APPENDIX H

SUPPLEMENTAL AIR QUALITY REPORT
(CH2M HILL, 2007)

TECHNICAL MEMORANDUM **CH2MHILL**

Cowlitz Casino Air Quality Supplemental Information

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At the request of the U.S. Bureau of Indian Affairs and AES, this technical memorandum provides supplemental information in response to comments made by the U. S. Environmental Protection Agency (USEPA) and the Confederated Tribes of Grand Ronde Community of Oregon (Grande Ronde) to air quality portions of the Cowlitz Casino Draft Environmental Impact Statement (DEIS).

Baseline Emissions

Table 1 presents results of the project's 2010 vehicle emission calculations for particulate matter with aerodynamic diameter of less than 10 microns (PM_{10}), particulate matter with aerodynamic diameter of less than 2.5 microns $PM_{2.5}$, nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2) and hydrocarbons (HC) and compares these values to estimated 2010 emissions from the project area, without the project, defined as Clark and Cowlitz counties in Washington State and Multnomah, Clackamas, and Washington counties in Oregon. The largest increases over the project area baseline values are for Alternative D. When comparing Alternative D emissions to the USEPA 2002 National Emissions Inventory projected to 2010 for the five counties as presented in Table 1, they represent a 0.01 to 0.6 percent increase.

TABLE 1
2010 Project Emissions and Percent Increase from Projected 2010 Inventory (tons/year)

Pollutant	Alternative					Combined Counties[1]
	A&B	C	D	E	No Action	
PM_{10}	9.9 (0.01%)	7.6 (0.01%)	10.3 (0.01%)	10.3 (0.01%)	0.02 (0.00002%)	98,953
$PM_{2.5}$	9.8 (0.03%)	7.6 (0.02%)	10.2 (0.03%)	10.2 (0.03%)	0.02 (0.00007%)	32,530
NO_x	482.1 (0.4%)	372.4 (0.3%)	500.1 (0.4%)	498.9 (0.4%)	1.17 (0.001%)	119,055
CO	4,735 (0.6%)	3,484 (0.4%)	4,940 (0.6%)	4,927 (0.6%)	0.65 (0.00008%)	806,996
HC	348.4 (0.3%)	256.6 (0.2%)	363.4 (0.3%)	362.5 (0.3%)	0.98 (0.0007%)	137,728
SO_2	1.7 (0.01%)	1.3 (0.004%)	1.8 (0.01%)	1.8 (0.01%)	0.005 (0.00002%)	29,358

[1] Projected 2010 emissions for mobile, point and area sources from the USEPA. (USEPA, 2006) Data is multiplied by a growth factor of 1.175 include Clark and Cowlitz counties in Washington and Multnomah, Washington and Clackamas counties in Oregon.

Table 2 updates Table 3.4-3 from the DEIS to show area and point source emissions by county.

TABLE 2
Projected 2010 Emissions by County and Source Category (tons/year)

County	CO	SO_2	VOC	NO_x	PM_{10}	$PM_{2.5}$
Clark						
Area	113,075	1,255	13,819	16,583	10,244	3,314
Point	23,105	3,049	746	2,039	2,361	1,893
Clark County Total	**136,180**	**4,304**	**14,565**	**18,621**	**12,604**	**5,206**
Cowlitz						
Area	49,590	1,016	6,213	10,401	4,110	1,650
Point	38,123	2,938	2,632	6,350	3,204	3,057
Cowlitz County Total	**87,713**	**3,954**	**8,845**	**16,751**	**7,314**	**4,707**
Multnomah						
Area	238,793	10,306	57,990	49,975	17,671	6,096
Point	10,943	3,907	2,465	1,444	1,502	1,211
Multnomah County Total	**249,736**	**14,213**	**60,455**	**51,419**	**19.172**	**7,307**
Washington						
Area	163,956	3,437	23,392	15,452	20,967	5,387
Point	1,579	51	588	207	306	233
Washington County Total	**165,535**	**3,488**	**23,979**	**15,659**	**21,272**	**5,620**
Clackamas						
Area	167,677	3,392	29,465	15,304	38,413	9.554
Point	155	8	417	1,300	176	135
Clackamas County Total	**167,832**	**3,400**	**29,883**	**16,604**	**38,589**	**9.689**
Point Sources Total	**73,905**	**9,952**	**6,848**	**11,339**	**7,548**	**6,529**
Area Sources Total	**733,091**	**19,406**	**130,880**	**107,716**	**91,404**	**26,000**
Grand Total	**806,996**	**29,358**	**137,728**	**119,055**	**98,953**	**32,530**

Source: EPA Emissions Inventory. (USEPA, 2006) Data is multiplied by a growth factor of 1.175.

$PM_{2.5}$ Concentrations

As shown in Table 3-3 of the Air Quality Technical Report prepared for the DEIS (CH2M HILL, 2006), several monitoring stations in the Vancouver-Portland area exceed the new $PM_{2.5}$ 24-hour standard. The proposed project has the potential to slightly increase these concentrations. However, the emissions from the project are small compared to overall $PM_{2.5}$ emissions in the general area. Any rules that would be developed to lower $PM_{2.5}$ emissions should lower concentrations below the 24-hour and annual standard.

PM_{10} Concentrations

As shown in Table 3-3 of the Air Quality Technical Report (CH2M HILL, 2006), the monitoring stations in the area have not recorded violations of the PM_{10} standard in the last 6 years. The proposed project has the potential to slightly increase the PM_{10} concentrations. However, the emissions from the project are small compared to overall PM_{10} emissions in the general area. PM_{10} concentrations are not expected to increase above the standard as a result of this project.

Sulfur Dioxide Concentrations

Sulfur dioxide (SO_2) emissions are provided from the USEPA's MOBILE 6.2 calculations as part of the grouping of PM_{10} emissions. This is because SO_2 is treated as a precursor to the formation of PM_{10}. SO_2 emissions are typically very low from mobile sources. Table 3 presents the SO_2 emissions from the MOBILE 6.2 calculations for 2010 for the build alternatives. These small increases in SO_2 emissions are not expected to lead to an increase in concentrations above the standard.

TABLE 3
2010 Vehicle Emissions (tons/year)

Pollutant	Alternative				
	A&B	C	D	E	No Action
SO_2	1.6	1.2	1.7	1.7	0.005

Nitrogen Dioxide Emissions

Table 3-3 of the Air Quality Technical Report (CH2M HILL, 2006) lists the annual arithmetic NO_2 concentrations at the one site in the Portland area that has been active during the last six years. The concentration has never exceeded the standard. The proposed project has the potential to slightly increase the concentration of nitrogen oxides. However, the emissions from the project are small compared to overall NO_2 emissions in the general area. NO_2 concentrations are not expected to increase above the standard as a result of this project.

MSAT Analysis

The following language, from the United States Department of Transportation (USDOT) - *Federal Highway Administration (FHWA) Interim Guidance on Air Toxic Analysis in (National Environmental Policy Act (NEPA) Documents*, Appendixes B and C (USDOT, 2006), is provided for additional information on the Mobile Source Air Toxic (MSAT) emissions analysis.

Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

- The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model with projected emission factors based on a typical 7.5-mile trip and average speed. MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle-operating condition at a specific location and time. MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with different trip speeds. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and MSATs are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of particulate matter (PM) under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

  These deficiencies compromise the capability of MOBILE 6.2 to estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emissions trends and performing relative analyses between alternatives for very large projects. But it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

- The tools to predict how MSATs disperse also are limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the National Ambient Air Quality Standards (NAAQS). The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time and location within a geographic area. In assessing potential health risks, this limitation makes it difficult to predict accurate exposure patterns at specific times and highway project locations across an urban area. The National Cooperative Highway Research Program (NCHRP) is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.

- Finally, even if emission levels and concentrations of MSATs could be predicted accurately, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is hard to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because

> unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over the same period of time. There also are considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show some statistically are associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of, or benchmark for, local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or state level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust** (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.

- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm and, chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems[1]. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have "significant adverse impacts on the human environment."

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, even though reliable methods do not exist to estimate accurately the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions - if any - from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled, *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives*, found at: www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

For each alternative, the amount of MSATs emitted would be proportional to the vehicle miles traveled (VMT) assuming that other variables such as fleet mix are the same for each

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[1] South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.

alternative. The VMT estimated for each of the Build Alternatives is higher than that for the No Build Alternative. This increase in VMT would lead to higher MSAT emissions for the action alternative along the highway corridor, along with a corresponding decrease in MSAT emissions along the parallel routes. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to EPA's MOBILE6 emissions model, emissions of all of the priority MSATs except for diesel particulate matter decrease as speed increases. The extent to which these speed-related emissions decreases will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of technical models.

Because the estimated VMT under Alternatives A, D and E vary by less than 5 percent, it is expected there would be no significant difference in overall MSAT emissions among these alternatives. The estimated VMT for Alternative C would be at least 40 percent less than the other alternatives. Also, regardless of the alternative chosen, emissions likely will be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by 57 to 87 percent between 2000 and 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

Mitigation Measures

Traffic data used in the air quality modeling incorporated mitigation. Additional details of the extent of mitigation measures are documented in the *Traffic Impact Study Final* (Parsons Brinckerhoff, 2006a) and the *Supplemental Traffic Impact Study* (Parsons Brinckerhoff, 2006b). The recommended traffic mitigation complies with the Memorandum of Understanding (MOU) between Clark County and the Cowlitz Indian Tribe.

Cowlitz Reservation Jurisdiction

The Federal Clean Air Act (42 U.S.C. s/s 7401 et seq. 1970) and its amendments are enforced by USEPA. The policy of the USEPA as stated in its *Policy for the Administration of Environmental Programs on Indian Reservations* (USEPA, 1984) is to give special consideration to Tribal interests in making Agency policy, and to insure the close involvement of Tribal Governments in making decisions and managing environmental programs affecting reservation lands. Tribal Governments interested in assuming regulatory and program management responsibilities for reservation lands may do so with the assistance of the USEPA. The Cowlitz Tribe, however, has not petitioned for and does not currently have an EPA-approved program. Therefore, the USEPA retains responsibility for managing the environmental programs for the Cowlitz Tribe until such time as the Cowlitz Tribal government is capable of and requests to run the program.

Emergency Generators

Approximately five 2-megawatt (MW) diesel-fueled generators will be used to provide emergency and stand-by power. Emissions from diesel combustion are calculated using emission factors from the manufacturer and the total number of hours of operation. Each generator will be exercised weekly for 30 minutes for an annual total for all five generators of 130 hours. However, pursuant to the EPA guidance outlined in the white paper *Calculating Potential to Emit (PTE) for Emergency Generators* (USEPA, 1995b) and confirmed in a telephone conversation with EPA on October 4, 2006 (USEPA, 2006), emergency generators are allowed to assume 500 hours of operation for estimating emissions for permitting purposes. Emission calculations for the diesel generators based on 500 hours of operation each are summarized in Table 4. Assuming 500 hours of operations allowed in the EPA guidance, which is significantly more than the hours expected for generator use at the site, emissions are far below the PSD emissions threshold of 250 tons per year for each pollutant and a PSD permit is not required. A detailed list of generator emissions is included in Appendix A.

TABLE 4
Projected Combustion Emissions (tons/year)

Pollutant	Emergency Generators[a]
CO	7.2
NO_X	56.3
PM	0.3
SO_2	12.2
VOC	1.6
Toxics	0.17

[a] Assumes 500 hours per year operation for each of 5 generators

Background CO Concentration

A background CO concentration of 3 parts per million (ppm) was used in the air quality analysis, which accounts for other CO emission sources in the project vicinity, such as home heating and train exhaust. This value is recommended for intersections located in suburban areas in the *Guidebook for Conformity: Air Quality Assistance for Nonattainment Areas* (KJS Associates, Inc., 1995). This background concentration was applied only to the 8-hour average as recommended by Mark Harrington of Southwest Washington Regional Transportation Council (SWRTC, 2005).

The closest available CO monitoring station to the site is approximately 15 miles away at a busy intersection along Fourth Plain Boulevard in Vancouver. This site is not representative of the project location which is in a more rural area. This station has recorded the second highest 8-hour average for this location in the state of Washington over the last five years. The CO air quality standard is defined in terms of the second-highest concentration in any location in a year. The second-highest value recorded was 5.7 ppm.

CO Air Dispersion Modeling

The air dispersion modeling analysis was updated using supplemental data provided to CH2M HILL by Parsons Brinckerhoff between October and December 2006 (Parsons Brinckerhoff, 2006b). This data was prepared for and is presented in the *Supplemental Traffic Impact Study* (Parsons Brinckerhoff, 2006c).

As in the original modeling, intersections were selected according to the *Guideline for Modeling Carbon Monoxide from Roadway Intersections* (USEPA, 1992a). Three years were considered for analysis: existing (2005), year of opening (2010), and design year (2030). Only intersections that will be signalized during those years were screened.

For those intersections currently unsignalized and proposed for signalization as part of the project, a comparison of traffic volumes and level of service (LOS) was made for 2005 and 2010, with and without the project, to verify that none would experience significant degradation. LOS levels range from A to F. An LOS of A corresponds to the shortest delays.

An LOS of F corresponds to the longest delays. Only those intersections with an LOS of D, E, or F were considered for analysis.

The three intersections with the highest traffic volumes (2, 6 and 133) and the three intersections with the worst LOS (1, 2, and 6) for each alternative and analysis year were selected for the hot spot analysis. The intersections selected are listed in Table 5 and located in Figures 1 and 2. Modeling information for all intersections examined is presented in Appendix B. All intersections were unsignalized under the previous traffic data. The current data has one intersection now signalized and, therefore, this intersection was modeled for existing conditions.

TABLE 5
Intersections Modeled

		Scenario						
ID	**Intersection Description**	**2005**	**A**	**B**	**C**	**D**	**E**	**No Action**
1	**NW 319th Street/NW La Center Road at I-5 Southbound On Ramps**							
	2010 weekday peak		✓	✓	✓	✓		
	2010 event peak		✓	✓	✓	✓		
	2030 weekday peak		✓	✓		✓		
2	**NW 319th Street/NW La Center Road at I-5 Northbound On Ramps**							
	2010 weekday peak		✓	✓	✓	✓		
	2010 event peak		✓	✓	✓	✓		
	2030 weekday peak		✓	✓		✓		
6	**Pioneer and 65th Avenue**							
	2010 weekday peak		✓	✓	✓	✓	✓	✓
	2010 event peak		✓	✓	✓	✓	✓	✓
	2030 weekday peak		✓	✓		✓	✓	✓
133	**SR-502 & NE 10th**							
	2005 weekday peak	✓						
	2005 event peak	✓						
	2010 weekday peak		✓	✓	✓	✓	✓	✓
	2010 event peak		✓	✓	✓	✓	✓	✓
	2030 weekday peak		✓	✓		✓	✓	✓

The USEPA CAL3QHC dispersion model (USEPA, 1992b) was used to calculate 1-hour and 8-hour maximum concentrations of CO near the four roadway intersections for weekdays in 2010 and 2030 and event days in 2010.

CAL3QHC modeling results for CO concentrations at intersections 1, 2, 6 and 133 (where signalized) during 2005, 2010 and 2030 weekdays are summarized in Tables 6-9. Modeling results for CO concentrations during 2010 event days (Saturdays) are summarized in Tables 10-13. Both 1-hour and 8-hour CO concentrations are reported. Because the 8-hour average CO national ambient air quality standard is lower and more limiting than the 1-hour standard, results of the air quality analyses of traffic emissions are typically reported for the 8-hour averaging period only. Regulatory guidance recommends adjusting the 1-hour concentrations to 8-hour using a factor of 0.7, which conservatively accounts for variations in meteorology over an 8-hour period.

Results of the dispersion modeling demonstrate that the ambient air quality standard for CO will not be exceeded at any intersection under any scenario. Weekday maximum CO concentrations decrease from 2010 to 2030 at all intersections for all alternatives. The highest 8-hr concentration, 8.3 ppm, occurs at intersection 3 for Alternative E in 2010 weekday traffic. The average CO concentration in weekday traffic is 5.3 ppm. The average CO concentration in Saturday/event traffic is 5.1 ppm.

Complete CAL3QHC model output files are listed by intersection in Appendix B.

TABLE 6
Maximum CO Concentrations (ppm)—Intersection 1 (Alternatives A-D only) Weekdays

Scenario	1-Hour Concentration		8-Hour Concentration	
	2010	2030	2010	2030
National and Washington Standards	35		9	
Alternative A	4.5	2.7	6.2	4.9
Alternative B	4.5	2.7	6.2	4.9
Alternative C	2.9	-	5.0	-
Alternative D	4.1	2.9	5.9	5.0

Note: The 8-hour concentrations include a 3 parts per million (ppm) background concentration. No background concentration is included in the 1-hour concentration.

TABLE 7
Maximum CO Concentrations (ppm)—Intersection 2 (Alternatives A-D only) Weekdays

Scenario	1-Hour Concentration		8-Hour Concentration	
	2010	2030	2010	2030
National and Washington Standards	35		9	
Alternative A	4.6	3.1	6.2	5.2
Alternative B	4.6	3.1	6.2	5.2
Alternative C	4.2	-	5.9	-
Alternative D	3.3	2.7	5.3	4.9

Note: The 8-hour concentrations include a 3 parts per million (ppm) background concentration. No background concentration is included in the 1-hour concentration.

TABLE 8
Maximum CO Concentrations (ppm)—Intersection 6 Weekdays

Scenario	1-Hour Concentration		8-Hour Concentration	
	2010	2030	2010	2030
National and Washington Standards	35		9	
No Action and Alternatives A-D	2.6	1.7	4.8	4.2
Alternative E	6.6	3.2	7.6	5.2

Note: The 8-hour concentrations include a 3 parts per million (ppm) background concentration. No background concentration is included in the 1-hour concentration.

TABLE 9
Maximum CO Concentrations (ppm)–Intersection 133 Weekdays

Scenario	1-Hour Concentration			8-Hour Concentration		
	2005	2010	2030	2005	2010	2030
National and Washington Standards	35			9		
All	2.8	3.9	3.0	5.0	5.7	5.1

Note: The 8-hour concentrations include a 3 parts per million (ppm) background concentration. No background concentration is included in the 1-hour concentration.

TABLE 10
Maximum CO Concentrations (ppm)—Intersection 1 (Alternatives A-D only) for 2010 Event Days

Scenario	1-Hour Concentration	8-Hour Concentration
	2010	2010
National and Washington Standards	35	9
Alternative A	4.7	6.3
Alternative B	4.7	6.3
Alternative C	5.0	6.5
Alternative D	1.2	3.8

Note: The 8-hour concentrations include a 3 parts per million (ppm) background concentration. No background concentration is included in the 1-hour concentration.

TABLE 11
Maximum CO Concentrations (ppm)—Intersection 2 (Alternatives A-D only) for 2010 Event Days

Scenario	1-Hour Concentration	8-Hour Concentration
	2010	2010
National and Washington Standards	35	9
Alternative A	4.5	6.2
Alternative B	4.5	6.2
Alternative C	4.5	6.2
Alternative D	2.1	4.5

Note: The 8-hour concentrations include a 3 parts per million (ppm) background concentration. No background concentration is included in the 1-hour concentration.

TABLE 12
Maximum CO Concentrations (ppm)—Intersection 6 (Alternatives A-E only) for 2010 Event Days

Scenario	1-Hour Concentration	8-Hour Concentration
	2010	2010
National and Washington Standards	35	9
No Action and Alternatives A-D	1.9	4.3
Alternative E	5.3	6.7

Note: The 8-hour concentrations include a 3 parts per million (ppm) background concentration. No background concentration is included in the 1-hour concentration.

TABLE 13
Maximum CO Concentrations (ppm)–Intersection 133 for 2005 and 2010 Event Days

Scenario	1-Hour Concentration		8-Hour Concentration	
	2005	2010	2005	2010
National and Washington Standards	35		9	
All	2.1	2.8	4.5	5.0

Note: The 8-hour concentrations include a 3 parts per million (ppm) background concentration. No background concentration is included in the 1-hour concentration.

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APPENDIX A

Generator Emission Worksheet

Generators

For each 2.0 MW Diesel Engine Generator Set:

Fuel use rate =	137.3	gph
Maximum fuel sulfur content =	0.5	%, by weight
Typical diesel density =	7.1	lb/gallon
Annual operation =	500	hours
Engine Rating =	2,922	horsepower
Diesel Energy Rating	7,000	Btu/hp-hr
Diesel Energy Rating	0.0070	MMBtu/hp-hr
Diesel Energy Rating	20.4540	MMBTU/hr

	Pollutant				
	HC (VOC)	**CO**	**NOx**	**PM10**	**SO2**
Cummins emission factor, gm/hp-hr	0.2	0.9	7	0.04	
Emission rates, lb/hr	1.287	5.793	45.1	0.257	9.784
Annual emissions, tons	0.32	1.45	11.26	0.06	2.45
Total emissions for five generators, tons	1.6	7.2	56.3	0.3	12.2

Notes:

1. SO_2 emission rate was calculated from assumed maximum fuel sulfur content of 0.5%. It was not supplied by Cummins.

Generator HAP Emissions

	Emission Factor (lb/MMBtu)	Emissions lb/hr	Annual Emissions (LB)	Annual Emissions (TON)	Total emissions for five generators
Benzeneb	9.33E-04	1.91E-02	9.54E+00	0.004770896	0.023854478
Tolueneb	4.09E-04	8.37E-03	4.18E+00	0.002091422	0.010457108
Xylenesb	2.85E-04	5.83E-03	2.91E+00	0.001457348	0.007286738
Propyleneb	2.58E-03	5.28E-02	2.64E+01	0.01319283	0.06596415
1,3-Butadieneb,c	3.91E-05	8.00E-04	4.00E-01	0.000199938	0.000999689
Formaldehydeb	1.18E-03	2.41E-02	1.21E+01	0.00603393	0.03016965
Acetaldehydeb	7.67E-04	1.57E-02	7.84E+00	0.003922055	0.019610273
Acroleinb	9.25E-05	1.89E-03	9.46E-01	0.000472999	0.002364994
Naphthaleneb	8.48E-05	1.73E-03	8.67E-01	0.000433625	0.002168124
Acenaphthylene	5.06E-06	1.03E-04	5.17E-02	2.58743E-05	0.000129372
Acenaphthene	1.42E-06	2.90E-05	1.45E-02	7.26117E-06	3.63059E-05
Fluorene	2.92E-05	5.97E-04	2.99E-01	0.000149314	0.000746571
Phenanthrene	2.94E-05	6.01E-04	3.01E-01	0.000150337	0.000751685
Anthracene	1.87E-06	3.82E-05	1.91E-02	9.56225E-06	4.78112E-05
Fluoranthene	7.61E-06	1.56E-04	7.78E-02	3.89137E-05	0.000194569
Pyrene	4.78E-06	9.78E-05	4.89E-02	2.44425E-05	0.000122213
Benzo(a)anthracene	1.68E-06	3.44E-05	1.72E-02	8.59068E-06	4.29534E-05
Chrysene	3.53E-07	7.22E-06	3.61E-03	1.80507E-06	9.02533E-06
Benzo(b)fluoranthene	9.91E-08	2.03E-06	1.01E-03	5.06748E-07	2.53374E-06
Benzo(k)fluoranthene	1.55E-07	3.17E-06	1.59E-03	7.92593E-07	3.96296E-06
Benzo(a)pyrene	1.88E-07	3.85E-06	1.92E-03	9.61338E-07	4.80669E-06
Indeno(1,2,3-cd)pyrene	3.75E-07	7.67E-06	3.84E-03	1.91756E-06	9.58781E-06
Dibenz(a,h)anthracene	5.83E-07	1.19E-05	5.96E-03	2.98117E-06	1.49059E-05
Benzo(g,h,l)perylene	4.89E-07	1.00E-05	5.00E-03	2.5005E-06	1.25025E-05
Total				**0.033000801**	**0.165004006**

APPENDIX B

CAL3QHC Model Information

CAL3QHC Model Information

Summary of Intersections Analyzed and Modeling Files Names

No.	Int.	Intersection	Type of Intersection	File Name	Year	Alternative	LOS new	Weekday/Saturday
1	1	NW 319th Street & I-5 SB Off Ramp	Unsignalized	NA	2005	Existing	A	Weekday
2	1	NW 319th Street & I-5 SB Off Ramp	Signalized	1a10.inp	2010	Alt A/B	D	Weekday
3	1	NW 319th Street & I-5 SB Off Ramp	Signalized	1c10.inp	2010	Alt C	A	Weekday
4	1	NW 319th Street & I-5 SB Off Ramp	Signalized	1d10.inp	2010	Alt D	E	Weekday
5	1	NW 319th Street & I-5 SB Off Ramp	Signalized	1a30.inp	2030	Alt A/B	E	Weekday
6	1	NW 319th Street & I-5 SB Off Ramp	Signalized	1d30.inp	2030	Alt D	F	Weekday
7	1	NW 319th Street & I-5 SB Off Ramp	Unsignalized	NA	2010	Alt E	C	Weekday
8	1	NW 319th Street & I-5 SB Off Ramp	Unsignalized	NA	2010	No Action	B	Weekday
9	1	NW 319th Street & I-5 SB Off Ramp	Unsignalized	NA	2030	Alt E	D	Weekday
10	1	NW 319th Street & I-5 SB Off Ramp	Unsignalized	NA	2030	No Action	D	Weekday
11	1	NW 319th Street & I-5 SB Off Ramp	Signalized	1a10s.inp	2010	Alt A/B	D	Saturday
12	1	NW 319th Street & I-5 SB Off Ramp	Signalized	1c10s.inp	2010	Alt C	D	Saturday
13	1	NW 319th Street & I-5 SB Off Ramp	Unsignalized	NA	2005	Existing	A	Saturday
14	1	NW 319th Street & I-5 SB Off Ramp	Signalized	1d10s.inp	2010	Alt D	C	Saturday
15	1	NW 319th Street & I-5 SB Off Ramp	Unsignalized	NA	2010	Alt E	C	Saturday
16	1	NW 319th Street & I-5 SB Off Ramp	Unsignalized		2010	No Action	C	Saturday
17	2	La Center Road & I-5 NB On Ramp	Unsignalized	NA	2005	Existing	C	Weekday
18	2	La Center Road & I-5 NB On Ramp	Signalized	2a10.inp	2010	Alt A/B	C	Weekday
19	2	La Center Road & I-5 NB On Ramp	Signalized	2c10.inp	2010	Alt C	E	Weekday
20	2	La Center Road & I-5 NB On Ramp	Signalized	2d10.inp	2010	Alt D	C	Weekday
21	2	La Center Road & I-5 NB On Ramp	Signalized	2a30.inp	2030	Alt A/B	D	Weekday
22	2	La Center Road & I-5 NB On Ramp	Signalized	2d30.inp	2030	Alt D	D	Weekday
23	2	La Center Road & I-5 NB On Ramp	Unsignalized	NA	2010	Alt E	H	Weekday
24	2	La Center Road & I-5 NB On Ramp	Unsignalized	NA	2010	No Action	G	Weekday

CAL3QHC Model Information

Summary of Intersections Analyzed and Modeling Files Names

No.	Int.	Intersection	Type of Intersection	File Name	Year	Alternative	LOS new	Weekday/Saturday
25	2	La Center Road & I-5 NB On Ramp	Unsignalized	NA	2030	Alt E	H	Weekday
26	2	La Center Road & I-5 NB On Ramp	Unsignalized		2030	No Action	H	Weekday
27	2	La Center Road & I-5 NB On Ramp	Unsignalized	NA	2005	Existing	A	Saturday
28	2	La Center Road & I-5 NB On Ramp	Signalized	2a10s.inp	2010	Alt A/B	D	Saturday
29	2	La Center Road & I-5 NB On Ramp	Signalized	2c10s.inp	2010	Alt C	D	Saturday
30	2	La Center Road & I-5 NB On Ramp	Signalized	2d10s.inp	2010	Alt D	B	Saturday
31	2	La Center Road & I-5 NB On Ramp	Unsignalized	NA	2010	Alt E	E	Saturday
32	2	La Center Road & I-5 NB On Ramp	Unsignalized		2010	No Action	E	Saturday
33	3	Pioneer Street SR(501) & SB off ramp	Signalized	3_05.inp	2005	Existing	A	Weekday
34	3	Pioneer Street SR(501) & SB off ramp	Signalized	3abcdf_10.in	2010	Alt A/B	A	Weekday
35	3	Pioneer Street SR(501) & SB off ramp	Signalized	same alt a	2010	Alt C	A	Weekday
36	3	Pioneer Street SR(501) & SB off ramp	Signalized	same alt a	2010	Alt D	A	Weekday
37	3	Pioneer Street SR(501) & SB off ramp	Signalized	3e10.inp	2010	Alt E	D	Weekday
38	3	Pioneer Street SR(501) & SB off ramp	Signalized	same alt a	2010	No Action	A	Weekday
39	3	Pioneer Street SR(501) & SB off ramp	Signalized	3abf_30.inp	2030	Alt A/B	C	Weekday
40	3	Pioneer Street SR(501) & SB off ramp	Signalized	same alt a	2030	Alt D	C	Weekday
41	3	Pioneer Street SR(501) & SB off ramp	Signalized	3e_30.inp	2030	Alt E	C	Weekday
42	3	Pioneer Street SR(501) & SB off ramp	Signalized	same alt a	2030	No Action	C	Weekday
43	3	Pioneer Street SR(501) & SB off ramp	Signalized	3_05s.inp	2005	Existing	A	Saturday
44	3	Pioneer Street SR(501) & SB off ramp	Signalized	3abc_10s.inp	2010	Alt A/B	A	Saturday
45	3	Pioneer Street SR(501) & SB off ramp	Signalized	same alt a	2010	Alt C	A	Saturday
46	3	Pioneer Street SR(501) & SB off ramp	Signalized	3d_10s.inp	2010	Alt D	A	Saturday
47	3	Pioneer Street SR(501) & SB off ramp	Signalized	3e10s.inp	2010	Alt E	D	Saturday
48	3	Pioneer Street SR(501) & SB off ramp	Signalized	same alt a	2010	No Action	A	Saturday

CAL3QHC Model Information

Summary of Intersections Analyzed and Modeling Files Names

No.	Int.	Intersection	Type of Intersection	File Name	Year	Alternative	LOS new	Weekday/Saturday
49	6	Pioneer Street & 65th Ave	Unsignalized		2005	Existing	A	Weekday
50	6	Pioneer Street & 65th Ave	Signalized	6abcdf_10s.inp	2010	Alt A/B	B	Weekday
51	6	Pioneer Street & 65th Ave	Signalized	same alt a	2010	Alt C	C	Weekday
52	6	Pioneer Street & 65th Ave	Signalized	same alt a	2010	Alt D	B	Weekday
53	6	Pioneer & 65th	Signalized	6e_10.inp	2010	Alt E	D	Weekday
54	6	Pioneer & 65th	Signalized	same alt a	2010	No Action	B	Weekday
55	6	Pioneer & 65th	Signalized	same alt a	2030	Alt A/B	C	Weekday
56	6	Pioneer & 65th	Signalized	same alt a	2030	Alt D	C	Weekday
57	6	Pioneer & 65th	Signalized	6E_30.INP	2030	Alt E	D	Weekday
58	6	Pioneer & 65th	Signalized	same alt a	2030	No Action	C	Weekday
59	6	Pioneer Street & 65th Ave	Unsignalized		2005	Existing	A	Saturday
60	6	Pioneer Street & 65th Ave	Signalized	6abcdf_10.inp	2010	Alt A/B	C	Saturday
61	6	Pioneer Street & 65th Ave	Signalized	same alt a	2010	Alt C	B	Saturday
62	6	Pioneer Street & 65th Ave	Signalized	same alt a	2010	Alt D	B	Saturday
63	6	Pioneer & 65th	Signalized	6e_10s.inp	2010	Alt E	E	Saturday
64	6	Pioneer & 65th	Signalized	same alt a	2010	No Action	C	Saturday
65	12	La Center Road & Timmen Road	Unsignalized		2005	Existing	B	Weekday
66	12	La Center Road & Timmen Road	Signalized	na	2010	Alt A/B	A	Weekday
67	12	La Center Road & Timmen Road	Signalized	na	2010	Alt C	A	Weekday
68	12	La Center Road & Timmen Road	Signalized	na	2010	Alt D	C	Weekday
69	12	La Center Road & Timmen Road	Signalized	na	2010	Alt E	A	Weekday
70	12	La Center Road & Timmen Road	Signalized	na	2030	Alt A/B	B	Weekday
71	12	La Center Road & Timmen Road	Signalized	na	2030	Alt D	C	Weekday
72	12	La Center Road & Timmen Road	Unsignalized		2010	No Action	G	Weekday

CAL3QHC Model Information

Summary of Intersections Analyzed and Modeling Files Names

No.	Int.	Intersection	Type of Intersection	File Name	Year	Alternative	LOS new	Weekday/Saturday
73	12	La Center Road & Timmen Road	Unsignalized		2030	Alt E	H	Weekday
74	12	La Center Road & Timmen Road	Unsignalized		2030	No Action	C	Weekday
75	12	La Center Road & Timmen Road	Unsignalized		2005	Existing	A	Saturday
76	12	La Center Road & Timmen Road	Signalized		2010	Alt A/B	A	Saturday
77	12	La Center Road & Timmen Road	Signalized		2010	Alt C	A	Saturday
78	12	La Center Road & Timmen Road	Signalized		2010	Alt D	A	Saturday
79	12	La Center Road & Timmen Road	Signalized		2010	Alt E	C	Saturday
80	12	La Center Road & Timmen Road	Unsignalized		2010	No Action	E	Saturday
81	13	4th St & Pacific Hwy	Unsignalized		2005	Existing	A	Weekday
82	13	4th St & Pacific Hwy	Unsignalized		2010	Alt E	A	Weekday
83	13	4th St & Pacific Hwy	Unsignalized		2010	No Action	D	Weekday
84	13	4th St & Pacific Hwy	Signalized	na	2010	Alt A/B	B	Weekday
85	13	4th St & Pacific Hwy	Signalized	na	2010	Alt C	B	Weekday
86	13	4th St & Pacific Hwy	Signalized	na	2010	Alt D	B	Weekday
87	13	4th St & Pacific Hwy	Signalized	na	2030	Alt A/B	B	Weekday
88	13	4th St & Pacific Hwy	Signalized	na	2030	Alt D	B	Weekday
89	13	4th St & Pacific Hwy	Unsignalized		2030	Alt E	E	Weekday
90	13	NW La Center Road & 4th Street	Unsignalized	NA	2030	No Action	E	Weekday
91	13	4th St & Pacific Hwy	Unsignalized		2005	Existing	A	Saturday
92	13	4th St & Pacific Hwy	Unsignalized		2010	Alt E	B	Saturday
93	13	4th St & Pacific Hwy	Signalized		2010	Alt A/B	B	Saturday
94	13	4th St & Pacific Hwy	Signalized		2010	Alt C	B	Saturday
95	13	4th St & Pacific Hwy	Signalized		2010	Alt D	A	Saturday
96	13	4th St & Pacific Hwy	Unsignalized		2010	No Action	C	Saturday

CAL3QHC Model Information

Summary of Intersections Analyzed and Modeling Files Names

No.	Int.	Intersection	Type of Intersection	File Name	Year	Alternative	LOS new	Weekday/Saturday
97	133	SR-502 & NE 10th	Signalized	133_05.inp	2005	Existing	B	Weekday
98	133	SR-502 & NE 10th	Signalized	133_10.inp	2010	Alt A/B	C	Weekday
99	133	SR-502 & NE 10th	Signalized	same alt a	2010	Alt C	C	Weekday
100	133	SR-502 & NE 10th	Signalized	same alt a	2010	Alt D	C	Weekday
101	133	SR-502 & NE 10th	Signalized	same alt a	2010	Alt E	C	Weekday
102	133	SR-502 & NE 10th	Signalized	same alt a	2010	No Action	C	Weekday
103	133	SR-502 & NE 10th	Signalized	133_30.inp	2030	Alt A/B	D	Weekday
104	133	SR-502 & NE 10th	Signalized	same alt a	2030	Alt D	D	Weekday
105	133	SR-502 & NE 10th	Signalized	same alt a	2030	Alt E	D	Weekday
106	133	SR-502 & NE 10th	Signalized	same alt a	2030	No Action	D	Weekday
107	133	SR-502 & NE 10th	Signalized	133_05s.inp	2005	Existing	A	Saturday
108	133	SR-502 & NE 10th	Signalized	133_10s.inp	2010	Alt A/B	C	Saturday
109	133	SR-502 & NE 10th	Signalized	same alt a	2010	Alt C	C	Saturday
110	133	SR-502 & NE 10th	Signalized	same alt a	2010	Alt D	C	Saturday
111	133	SR-502 & NE 10th	Signalized	same alt a	2010	Alt E	C	Saturday
112	133	SR-502 & NE 10th	Signalized	same alt a	2010	No Action	C	Saturday

Notes:

All data are mitigated PM (afternoon) data.

LOS data were obtained from the Revised Traffic data prepared by Parsons Brinckerhoff (Parsons Brinckerhoff, Nov 2006)