JEFFERSON ROAD IMPROVEMENTS

SOUTH CHARLESTON, KANAWHA COUNTY, WV

AIR QUALITY ANALYSIS

West Virginia Department of Transportation
Division of Highways

STATE PROJECT U320-601.00 03
FEDERAL PROJECT STP-0601(009)D
US119 TO US 60

SEPTEMBER 2015

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1.0 *INTRODUCTION*

An air quality analysis was undertaken to evaluate the Jefferson Road Improvements project in South Charleston. Figure 1 shows the project location map. The West Virginia Division of Highways (WVDOH) has identified two alternatives (Alternative 1 and 5) which provide the best options for improving traffic flow. This analysis identifies basic air quality fundamentals, the screening model results, a comparison to the criteria and/or NAAQS, as applicable, and an overall summary.

2.0 *SUMMARY OF RESULTS*

There were no regional or project level impacts as a result of the air quality analysis. Mitigation measures are not warranted and no further analysis is required.

3.0 *AIR QUALITY FUNDAMENTALS*

Transportation projects can create localized impacts on air quality through the changes they introduce to the volume, location and character of motor vehicle traffic. The frequency and magnitude of these impacts, which manifest themselves as health risks and a general decreased quality of life, can be identified through monitoring and projected through modeling.

It is the responsibility of WVDOH to satisfactorily identify and assess the potential impacts of all federally funded highway transportation projects in the State of West Virginia. Similarly, it is the responsibility of the Federal Highway Administration (FHWA) to assure compliance with applicable laws and regulations.

Consistent with the National Environmental Policy Act (NEPA) and as further detailed in 23 CFR Part 771, projects using federal-aid funds and/or requiring FHWA approval actions must be evaluated for the potential impacts that such actions would have on the human environment. Included among the evaluation elements is air quality. In addition to the NEPA based imperative referenced above, the Federal Clean Air Act (CAA) and its subsequent amendments have established specific procedures and limitations for evaluating transportation projects in designated air quality nonattainment areas. These procedures, generally referred to as the "conformity regulations," are outlined in 42 USC Part 7401 (et. seq.) and are further detailed in Federal regulations (40 CFR Part 93). Though separate from the NEPA process, the conformity regulations likewise require WVDOH to assess the potential air quality impacts of transportation projects on the human environment.

Two notable differences exist between NEPA and CAA project level air quality requirements. NEPA applies to Federal projects regardless of location whereas the CAA applies to projects in nonattainment and maintenance. NEPA regulations also provide limited detail on the direction and criteria for project level analyses whereas the CAA and its implementing regulations provide substantial detail. A common element to project level analysis under both NEPA and the CAA is that the seven criteria pollutants of the CAA are applied to both for considering potential air quality issues. The corresponding National Ambient Air Quality Standards (NAAQS) for these pollutants are applied as the criteria for evaluating proposed projects and actions. These criteria are shown in Table 1. Only O_3, CO, and PM are currently of concern to mobile sources (motor vehicles). The State of West Virginia adheres to the same standards.

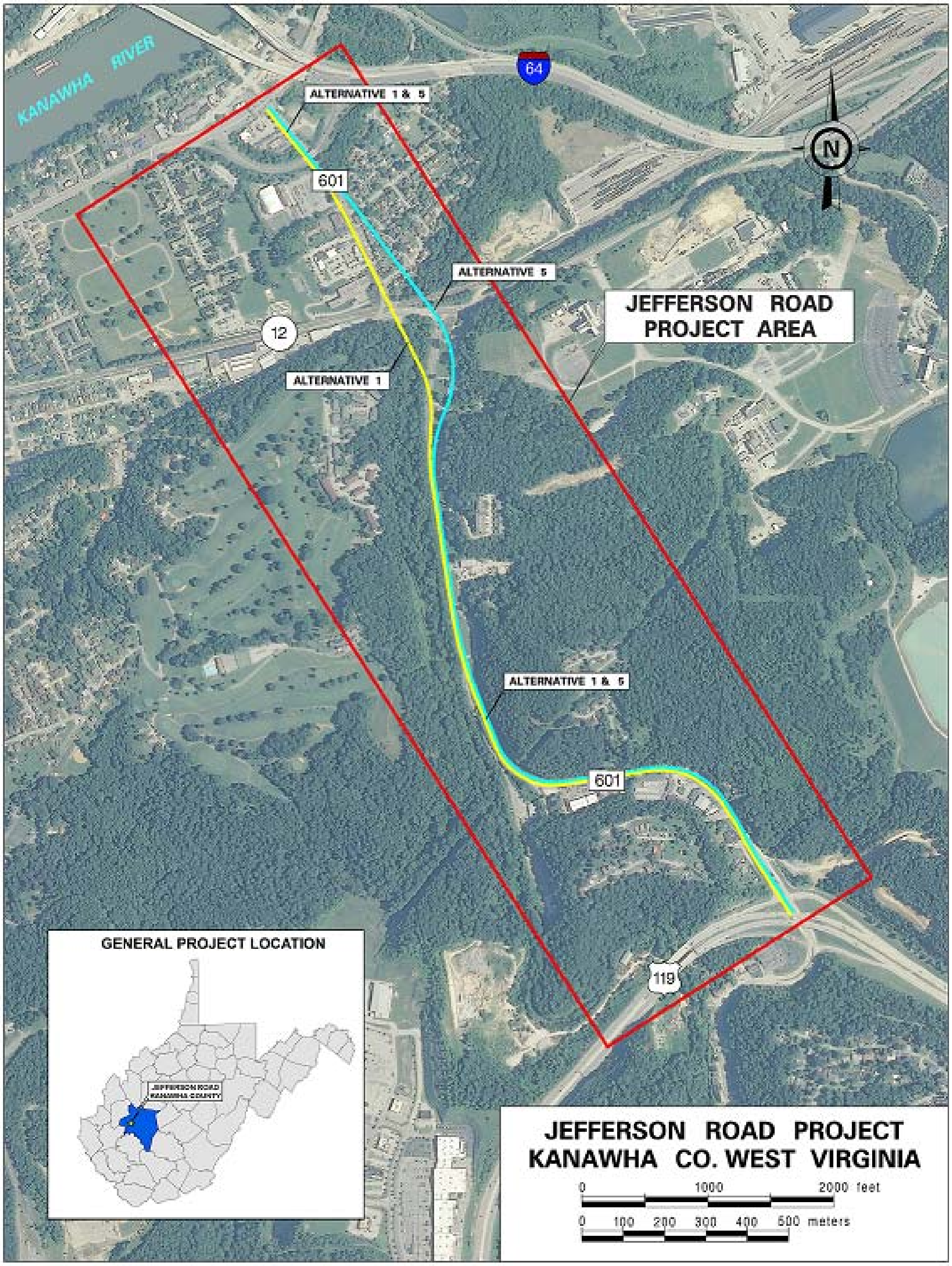


Figure 1: Project Location Map

Table 1: National Ambient Air Quality Standards

Pollutant [final rule cite]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead [73 FR 66964, Nov 12, 2008]		Primary Secondary	Rolling 3 month average	0.15 μg/m^3 [(1)]	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary Secondary	Annual	53 ppb [(2)]	Annual Mean
Ozone [73 FR 16436, Mar 27, 2008]		Primary Secondary	8-hour	0.075 ppm [(3)]	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution Dec 14, 2012	$PM_{2.5}$	Primary	Annual	12 μg/m^3	Annual mean, averaged over 3 years
		Secondary	Annual	15 μg/m^3	Annual mean, averaged over 3 years
		Primary Secondary	24-hour	35 μg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary Secondary	24-hour	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]		Primary	1-hour	75 ppb [(4)]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

4.0 *Overview, Conformity Determination, Study Methods and Analysis*

The proposed project is located in South Charleston, Kanawha County. FHWA, EPA and WVDOH applicable relevant guidance and regulations were followed in the assessment. The potential for air quality impacts were documented on a regional and project level. Based on 2010 ADT counts available on West Virginia's Department of Transportation website[1], the ADT does not exceed 22,000 vehicles on Jefferson Road.

5.0 *Ozone (O3)*

The proposed project is in an area that is no longer subject to the 1-hour standard as of June 15, 2005. It is an area currently designated as being in attainment for the 8-hour standard. Nonetheless, the project is listed as a recommended project in the 2040 Regional Intergovernmental Council Metro Mobility 2040 Transportation Plan (9/2013). The project ID is EC4/EC5 as catalogued under the Existing + Committed (E+C) Projects section in the accompanying air quality conformity analysis. Therefore, it meets its regional air quality requirements. As a result, no further action is required for ozone, a regional-level pollutant.

6.0 *Carbon Monoxide (CO)*

The proposed project is in an area designated as being in attainment of the CO standard. Please also note that there currently are no nonattainment areas in the United States for CO.

Traffic volumes and Level-Of-Service (LOS) analysis were provided by Stantec. As mentioned, the 2010 ADT of Jefferson Road is approximately 22,000 (21,800).

For CO project level requirements, the Clean Air Act Amendments do not require a CO analysis for an attainment area, however, NEPA requires some level of analysis. Therefore, a qualitative analysis was performed to document the potential of a CO impact as a result of the project as provided below.

The proposed action will modify the Jefferson Road/Kanawha Turnpike intersection to eliminate the existing "jogged' intersection. Alternative 1 will realign the Jefferson Road/Kanawha Turnpike intersection to form a single, four-legged intersection with a through-lane-only grade separation. Alternative 5 will provide a grade separation of Jefferson Road over Kanawha Turnpike. The worst case signalized intersection (Jefferson Road at Kanawha Turnpike/Mathias Lane) was selected based on LOS and delay.

In February of 2014 FHWA announced a Categorical Hot Spot Finding[2]. This document determines intersection parameter limits that when not exceeded, would not violate the NAAQS. The Carbon Monoxide Categorical Hot-Spot Finding tool was used to determine if a detailed quantitative analysis was required. This tool assesses whether a project falls within acceptable range of modeled parameters to rely on the CO categorical hot-spot finding. Based on the results of the screening tool (as shown in

[1] http://www.transportation.wv.gov/highways/programplanning/preliminary_engineering/traffic_analysis/trafficvolume/urbancounts/Pages/default.aspx

[2] FHWA's CO Categorical Hot-Spot Finding Technical Document

Appendix A) no further detailed analysis was required. Please note that although the project is outside the threshold for the allowable heavy-trucks percentage (The project has 2%, whereas the tool allows for 5% or greater since heavy trucks emit less CO than cars), the predicted volumes on each approach comprise less than 50% of the allowable 2,640 vehicles. As a result, it is highly unlikely that the project will cause a CO impact since the project falls within the acceptable modeling limits and can adhere to the categorical hot-spot finding.

Therefore, based on the predicted design year peak hour volumes, the proposed action will not cause an impact to the NAAQS for CO. No further action is needed.

7.0 PARTICULATE MATTER (PM 2.5)

The proposed project is in a designated maintenance area of the $PM_{2.5}$ standard for 1997 and 2006. For projects located in maintenance areas, no further action is required. Therefore, a $PM_{2.5}$ assessment was performed for the worst-case intersection to disclose that the proposed action will not be a project of air quality concern.

For projects with affected intersections with LOS D, E, or F (now or in the future), a qualitative $PM_{2.5}$ analysis is required based on a qualitative consideration of local factors (40 CFR Part 93.123(b)(2)).

There are several intersections in the project area that are LOS D or worse. As a result, the next step is to determine if the proposed action is a "Project of Air Quality Concern." The FHWA criteria to exempt Particulate Matter from analysis is a maximum AADT of 125,000 with a maximum of 8% (10,000) diesel trucks per day. The design year AADT is less than 30,000 and the diesel truck volume of less than 1,000 vehicles per day. Therefore, it is not a project of air quality concern. As a result, the proposed actions will not adversely affect $PM_{2.5}$. Further analysis is not required.

8.0 MOBILE SOURCE AIR TOXICS (MSAT)

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA 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 a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/iris/). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butidiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), 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. The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines.

Information that is Unavailable or Incomplete. 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 U.S. Environmental Protection Agency (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, http://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). 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.

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

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (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 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.

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

Analysis Summary. The MSAT analysis is based on FHWA's Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA (12/2012). The FHWA has developed a tiered approach for analyzing MSATs in NEPA documents. Depending on the specific project circumstances, FHWA identified three levels of analysis:

- No analysis for projects with no potential for meaningful MSAT effects;
- Qualitative analysis for projects with low potential MSAT effects;
- Quantitative analysis for projects with higher potential MSAT effects.

The proposed action is a "Project with No Meaningful Potential MSAT Effects." Three types of projects are included in this category:

- Projects qualifying as a categorical exclusion under 23 CFR 771.117(c);
- Projects exempt under the Clean Air Act (CAA) Conformity rule under 40 CFR
- Other projects with no meaningful impacts on traffic volumes or vehicle mix.

This project is classified as "Other projects with no meaningful impacts on traffic volumes or vehicle mix." For other projects with no or negligible traffic impacts, regardless of the class of NEPA environmental document, no MSAT analysis is required. However, the project record should document the basis for the determination of "no meaningful potential impacts" with a brief description of the factors considered. The qualitative assessment is presented below:

The amount of MSAT emitted would be proportional to the vehicle miles traveled (VMT), assuming that other variables such as fleet mix are the same for each alternative. The estimated VMT for Alternative 1 is slightly lower than that for the No-Build Alternative, because the realignment would slightly decrease the travel distance between north and south project construction limits termini. This decrease in VMT means MSAT under Alternative 1 would probably be lower than the No-Build Alternative in the study area. However, the estimated VMT for Alternative 5 is slightly higher than that for the No-Build Alternative, because the grade separation and realignment would slightly increase the travel distance between north and south project construction limits termini and may facilitate new development that attracts trips that would not otherwise occur in the area. This increase in VMT means MSAT under the chosen Preferred Alternative would probably be higher than the No-Build Alternative in the study area. There could also be localized differences in MSAT from indirect effects of the project such as associated access traffic, emissions of evaporative MSAT (e.g., benzene) from parked cars and emissions of diesel particulate matter from delivery trucks. Travel to other destinations would be reduced with subsequent decreases in emissions at those locations.

For both alternatives, emissions are virtually certain to 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 83 percent from 2010 to 2050 (Figure 2). 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 than they are today. Therefore, this project has been determined to generate minimal air quality impacts for CAAA criteria pollutants and has not been linked with any special MSAT concerns.

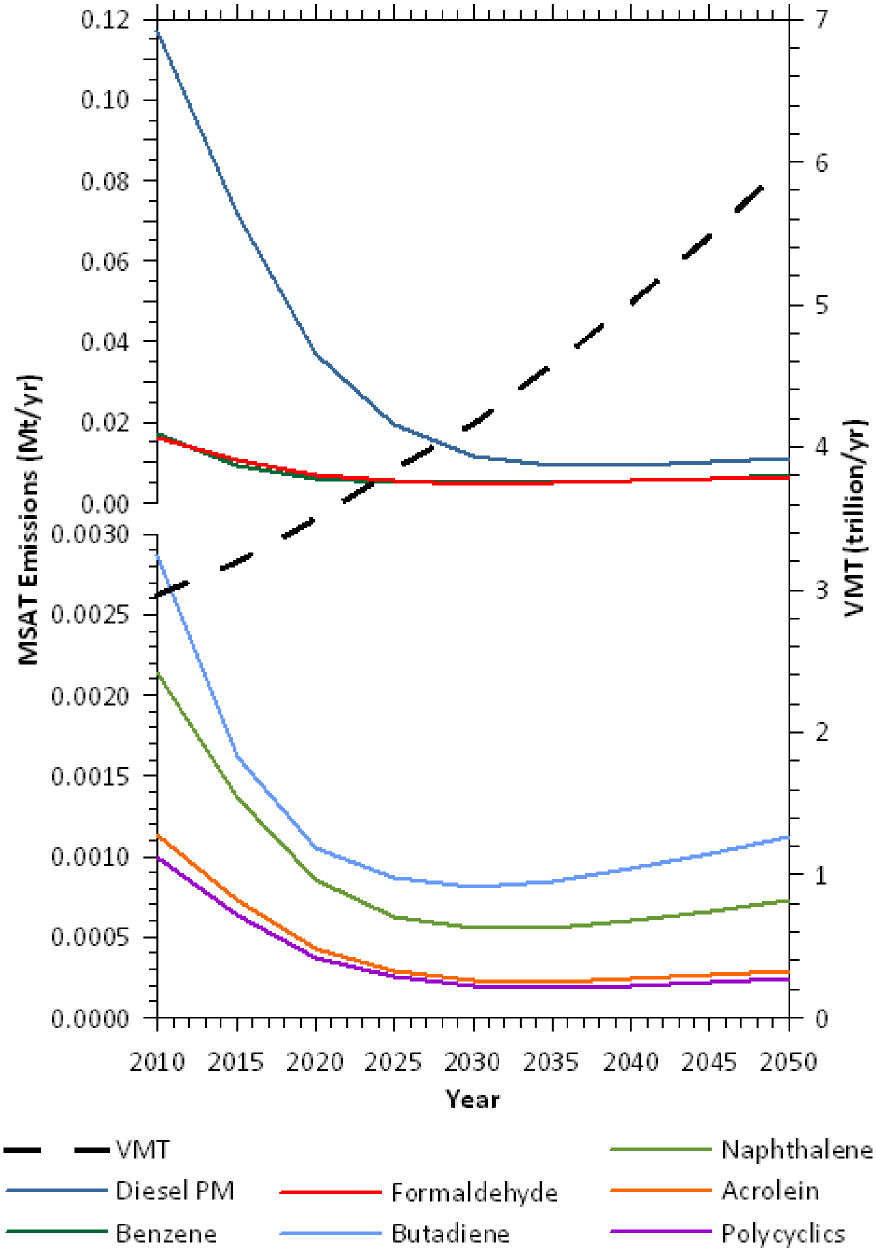
9.0 GREENHOUSE GASES (GHG) AND CLIMATE CHANGE

Transportation sources contribute to greenhouse gas emissions (GHG) through the burning of petroleum-based fuel. According to the FHWA, transportation sources are responsible for approximately one-quarter of the GHG emissions in the US. Under the Clean Air Act, the EPA has the authority to establish motor vehicle emissions standards for CO_2 and other greenhouse gases although such standards have not yet been established as part of the NAAQS. FHWA is actively involved in efforts to initiate, collect, and disseminate climate-change-related research and to provide technical assistance.

FHWA's current approach on the issue of carbon emissions is as follows:

> "To date, no national standards have been established regarding greenhouse gases, nor has the USEPA established criteria or thresholds for greenhouse gas emissions. FHWA does not believe it is informative at this point to consider greenhouse gas emissions in an EIS. FHWA is actively engaged in many activities with the USDOT Center for Climate Change to develop strategies to reduce transportation's contribution to greenhouse gases in particular CO_2 emissions, and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. FHWA will review and update its approach to climate change at both the project and policy level as more information

emerges and as policies and legal requirements evolve. Discussions regarding greenhouse gas emissions are ongoing."



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.

Figure 2: National MSAT Emission Trends 2010-2050 for Vehicles Operating on Roadways Using EPA's MOVES2010b Model

APPENDIX A

(Categorical Hot-Spot finding Screening Analyses)
(Alternatives 1 and 5)

Air Quality
Transportation Conformity

Carbon Monoxide Categorical Hot-Spot Finding

Results

Urban Intersection

Project Description
Jefferson Road Improvements Alt. 1

Parameter	Entered value	Acceptable range	
Analysis Year	2030	≥ 2015	✓
Angle of cross streets for intersection (degrees)	90	90	✓
Maximum grade for intersection (%)	2	≤ 2	✓
Maximum grade (%) on cross street for intersection	0	0	✓
Number of through lanes			
Approach 1	2	≤ 4	✓
Approach 2	2	≤ 4	✓
Approach 3	3	≤ 4	✓
Approach 4	2	≤ 4	✓
Number of left turn lanes			
Approach 1	1	≤ 2	✓
Approach 2	1	≤ 2	✓
Approach 3	1	≤ 2	✓
Approach 4	1	≤ 2	✓
Lane width (ft)	12	12	✓
Median width (ft)	0	0	✓
Peak hour average approach speed (mph)			
Approach 1	45	≥ 25	✓
Approach 2	45	≥ 25	✓
Approach 3	45	≥ 25	✓

Approach 4	45	≥ 25	✓
Maximum approach volume (vph)			
Approach 1	791	≤ 2640	✓
Approach 2	1036	≤ 2640	✓
Approach 3	964	≤ 2640	✓
Approach 4	611	≤ 2640	✓
Level of Service	d	A through E	✓
Ambient temperature (°F)	36	≥ -10	✓
Heavy-duty trucks (%)	2	≥ 5	✗
1-hour background CO concentration (ppm)	28	≤ 29.5	✓
8-hour background CO concentration (ppm)	5	≤ 5.1	✓
Persistence Factor	0.7	≤ 0.7	✓

If all checks are green, the project parameters entered on the form are within the acceptable range to rely on FHWA's categorical finding for the intersection being analyzed for the project. All intersections requiring analysis must fall within the acceptable range for all the parameters in order to rely on the CO categorical hot-spot finding. Reliance on the CO categorical hot-spot finding is still subject to existing interagency consultation and the public involvement requirements under NEPA and the conformity rule (40 CFR 93.105) for this project.

If any of the checks are red, as indicted by the red X(s) above, one or more of the project parameters entered on the form fall outside the acceptable range to rely on the FHWA's categorical finding for the intersection being analyzed for this project. A project specific CO hot-spot analysis will be necessary to meet the requirements of 40 CFR 93.116(a) of the transportation conformity rule.

Carbon Monoxide Categorical Hot-Spot Finding

Results

Urban Intersection

Project Description Jefferson Road Improvements Alt. 5 Jefferson Rd and Connector

Parameter	Entered value	Acceptable range	
Analysis Year	2030	≥ 2015	✓
Angle of cross streets for intersection (degrees)	90	90	✓
Maximum grade for intersection (%)	2	≤ 2	✓
Maximum grade (%) on cross street for intersection	0	0	✓
Number of through lanes			
Approach 1	1	≤ 4	✓
Approach 2	0	≤ 4	✓
Approach 3	1	≤ 4	✓
Approach 4	1	≤ 4	✓
Number of left turn lanes			
Approach 1	0	≤ 2	✓
Approach 2	0	≤ 2	✓
Approach 3	2	≤ 2	✓
Approach 4	1	≤ 2	✓
Lane width (ft)	12	12	✓
Median width (ft)	0	0	✓
Peak hour average approach speed (mph)			
Approach 1	45	≥ 25	✓
Approach 2	45	≥ 25	✓
Approach 3	45	≥ 25	✓

Approach 4	45	≥ 25	
Maximum approach volume (vph)			
Approach 1	808	≤ 2640	
Approach 2	0	≤ 2640	
Approach 3	1039	≤ 2640	
Approach 4	115	≤ 2640	
Level of Service	c	A through E	
Ambient temperature (°F)	36	≥ -10	
Heavy-duty trucks (%)	2	≥ 5	
1-hour background CO concentration (ppm)	28	≤ 29.5	
8-hour background CO concentration (ppm)	5	≤ 5.1	
Persistence Factor	0.7	≤ 0.7	

If all checks are green, the project parameters entered on the form are within the acceptable range to rely on FHWA's categorical finding for the intersection being analyzed for the project. All intersections requiring analysis must fall within the acceptable range for all the parameters in order to rely on the CO categorical hot-spot finding. Reliance on the CO categorical hot-spot finding is still subject to existing interagency consultation and the public involvement requirements under NEPA and the conformity rule (40 CFR 93.105) for this project.

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