

B. AIR

Affected Environment

The Puget Sound region has a winter-wet, summer-dry climate. Winters are moderate in temperature with few cold periods below 32°F, and summers are relatively cool with rare, short hot spells between 85°F and 100 °F. Annual precipitation, concentrated in the winter months, averages from 35 to 40 inches. Winds generally range south to southwest in the winter, and west to northwest in warmer periods.

In winter, inversions with very stable atmospheric conditions occur for periods of one to several days. Climate affects air pollution with regard to wind conditions and temperatures; both factors influence ambient concentrations of pollutants. Due to low solar heating of the land in winter, temperature inversions may occur, accompanied by stagnant atmospheric conditions. In most cases, these pollutant-trapping inversions have an upper 'lid' at altitudes between 1,000 and 6,000 feet, and break up by early afternoon.

The U.S. Environmental Protection Agency (EPA) has identified six air quality elements as criteria pollutants – pollutants with the potential for endangering public health and welfare. The six criteria pollutants include: carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, particulates, and lead. Refer to Table 4, Ambient Air Quality Standards.

There are four major sources of most criteria pollutant emissions in Washington State: motor vehicles, industrial emissions, residential woodstoves/fireplaces and outdoor burning. Emissions from motor vehicles are Washington's largest source of air pollution – criteria pollutants generated by motor vehicles include: carbon monoxide, nitrogen oxides, volatile organic compounds (hydrocarbons) and particulates.

Three governmental agencies have responsibility for monitoring and implementing air quality standards in the project area: the U.S. EPA, Washington State Department of Ecology (DOE) and the Puget Sound Clean Air Agency (PSCAA)⁵. DOE and PSCAA maintain a network of instrumented air quality monitoring stations throughout the Puget Sound area. These monitoring stations are located in areas that are projected to have higher concentrations for the pollutant being monitored (e.g., central business districts for carbon monoxide, industrial areas for particulates, resource areas for ozone). The monitoring station nearest the University of Washington campus is located at 1307 NE 45th Street, one block west of the northwest corner of the campus. Carbon monoxide is the only pollutant monitored at this location.

Seattle is located within the Department of Ecology's four-county⁶ Puget Sound Intrastate Air Quality Region. Portions of this region are currently "in attainment"⁷ for certain pollutants -- sulfur dioxide, lead, nitrogen dioxide, carbon monoxide and ozone. Attainment status for carbon monoxide and ozone was granted in October 1996 (PSCAA, 2000). Portions of the region, however, remain "out of attainment" for particulate matter.

⁵ PSCAA was formerly named the Puget Sound Air Pollution Control Agency (PSAPCA).

⁶ The Puget Sound Intrastate Air Quality Region includes King, Pierce, Snohomish and Kitsap counties.

⁷ Pollutant emissions are below the standards.

Table 4

AMBIENT AIR QUALITY STANDARDS

Pollutant	National Standards	Washington State Standards	Puget Sound Standards
Carbon Monoxide			
8 Hour Avg. ^a	9 ppm	9 ppm	9 ppm
1 Hour Avg. ^a	35 ppm	35 ppm	35 ppm
Particulate Matter (PM₁₀)			
Annual Arith. Avg. ^b	50 µg/m ³	50 µg/m ³	50µg/m ³
24 Hour Avg. ^c	150 µg/m ³	150 µg/m ³	150µg/m ³
Particulate Matter (PM_{2.5})			
Annual Arith. Avg. ^g	15 µg/m ³	15 µg/m ³	15 µg/m ³
24 Hour Avg. ^h	65 µg/m ³	65 µg/m ³	65 µg/m ³
Ozone			
8 Hour Avg. ^d	0.08 ppm	0.08 ppm	0.08 ppm
Sulfur Dioxide			
Annual Avg. ^e	0.03 ppm	0.02 ppm	0.02 ppm
24-Hour Avg. ^e	0.14 ppm	0.10 ppm ^a	0.10 ppm ^e
3 Hour Avg. ^a	No Standard	No Standard	No Standard
1 Hour Avg. ^f	No Standard	0.25 ppm	0.25 ppm
1 Hour Avg. ^e	No Standard	0.40 ppm ^a	0.40 ppm ^e
Lead			
Calendar Qtr. Avg. ^e	1.5 µg/m ³	1.5 µg/m ³	1.5µg/m ³
Nitrogen Dioxide			
Annual Avg. ^e	0.053 ppm	0.053 ppm	0.053 ppm
<i>Notes</i>			
1. ppm = parts per million			
2. µg/m ³ = micrograms per cubic meter			
^a Not to be exceeded more than once per year.			
^b Standard attained when the 3-year average of the annual arithmetic mean concentration, as determined in accordance with 40 CFR Part 50, Appendix N, is less than or equal to 50 µg/m ³ .			
^c Standard attained when the 3-year average of the 99 th percentile 24-hour average concentration above 150 µg/m ³ , as determined in accordance with 40 CFR Part 50, Appendix N, is less than or equal to 150 µg/m ³ .			
^d Standard attained when the 3-year average of the annual fourth-highest daily maximum 8-hour average concentration is less than or equal to 0.08 ppm, as determined in accordance with 40 CFR Part 50, Appendix I.			
^e Never to be exceeded.			
^f Not to be exceeded more than twice in seven consecutive days.			
^g Attained when the 3-year average of the annual arithmetic mean concentration, as determined in accordance with 40 CFR Part 50, Appendix N, is less than or equal to 15.0 µg/m ³ .			
^h Attained when the 3-year average of the 98 th percentile 24-hour average concentration, as determined in accordance with 40 CFR Part 50, Appendix N, is less than or equal to 65 µg/m ³ .			

The University campus is located within the attainment area for carbon monoxide and roughly 5 to 6 miles north of the industrial area south of downtown Seattle (area with a history of non-attainment for particulates). The University of Washington primarily affects local and regional air quality through vehicle traffic, construction activity and power generation. The University's central power plant generates energy through natural gas and fuel combustion. The power plant stack is considered a 'point source' of air pollutants and as such requires an Air Quality Operating Permit from PSCAA (under the Clean Air Act). The University submitted an operating permit application in October 1995 that lists all applicable air quality regulations, describes compliance methodology proposed by the University, and provides information on long-term monitoring. PSCAA is currently reviewing the permit application. The permit is expected to be approved in late 2001 and would be reviewed every 5 years.

The following is a brief discussion of the two most significant pollutants in the Seattle area - carbon monoxide and particulates, and ozone and sulfur dioxide. The following information is based on data from PSCAA (PSCAA, 2001).

Carbon Monoxide (CO)

Carbon monoxide is a colorless, odorless, tasteless gas associated with incomplete combustion, generated by motor vehicle traffic, wood-burning stoves and fireplaces. Locally higher concentrations of CO can occur immediately adjacent to major arterials and highways, some industrial sources, or in areas of concentrated wood burning. I-5 runs north-south less than one mile from the west side of campus. Four major arterials, NE 45th Street, 15th Avenue NE, Montlake Boulevard NE and NE Pacific Street, surround the campus. Particularly at times of high travel volumes, during morning and evening rush hour and major University events, CO concentrations in the University District rise above average levels. Table 5 shows carbon monoxide monitoring results from the NE 45th Street monitoring station, 1992 to 1999.

Table 5

CARBON MONOXIDE MONITORING RESULTS (1992 – 1999)

Year	Highest 8-hour Average (parts per million [ppm])	Number of Exceedence Days Recorded
1992	12.9	1
1993	7.0	0
1994	8.2	0
1995	8.1	0
1996	8.7	0
1997	6.7	0
1998	6.2	0
1999	7.0	0

Source: University of Washington, 2000c.

The monitoring results indicate that one exceedence of the eight-hour carbon monoxide standard has been recorded at NE 45th Street in the past eight years; the carbon monoxide reached 12.9 ppm in 1992. A single exceedence of the standard is not considered to be a violation; the Puget Sound region stayed within the established standard during 1992. The

existing levels of traffic and congestion periodically cause exceedences of the 1-hour standard for carbon monoxide, particularly during peak traffic periods in the vicinity of NE 45th Street and 15th Avenue NE, and NE 45th Street and I-5. However, no monitored values exceeded the federal 1-hour standard in 1998 (PSCAA, 2001). Overall CO levels were generally on the decline since 1992, but increased by 0.8 ppm in 1999.

Particulate Matter

Particulate matter consists of fine particles of smoke, dust, pollen or other materials that remain suspended in the atmosphere for a substantial period of time. Particulates are emitted from industrial operations, auto and bus traffic, residential wood burning, construction activities and other sources. PM₁₀ are small matter equal or less than 10 micrometers in diameter. Because of their size, they are respirable and are associated with a variety of respiratory effects. Particulate emissions are generally higher during the winter, when more fuel is burned and meteorological conditions favor the concentration of emissions. Fine particulate matter (PM_{2.5}) originates primarily from combustion sources and also forms in the atmosphere from the chemical reactions of pollutant gases. PSCAA views fine particulate matter as the main air pollution issue impacting the region.

The nearest PM₁₀ particulate monitoring stations are located several miles south and southwest of the University of Washington campus in the Duwamish, Harbor Island and South Park areas of Seattle. Of these locations, Duwamish typically experiences the highest concentrations due to surrounding commercial and industrial activity. In the past, PM₁₀ concentrations at other monitoring stations in the Puget Sound region have exceeded the ambient standard, which resulted in a non-attainment classification for the entire Puget Sound area. Since 1992, however, all monitoring stations have been in compliance with the annual standard and, for the past five years, all stations have recorded daily concentrations below the daily standard. The region is currently in compliance with the PM₁₀ standard.

There are three PM_{2.5} monitoring stations in the Puget Sound region: Seattle-Duwamish, Kent and the Tacoma Tide Flats. Fine particulate data show an overall improvement in air quality since 1992, with an annual 98th percentile of daily (24-hour) concentration of approximately 40 µg/m³ and an annual arithmetic mean of 13.6 µg/m³. These concentrations are well below the adopted standards of 65 µg/m³ and 15 µg/m³, respectively (see Table 4).

Ozone

Ozone is a product of photochemical reactions in the atmosphere on hot, sunny days. Most of the pollutants that contribute to ozone come from cars, buses and trucks, gasoline-powered yard equipment, paints/solvents and boat motors. Ozone concentrations are not temperature driven, but they are driven by the amount of sunlight that occurs concurrently with high temperatures and air pollution trapped near the surface by low-level temperature inversions (PSCAA, 2001).

The Washington State Department of Ecology conducts all ozone monitoring in the Puget Sound region. Monitoring sites for ozone are located in Beacon Hill of Seattle, Lake Sammamish, Highway 410 (near Enumclaw), Mud Mountain Road (also near Enumclaw) and Pack Forest near LaGrande (Eatonville).

Between 1988 and 1998 (the most recent date for which data was available at the publication date of this document), the overall regional ozone trend was flat and marginally within federal standards. Conditions that provide for high levels of ozone are relatively infrequent, and, in

comparison to other parts of the country, ozone pollution is not as critical a problem in the Puget Sound region. The U.S. EPA designated the Puget Sound area in attainment for the 1-hour ozone standard in 1996. The Beacon Hill monitoring site (the nearest monitoring site to the University of Washington) showed 1-hour and 8-hour average maximum concentrations to be well within federal standards (PSCAA, 2001).

Sulfur Dioxide

Sulfur dioxide is emitted from large coal or oil burning power plants, sulfuric acid production facilities, pulp mills, cement plants and other large industrial operations. Until it closed in 1984, the dominant regional sulfur dioxide source was the ASARCO smelter in Tacoma. The Washington Department of Ecology maintains four monitoring stations in Everett, Seattle, and Tacoma to measure sulfur dioxide.

Measured levels of sulfur dioxide in the region continue to be low. Sulfur dioxide levels did not reach even 3 percent of any of the state or federal standards during 1998. The only exceedence of the standard in the past 10 years was attributed to an upset emission from an Everett pulp and paper mill in 1994. This single exceedence did not constitute a violation of the state 1-hour standard, nor did it violate any federal standards. The Puget Sound area, including the University of Washington Seattle campus, remains in attainment for sulfur dioxide.

Impacts of the Proposed Action

The development of 3 million square feet throughout campus, as described in the Master Plan Seattle Campus, would result in localized short-term increases in particulates and carbon monoxide in the vicinity of the construction sites. Key construction activities causing potential impacts include: removal of existing pavement and/or buildings, excavation, grading, stockpiling of soils, soil compaction, and operation of diesel-powered trucks and equipment (i.e., generators and compressors) on-site. During construction, on-site activity and periodic traffic delays on adjacent streets could contribute to slightly greater vehicle emissions of carbon monoxide and nitrogen dioxide. Construction would contribute to temporary increases in hydrocarbons and oxides of nitrogen from vehicular exhaust.

Overall, no significant change in University-related traffic is projected (see Section III O. of this Final EIS, Transportation, Transportation Technical Report and the Master Plan Seattle Campus. Vehicle emissions would not be expected to cause significant changes to ambient concentrations of air pollutants in the University District or result in violations of existing 8-hour air quality standards. The existing levels of traffic and congestion may continue to cause periodic violations of the 1-hour standard for carbon monoxide, particularly during peak traffic periods in the vicinity of NE 45th Street and 15th Avenue NE, and NE 45th Street and I-5.

Population growth during the planning period would increase the consumption of electricity, fossil fuel, and natural gas on campus. The combustion of additional natural gas and fuel in the central power plant will contribute to cumulative air quality impacts. Emissions from the plant would be managed to comply with standards and methodology associated with the University's approved air Quality Operating Permit.

The Master Plan Seattle Campus includes potential construction of an aerial plaza over NE Pacific Street. Concentrations of carbon monoxide under the aerial plaza could increase. However, considering the width of the openings relative to the length of the cover, significant

impacts would not be anticipated. If and when the aerial plaza is proposed, additional environmental analysis -- identifying air quality conditions under the aerial plaza and appropriate mitigation measures -- would be prepared.

Impacts of the Alternatives

No Action Alternative

Under the *No Action Alternative*, air quality impacts would be expected to occur as development (approved but not yet built) under the GPDP occurs and the University population increases. The level of construction-related air quality impacts would be less than under the proposed *Master Plan Seattle Campus*. However, increased traffic would not be managed under the *Master Plan Seattle Campus* TMP. Increased vehicle volumes could cause greater impacts to air quality on campus.

Decentralized/Open Space Alternative

This alternative would include less on-campus development than under the *Proposed Action* (approximately 50 percent less development). This reduction in planned development would reduce temporary, construction-related air quality impacts by approximately half. Impacts would be reduced under this alternative, as less development and related traffic volumes would be concentrated on campus. However, this alternative could lead to decentralization and an increase in off-campus development activity. Decentralization of University development and activities could increase on- and off-campus vehicle activity and the presence of related air contaminants.

No Street and Alley Vacations Alternative

Without the street and alley vacations included in the proposed *Master Plan Seattle Campus*, a reduced amount of development would occur. Because development would be reduced under this alternative, temporary construction-related impacts to air quality would be more limited.

Lifting of Lease Limit

Removal of the existing limitation on leasing by the University of Washington would allow the University to lease additional building space within the University District. The University would not be limited in their ability to lease building space from private developers or under public/private partnerships and the pace of development activity in the University District could increase. Any new buildings developed in the University District would be built consistent with the goals of the UCUC Plan⁸ and applicable City of Seattle zoning and development regulations. As analyzed in the UCUC Plan Environmental Checklist⁹, construction of new buildings would temporarily generate dust from exposed soils and exhaust emissions from construction vehicles and machinery. Occupation of new buildings in the University District would increase traffic as identified in the UCUC Plan Environmental Checklist. It should be noted that with implementation of University of Washington TMP measures, traffic associated with University-

⁸ Seattle, 1998b.

⁹ Seattle, 1998a

related development could be less than that identified in the UCUC Plan Environmental Checklist.

Possible Mitigation Measures

The proposed *Master Plan Seattle Campus* includes goals and policies to create a more sustainable environment, protect natural resources and preserve views from campus. These policies would guide planned development and indirectly affect air quality mitigation efforts. The University of Washington would implement measures to mitigate air quality impacts associated with construction activities and construction traffic. Specific mitigation measures may include the following:

- During construction, best management practices to control dust and vehicle and equipment emissions would be implemented.
- The University's Transportation Management Program would be implemented (refer to *Section III O.* of this Final EIS [Transportation]).

Unavoidable Adverse Impacts

Increased traffic and congestion associated with on-campus construction activity and University operations could cause periodic, localized violations of the 1-hour standard for carbon monoxide. Other air quality standards would not be expected to be violated as a result of the proposed *Master Plan Seattle Campus*. Increases in suspended particulates would occur in construction areas to some extent during excavation for individual projects.