AIR QUALITY TECHNICAL REPORT

Interstate 64 Improvements: Exit 205 to Exit 234
00064-800-25632396

Exit 205 - Route 33/New Kent Highway to 1.15 miles west of Exit 234 - Route 199/646/Humelsine Parkway/Newman Road
00064-800-25632396
UPC 109885

Richmond District and Hampton Roads District
New Kent County and James City County

Prepared for:

VDOT
Virginia Department of Transportation

Environmental Division

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Table of Contents

List of Exhibits

Executive Summary

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is studying the environmental consequences of the proposed widening of Interstate 64 (I-64) from Exit 205 - Route 33/New Kent Highway to 1.15 miles west of Exit 234 – Route 199/646/Humelsine Parkway/Newman Road (MM 204.96 to MM 233.26) from four to six lanes.

The proposed improvements were assessed for potential air quality impacts and conformity consistent with all applicable air quality regulations and guidance. All models, methods and assumptions applied in modeling and analyses were made consistent with those provided or specified in the VDOT Resource Document[1]. The assessment indicates that 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 will not cause or contribute to a new violation of the national ambient air quality standards (NAAQS) established by the US Environmental Protection Agency (EPA). Additional detail on the analyses conducted for this project is provided below.

Carbon Monoxide (CO): As the project is located in a region that is in attainment of the CO NAAQS, only NEPA applies. EPA project-level ("hot-spot") transportation conformity requirements do not apply. As only NEPA applies, a project-specific analysis and/or assessment for CO is not needed under the terms of the 2020 Programmatic Agreement between VDOT and the Virginia Division of the FHWA[2] which applies for analyses or assessment of potential CO impacts for projects undergoing studies for purposes of NEPA.[3]

Based on the analysis and information presented in the template Programmatic Agreement and Technical Support Document (TSD)[4] developed in the National Cooperative Highway Research Program 25-25 Task 104 study (2020), the weight of evidence shows that it may be concluded that the NAAQS for CO will be met for all projects given:

- Continued implementation of effective emission control technology, increasingly more stringent motor vehicle emissions and fuel quality standards implemented over the past

[1] In 2016, in order to facilitate and streamline the preparation of project-level air quality analyses, and maintain high quality standards for modeling and documentation, the Department created a new resource for modeling. Titled the "Resource Document", it includes a general reference document as well as an associated online data repository (DR) for all modeling inputs needed for project-level air quality analyses in Virginia. The VDOT Resource Document and DR address in a comprehensive fashion the models, methods and assumptions (including data and data sources as well as protocols) needed for the preparation of air quality analyses for transportation projects by or on behalf of the Department. The latest version of the VDOT Resource Document and DR along with air quality-related programmatic agreements are available on or via the Department website (http://www.virginiadot.org/projects/environmental_air_section.asp).

[2] https://www.virginiadot.org/programs/resources/environmental/STIP/2020_VDOT_PA_for_CO.pdf

[3] The project may also qualify as exempt per the EPA conformity rule at 40 CFR 93.126 under the category "*Projects that correct, improve, or eliminate a hazardous location or feature*", as the project purpose includes safety as follows: "*The purpose of this project is to address traffic operations and **safety deficiencies**, including recurring congestion, congestion resulting from incidents along I-64, and **high crash frequency and severity**…*" (emphasis added)

[4] https://www.virginiadot.org/programs/resources/environmental/STIP/2020_VDOT_PA_for_CO_TSD.pdf

few decades by the USEPA 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-traveled (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 NAAQS established by USEPA for CO is readily demonstrated given 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;
- Extensive experience in programmatic agreements for project-level agreements for CO that establish ever-increasing thresholds for such analyses given the substantially reduced emission rates; and
- The results of worst-case modeling conducted for this PA for typical highway project types, configurations and operating conditions in which compliance with the NAAQS is readily demonstrated, and by a substantial safety margin.

The project therefore is not expected to cause or contribute to a violation of the CO standards.

Mobile Source Air Toxics (MSATs): The FHWA guidance[5] (2016) 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)[6]. These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter.*" The FHWA guidance specifies three possible tiers of MSAT analysis and associated traffic volume and other criteria, based on which this project may be categorized as one "…qualifying as a categorical exclusion under 23 CFR 771.117 with no meaningful potential MSAT effects. A quantitative assessment was therefore not required for the project, following FHWA guidance for projects.

Overall, 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 emissions 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 to reduce annual MSAT emissions by over 80 percent between 2010 and 2050. Although local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle-miles-travelled (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.

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5 FHWA, "*INFORMATION: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*", October 18, 2016. See: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/

6 See: https://www.epa.gov/national-air-toxics-assessment

Climate Change and Greenhouse Gases (GHGs): In 2018, 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.

The 2021 VDOT Statewide GHG Planning Level Analysis[7] evaluated a statewide inventory and forecast of GHG emissions from the surface transportation sector including:

- Direct operating emissions from system users including highway vehicles and passenger and freight rail vehicles:
- "Lifecycle" or upstream emissions associated with the production and transport of transportation fuels;
- Emissions from highway and rail construction and maintenance activities.

The proposed action was included within a larger set of highway, transit and rail projects that were assessed in a statewide build/no-build GHG effects analysis for the year 2040. The GHG effects of the statewide build scenario compared to the no-build were found to be small (0.3 percent increase) and are much smaller than the forecasted 47 percent decrease in GHG emissions between 2015 and 2040 as a result of cleaner and more efficient vehicles.

Construction and Maintenance GHG Emissions: The 2021 statewide GHG analysis estimated the magnitude of emissions from construction and maintenance activities associated with new highway and rail projects using the Infrastructure Carbon Estimator (ICE) tool version 2.0. Total emissions from construction and maintenance activities are estimated to be about 3.8 percent of emissions from surface transportation vehicles in the 2040 no-build scenario. For the 2040 build scenario, average annual construction and maintenance emissions associated with new projects are projected to increase statewide construction and maintenance emissions by 8.5 percent compared to no-build construction and maintenance emissions.

Highway capacity expansion projects can reduce emissions by reducing congestion but may also lead to increased VMT which can increase emissions and can also create additional emissions related to construction and maintenance. The statewide analysis found that on balance, highway capacity expansion projects were collectively found to cause a very small decrease in direct GHG emissions (0.03 percent), which is well within the margin of error in forecasts, although additional construction and maintenance emissions associated with the projects would increase overall emissions by less than 0.4 percent. The effect of this individual project would be expected to be less than the collective effects of all planned statewide projects. Indirect effects related to land use changes (including changes in travel patterns and losses of carbon sinks) are not included due to the limitations of existing models for estimating these effects.

Climate Change Considerations Relating to the Affected Environment: Greenhouse gas emissions have accumulated rapidly as the world has industrialized. If emissions continue, projected changes in global average temperature could range from to 0.4°—2.7°F (0.2°–1.5°C)

[7] Virginia Statewide Greenhouse Gas and Climate Change Impacts Planning Level Analysis, December 2021.

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. Virginia's transportation infrastructure faces risks from a changing climate including 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 state, have already engaged in efforts to plan for resiliency, including conducting a statewide vulnerability assessment of the Commonwealth's transportation network. The I-64 Improvements: Exit 205 to Exit 234 project has not been scored for exposure, sensitivity, and adaptive capacity. However, vulnerability to climate change is believed to be low because the project is not located in a coastal area or river valley.

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.

More specifically, the quantitative assessments conducted for project-specific CO and the general analysis for MSAT impacts as presented in the 2016 FHWA guidance 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.

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.

Mitigation: 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 of criteria pollutants 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*[8].

The Virginia Department of Environmental Quality (VDEQ) provides general comments for projects by jurisdiction. Their comments in part address mitigation. For the Piedmont Regional Office, covering Henrico County and New Kent County; and the Tidewater Regional Office, covering James City County, VDEQ comments relating to mitigation are[9] "*…all reasonable precautions should be taken to limit the emissions of VOC and NOx. In addition, the following VDEQ air*

[8] See: http://www.virginiadot.org/business/const/spec-default.asp

[9] Spreadsheet entitled: "DEQ SERP Comments rev8b", March 2017, downloaded from the online data repository for the VDOT Resource Document. http://www.virginiadot.org/projects/environmental_air_section.asp

pollution regulations must be adhered to during the construction of this project: 9 VAC 5-130, Open Burning restrictions[10]; 9 VAC 5-45, Article 7, Cutback Asphalt restrictions[11]; and 9 VAC 5-50, Article 1, Fugitive Dust precautions[12]".

Project Status in the Regional Transportation Plan and Program: Federal conformity requirements, including specifically 40 CFR 93.114[13] and 40 CFR 93.115[14], apply as the area in which the project is located (at least in part) is subject to regional conformity requirements for the 1997 ozone NAAQS.[15] 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 criteria specified in 40 CFR 93.109(b)).[16]

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[10] See: http://leg1.state.va.us/000/reg/TOC09005.HTM#C0130

[11] See: http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-45-760

[12] See: http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-50-60

[13] See: https://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol20/xml/CFR-2014-title40-vol20-sec93-114.xml

[14] See: https://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol20/xml/CFR-2014-title40-vol20-sec93-115.xml

[15] 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

In November 2018, EPA issued "Transportation Conformity Guidance for the South Coast II Court Decision" (EPA-420-B-18-050). While the guidance eliminated the need for regional emission analyses for orphan areas (p.11), it maintained certain requirements for project-level analyses for these areas, namely: "*Consultation requirements (40 CFR 93.112)"; "There is a currently conforming transportation plan and TIP in place (40 CFR 93.114)"; and "The project is from that transportation plan and TIP (40 CFR 93.115)."* See: https://www.epa.gov/state-and-local-transportation/policy-and-technical-guidance-state-and-local-transportation.

[16] See: https://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol20/xml/CFR-2014-title40-vol20-sec93-109.xml

1.0 Project Background

1.1 Project Description

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is studying the environmental consequences of the proposed widening of Interstate 64 (I-64) from Exit 205 - Route 33/New Kent Highway to 1.15 miles west of Exit 234 – Route 199/646/Humelsine Parkway/Newman Road (MM 204.96 to MM 233.26) from four to six lanes.

Exhibit 1 and Exhibit 2 provide an overview and an aerial, respectively, of the study corridor for the proposed project. This area encompasses approximately 30 miles along I-64. The widening will take place in the median of I-64 within the existing right-of-way and will avoid impacts to existing interchanges. The widening of I-64 from Exit 205 to 1.15 miles west of Exit 234 will tie into the following recently completed widening project along I-64:

- Widening I-64 from four to six lanes from Exit 200 – I-295 to Exit 205 – Route 33 at the western terminus; and
- Widening I-64 from four to six lanes from approximately 1.15 miles west of Exit 234 – Route 199 to 1.05 miles west of Exit 242 – Route 199 at the eastern terminus.

The project scope does not include improvements to the interchanges within the study area, except for improvements to the auxiliary lanes along I-64 at the Exit 205 interchange at the western project terminus. It is assumed that all other auxiliary lanes along I-64 will remain in their current configuration.

1.2 Purpose and Need

The purpose of this project is to improve traffic operations and safety on K-64 from MM 204.96 to MM 233.26. The I-64 corridor in this area has recurring congestion, including congestion resulting from incidents along I-64 and high crash frequency and crash severity.

Exhibit 1: I-64 Improvement Corridor Study Area

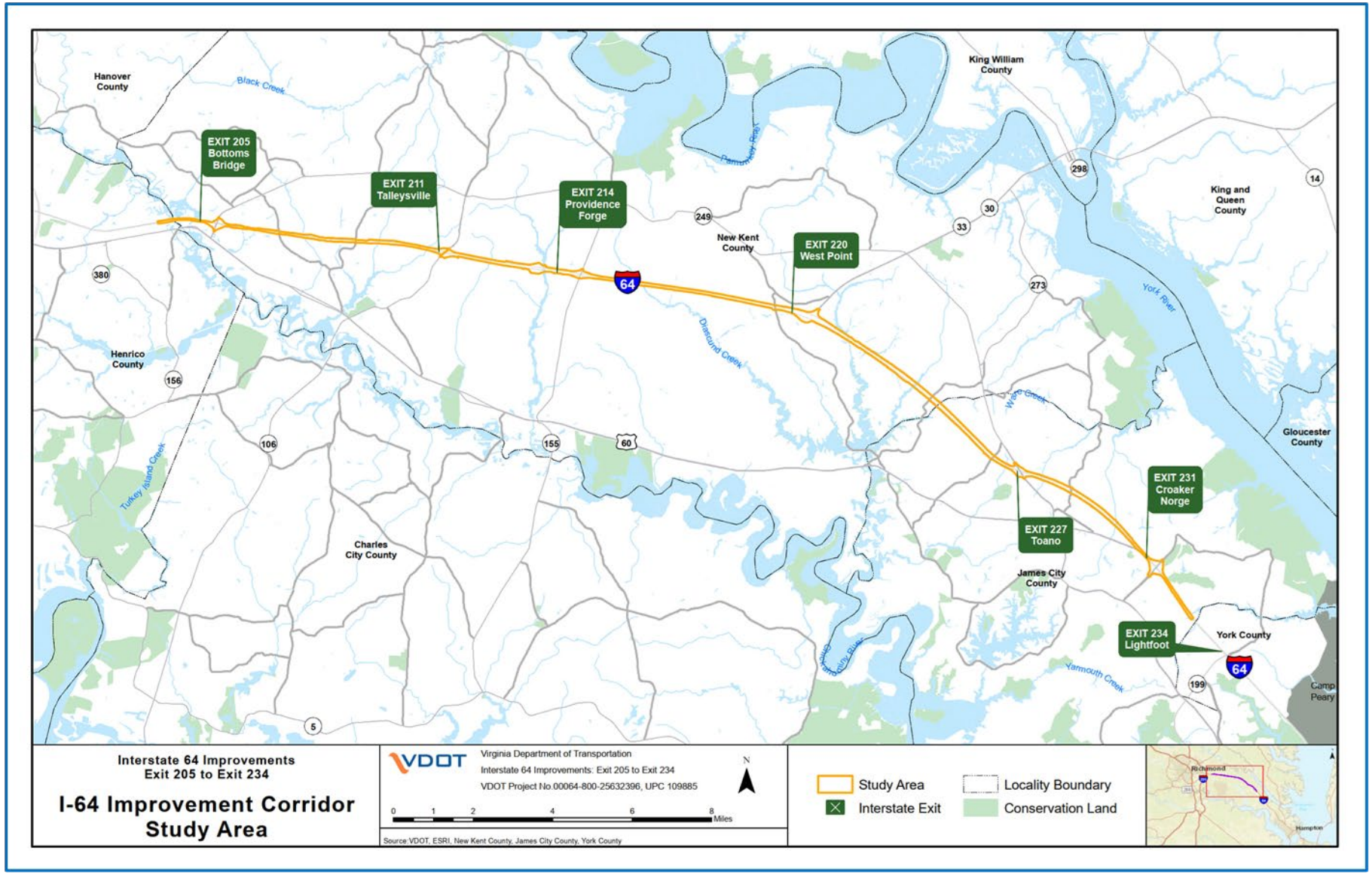
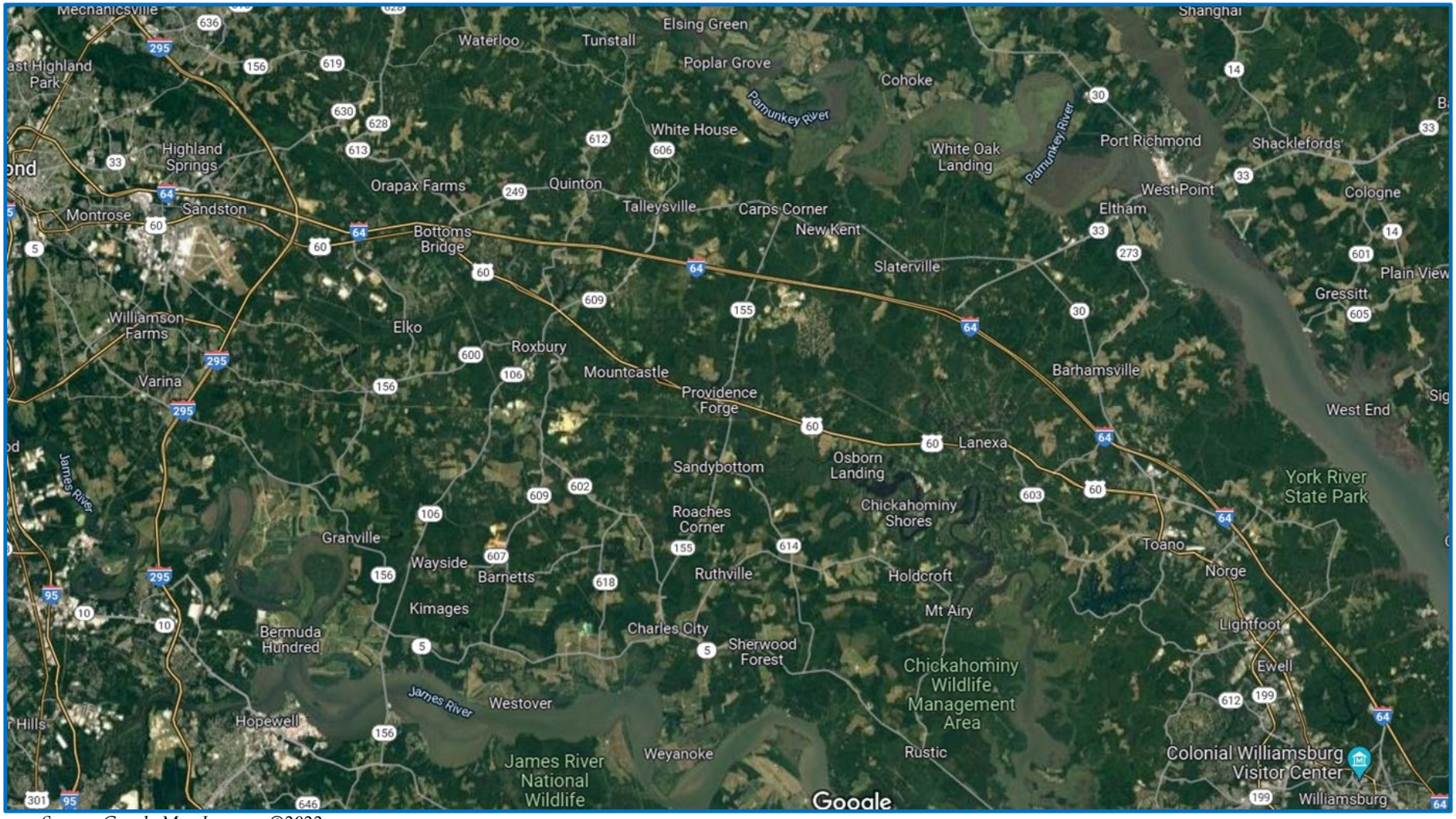


Exhibit 2: Aerial



Source: Google Map Imagery ©2022

1.3 Existing Conditions

The existing I-64 facility within the study area currently consists of two eastbound and two westbound lanes, supplemented in several locations by auxiliary lanes, and acceleration/deceleration lanes at on/off-ramps. Grade-separated interchanges provide access to and from I-64 at: Route 33/New Kent Highway; Route 609 (Emmaus Church Road); and Route 199/646/Humelsine Parkway/Newman Road. I-64 connects Richmond, VA west of the Study Area to Williamsburg, VA east of the Study Area. The posted speed limit is 70 mph.

The western portion of the Study Area, between Exit 205 and Exit 211, is predominately medium density residential with multi-family housing and single-family homes. Two recreation areas are also located within this area, Brookwoods Golf Club near North Hen Peck Road and Pine Fork Park, near Route 609. The center portion of the Study Area, between Exit 211 to Exit 231, is mostly rural, with neighborhoods interspersed along roads connecting SR 60 to the south to Route 249 to the north intersecting the I-64 project corridor. Two recreation areas are also located within this area, Stonehouse Golf Course and an area that permits camping. The eastern portion of the Study Area, between Exit 231 and Exit 234, is more densely populated near the communities of Toano, Norge, and Lightfoot before entering the City of Williamsburg. One recreation area is also located within this area, Williamsburg Recreational Vehicles (RV) and Camping Resort. Recently, projects to widen I-64 between Exit 200 and Exit 205 in the City of Richmond and Exit 234 to Exit 255 in Newport News were completed and added an additional 12-foot travel lane in each direction.

1.4 Alternatives

Based on the project's purpose and need, VDOT developed two alternatives: one build alternative and the No-Build alternative. The Build Alternative includes the proposed widening of I-64 from four to six lanes. 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[17] for VDOT, the Richmond Regional Transportation Planning Organization, 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 adding one general purpose (GP) lane in each direction along the I-64 corridor. The GP lanes will tie into the recently completed widening of I-64 from four to six GP lanes from Exit 200 – I-295 to Exit 205 – Route 33 at the western terminus and the widening of I-64 from four to six lanes from approximately 1.15 miles west of Exit 234 – Route 199 to 1.05 miles west of Exit 242 – Route 199 at the eastern terminus. The new GP lanes will be completed largely within the existing I-64 median. The project scope does not include improvements to the interchanges within the study area, with the exception of improvements to the auxiliary lanes along I-64 at the Exit 205 interchange at the western project terminus. It is assumed that all other auxiliary lanes along I-64 will remain in their current configuration. **Exhibits 3 and 4** show the existing and proposed typical sections.

[17] Virginia Statewide Transportation Improvement Program (STIP). Accessed June 24, 2022. *https://www.virginiadot.org/about/stip.asp*

Exhibit 3: Existing Typical Section

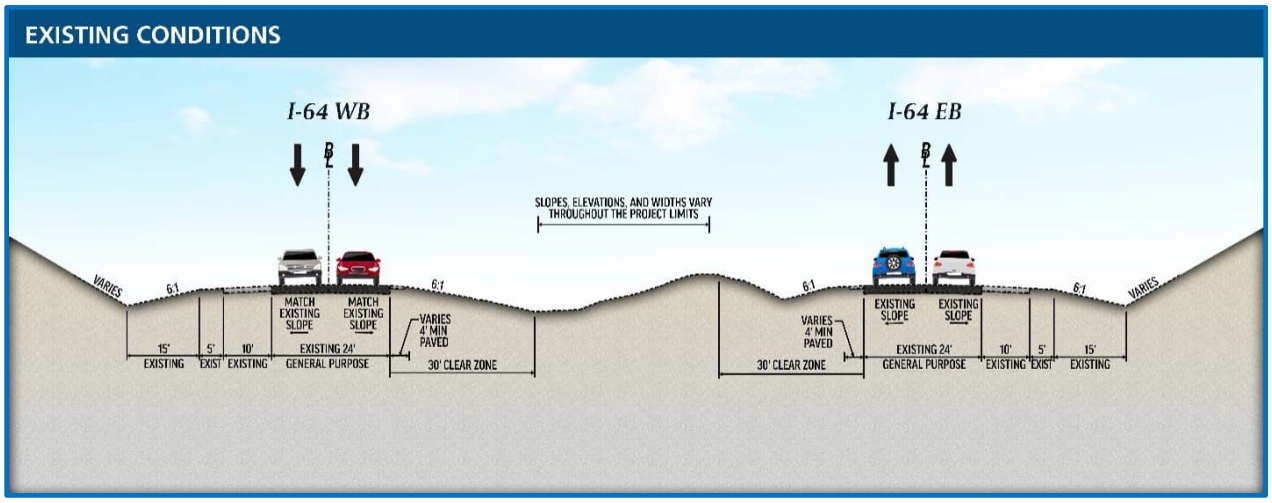
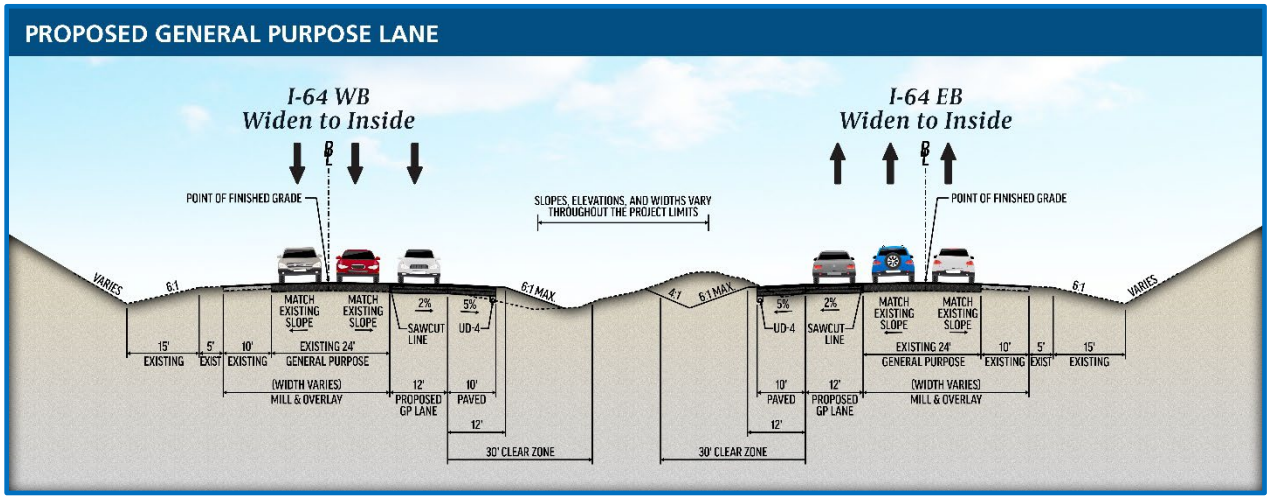


Exhibit 4: Proposed Typical Section



1.5 Summary of Traffic Data and Forecasts

Environmental traffic data for the Study Area was prepared by Whitman, Requardt, and Associates, consisting of hourly volumes and design-operational speeds by roadway segment for the Existing Conditions, No-Build Alternative, and Build Alternative. In situations where design-operational speeds were not available, posted speed limits were used. The traffic data was prepared for all interstate mainline segments and interchange ramps, within the Study Area. The detailed traffic data and forecasts are provided in the Preliminary Noise Analysis Report, July 2022, produced for the CE. **Exhibit 5** presents a summary of the mainline segments' base (2019) and design year (2048) average daily traffic (ADT) forecasts for the project. As shown in the exhibit, the peak ADT forecast for the design year is 53,400 from Exit 231 to Exit 234 on westbound I-64, which includes the densely populated communities of Toano, Norge, and Lightfoot near the City of Williamsburg. The corresponding no-build forecast is 50,400, which is about 5.6% lower. Trucks comprise 11.0% of total traffic for this segment.

Exhibit 5. Forecasted Average Daily Traffic Volumes

Interstate 64		2019 ADT	2048 ADT		2048 Speed (mph)	Daily Total Truck %
From	To	Base	No Build	Build		
Eastbound I-64						
Exit 205	Exit 211	30,660	46,800	48,300	67	12.8
Exit 211	Exit 214	31,160	47,200	49,000	67	12.8
Exit 214	Exit 220	30,300	46,200	47,700	67	12.8
Exit 220	Exit 227	27,900	42,800	44,500	67	11.3
Exit 227	Exit 231	30,400	48,700	51,100	67	11.3
Exit 231	Exit 234	34,030	51,900	54,100	63	11.3
Westbound I-64						
Exit 205	Exit 211	30,250	46,000	47,300	67	12.4
Exit 211	Exit 214	30,650	46,400	48,200	67	12.4
Exit 214	Exit 220	29,490	45,200	46,600	67	12.4
Exit 220	Exit 227	25,460	40,200	41,600	67	11.0
Exit 227	Exit 231	27,760	44,700	47,600	67	11.0
Exit 231	Exit 234	32,130	50,400	53,400	63	11.0

2.0 Regulatory Requirements and Guidance

2.1 National Environmental Policy Act of 1969 (NEPA)

Federal requirements for air quality analyses for transportation projects derive from the NEPA and, where applicable, the federal transportation conformity rule (40 CFR Parts 51 and 93). NEPA guidance for air quality analyses for transportation projects may be found on or via the FHWA website for planning and the environment[18].

2.1.1 FHWA Guidance for Implementing NEPA for Air Quality

For purposes of NEPA, general guidance for project-level air quality analyses is provided in the FHWA 1987 Technical Advisory 6640.8A, "*Guidance for Preparing and Processing Environmental and Section 4(f) Documents*"[19]. That guidance focuses on carbon monoxide. FHWA provides separate guidance for mobile source air toxics (MSATs)[20,21], including responses to "Frequently Asked Questions" (FAQs)[22].

2.1.2 Programmatic Agreements

Programmatic agreements are legal documents between the United States Department of Transportation and a state Department of Transportation that are designed to help streamline the environmental clearance process for transportation projects or studies. Programmatic agreements

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18 See: http://www.fhwa.dot.gov/environment/index.cfm

19 See: https://www.environment.fhwa.dot.gov/projdev/impTA6640.asp

20 FHWA, "*INFORMATION: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*", October 18, 2016. See: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/

21 See: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/

22 See: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/moves_msat_faq.cfm

can help focus limited resources on assessing larger projects or ones with greater potential for air quality impacts.

In October 2020, VDOT updated its Programmatic Agreement,[23] (2020 PA) with FHWA for Project-Level Air Quality Analyses for Carbon Monoxide. The primary effect of the updated PA is to eliminate CO analyses and assessments for all projects or studies in Virginia moving forward based on consideration of weight-of-evidence as summarized in the main agreement, with supporting information provided in the associated TSD. Qualitative text documenting the clearance should be prepared for NEPA documentation consistent with the PA. The screening procedures are based on the templates developed in the 2015 National Cooperative Highway Research Project (NCHRP) 25-25 Task 104 Study[24].

2.2 Transportation Conformity

The EPA issued the federal transportation conformity rule (40 CFR Parts 51 and 93) pursuant to requirements in the CAA as amended[25,26] Copies of the EPA conformity regulation and associated guidance are available on the EPA website[27]. For project-level analyses, the rule **only** applies in USEPA-designated non-attainment or maintenance areas (40 CFR 93.102(b)). The project is in an attainment area for all criteria pollutants. Therefore, *project-level* transportation conformity rule requirements for CO and PM do not apply for this region.

Notwithstanding that the region is in attainment of all of the NAAQS, *regional* conformity requirements, including specifically 40 CFR 93.114[28] and 40 CFR 93.115[21], apply for the study as the area in which it is located is one affected by a court decision[29] that reinstated regional conformity requirements nationwide associated with the 1997 ozone NAAQS that had previously been eliminated with the revocation by EPA of that NAAQS in 2015.

3.0 Ambient Air Quality

3.1 National Ambient Air Quality Standards (NAAQS)

Exhibit 6 presents the national ambient air quality standards (NAAQS) established by the EPA for criteria air pollutants, namely: carbon monoxide (CO), sulfur dioxide (SO_2), ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), and lead (Pb). There are two types of NAAQS—primary and secondary: "*Primary standards provide public health protection, including protecting the*

[23] https://www.virginiadot.org/programs/resources/environmental/STIP/2020_VDOT_PA_for_CO.pdf

[24] E. Carr, S. Hartley, G. Noel & A. Eilbert, NCHRP 25-25 Task 104, "*Streaming Carbon Monoxide Project-Level Air Quality Analysis with Programmatic Agreements*", March 2020.

[26] While corresponding state regulations for transportation conformity may apply, they generally focus on consultation requirements (rather than technical) and are therefore not addressed here. See: http://law.lis.virginia.gov/admincode/title9/agency5/chapter151/

[27] See: http://www.epa.gov/otaq/stateresources/transconf/index.htm

[28] See: https://www.gpo.gov/fdsys/pkg/CFR-2018-title40-vol22/xml/CFR-2018-title40-vol22-part93.xml#seqnum93.114

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

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."[30]

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.

[30] From the preamble to the EPA NAAQS table: https://www.epa.gov/criteria-air-pollutants/naaqs-table

Exhibit 6: 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 (NO_2)		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 (O_3)		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	12.0 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 (SO_2)		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 NO_2 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) O_3 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) O_3 standards.

(4) The previous SO_2 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 SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 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 6/20/2022.

3.2 Air Quality Attainment Status of Project Area

The EPA Green Book[31] lists non-attainment, maintenance, and attainment areas across the nation. It lists the areas within New Kent County and James City County, in which the Study Area is located as being in attainment for all of the NAAQS.

As noted in Section 6 on consultation, the VDEQ provides general comments by jurisdiction on proposed projects. With regard to attainment status for the area in which project is located, their comment[32] is:

"This project is located within a Marginal 8-hour Ozone Nonattainment area, volatile organic compounds (VOC) and nitrogen oxides (NOx) Emissions Control 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 restrictions; 9 VAC 5-45, Article 7, Cutback Asphalt restrictions; and 9 VAC 5-50, Article 1, Fugitive Dust precautions."

3.3 Air Quality Data and Trends

3.3.1 Carbon Monoxide (CO)

As shown in **Exhibit 7**, and due primarily to the implementation of more stringent vehicle emission and fuel quality standards, the national trend in ambient concentrations of CO is and has been downward for decades. The national trend is reflected in the relatively very low ambient CO concentrations observed in Virginia, as summarized in **Exhibits 8** and **9.** Currently, all values in Virginia are well under the one- and eight-hour NAAQS for CO.

3.3.2 Other Criteria Pollutants

VDEQ issues an annual report summarizing air quality monitoring data for the previous year and updating long-term trend data for certain of the criteria pollutants tabulated in **Exhibit 7**[33]. **Exhibits 9** through **12** are excerpts from that report showing ambient air quality trends by pollutant over the previous decade. The trend lines are generally flat or downward, reflecting the benefit of emission reduction measures or programs implemented for both mobile sources (e.g., more stringent emission and fuel quality standards) and stationary sources (industry etc.). For these figures, pollutants are measured in parts per million (ppm) or parts per billion (ppb).

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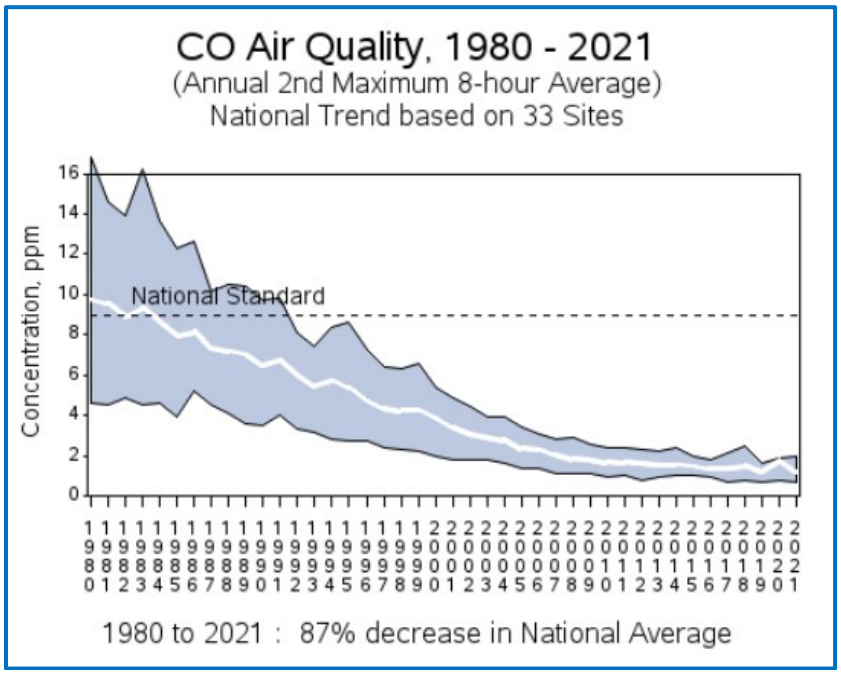
[31] EPA Green Book: https://www3.epa.gov/airquality/greenbook/faq.html

[32] Spreadsheet entitled: "DEQ SERP Comments rev8b", March 2017

[33] The current edition (2016) of the VDEQ Annual Report does not provide a comparable chart showing recent trend lines for Pb, $PM_{2.5}$ or PM_{10}.

Exhibit 7: Nationwide Long-Term Trend in Ambient CO Concentrations



Source: https://www.epa.gov/air-trends/carbon-monoxide-trends, accessed June 20, 2022.

Exhibit 8: Ambient Concentrations of Carbon Monoxide in Virginia

Site	2020			
	1-Hour Avg. (ppm)		8-Hour Avg. (ppm)	
	1st Max.	2nd Max.	1st Max.	2nd Max.
(19-A6) **Roanoke Co.**	0.9	0.8	0.5	0.5
(72-M) **Henrico Co.**	1.1	1.1	0.9	0.8
(158-X) **Richmond**	1.4	1.4	1.4	1.2
(179-K) **Hampton**	0.9	0.9	0.8	0.7
(181-A1) **Norfolk**	1.6	1.5	1.4	1.0
(46-C2) **Fairfax Co.**	1.4	1.2	1.0	0.9
(47-T) **Arlington Co.**	1.4	1.3	1.1	1.0

Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2020 Annual Report", October 2021. See: https://www.deq.virginia.gov/air/air-quality-monitoring-assessments/air-quality-reports, accessed June 20, 2022.

Exhibit 9a: Trend in Ambient CO Concentrations – Piedmont Region

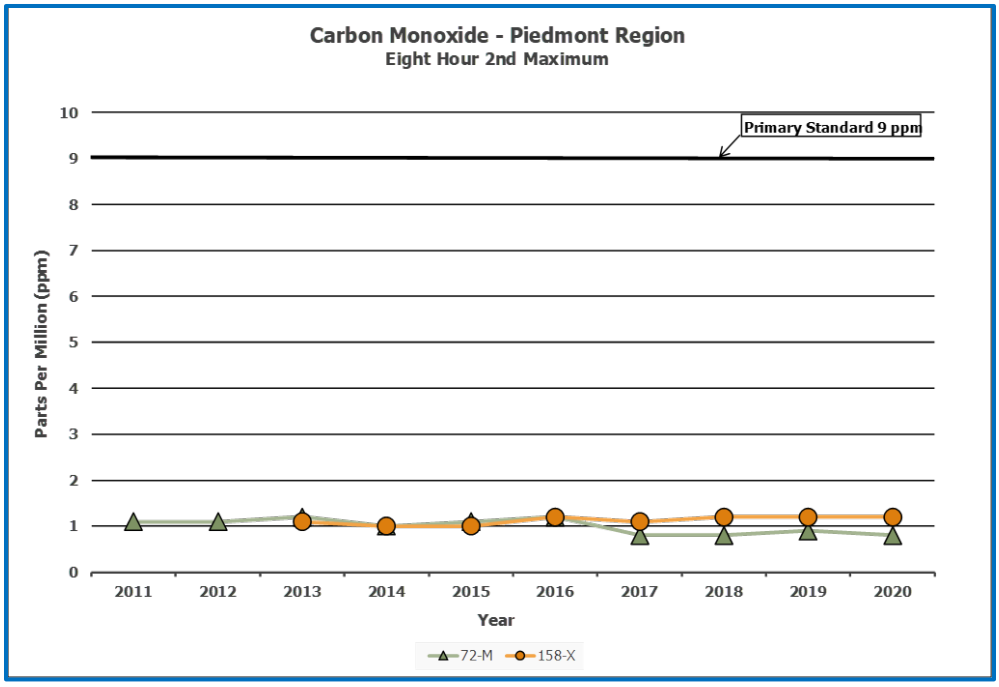
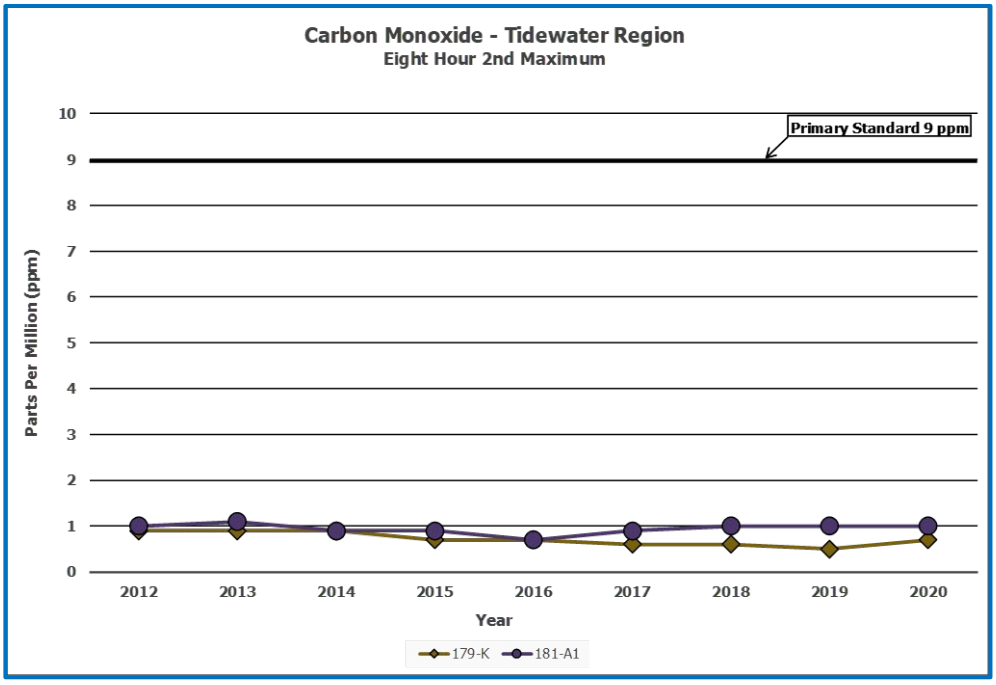


Exhibit 9b: Trend in Ambient CO Concentrations – Tidewater Region



Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2020 Annual Report", October 2021. See: https://www.deq.virginia.gov/air/air-quality-monitoring-assessments/air-quality-reports, accessed June 20, 2022.

Exhibit 10a: Trend for 1-hour Sulfur Dioxide (PPM) – Piedmont Region

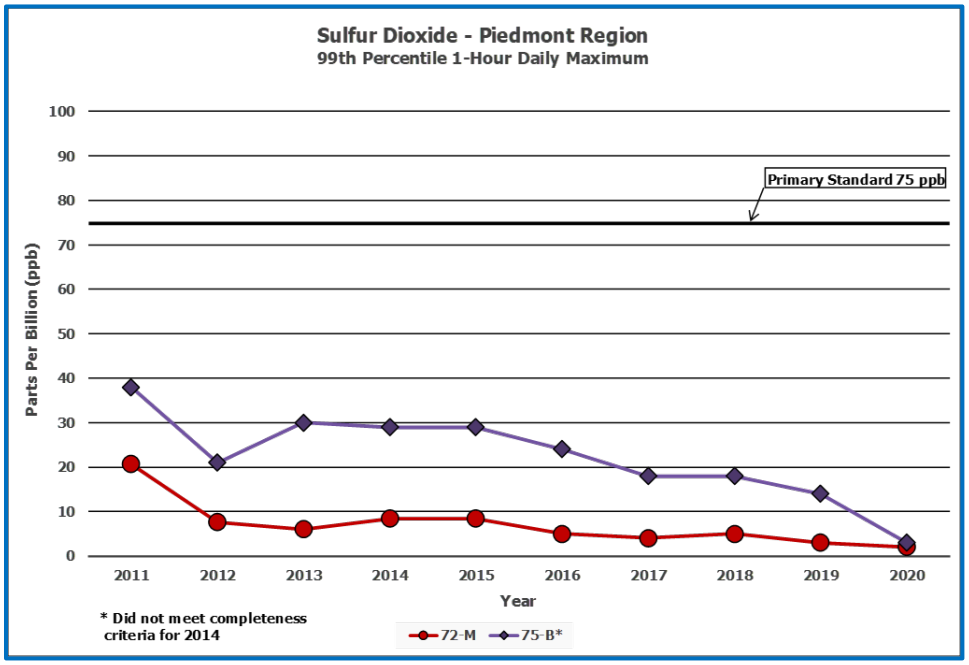
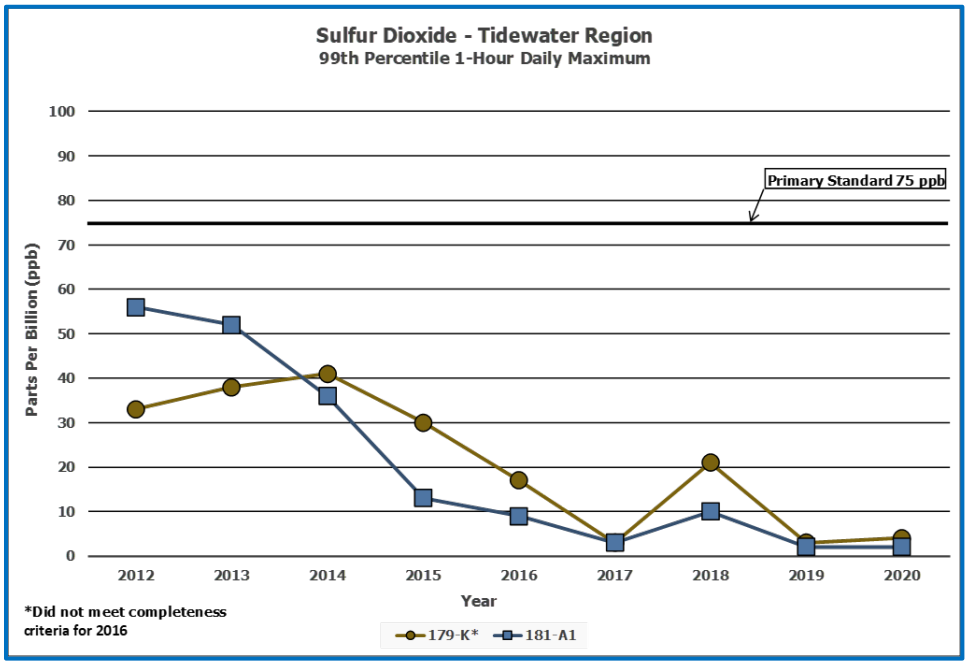


Exhibit 10b: Trend for 1-hour Sulfur Dioxide (PPM) – Tidewater Region



Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2020 Annual Report", October 2021. See: https://www.deq.virginia.gov/air/air-quality-monitoring-assessments/air-quality-reports, accessed June 20, 2022.

Exhibit 11a: Trend for Annual Nitrogen Dioxide (PPM) – Piedmont Region

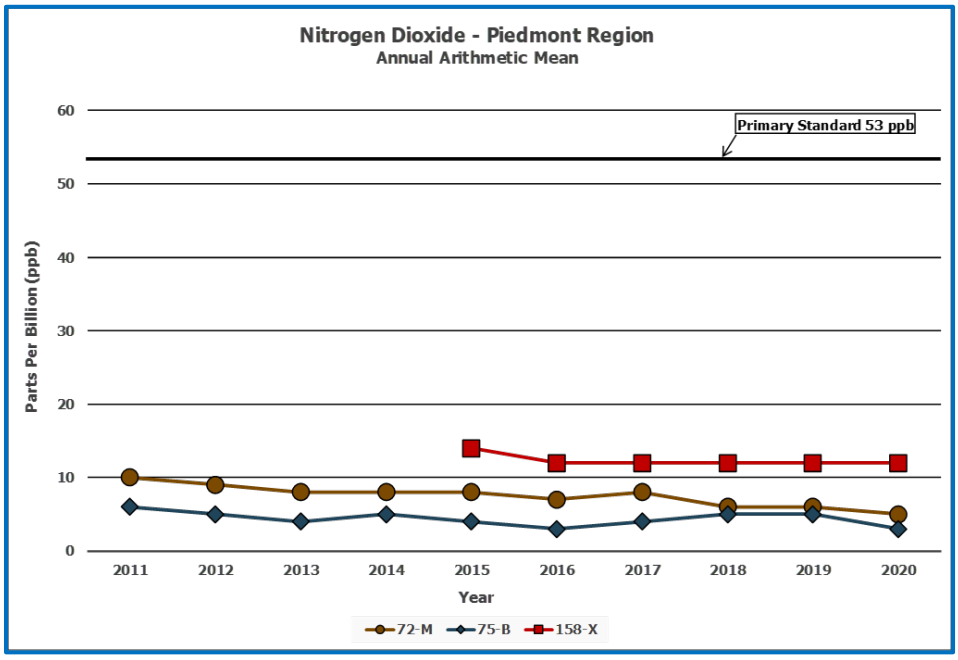
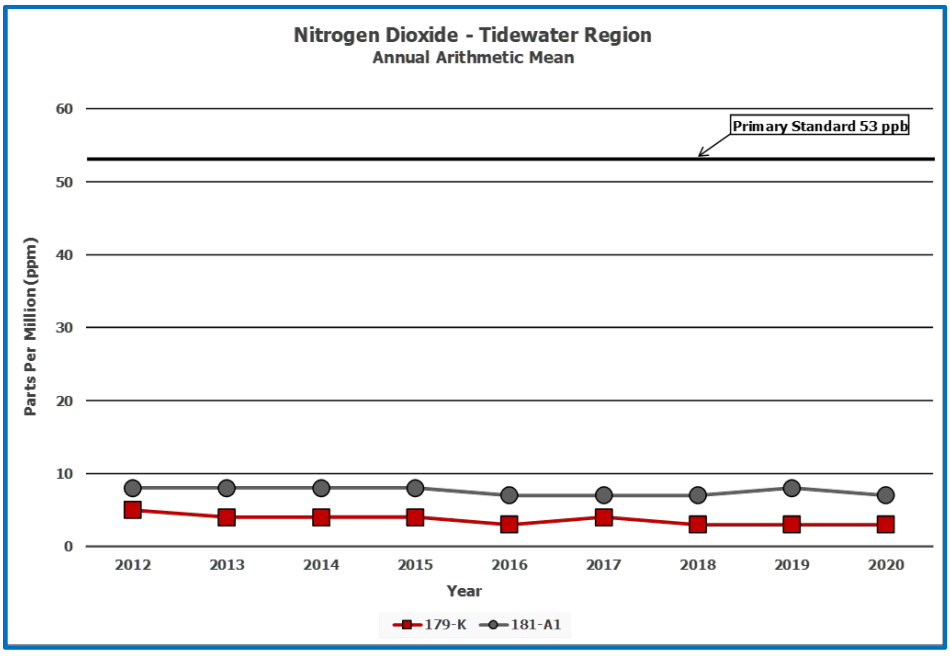


Exhibit 11b: Trend for Annual Nitrogen Dioxide (PPM) – Tidewater Region



Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2020 Annual Report", October 2021. See: https://www.deq.virginia.gov/air/air-quality-monitoring-assessments/air-quality-reports, accessed June 20, 2022.

Exhibit 12a: Trend for 8-hour Ozone (PPM) – Piedmont Region

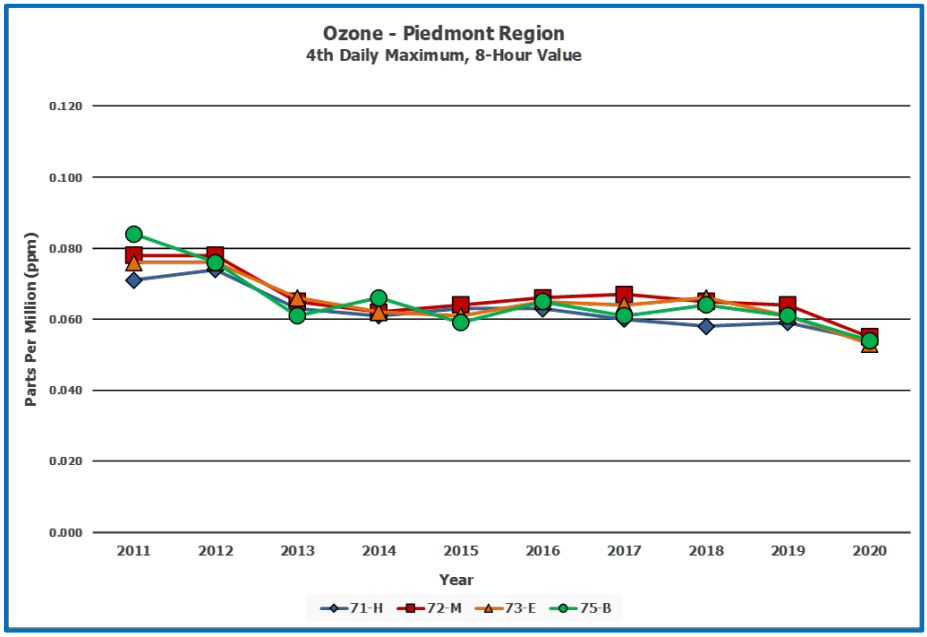
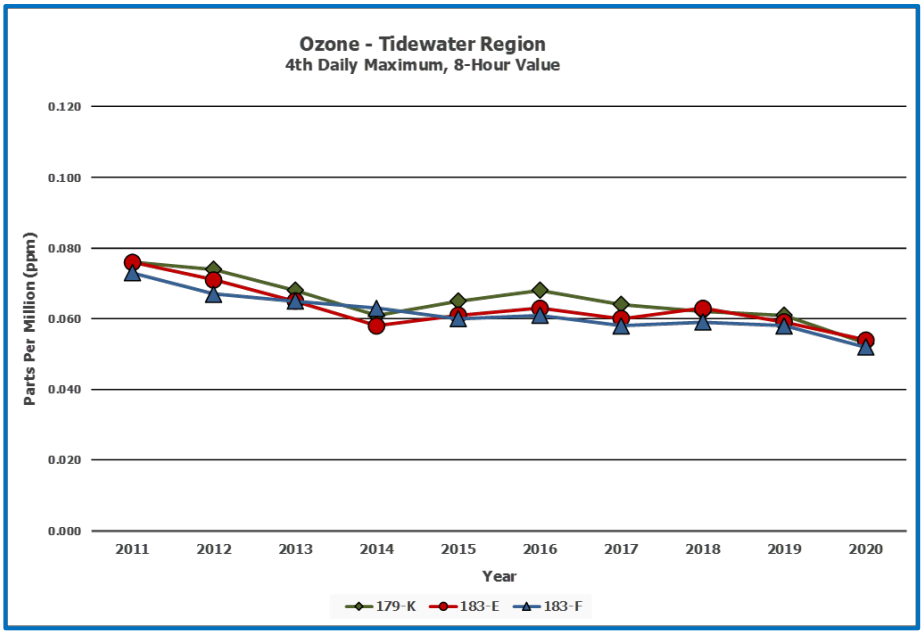


Exhibit 12b: Trend for 8-hour Ozone (PPM) – Tidewater Region



Source: Virginia Department of Environmental Quality, "Virginia Ambient Air Monitoring 2020 Annual Report", October 2021. See: https://www.deq.virginia.gov/air/air-quality-monitoring-assessments/air-quality-reports, accessed June 20, 2022.

4.0 Project Assessment

4.1 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 updated in 2018 to address changes in applicable regulation 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.

4.2 Carbon Monoxide Assessment

The 2020 PA between VDOT and the Virginia Division of the FHWA applies for analyses or assessment of potential CO impacts for projects undergoing studies for purposes of NEPA. Background information and analyses are provided in an associated TSD to the PA.

As the study area is located in a region that is in attainment of the CO NAAQS, USEPA project-level ("hot spot") transportation conformity requirements for CO do not apply. As only NEPA applies, a study-specific analysis and/or assessment for CO is not needed under the terms of the latest PA. This PA is based on the analysis and information presented in the template Programmatic Agreement and TSD developed in the National Cooperative Highway Research Program (NCHRP) 25-25 Task 104 study.[35] The weight of evidence shows that it may reasonably be concluded that the NAAQS for CO will be met for all projects given:

- Continued implementation of effective emission control technology, increasingly more stringent motor vehicle emissions and fuel quality standards implemented over the past few decades by the USEPA 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-traveled (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 NAAQS established by USEPA for CO is readily demonstrated given 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;

[34] See: http://www.virginiadot.org/projects/environmental_air_section.asp

[35] E. Carr, S. Hartley, G. Noel & A. Eilbert, NCHRP 25-25 Task 104, "Streamlining Carbon Monoxide Project-Level Air Quality Analyses with Programmatic Agreements", March 2020 http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4100

- Extensive experience in PAs for project-level agreements for CO that establish ever-increasing thresholds for such analyses given the substantially reduced emission rates; and
- The results of worst-case modeling conducted for this PA for typical highway project types, configurations, and operating conditions in which compliance with the NAAQS is readily demonstrated, and by a substantial safety margin.

4.3 Mobile Source Air Toxic (MSAT) Assessment

FHWA most recently updated its guidance for the assessment of MSATs in the NEPA process for highway projects in 2016[36]. The updated guidance 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)[37]. 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).

4.3.1 Level of Analysis Determination

As this project involves a CE, and therefore under FHWA guidance may be categorized as a Tier 1 project for which no meaningful MSAT effects would be expected, neither a qualitative nor a quantitative analysis is needed. In addition, this project has been determined to generate minimal air quality impacts for CAA criteria pollutants and has not been linked with any special MSAT concerns. As such, this project will not result in changes in traffic volumes, vehicle mix, basic project location, or any other factor that would cause a meaningful increase in MSAT impacts of the project from that of the no-build alternative.

Moreover, EPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. As noted in the referenced FHWA MSAT guidance, based on regulations now in effect, an analysis of national trends with EPA's MOVES2014 model forecasts a combined reduction of over 90 percent in the total annual emissions rate for the priority MSAT from 2010 to 2050 while vehicle-miles of travel are projected to increase by over 45 percent. This will both reduce the background level of MSAT as well as the possibility of even minor MSAT emissions from this project.

4.4 Greenhouse Gases (GHG)

In September 2019, the Virginia Governor announced an Executive Order that calls for the state to produce 30 percent of its electricity from renewable energy by 2030 and 100 percent from carbon-free sources by 2050. Title 45.2 of the state code sets a goal for the Commonwealth to reach net-zero emissions by 2045 in all sectors, including transportation, and a policy to develop energy resources necessary to produce 30 percent of Virginia's electricity from renewable energy sources by 2030 and 100 percent of Virginia's electricity from carbon-free sources by 2040. Virginia has

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[36] FHWA, "*INFORMATION: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*", October 18, 2016. See: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/

[37] See: https://www.epa.gov/national-air-toxics-assessment

also adopted regulations for a "low-emissions and zero-emissions vehicle program," consistent with the California Advanced Clean Cars (ACC) program, which would aggressively increase the light-duty vehicle zero-emission vehicles (ZEV) market share beginning in 2025. Actions consistent with these goals are expected to reduce surface transportation emissions nearly 50 percent by 2040, and much more in following years.

The proposed action was included within a larger set of highway, transit and rail projects that were assessed in a statewide build/no-build GHG effects analysis for the year 2040. This statewide analysis is described below. The GHG effects of the statewide build scenario compared to the no-build were found to be small (0.3 percent increase) and are much smaller than the forecast 47 percent decrease in surface transportation GHG emissions between 2015 and 2040 as a result of cleaner and more efficient vehicles. Details on the methods and findings of the statewide assessment are provided in Appendix A. A quantitative analysis of GHG impacts was not performed on the proposed project because the impacts of the proposed project are expected to be small, and the level of effort in quantifying these impacts would be disproportionate to the value of the information provided.

Highway capacity expansion projects can reduce emissions by reducing congestion but may also lead to increased VMT which can increase emissions and can also create additional emissions related to construction and maintenance. The statewide analysis found that on balance, highway capacity expansion projects were collectively found to cause a very small decrease in direct GHG emissions (0.03 percent), which is well within the margin of error in forecasts, although additional construction and maintenance emissions associated with the projects would increase overall emissions by less than 0.4 percent. After considering the net effects of population growth, vehicle efficiency improvements, and new highway and transit projects, emissions from all highway vehicles (except transit buses) are projected to decrease by 47 percent under the 2040 build scenario compared to 2015 levels. The emissions for this individual project would be expected to be less than the collective total of all planned statewide projects. Indirect effects related to land use changes (including changes in travel patterns and losses of carbon sinks) are not included due to the limitations of existing models for estimating these effects.

4.4.1 Statewide Analysis of Direct Operating GHG Emissions from Vehicles

In 2021, Virginia DOT conducted an evaluation of the statewide GHG emissions from highway, transit, and rail vehicles under 2040 build and no-build conditions. The statewide analysis considers the anticipated effects of electric vehicles as well as state and regional surface transportation investments. The no-build scenario represents the transportation network in its 2015 condition with 2040 levels of travel demand. The build scenario represents all highway projects planned and/or programmed by VDOT and the state's Metropolitan Planning Organizations (MPOs) that are significant enough to be included in the VDOT statewide travel demand model (i.e., they increase capacity) as well as significant planned passenger and freight rail investments and other transit service improvements. The build/no-build comparison therefore represents an upper bound on the GHG impacts that might be seen from any project or projects that are a subset of the 2040 planned network. Compared to the 2040 no-build scenario, the 2040 build scenario includes 1,227 new lane-miles of roadway capacity, increases in bus service, 5 urban transit expansion projects (bus rapid transit and heavy rail), and 12 commuter and intercity passenger and freight rail projects.

The evaluation found that in both the 2040 build and no-build scenarios, total direct emissions are projected to decrease by nearly half compared to a 2015 baseline. The decrease is due mainly

to improvements in vehicle efficiency and electrification, which lead to lower per-mile emissions, outweighing projected increases in VMT of 20 percent. Emissions from on-road motor vehicles (except transit buses) are projected to decrease by 61,000 metric tons (0.3 percent) between the build and no-build scenario due to reduced congestion and mode-shifting to transit and freight rail. Emissions from transit and rail collectively increase by 44,000 metric tons due to the increased service by these modes. On balance, the net change across all projects is a decrease of about 16,000 metric tons or less than 0.1 percent of surface transportation emissions. The effects of any individual project or projects would be expected to be smaller than this.

4.4.2 Statewide Analysis of Construction and Maintenance GHG Emissions

The 2021 statewide GHG analysis also considered the magnitude of emissions from construction and maintenance activities associated with new highway and rail projects. These were estimated using the Infrastructure Carbon Estimator (ICE) tool version 2.0. Total emissions from construction and maintenance activities are estimated to be about 3.8 percent of emissions from surface transportation vehicles in the 2040 no-build scenario. For the 2040 build scenario, average annual construction and maintenance emissions associated with new projects are projected to increase statewide construction and maintenance emissions by 88,000 metric tons or 8.5 percent compared to no-build construction and maintenance emissions.

Considering the net effects of highway traffic, transit and rail projects, and new construction and maintenance activities, the 2040 build scenario increases emissions by about 55,000 metric tons or 0.3 percent of the total surface transportation inventory compared to the 2040 no-build, a small effect compared to the net decrease in emissions projected between 2015 and 2040. The effects of any individual project or projects would be expected to be much smaller than this.

4.4.3 Statewide Analysis of Indirect GHG Emissions

In addition to direct emissions from combustion of fuels, vehicles generate indirect emissions from the "upstream" or "fuel cycle" emissions from extraction, refining, and transportation of the fuels, including generation of electricity. Many of these emissions are generated outside the Commonwealth of Virginia and/or are accounted for in sectors other than transportation.

The statewide analysis estimated the magnitude of these indirect, fuel-cycle emissions using fuel-specific multipliers. Considering fuel cycle emissions increases direct emissions by approximately 20 percent overall in both the 2040 build and no-build scenarios. Therefore, while the magnitude of emissions increases, the relative difference between the build and no-build scenarios is not materially affected by considering fuel-cycle emissions. As Virginia continues to electrify its vehicle fleet, emission from cars, trucks, and transit vehicles will decrease in the future even for the same level of activity.

Other indirect effects, including potential induced growth effects, were not quantified in the statewide analysis. Induced growth effects may include additional vehicle travel, loss of carbon sinks, and/or other effects related to land conversion and changes in travel patterns responding to infrastructure investment. Land use effects related to capacity expansion are generally speculative, localized, and difficult to model accurately and are therefore not captured in most of the travel demand modeling systems in use today, including VDOT's statewide model.

4.4.4 Statewide GHG 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 impacts of those strategies are not reflected in this statewide programmatic assessment.

4.5 Climate Change Considerations Relating to the Affected Environment

4.5.1 Potential Climate Change Impacts

Greenhouse gas emissions have accumulated rapidly as the world has industrialized, with concentration of atmospheric CO_2 increasing from roughly 300 parts per million in 1900 to over 400 parts per million today. 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.

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.[38] 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.[39] Storm surge presents major risks to Virginia's coastal areas, with over 300 bridges and structures that would face over 2 feet of storm surge inundation from a Category 2 hurricane.[40] By 2080, 10 percent of the roadway networks in Virginia Beach and Norfolk could be flooded by "king tides" (exceptionally high tide events) with 4 feet of sea level rise.[41]
- 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.[42] In the future, the southeastern U.S. is expected to see a continued increase in extreme rainfall events.

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38 City of Virginia Beach (2020). Sea Level Wise: Adaptation Strategy. https://www.vbgov.com/Government/departments/public-works/comp-sea-level-rise/Documents/20200330%20FullDocument%20(2).pdf.

39 Georgetown Climate Center (undated). "Understanding Virginia's Vulnerability to Climate Change." Accessed at https://www.georgetownclimate.org/files/report/understanding-virginias-vulnerability-to-climate-change.pdf.

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

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

42 Georgetown Climate Center (undated). "Understanding Virginia's Vulnerability to Climate Change." Accessed at https://www.georgetownclimate.org/files/report/understanding-virginias-vulnerability-to-climate-change.pdf.

- Extreme Heat—Heat waves are a leading cause of weather-related deaths.[43] 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.[44]

4.5.2 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 Long-Range Plan, the Office of Intermodal Planning and Investment undertook a vulnerability assessment. Initial work for this assessment conducted in 2019 established a definition of climate change vulnerability and resilience for the agency; created a draft vulnerability assessment methodology to score the state's transportation assets based on exposure, sensitivity to climate change, and adaptive capacity; and performed a review of Virginia's transportation vulnerability assessments. The Office is working to refine the indicators and weighting approach as needed, finalize remaining data collection, and produce a vulnerability rating for each segment of the National Highway System and for each bridge under the state's jurisdiction.

The VDOT Structure and Bridge Division has worked with the Virginia Transportation Research Council to implement new materials in the design of bridges in order to make them last longer. The Department now uses low permeable concrete, low shrinkage concrete, corrosion resistant reinforcing steel, stainless steel and carbon fiber prestressing strands in piles; mandates a jointless philosophy in bridge design; and requires consideration of future sea level rise and, when applicable, storm surge in design. These actions all serve to create a more resilient bridge.

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.[45] 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

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[43] Georgetown Climate Center (undated). "Understanding Virginia's Vulnerability to Climate Change." Accessed at https://www.georgetownclimate.org/files/report/understanding-virginias-vulnerability-to-climate-change.pdf.

[44] 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.

[45] 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/.

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.

4.6 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.[46]

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 project-specific CO and the general analyses for MSAT impacts as presented in the 2016 FHWA guidance 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. Therefore, the indirect and cumulative effects of the project are not expected to be significant.

5.0 Mitigation

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*[47].

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[46] See: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_466.pdf

[47] See http://www.virginiadot.org/business/const/spec-default.asp

In addition, as noted previously, the VDEQ provides general comments for projects by county. Their comments in part address mitigation[48]: "*…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 restrictions[49]; 9 VAC 5-45, Article 7, Cutback Asphalt restrictions[50]; and 9 VAC 5-50, Article 1, Fugitive Dust precautions[51].*"

6.0 Consultation

6.1 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.

6.2 Inter-Agency Consultation

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

All models, methods, assumptions and protocols specified or referenced within the VDOT Resource Document[52] were subjected to inter-agency consultation with FHWA, VDEQ and other agencies for purposes of NEPA prior to being finalized in 2016. Appendix A of the Resource Document provides a summary of the consultation process and results.

6.2.2 Virginia Department of Environmental Quality

VDEQ provides a tabulation of general comments organized by jurisdiction[53]. For New Kent County and James City County, they provided the following comments: "*This project is located within a Marginal 8-hour Ozone Nonattainment area, and a volatile organic compound (VOC) and nitrogen oxides (NOx) Emissions Control 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 restrictions[54]; 9 VAC 5-45, Article 7, Cutback Asphalt restrictions[55]; and 9 VAC 5-50, Article 1, Fugitive Dust precautions[56].*"

7.0 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

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48 Spreadsheet entitled: "DEQ SERP Comments rev8b", March 2017
49 See: http://leg1.state.va.us/000/reg/TOC09005.HTM#C0130
50 See: http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-45-760
51 See: http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-50-60
52 See: http://www.virginiadot.org/projects/environmental_air_section.asp
53 Spreadsheet entitled: "DEQ SERP Comments rev8b", March 2017, downloaded from the online data repository for the VDOT Resource Document. See: http://www.virginiadot.org/projects/environmental_air_section.asp.
54 See: http://leg1.state.va.us/000/reg/TOC09005.HTM#C0130
55 See: http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-45-760
56 See: http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-50-60

meet all applicable air quality requirements of the NEPA and 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.

Appendix A: GHG Assessment