



Appendix H

Air Quality Technical Report

VDOT Coordination
December 2023 - April 2024

Holmes, Victoria

From: Grinnell, Daniel T. (VDOT) <Daniel.Grinnell@VDOT.Virginia.gov>
Sent: Wednesday, April 24, 2024 10:55 AM
To: Fluitt, Allison
Cc: Tworek, Robert; Holmes, Victoria; Ponticello, James (VDOT)
Subject: RE: Revised Air Quality Report - Cleveland Street Phase IV

Categories: External

Some people who received this message don't often get email from daniel.grinnell@vdot.virginia.gov. [Learn why this is important](#)

Allison,

I've reviewed the final report, and it looks great! I have no further comments.

Thanks

-Dan

From: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>
Sent: Saturday, April 20, 2024 10:01 PM
To: Grinnell, Daniel T. (VDOT) <Daniel.Grinnell@VDOT.Virginia.gov>
Cc: Tworek, Robert <Robert.Tworek@kimley-horn.com>; Holmes, Victoria <Victoria.Holmes@kimley-horn.com>
Subject: Revised Air Quality Report - Cleveland Street Phase IV

Dan,
Attached you'll find our revised air quality report for Cleveland Street. I'm attaching our Word document with changes tracked for your reference, a clean PDF of the report, and the traffic report (Appendix A). Please let me know if you have any questions or any further comments.

Thank you,
Allison

From: Grinnell, Daniel T. (VDOT) <Daniel.Grinnell@VDOT.Virginia.gov>
Sent: Monday, April 8, 2024 11:39 AM
To: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>
Subject: FW: Draft Air Quality Report - Cleveland Street Phase IV

Meant to address that last email to you Allison. Sorry about that.

From: Grinnell, Daniel T. (VDOT) <daniel.grinnell@vdot.virginia.gov>
Sent: Monday, April 8, 2024 11:20 AM
To: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>
Cc: Tworek, Robert <Robert.Tworek@kimley-horn.com>; Holmes, Victoria <Victoria.Holmes@kimley-horn.com>; Ponticello, James (VDOT) <Jim.Ponticello@VDOT.Virginia.gov>
Subject: RE: Draft Air Quality Report - Cleveland Street Phase IV

Hey Kelsey,

We've completed a review of the draft report for this project and included proposed edits in the attached. Let me know if you have any questions.

Thanks

-Dan

From: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>
Sent: Thursday, March 28, 2024 3:37 PM
To: Grinnell, Daniel T. (VDOT) <daniel.grinnell@vdot.virginia.gov>
Cc: Tworek, Robert <Robert.Tworek@kimley-horn.com>; Holmes, Victoria <Victoria.Holmes@kimley-horn.com>
Subject: Draft Air Quality Report - Cleveland Street Phase IV

Dan,
Attached you will find the draft air quality report for Cleveland Street ([Click here](#) to download attachments). Please let us know any comments or questions you have following your review. I'll note that as we filled in the information commensurate with the new template, we added text in a few places that referenced VDEQ. We did not have access to the source that was referenced in the template, so we did this in a way that seemed to align with the intended purpose of the section. Let us know if we need to revisit this – if so, we can follow up on your thoughts for getting access to the source.

Thanks, and have a good weekend!
Allison

From: Grinnell, Daniel T. (VDOT) <Daniel.Grinnell@VDOT.Virginia.gov>
Sent: Wednesday, February 7, 2024 8:29 AM
To: Riley, Kelsey <kelsey.riley@kimley-horn.com>
Cc: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>; Ponticello, James (VDOT) <Jim.Ponticello@VDOT.Virginia.gov>; Sitler, Owen (VDOT) <Owen.Sitler@vdot.virginia.gov>
Subject: RE: Protocol UPC 110803 - Cleveland Street Phase IV

Hi Kelsey,

We received concurrence from FHWA on the approach outlined in the protocol. Please submit the draft report for review at your earliest convenience. Let me know if you have any questions or need any additional information.

Thanks

-Dan

From: Grinnell, Daniel T. (VDOT)
Sent: Friday, February 2, 2024 5:17 PM
To: Riley, Kelsey <kelsey.riley@kimley-horn.com>
Cc: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>; Ponticello, James (VDOT) <Jim.Ponticello@VDOT.Virginia.gov>; Sitler, Owen (VDOT) <Owen.Sitler@vdot.virginia.gov>
Subject: RE: Protocol UPC 110803 - Cleveland Street Phase IV

Kelsey,

I made a couple of minor edits; no additional changes are needed. Since this is an EA we are seeking FHWA concurrence on the proposed level of analysis outlined in the protocol. I will let you know if we receive any comments pending

FHWA review. We have also recently completed an update to the VDOT project level air quality template report (Attached). The report contains updated language and guidance you can include in the air quality report. Take a look and let me know if you have any questions.

From: Riley, Kelsey <kelsey.riley@kimley-horn.com>
Sent: Wednesday, January 31, 2024 11:17 PM
To: Grinnell, Daniel T. (VDOT) <daniel.grinnell@vdot.virginia.gov>
Cc: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>; Ponticello, James (VDOT) <Jim.Ponticello@VDOT.Virginia.gov>;
Sitler, Owen (VDOT) <Owen.Sitler@vdot.virginia.gov>
Subject: RE: Protocol UPC 110803 - Cleveland Street Phase IV

Dan,

I wanted to follow up to see if you have any additional comments on the updated protocol table.

Thanks,
Kelsey



Kelsey Riley
Kimley-Horn | 2619 Centennial Boulevard Suite 200. Tallahassee FL 32308
Direct: 850-553-3519 | Mobile: 901-603-4519|
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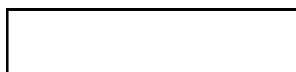
Celebrating **16** years as one of FORTUNE's 100 Best Companies to Work For

From: Riley, Kelsey
Sent: Friday, January 12, 2024 2:54 PM
To: Grinnell, Daniel T. (VDOT) <daniel.grinnell@vdot.virginia.gov>
Cc: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>; Ponticello, James (VDOT) <Jim.Ponticello@VDOT.Virginia.gov>;
Sitler, Owen (VDOT) <Owen.Sitler@vdot.virginia.gov>
Subject: RE: Protocol UPC 110803 - Cleveland Street Phase IV

Dan,

Thank you. We have updated the protocol report based on the comments you provided and the updated guidance from VDOT. Please let us know if you agree with the approach or if you have additional comments. Following concurrence we will provide you with our report for review and comment within a few weeks.

Thank you,
Kelsey



Kelsey Riley
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From: Grinnell, Daniel T. (VDOT) <daniel.grinnell@vdot.virginia.gov>

Sent: Wednesday, December 27, 2023 2:38 PM

To: Riley, Kelsey <kelsey.riley@kimley-horn.com>

Cc: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>; Ponticello, James (VDOT) <Jim.Ponticello@VDOT.Virginia.gov>;

Sitler, Owen (VDOT) <Owen.Sitler@vdot.virginia.gov>

Subject: RE: Protocol UPC 110803 - Cleveland Street Phase IV

Hey Kelsey,

I've reviewed protocol submitted for this project and highlighted comments in the attached. We've recently completed an update to the VDOT Project-Level Air Quality Resource Document v 3.0.1 (Attached). The VDOT website is also in the process of being updated and this version hasn't been posted yet to the new site. The revision includes the latest guidance on GHG analysis in app K that can be incorporated into your revised memo to indicate the level of GHG analysis required for this project. Take a look and let me know if you have any questions.

Thanks

-Dan

From: Riley, Kelsey <kelsey.riley@kimley-horn.com>

Sent: Tuesday, December 19, 2023 4:41 PM

To: Grinnell, Daniel T. (VDOT) <daniel.grinnell@vdot.virginia.gov>

Cc: Fluitt, Allison <Allison.Fluitt@kimley-horn.com>

Subject: Protocol UPC 110803 - Cleveland Street Phase IV

Dan,

I realized I never sent over the protocol table for Cleveland Street Phase IV Air Quality Assessment. Attached is the protocol table and the location map for your review. We are proposing a qualitative assessment under the programmatic agreement. Please advise if you would agree with this approach or if you have any questions or comments.

Thank you,
Kelsey



Kelsey Riley

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Air Quality Technical Report

AIR QUALITY TECHNICAL REPORT
Cleveland Street Phase IV Improvements
Witchduck Road to Independence Boulevard
UPC 110803

Hampton Roads District

Prepared for:



Environmental Division

Prepared by:

Kimley-Horn and Associates

March 2024

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ACRONYMS

AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
CAA	Clean Air Act
CEQ	Council of Environmental Quality
CF	Categorical Finding
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FY	Fiscal Year
FTA	Federal Transit Administration
GHG	Greenhouse Gas
HAP	Hazardous Air Pollutant
HEI	Health Effects Institute
HOT	High-Occupancy Toll
HRTPO	Hampton Roads Transportation Planning Organization
I-	Interstate-
IECI	Indirect Effects and Cumulative Impacts
IRIS	Integrated Risk Information System
L&D	Location & Design Division (VDOT)
LOS	Level of Service
LRTP	Long Range Transportation Plan
MOVES	Motor Vehicle Emission Simulator
MPO	Metropolitan Planning Organization
MSATs	Mobile Source Air Toxics
MTPY	Metric Tons per Year
NAAQS	National Ambient Air Quality Standards
NCHRP	National Cooperative Highway Research Program
NCRTPB	National Capital Region Transportation Planning Board
NEPA	National Environmental Policy Act

NOAA	National Oceanic and Atmospheric Administration
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
OIPI	Office of Intermodal Planning and Investment
O ₃	Ozone
PA	Programmatic Agreement
Pb	Lead
PM	Particulate Matter
PM _{2.5}	Fine inhalable particulate matter, with diameters that are generally 2.5 micrometers and less
PM ₁₀	Inhalable particulate matter, with diameters that are generally 10 micrometers and less
POM	Polycyclic Organic Matter
PPM	Parts per million
Ppb	Parts per billion
RTP	Long-Range Transportation Plan
SIP	State Implementation Plan
S&B	Structure & Bridge Division (VDOT)
SLR	Sea Level Rise
SO ₂	Sulfur Dioxide
TIP	Transportation Improvement Program
TMPD	Transportation Mobility and Planning Division (VDOT)
TPY	Tons per Year
TSD	Technical Support Document
USACE	U.S. Army Corps of Engineers
USDOT	US Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VA	Virginia
VAC	Virginia Administrative Code
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VDRPT	Virginia Department of Rail and Public Transportation
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound
VPHPL	Vehicles per Hour per Lane
VTRC	Virginia Transportation Research Council

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Executive Summary

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is proposing improvements along the Cleveland Street corridor from Witchduck Road to Independence Boulevard in Virginia Beach, Virginia. The project will include the construction of a three-lane undivided roadway within a variable width of 70 to 80-foot right-of-way between Witchduck Road and Independence Boulevard for a distance of approximately 1.2 miles.

The proposed improvements were assessed for potential air quality impacts and compliance with all applicable air quality regulations and guidance. Based on the assessment, the project would meet all applicable federal and state transportation conformity regulatory requirements as well as air quality guidance under the National Environmental Policy Act (NEPA). As such, the project would not cause or contribute to a new violation of the national ambient air quality standards (NAAQS) established by the Environmental Protection Agency (EPA).

Mobile Source Air Toxics (MSATs)

Federal Highway Administration (FHWA) guidance (2023)¹ states that “...EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (NATA).² These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter.” Following FHWA guidance for projects with low potential impacts based on forecast traffic volumes and other technical criteria, a qualitative assessment of potential MSAT impacts was conducted for this project.

Based on that assessment, best available information indicates that, nationwide, regional levels of MSATs are expected to decrease in the future due to ongoing fleet turnover and the continued implementation of increasingly more stringent emission and fuel quality regulations. Nonetheless, technical shortcomings of emission and dispersion models and uncertain science with respect to health effects effectively limit meaningful or reliable estimates of MSAT emissions and effects of this project at this time. While it is possible that localized increases in MSAT emissions may occur as a result of this project, emissions will likely be lower than present levels in the design year of this project as a result of EPA's national control programs that are projected (in the FHWA 2023 Guidance) to reduce annual MSAT emissions by 76 percent between 2020 and 2060 while vehicle-miles-travelled (VMT) are expected to increase on a national level by 31 percent. Although local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

¹ FHWA, “*INFORMATION: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*”, January 18, 2023. See: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/

² See: <https://www.epa.gov/national-air-toxics-assessment>

Greenhouse Gases (GHGs)

For each alternative in this EA, the amount of GHGs emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. Because the estimated VMT under each of the alternatives are nearly the same, it is expected there would be no appreciable difference in overall GHG emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of fuel efficiency improvements and electrification policies that are projected to reduce annual statewide GHG emissions from on-road sources by nearly 50 percent between 2015 and 2040 (VDOT, Statewide Planning-Level GHG Assessment, December 2021).

Climate Change: Considerations Relating to the Affected Environment

Greenhouse gas emissions have accumulated rapidly as the world has industrialized. According to the U.S. Global Climate Change Research Program,³ if emissions continue, projected changes in global average temperature could range from 0.4° – 2.7°F (0.2°–1.5°C) under a very low emissions scenario, to 4.2°–8.5°F (2.4°–4.7°C) under a higher scenario by the end of the 21st century. Based on information developed by the Georgetown Climate Center,⁴ Virginia's transportation infrastructure faces risks from a changing climate including increased levels of coastal flooding, inland flooding, and extreme heat.

Resiliency is an important consideration for VDOT when planning and designing future infrastructure investments. Resiliency considerations include siting and design of facilities both to minimize risk to the facility, and to minimize impacts on natural resiliency features such as wetlands, forests, and floodplains. Resiliency strategies that are cost-effective and can be adopted during the planning, project development, construction, and/or maintenance phases of a given infrastructure project are supported.

VDOT, and regional and local agency partners in the Commonwealth, have already engaged in efforts to plan for resiliency. As part of the development of VTrans, Virginia's transportation plan, the Commonwealth Transportation Board (CTB) has developed a Policy for the Development and Monitoring of VTrans Long-term Risk & Opportunity Register, which allows for quantification of impacts of ten macrotrends, including long-term flooding risk due to sea-level rise, storm surge, and inland/riverine flooding, as well as a Long-term Risk & Opportunity Register based on an assessment of these impacts. The CTB has also adopted strategic actions to mitigate the identified long-term risks and maximize opportunities, including collecting data to accurately assess flooding risks for the state- and locally-maintained roadways that can be used to identify funding needs and prioritize investment; developing policies based on robust data collection and analysis to ensure flooding risks are reflected in transportation asset life-cycle and/or transportation project planning processes; and collaborating with state and regional agencies to systematically identify solutions that facilitate

³ U.S. Global Climate Change Research Program (2018). Fourth National Climate Assessment.

⁴ Georgetown Climate Center (undated). "Understanding Virginia's Vulnerability to Climate Change." See: <https://www.georgetownclimate.org/files/report/understanding-virginias-vulnerability-to-climate-change.pdf> (accessed September 2021)

consistent and systematic prioritization and support the allocation of state resources to address flooding risks. Finally, the Office of Intermodal Planning and Investment (OIP) is required to track trends related to all macro trends, including the flooding risk, and report annually.

Indirect Effects and Cumulative Impacts (IECI)

A qualitative assessment of the potential for indirect effects and cumulative impacts attributable to this project was conducted. It concluded that the potential effects or impacts are not expected to be significant given available information from pollutant-specific analyses (CO and MSATs) and regional conformity analyses.

First, regarding the potential for indirect effects, the quantitative assessments conducted for programmatic CO and the qualitative analyses for MSAT impacts can be considered indirect effects analyses because they look at air quality impacts attributable to the project that occur in the future. These analyses demonstrate that, in the future: 1) air quality impacts from CO will not cause or contribute to violations of the CO NAAQS, and 2) MSAT emissions will be significantly lower than they are today.

Second, regarding the potential for cumulative impacts, EPA's air quality designations for the region reflect, in part, the accumulated mobile source emissions from past and present actions. Since EPA has designated the region to be in attainment for all of the NAAQS, the potential for cumulative impacts associated with the project is not expected to be significant.

Notwithstanding their attainment status, federal conformity requirements,⁵ including specifically 40 CFR 93.112, 40 CFR 93.114, and 40 CFR 93.115, apply for the project as the area in which it is located is one affected by a recent court decision⁶ that reinstated conformity requirements nationwide associated with the 1997 ozone NAAQS that had previously been eliminated with the revocation by EPA of that NAAQS in 2015.

Mitigation:

The 2021 VDOT statewide GHG analysis included sixteen discrete planned state and regional rail and transit projects that will reduce automobile and truck travel and GHG emissions, as well as increases to existing service. VDOT and the Department of Rail and Public Transportation have also continued to fund other air quality and GHG mitigation strategies. These include bicycle and pedestrian projects, travel demand management (TDM) programs that seek to reduce the amount of commuting in single-occupancy vehicles, and investment in electric vehicles and charging infrastructure.

Emissions may be produced in the construction of this project from heavy equipment and vehicle travel to and from the site, as well as from fugitive sources. Construction emissions are short term or temporary in nature. To mitigate these emissions, all construction activities are to be performed in accordance with VDOT *Road and Bridge Specifications*.⁷

⁵ <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100VOME.pdf>

⁶ [https://www.cadc.uscourts.gov/internet/opinions.nsf/217B6778AE3EC89C8525823600532AE0/\\$file/15-1115-1718293.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/217B6778AE3EC89C8525823600532AE0/$file/15-1115-1718293.pdf)

⁷ <https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/technical-guidance-documents/road-and-bridge-specifications/>

The Virginia Department of Environmental Quality (VDEQ) provides general comments for projects by jurisdiction that in part address mitigation. For Virginia Beach, VDEQ stated that⁸ “...all reasonable precautions should be taken to limit the emissions of VOC and NOx. In addition, the following VDEQ air pollution regulations must be adhered to during the construction of this project: 9 VAC 5-130, Open Burning restrictions⁹; 9 VAC 5-45, Article 7, Cutback Asphalt restrictions¹⁰; and 9 VAC 5-50, Article 1, Fugitive Dust precautions.¹¹”

Project Status in the Regional Transportation Plan and Program: Federal conformity requirements at 40 CFR 93.114¹² and 40 CFR 93.115¹³ (as incorporated by reference into the Virginia conformity SIP) apply under a federal court decision affecting former maintenance areas nationwide for the 1997 ozone NAAQS.¹⁴ Accordingly, there must be a currently conforming transportation plan and program at the time of project approval, and the project must come from a conforming plan and program or otherwise meet the criteria specified in 40 CFR 93.109(b).¹⁵ As of the date of preparation of this analysis, the project is included in the currently conforming FY 2024-2027 Transportation Improvement Program (TIP) and 2045 Long Range Transportation Plan (LRTP) developed by the designated metropolitan planning organization (MPO) for the region, the Hampton Roads Transportation Planning Organization (HRTPO).¹⁶

⁸ Spreadsheet entitled: “DEQ SERP Comments rev8b”, March 2017, downloaded from the online data repository for the VDOT Resource Document. The repository may be accessed via the Environmental Division webpage: <https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/environmental/>

⁹ See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter130/>

¹⁰ See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter45/>

¹¹ See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter50/>

¹² See: <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-93#93.114>

¹³ See: <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-93#93.115>

¹⁴ Per a 2/16/2018 court decision (South Coast Air Quality Management District v. EPA), all areas in the country that were in nonattainment or maintenance for the 1997 eight-hour ozone NAAQS before its revocation by EPA in 2015 were again made subject to conformity for that standard. This decision in part affects “orphan areas” (as defined in the ruling), which in Virginia include Fredericksburg, Richmond/Tri-Cities, and Hampton Roads.

The court ruling may be viewed at:

[https://www.cadc.uscourts.gov/internet/opinions.nsf/217B6778AE3EC89C8525823600532AE0/\\$file/15-1115-1718293.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/217B6778AE3EC89C8525823600532AE0/$file/15-1115-1718293.pdf)

¹⁵ See: <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-93#93.109>

¹⁶ See: <https://www.hrtpo.org/101/HRTPO>

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1.0 Project Background

This section presents background information including the project purpose and need, description, alternatives, summary traffic data and the project status in the regional transportation plan.

1.1 Purpose and Need

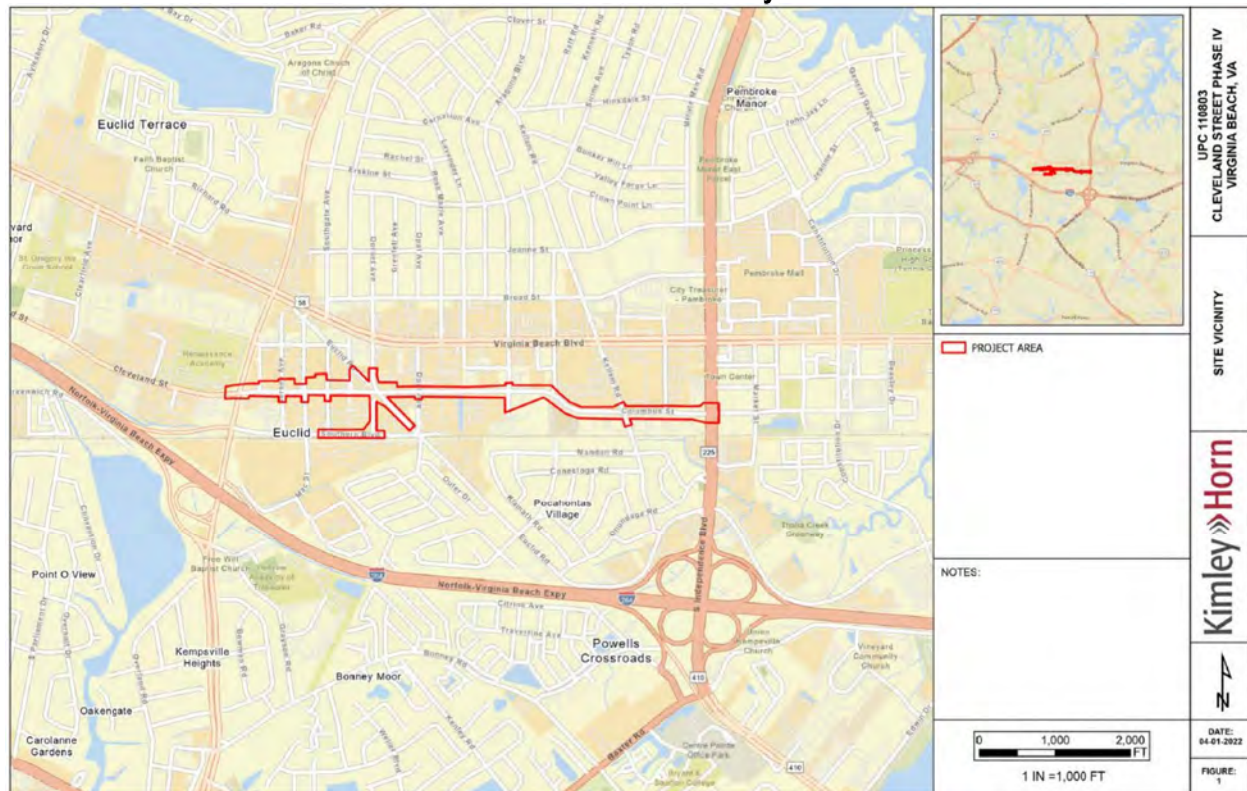
The purpose of the proposed project is to increase safety for all modes of transportation along Cleveland Street and improve vehicular travel time reliability by providing an additional lane, as well as provide bicycle and pedestrian accommodations along the transportation facility. Cleveland Street is currently a two-lane undivided roadway along the majority of the project corridor that carries 8,000 vehicles per day (2021) with a level of service of 'D'. There were 15 crashes along Cleveland Street in the 2013 to 2015 three-year span, one of which involved a fatality. The Cleveland Street corridor is ranked #15 of 289 in Virginia Beach's 2015 Technical Crash Ranking of Arterial and Collector Road Segments. The proposed project will address the need to provide a safe corridor for all modes of transportation and address the safety limitations along Cleveland Street by reducing the number and rate of Severe Injury Crashes by widening the existing lanes and providing either a raised median or two-way left turn lane to minimize head-on collisions.

Furthermore, this project will complete a vital connection within the Pembroke Strategic Growth Area (SGA) and will support the development of the Central Village District. The proposed project is located entirely within the Pembroke SGA. This growth area plan promotes walkable neighborhood centers, interconnected streets and blocks, diversity of land use and easy access to jobs, housing, and recreation by a variety of travel options (please see Pembroke SGA Plan supporting document attached). As can be seen on the master plan for the SGA, Cleveland Street is the backbone of the entire Central Village District. The widening of Cleveland Street will provide improved direct access within the Pembroke SGA for vehicles, pedestrians, and cyclists.

1.2 Project Description

The City of Virginia Beach is planning improvements along the Cleveland Street corridor from Witchduck Road to Independence Boulevard in Virginia Beach, Virginia. The project will include the construction of a three-lane undivided roadway within a variable width of 70 to 80-foot right-of-way between Witchduck Road and Independence Boulevard for a distance of approximately 1.2 miles. The intersection of Cleveland Street, Dorset Avenue, and Euclid Road will be realigned and reconfigured to a single-lane roundabout aligning Dorset Avenue to Southern Boulevard. The proposed improvements will provide 4' to 5' on-road bicycle lanes and 6' to 8' sidewalks on both sides of Cleveland Street west of the roundabout and 8' to 12' wide shared-use paths along both sides of Cleveland Street east of the roundabout, as well as aesthetic improvements including a landscaped verge area to enhance the roadway corridor. The existing aerial utilities will be relocated to a new overhead location and LED streetlights will be provided throughout the corridor. The proposed improvements will also include replacement of the traffic signal at Kellam Road and the emergency traffic signal at Virginia Beach Fire Station #7, as well as traffic signal modifications at Witchduck Road and Independence Boulevard. Exhibit 1.2.1 provides an overview of the study corridor for the proposed project.

Exhibit 1.2.1: Corridor Study Area



Previous alignment and typical section alternatives were developed that would have entailed full acquisition of up to 26 parcels, which included 46 industrial/commercial tenants, 10 residential tenants on a single mobile home park parcel, and one vacant parcel. These alternatives shifted the alignment north, south, and widened symmetrically along the existing centerline and varied from a 4-lane divided roadway section down to the current, proposed 3-lane undivided section. The current project design reduces the number of full acquisition parcels from 26 to 14, which includes 13 industrial/commercial tenants, 10 residential tenants on the single mobile home park parcel, and one vacant parcel. Additional partial takes for permanent and temporary easements from the majority of the parcels fronting the Cleveland Street corridor will be required.

A localized alignment study will be conducted for the segment of Cleveland Street fronting the mobile home parcel during alternatives analysis. The potential impacts and feasibility of proposed improvements on each side of the roadway will be evaluated in an Alternatives Analysis Technical Memorandum and provided as an attachment to the NEPA document. Based on existing conditions approximately half of the mobile homes are within the clear zone of the existing roadway, which poses a hazard to motorists as well as residents.

1.3 Alternatives

Based on the project purpose and need, VDOT developed two alternatives: one build alternative and the No-Build alternative. The Build Alternative includes the construction of a three-lane undivided roadway within a variable width of 70 to 80-foot right-of-way between Witchduck Road and Independence Boulevard for a distance of approximately 1.2 miles. The No-Build Alternative assumes that VDOT takes no action to address the project purpose and need, other than those typically completed as part of existing system preservation (i.e., resurfacing, landscape management, sign replacement, etc.). In a review of the Transportation Improvement Programs for VDOT, and the Hampton Roads Transportation Planning Organization, there are no planned projects that would influence the Build or No-Build Alternatives.

The proposed improvements include the realigning and reconfiguration of the intersections of Cleveland Street, Dorset Avenue, and Euclid Road to a single-lane roundabout aligning Dorset Avenue to Southern Boulevard. The proposed improvements will provide 4' to 5' on-road bicycle lanes and 6' to 8' sidewalks on both sides of Cleveland Street west of the roundabout and 8' to 12' wide shared-use paths along both sides of Cleveland Street east of the roundabout.

1.4 Summary of Traffic Data and Forecasts

Environmental traffic data for the Study Area includes hourly volumes and average daily traffic (ADT) forecasts for the project for the Existing Conditions, No-Build Alternative, and Build Alternative. The existing base year (2022) ADT along Cleveland Street ranges from 3,500-9,900 vehicles per day (vpd). The No-Build ADT forecasts for the 2025 opening year and 2045 design year range from 3,600-10,200 vpd and 5,500-15,600 vpd, respectively. The corresponding Build forecasts range from 3,800-10,600 vpd for 2025 and 5,700-16,200 vpd for 2045, which is about 4% higher. Truck percentages vary from 2%-7% of total traffic along Cleveland Street.

1.5 Project Status in the Regional Transportation Plan and Program

As of the date of preparation of this analysis, the project is included in the currently conforming FY 2024-2027 Transportation Improvement Program (TIP) and 2045 Long Range Transportation Plan (LRTP).¹⁷ The LRTP and TIP are developed by the Hampton Roads Transportation Planning Organization, which is the Metropolitan Planning Organization (MPO) for the region.¹⁸

¹⁷ TIP: <https://www.hrtpo.org/DocumentCenter/View/8530/Final-FY-24-27-TIP-PDF>
Plan: <https://www.hrtpo.org/331/2045-Long-Range-Transportation-Plan>

¹⁸ See: <https://www.hrtpo.org/101/HRTPO>

2.0 Ambient Air Quality and Attainment Status

2.1 National Ambient Air Quality Standards (NAAQS)

Exhibit 2.1.1 presents the national ambient air quality standards (NAAQS) established by the EPA for criteria air pollutants, namely: carbon monoxide (CO), sulfur dioxide (SO₂), ozone (O₃), particulate matter (PM), nitrogen dioxide (NO₂), and lead (Pb). There are two types of NAAQS—primary and secondary: “*Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.*”¹⁹

As a requirement of the Clean Air Act, EPA periodically reviews the NAAQS and revises them as needed, e.g., to make them more stringent and/or, on occasion, to revoke previous standards that were less stringent.²⁰ For example, EPA revoked the 1997 annual primary PM_{2.5} NAAQS effective October 24, 2016, with the implementation of the more stringent 2012 PM_{2.5} NAAQS.²¹

Areas that have never been designated by EPA as nonattainment for one or more of the NAAQS are classified as attainment areas, while areas that do not meet one or more of the NAAQS may be designated by EPA as nonattainment areas for that or those criteria pollutants. Areas that have failed to meet the NAAQS in the past but have since re-attained them may be re-designated as attainment (maintenance) areas, which are commonly referred to as maintenance areas.

¹⁹ From the preamble to the EPA NAAQS table: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

²⁰ On January 27, 2023, EPA issued a proposed rule for “Reconsideration of the National Ambient Air Quality Standards for Particulate Matter” (18 FR 5558). At the time of preparation of this report, that rule has not been finalized. The NAAQS table presented here may be updated for PM when the rule is finalized.

²¹ On August 24, 2016, EPA issued a final rule (81 FR 58010), effective October 24, 2016, on “*Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*” that stated, in part: “*Additionally, in this document the EPA is revoking the 1997 primary annual standard for areas designated as attainment for that standard because the EPA revised the primary annual standard in 2012.*” See: <https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf>.

Note the revocation of the 1997 annual primary NAAQS for PM_{2.5} also eliminated the associated conformity requirements. For example, conformity requirements for that NAAQS were eliminated for northern Virginia, which until then had been in attainment (maintenance) for that standard.

Exhibit 2.1.1: National Ambient Air Quality Standards (US EPA Tabulation)

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 µg/m ³ ⁽¹⁾	Not to be exceeded
Nitrogen Dioxide (NO₂)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb ⁽²⁾	Annual Mean
Ozone (O₃)		primary and secondary	8 hours	0.070 ppm ⁽³⁾	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	PM _{2.5}	primary	1 year	9.0 µg/m ³	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m ³	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m ³	98th percentile, averaged over 3 years
	PM ₁₀	primary and secondary	24 hours	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO₂)		primary	1 hour	75 ppb ⁽⁴⁾	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m³ as a calendar quarter average) also remain in effect.

(2) The level of the annual NO₂ standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O₃ standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1-hour (1979) and 8-hour (1997) O₃ standards.

(4) The previous SO₂ standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas:
 (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and
 (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO₂ standards or is not meeting the requirements of a SIP call under the previous SO₂ standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

Source: Excerpted from: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>, accessed 3/20/2024.

2.2 Air Quality Attainment Status of the Project Area

The EPA Green Book²² lists non-attainment, maintenance, and attainment areas across the nation. It lists the jurisdictions within the area in which the project is located as being in attainment for all of the NAAQS.

2.3 Ambient Air Quality Monitoring Data and Trends

VDEQ issues an annual report summarizing air quality monitoring data for the previous year, covering criteria pollutants (those for which EPA has established NAAQS) and other pollutants including air toxics.²³ Excerpts of the monitoring data from that report are presented below.

2.3.1 Criteria Pollutants

For transportation sources, the criteria pollutants of primary interest are CO, PM, and NO₂. As the region was previously in maintenance for the 1997 ozone NAAQS, the trend in ozone levels relative to current (more stringent) NAAQS is also of interest.

2.3.1.1 Carbon Monoxide

EPA provides the following background information on CO:²⁴

"CO is a colorless, odorless gas that can be harmful when inhaled in large amounts. CO is released when something is burned. The greatest sources of CO to outdoor air are cars, trucks and other vehicles or machinery that burn fossil fuels. A variety of items in your home such as unvented kerosene and gas space heaters, leaking chimneys and furnaces, and gas stoves also release CO and can affect air quality indoors."

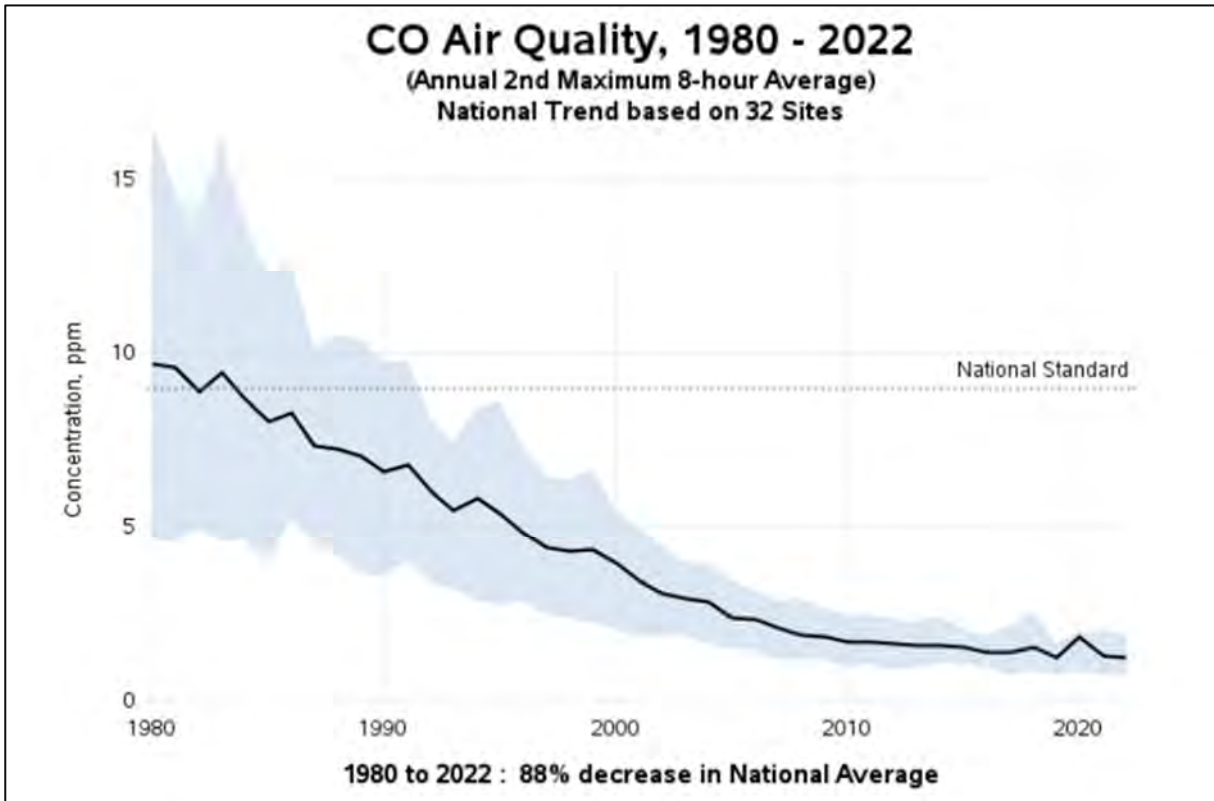
As shown in Exhibit 2.3.1, and due primarily to the implementation of more stringent vehicle emission and fuel quality standards, the national trend in ambient concentrations of CO over the past few decades has decreased to a level substantially below the current eight-hour NAAQS of nine parts per million (ppm). The national trend is reflected in the very low ambient CO concentrations currently observed in Virginia, which are presented in Exhibits 2.3.2 and 2.3.3. As noted above, Virginia is in attainment for both the one- and eight-hour NAAQS for CO.

²² EPA Green Book: <https://www.epa.gov/green-book>

²³ <https://www.deq.virginia.gov/our-programs/air/reports>

²⁴ <https://www.epa.gov/co-pollution/basic-information-about-carbon-monoxide-co-outdoor-air-pollution#What%20is%20CO>

Exhibit 2.3.1: National Trend in Ambient CO Concentrations



Source: <https://www.epa.gov/air-trends/carbon-monoxide-trends>, accessed March 20, 2024

Exhibit 2.3.2: Ambient Concentrations of Carbon Monoxide in Virginia

Primary NAAQS: 35 ppm (1-hour) and 9 ppm (8-hour)

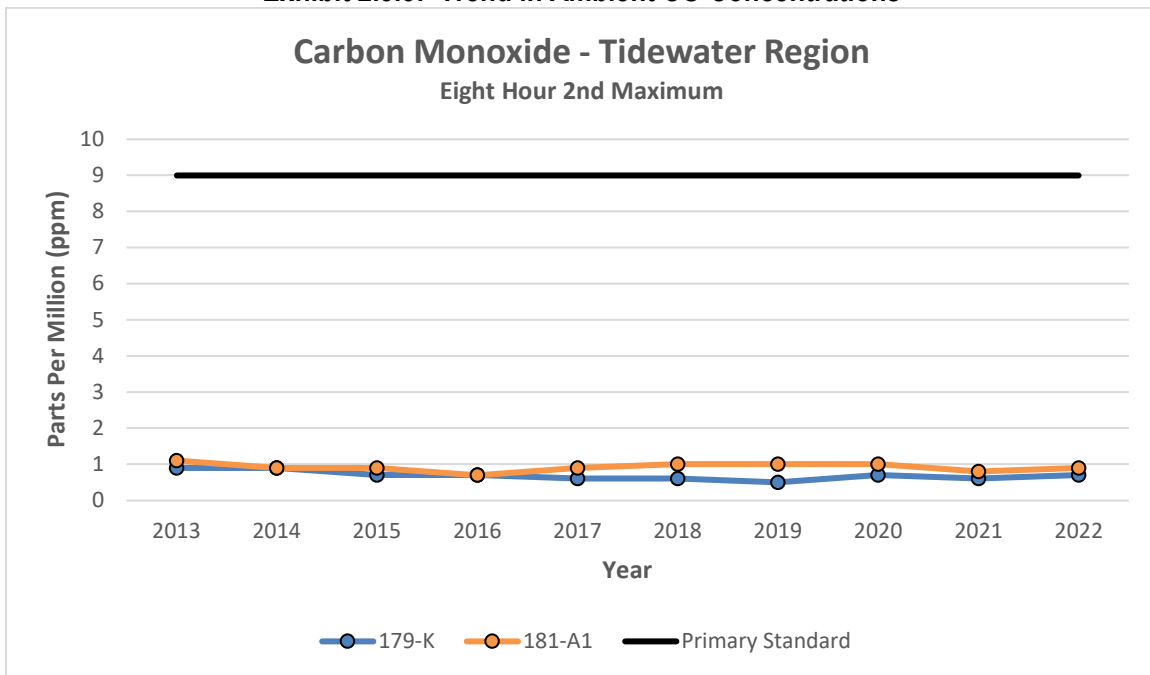
Site	2022			
	1-Hour Avg. (ppm)		8-Hour Avg. (ppm)	
	1 st Max.	2 nd Max.	1 st Max.	2 nd Max.
(19-A6) Roanoke Co.	0.9	0.8	0.6	0.6
(72-M) Henrico Co.	1.2	1.1	0.9	0.9
(158-X) Richmond	1.3	1.2	0.9	0.9
(179-K) Hampton	0.9	0.9	0.7	0.7
(181-A1) Norfolk	1.4	1.4	1.0	0.9
(46-C2) Fairfax Co.	1.9	1.7	1.1	1.0
(47-T) Arlington Co.	1.5	1.4	1.2	1.2

Eight Hour Averages stated as Ending Hour

Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2022 Annual Report", 2023. See:

<https://www.deq.virginia.gov/our-programs/air/reports>

Exhibit 2.3.3: Trend in Ambient CO Concentrations



Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2021 Annual Report", 2022. See: <https://www.deq.virginia.gov/our-programs/air/reports>

2.3.1.2 Particulate Matter

EPA provides the following background information on particulate matter (PM):²⁵

"PM stands for particulate matter (also called particle pollution): the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope.

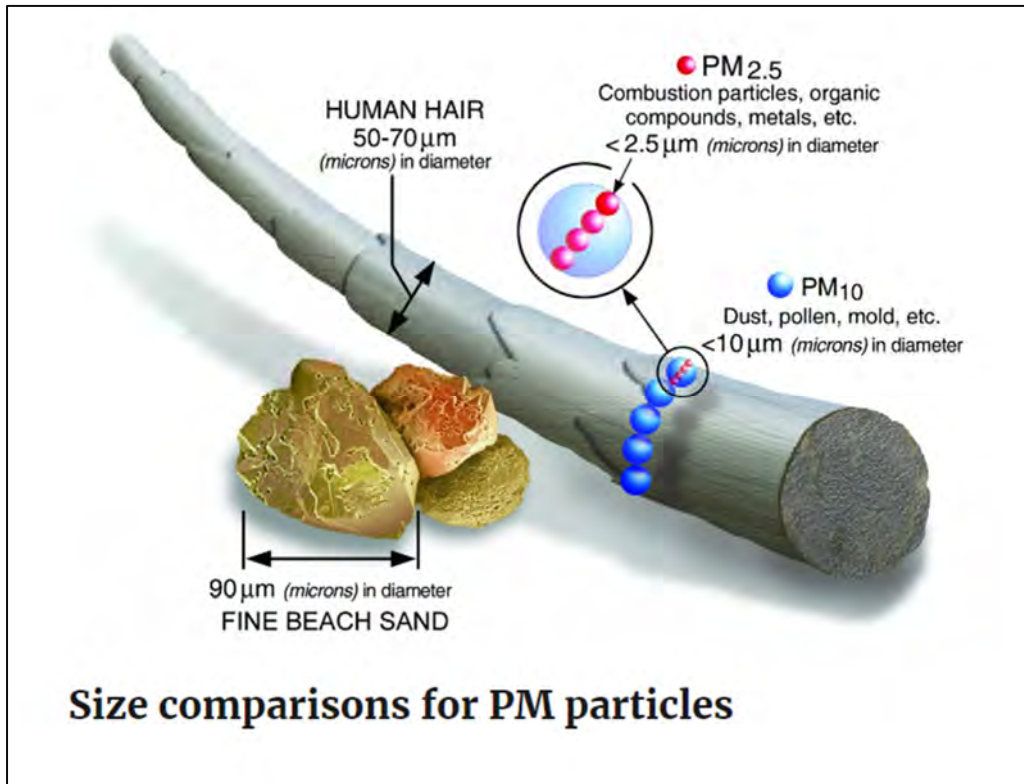
Particle pollution includes:

- *PM₁₀: inhalable particles, with diameters that are generally 10 micrometers and smaller; and*
- *PM_{2.5}: fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller."*

Exhibit 2.3.4 from EPA shows the size of PM_{2.5} and PM₁₀ particles relative to a human hair and to fine beach sand.

²⁵ See: <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>

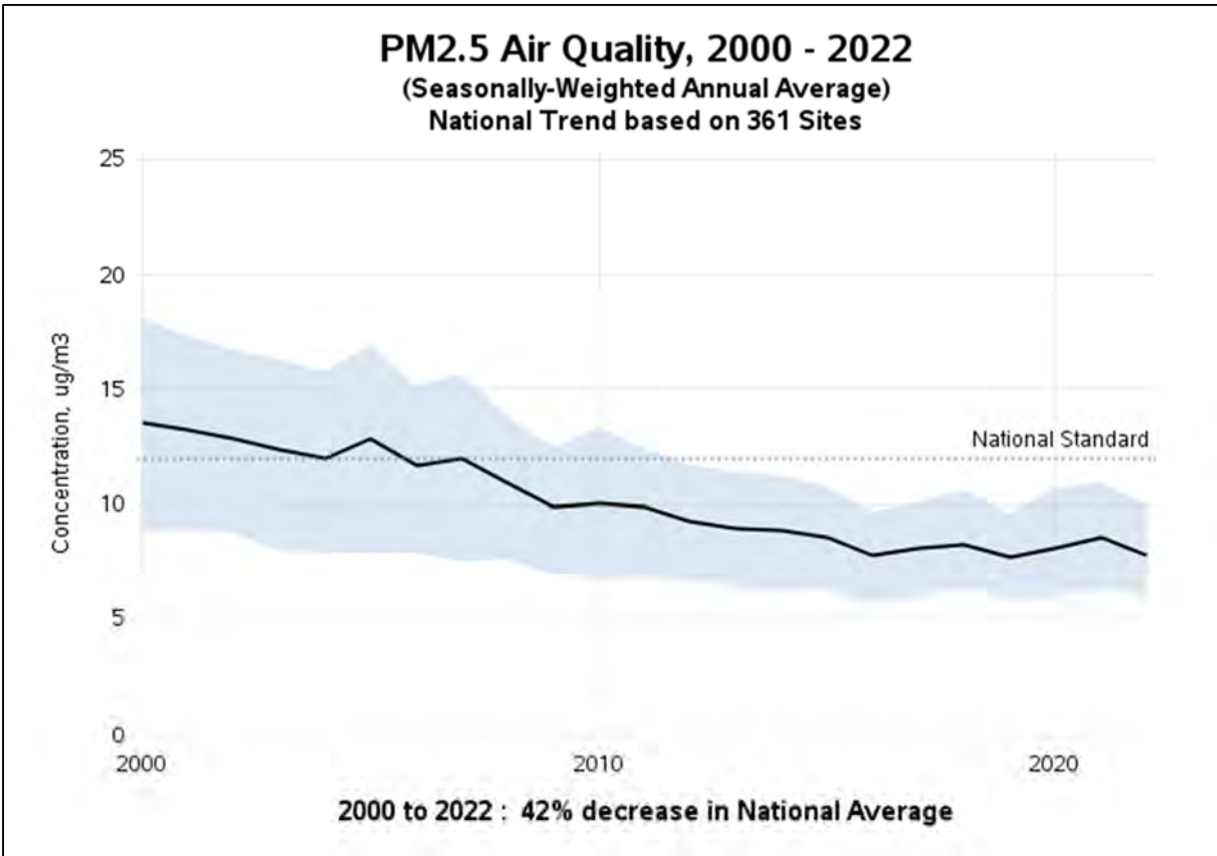
Exhibit 2.3.4: EPA Size Comparisons for PM Particles



Source: US EPA website accessed March 20, 2023. See:
<https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>

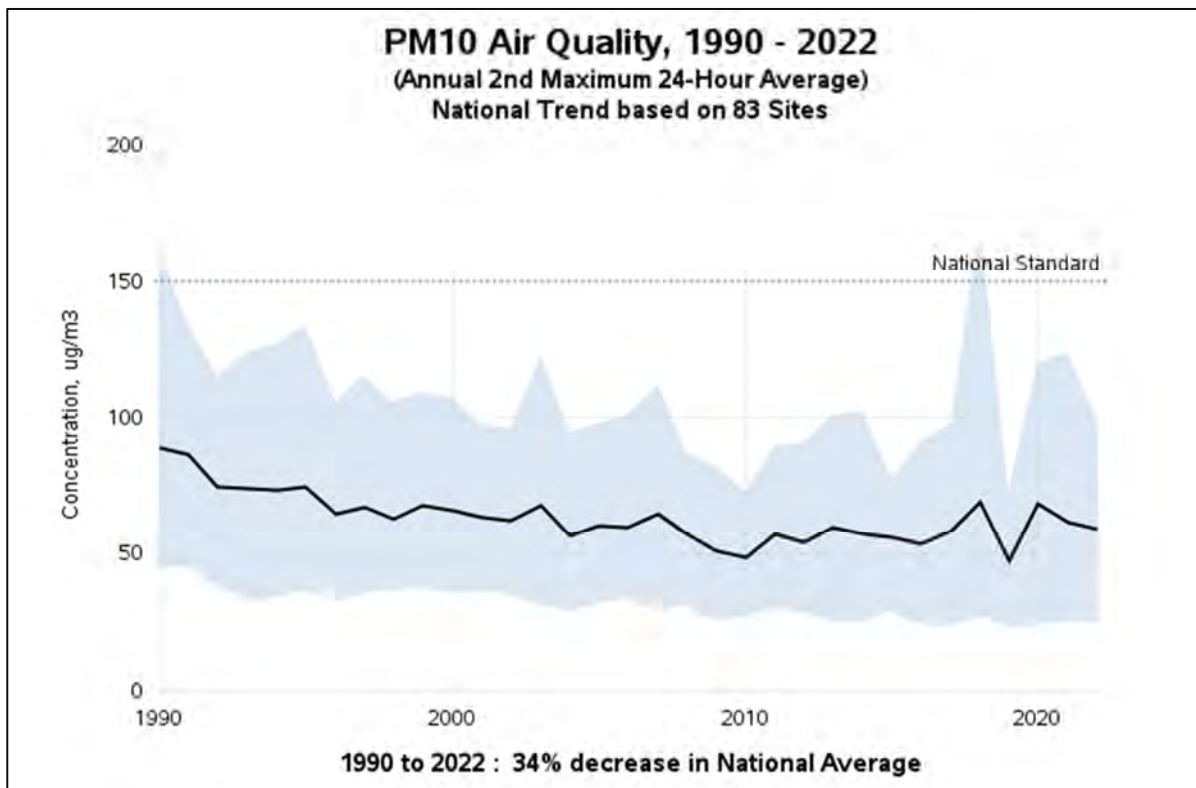
Exhibits 2.3.5 and 2.3.6 present the national trends in PM_{2.5} and PM₁₀ levels respectively.

Exhibit 2.3.5: National Trends in PM_{2.5} Concentrations (Annual Average)



Source: US EPA website accessed March 20, 2023. See:
<https://www.epa.gov/air-trends/particulate-matter-pm25-trends>

Exhibit 2.3.6: National Trends in PM₁₀ Concentrations (24-Hour Average)



Source: US EPA website accessed March 20, 2023 See:
<https://www.epa.gov/air-trends/particulate-matter-pm10-trends>

Exhibits 2.3.7 through 2.3.9 respectively present tabulations of PM_{2.5} (24-hour and annual standards) and PM₁₀ (24-hour standard) concentrations, which were excerpted from the referenced VDEQ annual air quality monitoring report. As noted above, all of Virginia is in attainment of the NAAQS for both pollutants.

Exhibit 2.3.7: Ambient Concentrations of PM_{2.5} (24-Hour Average)

2020-2022 PM_{2.5} 24-hour Averages, 98th Percentile Values (µg/m³, LC)				
Site	2020	2021	2022	3-Year Average
(101-E) Bristol	13.7	16.2	13.0	14.3
(26-F) Rockingham Co.	14.0	18.3	13.0	15.1
(28-J) Frederick Co.	16.2	21.2	19.2	18.9
(33-A) Albemarle Co.	12.3	17.9	15.0	15.1
(19-A6) Roanoke Co.	14.7	19.7	15.7	16.7
(110-C) Salem	13.5	18.8	12.6	15.0
(155-Q) Lynchburg	11.7	17.5	11.5	13.6
(71-H) Chesterfield Co.	11.4	18.9	11.9	14.1
(72-M) Henrico Co.	14.5	18.0	15.9	16.1
(72-N) Henrico Co.	12.7	17.2	11.1	13.7
(75-B) Charles City Co.	11.5	17.0	12.9	13.8
(158-X) Richmond	15.7*	17.6*	16.4	16.6
(179-K) Hampton	12.8	15.5	13.0	13.8
(181-A1) Norfolk	12.1*	15.4	12.8	13.4
(184-J) Va. Beach	15.1*	15.1	13.6	14.6
(38-I) Loudoun Co.	19.3*	16.0	13.0	16.1
(47-T) Arlington Co.	17.7	17.1	13.5	16.1
(46-B9) Franconia, Fairfax Co.	14.6	17.6	14.0	15.4
(46-C2) Springfield, Fairfax Co.	16.3	19.9*	15.7	17.3

* Annual value did not meet completeness criteria

Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2022 Annual Report", 2023. See: <https://www.deq.virginia.gov/our-programs/air/reports>

Exhibit 2.3.8: Ambient Concentrations of PM_{2.5} (Annual Average)

2020-2022 PM _{2.5} Weighted Annual Arithmetic Means (µg/m ³ , LC)				
Site	2020	2021	2022	3-Year Average
(101-E) Bristol	6.0	7.3	6.2	6.5
(26-F) Rockingham Co.	6.1	7.4	6.5	6.7
(28-J) Frederick Co.	6.6	8.6	7.7	7.6
(33-A) Albemarle Co.	6.5	7.7	7.7	7.3
(19-A6) Roanoke Co.	6.7	8.3	7.4	7.5
(110-C) Salem	5.9	7.1	6.4	6.5
(155-Q) Lynchburg	5.4	6.6	5.7	5.9
(71-H) Chesterfield Co.	5.5	7.0	5.8	6.1
(72-M) Henrico Co.	6.9	8.3	7.7	7.6
(72-N) Henrico Co.	5.6	7.2	6.0	6.3
(75-B) Charles City Co.	5.6	7.0	5.8	6.1
(158-X) Richmond	6.9*	8.3*	8.0	7.7
(179-K) Hampton	5.9	7.0	6.8	6.6
(181-A1) Norfolk	6.0*	7.2	6.3	6.5
(184-J) Va. Beach	6.2*	7.3*	6.5	6.7
(38-I) Loudoun Co.	6.2*	7.4	6.4	6.7
(47-T) Arlington Co.	6.6	7.9	6.7	7.1
(46-B9) Franconia, Fairfax Co.	6.6	7.9	7.2	7.2
(46-C2) Springfield, Fairfax Co.	7.9	9.1*	8.1	8.4

* Annual value did not meet completeness criteria.

Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2022 Annual Report", 2023. See: <https://www.deq.virginia.gov/our-programs/air/reports>

Exhibit 2.3.9: Ambient Concentrations of PM₁₀ (24-Hour Average)

2020-2022 PM ₁₀ 24-Hour Average Concentrations (units in µg/m ³ STD)							
Site	2020		2021		2022		>150 µg/m ³
	1 st Max	2 nd Max	1 st Max	2 nd Max	1 st Max	2 nd Max	
(23-A) Carroll Co.	16	15	36	27	25	22	0
(28-J) Frederick Co.*	-	-	51	46	45	42	0
(44-A) Stafford Co.	24	16	34	30	18	13	0
(46-B9) Fairfax Co.*	17	16	45	27	30	23	0
(72-M) Henrico Co.	16	15	39	23	29	27	0
(154-M) Hopewell@	16	15	34	19	25	16	0
(179-K) Hampton*	13	10	17	14	28	26	0
(181-A1) Norfolk	29	20	24	21	22	20	0

* Continuous monitoring started in 2022

@ Did not meet 4th quarter data completeness criteria in 2022

- No data

Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2022 Annual Report", 2023. See: <https://www.deq.virginia.gov/our-programs/air/reports>

2.3.1.3 Nitrogen Dioxide

EPA provides the following background information on NO₂:²⁶

"Nitrogen Dioxide (NO₂) is one of a group of highly reactive gases known as oxides of nitrogen or nitrogen oxides (NO_x). Other nitrogen oxides include nitrous acid and nitric acid. NO₂ is used as the indicator for the larger group of nitrogen oxides.

NO₂ primarily gets in the air from the burning of fuel. NO₂ forms from emissions from cars, trucks and buses, power plants, and off-road equipment."

and

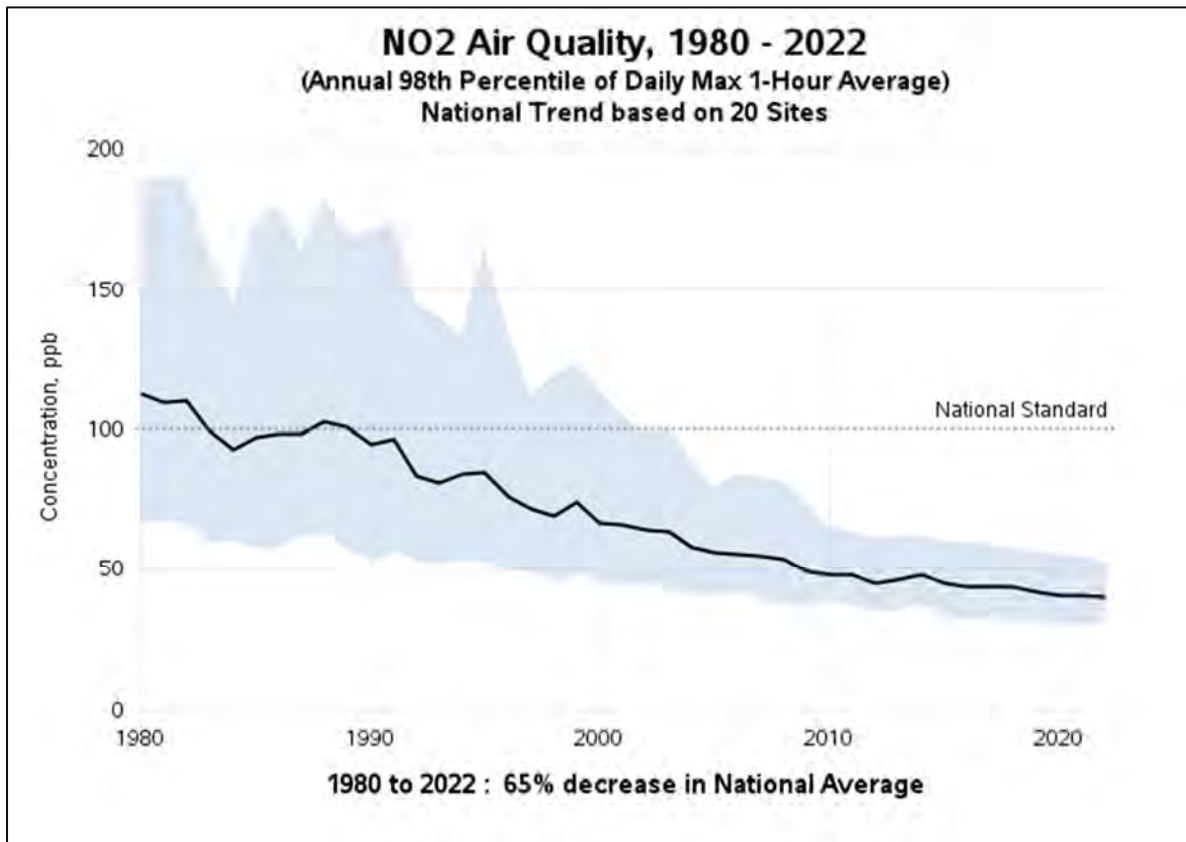
"Breathing air with a high concentration of NO₂ can irritate airways in the human respiratory system. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms. Longer exposures to elevated concentrations of NO₂ may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. People with asthma, as well as children and the elderly are generally at greater risk for the health effects of NO₂.

NO₂ along with other NO_x reacts with other chemicals in the air to form both particulate matter and ozone. Both of these are also harmful when inhaled due to effects on the respiratory system."

²⁶ See: <https://www.epa.gov/no2-pollution/basic-information-about-no2#What%20is%20NO2>

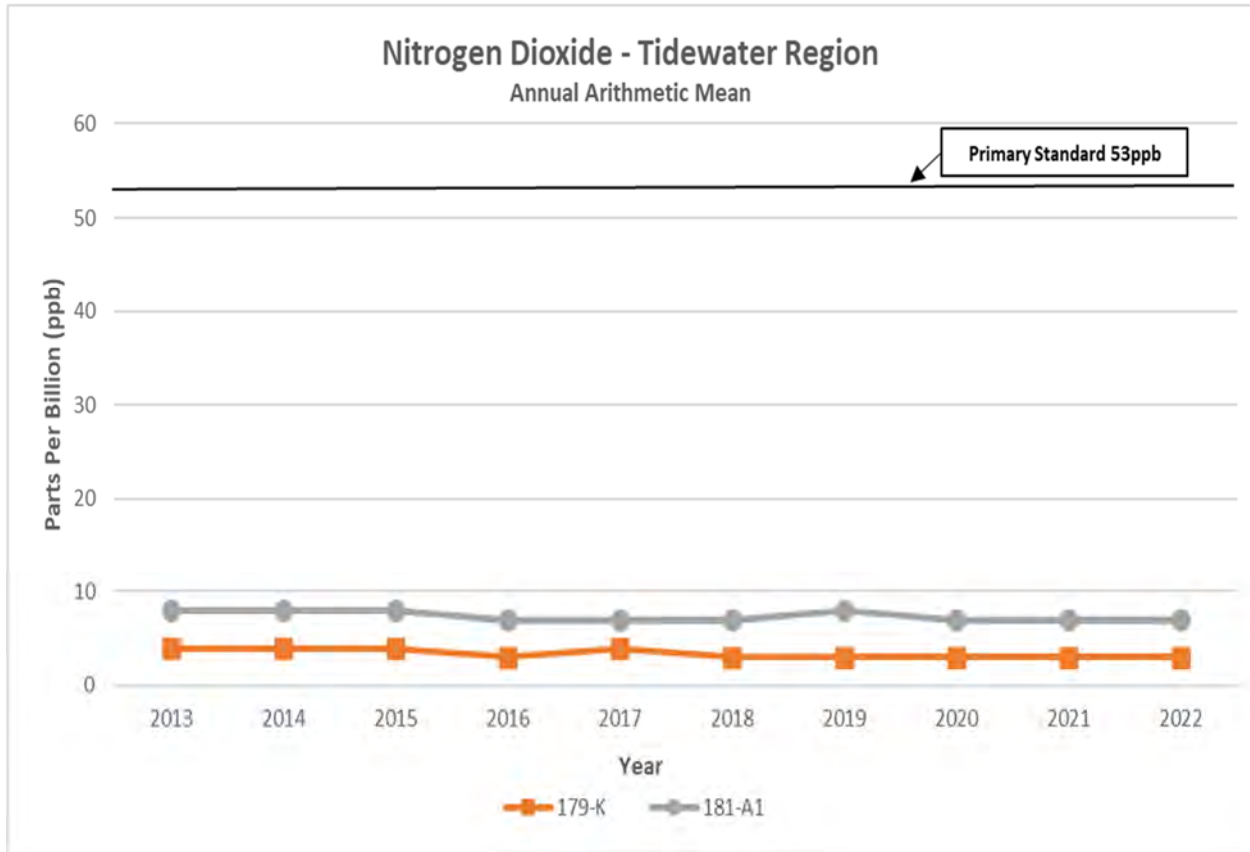
Exhibits 2.3.10 and 2.3.11 present the trend in levels of NO₂ on a national level and for northern Virginia respectively.

Exhibit 2.3.10: National Trends in NO₂ Concentrations



Source: US EPA website accessed March 20, 2023. See:
<https://www.epa.gov/air-trends/nitrogen-dioxide-trends>

Exhibit 2.3.11: Trends in NO₂ Concentrations in Northern Virginia

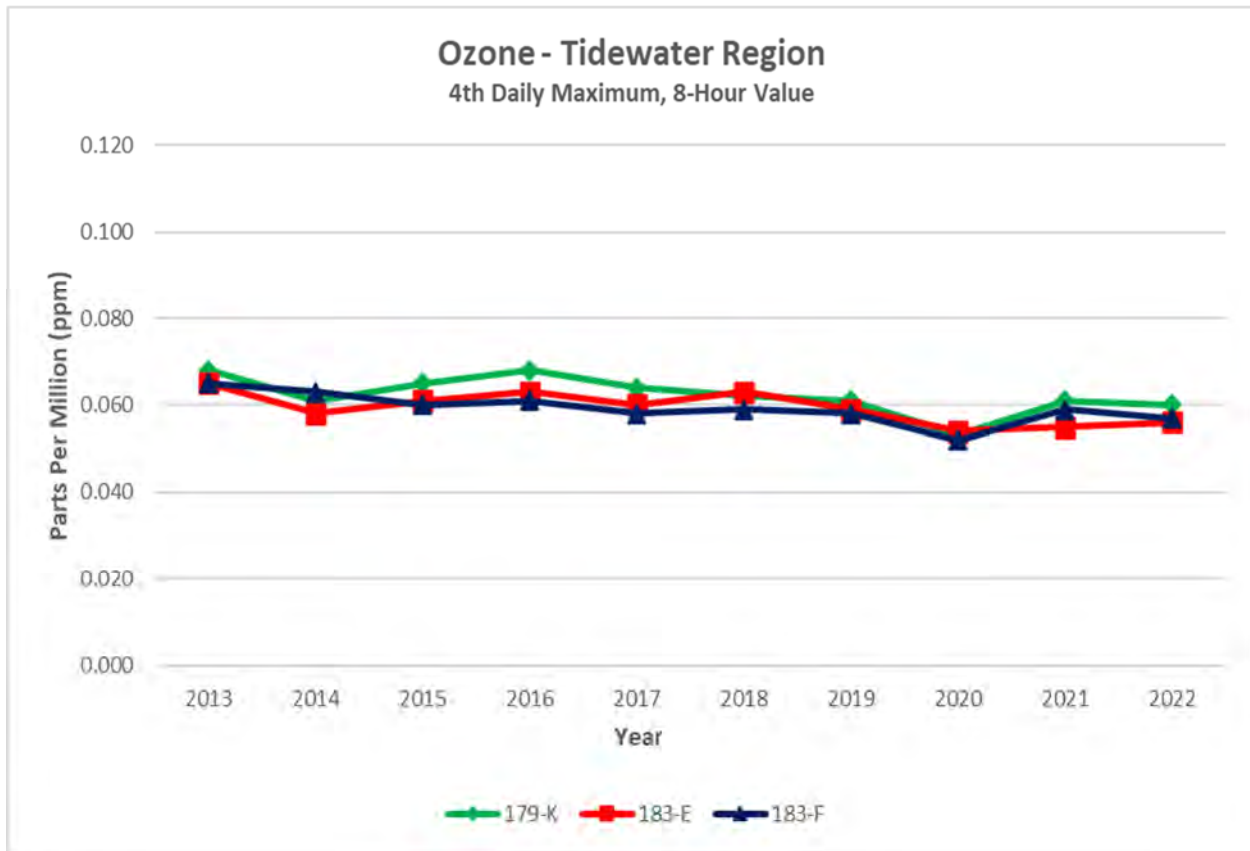


Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2022 Annual Report", 2023.
See: <https://www.deq.virginia.gov/our-programs/air/reports>

2.3.1.4 Ozone

Exhibit 2.3.12 presents the trend in regional ozone levels for the eight-hour standard.

Exhibit 2.3.12: Trend for the Eight-Hour Ozone Standard – Northern Region
Current NAAQS: 0.070 ppm



Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2022 Annual Report", 2023. See: <https://www.deq.virginia.gov/our-programs/air/reports>

2.3.2 Air Toxics

From the VDEQ website:²⁷

“Toxic air pollutants, also called Hazardous Air Pollutants or air toxics, are known or suspected to cause adverse health or environmental effects.

DEQ maintains two air toxics monitoring sites: one in the Richmond area at the MathScience Innovation Center, and one in Hopewell. Among the principal objectives of these stations are assessing trends and emission reduction program effectiveness, assessing and verifying air quality models (e.g., exposure assessments, emission control strategy development, etc.), and as direct input to source-receptor models.

At each of these sites, daily measurements are taken for dozens of pollutants, including volatile organic compounds (VOCs), carbonyls and metals, and the Richmond site also measures polycyclic aromatic hydrocarbons (PAHs). The Hopewell site was placed in 2009 as part of a grant to study localized impacts from air toxics. The Richmond site is part of a national network to study air toxics trends. In addition to these sites, DEQ will begin collecting data as part of an air toxics study in Newport News and Norfolk in the summer of 2021.

Find more information about these monitors in DEQ's Air Monitoring Network Plan. ”²⁸

Mobile source air toxics and trends are addressed in more detail in the next section on project assessment.

²⁷ See: <https://www.deq.virginia.gov/our-programs/air/monitoring-assessments/air-monitoring/pollutant-monitoring>, accessed February 1, 2023

²⁸ Ibid

3.0 Project Assessment

3.1 Regulatory Requirements

The assessments presented in this section were conducted for purposes of the National Environmental Policy Act of 1969 (NEPA) and, where applicable, to meet transportation conformity rule requirements. FHWA posts guidance for NEPA on its website for project development,²⁹ and provides guidance specific to air quality (focusing on carbon monoxide) in its 1987 Technical Advisory 6640.8A, *“Guidance for Preparing and Processing Environmental and Section 4(f) Documents.”*³⁰ FHWA posts separate guidance for mobile source air toxics (MSATs) along with responses to “Frequently Asked Questions” (FAQs) on its air quality webpage.³¹

Corresponding Commonwealth of Virginia requirements for conformity are specified in 9 VAC-5-151, which is also referred to as the state “conformity SIP” or “conformity implementation plan.”³² Note, per the federal transportation conformity regulation, its requirements apply only in the absence of corresponding requirements in the state conformity regulation.³³ The Virginia regulation incorporates by reference most of the requirements in the July 1, 2012 federal rule from 40 CFR 923.101 to 93.129, with the notable exception of 40 CFR 93.105 which addresses consultation. The Virginia regulation provides detailed requirements for consultation that are specific to Virginia but otherwise reflect the consultation requirements in 40 CFR 93.105.

3.2 Application of the VDOT Resource Document

In 2016, the Department created the “VDOT Resource Document” and associated online data repository to facilitate and streamline the preparation of project-level air quality analyses for purposes of NEPA and conformity.³⁴ Inter-agency consultation was conducted with FHWA Division and Headquarters and other agencies (including EPA) before the Resource Document was finalized. The Resource Document was most recently updated in 2023 to address changes in applicable regulations and guidance.

With regard to this project, the models, methods/protocols and assumptions as specified or referenced in the VDOT Resource Document were applied without change or without substantive change as defined in that document.

²⁹ See: https://www.environment.fhwa.dot.gov/nepa/nepa_projDev.aspx

³⁰ See: <https://www.environment.fhwa.dot.gov/projdev/impTA6640.asp>

³¹ See: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/

³² *Virginia Regulation for Transportation Conformity (9 VAC5-151):*
<https://law.lis.virginia.gov/admincode/title9/agency5/chapter151/>

³³ 40 CFR 51.390: “...The federal conformity rules under part 93, subpart A, of this chapter... establish the conformity criteria and procedures necessary to meet the requirements of Clean Air Act section 176(c) until such time as EPA approves the conformity implementation plan revision required by this subpart... The federal conformity regulations contained in part 93, subpart A, of this chapter would continue to apply for the portion of the requirements that the state did not include in its conformity implementation plan and the portion, if any, of the state's conformity provisions that is not approved by EPA.”
<https://ecfr.federalregister.gov/current/title-40/chapter-I/subchapter-C/part-51.390#51.390>

³⁴ See: <https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/environmental/>

3.3 Mobile Source Air Toxics (MSATs) Assessment

FHWA most recently updated its guidance for the assessment of MSATs in the NEPA process for highway projects in 2023.³⁵ It states that “...EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (NATA).³⁶ These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter.” It also specifies three possible categories or tiers of analysis, namely, 1) projects with no meaningful potential MSAT effects, or exempt projects (for which MSAT analyses are not required), 2) projects with low potential MSAT effects (requiring only qualitative analyses), and 3) projects with higher potential MSAT effects (requiring quantitative analyses).

3.3.1 Level of Analysis Determination

As this project involves an EA and is not exempt, it does not qualify as a Tier 1 project under FHWA MSAT Guidance. It also does not meet the criteria for a Tier 3 project in FHWA guidance, as total traffic is forecast to reach only 14,192 thousand ADT for the build scenario, which is below the 140-150 thousand ADT criteria specified in FHWA guidance for Tier 3 projects (i.e., ones for which quantitative analyses for MSATs would be required). Additionally, this project does not involve the creation or alteration of a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location.

This project may therefore be categorized as a Tier 2 project, i.e., one with “Low Potential MSAT Effects.” Projects in this category are addressed with a qualitative analysis, which as FHWA guidance states provides a basis for identifying and comparing potential differences for MSAT emissions, if any, from the various alternatives.

A qualitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below follows FHWA guidance. It is derived in part from a study conducted by FHWA entitled “A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives.”³⁷

3.3.2 Background

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA

³⁵ FHWA, “*INFORMATION: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*”, January 18, 2023. See: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/
Note: While the January 2023 FHWA updated guidance was based on modeling using MOVES3, which is reflected in the background information presented here, the current version of the emission model (MOVES4.0.1 at the time of preparation for this analysis) is used for any project-specific modeling.

³⁶ See: <https://www.epa.gov/national-air-toxics-assessment>

³⁷ https://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/mobile_source_air_toxics/msatemiissions.cfm

assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of EPA's Integrated Risk Information System (IRIS).³⁸ In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (NATA).³⁹ These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

3.3.3 Motor Vehicle Emissions Simulator (MOVES)

According to EPA, MOVES3 is a major revision to MOVES2014 and improves upon it in many respects. MOVES3 includes new data, new emissions standards, and new functional improvements and features. It incorporates substantial new data for emissions, fleet, and activity developed since the release of MOVES2014. These new emissions data are for light- and heavy-duty vehicles, exhaust and evaporative emissions, and fuel effects. MOVES3 also adds updated vehicle sales, population, age distribution, and vehicle miles travelled (VMT) data. MOVES3 incorporates the effects of three new Federal emissions standard rules not included in MOVES2014. These new standards are all expected to impact MSAT emissions and include Tier 3 emissions and fuel standards starting in 2017 (79 FR 60344), heavy-duty greenhouse gas regulations that phase in during model years 2014-2018 (79 FR 60344), and the second phase of light-duty greenhouse gas regulations that phase in during model years 2017-2025 (79 FR 60344). In the November 2020 EPA issued MOVES3 Mobile Source Emissions Model Questions and Answers.⁴⁰ EPA states that for on-road emissions, MOVES3 updated heavy-duty (HD) diesel and compressed natural gas (CNG) emission running rates and updated HD gasoline emission rates. They updated light-duty (LD) emission rates for hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxide (NO_x) and updated LD particulate matter rates, incorporating new data on Gasoline Direct Injection (GDI) vehicles.

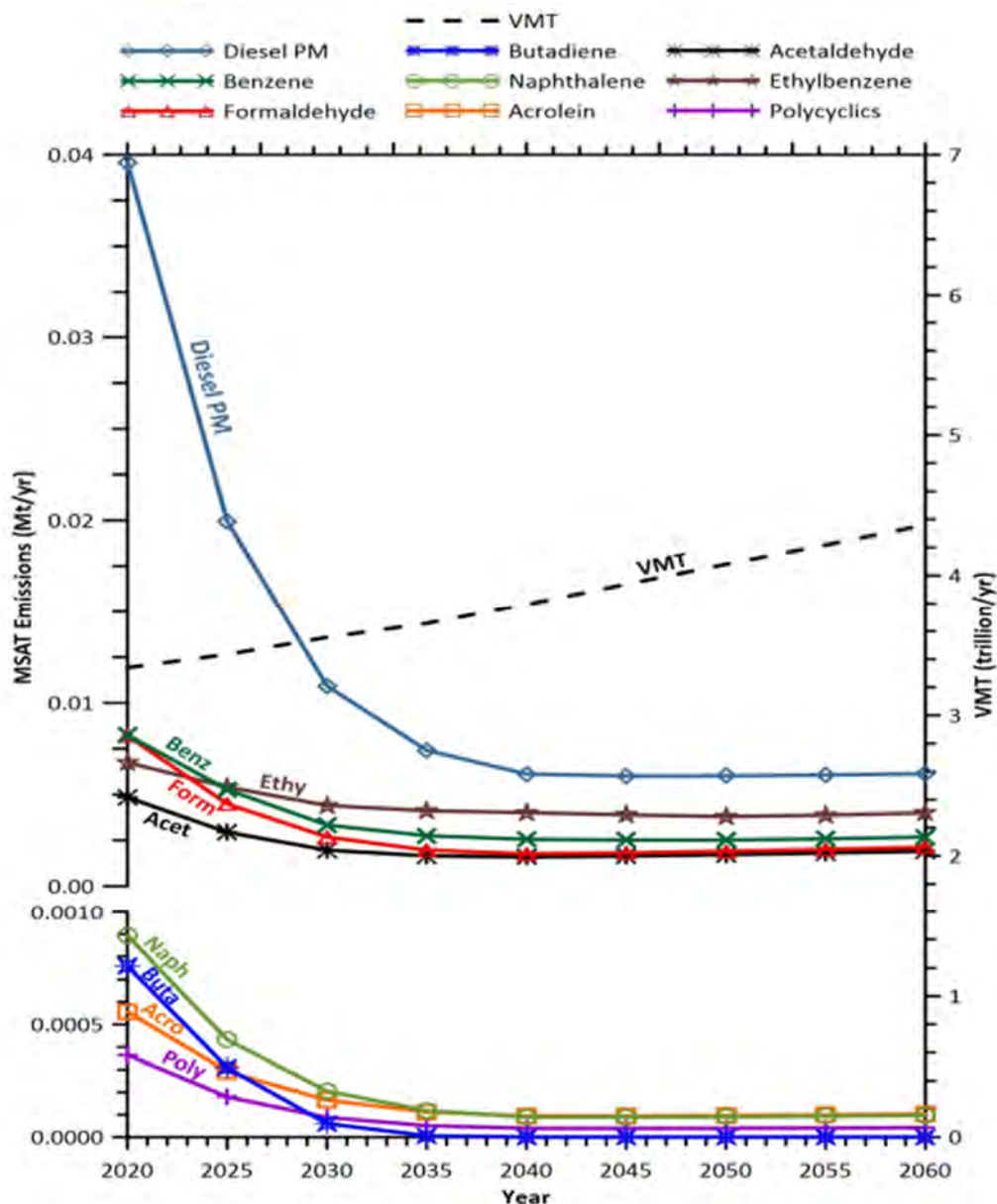
Using EPA's MOVES3 model, as shown in Exhibit 3.3.1, FHWA estimates that even if VMT increases by 31 percent at a national level from 2020 to 2060 as forecast, a combined reduction of 76 percent in the total annual emissions for the priority MSAT is projected for the same time period. Diesel PM is the dominant component of MSAT emissions, making up 36 to 56 percent of all priority MSAT pollutants by mass, depending on calendar year. Users of MOVES3 will notice some differences in emissions compared with MOVES2014. MOVES3 is based on updated data on some emissions and pollutant processes compared to MOVES2014, and also reflects the latest Federal emissions standards in place at the time of its release. In addition, MOVES3 emissions forecasts are based on slightly higher VMT projections than MOVES2014, consistent with nationwide VMT trends.

³⁸ <https://www.epa.gov/iris>

³⁹ <https://www.epa.gov/national-air-toxics-assessment>

⁴⁰ <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P1010M06.pdf>

Exhibit 3.3.1: FHWA Projected National MSAT Emission Trends 2020 – 2060 for Vehicles Operating on Roadways



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Source: EPA MOVES3 model runs conducted by FHWA, March 2021

3.3.4 MSAT Research

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks

posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to arise on highway projects during the NEPA process. Even as the science emerges, the public and other agencies expect FHWA to address MSAT impacts in its environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

3.3.5 Qualitative Analysis

Following FHWA guidance, this project has been determined to have low potential MSAT effects, thereby requiring a qualitative MSAT analysis. A qualitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives*.⁴¹

The amount of MSATs emitted is proportional to vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for the Build Alternative(s) therefore may be slightly higher than that for the No-Build Alternative, because additional capacity increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. This increase in VMT could lead to higher MSAT emissions for the preferred alternative along a highway corridor, along with a corresponding decrease in MSAT emissions along parallel routes. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to the EPA MOVES3 model, emissions of all of the priority MSAT decrease as speed increases.

Because the estimated ADT and VMT under each of the Alternatives are nearly the same, varying by less than 4 percent, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected in FHWA guidance to reduce annual MSAT emissions by over 76 percent between 2020 and 2060 even with a 31 percent increase in VMT on a national level. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases. Any additional travel lanes contemplated as part of the project may have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, there may be localized areas where ambient concentrations of MSATs could be higher for a Build Alternative than for the No-Build Alternative. However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts.

⁴¹ See: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/mobile_source_air_toxics/msatemiissions.cfm

In sum, when capacity is added, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No-Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). In addition, MSAT emissions will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region wide MSAT levels to be significantly lower than today.

3.3.6 Incomplete or Unavailable Information for Project-Specific MSAT Health Impacts Analysis

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects."⁴² Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). A number of HEI studies are summarized in Appendix D of FHWA's Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations⁴³ or in the future as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts – each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to

⁴² See: <https://www.epa.gov/iris/>

⁴³ HEI Special Report 16. See: <https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects>

be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI.⁴⁴ As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA states that with respect to diesel engine exhaust: “[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk (https://iris.epa.gov/static/pdfs/0642_summary.pdf).”

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an “acceptable” level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA’s approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.⁴⁵

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities while improving access for emergency response, that are better suited for quantitative analysis.

⁴⁴ Ibid

⁴⁵ See: [https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/\\$file/07-1053-1120274.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/$file/07-1053-1120274.pdf)

3.3.7 Conclusions

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project at this time. While it is possible that localized increases in MSAT emissions may occur as a result of this project, emissions will likely be lower than present levels in the design year of this project as a result of EPA's national control programs that are projected in FHWA guidance (2023) to reduce annual MSAT emissions by 76 percent between 2020 and 2060 even as VMT increases nationally by 31 percent. Although local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

3.4 Greenhouse Gases (GHGs)

3.4.1 Level of Analysis Determination

The project meets the screening criteria specified in the VDOT Resource Document (Appendix K) for a Category 2 project as one with low potential GHG effects as it does not fit within either Category 1 or 3. As such, a brief qualitative assessment is presented below for this project.

3.4.2 Qualitative Assessment

For each alternative in this EA, the amount of GHGs emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for each of the Build alternatives may be slightly higher than that for the No-Build alternative for each analysis year, because the additional capacity may increase the efficiency of the roadway and attract rerouted trips from elsewhere in the transportation network. An increase in VMT may lead to higher GHG emissions for the preferred action alternative compared to the No-Build alternative along the highway corridor, along with a corresponding decrease in GHG emissions along the parallel routes. The emissions increase may be offset somewhat by lower GHG emission rates due to increased speeds; according to the EPA MOVES model, emissions of GHG emissions decrease as speed increases (up to about 60 miles per hour). Because the estimated VMT under each of the alternatives are nearly the same, it is expected there would be no appreciable difference in overall GHG emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of fuel efficiency improvements and electrification policies that are projected to reduce annual statewide GHG emissions from on-road sources by nearly 50 percent between 2015 and 2040 (VDOT, Statewide Planning-Level GHG Assessment, December 2021).

3.4.3 Mitigation Strategies

The 2021 statewide GHG analysis included 16 discrete planned state and regional rail and transit projects that will reduce automobile and truck travel and GHG emissions, as well as increases to existing service. VDOT and the Department of Rail and Public Transportation have also continued to fund other air quality and GHG mitigation strategies. These include bicycle and pedestrian projects, travel demand management (TDM) programs that seek to reduce the amount of

commuting in single-occupancy vehicles, and investment in electric vehicles and charging infrastructure. The potential benefits of those strategies are not reflected in this statewide programmatic assessment.

3.4.4 Conclusions

In 2018, according to the Virginia Department of Environmental Quality (DEQ) Virginia Greenhouse Gas Inventory, direct emissions from cars, trucks, buses, and trains operating in the Commonwealth of Virginia contributed 29 percent of statewide greenhouse gas emissions. The Commonwealth has set goals to reach net-zero emissions by 2045 in all sectors, including transportation; to electrify vehicles; and to generate 100 percent carbon-free electricity by 2050. Actions consistent with these goals are currently expected to reduce surface transportation emissions nearly 50 percent by 2040, and much more in following years.

3.5 Climate Change

3.5.1 Potential Climate Change Impacts

Greenhouse gas emissions have accumulated rapidly as the world has industrialized, with concentration of atmospheric CO₂ increasing from roughly 300 parts per million in 1900 to over 400 parts per million today according to the U.S. Global Climate Change Research Program. Over this timeframe, average temperatures have increased by roughly 1.8 degrees Fahrenheit (1 degree Celsius). If emissions continue, projected changes in global average temperature could range from 0.4°–2.7°F (0.2°–1.5°C) under a very low emissions scenario, to 4.2°–8.5°F (2.4°–4.7°C) under a higher scenario by the end of the 21st century.⁴⁶

According to information prepared by the Georgetown Climate Center, Virginia’s transportation infrastructure faces risks from a changing climate including coastal flooding, inland flooding, and extreme heat.

- Coastal Flooding – Sea level rise is occurring at an accelerating rate, and five Virginia water level stations appear in the Nation’s top 20 highest sea level rise trends.⁴⁷ In the next 20 to 50 years, Virginia is likely to experience at least 1.5 feet of sea level rise, with the possibility of even greater increases.⁴⁸ Storm surge presents major risks to Virginia’s coastal areas, with over 300 bridges and structures that would face over two feet of storm surge inundation from a Category 2 hurricane.⁴⁹ By 2080, 10 percent of the roadway networks in Virginia Beach and Norfolk could be flooded by “king tides” (exceptionally high tide events) with four feet of sea level rise.⁵⁰

⁴⁶ U.S. Global Climate Change Research Program (2018). Fourth National Climate Assessment.

⁴⁷ City of Virginia Beach (2020). Sea Level Wise: Adaptation Strategy.
<https://pw.virginiabeach.gov/stormwater/sea-level-wise>

⁴⁸ Georgetown Climate Center (undated). “Understanding Virginia’s Vulnerability to Climate Change.” Accessed September 2021 at <https://www.georgetownclimate.org/files/report/understanding-virginias-vulnerability-to-climate-change.pdf>.

⁴⁹ Commonwealth of Virginia, Office of the Secretary of Transportation (2020). Vulnerability Assessment.

⁵⁰ Sadler, Jeffer, Nicole Haselden, Kimberly Mellon, and Allison Hackel (2017). Impact of Sea-Level Rise on

- Inland Flooding – The southeastern U.S. has experienced an increase in flooding from heavy rainfall and extreme precipitation events. Virginia has seen heavy rainstorms increase by 33 percent in the last 60 years.⁵¹ In the future, the southeastern U.S. is expected to see a continued increase in extreme rainfall events.
- Extreme Heat – Heat waves are a leading cause of weather-related deaths.⁵² Anticipated more intense heat events pose dangers to human activity and human health. Extreme heat combined with drought conditions can also increase the risk of wildfires. Pavements may also contribute to heat island effects in urban locations.⁵³

3.5.2 Project-Level Climate Strategies and Considerations

Resiliency is an important consideration for future infrastructure investments. Resiliency considerations include building in areas with minimal risk to the facility; designing infrastructure that is resilient to potential impacts that could affect its scope, function, and/or performance; and siting and designing projects to avoid or minimize impacts to natural resiliency features such as wetlands, forests, and floodplains. Resiliency strategies that are cost-effective and can be adopted during the planning, project development, construction, and/or maintenance phases of a given infrastructure project are supported. VDOT complies with all existing Federal and state laws and regulations and permitting requirements related to wetlands and water quality impacts.

VDOT, and some regional and local agency partners in the state, have already engaged in efforts to plan for resiliency. As part of the development of VTrans, Virginia's Transportation Plan, the Commonwealth Transportation Board (CTB) has developed the Policy for the Development and Monitoring of VTrans Long-term Risk & Opportunity Register, which allows for quantification of impacts of 10 macrotrends, including long-term flooding risk due to sea-level rise, storm surge, and inland/riverine flooding.

The CTB has also developed a Long-term Risk & Opportunity Register, a policy document, based on an assessment of these impacts. The 2021 Risk & Opportunity Register includes the following risks and opportunities:

- Risk: A large number of the state's roadways are at risk of flooding.
- Risk: Several unknown and unquantified flooding risks are present.
- Risk: Impacts of increased flooding risk are disproportionately higher for certain geographic areas and populations.
- Opportunity: Proactively eliminate or mitigate identified flooding risks.

Roadway Flooding in the Hampton Roads Region, Virginia. Journal of Infrastructure Systems. Accessed at: <https://ascelibrary.org/doi/pdf/10.1061/%28ASCE%29IS.1943-555X.0000397>.

⁵¹ Georgetown Climate Center, *ibid*.

⁵² Georgetown Climate Center, *ibid*.

⁵³ Georgetown Climate Center (2012). "Adapting to Urban Heat: A Tool Kit for Local Governments." https://www.georgetownclimate.org/files/report/Urban%20Heat%20Toolkit_9.6.pdf

- Opportunity: Increase the state's preparedness to address other macrotrends associated with the climate megatrend.
- The CTB has also adopted the following strategic actions to mitigate the identified long-term risks and maximize opportunities.
- Collect data (e.g., right-of-way mapping, precipitation, roadway elevation, etc.) to accurately assess flooding risks for the state- and locally-maintained roadways that can be used to identify funding needs and prioritize investment.
- Develop policies based on robust data collection and analysis to ensure flooding risks are reflected in transportation asset life-cycle and/or transportation project planning processes.
- Collaborate with state/regional agencies to systematically identify solutions that facilitate consistent and systematic prioritization and support the allocation of state resources to address flooding risks.

Finally, as part of the policy, the Office of Intermodal Planning and Investment (OIP) is required to track trends related to all macrotrends, including flooding risk, and report annually.

The Hampton Roads region has undertaken several studies to understand and plan for climate risks. In 2012, VDOT, the University of Virginia, and the Hampton Roads Planning District Commission undertook a pilot study assessing vulnerability and risk of climate change effects on transportation infrastructure in the region.⁵⁴ In 2016, the Hampton Roads Transportation Planning Organization released a report called “Sea Level Rise and Storm Surge Impacts to Roadways in Hampton Roads,” which determined where flooding is expected on roadways, bridges, and tunnels within the Hampton Roads area by 2045 as a result of relative sea level rise and storm surge risks and identified adaptation strategies. In 2020, the City of Virginia Beach released its adaptation and resiliency study titled “Sea Level Wise,” which documents years of planning and policy strategies to fight the coastal risks the region faces from climate change.

3.5.3 Conclusions

Greenhouse gas emissions have accumulated rapidly as the world has industrialized. According to the U.S. Global Climate Change Research Program,⁵⁵ if emissions continue, projected changes in global average temperature could range from 0.4°–2.7°F (0.2°–1.5°C) under a very low emissions scenario, to 4.2°–8.5°F (2.4°–4.7°C) under a higher scenario by the end of the 21st century. Based on information developed by the Georgetown Climate Center,⁵⁶ Virginia’s transportation

⁵⁴ Virginia Department of Transportation, University of Virginia, Hampton Roads Planning District Commission. 2012. Assessing Vulnerability and Risk of Climate Change Effects on Transportation Infrastructure: Hampton Roads Virginia Pilot. Available at: <https://www.adaptationclearinghouse.org/> or <https://www.cakex.org/>.

⁵⁵ U.S. Global Climate Change Research Program (2018). Fourth National Climate Assessment.

⁵⁶ Georgetown Climate Center (undated). “Understanding Virginia’s Vulnerability to Climate Change.” Accessed

infrastructure faces risks from a changing climate including increased levels of coastal flooding, inland flooding, and extreme heat.

Resiliency is an important consideration for VDOT when planning and designing future infrastructure investments. Resiliency considerations include siting and design of facilities both to minimize risk to the facility, and to minimize impacts on natural resiliency features such as wetlands, forests, and floodplains. Resiliency strategies that are cost-effective and can be adopted during the planning, project development, construction, and/or maintenance phases of a given infrastructure project are supported.

VDOT, and regional and local agency partners in the Commonwealth, have already engaged in efforts to plan for resiliency. As part of the development of VTrans, Virginia's transportation plan, the Commonwealth Transportation Board (CTB) has developed a Policy for the Development and Monitoring of VTrans Long-term Risk & Opportunity Register, which allows for quantification of impacts of ten macrotrends, including long-term flooding risk due to sea-level rise, storm surge, and inland/riverine flooding, as well as a Long-term Risk & Opportunity Register based on an assessment of these impacts. The CTB has also adopted strategic actions to mitigate the identified long-term risks and maximize opportunities, including collecting data to accurately assess flooding risks for the state- and locally-maintained roadways that can be used to identify funding needs and prioritize investment; developing policies based on robust data collection and analysis to ensure flooding risks are reflected in transportation asset life-cycle and/or transportation project planning processes; and collaborating with state and regional agencies to systematically identify solutions that facilitate consistent and systematic prioritization and support the allocation of state resources to address flooding risks. Finally, the Office of Intermodal Planning and Investment (OIPI) is required to track trends related to all macrotrends, including the flooding risk, and report annually.

3.6 Carbon Monoxide Assessment

EPA project-level ("hot-spot") transportation conformity requirements for CO do not apply as the project is located in a region that is in attainment of the NAAQS. A project-specific analysis or assessment for CO is also not needed for NEPA per the programmatic approach specified in the VDOT Resource Document (Protocol 4.2.2.2). Based on the overall weight-of-evidence, it may reasonably be concluded that the CO NAAQS will be met given:

- Continued implementation of effective emission control technology, increasingly more stringent motor vehicle emission and fuel quality standards implemented over the past few decades by the Environmental Protection Agency (EPA) that have had the combined effect of substantially reducing CO emission rates nationwide, resulting in long-term downward trends in emissions and near-road ambient concentrations of CO despite increasing vehicle-miles-travelled (VMT)
- Extensive experience in project-specific modeling for CO for a wide variety of project types, configurations and operating conditions in which compliance with the national ambient air quality standards (NAAQS) established by EPA for CO is readily demonstrated given the

September 2021 at <https://www.georgetownclimate.org/files/report/understanding-virginias-vulnerability-to-climate-change.pdf>.

- substantially reduced CO emission rates, and despite the use of multiple worst-case assumptions for emission and dispersion modeling that have a compounding effect such that emissions and near-road ambient concentrations are substantially over-estimated; and
- Extensive experience in programmatic agreements for project-level agreements for CO that established ever-increasing thresholds for such analyses given the substantially reduced emission rates.

3.7 Indirect Effects and Cumulative Impacts (IECI) Assessment

Indirect effects are defined by the CEQ as “effects which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water or other natural systems, including ecosystems” (40 CFR 1508.8(b)). For transportation projects, induced growth is attributed to changes in accessibility caused by the project that influences the location and/or magnitude of future development.⁵⁷

Cumulative impacts are “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” (40 CFR 1508.7). According to the Federal Highway Administration’s (FHWA) *Interim Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process*, cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a proposed project. Cumulative impacts include indirect effects. The potential for indirect effects or cumulative impacts to air quality that may be attributable to this project is not expected to be significant for two reasons.

First, regarding the potential for indirect effects, the quantitative assessments conducted for programmatic CO and the qualitative analyses for MSAT impacts can be considered indirect effects analyses because they look at air quality impacts attributable to the project that occur in the future. These analyses demonstrate that, in the future: 1) air quality impacts from CO will not cause or contribute to violations of the CO NAAQS, and 2) MSAT emissions will be significantly lower than they are today.

Second, regarding the potential for cumulative impacts, EPA’s air quality designations for the region reflect, in part, the accumulated mobile source emissions from past and present actions. Since EPA has designated the region to be in attainment for all the NAAQS, the potential for cumulative impacts associated with the project is not expected to be significant. Notwithstanding

their attainment status, federal conformity requirements,⁵⁸ including specifically 40 CFR 93.112, 40 CFR 93.114, and 40 CFR 93.115, apply for the project as the area in which it is located is one affected by a recent court decision⁵⁹ that reinstated conformity requirements nationwide associated with the 1997 ozone NAAQS that had previously been eliminated with the revocation by EPA of that NAAQS in 2015.

Therefore, the indirect and cumulative effects of the project are not expected to be significant.

4.0 Mitigation

Historically, the continued implementation of increasingly more stringent motor vehicle emission, fuel quality and fuel economy standards has resulted in substantial reductions of emissions of both criteria pollutants and GHGs across the nation. These and other measures as identified below for GHGs that reduce VMT serve to minimize emissions across the nation.

4.1 Greenhouse Gases

The 2021 VDOT statewide GHG analysis included sixteen discrete planned state and regional rail and transit projects that will reduce automobile and truck travel and GHG emissions, as well as increases to existing service. VDOT and the Department of Rail and Public Transportation have also continued to fund other air quality and GHG mitigation strategies. These include bicycle and pedestrian projects, travel demand management (TDM) programs that seek to reduce the amount of commuting in single-occupancy vehicles, and investment in electric vehicles and charging infrastructure.

In December 2021, the Virginia State Air Pollution Control Board adopted regulations for Low-Emission Vehicle (LEV) and Zero-Emission Vehicle (ZEV) standards consistent with the California Advanced Clean Cars (ACC) program that would aggressively increase the light-duty vehicle ZEV market share beginning in 2025. California has the unique authority to maintain motor vehicle emission standards that are more stringent than federal standards. California's LEV standards control tailpipe emissions of criteria and greenhouse gas pollutants. California's ZEV program requires major manufacturers of passenger cars and light trucks to produce and deliver for purchase a certain number of ZEVs. Manufacturers must increase the average fuel efficiency for light- and medium-duty vehicles, as well as increase the number of electric vehicles for sale, beginning with model year 2025.

On December 30, 2021, the EPA issued a final rule in the Federal Register that revised national GHG emissions standards for passenger cars and light trucks for Model Years 2023-2026.⁶⁰ The final standards are expected to achieve significant GHG emissions reductions along with

⁵⁸ <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100VQME.pdf>

⁵⁹ [https://www.cadc.uscourts.gov/internet/opinions.nsf/217B6778AE3EC89C8525823600532AE0/\\$file/15-1115-1718293.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/217B6778AE3EC89C8525823600532AE0/$file/15-1115-1718293.pdf)

⁶⁰ <https://www.govinfo.gov/content/pkg/FR-2021-12-30/pdf/2021-27854.pdf>

reductions in other criteria pollutants.⁶¹ The program will result in avoiding more than 3 billion tons of GHG emissions through 2050 which is equivalent to more than half the total U.S. CO₂ emissions in 2019. Additional benefits include reduced impacts of climate change, improved public health from lower pollution, and cost savings for vehicle owners through improved fuel efficiency.

On October 25, 2016, the EPA and the DOT National Highway Traffic Safety Administration issued the final rule in the Federal Register for jointly finalized standards for medium- and heavy-duty vehicles that would improve fuel efficiency and cut carbon pollution to reduce the impacts of climate change, while bolstering energy security and spurring manufacturing innovation.⁶² The final program promotes cleaner, more fuel-efficient trucks by encouraging the development and deployment of new and advanced cost-effective technologies. The vehicle and engine performance standards cover model years 2018-2027 for certain trailers and model years 2021-2027 for semi-trucks, large pickup trucks, vans, and all types and sizes of buses and work trucks. The final standards are expected to lower CO₂ emissions by approximately 1.1 billion metric tons, save vehicle owners fuel costs of about \$170 billion, and reduce oil consumption by up to two billion barrels over the lifetime of the vehicles sold under the program.⁶³

4.2 Construction

Emissions may be produced in the construction of this project from heavy equipment and vehicle travel to and from the site, as well as from fugitive sources. Construction emissions are short term or temporary in nature. To mitigate these emissions, all construction activities are to be performed in accordance with VDOT *Road and Bridge Specifications*.⁶⁴

4.3 VDEQ Requirements

The VDEQ provides general comments for projects by county that in part address mitigation.⁶⁵ For the region in which the proposed project is located, their comment is:

“...all reasonable precautions should be taken to limit the emissions of VOC and NO_x. In addition, the following VDEQ air pollution regulations must be adhered to during the construction of this project: 9 VAC 5-130, Open Burning restrictions⁶⁶; 9 VAC 5-45, Article 7, Cutback Asphalt restrictions⁶⁷; and 9 VAC 5-50, Article 1, Fugitive Dust precautions.⁶⁸”

⁶¹ <https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-passenger-cars-and>

⁶² <https://www.govinfo.gov/content/pkg/FR-2016-10-25/pdf/2016-21203.pdf>

⁶³ <https://www.govinfo.gov/content/pkg/FR-2016-10-25/pdf/2016-21203.pdf>

⁶⁴ <https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/technical-guidance-documents/road-and-bridge-specifications/>

⁶⁵ Spreadsheet entitled: “DEQ SERP Comments rev8b”, March 2017, downloaded from the online data repository for the VDOT Resource Document. The repository may be accessed via the Environmental Division webpage: <https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/environmental/>

⁶⁶ See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter130/>

⁶⁷ See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter45/>

⁶⁸ See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter50/>

5.0 Consultation

5.1 Public Consultation

Public consultation is generally conducted and documented within the overall NEPA process, and not separately by subject area (including air quality). Please refer to the overall NEPA documentation for a summary of public consultation activities for this project.

5.2 Inter-Agency Consultation

5.2.1 Models, Methods, Assumptions and Protocols Specified in the VDOT Resource Document

All models, methods, assumptions and protocols specified or referenced within the VDOT Resource Document⁶⁹ were subjected to inter-agency consultation with FHWA, DEQ and other agencies for purposes of NEPA prior to originally being finalized in 2016. Appendix A of the Resource Document provides a summary of the consultation process and results.

5.2.2 Virginia Department of Environmental Quality

VDEQ provides a tabulation of general comments organized by jurisdiction.⁷⁰ For Virginia Beach, they provided the following comments:

“This project is located within an 8-hour Ozone Attainment area. As such, all reasonable precautions should be taken to limit the emissions of VOC and NOx. In addition, the following VDEQ air pollution regulations must be adhered to during the construction of this project: 9 VAC 5-130, Open Burning restrictions⁷¹; 9 VAC 5-45, Article 7, Cutback Asphalt restrictions⁷²; and 9 VAC 5-50, Article 1, Fugitive Dust precautions.⁷³”

6.0 Conclusions

The proposed improvements were assessed for potential air quality impacts and compliance with applicable air quality regulations and requirements. All models, methods/protocols and assumptions applied in modeling and analyses were made consistent with those provided or specified in the VDOT Resource Document. The assessment indicates that the project would meet all applicable air quality requirements of the National Environmental Policy Act (NEPA) and

⁶⁹ See: http://www.virginiadot.org/projects/environmental_air_section.asp

⁷⁰ Spreadsheet entitled: “DEQ SERP Comments rev8b”, March 2017, downloaded from the online data repository for the VDOT Resource Document. The repository may be accessed via the Environmental Division webpage: <https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/environmental/>

⁷¹ See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter130/>

⁷² See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter45/>

⁷³ See: <https://law.lis.virginia.gov/admincode/title9/agency5/chapter50/>

federal and state transportation conformity regulations. As such, the project will not cause or contribute to a new violation of the NAAQS established by EPA.