Mobile Source Air Toxics

Quantitative Analysis Guidance
and
Emission Rates Look-up Tables

Office of Environmental Management
Florida Department of Transportation

February 2018

TABLE OF CONTENTS

Figures

Tables

Appendices

List of Acronyms and Abbreviations

AADT	Annual average daily traffic
CFR	Code of Federal Regulations
DPM	Diesel particulate matter
EPA	Environmental Protection Agency
ERLT	Emission Rate Look-up Tables
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FLHSMV	Florida Department of Highway Safety and Motor Vehicles
HAP	Hazardous air pollutants
hr	Hour
I/M	Inspection / Maintenance
lb	Pound
LOS	Level of service
MOVES	Motor Vehicle Emission Simulator
mph	Miles per hour
MSAT	Mobile Source Air Toxic
N/A	Not applicable
NATA	National Air Toxics Assessment
NEPA	National Environmental Policy Act
PD&E	Project Development & Environment
POM	Polycyclic organic matter
VMT	Vehicle miles traveled

Glossary

Emission Rate Lookup Tables

Tables of emission rates for the nine priority MSAT pollutants for varying locations, years, road types, and speeds developed using the MOVES2014 model. Emission Rate Lookup Tables can be found in Appendix A.

Mobile Source Air Toxics

Compounds emitted into the air from mobile sources that are known, or suspected, to cause cancer or other serious health and environmental effects.

Priority MSAT

Nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risks contributors according to EPA's 2011 National Air Toxics Assessment. The nine priority MSAT are: 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter.

This page intentionally left blank

CHAPTER 1

Introduction

This document provides guidance on conducting Mobile Source Air Toxics (MSAT) emission analysis in the Project Development and Environment (PD&E) Studies. The guidance explains how to determine the level of MSAT analysis, how to conduct quantitative MSAT analysis and how to document MSAT analysis in air quality technical report, if necessary.

This document further describes the methodology for developing quantitative analysis of mobile source air toxics (MSAT) using emission rates look-up tables (ERLT). ERLT contain an array of emission rates categorized by average speed, area type, functional classification, and analysis year. The Florida Department of Transportation used Motor Vehicle Emissions Model Simulator (MOVES2014a) model to develop the ERLT. ERLT should be used for quantitative MSAT analysis performed in the PD&E studies.

The remainder of this chapter provides a brief background concerning MSAT analysis. Chapter 2 describes the level of analysis requirements for MSAT analysis in the PD&E studies.

Chapter 3 provides guidance on estimating MSAT emissions quantitatively using FDOT prepared MSAT ERLT. Quantitative MSAT analyses involve identifying roadway links in an affected project area, calculating emissions for the analysis area for different analysis years, and comparing the estimated emissions between project alternatives.

Chapter 4 describes the ERLT development methodology, model used, data and assumptions used in the analysis, and outlines steps taken to assure quality. The ERLT are available in MS Excel format to allow the users to query emission rates based on project-specific information. ERLT can be downloaded from the Office of Environmental Management website. All supporting data used to prepare the tables (including model run specifications, input data, input data spreadsheets, output data, and post-processing scripts and spreadsheets) can be requested from the Office of Environmental Management.

Mobile Source Air Toxics Background

MSAT are hazardous air pollutants (HAP) emitted by mobile sources. HAP are compounds known, or suspected, to cause cancer or other serious health and environmental effects. The Environmental Protection Agency (EPA) has identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (NATA). In the **Updated Interim Guidance on MSAT Analysis in National Environmental**

Policy Act (NEPA) Documents (2016)[1], FHWA considers these nine compounds priority MSAT. The nine priority MSAT are acetaldehyde (ACE), acrolein (ACROL), benzene (BENZ), 1,3-butadiene (BUTA), diesel particulate matter plus diesel exhaust organic gases (DPM), ethylbenzene (ETB), formaldehyde (FORM), naphthalene (NAP), and polycyclic organic matter (POM).

According to the FHWA interim guidance, a quantitative MSAT analysis should be considered for transportation projects located in proximity to populated areas that create new capacity or add significant capacity to urban roadways with projected annual average daily traffic (AADT) of at least 140,000 vehicles, or create (or significantly alter) a major intermodal freight facility involving significant numbers of diesel vehicles. Using EPA's MOVES2014a emissions model, FHWA determined that this range of AADT would result in emissions significantly lower than the Clean Air Act definition of a HAP source, i.e., 25 tons per year for all HAPs or 10 tons per year for any single HAP.

[1]Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents
https://www.fhwa.dot.gov/environMent/air_quality/air_toxics/policy_and_guidance/msat/2016msat.pdf

CHAPTER 2

MSAT Analysis in PD&E Studies

Quantitative MSAT analysis is intended to differentiate project alternatives with higher potential MSAT effects. This analysis requires knowledge of the traffic volumes in roadway segments within the project area.

Level of Analysis

The **FHWA Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents** provides guidance regarding when and how to analyze MSAT in the NEPA review process for transportation projects. The guidance is based on the release of the most recent version of MOVES and the status of scientific research on air toxics. MOVES2014a includes updated data on some emissions and pollutant processes.

Using EPA's MOVES2014a model, FHWA estimated that even if projected VMT increases by 45 percent from 2010 to 2050, a combined reduction of 91 percent in the total annual emissions for the priority MSAT are projected for the same period (See **Figure 1**).

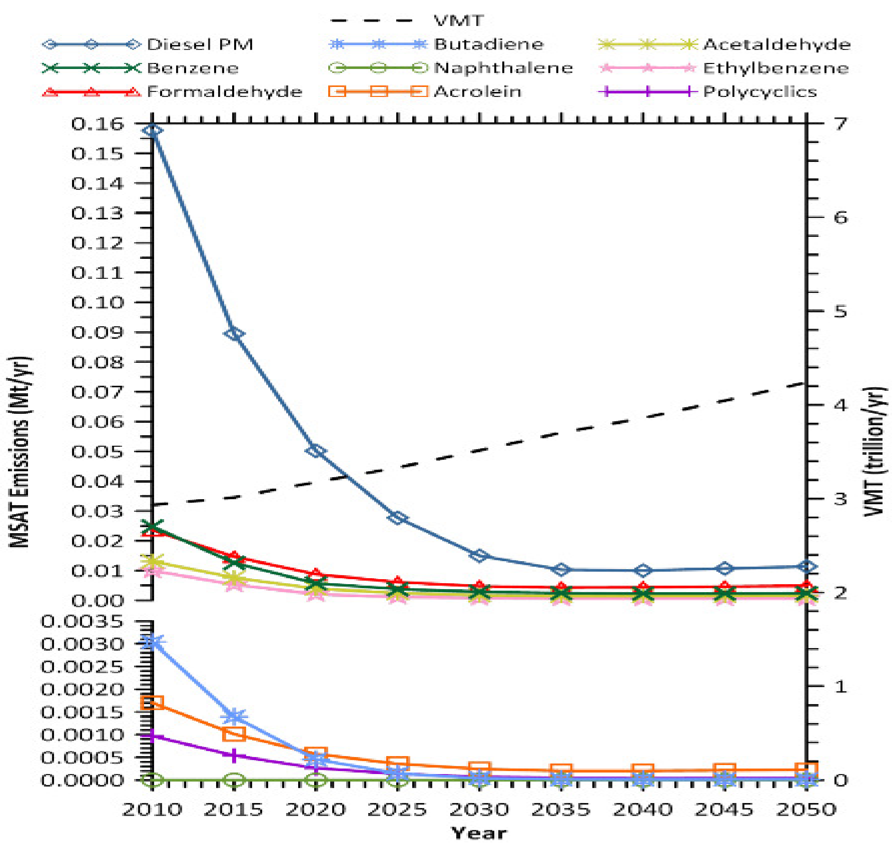


Figure 1. FHWA Projected National MSAT Emission Trends 2010 through 2050

FHWA has developed the following tiered approach for analyzing MSAT in NEPA documents based 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 Exempted from MSAT Analysis

FHWA has determined that the following types of projects have no meaningful potential MSAT effects and thus exempted from MSAT analysis:

- Projects qualifying as a categorical exclusion under 23 CFR 771.117;
- Projects exempt under the Clean Air Act conformity rule under 40 CFR 93.126; and
- Other projects with no meaningful impacts on traffic volumes or vehicle mix regardless of the NEPA class of action.

These projects do require analysis or discussion of MSAT. Documentation sufficient to demonstrate that the project qualifies as a Categorical Exclusion project will suffice..

Environmental Assessment (EA) or Environmental Impact Statement (EIS) with no impacts on traffic volumes or vehicles mix should document the basis for the determination of no meaningful potential impacts with a brief description of the factors considered. Appendix A of the FHWA interim guidance contain example language that should be modified to reflect the project-specific conditions and added in the EA or EIS prepared for these projects.

Projects Requiring Qualitative MSAT Assessment

Projects in this category include those which 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. Examples of these projects are minor widening projects; new interchanges; replacing a signalized intersection on a surface street; and projects where design year AADT is projected to be less than 140,000 vehicles.

Qualitative assessment should compare, in narrative form, the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic and the associated changes in MSAT for the project alternatives, including no-build, based on VMT, vehicle mix, and speed. It should also discuss national trend data projecting substantial overall reductions in emissions due to stricter engine and fuel regulations issued by EPA.

NEPA documents for this category must include a discussion of information that is incomplete or unavailable for a project specific assessment of MSAT impacts, in compliance with the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22(b)). This discussion should explain how current scientific techniques, tools, and data are not sufficient to accurately estimate human health impacts that could result from a transportation project in a way that would be useful to decision-makers. Also in compliance with 40 CFR 150.22(b), this discussion should contain information regarding the health impacts of MSAT as provided in Appendix C of the FHWA interim guidance.

Projects Requiring Quantitative MSAT Analysis

Projects in this category must be proposed in proximity to populated areas and either:

- 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 with 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 at least 140,000 vehicles by the design year;

Projects in this category should include a quantitative analysis for MSAT impacts.

CHAPTER 3

Quantitative MSAT Analysis

Quantitative MSAT analyses are intended to differentiate project alternatives with higher potential MSAT effects. The ERLT should be used to estimate MSAT emissions for projects warranting quantitative MSAT analysis—i.e. projects falling within category 3. Quantitative MSAT analysis consists of defining the area of analysis; obtaining data, estimating emissions using emission rates from ERLT, aggregating emissions, and discussion of results.

Defining the Area of MSAT Analysis

The area of quantitative MSAT analysis should be defined from the project traffic analysis area. The area should include freeway segments, ramps, crossing arterials, ramp terminals, and intersections. **Figure 2** shows an example of the area of analysis.

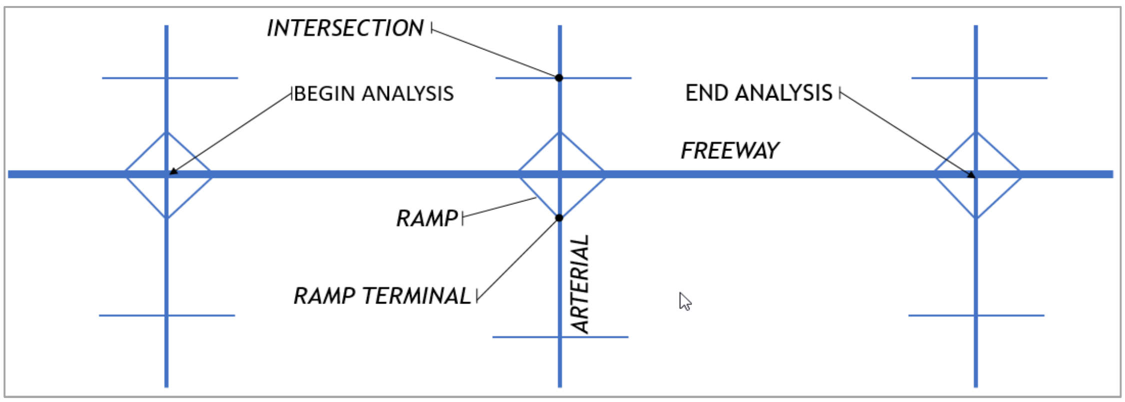


Figure 2. Area of analysis

Data Requirements

Quantitative MSAT analysis requires the following information:

1. Alternatives to be analyzed—No build alternative, and build alternative(s)
2. Area of MSAT Analysis
3. Existing traffic volumes (AADT)
4. Projected traffic volumes (AADT) on each link in each alternative
5. Average speed on each link in the study area in each alternative
6. Idling delay
7. Emission rates

Traffic data should be obtained from the Project Traffic Analysis Report or Project Traffic Demand Forecasting Memorandum, as appropriate.

Estimating Emission Rates

Once the MSAT analysis area has been determined, the daily vehicle miles traveled (VMT) per link should be calculated and applicable MSAT emission rates obtained from the ERLT. FDOT has prepared the ERLT to estimate emission rates for the nine priority MSAT pollutants for highways with projected AADT greater than 140,000 vehicles in each District. There are no highways with greater than 140,000 vehicles in District 3; therefore, ERLT are not available in this District. The emission rates can be used for estimating emissions for projects that require quantitative MSAT analysis. The emission rates are in grams per mile. ERLT can be downloaded from the Office of Environmental Management website. Emission rates can be queried from the ERLT based on project-specific information.

Obtaining MSAT Emission Rates from ERLT

The ERLT contain emission rates based on FDOT District, year, MSAT pollutant, roadway type, and speed. To obtain MSAT emission rates from ERLT, the analyst should know:

1. **The FDOT District the project is located**.
2. **The years of analysis for the project**. ERLT were estimated from 2016 up to 2040. Extrapolate if the design year is 2045. If design year is greater than 2045, contact the Office of Environmental Management to determine the appropriate methodology to use in developing the emission rates.
3. **The MSAT pollutants to be analyzed**. All the priority MSAT pollutants should be analyzed.
4. **The type of roadway facilities involved**. Emission rates vary by roadway type (restricted access or unrestricted access) and area type (urban or rural).
5. **The average speed of each link**. Emission factors for most MSAT decline abruptly between 2.5 and 20 miles per hour (mph) with a more gradual decline from 20 to 75 mph. Emission factors at 2.5 mph can be used to estimate idling emissions.

For example, suppose a specific link has an estimated average speed of 20 mph and is of the Urban Restricted Access road type. The project is in District 1 and the base years is 2016. Using this information, the analyst would obtain emission rates from the ERLT for the appropriate FDOT District (District 1), analysis year (2016), road type (Urban Restricted Access), and speed (20 mph) for the segment. Idling emission factors are determined in a similar manner, but the emission factor for 2.5 mph is used. For this link, the running and idling emission rates (rounded to four decimal places) for Benzene (BENZ) are 0.0045 g/mi and 0.0231 g/mi, respectively (See **Table 1**).

TABLE 1. EXAMPLES OF EMISSION RATES FROM ERLT FOR A SPECIFIC LINK

Speed mph	BENZ, g/mi	BUTA, g/mi	FORM, g/mi	NAP, g/mi	ACE, g/mi	ACROL, g/mi	ETB, g/mi	POM, g/mi	DPM, g/mi
2.5	0.0231	0.0037	0.0372	0.0042	0.0195	0.0025	0.0185	0.0017	0.3835
20	0.0045	0.0007	0.0063	0.0007	0.0034	0.0004	0.0031	0.0003	0.0643

Estimating Emissions

MSAT emission calculations will include estimating both running and idling emissions.

Running Emissions

For each roadway type and average speed, the following equation is used to estimate emission from running vehicles:

*Emissions (lb/day) = Emission Rate (grams/mile) * VMT (miles/day) *1 lb/453.59237 grams.*

VMT is the vehicle miles of travel calculated by multiplying daily traffic volume (AADT) and length of the link or segment.

Idling Emissions

Idling emissions are estimated at a speed of 2.5 mph, for each link in the study area using the following equation:

*Emissions (lb/day) = Emission Rate (grams/mile) * 2.5 miles/hr * Idling hr/day * 1 lb/453.59237 grams.*

Total Emission

Total emission for each alternative under evaluation is the sum of emissions of all nine priority MSAT pollutants in each link.

Total Emissions (lb/day) = Running emission (lb/day) + Idling emission (lb/day)

Example

Suppose the link or segment discussed in Obtaining MSAT Emission Rates from ERLT section had VMT of 250,000 miles/day and idling duration of 2 hours a day, the emissions will be estimated as shown in Table 8. For this link, idling and running emissions associated with BENZ are 0.0003 lb and 2.4802 lb, respectively. Benzene alone would contribute to 2.4805 lb of MSAT emissions in that link (See **Table 2**).

Note that the emissions from this link would be finally aggregated with the emissions from all other links or segments, to estimate total MSAT emissions for the project alternative.

TABLE 2. ESTIMATES OF MSAT EMISSIONS FOR A SPECIFIC LINK

Emission	BENZ, lb	BUTA, lb	FORM, lb	NAP, lb	ACE, lb	ACROL, lb	ETB, lb	POM, lb	DPM, lb
Idling	0.0003	0	0.0004	0	0.0002	0	0.0002	0	0.0042
Running	2.4802	0.3858	3.4723	0.3858	1.8739	0.2205	1.7086	0.1653	35.4393
Total	2.4805	0.3858	3.4727	0.3858	1.8741	0.2205	1.7088	0.1653	35.4435

Documentation of Quantitative MSAT Analysis

Documentation for quantitative MSAT analysis in the Air Quality Technical Memorandum should include the following items:

- **Project specific MSAT information.** Include a brief project description, project location, analysis years (base year and design year), identification of whether an interim year is required, names of alternatives evaluated; and explanation of why quantitative MSAT analysis is performed.

- **Methodology used to estimate MSAT emissions**. Use FDOT developed ERLT. Develop MSAT area of analysis with appropriate data (traffic volumes and average speeds in each link, length of each link). Reference or state the source of traffic inputs.

- **Estimation of MSAT emissions**. For each link in the project area, multiply applicable emission rates for each priority MSAT by VMT. Aggregate the emissions from each link to determine total emissions for each priority MSAT. Aggregate the emissions for each priority MSAT to determine the total MSAT emissions. Include a table with total MSAT emissions for the priority MSAT by analysis year, for each alternative analyzed. Include percent change of emission between the analysis years in the table.

- **Discussion of MSAT analysis results and comparison of the MSAT emission changes.** Discuss analysis results for the base year, interim year (if applicable), and design year for each build alternative and the no-build alternative. Include discussion of how the proposed improvement affect base MSAT emissions. Use a bar chart or similar chart to visually compare MSAT trends between analysis years.

- **Incomplete or unavailable information**. Since the MSAT analysis is evolving, include a discussion of unavailable information for project-specific MSAT health impact analysis from Appendix C of the FHWA Interim Guidance should be included.

- **Mitigation strategies** (if needed for projects with potentially significant MSAT levels). Use Appendix E of the FHWA Interim Guidance for information on mitigation strategies.

Documentation for quantitative MSAT analysis in the Environmental Document (EA or EIS) should include a summary of MSAT analysis and reference the Air Quality Technical

Memorandum. Appropriate statements regarding MSAT analysis based on the project specifics should be included in the Environmental Document as appropriate.

CHAPTER 4

ERLT Development Methodology

This Chapter provides a summary of the procedure that was followed to develop the ERLT.

Model Used

MOVES2014a emission model, with the November 2016 update, was used to derive the ERLT. Any references of MOVES2014 or MOVES modeling in this guidance refer to using the MOVES2014a model.

FDOT Districts

Table 3 describes the geographic location and counties for each FDOT District.

TABLE 3. FDOT DISTRICT GEOGRAPHIC LOCATIONS AND COUNTIES

District	Location	Counties
1	Southwest Florida	Charlotte, Collier, De Soto, Glades, Hardee, Hendry, Highlands, Lee, Manatee, Okeechobee, Polk, and Sarasota
2	Northeast Florida	Alachua, Baker, Bradford, Clay, Columbia, Dixie, Duval, Gilchrist, Hamilton, Lafayette, Levy, Madison, Nassau, Putnam, St. Johns, Suwannee, Taylor, and Union
3 *	Northwest Florida	Bay, Calhoun, Escambia, Franklin, Gadsden, Gulf, Holmes, Jackson, Jefferson, Leon, Liberty, Okaloosa, Santa Rosa, Wakulla, Walton, and Washington
4	Southeast Florida	Broward, Indian River, Martin, Palm Beach, and St. Lucie
5	Central Florida	Brevard, Flagler, Lake, Marion, Orange, Osceola, Seminole, Sumter, and Volusia
6	South Florida	Miami-Dade and Monroe
7	West Central Florida	Citrus, Hernando, Hillsborough, Pasco, and Pinellas

* While FDOT District 3 is listed, MSAT emission rates were not developed for this district. There are no highways greater than 140,000 annual average daily traffic (AADT) in District 3; therefore, quantitative MSAT analyses are not required.

The FHWA recommends using MOVES at the County scale for quantitative MSAT analysis. The County scale refers to a method of operating MOVES and does not imply that an entire geographic county is being modeled. The County scale requires area-specific input data, which is conducive to developing MSAT emission inventories for the affected transportation network or affected environment of a proposed project in the NEPA context. Data is input to the County Data Manager for specific parameters. **Table 4** provides the sources used for input parameters into the MOVES County Data Manager. Inputs to the MOVES County Data Manager can be found in Appendix A.

TABLE 4. MOVES 2014 COUNTY DATA MANAGER INPUT PARAMETERS

Input Parameter	Description	Source
Source Type Population	Fraction of vehicle population by 13 source types	Florida Department Highway Safety and Motor Vehicles Registration Data
Average Speed Distribution	Fraction of VMT by 16 speed bins, for 13 source types, 4 road types, 24 hours of a day, and weekday versus weekend	Florida Department of Transportation Highway Performance Monitoring System Data
Source Type Age Distribution	Fraction of vehicle population by age for 13 source types	Florida Department of Highway Safety and Motor Vehicles Registration Data and age distribution tool for MOVES2014 [1]
Road Type Distribution	Fraction of VMT occurring by 4 road types, for 13 source types	Florida Department of Transportation Highway Performance Monitoring System Data
Fuel Supply, Formulation, and Usage Fraction, and Alternative Vehicle Fuel Technology	Various data describing local fuel supply, formulations, usage fraction, and alternative vehicle fuel technologies	MOVES default
Meteorology	Ambient temperature and relative humidity for each hour of each month	Averaged MOVES defaults for every county within FDOT District
Inspection/Maintenance (I/M) Program Coverage	Various data describing local I/M program characteristics	Not applicable; Florida does not have I/M programs
VMT Fraction	Fraction of total VMT for 6 vehicle types; fraction of VMT occurring by month, day, and hour for 13 source types	Florida Department of Transportation and MOVES default

[1] Environmental Protection Agency (EPA), 2014. Default Age Distribution Tool for MOVES2014 (XLS). Available: https://www.epa.gov/sites/production/files/2016-06/default-age-distribution-tool-moves2014.xlsx. Accessed May 11, 2017.

The MOVES Rates calculation type was used to provide MSAT emission rates differentiated by vehicle speed. Each MOVES model run, at the County scale, only accepts input and provides output for a geographical region for a specific analysis year. There are six FDOT Districts and 26 analysis years. The FDOT Districts and analysis years used in the MOVES modeling are presented in **Table 5**.

TABLE 5. FDOT DISTRICTS AND ANALYSIS YEARS MODELED

Parameter	Input
FDOT Districts [1]	1, 2, 4, 5, 6, 7
Analysis years	2010 and 2016 through 2040

[1] FDOT District 3 is not included in the modeling because there are no highways where the AADT is projected to be 140,000 or greater.

The nine priority MSATs modeled include: 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (DPM), ethyl benzene, formaldehyde, naphthalene, and polycyclic organic matter (POM). MOVES calculates the emissions of some MSATs from other pollutants.

These other prerequisite pollutants were modeled in order to estimate emissions of the MSAT pollutants.

DPM emissions are not computed as a separate pollutant type in MOVES. DPM emissions are represented as the total Particulate Matter 10 micrometers (PM10) from running exhaust and crankcase running exhaust for diesel fueled vehicles only. Because of this, separate sets of MOVES runs were conducted for DPM than for the other MSAT to ease the amount of post-processing.

Emissions of 1,3-butadiene, acetaldehyde, acrolein, benzene, ethyl benzene, formaldehyde, and naphthalene are estimated directly by the model. Naphthalene emissions are the sum of naphthalene gas and naphthalene particles. Like DPM, polycyclic organic matter (POM) cannot be modeled directly as an individual pollutant in MOVES. **Table 6** presents the following individual pollutants that were modeled and summed to determine POM.

TABLE 6. POLYCYCLIC ORGANIC MATTER POLLUTANT CONSTITUENTS

Pollutant Name	MOVES Pollutant ID	Pollutant Name	MOVES Pollutant ID
Dibenzo(a,h)anthracene particle	68	Dibenzo(a,h)anthracene gas	168
Fluoranthene particle	69	Fluoranthene gas	169
Acenaphthene particle	70	Acenaphthene gas	170
Acenaphthylene particle	71	Acenaphthylene gas	171
Anthracene particle	72	Anthracene gas	172
Benz(a)anthracene particle	73	Benz(a)anthracene gas	173
Benzo(a)pyrene particle	74	Benzo(a)pyrene gas	174
Benzo(b)fluoranthene particle	75	Benzo(b)fluoranthene gas	175
Benzo(g,h,i)perylene particle	76	Benzo(g,h,i)perylene gas	176
Benzo(k)fluoranthene particle	77	Benzo(k)fluoranthene gas	177
Chrysene particle	78	Chrysene gas	178
Fluorene particle	81	Fluorene gas	181
Indeno(1,2,3,c,d)pyrene particle	82	Indeno(1,2,3,c,d)pyrene gas	182
Phenanthrene particle	83	Phenanthrene gas	183
Pyrene particle	84	Pyrene gas	184

A representative county was defined for each district, using information applicable to the entire district (if available). **Table 7** presents the representative counties for each district used in the modeling. Meteorological data was averaged over all counties within each FDOT District. Winter and summer seasons (months of January and July) were modeled to account for changes in meteorology and fuels during the year. The greater of the two emission factor values between January and July was selected to develop the ERLT.

Data provided by FDOT for 2010 and 2040 was mapped to an appropriate FDOT District and linearly interpolated to estimate values for interim years. This data includes average speed distribution, hourly VMT fractions, ramp fractions, road type VMT distribution, and vehicle type VMT. Data provided by Florida Department of Highway Safety and Motor Vehicles (FLHSMV) includes vehicle age distribution and vehicle registration data (which served as a surrogate of vehicle population). Vehicle type registration information from registrations were appropriately mapped from the Florida registration classification system to the MOVES model classification system. Source vehicle type populations for future analysis years were assumed to grow at the same rate as the human population in each FDOT District, according to data from the Florida Office of Economic and Demographic Research.[2]

TABLE 7. REPRESENTATIVE COUNTIES USED FOR EACH DISTRICT

District	Representative County
1	Lee
2	Duval
4	Broward
5	Orange
6	Miami-Dade
7	Hillsborough

All vehicles and fuels, except for electric vehicles/electricity, were modeled. All road types, except for off-network, were modeled. Off-network includes only non-roadway emissions that are not included in MSAT analysis. Emissions processes modeled running exhaust, crankcase running exhaust, evaporative permeation and evaporative fuel leaks (the other emission processes from vehicles do not occur on roadways). There is no Rural Restricted Access or Rural Unrestricted Access emission factors for FDOT Districts 4 and 6 because those road types do not exist in these districts.

The MOVES2014a default values for fuel formulation and fuel supply were used because Florida does not have a full local fuel property study as recommended in the MOVES2014a Technical Guidance Document, Section 4.9.1: "EPA strongly recommends using the default fuel properties for a region unless a full local fuel property study exists." Within a FDOT District, some counties use a different set of fuel formulations and fuel usage fractions than other counties. The set of fuel formulations and usage fractions that result in slightly greater values were used to model the entire FDOT District to provide a conservative estimate.

[2] Florida Office of Economic and Demographic Research, 2016. Projects of Florida Population by County, 2020-2045, with Estimates for 2016. Available: http://edr.state.fl.us/Content/population-demographics/data/MediumProjections_2016.pdf. Accessed September 15, 2017.

Quality Assurance

Most cases of incorrect or counterintuitive MOVES results are explained by input errors. The MOVES 2014a County Data Manager tool for importing data provides important error-checking capabilities. Any errors involved in input data are resolved upon import using the County Data Manager. Any runs that resulted in an error were diagnosed and corrected prior to being re-run.

MOVES model run results were post-processed with queries to determine that all applicable pollutants, emissions processes, road types, source types, fuel types, and average speed bins were modeled for every run. Note that MOVES currently reports zero emissions from some pollutants and fuel combinations.

Additional quality assurance was performed to determine:

- Distributions sum to one,
- Emissions trends between model runs (e.g., analysis years) make sense,
- Related model runs are of the same number of rows and file size, and
- Consistency between model runs and any data outliers

This page intentionally left blank

Appendix A

Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents

U.S. Department of Transportation
Federal Highway Administration

Memorandum

SENT VIA ELECTRONIC MAIL

Subject: **INFORMATION:** Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents

Date: October 18, 2016

/S/Original signed by

From: Emily Biondi
Acting Director, Office of Natural Environment

In Reply Refer To: HEPN-10

To: Division Administrators
Federal Lands Highway Division Engineers

PURPOSE

The purpose of this memorandum is to update the December 2012, Interim Guidance that advised Federal Highway (FHWA) Division Offices on when and how to analyze Mobile Source Air Toxics (MSAT) within the National Environmental Policy Act (NEPA) review process for proposed highway projects.

This update was prompted by recent changes in the emissions model required for conducting emissions analysis. In 2014, the U.S. Environmental Protection Agency (EPA) released MOVES2014,[1] the latest major update of the Motor Vehicle Emissions Simulator (MOVES) vehicle emissions model, and started a 2-year grace period to phase in the requirement of using MOVES2014 for transportation conformity analysis. Beginning October 7, 2016, project sponsors should use MOVES2014 (or minor revisions such as MOVES2014a,[2] which is the most recent version of MOVES released by EPA) to conduct emissions analysis for both transportation conformity determinations and for NEPA purposes.

This Updated Interim Guidance incorporates new analysis conducted using MOVES2014a. Based on FHWA's analysis using MOVES2014a, diesel particulate matter (diesel PM) remains the dominant MSAT of concern for highway projects. We have also provided an update on the status of scientific research on air toxics. This Updated Interim Guidance supersedes the December 2012 Interim Guidance and should be referenced in NEPA documentation.

[1] Federal Register, Vol. 79, No. 194, page 60343, October 7, 2014.

Available at: https://www.gpo.gov/fdsys/pkg/FR-2014-10-07/pdf/2014-23258.pdf

[2] https://www.epa.gov/moves/moves2014a-latest-version-motor-vehicle-emission-simulator-moves

BACKGROUND

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA 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).[3] 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).[4] 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.

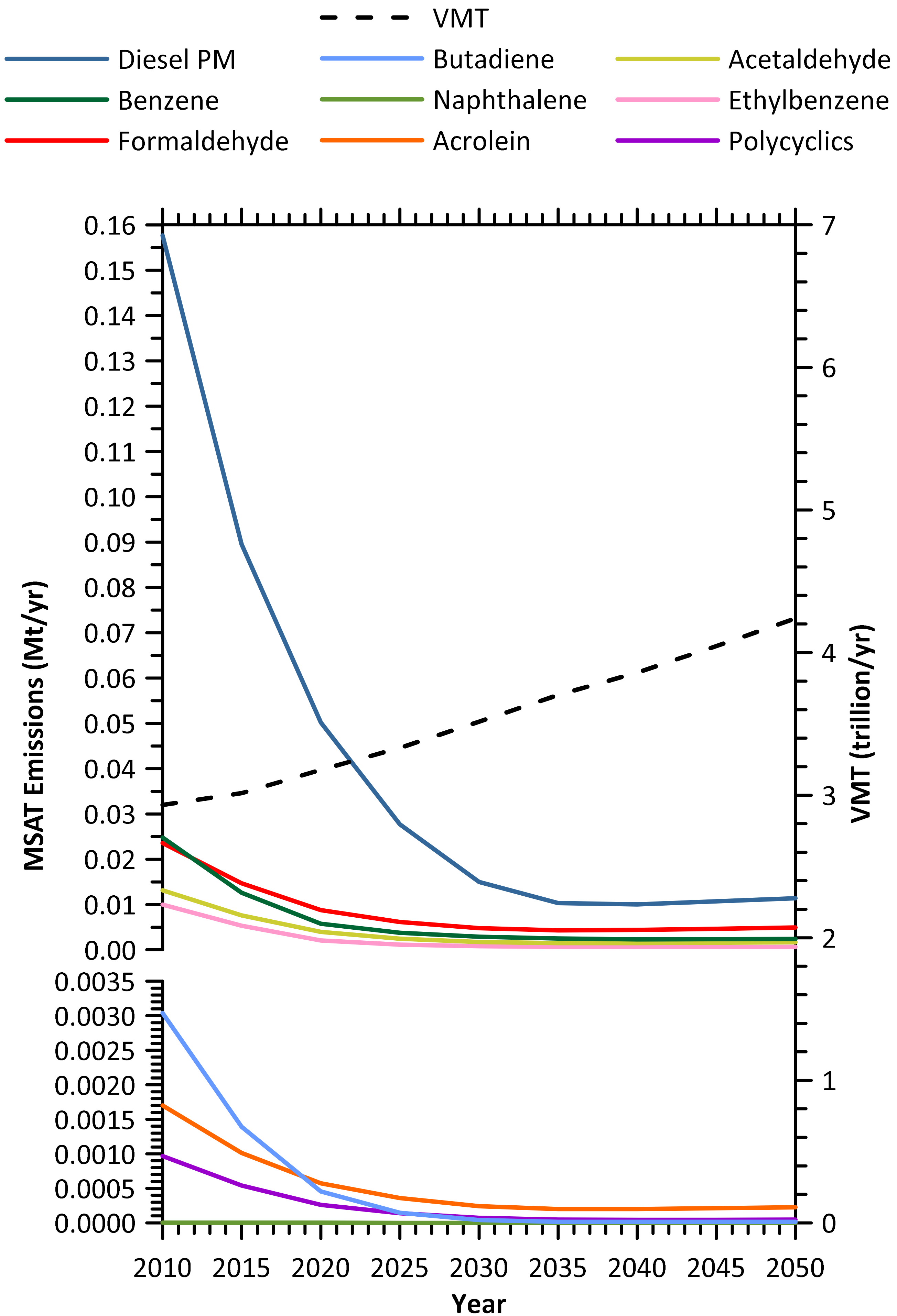
Motor Vehicle Emissions Simulator (MOVES)

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,[5] 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 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.

---

[3] https://www.epa.gov/iris
[4] https://www.epa.gov/national-air-toxics-assessment
[5] https://www.epa.gov/moves/moves2014a-latest-version-motor-vehicle-emission-simulator-moves


VMT
Diesel PM
Butadiene
Acetaldehyde
Benzene
Naphthalene
Ethylbenzene
Formaldehyde
Acrolein
Polycyclics
MSAT Emissions (Mt/yr)
VMT (trillion/yr)
Year
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
7
6
5
4
3
2
1
0
2010
2015
2020
2025
2030
2035
2040
2045
2050

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. Users of MOVES2014a will notice some differences in emissions compared with MOVES2010b. MOVES2014a is based on updated data on some emissions and pollutant processes compared to MOVES2010b, and also reflects the latest Federal emissions standards in place at the time of its release. In addition, MOVES2014a emissions forecasts are based on lower VMT projections than MOVES2010b, consistent with recent trends suggesting reduced nationwide VMT growth compared to historical trends.

MSAT Research

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

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

NEPA CONTEXT

The NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the Federal Government be interpreted and administered in accordance with its environmental protection goals, and that Federal agencies use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment (42 U.S.C. 4332). In addition to evaluating the potential environmental effects, FHWA must also take into account the need for safe and efficient transportation in reaching a decision that is in the best overall public interest (23 U.S.C. 109(h)). The FHWA policies and procedures for implementing NEPA are contained in regulation at 23 CFR Part 771.

CONSIDERATION OF MSAT IN NEPA DOCUMENTS

The 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.

For projects warranting MSAT analysis, all nine priority MSAT should be considered.

(1) Projects with No Meaningful Potential MSAT Effects, or Exempt Projects.

The types of projects included in this category are:

- Projects qualifying as a categorical exclusion under 23 CFR 771.117;
- Projects exempt under the Clean Air Act conformity rule under 40 CFR 93.126; and
- Other projects with no meaningful impacts on traffic volumes or vehicle mix.

For projects that are categorically excluded under 23 CFR 771.117, or are exempt from conformity requirements under the Clean Air Act pursuant to 40 CFR 93.126, no analysis or discussion of MSAT is necessary. Documentation sufficient to demonstrate that the project qualifies as a categorical exclusion and/or exempt project will suffice. For other projects with no or negligible traffic impacts, regardless of the class of NEPA environmental document, no MSAT analysis is recommended. However, the project record should document in the EA or EIS the basis for the determination of no meaningful potential impacts with a brief description of the factors considered. Example language, which must be modified to correspond with local and project-specific circumstances, is provided in Appendix A.

(2) Projects with Low Potential MSAT Effects

The types of projects included in this category are 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.

We anticipate that most highway projects that need an MSAT assessment will fall into this category. Examples of these types of projects are 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).

For these projects, a qualitative assessment of emissions projections should be conducted. This qualitative assessment should compare, in narrative form, the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic and the associated changes in MSAT for the project alternatives, including no-build, based on VMT, vehicle mix, and speed. It should also discuss national trend data projecting substantial overall reductions in emissions due to stricter engine and fuel regulations issued by EPA. Because the emission effects of these projects typically are low, we expect there would be no appreciable difference in overall MSAT emissions among the various alternatives.

Appendix B includes example language for a qualitative assessment, with specific examples for four types of projects: (1) a minor widening project; (2) a new interchange connecting an existing roadway with a new roadway; (3) a new interchange connecting new roadways; and (4) minor improvements or expansions to intermodal centers or other projects that affect truck traffic. The information provided in Appendix B should be modified to reflect the local and project-specific situation.

In addition to the qualitative assessment, a NEPA document for this category of projects must include a discussion of information that is incomplete or unavailable for a project specific assessment of MSAT impacts, in compliance with the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22(b)). This discussion should explain how current scientific techniques, tools, and data are not sufficient to accurately estimate human health impacts that could result from a transportation project in a way that would be useful to decision-makers. Also in compliance with 40 CFR 150.22(b), this discussion should contain information regarding the health impacts of MSAT. See Appendix C.

(3) Projects with Higher Potential MSAT Effects

This category includes projects that have the potential for meaningful differences in MSAT emissions among project alternatives. We expect a limited number of projects to meet this two-pronged test. To fall into this category, a project should:

- 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 with 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[6] or greater by the design year;

And also

- Be proposed to be located in proximity to populated areas.

Projects falling within this category should be more rigorously assessed for impacts. If a project falls within this category, you should contact the Office of Natural Environment (HEPN) and the Office of Project Development and Environmental Review (HEPE) in FHWA Headquarters for assistance in developing a specific approach for assessing impacts. This approach would include a quantitative analysis to forecast local-specific emission trends of the priority MSAT for each alternative, to use as a basis of comparison. This analysis also may address the potential for

[6] Using EPA's MOVES2014a emissions model, FHWA determined that this range of AADT would result in emissions significantly lower than the Clean Air Act definition of a major hazardous air pollutant (HAP) source, i.e., 25 tons/yr. for all HAPs or 10 tons/yr. for any single HAP. Variations in conditions such as congestion or vehicle mix could warrant a different range for AADT; if this range does not seem appropriate for your project, please consult with the contacts from HEPN and HEPE identified in this memorandum.

cumulative impacts, where appropriate, based on local conditions. How and when cumulative impacts should be considered would be addressed as part of the assistance outlined above. The NEPA document for this project should also include relevant language on unavailable information described in Appendix C.

If the analysis for a project in this category indicates meaningful differences in levels of MSAT emissions among alternatives, mitigation options should be identified and considered. See Appendix E for information on mitigation strategies.

You should also consult with HEPN and HEPE if you have a project that does not fall within any of the types of projects listed in category 3 above, but you think has the potential to substantially increase future MSAT emissions.

CONCLUSION

What we know about mobile source air toxics is still evolving. As the science progresses FHWA will continue to revise and update this guidance. The FHWA is working with Stakeholders, EPA and others to better understand the strengths and weaknesses of developing analysis tools and the applicability on the project-level decision documentation process. The FHWA wants to make project sponsors aware of the implications of the transition to the MOVES2014 model and that FHWA will be issuing updates to this interim guidance when necessary. Additional background information on MSAT-related research is provided in Appendix D.

The FHWA Headquarters and Resource Center staff, Victoria Martinez (787) 771-2524, James Gavin (202) 366-1473, and Michael Claggett (505) 820-2047, are available to provide information and technical assistance, support any necessary analysis, and limit project delays. All MSAT analysis beginning on or after October 7, 2016, should use the MOVES2014 model. Any MSAT analysis initiated prior to that date may continue to operate under the previous guidance and utilize MOVES2010. The FHWA offices and staff listed above are available to answer questions from project sponsors.

APPENDICES

Appendix A – Prototype Language for Exempt Projects
Appendix B – Prototype Language for Qualitative Project Level MSAT Analysis
Appendix C – The Council on Environmental Quality (CEQ) Provisions Covering Incomplete or Unavailable Information (40 CFR 1502.22) including a discussion of unavailable information for project-specific MSAT Health Impacts Analysis
Appendix D – FHWA Sponsored Mobile Source Air Toxics Research Efforts
Appendix E – MSAT Mitigation Strategies

APPENDIX A – Prototype Language for Exempt Projects

The purpose of this project is to (*insert major deficiency that the project is meant to address*) by constructing (*insert major elements of the project*). This project has been determined to generate minimal air quality impacts for Clean Air Act criteria pollutants and has not been linked with any special mobile source air toxic (MSAT) concerns. As such, this project will not result in changes in traffic volumes, vehicle mix, basic project location, or any other factor that would cause a meaningful increase in MSAT impacts of the project from that of the no-build alternative.

Moreover, Environmental Protection Agency (EPA) regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. Based on regulations now in effect, an analysis of national trends with EPA's MOVES2014 model forecasts a combined reduction of over 90 percent in the total annual emissions rate for the priority MSAT from 2010 to 2050 while vehicle-miles of travel are projected to increase by over 45 percent (Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents, Federal Highway Administration, October 12, 2016). This will both reduce the background level of MSAT as well as the possibility of even minor MSAT emissions from this project.

APPENDIX B – Examples of Prototype Language for Qualitative Project-Level MSAT Analysis

The information in this Appendix is for projects with low potential MSAT effects **–** any non-exempt project that does not meet the threshold criteria for higher potential effects, as described in the interim guidance, should be considered for treatment provided here. The types of projects that fall into this category are those that improve operations of highways or freight facilities without adding substantial new capacity. Examples include minor widening projects or new interchanges replacing signalized intersection on surface streets.

The following are some examples of qualitative MSAT analyses for different types of projects. Each project is different, and some projects may contain elements covered in more than one of the examples below. Analysts can use the example language as a starting point, but should tailor it to reflect the unique circumstances of the project being considered. The following factors should be considered when crafting a qualitative analysis:

- For projects on an existing alignment, MSAT are expected to decline due to the effect of new EPA engine and fuel standards.

- Projects that result in increased travel speeds will reduce MSAT emissions per VMT basis, MOVES2014 provides an estimation of the effect of speed changes on diesel particulate matter and should be accounted for accordingly. This speed benefit may be offset somewhat by increased VMT if the more efficient facility attracts additional vehicle trips.

- Projects that facilitate new development may generate additional MSAT emissions from new trips, truck deliveries, and parked vehicles (due to evaporative emissions). However, these may also be activities that are attracted from elsewhere in the metro region; thus, on a regional scale there may be no net change in emissions.

- Projects that create new travel lanes, relocate lanes, or relocate economic activity closer to homes, schools, businesses, and other populated areas may increase concentrations of MSAT at those locations relative to No Action.

Other elements related to a qualitative analysis are a discussion of information that is incomplete or unavailable for a project specific assessment of MSAT impacts and a discussion of any MSAT mitigation measures that may be associated with the project.

INTODUCTORY LANGUAGE FOR QUALITATIVE ANALYSIS FOR ALL PROJECTS

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.

(1) Minor Widening Project

(For purposes of this scenario, minor highway widening projects are those in which the design year traffic is predicted to be less than 140,000 – 150,000 AADT. Widening projects that surpass these criteria may be subject to a quantitative analysis.)

For each alternative in this EIS/EA (*specify*), the amount of mobile source air toxics (MSAT) 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 each of the Build Alternatives is slightly higher than that for the No Build Alternative, because the additional capacity increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. Refer to Table ___ (*specify*). This increase in VMT would lead to higher MSAT emissions for the preferred action alternative along the highway corridor, along with a corresponding decrease in MSAT emissions along the parallel routes. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to the Environmental Protection Agency's (EPA) MOVES2014 model, emissions of all of the priority MSAT decrease as speed increases. Because the estimated VMT under each of the Alternatives are nearly the same, varying by less than ___ (*specify*) 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 (Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents, Federal Highway Administration, October 12, 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.

(The following paragraph may apply if the project includes plans to construct travel lanes closer to populated areas.)

The additional travel lanes contemplated as part of the project alternatives will have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT could be higher under certain Build Alternatives than the No Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections that would be built at **_____** (*specify location*), under Alternatives **_____** (*specify*), and along **_____** (*specify route*) under Alternatives **_____** (*specify*). However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In sum, when a highway is widened, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

(2) New Interchange Connecting an Existing Roadway with a New Roadway

(This scenario is oriented toward projects where a new roadway segment connects to an existing limited access highway. The purpose of the roadway is primarily to meet regional travel needs, e.g., by providing a more direct route between locations.)

For each alternative in this EIS/EA (*specify*), the amount of mobile source air toxics (MSAT) 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. Because the VMT estimated for the No Build Alternative is higher than for any of the Build Alternatives, higher levels of MSAT are not expected from any of the Build Alternatives compared to the No Build. Refer to Table **___** (*specify*). In addition, because the estimated VMT under each of the Build Alternatives are nearly the same, varying by less than **___** (*specify*) 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 the Environmental Protection Agency’s (EPA) national control programs that are projected to reduce annual MSAT emissions by over 90 percent from 2010 to 2050 (Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents, Federal Highway Administration, October 12, 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 virtually all locations.

Under each alternative there may be localized areas where VMT would increase, and other areas where VMT would decrease. Therefore, it is possible that localized increases and decreases in MSAT emissions may occur. The localized increases in MSAT emissions would likely be most pronounced along the new roadway sections that would be built at **_____** (*specify location*), under Alternatives **_____** (*specify*), and along **_____** (*specify route*) under Alternatives _____ (*specify*). However, even if these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

In sum, under all Build Alternatives in the design year it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to the No Build Alternative, due to the reduced VMT associated with more direct routing, and due to EPA's MSAT reduction programs.

(3) New Interchange Connecting New Roadways

(This scenario is oriented toward interchange projects developed in response to or in anticipation of economic development, e.g., a new interchange to serve a new shopping/residential development. Projects from the previous example may also have economic development associated with them, so some of this language may also apply.)

For each alternative in this EIS/EA (*specify*), the amount of mobile source air toxics (MSAT) 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 each of the Build Alternatives is slightly higher than that for the No Build Alternative, because the interchange facilitates new development that attracts trips that would not otherwise occur in the area. Refer to Table ___ (*specify*). This increase in VMT means MSAT under the Build Alternatives 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 (*modify depending on the type and extent of the associated development*). Travel to other destinations would be reduced with subsequent decreases in emissions at those locations.

Because the estimated VMT under each of the Build Alternatives are nearly the same, varying by less than ___ (*specify*) percent, it is expected there would be no appreciable difference in overall MSAT emissions among the various Build Alternatives. For all Alternatives, emissions are virtually certain to be lower than present levels in the design year as a result of the Environmental Protection Agency's (EPA) national control programs that are projected to reduce annual MSAT emissions by over 90 percent from 2010 to 2050 (Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents, Federal Highway Administration, October 12, 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 than they are today.

(The following discussion would apply to new interchanges in areas already developed to some degree. For new construction in anticipation of economic development in rural or largely undeveloped areas, this discussion would be applicable only to populated areas, such as residences, schools, and businesses.)

The travel lanes contemplated as part of the project alternatives will have the effect of moving some traffic closer to nearby homes, schools and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of mobile source air toxics (MSAT) would be higher under certain Alternatives than others. The localized differences in MSAT concentrations would likely be most pronounced along the new/expanded roadway sections that would be built at _____ (*specify location*), under Alternatives _____ (*specify*), and along _____ (*specify route*) under Alternatives _____ (*specify*). However, the magnitude and the duration of these potential increases cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. Further, under all Alternatives, overall future MSAT are expected to be substantially lower than today due to implementation of the Environmental Protection Agency's (EPA) vehicle and fuel regulations.

In sum, under all Build Alternatives in the design year it is expected there would be slightly higher MSAT emissions in the study area relative to the No Build Alternative due to increased VMT. There also could be increases in MSAT levels in a few localized areas where VMT increases. However, EPA's vehicle and fuel regulations will bring about significantly lower MSAT levels for the area in the future than today.

(4) Minor Improvements or Expansions to Intermodal Centers or Other Projects that Affect Truck Traffic

(The description for these types of projects depends on the nature of the project. The key factor from an MSAT standpoint is the change in truck and rail activity and the resulting change in MSAT emissions patterns.)

For each alternative in this EIS/EA (*specify*), the amount of mobile source air toxics (MSAT) emitted would be proportional to the amount of truck vehicle miles traveled (VMT) and rail activity, assuming that other variables (such as travel not associated with the intermodal center) are the same for each alternative. The truck VMT and rail activity estimated for each of the Build Alternatives are higher than that for the No Build Alternative, because of the additional activity associated with the expanded intermodal center. Refer to Table ___ (*specify*). This increase in truck VMT and rail activity associated with the Build Alternatives would lead to higher MSAT emissions (particularly diesel particulate matter) in the vicinity of the intermodal center. The higher emissions could be offset somewhat by two factors: 1) the decrease in regional truck traffic due to increased use of rail for inbound and outbound freight; and 2) increased speeds on area highways due to the decrease in truck traffic. The extent to which these emissions decreases will offset intermodal center-related emissions increases is not known.

Because the estimated truck VMT and rail activity under each of the Build Alternatives are nearly the same, varying by less than **___** (*specify*) 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 the Environmental Protection Agency's (EPA) national control programs that are projected to reduce annual MSAT emissions by over 90 percent from 2010 to 2050 (Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents, Federal Highway Administration, October 12, 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 EPA-projected reductions are so significant (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future as well.

(The following discussion may apply if the intermodal center is close to other development.)

The additional freight activity contemplated as part of the project alternatives will have the effect of increasing diesel emissions in the vicinity of nearby homes, schools, and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT would be higher than under the No Build alternative. The localized differences in MSAT concentrations would likely be most pronounced under Alternatives **_____** (*specify*). However, as discussed above, the magnitude and the duration of these potential differences cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific health impacts. Even though there may be differences among the Alternatives, on a region-wide basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial reductions over time that in almost all cases the MSAT levels in the future will be significantly lower than today.

(Insert a description of any emissions-reduction activities that are associated with the project, such as truck and train idling limitations or technologies, such as auxiliary power units; alternative fuels or engine retrofits for container-handling equipment, etc.)

In sum, the Build Alternatives in the design year could be associated with higher levels of MSAT emissions in the study area, relative to the No Build Alternative, along with some benefit from improvements in speeds and reductions in region-wide truck traffic. There also could be slightly higher differences in MSAT levels among Alternatives in a few localized areas where freight activity occurs closer to homes, schools, and businesses. Under all alternatives, MSAT levels are likely to decrease over time due to nationally mandated cleaner vehicles and fuels.

MSAT MITIGATION STRATEGIES

Although there is no obligation to identify and consider MSAT mitigation strategies as part of a qualitative analysis, such strategies may be part of a project's design. Refer to the examples provided in (4) Minor Improvements or Expansions to Intermodal Centers or Other Projects that Affect Truck Traffic, or Appendix E. For these and similar circumstances, MSAT mitigation strategies should be discussed as part of a qualitative analysis.

CEQ PROVISIONS COVERING INCOMPLETE OR UNAVAILABLE INFORMATION (40 CFR 1502.22)

The introductory language for qualitative analysis should be followed by a 40 CFR 1502 assessment of incomplete or unavailable information. Refer to Appendix C for details.

APPENDIX C – Council on Environmental Quality (CEQ) Provisions Covering Incomplete or Unavailable Information (40 CFR 1502.22)

Sec. 1502.22 INCOMPETE OR UNAVAILABLE INFORMATION

When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.

(a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.

(b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement:

1. a statement that such information is incomplete or unavailable;
2. a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment;
3. a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and
4. the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts that have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

(c) The amended regulation will be applicable to all environmental impact statements for which a Notice to Intent (40 CFR 1508.22) is published in the Federal Register on or after May 27, 1986. For environmental impact statements in progress, agencies may choose to comply with the requirements of either the original or amended regulation.

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 mobile source air toxic (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 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, 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-review-literature-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 occupational exposure data to the general population, a concern expressed by HEI (Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-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.

Due to the limitations cited, a discussion such as the example provided in this Appendix (reflecting any local and project-specific circumstances), should be included regarding incomplete or unavailable information in accordance with Council on Environmental Quality (CEQ) regulations [40 CFR 1502.22(b)]. The FHWA Headquarters and Resource Center staff, Victoria Martinez (787) 771-2524, James Gavin (202) 366-1473, and Michael Claggett (505) 820-2047, are available to provide guidance and technical assistance and support.

APPENDIX D – FHWA Sponsored Mobile Source Air Toxics Research Efforts

Human epidemiology and animal toxicology experiments indicate that many chemicals or mixtures termed air toxics have the potential to impact human health. As toxicology, epidemiology and air contaminant measurement techniques have improved over the decades, scientists and regulators have increased their focus on the levels of each chemical or material in the air in an effort to link potential exposures with potential health effects.

Air toxics emissions from mobile sources have the potential to impact human health and often represent a regulatory agency concern. The FHWA has responded to this concern by developing an integrated research program to answer the most important transportation community questions related to air toxics, human health, and the NEPA process. To this end, FHWA has performed, or funded several research efforts.

There are hundreds, if not thousands of published analyses of air pollution, air pollution from mobile sources, near road air pollution, and health. It would not be practical to list them all, as they vary in terms of quality, methodology, spatial, temporal and geographic applicability and other possible factors. However, several of the studies either initiated or supported by FHWA are described below.

THE NATIONAL NEAR ROADWAY MSAT STUDY

The FHWA, in conjunction with the EPA and a consortium of State departments of transportation, studied the concentration and physical behavior of MSAT and mobile source PM 2.5 in Las Vegas, Nevada and Detroit, Michigan. The study criteria dictated that the study site be open to traffic and have 150,000 Annual Average Daily Traffic or more. These studies were intended to provide knowledge about the dispersion of MSAT emissions with the ultimate goal of enabling more informed transportation and environmental decisions at the project-level. The Las Vegas study was unique in that the monitored data was collected for the entire year. Both the Las Vegas, NV and Detroit, MI reports revealed there are a large number of influences in these urban settings and researchers must look beyond the roadway to find all the pollution sources in the near road environment. Additionally, meteorology played a large role in the concentrations measured in the near road study area. More information is available at http://www.fhwa.dot.gov/environment/air_quality/air_toxics/index.cfm.

DIESEL EMISSIONS

Advanced Collaborative Emissions Study

In 2015 the Health Effects Institute (HEI) released the last in a three part series of reports in a multiyear research effort to study the health effects of diesel emissions: *Advanced Collaborative Emissions Study* (ACES) https://www.healtheffects.org/publication/advanced-collaborative-emissions-study-aces-lifetime-cancer-and-non-cancer-assessment. This included reports on Subchronic

Exposure Results: Biologic Responses in Rats and Mice and Assessment of Genotoxicity and Lifetime Cancer and Non-Cancer Assessment in Rats Exposed to New-Technology Diesel Exhaust. The Executive Summary "summarizes the main findings of emissions and health testing of new technology heavy-duty diesel engines capable of meeting US 2007/2010 and EURO VI/6 diesel emissions standards. The results demonstrated the dramatic improvements in emissions and the absence of any significant health effects. The Executive Summary presents the main findings of all three phases of the project and places the results in the context of health risk assessment, noting that 'the overall toxicity of exhaust from modern diesel engines is significantly decreased compared with the toxicity of emissions from traditional-technology diesel engines.'" https://www.healtheffects.org/publication/executive-summary-advanced-collaborative-emissions-study-aces

Diesel Emissions and Lung Cancer: An Evaluation of Recent Epidemiological Evidence for Quantitative Risk Assessment (Special Report 19)

In 2015 the Health Effects Institute (HEI) released Special Report 19 https://www.healtheffects.org/publication/diesel-emissions-and-lung-cancer-evaluation-recent-epidemiological-evidence-quantitative that contains "the intensive review and analysis of the studies of mine and truck workers exposed to older diesel engine exhaust." The purpose was to review two epidemiological studies of diesel exhaust and lung cancer "to consider whether data or results from these studies might also be used to quantify lung cancer risk in populations exposed to diesel exhaust at lower concentrations and with different temporal patterns, such as those experienced by the general population in urban areas worldwide." To date, the Environmental Protection Agency (EPA) has not established a cancer risk screening level for diesel exhaust*. In its report, HEI's Diesel Epidemiology Panel concluded that "the studies are well prepared and are useful for applying the data to calculate the cancer risk due to exposure to diesel exhaust. The Panel noted, however, that efforts to apply these studies to estimate human risk at today's ambient levels will need to consider the much lower levels of emission pollutants from newer diesel technology as well as the limitations . . . identified in each study." In the Report (page 6), it is stated that "detailed evaluations of these studies . . . lay the groundwork for a systematic characterization of the exposure–response relationship and associated uncertainties in a quantitative risk assessment, should one be undertaken" by the EPA.

*HEI 1999 Diesel Exhaust review identified numerous limitations of epidemiological studies available at that time and did not recommend a cancer risk due to exposure to diesel exhaust be established. See the HEI Diesel Epidemiology Expert Panel. 1999. Diesel Emissions and Lung Cancer: Epidemiology and Quantitative Risk Assessment. Special Report. Cambridge, MA: Health Effects Institute. https://www.healtheffects.org/publication/diesel-emissions-and-lung-cancer-epidemiology-and-quantitative-risk-assessment

TRAFFIC-RELATED AIR POLLUTION

Mobile Source Air Toxic Hot Spot

Given concerns about the possibility of MSAT exposure in the near road environment, The Health Effects Institute (HEI) dedicated a number of research efforts at trying to find a MSAT "hotspot." In 2011 three studies were published that tested this hypothesis. In general the authors confirm that while highways are a source of air toxics, they were unable to find that highways were the only source of these pollutants and determined that near road exposures were often no different or no higher than background or ambient levels of exposure, and hence no true hot spots were identified. These studies provide additional information:

- Lioy, P.J., et al (2011). Personal and Ambient Exposures to Air Toxics in Camden, New Jersey, Health Effects Institute No. 160, https://www.healtheffects.org/publication/personal-and-ambient-exposures-air-toxics-camden-new-jersey, page 137
- Spengler, J., et al (2011). Air Toxics Exposure from Vehicle Emissions at a U.S. Border Crossing: Buffalo Peace Bridge Study, Health Effects Institute No. 158, https://www.healtheffects.org/publication/air-toxics-exposure-vehicle-emissions-us-border-crossing-buffalo-peace-bridge-study, page 143
- Fujita, E.M., et al (2011). Concentrations of Air Toxics in Motor Vehicle–Dominated Environments, Health Effects Institute No. 156, https://www.healtheffects.org/publication/concentrations-air-toxics-motor-vehicle-dominated-environments, page 87 - where monitored on-road emissions were higher than emission levels monitored near road residences, but the issue of hot spot was not ultimately discussed.

Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects

In 2010, HEI released Special Report #17, investigating the health effects of traffic related air pollution. The goal of the research was to synthesize available information on the effects of traffic on health. Researchers looked at linkages between: (1) traffic emissions (at the tailpipe) with ambient air pollution in general, (2) concentrations of ambient pollutants with human exposure to pollutants from traffic, (3) exposure to pollutants from traffic with human-health effects and toxicologic data, and (4) toxicologic data with epidemiological associations. Challenges in making exposure assessments, such as quality and quantity of emissions data and models, were investigated, as was the appropriateness of the use of proximity as an exposure-assessment model. Overall, researchers felt that there was "sufficient" evidence for causality for the exacerbation of asthma. Evidence was "suggestive but not sufficient" for other health outcomes such as cardiovascular mortality and others. Study authors also note that past epidemiologic studies may not provide an appropriate assessment of future health associations as vehicle emissions are decreasing overtime. The report is available from HEI's website at https://www.healtheffects.org/publication/traffic-related-air-pollution-critical-review-literature-emissions-exposure-and-health.

HEI SPECIAL REPORT #16

In 2007, the HEI published Special Report #16: Mobile-Source Air Toxics: A Critical Review of the Literature on Exposure and Health Effects. The purpose of this Report was to accomplish the following tasks:

- Use information from the peer-reviewed literature to summarize the health effects of exposure to the 21 MSATs defined by the EPA in 2001;
- Critically analyze the literature for a subset of priority MSAT; and
- Identify and summarize key gaps in existing research and unresolved questions about the priority MSAT.

The HEI chose to review literature for acetaldehyde, acrolein, benzene, 1,3-butadiene, formaldehyde, naphthalene, and polycyclic organic matter (POM). Diesel exhaust was included, but not reviewed in this study since it had been reviewed by HEI and EPA recently. In general, the Report concluded that the cancer health effects due to mobile sources are difficult to discern since the majority of quantitative assessments are derived from occupational cohorts with high concentration exposures and some cancer potency estimates are derived from animal models. The Report suggested that substantial improvements in analytical sensitively and specificity of biomarkers would provide better linkages between exposure and health effects. Noncancer endpoints were not a central focus of most research, and therefore require further investigation. Subpopulation susceptibility also requires additional evaluation. The study is available from HEI's website at https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects.

Going One Step Beyond: A Neighborhood Scale Air Toxics Assessment in North Denver (The Good Neighbor Project)

In 2007, the Denver Department of Environmental Health (DDEH) issued a technical report entitled *Going One Step Beyond: A Neighborhood Scale Air Toxics Assessment in North Denver (The Good Neighbor Project)*. This research project was funded by FHWA. In this study, DDEH conducted a neighborhood-scale air toxics assessment in North Denver, which includes a portion of the proposed I-70 East project area. Residents in this area have been very concerned about both existing health effects in their neighborhoods (from industrial activities, hazardous waste sites, and traffic) and potential health impacts from changes to I-70.

The study was designed to compare modeled levels of the six priority MSATs identified in FHWA's 2006 guidance with measurements at existing MSAT monitoring sites in the study area. MOBILE6.2 emissions factors and the ISC3ST dispersion model were used (some limited testing of the CALPUFF model was also performed). Key findings include: 1) modeled mean annual concentrations from highways were well below estimated Integrated Risk Information System (IRIS) cancer and non-cancer risk values for all six MSAT; 2) modeled concentrations dropped off sharply within 50 meters of roadways; 3) modeled MSAT concentrations tended to be higher along highways near the Denver Central Business District (CBD) than along the I-70 East corridor (in some cases, they were higher within the CBD itself, as were the monitored values); and 4) dispersion model results were generally lower than monitored concentrations but within a factor of two at all locations.

KANSAS CITY PM CHARACTERIZATION STUDY (KANSAS CITY STUDY)

This study was initiated by EPA to conduct exhaust emissions testing on 480 light-duty, gasoline vehicles in the Kansas City Metropolitan Area (KCMA). Major goals of the study included characterizing PM emissions distributions of a sample of gasoline vehicles in Kansas City; characterizing gaseous and PM toxics exhaust emissions; and characterizing the fraction of high emitters in the fleet. In the process, sampling methodologies were evaluated. Overall, results from the study were used to populate databases for the MOVES emissions model. The FHWA was one of the research sponsors. This study is available on EPA's website at: https://www3.epa.gov/otaq/emission-factors-research/documents/420r08009.pdf

ESTIMATING THE TRANSPORTATION CONTRIBUTION TO PARTICULATE MATTER POLLUTION (AIR TOXICS SUPERSITE STUDY)

The purpose of this study was to improve understanding of the role of highway transportation sources in particulate matter (PM) pollution. In particular, it was important to examine uncertainties, such as the effects of the spatial and temporal distribution of travel patterns, consequences of vehicle fleet mix and fuel type, the contribution of vehicle speed and operating characteristics, and influences of geography and weather. The fundamental methodology of the study was to combine EPA research-grade air quality monitoring data in a representative sample of metropolitan areas with traffic data collected by State departments of transportation (DOTs) and local governments.

Phase I of the study, the planning and data evaluation stage, assessed the characteristics of EPA's ambient PM monitoring initiatives and recruited State DOTs and local government to participate in the research. After evaluating and selecting potential metropolitan areas based on the quality of PM and traffic monitoring data, nine cities were selected to participate in Phase II. The goal of Phase II was to determine whether correlations could be observed between traffic on highway facilities and ambient PM concentrations. The Phase I report was published in September 2002. Phase II included the collection of traffic and air quality data and data analysis. Ultimately, six cities participated: New York City (Queens), Baltimore, Pittsburgh, Atlanta, Detroit and Los Angeles.

In Phase II, air quality and traffic data were collected. The air quality data was obtained from the EPA Air Quality System, Supersite personnel, and NARSTO data archive site. Traffic data included intelligent transportation system (ITS) roadway surveillance, coverage counts (routine traffic monitoring) and supplemental counts (specifically for research project). Analyses resulted in the conclusion that only a weak correlation existed between PM2.5 concentrations and traffic activity for several of the sites. The existence of general trends indicates a relationship, which however is primarily unquantifiable.

Limitations of the study include the assumption that traffic sources are close enough to ambient monitors to provide sufficiently strong source strength, that vehicle activity is an appropriate surrogate for mobile emissions, and lack of knowledge of other factors such as non-traffic sources of PM and its precursors. A paper documenting the work of Phase II was presented at EPA's 13th International Emissions Inventory Conference and is available at http://www.epa.gov/ttn/chief/conference/ei13/mobile/black.pdf.

APPENDIX E – MSAT Mitigation Strategies

Lessening the effects of mobile source air toxics should be considered for projects with substantial construction-related MSAT emissions that are likely to occur over an extended building period, and for post-construction scenarios where the NEPA analysis indicates potentially meaningful MSAT levels. Such mitigation efforts should be evaluated based on the circumstances associated with individual projects, and they may not be appropriate in all cases. However, there are a number of available mitigation strategies and solutions for countering the effects of MSAT emissions.

Mitigating for Construction MSAT Emissions

Construction activity may generate a temporary increase in MSAT emissions. Project-level assessments that render a decision to pursue construction emission mitigation will benefit from a number of technologies and operational practices that should help lower short-term MSAT. In addition, the Federal Highway Administration has supported a host of diesel retrofit technologies in the Congestion Mitigation and Air Quality Improvement (CMAQ) Program provisions – technologies that are designed to lessen a number of MSATs.[1]

Construction mitigation includes strategies that reduce engine activity or reduce emissions per unit of operating time, such as reducing the numbers of trips and extended idling. Operational agreements that reduce or redirect work or shift times to avoid community exposures can have positive benefits when sites are near populated areas. For example, agreements that stress work activity outside normal hours of an adjacent school campus would be operations-oriented mitigation. Verified emissions control technology retrofits or fleet modernization of engines for construction equipment could be appropriate mitigation strategies. Technology retrofits could include particulate matter traps, oxidation catalysts, and other devices that provide an after-treatment of exhaust emissions. Implementing maintenance programs per manufacturers' specifications to ensure engines perform at EPA certification levels, as applicable, and to ensure retrofit technologies perform at verified standards, as applicable, could also be deemed appropriate. The use of clean fuels, such as ultra-low sulfur diesel, biodiesel, or natural gas also can be a very cost-beneficial strategy.

The EPA has listed a number of approved diesel retrofit technologies; many of these can be deployed as emissions mitigation measures for equipment used in construction. This listing can be found at: https://www.epa.gov/verified-diesel-tech/verified-technologies-list-clean-diesel.

Post-Construction Mitigation for Projects with Potentially Significant MSAT Levels

Travel demand management strategies and techniques that reduce overall vehicle-mile of travel; reduce a particular type of travel, such as long-haul freight or commuter travel; or improve the transportation system's efficiency will mitigate MSAT emissions. Examples of such strategies include congestion pricing, commuter incentive programs, and increases in truck weight or length limits. Operational strategies that focus on speed limit enforcement or traffic management policies may help reduce MSAT emissions even beyond the benefits of fleet turnover. Well-traveled highways with high proportions of heavy-duty diesel truck activity may benefit from active Intelligent Transportation System programs, such as traffic management centers or incident management systems. Similarly, anti-idling strategies, such as truck-stop electrification can complement projects that focus on new or increased freight activity.

Planners also may want to consider the benefits of establishing buffer zones between new or expanded highway alignments and populated areas. Modifications of local zoning or the development of guidelines that are more protective also may be useful in separating emissions and receptors.

The initial decision to pursue MSAT emissions mitigation should be the result of interagency consultation at the earliest juncture. Options available to project sponsors should be identified through careful information gathering and the required level of deliberation to assure an effective course of action. Such options may include local programs, whether voluntary or with incentives, to replace or rebuild older diesel engines with updated emissions controls. Information on EPA clean diesel programs can be found at https://www.epa.gov/cleandiesel.

1

http://www.fhwa.dot.gov/environment/air_quality/cmaq/policy_and_guidance/2013_guidance/index.cfm

Appendix B

Can be accessed from OEM Website

http://www.fdot.gov/environment/pubs/msat.shtm