

## 4.4 AIR QUALITY

Highway improvement projects have the potential to affect air quality by changing traffic volumes and/or vehicle operating characteristics at specific locations. The air quality impacts of highway construction projects can range from intensifying existing air pollution problems to improving ambient air quality. Understanding the air quality impacts of the Build Alternative is an integral part of this study. The air quality analysis was completed in compliance with the Clean Air Act (CAA) and its amendments, related Federal regulations and FHWA Guidance.

An air quality study was completed in June 2016, and is documented in an *Air Quality Technical Memorandum*. This study describes existing air quality conditions in the North Study Area and evaluates potential air quality impacts associated with the No Build and Build Alternatives. This section also addresses potential impacts of the Build Alternative on Greenhouse Gas (GHG) emissions. Highlights of the study are presented in this section.

### 4.4.1 What Methods, Assumptions and Resources Were Considered in the Air Quality Evaluation?

The state of Washington is subject to air quality regulations issued by the U.S. Environmental Protection Agency (EPA), the state Department of Ecology (DOE) and local agencies. EPA's National Ambient Air Quality Standards (NAAQS) set limits on the pollutants of concern in the study area. Concentrations of these pollutants must not exceed the NAAQS over specified periods of time. Pollutant levels are monitored by DOE and the Puget Sound Clean Air Agency (PSCAA) to determine compliance with the NAAQS and conformity with the State Implementation Plan (SIP) for attainment and/or maintenance of the NAAQS.

The air quality analysis in this section addresses the status of the Build Alternative's conformity with the NAAQS and transportation conformity rules. Conformity with the NAAQS is determined in accordance with 40 CFR Parts 51 and 93, "Criteria and Procedures for Determining Conformity to State or Federal Implementation Plans, Programs, and Projects Funded or Approved Under Title 23 USC or the Federal Transit Act". This document presents a microscale analysis of carbon monoxide (CO) impacts for the existing year (2013), the opening year (2020) and the design year (2040), comparing the results to the NAAQS. It also addresses particulate matter (PM<sub>2.5</sub>) and presents a quantitative estimate of Mobile Source Air Toxics (MSATs) for 2013, 2020 and 2040.

**NOTE TO READER:** *This EA provides a tiered environmental review. Chapter 4 evaluates the project specific environmental impacts associated with construction of the North Study Area Build Alternative (See Section 3.4 for description). Chapter 5 provides a corridor level discussion of the South Study Area (See Section 3.5). Specific project footprint improvements are not currently defined for the South Study Area.*

### **What Are the Primary Air Quality Pollutants of Concern?**

The primary pollutants from motor vehicles that affect air quality in the North Study Area are unburned hydrocarbons, nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO) and particulate matter (PM). Hydrocarbons (HC) and NO<sub>x</sub> can combine in a complex series of reactions catalyzed by sunlight to produce photochemical oxidants such as ozone and nitrogen dioxide (NO<sub>2</sub>). Because these reactions take place over a period of several hours, maximum concentrations of photochemical oxidants are often found far downwind of the precursor sources. Therefore, these pollutants are regional problems.

The North Study Area is located in Pierce County, which is an air quality maintenance area for CO. A portion of Pierce County, including the city of Lakewood, is also designated as a maintenance area for fine particulate matter (PM<sub>2.5</sub>). The EPA's transportation conformity rule requires that projects in maintenance areas demonstrate conformity with SIPs. For CO, this is done through hot-spot analysis to determine the CO concentrations at specific North Study Area intersections. Three time periods were evaluated: 2013 (representing existing conditions), 2020 (representing Project opening year) and 2040 (representing Project design year). For PM<sub>2.5</sub>, conformity must be demonstrated through hot-spot analysis for projects that are deemed to be "projects of air quality concern."

In the 2007 report, *Control of Hazardous Air Pollutants from Mobile Sources*, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA). These are: 1) acrolein, 2) benzene, 3) 1,3-butadiene, 4) diesel particulate matter plus diesel exhaust organic gases (diesel PM), 5) formaldehyde, 6) naphthalene, and 7) 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. Currently no standards establish maximum concentrations of MSATs. DOE conducted a study to monitor several air toxic compounds in the Seattle area from 2000 to 2001. This study indicated that the primary contributors to air toxics are diesel exhaust and wood smoke (Ecology, 2001). The 2007 EPA rule mentioned above requires controls that are expected to dramatically decrease MSAT emissions through cleaner fuels and cleaner engines.

### *How Was the Air Quality Study Area Defined?*

The air quality study looks at the effects of the No Build and Build Alternatives on Pierce County and, more specifically, the I-5 corridor

adjacent to Joint Base Lewis-McChord. Independent study areas were identified for each pollutant of concern.

### CARBON MONOXIDE

For CO, a hot-spot analysis was conducted to evaluate potential CO concentrations at specific intersections in the North Study Area. Air quality projections were calculated using the Washington State Intersection Screening Tool (WASIST) program for 2013, 2020 and 2040 for both the No Build and Build Alternatives. This screening tool is dependent on traffic volumes and level of congestion as key inputs in identifying intersections with the potential to generate the highest localized CO concentrations over the length of the North Study Area. The CO microscale hot spot analysis considered all study area signalized intersections that operate or are predicted to operate at the level of service (LOS) D, E or F in the existing or design year (2040), and that would experience an increase in traffic volumes of 10 percent or more between existing conditions and the Build Alternative, or would degrade to an LOS of D or worse. The six intersections that met these criteria are:

- ◆ I-5 northbound ramps at Berkeley Avenue.
- ◆ I-5 southbound ramps at Thorne Lane.
- ◆ I-5 northbound ramps at Gravelly Lake Drive.
- ◆ I-5 southbound ramps at Berkeley Avenue.
- ◆ I-5 southbound ramps at Gravelly Lake Drive.
- ◆ I-5 northbound ramps at Thorne Lane.

These intersections are the focus of the air quality analysis for the No Build and Build Alternatives.

### PARTICULATE MATTER

For PM<sub>2.5</sub>, the Build Alternative was evaluated qualitatively by the Puget Sound Regional Council's air quality consultation partners to

determine if it was of air quality concern. Particulate matter hot-spot analysis is required for projects of local air quality concern, which include certain highway and transit projects that involve significant levels of diesel vehicle traffic. Section 93.123(b) (1) of the conformity rule defines projects that require a PM<sub>2.5</sub> hot-spot analysis, including an “expanded highway project that [has] a significant increase in the number of diesel vehicles.” The conformity rule, however, does not define a threshold for what should be considered a significant amount of diesel traffic.

**Maintenance Area** is an area that has a history of not meeting air quality standards for a particular air pollutant, but is now meeting the standards and has a maintenance plan for monitoring levels of that pollutant and ensuring continued conformity to the appropriate standards.

Appendix B of EPA’s *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM<sub>2.5</sub> and PM<sub>10</sub> Nonattainment and Maintenance Areas* includes examples of projects of air quality concern. The first example listed is “A project on a new highway or expressway that serves a significant volume of diesel

truck traffic, such as facilities with greater than 125,000 annual average daily traffic (AADT) and 8% or more of such AADT is diesel truck traffic” (i.e., 10,000 diesel trucks). In 2013, WSDOT chose to use these values as a guideline to determine projects of air quality concern. Since there is no threshold listed in the conformity rule, interagency consultation is used to determine if a project is of air quality concern.

Because the Build Alternative’s design year traffic is well over 125,000 and includes over 10,000 diesel trucks, the consultation partners examined project attributes and compared No Build and Build conditions to determine if it was of air quality concern. The partners determined the Build Alternative is not a project of air quality concern

and a PM<sub>2.5</sub> hot-spot analysis is not warranted. The Build Alternative is intended to reduce congestion, thus vehicles will be traveling at more efficient speeds, which lowers emissions. More importantly, increasingly stringent federal vehicle standards for new vehicles will result in pollution declining as the vehicle fleet turns over, i.e., older vehicles are replaced with newer ones. Lastly, the primary contributor to the Pierce County PM<sub>2.5</sub> maintenance area is wood smoke, not vehicles (Ecology, 2014).

### MOBILE SOURCE AIR TOXICS

FHWA’s Interim Guidance Update on Mobile Sourced Air Toxic Analysis in NEPA Documents (FHWA, 2012) groups projects into the following categories:

- ◆ Exempt projects and projects with no meaningful potential MSAT effects.
- ◆ Projects with low potential MSAT effects.
- ◆ Projects with higher potential MSAT effects.

FHWA defines “Projects with Higher Potential MSAT Effects” to include projects that add capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000 or greater by the design year. Because this Build Alternative’s daily traffic volumes are estimated to be well over 140,000, an MSAT analysis was completed. The study area for the MSAT analysis was defined as including I-5 between the Steilacoom-DuPont Road interchange and the Gravelly Lake Drive interchange, and the major roadways crossing I-5 on which traffic volumes would be affected by the Build Alternative.

#### 4.4.2 What Are the Existing Air Quality Conditions in the Study Area?

The North Study Area is located in Pierce County, which was designated as a maintenance area for CO under the eight-hour CO standard. A portion of Pierce County is designated maintenance for PM<sub>2.5</sub>. The Puget Sound area was re-designated for CO from nonattainment status to maintenance status on October 11, 1996, due to improved monitoring data. The PM<sub>2.5</sub> area was designated

**Non-attainment** is a geographic area where concentrations of one or more air quality pollutants are found to exceed the regulated or “threshold” level for one or more of the NAAQS.

nonattainment in 2009 and redesignated to maintenance in 2015. Section 176(c) of the CAA requires that transportation plans, programs and projects conform to the intent of the SIP which identifies how the NAAQS for each pollutant are to be achieved and/or maintained. The North Study Area is in attainment for PM<sub>10</sub> and ozone.

Sensitive receptors within the study area include three schools (Woodbrook Middle School, Evergreen Elementary School, and Tillicum Elementary School), the Madigan Army Medical Center on JBLM, the SeaMar Tillicum Medical Clinic, and the Tillicum-Woodbrook Community Center.

#### 4.4.3 What Would Be the Impact of the No Build Alternative?

A microscale air quality analysis was performed to determine future CO concentrations resulting from the No Build Alternative. The WASIST was used to predict the CO concentration near sensitive receptors. Inputs into the mathematical model used to estimate hourly CO concentrations consisted of a level roadway under normal conditions with predicted traffic volumes, vehicle emission factors, and worst-case meteorological parameters.

Based on this analysis, no violations of the 1-hour standard (35 ppm) or 8-hour standard (9 ppm) are expected. For the No Build Alternative, the 1-hour and 8-hour CO concentrations are not expected to exceed 3.8 ppm and 3.6 ppm including background contributions, respectively, at any of the sites for 2020 or 2040. The results of CO analysis for the No Build Alternative are illustrated in Table 4.4-1.

The sensitive receptors within the study area are expected to see a similar trend in CO concentrations to the receptors analyzed near the intersections.

In comparing results from the quantitative MSAT analysis for the existing and No Build conditions, emissions with the No Build Alternative are predicted to be less than the existing condition. This is due to implementation of EPA’s vehicle and fuel regulations coupled with fleet turnover which, over time, will cause substantial reductions in region-wide MSAT levels in comparison with today.

#### 4.4.4 What Would Be the Long-Term Impact of the Build Alternative?

##### *Would Air Quality for the Build Alternative Be in Conformance with State and Federal Regulations?*

Based on the air quality analysis completed for the proposed improvements, the Build Alternative would not cause or contribute to any violation of the NAAQS for any of the priority pollutants. Additionally, the Project would not delay timely attainment of any standard.

##### *What Were the Results of Carbon Monoxide Air Quality Analysis?*

As described under the No Build Alternative, a microscale air quality analysis was performed to determine future CO concentrations resulting from the proposed highway improvements in the Build

**Table 4.4-1** Predicted Carbon Monoxide Concentrations (Parts per Million)

Intersection	Averaging Time	2013 Existing	2020 No-Build	2020 Build	2040 No-Build	2040 Build
I-5 NB Ramps and Berkeley Avenue	1-Hour <sup>1</sup>	4.1	3.8	3.9	3.4	3.4
	8-Hour <sup>2</sup>	3.8	3.6	3.6	3.3	3.3
I-5 SB Ramps and Thorne Lane			Passed Pre-Screening			
I-5 NB Ramps and Gravelly Lake Drive			Passed Pre-Screening			
I-5 SB Ramps and Berkeley Avenue			Passed Pre-Screening			
I-5 SB Ramps and Gravelly Lake Drive	1-Hour <sup>1</sup>	4.0	3.7	3.7	3.3	3.3
	8-Hour <sup>2</sup>	3.7	3.5	3.5	3.2	3.2
I-5 NB Ramps and Thorne Lane	1-Hour <sup>1</sup>	4.1	3.8	4.2	3.4	3.6
	8-Hour <sup>2</sup>	3.8	3.6	3.8	3.3	3.4

<sup>1</sup> Includes 3.0 ppm Background concentration

<sup>2</sup> Includes 3.0 ppm Background concentration

Alternative. Based on this analysis, no violations of the 1-hour standard (35 ppm) or 8-hour standard (9 ppm) are expected. For the Build Alternative the 1-hour and 8-hour CO concentrations are not expected to exceed 4.2 and 3.8 ppm (including background contributions), respectively, at any of the sites for 2020 and 2040. Since the six intersections studied represent worst-case scenarios, these results for CO can reasonably be applied along the length of the Project, [including at sensitive receptors](#).

[In 2020, at the Thorne Lane interchange, the Build Alternative 1-hour CO levels are expected to increase slightly over existing conditions, from 4.1 to 4.2 parts per million \(ppm\). The levels remain well below the standard of 9 ppm. The increase in estimated CO levels is the result of the receptor being closer to the new roadway than the](#)

[existing roadway \(10 feet instead of 20 feet\), as well as increased traffic volumes traveling through the intersection. The CO levels in 2040 are expected to decrease to 3.6 ppm.](#)

### ***How Would the Build Alternative Address Mobile Source Air Toxic (MSAT) Emissions?***

A quantitative analysis of MSAT emissions was performed to identify potential effects of the Build Alternative. In comparing results from the No Build and Build Alternatives, emissions for the Build Alternative are predicted to be slightly higher than No Build. This is due to an expected increase in Vehicle Miles of Travel (VMT). Any reduction in emissions as a result of reduced congestion and improved traffic flow are expected to be offset by the increase in emissions resulting from a higher VMT. However, on a regional basis, EPA's vehicle and

**Table 4.4-2 Predicted Mobile Source Air Toxic Emissions**

Pollutant (kg)	2013	2020 No Build	2020 Build	2040 No Build	2040 Build
Acrolein	127	75	79	30	33
Benzene	4,183	2,167	2,275	1,365	1,511
Formaldehyde	2,066	1,213	1,273	618	687
1,3-Butadiene	553	291	305	180	200
Diesel Particulate Matter	17,586	11,051	11,675	7,610	8,356
Naphthalene	334	187	196	97	108
Polycyclic Organic Matter	114	73	76	36	39

fuel regulations, coupled with fleet turnover, over time will cause substantial reductions that will cause region-wide MSAT levels to be significantly lower than today. A comparison of 2013, 2040 No Build and 2040 Build MSAT projections is presented in Table 4.2-2.

#### 4.4.5 How Would the Build Alternative Affect Greenhouse Gas Emissions?

##### *What Are Greenhouse Gases?*

Vehicles emit a variety of gases during their operation; some of these are greenhouse gases (GHGs). The GHGs associated with transportation are water vapor, carbon dioxide (CO<sub>2</sub>), methane, and nitrous oxide. Any process that burns fossil fuel releases CO<sub>2</sub> into the air. Carbon dioxide makes up the bulk of the emissions from transportation.

Vehicles are a significant source of greenhouse gas emissions and contribute to global warming primarily through the burning of

gasoline and diesel fuels. National estimates show that the transportation sector (including on-road vehicles, construction activities, airplanes, and boats) accounts for almost 30 percent of total domestic CO<sub>2</sub> emissions. However, in Washington State, transportation accounts for nearly half of GHG emissions because the state relies heavily on hydropower for electricity generation, unlike other states that rely on fossil fuels such as coal, petroleum, and natural gas to generate electricity. The next largest contributors to total GHG emissions in Washington are fossil fuel combustion in the residential, commercial, and industrial sectors at 22 percent; and electricity consumption at 17 percent. Figure 4.4-1 shows the gross GHG emissions by sector, nationally and for Washington State.

##### *What Actions Is WSDOT Taking to Reduce Transportation Greenhouse Gas Emissions?*

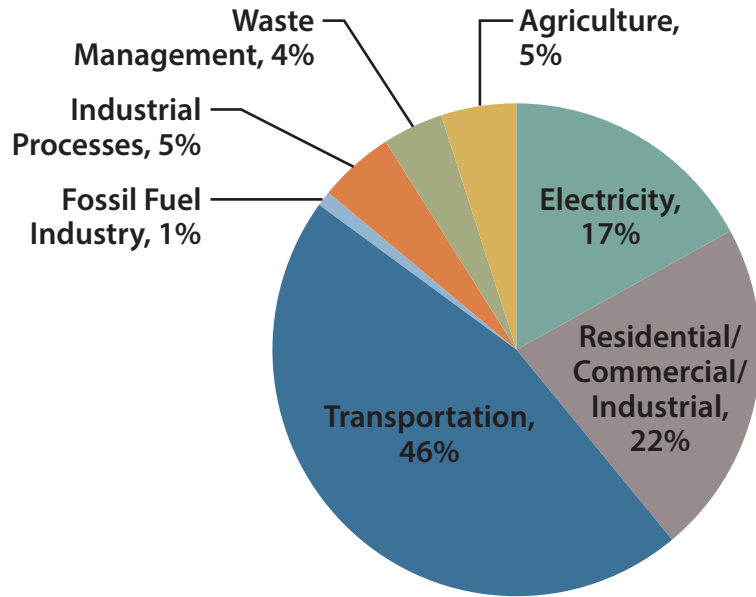
WSDOT works both alone and in partnership with numerous organizations to implement projects that reduce transportation greenhouse gas emissions across the state. A selection of sustainable transportation actions are highlighted in the agency's *Sustainable Transportation Action Plan*. Many of these actions reduce emissions by providing active transportation alternatives (including bicycle and pedestrian facilities), improving highway system efficiency, or improving access to alternative fuels.

##### *What Is WSDOT's Approach to Addressing Climate Change at the Project-Level?*

In the work to date, it was found that the GHG emissions from a single project action are usually very small. However, overall, users of the transportation system contribute close to half of the state's

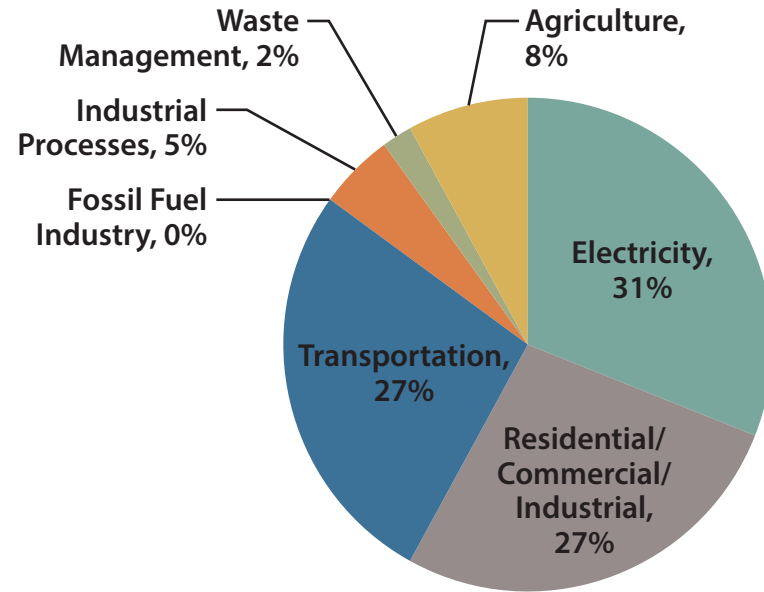
**Figure 4.4-1** GHG Emissions by Sector, Washington State (2012) and National (2013)

### Washington Emissions, 2012



Source: Washington Department of Ecology, 2015

### US Emissions, 2013



Source: EPA's Inventory of US Greenhouse Gas Emissions, 2015

GHG emissions (see Figure 4.4-1). WSDOT believes that transportation GHG emissions are better addressed at the regional, state, or transportation systems level where multiple projects can be analyzed in the aggregate. It is recognized that most existing regional or statewide plans do not yet provide the necessary emissions analysis to put the proposed Build Alternative into a larger context. It is also recognized that the public has an interest in these issues. Accordingly, based on direction from the Governor and WSDOT's leaders, project-specific analysis has been undertaken to disclose GHG emissions at the project level. WSDOT will reference planning level information to provide context for individual projects when it becomes available.

Analysis of the Build Alternative followed an approach identified in WSDOT's *Guidance for Project-Level Greenhouse Gas Evaluations under NEPA and SEPA*, and received technical support from the WSDOT Environmental Services Office.

#### ***What Effects Will the Build Alternative Have on GHG Emissions?***

The state and federal investments in transportation projects are made to improve current conditions of the multimodal transportation network, and to address expected future needs associated with

growing travel demand. In general, project-level actions that can help reduce greenhouse gas emissions include:

- ◆ Reducing stop-and-go conditions.
- ◆ Improving roadway speeds to a moderate level.
- ◆ Improving intersection traffic flow to reduce idling.
- ◆ Creating more safe and efficient freight movement.
- ◆ Expanding transit and non-motorized options for travelers.
- ◆ Increasing the reliability of transit and HOV travel times.
- ◆ Increasing vegetation density over pre-project conditions to sequester carbon.

The Build Alternative would improve traffic operations at study area intersections and along the I-5 mainline, thereby reducing traffic congestion and the rate of expected collisions. By reducing chronic traffic congestion throughout the JBLM area, vehicles would be able to operate at consistent and moderate speeds where they run most efficiently. The shared use (bicycle and pedestrian) path would give travelers healthy and non-pollution-emitting travel mode choices. Safety improvements would reduce non-reoccurring congestion in several ways. New interchanges that incorporate roundabouts instead of signals would reduce the potential for collisions, and new travel lanes that add capacity to the freeway will reduce collisions along the corridor. Fewer collisions would lead to less periodic and unexpected traffic congestion, thereby also reducing emissions.

### ***How Will the I-5 JBLM Congestion Relief Project Minimize Emissions During Construction?***

Construction of the I-5 JBLM Congestion Relief Project is currently planned to take place in two stages which will last approximately five years from 2018 to 2023. The initial construction traffic management approach would include detours and strategic construction timing

(like night work) to continue moving traffic through the area and reduce backups to the traveling public to the maximum extent possible. WSDOT would work with the Project contractor to set up active construction areas, staging areas, and material transfer sites in a way that reduces standing wait times for equipment. WSDOT would work with partnering stakeholders to promote ridesharing and other commute trip reduction efforts for employees working on the Project.

### **4.4.6 How Would Construction of the Project Affect Air Quality?**

Construction activities would generate particulate matter and small amounts of CO and nitrogen oxides (NOx) at different locations along the project corridor during the approximately 60-month construction window. If not properly mitigated, fugitive dust could escape from the construction site and from soil blown from uncovered trucks carrying materials. Vehicles leaving the site could deposit mud on public streets, which would become a source of dust after it dries. Construction equipment would emit CO and NOx. These emissions would be greatest during the excavation phase because most emissions would be associated with removing dirt from the site.

Dust emissions would be associated with demolition, land clearing, ground excavation, cut-and-fill operations, and roadway and interchange construction. Particulate emissions would vary from day to day, depending on the level of activity, specific operations, and weather conditions. Particulate emissions would also depend on soil moisture, the soil's silt content, wind speed, and the amount and type of equipment operating. The quantity of particulate emissions would be proportional to the area of the construction operations and the level of activity.

In addition to particulate emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate



CO and NOx in exhaust emissions. These emissions would be limited to the immediate area surrounding the construction site, and would contribute a small amount compared to automobile traffic in the project area. Some construction phases (particularly during paving operations using asphalt) would result in the emission of volatile organic compounds (VOCs) and odorous compounds. Odors might be detectable to some people near the project site, and would be diluted as distance from the site increases.

The No Build Alternative would not result in any emissions because no construction activities would occur.

#### **4.4.7 What Are the Proposed Mitigation Measures for Construction of the Project?**

Particulate emissions (in the form of fugitive dust during construction activities) are regulated by the Puget Sound Clean Air Agency (PSCAA). The operator of a source of fugitive dust is required to take reasonable precautions to prevent fugitive dust from becoming airborne and must maintain and operate the source to minimize emissions. Fugitive dust may become airborne during demolition, material transport, grading, driving vehicles and machinery on and off the site, and through wind events. Construction impacts will be minimized by incorporating mitigation measures per the WSDOT standard specifications into the construction specifications for the project. WSDOT will comply with the procedures outlined in the Memorandum of Agreement between WSDOT and the PSCAA for controlling fugitive dust and will employ the following types of actions where warranted by site conditions:

- ◆ Design construction phases to keep disturbed areas to a minimum.
- ◆ Cover dirt, gravel, and debris piles as needed to reduce dust and wind-blown debris.

- ◆ Spray exposed soil with water or other dust suppressant. Use only allowed dust suppressants.
- ◆ Plant vegetative cover as soon as possible after grading.
- ◆ Minimize dust emissions during transport of excavated or fill materials by wetting down loads or by ensuring adequate freeboard (space from the top of the material to the top of the truck bed) on trucks.
- ◆ Promptly clean up spills of transported material on public roads.
- ◆ Restrict traffic onsite to reduce soil upheaval and the tracking of material onto roadways.
- ◆ Place quarry spall aprons or wheel washers where trucks enter public roads to remove particulate matter from vehicles before it is carried offsite.
- ◆ Locate construction equipment and staging areas away from sensitive receptors as practical and in consideration of potential effects on other resources.
- ◆ Develop streamlined staging/work zone areas to minimize construction equipment back-ups and idling.
- ◆ Minimize hours of operation near sensitive receptor areas and route the diesel truck traffic away from sensitive receptor areas.
- ◆ Minimize delays to traffic during peak travel times.
- ◆ Educate vehicle operators to shut off equipment when not in active use to reduce idling.
- ◆ Use cleaner fuels and newer equipment with add-on emission controls as appropriate.

#### 4.4.8 Would There Be Any Unavoidable Adverse Impacts from the Build Alternative?

The Build Alternative would not have unavoidable adverse effects on air quality that could not be mitigated.