# 4.6 Air Quality and Greenhouse Gases

## 4.6.1 Introduction to Resources and Regulatory Requirements

The East Link Project is located in King County in the Puget Sound Region and therefore falls within the jurisdiction of the Puget Sound Clean Air Agency (PSCAA) for local air quality regulation. Characterizing the existing air quality environment is essential in developing a baseline to assess how changes in vehicle traffic patterns related to the East Link Project may affect existing air pollutant concentration levels. Air quality is characterized in this section by discussing the applicable regulatory framework for the Puget Sound region, describing the existing attainment status with established air quality standards in the project vicinity for each regulated pollutant, and presenting existing air quality monitoring data that support the trend of how existing air pollution control measures improve air quality in the region.

Although greenhouse gas (GHG) is not federally regulated, on May 3, 2007, the state of Washington passed Senate Bill 6001, which aims to achieve 1990 greenhouse gas levels by 2020, a 50 percent reduction below 1990 levels by 2030, and more by 2050.

## 4.6.2 Affected Environment

### 4.6.2.1 Regulatory Agencies and Requirements

Air quality in the Puget Sound region is regulated and enforced by federal, state and local agencies—the Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and PSCAA—each with its own role in regulating air quality. Following the requirements of the federal Clean Air Act (CAA), EPA sets the criteria for National Ambient Air Quality Standards (NAAQS) and conformity requirements and has oversight authority over both PSCAA and Ecology. Ecology strives to improve air quality throughout the state by overseeing the development and conformity of the State Implementation Plan (SIP), which is the state's plan for meeting and maintaining NAAQS. The PSCAA has local authority for setting regulations and permitting of stationary air pollutant sources and construction emissions.

EPA's NAAQS sets limits on concentration levels of certain pollutants, commonly referred to as the "criteria pollutants." The six criteria pollutants are carbon monoxide (CO), lead, nitrogen dioxide ($NO_2$), particulate matter less than 10 microns ($PM_{10}$) and 2.5 microns ($PM_{2.5}$) in diameter, ozone ($O_3$), and sulfur dioxide ($SO_2$) (EPA, 2007b). The NAAQS for these criteria pollutants are separated into two standard categories: the Primary and the Secondary standards (40 Code of Federal Regulations [CFR] 50) (EPA). The Primary standards were created to protect public health; the secondary pollutant standards were established to protect public welfare and the environment.

Table 4.6-1 displays the Primary and Secondary NAAQS for these six criteria pollutants. Ecology and PSCAA have authority to adopt more stringent standards, although many of the state and local standards are equivalent to the federal mandate.

### 4.6.2.2 Conformity Requirements

The CAA amendment of 1990 and Washington state regulation require all transportation projects located in air quality maintenance and nonattainment areas in Washington to follow conformity requirements promulgated in their respective regulations (40 CFR Part 93 and Washington Administrative Code [WAC] 173-420) and to conform to the SIP. By conforming to the SIP, the proponent demonstrates that the transportation project will not add any new air quality violations to the area, will not worsen the current violations, and/or will not delay the attainment goals of the NAAQS. The state regulation requires Ecology and the Washington State Department of Transportation (WSDOT) to develop air quality-based criteria for transportation projects to demonstrate conformity to the SIP, for attaining and maintaining the NAAQS, and for meeting all standards of the CAA.

The East Link Project is located in the Puget Sound region, which is a maintenance area for CO, with a portion of the project also located in the Duwamish $PM_{10}$ maintenance area. The area is in attainment for all other criteria pollutants.

The project is required to meet conformity requirements both on a regional and project level. Regional conformity is demonstrated if the project is included in a conforming regional transportation plan (RTP) and a regional transportation improvement program (RTIP). Project-level conformity is demonstrated when three conditions are met:

- The project does not increase the severity or frequency of existing exceedances of the CO and $PM_{10}$ standards.
- The project does not cause a new exceedance of the CO and $PM_{10}$ standards.

TABLE 4.6-1
Ambient Air Quality Standards by Government Jurisdiction

| Pollutant | National | | Washington State | Puget Sound Region |
|---|---|---|---|---|
| | Primary | Secondary | | |
| **Nitrogen Dioxide ($NO_2$)** | | | | |
| Annual Average | 0.053 ppm | 0.053 ppm | 0.05 ppm | 0.05 ppm |
| **Carbon Monoxide (CO)** | | | | |
| 1-hour average | 35.0 ppm[a] | NS | 35.0 ppm | 35.0 ppm |
| 8-hour average | 9.0 ppm[a] | NS | 9.0 ppm | 9.0 ppm |
| **Ozone ($O_3$)** | | | | |
| 8-hour average | 0.08 ppm[b] | 0.08 ppm[b] | NS | NS |
| **Lead** | | | | |
| Maximum arithmetic mean (averaged over a calendar quarter) | 1.5 µg/m3 | 1.5 µg/$m^3$ | NS | 1.5 µg/m[c] |
| **Sulfur Dioxide ($SO_2$)** | | | | |
| 1-hour average | NS | NS | 0.40 ppm | 0.40 ppm |
| 3-hour average | NS | 0.5 ppm | NS | NS |
| 24-hour average | 0.14 ppm[a] | NS | 0.10 ppm | 0.10 ppm |
| Annual arithmetic average | 0.03 ppm | NS | 0.02 ppm | 0.02 ppm |
| **Particulate Matter ($PM_{10}$)** | | | | |
| 24-hour average | 150 µg/$m^3$ | 150 µg/$m^3$[c] | 150 µg/$m^3$ | 150.0 µg/$m^3$ |
| Annual arithmetic average | Revoked[d] | Revoked[d] | 50 µg/$m^3$ | 50.0 µg/$m^3$ |
| **Particulate Matter ($PM_{2.5}$)** | | | | |
| 24-hour average | 35 µg/$m^3$[e] | 35 µg/$m^3$[e] | NS | NS |
| Annual arithmetic average | 15.0 µg/$m^3$[f] | 15 µg/$m^3$[f] | NS | NS |
| **Particulate Matter (TSP)** | | | | |
| 24-hour average | NS | NS | 150 µg/$m^3$ | NS |
| Annual geometric average | NS | NS | 60 µg/$m^3$ | NS |

[a] Not to be exceeded more than once per year.

[b] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor station within an area over each year must not exceed 0.08 ppm.

[c] Not to be exceeded more than once per year on average over 3 years.

[d] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual $PM_{10}$ standard in 2006 (effective December 17, 2006).

[e] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor station within an area must not exceed 35 µg/$m^3$ (effective December 17, 2006).

[f] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitor station must not exceed 15.0 µg/$m^3$.

ppm = parts per million

µg/$m^3$ = microgram per cubic meter

NS = no standard established

TSP = total suspended particulates

- The project does not delay the timely attainment of the CO and $PM_{10}$ standards.

### 4.6.2.3 Climate and Air Quality

The East Link Project is in the Puget Sound Lowland, which comprises a narrow strip of land along the western side of Puget Sound extending from the Strait of Juan de Fuca in the north to the southern cities of Centralia and Chehalis, and a somewhat wider strip along the eastern side of Puget Sound extending north to the Canadian border. Buffered by the Olympic and Cascade mountain ranges and Puget Sound, the Puget Sound Lowland has a relatively mild, marine climate with cool summers and mild, wet, and cloudy winters.

The prevailing wind direction in the summer is from the north or northwest. The average wind velocity is less than 10 miles per hour (mph). Persistent high-pressure cells often dominate summer weather, creating stagnant air conditions. This weather pattern sometimes contributes to the formation of photochemical smog.

During the winter wet season, the prevailing wind direction is south or southwest. Cold air occasionally flows southward from the interior of Canada through the Fraser River canyon into the Puget Sound Lowland. In the fall and winter, severe storms can produce strong winds that cross the state from the southwest.

Although the Puget Sound Lowland area is the most densely populated and industrialized area in Washington, there is sufficient wind most of the year to disperse air pollutants released into the atmosphere. Air pollution is usually most noticeable in the late fall and winter, under conditions of clear skies, light wind, and a sharp temperature inversion. Temperature inversions occur when cold air is trapped under warm air, preventing vertical mixing in the atmosphere. Inversions can last several days and can prevent pollutants from being dispersed by the wind. Inversions are most likely to occur during the months of January, February, October, November, and December. If poor dispersion persists for more than 24 hours, the PSCAA can declare an “air pollution episode” or local “impaired air quality.”

### 4.6.2.4 Pollutants of Concern

Air quality is affected by pollutants that are generated by both natural and man-made sources. In general, the largest man-made contributors to air emissions are transportation vehicles and power-generating equipment, both of which typically burn fossil fuels. The main criteria pollutants of interest for transportation projects are CO, particulate matter, $O_3$ and the $O_3$ precursors, volatile organic compounds (VOCs), and oxides of nitrogen ($NO_x$). Both federal and state standards regulate these pollutants, along with two other criteria pollutants, $SO_2$ and lead. However, since the Puget Sound region is in attainment and not a maintenance area for NOx, lead, and $SO_2$, these pollutants are not addressed in this analysis.

The largest contributors of pollution related to transportation projects are motor vehicles. The main pollutants emitted from motor vehicles are CO, particulates, $O_3$, greenhouse gases, and air toxic pollutants. Motor vehicles also emit pollutants that contribute to the formation of ground-level ozone. This section discusses the main pollutants of concern and their effect on public health and the environment.

#### Carbon Monoxide

In assessing the localized air quality impacts of transportation projects, CO is the main pollutant of concern. CO is a colorless, odorless, and tasteless gas that results from the incomplete combustion of fuel. CO is ingested into the body by breathing. In low concentrations, CO can cause fatigue in healthy people and chest pain in people with heart conditions. At higher concentrations, CO can cause dizziness, impaired vision and coordination, confusion, headaches, and nausea. In exceptionally high concentrations, CO can be fatal.

The major source of CO is vehicular traffic, along with industry, wood stoves, and slash burns. For urban areas, the internal combustion engines of motor vehicles are the principal sources of CO that cause ambient air quality levels to exceed the NAAQS. CO concentration increases occur during vehicle cold-starts and winter months when meteorological conditions favor the build-up of directly emitted contaminants. CO is a pollutant whose impact is usually localized, with the highest ambient concentrations of CO occurring near congested roadways and intersections.

#### Particulate Matter

Particulate matter (PM) consists of small particles of dirt, soot, metals, and organic matter. PM of 10 micrometers in diameter and smaller pose the greatest health problems because it can bypass the natural filtration systems of the nose and throat and enter deep into the lungs, heart, and even the bloodstream, which can cause difficulty with breathing, aggravation of asthma, irregular heartbeat, nonfatal heart attacks, and death in people with heart or lung problems. Due to the size of $PM_{10}$ and $PM_{2.5}$, the wind easily picks up the particles and transports them over long distances to settle on either the ground or water. PM that lands on the ground has the potential to deplete nutrients in the soil, damage sensitive crops, and change the structure of the ecosystem. PM that lands on water can change the acidity in lakes and streams and change the nutrient balance in coastal waters and large river basins. Major sources of PM are construction activity, smokestacks, fires, power plants, and automobiles.

The EPA has set standards for two different size categories of PM. The first standard set is for $PM_{10}$: particles that are larger than 2.5 micrometers and smaller than 10 micrometers in size. These particles are considered "inhalable course particles" and can be found near roadways and dusty industries. The second set of standards is for $PM_{2.5}$: particles that measure 2.5 micrometers in size and smaller. These particles are called "fine particles" and can usually be found in smoke and haze. These particles are normally directly emitted from forest fires or they can be formed from gases emitted from power plants and automobiles.

### Ozone

Normally, ozone ($O_{3)}$ is not emitted directly into the air; however, at ground level, $NO_x$ and VOCs react under the presence of sunlight to form $O_3$. Emissions from industrial and electric facilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are major sources of $NO_x$ and VOCs.

Ground-level and stratosphere-level $O_3$ share the same chemical structure; however, their effects differ greatly due to their positions in the atmosphere. Ground-level $O_3$ has adverse effects due to its potential impacts to human health, while stratospheric ozone has a protective effect by shielding the earth's surface from harmful radiation. When $O_3$ is inhaled, it can cause a variety of health problems, such as chest pain, coughing, throat irritation, and congestion. The effects can potentially worsen to bronchitis, emphysema, and asthma, reducing lung function and inflaming the linings of the lungs. Repeated exposure can eventually lead to permanently scarring of the lung tissue. Not only does $O_3$ cause negative human health affects, but it also causes damage to the environment. $O_3$ can cause sensitive plants to be more susceptible to certain diseases, insects, and other pollutants, which can lead to reduced crop yields, forest growth, and potentially to impacts on species diversity in ecosystems.

$O_3$ is also the primary element of smog. Sunlight and hot weather are the main causes of the formation of ground-level $O_3$. As a result, $O_3$ is referred to as a summertime air pollutant. Many urban areas tend to have high levels of $O_3$, although even rural areas are subject to increased $O_3$ levels because the wind can carry $O_3$ and the pollutant that form $O_3$ miles away from their original sources.

### Climate Change and Greenhouse Gases

Global climate change refers to changes in average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation, and storms. Global warming is a regional and ultimately a worldwide concern. Historical records indicate that global climate changes have occurred in the past due to natural phenomena. However, data indicate that the current global conditions differ from past climate changes in rate and magnitudeSince GHG effects are experienced on a global scale, it is impossible to discuss direct effects of a single development project with future specific climate change.

GHGs include $CO_2$, methane ($CH_4$), $O_3$, water vapor, nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride ($SF_6$). $CO_2$ is the most abundant GHG and the primary GHG pollutant emitted by the combustion of fossil fuels. Although they are released by natural processes, burning of fossil fuels by humans produces substantial amounts of these gases. Changes in global $CO_2$ emissions from fossil fuel combustion are influenced by many long-term and short-term factors, including population and economic growth, energy price fluctuations, technological changes, and seasonal temperatures.

In contrast to most criteria pollutants, emissions of GHGs have been rising from many sources (i.e., industrial, residential, commercial, and transportation). Two of the largest contributors to GHG emissions in the United States are transportation and energy production, although residences, offices and industries contribute as well. In 2003, it was found that combustion of transportation fuels, the largest source of $CO_2$, contributed 28 percent of the U.S. GHG emissions. In Washington State, the transportation sector accounts for roughly 47 percent of GHG emissions (Exhibit 4.6-1).

GHG emissions from transportation sources are directly related to energy consumption and primarily result from the combustion of fossil fuels in vehicles. The GHG emission associated with electrical transportation vary widely depending on the source of electricity. For example hydro-electric generation produces much less GHG emissions than coal plants do. Generally, combusting fuel at a power plant to produce electricity is more efficient than fuel combustion in vehicles. To reduce GHG emissions from transportation sources, effective planning must incorporate modes of transport that use less energy

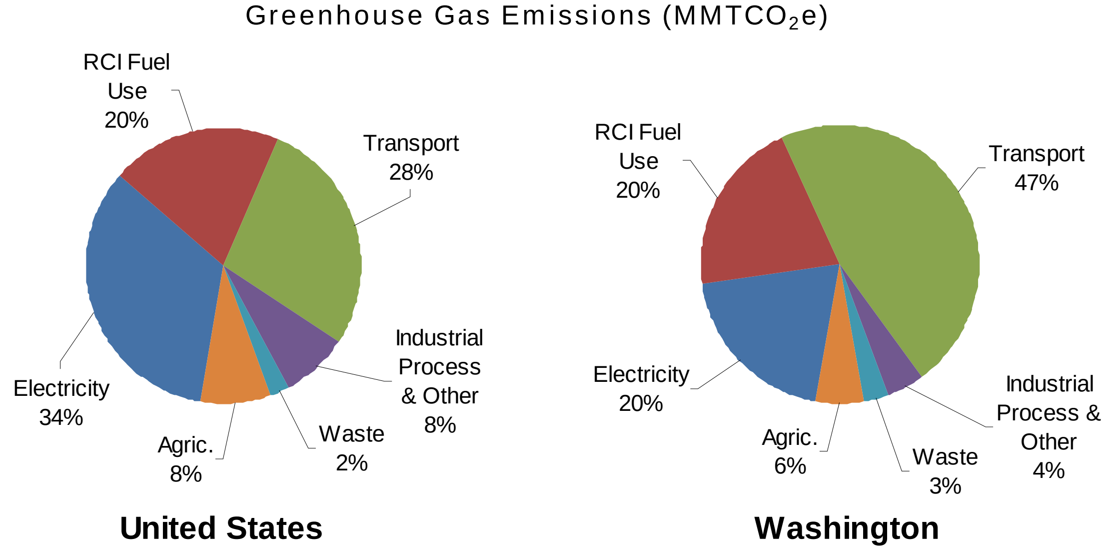


EXHIBIT 4.6-1
Comparison of National and Washington Greenhouse Gas Emissions
*Source: Leading the Way on Climate Change: The Challenge of Our Time, February 2008, Washington Dept. of Ecology Publication #08-01-008*

per person per mile traveled and/or use energy derived from fuels that have low carbon content per unit of energy. For example, by changing bus fleets from diesel to natural gas, GHG emissions can be reduced through the use of a low carbon-intensity fuel, and they can be further reduced by increasing regional transit ridership, which uses less energy per person per mile traveled than single-occupant vehicles.

Currently, transit is expected to reduce the automobile use that causes a high percentage of GHG emissions. The East Link Project would result in lower vehicle miles traveled (VMT) and would reduce GHG emissions. Additional savings in VMT can be attained from transit-oriented development that is expected to occur around light rail stations. This discussion is expanded in Chapter 5, subsection 5.5.7 of this Draft EIS.

High-capacity transit is integral to fostering the urban villages and growth patterns encouraged by the Washington State Growth Management Act (GMA) and *VISION 2040* (Puget Sound Regional Council [PSRC], 2008). Transit provides an alternative to the car and therefore to the dependence on burning fossil fuels, and it reduces individual vehicle miles estimates. Across the country, studies show how rail-based transit is spurring high quality, dense transit-oriented development (Cervero, 2008). Focusing growth in "urban centers"—and the density and mix of land uses it implies—is intended to enable residents to live near jobs and other urban activities, to help strengthen existing communities, and to promote bicycling, walking, and transit use. The benefits of more walkable communities and convenient alternatives to single-occupant vehicles are well-understood but not easily quantified.

### Air Toxic Pollutants

Other pollutants known to cause cancer or other serious health effects are called air toxics. Ecology began monitoring air toxics at the Seattle Beacon Hill site in 2000. In addition to regulating the criteria pollutants, the CAA identifies 188 air toxics, also known as hazardous air pollutants. EPA assessed this expansive toxics list and identified a group of 21 air toxics as mobile source air toxics (MSATs), which are set forth in an EPA final rule, Control of Emissions of Hazardous Air Pollutants from Mobile Sources (66 *Federal Register* [FR] 17235). The EPA then extracted a subset of this list of 21 that it labels the six priority MSATs: benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene. Exposure to these pollutants for long durations and sufficient concentrations increases the chances of cancer or other serious health effects, including damage to the immune system, neurological problems, and reproductive, developmental, respiratory, and other serious health problems.

The 2004 PSCAA inventory shows that on-road vehicles continue to be the greatest contributors to both criteria pollutant and air toxics emissions in the Puget Sound airshed (PSCAA, 2007). Transportation projects with high potential for MSAT effects are required to perform project-level MSAT analysis.

#### 4.6.2.5 Air Quality Monitoring and Trends

An area is designated a "nonattainment area" when measured concentrations exceeds the NAAQS for a particular pollutant. The area remains a nonattainment area for that particular pollutant until concentrations are in compliance with the NAAQS. Only after measured concentrations have fallen below the NAAQS can the state apply for redesignation to attainment, and it must then submit a 10-year plan for continuing to meet and maintain air quality standards that follow the CAA.

In October 1996, EPA approved a CO maintenance plan and redesignated the Puget Sound region as being in attainment for all criteria pollutants. The following month, in November 1996, the maintenance plan for $O_3$ was approved. The maintenance plans for CO and $O_3$ were updated and approved by EPA on September 7, 2004. The approval for $PM_{10}$ in the Seattle Duwamish area came in December 2000 and was redesignated as a maintenance area on March 13, 2002. King County is classified as a maintenance area for CO. The Seattle Duwamish area is a maintenance area for $PM_{10}$. The 1-hour $O_3$ standard was revoked by EPA on June 15, 2005 (40 CFR 50.9(6) and 70 FR 44470). The area currently meets the 8-hour standard; therefore the maintenance designation for $O_3$ no longer applies in the Puget Sound region.

The PSCAA monitors criteria air pollutant concentrations at eight facilities in King County, but there are no facilities monitoring $NO_2$, $SO_2$, or lead near the project vicinity. CO concentrations are measured at two locations, four locations are currently monitoring $O_3$ concentrations, three locations are monitoring $PM_{2.5}$ concentrations, and two locations are measuring $PM_{10}$ concentrations.

One monitoring station located near Beacon Hill was identified near the project vicinity that measures concentrations of all four pollutants: CO, $PM_{10}$, $PM_{2.5}$ and $O_3$. Table 4.6-2 displays the last 3 years of monitoring data to show that the air pollutant concentration trends for these pollutants remain below the NAAQS.

Emission projections and ongoing monitoring throughout the Central Puget Sound region indicate that the ambient air pollution concentrations for CO and $PM_{10}$ have been decreasing over the past decade. Measured $O_3$ concentrations, in contrast, have remained fairly static. The decline of CO is due primarily to improvements made to emission controls on motor vehicles and the retirement of older, higher-polluting vehicles. However, PSRC estimates that by the year 2030, the Puget Sound region population will grow by 1.1 million people and travel will increase by nearly 50 percent over its current level (PSRC, 2001). The highest population increase is estimated to be in King County, with nearly 40 percent growth from the year 2020 to 2040. Estimates like this indicate that CO, $PM_{10}$, and $O_3$ emissions will begin to increase as early as 2010, which could lead to future violations. The PSRC's *Destination 2030* transportation plan discusses methods to ease the current congestion and to prepare for future growth by offering more public transit services, better traffic management, and improved road facilities. If none of these methods succeed in maintaining emissions, more stringent standards may be needed for the central Puget Sound region to stay in attainment for all criteria pollutants.

Air toxic pollutant emissions are also of concern because of the projected growth in VMT. EPA has been able to reduce benzene, toluene, and other air toxics emissions from mobile sources by placing stringent standards on tailpipe emissions and requiring the use of reformulated gasoline. Future regulations on fuel and motor vehicles are expected to reduce air pollutant emissions from 1990 by more than 75 percent by the year 2020 (EPA, 2007a).

### 4.6.3 Air Quality Impacts

Operational impacts are assessed at both the regional and local scale of the project.

#### 4.6.3.1 Regional Operational Impacts

Regional operational impacts were assessed by calculating tailpipe emissions for all criteria and toxic air pollutants for the East Link Project using the annual traffic forecast for the full-length, low-ridership and high-ridership projects for the years 2020 and 2030. These two conditions represent the full range of potential operational impacts for the project. The year 2020 was chosen as the project's initial forecast year and is the estimated year of opening. The year 2030 represents the future forecast year that is consistent with the adopted regional transportation plan (PSRC, 2001).

TABLE 4.6-2
Ambient Air Quality Monitoring Data at Beacon Hill in Seattle

| Pollutant | 2004 Maximum Concentration | 2005 Maximum Concentration | 2006 Maximum Concentration | NAAQS/PSCAA Standard[a] |
|---|---|---|---|---|
| **Carbon Monoxide[b]** | | | | |
| 1-hour average | 2.7 ppm | 2.7 ppm | 2.3 ppm | 35 ppm |
| 8-hour average | 1.8 ppm | 1.9 ppm | 1.5 ppm | 9 ppm |
| **Ozone[c]** | | | | |
| 8-hour average | 0.058 ppm | 0.049 ppm | ND | 0.08ppm/NS |
| **Particulate Matter ($PM_{10}$)[b]** | | | | |
| 24-hour average | 33.0 µg/$m^3$ | 30.0 µg/$m^3$ | 42.0 µg/$m^3$ | 150 µg/$m^3$ |
| **Particulate Matter ($PM_{2.5}$)[d]** | | | | |
| 24-hour average | 33.0 µg/$m^3$ | 28.0 µg/$m^3$ | 26.0 µg/$m^3$ | 35 µg/$m^3$ /NS |
| Annual arithmetic average | 8.5 µg/$m^3$ | 8.0 µg/$m^3$ | 7.9 µg/$m^3$ | 15 µg/$m^3$ /NS |

[a] Source: http://www.epa.gov/air/data/geosel.html. NAAQS standard is listed first.

[b] NAAQS and PSCAA standards are the same.

[c] No PSCAA ozone standard has been established. To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor station within an area over each year must not exceed 0.08 ppm.

[d] Only an NAAQS standard has been established for PM2.5.

Notes:
Monitoring location was at 4103 Beacon Hill South, Seattle, WA.
ND = no data collected
ppm = parts per million
µg/m3 = micrograms per cubic meter
NS = no standard

### Criteria Pollutant Emissions

The tailpipe emission burden was determined using Sound Transit's comparison of annual vehicle-miles for each alternative and the pollutant emission rate data from PSRC. The pollutant emission rates vary depending upon the year examined (2007, 2020, and 2030) and the average speed, ranging from 37.7 to 38.3 mph.

Tailpipe emissions for existing conditions were compared to the 2020 and 2030 No Build Alternatives to illustrate the future trend in pollutant emissions for the Puget Sound regional air shed. Table 4.6-3 summarizes tailpipe emissions for the existing, no-build 2020, and no-build 2030 conditions as well as for the low-ridership and high-ridership projects as determined through ridership modeling. Emission rates for all pollutants would fall during the projected 2007-2030 period under all ridership conditions represented. All criteria pollutants under the build conditions would be well below existing conditions and at or below no-build pollutant levels. Other pollutants would also be at or below no-build pollutant levels.

### Mobile Source Air Toxics

Regional impacts of MSATs must be evaluated in accordance with FHWA's Interim Guidance on Air Toxic Analysis in National Environmental Policy Act (NEPA) Documents (FHWA, 2006). Currently, there are no established criteria for determining when MSAT emissions should be considered a problem. For the purpose of MSAT impact evaluation under NEPA, FHWA has developed a tiered approach for analyzing MSATs. Based on this tiered approach, the East Link Project would be considered to have a low potential MSAT effect because it would not add substantial traffic volumes or change the traffic mix considerably from the No Build Alternative. Rather, it would provide a slight decrease in the total project corridor vehicle volumes. As indicated in Table 4.6-4, future year MSAT emissions would decrease from existing conditions and remain unchanged under the project alternatives when compared to the No Build Alternative. As a result, the East Link Project would generate minimal air quality impacts for CAA criteria pollutants and would not be linked with any special MSAT concerns. Consequently, MSATs impacts are not expected to occur as a result of the East Link Project.

TABLE 4.6-3
Projected Tailpipe Emissions in Project Corridor

| | | 2020 | | | 2030 | | |
|---|---|---|---|---|---|---|---|
| **Pollutants** | **Existing** | **No Build** | **Low Ridership** | **High Ridership** | **No Build** | **Low Ridership** | **High Ridership** |
| **Criteria Pollutants (tons/year)** | | | | | | | |
| CO | 377 | 206 | 205 | 205 | 248 | 246 | 245 |
| $NO_x$ | 40 | 11 | 11 | 11 | 10 | 10 | 10 |
| VOC | 25 | 9 | 9 | 9 | 10 | 10 | 10 |
| $SO_2$ | 0.8 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| $SO_4$ | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| $PM_{2.5}$ | 0.7 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| $PM_{10}$ | 1 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| **Air Toxics (pounds/year)** | | | | | | | |
| Benzene | 7,238 | 3,210 | 3,193 | 3,193 | 4,079 | 4,027 | 4,026 |
| MTBE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,3 Butadiene | 503 | 217 | 216 | 216 | 285 | 281 | 281 |
| Formaldehyde | 1,671 | 806 | 802 | 802 | 975 | 963 | 962 |
| Acetaldehyde | 779 | 361 | 359 | 359 | 447 | 442 | 441 |
| Acrolein | 79 | 37 | 37 | 37 | 45 | 45 | 45 |

EPA has developed several emission control programs for vehicle engines and fuels that will reduce MSATs over the next 20 years. These programs include reformulated gasoline, a product of CAA legislation, targeting the nation's more acute $O_3$ nonattainment areas; National Low Emissions Vehicle standards; Tier 2 motor vehicle emission standards and associated gasoline sulfur control requirements; heavy-duty engine standards and on-highway diesel sulfur control requirements; the final rule for non-road diesel engines; and proposals for marine and locomotive engines and the 2001 MSAT rule toxic emissions performance standard. From implementation of these programs, FHWA predicts MSATs will decline in the range of 57 to 87 percent from 2000 to 2020 even with a predicted 64 percent increase in annual VMT.

Regardless of the build alternative chosen, emissions would likely be lower than existing levels in the 2030 design year as a result of the EPA's national control programs. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures; however, the magnitude of the EPA-projected reductions is remarkable in that MSAT emissions in the project vicinity are likely to be lower in the future in nearly all cases.

#### 4.6.3.2 Localized Operational Impacts

The East Link Project would not generate air pollutant emissions during operation because the proposed trains are electrically powered. However, air quality in the project vicinity could be affected by changes in traffic flow and volumes locally and regionally and as a result of increased vehicular traffic near the light rail stations and park-and-ride lots. Light rail is anticipated to improve air quality by shifting commuters from motor vehicle to train ridership. Compared to the No Build Alternative, increased use of light rail is projected to decrease peak-hour morning (AM) and afternoon (PM) traffic volumes locally and regionally, although intersections located near the stations and park-and-ride lots could experience an increase in traffic congestion as more commuters transfer at these locations.

The Washington State Intersection Screening Tool (WASIST) was used to model and analyze the CO concentrations levels of specifically affected intersections in the project corridor. WASIST uses predefined traffic data to estimate the project-generated CO emissions by inputting a combination of worse case scenarios simultaneously into the model in an effort to produce the highest possible level of CO emissions. Traffic data were collected to determine which intersections would be representative for modeling. The collected traffic data were then used to identify the intersections with a level of service (LOS) of D or worse, which were then selected for modeling analysis. Exhibits 4.6-2 through 4.6-4 show all the intersections considered and those that meet the WASIST criteria for modeling CO concentrations.

The initial step in the WASIST modeling process is to perform a "pre-screen." If the pre-screen does not provide a passing result, a complete WASIST analysis is required to better estimate the intersection's impact on ambient CO concentrations. Additional information on how the WASIST modeled was applied to this project is described in the technical memorandum in Appendix F4.6.

Affected intersections with an LOS of D or worse were modeled using the WASIST pre-screening analysis. However, they all initially were above the WASIST pre-screen analysis, requiring a complete WASIST analysis, for existing conditions and for future year no-build and build conditions. The tables in Appendix F4.6 provide the model results at all intersections requiring analysis. Although there are CO NAAQS for both 1-hour and 8-hour averaging periods, past monitoring data show that only the 8-hour NAAQS of 9 ppm has the potential to be exceeded, and, therefore, only the 8-hour CO concentrations from the highest receptor at each affected intersection are reported.

The modeled CO concentrations did not exceed the NAAQS in each case and therefore passed the complete WASIST analysis. Modeled results indicated that the highest CO concentrations would occur under existing conditions. However, these CO levels are still below the 8-hour standard. When existing CO concentrations levels were compared to those in future years, for both the No Build Alternative and the project alternatives, the results indicated a decreasing trend with time. Higher concentration levels under existing conditions can be attributable to an older vehicle fleet with higher emissions. Under the future years of 2020 and 2030, modeled CO levels decrease as vehicle emissions decrease based on expected future improvements in inspection and maintenance programs, improved vehicle fuel efficiency, and improvements directed by the SIP.

The differences in CO concentrations between no-build and build conditions rely mainly on their differences in traffic volume or longer vehicle idle times at intersections. Generally, build CO concentrations were similar to no-build concentrations, except in a few instances where increases in CO concentrations under build conditions could be attributed to an intersection's proximity to one of the stations or park-and-ride lots. Minor CO concentration variations would occur among the build alternatives due to increases in traffic volumes resulting from an alternative and due to increases in extended idle times causing vehicles to remain longer at intersections. However, for the scenarios evaluated, none of the CO concentrations are predicted to exceed the 8-hour CO standard of 9.0 ppm with the project alternatives. The modeled impact levels for the various alternatives are between 3.6 ppm and 6.4 ppm at intersections. Often there are slight differences between the no build and the build alternatives at congested intersections, but none exceed the 8-hour standard. A summary by segment is provided in the following subsections.

#### Segment A

Intersection operations generally would improve in the City of Seattle, especially along Rainier Avenue, because East Link would reduce the amount of auto demand on this corridor and near the Interstate 90 (I-90) HOV ramp (D2 Roadway) terminus at 5th Avenue S and Airport Way/Dearborn Street (vehicle access to the ramp is restricted). These improvements would provide an air quality benefit at intersections in the City of Seattle. The modeled levels of CO concentrations at Segment A intersection range between 4.3 ppm and 5.6 ppm for the Build Alternative.

Intersections that show an air quality benefit under build conditions include the 23rd Avenue S and Rainier Avenue, and the I-90 eastbound off-ramp and Rainier Avenue. These intersections would have a lower CO concentration than under the 2020 no-build condition.

#### Segment B

Depending on which Segment B alternative is chosen, minor traffic increases would occur and slightly degrade the LOS from no-build conditions at the following intersections:

- Bellevue Way SE at the park-and-ride lot intersection would be affected by an increase in traffic to the site under all Segment B alternatives except the BNSF Alternative (B7).
- The 112th At-Grade Alternative (B2A) is expected to create additional vehicle delay at the Bellevue Way SE and 112th Avenue SE intersection.


EXHIBIT 4.6-2
Segment A Intersections Analyzed for CO Concentrations with WASIST Model

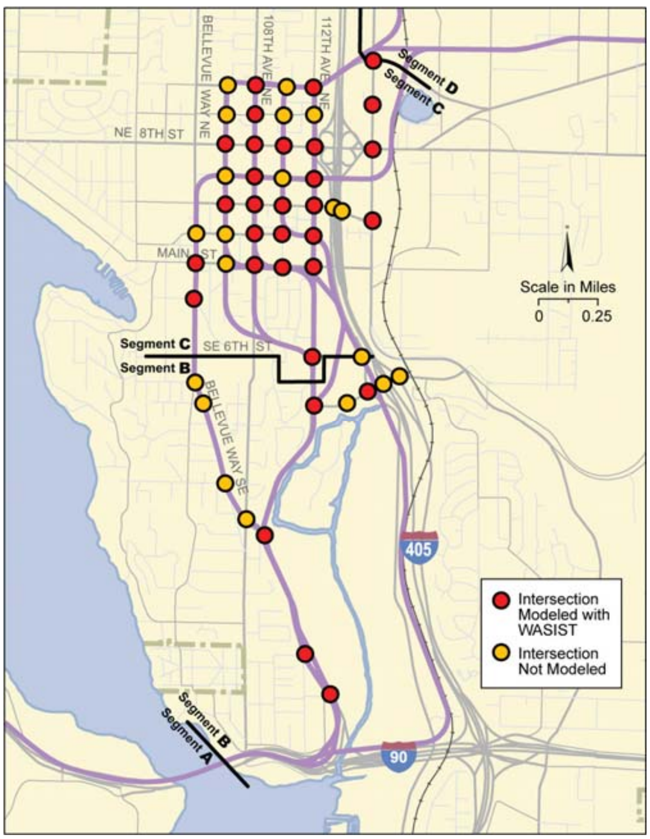


EXHIBIT 4.6-3
Segment B and C Intersections Analyzed for CO Concentrations with WASIST Model


EXHIBIT 4.6-4
Segment D and E Intersections Analyzed for CO Concentrations with WASIST Model

- The BNSF Alternative (B7) is expected to degrade intersection operations at SE 8th Street and 118th Avenue SE due to the increase in vehicle traffic from the 118th Avenue S Station.

Air quality impacts at these intersections show only minor differences in CO concentrations among alternatives. For instance, at 112th Avenue and Bellevue Way the range is between 5.2 ppm to 5.4 ppm, which is equivalent to the 2030 no-build CO concentrations at this intersection.

### Segment C

In general, there would be a shift to mass transit from personal vehicle use. The use of transit is expected to provide a slight air quality benefit at intersections in the Downtown Bellevue area. Intersections that are altered under the various alternatives due to turn movements, travel lane reduction, safety improvements, and the median requirements for the light rail tracks would not have a noticeable affect on CO concentrations. The only exception is the intersection of NE 8th Street and 106th Avenue NE or, depending on the alternative, NE 8th Street and 108th Avenue NE, where the build CO concentration is modeled at 4.3 ppm for the 2030 no build, but up to 5.0 ppm under all the 2030 Build Alternatives. None of the modeled CO concentration exceeded 5.9 ppm under the 2030 build alternatives.

### Segment D

The Segment D alternatives would require a number of light rail crossing signals and gates to provide a protected and safe rail crossing. These crossings would require some widening of intersections, dedicated turn pockets, and signal phasing to clear queued vehicles. Alternatives for Segment D would not experience increased vehicular delay except for the intersections along NE 24th Street at 151st Avenue NE and 152nd Avenue NE, where intersection operations would degrade noticeably due to delay caused by the light rail train as it travels through this short block for Alternative D2A. These intersections would experience increased CO concentrations of up to 6.2 ppm due to the additional delay. This delay still does not exceed the 8-hour concentration standard.

### Segment E

Alternatives in Segment E would experience increased vehicular delay due to additional volumes from the SE Redmond Park-and-Ride Lot. However, these traffic modifications would have little impact on CO concentrations. CO concentrations range between 4.1 and 6.4 ppm under both the no build and build alternatives in Segment E. The differences between the no build and the build alternatives are only slight, with the greatest difference being less than 0.3 ppm higher for the Build Alternative at Redmond Way and NE 70th Street.

### Greenhouse Gases from Operation

Greenhouse gas emissions are normally presented as the total $CO_2$ equivalent ($CO_2e$) released. The $CO_2e$ emissions take into account the global warming potential of chemical emissions from a source. The combustion of fossil fuels emits small amounts of nitrous oxide ($N_2O$) and methane ($CH_4$). The global warming potential of $N_2O$ and $CH_4$ are respectively 310 and 21 times that of $CO_2$. The total $CO_2e$ emissions take into account the other pollutants and their global warming potential.

A quantitative analysis was conducted on greenhouse gas emissions from project operations in the design year 2030. The potential $CO_2e$ affects during operation, includes reductions resulting from the decreased vehicular traffic, measured as VMT, resulting from the East Link Project. Brief methodology, assumptions and a summary of the calculations for the GHG emissions analysis from construction and operation are provided in Appendix F4.6.

The analysis estimated fuel or energy consumption by vehicle type from vehicles operating in the region and the project subarea. The East Link Project study subarea for GHG is defined as the transportation area zones that make up roughly the North and East subareas of the Sound Transit District and includes more than 90 percent of the East Link riders in the 2030 projections. Because most of the potential riders are within the subarea, it can be assumed that the majority of the effects occur within this subarea.

Regional and subarea transit bus VMT was allocated between diesel, hybrid, compressed natural gas, and trolley buses. As shown in Table 4.6-4, transit bus VMT was allocated by vehicle type based on the number of vehicles operated by the four transit authorities for the region. The U.S. Department of Energy produces the energy usage for different modes in terms of Btu per vehicle mile. This source was also used for light rail energy use. For buses, automobiles, and trucks, EPA's MOBILE6—Mobile Source Emission Factor Program—was applied as provided by the PSRC.

Fuel and energy consumption were converted to metric tones of $CO_2e$ emitted by vehicle type. This conversion factor was obtained from the Climate Registry (2008). The $CO_2e$ emission rates by fuel type are presented in Table 4.6-5. For this analysis, all energy consumption from trolley, light rail, and commuter rail was converted to gallons of gasoline (g/gal). However, an additional step was applied to East Link energy use because the energy provided for light rail includes non-GHG emission energy sources. Electricity for East Link would be drawn from Seattle City Light for those portions of the route in Seattle and from Puget Sound Energy for the portions on Mercer Island, Bellevue, and Redmond. Both Seattle City Light and Puget Sound Energy rely heavily on hydropower and other non-petroleum energy resources that generate low GHG emissions (See Section 4.10.2, Energy). In fact, Seattle City Light plans to continue to meet a goal of zero net GHG emissions.

In 2006 and 2007, Puget Sound Energy sources ranged between 30 to 40 percent zero-GHG-emission and may soon offer clients the ability to choose their energy sources, thereby offering Sound Transit the option to only use non-GHG-emitting power, such as wind, hydropower, and solar. Therefore, to be conservative,

TABLE 4.6-4
Regional and Subarea Bus Fleet Mix

| Type | Region | Subarea |
|---|---|---|
| Diesel | 69% | 75% |
| Hybrid | 12% | 19% |
| Compressed Natural Gas | 11% | 0% |
| Trolley | 8% | 6% |
| **Total** | **100%** | **100%** |

Notes:
Regional fleet mix based on number of transit vehicles operated by Sound Transit, King County Metro, Pierce Transit, and Community Transit.

Subarea fleet mix based on fleet VMT reported by King County Metro.

TABLE 4.6-5
$CO_2$e Emission Rates by Fuel Type

| Fuel Type | $CO_2$e g/gal |
|---|---|
| Diesel | 10,156 |
| Gasoline | 8,970 |
| Compressed Natural Gas | 7,899 |

g/gal = gallons of gasoline

Source: The Climate Registry, 2008.

energy use for East Link was reduced by 30 percent and light rail miles in Seattle were removed from the GHG calculation.

Table 4.6-6 shows the total projected GHG emissions for the no-build condition and 2030 high- and low-ridership conditions. The build scenarios show that there would be a range of 34,310 to 37,960metric tonnes annual reduction of tonnes of $CO_2$e emissions in the region due to the reduction of VMT for automobiles and the use of cleaner energy sources for operating the light rail system. The gains would be more pronounced in the subarea, as this is where most of the change in VMT would occur. Under the No Build Alternative, the subarea would contribute almost one-third of the Puget Sound region GHG emissions. Implementing the East Link Project could reduce the region's yearly GHG by almost 0.2 percent. This would result in a savings of 0.4 percent annually for the sub area.

According to the EPA web site (2008), the regional saving for the high ridership East Link Project estimated as 37,960 metric tonnes of $CO_2$e per year is the equivalent of the following:

- Supplying electricity for 4,561 homes for 1 year
- 80,085 barrels of oil per year
- Planting 882,993 trees or saving 240 acres of forest from deforestation

In addition, according to the California Air Resource Board, improving automobile speeds up to 46 miles per hour would reduce GHG emissions (Urban Land Institute, 2008). Sound Transit traffic modeling shows that the build alternatives would result in improving traffic speeds over the No Build Alternative on I-90 during congestion periods. For example, the build alternative would improve traffic flow by 2 to 4 mph on average in the PM peak-hour commute. However, there are some places where traffic flow would decrease by 1 mph (westbound between Mercer Island and Seattle) and others, where speeds would improve by as much as 30 mph (eastbound from Mercer Island). Overall, the project would result in additional reduction in GHG emissions from improved traffic flow during project operation (see Chapter 3 of this Draft EIS).

Finally, Sound Transit adopted a Sustainability Initiative in 2007 that promotes and implements more energy-efficient alternatives than current practices. According to the initiative, Sound Transit will integrate efficient operating practices at existing and new facilities, use energy-saving equipment to reduce energy demand, and maximize intermodal transit connections to reduce automobile VMT. Many of these practices have been incorporated in the Central Link Initial Segment planned to open in 2009. The implementation of the sustainability initiatives will reduce energy consumption and thus GHG emissions for operation of East Link.

The East Link Project would also require the operations of a maintenance facility. The maintenance facility would be the equivalent of a light industrial site of approximately 18.344X10 Btu per year. Puget Sound Energy would provide power. Considering that over 30 percent of Puget Sound Energy is already provided by hydro-power or other non-CO2e-emitting sources the East Link maintenance facility would produce approximately 1,503 metric tonnes of $CO_2$e per year. This is approximately 8 percent of the yearly GHG emissions from the East Link Project.

### 4.6.3.3 Project Construction Impacts

During construction, the release of particulate emissions (airborne dust) associated with site preparation, fill operations, and roadway improvements is anticipated to be the primary cause

TABLE 4.6-6
Greenhouse Gas Emissions in Terms of $CO_2e$ During Light Rail Operation

| | 2030 No-Build[1] | 2030 High Ridership | 2030 Low Ridership | Units |
|---|---|---|---|---|
| Regional (Daily $CO_2e$) | 42,334 | 42,230 | 42,240 | Metric Tonnes $CO_2e$ Emissions Daily |
| Daily $CO_2e$ Reduction | Not applicable | 104 | 94 | Metric Tonnes $CO_2e$ Daily |
| Annual $CO_2e$ Reduction | Not applicable | 37,960 | 34,310 | Metric Tonnes $CO_{2e}$ Annually |
| Subarea (Daily $CO_2e$) | 15,025 | 14,947 | 14,957 | Metric Tonnes $CO_2e$ Emissions Daily |
| Daily $CO_2e$ Reduction | Not applicable | 78 | 68 | Metric Tonnes $CO_2e$ Daily |
| Annual $CO_2e$ Reduction | Not applicable | 28,470 | 24,820 | Metric Tonnes $CO_2e$ Annually |

of potential short-term air quality impacts for the East Link Project. Emissions from construction equipment

also are anticipated and would include CO, PM, $NO_x$, and VOCs. Site preparation and roadway construction would involve clearing, cut-and-fill activities, grading, removing or improving existing roadways, and paving roadway surfaces.

Construction-related impacts to air quality would be greatest during the site preparation phase because most engine emissions are associated with the excavation, handling, and transport of soils to and from the site. If not properly controlled, these construction-related activities would temporarily generate $PM_{10}$, $PM_{2.5}$, and small amounts of CO, $SO_2$, $NO_x$, and VOCs. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries. $PM_{10}$ and $PM_{2.5}$ emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. $PM_{10}$ and $PM_{2.5}$ emissions would depend on soil moisture, silt content of soil, wind speed, and the amount of equipment operation. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the construction site.

In addition to $PM_{10}$ and $PM_{2.5}$ emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate CO, $SO_2$ , $NO_x$, and VOCs in exhaust emissions. If construction traffic were to reduce the speed of hauling trucks and other vehicles in the area, CO emissions from traffic would increase slightly while those vehicles are delayed. These emissions would be temporary and limited to the immediate area surrounding the construction site.

$SO_2$ is generated by oxidation during combustion of organic sulfur compounds contained in diesel fuel. Some phases of construction, particularly asphalt paving, would result in short-term odors from VOC in the immediate area of paving sites. Such odors would be quickly dispersed below detectable thresholds as distance from the sites increases.

Increases in air pollutant emissions from construction of the East Link Project are considered temporary impacts. The duration of civil construction for any one particular location along the East Link corridor is expected to range from about 2 to 5 years. The most intense activity, such as site preparation, would occur during the initial phase of construction.

Little is known at this time about the number and exact types of equipment that would be required for each alternative. In lieu of analyzing project construction impacts for each alternative within the different segments, Sound Transit selected two components that would involve a diversity of equipment and materials and potentially high dust and emissions in a concentrated area. These were evaluated to present a worst-case scenario for any given project construction period. The components that were chosen are the proposed garage at the South Bellevue Park-and-Ride Lot and the SE Redmond Maintenance Facility (MF5).

A projected pollutant emission inventory was developed for the parking garage and maintenance facility using a spreadsheet tool titled *Road Construction Emissions Model Version 5.2*, which was developed by the Sacramento Air Quality Management District. This emission spreadsheet uses a number of default assumptions and detailed, project-specific information. The available project data included specific information about the disturbed surface area, the quantity of cut-and-fill material, and the construction duration period. The model's defaults were used for the number and types of project construction equipment needed, the number of construction workers commuting to the job sites, and the length of their commute.

Because there are no state or local guidelines for evaluating the degree of impact from construction pollutant emissions, criteria proposed in the *California Environmental Quality Act (CEQA) Air Quality Handbook*, prepared by the South Coast Air Quality Management District (SCAQMD, 1993), were used as a guideline for this project. The CEQA Air Quality Handbook establishes recommended daily thresholds for construction-related emissions from construction projects. Construction-related emissions that exceed these established threshold levels are considered to be a concern.

Table 4.6-7 presents the model emission results for the South Bellevue Park-And-Ride garage and MF5. The projected emissions from both of these facilities are essentially the same because, given the estimates that were available at the time of this analysis, they occupy approximately the same area (12 to 15 acres). The construction emissions for the two facilities would be substantially below the daily emissions thresholds set by SCAQMD.

TABLE 4.6-7
Projected Construction Emissions

| Pollutant | South Bellevue Park-and-Ride Lot Garage (lb/day) | SE Redmond Maintenance Facility (MF5) (lb/day) | SCAQMD Construction Emission Threshold (lb/day) |
|---|---|---|---|
| CO | 32 | 32 | 550 |
| $NO_x$ | 31 | 31 | 100 |
| Reactive Organic Gases (ROG) | 7 | 7 | 75 |
| Exhaust $PM_{10}$ | 2 | 2 | NA |
| Fugitive Dust | 5 | 5 | NA |
| Total $PM_{10}$ | 7 | 7 | 150 |

lb/day = pounds per day

### Greenhouse Gases from Construction

GHG associated with the construction phase of the East Link Project are expected to be consistent with other projects of this scale. In large-scale construction projects, the major sources of GHG emissions are fossil-fueled construction equipment (mobile and stationary). It was conservatively assumed that all of the fossil fuel used during construction would be diesel. The $CO_2e$ factor for diesel used in the analysis is from The Climate Registry General Reporting Protocol (The Climate Registry, 2008).

The amount of GHG emissions produced by fossil-fueled construction equipment is directly proportional to the quantity of fuel used. Construction fuel consumption is based on recent experience in building light rail in the Seattle region and provides an order of magnitude estimate of GHG emissions. The estimate includes the following factors:

- Transportation of construction materials, waste and fill material
- Equipment used during construction site preparation
- Construction of the rail track and guideway, rail stations, associated park-and-ride lots, and a representative maintenance facility

The fuel used also encompasses the difference in building at-grade, elevated, retained cut and tunnel profiles, specific station design, parking structures as well as the need for a maintenance facility for the project.

Table 4.6-8 shows the range of the GHG emissions for constructing the project. The construction of one maintenance facility is included in the full project emissions calculation, which alone would be approximately 1,740 tonnes of $CO_2e$.

TABLE 4.6-8
$CO_2e$ Emission for Construction of Full-Length Project

| Project | Tonnes of $CO_2e$ |
|---|---|
| High Construction Emissions | 173,197 |
| Low Construction Emissions | 94,893 |
| Potential difference in $CO_2e$ | 78,304 |

The highest potential GHG emissions for the East Link Project would result from the option of building the I-90 (A1), 112th SE Elevated (B2E), 106th NE Tunnel (C2T), NE 20th (D3), and Redmond Way (E1) alternatives. The lowest GHG emissions for the project would result from the option of building the I-90 (A1), BNSF (B7), 112th NE Elevated (C7E), SR 520 (D5), and Leary Way (E4) alternatives. The differentiation is largest in Segment C where alternatives vary among at-grade, elevated, and tunnel profiles. The tunnels would have almost 5 to 6 times more GHG emissions than the elevated profile, and almost 4 times the emissions for at-grade profile alternative. In all other segments, alternatives with extensive elevated profiles would result in more GHG emissions to construct over at-grade profile alternatives, but generally only about 10 percent more. One additional difference occurs in Segment D, where the NE 20th Alternative (D3) would include a portion of retained cut profile. Construction of this alternative would have almost 60 percent higher GHG emission than that of the lowest CO2e emissions alternative, the SR 520 Alternative (D5), which is extensively elevated but also has two fewer stations than all other Segment D alternatives.

#### 4.6.3.4 Hot Spot Analysis at Station Platforms

The East Link Project is unique in that several of the proposed stations (specifically, the Rainier, the Mercer Island, and the Hospital/Ashwood stations) are along heavily traveled highways that may expose passengers standing at station platforms to CO concentrations resulting from automobile tailpipe emissions. The project would not substantially change the volumes of vehicular traffic in the project vicinity; however the station platforms are representative of sensitive locations where passengers would be exposed to CO concentrations. The project vicinity is in an attainment maintenance area for CO. As presented in Table 4.6-9, data collected from CO monitoring sites in the project vicinity demonstrate that the area has not exceeded the CO NAAQS in the last 3 years.

A “hot-spot” modeling analysis was performed for the East Link Project to quantify passenger exposure levels at station platforms using two modeling programs approved by EPA—MOBILE6.2 and CALINE3—to predict CO concentration levels. The highest predicted 1-hour CO concentration levels were obtained and compared to the EPA National Ambient Air Quality Standards (NAAQS) 1-hour CO primary standard of 35ppm. The longest amount of time passengers are expected to wait on the station platform is assumed to be 15 minutes. There is currently no 15-minute CO standard; however, it is assumed that if the highest predicted 1-hour CO standard is below the NAAQS, then the passengers’ exposure levels for 15 minutes would also be acceptable.

Emission factors for the year 2030 were estimated using MOBILE6.2, a modeling program developed by the EPA to estimate current and future emissions from highway motor vehicles. This model was used to calculate the CO emission factor for use in the CALINE3 model. This model is used to calculate the dispersion of vehicle emissions and expected concentrations at select points in the vicinity of roadways. The CO emission factor is based on local climate, vehicle speed, and fuel and vehicle registration data specific to the Puget Sound region. Model inputs were provided by the Puget Sound Regional Council (C. Peak, PSRC, e-mail to R. King, CH2M HILL, May 1, 2008).

Each station has a unique configuration, and the CALINE3 model was run separately for each station: the Rainier, Mercer Island and Ashwood/Hospital stations. As shown in Table 4.6-10, the highest predicted 1-hour CO concentrations for all three station platforms were found to be well below the CO NAAQS 1-hour standard of 35 ppm.

TABLE 4.6-9
Ambient Air Quality Monitoring Data from CO Monitoring Sites in the Project Vicinity

| | Maximum Concentration | | |
|---|---|---|---|
| **Pollutant** | **2005** | **2006** | **2007** |
| **Beacon Hill Monitoring Site** | | | |
| 1-hour | 2.7 ppm | 2.3 ppm | 1.4 ppm |
| 8-hour | 1.9 ppm | 1.5 ppm | 1.0 ppm |
| **Bellevue Monitoring Site** | | | |
| 1-hour | 5.9 ppm | 5.1 ppm | 3.9 ppm |
| 8-hour | 4.0 ppm | 3.7 ppm | 2.7 ppm |

Source: http://www.epa.gov/air/data/geosel.html.

TABLE 4.6-10
1-hour CO concentrations at Station Platforms

| Station Name | 1-hour CO concentrations (ppm) |
|---|---|
| Rainier Avenue Station | 5.5 |
| Mercer Island Station | 7.7 |
| Ashwood Station | 7.1 |

### 4.6.4 Conformity Determination

Under the Clean Air Act, a transportation project located in a nonattainment or maintenance area for a given pollutant is required to meet a conformity determination with the State Implementation Plan (SIP). Conformity requirements are met when a project does not cause or contribute to an exceedance of the NAAQS. In air quality maintenance areas, regionally significant projects are evaluated for their conformity to Air Quality Maintenance Plans. Projects that conform to the plan are not expected to cause exceedance of the standard. The East Link Project would be located in the Puget Sound region, which is a maintenance area for CO, with a portion of the project also located in the Duwamish $PM_{10}$ maintenance area. In the Puget Sound region, PSRC determines regional conformity by including a project in the Metropolitan Transportation Plan (MTP) and the Transportation Improvement Plan (TIP).

The proposed project is included in the region's MTP, *Destination 2030* (PSRC, 2001), and in the *2005-2007 Regional Transportation Improvement Program* (PSRC, 2005), both of which have been found to meet the CO and $PM_{10}$ conformity tests as identified by federal and state conformity regulations. Therefore, the East Link Project has met the requirement of being included in the regional plans, which have been found to conform to the SIP.

A project-level conformity determination was performed by conducting a CO hotspot analysis on affected intersections in the project vicinity. Based on modeling, intersections in the project vicinity currently do not exceed the CO NAAQS. Affected intersections under all build conditions would not create any new exceedances of the CO NAAQS.

A $PM_{10}$ project-level hotspot analysis is not required for the East Link Project because it is not a project of air quality concern. Based on the FHWA $PM_{10}$ guidance (March 2006), projects of air quality concern are defined in 40 CFR 93.123(b)(1).

Therefore, this project meets conformity requirements for $PM_{10}$ by its inclusion in the MTP, the Plan, and the RTIP, which have been found to meet the conformity test for $PM_{10}$. In addition, The Bus Integration Plan would convert existing bus lines to rail lines and should not substantially increase the diesel bus congregation at a single location.

Temporary impacts from construction activities would be reduced by incorporating minimization measures into the construction specifications that control release of $PM_{10}$, deposition of particulate matter, and emissions of CO and $NO_X$ within the study area.

### 4.6.5 Potential Mitigation Measures

There is no operational impact that would require mitigation, as the East Link Project would provide a net benefit over the No Build Alternative. However, consistent with Sound Transit's sustainability policies, further reductions in fuel and energy use would continue to reduce GHG emissions for project operations.

For construction activities, PSCAA regulates particulate emissions (in the form of fugitive dust). Any emission of fugitive dust requires the use of best practices to minimize impacts. The general policy of PSCAA and WSDOT is to prevent and reduce fugitive dust resulting from construction activities so as not to injure human health, plants and animals, or property, and so as not to unreasonably interfere with the enjoyment of life and property. To comply with PSCAA and WSDOT policy of preventing air quality degradation, the following mitigation measures may be used as necessary and in accordance with standard practice to control $PM_{10}$, $PM_{2.5}$, and emissions of CO and $NO_x$ during construction of the project. Several of these measures would also reduce GHG emissions.

- Spray exposed soil with dust control agent to reduce emissions of $PM_{10}$ and deposition of particulate matter
- Cover all transported loads of soils and wet materials before transport, or provide adequate freeboard (i.e., space from the top of the material to the top of the truck) to reduce $PM_{10}$ and deposition of particulate during transportation
- Provide wheel washes to reduce dust and mud that would be carried offsite by vehicles and to decrease particulate matter on area roadways
- Remove the dust and mud that are deposited on paved, public roads to decrease particulate matter
- Route and schedule construction traffic to reduce congestion and related air quality impacts caused by idling vehicles along local roads during peak travel times, which reduces emissions of CO, $NO_x$, and $CO_2e$.
- Require appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel to reduce CO and $NO_X$ emissions in vehicular exhaust.
- Use relatively new, well-maintained heavy equipment to reduce CO and $NO_X$ emissions, which may also reduce GHG emissions.
- Install mulch or plant vegetation as soon as practical after grading to reduce windblown particulate in the area.

Emissions of CO, $NO_X$, and VOCs are best controlled through use of new construction equipment and proper maintenance of this equipment. Use of low-sulfur diesel fuel controls emissions of $SO_2$. $SO_2$ and $NO_x$ emissions are considered precursor to $PM_{2.5}$ emissions; therefore, reductions in SO2 and $NO_x$ will also help reduce $PM_{2.5}$ emissions. All mitigation measures must comply with local regulations governing air quality including those for controlling fugitive dust during construction.