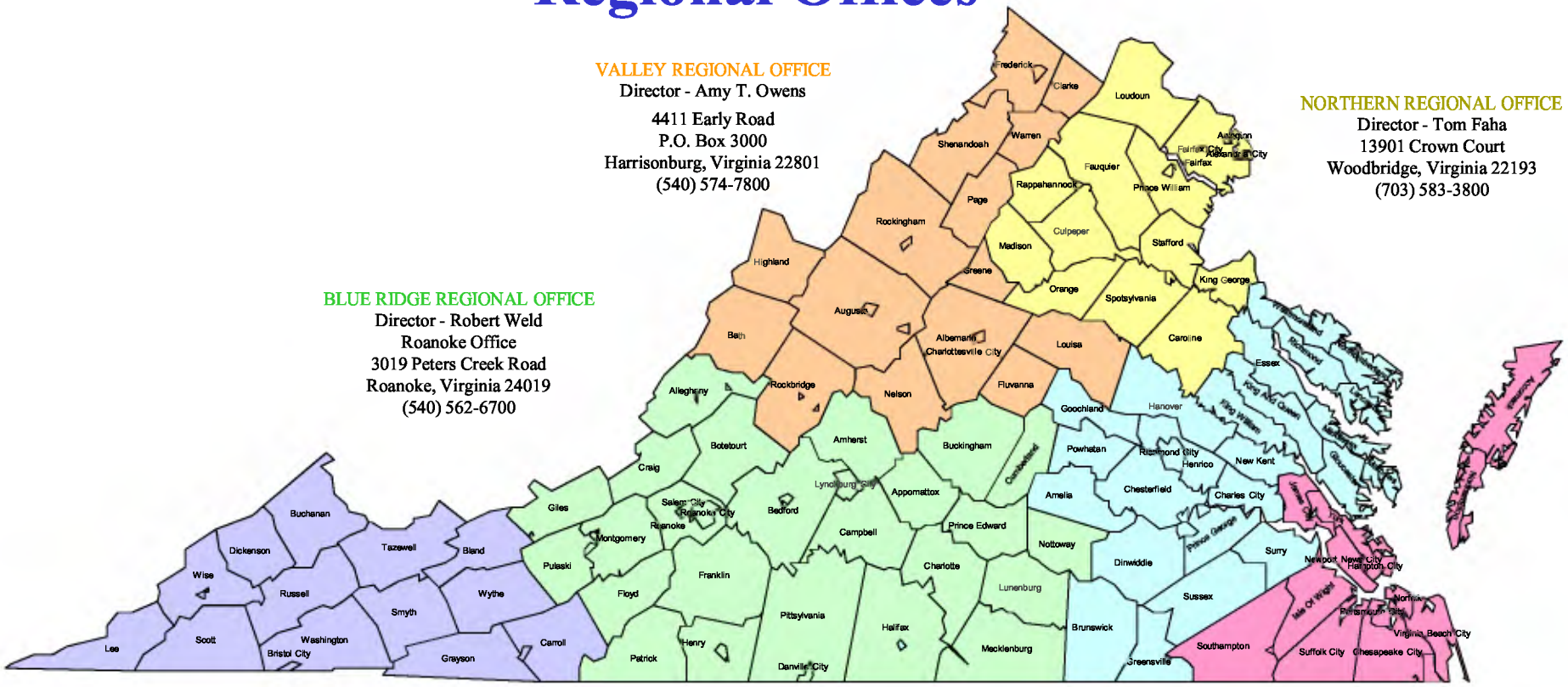


ATTACHMENT 4

SITE MAPS – MONITOR LOCATIONS

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Regional Offices



VALLEY REGIONAL OFFICE
Director - Amy T. Owens
4411 Early Road
P.O. Box 3000
Harrisonburg, Virginia 22801
(540) 574-7800

NORTHERN REGIONAL OFFICE
Director - Tom Faha
13901 Crown Court
Woodbridge, Virginia 22193
(703) 583-3800

BLUE RIDGE REGIONAL OFFICE
Director - Robert Weld
Roanoke Office
3019 Peters Creek Road
Roanoke, Virginia 24019
(540) 562-6700

SOUTHWEST REGIONAL OFFICE
Director – Allan Newman
355 Deadmore St.
P.O. Box 1688
Abingdon, Virginia 24212
(276) 676-4800

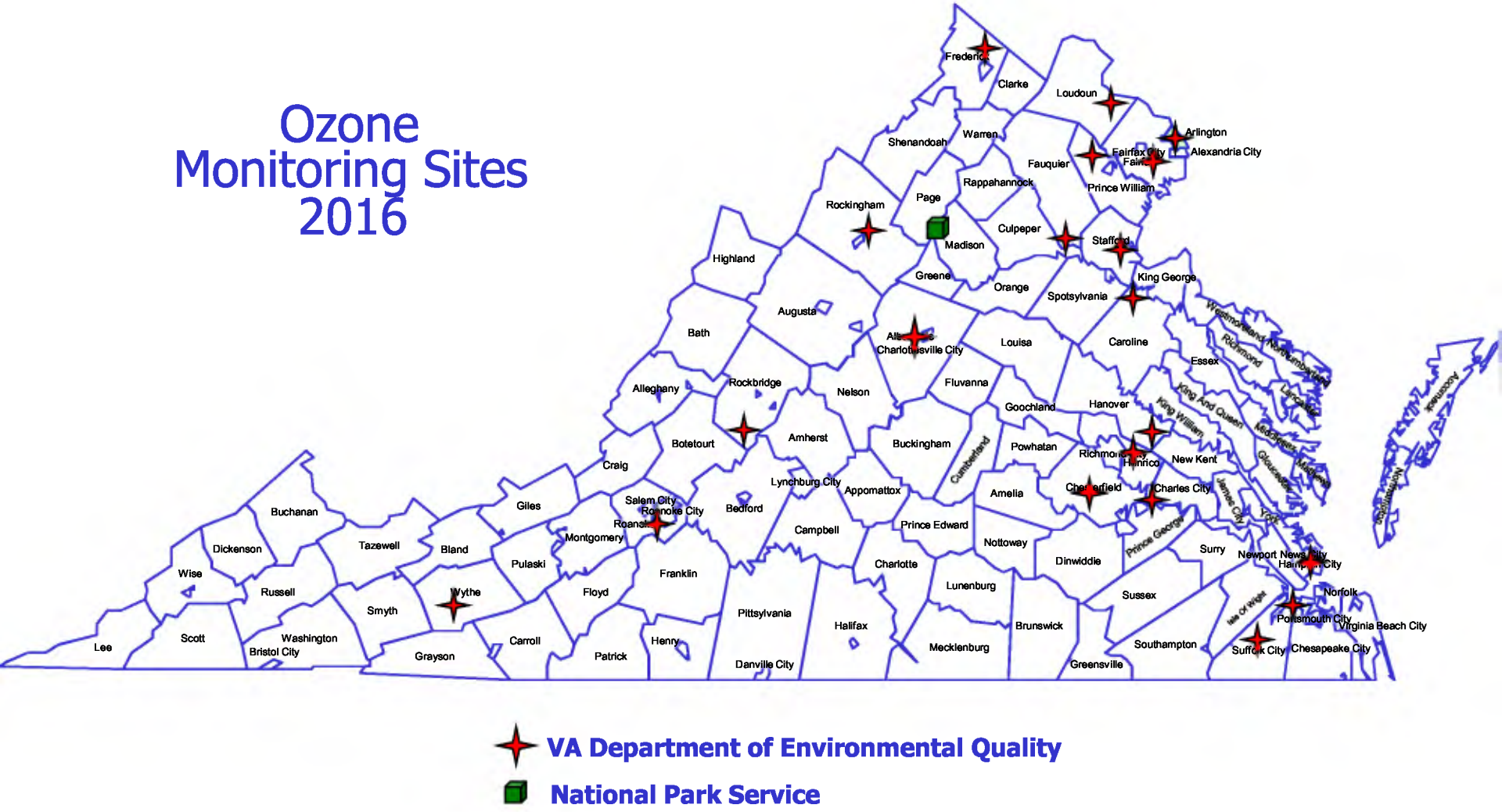
BLUE RIDGE REGIONAL OFFICE
Director - Robert Weld
Lynchburg Office
7705 Timberlake Road
Lynchburg, Virginia 24502
(434) 582-5120

PIEDMONT REGIONAL OFFICE
Director - Mike Murphy
4949-A Cox Road
Glen Allen, Virginia 23060
(804) 527-5020

TIDEWATER REGIONAL OFFICE
Director - Maria Nold
5636 Southern Blvd.
Virginia Beach, Virginia 23462
(757) 518-2000

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Ozone Monitoring Sites 2016

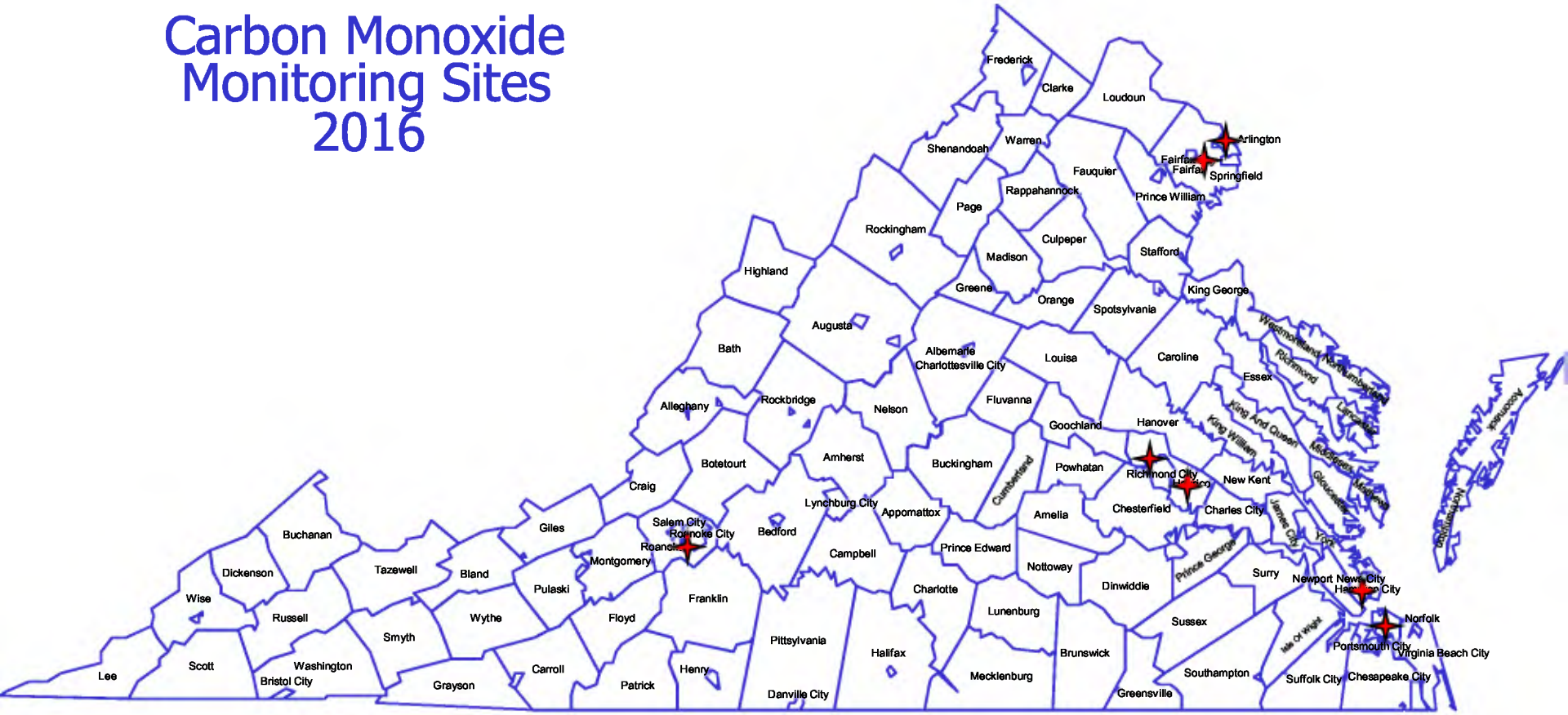


VA Department of Environmental Quality

National Park Service

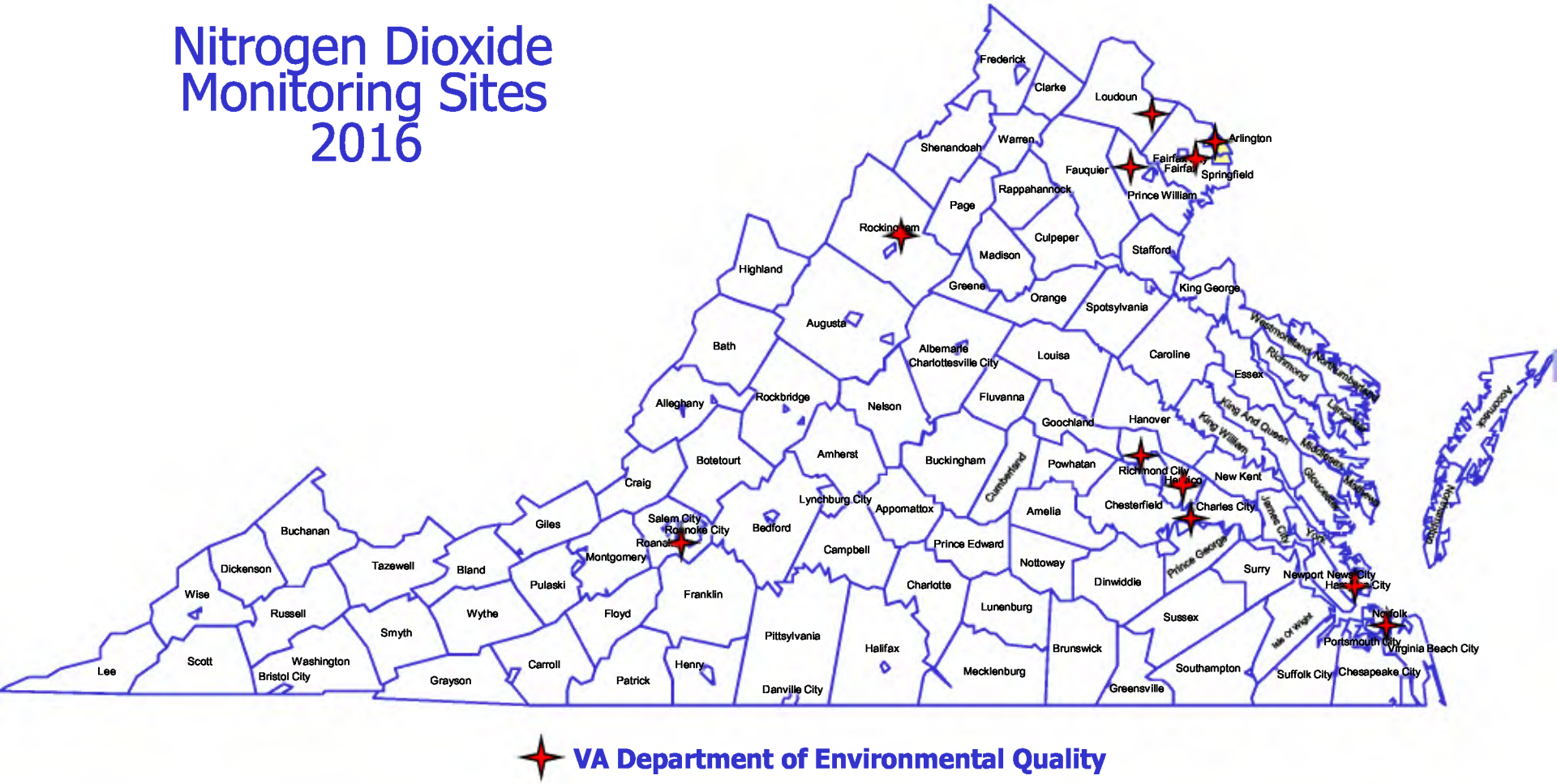
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Carbon Monoxide Monitoring Sites 2016



VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

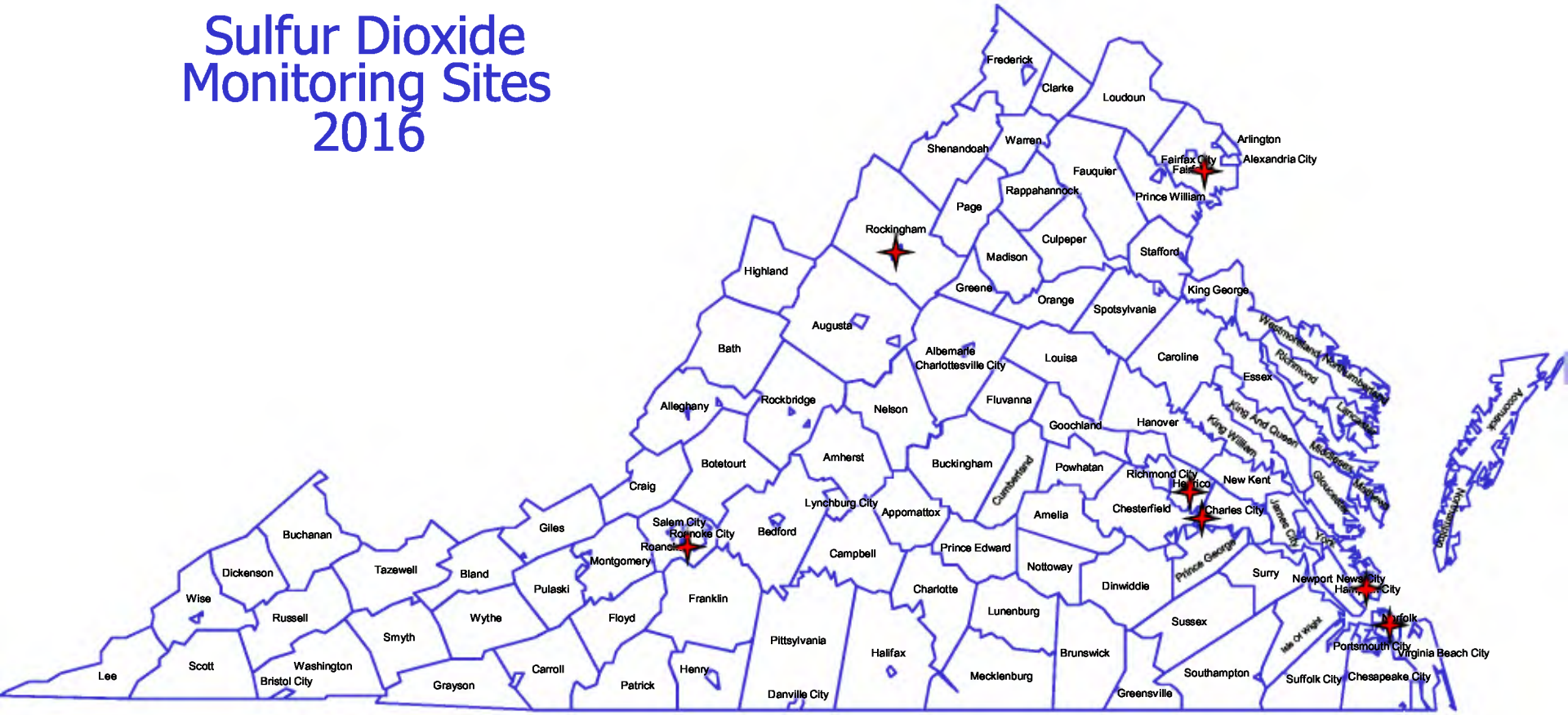
Nitrogen Dioxide Monitoring Sites 2016



VA Department of Environmental Quality

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Sulfur Dioxide Monitoring Sites 2016

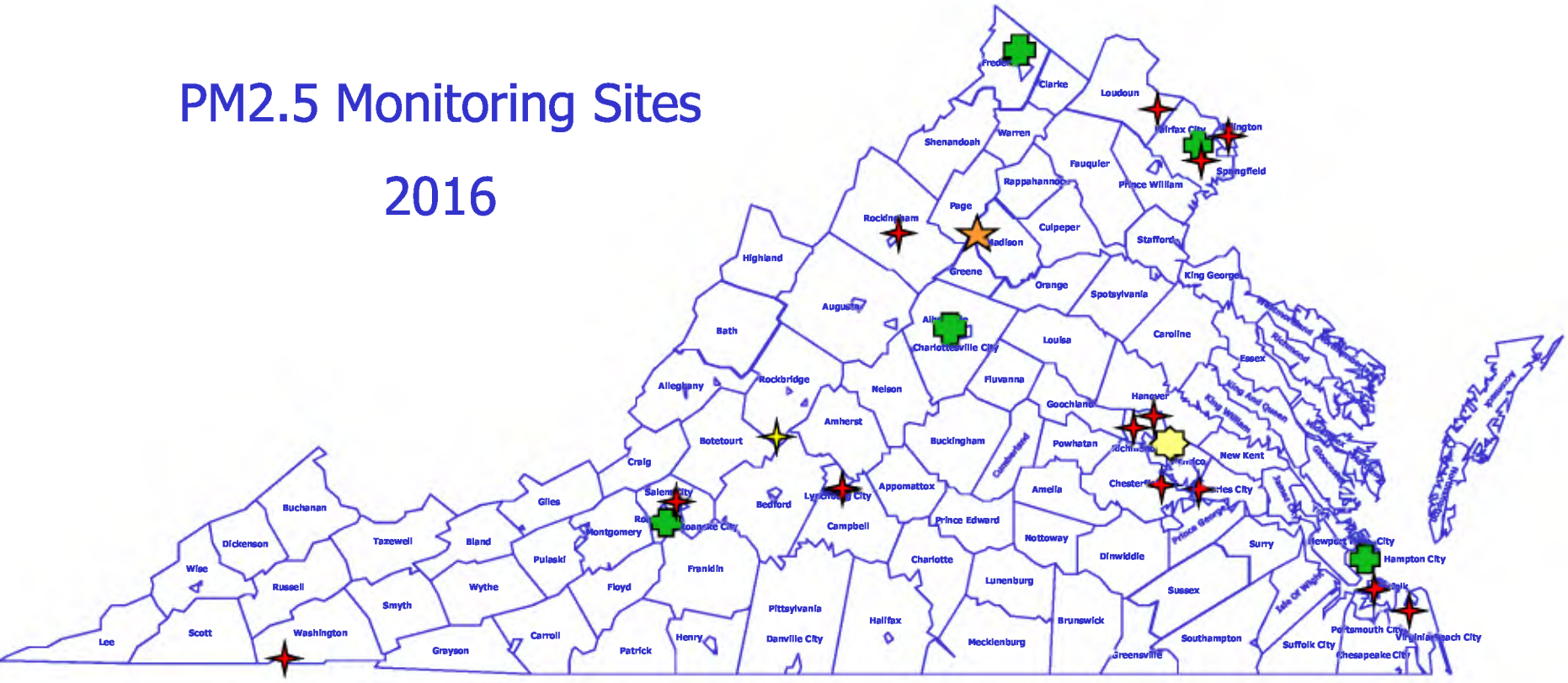


VA Department of Environmental Quality

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

PM2.5 Monitoring Sites

2016



FRM or FEM Mass Sampler

FRM Mass and TEOM Samplers

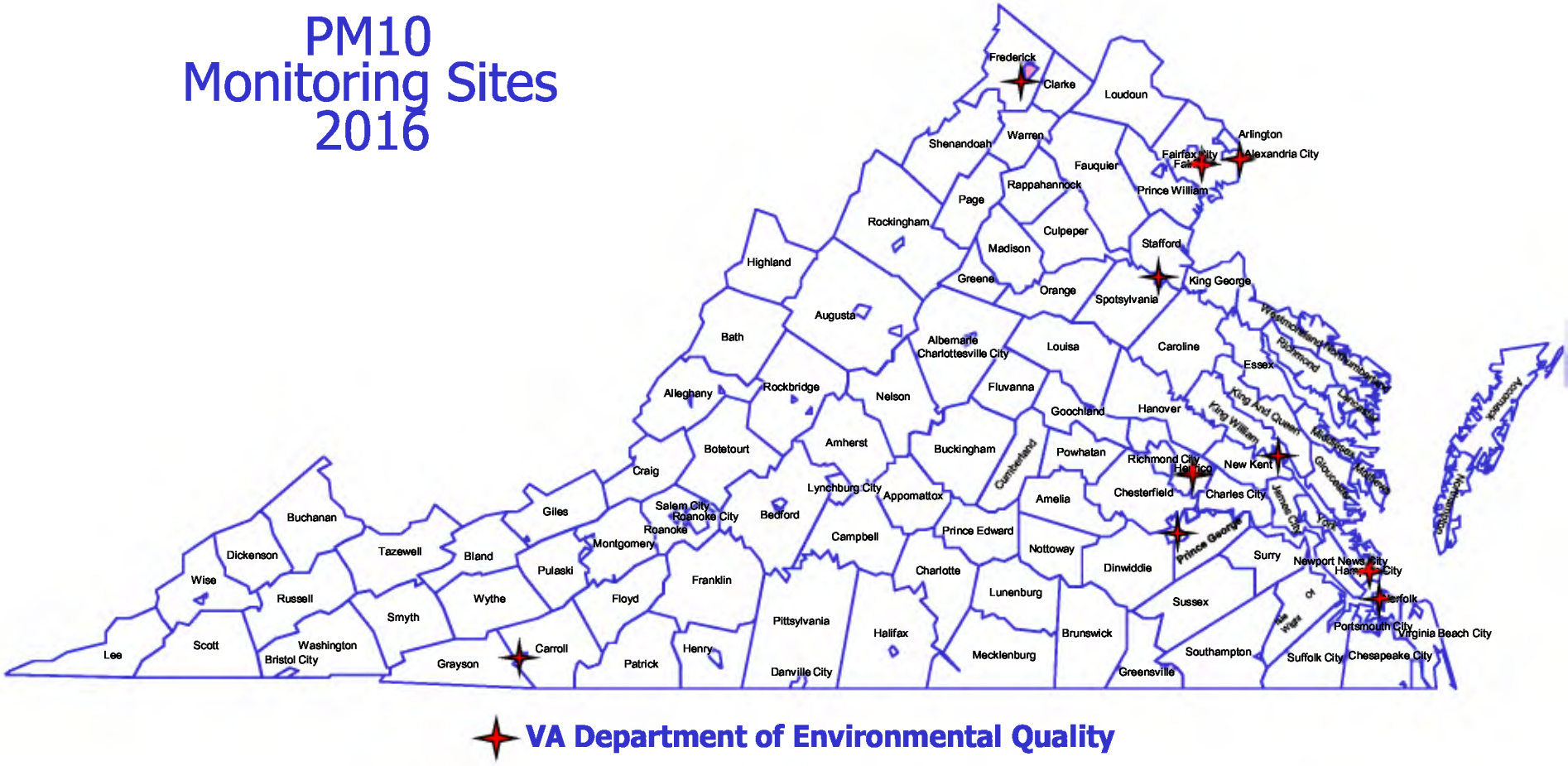
IMPROVE sampler

FRM Mass, Speciation, TEOM Sampler, Carbon

TEOM & IMPROVE sampler, Big Meadows, NPS

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

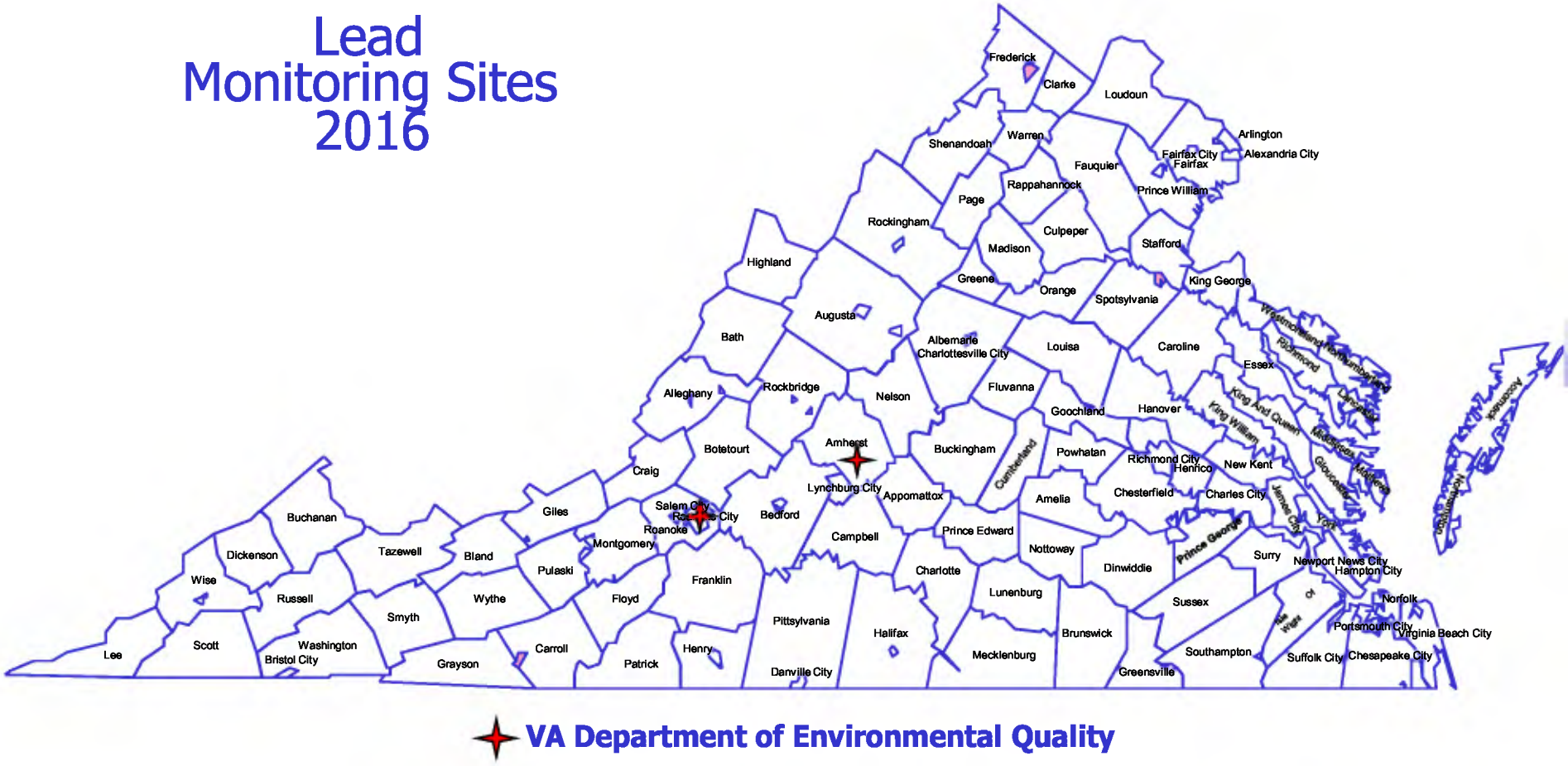
PM10 Monitoring Sites 2016



VA Department of Environmental Quality

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Lead Monitoring Sites 2016



VA Department of Environmental Quality

APPENDIX A. AMHERST COUNTY

GRIFFIN PIPE PRODUCTS LEAD (Pb) SAMPLER WAIVER

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4020
1-800-592-5482

April 18, 2016

Mr. Shawn Garvin
Regional Administrator
U.S. EPA Region III
1650 Arch Street – Mail Code: 3RA00
Philadelphia, PA 19103-2029

Subject: Request for Waiver of Source Oriented Lead-TSP Air Monitoring site

Dear Mr. Garvin:

The Virginia Department of Environmental Quality (DEQ) is formally requesting a waiver of the requirement for a source oriented Lead-TSP monitor in Amherst County, Virginia. Appendix D of 40 CFR part 58 requires that state agencies install source oriented monitors at locations near sources that emit more than one half ton per year of Lead air emissions. This section of the regulations also provides the criteria for requesting a waiver of this requirement. The technical and regulatory basis for this request is outlined in Attachment A to this letter.

The original Lead monitor has been in place since October 1, 2010. The monitor has been in operation since this date. The most recent analytical information from this site indicates that there is no concern relative to any NAAQS compliance issues, and the maximum value for this site is well below the regulatory threshold of less than 50 percent of the ambient air standard. The most recent design value calculations for this site are included in Attachment B to this letter. If you have any questions regarding this waiver request, please contact Chuck Turner, Manager of DEQ's Office of Air Quality Monitoring, at (804) 527-5178. Thank you for your consideration of this request.

Sincerely

David K. Paylor

Attachments

Attachment A. - Waiver Request, Monitoring Site EPA No. 51-009-0007, Madison Heights Lead TSP Site, Amherst County, Air Quality Control Region 3

Regulatory Basis for Waiver Request

The requirement to submit an annual monitoring network plan is contained in 40 CFR §58.10 entitled "Annual monitoring network plan and periodic network assessment". Paragraph 10 of §58.10 allows for a waiver request for source oriented Lead TSP monitors according to the requirements of paragraph 4.5(a)(ii) of Appendix D to 40 CFR part 58. The basis upon which a waiver can be granted from the criteria from paragraph 4.5(a)(ii) is as follows:

the State ... can demonstrate the Pb source will not contribute to a maximum Pb concentration in ambient air in excess of 50 percent of the NAAQS (based on historical monitoring data, modeling, or other means).

Applicable Ambient Air Standard

The primary and secondary ambient air quality standard for Lead TSP is specified in 40 CFR §50.16(a) and is described as "0.15 micrograms per cubic meter, arithmetic mean concentration over a 3-month period, measured in the ambient air as Pb". The method by which compliance with these standards is demonstrated is contained in paragraph (b) of the same section which states that "The national primary and secondary ambient air quality standards for Pb are met when the maximum arithmetic 3-month mean concentration for a 3-year period, as determined in accordance with appendix R of this part, is less than or equal to 0.15 micrograms per cubic meter".

Background

The Source-oriented Lead TSP monitor located at the Madison Heights monitoring site (EPA no. 51-009-0007) was designated a source-oriented monitor intended to determine the ambient impacts on the ambient lead concentration from Griffin Pipe Products Company air emissions. . The monitor is located on grounds of the Central Virginia Training Center. The site began operating on October 1, 2010 and has been in operation since that time.

Request for Waiver

The Virginia Department of Environmental Quality is requesting a waiver of the requirement to relocate a source oriented monitor for the purpose of determining ambient lead impacts from Griffin Pipe Products Company. The monitor has operated for more than three years so a regulatorily accurate design value for Lead can be determined. The AQS AMP 480 Design Value Report for design value years 2012 -2014 indicates that the design value for this monitor is .01 which is less than 50% of the NAAQS which is the criteria for granting the waiver. The AQS AMP 480 report is attached for your review.

ATTACHMENT B. AQS DESIGN VALUE REPORT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Jan. 27, 2016

Pollutant: Lead (TSP) LC(14129)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: Lead 3-Month 2009
Statistic: 3-Month Rolling Average **Level:** .15

Design Value Year: 2014
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State Name: Virginia

		2014					2013					2012							
Site ID	STREET ADDRESS	Max Value	Maximum Month	Param	Cert& Eval	Total Valid Months	Max Value	Maximum Month	Param	Cert& Eval	Total Valid Months	Max Value	Max Month	Param	Cert& Eval	Total Valid Months	3-Year DV Valid	and Max Mon/Yr	Total Valid Months
51-009-0007	788 Colony Road	.01	MAR	14129	S	12	.01	JAN	14129	S	12	.01	MAY	14129		12	.01	Y MAR 2014	36

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').