CHAPTER 3

Air Quality

This chapter identifies the potential for air quality impacts as a result of redevelopment in the Bel-Red Corridor. This evaluation compares the relative potential for impacts among the No-Action Alternative and the three proposed action alternatives.

Methodology

Potential air quality impacts during construction were evaluated qualitatively by describing the types of sources and typical pollutants expected from typical construction activities associated with developing the land uses envisioned in the Bel-Red Corridor. Particulate matter (PM) is the primary pollutant of concern resulting from earth-moving activities; exhaust emissions from diesel-fueled trucks and construction equipment also are a source of PM.

Vehicle exhaust would be the primary source of air emissions associated with the project. Air quality impacts were evaluated quantitatively using an emissions burden analysis to evaluate the alternatives within the study area. This analysis was performed using the U.S. Environmental Protection Agency (USEPA)-approved MOBILE6.2 vehicle emission modeling software, which is used to estimate a fleet-average vehicle emission factor in terms of grams per vehicle mile traveled (VMT). These emission factors were obtained from the Puget Sound Regional Council (PSRC; Peak, 2006). This emission factor is then multiplied by the traffic forecast data for each alternative in the study area. In this case, estimated VMT for the afternoon peak hour were multiplied by the MOBILE6.2 emission factor to calculate the pounds per hour (during PM peak hour) of emissions for each alternative (including the No-Action Alternative) in the year 2030.

Existing Conditions

Existing conditions provide background information for the air quality analysis, and this background information includes the following:

- The **regulatory status** describes the regulatory environment that establishes the impact analysis requirements for this EIS, identifies the pollutants of concern, and describes current air quality status with respect to air quality standards.
- The **existing air quality** summarizes existing air emissions sources and measurement data indicating pollutant concentrations in the study area and vicinity.

Regulatory Status

Air quality is protected by federal, state, and local air quality regulations that are enforced locally by the Puget Sound Clean Air Agency (PSCAA) and the Washington State Department of Ecology (Ecology). Air quality standards have been established to protect human health from

the effects of several pollutants collectively referred to as "criteria pollutants." These pollutants—and the health effects of each—are described below:

- **Carbon monoxide** (CO) is a colorless, odorless gas that forms when fuels containing carbon burn. Motor vehicles are the principal source of CO emissions in urban areas. Maximum concentrations usually occur near roadway intersections and other areas of traffic congestion, and they decrease rapidly with distance from the source. CO interferes with the uptake of oxygen by red blood cells, which can affect the heart, lungs, and brain.
- **Particulate matter** enters the air from industrial operations, vehicle traffic, and other sources, such as burning wood and other materials. Two historically common classifications for PM are total suspended particulates (TSP) and inhalable PM (PM_{10}), which are particles with a diameter less than or equal to 10 micrometers. Recent regulatory changes by the USEPA have also created an additional standard for even smaller particles, those less than 2.5 micrometers in diameter ($PM_{2.5}$). Health effects from smaller particles include damage to lungs from particles that are deeply inhaled, as well as synergistic effects with other pollutants. Aesthetic effects can occur when PM deposits cover surfaces on which they settle, thereby reducing visibility.
- **Volatile organic compounds** (VOCs) are a key component in the formation of ozone, or O_3 (see below). These compounds are emitted or evaporate into the atmosphere from a variety of sources, including natural (nonhuman-caused) sources. In most urban areas, however, most VOC emissions come from mobile sources (automobiles and other vehicles). There are no National Ambient Air Quality Standards (NAAQS) for this pollutant category; it is regulated to prevent O_3 effects and, thus, is covered under construction and operating permit programs.
- **Oxides of nitrogen** (NOx) are produced as the result of high-temperature fuel combustion and subsequent atmospheric reactions. Common NO_X sources are motor vehicles, power plants, refineries, and other industrial operations. Like VOCs, NO_X emissions in an urban setting are overwhelmingly produced by transportation sources. NO_X is a contributing factor in O_3 formation, and it also has its own ambient air quality standard because nitrogen dioxide is a poisonous gas that is a factor in a range of respiratory diseases.
- **Ozone** (O_3) in the lower atmosphere is a harmful air pollutant and contributes to the formation of smog. Ozone is a secondary pollutant formed by the reaction of VOCs and NO_x in the presence of strong sunlight. Thus, O_3 levels can be reduced by minimizing emissions of those precursor pollutants. Ozone is a pungent-smelling, colorless gas that is an irritant to lungs and respiratory functions. People with chronic respiratory problems, like asthma, are most sensitive to elevated O_3 levels.
- **Mobile source air toxics** (MSATs) are compounds that have been found to cause health effects such as cancer or neurological or reproduction problems. USEPA has identified 21 MSATs that can occur in motor vehicle emissions, six of which are listed as priority MSATs: benzene, formaldehyde, acetaldehyde, diesel PM, acrolein, and 1,3-butadiene. MSATs are not currently regulated as criteria pollutants, and they have no ambient air quality standards established.

Table 3-1 summarizes the federal, state, and regional air quality standards for the criteria pollutants. Areas that do not meet these standards—as evidenced by monitoring data that has

measured concentrations above the standards—are classified as "nonattainment areas" and are required to take measures to reduce pollutant concentrations below the standards. Once an area has improved its air quality to the point that it meets the standards, then it is reclassified as a "maintenance area," in which special measures must be taken to ensure that the area will continue to comply with future ambient air quality standards. The State Implementation Plan (SIP), maintained by Ecology, documents these special measures, which include requirements for controlling emissions from both motor vehicles and point sources (e.g., industrial facilities).

TABLE 3-1
National, State, and Regional Ambient Air Quality Standards
Bel-Red Corridor Draft Environmental Impact Statement

Pollutant	National		Washington State	Puget Sound Region
	Primary	Secondary		
Nitrogen dioxide				
Annual average (ppm)	0.05	0.05	0.05	0.05
Carbon monoxide				
8-hour average (ppm)	9	NS	9	9
1-hour average (ppm)	35	NS	35	35
Ozone				
8-hour average (ppm)	0.08	0.08	NS	NS
Lead				
Maximum arithmetic mean (µg/m^3; averaged over calendar quarter)	1.5	1.5	NS	1.5
Sulfur dioxide				
Annual arithmetic average (ppm)	0.03	NS	0.02	0.02
24-hour average (ppm)	0.14	NS	0.10	0.10
3-hour average (ppm)	NS	0.5	NS	NS
1-hour average (ppm)	NS	NS	0.40	0.40
Particulate matter (PM_{10})				
Annual arithmetic average (µg/m^3)	50	50	50	50
24-hour average (µg/m^3)	150	150	150	150
Particulate matter ($PM_{2.5}$)				
Annual arithmetic average (µg/m^3)	15	15	NS	NS
24-hour average (µg/m^3)	65	65	NS	NS
Particulate matter (total suspended particulates)				
Annual geometric average (µg/m^3)	NS	NS	60	NS
24-hour average (µg/m^3)	NS	NS	150	NS

Source: Ecology, 2006.
µg/m^3 micrograms per cubic meter
NS No standard established
PM_{10} particulate matter smaller than 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than 2.5 microns in diameter
ppm parts per million

The Bel-Red Corridor is located approximately 10 miles east of Seattle, within the Puget Sound area as defined by state air quality plans. Although currently designated as attainment for all criteria pollutants, the Puget Sound area is considered a maintenance area for CO due to measured violations of the standard in the late 1980s. The region was redesignated from CO nonattainment to attainment/maintenance on October 10, 1996, based on air quality improvements. The CO attainment/maintenance area extends roughly from Everett to Olympia along the Interstate 5 (I-5) corridor.

Transportation projects in Washington State are subject to Transportation Conformity Regulations (Code of Federal Regulations [CFR], Title 40, Part 93 and WAC 173-420) if they are proposed within an air quality nonattainment or maintenance area. These regulations ensure that the project will conform to the SIP and will not impede the goal of improving air quality. The conformity regulations require that projects resulting in additional traffic (such as a new development or new roadway capacity) be analyzed to determine whether they will violate air quality standards by creating or increasing congestion at specific intersections. However, because this is a programmatic-level EIS, there is not enough information on any individual project to complete a conformity analysis. Because the Bel-Red Corridor is located in a CO maintenance area, individual projects proposed within this area will need to undergo conformity analysis. These analyses will be completed as part of project-level environmental reviews as redevelopment and/or transportation projects are advanced for implementation under any new *Bel-Red/Northup Subarea Plan* (City of Bellevue, 1988).

Existing Air Quality Emissions

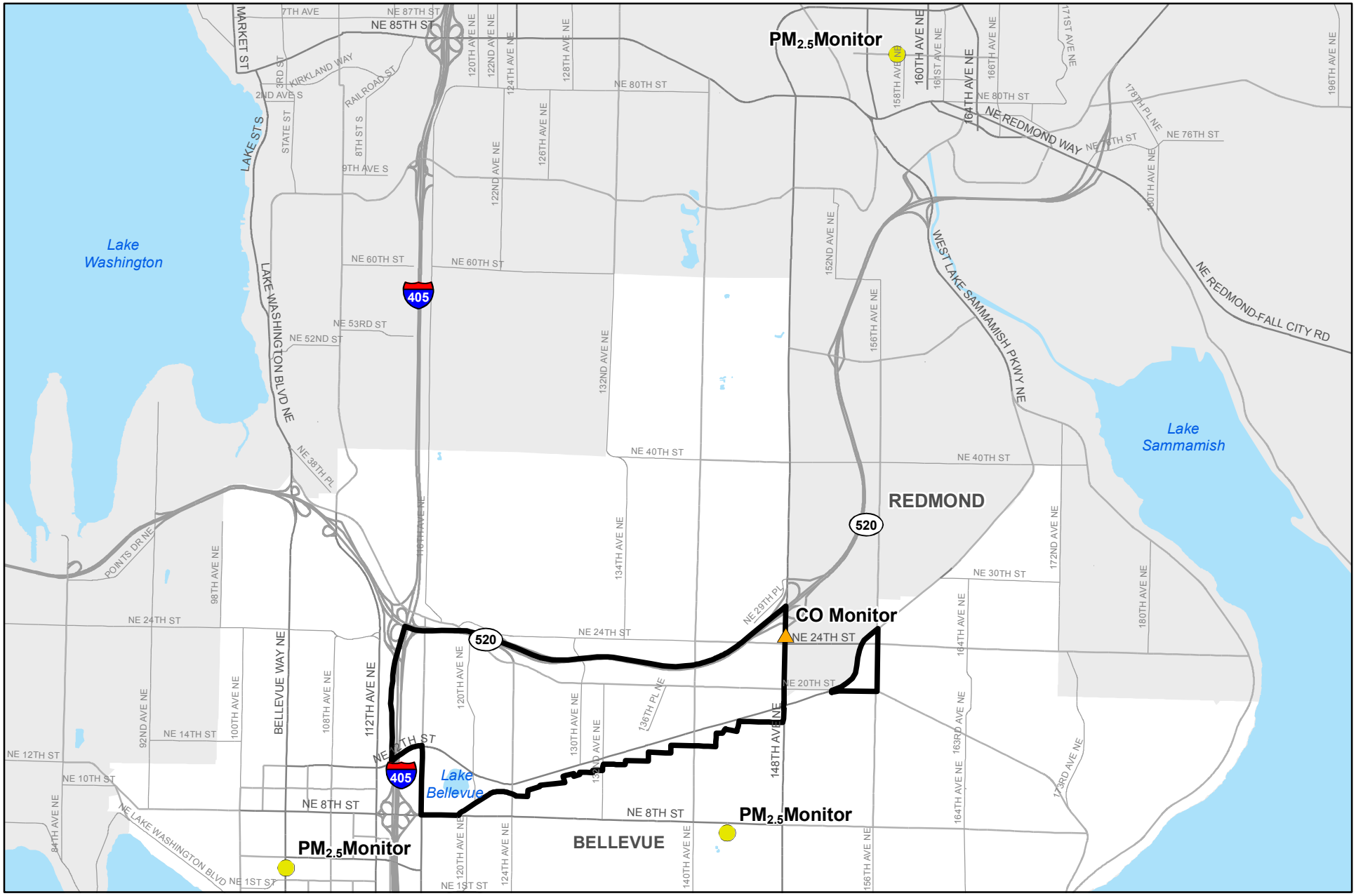
Air pollutant emissions in the Bel-Red Corridor are primarily from motor vehicle exhaust and light industrial and commercial facilities. Motor vehicle emissions depend on various factors (i.e., vehicle age, engine type, and travel speed) and tend to be highest during peak commuting hours when volumes are greatest and delays at signals and stop signs are longest. Industrial and commercial facilities in the study area that contribute to air emissions include dry cleaners, automotive body repair shops, gasoline stations, commercial bakers, and coffee roasters. These facilities primarily emit VOCs, but they also emit, to a lesser degree, CO, NOx, and PM.

Ecology and PSCAA monitor and measure pollutant concentrations in the Puget Sound region. Only two pollutants are measured near the Bel-Red Corridor: CO and $PM_{2.5}$. Figure 3-1 locates the monitors nearest the study area, and Table 3-2 shows the measured concentrations at the nearest sites for the last three full years of data for CO and $PM_{2.5}$, as compared to the air quality standards for each. There have been no measured air quality standard exceedances in the last three years for any criteria pollutant monitored in the Puget Sound region.

Impacts

Construction Impacts

Air quality impacts related to project construction activities would occur primarily as a result of emissions from heavy-duty construction equipment (such as bulldozers, backhoes, and cranes), diesel-fueled mobile sources (such as trucks), diesel- and gas-fueled generators, and on- and off-site project-related vehicles (such as service and pick-up trucks).



CO Monitor

$PM_{2.5}$ Monitor

Bel-Red Corridor

N

0 0.25 0.5 Miles

Figure 3-1
Location of Air Quality Monitors in or near the Bel-Red Corridor
Bel-Red Corridor Draft EIS

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TABLE 3-2
Ambient Criteria Pollutant Concentration Levels Measured from 2003 to 2005
Bel-Red Corridor Draft Environmental Impact Statement

Monitoring Location	Parameter	Maximum Concentration			NAAQS
		2003[1]	2004[1]	2005[2]	
Particulate Matter ($PM_{2.5}$)[1]					
Bellevue (601 143rd Ave NE)	Annual arithmetic mean (µg/m^3)	8.3	8.3	7.3	15
	24-hour average (µg/m^3)	28	22	28	65
Bellevue (305 Bellevue Way NE)	Annual arithmetic mean (µg/m^3)	7.0	7.7	7.1	15
	24-hour average (µg/m^3)	34	30	26	65
Redmond[2] (Redmond City Hall 15670 NE 85th Street)	Annual arithmetic mean (µg/m^3)	7.2	7.0	7.1	15
	24-hour average (µg/m^3)	36	34	42	65
Carbon Monoxide[1]					
Bellevue (2421 148th Avenue NE)	8-hour average (ppm)	6.5	4.8	4.0	9
	1-hour average (ppm)	9.0	3.2	5.9	35

[1]Source: PSCAA, 2006.
[2]Nephelometer data.
µg/m^3 micrograms per cubic meter
NAAQS National Ambient Air Quality Standard
$PM_{2.5}$ particulate matter smaller than 2.5 microns in diameter
ppm parts per million

The following types of construction operations were considered in assessing construction air quality impacts:

- Material storage, handling, and processing
- Loading and unloading (stockpile to trucks)
- Demolition and dumping
- Earth-moving and excavating
- Grading, scraping, dozing, and removal activities
- Paving, asphalt, or concrete activities
- Materials hauling
- Wind erosion of exposed surfaces
- Transporting materials on paved and unpaved roads

Fugitive PM_{10} and $PM_{2.5}$ emissions are associated with site preparation, demolition, ground excavation, grading, cut-and-fill operations, and structure erection. Fugitive dust emissions also could be generated as a result of construction-related traffic and wind erosion of uncovered demolition and excavation areas. PM emissions would vary from day to day, depending on the level of activity, specific operations, and weather conditions. For example, hot, dry weather conditions could increase PM emissions. Emission rates would depend on soil moisture, soil silt content, wind speed, and the quantity and type of operating equipment.

Larger dust particles would settle near the source, and fine particles (PM_{10} and $PM_{2.5}$) would be dispersed over greater distances from the construction sites. Construction contractors in the Puget Sound area are encouraged to use best management practices (BMPs) to minimize impacts to air quality during construction; these BMPs include the following:

- Spray exposed soil with water or other dust suppressants to prevent visible dust emissions, particularly during demolition activities by mechanical or explosive methods.
- Cover dirt, gravel, and debris piles as needed to reduce dust and wind-blown debris.
- Cover all trucks when transporting fill materials or soil, wet materials in trucks, or providing adequate freeboard (space from the top of the material to the top of the truck) to minimize dust emissions during transportation.
- Cover loads of hot asphalt to minimize odors.
- Provide wheel washers to remove dirt that vehicles would otherwise carry off site to decrease PM deposits on area roadways.
- Remove dirt from public roads, sidewalks, and bicycle and pedestrian paths to reduce windblown dust on area roadways.
- Route and schedule construction trucks to minimize disruption or delays to traffic during peak travel times to reduce potential air quality impacts caused by congestion.
- Route construction trucks away from residential and business areas to minimize annoyance from dust.
- Gravel or pave haul roads to reduce windblown dust and dirt being deposited on local roads.
- Use ultra-low sulfur fuels in construction equipment to reduce sulfur emissions.
- Locate construction equipment and truck staging areas away from sensitive receptors as practical and while considering potential impacts to other resources.
- Plant vegetative cover on graded areas that would be left vacant for more than one season to reduce windblown particulates in the area.
- Coordinate (by lead agencies) construction activities with other projects in local proximity to reduce the cumulative effects of concurrent construction projects.
- Minimize emissions by assuring proper equipment operation:
  - Turn off the engine of construction vehicles if they are left idling for more than 15 minutes.
  - Require appropriate emission-control devices (catalytic converters or particulate traps) on all construction equipment powered by gasoline or diesel fuel to reduce CO, NO_X, and PMs in vehicular exhaust.
  - Use relatively new, well-maintained equipment to reduce CO and NO_X emissions.

Additionally, there will be engine exhaust from personal vehicles (construction workers), heavy trucks, and construction equipment. These emissions would primarily comprise NO_x, sulfur dioxide (SO_2), PM, CO, and VOCs, which are common at construction sites. If construction traffic and lane closures were to increase congestion in the area, then traffic emissions would increase temporarily as a result of increased idling and would be limited to the area surrounding the construction site. The effects would be temporary and would likely not be significant within the context of overall traffic within the corridor. Some construction phases (particularly during paving operations using asphalt) would result in short-term odors; these odors might be detectable to some people near the project site but would be diluted as distance from the site increases.

Operational Impacts

An emissions burden analysis was performed to estimate the Bel-Red Corridor PM peak-hour emission rates associated with each alternative. CO, PM (both PM_{10} and $PM_{2.5}$), and O_3 precursor (VOC and NO_X) emission rates were calculated as part of the burden analysis to indicate the effects of each action alternative throughout the study area on those air pollutants. Only direct emissions of each pollutant were estimated, and there was no attempt to estimate secondary formation downwind of the release. (For example, VOCs and NOx can contribute to O_3 formation under certain conditions, and NOx is a precursor to $PM_{2.5}$.) The emission estimates are calculated as a peak-hour emission rate in pounds per hour (lb/hr) for the study area in the design year (2030).

The potential air pollutant rates for the proposed alternatives were estimated by multiplying MOBILE6.2 emission factors by the project-specific PM peak-hour project area VMT. Emission rates were estimated for each action alternative and compared to the No-Action Alternative emission rates for the year 2030. Because the VMT were calculated only within the study area boundaries, they do not characterize changes that might occur elsewhere in the region as a result of study area changes. These values are useful for comparing the action alternatives, but they are not meant to predict localized or regional air quality effects that would result from specific projects.

Table 3-3 presents the results of the burden analysis. The data show higher predicted emissions for all action alternatives as compared to the No-Action Alternative. This is primarily due to the fact that each action alternative proposes additional housing and commercial development, thus resulting in additional vehicles traveling to and from these facilities within the corridor. The highest air emissions are predicted for Alternative 3, which has the highest predicted number of additional housing units and commercial square footage.

Based on the existing monitoring data, predicted concentrations would be significantly below their respective standards for both CO and $PM_{2.5}$. This indicates that, despite the predicted increase in traffic volumes and emissions, the Bel-Red Corridor redevelopment is not likely to result in any exceedance of the air quality standards. The corridor design has incorporated assumed improvements to roadways and transit options that will maintain an acceptable level of service (LOS) for vehicles, despite an increase in volume. Maintaining traffic flow will reduce idling and, therefore, reduce pollutant emissions from vehicles. It should also be noted that each alternative assumes a varied number of LRT alightings and boardings (see Chapter 1 for more discussion), the highest number of which occur under Alternative 3; therefore, potential pollutant emissions from vehicles are assumed to be further reduced.

TABLE 3-3
Burden Emissions Analysis: PM Peak-Hour Project Emissions for the Region (pounds per hour)
Bel-Red Corridor Draft Environmental Impact Statement

Alternative	CO	PM_{10}	$PM_{2.5}$	VOC	NOx
2030 No-Action Alternative	2,921	7.0	3.4	162	105
2030 Alternative 1	4,204	9.2	4.4	259	147
2030 Alternative 2	4,283	8.8	4.3	281	147
2030 Alternative 3	4,786	9.1	4.4	337	160

Source: CH2M HILL, 2006.
CO carbon monoxide
NOx oxides of nitrogen
PM10 particulate matter smaller than 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than 2.5 microns in diameter
VOC volatile organic compound

As noted earlier in this chapter, a conformity analysis will be required for individual projects proposed as part of the corridor redevelopment. The conformity analysis will identify intersections at which project-related traffic increases result in the potential for localized exceedances of the ambient air quality standards. These intersections are known as "hot spots" and are identified by the PSCAA for each project based upon its location and anticipated traffic volumes. For the Bel-Red Corridor, the intersections with the highest traffic volumes under all action alternatives are those along 116th Avenue NE and 148th Avenue NE; many of these intersections will be at LOS E or F in 2030. PSCAA will likely require hot-spot analyses for some or all of these intersections for future development and/or transportation improvement projects.

To the extent that existing pollutant-generating land uses (e.g., repair shops or dry cleaners) redevelop over time, overall emissions within the Bel-Red Corridor would be lower in the future than they are now. This improvement would be less under Alternatives 1 and 2 that retain areas of service uses and light industrial uses, respectively. Most pollutants generated by these land uses, however, are regional in their effects. If businesses were to relocate elsewhere within the Puget Sound region, then there would be little difference in regional air quality as compared to the No-Action Alternative.

Mitigation Measures

No significant adverse air quality impacts during operation are anticipated as a result of any project alternative; therefore, no mitigation is required. Construction impacts would be mitigated by the BMPs described above.

Unavoidable Adverse Impacts

No unavoidable adverse impacts to air quality are anticipated.