Air Quality Technical Report

Multnomah County | Earthquake Ready Burnside Bridge Project

Portland, OR

January 29, 2021

EARTHQUAKE READY BURNSIDE BRIDGE

Earthquake Ready Burnside Bridge Air Quality Technical Report

Prepared for

Multnomah County
Transportation Division – Bridges
1403 SE Water Ave
Portland, OR 97214

Prepared by

HDR
1050 SW 6th Ave, Suite 1800
Portland, OR 97204
T (503) 423-3700

HMMH
5 Centerpointe Dr, Suite 400
Lake Oswego, OR 97035
T (781) 229-0707

Contract# DCS-SVCSGEN-857-2019-conv
HDR Project #10144814

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, as a professional air quality consultant.

__________________________ Signature Reserved for Final Version

Prepared by Scott Noel (Principal Consultant)

__________________________ Signature Reserved for Final Version

Checked by Phil DeVita (Principal Consultant)

__________________________ Signature Reserved for Final Version

Approved by Heather Catron (Consultant Project Manager)

Contents

Executive Summary 1

1 Introduction 1
- 1.1 Project Location..1
- 1.2 Project Purpose..1

2 Project Alternatives..3

3 Definitions 3

4 Legal Regulations, Standards and Guidance 4
- 4.1 Laws, Plans, Policies, and Regulations 4
- 4.2 Clean Air Act..4
- 4.3 Description of Pollutants 5
  - 4.3.1 Carbon Monoxide..6
  - 4.3.2 Particulate Matter 6
  - 4.3.3 Ozone..6
- 4.4 MSAT Background..6
- 4.5 Transportation Conformity..7
- 4.6 Oregon State Air Toxics Benchmarks..7
- 4.7 Design Standards 7

5 Affected Environment..7
- 5.1 Area of Potential Impact..7
- 5.2 Resource Identification and Evaluation Methods..7
  - 5.2.1 Published Sources and Databases..7
  - 5.2.2 Field Visits and Surveys..8
- 5.3 Existing Conditions..8

6 Impact Assessment Methodology and Data Sources..11
- 6.1 Long-Term Impact Assessment Methods..11
- 6.2 Short-Term Impact Assessment Methods 11
- 6.3 Indirect Impact Assessment Methods..11
- 6.4 Cumulative Impact Assessment Methods..11
- 6.5 Potential Off-Site Staging Areas 12

7 Environmental Consequences..12
- 7.1 Traffic Analysis..12
- 7.2 No-Build Alternative..18
  - 7.2.1 Direct Impacts..18
  - 7.2.2 Indirect Impacts..18
- 7.3 Build Alternatives..18
  - 7.3.1 Direct Impacts..18
  - 7.3.2 Indirect Effects and Cumulative Impacts..26
- 7.4 Compliance with Laws, Regulations, and Standards..26
- 7.5 Conclusion..26

8 Mitigation Measures....27
8.1 Construction Mitigation....27
9 Contacts and Coordination....28
10 Preparers....29
11 References....30

Tables

Table 1. National Ambient Air Quality Standards (NAAQS)....5
Table 2. Summary of DEQ Air Quality Monitoring Data (2016-2018) Nearest the Project Area....9
Table 3. Existing AADT, VMT, and Percentage of Diesel Vehicles....14
Table 4. Future No Build Alternative AADT, VMT, and Percentage of Diesel Vehicles....15
Table 5. Future Build Alternatives Short- or Long-span Conditions AADT, VMT, and Percentage of Diesel Vehicles....16
Table 6. Future Build Alternatives Couch Extension Conditions AADT, VMT, and Percentage of Diesel Vehicles....17

Figures

Figure 1. Project Area....2
Figure 2. Formaldehyde Trends....10
Figure 3. Benzene Trends....10
Figure 4. National MSAT Emission Trends 2010 – 2050 for Vehicles Operating on Roadways....20

Appendices

Appendix A. Council of Environmental Quality (CEQ) Provisions Covering Incomplete or Unavailable Information and Information on the FHWA Sponsored Mobile Source Air Toxics Research Efforts....A-1
Appendix B. FHWA Interim MSAT Guidance Mitigation Strategies....B-1

Acronyms, Initialisms, and Abbreviations

AADT	Annual average daily traffic
API	Area of Potential Impact
CAA	Clean Air Act of 1970
CAAA	Clean Air Act Amendment of 1990
DEQ	Oregon Department of Environmental Quality
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EQRB	Earthquake Ready Burnside Bridge
FHWA	Federal Highway Administration
LOS	Level of Service
MOVES	U.S. Environmental Protection Agency Motor Vehicle Emissions Simulator
MSAT	mobile source air toxic
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
OAR	Oregon Administrative Rules
ODOT	Oregon Department of Transportation
ppb	parts per billion
ppm	parts per million
µg/m3	micrograms of pollutant per cubic meter of air
VMT	vehicle miles traveled

This page is intentionally left blank.

Executive Summary

This Air Quality Technical Report was prepared to support the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) for the Multnomah County, Oregon Earthquake Ready Burnside Bridge Project (EQRB or Project). The entire Project is located in an area designated by the U.S. Environmental Protection Agency (EPA) as being in attainment with the National Ambient Air Quality Standards (NAAQS). The results of this analysis indicate that the Project would not significantly impact air quality and mobile source air toxics (MSATs) are expected to be lower in the future relative to existing conditions.

This page is intentionally left blank.

1 Introduction

As a part of the preparation of the Environmental Impact Statement (EIS) for the Earthquake Ready Burnside Bridge (EQRB) Project, this technical report has been prepared to identify and evaluate air quality impacts within the Project's Area of Potential Impact (API).

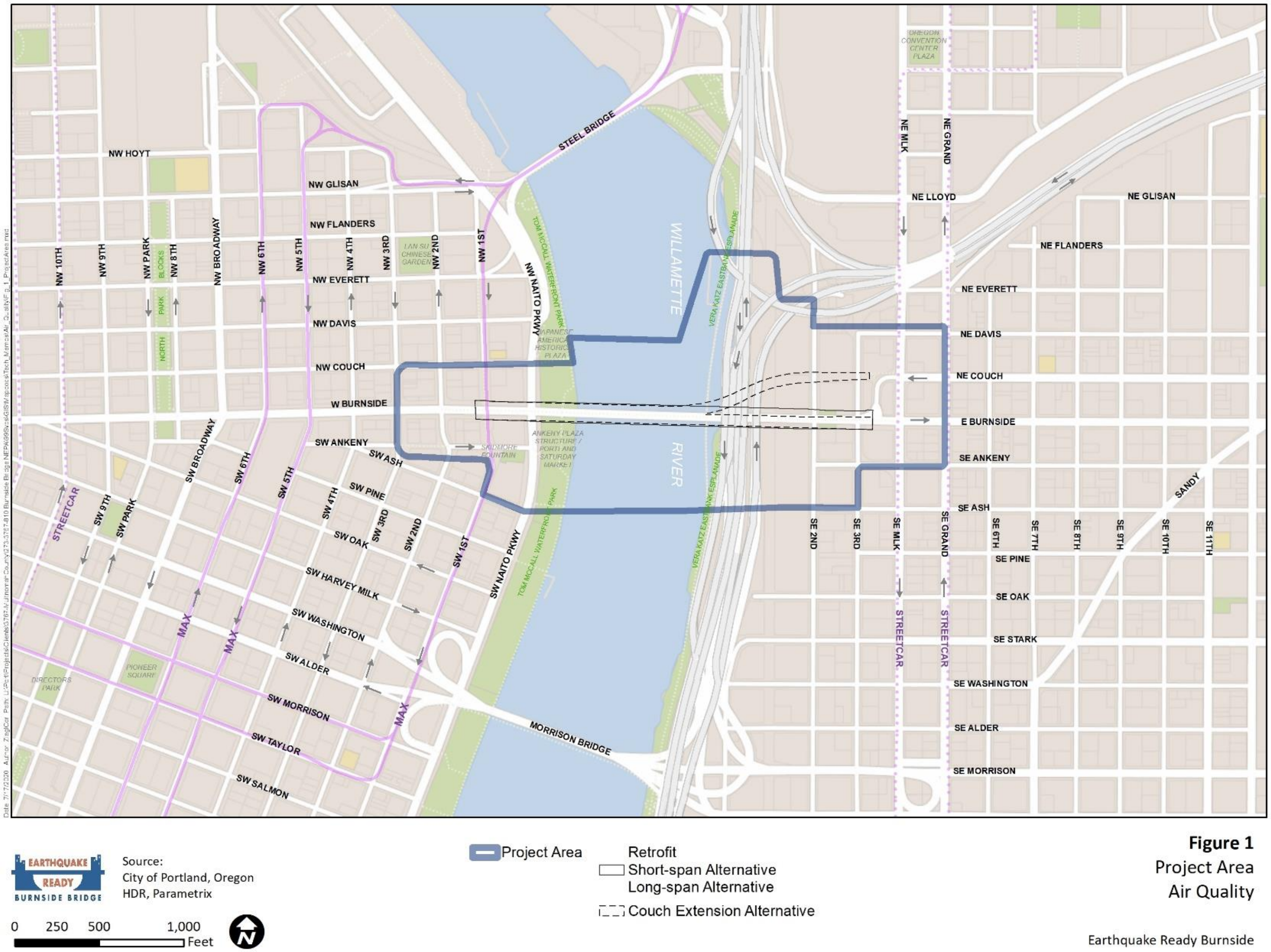
1.1 Project Location

The Project Area is located within the central city of Portland. The Burnside Bridge crosses the Willamette River connecting the west and east sides of the city. As shown in Figure 1, the Project Area encompasses a one-block radius around the existing Burnside Bridge and W/E Burnside Street, from NW/SW 3rd Avenue on the west side of the river and NE/SE Grand Avenue on the east side. Several neighborhoods surround the area including Old Town/Chinatown, Downtown, Kerns, and Buckman.

1.2 Project Purpose

The primary purpose of the Project is to replace the existing Burnside Bridge and build a new seismically resilient Burnside Bridge Street lifeline crossing over the Willamette River that will remain fully operational and accessible for vehicles and other modes of transportation following a major Cascadia Subduction Zone earthquake. The Burnside Bridge will provide a reliable crossing for emergency response, evacuation, and economic recovery after an earthquake. Additionally, the bridge will provide a long-term safe crossing with low-maintenance needs.

Figure 1. Project Area



2 Project Alternatives

The Project Alternatives' design, operations, and construction assumptions are described in detail in the *EQRB Description of Alternatives Report* (Multnomah County 2021).

The DEIS evaluates the No-Build Alternative and three Build Alternatives. Among the Build Alternatives there is an Enhanced Seismic Retrofit Alternative that would replace certain elements of the existing bridge and would retrofit other elements. There are three Replacement Alternatives that would completely remove and replace the existing bridge. In addition, the DEIS considers options for managing traffic during construction. Nomenclature for the alternatives/options are:

- No-Build Alternative
- Build Alternatives:
  - Enhanced Seismic Retrofit (Retrofit Alternative)
  - Replacement Alternative with Short-span Approach (Short-span Alternative)
  - Replacement Alternative with Long-span Approach (Long-span Alternative)
  - Replacement Alternative with Couch Extension (Couch Extension Alternative)
- Construction Traffic Management Options
  - Temporary Detour Bridge Option (Temporary Bridge) includes three modal options:
    - Temporary Bridge: All modes
    - Temporary Bridge: Transit, Bicycles and Pedestrians only
    - Temporary Bridge: Bicycles and Pedestrians only
  - Without Temporary Detour Bridge Option (No Temporary Bridge)

3 Definitions

The following terminology will be used when discussing geographic areas in the EIS:

- **Project Area –** The area within which improvements associated with the Project Alternatives would occur and the area needed to construct these improvements. The Project Area includes the area needed to construct all permanent infrastructure, including adjacent parcels where modifications are required for associated work such as utility realignments or upgrades. For the EQRB Project, the Project Area includes approximately a one-block radius around the existing Burnside Bridge and W/E Burnside Street, from NW/SW 3rd Avenue on the west side of the river and NE/SE Grand Avenue on the east side.
- **Area of Potential Impact –** This is the geographic boundary within which physical impacts to the environment could occur with the Project Alternatives. The API is resource-specific and differs depending on the environmental topic being addressed.

For all topics, the API will encompass the Project Area, and for some topics, the geographic extent of the API will be the same as that for the Project Area; for other topics (such as for transportation effects) the API will be substantially larger to account for impacts that could occur outside of the Project Area. The API for air quality is defined in Section 5.1.

- **Project vicinity –** The environs surrounding the Project Area. The Project vicinity does not have a distinct geographic boundary but is used in general discussion to denote the larger area, inclusive of the Old Town/Chinatown, Downtown, Kerns, and Buckman neighborhoods.

4 Legal Regulations, Standards and Guidance

4.1 Laws, Plans, Policies, and Regulations

The following is a list of federal, state, and local laws, regulations, plans, and policies that guide or inform the air quality assessment:

- National Ambient Air Quality Standards (NAAQS) established under the Clean Air Act (CAA) of 1970
- Oregon Department of Environmental Quality (DEQ) established the State Ambient Air Quality Standards, which are at least as stringent as the NAAQS
- Clean Air Act Amendment (CAAA) of 1990 and its regulation of hazardous air pollutants and the Cleaner Air Oregon Standards and its regulation of the human health impacts of hazardous air pollutants
- Federal Highway Administration (FHWA) interim guidance regarding mobile source air toxics (MSATs) (FHWA 2016)
- Oregon Department of Transportation (ODOT) Air Quality Manual (ODOT 2018)
- Multnomah County, Resolution No. 2018-095 requiring contractors working in the County to use equipment that reduces air pollution (2018)
- National Environmental Policy Act of 1969

4.2 Clean Air Act

The National Ambient Air Quality Standards (NAAQS) were established by the EPA under the Clean Air Act of 1970 and are summarized in Table 1. The DEQ has the responsibility of maintaining compliance with the NAAQS and has also established the State Ambient Air Quality Standards which are at least as stringent as the NAAQS.

The NAAQS apply to the concentration of a pollutant in outdoor ambient air. If the air quality in a geographic area is equal to or better than the national standard, the EPA will designate the region as an attainment area. Areas where air quality does not meet the national standards are designated as nonattainment areas. Once the air quality in a nonattainment area improves to the point where it meets the standards and the additional redesignation requirements in the CAA (Section 107(d)(3)(E)), the EPA may redesignate the area as an attainment/maintenance area, which is typically referred to as a maintenance area. After a 20-year period of demonstrating that an area is in attainment, a 'maintenance area" may ask the EPA to redesignate an area to being in attainment.

Table 1. National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Time	NAAQS Violation Determination	Primary NAAQS Exceedance Level	Secondary NAAQS Exceedance Level
Carbon monoxide (CO)	1-Hour	Not to be exceeded more than once/year.	35 ppm	-
	8-Hour	Not to be exceeded more than once/year.	9 ppm	-
Lead (Pb)	3 Months	Rolling 3-month average, not to be exceeded.	0.15 µg/m^3	0.15 µg/m^3
Nitrogen dioxide (NO_2)	Annual	Annual arithmetic mean.	53 ppb	53 ppb
	1-Hour	3-year average of the maximum daily 98th percentile one-hour average.	100 ppb	
Ozone (O_3)	8-Hour	3-year average of the annual 4th highest daily maximum 8-hour average.	0.070 ppm	0.070 ppm
Particulate matter less than 2.5 micrometers ($PM_{2.5}$)	24-Hour	3-year average of the 24-hour average daily 98th percentile.	35 µg/m^3	35 µg/m^3
	Annual Average	3-year average of the annual arithmetic mean.	12 µg/m^3	15 µg/m^3
Particulate matter less than 10 micrometers (PM_{10})	24-Hour	Not to be exceeded more than once per year on average over 3 years.	150 µg/m^3	150 µg/m^3
Sulfur Dioxide (SO_2)	1-Hour	3-year average of the maximum daily 99th percentile one-hour average.	75 ppb	
	3-Hour	Not to be exceeded more than once per year.		0.5 ppm

Source: EPA as viewed on January 23, 2020. https://www.epa.gov/criteria-air-pollutants/naaqs-table 8
Notes: ppm = parts per million, µg/m^3 = micrograms of pollutant per cubic meter of air, ppb = parts per billion

4.3 Description of Pollutants

As indicated earlier, the area represented by Portland Metro (Metro) is designated by EPA in attainment with all NAAQs.

4.3.1 Carbon Monoxide

The Metro ended their 20 years as a CO maintenance area on October 2, 2017 and has been redesignated as attainment with the CO NAAQS. However, the terms of the maintenance plan remain in effect and all measures and requirements contained in the plan must be complied with until the state revises and EPA approves the changes.

4.3.2 Particulate Matter

The Project is in an attainment area for particulate matter (PM_{10}/$PM_{2.5}$).

4.3.3 Ozone

The Project is located in an area designated as attainment for ozone under the federal EPA designation and state designation; however, it continues to be defined as a maintenance area that is subject to transportation controls measures listed in the state air quality implementation plan.

4.4 MSAT Background

On October 18, 2016, FHWA issued updated interim guidance (Appendix A) regarding MSATs in a NEPA analysis to include the EPA's recent Motor Vehicle Emissions Simulator (MOVES), Version 2014a emission model along with updated research on air toxic emissions from mobile sources.

The EPA identified nine compounds from mobile sources that are among the national and regional scale contributing cancer drivers from their 1999 National Air Toxics Assessment. The nine compounds identified were: acetaldehyde; acrolein; benzene; 1,3-butadiene; diesel particulate matter (PM) plus diesel exhaust organic gases; ethylbenzene; formaldehyde; naphthalene; and polycyclic organic matter. While FHWA considers these the priority MSATs, the list is subject to change and may be adjusted in consideration of future EPA rules.

The October 18, 2016 FHWA guidance presents a tiered approach for assessing MSATs in NEPA documents. The three levels are for projects with: (1) no meaningful MSAT effects; (2) low potential MSAT effects; and (3) high potential MSAT effects. The FHWA guidance defines the levels of analysis for each type of MSAT effect as:

- No analysis for projects with no potential for meaningful MSAT effects
- A qualitative analysis for projects with low potential MSAT effects
- A quantitative analysis for projects with high potential MSAT effects

The Build Alternatives were evaluated against each threshold criteria to determine the type of MSAT analysis required to satisfy NEPA.

In accordance with the MSAT guidance, the study area is best characterized as a project with "no meaningful MSAT effects" or "low potential MSAT effects" for the Build Alternatives. Appendix B provides a copy of FHWA's MSAT guidance for mitigation strategies.

4.5 Transportation Conformity

The EPA promulgated the transportation conformity rule (40 CFR Parts 51 and 93) pursuant to requirements of the CAA. The rule only applies in EPA-designated nonattainment or maintenance areas (40 CFR 93.102(b)). The study area is located in the Portland Metro Area and EPA designates the Portland Metro Area as an attainment area for all criteria pollutants. Therefore, Project-level transportation conformity rule requirements for CO do not apply for this region.

Metro projects should be included in the State Transportation Improvement Program (STIP). The terms of the maintenance plan remain in effect and all measures and requirements contained in the plan must be complied with until the state submits, and the EPA approves a revision to the state plan. The Project is not currently included in the 2018-2021 Active STIP (ODOT 2020) but would need to be before the Project is approved for NEPA.

4.6 Oregon State Air Toxics Benchmarks

Ambient benchmark concentrations for air toxics were developed by the DEQ. While these DEQ benchmarks are not standards, they are used as goals for evaluation and planning. Originally, the toxic benchmarks were set at a level representing the concentration at which an individual has a one in a million chance of developing cancer if exposed over a lifetime. However, it should be noted that DEQ is in the process of re-evaluating this approach and future benchmarks may not follow this principle.

4.7 Design Standards

There are no design standards specific to air quality that are applicable to the Project.

5 Affected Environment

5.1 Area of Potential Impact

The API for the Project includes areas within the immediate vicinity of the Project's construction footprint and the roadways utilized for rerouting traffic. Although this analysis of air quality is specific to the Project itself, the results of the analysis of air pollutants from short-term (construction) and long-term potential impacts/effects of the Project from PM10, CO, NOx, VOC, and MSATs are considered to be local to the vicinity of the Project Area.

5.2 Resource Identification and Evaluation Methods

5.2.1 Published Sources and Databases

The following sources and databases were used to determine the Affected Environment and Environmental Consequences of the Project for the *EQRB Air Quality Technical Report* (Multnomah County 2021):

- Climate statistics from the Western Regional Climate Center, 2008.
- U.S. Environmental Protection Agency attainment status for the Portland Metropolitan area as documented in the U.S. Environmental Protection Agency (EPA) Green Book. May 31, 2020.
- ODEQ Oregon Air Quality Data Summaries Report, 2018.
- *EQRB Transportation Technical Report*, 2019.
- National Air Toxics Assessment, 2014.

5.2.2 Field Visits and Surveys

No field visits or surveys were conducted for the air quality analysis.

5.3 Existing Conditions

The Project is located in the Portland Metropolitan area, which has a relatively mild climate. Ambient temperatures range from an average low of 37 degrees Fahrenheit (ºF) in January to an average high of 80ºF in August (Western Regional Climate Center 2008). The area experiences on average 43 inches of precipitation per year with the highest occurring in December (6.79 inches), and the least amount in July (0.79 inches; Western Regional Climate Center 2008). General climatic and meteorological conditions in the study area include prevailing winds, valley effects, inland/coastal influences, etc. (ODOT Air Quality Manual - Technical Report Outline)

As discussed above, the EPA has designated the Project Area as in attainment for all criteria pollutants. Of primary concern for air pollutants from transportation sources are NO_x, VOCs, CO, PM_{10}, $PM_{2.5}$, and MSATs.

For context, in the 1970s pollution concentrations in the Metro area exceeded the CO NAAQS frequently. Maintenance plans were enacted to help with reducing these emissions in combination with technology improvements. The area was redesignated as attainment for CO in 2017 after completing the 20-year maintenance plan; however, the maintenance plan is still in effect.

In addition, most other criteria pollutants have also shown reductions over time through EPA regulation for vehicle improvement, fuels, vehicle manufacturing and efficiency, and vehicle turnover. These trends should continue with the proliferation and development of electric cars in the future. In 2005 and 2015, the 8-hour ozone standard was revised to 0.75 ppm and 0.070 ppm, respectively. Regardless, to date the Portland area has been in attainment with the ozone standards.

The DEQ annual air quality monitoring report shows measured pollutant concentrations from all stations representative of the study area. A review of DEQ monitoring data for the most recent three years (2016-2018) nearest the Project are well below the corresponding NAAQS. Table 2 presents the 3-year monitoring data for CO, $PM_{2.5}$, PM_{10}, NO_2, SO_2, and ozone. Furthermore, DEQ's 10-year monitoring data indicates that criteria pollutants concentrations have been decreasing in the Project region.

Table 2. Summary of DEQ Air Quality Monitoring Data (2016-2018) Nearest the Project Area

Pollutant[a]	NAAQS	2016	2017	2018	3-Year Average
CO (8-Hour) (ppm)	9	1.5	1.6	1.6	n/a
$PM_{2.5}$ (24-Hour 98th Percentile) (µg/m^3) [b]	35	14	34	20	n/a
$PM_{2.5}$ (Annual Average) (µg/m^3) [b]	12	5.6	7.9	7.4	n/a
PM_{10} (24-Hour) (µg/m^3) [b]	150	32	59[a]	27[a]	n/a
O_3 (8-Hour 98th Percentile) (ppm)	0.070	0.055	0.060	0.063	n/a
NO_2 (Annual) (ppb)	53	9	9	9	n/a
NO_2 (1-Hour) (ppb)	100	34	40	35	36
SO_2 (1-Hour) (ppb)	75	3	3	3	3
SO_2 (3-Hour) (ppb)	0.5	0.003	0.004	0.003	n/a

Source: ODEQ 2018 Oregon Air Quality Data Summaries Report from S.E. Portland Station EPA #41-051-0080
Notes: EPA Station #41-051-0080 is located 3.6 miles from the Project, ppm = parts per million, µg/m^3 = micrograms of pollutant per cubic meter of air, ppb = parts per billion
[a] Pollutant concentrations in Table 2 represent maximum concentration for annual averages, highest second highest concentrations for short-term averages, except PM2.5 and Ozone which represent 98th percentile consistent with the NAAQS.
[b] Forest fire data included.

As with criteria pollutants, air toxics have also been declining since monitoring commenced in the area in 1999. DEQ's monitoring data (DEQ 2016) indicates that most pollutants are trending downward, however some such as benzene are trending downward but still remain above the state's health benchmarks (i.e., a one in a million chance of developing cancer over an individual's lifetime). These benchmarks are for evaluation and planning purposes and not considered standards like the NAAQS. Figure 2 and Figure 3 provide charts of these trends.

Figure 2. Formaldehyde Trends

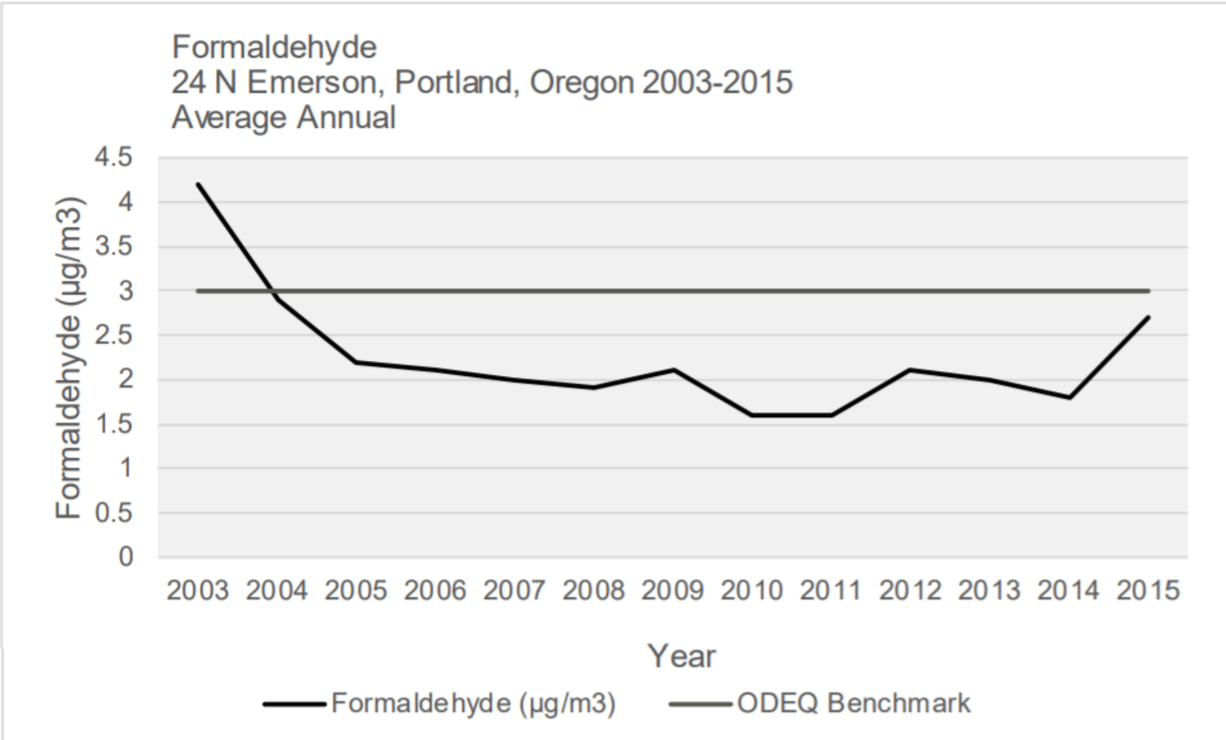
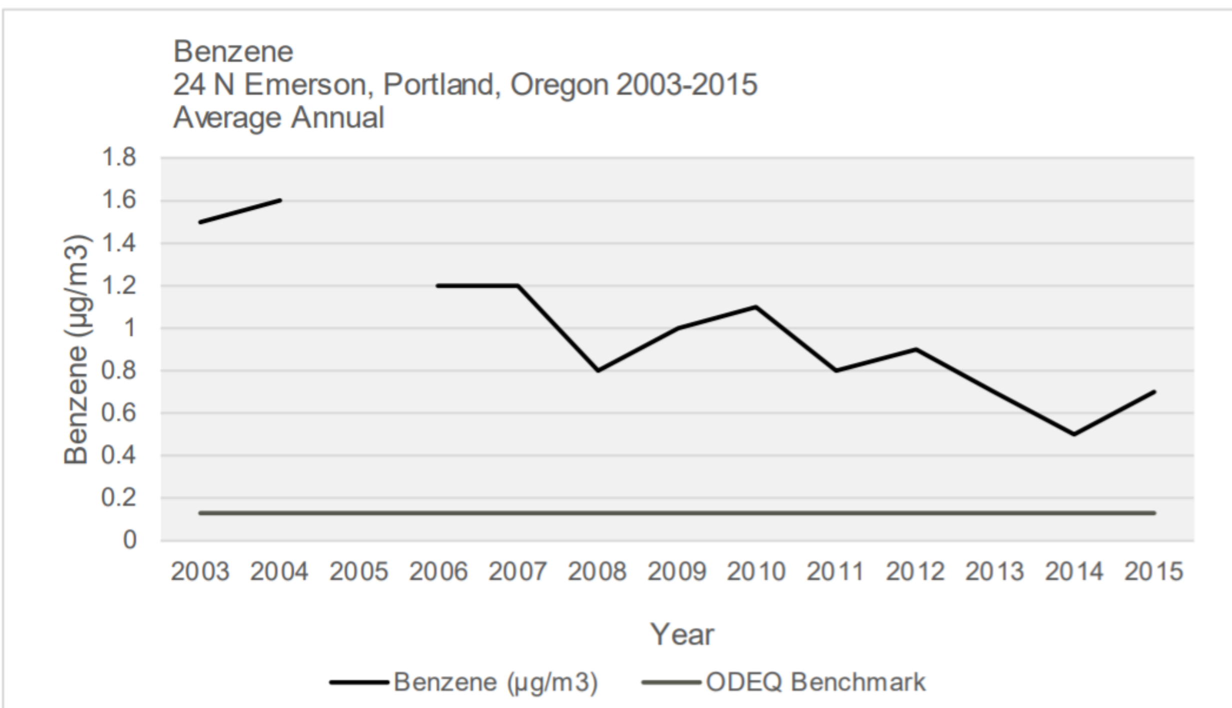


Figure 3. Benzene Trends



6 Impact Assessment Methodology and Data Sources

The impacts analysis addresses the direct long-term, direct short-term, indirect, and cumulative air quality impacts of the Build and No-Build Alternatives, including operational and construction activity emissions. The analysis methodology and assumptions were consistent with the latest version of the ODOT Air Quality Manual. Operational air quality impacts for criteria pollutants are qualitatively addressed by comparing operational traffic data for each of the alternatives. Because the Project is in an EPA designated attainment area for CO and PM, a hot-spot analysis is not required.

6.1 Long-Term Impact Assessment Methods

The analysis of direct long-term air quality impacts considers:

- Operations associated with vehicular traffic utilizing the Project.
  - These will include existing year and design year.
- Mobile Source Air Toxics (MSATs) were addressed qualitatively per FHWA guidelines.

Analysis includes a comparison of traffic data between the existing, future No-Build Alternative and Build Alternatives to identify potential change in emissions consistent with the guidelines and methods described in the latest version of the ODOT Air Quality Manual.

6.2 Short-Term Impact Assessment Methods

The qualitative analysis of direct short-term air quality impacts considers temporary emissions associated with construction activity for the Project as stipulated in the latest version of the ODOT Air Quality Manual.

6.3 Indirect Impact Assessment Methods

As documented in the *EQRB Transportation Technical Report* (Multnomah County 2021), the Project proposes no change in traffic capacity between the No-Build and Build Alternatives and therefore there would be no meaningful potential for induced growth. A qualitative analysis of potential indirect impacts was considered.

6.4 Cumulative Impact Assessment Methods

The forecast traffic volumes used to analyze the air quality impacts of the Project Alternatives include traffic forecast from all planned transportation projects and includes anticipated land use and population changes. Background concentrations (i.e., existing air quality monitoring data) from other sources (i.e., mobile sources; closest monitoring data is 3 miles away), are not representative of other sources in the area, (i.e., I-5), but were also considered. Because of these inclusive analysis methodologies, the impacts shown throughout this report represent cumulative air quality impacts.

6.5 Potential Off-Site Staging Areas

The construction contractor may use one or more off-site staging areas, outside the bridge study area to store and and/or assemble materials that would then be transported by barge to the construction site. Off-site staging could occur with any of the alternatives. Whether, where and how to use such sites would be the choice of the contractor and therefore the actual site or sites are unknown at this time and detailed analysis of impacts is not possible. To address this uncertainty, four possible sites have been identified that represent a much broader range of potential sites where off-site staging might occur. While the contractor could choose to use one of these or any other site, it is assumed that because of regulatory and time constraints on the contractor, any site they choose would need to be already developed with road and river access. It is also assumed that the contractor would be responsible for relevant permitting and/or mitigation that could be required for use of a chosen site. The Draft EIS identifies the types of impacts that could occur from off-site staging, based on the above assumptions. This analysis is not intended to "clear" any specific site, but rather to disclose the general types of impacts based on the possible sites.

The four representative sites include:

- A Willamette Staging Option off Front Avenue
- B USACE Portland Terminal 2
- C Willamette Staging Option off Interstate Avenue
- D Ross Island Sand and Gravel Site

Based on the four potential sites identified, the types of impacts that could occur from off-site staging include emissions associated with moving materials and equipment to and from the sites.

If the contractor chooses to use an off-site staging area, the local, state, and federal regulations associated with construction emissions described in Section 4 of this document could apply.

7 Environmental Consequences

The following subsections discuss the potential air quality impacts from the Project Alternatives.

7.1 Traffic Analysis

Traffic forecast for the Project was documented in the *EQRB Transportation Technical Report* (Multnomah County 2021). Table 3 to Table 6 presents the annual average daily traffic (AADT), vehicle miles traveled (VMT), and diesel truck percentage for the existing conditions and future alternatives. The Project traffic forecast shows the future No-Build Alternative traffic conditions are the same as the future Build Alternatives because bridge capacity and hence traffic and vehicle mix will be the same for each alternative. Traffic counts, which were collected by HDR and Parametrix, were used to determine the peak AM (8:00 AM) and PM (5:00 PM) hours. The peak AM PM hour traffic conditions represent the highest 1-hour concentration of traffic on the roadways indicated in Table 3 to Table 6. Percentage of diesel vehicle (i.e., trucks) traffic for the AM peak hour and PM peak hour are also provided in Table 3 to Table 6. Note that level of service (LOS) does not change with or without the Project on Burnside Street, side streets, or Interstates because of any of the Project Alternatives. Similarly, delays along Burnside Street, side streets, and Interstates would also not change because of the Project. For these reasons, a summary of LOS was not calculated for the Project. Traffic forecast details are presented in the *EQRB Transportation Technical Report* (Multnomah Count 2021), and Table 3 to Table 6 summarizes selected data. Delays associated with construction are anticipated to be less than 5-minutes.

Table 3. Existing AADT, VMT, and Percentage of Diesel Vehicles

Condition	Roadway	Segment Description	Peak Hour Speed (mph)	AADT	VMT	AM Peak Hour Traffic	PM Peak Hour Traffic	AM Peak Hour Diesel Vehicles (%)	PM Peak Hour Diesel Vehicles (%)
Existing Conditions (2019)	Burnside St	EB b/w NW/SW 2nd Ave and MLK Jr Blvd	25	19,000	9,748	940	1,575	1	0.1
		WB b/w NW/SW 2nd Ave and MLK Jr Blvd	35	16,000	8,209	1,485	1,125	0.4	0
	Couch St	b/w Grand Ave and MLK Jr Blvd	10	12,700	604	1,325	1,070	1	0.1
	Grand Ave	b/w Couch St and Burnside St	10	20,500	995	1,655	1,735	6.1	6.1
	MLK Jr Blvd	b/w Couch St and Burnside St	10	24,900	1,206	1,220	2,110	6.1	6.1
	Naito Pkwy	NB b/w Couch St and Ankeny St	15	6,840	654	580	600	5.65	5.65
		SB b/w Couch St and Ankeny St	25	8,105	775	510	775	5.65	5.65
	NW/SW 2nd Ave	b/w Couch St and Burnside St	10	5,600	271	555	475	9.6	0.965
	I-5	NB Mainline near Burnside Crossing	13	43,650	31,415	3,100	2,400	7.14	7.14
		SB Mainline near Burnside Crossing	17	21,110	15,193	1,370	1,265		
		NB C-D to I-84 Interchange	13	44,580	24,443	3,165	2,450		
		SB I-5 Off-ramp to Morrison	17	14,930	7,013	970	895		
		SB C-D from I-84 Interchange	17	55,320	17,549	3,595	3,320		

Annual average daily traffic (AADT), eastbound (EB), miles per hour (mph), vehicle miles traveled (VMT), westbound (WB)

Table 4. Future No Build Alternative AADT, VMT, and Percentage of Diesel Vehicles

Condition	Roadway	Segment Description	Peak Hour Speed (mph)	AADT	VMT	AM Peak Hour Traffic	PM Peak Hour Traffic	AM Peak Hour Diesel Vehicles (%)	PM Peak Hour Diesel Vehicles (%)
Future No Build Alternative Conditions (2045)	Burnside St	EB b/w NW/SW 2nd Ave and MLK Jr Blvd	25	18,500	9,491	970	1,495	1	0.1
		WB b/w NW/SW 2nd Ave and MLK Jr Blvd	35	15,500	7,952	1,400	1,110	0.4	0
	Couch St	b/w Grand Ave and MLK Jr Blvd	10	13,600	647	1,360	1,195	1	0.1
	Grand Ave	b/w Couch St and Burnside St	10	18,000	874	1,305	1,685	6.1	6.1
	MLK Jr Blvd	b/w Couch St and Burnside St	10	20,800	1,007	1,050	1,715	6.1	6.1
	Naito Pkwy	NB b/w Couch St and Ankeny St	15	7,000	669	610	680	5.65	5.65
		SB b/w Couch St and Ankeny St	20	8,200	784	495	730	5.65	5.65
	NW/SW 2nd Ave	b/w Couch St and Burnside St	10	5,600	271	570	470	9.6	0.965
	I-5	NB Mainline near Burnside Crossing	13	46,162	33,223	3,278	2,538	7.14	7.14
		SB Mainline near Burnside Crossing	17	21,709	15,624	1,409	1,301		
		NB C-D to I-84 Interchange	13	47,145	25,849	3,347	2,591		
		SB I-5 Off-ramp to Morrison	17	15,354	7,212	998	920		
		SB C-D from I-84 Interchange	17	56,890	18,047	3,697	3,414		

Annual average daily traffic (AADT), eastbound (EB), miles per hour (mph), vehicle miles traveled (VMT), westbound (WB)

Table 5. Future Build Alternatives Short- or Long-span Conditions AADT, VMT, and Percentage of Diesel Vehicles

Condition	Roadway	Segment Description	Peak Hour Speed (mph)	AADT	VMT	AM Peak Hour Traffic	PM Peak Hour Traffic	AM Peak Hour Diesel Vehicles (%)	PM Peak Hour Diesel Vehicles (%)
All Future Build Alternative Short- or Long span Conditions (2045)	Burnside St	EB b/w NW/SW 2nd Ave and MLK Jr Blvd	25	18,500	9,491	970	1,495	1	0.1
		WB b/w NW/SW 2nd Ave and MLK Jr Blvd	35	15,500	7,952	1,400	1,110	0.4	0
	Couch St	b/w Grand Ave and MLK Jr Blvd	10	13,600	647	1,360	1,195	1	0.1
	Grand Ave	b/w Couch St and Burnside St	10	18,000	874	1,305	1,685	6.1	6.1
	MLK Jr Blvd	b/w Couch St and Burnside St	10	20,800	1,007	1,050	1,715	6.1	6.1
	Naito Pkwy	NB b/w Couch St and Ankeny St	15	7,000	669	610	680	5.65	5.65
		SB b/w Couch St and Ankeny St	20	8,200	784	495	730	5.65	5.65
	NW/SW 2nd Ave	b/w Couch St and Burnside St	10	5,600	271	570	470	9.6	0.965
	I-5	NB Mainline near Burnside Crossing	13	46,162	33,223	3,278	2,538	7.14	7.14
		SB Mainline near Burnside Crossing	17	21,709	15,624	1,409	1,301		
		NB C-D to I-84 Interchange	13	47,145	25,849	3,347	2,591		
		SB I-5 Off-ramp to Morrison	17	15,354	7,212	998	920		
		SB C-D from I-84 Interchange	17	56,890	18,047	3,697	3,414		

Annual average daily traffic (AADT), eastbound (EB), miles per hour (mph), vehicle miles traveled (VMT), westbound (WB)

Table 6. Future Build Alternatives Couch Extension Conditions AADT, VMT, and Percentage of Diesel Vehicles

Condition	Roadway	Segment Description	Peak Hour Speed (mph)	AADT	VMT	AM Peak Hour Traffic	PM Peak Hour Traffic	AM Peak Hour Diesel Vehicles (%)	PM Peak Hour Diesel Vehicles (%)
Future Build Alternative Couch Extension Conditions (2045)	Burnside St	EB b/w NW/SW 2nd Ave and MLK Jr Blvd	25	18,500	9,491	970	1,495	1	0.1
		WB b/w NW/SW 2nd Ave and MLK Jr Blvd	35	15,500	7,952	1,400	1,110	0.4	0
	Couch St	b/w Grand Ave and MLK Jr Blvd	10	13,600	647	1,360	1,195	1	0.1
	Grand Ave	b/w Couch St and Burnside St	10	18,000	874	1,305	1,685	6.1	6.1
	MLK Jr Blvd	b/w Couch St and Burnside St	10	20,800	1,007	1,050	1,715	6.1	6.1
	Naito Pkwy	NB b/w Couch St and Ankeny St	15	7,000	669	610	680	5.65	5.65
		SB b/w Couch St and Ankeny St	20	8,200	784	495	730	5.65	5.65
	NW/SW 2nd Ave	b/w Couch St and Burnside St	10	5,600	271	570	470	9.6	0.965
	I-5	NB Mainline near Burnside Crossing	13	46,162	33,223	3,278	2,538	7.14	7.14
		SB Mainline near Burnside Crossing	17	21,709	15,624	1,409	1,301		
		NB C-D to I-84 Interchange	13	47,145	25,849	3,347	2,591		
		SB I-5 Off-ramp to Morrison	17	15,354	7,212	998	920		
		SB C-D from I-84 Interchange	17	56,890	18,047	3,697	3,414		

Annual average daily traffic (AADT), eastbound (EB), miles per hour (mph), vehicle miles traveled (VMT), westbound (WB)
Notes: Traffic data is from the Project's traffic report unless otherwise specified below. Burnside vehicle mix percentage from Project tube count. Peak hour diesel vehicle percentages for all other roadways obtained from average diesel vehicles from City of Portland traffic count data in ArcGIS https://www.arcgis.com/home/item.html?id=10be98cd6f53489490b2428c379c98fe

7.2 No-Build Alternative

7.2.1 Direct Impacts

Under the No-Build Alternative, the proposed action is not implemented, and the area would remain in attainment with all NAAQS. Furthermore, with stricter EPA regulations for vehicle engines, fuels, and vehicle turnover over time, future pollutant emissions are expected to decrease compared to existing conditions. MSATs would remain unchanged as well. Finally, there would be no Burnside Bridge construction associated with the No-Build Alternative, therefore no construction emissions would be expected.

7.2.2 Indirect Impacts

Indirect impacts are caused by the Project but can be later in time or farther removed in distance from the Project. The travel demand model used for the air quality analysis reflects future land use, employment, and growth and therefore includes forecasted indirect impacts. No indirect air quality impacts are expected under the No-Build Alternative.

7.3 Build Alternatives

7.3.1 Direct Impacts

Short-Term Direct Impacts

Emission from construction activities would result in temporary and localized increases in CO and PM_{10} levels. These emissions are the result of fossil fuel combustion by heavy construction equipment and vehicle travel to and from the site, as well as fugitive sources. Short-term mitigation measures to control dust (i.e., particulate matter) during construction will be implemented as discussed in Section 8.

Long-Term Direct Impacts

Long-term direct impacts from the Build Alternatives are expected to remain unchanged compared to the No-Build Alternative as future traffic volumes are expected to remain the same for all alternatives (Table 4 to Table 6).

Furthermore, air quality analyses of nearby projects were reviewed, including modeling results for other projects in the Portland metropolitan area with similar or higher traffic volumes to the Project, to substantiate that the Project Alternatives are unlikely to result in CO impacts above the NAAQS. Project-level CO hotspot analyses reviewed were:

- I-5 Southbound Off-Ramp at North Broadway Project (ODOT 2015c)
- US 26 Outer Powell Transportation Safety Project (ODOT 2016a)
- Foster Road Streetscape—Southeast 50th to Southeast 84th Avenue (ODOT 2016b)
- US 26 Southeast 20th to Southeast 34th Avenue Project (ODOT 2016c)

For each of these projects, the worst-case intersections showed CO concentrations, including monitored background values, were well below the 1-hour and 8-hour CO NAAQS for all modeled scenarios. All intersections modeled were forecast to operate at LOS of F (failing operations). Based on the review of other nearby projects, the LOSs evaluated at these locations are generally worse than the forecast for the Project Alternatives, and traffic volumes at these locations are generally higher than the volumes expected at the signalized intersections for the Project Alternatives. Therefore, it is reasonable to conclude that CO concentrations from the Project Alternatives are not expected to show concentrations above the CO 1-hour and 8-hour NAAQS.

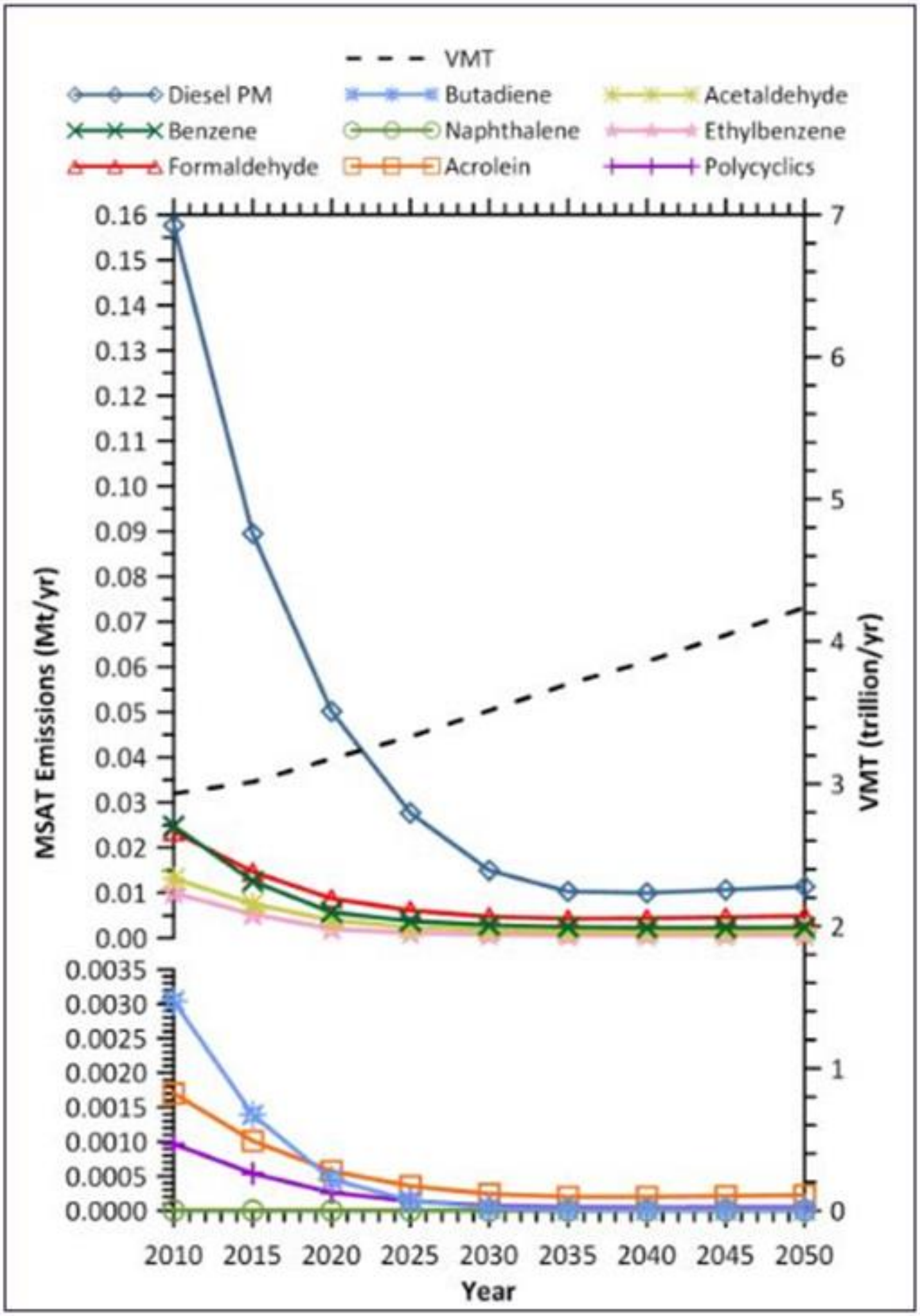
Overall, it is reasonable to conclude the Build Alternatives are not expected to increase CO emissions compared to the No-Build Alternative because traffic volumes and LOS will remain the same. In addition, the Project is not expected to affect air quality or cause or contribute to a violation of the CO NAAQS because monitored CO background values in the area are well below the NAAQS and CO modeling results for other projects in the Portland metropolitan area are unlikely to result in CO above the NAAQS.

Mobile Source Air Toxics Analysis

Under FHWA guidance, this Project is anticipated to be categorized as a project for which no meaningful MSAT effects would be expected, neither a qualitative nor a quantitative analysis is needed. In addition, this Project, because the traffic on Burnside Street currently has, and in the future would have, AADT associated with low MSAT potential, has been determined to generate minimal air quality impacts for Clean Air Act criteria pollutants and has not been linked with any special MSAT concerns. Additionally, the Project Alternatives that would replace the bridge on the same alignment are exempt. The Couch Extension Alternative is the only alternative not exempt; however, as stated previously this alternative has a low MSAT potential due to its AADT. 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 different from that of the No-Build Alternative. Additionally, the Couch Extension Alternative would move traffic closer to some residences.

Moreover, EPA regulations for vehicle engines and fuels are reasonably forecast to cause overall MSAT emissions to decline over the next several decades (Figure 4). As noted in the referenced FHWA MSAT guidance, based on regulations now in effect, an analysis of national trends with EPA's 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 (see traffic volume Table 4).

Figure 4. National MSAT Emission Trends 2010 – 2050 for Vehicles Operating on Roadways



Source: EPA MOVES2014a model runs conducted by FHWA, September 2016.
Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

The October 18, 2016 updated FHWA interim guidance regarding MSATs in a NEPA analysis recommended the EPA's recent MOVES2014a emission model along with updated research on air toxic emissions from mobile sources, including the addition of two compounds identified as contributors from mobile sources: Acetaldehyde and Ethylbenzene. The guidance includes three categories and criteria for analyzing MSATs in NEPA documents:

1. No meaningful MSAT effects;
2. Low potential MSAT effects; and
3. High potential MSAT effects.

A qualitative analysis is required for projects that meet the low potential MSAT effects criteria, while a quantitative analysis is required for projects meeting the high potential MSAT effects criteria. For projects that meet no meaningful MSAT effects, neither a qualitative nor quantitative analysis is required.

The Build Alternatives that do not change the alignment (i.e., Short-span Alternative, Long-span Alternative, Retrofit Alternative) under FHWA guidance may be categorized as a Tier 1 project for which no meaningful MSAT effects would be expected, neither a qualitative nor a quantitative analysis is needed. In addition, these Project Alternatives would generate minimal air quality impacts for Clean Air Act criteria pollutants, but not linked with any special MSAT concerns. As such, this Project would not result in changes in traffic volumes, vehicle mix, basic Project location, or any other factor that would cause a meaningful increase in MSAT impacts of the Project from that of the No-Build Alternative.

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

In accordance with the MSAT guidance, the Couch Extension Alternative is best characterized as a project with "low potential MSAT effects" because projected Design-Year traffic is expected to be well below the 140,000 to 150,000 AADT criteria. Specifically, the Design year Build Alternative is expected to have the highest ADT volumes of 56,890 ADT on I-5 along segment SB C-D from I-84 Interchange and these segments are not associated with Project improvements. Table 5 and Table 6 summarizes the ADT throughout the Project corridor.

The results demonstrate that the forecast ADT volumes would be much less than the 140,000 to 150,000 AADT MSAT criteria. As a result, a qualitative assessment of MSAT emissions projections was conducted for the affected network for this Build Alternative consistent with FHWA guidance.

MSAT Background

Controlling air toxic emissions became a national priority with the passage of the 1990 Clean Air Act Amendment, whereby Congress mandated the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA assessed this expansive list in its rule on the Control of HAPs from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8,430, February 26, 2007), and identified 93 compounds emitted from mobile sources that are part of the EPA's Integrated Risk Information System (IRIS) 2011 National Air Toxics Assessment. In addition, the EPA identified nine compounds from mobile sources that are among the national and regional scale contributing cancer risk drivers, and non-cancer hazards from the 2011 National Air Toxics Assessment (2011). These compounds 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 MSATs, the list is subject to change and may be adjusted in consideration of future EPA rules.

Motor Vehicles Emissions Simulator (MOVES)

According to the EPA, MOVES2014 is a major revision to MOVES2010 with many improvements. 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 VMT data. MOVES2014 incorporates the effects of three new federal emissions standard rules not included in MOVES2010. These new standards are all expected to affect 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, the EPA released MOVES2014a in November 2015. In the MOVES2014a Questions and Answers Guide, the 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 in MOVES2014.

Using the EPA's MOVES2014a model, as shown in Figure 4, FHWA estimates that even if VMT increases by 45 percent from 2010 to 2050 as forecasted, a combined reduction of 91 percent in the total annual emissions for the priority MSAT is projected for the same time period.

Diesel PM is the dominant component of MSAT emissions, making up 50 to 70 percent of all priority MSAT pollutants by mass, depending on the 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 be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, EPA, 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.

Project Qualitative MSAT Analysis

For each alternative, the amount of MSATs emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same. The daily VMT estimated for the Couch Extension Alternative is expected to be the same as the No-Build Alternative because the proposed extension of Couch Street replaces the existing Burnside Street westbound lanes that are currently one block south. The MSAT emissions for the westbound traffic in that segment of Burnside Street would be expected to shift one block north to the proposed Couch Street extension. Because the estimated VMT under each of the alternatives are the same, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative, 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. 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 relocation of westbound travel lanes under the Couch Extension Alternative will move some traffic closer to nearby homes, schools, and businesses on this section of Couch Street, and away from those on the parallel section of Burnside Street; under the Couch Extension Alternative there may be localized areas where ambient concentrations of MSAT could be higher than the No-Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded new Couch Extension roadway sections as shown in Figure 1. However, while the magnitude and duration of these potential increases compared to the No-Build Alternative could be quantified, forecasting Project-specific MSAT health impacts cannot be accomplished due to incomplete or unavailable information. In sum, when a highway is widened, the localized level of MSAT emissions for the Build Alternatives could be higher relative to the No-Build Alternative. MSAT will also be lower in the Burnside Street alignment parallel to the new Couch Street alignment, given that the westbound traffic would shift from Burnside Street to the new Couch Street alignment in this segment. 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 lower than today.

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

As per FHWA guidance, there is not enough complete or available information to credibly predict Project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. The EPA is the lead authority for administering the CAA and its amendments and has 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. The EPA maintains the IRIS, which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, http://www.epa.gov/iris/). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning up to an order of magnitude.

Other organizations are also active researching and analyzing the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's updated interim guidance on MSAT analysis in NEPA documents. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings, cancer in animals, and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease
(HEI, http://pubs.healtheffects.org/view.php?id=306).

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and then final determination of health impacts, with each step in the process building on the model predictions obtained in the previous step. All methodologies 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 assessments (i.e., 70 years), 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, because such information is unavailable.

It is difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways to: (1) determine the portion of time people are actually exposed at a specific location; and (2) 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.[1] 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 and HEI have not established a basis for quantitative risk assessment of diesel PM in ambient settings.[2,3]

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 CAA to determine whether more stringent controls are required to provide an ample margin of safety to protect public health or 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 for evaluating level of risk due to emissions from a source: (1) EPA to determine an acceptable level of risk, which is generally no greater than approximately 100 in a million, and (2) maximize the number of people with risks of less than one in a million. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than one 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 the EPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.

Because of methodology limitations for forecasting the health effects described, any predicted difference between alternatives is likely smaller than the uncertainties associated with predicting the effects. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against Project benefits. These assessments, such as reducing traffic congestion, accident rates, and fatalities, in addition to improved access for emergency response, may be better suited using a quantitative analysis.

MSAT Conclusions

What is known about MSATs is still evolving. Information is currently incomplete or unavailable to credibly predict Project-specific health impacts due to changes in MSAT emissions associated with each of the Project Alternatives. Under the Couch Extension Alternative, there may be the same or slightly higher MSAT emissions in the Design-Year relative to the No-Build Alternative in the extended section of Couch Street due to shifting westbound traffic one lane north. There could also be increases in MSAT levels in part of that section. However, for all alternatives, the EPA's vehicle and fuel regulations are expected to result in lower future MSAT levels than exist today due to cleaner engine standards coupled with fleet turnover. The magnitude of the EPA-projected reductions is so great that, even after accounting for VMT growth, MSAT emissions in the study area

[1] See: http://pubs.healtheffects.org/view.php?id=282

[2] See: http://www.epa.gov/risk/basicinformation.htm#g

[3] See: http://pubs.healtheffects.org/getfile.php?u=395

would be lower in the future than they are today, regardless of the preferred alternative chosen.

7.3.2 Indirect Effects and Cumulative Impacts

Indirect impacts are caused by the Project but can be later in time or farther removed in distance from the Project. The travel demand model used for the air quality analysis reflects future land use, employment and growth, and therefore forecasted indirect impacts.

A qualitative assessment based on future traffic volumes, the proposed bridge cross-sections and capacity, suggests that there is little potential for the Project to cause indirect effects to future air quality or to contribute to cumulative air quality impacts. This is based on: (1) air quality impacts from the Project are expected to be the same as the No-Build Alternative because bridge capacity and hence vehicular volumes and fleet mix are expected to be the same; (2) with no change in traffic capacity on the crossings, there would be little or no potential for induced growth or meaningful effects on land use; and (3) MSAT emissions from the affected network would be lower than they are today. There is potential that the proposed improvements to bicycle and pedestrian facilities on the crossing could promote some mode shift, which in turn could slightly reduce future vehicle emissions compared to the No-Build Alternative.

Regarding the potential for cumulative impacts, EPA's air quality monitoring data for the region reflect, in part, the accumulated mobile source emissions from past and present actions. Since EPA has designated the region to be in attainment for all of the NAAQS, the potential for cumulative impacts associated with the Project may reasonably be expected to not be significant.

7.4 Compliance with Laws, Regulations, and Standards

This analysis has been prepared in compliance with the laws, regulations, and standards as discussed in Section 4 of this report.

7.5 Conclusion

This analysis determined that the Build Alternatives would not add any additional capacity and hence no additional vehicular traffic or change the vehicle fleet mix compared to the No-Build Alternative would occur. Daily traffic volumes, including diesel vehicles are the same compared to the No-Build Alternative. Furthermore, it can reasonably be concluded the Build Alternatives are not expected to increase CO emissions compared to the No-Build Alternative because traffic volumes would remain the same and LOS would be the same or improve for the AM and PM peak hours. With these conclusions, coupled with monitored CO background values in the area being well below the NAAQS and CO modeling results for other projects in the Portland metropolitan area unlikely to result in CO impacts above the NAAQS, the Project is not expected to affect air quality or cause/contribute to a violation of the CO NAAQS.

Under the Couch Extension Alternative, there may be the same or slightly higher MSAT emissions in the Design-Year relative to the No-Build Alternative where the shifted location of travel lanes would move some traffic closer to nearby homes, schools, and businesses. Therefore, under the Couch Extension Alternative there may be localized areas where ambient concentrations of MSAT could be higher than the No-Build Alternative. For all Build Alternatives, however, the EPA's vehicle and fuel regulations are expected to result in lower future MSAT levels than exist today due to cleaner engine standards and fleet turnover. The magnitude of EPA-projected reductions, even after accounting for VMT growth, would lower MSAT future emissions beyond current amounts, regardless of the preferred alternative chosen.

Emissions will be produced in the construction of this Project from heavy equipment and vehicle travel to and from the site, traffic delays due to rerouting, as well as from fugitive sources. Construction of this Project would cause only temporary increases in emissions. Mitigation measures as discussed in Section 8 will be implemented to mitigate construction emissions.

8 Mitigation Measures

No long-term direct impacts are anticipated from the Project's Build Alternatives. There would be temporary short-term impacts from construction activity.

8.1 Construction Mitigation

Mitigation measures for potential temporary construction impacts normally include best management practices for dust suppression. Construction contractors are required to comply with Division 208 of Oregon Administrative Rules (OAR) 340, which addresses visible emissions and nuisance requirements. Subsection of OAR 340-208 places limits on fugitive dust that causes a nuisance or violates other regulations. Violations of the regulations can result in enforcement action and fines. The regulation provides that the following reasonable precautions be taken to avoid dust emissions (OAR 340-208, Subsection 210):

- Use of water or chemicals, where possible, for the control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land
- Application of asphalt, oil, water, or other suitable chemicals on unpaved roads, materials stockpiles, and other surfaces that can create airborne dusts
- Full or partial enclosure of materials stockpiled in cases where application of oil, water, or chemicals are not sufficient to prevent particulate matter from becoming airborne
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials
- Application of water or other suitable chemicals on unpaved roads, materials stockpiles, and other surfaces that can create airborne dusts
- Adequate containment during sandblasting or other similar operations
- When in motion, always cover open-bodied trucks transporting materials likely to become airborne

- The prompt removal from paved streets of earth or other material that does or may become airborne

Based on ODOT Standard Specification, Section 290, construction contractors must follow certain control measures, which include vehicle and equipment idling limitations, designed to minimize vehicle track-out and fugitive dust. These measures would be documented in the erosion and sediment control plan the contractor is required to submit prior to the preconstruction conference. To reduce the impact of construction delays on traffic flow and resultant emissions, road or lane closures should be restricted to non-peak traffic periods, when possible. Additional mitigation measures for reducing emissions from construction equipment and activities would be achieved by following the Multnomah County Clean Air Construction guidance.

Particular consideration will be given to reducing potential impacts from construction dust and emissions on the residents and occupants of older buildings (such as the Portland Rescue Mission and Central City Concern) located immediately adjacent to the construction zone on the west end. Compared to newer buildings, residents of older buildings that do not currently have air conditioning and rely on opening windows to cool interior temperatures, could be exposed to more construction-related dust and emissions, and could benefit from measures to reduce those impacts, especially when bridge demolition activities are occurring in that location. The potential for impacts as well as mitigation options will be evaluated and coordinated with those facilities as the Project progresses.

9 Contacts and Coordination

Project work includes an extensive public involvement and agency coordination effort including local jurisdictions and neighborhoods within the Project Area.

At the appropriate time, agencies and organizations are notified of the intent to prepare an EIS through the Federal Register and other Project outreach activities. Interested organizations have the opportunity to review and comment on the air quality analysis through the course of the Project, including during the public comment period for the Draft EIS.

During the impact analysis, the following agencies are contacted for data and other information related to air quality:

- ODOT
- ODEQ

10 Preparers

Name	Professional Affiliation	Education	Years of Experience
Scott Noel	HMMH	Bachelors Geography and Environmental Planning	20
Phillip DeVita	HMMH	B.S. Meteorology M.S. Environmental Studies	31
Dillon Tannler	HMMH	B.S. Economic, Environmental Policy, & Management	9

11 References

Federal Highway Administration (FHWA).

2016 A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives Available at: https://www.fhwa.dot.gov/ENVIRonment/air_quality/air_toxics/policy_and_guidance/msat/. Accessed January 22, 2020.

2017 Mobile Source Air Toxics Frequently Asked Questions Available at: https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/moves_msat_faq.cfm. Accessed January 22, 2020.

Multnomah County

2021a EQRB Description of Alternatives Report. https://multco.us/earthquake-ready-burnside-bridge/project-library.

2021b EQRB Transportation Technical Report. https://multco.us/earthquake-ready-burnside-bridge/project-library.

Oregon Department of Transportation (ODOT)

2018 Air Quality Manual Project Level, Version 1.0. Prepared by Geo-Environmental for Oregon Department of Transportation. October 1, 2018.

Oregon Department of Environmental Quality (DEQ).

2019 2018 Oregon Air Quality Data Summaries. October 2019.

2018 Active State Transportation Improvement Program (STIP). http://www.oregon.gov/ODOT/STIP/Documents/OnlineSTIP_Public.pdf. Accessed March 9, 2020.

U.S. Environmental Protection Agency (EPA)

2014 Motor Vehicle Emissions Simulator. October 2015

2014a Motor Vehicle Emissions Simulator version 2014a. December 2017

2014b Motor Vehicle Emissions Simulator version 2014b. August 2018

Western Regional Climate Center.

2008 Local Climatological Data, Portland, Oregon, Portland International Airport (KPDX). National Oceanic and Atmospheric Association, National Climatic Data Center. July and August 2008.

Appendix A. Council of Environmental Quality (CEQ) Provisions Covering Incomplete or Unavailable Information and Information on the FHWA Sponsored Mobile Source Air Toxics Research Efforts

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. FHWA Interim MSAT Guidance Mitigation Strategies

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

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