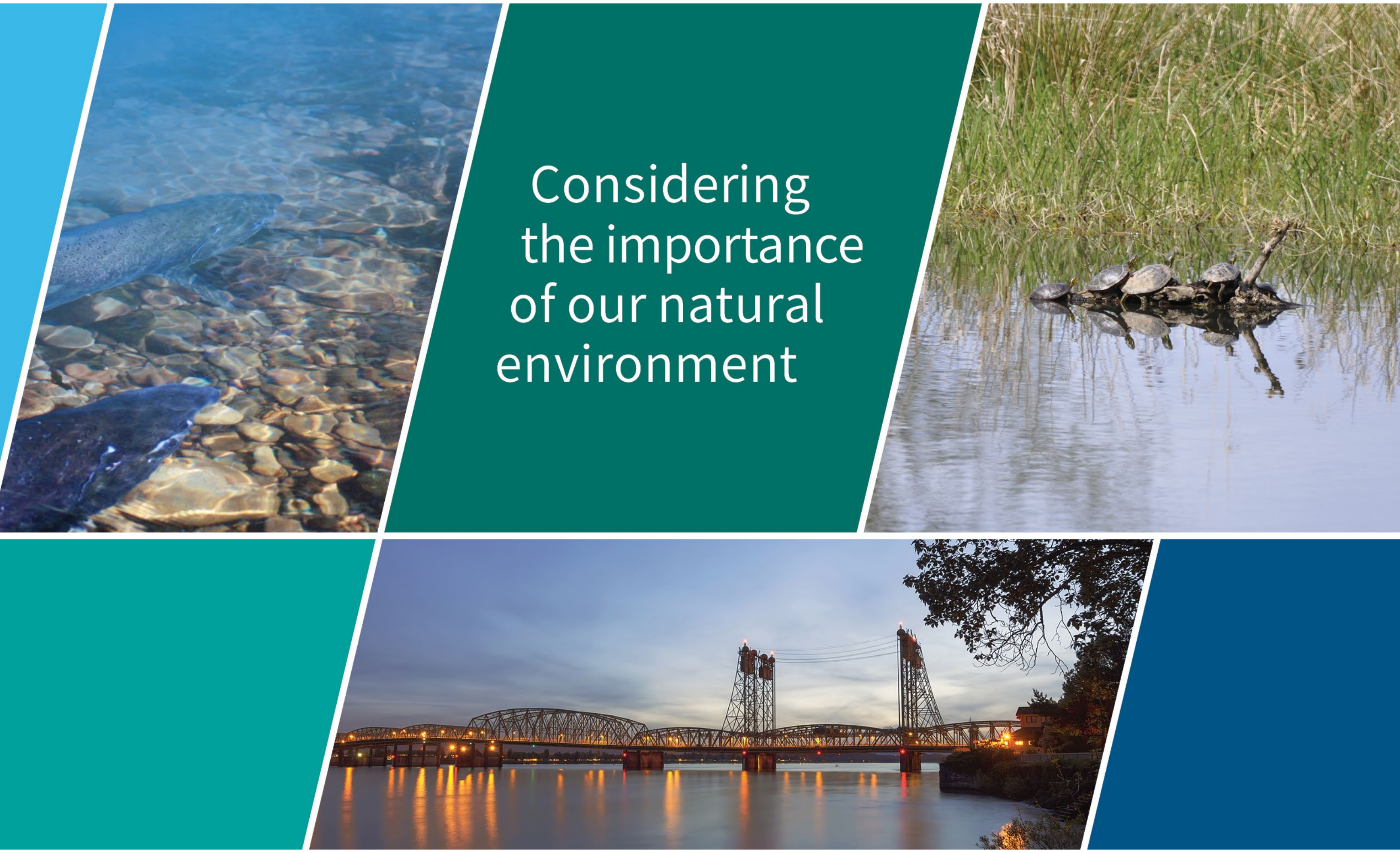
Interstate BRIDGE Replacement Program



DRAFT Air Quality Technical Report

March 2023

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Interstate BRIDGE Replacement Program

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Air Quality Technical Report

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TABLES

ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADA	Americans with Disabilities Act
CAA	Clean Air Act
CRC	Columbia River Crossing
CO	Carbon Monoxide
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
HEI	Health Effects Institute
I-5	Interstate 5
IBR	Interstate Bridge Replacement
LPA	Locally Preferred Alternative
MSAT	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_X	Nitrogen Oxide
ODOT	Oregon Department of Transportation
PM	Particular Matter
ROD	Record of Decision
SEIS	Supplemental Environmental Impact Statement
SIP	State Implementation Plan
SWCAA	Southwest Clean Air Agency
TOD	Transit-oriented development
VMT	Vehicle miles traveled
VOC	Volatile organic compounds
WSDOT	Washington State Department of Transportation

1. PROJECT OVERVIEW

This technical report identifies, describes, and evaluates the existing air quality within the study area and the long-term and temporary effects to air quality from the Interstate Bridge Replacement (IBR) program. This report also provides mitigation measures for potential effects to air quality when avoidance is not feasible.

The purpose of this report is to satisfy applicable portions of the National Environmental Policy Act (NEPA) 42 United States Code (USC) 4321 “to promote efforts which will prevent or eliminate damage to the environment.” Information and potential environmental consequences described in this technical report will be used to support the Draft Supplemental Environmental Impact Statement (SEIS) for the IBR program pursuant to 42 USC 4332.

The objectives of this report are to:

- Define the study area and the methods of data collection and evaluation (Chapter 2).
- Describe the existing air quality conditions within the study area (Chapter 3).
- Discuss potential long-term, temporary, and indirect effects on air quality resulting from construction and operation of the Modified Locally Preferred Alternative (LPA) compared to the No-Build Alternative (Chapters 4, 5, and 6).
- Provide proposed avoidance and mitigation measures to help prevent, eliminate, or minimize environmental consequences from the Modified LPA (Chapter 7).
- Identify federal, state, and local permits and approvals that would be required (Chapter 8).

The IBR programs’ Modified LPA is a modification of the LPA for the Interstate 5 (I-5) Columbia River Crossing (CRC) project, which completed the NEPA process with a signed Record of Decision (ROD) in 2011 and two reevaluations that were completed in 2012 and 2013. The CRC Project was suspended in 2014. The IBR program’s SEIS is evaluating the effects of changes in design since the CRC ROD, as well as changes in regulations, policy, and physical conditions.

Please refer to the separate IBR Program Description file on the portal for a description of the Modified LPA, Modified LPA Construction, and the No-Build Alternative. The IBR program description will be inserted into the final version of this technical report.

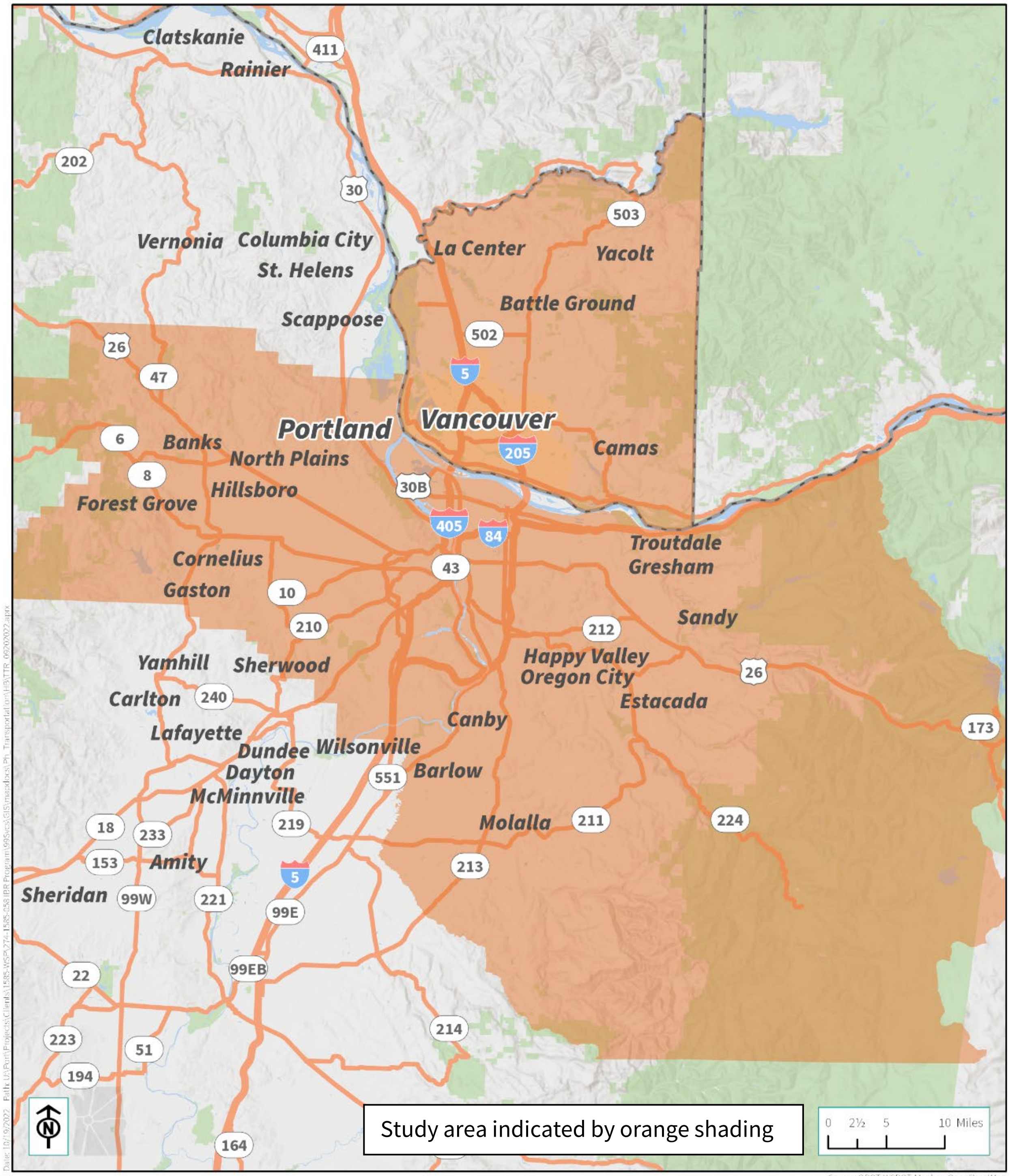
2. METHODS

This chapter describes the methods used to evaluate air quality impacts from the Modified LPA.

2.1 Study Area

The study area for air quality is shown in Figure 2-1. Air quality impacts are closely tied to traffic impacts. Air quality impacts from the IBR program were evaluated based on the boundaries of Metro's regional travel-demand model that encompasses Multnomah, Clackamas, Washington, and Clark Counties. Air quality modeling analyses used a refined set of data meant to capture differences in emissions due to the Modified LPA, as described in more detail in Section 2.4.1.1.

Figure 2-1. Air Quality Study Area



Source: ODOT, WSDOT, Mapbox, OpenStreetMap

2.2 Relevant Laws and Regulations

2.2.1 Criteria Air Pollutants

As required by the Clean Air Act (CAA), the National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants: carbon monoxide (CO), nitrogen dioxide, ozone, particulate matter (PM) (less than or equal to 2.5 microns in diameter [$PM_{2.5}$] and 10 microns in diameter [PM_{10}]), sulfur dioxide, and lead. Table 2-1 provides a summary of these standards. "Primary" standards have been established to protect public health; "secondary" standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare. An air quality impact would occur with a violation of the NAAQS.

Geographic areas where pollutant concentrations exceed the ambient air quality standards (do not attain standards) are classified as nonattainment areas. Previously designated nonattainment areas that are now in compliance with air quality standards are classified as attainment areas with a maintenance plan (commonly referred to "maintenance areas"), because they have maintenance plans to prevent regressing air quality conditions. Areas that meet the standards (attain standards) are classified as attainment areas. Federal regulations require states to prepare State Implementation Plans (SIPs) that identify emission-reduction strategies for nonattainment and maintenance areas.

Table 2-1. National Ambient Air Quality Standards

Criteria Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon monoxide (CO)		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead (Pb)		Primary and secondary	Rolling 3-month average	0.15 µg/m3 [a]	Not to be exceeded
Nitrogen dioxide (NO_2)		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and secondary	Annual	53 ppb [b]	Annual mean
Ozone (O_3)		Primary and secondary	8-hour	0.070 ppm [c]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate matter	$PM_{2.5}$	Primary	Annual	12 µg/m3	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m3	Annual mean, averaged over 3 years
		Primary and secondary	24-hour	35 µg/m3	98th percentile, averaged over 3 years
	PM_{10}	Primary and secondary	24-hour	150 µg/m3	Not to be exceeded more than once per year on average over 3 years
Sulfur dioxide (SO_2)		Primary	1-hour	75 ppb [d]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: EPA 2022a

[a] Final rule signed October 15, 2008. The 1978 Pb standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 year, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[b] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

[c] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

[d] The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: a) any area for which it is not yet one year since the effective date of designation under the current (2010) standards, and b) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a State Implementation Plan (SIP) call under the previous SO_2 standards (40 Code of Federal Regulations 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required National Ambient Air Quality Standard.

CO = carbon monoxide; EPA = U.S. Environmental Protection Agency; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; PM = particulate matter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter particulate matter; ppb = parts per billion; ppm = parts per million; SO_2 = sulfur dioxide; µg/m^3 = micrograms per cubic meter

"Primary" and "secondary" standards are discussed in the text above this table.

During the 1970s, pollutant concentrations in the Portland and Vancouver metropolitan areas exceeded the NAAQS for CO on one out of every three days, and ozone levels were often as high as 50% over the federal standard. Programs and regulations put into effect to control air pollutant emissions have been effective, and air quality in the area has improved. The area was redesignated from a nonattainment area to a maintenance area for CO in 1997. In October 2017, the 20-year CO maintenance planning period ended in Portland. In the City of Vancouver, the CO maintenance period ended on October 21, 2016, and the ozone maintenance period ended on June 18, 2017.

Portland metropolitan region's nonattainment designation for the ozone standard and the subsequent revocation of the standard. As a result, the Portland region has obligations to an ozone SIP, which includes transportation strategies to address ozone pollution.

The Oregon Department of Environmental Quality (DEQ) and the Southwest Clean Air Agency (SWCAA) cooperate on management of air quality in the Portland metropolitan area. Because the Portland metropolitan area is in attainment for all NAAQS, the region is not subject to the transportation conformity requirements of 40 Code of Federal Regulations Part 93 subpart A as was the case during evaluation of the CRC Project. Compared to the CRC Project's analysis, some documentation requirements are no longer needed and are not included this report because transportation projects are no longer required to demonstrate NAAQS compliance. However, the terms of the maintenance plan remain in effect, and the DEQ and SWCAA must comply with all measures and requirements contained in the regional 2007 Carbon Monoxide Maintenance Plan until each state and the U.S. Environmental Protection Agency (EPA) revise them and approve the changes.

In 2005, the EPA revoked the 1-hour ozone standard. At that time, the region was designated as attainment with a maintenance plan. Although the region no longer has a requirement to demonstrate air quality conformity for ozone, the maintenance plan is still in place, including transportation strategies to which the region has committed.

2.2.2 Mobile Source Air Toxics

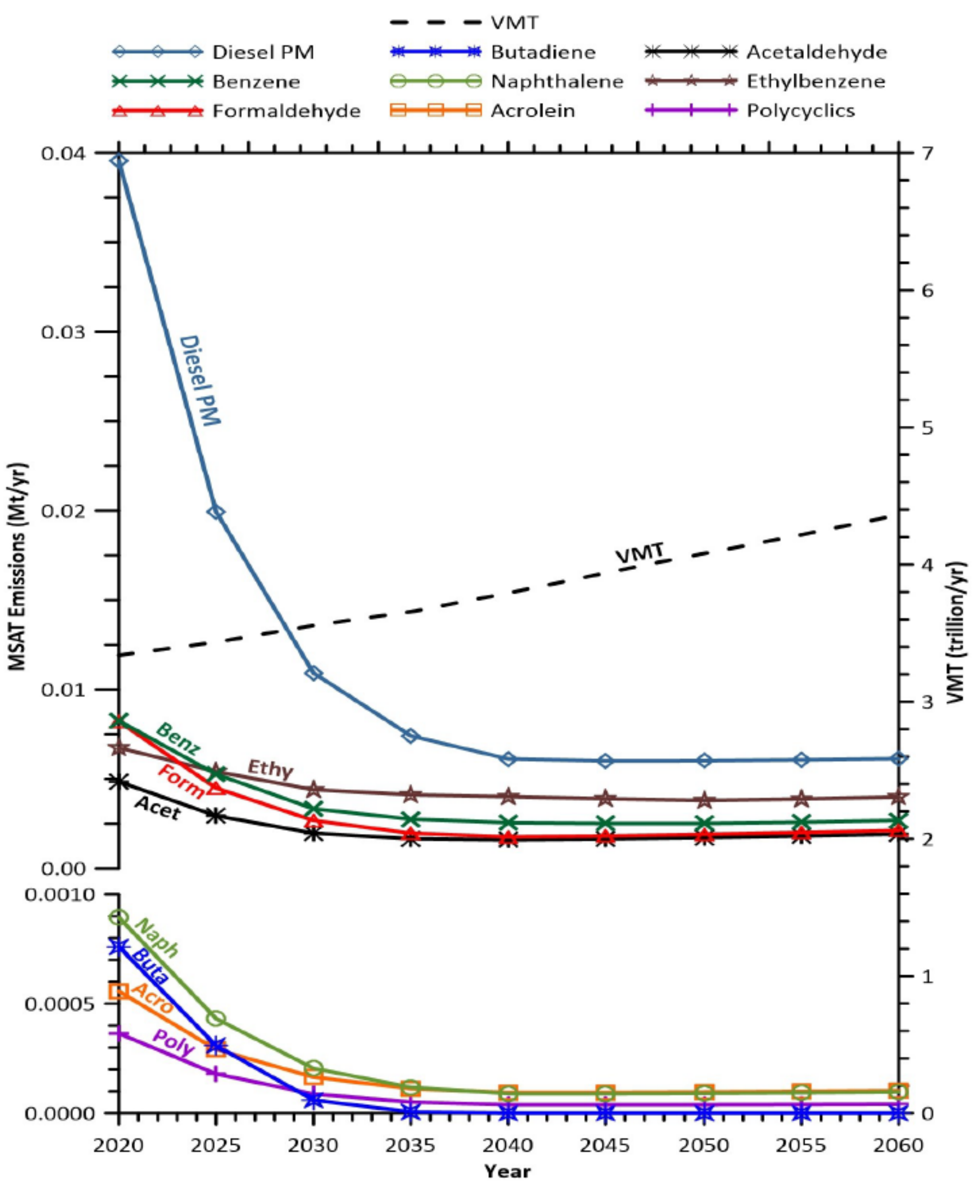
In addition to the criteria pollutants that EPA regulates through the NAAQS, the EPA also regulates air toxics. Toxic air pollutants are pollutants known or suspected to cause cancer or other serious health effects. Most air toxics originate from humanmade sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

Controlling air toxic emissions became a national priority with the passage of the CAA Amendments of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in its latest rule—Control of Hazardous Air Pollutants from Mobile Sources (72 Federal Register 8427, February 26, 2007)—and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (EPA 2021). In addition, the EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 2011 National Air Toxics Assessment (EPA 2011). These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While the Federal Highway Administration (FHWA) considers these the priority Mobile Source Air

Toxics (MSAT), the list is subject to change and may be adjusted in consideration of future EPA rules. The Federal Transit Administration does not have additional requirements for MSAT emissions.

The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. Using the EPA's MOVES3 model, as shown in Figure 2-2, the FHWA estimates that even if vehicle miles traveled (VMT) increases by 31% from 2020 to 2060 as forecast, a combined reduction of 76% in the total annual emissions for the priority MSATs is projected for the same time period.

Figure 2-2. Projected National Mobile Source Air Toxics Emission Trends (2020 to 2060)



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.
Source: EPA MOVES3 model runs conducted by FHWA, March 2021.

Source: FHWA 2023a

On February 3, 2006, the FHWA released Interim Guidance on Air Toxic Analysis in NEPA Documents. This guidance was superseded on January 18, 2023, by the FHWA's Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents (FHWA 2023a). The purpose of this is to advise when and how to analyze MSATs in the NEPA environmental review process for highways. This guidance is considered interim, because MSAT science is still evolving. As the science progresses, the FHWA will update the guidance.

A quantitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The FHWA's Updated Interim Guidance groups projects into the following tier categories:

- Tier 1 - No analysis for projects without potential for meaningful MSAT effects.
- Tier 2 - Qualitative analysis for projects with low potential MSAT effects.
- Tier 3 - Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

Based on the FHWA's recommended tiering approach, the Modified LPA falls within the Tier 3 approach. In accordance with FHWA's guidance, estimated annual MSAT emissions were calculated for the Modified LPA and No-Build Alternative.

2.2.3 Additional Air Quality Regulations

In addition to NAAQS compliance and conformity requirements, the following air quality regulations directly or indirectly apply:

- The SWCAA requires permitting of non-road engines that remain at "any single site at a building, structure, or installation" for more than 12 consecutive months. This regulation could affect construction equipment in Washington and requires dispersion modeling of emissions. The regulation excludes mobile cranes and pile drivers.
- Asbestos regulations that the DEQ and SWCAA administer could affect demolition activities. DEQ and SWCAA require notification of potential asbestos removal activities and the use of certified contractors.
- Although there is not a specific air quality regulation (except for compliance with the NAAQS) governing emissions of lead from demolition activities during construction, control of potential lead emissions is addressed in the construction contracts.
- Oregon House Bill 2007, known as the "Clean Diesel Bill," authorizes the Environmental Quality Commission of the DEQ to adopt rules for certification of approved retrofit technologies of diesel engines that power medium-duty and heavy-duty trucks. The legislation includes prohibitions on registering and titling older diesel engines in Clackamas, Multnomah, and Washington Counties after specified deadlines, unless the older diesel engines are equipped with retrofit technologies established by the commission or the DEQ. This bill also includes policy for clean diesel in public contracts, requiring at least 80% of the total fleet vehicles and equipment to be powered by model year 2010 or newer engines and meet EPA Tier 4 exhaust emission standards.

The Oregon State Air Toxics Program establishes ambient benchmark concentrations for 52 air toxics of concern to Oregon. These benchmarks provide consistent health-based goals, as the DEQ develops strategies to reduce air toxics. Estimates of MSATs emitted by the vehicle network are included in this air quality analysis, but the resulting concentrations of MSATs or other air toxics are not calculated as part of this analysis. FHWA prepared information to explain how current scientific techniques, tools, and data are not sufficient to accurately estimate human health impacts that could result from a transportation project in a way that would be useful to decision-makers. This FHWA language is included in Section 4.1.1.1.

2.3 Data Collection Methods

The air quality analysis used secondary data (traffic information) and assumptions about the local vehicle fleet and fuel specifications to estimate regional pollutant emissions. Pollutant emissions data were estimated using the EPA's MOVES model version MOVES3.1.0. MOVES input files were acquired from DEQ and the Washington Department of Ecology (Ecology) that are consistent with regional emissions modeling used for transportation planning purposes. The IBR program team developed input files using detailed traffic data from regional travel-demand modeling. Detailed model inputs and options are described in this air quality technical report. In addition, model run specification files and input and output databases will be available electronically.

2.4 Analysis Methods

An operational impacts analysis provides information to the public and decision-makers on emissions of pollutants as required by federal regulations and state guidelines. Additional analyses described in the following sections address concerns that the public expressed related to health impacts and equity. The pollutant emissions were estimated for analysis year 2015 to represent existing conditions, which corresponds to the base year of the regional travel-demand model that is the basis for the regional emissions analysis. Emissions for the Modified LPA and the No-Build Alternative were estimated for the 2045 analysis year. This comparison demonstrates the potential effects of the alternatives and describes how this information relates to potential health risks.

2.4.1 Mobile Source Air Toxics

As noted in Section 2.2.2, based on the FHWA's recommended tiering approach for MSAT, the Modified LPA falls within Tier 3, and a quantitative analysis was performed. The quantitative analysis is consistent with FHWA's *Frequently Asked Questions (FAQs): FHWA Recommendations for Conducting Quantitative MSAT Analysis for FHWA NEPA Documents* (referred to herein as FHWA FAQ) (FHWA 2023b).

2.4.1.1 MSAT Study Area

The MSAT study area is a subset of the area covered by the regional travel-demand model. Analyzing a metropolitan area's entire roadway network would result in emissions estimates for many roadway links that would not be affected, which would dilute the results of the analysis and not allow for a meaningful comparison between the Modified LPA and the No-Build Alternative. The FHWA recommends analyzing a subset of the regional data by including all segments associated with the

Modified LPA plus those segments expecting meaningful changes (i.e., ± 10% or more) in MSAT emissions.

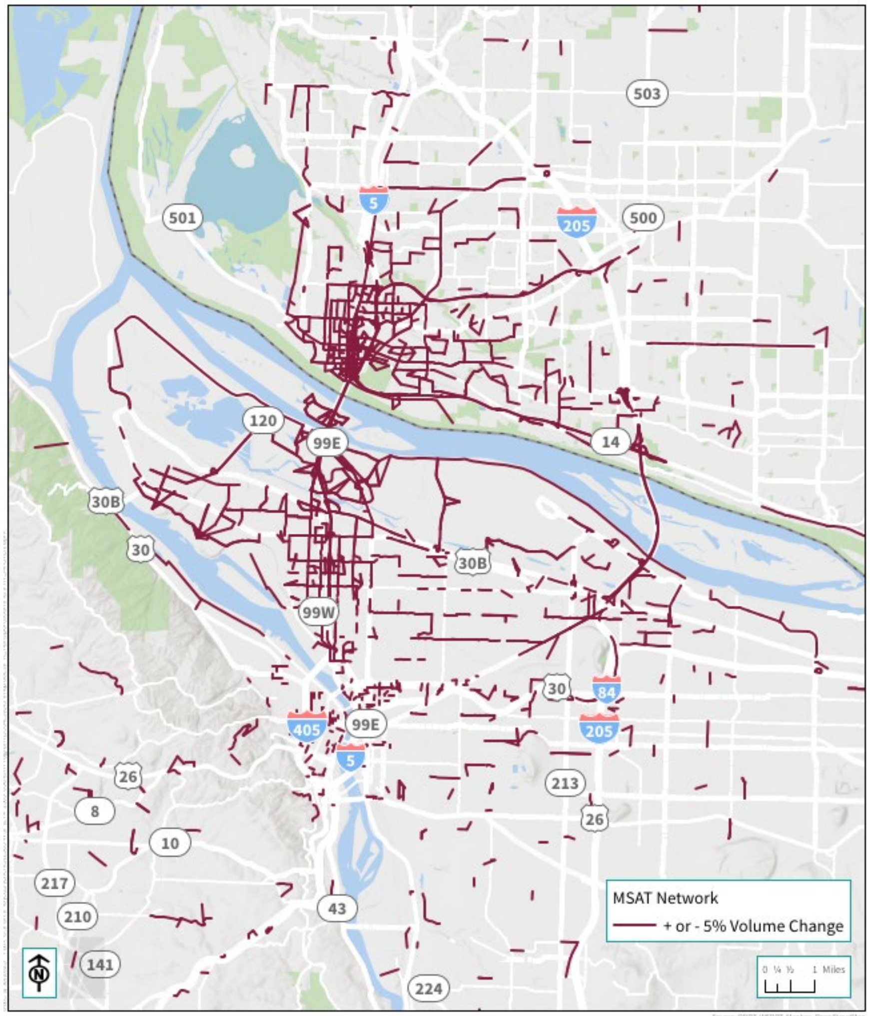
FHWA recommends defining the affected network using available program-specific information considering changes in the following metrics outlined in the FHWA FAQ (FHWA 2023b):

- ± 5% or more change in annual average daily traffic (AADT) on congested highway links.
- ± 10% or more in AADT on uncongested highway links of Level of Service C or better.
- ± 10% or more in travel time.
- ± 10% or more in intersection delay.

The study area was determined by comparing traffic volumes for all links in the regional model between the No-Build Alternative and the Modified LPA. Using the recommendations described above, highway links (congested and uncongested) with traffic volume differences of ± 5%, along with professional judgment and local knowledge of the IBR Transportation Team, were used to develop one roadway analysis network for a thorough review of the Modified LPA. Travel time and intersection delays were not used to develop the roadway analysis network. The traffic data used to develop the roadway analysis network included changes from traffic diverted onto other local routes to avoid tolling. Travel time and delay were not used to determine the MSAT analysis network because they were not estimated for the entire region included in the regional traffic data.

Figure 2-3 shows the MSAT study area, including the segments with a predicted change in AADT greater than 5% or less than negative 5% that were used to determine the affected network. All roadway links were considered, but only the highlighted links within the boundary were included in emissions calculations. Figure 2-3 provides a closer look at the MSAT study area to more clearly show individual roadway links adjacent to the study area that met or did not meet the criteria described above.

Figure 2-3. Mobile Source Air Toxics Study Area – Roadway Analysis Network



2.4.1.2 Model Inputs and Options

The EPA's MOVES model version MOVES3.1.0 was used to estimate emissions from the affected roadway analysis network. Quantities of pollutant emissions in tons per year were calculated for the roadways identified; concentrations of MSATs are not calculated as part of this analysis. MOVES input files were provided by DEQ and Ecology, consistent with their regional emissions analyses. Link-by-link traffic data was retrieved from regional travel-demand modeling and used to develop program-specific input files to demonstrate the effects of the No-Build Alternative and Modified LPA.

The link-by-link traffic data indicates the link length and facility type, and it includes volume and speed data for an average weekday. The volume and speed data were provided by time period and vehicle type, as available from the regional travel-demand model. Section 2.4.3 presents specific modeling inputs, options, and data sources.

MOVES was used to estimate the total emissions from the MSAT network for the Modified LPA. The VMT within the MSAT study area and the emissions of each MSAT pollutant are provided in results tables in Section 4.1.1 for comparison. MSAT burdens were calculated for the following MSATs, as required by the FHWA:

- 1,3 Butadiene
- Acetaldehyde
- Acrolein
- Benzene
- Diesel particulate matter
- Ethylbenzene
- Formaldehyde
- Naphthalene
- Polycyclic organic matter

Section 4.1.1.1 includes a discussion of ongoing MSAT research efforts, strategies to minimize emissions, and an explanation of the incomplete or unavailable information for a specific MSAT health impacts analysis.

2.4.2 Criteria Pollutants

Under the CAA Amendments of 1990, the U.S. Department of Transportation cannot fund, authorize, or approve federal actions to support programs or projects that are not first found to conform to the SIP. Highway projects in attainment areas are in conformity with the CAA and are not required to perform detailed microscale air quality modeling or regional air quality analysis.

In response to public concerns about the health impacts from criteria pollutants, a quantitative analysis of the criteria pollutant emissions at the regional scale was conducted. This analysis used the same methodology described for the MSAT analysis. Emissions are reported for the same roadway segments included in the MSAT study, because this was the FHWA's suggestion to provide a regional estimate that demonstrates potential changes in emissions between alternatives.

MOVES was used to estimate the total annual emissions from the study area. Emissions burdens were calculated for the following criteria pollutants and their precursors:

- CO
- Oxides of nitrogen
- Oxides of sulfur
- Volatile organic compounds (a precursor for ozone)
- Particulate matter (PM_{10} and $PM_{2.5}$)

There are no thresholds for determining significance of criteria pollutants within areas that are in attainment of the NAAQS. Instead, the results were used for informational purposes to compare the emissions of the Modified LPA and the No-Build Alternative.

2.4.3 Emissions Modeling Inputs

EPA's MOVES model version MOVES3.1.0 was used to estimate MSAT emissions from the roadway links included in the MSAT study network. MOVES is the EPA's state-of-the-art tool for estimating emissions from highway vehicles. The model is based on analyses of millions of emission test results and considerable advances in EPA's understanding of vehicle emissions. Compared to previous versions, MOVES3.1.0 incorporates the latest emissions data; applies more sophisticated calculation algorithms; accounts for new regulations, including the Heavy-Duty Greenhouse Gas Phase 2 rule and the Safer Affordable Fuel Efficient Vehicles Rule; and provides an improved user interface. Table 2-2 summarizes the MOVES run specifications as recommended in the FHWA FAQ (FHWA 2023b).

Table 2-2. MOVES Run Specification Options

MOVES Tab	Model Selections
Scale	• County Scale. • Inventory Calculation Type.
Time Span	• Hourly time aggregation including all months, days, and hours. • Analysis years 2015 and 2045.
Geographic Bounds	• Multnomah County was used to represent emissions from segments in Oregon, consistent with Metro's regional emissions model. • Clark County was used to represent emissions from segments in Washington.
Vehicles/Equipment	• All on-road vehicle and fuel type combinations.
Road Type	• Rural restricted, rural unrestricted, urban restricted, and urban unrestricted.
Pollutants and Processes	• FHWA's nine priority MSAT pollutants (1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter) were selected, as well as precursor pollutants needed to make the calculations. • Diesel particulate matter was represented by Primary Exhaust PM_{10}. • Criteria pollutants: volatile organic compounds (VOCs), carbon monoxide, oxides of nitrogen, primary exhaust $PM_{2.5}$-Total, Primary $PM_{2.5}$-Brakewear Particulate, Primary $PM_{2.5}$-Tirewear Particulate, Primary Exhaust PM_{10}-Total, Primary PM_{10}-Brakewear Particulate, Primary PM_{10}-Tirewear Particulate, sulfur dioxide, and all applicable precursor pollutants. • Processes included running exhaust, crankcase running exhaust, evaporative permeation, and evaporative fuel leaks.
Advanced Features	• MOVES Advanced Features option was used to create database for each state that identifies the year of adoption of California's Low Emission Vehicle program.

MOVES Tab	Model Selections
Output	• Output was in an annual inventory of pollutant emissions by roadway type and vehicle type.

[a] Although the study area spans multiple counties in Oregon, Multnomah County was used to represent all Oregon emissions in the metropolitan Portland area, which is consistent with Metro's approach to regional emissions modeling.

MOVES input files were developed using data provided by DEQ and Ecology, output from the traffic analysis, and EPA defaults. MOVES model runs combined data representing regional conditions and project-specific data characterizing the differences in traffic volumes and speeds. For the Modified LPA and the No-Build Alternative, two MOVES runs were created to determine the emissions on Oregon roadway segments using Oregon regional conditions and the emissions on Washington roadway segments using Washington regional conditions. Table 2-3 summarizes specific inputs and their sources.

Table 2-3. MOVES County Data Manager Inputs

County Data Manager Tab	Data Source – Oregon	Data Source – Washington
Source Type Population	DEQ	Ecology
Age Distribution	DEQ and MOVES county defaults	Ecology and MOVES county defaults
Fuel	DEQ	Ecology
Inspection/Maintenance Programs	DEQ	Ecology
Meteorological Data	MOVES county defaults	MOVES county defaults
Road Type Distribution	Created from project data for segments located in Oregon	Created from project data for segments located in Washington
Average Speed Distribution	Created from project data for segments located in Oregon	Created from project data for segments located in Washington
Vehicle Type VMT	Created from project data for segments located in Oregon	Created from project data for segments located in Washington

The following agency-supplied input files were modified for the analysis:

- Source Type Population: DEQ provided the population of registered vehicles in the metropolitan area for analysis year 2020. Ecology provided the population of registered vehicles in Clark County for 2017. The same population data was used for each analysis year because MOVES does not use these values to calculate running emissions, but a value must be entered for the model to run.
- Age Distribution: DEQ provided the age distribution of all vehicle types in the metropolitan area for analysis year 2020, and Ecology provided the same data for Clark County for the year 2017. These distributions were used to represent existing and future conditions.
- Fuel: MOVES defaults for Multnomah County were used for fuel supply, fuel usage fraction, and fuel type and technology allocations. Default fuel formulation data was adjusted as recommended by DEQ to reflect the local biodiesel formulation details. These data were used for Oregon and Washington, which is consistent with Ecology's regional modeling

methodology that assigns Multnomah County fuel defaults to Clark County. The EPA does not provide MOVES defaults for electric vehicle use and conservatively assumes that no electric vehicles are in the fleet. As recommended by the Oregon Department of Transportation (ODOT) and Washington State Department of Transportation (WSDOT) to provide a conservative air pollutant emissions estimate, no electric vehicles were considered in this emissions analysis.

- Inspection/Maintenance Programs: DEQ prepared MOVES input files characterizing required vehicle inspection/maintenance programs in the metropolitan area for analysis year 2019. These files were modified for the program analysis years 2015 and 2045 by adjusting the ending model years as recommended by the EPA to assume the programs would remain in place with consistent grace periods and exemptions based on vehicle age. No inspection/maintenance program was used for Washington emissions because the state does not have an inspection/maintenance program.
- Meteorological Data: MOVES defaults for Multnomah County and Clark County were used for the temperature and humidity profiles.

Link-by-link traffic data developed as part of the traffic analysis was used to create input files to demonstrate the effects of the No-Build Alternative and Modified LPA:

- Existing (2015)
- No-Build Alternative (2045)
- Modified LPA (2045)

The link-by-link traffic data indicated the link length and roadway type, and it included volume and average modeled speed data for every hour of an average weekday. These average weekday values were applied to all days throughout the analysis year. Volumes were provided by vehicle type and accounted for expected changes to the vehicle mix with or without the Modified LPA. The data were processed for use in MOVES using the following assumptions:

- Road Type Distribution: The roadway types and locations were mapped to the four MOVES roadway types: rural restricted, rural unrestricted, urban restricted, and urban unrestricted. The off-network road type was not used for this analysis.
- Average Speed Distribution: The link-level traffic data was provided for each hour of an average weekday. Speeds were mapped to respective MOVES 5-miles-per-hour speed bins. In the absence of weekend speed estimates, the average weekday speed profile was applied to all days in the analysis year.
- Vehicle Type VMT: VMT from each hour was added to develop a daily VMT value for the No-Build Alternative and Modified LPA. Three vehicle types provided the link-level volume data: passenger vehicle, medium truck, and heavy truck. The VMT from these three types were allocated to the 13 MOVES source types using MOVES county defaults to determine the distribution of each vehicle type. For example, the Oregon passenger vehicle VMT was divided among the appropriate MOVES source types (i.e., motorcycles, passenger cars, passenger trucks) using the percentages in the MOVES default VMT for Multnomah County.

2.4.3.1 MOVES Electric Vehicle Use

MOVES input files were developed following EPA methodology, which uses model defaults and data provided by DEQ and Ecology to represent regional climate conditions, fuel specifications, and fleet makeup. The EPA methodology does not include input files for electric vehicle use; therefore, existing and future electric vehicle use is not included in the MOVES modeling in this air quality analysis.

2.4.4 Maintenance Base Operations

Stationary sources such as bus and light-rail maintenance facilities are subject to the permitting regulations of either DEQ or SWCAA. The existing permitting regulations are designed to protect the health of the public. Consequently, no impacts are expected as a result of maintenance base operations, and they are not evaluated as part of this analysis.

2.4.5 Temporary Effects

The analysis of direct short-term air quality impacts that would occur during construction of the Modified LPA consists of a qualitative discussion of typical sources of pollutant emissions from the anticipated types of construction activities.

3. AFFECTED ENVIRONMENT

This section describes existing air quality conditions and trends in the air quality study area.

3.1 General Climate Conditions

The climate within the study area is characterized by short, dry, warm summers, with a typically cool and wet spring, fall, and winter. The Coast Range offers limited shielding from the Pacific Ocean storms, while the Cascades provide an orographic lift of moisture-laden westerly winds, resulting in moderate rainfall. As monitored at the Portland International Airport by the National Oceanic and Atmospheric Administration, nearly 90% of the average annual rainfall of approximately 36 inches occurs from October through May (NOAA 2022). Average monthly temperatures taken at the Portland International Airport vary from approximately 41 degrees Fahrenheit (°F) in January to 70°F in August (NOAA 2022).

The area experiences winter inversion conditions that lead to higher concentrations of CO and particulate matter as emissions accumulate from vehicles and home heating, particularly from wood-burning. Extended periods of high summer temperatures can lead to high ozone levels with emissions of volatile organic compounds (VOCs) and oxides of nitrogen from vehicles and industrial sources.

3.2 Monitored Air Quality Concentrations

3.2.1 Criteria Pollutant Monitoring

DEQ measures air pollutant levels by operating a network of air monitoring and sampling equipment at more than 40 sites throughout Oregon. The Tualatin Near-Road monitor is near I-5 (about 15 miles from the bridge), and the monitor on SE Lafayette Street is about 8 miles southeast of the bridge in a location more representative of local roadways. For pollutants that were not measured at these monitors, concentrations at the nearest monitor were provided.

Ecology operates 75 monitoring sites as part of the Washington network. These sites are located to meet monitoring objectives throughout the state at various scales of population density. Ecology does not operate many monitors in the Vancouver area because the monitors operated by DEQ fulfill the federal monitoring requirements for the metropolitan area.

Monitor data for Washington are provided in the following tables where it is available. Table 3-1 through Table 3-6 summarize the criteria pollutant monitor data for the three most recent years of validated measurements. CO and ozone concentrations were above the standards in the Portland metropolitan area in 2020 due to wildfires. As discussed in DEQ's *Wildfire Smoke Trends and the Air Quality Index*, air pollutant concentrations in 2020 were outliers as compared to the historical trends (DEQ 2022). For the remainder of the year, CO, ozone, and other criteria pollutants were below the federal health standard. These pollutants have been trending mostly downward for most locations over the last 10 years.

Table 3-1. Carbon Monoxide Measured Concentrations in Parts per Billion

Pollutant Monitor Location	Value	2019	2020[a]	2021
5824 SE Lafayette Street, Portland, OR	1-hour Maximum	1.9	15.3	2.6
	1-hour 2nd Maximum	1.8	15.1	2.1
	# of 1-hour Exceedances	0	0	0
	8-hour Maximum	1.6	14.2	1.7
	8-hour 2nd Maximum	1.4	14.1	1.4
	# of 8-hour Exceedances	0	**24**	0
6745 Bradbury Court, Tualatin, OR	1-hour Maximum	1.3	14.7	1.4
	1-hour 2nd Maximum	1.2	14.6	1.3
	# of 1-hour Exceedances	0	0	0
	8-hour Maximum	1	14.3	1
	8-hour 2nd Maximum	1	13.3	0.9
	# of 8-hour Exceedances	0	**31**	0

Source: EPA 2023

[a] Elevated concentrations occurred during wildfire impacts. Eight-hour CO standard of 9 ppm is not to be exceeded more than once per year.

Table 3-2. PM_{10} Measured Concentrations in Micrograms per Cubic Meter

Monitor Location	Value	2019	2020	2021
5824 SE Lafayette Street, Portland, OR	24-hour Maximum	33	35	31
	24-hour 2nd Maximum	29	35	29
	# of Exceedances	0	0	0
4915 N Gantenbein Avenue, Portland, OR	24-hour Maximum	29	23	27
	24-hour 2nd Maximum	28	22	24
	# of Exceedances	0	0	0

Source: EPA 2023

PM_{10} = particulate matter less than or equal to 10 microns in diameter. 24-hour PM_{10} standard of 150 µg/m^3 is not to be exceeded more than once per year on average over three years.

Table 3-3. $PM_{2.5}$ Measured Concentrations in Micrograms per Cubic Meter

Monitor Location	Value	2019	2020[a]	2021
5824 SE Lafayette Street, Portland, OR	24-Hour 98th percentile	20.0	31.0	16.0
	Mean Annual	6.5	10.7	6.4
6745 Bradbury Court, Tualatin, OR	24-Hour 98th percentile	21.0	28.0	18.0
	Mean Annual	6.9	11.2	6.7
1149 NE Grant Street, Hillsboro, OR	24-Hour 98th percentile	24.0	30.0	15.0
	Mean Annual	6.7	10.9	5.8
2722 NE 84th Avenue, Vancouver, WA	24-Hour 98th percentile	25.0	147.0	16.0
	Mean Annual	7	13.9	5.7

Source: EPA 2023

$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter

a Elevated concentrations occurred during wildfire impacts. 24-hour $PM_{2.5}$ standard is exceeded when the 98th percentile, averaged over three years, is greater than 35 µg/m³.

Table 3-4. Ozone Measured Concentrations in Parts per Million

Monitor Location	Value	2019	2020[a]	2021[a]
5824 SE Lafayette Street, Portland, OR	1st Highest	0.066	0.075	0.072
	2nd Highest	0.065	0.066	0.066
	3rd Highest	0.06	0.064	0.066
	4th Highest	0.058	0.059	0.060
	# of days standard exceeded	0	**1**	**1**
6745 Bradbury Court, Tualatin, OR	1st Highest	0.065	0.076	0.070
	2nd Highest	0.054	0.063	0.057
	3rd Highest	0.05	0.062	0.056
	4th Highest	0.05	0.059	0.056
	# of days standard exceeded	0	**1**	0
1500 SE Blairmont Drive (Mountain View High School), Vancouver, WA	1st Highest	0.065	0.059	0.068
	2nd Highest	0.065	0.059	0.064
	3rd Highest	0.061	0.057	0.057
	4th Highest	0.058	0.054	0.057
	# of days standard exceeded	0	0	0

Source: EPA 2023

a Elevated concentrations occurred during wildfire impacts. Ozone standard is exceeded when the annual fourth-highest daily maximum 8-hour concentration, averaged over three years, is greater than 0.070 ppm.

Table 3-5. Nitrogen Dioxide Measured Concentrations in Parts per Billion

Monitor Location	Value	2019	2020	2021
5824 SE Lafayette Street, Portland, OR	1-hour Maximum	43	35	36
	1-hour 2nd Maximum	37	33	33
	98th Percentile	32	29	31
	Annual Mean	7.73	6.36	6.64
6745 Bradbury Court, Tualatin, OR	1-hour Maximum	41	42	38
	1-hour 2nd Maximum	35	37	36
	98th Percentile	33	30	30
	Annual Mean	10.57	10.17	9.23

Source: EPA 2023

1-hour nitrogen dioxide standard is exceeded when the 98th percentile of 1-hour daily maximum concentrations, averaged over three years, is greater than 100 ppb.

Table 3-6. Sulfur Dioxide Measured Concentrations in Parts per Billion

Monitor Location	Value	2019	2020	2021
5824 SE Lafayette Street, Portland, OR	1-hour Maximum	3.2	3	3
	24-hour Maximum	1.3	1.5	1.9
	# of days standard exceeded	0	0	0
8678 NE Sumner Street, Portland, OR	Maximum 24 hours	12	8	NA
	2nd Maximum	5.6	3.5	NA
	# of Exceedances	0	0	NA

Source: EPA 2023

NA = pollutant not monitored during this period

1-hour SO2 standard is exceeded when the 99th percentile of 1-hour daily maximum concentrations, averaged over three years, is greater than 75 ppb.

3.2.2 Attainment Status

An area's attainment status is based on data collected by the state monitoring network on a pollutant-by-pollutant basis. Areas that have a history of monitored concentrations above the NAAQS may be designated by the EPA as nonattainment areas.

The study area spans four counties in the Portland and Vancouver metropolitan areas, which the EPA designates as in attainment for all criteria pollutants. The Portland metropolitan area was subject to a Carbon Monoxide Maintenance Plan. As of October 2, 2017, however, the 20-year transportation conformity planning period associated with the plan expired (EPA 2021), and the area is classified as an attainment area for all criteria pollutants. In Vancouver, the CO maintenance period ended in

October of 2016. All measures and requirements contained in the Carbon Monoxide Maintenance Plan must be complied with until the EPA approves a revision to the state plan; however, transportation projects are no longer required to demonstrate NAAQS compliance with localized "hot-spot" air modeling analysis.

The region was also subject to an ozone maintenance plan. The 1-hour ozone standard was revoked by EPA in 2005. The region is considered in attainment of this standard, but it is still subject to the requirements of the maintenance plan that was in effect at the time of revocation.

The monitor data above indicate that the NAAQS were exceeded for some monitor periods for ozone and CO because of wildfires in 2020. Individual exceedances do not change an area's attainment status. A change in attainment status can be defined only by the EPA, and the process usually occurs when new or revised NAAQS are promulgated.

3.2.3 Toxic Air Pollutants Monitoring

DEQ implements several programs that regulate emissions of air toxics and monitors ambient levels present at various locations across Oregon. Washington does not monitor concentrations of toxic air pollutants in this region. DEQ (n.d.) details information about Oregon's air toxics program.

DEQ operates long-term air toxic monitoring stations and rotates annual sites that operate for a one-year period. As part of DEQ's air toxics monitoring program, 109 air toxics are measured at each monitoring site. Four monitoring sites are in the Portland metropolitan area, and the closest monitor to the Modified LPA location, as identified by the 2018 Oregon Air Toxics Monitoring Summary (DEQ 2020), is the Portland National Air Toxics Trends Station at the Humboldt School. Table 3-7 summarizes annual concentrations for each pollutant that exceeded the DEQ ambient benchmark concentration at this monitor during 2018, the most recently reported monitor period. Air toxics are not criteria pollutants and do not have NAAQS, but Oregon has established benchmarks for air toxics that represent levels that would not pose more than one-in-a-million excess lifetime cancer risk if a person breathed air with that level every day for a lifetime. DEQ uses the benchmarks to provide consistent health-based goals, as the agency develops strategies to reduce air toxics. DEQ developed annual ambient benchmark concentrations for 52 air toxics of concern in Oregon. The benchmarks are based on concentration levels that protect the health of the state's most sensitive individuals that equate to a one-in-a-million chance of cancer or other detrimental health effects. These benchmarks provide consistent health-based goals, as DEQ develops strategies to reduce air toxics that continue to exceed the benchmarks.

Table 3-7. 2018 Concentrations of Air Toxics at the Humboldt School Portland National Air Toxics Trends Site

Pollutant	Monitored Concentration (μg/m^3)	DEQ Benchmark (μg/m^3)	Mobile Source Air Toxic
Arsenic	0.000719	0.0002	No
1,3-Butadiene	0.095	0.03	Yes
Acrylonitrile	0.109	0.111	No

Pollutant	Monitored Concentration (µg/m^3)	DEQ Benchmark (µg/m^3)	Mobile Source Air Toxic
Benzene	0.457	0.13	Yes
Carbon Tetrachloride	0.336	0.2	No
Naphthalene	0.03906	0.03	Yes
Acetaldehyde	1.283	0.45	Yes
Formaldehyde	1.828	0.2	Yes

Source: DEQ 2020
µg/m^3 = microgram per cubic meter

4. LONG-TERM EFFECTS

This chapter describes and compares the long-term impacts expected from the No-Build Alternative and Modified LPA. This discussion focuses on how the Modified LPA or No-Build Alternative would affect air quality in the corridor and regionally. The traffic data used in the analysis are based on regional models for land use and employment; and include traffic from all sources and potential growth as a result of the alternatives. Consequently, the results analyzed and discussed in this section include both direct and indirect effects.

The design options of without the I-5 C Street ramps, the I-5 mainline westward shift, and the options for the park-and-ride locations in Vancouver would have the same effects on air quality as the Modified LPA; therefore, they are not specifically discussed. The park-and-ride options could encourage transit use, which would generally have a beneficial effect on air quality.

4.1 Impacts from the No-Build Alternative and the Modified LPA

This section describes the regional impacts, performance, and total costs associated with the No-Build Alternative and the Modified LPA, which are combinations of highway, Columbia River bridge crossing, transit, and active transportation elements.

4.1.1 Regional Effects

The pollutant emissions estimated by the MOVES model are summarized in Table 4-1 (MSAT) and Table 4-2 (criteria pollutants) for the No-Build Alternative and the Modified LPA and the differences between them. The results represent the annual emissions from vehicles using the roadway segments included in the MSAT network described in Section 2.4.1.1.

The results of the emissions analysis show that for the No-Build Alternative and the Modified LPA, emissions from the analysis network are expected to be substantially lower than existing emissions for all MSAT and criteria pollutants, except for Total PM_{10} which would only be about 1% lower, consistent with national trends. Although the daily VMT in the MSAT study area would increase by approximately 37% under the No-Build Alternative compared to existing conditions, MSAT emissions would decrease substantially with fuel and engine regulations being implemented, as described in Section 2.2.2. Total PM_{10} emissions do not show the same trend because they include emissions from brakewear and tirewear, which do not decrease over time.

On a regional basis, differences between the future 2045 emissions for the No-Build Alternative and the Modified LPA are small enough not to be meaningful within the accuracy of the estimation methods. The emissions shown for the roadway segments defined in Section 2.4.1.1are meant to present the difference between the No-Build and Modified LPA, and the MOVES model results do not represent the total emissions for the entire study area. There are no thresholds to determine the significance of MSAT emissions or criteria pollutant emissions for projects in areas that EPA has designated as in attainment of the NAAQS.

Table 4-1. Mobile Source Air Toxics Emissions (tons per year)

Pollutant	Existing (2015)	No-Build Alternative (2045)	Modified LPA (2045)	Modified LPA Difference from Existing	Modified LPA Difference from No-Build Alternative
MSAT Study Area Daily VMT	2,762,725	3,775,944	3,685,411	33%	-2.4%
1,3-Butadiene	0.92	0.00	0.00	-100%	0%
Acetaldehyde	3.21	0.49	0.43	-87%	-12.7%
Acrolein	3.21E-01	3.10E-02	2.77E-02	-91%	-10.7%
Benzene	15.75	4.44	4.38	-72%	-1.4%
Diesel Particulate Matter	16.10	1.79	1.57	-90%	-12.5%
Ethylbenzene	19.89	13.57	13.49	-32%	-0.6%
Formaldehyde	4.94	0.59	0.52	-89%	-11.2%
Naphthalene	4.47E-04	6.36E-05	6.12E-05	-86%	-3.8%
Polycyclic Organic Matter	0.26	0.01	0.01	-95%	-6.1%

MSAT = mobile source air toxics; VMT = vehicle miles traveled

Table 4-2. Regional Criteria Pollutant Emissions (tons per year)

Pollutant	Existing (2015)	No-Build Alternative (2045)	Modified LPA (2045)	Modified LPA Difference from Existing	Modified LPA Difference from No-Build Alternative
MSAT Study Area Daily VMT	2,762,725	3,775,944	3,685,411	33%	-2.4%
Carbon Monoxide	5,676.9	1,822.3	1,729.5	-70%	-5.1%
Nitrogen Dioxide	1,213.3	269.4	226.0	-81%	-16.1%
Sulfur Dioxide	3.2	3.0	2.8	-11%	-5.5%
Volatile Organic Compounds	1813.7	836.4	831.5	-54%	-0.6%
Total PM_{10}[a]	63.8	74.4	63.0	-1%	-15.3%
Total $PM_{2.5}$[b]	26.2	12.5	10.8	-59%	-13.4%

[a] Total PM_{10} emissions are the sum of PM_{10} exhaust, PM_{10} brakewear, and PM_{10} tirewear.

[b] Total $PM_{2.5}$ emissions are the sum of $PM_{2.5}$ exhaust, $PM_{2.5}$ brakewear, and $PM_{2.5}$ tirewear.

MSAT = mobile source air toxics, $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; VMT = vehicle miles traveled

4.1.1.1 Mobile Source Air Toxics Health Effects

Within the study area, there may be localized areas where ambient concentrations of MSAT could be different under the Modified LPA compared to the No-Build Alternative. The traffic data used to develop the roadway analysis network included changes from traffic diverted onto other local routes to avoid tolling; see the Transportation Discipline Report for more information. The localized changes in MSAT concentrations would likely be most pronounced on roadway links where traffic volumes would increase under the Modified LPA relative to the No-Build Alternative from vehicles diverted from highways to avoid tolling. However, the magnitude and duration of these potential localized concentration increases compared to the No-Build Alternative cannot be reliably quantified because of incomplete or unavailable information in forecasting project-specific MSAT concentrations and related health impacts.

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

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. 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 a continual process of assessing human health effects, exposures, and risks posed by air pollutants. It maintains the Integrated Risk Information System, which identifies and characterizes the health hazards of chemicals found in the environment. 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). Appendix D of FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA 2023a) summarizes several HEI studies. 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 are the adverse human health effects of MSAT compounds at current environmental concentrations (HEI 2007) or in the future as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and finally determination of health impacts, with 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 because 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 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.

Considerable uncertainties are associated with the existing estimates of toxicity of the various MSAT compounds because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (HEI 2007). 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 particulate matter. 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" (EPA 2003).

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 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 the EPA to determine an "acceptable" level of risk caused by 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 one 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 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 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 (see https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/$file/07-1053-1120274.pdf).

Because of the described limitations in the methodologies for forecasting health impacts, 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.

4.1.1.2 Regional Effects Conclusions

The pollutant emissions estimated by the MOVES model summarized in Table 4-1 (MSAT) and Table 4-2 (criteria pollutants) shows that emissions in the most affected roadway links decrease under the

Modified LPA. The MOVES model results follow the expected reduction in emissions shown in Figure 2-2 due to the 2007 EPA rule that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines as compared to existing conditions. The pollutant emissions estimated by the MOVES model correlate to the monitored CO, ozone and other criteria pollutant emissions that have been trending mostly downward for most locations over the last 10 years.

Figure 2-2 shows that diesel particulate matter is the pollutant that will have the greatest decline in the next 10 years. With the DEQ clean truck rule and other state and federal actions, diesel particulate matter will continue to decrease under the Modified LPA. Additional actions to reduce emissions of diesel particulate matter are recommended by local groups, such as Portland Clean Air.

Even though no localized analysis is required, and no thresholds are available for emissions analysis now because the area is in attainment, in 2011 when the area was in maintenance for some pollutants, the CRC Project air quality analysis concluded that long-term localized air quality impacts were not expected to occur as a result of the CRC LPA.

The Transportation Technical Report evaluates the long-term effects of all modes, each of which demonstrates reductions in VMT or improvements in travel times, which are factors generally conducive to improved air quality. The air quality impacts of the Modified LPA, which were analyzed for the system as a whole, demonstrate that the combination of improvements to each mode (I-5, transit and active transportation) result in an overall decrease in pollutant emissions.

Furthermore, this analysis conservatively assumes that there are no electric vehicles in the fleet. WSDOT and ODOT expect that the vehicle fleets in Oregon and Washington in 2045 will have a significant increase in electric vehicles, which would result in a large reduction in air pollutant emissions as compared to the modeled results.

Air pollutant emissions are expected to be substantially lower in the future than under existing conditions for all pollutants evaluated except for VOCs, which will be higher and Total PM_{10} which would only be about 1% lower. On a regional basis, future differences between the Modified LPA and No-Build Alternative are small enough not to be meaningful within the accuracy of the estimation methods. Long-term air quality impacts are not expected to occur as a result of the Modified LPA.

5. TEMPORARY EFFECTS

The following is a qualitative discussion of the potential effects on air quality from construction of the Modified LPA.

5.1 Construction Activities

Construction-related activities would result in short-term impacts that include increases in particulate matter in the form of fugitive dust (from demolition, ground clearing and preparation, grading, stockpiling of materials, on-site movement of equipment, and transportation of construction materials), as well as exhaust emissions from material delivery trucks, construction equipment, and workers' private vehicles. Dust emissions typically occur during dry weather, construction activities, or high wind conditions. Short-term impacts to air quality from construction activities would occur during the 7- to 13-year construction period, which is expected to last from 4 to 10 years at any one location.

6. INDIRECT EFFECTS

The air quality analysis is based on traffic modeling, which includes forecasted land use changes and employment growth by the Metropolitan Planning Organizations (Metro for the Portland area and the Southwest Washington Regional Transportation Council for the Vancouver area). Traffic generated by potential future development as represented in traffic modeling based on approved future land uses is likely to be small compared to the existing and anticipated interstate and local traffic volumes within the study area.

The degree to which the Modified LPA would indirectly effect development and an increase or decrease in motor vehicle trips in the region, in subareas, and near specific intersections, would determine whether it would have a beneficial or adverse indirect on air quality compared to the No-Build Alternative. The air quality analysis discussed in Section 4, Long-term Effects, evaluated impacts on I-5 as well as traffic diverted onto other local routes to avoid tolling. The Modified LPA is not expected to create other effects that would cause indirect impacts to motor vehicle trips that would impact the modeling included in the analysis. No additional indirect impacts or benefits would occur under the Modified LPA.

In compliance with local land use plans, the Modified LPA would be anticipated to encourage development activity primarily near light-rail transit stations specifically, and in urban areas with transit service generally, rather than dispersed, automobile-oriented development at the urban periphery. As such, it can be qualitatively assumed that over the long term, automobile trips and emissions in the region would be reduced relative to the No-Build Alternative. At the neighborhood or intersection level, a transit-oriented development (TOD) or other development may result in more jobs and residences, which could result in more automobile trips. However, increases in automobile trips at these more localized locations would be expected to be limited by the convenience of the light-rail extension proposed by the Modified LPA, as well as other existing transit service in these areas. It is assumed that many of those traveling to a TOD's retail and office uses, and many of those traveling from a TOD's residential uses, would do so via transit, biking, and walking.

Indirect impacts also include the potential for growth-inducing effects and other effects related to induced changes in patterns of land use, population density, or population growth rate. The Land Use Technical Report evaluates the potential for induced land use growth associated with the Modified LPA.

7. MITIGATION

7.1 Long-term Effects

Air pollutant emissions are expected to be substantially lower in the future than under existing conditions for all pollutants evaluated except Total PM_{10} which would only be about 1% lower. On a regional basis, future differences between the Modified LPA and No-Build Alternative are small enough not to be meaningful within the accuracy of the estimation methods. Long-term air quality impacts are not expected to occur because of the Modified LPA, and mitigation for long-term impacts is not proposed.

7.2 Temporary Effects

Construction contractors would be required to comply with the rules applicable to the state in which the construction activity occurs.

The following measures would be implemented to minimize impacts to air quality from construction activities in Oregon:

- Construction contractors would be 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 during project construction.
    - ➢ Application of water or other suitable chemicals on materials stockpiles and other surfaces that can create airborne dust.
    - ➢ Full or partial enclosure of materials stockpiles in cases where application of water or other suitable chemicals is 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.
    - ➢ Adequate containment during sandblasting or other similar operations.
    - ➢ When in motion, always cover open-bodied trucks transporting materials likely to become airborne.
    - ➢ Prompt removal from paved areas of earth or other material that does or could become airborne.
- Contractors would be required to comply with ODOT Standard Specifications Section 290, which has requirements for environmental protection, including air-pollution control measures. These control measures, which include vehicle and equipment idling limitations,

are designed to minimize vehicle track-out and fugitive dust. These measures would be documented in the erosion and sediment control plan that would be required prior to construction. To reduce the impact of construction delays on traffic flow and resultant emissions, road or lane closures would be restricted to non-peak traffic periods when possible.

- Contractors would be required to comply with the Clean Diesel Construction Standard (OAR-731-005-0800) that requires Public Improvement Contracts in the amount of $20 million or more to include equipment that meets EPA Tier 4 Exhaust Emissions Standards for at least 60% of the total non-road diesel equipment. If not equipped with a Tier 4 compression ignition engine, the equipment must be retrofit with a verified diesel oxidation catalyst or verified diesel particulate filter.
- In addition to the regulations outlined above, ODOT encourages all contractors to minimize impacts to surrounding communities by making choices that go beyond the baseline requirements. Examples include using newer low-emitting construction equipment, using electric equipment, and avoiding haul routes through residential areas.

Construction impacts from activities in Washington would be minimized by incorporating minimization and mitigation measures per the WSDOT standard specifications into the construction specifications for the Modified LPA. Specific minimization and mitigation measures would include the following, as applicable:

- Spraying exposed soil with water or other dust palliatives.
- Covering all trucks transporting materials, wetting materials in trucks, or providing adequate freeboard (space from the top of the material to the top of the truck).
- Removing particulate matter deposited on paved, public roads.
- Minimizing delays to traffic during peak travel times.
- Placing quarry spall aprons where trucks enter public roads.
- Graveling or paving haul roads.
- Planting vegetative cover as soon as possible after grading.
- Minimizing unnecessary idling of on-site diesel construction equipment.
- Locating diesel engines, motors, or equipment as far away as possible from existing residential areas and other sensitive areas.
- Minimizing hours of operation near sensitive receptor areas and rerouting the diesel truck traffic away from sensitive receptor areas.
- Educating vehicle operators to shut off equipment when not in active use to reduce idling.
- Using cleaner fuels as appropriate.
- Include detours and strategic construction timing (such as night work) on the traffic control plans to continue moving traffic through the area and reduce backups and delays to the traveling public to the extent possible.
- Work with partners to promote ridesharing and other commute trip reduction efforts for employees working on the Modified LPA.

8. PERMITS AND APPROVALS

8.1 Stationary Source Permits

Stationary sources such as concrete and asphalt mix plants are generally required to obtain air permits from DEQ or SWCAA and to comply with regulations to control dust and other pollutant emissions. As a result, their operations are typically well controlled and do not require project-specific mitigation measures. This would also be true for demolition of asbestos-containing structures because this activity is regulated.

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