AIR QUALITY TECHNICAL MEMORANDUM

for

Soapstone Connector Environmental Assessment

Fairfax County Project No. 2G40-078

February 24, 2017

CONTENTS

SECTION 1
INTRODUCTION

1.1 PROJECT BACKGROUND AND LOCATION

The Fairfax County Department of Transportation (FCDOT), in cooperation with the Virginia Department of Transportation (VDOT) and the Federal Highway Administration (FHWA), is preparing an Environmental Assessment (EA) for the Soapstone Connector. The Soapstone Connector is a new roadway, approximately one-half mile long between Sunrise Valley Drive and Sunset Hills Road, in Fairfax County (Reston), Virginia. The project is located just west of the new Wiehle-Reston East Metrorail Station and would include a new crossing over the Dulles Corridor, which includes VA Route 267 (Dulles Toll Road (DTR)), the Dulles International Airport Access Highway (DIAAH), and the Silver Line of the Metrorail system, as shown in **Figure 1-1**.

This memorandum documents the air quality analysis completed as part of the EA for the Soapstone Connector.

1.2 PROJECT ALTERNATIVES

No Build Alternative

Included for evaluation in accordance with 23 CFR §1502.14(d), the no action or No Build condition serves as a baseline for comparison against build alternatives. The No Build Alternative assumes that the Soapstone Connector would not be constructed. The transportation network would include existing roads and projects within the study area that are programmed in the National Capital Region's 2015 Financially Constrained Long-Range Transportation Plans (CLRP), adopted by the Transportation Planning Board (TPB) in October 2015. Projects included in VDOT's Six-Year Improvement Program (SYIP) are also assumed to be completed. The following projects were included in the No Build Alternative:

- Dulles Airport Access Road – Widen from 4 to 6 lanes from Dulles Airport to VA 123
- VA 286 Fairfax County Pkwy HOV – Convert from 6 to 4+2 from Dulles Toll Road to Sunrise Valley Drive
- VA 286 Fairfax County Pkwy HOV – Widen from 4 to 4+2 from Sunrise Valley Drive to West Ox Road
- Collector-Distributor Rd EB – New 2 lane road from Wiehle Avenue to Spring Hill Road
- Collector-Distributor Rd WB – New 2 lane road from Spring Hill Road to Wiehle Avenue
- East Elden Street – Widen from 4 to 6 lanes from Monroe Street to Fairfax County Parkway
- Spring Street – Widen from 4 to 6 lanes from Herndon Parkway to Fairfax County Parkway
- Route 602 Reston Pkwy – Widen from 4 to 6 lanes from Sunrise Valley Drive to Baron Cameron Avenue

Build Alternatives

The Build Alternatives assume completion of those projects identified in the No Build Alternative and the addition of the Soapstone Connector between Sunrise Valley Drive and Sunset Hills Road.

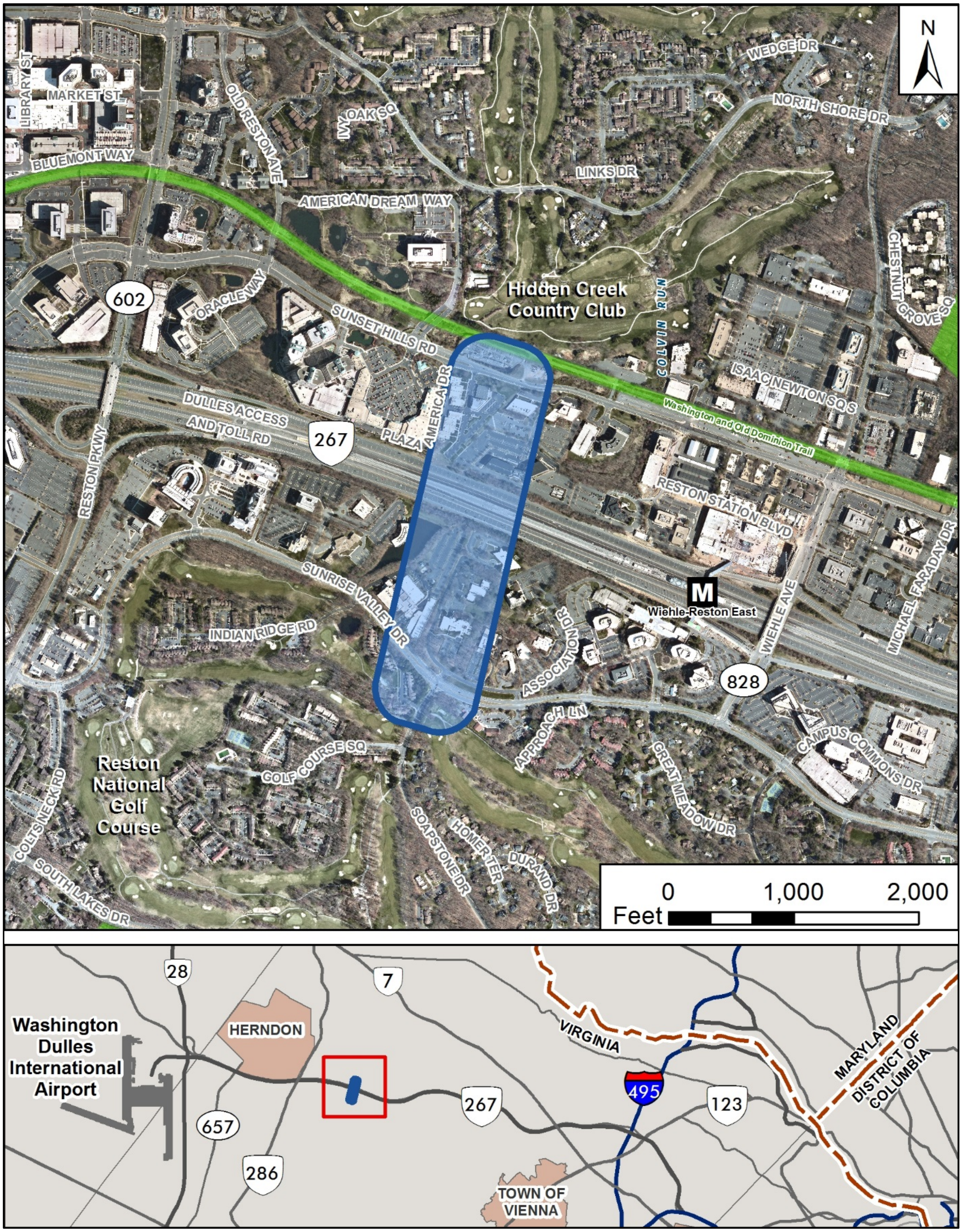

Figure 1-1. Project Location Map

The southern terminus of Alternative 1 is located at the intersection of Soapstone Drive and Sunrise Valley Drive while the northern terminus would connect to Sunset Hills Road, as shown in **Figure 1-2.** In the figure, the alternative is represented as a 200-foot-wide corridor, which would be wide enough to encompass minor variations in actual roadway alignments and design features during the design phase, should a build alternative be selected, and to illustrate the maximum potential impacts of the alternative. The corridor has been estimated for planning purposes and decision-making during the NEPA process, but would be further refined during final design.

The 200-foot-wide corridor for Alternative 2 is shown in **Figure 1-3**, and the alignment is the same as Alternative 1 south of the Dulles Corridor. North of the Dulles Corridor crossing, Alternative 2 is aligned slightly to the east of Alternative 1. A closer view of the differences between the two alternatives north of the Dulles Access and Roll Road is shown in **Figure 1-4**.

The typical section of the new roadway would feature a three-lane cross-section (one travel lane in each direction and a two-way, left-turn-only lane); 5-foot-wide on-road bicycle lanes on each side; a 5-foot-wide concrete sidewalk on the west side; and a 10-foot-wide shared use path on the east side, as shown in **Figure 1-5.** The typical section for the bridge includes four travel lanes, as shown in **Figure 1-6.**

There are four planned access points throughout the length of the roadway. North of the Dulles Toll Road, access points include an at-grade intersection south of Sunset Hills Road and the intersection with Sunset Hills Road at its northern terminus. South of the Dulles Toll Road, access points include an intersection north of Sunrise Valley Drive and the intersection with Sunrise Valley Drive at its southern terminus.

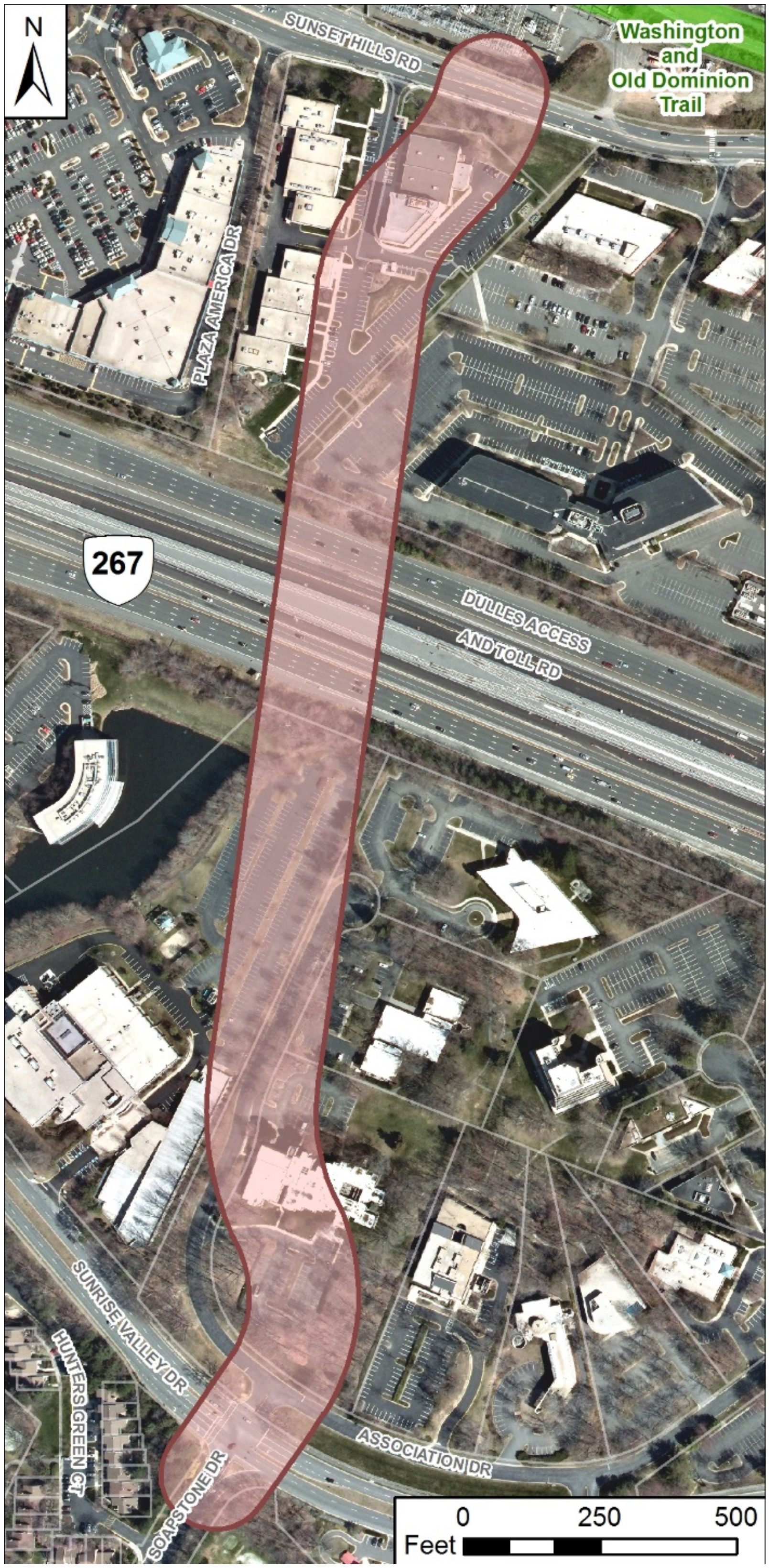

Figure 1-2. Alternative 1

Figure 1-3. Alternative 2

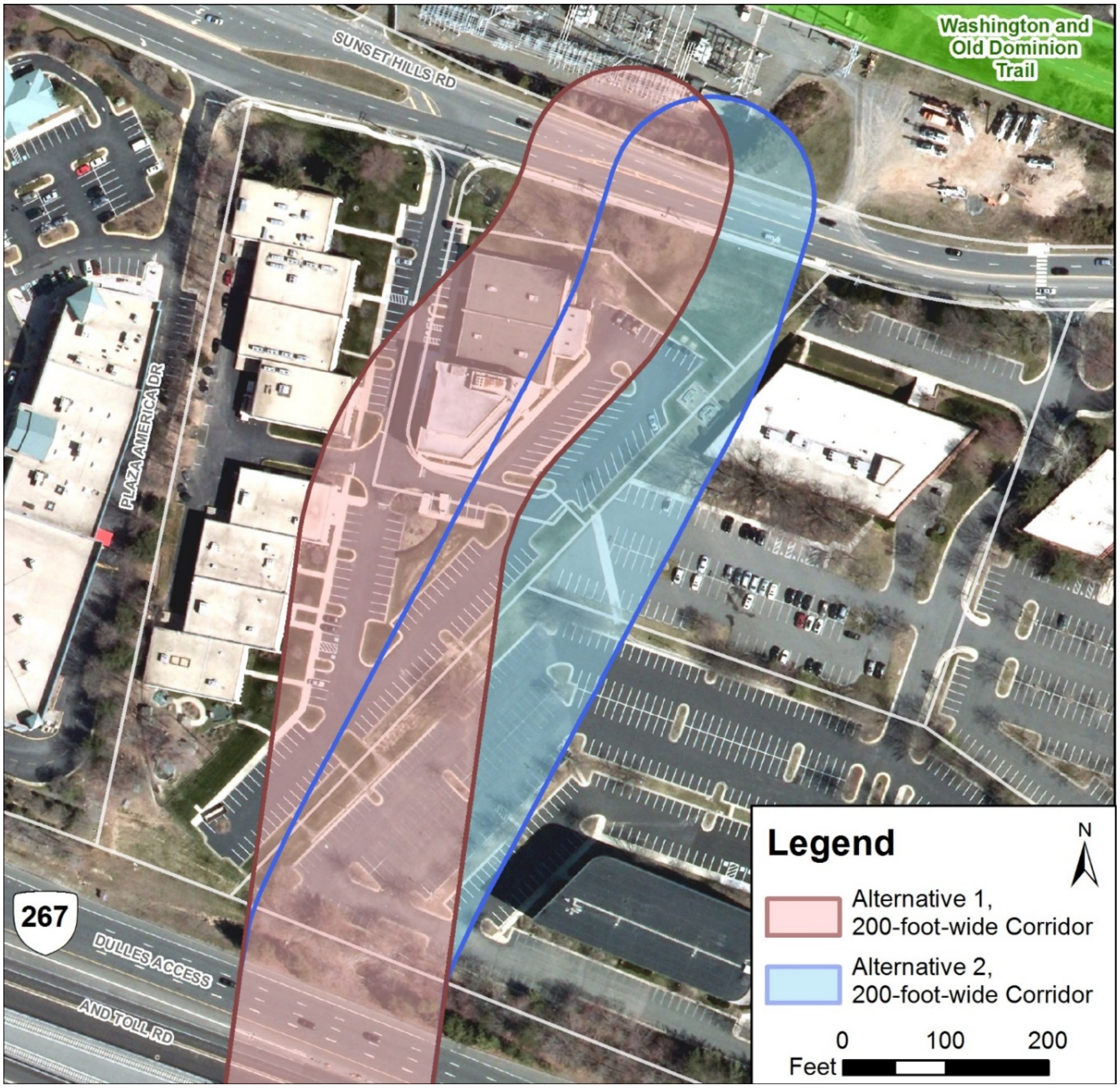

Figure 1-4. Comparison of Alternatives 1 and 2 North of Dulles Corridor

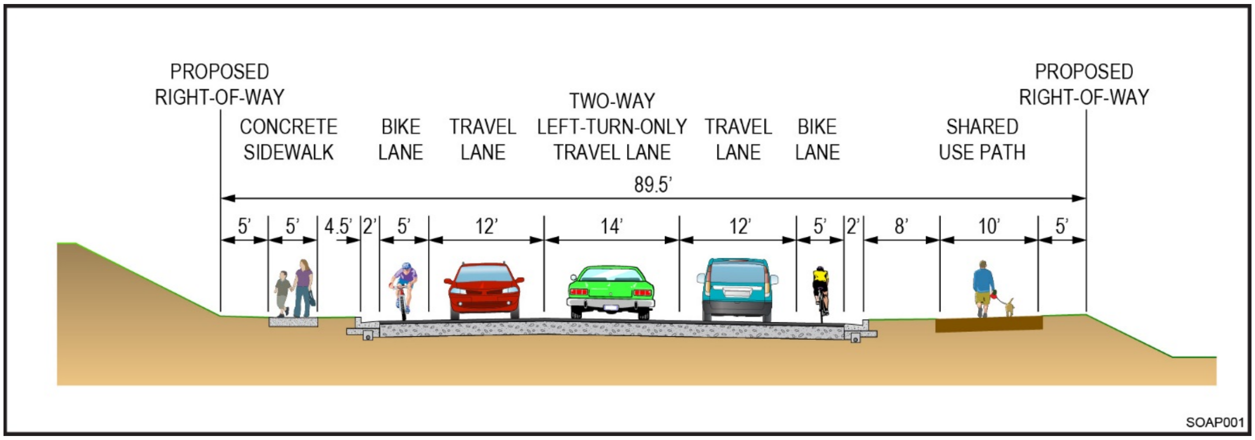

Figure 1-5. Typical Roadway Cross Section

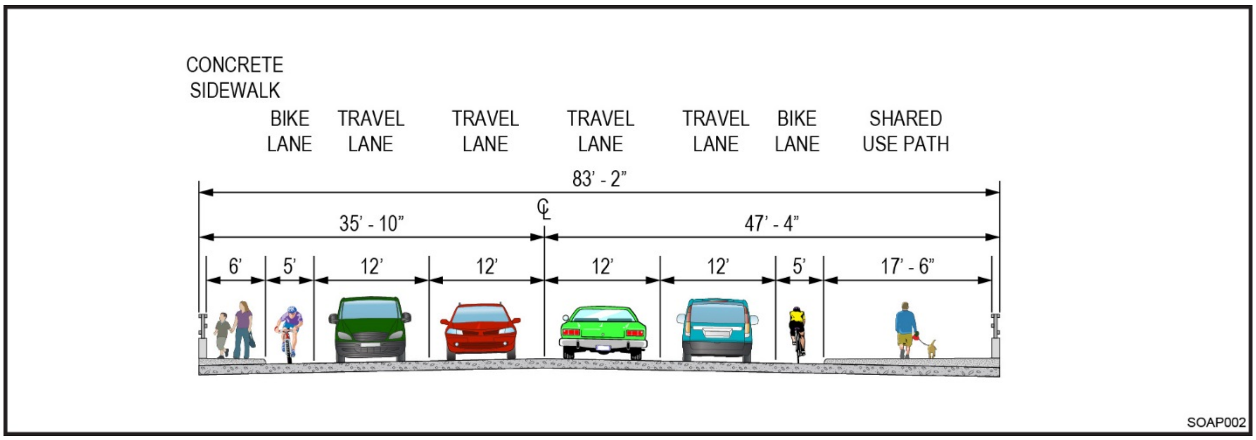

Figure 1-6. Typical Bridge Cross Section

SECTION 2
TRAFFIC DATA AND ANALYSIS

The following sections provide a summary of the traffic data collected or developed as part of the study and the operations analysis that was completed to assess traffic operations for existing and future year conditions. This traffic data was used as input to the qualitative air quality analysis described in Section 3.

Additional details on the traffic data and analysis can be found in the *Traffic Technical Memorandum* (Parsons 2017).

2.1 EXISTING TRAFFIC DATA

Existing traffic data for the project was generated from a project-specific data collection program and data gathered from Fairfax County and VDOT databases. The data collection, conducted in May 2015, included both intersection turning movement counts and roadway segment counts at key locations within the traffic analysis area bounded by Reston Parkway, Wiehle Avenue, Sunrise Valley Drive, and Sunset Hills Road.

2.2 FUTURE YEAR TRAFFIC FORECASTS

Future year traffic forecasts were developed for this study to support comparative analyses between the No Build and Build Alternatives. The forecasts were based on project-specific modeling based on the framework of the Metropolitan Washington Council of Governments' (MWCOG) regional travel demand model. The project-specific modeling included the development of a sketch-level[1] travel demand model focused on the study area. Since the primary purpose of the model was to identify changes in traffic patterns based on the construction of the proposed Soapstone Connector, the two primary inputs to the sketch-level modeling was the roadway network (coded with both No Build and Build conditions) and vehicle trip tables.

The MWCOG model, Version 2.3.57A, with Round 8.4 Cooperative Forecast land use was obtained from MWCOG on January 27, 2016; this model served as the basis for developing the trip tables for use in the sketch-level model. The MWCOG model was run for the years 2015, 2020, and 2040 with the standard model structure. The assignment step of the final model iteration was then re-run in order to extract subarea trip table information. The subarea trip tables were extracted for an area that was bounded by Route 606 (Baron Cameron Avenue), Route 674 (Hunter Mill Road), Route 673 (Lawyers Road), Route 669 (Stuart Mill Road), Route 665 (Fox Mill Road), and VA 286 (Fairfax County Parkway). Finally, the subdivided trip tables for 2015 and 2040 were used to calculate growth factors, extrapolated to the design year 2046.

The daily volumes on the north-south roadways within the study area (Reston Parkway, Wiehle Avenue, and Soapstone Connector in the Build Alternative) in existing year 2015 and forecast year 2046 are summarized in **Table 2-1**. The anticipated opening year of the project is 2026,

[1] The model is considered sketch-level as it includes primarily just the traffic assignment step of the traditional four-step model process.

although traffic was not generated for this year since it was not needed to demonstrate compliance with all applicable air quality requirements (see Section 3 below).

Table 2-1. Existing (2015) and Forecast (2046) Daily Volumes

		Daily Volume (NB + SB) (vehicles per day)						
		2015	2046		No Build vs Existing		Build vs No Build	
		Existing	No Build	Build	Growth	%	Difference	%
Reston Parkway	North of DTR	51,300	68,000	62,000	16,700	33%	-6,000	-10%
	South of DTR	43,700	63,800	57,300	20,100	46%	-6,500	-11%
Soapstone Connector	North of DTR	-	-	18,100	-	-	18,100	-
	South of DTR	-	-	18,300	-	-	18,300	-
Wiehle Avenue	North of DTR	36,900	46,800	37,400	9,900	27%	-9,400	-25%
	South of DTR	34,900	38,500	29,500	3,600	10%	-9,000	-31%

2.3 OPERATIONAL ANALYSES

All operational analyses in support of this project used the methods outlined in the 2010 Highway Capacity Manual (HCM) as implemented in the Trafficware Synchro software (Version 9). For this study, the analysis allowed for the comparison of traffic operations with and without construction of the Soapstone Connector using the measures of effectiveness of delay and level of service (LOS) as comparison metrics.

A summary of the 2015 existing conditions intersection LOS is provided in **Table 2-2**. As shown in the table, the two Reston Parkway intersections in the traffic analysis study area operate at LOS E or worse during both peak hours under existing conditions, with average delay ranging from 60 to 80 seconds. The Wiehle Avenue intersections with Sunset Hills Road and Sunrise Valley Drive operate at LOS D or worse, with delay ranging from 40 to 60 seconds. Congestion at these intersections acts as a constraint to traffic mobility within the area surrounding the station.

Table 2-2. Intersection Operations – 2015 Existing Conditions

Intersection No.	Intersection Name	AM Peak Hour		PM Peak Hour	
		Delay (sec)	LOS	Delay (sec)	LOS
1	Sunset Hills Rd at Reston Parkway	63.2	E	57.6	E
2	Sunset Hills Rd at Oracle Way & Old Reston Ave	27.3	C	27.6	C
3	Sunset Hills Rd at Plaza America Dr	5.5	A	11.8	B
4	Sunset Hills Rd at American Dream Way	23.1	C	33.2	C
5	Sunset Hills Rd at Isaac Newton Sq & Metro Ctr Dr	17.0	B	28.8	C
6	Wiehle Ave at Sunset Hills Road	43.7	D	58.4	E
7	Wiehle Ave at Reston Station Blvd	19.4	B	32.0	C
8	Wiehle Ave at WB DTR Ramps	20.0	C	20.8	C
9	Wiehle Ave EB DTR Ramps	29.4	C	19.4	B
10	Wiehle Avenue at Sunrise Valley Drive	50.4	D	50.6	D
11	Sunrise Valley Dr at Soapstone Dr	18.4	B	16.6	B

Intersection No.	Intersection Name	AM Peak Hour		PM Peak Hour	
		Delay (sec)	LOS	Delay (sec)	LOS
12	Sunrise Valley Drive at Sheraton Plaza	9.7	A	11.3	B
13	Sunrise Valley Dr at Colts Neck Road	26.0	C	11.1	B
14	Sunrise Valley Drive at Reston Pkwy	66.0	E	82.0	F

As summarized in **Table 2-3**, levels of service at the four aforementioned intersections will deteriorate by 2046 under the No Build condition. Operations will worsen by 2046 at these four intersections under the Build condition as well, albeit to a lesser extent with the construction of the Soapstone Connector.

Table 2-3. Intersection Operations – 2046 No Build and Build Conditions

Intersection No.	Intersection Name	2046 No Build Conditions				2046 Build Conditions			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Reston Pkwy at Sunset Hills Rd	86.9	F	103.4	F	82.7	F	93.2	F
2	Sunset Hills Rd at Oracle Way & Old Reston Ave	41.7	D	50.0	D	63.7	E	41.3	D
3	Sunset Hills Rd at Plaza America Dr	5.6	A	12.4	B	6.5	A	12.7	B
4	Sunset Hills Rd at American Dream Way	25.3	C	41.8	D	25.2	C	52.9	D
NEW	Sunset Hills Rd at Soapstone Connector	-	-	-	-	28.5	C	20.9	C
5	Sunset Hills Rd at Isaac Newton Sq & Metro Ctr Dr	116.5	F	191.3	F	53.9	D	97.6	F
6	**Wiehle Ave at Sunset Hills Road**	**79.2**	**E**	**101.3**	**F**	**64.2**	**E**	**75.7**	**E**
7	**Wiehle Ave at Reston Station Blvd**	**30.5**	**C**	**74.8**	**E**	**24.5**	**C**	**46.9**	**E**
8	**Wiehle Ave at WB DTR Ramps**	**29.3**	**C**	**41.2**	**D**	**22.9**	**C**	**50.9**	**D**
9	**Wiehle Ave EB DTR Ramps**	**39.5**	**D**	**22.7**	**C**	**26.1**	**C**	**22.4**	**C**
10	**Wiehle Avenue at Sunrise Valley Drive**	**62.6**	**E**	**65.1**	**E**	**39.6**	**D**	**46.4**	**D**
11	Sunrise Valley Dr at Soapstone Dr	26.6	C	29.0	C	83.5	F	88.0	F
12	Sunrise Valley Drive at Sheraton Plaza	3.9	A	8.8	A	6.3	A	8.6	A
13	Sunrise Valley Dr at Colts Neck Road	46.0	D	30.7	C	33.1	C	25.8	C
14	Sunrise Valley Drive at Reston Pkwy	105.6	F	144.7	F	95.1	F	123.4	F

An element of the purpose of the Soapstone Connector project is to reduce traffic congestion and delay along Wiehle Avenue and within the traffic analysis area. The results shown in Table 2-3 allow for the assessment of the project's effect on numerous intersections within the defined project area and allow for a comparison between the 2046 No Build and Build conditions in the NEPA document to support decision-making regarding the Soapstone Connector. As shown in the table, delays at intersections #6 through #10 on Wiehle Avenue (shown in bold font), are anticipated to be lower in the Build condition with the addition of the Soapstone Connector (compared to the No Build condition).

At the intersections of the Soapstone Connector with Sunset Hills Road and Sunrise Valley Drive, the new approaches were assumed to have an appropriate number of turn lanes to be consistent with the number of receiving lanes, and the configuration of existing approaches was modified as needed to accommodate turn movements to the new roadway. Based on the assumed configurations, the intersection with Sunset Hills Road is projected to operate at LOS C in both the AM and PM peak hours. At the intersection with Sunrise Valley Drive, delay is higher, with a resulting LOS F during both peak hours; however, further adjustments to signal timing, lane configuration, and/or intersection geometry can be made during the design stage of the project to improve operations. Additional information on traffic operations and assumptions made in the analysis can be found in the *Traffic Technical Memorandum*.

Note that within the study area, which lies within the Wiehle-Reston East Transit Station Area (TSA), LOS E or better is assumed to be acceptable. As described in the Memorandum of Understanding (MOU) between VDOT and Fairfax County regarding the LOS standard for multimodal mixed use areas, LOS E has been established as the standard in order to balance the mobility needs of bicyclists, pedestrians, transit users, and vehicles.

2.4 ENTRADA

Traffic data was developed using the Environmental Traffic Data (ENTRADA) program[2], a spreadsheet-based tool developed by VDOT to standardize the production of planning-level traffic data for environmental analyses. Inputs to the ENTRADA program include the following:

- Project Information
- Roadway Segment Information (facility type, posted speed, number of lanes, lane width, terrain, signalization, etc.)
- Directional Factors
- K (Hourly) Factors
- Truck Percentages
- Existing and Forecast Daily Traffic Volumes

These inputs were derived primarily from the data collection program and traffic forecasting efforts described in Section 2.1 and 2.2. Environmental traffic data were prepared for existing (2015) and 2046 (No Build and Build) conditions for the 10 segments shown in **Figure 2-1**.

[2] ENTRADA Version 2016-08, received from VDOT September 13, 2016.

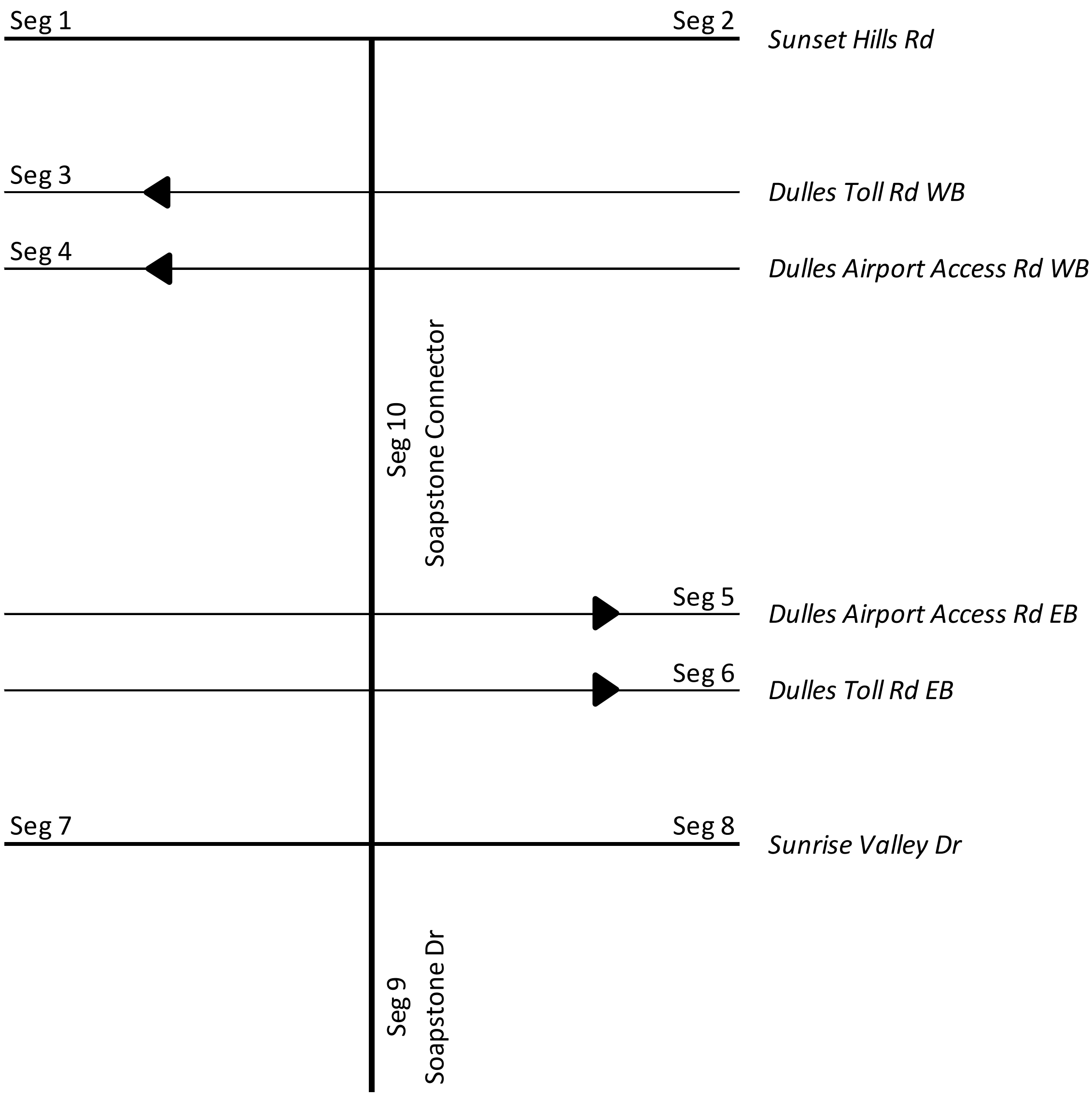

Figure 2-1. ENTRADA Roadway Segments

SECTION 3
AIR QUALITY ANALYSIS

The following subsections describe each of the pollutants or pollutant classes assessed as part of the air quality analysis.

3.1 CARBON MONOXIDE

The carbon monoxide (CO) analysis was prepared in accordance with the April 2016 *FHWA-VDOT Programmatic Agreement for Project-Level Air Quality Analyses for Carbon Monoxide* (PA) between VDOT and FWHA (VDOT 2016a).[3] The PA outlines when a quantitative or qualitative CO hot-spot analysis is required and covers projects of the types and conditions outlined in the Agreement whose opening year is 2015 or later. To determine the level of analysis that would be required for the Soapstone Connector, the application of the PA was conducted at the following signalized intersections that will be located at either end of the Soapstone Connector (see Figure 1-1):

1. The existing signalized intersection of Soapstone Drive /Association Drive with Sunrise Valley Drive at the southern terminus of the Soapstone Connector will be modified as part of the project.
2. A new signalized intersection will be added to the roadway network where the Soapstone Connector will tie into Sunset Hills Road at the northern terminus.

At both locations, additional turn lanes would be provided to accommodate the new or increased turning movement volumes. For purposes of the traffic analysis, the maximum numbers of turn lanes were constrained to the downstream receiving conditions. This reflects the assumption that the design of the Soapstone Connector intersection configurations would accommodate the demands of turning traffic to the extent possible. The number of lanes by approach and movement for these intersections are shown in **Table 3-1** for the No Build and Build conditions.

Table 3-1. Soapstone Connector Intersection Configurations

<table>
<tr><th rowspan="2">Approach</th><th rowspan="2">Movement</th><th colspan="2">Soapstone Connector at Sunset Hills Road</th><th colspan="2">Soapstone Connector/Soapstone Drive at Sunrise Valley Drive</th></tr>
<tr><th>No Build</th><th>Build</th><th>No Build</th><th>Build</th></tr>
<tr><td rowspan="3">EB</td><td>Left (L)</td><td>-</td><td>-</td><td>1</td><td>1</td></tr>
<tr><td>Through (T)</td><td>2</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>Right (R)</td><td>-</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td rowspan="3">WB</td><td>Left (L)</td><td>-</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Through (T)</td><td>2</td><td>2</td><td rowspan="2">1 T, 1 T+R</td><td>2</td></tr>
<tr><td>Right (R)</td><td>-</td><td>-</td><td>1</td></tr>
<tr><td rowspan="3">NB</td><td>Left (L)</td><td>-</td><td>2</td><td rowspan="2">1 T+L</td><td>1</td></tr>
<tr><td>Through (T)</td><td>-</td><td>-</td><td>1</td></tr>
<tr><td>Right (R)</td><td>-</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td rowspan="3">SB</td><td>Left (L)</td><td>-</td><td>-</td><td>1</td><td>2</td></tr>
<tr><td>Through (T)</td><td>-</td><td>-</td><td rowspan="2">1 T+R</td><td>1</td></tr>
<tr><td>Right (R)</td><td>-</td><td>-</td><td>1</td></tr>
</table>

[3] Application of this agreement is appropriate as it is anticipated that the intersections created by the project will not be skewed.

The following is the application of the step-by-step process outlined in the PA to determine project-specific 1-hour and 8-hour carbon monoxide concentrations for comparison to the applicable national ambient air quality standards (NAAQS):

1. As prescribed in the PA, Table 2 in the Attachment to the PA (copied below) should be utilized for determination of a generalized 1-hour concentration value for carbon monoxide at an intersection in an urban location. Use of this table is appropriate as each leg of the two new intersections created by the Soapstone Connector is anticipated to have a grade of two percent or less.

Table 2. One-hour CO concentrations (not including background concentrations) for rural and urban intersections at varying approach speeds for a six approach lane intersection for each leg at two percent grade.

LOCATION	APPROACH SPEED (MPH)	CONCENTRATION (PPM)
Urban	15	6.5
Urban	25	5.7
Urban	35	5.2
Rural	25	8.8
Rural	35	8.4

Source: Attachment to the April 2016 *FHWA-VDOT Programmatic Agreement for Project-Level Air Quality Analyses for Carbon Monoxide.*

Intersection approach speeds were extracted from the environmental traffic data (ENTRADA) that was prepared for the project, which was used for the noise analysis as well. Approach speeds at both signalized intersections are projected to be between 25 and 35 mph.

Accordingly, for a more conservative estimate, the concentration associated with the 25 mph approach speed in Table 2 was used for this analysis, i.e., 5.7 ppm.

2a. According to Table 2 in Appendix H2 of the *Project-Level Air Quality Analysis Resource Document*, the default background concentrations to be utilized for an urban area in Northern Virginia are 1.6 ppm for 1-hour concentration and 1.4 ppm for 8-hour concentration (VDOT 2016b).

Therefore, the worst-case 1-hour concentration for comparison to the applicable NAAQS = 5.7 ppm + 1.4 ppm = 7.1 ppm

2b. According to Appendix G2 of the *Project-Level Air Quality Analysis Resource Document*, a default persistence factor of 0.77 should be utilized to estimate an 8-hour concentration from the 1-hour concentration (VDOT 2016b).

Therefore, the worst-case 8-hour concentration for comparison to the applicable NAAQS = (5.7 ppm * 0.77) + 1.4 ppm = 5.8 ppm

3. The NAAQS for carbon monoxide are shown below:

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	

Source: US EPA, https://www.epa.gov/criteria-air-pollutants/naaqs-table

4. The calculated 1- and 8-hour concentrations of 7.1 ppm and 5.8 ppm, respectively, with the appropriate background concentration and adjusted persistence factor, are both below the standards.

Based on the above determination, the Soapstone Connector project is consistent with (and does not exceed) the project types and conditions listed in the agreement between the Federal Highway Administration and the Virginia Department of Transportation for streamlining the project-level air quality analysis process for carbon monoxide. Modeling using "worst-case" parameters has been conducted for these project types and conditions. It has been determined that projects such as this one would not significantly impact air quality and would not cause or contribute to a new violation, increase the frequency or severity of an existing violation, or delay timely attainment of the NAAQS for carbon monoxide.

3.2 FINE PARTICULATE MATTER

The project is located in an attainment area for particulate matter (PM) and therefore is not subject to a PM conformity assessment.

3.3 MOBILE SOURCE AIR TOXICS

The Mobile Source Air Toxics (MSAT) analysis was prepared in accordance with FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* dated October 18, 2016 (FHWA 2016). This Updated Interim Guidance incorporates new analysis conducted using MOVES2014a, the latest major update of the Motor Vehicle Emissions Simulator (MOVES) vehicle emissions model.

FHWA developed a tiered approach with three categories for analyzing MSAT in NEPA documents, depending on specific project circumstances:

1) No analysis for projects with no potential for meaningful MSAT effects;
2) Qualitative analysis for projects with low potential MSAT effects; or
3) Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

Projects with Low Potential MSAT Effects are described as:

- Those that serve to improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. This category covers a broad range of projects, including minor widening projects; new interchanges; replacing a signalized intersection on a surface street; and projects where design year traffic is projected to be less than 140,000 to 150,000 annual average daily traffic (AADT).

Projects with High Potential MSAT Effects must:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location, involving a significant number of diesel vehicles for new projects or accommodating a significant increase in the number of diesel vehicles for expansion projects; or
- Create new capacity or add significant capacity to urban highways such as Interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000 or greater by the design year; and
- Proposed to be located in proximity to populated areas.

In accordance with the MSAT guidance, the study area is best characterized as a project with "Low Potential MSAT Effects" since projected design year traffic on the Soapstone Connector is expected to be lower than the 140,000 to 150,000 AADT threshold (see Table 2-1).

3.3.1 MSAT 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. EPA 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). 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). 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.

3.3.2 Motor Vehicle Emissions Simulator (MOVES)

According to EPA, MOVES2014 is a major revision to MOVES2010 and improves upon it in many respects. MOVES2014 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 MOVES2010. These new emissions data are for light- and heavy-duty vehicles, exhaust and evaporative emissions, and fuel effects. MOVES2014 also adds updated vehicle sales, population, age distribution, and vehicle miles travelled (VMT) data. MOVES2014 incorporates the effects of three new Federal emissions standard rules not included in MOVES2010. 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). Since the release of MOVES2014, EPA has released MOVES2014a. In the November 2015 MOVES2014a *Questions and Answers Guide*, EPA states that for on-road emissions, MOVES2014a adds new options requested by users for the input of local VMT, includes minor updates to the default fuel tables, and corrects an error in MOVES2014 brake wear emissions. The change in brake wear emissions results in small decreases in PM emissions, while emissions for other criteria pollutants remain essentially the same as MOVES2014.

Using EPA's MOVES2014a model, as shown in **Figure 3-1**, FHWA estimates that even if VMT increases by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 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 50 to 70 percent of all priority MSAT pollutants by mass, depending on calendar year.

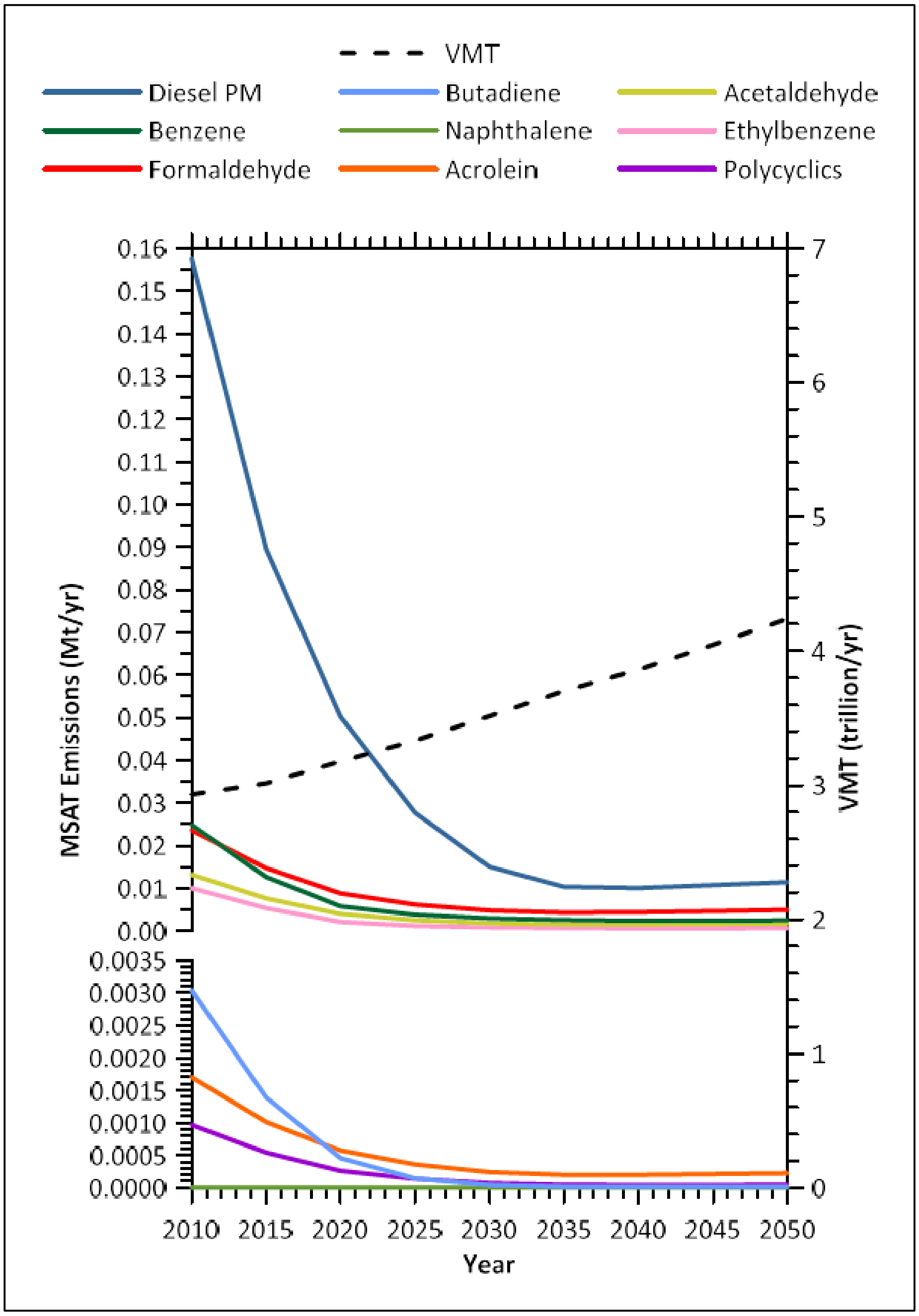

Figure 3-1. National MSAT Emission Trends 2010-2050 for Vehicles Operating on Roadways Using EPA's MOVES2014a Model

3.3.3 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. FHWA will continue to monitor the developing research in this field.

3.3.4 Project 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*, found at: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/mobile_source_air_toxics/msatemissions.cfm.

For each alternative in the Soapstone Connector EA, the amount of MSATs emitted would be proportional to the 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 Alternatives is approximately the same as that for the No Build Alternative because trips are being rerouted within the transportation network as additional north-south capacity becomes available with the provision of the Soapstone Connector (see Table 2-1). Because the estimated VMT under each of the alternatives is nearly the same, varying by less than one 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 to reduce annual MSAT emissions by over 90 percent between 2010 and 2050 (FHWA 2016). 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.

3.3.5 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.

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. 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" (EPA, https://www.epa.gov/iris/). 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 concentrations (HEI Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-reviewliterature-exposure-and-health-effects) 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 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 C-3 occupational exposure data to the general population, a concern expressed by HEI (Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxicscritical-review-literature-exposure-and-health-effects). 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://www.epa.gov/iris)."

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

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 plus improved access for emergency response, that are better suited for quantitative analysis.

3.4 GREENHOUSE GASES

Given the advanced status of the Soapstone Connector EA that was initiated well prior to the August 5, 2016 effective date of the CEQ *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*, a greenhouse gas emissions analysis has not been completed for this project.

3.5 CONSTRUCTION IMPACTS

The temporary air quality impacts from construction are not expected to be significant. Emissions will be produced during the construction of this project by heavy equipment and vehicle travel to and from the site. Earthmoving and ground-disturbing operations will generate airborne dust. Construction emissions are short term or temporary in nature. In order to mitigate these emissions, all construction activities are to be performed in accordance with VDOT's *Road and Bridge Specifications*. These specifications are approved as conforming to the State Implementation Plan and require compliance with all applicable local, state, and federal regulations.

3.6 REGIONAL CONFORMITY STATUS OF THE PROJECT

Because the project is located in an eight-hour ozone nonattainment area, conformity applies and the project will need to be included in a conforming financially constrained regional long-range transportation plan adopted by the Metropolitan Planning Organization (MPO). As of this writing, the project is not included in the current approved Financially Constrained Long-Range Transportation Plan (CLRP) for the National Capital Region.

With respect to air quality conformity, based on coordination with the Metropolitan Washington Council of Governments (MWCOG), the region's MPO, it has been determined that the Soapstone Connector would be considered Not Regionally Significant for air quality conformity purposes and therefore does not need to be included in the air quality conformity analysis associated with the CLRP. However, the project would be included in the Transportation Improvement Program (TIP) (and therefore the CLRP, as the TIP is a subset of the CLRP) if any federal funding will be used for the project.

REFERENCES

Federal Highway Administration

2016 *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*, October 18, 2016. http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/2016msat.pdf

Parsons

2017 Traffic Technical Memorandum for the Soapstone Connector Environmental Assessment, February 3, 2017.

Virginia Department of Transportation

2016a *FHWA-VDOT Programmatic Agreement for Project-Level Air Quality Analyses for Carbon Monoxide*, April 2016. http://www.virginiadot.org/projects/resources/air/2016_FHWA-VDOT_PA_for_CO_from_NCHRP25-2578_Attachment2_FINAL.pdf

2016b *Project-Level Air Quality Analysis Resource Document,* April 2016. https://www.virginiadot.org/projects/environmental_air_section.asp