AIR QUALITY

This section describes the potential for air quality impact and mitigation review related to the construction and operation of the proposed project. It includes discussion of applicable air quality rules and regulations, review of existing conditions in the project vicinity, qualitative consideration of potential impacts of the alternatives, and discussion of potential mitigation measures. Potential climate change issues are addressed by estimating greenhouse gas emissions related to the construction and operation of the proposed developed parcels and comparing potential emissions associated with each project alternative.

EXISTING CONDITIONS/AFFECTED ENVIRONMENT

Air quality is generally assessed in terms of whether concentrations of air pollutants exceed or comply with ambient air quality standards set to protect human health and welfare. Three agencies have jurisdiction over the ambient air quality in the proposed project area: the EPA, the Washington Department of Ecology (Ecology), and the Puget Sound Clean Air Agency (PSCAA). These agencies establish regulations that govern both the concentrations of pollutants in the outdoor air and contaminant emissions from air pollution sources. Selected applicable local, state and federal ambient air quality standards are displayed in **Table 1**.

To track air quality conditions, Ecology and PSCAA maintain a network of monitoring stations throughout the Puget Sound region. These stations are typically located where air quality problems may occur, and so they are usually in or near urban areas or close to specific large air pollution sources. Other stations in more remote areas indicate regional air pollution levels. Based on monitoring information collected over a period of years, the state (Ecology) and federal (EPA) agencies designate regions as being "attainment" or "nonattainment" areas for particular air pollutants. Attainment status is therefore a measure of whether air quality in an area complies with the National Ambient Air Quality Standard (NAAQS). Regions that were once designated nonattainment that have since attained the standard are considered "maintenance" areas. The project area is considered in "attainment" for all monitored air pollutants except ozone, for which the entire region is considered a maintenance area under the NAAQS. This suggests that air quality is generally good in the vicinity of Black Diamond.

Typical air pollution sources in the Black Diamond area include automobile and truck traffic traveling on local roads, retail/commercial entities, some light industrial activities including limited mining and rock quarries, and residential wood-burning devices. While many types of pollutant sources are present, the single largest contributor to most criteria pollutant emissions is on-road mobile sources (CO emissions) and residential wood burning. Pollutant emissions from diesel sources (e.g., most heavy-duty truck engines) include fine particles and a variety of toxic air pollutants. Non-diesel vehicle emissions are comprised primarily of carbon monoxide (CO), but also include small amounts of sulfur dioxide (SO_2), toxic air pollutants, and both hydrocarbons and nitrogen oxides, which can transform to become ground-level ozone. Residential wood burning produces a variety of air contaminants, including relatively large quantities of fine particulate matter (PM_{10} and $PM_{2.5}$ – defined later).

Table 1 Ambient Air Quality Standards

Pollutant	National (EPA)		Washington	Local
	Primary	Secondary	Ecology	PSCAA
Inhalable Coarse Particulate Matter (PM_{10})				
Annual Average (µg/m^3)			50	54 (c)
24-Hour Average (µg/m^3)	150 (a, b)		150 (a)	154 (d)
Fine Particulate Matter ($PM_{2.5}$)				
Annual Average (µg/m^3)	15 (e)	15 (e)		15 (c)
24-Hour Average (µg/m^3)	35 (f)			35 (g)
Carbon Monoxide (CO)				
8-Hour Average (ppm) [a]	9		9	9
1-Hour Average (ppm) [a]	35		35	35
Ozone (O_3)				
8-Hour Average (ppm) [h]	0.075	0.075		0.075
1-Hour Average (ppm)	(i)	(i)	0.12	(i)

Notes:
µg/m^3 = micrograms per cubic meter; **ppm** = parts per million; **blank cells** indicate no standard
All values not to be exceeded except as noted; all averages arithmetic except TSP annual geometric mean.
[a] Not to be exceeded more than once per year
[b] Particles <10 micrometers in size; federal annual PM_{10} standard revoked as of Sept. 21, 2006 (EPA 2006)
[c] The 3-year annual average of the daily concentrations must not exceed level
[d] The 3-year average of the 99th percentile (based on the number of samples taken) of the daily concentrations must not exceed level
[e] Attainment based on the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors not exceeding level
[f] Attainment based on the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area not exceeding level
[g] The federal 24-hour standard for PM2.5 was revised as of Sept. 21, 2006. The current PSCAA standard of 65 ppm is based on the previous federal standard but has been superseded by the new federal limits. Although PSCAA has not yet adopted the new federal standard, it must do so soon. To avoid confusion, only the prevailing federal standard is reported to represent the maximum level that PSCAA can adopt.
[h] Attainment based on 3-year average of the 4th highest daily maximum 8-hour ozone concentration at each monitoring location
[i] Federal 1-hour ozone standard was revoked in all areas except 14 remaining nonattainment areas. The federal and the PSCAA 1-hour standard lapsed on June 15, 2005.

Source: ENVIRON International Corporation based on most recent local, state and federal rules.

Particulate Matter – PM_{10} and $PM_{2.5}$

Particulate matter air pollution is generated primarily by industrial activities and operations, fuel combustion sources like residential wood burning, motor vehicle engines and tires, as well as other, more minor sources. Federal, state, and local regulations set limits for particle concentrations in the air based on the size of the particles and the related potential threat to health. When first regulated, particle pollution was based on "total suspended particulate," which included all size fractions. As sampling technology improved and the importance of particle size and chemical composition became clearer, ambient standards were revised to focus on the size fractions thought to be most dangerous to human health.

At present, there are standards for inhalable coarse particles less than about 10 micrometers (microns) in diameter (PM_{10}) and inhalable fine particles less than about 2.5 microns in diameter

$PM_{2.5}$. The latter is now thought to represent the most dangerous size fraction of airborne particulate matter because such small particles (e.g., a typical human hair is about 100 microns in diameter) can be breathed deeply into the lungs. In addition, such particles are often associated with toxic substances, deleterious in their own right. The toxic substances can adsorb to particulate matter and then be carried into the respiratory system. Based on the most recent studies, in 2006 the EPA set new, more stringent standards for $PM_{2.5}$ (EPA 2006).

There are currently no PM_{10} or $PM_{2.5}$ monitoring stations in the City of Black Diamond. The closest monitors are located in the cities of Enumclaw and Kent. Black Diamond is not included in an existing PM_{10} nonattainment or maintenance area. Given the lack of major sources of PM_{10}, and the fact that measured concentrations of both PM_{10} and $PM_{2.5}$ at most monitoring stations in the Puget Sound area since 1997 have complied with the applicable ambient air quality standards (PSCAA 2008, EPA 2008a), it is likely that throughout most of the year, existing fine particulate concentrations are below the limits set by the standards. [(1)] During prolonged periods of stagnant meteorological conditions, however, it is possible that emissions from vehicles, residential solid-fuel space heating, and other sources in the study area could elevate particulate matter concentrations so that concentrations reach or exceed the health based standards. But the operation of the proposed alternatives would be a relatively minor source of particulate matter, so it is not necessary to analyze these emissions to conclude that the project would not result in impacts due to particulate matter. [(2)]

Carbon Monoxide (CO)

Carbon monoxide (CO) is a by-product of incomplete combustion. It is generated by vehicular traffic and other fuel-burning activities, such as residential space heating, especially heating units that use solid fuels such as coal or wood. There are two short-term air quality standards for CO: a 1-hour average standard of 35 ppm and an 8-hour average standard of 9 ppm (see **Table 1**). Short-term standards are often the controlling, or most restrictive, air pollution standards.

The impacts of CO are usually localized, with the highest ambient concentrations usually occurring near congested roadways and intersections during periods of cold temperatures (autumn and winter months), light winds, and stable atmospheric conditions. Such weather conditions reduce the mechanisms that disperse and dilute pollutants.

In recent years, the Central Puget Sound region has not violated the NAAQS for CO and is considered a maintenance area for this pollutant. Black Diamond lies outside the Central Puget Sound region CO maintenance area and is considered in attainment for CO.

There are no CO monitors in Black Diamond; the nearest monitor is in downtown Seattle along a heavily traveled and congested traffic corridor unlike the existing traffic routes in Black Diamond. This station and others in the Puget Sound region have not measured a violation of the 1-hour or 8-hour CO standard in recent years. Because CO impacts typically occur close to the emissions source, it is not possible to extrapolate CO concentrations from regional data or distant monitors for this project.

Ozone

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(1) The Tacoma area is expected to be designated nonattainment for the revised PM2.5 standard.

(2) No wood-burning devices are proposed as part of the residential development in either the Proposed Action or Alternative 1.

Ozone is a highly reactive form of oxygen created by sunlight-activated chemical transformations of nitrogen oxides and volatile organic compounds (hydrocarbons) in the atmosphere. Ozone problems tend to be regional in nature because the atmospheric chemical reactions that produce ozone occur over a period of time, and because during the delay between emission and ozone formation, ozone precursors can be transported far from their sources. Transportation sources like automobiles and trucks are among the sources that produce ozone precursors.

In the past, due to violations of the federal ozone standards, the Puget Sound region was designated as nonattainment for ozone. In 1997, EPA determined that the Puget Sound ozone nonattainment area had attained the health-based ozone standard in effect at that time. The EPA reclassified the Puget Sound region as attainment for ozone and approved the associated air quality maintenance plan. Black Diamond is, therefore, in an ozone air quality maintenance area.

In March 2008, EPA revised the 8-hour ozone standard to set a new, more stringent limit. At this time, all jurisdictions in Washington State are projected to meet the new EPA ozone standards (EPA 2008b). Measured ozone concentrations at several regional stations have exceeded the new 8-hour ozone standard, so the area could be on the brink of again becoming nonattainment for this air pollutant. Under the current air quality plans and policies, this status has no direct implications for the project under consideration.

IMPACTS

The following several sections describe the potential impacts common to all of the project alternatives including construction-related impacts, operational impacts related to increases in traffic, and greenhouse gas emissions estimates related to climate change.

Impacts Related to Construction

Development of land parcels with any of the project "build" alternatives would include the demolition of existing buildings and construction of residences, office, retail and commercial buildings, and creation of roads and other infrastructure improvements. Such activities could result in temporary, localized increases in particulate concentrations because of emissions from construction-related sources. For example, dust from short-term construction activities such as excavation, grading, sloping and filling would contribute to ambient concentrations of suspended particulate matter. Construction contractor(s) would be required to comply with PSCAA regulations requiring that reasonable precautions be taken to minimize fugitive dust emissions.

In this event, demolition of existing structures would require the removal and disposal of building materials that could possibly contain asbestos. Demolition contractors would therefore be required to comply with EPA and PSCAA regulations related to the safe removal and disposal of any asbestos-containing materials.

Construction would require use of heavy trucks, excavators, graders and a range of smaller equipment such as generators, pumps, and compressors. Emissions from existing traffic around the project area would outweigh any slight degradation of local air quality resulting from the emissions and the concentrations from air pollutants engines on construction equipment emit. Nonetheless, emissions from such sources, and especially from diesel-fueled engines, are coming under increasing scrutiny because of their suspected risk to human health. Specific dose/response

effects are unknown, but long-term exposure to excessive amounts of diesel emissions could represent a health risk, especially to sensitive individuals like the chronically ill, the old and the very young. Hence, although there is little or no danger of such emissions resulting in pollutant concentrations that would exceed an applicable ambient air quality standard, pollution control agencies are now urging that emissions from diesel equipment be minimized to the extent practicable in order to reduce potential health risks. With implementation of effective actions to minimize on-site diesel engine idling and to locate combustion-fueled equipment as far as possible from nearby residences, diesel emissions from on-site construction would be unlikely to substantially affect air quality in the project vicinity.

Although some construction phases would cause odors, particularly during paving operations using tar and asphalt, any odors related to construction would be short-term and unlikely to significantly affect the nearest residences. Construction contractor(s) would have to comply with PSCAA regulations that prohibit the emission of any air contaminant in sufficient quantities and of such characteristics and duration as is, or is likely to be, injurious to human health, plant or animal life, or property, or which unreasonably interferes with enjoyment of life and property.

Construction activities would also yield land clearing debris. Washington State is phasing out outdoor burning of land clearing debris in favor of alternative disposal methods (e.g., chipping and composting) to reduce risk to public health related to combustion emissions. For example, residential yard debris and land-clearing materials burning is now banned in all urban growth areas (UGAs). PSCAA has adopted the state outdoor burning restrictions. All portions of the project site are within the City of Black Diamond and the UGA, so the state and PSCAA prohibitions on land-clearing debris and all other outdoor waste burning applies.

Construction equipment and material hauling can affect traffic flow in a project area if construction-related vehicles travel during peak periods or other heavy-traffic hours of the day and pass through congested areas. Although there is heavy traffic during the day in Black Diamond, especially on SR-169, there is little delay at intersections now or expected in the future, so project-related construction traffic would not likely substantially affect traffic through the area.

There is a potential for dust and other emissions to affect on-site residences during construction of other residential and commercial facilities *if the on-site residences are occupied before project construction is complete*. Any impacts from construction or equipment emissions would be temporary and probably minor after implementation of reasonable methods and best management practices to minimize such emissions. However, even small increases in construction-related dust or equipment emissions could represent a health risk to sensitive individuals like the chronically ill, the old, and the very young if these populations occupy on-site residences and are exposed to such emissions. Communication with on-site residential and other sensitive users during construction and implementation of a construction management plan designed to control emissions and/or limit on-site residential exposure could prevent or minimize the potential for such on-site impacts.

With implementation of the controls required for the various aspects of construction activities, and with attention to minimize exposure of any nearby people to prolonged exposure to emissions from diesel equipment, construction would not be expected to significantly affect air quality.

Operational Impacts

Project-related traffic could affect operation of off-site transportation facilities and thereby increase pollutant concentrations beyond the project site. This potential is explored further below.

Potential Impacts Related to Off-Site Traffic

One air pollutant of concern for projects with transportation components is carbon monoxide (CO). Of the various vehicular emissions that are regulated, CO is the pollutant emitted in the largest quantity. Therefore, potential changes in emissions that could affect CO levels are the focus of this part of the air quality review. Because the project area is in an attainment area for CO, the federal transportation conformity rules do not apply to this review.[3] However, the project is still subject to an air quality review under SEPA requirements.

A SEPA air quality review of transportation sources (i.e., vehicles) typically considers potential air quality impacts in accordance with EPA air quality "hot-spot" modeling guidelines. Based on these guidelines, *signalized* intersections that would be affected by traffic related to a proposed project are screened for possible quantitative analysis using dispersion modeling (i.e., computerized analysis to estimate air pollutant concentrations due to sources of interest). Such screening is conducted by reviewing the predicted future signalized intersection peak-hour traffic levels of service (LOS – a measure of overall delay, from "A" - good to "F" - very congested, due to expected intersection operation). EPA guidance suggests modeling signalized intersections with an LOS that would deteriorate to "D" or worse due to a proposed project. By definition, intersections that do not warrant signalization, or signalized intersections that operate at LOS "C" or better, have little if any potential to cause air quality impacts at nearby locations.

The traffic analysis for the proposed project was reviewed to assess the potential for off-site traffic-related air quality impacts due to each project alternative. The traffic study indicated most existing and future intersections within the study area are not currently and would not be signalized in the future. In addition, most of the existing or future signalized intersections would operate at LOS "C" or better with or without the project alternatives in 2015. (See EIS Section X, Traffic Data.) However, at one intersection that would be signalized in 2015, project-related traffic would decrease intersection performance to LOS D under the Proposed Action. Based on EPA guidance, this intersection should be considered for "hot spot" modeling, such a review was conducted using an approved screening tool to assess the potential for impacts near the North Connector/SR-169 intersection under the Proposed Action. This review is described below.

WASIST Modeling and Results

ENVIRON used the Washington State Intersection Screening Tool (WASIST) to estimate peak-hour CO concentrations near the most project-affected intersection at the North Connector/ SR-169. WASIST estimates worst-case 1-hour and 8-hour CO concentrations at signalized intersections based on the latest version of the EPA emission factor model (MOBILE 6.2) and the CAL3QHC mobile source dispersion model. This tool considers "free-flow" and "queue" emissions together with intersection geometry, wind direction, and other worst-case meteorological factors. The purpose of WASIST is to quickly and conservatively estimate the

(3) Transportation conformity is a program under the federal clean air act that requires special review for transportation projects and transportation components of development projects within nonattainment and maintenance areas when those projects would affect the regional transportation system.

highest CO concentrations that would occur at an intersection. Results of the analysis are provided in **Table 2**.

The following assumptions and parameters were used in the WASIST to calculate the worst case CO concentrations:

- The modeling assumed a "background" 1-hour CO concentration of 3 ppm to represent other nearby sources in the vicinity. This is probably a very conservative assumption.
- Emission factors were based on the King County Puget Sound CO maintenance area emissions for 2015.
- No Action, and Proposed future p.m. peak-hour traffic operating conditions provided by The Transpo Group.
- Near-road receptors were placed at sidewalk locations 10 feet from each roadway, at 10 and 80 feet from the cross street
- Surface roughness factor and stability class were based on the "Deciduous/Fir Forest" option.
- When possible, the most accurate or worst-case intersection configuration based on WSDOT guidance was used.

Table 2. WASIST CO Screening Model Results (ppm)

Intersection	Averaging Period	2015 Alternatives		
		No Action	Proposed Action	Cumulative Growth
North Connector and SR-169	1-hour	5.2	6.3	6.6
	8-hour	4.5	5.3	5.5

- The North Connector and SR-169 intersection does not currently exist. Thus, worst case CO concentrations under existing conditions were not evaluated.
- All CO concentrations include a background concentrations of 3.0 ppm
- 8-hour average CO concentrations are calculated by multiplying the 1-hour average concentrations (without background) by a persistence factor of 0.7 and then adding the background concentration.
- 1-hr CO NAAQS standard is 35 ppm; 8-hr CO standard is 9 ppm

Although traffic related to the Proposed Action increases the maximum-predicted CO concentrations compared to No Action, CO concentrations near the most project-affected intersection would not reach or exceed the 1-hour or 8-hour NAAQS under the alternatives considered. Because there are no forecast problems at this most project-affected intersection, and because the performance of all other intersections is better than at this location and all have generally good LOS, it is unlikely that the project-related traffic would significantly impact air quality in the project study area.

On-Site Operational Impacts

The development under the Proposed Action or Alternative 1 would provide retail and business space on mixed land use parcels for site visitors as well as residences located primarily on the Main Property. Potential air quality impacts to off-site locations from these on-site activities would be limited by ambient air quality standards and air quality nuisance rules (e.g., odor). These rules are intended to protect sensitive individuals from unhealthy pollutant concentrations in ambient (outdoor) air. Therefore, any potential impact from a regulated source (such as a dry cleaner) would be subject to rules limiting pollutant emissions to minimize potentially unhealthy air quality concentrations to the nearest neighboring land uses. With that said, the potential for impacts perceived as annoying (as opposed to unhealthy) could still exist from some sources and activities despite meeting applicable air quality rules. For example, even small amounts of

fugitive dust from parking lots or odors from restaurant ventilation can be perceived as an annoyance. At most proposed mixed-use locations, the nearest existing neighbors would be either sufficiently distant from on-site sources, or else are non-residential uses that are less sensitive to potential project-related emissions. Distance from such activities and prudent building and site design could minimize effects such as these.

With Alternative 1, additional retail/office use is proposed on the same parcels as under the Proposed Action. The potential for annoyance related to mixed land uses is therefore greater under Alternative 1 than for the Proposed Action. But again, with appropriate distance from off-site locations and prudent building and site design, any potential for impacts could be minimized.

With the No Action alternative, the project site parcels could be developed as outlined in the City's Comprehensive Plan. However, it is unlikely that the level of development would occur similar to either of the "build" alternatives by 2015. Nonetheless, potential off-site impacts are possible, but like the other alternatives, are unlikely with prudent building site and design.

In general, the proposed alternatives are unlikely to cause any project-related significant air quality implications unless any regulated sources violate air pollution control standards and efforts are not made to minimize construction activities likely to impact nearby users using best management practices.

Climate Change and Greenhouse Gases

The phenomenon of natural and human-caused effects on the atmosphere due to global warming and other changes is generally referred to as "climate change." Due to the importance of the "greenhouse effect" and related atmospheric warming to climate change, the gases that affect such warming are called greenhouse gases or GHGs. The GHGs of primary importance are carbon dioxide (CO_2), methane, ozone, and nitrous oxide. Because CO_2 is the most abundant of these gases (but not necessarily the most damaging to the atmosphere on a volume basis because of varying residence time after emission), GHGs are now often quantified in terms of CO_2 equivalents, or CO_2e.

Vehicles are a significant source of GHG emissions primarily through the burning of gasoline and diesel fuels. National estimates indicate the transportation sector (including on-road, construction, airplanes and boats) accounts for 30 percent or more of total domestic CO_2 emissions. Estimates for Washington State suggest transportation accounts for nearly half of GHG emissions because the state relies heavily on hydropower for electricity, unlike other states that rely more heavily on fossil fuels (coal, petroleum, and natural gas) to generate electricity. The next largest contributors to total gross GHG emissions in Washington are about 20% each in fossil fuel combustion in the residential, commercial, and industrial sectors; and in electricity consumption. Solid waste contributes about 2% (Ecology 2008).

Compared to the "criteria" air pollutants like carbon monoxide and fine particulate matter, GHGs are only recently being recognized as an issue for consideration during the environmental review of proposed projects. CO_2 is not considered an air "pollutant" based on direct health-related impacts, so it is not subject to ambient standards used to gauge pollutant concentrations in the air. Instead, approaches to managing CO_2e emissions are based on controls aimed at first slowing down and then reducing overall atmospheric concentrations over time. On the local level, GHG

management is typically aimed at transportation and land use planning and energy conservation of proposed developments.

In response to the issue of climate change on a global or regional scale, several states and many local jurisdictions are now taking steps to begin reducing GHG emissions. For example, the states of California, Massachusetts, and Washington have adopted GHG emission reduction goals similar to those included in the Kyoto Protocol, the widely-adopted international guideline intended to address this issue. In addition, numerous cities have adopted similar goals and have begun implementing programs to begin quantifying GHG emissions in order to eventually begin reducing them. Although recent legislation established GHG emission reduction targets in future years and set specific emission targets for some sources, there are as yet no specific emission reduction requirements or targets that apply to land use projects. Nor are there generally accepted emission level "impact" thresholds that provide effective means to assess potential localized impacts of GHG emissions.

The GHG emissions assessment for this project was performed using tools that are still in the process of being developed and refined. Procedures for calculating, analyzing, and interpreting the implications of greenhouse gas emission generation from site-specific land use proposals are in the earliest stages at the time of this writing. There is no uniform guidance at the State level (i.e., from the Washington Department of Ecology), nor from local jurisdictions other than King County. Consequently, the GHG tabulation reported below is a preliminary indication of expected project-related GHG emissions based on a modified version of King County's emission tabulation tool. [(4)]

Analysis Method

The tabulation of GHG emissions was based on the spreadsheet tool issued by King County, Washington in December 2007. ENVIRON modified this tool to reflect project-specific data where possible. In accordance with findings regarding the primary sources of GHG emissions, this tabulation focused on three areas/sources of emissions as described below.

- Building materials and processes (Embodied emissions). This portion of the calculation considered both the "upstream" (i.e., mining, harvest, manufacturing, and transport) and the "downstream" (i.e., subsequent, "in place" use and maintenance) of building materials. The default values were modified to reflect values based on materials expected to be used in the buildings' construction (instead of applying averages based on all materials combined). Materials assumed include the average of all types of roofing, average of wood or composite exterior siding, average of all window types, and no steel or concrete interior walls or floors for residential buildings. The estimated amount of pavement for roads is also included. (There is no data for the amount of pavement for parking lots at mixed-use parcels.) The lifespan of the buildings is projected to be 62.5 years for retail/office, and 58 or 80 years for single-family and multi-family residential respectively, based on the King County spreadsheet model.
- Post-development energy usage (Energy). This element considered energy consumption such as heating and electrical usage. For this calculation, the energy values were adjusted to reflect the usage reported for the Pacific Northwest (as apposed to national averages). Also, because the residential buildings would likely be constructed to reflect a high level

(4) http://www.metrokc.gov/ddes/forms/SEPA-GHG-EmissionsWorksheet-Bulletin26.xls

of Built Green or Energy Star ratings, a 25% reduction was applied after the calculations which equates to a LEED-Silver® rating.

- Transportation (Transport). This component considered GHG emissions related to vehicle travel of residences and employees. The King County default calculation was used because no other project-specific data were available.

GHG Emissions

The estimated CO_2 equivalent (CO_2e) emissions shown in **Table 2** represent the lifecycle emissions of the Proposed Action and Alternative 1, respectively. The lifecycle emissions are the cumulative emissions over the useful life of the buildings included in the development alternatives. Based on the King County tool, the construction and operation of single family homes (including vehicle use) would generate the most GHG emissions associated with this project.

Table 2. Project-Related Lifecycle GHG Emissions

Type of Building/Use	Proposed Action		Alternative 1	
	# of Units or Thousand sq. ft.	Total Estimate ($MTCO_2e$)	# of Units or Thousand sq. ft.	Total Estimate ($MTCO_2e$)
Single-Family Home	930	1,797,288	790	1,526,729
Multi-Family Unit in Large Building	109	148,274	110	149,634
Multi-Family Unit in Small Building	211	399,651	225	426,168
Retail (other than Mall)	90	69,083	190	145,841
Office	300	352,894	200	235,263
Pavement	440	21,989	439,776	21,989
Totals		2,789,179		2,505,624

MT = metric tons = 1.1023 short tons; a short ton = 2,000 pounds
Source: ENVIRON International Corp., adapted from King County calculation procedure; see Appendix x for spreadsheet calculations.

Comparison of Alternatives

Based on these results shown in **Table 2**, the Proposed Action would generate more GHG emissions than Alternative 1 due primarily to the greater number of single-family residential units associated with the Proposed Action.

Although GHG emissions associated with the No Action Alternative were not calculated, the expected emissions would likely be similar or even more than shown above unless this sort of development represented many fewer homes and less paving for access roads. In addition, No Action development would likely occur more slowly, so that by 2015 (the expected build out of the proposed project) emissions would be less under the No Action Alternative because not all structures would yet be built.

Summary

There are as yet no particular means to gauge whether GHG emissions constitute an "impact" in terms of their potential effects on climate. Current guidance in this area simply indicates the need to estimate CO_2e emissions with the intent to compile data for use in later discussions of this issue. And although it would be useful to put these emissions into perspective based on comparisons with similar sorts of projects, no truly comparative data yet exist.

To put the project-related CO_2e emissions estimate in perspective with a large source of GHG emissions, consider that a new, natural gas-fired power plant (about 600 MW) generates about 2 million tons of CO_2e *annually* during each year it operates, or about 100 million tons over 50 years. This compares with a maximum of about 2.8 million tons of CO_2e over the entire life of the Proposed Action assumed for this project (up to 80 years for some buildings), or less than 3% of a clean power plant (over 50 years). Older power plants and any plant burning coal emit much more CO_2e. With this perspective, the proposed project would be a less significant contributor to overall emissions of CO_2e.

CUMULATIVE AND SECONDARY IMPACTS

The traffic analysis that provided the basis for the air quality analysis also included the traffic conditions expected with cumulative growth in the project vicinity. Cumulative growth in the Black Diamond area in 2015 is expected to cause traffic conditions at signalized intersections to deteriorate below LOS "C." Similar to the Proposed Action, the WASIST screening tool was used to evaluate the potential for traffic-related air quality impacts due to cumulative growth. While more than one intersection is expected to deteriorate to LOS D or worse, the most affected intersection was again the North Connector at SR-169. Screening modeling results indicate that maximum-predicted CO concentrations would remain well below the respective 1-hour and 8-hour standards (**Table 2**). Consequently, cumulative traffic growth would be unlikely to significantly impact CO concentrations and no significant air quality impacts would be expected.

Similarly, the GHG emissions estimate considered the lifecycle emissions related to the proposed project, and no additional GHG emissions would be expected.

MITIGATION

Construction Impact Mitigation

Although significant air quality impacts are not anticipated for construction of the developed parcels, construction contractors would be required to comply with all relevant federal, state and local air quality laws. Possible management practices for reducing the potential for air quality impacts during construction include measures for reducing both exhaust emissions and fugitive dust. The Washington Associated General Contractors brochure *Guide to Handling Fugitive Dust from Construction Projects* and the PSCAA suggest a number of methods for controlling dust and reducing the potential exposure of people to emissions from diesel equipment. A brief list of some of the possible control measures that could be implemented to reduce potential air quality impacts from construction activities follows:

- Use only equipment and trucks that are maintained in optimal operational condition

- Require all off-road equipment to have emission reduction equipment (i.e., require participation in Puget Sound Region Diesel Solutions, a program designed to reduce air pollution from diesel sources [PSCAA 2007b], by project sponsors and contractors).
- Use car-pooling or other trip-reduction strategies for construction workers.
- Use biodiesel or other lower emission fuels for vehicles and equipment.
- Implement restrictions on construction truck idling (e.g., limit idling to a maximum of 5 minutes).
- Spray exposed soil with water or other suppressant to reduce emissions of PM_{10} and deposition of particulate matter.
- Pave or use gravel on staging areas and roads that would be exposed for long periods
- Cover all trucks transporting materials, wetting materials in trucks, or providing adequate freeboard (space from the top of the material to the top of the truck bed), to reduce PM_{10} emissions and deposition during transport.
- Provide wheel washers to remove particulate matter that would otherwise be carried off site by vehicles to decrease deposition of particulate matter on area roadways.
- Cover dirt, gravel, and debris piles as needed to reduce dust and wind blown debris.
- Locate construction equipment away from sensitive receptors such as fresh air intakes to buildings, air conditioners, and sensitive populations.
- Locate construction staging zones where diesel emissions will not be noticeable to the public or near sensitive populations such as the elderly and the young.
- Stage construction to minimize overall transportation system congestion and delays to reduce regional emissions of pollutants during construction.

Operation

The air quality impact analysis indicates that the proposed project alternatives would not be anticipated to result in any significant adverse air quality impacts in the study area resulting from off-site traffic or on-site operations associated with mixed land use and development. Consequently, no operational impact mitigation measures are warranted or proposed.

Mitigation Measures for Greenhouse Gas Emissions

Although there are no specific requirements to do so, some of the elements of the proposed development would serve to reduce CO_2e emissions over the life of the project, including Built Green and LEED®-certified/Energy Star homes and available transit options. Other measures that would reduce GHG emissions on the local level include any steps that would alter those aspects of the project that contribute to emissions due to construction of the development, energy use by the people who live there, or the need to drive. While the global impacts of GHG emissions cannot be solved on the local level by measures suggested in this study, reducing GHGs on the local level does contribute to the reduction goal of the WA state legislature to reduce GHG emissions in our state. Each of these measures is addressed further below.

Construction-related GHG emission reduction measures include features that focus on use of renewable resources, composites, and/or materials made from recyclables (e.g., farmed wood and wood/plastic composites – from recycled plastic and wood), and de-emphasize use of non-renewal resources (e.g., old-growth or exotic lumber, virgin metals, or more than essential quantities of concrete). Because renewable and recycled materials use less resources and require a fraction of the energy necessary to produce virgin materials, associated GHG emissions are substantially lower. The applicant's proposal to minimize use of concrete and maximize use of

wood and wood composites would reduce GHG emissions compared with more conventional development techniques.

End-use energy consumption in residences is a primary contributor to overall GHG emissions. Such energy use is a function a multiple factors, many of which can be positively affected during development of the facility. Site layout/design that maximizes exposure to the sun in the winter and takes advantage of natural ventilation can reduce winter heating needs and the need for summertime forced-air ventilation. Using construction techniques and materials that exceed building code requirements can reduce long-term energy use. Employing innovative heating technologies such as heat pumps, hot-water radiant floors, and ultra-high efficiency furnaces also would reduce energy consumption compared with standard space-heating systems. Similarly, technologies to provide or supplement water-heating (e.g., on-demand and/or solar-assisted heating instead of continuously heated, large tank reservoirs) also would reduce the overall energy footprint of the development. And any steps that reduce energy use would reduce any related GHG emissions. Implementing a high LEED®, Built Green, or other low-impact/high-efficiency building standard, help conserve resources and reduce GHG emissions compared with conventional development techniques.

SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

No significant unavoidable adverse air quality impacts have been identified related to the proposed project alternatives, and none would be anticipated.

REFERENCES

EPA. 2006. 40 CFR 50: National Ambient Air Quality Standards for Particulate Matter. EPA-HQ-OAR-2001-0017; FRL-RIN 2060-AI44. September 21.

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EPA 2008b. EPA Newsroom. "EPA Strengthens Smog Standards to Better Protect Human Health and the Environment." Released March 12, 2008.

PSCAA. 2008. General information. Web Page: http://www.pscleanair.org. Assessed March 2008.

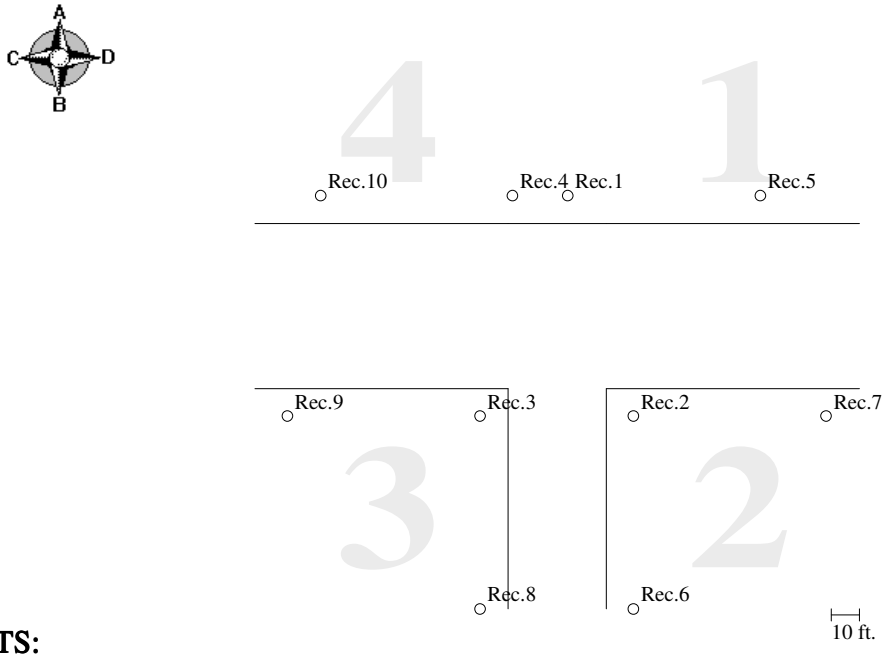
Washington Associated General Contractors (AGC). Undated. *Guide to Handling Fugitive Dust from Construction Projects*. Washington Associated General Contractors. Washington.

Washington State Department of Ecology (Ecology). 2008. *Leading the Way: A Comprehensive Approach to Reducing Greenhouse Gases in Washington State.* Washington Climate Advisory Team. February 1, 2008.

Washington State Intersection Screening Tool 1.0

09-18-08
03:31 PM
Lawson Hills MPD

Description: **North Connector and SR 169**
Performed by: **Kurt Richman - ENVIRON**
425.672.1440 - krichman@environcorp.com
Intersection Type: **T-type Intersection, 3 x 4**
Street Names: **A-B: North Connector C-D: SR 169**



RESULTS:

Receptor#	Quadrant	Distance from A-B boundary (feet)	Distance from C-D roadway (feet)	CO 1-hour avg. Conc. (ppm)	CO 8-hour avg. Conc. (ppm)	Pass/Fail*
1	1	10	10	4.2	3.8	Pass
2	2	10	10	5.2	4.5	Pass
3	3	10	10	4.8	4.3	Pass
4	4	10	10	4.2	3.8	Pass
5	1	80	10	4.2	3.8	Pass
6	2	10	80	3.7	3.5	Pass
7	2	80	10	4.7	4.2	Pass
8	3	10	80	3.7	3.5	Pass
9	3	80	10	4.7	4.2	Pass
10	4	80	10	4.2	3.8	Pass

*Project **PASSES** 1-hr and 8-hr NAAQS of 35 ppm and 9 ppm, respectively.
Largest modeled CO concentrations are at **receptor 2**.
- All CO concentrations include a background concentration of **3.0** ppm.
- 8-hr average CO concentrations are calculated by multiplying the 1-hr average concentrations (without background) by a persistence factor of 0.7 and then adding the background concentration.

Washington State Intersection Screening Tool 1.0

USER INPUTS

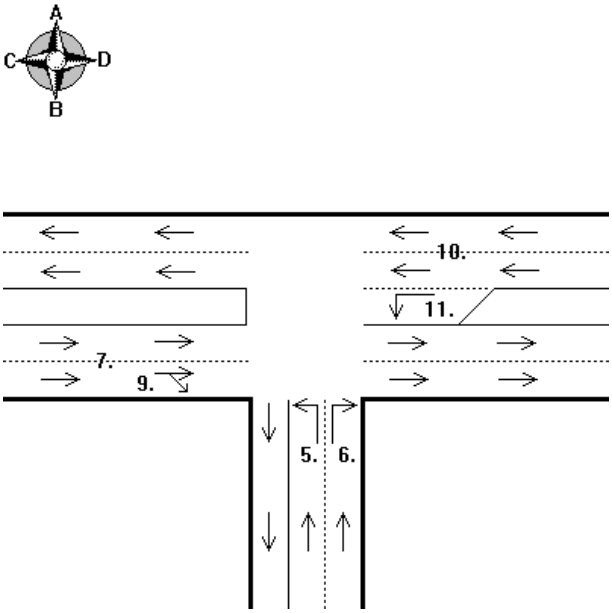
Lawson Hills MPD

Intersection Data:

Predominant Surroundings: **Deciduous Trees**

Traffic Volumes:

Vol. Index	Movement	Volume (vph)
1	A-B Thru	-----
2	A-D Left Turn	-----
3	A-C Right Turn	-----
4	B-A Thru	-----
5	B-C Left Turn	45
6	B-D Right Turn	50
7	C-D Thru	915
8	C-A Left Turn	-----
9	C-B Right Turn	60
10	D-C Thru	550
11	D-B Left Turn	40
12	D-A Right Turn	-----



CO Emission Factors Based On:

Location: **Western Washington - KING County**
CO Maint. Area: **Puget Sound**
I/M Program: **No**
Model Year: **2015**
Gasoline sulfur content of 160 ppm for 2005-2006, 60 ppm for 2007, & 30 ppm for 2008-2050.

MOBILE6.2 CO Emission Factors:

Idle Emission Factor (g/hr): **100.54**

Approach	Speed (mph)	EF (g/mile)
Leg A	---	-----
Leg B	**25**	**15.57**
Leg C	**35**	**15.23**
Leg D	**35**	**15.23**

***Note: Local roadways should be modeled using an approach speed of 15 mph or less.**
Highway ramps should be modeled using an approach speed of 5 mph.

Traffic Signal Timing:

Total Cycle Length (sec): **82**

Red Times:

Type of Movement	Red Times (sec)
Leg A Thru & Rt	---
Leg A Left Turn	---
Leg B Thru & Rt	**70**
Leg B Left Turn	**72**
Leg C Thru & Rt	**16**
Leg C Left Turn	---
Leg D Thru & Rt	**10**
Leg D Left Turn	**10**

USER COMMENTS

Lawson Hills MPD

User Comments:

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Washington State Intersection Screening Tool 1.0

09-18-08
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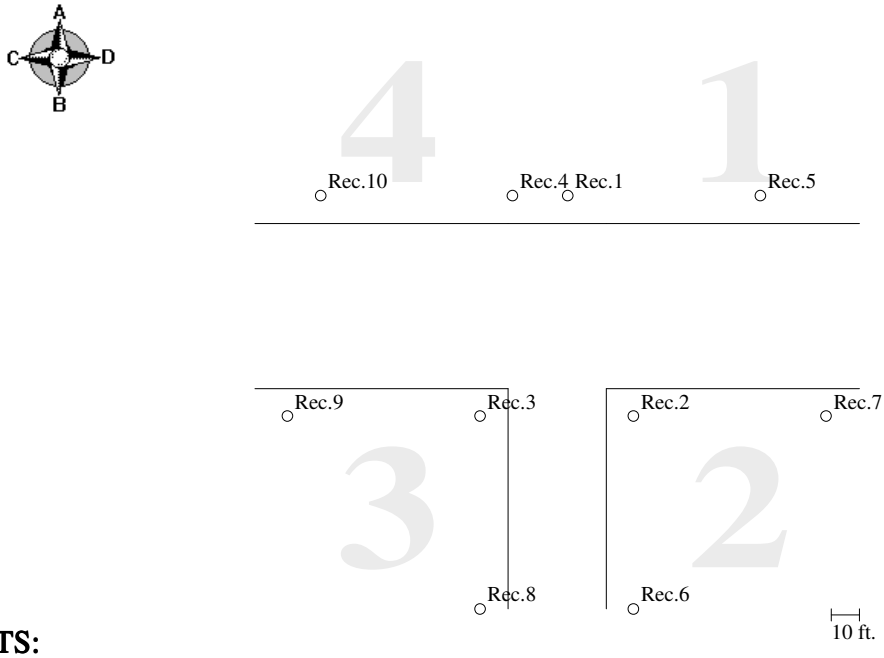
Lawson Hills MPD

Description: **North Connector and SR 169**
Performed by: **Kurt Richman - ENVIRON**
425.672.1440 - krichman@environcorp.com
Intersection Type: **T-type Intersection, 3 x 4**
Street Names: **A-B: North Connector C-D: SR 169**



RESULTS:

Receptor#	Quadrant	Distance from A-B boundary (feet)	Distance from C-D roadway (feet)	CO 1-hour avg. Conc. (ppm)	CO 8-hour avg. Conc. (ppm)	Pass/Fail*
1	1	10	10	5.6	4.8	Pass
2	2	10	10	6.3	5.3	Pass
3	3	10	10	5.7	4.9	Pass
4	4	10	10	5.4	4.7	Pass
5	1	80	10	5.2	4.5	Pass
6	2	10	80	5.6	4.8	Pass
7	2	80	10	5.6	4.8	Pass
8	3	10	80	5.1	4.5	Pass
9	3	80	10	5.7	4.9	Pass
10	4	80	10	5.1	4.5	Pass

*Project **PASSES** 1-hr and 8-hr NAAQS of 35 ppm and 9 ppm, respectively.
Largest modeled CO concentrations are at **receptor 2**.
- All CO concentrations include a background concentration of **3.0** ppm.
- 8-hr average CO concentrations are calculated by multiplying the 1-hr average concentrations (without background) by a persistence factor of 0.7 and then adding the background concentration.

Washington State Intersection Screening Tool 1.0

USER INPUTS

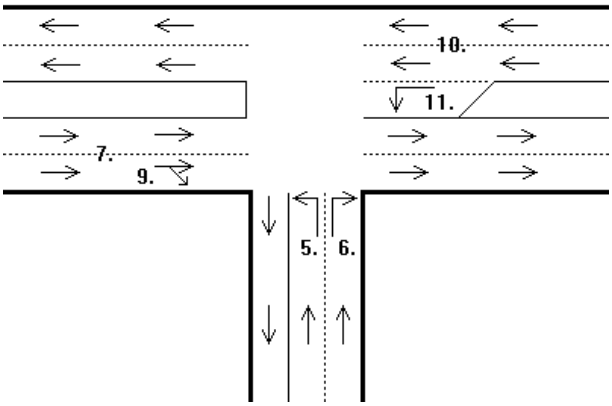
Lawson Hills MPD

Intersection Data:

Predominant Surroundings: **Deciduous Trees**

Traffic Volumes:

Vol. Index	Movement	Volume (vph)
1	A-B Thru	-----
2	A-D Left Turn	-----
3	A-C Right Turn	-----
4	B-A Thru	-----
5	B-C Left Turn	276
6	B-D Right Turn	337
7	C-D Thru	1069
8	C-A Left Turn	-----
9	C-B Right Turn	198
10	D-C Thru	669
11	D-B Left Turn	243
12	D-A Right Turn	-----



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CO Maint. Area: **Puget Sound**
I/M Program: **No**
Model Year: **2015**
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MOBILE6.2 CO Emission Factors:

Idle Emission Factor (g/hr): **100.54**

Approach	Speed (mph)	EF (g/mile)
Leg A	---	-----
Leg B	**25**	**15.57**
Leg C	**35**	**15.23**
Leg D	**35**	**15.23**

***Note: Local roadways should be modeled using an approach speed of 15 mph or less.**
Highway ramps should be modeled using an approach speed of 5 mph.

Traffic Signal Timing:

Total Cycle Length (sec): **110**

Red Times:

Type of Movement	Red Times (sec)
Leg A Thru & Rt	---
Leg A Left Turn	---
Leg B Thru & Rt	**76**
Leg B Left Turn	**88**
Leg C Thru & Rt	**38**
Leg C Left Turn	---
Leg D Thru & Rt	**22**
Leg D Left Turn	**22**

USER COMMENTS

Lawson Hills MPD

User Comments:

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Washington State Intersection Screening Tool 1.0

09-18-08
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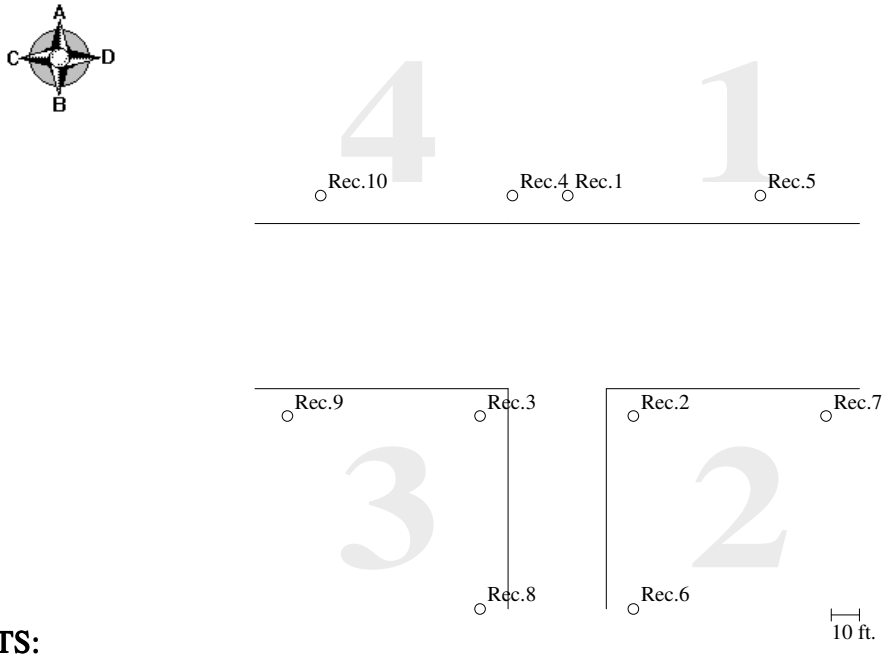
Lawson Hills MPD

Description: **North Connector and SR 169**
Performed by: **Kurt Richman - ENVIRON**
425.672.1440 - krichman@environcorp.com
Intersection Type: **T-type Intersection, 3 x 4**
Street Names: **A-B: North Connector C-D: SR 169**



RESULTS:

Receptor#	Quadrant	Distance from A-B boundary (feet)	Distance from C-D roadway (feet)	CO 1-hour avg. Conc. (ppm)	CO 8-hour avg. Conc. (ppm)	Pass/Fail*
1	1	10	10	5.9	5.0	Pass
2	2	10	10	6.6	5.5	Pass
3	3	10	10	6.0	5.1	Pass
4	4	10	10	5.7	4.9	Pass
5	1	80	10	5.3	4.6	Pass
6	2	10	80	5.6	4.8	Pass
7	2	80	10	5.8	5.0	Pass
8	3	10	80	5.2	4.5	Pass
9	3	80	10	5.9	5.0	Pass
10	4	80	10	5.2	4.5	Pass

*Project **PASSES** 1-hr and 8-hr NAAQS of 35 ppm and 9 ppm, respectively.
Largest modeled CO concentrations are at **receptor 2**.
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Washington State Intersection Screening Tool 1.0

USER INPUTS

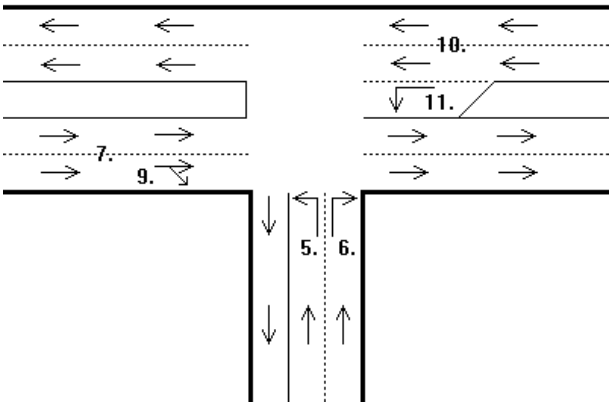
Lawson Hills MPD

Intersection Data:

Predominant Surroundings: **Deciduous Trees**

Traffic Volumes:

Vol. Index	Movement	Volume (vph)
1	A-B Thru	-----
2	A-D Left Turn	-----
3	A-C Right Turn	-----
4	B-A Thru	-----
5	B-C Left Turn	276
6	B-D Right Turn	337
7	C-D Thru	1203
8	C-A Left Turn	-----
9	C-B Right Turn	198
10	D-C Thru	796
11	D-B Left Turn	243
12	D-A Right Turn	-----



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I/M Program: **No**
Model Year: **2015**
Gasoline sulfur content of 160 ppm for 2005-2006, 60 ppm for 2007, & 30 ppm for 2008-2050.

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Idle Emission Factor (g/hr): **100.54**

Approach	Speed (mph)	EF (g/mile)
Leg A	---	-----
Leg B	**25**	**15.57**
Leg C	**35**	**15.23**
Leg D	**35**	**15.23**

***Note: Local roadways should be modeled using an approach speed of 15 mph or less.**
Highway ramps should be modeled using an approach speed of 5 mph.

Traffic Signal Timing:

Total Cycle Length (sec): **120**

Red Times:

Type of Movement	Red Times (sec)
Leg A Thru & Rt	---
Leg A Left Turn	---
Leg B Thru & Rt	86
Leg B Left Turn	98
Leg C Thru & Rt	38
Leg C Left Turn	---
Leg D Thru & Rt	22
Leg D Left Turn	22

USER COMMENTS

Lawson Hills MPD

User Comments:

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2015 Lawson Hills GHG Projections -Proposed MPD

Section I: Buildings

Set for residential units only			Emissions Per Unit (MTCO2e)			
Type (Residential)	# Units	Square Feet (in thousands of square feet)	Embodied	Energy	Transportation	**Lifespan Emissions (MTCO2e)**
Single-Family Home.....	930		58	812	792	**1,797,288**
Multi-Family Unit in Large Building	109		20	431	766	**148,274**
Multi-Family Unit in Small Building	211		32	822	766	**399,651**

Section II: Pavement.....

Pavement.....		440				**21,989**

Total Project Emissions: **2,367,202**

Adjustments Completed:

1) Using Athena Model specific GWP for residential units
2) Adjusted energy use to reflect Pacific region versus national consumption
3) Adjusted energy use to reflect LEED-Silver rating - 25% reduction
4) Pavement sq ft based on new roads for Main site/Lawson connector areas

2015 Lawson Hills GHG Projections -Proposed MPD

Section I: Buildings

Set for Retail/Office units only			Emissions Per Unit (MTCO2e)			
Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Embodied	Energy	Transportation	**Lifespan Emissions (MTCO2e)**
Retail (Other Than Mall).....		190	30	368	247	**145,841**
Office		200	30	419	588	**235,263**

Section II: Pavement.....

Pavement.....		0				**-**

Total Project Emissions: **381,104**

Adjustments Completed:

1) Using Athena Model specific GWP for residential units
2) Adjusted people per unit for project specific
3) Adjusted energy use to reflect Pacific region versus national consumption
4) no pavement emissions due to project can be calcuated at this time

2015 Lawson Hills GHG Projections -Alternative Action

Section I: Buildings

Set for residential units only			Emissions Per Unit (MTCO2e)			
Type (Residential)	# Units	Square Feet (in thousands of square feet)	Embodied	Energy	Transportation	**Lifespan Emissions (MTCO2e)**
Single-Family Home.....	790		58	812	792	**1,526,729**
Multi-Family Unit in Large Building	110		20	431	766	**149,634**
Multi-Family Unit in Small Building	225		32	822	766	**426,168**

Section II: Pavement.....

Pavement.....		440				**21,989**

Total Project Emissions: **2,124,520**

Adjustments Completed:

1) Using Athena Model specific GWP for residential units
2) Adjusted energy use to reflect Pacific region versus national consumption
3) Adjusted energy use to reflect LEED-Silver rating - 25% reduction
4) Pavement sq ft based on new roads for Main site/Lawson connector areas

2015 Lawson Hills GHG Projections -Proposed MPD

Section I: Buildings

Set for Retail/Office units only			Emissions Per Unit (MTCO2e)			
Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Embodied	Energy	Transportation	**Lifespan Emissions (MTCO2e)**
Retail (Other Than Mall).....		90	30	368	247	**69,083**
Office		300	30	419	588	**352,894**

Section II: Pavement.....

Pavement.....		0				**-**

Total Project Emissions: **421,977**

Adjustments Completed:

1) Using Athena Model specific GWP for residential units
2) Adjusted people per unit for project specific
3) Adjusted energy use to reflect Pacific region versus national consumption
4) no pavement emissions due to project can be calcuated at this time