Virginia Department of Transportation
US 460 Bypass and Southgate Drive Relocation

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UPC#99425

Town of Blacksburg, Virginia

FINAL AIR QUALITY TECHNICAL REPORT

Virginia Department of Transportation
Environmental Division
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I. Introduction

Air quality became a national concern in the 1960s, leading to the passage of the Clean Air Act of 1963. This was followed by the Air Quality Act of 1967, the Clean Air Act of 1970, the Clean Air Act Amendments of 1977, and the Clean Air Act Amendments of 1990. With the passage of each piece of legislation, requirements for addressing and controlling air pollution became more stringent as prior legislation failed to achieve its intended purpose. Following the passage of the Federal Clean Air Act Amendments of 1990, states were mandated to implement additional steps to reduce airborne pollutants and improve local and regional conditions. Automobile emissions have been identified as a critical element in attaining federal air quality standards for carbon monoxide (CO), particulate matter (PM), and ozone (O_3).

As a result of federal funding for this project, compliance is required with both the National Environmental Policy Act (NEPA) and the Clean Air Act. Highway agencies are required to consider the impacts of transportation improvement projects on both the local and regional level. Regional air quality, when located in ozone nonattainment and maintenance areas, is assessed by ensuring that region wide volatile organic compounds (VOC) and nitrogen oxide (NOx) emissions fall below the established motor vehicle emission budgets identified by the State Implementation Plan (SIP). When applicable, this assessment is performed by the Virginia Department of Transportation (VDOT) and / or Metropolitan Planning Organizations (MPOs) and documented in an Air Quality Conformity Analysis of the Transportation Improvement Program (TIP) and Long Range Transportation Plan (LRTP). The project lies within an area designated as attainment for all criteria pollutants; therefore, the project is exempt from regional and project-level conformity requirements.

Generally, local air quality is assessed on a micro-scale by evaluating CO concentrations at the project level. CO is a colorless, odorless, poisonous gas considered to be a serious threat to those who suffer from cardiovascular disease. High concentrations of CO tend to occur in areas of high traffic volumes or areas adjacent to a stationary source of the pollutant. CO emissions are associated with the incomplete combustion of fossil fuels in motor vehicles and are considered to be a good indicator of vehicle-induced air pollution.

II. Project Description / Alternatives

Project Study Area

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is studying the environmental consequences of improvements along the existing signalized at-grade intersection of Southgate Drive on the US 460 Bypass. The US 460 Bypass, a four-lane divided limited access highway, provides a north-south connection between and around the Towns of Christiansburg and Blacksburg. It has a posted speed limit of 65 miles per hour (mph). Southgate Drive (Route 314), a two-lane road, provides access to Virginia Polytechnic Institute and State University (Virginia Tech), downtown Blacksburg, the Virginia Tech-Montgomery Executive Airport, and the Virginia Tech Corporate Research Center. Southgate Drive has a posted speed limit of 35 mph. The study area encompasses approximately 0.85 miles along US 460 Bypass and approximately 0.8 miles along Southgate Drive, as well as areas on new location for the relocation of Southgate Drive and the potential interchange area.

ALTERNATIVES:

No-Build Alternative

The no action, or No-Build alternative, would include all transportation improvements in the study area that are funded for construction in the MPO's fiscally constrained long range plan, *2035 Transportation Plan* (adopted November 4, 2010 and amended June 2, 2011) and in VDOT's current Six-year Improvement Program (2012-2017), excluding those projects associated with the Build Alternative. These projects are shown below in **Table 1**.

Table 1
2035 Fiscally Constrained Long Range Plan and Six Year Plan Projects
(excluding Build Alternative)

Plan	Route Number	Project Location	Project Description
2035 Plan	U.S. 460	U.S. 460 Bypass at US 460 Business (North Main Street)	Perform study to identify specific safety concerns.
2035 Plan	----------	Progress Street and Givens Lane	Widen Givens Lane to include bike lanes and sidewalks. Extend Progress Street to Givens Lane.
2035 Plan	----------	Construct multi-modal transfer facility on Perry Street.	Construct new facility (on Virginia Tech Campus).
2035 Plan and SY2012-2017	US 460	Ramble Road at Industrial Park Drive	Upgrade intersection.
SY2012-2017	U.S. 460	U.S. 460 Bypass / Pandapas Pond Road to U.S. 460 Business (N Main Street)	Install safety and warning equipment.
SY2012-2017	N. Main Street	Giles Road to Tabor Road	Reconstruction; preliminary engineering only.
SY2012-2017	N. Main Street	N. Main Street and Red Maple Drive	Improve sight distance.
SY2012-2017	N. Main Street	Just north of intersection with Kabrich Street to just south of intersection with College Avenue	Safety and traffic operations.
SY2012-2017	Progress Street	Just south of Ashford Court/Givens Lane to just east N. Main Street/north of Cherokee Drive	Extend Progress Street
SY2012-2017	Prices Fork Road	Prices Fork Road to Plantation Road	Upgrade traffic signals.

Proposed Build Alternative

The Build Alternative includes the construction of a grade-separated interchange on new location south of existing Southgate Drive, relocation of Southgate Drive to connect to the new interchange, and closure and demolition of existing Southgate Drive and its intersection with US 460 Bypass. Although several preliminary designs were tested for purposes of the previously published *Analysis for a New Interchange on the US Route 460 Bypass in the Vicinity of Southgate Drive*, those designs were not based on engineering surveys and do not represent actual final designs for elements of the project. Therefore, the Build Alternative for purposes of the Environmental Assessment is represented as a study corridor that encompasses sufficient area to accommodate several design variations. This approach provides a worst-case assessment of the potential impacts while providing flexibility during final design with respect to specific alignment and design features. Notwithstanding, for purposes of the air quality analysis a roadway configuration was assumed as shown on **Figure 1**. Furthermore, for purposes of examining cumulative impacts of roadway elements of the airport expansion project, a configuration was assumed for the relocation of Tech Center Drive (now called Research Center Drive) that would be displaced by the airport runway expansion.

III. Existing Conditions

The proposed project is located in the Town of Blacksburg, Virginia. The area is best categorized as mountain temperate or humid continental and generally averages approximately 42 inches of precipitation per year. The summers are warm and humid although it typically is much cooler than low-elevation areas within the state. The average daily high temperature in July is 82 degrees Fahrenheit while the average daily low temperature in January is 20 degrees Fahrenheit.

Traffic Summary Information

Traffic forecasts were developed for the project for Existing (2010), Design Year No-Build (2040), and Design Year Build (2040) conditions for the project locations. The traffic volumes referenced in the air study are based on the preliminary Annual Daily Traffic (ADT) volume projections for the project and surrounding roadway network used by the Project Team for the traffic analysis and was derived from the VDOT ENTRADA system.

IV. Regulations / Criteria

Under the National Environmental Policy Act (NEPA), federal agencies must consider environmental factors in the decision making process. Changes in air quality, and the effects of such changes on human health and welfare, are among the factors to be considered. A project level air quality analysis has been performed to assess the air quality impacts of the project, document the findings of the analysis, and make the findings available for review by the public and decisionmakers. The findings of the analysis, as presented in this report, are summarized in the NEPA documentation.

As implemented by the Clean Air Act, the EPA is required to set the National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and welfare. As shown in **Table 2**, there are currently two standards: Primary Standards to protect public health and Secondary Standards to protect the public welfare (e.g., to

Table 2
National Ambient Air Quality Standards

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [(1)]	None	
	35 ppm (40 mg/m^3)	1-hour [(1)]		
Lead	0.15 µg/m^3 [(2)]	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m^3	Quarterly Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour [(3)]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual [(4)] (Arithmetic Mean)	Same as Primary	
	35 µg/m^3	24-hour [(5)]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [(6)]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [(7)]	Same as Primary	
	0.12 ppm	1-hour [(8)]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m^3)	3-hour [(1)]
	0.14 ppm	24-hour [(1)]		

[(1)] Not to be exceeded more than once per year.
[(2)] Final rule signed October 15, 2008.
[(3)] Not to be exceeded more than once per year on average over 3 years.
[(4)] To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
[(5)] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
[(6)] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
[(7)] (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
[(8)] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

(b) As of June 15, 2005 EPA has revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) Areas. For one of the 14 EAC areas (Denver, CO), the 1-hour standard was revoked on November 20, 2008. For the other 13 EAC areas, the 1-hour standard was revoked on April 15, 2009.

Source: Table and footnotes above are excerpted from US Environmental Protection Agency website: http://www.epa.gov/air/criteria.html

protect against damage to crops, vegetation, buildings and animals). Federal actions must not cause or contribute to any new violation of any standard, increase the frequency or severity of any existing violation, or delay timely attainment of any standard or required interim milestone.

Geographic regions that do not meet NAAQS for one or more criteria pollutants are designated by EPA as "nonattainment areas." Areas previously designated as nonattainment, but subsequently re-designated attainment because they no longer violate NAAQS, are designated as "maintenance areas" subject to maintenance plans to be developed and included in a state's SIP. However, this project is located in the Town of Blacksburg which is currently designated as attainment for all the NAAQS, and therefore the project is exempt from all regional and project-level conformity requirements.

The federal conformity rule (40 CFR Parts 51 and 93) requires air quality conformity determinations for transportation plans, programs, and projects in "non-attainment or maintenance areas for transportation-related criteria pollutants for which the area is designated nonattainment or has a maintenance plan" (40 CFR 93.102(b)). Transportation-related criteria pollutants, as specified in the conformity rule, include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), and particulate matter less than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively). Regional conformity analysis requirements apply for plans and programs; hot-spot analysis requirements of 40 CFR 93.116 and 93.123 apply for projects.

EPA and FHWA issued joint guidance for conducting hot-spot analyses for particulate matter: *Transportation Conformity Guidance for Qualitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (March 2006) commonly referred to as the Final Rule. Although the area is designated attainment for PM, it was reviewed in light of the guidance. Based on the guidance, the proposed project is not considered a "project of air quality concern," and, as such, is exempt from a qualitative assessment of $PM_{2.5}$. A detailed discussion can be found in **Section VI** of this report.

As indicated in the *Consultant Guide*, on February 27, 2009, FHWA and VDOT completed the updated Memorandum of Understanding (MOU) addressing requirements on when a quantitative or qualitative CO hot-spot analysis is required. Under this revised agreement (original agreement was August 4, 2004) project-level air quality (hot-spot) analyses are conducted for CO for projects that meet traffic and related criteria as specified in the revised agreement. As shown in **Table 3**, ADT volumes do not exceed the applicable thresholds contained in the MOU on any of the roadway network where proposed improvements are planned as part of this project. The relocation of Southgate Drive will carry approximately 22,900 ADT under a future 2040 Build condition. As such, since 2040 ADT volumes do not exceed any applicable threshold identified by the MOU, a qualitative CO analysis was performed for inclusion in the air study. A detailed discussion can be referenced in **Section V** of this report.

On September 30, 2009, FHWA issued updated guidance titled *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents*. The guidance included specific criteria for determining which projects are to be considered exempt from mobile source air toxics (MSAT) analysis requirements and which may require a qualitative or quantitative analysis. Projects considered exempt under section 40 CFR 93.126 of the federal conformity rule are also specifically designated as exempt from MSAT analysis

Table 3 - U.S. Route 460 - Southgate Drive Intechange & Connector Study
Traffic Data Summary

Link Description	2010 Existing		2040 No-Build		2040 Build	
	ADT	% Truck	ADT	% Truck	ADT	% Truck
Duckpond Dr, NB	3400	2%	6710	2%	6720	2%
Duckpond Dr, SB	3400	2%	6720	2%	6720	2%
Main St, North of US 460, NB	11510	9%	17530	9%	17530	9%
Main St, North of US 460, SB	11050	10%	17540	10%	17540	10%
Price's Fork Rd, West of US 460, WB	14900	7%	18250	7%	18250	7%
Price's Fork Rd, West of US 460, EB	14900	8%	18230	8%	18230	8%
Price's Fork Rd, East of US 460, WB	14500	14%	17490	14%	17490	14%
Price's Fork Rd, East of US 460, EB	14500	11%	17480	11%	17480	11%
Spring Rd, NB	3400	2%	7510	2%	5480	3%
Spring Rd, SB	3400	2%	7510	2%	5510	3%
Southgate Dr, West of Tech Center Relocated, WB	5800	1%	7820	1%	11620	1%
Southgate Dr, West of Tech Center Relocated, EB	5800	2%	7810	2%	11360	2%
Southgate Dr, between Tech Center Relocated and Duckpond Dr, WB	5800	1%	7820	1%	9000	1%
Southgate Dr, between Tech Center Relocated and Duckpond Dr, EB	5800	2%	7810	2%	9220	2%
Southgate Dr, between Duckpond Dr and Spring Rd, WB	4200	7%	3210	7%	4330	7%
Southgate Dr, between Duckpond Dr and Spring Rd, EB	4200	7%	3210	7%	4690	7%
Southgate Dr, East of Spring Rd, WB	3000	1%	7150	1%	5360	1%
Southgate Dr, East of Spring Rd, EB	3000	1%	7150	1%	5190	1%
Tech Center Dr, between Southgate Dr and Tech Center Relocation, NB	2600	3%	8270	3%	1730	3%
Tech Center Dr, between Southgate Dr and Tech Center Relocation, SB	2600	2%	8270	2%	2160	2%
Tech Center Dr, South of Tech Center Relocation, NB	2600	3%	8270	3%	1730	3%
Tech Center Dr, South of Tech Center Relocation, SB	2600	2%	8270	2%	2160	2%
Tech Center Relocation, NB	N/A	N/A	N/A	N/A	6440	3%
Tech Center Relocation, SB	N/A	N/A	N/A	N/A	6010	2%
US 460, North of Price's Ford Rd, WB	9000	13%	15930	13%	19910	13%
US 460, North of Price's Ford Rd, EB	9000	14%	15950	14%	19750	14%
US 460, between Prices Ford Rd and Southgate Dr, WB	16000	9%	27820	9%	31800	9%
US 460, between Prices Ford Rd and Southgate Dr, EB	16000	9%	27810	10%	31570	9%
US 460, between Southgate Dr and Main St, WB	15200	10%	28600	10%	28600	10%
US 460, between Southgate Dr and Main St, EB	15200	10%	28590	10%	28590	10%

requirements. In contrast, projects that create new capacity or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with forecasted design year average annual daily traffic volumes in the range of 140,000 to 150,000 or greater, and which are also in proximity to populated areas are projects with a higher potential for MSAT effects. As stipulated in the guidance, since the project does not meet the traffic criteria described above and is not considered exempt, it is best characterized as a project with low potential MSAT effects. As such, the project includes a qualitative assessment of emissions projections and compares the associated changes in MSAT between No-Build and Build conditions. Additionally, the updated guidance reflects recent regulatory changes, projects national MSAT emission trends out to 2050, and summarizes recent research efforts; however, it does not change any project analysis thresholds, recommendations, or guidelines.

VDOT's May 2009 *Consultant Guide, Air Quality Project-Level Analysis, Revision 18*, provides guidelines and standards for conducting air quality analyses for transportation projects in Virginia. The guide complies with and supplements FHWA and EPA regulations and guidelines. The air quality analyses presented in this report are consistent with the Consultant's Guide.

Transportation Conformity Rule

EPA promulgated the Transportation Conformity Rule concerning the applicability, procedures, and criteria that transportation agencies must use in analyzing and determining conformity of transportation projects. The Transportation Conformity Rule applies to federally-funded transportation projects in certain areas that have violated one or more of the NAAQS (non-attainment/maintenance areas). As discussed previously, this project is located in an area designated as attainment for all the NAAQS, and therefore the project is exempt from a regional and project-level conformity analysis and has met all conformity requirements as outlined by the Clean Air Act Amendments. The appropriate documentation can be referenced in **Chapter XI** of this report.

V. Qualitative CO Assessment

A qualitative CO analysis was prepared in accordance with the February 27, 2009 Project Level Carbon Monoxide Air Quality Studies Agreement between VDOT and FWHA, which provided an update to the original agreement signed in August 2004. The updated memorandum of understanding (MOU) was approved based on extensive experience conducting air quality studies for projects implemented throughout the Commonwealth of Virginia using worst-case modeling assumptions. As part of this process, project-level air quality studies have shown that with continued implementation of more stringent vehicle emission and fuel quality standards across the nation and within the Commonwealth over the past few decades, mobile source emissions and ambient CO concentrations have been reduced to the extent that detailed studies are not appropriate for many smaller projects (**Figure 1** shows the project study corridor).

The February 27, 2009 Agreement outlines when a quantitative or qualitative CO hot-spot analysis is required. Based on the signed memorandum, the ADT associated with the US 460 Bypass interchange and Southgate Drive relocation falls below the applicable thresholds described below:

Figure 1. Study Corridor

- *Any project affecting capacity for roadways with intersections and/or freeway interchanges for which the build scenario design year intersection/freeway interchange level-of-service (LOS) is E or better (or reasonable proxy thereof) and the corresponding ADT does not exceed the following levels for the roadway being improved as part of the project or any intersecting roadway within the project area:*
    - *59,000 (ADT) for intersections and freeway interchanges for which the minimum skew angle (defined here as the smallest angle modeled between intersecting roadways in a reasonable representation of the intersection or interchange selected for air quality analysis following applicable state and federal guidance) is 60 degrees or more.*

As shown in **Table 3**, the projected ADTs for the project area are below the threshold of 59,000 identified by the above guidance and as referenced in the memorandum. In addition, the LOS data as shown in **Table 4** is projected to be LOS D or better for all parts of the corridor and all roadway intersection skew angles are 60 degrees or more. Therefore, the project has satisfied the criteria as outlined above.

Consistent with the procedures outlined in the *Consultant Guide*, the following documentation below has been included to satisfy this requirement:

Traffic Volume, Skew Angle, and Level of Service

"*The project does not include or directly affect any roadway whose design year average daily traffic volume, skew angle or level of service would exceed the threshold criteria specified 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 thresholds and it has been determined that projects, such as this one, for which the thresholds would not be exceeded would not significantly impact air quality and would not cause or contribute to a new violation, or delay timely attainment of the National Ambient Air Quality Standards for carbon monoxide*."

Table 4 - U.S. Route 460 - Southgate Drive Intechange & Connector Study
Level-of-Service and Delay Summary Data

Intersection	Existing (2010)				No-Build (2040)			
	AM		PM		AM		PM	
	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS
Southgate at U.S. Route 460	11.9	B	35.9	D	42.2	D	139.3	F
Southgate at Duck Pond Road	6.6	A	16.4	B	59.8	E	15.9	B
Southgate at Spring St / Tech Center Drive	16	B	262.4	F	70.7	E	300.6	F

Intersection	Build (2040)			
	AM		PM	
	Delay (sec.)	LOS	Delay (sec.)	LOS
Southgate at U.S. Route 460 Ramps	9.8	A	12.5	B
Southgate at relocated Tech Center Drive	42.9	D	21.3	C
Southgate at Duck Pond Road	3.4	A	13.1	B
Southgate at Spring Street	36.8	D	46	D

VI. Fine Particulate Matter Analysis

Particle pollution is comprised of a mixture of solid particles and liquid droplets found in the atmosphere. The particles are a combination of several items including dust, dirt, soot, and smoke, and they can vary in size. Particulate matter (PM) created by human activity includes, but is not limited to, the following sources: wood stoves, industry and power plants, and emissions from motor vehicles. It can also be formed in the atmosphere from gases, including sulfur dioxide, nitrogen dioxide, and volatile organic compounds (VOC).

Particle pollution includes "inhalable coarse particles" with diameters larger than 2.5 microns and smaller than 10 microns and "fine particles" with diameters 2.5 microns and smaller. The average human hair is about 70 microns in diameter – making it 30 times larger than the largest fine particle.

The project is located in the Town of Blacksburg, an area designated as attainment for PM_{10} and for $PM_{2.5}$. Although the project is designated as attainment for $PM_{2.5}$ for regional conformity purposes, the project was still evaluated to determine whether it is a project of air quality concern. As per 40 CFR 93.123(b)(1) of the federal conformity rule, PM_{10} and $PM_{2.5}$ hotspot analyses are generally required for the following types of projects:

> *(i) New highway projects that have a significant number of diesel vehicles, and expanded highway projects that have a significant increase in the number of diesel vehicles;*
>
> *(ii) Projects affecting intersections that are at Level-of-Service D, E, or F with a significant number of diesel vehicles or those that will change to Level of Service D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project;*
>
> *(iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;*
>
> *(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; and*
>
> *(v) Projects in or affecting locations, areas, or categories of sites which are identified in the* PM_{10} *or* $PM_{2.5}$ *applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.*

In addition, EPA guidance indicates that a project of air quality concern that would be covered by 40 CFR 93.123(b)(i) and (ii) would be a project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as facilities with greater than 125,000 annual average daily traffic (AADT) and 8% or more of such AADT is diesel truck traffic, or effectively 10,000 or more diesel truck traffic per day.

The study area primarily services gasoline vehicle traffic and will not involve a significant number or increase in diesel vehicles. The proposed Southgate Connector realignment is projected to carry 22,900 vehicles per day with 2% diesel trucks. The project is also designed to improve traffic flow and vehicle speeds along the U.S. Route 460 corridor, as well as along Southgate and Tech Center Drive and will not involve any increases in idling. In addition, the project does not affect intersections that are at LOS

D, E or F with a significant number of diesel vehicles, or those that will change to LOS D, E or F because of increased traffic volumes from a significant number of diesel vehicles related to the project. Last, criteria (iii), (iv), and (v) noted above are not applicable to this project.

Based on the above analysis, it was determined that the project is not considered to be a project of "air quality concern" with respect to particulate matter (PM). Regardless, the project is located in a geographic area that is in attainment for particulate matter and was found to be in compliance with all applicable state and federal air quality requirements. As such, the project will not cause or contribute to a new violation of the PM NAAQS, increase the frequency or severity of a violation, or delay timely attainment of the PM NAAQS.

VII. Mobile Source Air Toxics

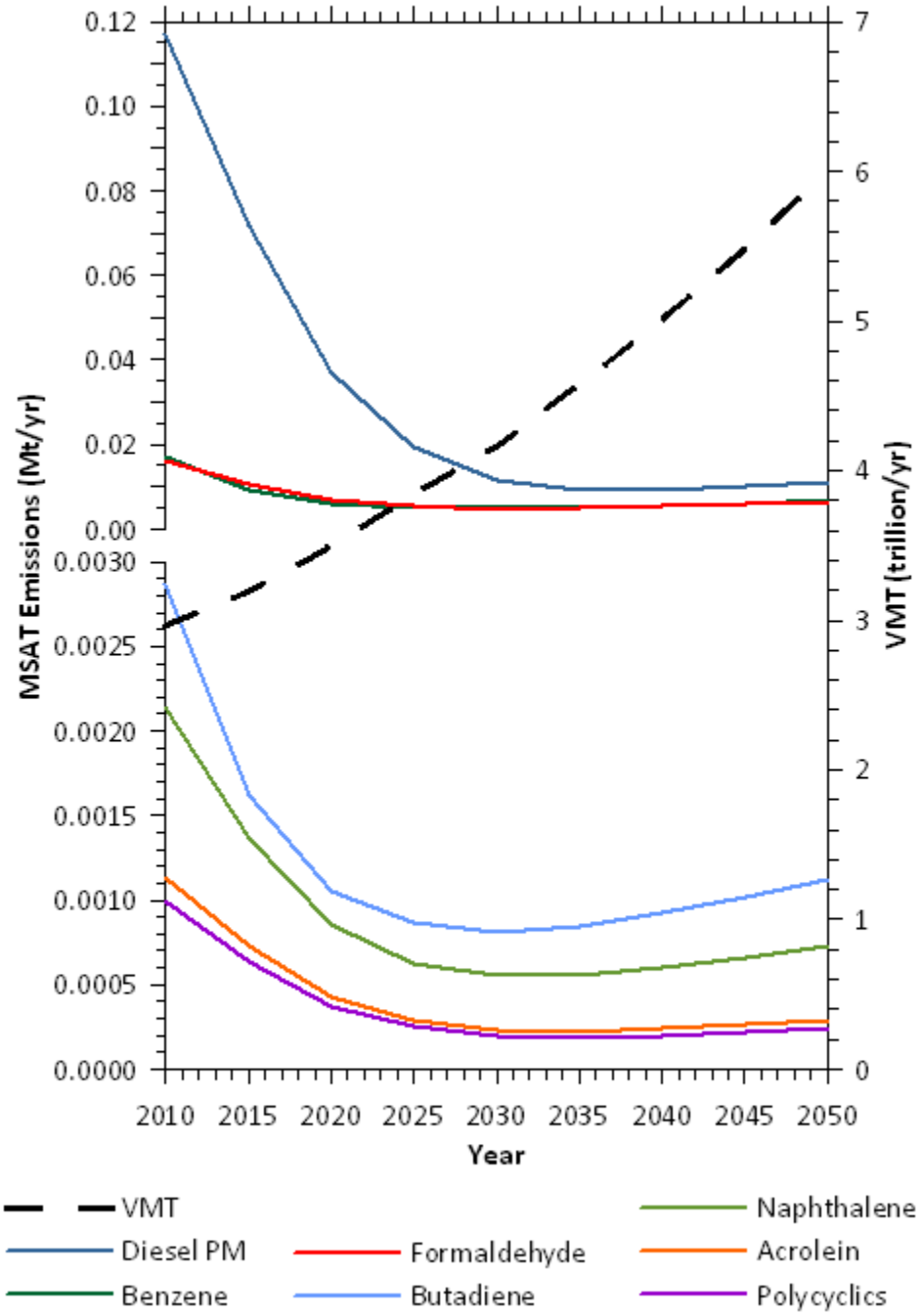
In addition to the criteria air pollutants for which there are NAAQS, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources, and stationary sources (e.g., factories or refineries). MSAT are a subset of the 188 air toxics defined by the Clean Air Act. EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (*Federal Register*, Vol. 72, No. 37, page 8430, February 26, 2007) and identified seven compounds of particular concern: acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. These are compounds that EPA's 1999 *National-Scale Air Toxics Assessment* (NATA) identified as the most significant contributors to cancer and non-cancer health risk from breathing outdoor air toxics, and that have a significant contribution from mobile sources.

The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOVES2010b model, even if vehicle-miles travelled (VMT) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period, as shown in **Figure 2**.

On December 6, 2012, FHWA issued *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents*. This interim guidance update reflects recent changes in methodology for conducting emissions analysis and updates of research in the MSAT arena.

In accordance with the updated guidance, the project area is best characterized as a project with "low potential MSAT effects" since design year traffic is projected to be significantly less than 140,000 to 150,000 annual average daily traffic (AADT) thresholds. As a result, a qualitative assessment of emissions projections was prepared in accordance with Appendix B of the guidance. Project specific elements, including increased travel speeds and improvements to level-of-service (LOS) and the overall effects on MSAT emissions are discussed below.

Figure 2. National MSAT Emission Trends 1999 – 2050 for Vehicles Operating on Roadways Using EPA's MOVES2010b Model



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors
Source: EPA MOVES2010b model runs conducted during May - June 2012 by FHWA.

As stipulated in the guidance, additional discussion is required including information that is incomplete or unavailable for a project specific assessment of MSAT impacts. Additionally, air toxics is an emerging field and current scientific techniques, tools, and data are not sufficient to accurately estimate human health impacts that would result from the transportation project. Appendix C from the guidance is also included in the discussions below to satisfy this portion of the requirements.

When analyzing the project, the amount of MSAT emissions emitted is generally proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix and diesel vehicle percentages remain constant for each alternative. The VMT estimated within the project area is projected to be slightly higher for the 2040 Build alternative as compared to the 2040 No-Build alternative, primarily because the project could potentially facilitate new development that attracts trips that would not otherwise occur in the area. However, regardless of whether the project is built, MSAT emissions are anticipated to be significantly 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 72 percent from 1999 to 2050. 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 any marginal increase in MSAT emissions in the study area due to the project are expected to be significantly offset by EPA's national control programs.

Under the Build alternative, there may be localized areas where VMT could increase and other areas where VMT could decrease. The localized increases in MSAT emissions would be most pronounced along the relocation of Southgate Drive because it is on new location but as stated previously, any localized increase has a low potential for MSAT effects. Regardless, even if localized increases do occur in some areas, total MSAT emissions will be substantially lower in future years due to fleet turnover and the implementation of EPA's vehicle and fuel regulations.

In summary, for the Build scenario in the design year, total MSAT emissions are expected to be significantly lower than those emitted today even when taking into account the small projected increase in vehicle miles travelled in the project area Additionally, EPA's vehicle and fuel regulations will bring about significantly lower MSAT levels for the area in the future than today (**Figure 2**).

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

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

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to

hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA). 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). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update 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, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

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. The results produced by the EPA's MOBILE6.2 model, the California EPA's Emfac2007 model, and the EPA's DraftMOVES2009 model in forecasting MSAT emissions are highly inconsistent. Indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates diesel particulate matter (PM) emissions and significantly overestimates benzene emissions.

Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in an NCHRP study (http://www.epa.gov/scram001/dispersion_alt.htm#hyroad), which documents poor model performance at ten sites across the country - three where intensive monitoring was conducted plus an additional seven with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with NAAQS for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70-year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways, and to determine the portion of time that people are actually exposed at a specific location. There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational

exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282). 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 (http://www.epa.gov/risk/basicinformation.htm#g) and the HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

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 a "safe" or "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 safe or acceptable.

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.

Moreover, EPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. This trend will both reduce the background level of MSAT as well as the possibility of even minor MSAT emission increases from this project.

VIII. 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.

IX. Conclusion

A qualitative CO analysis was performed in accordance with the *Project Level Carbon Monoxide Air Quality Studies Agreement* and indicated that the projected ADT volumes for the Design Year Build (2040) condition will be well below the thresholds identified in the MOU. Additionally, the LOS is projected to be D or better for the Design Year Build (2040) conditions and has satisfied the LOS criteria as outlined in the MOU. Since the projected ADT and LOS associated with the project falls below all applicable thresholds in the Agreement, a quantitative CO hot-spot analysis was not required at this time.

Additionally, the Town of Blacksburg has been designated as attainment with the 8-hour ozone and fine particulate matter standards, and therefore transportation conformity requirements do not apply. Regardless, the project was evaluated for fine particulate matter impacts and was found not to be a project of air quality concern. In addition, FHWA has determined that the U.S. Route 460 – Southgate Drive Interchange Connector Study will generate minimal air quality impacts for CAAA criteria pollutants and has not been linked with any special MSAT concerns. As shown in **Table 2,** design year traffic is projected to be less than the 140,000 to 150,000 annual average daily traffic (AADT) thresholds identified in FHWA's guidance and as such, the project area is best characterized as a project with "low potential MSAT effects".

The temporary air quality impacts from construction are not expected to be significant. Construction activities are to be performed in accordance with VDOT's current *Road and Bridge Specifications*.

Finally, the project is not expected to cause or contribute to any violations of the NAAQS, worsen any existing violations, or interfere with the attainment of any applicable NAAQS.

APPENDIX A
TRAFFIC SUMMARY

Table 3 - U.S. Route 460 - Southgate Drive Intechange & Connector Study

Traffic Data Summary

Link Description	2010 Existing		2040 No-Build		2040 Build	
	ADT	% Truck	ADT	% Truck	ADT	% Truck
Duckpond Dr, NB	3400	2%	6710	2%	6720	2%
Duckpond Dr, SB	3400	2%	6720	2%	6720	2%
Main St, North of US 460, NB	11510	9%	17530	9%	17530	9%
Main St, North of US 460, SB	11050	10%	17540	10%	17540	10%
Price's Fork Rd, West of US 460, WB	14900	7%	18250	7%	18250	7%
Price's Fork Rd, West of US 460, EB	14900	8%	18230	8%	18230	8%
Price's Fork Rd, East of US 460, WB	14500	14%	17490	14%	17490	14%
Price's Fork Rd, East of US 460, EB	14500	11%	17480	11%	17480	11%
Spring Rd, NB	3400	2%	7510	2%	5480	3%
Spring Rd, SB	3400	2%	7510	2%	5510	3%
Southgate Dr, West of Tech Center Relocated, WB	5800	1%	7820	1%	11620	1%
Southgate Dr, West of Tech Center Relocated, EB	5800	2%	7810	2%	11360	2%
Southgate Dr, between Tech Center Relocated and Duckpond Dr, WB	5800	1%	7820	1%	9000	1%
Southgate Dr, between Tech Center Relocated and Duckpond Dr, EB	5800	2%	7810	2%	9220	2%
Southgate Dr, between Duckpond Dr and Spring Rd, WB	4200	7%	3210	7%	4330	7%
Southgate Dr, between Duckpond Dr and Spring Rd, EB	4200	7%	3210	7%	4690	7%
Southgate Dr, East of Spring Rd, WB	3000	1%	7150	1%	5360	1%
Southgate Dr, East of Spring Rd, EB	3000	1%	7150	1%	5190	1%
Tech Center Dr, between Southgate Dr and Tech Center Relocation, NB	2600	3%	8270	3%	1730	3%
Tech Center Dr, between Southgate Dr and Tech Center Relocation, SB	2600	2%	8270	2%	2160	2%
Tech Center Dr, South of Tech Center Relocation, NB	2600	3%	8270	3%	1730	3%
Tech Center Dr, South of Tech Center Relocation, SB	2600	2%	8270	2%	2160	2%
Tech Center Relocation, NB	N/A	N/A	N/A	N/A	6440	3%
Tech Center Relocation, SB	N/A	N/A	N/A	N/A	6010	2%
US 460, North of Price's Ford Rd, WB	9000	13%	15930	13%	19910	13%
US 460, North of Price's Ford Rd, EB	9000	14%	15950	14%	19750	14%
US 460, between Prices Ford Rd and Southgate Dr, WB	16000	9%	27820	9%	31800	9%
US 460, between Prices Ford Rd and Southgate Dr, EB	16000	9%	27810	10%	31570	9%
US 460, between Southgate Dr and Main St, WB	15200	10%	28600	10%	28600	10%
US 460, between Southgate Dr and Main St, EB	15200	10%	28590	10%	28590	10%

Table 4 - U.S. Route 460 - Southgate Drive Intechange & Connector Study
Level-of-Service and Delay Summary Data

Intersection	Existing (2010)				No-Build (2040)			
	AM		PM		AM		PM	
	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS
Southgate at U.S. Route 460	11.9	B	35.9	D	42.2	D	139.3	F
Southgate at Duck Pond Road	6.6	A	16.4	B	59.8	E	15.9	B
Southgate at Spring St / Tech Center Drive	16	B	262.4	F	70.7	E	300.6	F

Intersection	Build (2040)			
	AM		PM	
	Delay (sec.)	LOS	Delay (sec.)	LOS
Southgate at U.S. Route 460 Ramps	9.8	A	12.5	B
Southgate at relocated Tech Center Drive	42.9	D	21.3	C
Southgate at Duck Pond Road	3.4	A	13.1	B
Southgate at Spring Street	36.8	D	46	D

APPENDIX B
REFERENCES

Reference Materials Used For Air Quality Analysis

Claggett, Michael, Ph.D. "The Easy Mobile Inventory Tool – EMIT." (Principal Author and Designer), Air Quality Modeling Specialist, FHWA Resource Center, 604 West San Mateo Road, Santa Fe, New Mexico 87505, and Jeffery Houk, Air Quality Modeling Specialist, FHWA Resource Center, 12300 West Dakota Avenue, Suite 340, Lakewood Colorado 80228, dated November 2, 2006.

Eckoff, P. and T. Braverman. Addendum to the CAL3QHC Version 2.0 Users Guide.

Environmental Protection Agency and the Federal Highway Administration. Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents. September 30, 2009.

Environmental Protection Agency. EPA's User's Guide to MOBILE6.1 and MOBILE6.2 Mobile Source Emission Factor Model. Report Number EPA420-R-03-010. August 2003.

Environmental Protection Agency, "EPA's User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections" EPA-454/R-92-006. November 1992.

Environmental Protection Agency and Federal Highway Administration. "Transportation Conformity Guidance for Qualitative Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas." March 2006.

Environmental Protection Agency. National Ambient Air Quality Standards. *http://www.epa.gov/air/criteria.html*

Environmental Protection Agency. Information on Health and Environmental Effects of Particulate Matter. www.epa.gov/air/particlepollution/health.html.

Environmental Protection Agency, "Guideline for Modeling Carbon Monoxide from Roadway Intersections". Report Number EPA-454/R-92-005, November 1992.

Federal Highway Administration and the Virginia Department of Transportation. Procedures for Updating Air Studies When New Planning Assumptions Become Available. October 28, 2004.

Virginia Department of Transportation. Consultant Guide. Air Quality Project-Level Analysis. Revision 18. May 2009.

APPENDIX C
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