US 36 Corridor

Final Environmental Impact Statement/
Final Section 4(f) Evaluation

Air Quality Technical Report Addendum

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ADT	average daily traffic
APCD	Air Pollution Control Division
BMP	best management practice
CDOT	Colorado Department of Transportation
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
DEIS	Draft Environmental Impact Statement
DRCOG	Denver Regional Council of Governments
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
I-25	Interstate 25
IRIS	Integrated Risk Information System
LOS	level of service
MSAT	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NO_x	oxides of nitrogen
O_3	ozone
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
RAQC	Regional Air Quality Council
ROD	Record of Decision
SIP	State Implementation Plan
SO_2	sulfur dioxide
TIP	Transportation Improvement Program
U.S.	United States
US 36	United States Highway 36
USEPA	U.S. Environmental Protection Agency
VMT	vehicle miles traveled
VOC	volatile organic compound

The construction and operation of any of the proposed US 36 FEIS packages would not cause any new violations, nor worsen existing violations of the NAAQS.

Air quality impacts may result from the construction and operation of any of the proposed United States Highway 36 (US 36) Final Environmental Impact Statement (FEIS) packages. Temporary impacts are expected from construction activities, while impacts associated with the operation of a proposed package would affect air quality over the life of the project.

Temporary impacts to air quality would result from equipment emissions during site preparation and project construction activities such as clearing, grading, excavating, and demolition. These activities would involve the use of heavy-duty off-road diesel- and gasoline-powered equipment that would generate emissions of air pollutants; namely oxides of nitrogen (NO_x), carbon monoxide (CO), particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), oxides of sulfur, and volatile organic compounds (VOC). In addition, fugitive dust (PM_{10}) would be generated from earth-moving activities such as grading and excavating and from travel on temporary unpaved roads.

Permanent impacts to air quality associated with the operation of a US 36 build package would primarily result from emissions from motor vehicles. Local and regional air quality would be impacted in varying degrees, depending on the net change in regional vehicle miles traveled (VMT), and the potential traffic congestion caused or eased by each package.

The air quality impact analysis of the build packages for the US 36 Corridor Project indicates that the build packages are not expected to cause any new violations of any standard, increase frequency or severity of any existing violation, or delay timely attainment of the National Ambient Air Quality Standards (NAAQS). Both regional- and project-level air quality conformity has been demonstrated by this project.

2.1 DESCRIPTION OF GOVERNING REGULATIONS

The regulatory structure for air quality planning in Colorado includes federal, state, regional, and local agencies.

The regulatory structure for air quality planning in Colorado includes federal, state, regional, and local agencies. These agencies either have regulatory authority or are responsible for the development and implementation of programs and plans designed to reduce air pollution levels, including emissions from transportation sources.

National air quality policies are regulated through the Federal Clean Air Act. Pursuant to this Act, the U.S. Environmental Protection Agency (USEPA) has established NAAQS for the following air pollutants (termed "criteria" pollutants): CO, ozone (O_3), nitrogen dioxide, sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$, and lead. The NAAQS represent safe levels that allow for avoidance of specific adverse health and welfare effects associated with each pollutant, and ambient air quality standards are summarized in Table 2-1, National Ambient Air Quality Standards.

Table 2-1: National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards	
		Primary	Secondary
O_3	8-hour[1] 1-hour[2]	0.075 ppm[8] (147 µg/m^3) –	0.075 ppm (147 µg/m^3) –
CO	8-hour[3] 1-hour[3]	9 ppm (10,000 µg/m^3) 35 ppm (40,000 µg/m^3)	– –
NO_2	Annual arithmetic mean	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)
SO_2	Annual arithmetic mean 24-hour[3] 3-hour[3]	0.03 ppm (80 µg/m^3) 0.14 ppm (365 µg/m^3) –	– – 0.5 ppm (1,300 µg/m^3)
PM_{10}	Annual arithmetic mean[4] 24-hour[5]	– 150 µg/m^3	– 150 µg/m^3
$PM_{2.5}$	Annual arithmetic mean[6] 24-hour[7]	15 µg/m^3 35 µg/m^3	15 µg/m^3 –

Source: USEPA, 2009.

Notes:

[1] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor over each year must not exceed 0.075 ppm.

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

[3] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the U.S. Environmental Protection Agency revoked the annual respirable PM_{10} National Ambient Air Quality Standards in 2006 (effective December 17, 2006).

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

[5] To attain this standard, the 3-year average of the weighted annual mean respirable $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 µg/m^3.

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

[7] Colorado approval of the U.S. Environmental Protection Agency standard is pending.

– = not applicable
µg/m^3 = micrograms per cubic meter
CO = carbon monoxide
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
ppm = parts per million
SO_2 = sulfur dioxide

The Colorado Air Pollution Control Division (APCD) oversees Colorado air quality policies and is responsible for preparing and submitting the State Implementation Plan (SIP) to the USEPA.

The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) require projects to comply with the conformity provision of the Federal Clean Air Act and the USEPA transportation air quality conformity regulations (40 Code of Federal Regulations [CFR] 51 Subpart T and 40 CFR 93 Subpart A).

The following sections of 40 CFR 93 Subpart A are the conformity criteria that apply to the FEIS packages:

§93.110 – The conformity determination must be based on the latest planning assumptions.

§93.111 – The conformity determination must be based on the latest emissions model.

§93.112 – Conformity must be determined according to the interagency consultation procedures in §93.105 (a)(2) and (e) and the requirements of 23 CFR Part 450 and in the applicable implementation plan, and according to the public involvement procedures established in compliance with 23 CFR Part 450.

§93.114 – There must be a currently conforming transportation plan and currently conforming Transportation Improvement Program (TIP) at the time of project approval.

§93.115 – The project must come from a conforming transportation plan and TIP.

§93.116 – The project must not cause or contribute to any new localized CO or PM_{10} violations in CO and PM_{10} nonattainment and maintenance areas.

§93.117 – The project must comply with PM_{10} control measures in the implementation plan.

§93.118 – The transportation plan and TIP must be consistent with the motor vehicle emissions budget in the implementation plan submittal.

In addition, 23 CFR 450 requires that the Regional Transportation Plan (RTP) and TIP be fiscally constrained. Before the Record of Decision (ROD) can be signed and project advanced, the project must be included in a fiscally constrained, air quality conforming RTP.

2.2 DESCRIPTION OF EXISTING CONDITIONS

The concentration of a pollutant in the atmosphere depends on the amount of pollutant released, the nature of the source, and the ability of the atmosphere to transport and disperse the pollutant. The main determinants of transport and dispersion are wind, atmospheric stability or turbulence, topography, and the existence of inversion layers. The Denver metropolitan area is located in the South Platte River drainage area, with mountains located to the west and relatively high terrain to the south and north. Under certain meteorological conditions, the local topography has the tendency to trap pollutants resulting in elevated ambient concentrations. The pollutants can be trapped under strong inversions that inhibit dispersion and cause poor air quality. Certain photo-chemically active pollutants, such as NO_x and VOCs, react under the presence of sunlight and can cause elevated levels of ground level O_3. Warm temperatures accelerate the creation of ground level O_3 and can exacerbate conditions of poor air quality.

The Denver metropolitan area is in attainment/maintenance for PM_{10} and CO, and effective November 2007, is designated nonattainment for the 8-hour O_3 standard. It is currently in attainment for the remaining criteria pollutants.

The Regional Air Quality Council (RAQC), in cooperation with the state of Colorado, has proposed a SIP to be submitted to USEPA in mid-2009 to demonstrate compliance with the O_3 NAAQS (8-hour average less than 0.08 parts per million) by the end of 2010. In addition, in March 2008 the USEPA revised the 8-hour O_3 standard from 0.08 parts per million to 0.075 parts per million. A revised SIP for the new standard must be submitted to USEPA in 2013.

2.3 POLLUTANTS OF PRIMARY CONCERN

When assessing the impacts of transportation projects, the pollutants of primary concern are CO, O_3, and PM_{10}.

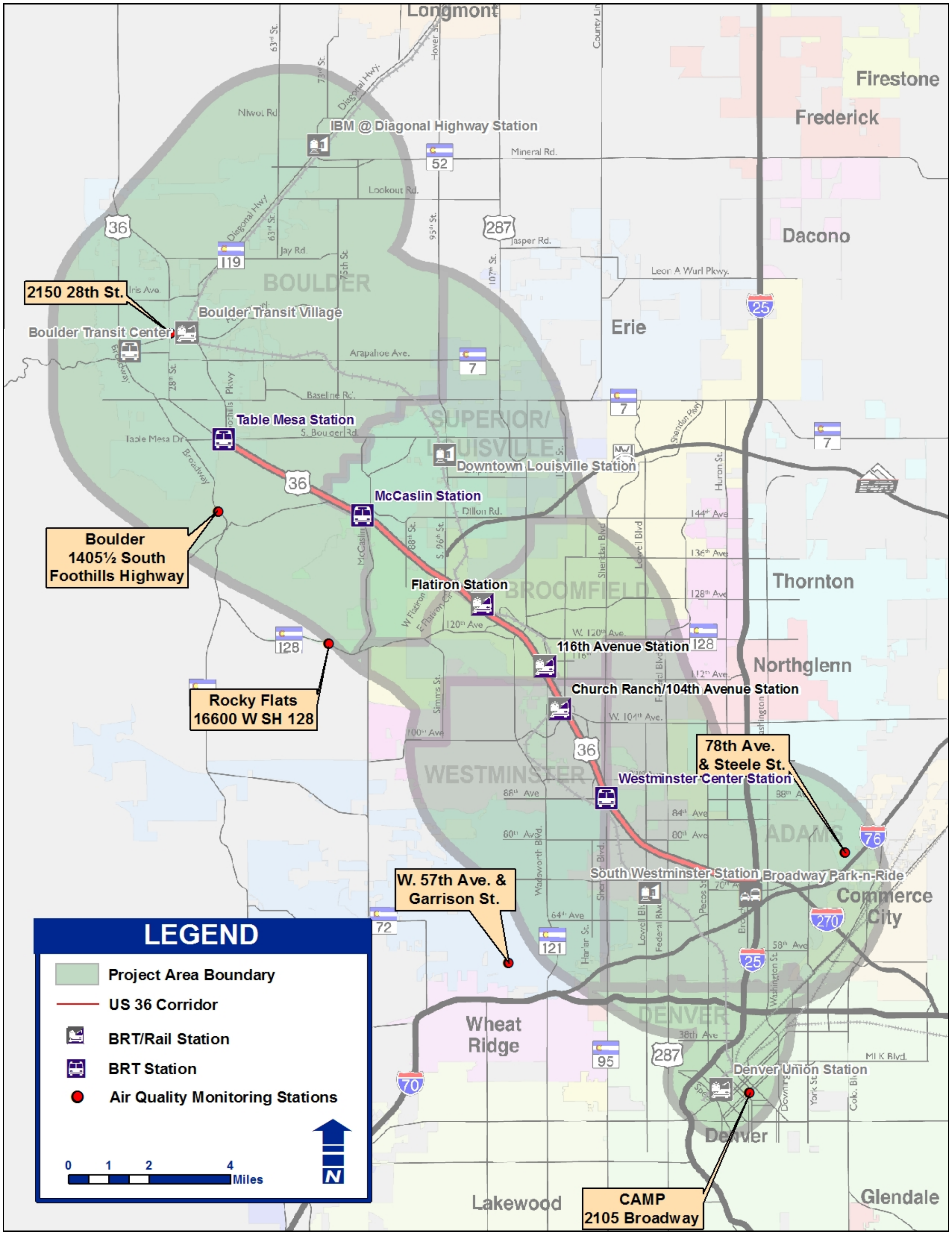
When assessing the impacts of transportation projects, the pollutants of primary concern for the Denver metropolitan area are CO, O_3, and PM_{10}. A transportation project can affect regional air quality when emissions of O_3 precursors (NO_x and VOCs) from traffic are greater if the project is implemented than if not. Because the region is designated as an attainment/maintenance area by federal standards for CO or PM_{10}, and designated nonattainment for O_3, the project is subject to federal conformity requirements. While regional conformity requirements apply for all three pollutants, no project-level analysis requirements apply for O_3 due to the fact that it is formed downwind of the source of the precursor emissions and therefore a pollutant of regional concern. Conversely, CO and PM_{10} concentrations can accumulate near areas of heavy traffic congestion where average vehicle speeds are low. Therefore, emissions of CO and PM_{10} are evaluated for localized or "hot-spot" impacts, and the project must be analyzed for project level conformity. The impacts of these two pollutants are addressed later in this section.

NO_x, SO_2, and $PM_{2.5}$ can be emitted from combustion sources, including on-road vehicles and non-road equipment. The Denver metropolitan area is currently designated as attainment for these three pollutants. In the past few years, the $PM_{2.5}$ annual concentrations and the 3-year average of the 98th percentile 24-hour concentrations did not exceed NAAQS in the project area. Therefore, $PM_{2.5}$ was not considered as a pollutant of primary concern for this project. Detailed analyses of $PM_{2.5}$ were not included in this report. Similarly, the project area is classified as attainment for NO_x and SO_2 NAAQS; therefore, no detailed analyses were performed.

2.4 AIR QUALITY MONITORING DATA

The APCD operates a network of ambient air quality monitoring stations within the Denver/Boulder area. Figure 2-1, Location of Colorado Air Pollution Control Division Monitoring Stations Within/Near the Project Area, shows the locations of the monitoring stations within the study corridor. Table 2-2, Summary of Ambient Monitoring Concentrations within the Study Area, lists the maximum CO, O_3, PM_{10}, and $PM_{2.5}$ concentrations measured from 2004 through 2008 for monitoring stations in the area, and displays the NAAQS for comparison.

Figure 2-1: Location of Colorado Air Pollution Control Division Monitoring Stations Within/Near the Project Area



Source: US 36 Mobility Partnership, 2009.

Note: The 116th Avenue Rail Station is not a part of the 2004 FasTracks Program. Additional stations were added in the early planning stages of the US 36 Environmental Impact Statement. Exact rail station locations and additional stations may be reconsidered in the U.S. Army Corps of Engineers/ Regional Transportation District Northwest Rail Environmental Assessment/Environmental Evaluation.

Table 2-2: Summary of Ambient Monitoring Concentrations within the Study Area

Monitoring Station	Pollutant	Averaging Time	2004	2005	2006	2007	2008
NAAQS	CO (ppm)	1-hour[1] 8-hour[1]	35.0 9.0	35.0 9.0	35.0 9.0	35.0 9.0	35.0 9.0
Boulder – 2150 28th Street	CO (ppm)	1-hour (2nd max.) 8-hour (2nd max.)	4.5 2.5	3.2 1.9	N/A N/A	N/A N/A	N/A N/A
Arvada – West 57th Avenue and Garrison Street	CO (ppm)	1-hour (2nd max.) 8-hour (2nd max.)	3.7 2.6	3.6 2.0	3.5 2.0	N/A N/A	N/A N/A
Welby – 78th Avenue and Steele Street, Adams County	CO (ppm)	1-hour (2nd max.) 8-hour (2nd max.)	4.0 2.8	3.3 2.2	3.8 2.5	3.0 2.1	3.1 1.7
CAMP – 2105 Broadway, Denver	CO (ppm)	1-hour (2nd max.) 8-hour (2nd max.)	8.7 4.1	4.3 2.5	4.6 3.1	5.9 2.8	7.0 2.3
NAAQS	O_3 (ppm)	1-hour[2] 8-hour[3]	– 0.075	– 0.075	– 0.075	– 0.075	– 0.075
Boulder – 1405½ South Foothills Highway	O_3 (ppm)	1-hour (max.) 8-hour (4th max.)	0.08 0.068	0.100 0.076	0.099 0.083	0.095 0.079	0.093 0.074
Arvada – West 57th Avenue and Garrison Street	O_3 (ppm)	1-hour (max.) 8-hour (4th max.)	0.086 0.065	0.099 0.078	0.099 0.082	0.095 0.079	0.093 0.074
Welby – 78th Avenue and Steele Street, Adams County	O_3 (ppm)	1-hour (max.) 8-hour (4th max.)	0.078 0.066	0.090 0.073	0.089 0.069	0.098 0.070	0.100 0.076
CAMP – 2105 Broadway, Denver	O_3 (ppm)	1-hour (max.) 8-hour (4th max.)[4]	N/A N/A	0.072 0.051	0.085 0.062	0.084 0.057	N/A N/A
Rocky Flats North – 16600 West State Highway 128	O_3 (ppm)	1-hour (max.) 8-hour (4th max.)[4]	0.086 0.073	0.099 0.077	0.104 0.090	0.108 0.090	0.088 0.079
NAAQS	PM_{10} ($\mu g/m^3$)	Annual Mean[4] 24-hour[5]	(50.0) 150.0	(50.0) 150.0	(50.0) 150.0	(50.0) 150.0	(50.0) 150.0
Boulder – 2440 Pearl Street	PM_{10}[6] ($\mu g/m^3$)	Annual Arith. Mean 24-hour (2nd max.)	19 33	20 38	17 34	22 59	21 46
Welby – 78th Avenue and Steele Street, Adams County	PM_{10}[6] ($\mu g/m^3$)	Annual Arith. Mean 24-hour (2nd max.)	30 95	32 66	28 82	30 73	27 63
CAMP – 2105 Broadway, Denver	PM_{10}[6] ($\mu g/m^3$)	Annual Arith. Mean 24-hour (2nd max.)	30 69	28 68	29 61	28 67	30 56
NAAQS	$PM_{2.5}$ ($\mu g/m^3$)	Annual Mean 24-hour[7]	15 35	15 35	15 35	15 35	15 35
CAMP – 2105 Broadway, Denver	$PM_{2.5}$[6], ($\mu g/m^3$)	Annual Arith. Mean 24-hour (98th percentile)	9.36 22.9	9.82 29.4	8.90 24.3	10.73 37.2	7.90 19.4
Boulder – 2440 Pearl Street	PM_{10}[6] ($\mu g/m^3$)	Annual Arith. Mean 24-hour (2nd max.)	6.72 18.7	6.97 18.4	6.72 15.7	7.40 25.0	6.49 17.1

Source: USEPA, 2009.

Notes:

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

[2] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than 1.

[3] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor over each year must not exceed 0.08 ppm.

[4] The U.S. Environmental Protection Agency revoked the annual respirable PM_{10} NAAQS in 2006 (effective December 17, 2006).

[5] Not to be exceeded more than once per year on average over 3 years. The standard has been revoked. The data presented here are for information purposes only.

[6] If a monitoring station has more than one monitor for a pollutant, the highest reading among the monitors was used.

[7] The $PM_{2.5}$ 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, is equal to or less than the standard.

$\mu g/m^3$ = micrograms per cubic meter
arith. = arithmetic
CO = carbon monoxide
max. = maximum
N/A = data not available
NAAQS = National Ambient Air Quality Standards
O_3 = ozone
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
ppm = parts per million

These data indicate that the air quality in the study area meets the NAAQS for CO and PM_{10}. There were some incidents when the maximum 24-hour concentrations of $PM_{2.5}$ were measured higher than the NAAQS of 35 micrograms per cubic meter. To attain the 24-hour $PM_{2.5}$ NAAQS, the 3-year average of the 98th percentile of 24-hour $PM_{2.5}$ concentrations at each monitor within the area must not exceed 35 micrograms per cubic meter. The calculated 3-year average of the 98th percentile of 24-hour $PM_{2.5}$ concentration did not exceed the 35 micrograms per cubic meter NAAQS in the project area; therefore, the area is currently in attainment for $PM_{2.5}$.

Several monitors in the Denver metropolitan area (Boulder, Welby, Arvada, and Denver) have measured violations of the new 8-hour O_3 standard. An O_3 exceedance is derived from the 3-year average of the fourth maximum 8-hour O_3 concentrations. In this case, 8-hour O_3 data have recently exceeded NAAQS.

Air quality impacts were evaluated for Package 1 (No Action) and two build packages (Package 2 and Package 4) in the Draft Environmental Impact Statement (DEIS). Through public comments received after the publication of the DEIS, it was apparent that there was overwhelming agency and community support for a hybrid alternative. In late 2007, a Preferred Alternative Committee was formed and developed the Combined Alternative Package. The Combined Alternative Package contains characteristics of both Package 2 and Package 4. The Combined Alternative Package would have fewer lanes which in turn reduces environmental impacts and cost while maximizing the transportation benefits. This effort resulted in the Combined Alternative Package being identified as the Preferred Alternative and evaluated in this FEIS.

The following sections present the methodology and results of the air quality analysis. Detailed emission modeling and emission calculation files are presented in the appendices as follows:

- **Appendices 1 through 9**: MOBILE6 modeling files and emission estimates for 2005 (existing conditions);
- **Appendices 10 through 13**: emission summaries for the Combined Alternative Package (Preferred Alternative) and Package 1 in 2035;
- **Appendices 14 through 17**: emission estimates for Package 2 and Package 4 in 2035; and
- **Appendices 18 through 24**: CO emission factors, intersection screening, and CAL3QHC modeling files for the Combined Alternative Package (Preferred Alternative) and Package 1 CO hot-spot analysis; and MOBILE6 modeling files for the Combined Alternative Package (Preferred Alternative) and Package 1 in 2035.

3.1 CORRIDOR EMISSION ESTIMATES

3.1.1 Methodology

Total emissions within the project corridor for criteria air pollutants of concern were estimated for each package.

Total emissions within the project corridor for NO_x, CO, VOC, and PM_{10} were estimated for each package. These emission estimates were based on the expected traffic levels for each package for the year 2035. An estimate of the emissions for the baseline year 2005 was added for further comparison.

3.1.1.1 Emission Modeling of the Combined Alternative Package (Preferred Alternative) and Package 1 for Year 2035

The VMT for Package 1 and the Combined Alternative Package (Preferred Alternative) in 2035 were obtained from the travel demand forecasting completed for the FEIS. Corridor vehicle emissions for Package 1 and the Combined Alternative Package (Preferred Alternative) in year 2035 were modeled by the Colorado APCD using a link-based motor vehicle emissions modeling system within MOBILE6.2. The modeling system was used to generate the on-road mobile source emissions of the Denver Regional Council of Governments (DRCOG) Network. The motor vehicle emissions model estimates link-level emissions using the output from the DRCOG Travel Demand Model. The Travel Demand Model provides VMT or volume for multi-hour periods, and the emission model uses temporal allocation factors and VMT mix fractions to estimate hourly emissions for each vehicle class for each roadway type and speed.

Corridor emissions were calculated on a link-by-link basis using MOBILE6.2 model emission factors and corresponding VMT. Vehicle speeds were obtained from the Metropolitan Planning Organization transportation networks. The ambient temperatures for the regional emissions analysis were derived from the meteorological modeling performed for the attainment demonstration for a typical O_3 episode period. The motor vehicle mix was obtained from the Colorado Department of Transportation (CDOT) automated traffic counters. Detailed emission modeling files are presented in Appendix 24.

Emissions for Package 1 and the Combined Alternative Package (Preferred Alternative) in 2035 were estimated for both summer and winter months using corridor-specific roadway settings and vehicle distributions. The worst-case emissions of each pollutant were used in the analysis. A summary of corridor-wide daily emissions from Package 1 and Combined Alternative Package (Preferred Alternative) is presented in Appendix 10 and Appendix 11, respectively. A summary of peak-hour emissions of Package 1 and the Combined Alternative Package (Preferred Alternative) is presented in Appendix 12 and Appendix 13, respectively.

In addition, the DRCOG regional Travel Demand Model used to generate year 2035 traffic information contained some changes from the model used to generate year 2005 traffic information for the DEIS, and these changes resulted in differences in traffic information for the base year of 2005. However, the emissions developed for the DEIS for year 2005 are still relevant for general comparison purposes.

3.1.1.2 Emission Adjustment of Package 2 and Package 4 from 2030 to 2035

Emissions from Package 2 and Package 4 were evaluated in the DEIS based on 2030 traffic information. Because traffic modeling was not updated for Package 2 and Package 4 for 2035, emissions of these two packages were adjusted to 2035 values for full disclosure and comparison among packages. Trend analyses were applied to VMT of these two packages to reconcile 2035 modeling.

The emission adjustments took into account the changes to VMT and vehicle speeds between 2030 and 2035 for Package 2 and Package 4 as follows. Detailed corridor-wide emission adjustments of Package 2 and Package 4 are presented in Appendix 14 and Appendix 15. Speed adjustment factors used in the emission estimate are presented in Appendix 17, and are summarized below.

1. **VMT Adjustment Factors**: VMT changes in Package 2 and Package 4 in 2035 were assumed to be the same percentage of the VMT growth rate as modeled in the DEIS relative to Package 1 in 2030. The VMT adjustment factors were calculated as:

Package 2 or Package 4 VMT Adjustment Factors = Package 1 2035 VMT/Package 1 2030 VMT

2. **Vehicle Speed Adjustment Factor**: Average vehicle speed changes in Package 2 and Package 4 in 2035 were assumed to be the same percentage of the speed changes as modeled in DEIS relative to Package 1 in 2030. Vehicle speed adjustment factors were calculated as:

Package 2 or Package 4 Vehicle Speed Adjustment Factors = Package 1 2035 Speed/Package 1 2030 Speed

3. **Vehicle Emission Factor Adjustment**: Vehicle emission factors change when vehicle speed changes. Vehicle emission factors for Package 2 and Package 4 at 2030 and 2035 speeds were modeled by the MOBILE6.2 model. The vehicle emission adjustment factors for speed change were calculated as:

Package 2 or Package 4 Emission Adjustment Factor for Speed = MOBILE6.2 Emission Factor at 2035 Speed for Package 2 or Package 4/MOBILE6.2 Emission Factor at 2030 Speed for Package 2 or Package 4

4. **Vehicle Emission Calculation**: Vehicle emissions for Package 2 and Package 4 were calculated using the following equation:

Package 2 or Package 4 Vehicle Emissions in 2035 = (Package 2 or Package 4 Vehicle Emissions in 2030) X (VMT Adjustment Factor of Package 2 or Package 4) X (Emission Adjustment Factor for Package 2 or Package 4).

3.1.1.3 Emissions of Existing Condition in 2005

The DRCOG regional Travel Demand Model used to generate year 2035 traffic information contained some changes from the model used to generate year 2005 traffic information for the DEIS, and these changes resulted in differences in traffic information for the base year of 2005. The 2035 traffic model was not updated for the FEIS, and the emissions developed for the DEIS for year 2005 are used in the FEIS for general comparison purposes. Refer to Appendices 1 through 8 for detail and documentation of the emission estimate for the existing condition in 2005:

- **Appendix 1 and Appendix 2**: VMT and bus rapid transit (BRT) service miles used in the emission estimate for 2005
- **Appendix 3**: Peak hour corridor-wide criteria pollutant emission calculations by segments for 2005
- **Appendix 4**: Daily corridor-wide criteria pollutant emission calculations by segments for 2005
- **Appendix 5**: Daily regional criteria pollutant emission calculations by segments for 2005
- **Appendix 6 and Appendix 7**: Corridor and regional Mobile Source Air Toxics (MSAT) emission calculations for 2005
- **Appendix 8**: MOBILE6.2 emission factor output files for criteria pollutants

3.1.2 Impact Analysis

Table 3-1, Peak-hour Corridor-wide Vehicle Miles Traveled and Emission Inventory Estimates, presents the estimated peak hourly VMT and emissions for each package. Table 3-2, Daily Corridor-wide Vehicle Miles Traveled and Emission Inventory Estimates, presents the estimated daily VMT and emissions for each package.

Table 3-1: Peak-hour[1] Corridor-wide Vehicle Miles Traveled and Emission Inventory Estimates

Parameter	Year 2005	Package 1 (2035)	Package 2 (2035)[2]	Package 4 (2035)[2]	Combined Alternative Package (Preferred Alternative) (2035)
VMT: Total Corridor Wide	1,073,540	1,393,441	1,443,036	1,457,695	1,489,741
Emissions: VOC (lb/hr)	3,434	1,370	1,382	1,402	1,388
Emissions: CO (lb/hr)	47,959	33,398	34,135	34,556	34,471
Emissions: NO_x (lb/hr)	4,326	708	723	733	733
Emissions: PM_{10} (lb/hr)	110	104	108	109	108

Source: US 36 Mobility Partnership, 2006 and 2009.
Notes:
[1]Peak-hour emissions represent the worst-case of morning and afternoon peak-hour emissions.
[2]VMT emissions of Package 2 and Package 4 in 2035 were estimated by applying adjustment factors to the 2030 data, taking into account the VMT growth rate and vehicle speed change between 2030 and 2035.

CO = carbon monoxide
lb/hr = pound(s) per hour
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 microns in diameter
VMT = vehicle miles traveled
VOC = volatile organic compound

Table 3-2: Daily Corridor-wide Vehicle Miles Traveled and Emission Inventory Estimates

Parameter	Year 2005	Package 1 (2035)	Package 2 (2035)[1]	Package 4 (2035)[1]	Combined Alternative Package (Preferred Alternative) (2035)
VMT: Total Automobile/ Truck/BRT for US 36	12,105,100	16,186,920	16,589,894	16,796,701	16,567,130
Emissions: VOC (lb/day)	38,734	13,215	13,408	13,575	13,473
Emissions: CO (lb/day)	541,040	379,153	388,154	392,959	388,152
Emissions: NO_x (lb/day)	48,248	8,353	8,536	8,643	8,619
Emissions: PM_{10} (lb/day)	1,219	1,240	1,271	1,287	1,272

Source: US 36 Mobility Partnership, 2006 and 2009.
[1]VMT emissions of Package 2 and Package 4 in 2035 were estimated by applying adjustment factors to the 2030 data, taking into account the VMT growth rate and vehicle speed change between 2030 and 2035.
Notes:
BRT = bus rapid transit
CO = carbon monoxide
lb/day = pound(s) per hour
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 microns in diameter
US 36 = United States Highway 36
VMT = vehicle miles traveled
VOC = volatile organic compound

Within the project corridor, the build packages would produce slightly higher pollutant emissions than Package 1 in 2035 due to the increased VMT on US 36 with the build packages. Package 4 would produce the greatest VMT and emissions increase above Package 1 2035 levels. Daily and peak-hour emissions of VOC, CO, and NO_x for the build packages in 2035 are much lower than those in the baseline year 2005, which is attributed to the addition of newer vehicles with tighter emission controls, cleaner fuels, and more stringent emission restrictions in future years.

The daily PM_{10} emissions in 2035 presented in Table 3-2, Daily Corridor-wide Vehicle Miles Traveled and Emission Inventory Estimates, are slightly higher than 2005. Note that the APCD has refined their modeling approaches over time. The VMT estimated for the build packages in 2035 is about 34 to 38 percent higher than the 2005 VMT. However, vehicle PM_{10} emission factors are expected to be reduced at a faster rate than the estimated VMT increase on US 36;

therefore, the slight increase of the PM_{10} emissions are likely due to the different modeling approaches used for 2005 and 2035 emission estimates (see Section 3.1.1, Methodology).

3.2 REGIONAL EMISSION ESTIMATES

3.2.1 Methodology

For comparison, total emissions within the entire Denver metropolitan area for VOC, NO_x, CO, and PM_{10} were estimated for each package. As with the corridor-wide emission estimates, the region-wide estimates for Package 1 and the Combined Alternative Package (Preferred Alternative) were based on the expected traffic levels for each package for the year 2035, the expected mix of vehicles, and emission factors for each vehicle type. Total daily emissions were estimated for each package for the regional analysis.

For Package 1 and the Combined Alternative Package (Preferred Alternative), vehicle emissions were modeled for year 2035 using traffic model outputs and Denver-specific vehicle fleet information and roadway settings in 2035 — using the same methodologies as the 2035 corridor emission modeling. A summary of regional emissions from Package 1 and the Combined Alternative Package (Preferred Alternative) is presented in Appendices 10 through 13. Regional emissions of Package 2 and Package 4 were estimated by applying VMT and speed adjustment factors to the 2035 Package 1 emissions. A summary of regional emission adjustments for Package 2 and Package 4 is presented in Appendix 16. Speed adjustment factors used in the emission estimate are presented in Appendix 17.

3.2.2 Impact Analysis

Table 3-3, Daily Region-wide Vehicle Miles Traveled and Emission Inventory Estimates, presents the estimated daily emissions for the region.

Table 3-3: Daily Region-wide Vehicle Miles Traveled and Emission Inventory Estimates

Parameter	Year 2005	Package 1 (2035)	Package 2 (2035)[1]	Package 4 (2035)[1]	Combined Alternative Package (Preferred Alternative) (2035)
VMT: Total Automobile/Truck	61,813,300	113,244,870	113,463,909	113,907,582	113,605,913
Emissions: VOC (lb/day)	197,409	93,680	93,620	93,986	94,956
Emissions: CO (lb/day)	2,768,912	2,694,573	2,699,081	2,710,106	2,698,663
Emissions: NO_x (lb/day)	244,493	58,776	58,890	59,120	59,388
Emissions: PM_{10} (lb/day)	6,124	8,626	8,643	8,676	8,681

Source: US 36 Mobility Partnership, 2009.

Notes:

[1]VMT emissions of Package 2 and Package 4 in 2035 were estimated by applying adjustment factors to the 2030 data, taking into account the VMT growth rate and vehicle speed change between 2030 and 2035.

CO = carbon monoxide
lb/day = pound(s) per day
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than 10 microns in diameter
VMT = vehicle miles traveled
VOC = volatile organic compound

Within the entire Denver metropolitan area, daily emissions of the criteria pollutants that would occur with implementation of the build packages are estimated to be higher than Package 1 in 2035 due to the increased regional VMT. Estimated emissions of VOC, CO, and NO_x emissions of the build packages in 2035 indicate substantial reductions of these pollutants when compared to year 2005, due to greater control efficiencies of these pollutants in the future. The regional PM_{10} emissions estimated for the project are higher in 2035 compared to 2005, which may be due to the greater VMT growth rate than the PM_{10} emission reduction rate between 2005 and 2035.

3.3 PROJECT-LEVEL CARBON MONOXIDE IMPACTS

3.3.1 Methodology

Project-level CO hot-spot analysis is required to demonstrate conformity because the project area is in a maintenance area for CO. Localized CO effects were assessed by estimating the maximum ambient CO concentrations near the affected intersections assumed to have the greatest potential effect during operation of the build packages. The predicted worst-case CO concentrations of the build packages were compared to the NAAQS and to Package 1 to determine if the project would cause any new violation or worsen the existing violation of the standards. Detailed methodology and modeling results are presented in the following sections.

CO hot-spot analyses were conducted for Package 2, Package 4, and the Combined Alternative Package (Preferred Alternative) in this FEIS based on the worst-case scenario for 2005 emission factors and worst-case 2035 traffic conditions.

The following two worst-case intersections for Package 2 and Package 4 were identified in the DEIS based on the 2030 traffic information at the affected intersections:

- Wadsworth Parkway/120th Avenue in Broomfield.
- Foothills Parkway/Arapahoe Road in Boulder.

Detailed traffic modeling was not conducted for these two packages for the year of 2035. The traffic volumes and turning movements of Package 2 and Package 4 used in this analysis were estimated according to the local traffic growth rates anticipated between 2030 and 2035.

For the Combined Alternative Package (Preferred Alternative), a screening analysis was first performed to identify the worst intersections within the study area that were predicted to be affected in 2035. For the purposes of this analysis, the “worst” intersections are identified in terms of intersection level of service (LOS), traffic delay, and traffic volume. Only signalized intersections with a deficient LOS of D, E, or F were subjected to the screening. Screening analysis of the intersections is summarized in Table 3-4, Screening Analysis of 2035 Intersection Operations, and is included in Appendix 18. Intersections were chosen to be representative of: a) the highest overall traffic volume intersection operating at a deficient LOS and traffic delay, and b) the worst LOS and highest consistent peak-hour traffic delay, high traffic volume intersection in the US 36 corridor.

Table 3-4: Screening Analysis of 2035 Intersection Operations

Intersection	Peak Hour	2035 Package 1 (No Action)			2035 Combined Alternative Package (Preferred Alternative)			Notes
		LOS	Delay/ Vehicle (seconds)	Volume	LOS	Delay/ Vehicle (seconds)	Volume	
Federal Boulevard/74th Avenue	p.m.	F	88.4	6,530	E	78.0	8,145	
Federal Boulevard/74th Avenue	a.m.	D	43.3	5,640	E	66.9	6,750	
Federal Boulevard/80th Avenue	p.m.	F	123.5	7,345	F	121.7	7,375	Worst-Case Delay (Combined Alternative Package [Preferred Alternative]), Non-Phase 1
Federal Boulevard/80th Avenue	a.m.	F	129.6	6,350	F	116.0	5,975	
Wadsworth Parkway/Midway Boulevard	p.m.	E	59.6	5,685	E	78.0	7,230	
Wadsworth Parkway/Midway Boulevard	a.m.	E	69.0	5,315	E	59.6	6,620	
Dillon Road/McCaslin Boulevard	p.m.	F	140.1	7,055	F	94.6	7,555	
Dillon Road/McCaslin Boulevard	a.m.	F	173.2	8,150	F	108.5	6,735	Worst-Case Delay (Package 1 [No Action])
Church Ranch Boulevard/ Westminster Boulevard	p.m.	F	111.0	7,215	F	96.9	7,425	
Church Ranch Boulevard/ Westminster Boulevard	a.m.	F	102.1	6,620	F	92.9	6,520	
Sheridan Boulevard/92nd Avenue	p.m.	F	108.8	9,325	E	68.0	8,615	Highest Volume (Combined Alternative Package [Preferred Alternative] and Package 1 [No Action])
Sheridan Boulevard/92nd Avenue	a.m.	E	73.2	8,330	E	66.5	8,495	
Sheridan Boulevard/88th Place	p.m.	D	53.2	5,750	D	35.3	7,220	
Sheridan Boulevard/88thPlace	a.m.	D	40.3	5,415	D	35.5	7,300	
Pecos Street/72nd Avenue	p.m.	E	53.0	4,970	E	60.1	5,355	
Pecos Street72nd Avenue	a.m.	F	91.2	5,265	E	77.8	5,540	
Pecos Street/76th Avenue	p.m.	C	29.1	4,485	D	37.2	4,480	
Pecos Street/76th Avenue	a.m.	F	82.6	4,080	E	75.5	4,425	
Church Ranch Boulevard/ Eastbound Ramps	p.m.	E	71.3	5,100	D	43.6	5,060	
Church Ranch Boulevard/ Eastbound Ramps	a.m.	B	19.9	3,920	B	17.2	4,180	

Source: US 36 Mobility Partnership, 2009.

Notes:

Data for Federal Boulevard/74th Avenue, Federal Boulevard/80th Avenue, and Wadsworth Parkway/Midway Boulevard represent the mitigated traffic conditions at these intersections.

a.m. = morning

LOS = level of service

p.m. = evening

Based on the screening analysis, the following intersections were analyzed quantitatively in a hot-spot analysis to determine localized CO impacts:

- 92nd Avenue and Sheridan Boulevard
- 80th Avenue and Federal Boulevard

The two worst-case intersections for Package 1 were identified in order to compare modeled CO concentrations across packages in 2035. Based on delay and volume, the intersection of Dillon Road and McCaslin Boulevard was the worst-case. Model results from this intersection will be discussed in the ROD (which is further discussed in Chapter 8, Phased Project Implementation). Model results for the other worst-case intersection, 80th Avenue and Federal Boulevard, are provided below.

Emission factors in grams per mile were provided by APCD in August 2009 and are presented in Appendix 19. Emission factors were estimated for each vehicle speed evaluated in the analysis using USEPA's MOBILE6.2 model. To be conservative, the highest estimated emission factors for 2005 were used to generate a worst-case CO emission scenario for each intersection to ensure that no interim years between project opening and design year (2035) would have a greater impact. The USEPA CAL3QHC dispersion model was used to calculate the ambient concentrations of CO at the selected worst-case intersections.

CAL3QHC modeling parameters were obtained from CDOT in August 2009. A persistence factor of 0.57 was used to estimate the 8-hour concentrations from the 1-hour concentrations as instructed by CDOT. Receptors were placed at the four corners of the intersections and at a spacing of 25 meters and 50 meters, respectively, along the street. According to modeling guidance, the receptors were placed 3 meters (9.8 feet) from the edge of the roadway to ensure they were not within the mixing zone of the travel lanes. Although sidewalks do not exist around all the intersections, it was assumed that the public could have access to these locations. Concentrations were calculated at a receptor height of 1.8 meters (5.9 feet). Other CAL3QHC model inputs included:

- **Surface Roughness Coefficient**: 75 centimeters
- **Signal Type**: actuated
- **Intersection Arrival Rate**: average progression
- **Saturation Flow Rate**: provided by traffic forecast model
- **Clearance Lost Time**: 2 seconds
- **Averaging Time**: 60 seconds
- **Settling Velocity**: 0
- **Deposition Value**: 0

The model was run using a meteorological condition of 1-meter-per-second wind speed (3.3 feet per second); 1,000-meters-mixing-height (3,281 feet); and a moderately stable (Class D) atmosphere. Wind directions were evaluated in 10-degree increments.

No adjustments were made in CAL3QHC to account for altitude. The MOBILE6.2 model accounts for high altitude in emission factor calculations. All high-altitude considerations are represented within the emission factors used for hot-spot modeling. Detailed CAL3QHC modeling files and the traffic data used for the modeling setup for each package are presented in Appendices 20 through 23.

The modeled CO concentrations were added to background concentrations and compared with NAAQS to determine the CO hot-spot impacts (background concentrations provided by APCD are presented in Appendix 19). This methodology sufficiently simulates the worst-case air quality impacts during the interim years from project opening to design year, as the emissions would never be higher than how they have been represented here using 2005 emission factors and 2035 traffic volumes.

3.3.2 Results

Tables 3-5 through 3-7 summarize the project level CAL3QHC modeling results for CO for worst-case scenario of highest expected emissions in 2035 for all packages. For each package, CO hot-spot modeling was performed for the two poorest operating, highest traffic volume intersections in the US 36 corridor. The concentrations presented in the following tables include background CO concentrations provided by APCD for each intersection.

Table 3-5: Package 2 and Package 4 Worst-Case 2035 Maximum Carbon Monoxide Concentrations

Scenario	Concentration (ppm)[1]			
	Wadsworth Parkway and 120th Avenue		Foothills Parkway and Arapahoe Road	
	1-hour	8-hour	1-hour	8-hour
Package 2 (2035)	14.3	7.6	13.8	7.9
Package 4 (2035)	15.5	8.2	13.6	7.8
NAAQS	35	9	35	9

Source: US 36 Mobility Partnership, 2009.

Notes:

[1] Includes background concentrations provided by the Air Pollution Control Division. See Appendix 19, 2005 CO Emission Factors and Background Concentrations for CO Hot-Spot Analysis, for additional details.

NAAQS = National Ambient Air Quality Standards

ppm = parts per million

Table 3-6: Combined Alternative Package (Preferred Alternative) Worst-Case 2035 Maximum Carbon Monoxide Concentrations

Scenario	Concentration (ppm)[1]			
	92nd Avenue and Sheridan Boulevard		80th Avenue and Federal Boulevard	
	1-hour	8-hour	1-hour	8-hour
Combined Alternative Package (Preferred Alternative) 2035	17.1	8.6	12.3	7.0
NAAQS	35	9	35	9

Source: US 36 Mobility Partnership, 2009.

Notes:

[1] Includes background concentrations provided by the Air Pollution Control Division. See Appendix 19, 2005 CO Emission Factors and Background Concentrations for CO Hot-Spot Analysis, for additional details.

NAAQS = National Ambient Air Quality Standards

ppm = parts per million

Table 3-7: Package 1 (No Action) Worst-Case 2035 Maximum Carbon Monoxide Concentrations

Scenario	Concentration (ppm)[1]	
	80th Avenue and Federal Boulevard	
	1-hour	8-hour
Package 1 (2035)	12.9	7.3
NAAQS	35	9

Source: US 36 Mobility Partnership, 2009.

Notes:

[1] Includes background concentrations provided by the Air Pollution Control Division. See Appendix 19, 2005 CO Emission Factors and Background Concentrations for CO Hot-Spot Analysis, for additional details.

NAAQS = National Ambient Air Quality Standards

ppm = parts per million

The maximum modeled 1-hour and 8-hour CO concentrations are below the NAAQS for all packages. Furthermore, the model results show that the Combined Alternative Package (Preferred Alternative) would improve CO concentrations in the vicinity of 80th Avenue and Federal Boulevard, as compared to Package 1.

The 1-hour CO concentrations at these highest volume, most deficient LOS intersections are predicted to be 17.1 and 12.3 parts per million, respectively, lower than the NAAQS of 35 parts per million. The 8-hour CO concentrations are predicted to be 8.6 and 7.0 parts per million lower than the NAAQS of 9.0 parts per million.

3.3.3 Conclusion

Build Packages: Based on the CAL3QHC modeling results for Package 2, Package 4, and the Combined Alternative Package (Preferred Alternative), CO concentrations at the worst-case intersections are predicted to be below the 1-hour and 8-hour NAAQS for all three build packages. Therefore, CO concentrations of the build packages are not expected to exceed the NAAQS in the project area.

Phase 1 of the Combined Alternative Package (Preferred Alternative): The above analysis has demonstrated that the CO concentrations will be below NAAQS when the project is fully implemented. Because the Combined Alternative Package (Preferred Alternative) will be implemented in phases, and currently only Phase 1 of the project is funded, additional analysis was conducted for the intersections. This analysis was done to demonstrate that the CO concentrations before the project build-out will also be in compliance with NAAQS.

Since detailed intersection traffic analysis was not conducted for Phase 1 of the Combined Alternative Package (Preferred Alternative), a comparison of peak-hour ramp and arterial volumes for Phase 1 and the Combined Alternative Package (Preferred Alternative) was conducted to estimate the traffic condition at intersections under Phase 1. Ramp volumes for Phase 1 were found to be less than, or the same as, the forecast volumes for the Combined Alternative Package (Preferred Alternative). The consistency in ramp volume between Phase 1 and the Combined Alternative Package (Preferred Alternative), and traffic demand on the arterial roadway networks is forecast to increase with the addition of auxiliary lanes to US 36 under the Combined Alternative Package (Preferred Alternative).

Some of the intersections may operate at slightly worse conditions compared to the Combined Alternative Package (Preferred Alternative) before all phases of the project are constructed; however, overall traffic conditions at intersections within the project area are expected to be the same or slightly improve as compared to Package 1 with implementation of Phase 1 and the other phases of the Combined Package Alternative (Preferred Alternative).

The Dillon Road and McCaslin Boulevard intersection was modeled as a representative worst-case intersection with the Package 1 2035 traffic volumes and 2005 emission factors. This additional modeling is intended to demonstrate that the worst performing intersection under Package 1 conditions would not produce CO concentrations above the NAAQS. Under Phase 1 conditions, which will be no worse than Package 1, traffic volumes would likewise not cause a violation of the CO NAAQS.

The resulting 8-hour CO concentration, including the background concentration, is 7.8 parts per million, below the NAAQS of 9.0 parts per million. Additional details on conformity for Phase 1 is included in the ROD discussion in Chapter 8, Phased Project Implementation.

3.4 PROJECT-LEVEL PM_{10} HOT-SPOT ANALYSIS

Unlike modeling CO concentrations, PM_{10} concentrations in the US 36 corridor cannot be calculated because there is no USEPA-approved methodology for calculating PM_{10} concentrations at the project level. Therefore, a qualitative hot-spot analysis was performed for the project following the *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in* $PM_{2.5}$ *and* PM_{10} *Nonattainment and Maintenance Areas* (USEPA 2006a). The project-level hot-spot analysis was conducted to assess whether the project would cause or contribute to any new localized PM_{10} violations, or increase the frequency or severity of any existing violations, or delay timely attainment of the PM_{10} NAAQS. As required by the USEPA guidance and according to CDOT's instruction, the PM_{10} hot-spot analysis covers the following elements:

- Description of project.
- Description of type of emissions considered in the analysis.
- Contributing factors, including: air quality; transportation and traffic conditions; built and natural environment; meteorology, climate, and seasonal data; and adopted emission control measures.
- Description of analysis years.
- Description of existing conditions.
- Description of changes resulting from project.
- Description of analysis method chosen.
- Professional judgment of impact.
- Discussion of any mitigation measures.
- Written commitments for mitigation (if needed).
- Conclusion on how project meets 40 CFR 93.116 and 93.123.

Because Colorado has an approved PM_{10} maintenance plan, the March 10, 2006 final conformity rule does not apply to the Denver metropolitan area. Under the 1993 version of the transportation conformity rule (40 CFR Part 93), a PM_{10} hot-spot analysis is required for all non-exempt federal projects in Colorado's PM_{10} maintenance area.

3.4.1 Description of the Project

A description of the US 36 Corridor Project is provided in Chapter 1, Purpose and Need, and Chapter 2, Alternatives Considered, of the FEIS.

3.4.2 Description of Type of Emissions Considered in the Analysis

The hot-spot analysis was based on directly emitted emissions from vehicles, including tailpipe, brake wear, and tire wear. Re-entrained road dust was also included in the analysis as required by the USEPA/FHWA guidance.

Construction-related PM_{10} emissions were not included in this hot-spot analysis because these emissions would be considered temporary since construction would last less than 5 years (40 CFR 93.123[c][5]). Secondary PM_{10} emissions would be associated with regional impacts and, therefore, are not included in the hot-spot analysis.

3.4.3 Contributing Factors

Existing and future air quality information was considered in assessing the probability of the project causing or contributing to an air quality violation. Existing conditions of air quality in the project area are presented in Section 4.12, Air Quality, of the FEIS. There has been no exceedance of the PM_{10} NAAQS measured in the project area for the past 10 years based on the data from three monitoring stations along the US 36 corridor.

Future year air quality was modeled by the Colorado Department of Public Health and Environment (CDPHE)/APCD in support of the SIP (CDPHE and APCD 2005). The model provides predicted PM_{10} concentrations for a modeling grid that covers the Denver metropolitan area. The modeling results show a trend of PM_{10} concentration increase during the period of 2005 through 2030, mainly due to increased vehicle traffic in future years. However, the PM_{10} concentrations predicted by regional modeling are all below the NAAQS of 150 micrograms per cubic meter in the Denver metropolitan area, including the grids that covers the US 36 Corridor Project.

PM_{10} concentration in the future years will be largely reduced by more stringent vehicle emission standards and better control technologies. The final rule re-designating the Denver metropolitan area from nonattainment to maintenance status for PM_{10} became effective on October 16, 2002. This re-designation also included approval of a maintenance plan for PM_{10} for the Denver metropolitan area. The maintenance plan was updated in 2005 and included a number of strategies to reduce future PM_{10} emissions to demonstrate maintenance for 2002 and beyond. The emission reductions will come mostly from lower tailpipe emissions, better street sanding procedures, utilization of chemical de-icers, and ongoing vehicle inspection/maintenance requirements of the Automobile Inspection and Readjustment Program. Re-entrained road dust tends to be a larger source of PM_{10} than tailpipe emissions for mobile sources. Street sanding is controlled by Colorado Air Quality Commission Regulation No. 16 and is expected to be the biggest contributor to PM_{10} control for the Denver metropolitan area. The maintenance plan also includes control of PM_{10} emissions from road construction activities. All these control programs would be in place regardless of the implementation of the project, and will improve the air quality in Denver metropolitan area.

Natural environment, local meteorology, and seasonal climate change will also affect the PM_{10} air quality impacts of a project. The Denver metropolitan area is located in the South Platte River drainage area, with mountains located to the west and relatively high terrain to the south and north. High winds are common within the US 36 corridor, often leading to conditions favorable to entrainment of fugitive dust. However, due to the implementation of the PM_{10} control measures, PM_{10} concentrations in the Denver metropolitan area has been in compliance with NAAQS for the past 10 years.

3.4.4 Description of the Analysis Year

The conformity rule and the USEPA/FHWA guidance require the PM_{10} hot-spot analysis in metropolitan nonattainment and maintenance areas to consider the full timeframe of the area's transportation plan. The analysis-year to be examined needs to be the year that the peak emissions from the project are expected. The current adopted transportation plan in the Denver metropolitan area is the DRCOG *2035 Metro Vision Regional Transportation Plan (2035 MVRTP)* (DRCOG 2007). Therefore, the hot-spot analysis was extended through the year 2035.

To identify the year of peak emissions, both mobile source trends and trends in background ambient concentrations were considered. As a starting point, the mobile source emission inventories from the Colorado PM_{10} maintenance plan were evaluated. These emission inventories are presented in Table 3.1-1, Table 3.4-1, and Table 3.4-3 of the *Technical Support Document for the Colorado SIP for PM_{10}* (CDPHE and APCD 2005). The Colorado PM_{10} maintenance plan presents the emission inventory through 2030 and it shows a trend of increased mobile source emissions, with the highest emissions in 2030. While the tailpipe fraction of the emissions decline due to more stringent emission standards, road dust emissions increase due to increased traffic volumes.

The regional air dispersion modeling results presented in the *Technical Support Document for the Colorado SIP for PM_{10}* (CDPHE and APCD 2005) were used to identify the year with the highest background PM_{10} concentrations. The modeling results show a clear trend of increased concentrations from 2015 through 2030 at the modeling grid inside the project area near the interchange of US 36 and Interstate 25 (I-25).

The maintenance plan does not cover years beyond 2030; however, based on the emissions and modeled PM_{10} concentration trend presented in the PM_{10} maintenance plan, it was assumed that the emission and concentration increase trend will continue through 2035. Because 2035 is expected to be the year with peak emissions and the highest background concentrations, it was selected as the analysis year for the PM_{10} hot-spot analysis.

3.4.5 Description of the Existing Conditions

The VMT for the existing condition (2005) within the US 36 corridor is approximately 12.1 million miles. The location with most traffic volume is near the interchange at US 36 and I-25, with an average daily traffic (ADT) volume of 135,000 vehicles per day.

Five years of ambient PM_{10} data (2004 to 2008) measured near the project area are presented in Table 2-2, Summary of Ambient Monitoring Concentrations within the Study Area, and show that there have been no violations of the 24-hour federal PM_{10} standard during that time for the Denver metropolitan area. A violation would be recorded at a particular monitor if more than one measured 24-hour value equals or exceeds NAAQS during a calendar year. Therefore, the highest measured value is disregarded and the next highest value (the "high second-high") is compared to NAAQS. The second-high 24-hour PM_{10} concentrations measured at the three monitoring stations closest to the project area (Boulder, Welby, and CAMP stations) were at most, 39 percent, 63 percent, and 43 percent, respectively, of the federal 24-hour standard of 150 micrograms per cubic meter. The three monitoring stations have shown fairly stable PM_{10} concentrations over the last few years. The PM_{10} concentrations measured in 2008 at all these stations are lower than those measured in 2007.

For comparison purposes, monitoring data at a location that has similar characteristics with the US 36 project setting and traffic volume were also reviewed. The location of the monitoring station is 1050 South Broadway. This monitoring station is near I-25 in the central South Platte River Valley and has similar characteristics to the US 36 project area. In this area, I-25 carries more than 180,000 vehicles per day. The values listed in Table 3-8, Second Highest 24-hour PM_{10} Concentration, are the second highest 24-hour values measured during the year, which is the method required to assess compliance with the NAAQS. As indicated in the table, the measured PM_{10} concentrations at this location were well below the PM_{10} NAAQS of 150 micrograms per cubic meter.

Table 3-8: Second Highest 24-hour PM_{10} Concentration

Year	Second Highest 24-hour PM_{10} Concentration ($\mu g/m^3$)
2005	54
2004	76
2003	77
2002	67
2001	60
2000	54

Source: US 36 Mobility Partnership, 2009.

Notes:

Monitoring data after 2005 are not available at this station.

PM_{10} = particulate matter less than 10 microns in diameter

$\mu g/m^3$ = micrograms per cubic meter

Existing conditions regarding regional air quality, traffic conditions, built and natural environment of the project, meteorology and seasonal climate change of the project area, and the adopted emission control measures are discussed in Section 3.4.3, Contributing Factors.

3.4.6 Description of Changes Resulting from the Project

Change of VMT: As indicated in Table 3-1, Peak-hour Corridor-wide Vehicle Miles Traveled and Emission Inventory Estimates, daily corridor-wide VMT for the build packages would be similar, within 2 to 4 percent of Package 1 VMT, and would increase approximately 34 to 39 percent compared to 2005. The worst-case ADT volumes for the build packages on the US 36 corridor would be between 167,000 to 196,000 in 2035. Because current PM_{10} concentrations monitored in the project area are sufficiently below the NAAQS, the VMT and ADT increase associated with the build packages is unlikely to cause an exceedance of the PM_{10} NAAQS.

Change of LOS: Hot spots of PM_{10} would most likely occur where large volumes of traffic operate under heavily congested conditions. Even though the VMT will increase in future years, the traffic operating conditions on US 36 are expected to improve due to the expanded capacity and efficiency. The projected LOS at affected intersections for the build packages improves or remains the same on US 36 compared to Package 1.

Change of Vehicle Emissions: Overall vehicle emissions, including pipeline, brake wear, and tire wear are shown in Table 3-2, Daily Corridor-wide Vehicle Miles Traveled and Emission Inventory Estimates. The daily vehicle emissions of PM_{10} for the build packages are slightly higher (about 2 to 4 percent) than Package 1 in 2035. There is a slight increase (4 to 6 percent) of vehicle PM_{10} exhaust in 2035 from build packages compared to 2005 in the project area.

Change of Re-entrained Dust Emissions: Vehicle re-entrained dust accounted for 40 to 60 percent of the vehicle related PM_{10} emissions in the Denver metropolitan area. According to the emission calculation methodology described in Chapter 13.2.1 of *AP-42, Fifth Edition, Compilation of Air Pollutant Emission Factors* (USEPA 2006b), road re-entrained dust emissions are a function of the road silt content, average weight of vehicles traveled on the road, and VMT. Because the project would not significantly change the vehicle mix of the corridors, the re-entrained road dust emissions would be proportional to the VMT on paved roads. Based on the total VMT data presented in Table 3-2, Daily Corridor-wide Vehicle Miles Traveled and Emission Inventory Estimates, daily VMT of build packages are approximately 37 to 39 percent higher compared to 2005. However, fugitive dust emissions are not expected to increase at the same percentage as VMT due to the additional reduction in sand applications and increased road sweeping activities in future years (DRCOG 2009). VMT for build packages would be about 2 to 4 percent higher than Package 1 in 2035. Therefore, fugitive dust emissions of build packages are expected to be only slightly higher than Package 1, and are not expected to cause an exceedance of the NAAQS.

3.4.7 Description of the Analysis Method Chosen

In lieu of a quantitative methodology, the analysis uses a combination of the two methods outlined in Section 4.1 of the March 2006 USEPA/FHWA guidance, by using the "air quality studies for the proposed project location" as well as the "comparison to another location with similar characteristics."

The analysis relied on the air dispersion modeling already conducted for the Denver metropolitan PM_{10} maintenance plan to evaluate the potential for the build packages to cause or contribute to violations of the PM_{10} NAAQS. This approach has been used for other projects in the Denver metropolitan area, and involves three technical steps: 1) identify worst-case locations based on traffic volume for the proposed project, 2) review the PM_{10} maintenance plan dispersion modeling to identify similar comparison locations that have similar or even higher traffic volumes, and 3) ensure that the modeled concentrations at these comparison locations in the maintenance plan are below NAAQS. In this case, the regional air dispersion modeling already included the US 36 Corridor Project; therefore, the maintenance plan itself already incorporated the traffic impacts of the project, and no comparison is necessary.

The US 36 Corridor Project was also compared to another location with similar characteristics to demonstrate that the PM_{10} concentration with the build packages would not cause violations of the NAAQS. Details of the evaluation are presented below.

1. Air Quality Studies for the Proposed Project Location

The regional modeling for the PM_{10} maintenance plan for the Denver metropolitan area was conducted by the Colorado APCD with the RAM and ISCST3 models and includes all major point sources, as well as mobile sources and background concentrations (CDPHE and APCD 2005). The maintenance plan shows that none of the modeling grids in the Denver metropolitan area would violate the PM_{10} NAAQS in 2005 through 2030. For the sections of US 36 within the PM_{10} modeling domain, the grid cells containing US 36 with the maximum sixth-highest modeled 24-hour PM_{10} concentrations were selected to represent the worst-case PM_{10} concentrations in the corridor.[1] The top two maximum sixth-highest modeled 24-hour PM_{10} concentration in the US 36 corridor are 149.9 and 139.7 micrograms per cubic meter for the grid cells near the I-25/US 36 interchange in 2030. Both concentrations are lower than the 24-hour PM_{10} NAAQS of 150 micrograms per cubic meter. Currently, no modeling data are available to predict the PM_{10} concentrations in the vicinity of the project beyond 2030.

The US 36 Corridor Project was included in the PM_{10} maintenance plan modeling. Although the build packages of the project went through some changes in the past few years, VMT and LOS are not appreciably different between the packages such that the model would show differences in PM_{10} concentration. Therefore, it is expected that the PM_{10} concentrations predicted by the regional modeling represent the PM_{10} air quality impacts of all the build packages. As a result, the project is not expected to cause exceedance of the NAAQS within the project area.

2. Comparison to another Location with Similar Characteristics

To further demonstrate that the US 36 Corridor Project would not cause violations of the NAAQS, monitoring data from 1050 South Broadway were used as an indication of potential PM_{10} concentration levels due to implementation of the build packages of the US 36 Corridor Project. The station at the 1050 South Broadway location was selected because it is near I-25 in the central South Platte River Valley with similar characteristics to the US 36 project area.

The location with the highest traffic volume of the US 36 project is near the interchange of US 36 and I-25. The ADT is 169,000 for Package 2, 188,000 for Package 4, and 196,000 for the Combined Alternative Package (Preferred Alternative) in 2035 at this location. Because I-25

[1] The PM_{10} regional modeling process used by the Colorado Air Pollution Control District to demonstrate attainment of the 24-hour particulate matter less than 10 microns in diameter (PM_{10}) standard for the PM_{10} maintenance plan is based on 5 years of meteorological data. Therefore, the maximum sixth highest value at each modeled receptor is used to determine if the standard has been met.

near the South Broadway station carries an ADT of 180,000, similar to the ADT of the build packages in 2035, the PM_{10} concentrations measured at the South Broadway station were used as reference points for estimating the PM_{10} concentration of the build packages. Monitoring data from the South Broadway station are presented in Table 3-8, Second Highest 24-hour PM_{10} Concentration, from 1050 South Broadway. There has been no exceedance of NAAQS at the South Broadway station in the past 10 years.

Package 2 and Package 4 have similar ADT in 2035 compared to the I-25 near 1050 South Broadway station. Therefore, it is expected that PM_{10} concentrations for Package 2 and Package 4 in 2035 would be similar to what was monitored at the 1050 South Broadway station, and would be below NAAQS.

ADT of the Combined Alternative Package (Preferred Alternative) would be 155,000, which is less than the ADT on I-25 near the South Broadway station; thus, it is not expected to cause PM_{10} to exceed the NAAQS. The worst-case ADT of the Combined Alternative Package (Preferred Alternative) would be at the southern end of the project corridor near the interchange of US 36 and I-25. The Combined Alternative Package (Preferred Alternative) would have slightly higher (less than 10 percent) ADT at the worst-case location in 2035 than the ADT on I-25 at the South Broadway station. However, the 24-hour PM_{10} concentrations measured at the South Broadway station are only 36 to 51 percent of the NAAQS.

The highest "second-highest" PM_{10} concentration measured at the 1050 South Broadway monitoring station was 77 micrograms per cubic meter in 2003. Because the measured PM_{10} concentrations are so much lower than the NAAQS, the PM_{10} concentration increase is due to the 10 percent traffic volume increase, which is only one of the many sources of PM_{10} emissions, and are unlikely to cause or contribute an exceedance of the NAAQS.

3.4.8 Professional Judgment of Impact

Based on the PM_{10} maintenance plan modeling results and the comparison to another location with similar characteristics to the project, the project is not expected to cause an exceedance of the PM_{10} NAAQS during project operation.

The PM_{10} maintenance plan modeling includes the traffic impacts due to US 36, other new development in the Denver metropolitan area, and changes in regional background concentrations expected over time. The maintenance plan shows that none of the modeling grids in the Denver metropolitan area would violate the PM_{10} NAAQS during the maintenance period, including the grids covering the project area.

Phase 1 of the Combined Alternative Package (Preferred Alternative) is included in the current *2008-2013 TIP* (DRCOG 2009) and the fiscally constrained *2035 MVRTP* (DRCOG 2007). Other phases of the project will be included in the RTP when funds are available. As discussed previously, the worst-case traffic locations have been evaluated independently from the project phasing to define the worst possible operating conditions that could prevail at any location within the US 36 corridor to the year 2035. The LOS and delay at the worst-case locations of Phase 1 are expected to improve compared to the worst-case intersections analyzed for Package 1 and the project is not expected to cause new violations of PM_{10} NAAQS in any of the interim years before the Combined Alterative Package (Preferred Alternative) is completed.

3.4.9 Evaluation of Both Forms of the Particulate Matter Standard (24-hour and annual)

24-hour PM_{10} Concentration: The maintenance plan shows that PM_{10} concentrations in the project vicinity are predicted to be below the 24-hour PM_{10} standard. Monitoring data at a location with similar characteristics with the project have demonstrated that the 24-hour PM_{10} concentrations are below NAAQS.

Annual PM_{10} Concentration: Denver has not historically had problems with the annual PM_{10} standard. In December 2006, USEPA revoked the annual PM_{10} standard. Annual PM_{10} concentration is no longer a concern.

3.4.10 Discussion of Mitigation Measures

Because the hot-spot analysis does not predict an adverse impact from project operation, no mitigation measures are required. Best management practices (BMPs) will be implemented to reduce air quality effects. Details of the regional PM_{10} control measures are presented in Section 4, Mitigation.

3.4.11 Conclusion on How the US 36 Corridor Project Meets 40 CFR 93.116 and 93.123

As discussed above, the US 36 Corridor Project is not anticipated to cause any new or worsen the existing violations of NAAQS. The Denver metropolitan area is currently in attainment of the PM_{10} NAAQS; thus, the project, by definition, will not delay attainment of the NAAQS. Therefore, the project meets the conformity requirements in 40 CFR 93.116 and 93.123 for PM_{10}.

3.5 AIR QUALITY CONFORMITY

The project will be implemented in phases when funding becomes available. The following air quality conformity analysis covers the conformity evaluation for scenarios when only Phase 1 of the project is implemented, and when the entire project is fully constructed.

Regional Conformity: The estimated capital costs for each of the build packages exceeds the current available or planned funding contained in the *2035 MVRTP* (DRCOG 2007) for the US 36 corridor. To accommodate these funding limitations, the Combined Alternative Package (Preferred Alternative) has been separated into three phases. Details of the components included for each phase are presented in Chapter 8, Phase project Implementation, of the FEIS.

Only Phase 1 of the Combined Alternative Package (Preferred Alternative) is incorporated into the *Draft 2009 Amendment Cycle 1 DRCOG Conformity Determination (CO, PM_{10}, and 1-hour Ozone) for the Amended Fiscally Constrained 2035 Regional Transportation Plan and the Amended 2008-2013 Transportation Improvement Program* (DRCOG 2009). Phase 1 consists of the managed lane from Federal Boulevard to east of the Foothills Parkway/Table Mesa Drive interchange; improvements to the Sheridan Boulevard and Wadsworth Parkway interchanges; replacement of four bridges; pavement rehabilitation; shoulder widening; BRT station enhancements; construction of the bikeway; and intelligent transportation system elements related to the managed lane and BRT operations. Other phases of the Combined Alternative Package (Preferred Alternative) will be included in the RTP when funds become available in the future.

To demonstrate that the project would not cause significant air quality impacts when it is built out, DRCOG completed a regional modeling run that included all phases of the Combined Alternative Package (Preferred Alternative) to ensure that there would not be any significant regional air quality impacts once all phases of the project are completed. For a complete description of the phasing and funding of the Combined Alternative Package (Preferred Alternative), please refer to Chapter 5, Financial Analysis, of this FEIS.

Phase 1 of the Combined Alternative Package (Preferred Alternative) meets regional conformity requirements by its inclusion in the fiscally-constrained, conforming *2035 MVRTP* (DRCOG 2007) and *2008-2013 TIP* (DRCOG 2009). Phase 1 of the project satisfies the regional transportation conformity requirements, thus is not expected to cause significant regional air quality impacts.

To demonstrate that this project would not cause significant air quality impacts and would comply with the SIP when it is fully constructed, DRCOG completed a non-fiscally constrained regional model run that included all phases of the Combined Alternative Package (Preferred Alternative). This long-range non-fiscally constrained model was produced to ensure that there would not be any significant regional air quality impacts once all phases of the project are funded and completed. For a complete description of the phasing and funding of the Combined Alternative Package (Preferred Alternative), refer to Chapter 5, Financial Analysis, of the FEIS.

Project Level Conformity: Because the project area is in attainment/maintenance for CO and PM_{10}, a project level conformity analysis was performed for these two pollutants. CO and PM_{10} hot-spot analyses indicated the project would meet the transportation conformity requirements because the build packages would not cause or contribute to any new localized CO or PM_{10} violations, or increase the frequency or severity of any existing violations, or delay timely attainment of the CO or PM_{10} NAAQS.

As indicated in the CO hot-spot analysis section, additional CO modeling analysis has been conducted for the intersection at Dillon Road and McCaslin Boulevard for Package 1 in 2035. Because overall traffic conditions within the project area are expected to improve with Phase 1 and the other phases of the Combined Alternative Package (Preferred Alternative), air quality impacts at Dillon Road and McCaslin Boulevard under Package 1 are considered the worst-case during the interim years before the project is completely built. The modeled 1-hour and 8-hour CO concentrations using 2035 traffic volume and 2005 emission factors are below the NAAQS, indicating that the worst performing intersection outside of the Phase 1 would not produce CO concentrations exceeding the NAAQS. Detailed discussions regarding conformity of Phase 1 will be included in the ROD discussed in Chapter 8, Phased Project Implementation.

3.6 MOBILE SOURCE AIR TOXICS

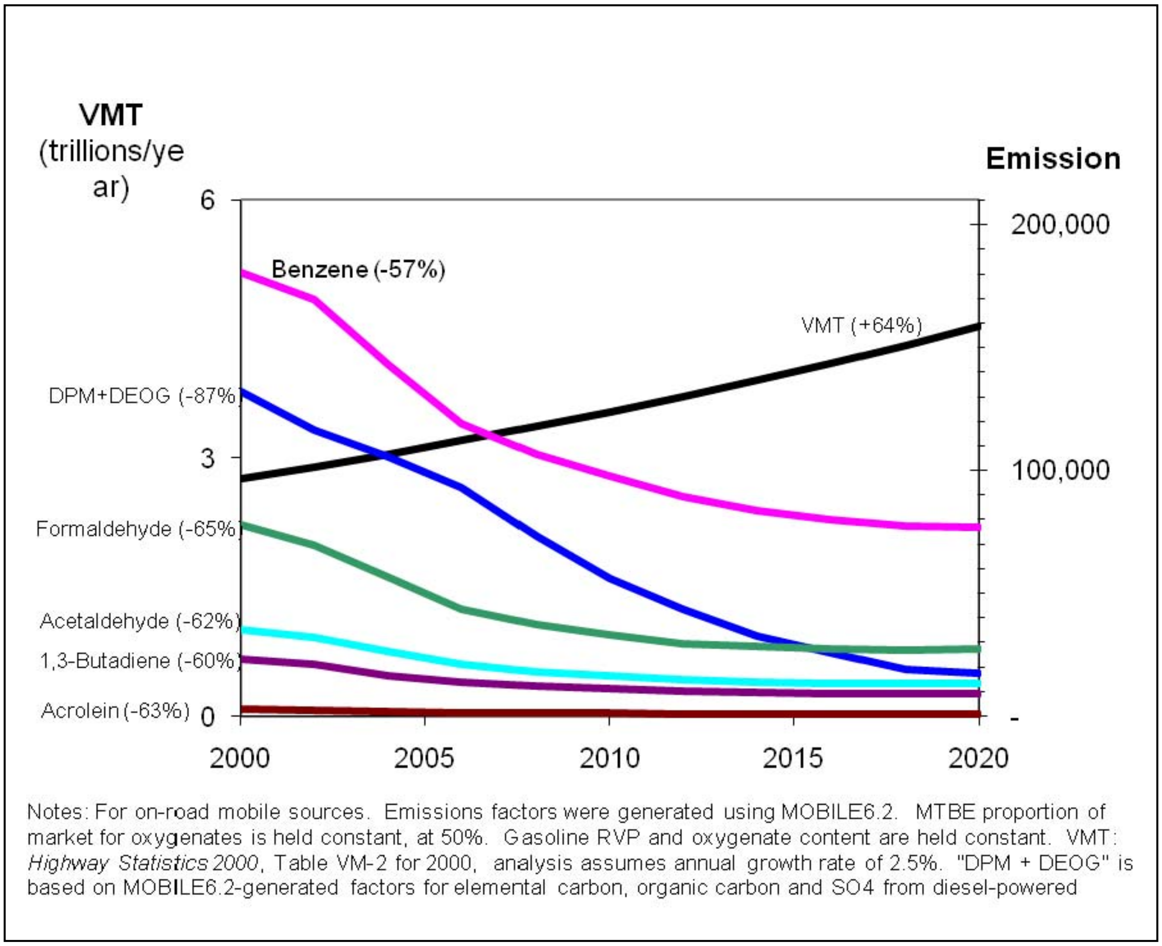
3.6.1 Methodology

In addition to NAAQS, USEPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

MSATs are a subset of the 188 air toxics defined by the Clean Air Act. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline (see document No. EPA420-R-00-023, December 2000).

USEPA is the lead federal agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs (see document No. EPA400-F-92-004, August 1994). More recently, USEPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources, 66 *Federal Register* 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, USEPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline program, its national low emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 to 65 percent, and will reduce on-highway diesel particulate matter emissions by 87 percent, as shown in Figure 3-1, U.S. Annual Vehicle Miles Traveled Versus Mobile Source Air Toxic Emissions (2000 to 2020).

Figure 3-1: U.S. Annual Vehicle Miles Traveled Versus Mobile Source Air Toxic Emissions (2000 to 2020)



Source: U.S. 36 Mobility Partnership, 2006.

3.6.2 Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of Mobile Source Air Toxics

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some are either statistically 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 USEPA efforts. Most notably, the agency conducted the National Air Toxics Assessment 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 National Air Toxics Assessment database best illustrate the levels of various toxics when aggregated to a national or state level.

The USEPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The USEPA 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 USEPA'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** 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 non-cancer hazard from MSATs. Prolonged exposure 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 USEPA, 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[2]. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. 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 later in this section. However, these studies would enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

[2] The 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; National Environmental Policy Act of 1969, *Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles*, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.

3.7 IMPACT ANALYSIS

3.7.1 Corridor Emission Estimates for Priority Mobile Source Air Toxics

Total emissions within the project corridor for the priority MSATs were estimated for each package. Emissions were estimated for the year 2035. Year 2005 emissions are included to show the effect of "current" VMT levels and the degree of pollution control on the current mix of vehicles. Corridor-wide MSATs emissions were estimated using the same methodology as for criteria pollutants. Detailed emission estimates for 2005 corridor-wide MSATs are presented in Appendix 6. MOBILE6.2 modeling files for MSAT in 2005 are presented in Appendix 9. Corridor-wide MSAT emissions for Package 1 and the Combined Alternative Package (Preferred Alternative) are summarized Appendices 10 through 13, with the emission modeling files presented in Appendix 24. MSAT emission adjustments for Package 2 and Package 4 in 2035 are presented in Appendix 15.

Table 3-9, Daily Corridor-wide Emission Estimates (Priority Mobile Source Air Toxics), presents the estimated daily MSAT emissions for each package. The estimated emissions for the build packages are higher than Package 1 in 2035, mainly because of increased VMT on US 36.

Table 3-9: Daily Corridor-wide Emission Estimates (Priority Mobile Source Air Toxics)

Parameter	Year 2005	Package 1 (2035)	Package 2 (2035)[1]	Package 4 (2035)[1]	Combined Alternative Package (Preferred Alternative) (2035)
Benzene (lb/day)	1,236.1	303.3	310.9	314.7	309.6
1,3-Butadiene (lb/day)	148.9	37.5	38.2	38.6	38.6
Formaldehyde (lb/day)	508.9	163.1	166.0	168.1	169.5
Acetaldehyde (lb/day)	361.4	85.0	85.9	86.8	87.9
Acrolein (lb/day)	23.9	7.5	7.6	7.7	7.8
Diesel Particulate Matter (lb/day)[2]	1,219	1,240	1,271	1,287	1,272

Source: US 36 Mobility Partnership, 2006 and 2009.

Notes:

[1]VMT and emissions of Package 2 and Package 4 in 2035 were estimated by applying adjustment factors to the 2030 data, taking into account the VMT growth rate and vehicle speed change between 2030 and 2035.

[2]Diesel particulate matter emissions included all particulate matter emissions from vehicles, including those powered by diesel, gasoline, and other fuels. These data were used as overly conservative approximations of diesel particulate emissions for the purpose of comparing differences between the packages.

lb/day = pound(s) per day

VMT = vehicle miles traveled

Except diesel particulate matter, year 2005 emissions of the other five MSATs are higher than each of the build packages despite much lower VMT, because of the significantly higher emission factors for the priority MSATs for the current fleet of vehicles. Regardless of the package, these five MSAT emissions are projected to decline markedly in the future. This is directly due to the improved pollution emission performance of a modernizing fleet of all diesel-fueled vehicles, a trend that is anticipated to continue throughout the planning horizon. As discussed in Section 2.3, Pollutants of Primary Concern, the slightly increased PM_{10} emissions over 2005 may be a result of different approaches taken in the emission modeling compared to 2035.

3.7.2 Regional Emission Estimates for Priority Mobile Source Air Toxics

Region-wide MSATs emissions were estimated using the same methodology as for criteria pollutants. Detailed emission estimates for 2005 regional MSATs are presented in Appendix 7. MOBILE6.2 modeling files for MSAT in 2005 are presented in Appendix 9. Regional MSAT emissions for Package 1 and the Combined Alternative Package (Preferred Alternative) are summarized in Appendices 10 through 13, with the emission modeling files presented in Appendix 24. MSAT emission adjustments for Package 2 and Package 4 in 2035 are presented in Appendix 16.

Table 3-10, Daily Region-wide Emission Estimates (Priority Mobile Source Air Toxics), summarizes the estimated emissions of each package.

Table 3-10: Daily Region-wide Emission Estimates (Priority Mobile Source Air Toxics)

Parameter	Year 2005	Package 1 (2035)	Package 2 (2035)	Package 4 (2035)	Combined Alternative Package (Preferred Alternative) (2035)
Benzene (lb/day)	6,323.5	2,151.5	2,155.6	2,164.1	2,164.0
1,3-Butadiene (lb/day)	760.5	259.5	259.8	260.8	267.2
Formaldehyde (lb/day)	2,592.8	1,094.5	1,096.6	1,100.9	1,138.0
Acetaldehyde (lb/day)	1,846.1	580.2	579.7	582.8	597.0
Acrolein (lb/day)	121.6	50.6	50.6	50.8	52.3
Diesel Particulate Matter (lb/day) [2]	6,124	8,626	8,643	8,676	8,681

Source: US 36 Mobility Partnership, 2006 and 2009.

Notes:

[1]VMT and emissions of Package 2 and Package 4 in 2035 were estimated by applying adjustment factors to the 2030 data, taking into account the VMT growth rate and vehicle speed change between 2030 and 2035.

[2]Diesel particulate matter emissions included all particulate matter emissions from vehicles, including those powered by diesel, gasoline, and other fuels. These data were used as overly conservative approximations of diesel particulate emissions for the purpose of comparing differences between the packages.

lb/day = pound(s) per day

VMT = vehicle miles traveled

3.7.3 Unavailable Information for Project-Specific MSAT Impact Analysis

This FEIS includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable us to predict the project-specific health impacts of the emission changes associated with the packages in this FEIS. Due to these limitations, the following discussion is included in accordance with Council on Environmental Quality regulations (40 CFR 1502.22[b]) regarding incomplete or unavailable information.

3.7.4 Information that is Unavailable or Incomplete

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.

1. **Emissions**: The USEPA 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 MOBILE6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE6.2 is a trip-based model. Emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE6.2 does not have the ability to predict emission factors for a specific vehicle operating condition, at a specific location at a specific time. Because of this limitation, MOBILE6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emission 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 changes in trip speed. Also, the emissions rates used in MOBILE6.2 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 under the conformity rule, USEPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

   These deficiencies compromise the capability of MOBILE6.2 to estimate MSAT emissions. MOBILE 6.2 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.

2. **Dispersion**. The tools to predict how MSATs disperse are also limited. The USEPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of CO to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time, at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risks. The National Cooperative Highway Research Program 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 National Environmental Policy Act of 1969 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.

3. **Exposure levels and health effects**. Finally, even if emission levels and concentrations of MSATs could be accurately predicted, 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 difficult 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 a 70-year period. There

are also 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 packages 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.

3.7.5 Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Adverse Impacts on the Environment

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emission impacts on human health cannot be made at the project level. While available tools do allow us to reasonably predict relative emission 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 at the project level. Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the packages would have “significant adverse impacts on the human environment.”

In this document, FHWA has provided a quantitative analysis of MSAT emissions relative to the various packages, and has acknowledged that the project packages may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

3.8 SUMMARY OF IMPACT ANALYSES

3.8.1 Package 1: No Action

Regional air quality is anticipated to improve negligibly over the 25-year planning period with implementation of Package 1.

3.8.2 Package 2: Managed Lanes/Bus Rapid Transit

The regional VMT of Package 2 is comparable to the VMT of Package 1, with a slight increase of less than 0.2 percent. The air quality is expected to change negligibly over Package 1.

3.8.3 Package 4: General-Purpose Lanes, High-Occupancy Vehicle, and Bus Rapid Transit

The effects on regional air quality from Package 4 would be similar to those of Package 2. The air quality impacts due to the slight increase of VMT compared to Package 1 would be minimal.

3.8.4 Combined Alternative Package (Preferred Alternative): Managed Lanes, Auxiliary Lanes, and Bus Rapid Transit

The regional VMT of the Combined Alternative Package (Preferred Alternative) is comparable to the VMT. Emission increases due to the VMT change are minimal. The air quality is expected to change negligibly over Package 1.

3.9 CONSTRUCTION IMPACTS

The emissions of PM_{10} during the construction phase of the project were estimated by using an emission factor from the URBEMIS model. This emission factor, which estimates fugitive dust from site grading, was applied to estimates of the maximum number of acres of disturbed ground for each package. For each of the build packages, it was assumed that the area to be disturbed on a daily basis would be less than 10 acres. Therefore, the maximum daily fugitive dust emissions would be 100 pounds per day for the project construction. Other impacts to air quality during construction include emissions from construction vehicles and equipment, emissions from paving and from motor vehicles traveling in the vicinity of the project which may, on occasion, be subject to detours and delays.

3.10 CLIMATE CHANGE CUMULATIVE EFFECTS DISCUSSION

The issue of global climate change is an important national and global concern that is being addressed in several ways by the federal government. The transportation sector is the second largest source of total greenhouse gases in the United States (U.S.), and the greatest source of carbon dioxide (CO_2) emissions — the predominant greenhouse gas. In 2004, the transportation sector was responsible for 31 percent of all U.S. CO_2 emissions. The principal anthropogenic (human-made) source of carbon emissions is the combustion of fossil fuels, which account for approximately 80 percent of anthropogenic emissions of carbon worldwide. Almost all (98 percent) of transportation-sector emissions result from the combustion of petroleum products such as gasoline, diesel fuel, and aviation fuel.

Recognizing this concern, FHWA is working nationally with other modal administrations through the U.S. Department of Transportation Center for Climate Change and Environmental Forecasting to develop strategies to reduce transportation's contribution to greenhouse gases — particularly CO_2 emissions — and to assess the risks to transportation systems and services from climate changes. At the state level, there are also several programs underway in Colorado to address transportation greenhouse gases. The Governor’s Climate Action Plan, adopted in November 2007, includes measures to adopt vehicle CO_2 emission standards and to reduce vehicle travel through transit, flex time, telecommuting, ridesharing, and broadband communications. CDOT issued a policy Directive on Air Quality in May 2009. This Policy Directive was developed with input from a number of agencies, including CDPHE, USEPA, FHWA, FTA, Denver Regional Transportation District, and Denver RAQC. This Policy Directive addresses unregulated MSATS and greenhouse gases produced from Colorado’s state highways, interstates, and construction activities. As a part of CDOT’s commitment to addressing MSATs and greenhouse gases, some of CDOT’s program-wide activities include:

1. Developing truck routes/restrictions with the goal of limiting truck traffic in proximity to facilities, including schools, with sensitive receptor populations.
2. Continue researching pavement durability opportunities with the goal of reducing the frequency of resurfacing and/or reconstruction projects.
3. Developing air quality educational materials, specific to transportation issues, for citizens, elected officials, and schools.
4. Offering outreach to communities to integrate land use and transportation decisions to reduce growth in VMT, such as smart growth techniques, buffer zones, transit-oriented development, walkable communities, access management plans, etc.
5. Committing to research additional concrete additives that would reduce the demand for cement.
6. Expanding Transportation Demand Management efforts statewide to better utilize the existing transportation mobility network.
7. Continuing to diversify the CDOT fleet by retrofitting diesel vehicles, specifying the types of vehicles and equipment contractors may use, purchasing low-emission vehicles, such as hybrids, and purchasing cleaner burning fuels through bidding incentives where feasible. Incentivizing is the likely vehicle for this.
8. Exploring congestion and/or right-lane only restrictions for motor carriers.
9. Funding truck parking electrification (note: mostly via exploring external grant opportunities).
10. Researching additional ways to improve freight movement and efficiency statewide.
11. Committing to incorporating ultra-low sulfur diesel for non-road equipment statewide before June 2010 – likely using incentives during bidding.
12. Developing a low-VOC emitting tree landscaping specification.

Because climate change is a global issue, and the emissions changes due to project alternatives are very small compared to global totals, corridor-wide greenhouse gas emissions associated with the packages were not calculated. Estimates of regional greenhouse gas emissions are presented in Section 4.19, Energy. Because greenhouse gases are directly related to energy use, the changes in greenhouse gas emissions are similar to the changes in energy consumption. The relationship of current and projected Colorado highway emissions to total global CO_2 emissions is presented in Table 3-11, Greenhouse Gas Inventory. Colorado highway emissions are expected to increase by 4.7 percent between now and 2035. The benefits of the fuel economy and renewable fuels programs in the 2007 Energy Bill are offset by growth in VMT; the draft 2035 statewide transportation plan predicts that Colorado VMT will double between 2000 and 2035. Table 3-11 also illustrates the size of the project corridor relative to total Colorado travel activity.

Table 3-11: Greenhouse Gas Inventory

Global CO_2 Emissions, 2005 (MMT)[1]	Colorado Highway CO_2 Emissions, 2005 (MMT)[2]	Projected Colorado 2035 Highway CO_2 Emissions, (MMT)[2]	Colorado Highway Emissions, % of Global Total (2005)[2]	Project Corridor VMT, % of Statewide VMT (2005)[3]
27,700	29.9	31.3	0.108%	9.1%

Source: US 36 Mobility Partnership, 2009.

Notes:

[1]Energy Information Administration (EIA), International Energy Outlook 2007.

[2]Calculated by Federal Highway Administration Resource Center.

[3]Statewide VMT was 47.9 billion in 2005, based on the Colorado Department of Transportation's *Fact Book 2006–2007, Transportation Facts* (CDOT 2007).

% = percent

CO_2 = carbon dioxide

MMT = million metric tons

VMT = vehicle miles traveled

The air quality analysis does not predict an adverse impact from the project operation; therefore, no mitigation measures are required. However, BMPs will be implemented to reduce air quality effects, particularly during construction. The project construction will exceed 25 acres and last more than 6 months, and therefore an Air Pollutant Emissions Notice and an air permit is required by APCD. Mitigation measures during construction will be covered in the Air Pollutant Emissions Notice submitted to APCD.

Regional and local agency strategies that could be used to reduce criteria pollutant and MSATs emissions include but are not limited to: tailpipe retrofits, closed crankcase filtration systems, clean fuels, engine rebuild and replacement requirements, contract requirements, anti-idling ordinances and legislation, truck stop electrification programs, and aggressive fleet turnover policies. Future emissions from on-road mobile sources will be minimized regionally through programmatic plans outlined in CDOT's *Air Quality Policy Directive 1901*. The purpose of programmatic air quality mitigation is to establish region-wide goals and potential mitigation strategies to reduce air impacts from the roadway network, including US 36.

CDOT will continue sponsorship of Rideshare programs, variable work hour programs, and employee EcoPass distribution to further reduce VMT — reducing criteria pollutant, MSATs, and greenhouse gas emissions on US 36 and other regional roadways.

The Denver metropolitan area maintenance plans for CO, O_3, and PM_{10} will serve to avoid and minimize pollutant emissions from US 36 and other project roads through regional programs and control measures such as additional transit improvements, and new and improved bike and pedestrian facilities.

The following mitigation measures, displayed in Table 4-1, Mitigation Measures — Air Quality, apply to all of the build packages. All of these mitigation measures would be prepared as part of the Construction Management Plan presented in Section 4.22, Construction-Related Impacts.

Table 4-1: Mitigation Measures — Air Quality

Impact	Impact Type	Mitigation Measures
Criteria Pollutants	Construction	• APEN and an air permit is required for projects over 25 acres and last more than 6 months in length. APEN will cover APCD required mitigation measures for active construction. • CDOT will include language in the construction specifications requiring that all construction equipment will be equipped to burn ultra-low sulfur diesel fuel. • Using water or wetting agents to manage dust. • Using wind barriers and wind screens to minimize the spreading of dust in areas where large amounts of materials are stored. • Using a wheel wash station and/or large-diameter cobble apron at egress/ingress areas to minimize dirt being tracked onto public streets. • Using vacuum powered street sweepers to control dirt tracked onto streets. • Covering all dump trucks leaving the site. • Covering or wetting temporary excavated materials. • Using a binding agent for long-term excavated materials. • For winter time construction, install engine pre-heater devices to eliminate unnecessary idling. • Prohibit tampering with equipment to increase horsepower or to defeat emissions control devices effectiveness. • Require construction vehicle engines to be properly tuned and maintained. • Use construction vehicles and equipment with the minimum practical engine size for the intended jobs. • Active grading and parking areas will be watered as required. • Best management practices will be used for stockpiles. • All trucks hauling dirt, sand, or other loose material will be covered or maintain freeboard in accordance with local jurisdiction requirements. • Refer to the CMP in Section 4.22, Construction-Related Impacts.
Visibility/Opacity	Construction	• Refer to the CMP in Section 4.22, Construction-Related Impacts.
Ozone	Construction/ Operations	• Commitment to any appropriate Regional Air Quality Council adopted mitigation measures for ozone.
MSAT	Construction/ Operations	• Restrict truck routes to avoid sensitive receptor populations. • Improve pavement durability to reduce the frequency of repaving. • Use ultra-low sulfur diesel in non-road equipment.

Source: US 36 Mobility Partnership, 2009.

Notes:

APCD = Air Pollution Control Division
APEN = Air Pollutant Emissions Notice
CDOT = Colorado Department of Transportation
CMP = Construction Management Plan
MSAT = Mobile Source Air Toxics

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Air Quality
Technical Report Addendum
Appendices

Appendix 1
Vehicle Miles Traveled
(US 36 Corridor and Regional for 2005)

Appendix 1: Vehicle Miles Traveled (US 36 Corridor and Regional for 2005)

Freeway VMT (ROUNDED)

	Daily	PM Peak Hour
Corridor	**2005 (Base Year)**	**2005 (Base Year)**
US 36	1,878,900	145,900
GP	1,857,900	142,400
Special	21,000	3,500
I-25 (US 36 to DUS)	1,058,000	86,800
GP	1,000,600	76,000
Special	57,400	10,800
Other Study Area Freeways*	2,816,600	230,100

Notes:

Freeways are defined as FACILITY TYPE = 1

Rounded to the nearest 100

*Other Study Area Freeways include parts of I-70, I-270, I-76, and I-25

Arterial VMT (ROUNDED)

	Daily	PM Peak Hour
	2005 (Base Year)	**2005 (Base Year)**
VMT	6,339,900	608,400
VHT	200,000	22,100
Average Speed (mile/hr)	31.70	27.53

Notes:

Rounded to the nearest 100 (VMT, VHT)

Based on raw model volumes

Arterials are defined as FACILITY TYPE = 2 or 3 or 4

Average Speed = VMT/VHT

Regional VMT (ROUNDED)

	2005 (Base Year)	P4 (2030)
Total VMT	61,813,300	99,742,500

Notes:

Rounded to the nearest 100

Includes all links except centroid connectors

Data source: US 36 Mobility Partnership, 2006

Appendix 2
BRT Service Miles for 2005

Appendix 2: BRT Service Miles for 2005

Transit Service Miles

BRT	2005 (Base Year)
Daily Service Miles*	11,700
Regional/Express/skyRide	11,700
Activity Center Connector	0
Peak Period Service Miles	7,000
Regional/Express/skyRide	7,000
Activity Center Connector	0
Off-Peak Period Service Miles	3,500
Regional/Express/skyRide	3,500
Activity Center Connector	0

Notes:

Rounded to the nearest 100

*Daily = Peak Period + Off-Peak Period + Early-Late

BRT is defined as routes that travel on US 36.

Regional/Express/skyRide include the following routes: AB, B, BOLT, DD, DM, H, L, 31x, 80x, 82x, 108x

Activity Center Connectors includes the following routes: ACC Int, ACC ST, ACC CU.

Data source: US 36 Mobility Partnership, 2006

Peak Hour Service Miles

Peak Hour Service Miles	2005 (Base Year)
	2,340
	2,340
	0
	1,400
	1,400

Note:

Peak hour service miles were calculated 20% of the daily service miles.

Appendix 3
Corridor-Wide Criteria Pollutant Emissions – Daily for 2005

Appendix 3

US 36

Corridor-Wide Criteria Pollutant Emissions - Daily for 2005

Segment: **US 36: Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT for US36: 1,878,900

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	735,589	752,124	256,658	35,511	2,067	4,134	87,745	5,261	11,700	1,890,788
VOC (g/mi)	1.35	1.146	2.602	1.978	1.053	0.761	0.961	7.44	1.111	n/a
CO (g/mi)	19.93	20.65	24.41	29.34	2.519	1.951	5.928	27.6	9.97	n/a
NOx (g/mi)	1.093	1.218	1.502	3.951	1.816	1.297	12.638	1.35	18.169	n/a
PM_{10} (g/mi)	0.0266	0.0277	0.0305	0.093	0.2292	0.1464	0.3605	0.0376	0.7522	n/a
VOC (lb/day)	2,189.3	1,900.2	1,472.3	154.9	4.80	6.9	185.9	86.3	28.66	**6,029**
CO (lb/day)	32,319.9	34,240.2	13,811.8	2,297.0	11.5	17.8	1,146.7	320.1	257	**84,422**
NOx (lb/day)	1,772.5	2,019.6	849.9	309.3	8.274	11.8	2,444.7	15.7	469	**7,900**
PM_{10} (lb/day)	43.14	45.93	17.26	7.28	1.044	1.33	69.74	0.44	19.40	**206**

Segment: **I-25 to DUS: Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT for I-25 to DUS: 1,058,000

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.4418	0.3615	0.1234	0.0194	0.0013	0.0019	0.048	0.0027	n/a	1.00
VMT	467,424	382,467	130,557	20,525	1,375	2,010	50,784	2,857	-	1,058,000
VOC (g/mi)	1.392	1.175	2.661	2.16	1.105	0.801	1.061	7.57	1.224	n/a
CO (g/mi)	19.54	20.24	24.02	31.4	2.608	2.017	6.446	28.64	10.828	n/a
NOx (g/mi)	1.085	1.209	1.494	3.826	1.769	1.263	12.246	1.3	17.635	n/a
PM_{10} (g/mi)	0.0267	0.0278	0.0306	0.0931	0.2292	0.1464	0.3641	0.0376	0.7277	n/a
VOC (lb/day)	1,434.4	990.7	765.9	97.7	3.35	3.5	118.8	47.7	-	**3,462**
CO (lb/day)	20,135.5	17,066.0	6,913.5	1,420.8	7.9	8.9	721.7	180.4	-	**46,455**
NOx (lb/day)	1,118.1	1,019.4	430.0	173.1	5.364	5.6	1,371.0	8.2	-	**4,131**
PM_{10} (lb/day)	27.51	23.44	8.81	4.21	0.695	0.65	40.76	0.24	-	**106**

US 36

Corridor-Wide Criteria Pollutant Emissions - Daily for 2005

Segment: **Other Study Area Freeways*: Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT: 2,816,600

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	1,102,699	1,127,485	384,748	53,234	3,098	6,197	131,535	7,886	-	2,816,882
VOC (g/mi)	1.35	1.146	2.602	1.978	1.053	0.761	0.961	7.44	1.111	n/a
CO (g/mi)	19.93	20.65	24.41	29.34	2.519	1.951	5.928	27.6	9.97	n/a
NOx (g/mi)	1.093	1.218	1.502	3.951	1.816	1.297	12.638	1.35	18.169	n/a
PM_{10} (g/mi)	0.0266	0.0277	0.0305	0.093	0.2292	0.1464	0.3605	0.0376	0.7522	n/a
VOC (lb/day)	3,281.8	2,848.5	2,207.0	232.1	7.19	10.4	278.7	129.4	-	**8,995**
CO (lb/day)	48,449.7	51,328.4	20,704.8	3,443.3	17.2	26.7	1,719.0	479.9	-	**126,169**
NOx (lb/day)	2,657.1	3,027.5	1,274.0	463.7	12.404	17.7	3,664.8	23.5	-	**11,141**
PM_{10} (lb/day)	64.66	68.85	25.87	10.91	1.566	2.00	104.54	0.65	-	**279**

* Include parts of I-70, I-270, I-76, and I-25

Segment: **Arterial Links: Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT: 6,339,900

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	2,482,071	2,537,862	866,030	119,824	6,974	13,948	296,073	17,752	-	6,340,534
VOC (g/mi)	1.35	1.146	2.602	1.978	1.053	0.761	0.961	7.44	1.111	n/a
CO (g/mi)	19.93	20.65	24.41	29.34	2.519	1.951	5.928	27.6	9.97	n/a
NOx (g/mi)	1.093	1.218	1.502	3.951	1.816	1.297	12.638	1.35	18.169	n/a
PM_{10} (g/mi)	0.0266	0.0277	0.0305	0.093	0.2292	0.1464	0.3605	0.0376	0.7522	n/a
VOC (lb/day)	7,387.1	6,411.8	4,967.8	522.5	16.19	23.4	627.3	291.2	-	**20,247**
CO (lb/day)	109,055.7	115,535.4	46,604.5	7,750.5	38.7	60.0	3,869.3	1,080.1	-	**283,994**
NOx (lb/day)	5,980.8	6,814.6	2,867.7	1,043.7	27.920	39.9	8,249.1	52.8	-	**25,077**
PM_{10} (lb/day)	145.55	154.98	58.23	24.57	3.524	4.50	235.31	1.47	-	**628**

Baseline Yr Total
38,734
541,040
48,248
1,219

Note:
MOBILE6.2 VMT distribution and emission factors for urban area applied to I-25 (US36 to DUS). All other segments used suburban area VMT distribution and emission factors

Appendix 4
Corridor-Wide Criteria Pollutant Emissions – Peak Hour for 2005

Appendix 4

US 36
Corridor-Wide Criteria Pollutant Emissions - Peak Hour for 2005

Segment: **US 36: Base Year (2005)**
Scenario: **Peak PM Hour**

Total Auto/Truck VMT for US36: 145,900

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	57,120	58,404	19,930	2,758	160	321	6,814	409	2,340	148,255
VOC (g/mi)	1.35	1.146	2.602	1.978	1.053	0.761	0.961	7.44	1.111	n/a
CO (g/mi)	19.93	20.65	24.41	29.34	2.519	1.951	5.928	27.6	9.97	n/a
NOx (g/mi)	1.093	1.218	1.502	3.951	1.816	1.297	12.638	1.35	18.169	n/a
PM_{10} (g/mi)	0.0266	0.0277	0.0305	0.093	0.2292	0.1464	0.3605	0.0376	0.7522	n/a
VOC (lb/hr)	170.0	147.6	114.3	12.0	0.37	0.5	14.4	6.7	5.73	**472**
CO (lb/hr)	2,509.7	2,658.8	1,072.5	178.4	0.9	1.4	89.0	24.9	51	**6,587**
NOx (lb/hr)	137.6	156.8	66.0	24.0	0.643	0.9	189.8	1.2	94	**671**
PM_{10} (lb/hr)	3.35	3.57	1.34	0.57	0.081	0.10	5.42	0.03	3.88	**18**

Segment: **I-25 to DUS: Base Year (2005)**
Scenario: **Peak PM Hour**

Total Auto/Truck VMT for I-25 to DUS: 86,800

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.4418	0.3615	0.1234	0.0194	0.0013	0.0019	0.048	0.0027	n/a	1.00
VMT	38,348	31,378	10,711	1,684	113	165	4,166	234	-	86,800
VOC (g/mi)	1.392	1.175	2.661	2.16	1.105	0.801	1.061	7.57	1.224	n/a
CO (g/mi)	19.54	20.24	24.02	31.4	2.608	2.017	6.446	28.64	10.828	n/a
NOx (g/mi)	1.085	1.209	1.494	3.826	1.769	1.263	12.246	1.3	17.635	n/a
PM_{10} (g/mi)	0.0267	0.0278	0.0306	0.0931	0.2292	0.1464	0.3641	0.0376	0.7277	n/a
VOC (lb/hr)	117.7	81.3	62.8	8.0	0.27	0.3	9.7	3.9	-	**284**
CO (lb/hr)	1,652.0	1,400.1	567.2	116.6	0.6	0.7	59.2	14.8	-	**3,811**
NOx (lb/hr)	91.7	83.6	35.3	14.2	0.440	0.5	112.5	0.7	-	**339**
PM_{10} (lb/hr)	2.26	1.92	0.72	0.35	0.057	0.05	3.34	0.02	-	**9**

US 36

Corridor-Wide Criteria Pollutant Emissions - Peak Hour for 2005

Segment: **Other Study Area Freeways*: Base Year (2005)**
Scenario: **Peak PM Hour**

Total Auto/Truck VMT for US36: 230,100

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	90,084	92,109	31,432	4,349	253	506	10,746	644	-	230,123
VOC (g/mi)	1.35	1.146	2.602	1.978	1.053	0.761	0.961	7.44	1.111	n/a
CO (g/mi)	19.93	20.65	24.41	29.34	2.519	1.951	5.928	27.6	9.97	n/a
NOx (g/mi)	1.093	1.218	1.502	3.951	1.816	1.297	12.638	1.35	18.169	n/a
PM_{10} (g/mi)	0.0266	0.0277	0.0305	0.093	0.2292	0.1464	0.3605	0.0376	0.7522	n/a
VOC (lb/hr)	268.1	232.7	180.3	19.0	0.59	0.8	22.8	10.6	-	**735**
CO (lb/hr)	3,958.1	4,193.2	1,691.5	281.3	1.4	2.2	140.4	39.2	-	**10,307**
NOx (lb/hr)	217.1	247.3	104.1	37.9	1.013	1.4	299.4	1.9	-	**910**
PM_{10} (lb/hr)	5.28	5.62	2.11	0.89	0.128	0.16	8.54	0.05	-	**23**

* Include parts of I-70, I-270, I-76, and I-25

Segment: **Arterial Links: Base Year (2005)**
Scenario: **Peak PM Hour**

Total Auto/Truck VMT for I-25 to DUS: 608,400

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	238,189	243,543	83,107	11,499	669	1,338	28,412	1,704	-	608,461
VOC (g/mi)	1.35	1.146	2.602	1.978	1.053	0.761	0.961	7.44	1.111	n/a
CO (g/mi)	19.93	20.65	24.41	29.34	2.519	1.951	5.928	27.6	9.97	n/a
NOx (g/mi)	1.093	1.218	1.502	3.951	1.816	1.297	12.638	1.35	18.169	n/a
PM_{10} (g/mi)	0.0266	0.0277	0.0305	0.093	0.2292	0.1464	0.3605	0.0376	0.7522	n/a
VOC (lb/hr)	708.9	615.3	476.7	50.1	1.55	2.2	60.2	27.9	-	**1,943**
CO (lb/hr)	10,465.4	11,087.2	4,472.3	743.8	3.7	5.8	371.3	103.7	-	**27,253**
NOx (lb/hr)	573.9	654.0	275.2	100.2	2.679	3.8	791.6	5.1	-	**2,406**
PM_{10} (lb/hr)	13.97	14.87	5.59	2.36	0.338	0.43	22.58	0.14	-	**60**

Base Yr Total
3,434
47,959
4,326
110

MOBILE6.2 VMT distribution and emission factors for urban area applied to I-25 (US36 to DUS). All other segments used suburban area VMT distribution and emission factors

Appendix 5
Regional Criteria Pollutant Emissions – Daily for 2005

Appendix 5

US 36
Regional Criteria Pollutant Emissions - Daily for 2005

Segment: **Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT: 61,813,300

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	1.00
VMT	24,199,907	24,743,864	8,443,697	1,168,271	67,995	135,989	2,886,681	173,077	61,819,481
VOC (g/mi)	1.35	1.146	2.602	1.978	1.053	0.761	0.961	7.44	n/a
CO (g/mi)	19.93	20.65	24.41	29.34	2.519	1.951	5.928	27.6	n/a
NOx (g/mi)	1.093	1.218	1.502	3.951	1.816	1.297	12.638	1.35	n/a
PM_{10} (g/mi)	0.0266	0.0277	0.0305	0.093	0.2292	0.1464	0.3605	0.0376	n/a
VOC (lb/day)	72,023.5	62,514.3	48,435.8	5,094.4	157.84	228.1	6,115.7	2,838.8	**197,409**
CO (lb/day)	1,063,280.7	1,126,456.8	454,388.5	75,566.8	377.6	584.9	37,725.4	10,531.2	**2,768,912**
NOx (lb/day)	58,312.4	66,441.9	27,959.5	10,176.0	272.218	388.8	80,427.4	515.1	**244,493**
PM_{10} (lb/day)	1,419.13	1,511.03	567.75	239.53	34.357	43.89	2,294.20	14.35	**6,124**

MOBILE6.2 VMT distribution and emission factors for suburban area applied in regional emission calculations.

Appendix 6
Corridor-Wide Mobile Source Air Toxic Emissions – Daily for 2005

Appendix 6

US 36
Corridor-Wide Mobile Source Air Toxic Emissions - Daily for 2005

Segment: **US 36: Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT for US36: 1,878,900

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	735,589	752,124	256,658	35,511	2,067	4,134	87,745	5,261	11,700	1,890,788
Benzene (mg/mi)	41.27	42.36	81.50	57.20	23.05	16.62	12.31	156.64	12.31	n/a
1,3 Butadiene (mg/mi)	5.09	4.22	9.13	7.29	10.37	7.48	7.15	54.33	7.15	n/a
Formaldehyde (mg/mi)	9.45	11.82	37.11	40.26	44.48	32.07	91.69	130.05	91.69	n/a
Acetaldehyde (mg/mi)	8.54	10.35	28.37	20.39	14.17	10.22	33.77	66.11	33.77	n/a
Acrolein (mg/mi)	0.54	0.56	1.35	3.22	4.03	2.91	4.10	3.17	4.10	n/a
Benzene (lb/day)	66.93	70.24	46.11	4.48	0.11	0.15	2.38	1.82	0.32	**192.53**
1,3 Butadiene (lb/day)	8.25	7.00	5.17	0.57	0.05	0.07	1.38	0.63	0.18	**23.30**
Formaldehyde (lb/day)	15.32	19.60	21.00	3.15	0.20	0.29	17.74	1.51	2.37	**81.18**
Acetaldehyde (lb/day)	13.85	17.16	16.05	1.60	0.06	0.09	6.53	0.77	0.87	**56.99**
Acrolein (lb/day)	0.876	0.929	0.764	0.252	0.018	0.027	0.793	0.037	0.106	**3.80**

Segment: **I-25 to DUS: Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT for I-25 to DUS: 1,058,000

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.4418	0.3615	0.1234	0.0194	0.0013	0.0019	0.048	0.0027	n/a	1.00
VMT	467,424	382,467	130,557	20,525	1,375	2,010	50,784	2,857	-	1,058,000
Benzene (mg/mi)	41.27	42.35	81.52	57.43	23.05	16.62	12.35	156.64	12.31	n/a
1,3 Butadiene (mg/mi)	5.09	4.22	9.14	7.36	10.37	7.48	7.17	54.33	7.15	n/a
Formaldehyde (mg/mi)	9.45	11.82	37.13	40.58	44.48	32.07	91.97	130.05	91.69	n/a
Acetaldehyde (mg/mi)	8.54	10.35	28.38	20.50	14.17	10.22	33.87	66.11	33.77	n/a
Acrolein (mg/mi)	0.54	0.56	1.35	3.26	4.03	2.91	4.12	3.17	4.10	n/a
Benzene (lb/day)	42.53	35.71	23.46	2.60	0.07	0.07	1.38	0.99	-	**1.07E+02**
1,3 Butadiene (lb/day)	5.25	3.56	2.63	0.33	0.03	0.03	0.80	0.34	-	**1.30E+01**
Formaldehyde (lb/day)	9.74	9.97	10.69	1.84	0.13	0.14	10.30	0.82	-	**4.36E+01**
Acetaldehyde (lb/day)	8.80	8.73	8.17	0.93	0.04	0.05	3.79	0.42	-	**3.09E+01**
Acrolein (lb/day)	0.556	0.472	0.389	0.148	0.012	0.013	0.461	0.020	-	**2.07E+00**

US 36

Corridor-Wide Mobile Source Air Toxic Emissions - Daily for 2005

Segment: **Other Study Area Freeways*: Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT: 2,816,600

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	1,102,699	1,127,485	384,748	53,234	3,098	6,197	131,535	7,886	-	2,816,882
Benzene (mg/mi)	41.27	42.36	81.50	57.20	23.05	16.62	12.31	156.64	12.31	n/a
1,3 Butadiene (mg/mi)	5.09	4.22	9.13	7.29	10.37	7.48	7.15	54.33	7.15	n/a
Formaldehyde (mg/mi)	9.45	11.82	37.11	40.26	44.48	32.07	91.69	130.05	91.69	n/a
Acetaldehyde (mg/mi)	8.54	10.35	28.37	20.39	14.17	10.22	33.77	66.11	33.77	n/a
Acrolein (mg/mi)	0.54	0.56	1.35	3.22	4.03	2.91	4.10	3.17	4.10	n/a
Benzene (lb/day)	100.33	105.29	69.13	6.71	0.16	0.23	3.57	2.72	-	**2.88E+02**
1,3 Butadiene (lb/day)	12.37	10.49	7.74	0.86	0.07	0.10	2.07	0.94	-	**3.47E+01**
Formaldehyde (lb/day)	22.97	29.38	31.48	4.72	0.30	0.44	26.59	2.26	-	**1.18E+02**
Acetaldehyde (lb/day)	20.76	25.73	24.06	2.39	0.10	0.14	9.79	1.15	-	**8.41E+01**
Acrolein (lb/day)	1.313	1.392	1.145	0.378	0.028	0.040	1.189	0.055	-	**5.54E+00**

* Include parts of I-70, I-270, I-76, and I-25

Segment: **Arterial Links: Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT: 6,339,900

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Diesel Bus	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	n/a	1.00
VMT	2,482,071	2,537,862	866,030	119,824	6,974	13,948	296,073	17,752	-	6,340,534
Benzene (mg/mi)	41.27	42.36	81.50	57.20	23.05	16.62	12.31	156.64	12.31	n/a
1,3 Butadiene (mg/mi)	5.09	4.22	9.13	7.29	10.37	7.48	7.15	54.33	7.15	n/a
Formaldehyde (mg/mi)	9.45	11.82	37.11	40.26	44.48	32.07	91.69	130.05	91.69	n/a
Acetaldehyde (mg/mi)	8.54	10.35	28.37	20.39	14.17	10.22	33.77	66.11	33.77	n/a
Acrolein (mg/mi)	0.54	0.56	1.35	3.22	4.03	2.91	4.10	3.17	4.10	n/a
Benzene (lb/day)	225.83	237.00	155.60	15.11	0.35	0.51	8.03	6.13	-	**6.49E+02**
1,3 Butadiene (lb/day)	27.85	23.61	17.43	1.93	0.16	0.23	4.67	2.13	-	**7.80E+01**
Formaldehyde (lb/day)	51.71	66.13	70.85	10.64	0.68	0.99	59.85	5.09	-	**2.66E+02**
Acetaldehyde (lb/day)	46.73	57.91	54.17	5.39	0.22	0.31	22.04	2.59	-	**1.89E+02**
Acrolein (lb/day)	2.955	3.133	2.577	0.851	0.062	0.089	2.676	0.124	-	**1.25E+01**

Baseline Yr Total
1.236E+03
1.49E+02
5.09E+02
3.61E+02
2.39E+01

MOBILE6.2 VMT distribution and emission factors for urban area applied to I-25 (US36 to DUS). All other segments used suburban VMT distribution and emission factors

Appendix 7
Regional Mobile Source Air Toxic Emissions – Daily for 2005

Appendix 7

US 36
Regional Mobile Source Air Toxic Emissions - Daily for 2005

Segment: **Base Year (2005)**
Scenario: **Daily**

Total Auto/Truck VMT: 61,813,300

Vehicle Type	LDGV	LDGT12	LDGT34	HDGV	LDDV	LDDT	HDDV	MC	Total
VMT Distribution	0.3915	0.4003	0.1366	0.0189	0.0011	0.0022	0.0467	0.0028	1.00
VMT	24,199,907	24,743,864	8,443,697	1,168,271	67,995	135,989	2,886,681	173,077	61,819,481
Benzene (mg/mi)	41.27	42.36	81.50	57.20	23.05	16.62	12.31	156.64	n/a
1,3 Butadiene (mg/mi)	5.09	4.22	9.13	7.29	10.37	7.48	7.15	54.33	n/a
Formaldehyde (mg/mi)	9.45	11.82	37.11	40.26	44.48	32.07	91.69	130.05	n/a
Acetaldehyde (mg/mi)	8.54	10.35	28.37	20.39	14.17	10.22	33.77	66.11	n/a
Acrolein (mg/mi)	0.54	0.56	1.35	3.22	4.03	2.91	4.10	3.17	n/a
Benzene(lb/day)	2,201.79	2,310.74	1,517.11	147.32	3.46	4.98	78.34	59.77	**6,324**
1,3 Butadiene (lb/day)	271.56	230.20	169.95	18.78	1.55	2.24	45.50	20.73	**761**
Formaldehyde (lb/day)	504.16	644.78	690.80	103.69	6.67	9.61	583.51	49.62	**2,593**
Acetaldehyde (lb/day)	455.62	564.59	528.10	52.52	2.12	3.06	214.91	25.23	**1,846**
Acrolein(lb/day)	28.809	30.548	25.130	8.293	0.604	0.872	26.092	1.210	**122**

MOBILE6.2 VMT distribution and emission factors for suburban area applied in regional emission calculations.

Appendix 8
MOBILE6.2 Output Files for Criteria Pollutants for 2005

```
*****************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                                *
* Input file: TEMP05.IN (file 1, run 1).                                    *
*****************************************************************************
* Evaluation year 2005 only
* Program data from inspection year 2000
* Basic and Enhanced I/M Programs
* Pass/fail Idle only for all HDGV vehicles >1981
* Colorado 2005 I/M240 cutpoints for cars and trucks

* Reading non-default I/M CUTPOINTS from the following external
* data file: 05CUTPC.D

* Reading non-default I/M CUTPOINTS from the following external
* data file: 05CUTPT.D
  M616 Comment:
             User has supplied post-1999 sulfur levels.

* Reading Registration Distributions from the following external
* data file: ../../REGDIST/REG_MET.D
  M 49 Warning:
               1.00     MYR sum not = 1. (will normalize)
  M 49 Warning:
               1.00     MYR sum not = 1. (will normalize)
  M 49 Warning:
               1.00     MYR sum not = 1. (will normalize)
  M 49 Warning:
               1.00     MYR sum not = 1. (will normalize)
  M 49 Warning:
               1.00     MYR sum not = 1. (will normalize)
  M 49 Warning:
               1.00     MYR sum not = 1. (will normalize)
  M 49 Warning:
               1.00     MYR sum not = 1. (will normalize)

* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG   cbd  2005FA
* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading Hourly, Roadway, and Speed VMT dist. from the following external
* data file: SPEED\CBD.DEF

* Reading Hourly VMT distribution from the following external
* data file: VMT\CBD.DEF

* Reading Hourly Roadway VMT distribution from the following external
* data file: FACVMT\CBD.DEF

  Reading User Supplied ROADWAY VMT Factors
  M615 Comment:
             User supplied VMT mix.
*** I/M credits for Tech1&2 vehicles were read from the following external
    data file: TECH12.D
  M 48 Warning:
            there are no sales for vehicle class HDGV8b

                    Calendar Year:  2005
                            Month:  Jan.
                         Altitude:  High
```

```
             Minimum Temperature:  30.0 (F)
             Maximum Temperature:  58.0 (F)
               Absolute Humidity:   75. grains/lb
                Nominal Fuel RVP:  12.5 psi
                   Weathered RVP:  13.1 psi
             Fuel Sulfur Content:  160. ppm

             Exhaust I/M Program:  Yes
                Evap I/M Program:  No
                     ATP Program:  Yes
                Reformulated Gas:  No

  Ether Blend Market Share: 0.000       Alcohol Blend Market Share: 1.000
  Ether Blend Oxygen Content: 0.000     Alcohol Blend Oxygen Content: 0.034
                                         Alcohol Blend RVP Waiver: Yes

      Vehicle Type:      LDGV    LDGT12    LDGT34     LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:               <6000     >6000    (All)
                       ------    ------    ------   ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.4990    0.3166    0.1080              0.0138    0.0014    0.0017    0.0550    0.0044    1.0000
 ---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :      1.579     1.314     2.928     1.724     4.732     1.315     0.962     1.692      8.06     1.718
     Composite CO  :     18.85     19.52     23.53     20.54     67.13     3.029     2.331     9.797     30.73    19.742
     Composite NOX :      1.117     1.246     1.544     1.322     4.061     1.668     1.190    12.274      1.12     1.859
 ---------------------------------------------------------------------------------------------------------------------
         Veh. Type:    GasBUS     URBAN    SCHOOL
                       ------    ------    ------
          VMT Mix:     0.0039    0.0115    0.0204
---------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :     9.915     1.678     2.018
     Composite CO  :   141.68     14.887     8.191
     Composite NOX :     5.973    16.480    11.733
---------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG   frn  2005FA
* File 1, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading Hourly, Roadway, and Speed VMT dist. from the following external
* data file: SPEED\FRN.DEF

* Reading Hourly VMT distribution from the following external
* data file: VMT\FRN.DEF

* Reading Hourly Roadway VMT distribution from the following external
* data file: FACVMT\FRN.DEF

  Reading User Supplied ROADWAY VMT Factors
  M615 Comment:
               User supplied VMT mix.
  M 48 Warning:
             there are no sales for vehicle class HDGV8b

                   Calendar Year:  2005
                           Month:  Jan.
                        Altitude:  High
             Minimum Temperature:  30.0 (F)
```

```
            Maximum Temperature:  58.0 (F)
              Absolute Humidity:   75. grains/lb
               Nominal Fuel RVP:  12.5 psi
                  Weathered RVP:  13.1 psi
            Fuel Sulfur Content:  160. ppm

            Exhaust I/M Program:  Yes
               Evap I/M Program:  No
                    ATP Program:  Yes
               Reformulated Gas:  No

  Ether Blend Market Share: 0.000      Alcohol Blend Market Share: 1.000
  Ether Blend Oxygen Content: 0.000    Alcohol Blend Oxygen Content: 0.034
                                        Alcohol Blend RVP Waiver: Yes

     Vehicle Type:      LDGV    LDGT12    LDGT34     LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
             GVWR:               <6000     >6000    (All)
                      ------    ------    ------   ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:   0.4574    0.3556    0.1213             0.0169    0.0013    0.0019    0.0432    0.0024    1.0000
 ------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :      1.398     1.181     2.672     1.560     2.254     1.115     0.808     1.092      7.54     1.490
    Composite CO  :     19.64     20.34     24.12     21.30     32.60     2.623     2.028     6.579     27.83    20.052
    Composite NOX :      1.089     1.214     1.500     1.286     3.845     1.752     1.250    12.445      1.29     1.722
 ------------------------------------------------------------------------------------------------------------------------
        Veh. Type:    GasBUS     URBAN    SCHOOL
                      ------    ------    ------
          VMT Mix:    0.0007    0.0020    0.0036
------------------------------------------------------------------------------------------------------------------------
 Composite Emission Factors (g/mi):
    Composite VOC :     7.131     1.244     1.497
    Composite CO  :   108.62     10.971     6.036
    Composite NOX :     6.692    17.442    12.377
------------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG   urb  2005FA
* File 1, Run 1, Scenario 3.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading Hourly, Roadway, and Speed VMT dist. from the following external
* data file: SPEED\URB.DEF

* Reading Hourly VMT distribution from the following external
* data file: VMT\URB.DEF

* Reading Hourly Roadway VMT distribution from the following external
* data file: FACVMT\URB.DEF

  Reading User Supplied ROADWAY VMT Factors
  M615 Comment:
              User supplied VMT mix.
  M 48 Warning:
             there are no sales for vehicle class HDGV8b

                   Calendar Year:  2005
                           Month:  Jan.
                        Altitude:  High
             Minimum Temperature:  30.0 (F)
             Maximum Temperature:  58.0 (F)
```

```
         Absolute Humidity:   75. grains/lb
          Nominal Fuel RVP:  12.5 psi
             Weathered RVP:  13.1 psi
       Fuel Sulfur Content:  160. ppm

       Exhaust I/M Program:  Yes
          Evap I/M Program:  No
               ATP Program:  Yes
          Reformulated Gas:  No

 Ether Blend Market Share: 0.000      Alcohol Blend Market Share: 1.000
 Ether Blend Oxygen Content: 0.000    Alcohol Blend Oxygen Content: 0.034
                                       Alcohol Blend RVP Waiver: Yes
```

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.4418	0.3615	0.1234		0.0194	0.0013	0.0019	0.0480	0.0027	1.0000
Composite Emission Factors (g/mi):										
Composite VOC :	1.392	1.175	2.661	1.553	2.160	1.105	0.801	1.061	7.57	1.484
Composite CO :	19.54	20.24	24.02	21.20	31.40	2.608	2.017	6.446	28.64	19.919
Composite NOX :	1.085	1.209	1.494	1.281	3.826	1.769	1.263	12.246	1.30	1.771

Veh. Type:	GasBUS	URBAN	SCHOOL
VMT Mix:	0.0006	0.0016	0.0029
Composite Emission Factors (g/mi):			
Composite VOC :	7.013	1.224	1.472
Composite CO :	107.83	10.828	5.957
Composite NOX :	6.724	17.635	12.510

```
* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG   sub  2005FA
* File 1, Run 1, Scenario 4.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading Hourly, Roadway, and Speed VMT dist. from the following external
* data file: SPEED\SUB.DEF

* Reading Hourly VMT distribution from the following external
* data file: VMT\SUB.DEF

* Reading Hourly Roadway VMT distribution from the following external
* data file: FACVMT\SUB.DEF

  Reading User Supplied ROADWAY VMT Factors
  M615 Comment:
               User supplied VMT mix.
  M 48 Warning:
              there are no sales for vehicle class HDGV8b

                    Calendar Year:  2005
                            Month:  Jan.
                         Altitude:  High
             Minimum Temperature:  30.0 (F)
             Maximum Temperature:  58.0 (F)
               Absolute Humidity:   75. grains/lb
```

```
           Nominal Fuel RVP:  12.5 psi
              Weathered RVP:  13.1 psi
        Fuel Sulfur Content:  160. ppm

        Exhaust I/M Program:  Yes
           Evap I/M Program:  No
                ATP Program:  Yes
           Reformulated Gas:  No

 Ether Blend Market Share: 0.000       Alcohol Blend Market Share: 1.000
 Ether Blend Oxygen Content: 0.000     Alcohol Blend Oxygen Content: 0.034
                                        Alcohol Blend RVP Waiver: Yes
```

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.3915	0.4003	0.1366		0.0189	0.0011	0.0022	0.0467	0.0028	1.0000
Composite Emission Factors (g/mi):										
Composite VOC :	1.350	1.146	2.602	1.516	1.978	1.053	0.761	0.961	7.44	1.448
Composite CO :	19.93	20.65	24.41	21.61	29.34	2.519	1.951	5.928	27.60	20.317
Composite NOX :	1.093	1.218	1.502	1.290	3.951	1.816	1.297	12.638	1.35	1.794

Veh. Type:	GasBUS	URBAN	SCHOOL
VMT Mix:	0.0005	0.0015	0.0026
Composite Emission Factors (g/mi):			
Composite VOC :	6.363	1.111	1.336
Composite CO :	101.29	9.970	5.486
Composite NOX :	6.955	18.169	12.874

```
* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG   rur  2005FA
* File 1, Run 1, Scenario 5.
* # # # # # # # # # # # # # # # # # # # # # # # # #

* Reading Hourly, Roadway, and Speed VMT dist. from the following external
* data file: SPEED\RUR.DEF

* Reading Hourly VMT distribution from the following external
* data file: VMT\RUR.DEF

* Reading Hourly Roadway VMT distribution from the following external
* data file: FACVMT\RUR.DEF

  Reading User Supplied ROADWAY VMT Factors
  M615 Comment:
             User supplied VMT mix.
  M 48 Warning:
            there are no sales for vehicle class HDGV8b

              Calendar Year:  2005
                      Month:  Jan.
                   Altitude:  High
        Minimum Temperature:  30.0 (F)
        Maximum Temperature:  58.0 (F)
          Absolute Humidity:   75. grains/lb
           Nominal Fuel RVP:  12.5 psi
```

```
           Weathered RVP:  13.1 psi
     Fuel Sulfur Content:  160. ppm

     Exhaust I/M Program:  Yes
        Evap I/M Program:  No
             ATP Program:  Yes
        Reformulated Gas:  No

Ether Blend Market Share: 0.000      Alcohol Blend Market Share: 1.000
Ether Blend Oxygen Content: 0.000    Alcohol Blend Oxygen Content: 0.034
                                      Alcohol Blend RVP Waiver: Yes
```

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.4003	0.3893	0.1328		0.0203	0.0012	0.0021	0.0486	0.0054	1.0000
Composite Emission Factors (g/mi):										
Composite VOC :	1.306	1.113	2.535	1.475	1.785	1.006	0.724	0.862	7.55	1.414
Composite CO :	20.60	21.37	25.17	22.34	29.20	2.488	1.928	5.713	31.29	20.954
Composite NOX :	1.115	1.243	1.526	1.315	4.107	2.045	1.463	14.364	1.43	1.928

Veh. Type:	GasBUS	URBAN	SCHOOL
VMT Mix:	0.0003	0.0010	0.0017
Composite Emission Factors (g/mi):			
Composite VOC :	5.802	1.008	1.213
Composite CO :	103.61	9.673	5.322
Composite NOX :	7.291	20.751	14.633

```
*****************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                                *
* Input file: BUS_PM.IN (file 1, run 1).                                    *
*****************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG     cbd     2005
* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2005
                                      Month:  Jan.
               Gasoline Fuel Sulfur Content:  160. ppm
                 Diesel Fuel Sulfur Content:   12. ppm
                       Particle Size Cutoff: 10.00 Microns
                           Reformulated Gas:  No
```

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.4990	0.3166	0.1080		0.0138	0.0014	0.0017	0.0550	0.0044	1.0000
Composite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	------	------	------	0.0000	0.0000
GASPM:	0.0042	0.0045	0.0068	0.0051	0.0885	------	------	------	0.0205	0.0056
ECARBON:	------	------	------	------	------	0.1627	0.0515	0.3324	------	0.0186
OCARBON:	------	------	------	------	------	0.0459	0.0741	0.2399	------	0.0134
SO4:	0.0026	0.0031	0.0035	0.0032	0.0041	0.0001	0.0002	0.0009	0.0008	0.0027
Total Exhaust PM:	0.0068	0.0076	0.0103	0.0083	0.0927	0.2087	0.1258	0.5732	0.0213	0.0403
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0096	0.0080	0.0080	0.0180	0.0040	0.0086
Total PM:	0.0273	0.0281	0.0308	0.0288	0.1148	0.2293	0.1464	0.6038	0.0379	0.0614
SO2:	0.0362	0.0464	0.0610	0.0501	0.1046	0.0028	0.0043	0.0127	0.0174	0.0416
NH3:	0.1013	0.1006	0.0929	0.0986	0.0451	0.0068	0.0068	0.0270	0.0113	0.0946

Veh. Type:	GasBUS	URBAN	SCHOOL
VMT Mix:	0.0039	0.0115	0.0204
Composite Emission Factors (g/mi):			
Lead:	0.0000	------	------
GASPM:	0.1530	------	------
ECARBON:	------	0.4068	0.4575
OCARBON:	------	0.3197	0.3595
SO4:	0.0015	0.0012	0.0009
Total Exhaust PM:	0.1545	0.7278	0.8179
Brake:	0.0125	0.0125	0.0125
Tire:	0.0120	0.0120	0.0120
Total PM:	0.1791	0.7523	0.8424
SO2:	0.1410	0.0178	0.0122
NH3:	0.0451	0.0270	0.0270

```
* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG     frn     2005
* File 1, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2005
                                      Month:  Jan.
```

Gasoline Fuel Sulfur Content: 160. ppm
Diesel Fuel Sulfur Content: 12. ppm
Particle Size Cutoff: 10.00 Microns
Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.4574	0.3556	0.1213		0.0169	0.0013	0.0019	0.0432	0.0024	1.0000
Composite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	------	------	------	0.0000	0.0000
GASPM:	0.0042	0.0045	0.0068	0.0051	0.0673	------	------	------	0.0205	0.0056
ECARBON:	------	------	------	------	------	0.1627	0.0515	0.2172	------	0.0097
OCARBON:	------	------	------	------	------	0.0459	0.0741	0.1265	------	0.0057
SO4:	0.0021	0.0028	0.0033	0.0029	0.0053	0.0001	0.0002	0.0008	0.0007	0.0025
Total Exhaust PM:	0.0064	0.0073	0.0101	0.0081	0.0726	0.2087	0.1258	0.3445	0.0211	0.0234
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0088	0.0080	0.0080	0.0245	0.0040	0.0087
Total PM:	0.0269	0.0279	0.0307	0.0286	0.0940	0.2293	0.1464	0.3815	0.0377	0.0447
SO2:	0.0363	0.0465	0.0610	0.0502	0.0925	0.0028	0.0043	0.0110	0.0175	0.0426
NH3:	0.1013	0.1006	0.0929	0.0986	0.0451	0.0068	0.0068	0.0270	0.0113	0.0954

Veh. Type:	GasBUS	URBAN	SCHOOL
VMT Mix:	0.0007	0.0020	0.0036
Composite Emission Factors (g/mi):			
Lead:	0.0000	------	------
GASPM:	0.1530	------	------
ECARBON:	------	0.4069	0.4576
OCARBON:	------	0.3197	0.3595
SO4:	0.0014	0.0012	0.0009
Total Exhaust PM:	0.1545	0.7278	0.8179
Brake:	0.0125	0.0125	0.0125
Tire:	0.0120	0.0120	0.0120
Total PM:	0.1790	0.7523	0.8425
SO2:	0.1410	0.0178	0.0122
NH3:	0.0451	0.0270	0.0270

* #
* DRCOG urb 2005
* File 1, Run 1, Scenario 3.
* #

Calendar Year: 2005
Month: Jan.
Gasoline Fuel Sulfur Content: 160. ppm
Diesel Fuel Sulfur Content: 12. ppm
Particle Size Cutoff: 10.00 Microns
Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.4418	0.3615	0.1234		0.0194	0.0013	0.0019	0.0480	0.0027	1.0000
Composite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	------	------	------	0.0000	0.0000

```
            GASPM:    0.0042   0.0045   0.0068   0.0051   0.0662   ------   ------   ------   0.0205   0.0057
          ECARBON:    ------   ------   ------   ------   ------   0.1627   0.0515   0.2083   ------   0.0103
          OCARBON:    ------   ------   ------   ------   ------   0.0459   0.0741   0.1175   ------   0.0058
              SO4:    0.0019   0.0027   0.0032   0.0028   0.0056   0.0001   0.0002   0.0008   0.0006   0.0024
 Total Exhaust PM:    0.0062   0.0072   0.0100   0.0079   0.0718   0.2087   0.1258   0.3266   0.0211   0.0242
            Brake:    0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125
             Tire:    0.0080   0.0080   0.0080   0.0080   0.0088   0.0080   0.0080   0.0250   0.0040   0.0088
         Total PM:    0.0267   0.0278   0.0306   0.0285   0.0931   0.2292   0.1464   0.3641   0.0376   0.0456
              SO2:    0.0363   0.0466   0.0610   0.0502   0.0918   0.0028   0.0043   0.0109   0.0175   0.0428
              NH3:    0.1013   0.1006   0.0928   0.0986   0.0451   0.0068   0.0068   0.0270   0.0113   0.0948
-----------------------------------------------------------------------------------------------------------------------
        Veh. Type:    GasBUS    URBAN   SCHOOL
                      ------   ------   ------
          VMT Mix:    0.0006   0.0016   0.0029
-----------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
             Lead:    0.0000   ------   ------
            GASPM:    0.1530   ------   ------
          ECARBON:    ------   0.4068   0.4575
          OCARBON:    ------   0.3196   0.3595
              SO4:    0.0014   0.0012   0.0009
 Total Exhaust PM:    0.1544   0.7277   0.8178
            Brake:    0.0125   0.0125   0.0125
             Tire:    0.0120   0.0120   0.0120
         Total PM:    0.1790   0.7522   0.8424
              SO2:    0.1410   0.0178   0.0122
              NH3:    0.0451   0.0270   0.0270
-----------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG     sub     2005
* File 1, Run 1, Scenario 4.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                         Calendar Year:  2005
                                 Month:  Jan.
              Gasoline Fuel Sulfur Content:  160. ppm
                Diesel Fuel Sulfur Content:   12. ppm
                     Particle Size Cutoff: 10.00 Microns
                         Reformulated Gas:  No

     Vehicle Type:      LDGV   LDGT12   LDGT34     LDGT     HDGV     LDDV     LDDT     HDDV       MC  All Veh
             GVWR:              <6000    >6000    (All)
                      ------   ------   ------   ------   ------   ------   ------   ------   ------   ------
 VMT Distribution:    0.3915   0.4003   0.1366            0.0189   0.0011   0.0022   0.0467   0.0028   1.0000
-----------------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
             Lead:    0.0000   0.0000   0.0000   0.0000   0.0000   ------   ------   ------   0.0000   0.0000
            GASPM:    0.0042   0.0045   0.0068   0.0051   0.0660   ------   ------   ------   0.0205   0.0057
          ECARBON:    ------   ------   ------   ------   ------   0.1627   0.0515   0.2063   ------   0.0099
          OCARBON:    ------   ------   ------   ------   ------   0.0459   0.0741   0.1158   ------   0.0056
              SO4:    0.0018   0.0026   0.0032   0.0028   0.0056   0.0001   0.0002   0.0008   0.0005   0.0023
 Total Exhaust PM:    0.0061   0.0072   0.0100   0.0079   0.0717   0.2087   0.1258   0.3229   0.0210   0.0236
            Brake:    0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125   0.0125
             Tire:    0.0080   0.0080   0.0080   0.0080   0.0088   0.0080   0.0080   0.0251   0.0040   0.0088
         Total PM:    0.0266   0.0277   0.0305   0.0284   0.0930   0.2292   0.1464   0.3605   0.0376   0.0449
              SO2:    0.0364   0.0466   0.0610   0.0503   0.0917   0.0028   0.0043   0.0108   0.0175   0.0435
              NH3:    0.1013   0.1006   0.0928   0.0986   0.0451   0.0068   0.0068   0.0270   0.0113   0.0948
-----------------------------------------------------------------------------------------------------------------------
        Veh. Type:    GasBUS    URBAN   SCHOOL
```

```
                   ------    ------    ------
         VMT Mix:  0.0005    0.0015    0.0026
------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
            Lead:  0.0000    ------    ------
           GASPM:  0.1530    ------    ------
         ECARBON:  ------    0.4068    0.4575
         OCARBON:  ------    0.3196    0.3594
             SO4:  0.0014    0.0012    0.0009
Total Exhaust PM:  0.1544    0.7276    0.8178
           Brake:  0.0125    0.0125    0.0125
            Tire:  0.0120    0.0120    0.0120
        Total PM:  0.1790    0.7522    0.8423
             SO2:  0.1410    0.0178    0.0122
             NH3:  0.0451    0.0270    0.0270
------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* DRCOG     rur     2005
* File 1, Run 1, Scenario 5.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                    Calendar Year:  2005
                            Month:  Jan.
    Gasoline Fuel Sulfur Content:  160. ppm
      Diesel Fuel Sulfur Content:   12. ppm
            Particle Size Cutoff: 10.00 Microns
               Reformulated Gas:  No
```

Vehicle Type: GVWR:	LDGV	LDGT12 <6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
VMT Distribution:	0.4003	0.3893	0.1328		0.0203	0.0012	0.0021	0.0486	0.0054	1.0000
Composite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	------	------	------	0.0000	0.0000
GASPM:	0.0042	0.0045	0.0068	0.0051	0.0651	------	------	------	0.0205	0.0058
ECARBON:	------	------	------	------	------	0.1627	0.0515	0.1981	------	0.0099
OCARBON:	------	------	------	------	------	0.0459	0.0741	0.1075	------	0.0054
SO4:	0.0018	0.0026	0.0031	0.0027	0.0058	0.0001	0.0002	0.0008	0.0005	0.0023
Total Exhaust PM:	0.0060	0.0071	0.0100	0.0078	0.0708	0.2088	0.1259	0.3064	0.0210	0.0234
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0087	0.0080	0.0080	0.0256	0.0040	0.0089
Total PM:	0.0266	0.0277	0.0305	0.0284	0.0921	0.2293	0.1464	0.3445	0.0376	0.0448
SO2:	0.0364	0.0466	0.0611	0.0503	0.0911	0.0028	0.0043	0.0107	0.0175	0.0433
NH3:	0.1014	0.1006	0.0929	0.0987	0.0451	0.0068	0.0068	0.0270	0.0113	0.0944

Veh. Type:	GasBUS	URBAN	SCHOOL
VMT Mix:	0.0003	0.0010	0.0017
Composite Emission Factors (g/mi):			
Lead:	0.0000	------	------
GASPM:	0.1531	------	------
ECARBON:	------	0.4069	0.4576
OCARBON:	------	0.3197	0.3596
SO4:	0.0014	0.0012	0.0009
Total Exhaust PM:	0.1545	0.7279	0.8181
Brake:	0.0125	0.0125	0.0125
Tire:	0.0120	0.0120	0.0120

Total PM:	0.1790	0.7525	0.8426
SO2:	0.1411	0.0178	0.0122
NH3:	0.0451	0.0270	0.0270

Appendix 9
MOBILE6.2 Output Files for Mobile Source Air Toxics for 2005

```
* # # # # # # # # # # # # # # # # # # # # # # # # #
* CBD
* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                        Calendar Year:  2005
                                Month:  Jan.
       Market Weighted Oxygen Level: 3.314 wt%
       Gasoline Fuel Sulfur Content:  160. ppm
                Maximum Temperature:  85.0 F
                Minimum Temperature:  55.0 F
                      Weathered RVP:   8.8 psi
                               E200: 48.20 %
                               E300: 81.10 %
                          Aromatics: 27.60 vol%
                            Olefins: 11.80 vol%
                            Benzene:  1.16 vol%
                               MTBE:  0.00 vol% (market fraction: 0.000)
                               ETBE:  0.00 vol% (market fraction: 0.000)
                            Ethanol:  9.50 vol% (market fraction: 1.000)
                               TAME:  0.00 vol% (market fraction: 0.000)

      Vehicle Type:     LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:              <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:   0.4990    0.3166    0.1080              0.0138    0.0014    0.0017    0.0550    0.0044    1.0000
-----------------------------------------------------------------------------------------------------------------------
Exhaust Emission Factors (mg/mi):
           Benzene:    29.55     31.10     56.87     37.66     72.23     23.05     16.62     14.37    148.60    33.243
              MTBE:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     1,3 Butadiene:     3.62      3.07      6.11      3.84     13.59     10.37      7.48      8.35     47.77     4.319
      Formaldehyde:     6.36      7.79     23.05     11.67     67.07     44.48     32.08    107.01    114.35    15.563
      Acetaldehyde:     5.78      6.41     17.33      9.19     28.29     14.17     10.22     39.41     58.13     9.639
          Acrolein:     0.34      0.36      0.83      0.48      6.91      4.03      2.91      4.79      2.79     0.753
-----------------------------------------------------------------------------------------------------------------------
Evaporative Emission Factors (mg/mi):
 Benzene Hot Soak :     1.84      1.10      1.85      1.29      3.58      0.00      0.00      0.00      2.59     1.526
 Benzene Diurnal  :     0.51      0.31      0.77      0.43      1.13      0.00      0.00      0.00      9.37     0.491
 Benzene Running  :     2.73      1.58      2.32      1.77      4.54      0.00      0.00      0.00      0.00     2.178
 Benzene Resting  :     1.09      0.61      1.71      0.89      2.21      0.00      0.00      0.00     15.84     1.022
 Benzene Refueling:     0.54      0.86      1.69      1.07      3.18      0.00      0.00      0.00      0.00     0.768
 Benzene Total Evp:     6.71      4.45      8.33      5.44     14.64      0.00      0.00      0.00     27.80     5.985
    MTBE Hot Soak :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Diurnal  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Running  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Resting  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Refueling:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Total Evp:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
-----------------------------------------------------------------------------------------------------------------------
Exhaust + Evaporative Emission Factors (mg/mi):
 Benzene Exh + Evp:    36.27     35.55     65.21     43.10     86.87     23.05     16.62     14.37    176.41    39.228
    MTBE Exh + Evp:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
-----------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* Fringe
* File 1, Run 1, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # #
```

```
                  Calendar Year:  2005
                          Month:  Jan.
 Market Weighted Oxygen Level: 3.314 wt%
 Gasoline Fuel Sulfur Content:  160. ppm
          Maximum Temperature:  85.0 F
          Minimum Temperature:  55.0 F
                Weathered RVP:   8.8 psi
                         E200: 48.20 %
                         E300: 81.10 %
                    Aromatics: 27.60 vol%
                      Olefins: 11.80 vol%
                      Benzene:  1.16 vol%
                         MTBE:  0.00 vol% (market fraction: 0.000)
                         ETBE:  0.00 vol% (market fraction: 0.000)
                      Ethanol:  9.50 vol% (market fraction: 1.000)
                         TAME:  0.00 vol% (market fraction: 0.000)
```

Vehicle Type: GVWR:	LDGV	LDGT12 <6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
VMT Distribution:	0.4574	0.3556	0.1213		0.0169	0.0013	0.0019	0.0432	0.0024	1.0000
Exhaust Emission Factors (mg/mi):										
Benzene:	29.55	31.10	56.88	37.66	46.07	23.05	16.62	12.50	148.60	33.214
MTBE:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
1,3 Butadiene:	3.62	3.07	6.11	3.84	6.38	10.37	7.48	7.26	47.77	4.049
Formaldehyde:	6.36	7.79	23.05	11.67	34.20	44.48	32.08	93.06	114.35	13.469
Acetaldehyde:	5.78	6.41	17.33	9.19	16.58	14.17	10.22	34.27	58.13	8.966
Acrolein:	0.34	0.36	0.83	0.48	2.94	4.03	2.91	4.17	2.79	0.629
Evaporative Emission Factors (mg/mi):										
Benzene Hot Soak :	1.84	1.10	1.85	1.29	2.06	0.00	0.00	0.00	2.59	1.497
Benzene Diurnal :	0.51	0.31	0.77	0.43	0.73	0.00	0.00	0.00	9.37	0.470
Benzene Running :	2.73	1.58	2.32	1.77	2.66	0.00	0.00	0.00	0.00	2.139
Benzene Resting :	1.09	0.61	1.71	0.89	1.40	0.00	0.00	0.00	15.84	0.985
Benzene Refueling:	0.54	0.86	1.69	1.07	2.83	0.00	0.00	0.00	0.00	0.805
Benzene Total Evp:	6.71	4.45	8.34	5.44	9.68	0.00	0.00	0.00	27.80	5.896
MTBE Hot Soak :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Diurnal :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Running :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Resting :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Refueling:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Total Evp:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
Exhaust + Evaporative Emission Factors (mg/mi):										
Benzene Exh + Evp:	36.27	35.55	65.22	43.10	55.75	23.05	16.62	12.50	176.41	39.110
MTBE Exh + Evp:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000

```
* # # # # # # # # # # # # # # # # # # # # # # # # #
* Urban
* File 1, Run 1, Scenario 3.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                  Calendar Year:  2005
                          Month:  Jan.
 Market Weighted Oxygen Level: 3.314 wt%
 Gasoline Fuel Sulfur Content:  160. ppm
          Maximum Temperature:  85.0 F
          Minimum Temperature:  55.0 F
```

Weathered RVP: 8.8 psi
E200: 48.20 %
E300: 81.10 %
Aromatics: 27.60 vol%
Olefins: 11.80 vol%
Benzene: 1.16 vol%
MTBE: 0.00 vol% (market fraction: 0.000)
ETBE: 0.00 vol% (market fraction: 0.000)
Ethanol: 9.50 vol% (market fraction: 1.000)
TAME: 0.00 vol% (market fraction: 0.000)

Vehicle Type: GVWR:	LDGV	LDGT12 <6000	LDGT34 >6000	LDGT (All)	HDGV	LDDV	LDDT	HDDV	MC	All Veh
VMT Distribution:	0.4418	0.3615	0.1234		0.0194	0.0013	0.0019	0.0480	0.0027	1.0000
Exhaust Emission Factors (mg/mi):										
Benzene:	29.55	31.10	56.89	37.66	44.72	23.05	16.62	12.35	148.60	33.241
MTBE:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
1,3 Butadiene:	3.62	3.06	6.11	3.84	6.01	10.37	7.48	7.17	47.77	4.077
Formaldehyde:	6.36	7.79	23.06	11.68	32.50	44.48	32.07	91.97	114.35	13.945
Acetaldehyde:	5.78	6.41	17.33	9.19	15.98	14.17	10.22	33.87	58.13	9.142
Acrolein:	0.34	0.36	0.83	0.48	2.73	4.03	2.91	4.12	2.79	0.649
Evaporative Emission Factors (mg/mi):										
Benzene Hot Soak :	1.84	1.10	1.85	1.29	1.98	0.00	0.00	0.00	2.59	1.483
Benzene Diurnal :	0.51	0.31	0.77	0.43	0.71	0.00	0.00	0.00	9.37	0.470
Benzene Running :	2.73	1.58	2.32	1.77	2.57	0.00	0.00	0.00	0.00	2.115
Benzene Resting :	1.09	0.61	1.71	0.89	1.36	0.00	0.00	0.00	15.84	0.982
Benzene Refueling:	0.54	0.86	1.69	1.07	2.81	0.00	0.00	0.00	0.00	0.812
Benzene Total Evp:	6.71	4.45	8.34	5.44	9.42	0.00	0.00	0.00	27.80	5.862
MTBE Hot Soak :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Diurnal :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Running :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Resting :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Refueling:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Total Evp:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
Exhaust + Evaporative Emission Factors (mg/mi):										
Benzene Exh + Evp:	36.27	35.55	65.23	43.10	54.15	23.05	16.62	12.35	176.41	39.103
MTBE Exh + Evp:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000

* #
* Suburban
* File 1, Run 1, Scenario 4.
* #

Calendar Year: 2005
Month: Jan.
Market Weighted Oxygen Level: 3.314 wt%
Gasoline Fuel Sulfur Content: 160. ppm
Maximum Temperature: 85.0 F
Minimum Temperature: 55.0 F
Weathered RVP: 8.8 psi
E200: 48.20 %
E300: 81.10 %
Aromatics: 27.60 vol%
Olefins: 11.80 vol%
Benzene: 1.16 vol%

MTBE: 0.00 vol% (market fraction: 0.000)
ETBE: 0.00 vol% (market fraction: 0.000)
Ethanol: 9.50 vol% (market fraction: 1.000)
TAME: 0.00 vol% (market fraction: 0.000)

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.3915	0.4003	0.1366		0.0189	0.0011	0.0022	0.0467	0.0028	1.0000
Exhaust Emission Factors (mg/mi):										
Benzene:	29.55	31.10	56.87	37.66	44.49	23.05	16.62	12.31	148.60	33.680
MTBE:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
1,3 Butadiene:	3.62	3.06	6.11	3.84	5.95	10.37	7.48	7.15	47.77	4.085
Formaldehyde:	6.36	7.79	23.05	11.67	32.22	44.48	32.07	91.69	114.35	14.086
Acetaldehyde:	5.78	6.41	17.32	9.19	15.87	14.17	10.22	33.77	58.13	9.275
Acrolein:	0.34	0.36	0.83	0.48	2.70	4.03	2.91	4.10	2.79	0.649
Evaporative Emission Factors (mg/mi):										
Benzene Hot Soak :	1.84	1.10	1.85	1.29	1.96	0.00	0.00	0.00	2.59	1.457
Benzene Diurnal :	0.51	0.31	0.77	0.43	0.70	0.00	0.00	0.00	9.37	0.467
Benzene Running :	2.73	1.58	2.32	1.77	2.55	0.00	0.00	0.00	0.00	2.068
Benzene Resting :	1.09	0.61	1.71	0.89	1.35	0.00	0.00	0.00	15.84	0.974
Benzene Refueling:	0.54	0.86	1.69	1.07	2.81	0.00	0.00	0.00	0.00	0.838
Benzene Total Evp:	6.71	4.45	8.33	5.44	9.38	0.00	0.00	0.00	27.80	5.804
MTBE Hot Soak :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Diurnal :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Running :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Resting :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Refueling:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
MTBE Total Evp:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
Exhaust + Evaporative Emission Factors (mg/mi):										
Benzene Exh + Evp:	36.27	35.55	65.21	43.10	53.88	23.05	16.62	12.31	176.41	39.484
MTBE Exh + Evp:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000

* #
* Rural
* File 1, Run 1, Scenario 5.
* #

Calendar Year: 2005
Month: Jan.
Market Weighted Oxygen Level: 3.314 wt%
Gasoline Fuel Sulfur Content: 160. ppm
Maximum Temperature: 85.0 F
Minimum Temperature: 55.0 F
Weathered RVP: 8.8 psi
E200: 48.20 %
E300: 81.10 %
Aromatics: 27.60 vol%
Olefins: 11.80 vol%
Benzene: 1.16 vol%
MTBE: 0.00 vol% (market fraction: 0.000)
ETBE: 0.00 vol% (market fraction: 0.000)
Ethanol: 9.50 vol% (market fraction: 1.000)
TAME: 0.00 vol% (market fraction: 0.000)

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh

```
            GVWR:              <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:   0.4003    0.3893    0.1328              0.0203    0.0012    0.0021    0.0486    0.0054    1.0000
-----------------------------------------------------------------------------------------------------------------------
Exhaust Emission Factors (mg/mi):
           Benzene:    29.55     31.10     56.88     37.66     43.31     23.05     16.62     12.18    148.60    33.829
              MTBE:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     1,3 Butadiene:     3.62      3.07      6.11      3.84      5.62     10.37      7.48      7.07     47.77     4.196
      Formaldehyde:     6.36      7.79     23.06     11.67     30.73     44.48     32.07     90.69    114.35    14.412
      Acetaldehyde:     5.78      6.41     17.33      9.19     15.34     14.17     10.22     33.40     58.13     9.401
          Acrolein:     0.34      0.36      0.83      0.48      2.52      4.03      2.91      4.06      2.79     0.658
-----------------------------------------------------------------------------------------------------------------------
Evaporative Emission Factors (mg/mi):
 Benzene Hot Soak :     1.84      1.10      1.85      1.29      1.90      0.00      0.00      0.00      2.59     1.463
 Benzene Diurnal  :     0.51      0.31      0.77      0.43      0.69      0.00      0.00      0.00      9.37     0.490
 Benzene Running  :     2.73      1.58      2.32      1.77      2.46      0.00      0.00      0.00      0.00     2.068
 Benzene Resting  :     1.09      0.61      1.71      0.89      1.32      0.00      0.00      0.00     15.84     1.013
 Benzene Refueling:     0.54      0.86      1.69      1.07      2.79      0.00      0.00      0.00      0.00     0.831
 Benzene Total Evp:     6.71      4.45      8.34      5.44      9.16      0.00      0.00      0.00     27.80     5.865
    MTBE Hot Soak :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Diurnal  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Running  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Resting  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Refueling:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Total Evp:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
-----------------------------------------------------------------------------------------------------------------------
Exhaust + Evaporative Emission Factors (mg/mi):
 Benzene Exh + Evp:    36.27     35.55     65.22     43.10     52.47     23.05     16.62     12.18    176.41    39.694
    MTBE Exh + Evp:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
-----------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* CBD
* File 1, Run 2, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                             Calendar Year:  2005
                                     Month:  Jan.
              Market Weighted Oxygen Level: 3.314 wt%
              Gasoline Fuel Sulfur Content:  160. ppm
                       Maximum Temperature:  40.0 F
                       Minimum Temperature:  20.0 F
                             Weathered RVP:  12.5 psi
                                      E200: 55.10 %
                                      E300: 83.10 %
                                 Aromatics: 24.90 vol%
                                   Olefins: 11.50 vol%
                                   Benzene:  1.08 vol%
                                      MTBE:  0.00 vol% (market fraction: 0.000)
                                      ETBE:  0.00 vol% (market fraction: 0.000)
                                   Ethanol:  9.50 vol% (market fraction: 1.000)
                                      TAME:  0.00 vol% (market fraction: 0.000)

      Vehicle Type:     LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:              <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:   0.4990    0.3166    0.1080              0.0138    0.0014    0.0017    0.0550    0.0044    1.0000
-----------------------------------------------------------------------------------------------------------------------
Exhaust Emission Factors (mg/mi):
           Benzene:    38.74     40.46     77.74     49.94     79.62     23.05     16.62     14.37    147.98    43.141
```

```
              MTBE:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     1,3 Butadiene:      5.09      4.22      9.13      5.47     15.97     10.37      7.48      8.35     54.33     5.810
      Formaldehyde:      9.45     11.82     37.12     18.25     79.65     44.48     32.08    107.01    130.05    20.139
      Acetaldehyde:      8.54     10.35     28.37     14.93     34.30     14.17     10.22     39.41     66.11    13.571
          Acrolein:      0.54      0.56      1.35      0.76      8.02      4.03      2.91      4.79      3.17     0.989
-----------------------------------------------------------------------------------------------------------------------
Evaporative Emission Factors (mg/mi):
 Benzene Hot Soak :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
 Benzene Diurnal  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
 Benzene Running  :      1.33      0.76      1.07      0.84      1.99      0.00      0.00      0.00      0.00     1.046
 Benzene Resting  :      0.74      0.39      1.24      0.61      1.29      0.00      0.00      0.00      8.66     0.683
 Benzene Refueling:      0.47      0.74      1.45      0.92      2.74      0.00      0.00      0.00      0.00     0.662
 Benzene Total Evp:      2.53      1.89      3.76      2.37      6.02      0.00      0.00      0.00      8.66     2.390
    MTBE Hot Soak :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Diurnal  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Running  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Resting  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Refueling:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
    MTBE Total Evp:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
-----------------------------------------------------------------------------------------------------------------------
Exhaust + Evaporative Emission Factors (mg/mi):
 Benzene Exh + Evp:     41.27     42.36     81.50     52.31     85.64     23.05     16.62     14.37    156.64    45.532
    MTBE Exh + Evp:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
-----------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* Fringe
* File 1, Run 2, Scenario 2.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2005
                                      Month:  Jan.
               Market Weighted Oxygen Level: 3.314 wt%
               Gasoline Fuel Sulfur Content:  160. ppm
                        Maximum Temperature:  40.0 F
                        Minimum Temperature:  20.0 F
                              Weathered RVP:  12.5 psi
                                       E200: 55.10 %
                                       E300: 83.10 %
                                  Aromatics: 24.90 vol%
                                    Olefins: 11.50 vol%
                                    Benzene:  1.08 vol%
                                       MTBE:  0.00 vol% (market fraction: 0.000)
                                       ETBE:  0.00 vol% (market fraction: 0.000)
                                    Ethanol:  9.50 vol% (market fraction: 1.000)
                                       TAME:  0.00 vol% (market fraction: 0.000)

      Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:               <6000     >6000     (All)
                       ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.4574    0.3556    0.1213              0.0169    0.0013    0.0019    0.0432    0.0024    1.0000
-----------------------------------------------------------------------------------------------------------------------
Exhaust Emission Factors (mg/mi):
           Benzene:     38.74     40.46     77.75     49.95     54.35     23.05     16.62     12.50    147.98    43.413
              MTBE:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     1,3 Butadiene:      5.09      4.22      9.13      5.47      7.78     10.37      7.48      7.26     54.33     5.541
      Formaldehyde:      9.45     11.82     37.13     18.26     42.50     44.48     32.08     93.06    130.05    18.195
      Acetaldehyde:      8.54     10.35     28.37     14.93     21.18     14.17     10.22     34.27     66.11    13.063
          Acrolein:      0.54      0.56      1.35      0.76      3.49      4.03      2.91      4.17      3.17     0.864
-----------------------------------------------------------------------------------------------------------------------
```

```
 Evaporative Emission Factors (mg/mi):
  Benzene Hot Soak :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
  Benzene Diurnal  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
  Benzene Running  :      1.33      0.76      1.07      0.84      1.19      0.00      0.00      0.00      0.00      1.027
  Benzene Resting  :      0.74      0.39      1.24      0.61      0.83      0.00      0.00      0.00      8.66      0.663
  Benzene Refueling:      0.47      0.74      1.45      0.92      2.43      0.00      0.00      0.00      0.00      0.694
  Benzene Total Evp:      2.53      1.89      3.76      2.37      4.46      0.00      0.00      0.00      8.66      2.383
     MTBE Hot Soak :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
     MTBE Diurnal  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
     MTBE Running  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
     MTBE Resting  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
     MTBE Refueling:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
     MTBE Total Evp:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
 -------------------------------------------------------------------------------------------------------------------------
 Exhaust + Evaporative Emission Factors (mg/mi):
  Benzene Exh + Evp:     41.27     42.36     81.51     52.32     58.81     23.05     16.62     12.50    156.64     45.797
     MTBE Exh + Evp:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
 -------------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* Urban
* File 1, Run 2, Scenario 3.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2005
                                      Month:  Jan.
               Market Weighted Oxygen Level: 3.314 wt%
               Gasoline Fuel Sulfur Content:  160. ppm
                        Maximum Temperature:  40.0 F
                        Minimum Temperature:  20.0 F
                              Weathered RVP:  12.5 psi
                                       E200: 55.10 %
                                       E300: 83.10 %
                                  Aromatics: 24.90 vol%
                                    Olefins: 11.50 vol%
                                    Benzene:  1.08 vol%
                                       MTBE:  0.00 vol% (market fraction: 0.000)
                                       ETBE:  0.00 vol% (market fraction: 0.000)
                                    Ethanol:  9.50 vol% (market fraction: 1.000)
                                       TAME:  0.00 vol% (market fraction: 0.000)

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
               GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
   VMT Distribution:    0.4418    0.3615    0.1234              0.0194    0.0013    0.0019    0.0480    0.0027    1.0000
 -------------------------------------------------------------------------------------------------------------------------
 Exhaust Emission Factors (mg/mi):
            Benzene:     38.74     40.46     77.76     49.95     53.06     23.05     16.62     12.35    147.98     43.416
               MTBE:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
      1,3 Butadiene:      5.09      4.22      9.14      5.47      7.36     10.37      7.48      7.17     54.33      5.564
       Formaldehyde:      9.45     11.82     37.13     18.26     40.58     44.48     32.07     91.97    130.05     18.698
       Acetaldehyde:      8.54     10.35     28.38     14.94     20.50     14.17     10.22     33.87     66.11     13.255
           Acrolein:      0.54      0.56      1.35      0.76      3.26      4.03      2.91      4.12      3.17      0.885
 -------------------------------------------------------------------------------------------------------------------------
 Evaporative Emission Factors (mg/mi):
  Benzene Hot Soak :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
  Benzene Diurnal  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
  Benzene Running  :      1.33      0.76      1.07      0.84      1.15      0.00      0.00      0.00      0.00      1.016
  Benzene Resting  :      0.74      0.39      1.24      0.61      0.81      0.00      0.00      0.00      8.66      0.660
  Benzene Refueling:      0.47      0.74      1.45      0.92      2.42      0.00      0.00      0.00      0.00      0.699
```

```
 Benzene Total Evp:      2.53      1.89      3.76      2.37      4.38      0.00      0.00      0.00      8.66      2.375
    MTBE Hot Soak :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Diurnal  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Running  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Resting  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Refueling:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Total Evp:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
-----------------------------------------------------------------------------------------------------------------------
Exhaust + Evaporative Emission Factors (mg/mi):
 Benzene Exh + Evp:     41.27     42.35     81.52     52.32     57.43     23.05     16.62     12.35    156.64     45.791
    MTBE Exh + Evp:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
-----------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* Suburban
* File 1, Run 2, Scenario 4.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                              Calendar Year:  2005
                                      Month:  Jan.
               Market Weighted Oxygen Level: 3.314 wt%
               Gasoline Fuel Sulfur Content:  160. ppm
                        Maximum Temperature:  40.0 F
                        Minimum Temperature:  20.0 F
                              Weathered RVP:  12.5 psi
                                       E200: 55.10 %
                                       E300: 83.10 %
                                  Aromatics: 24.90 vol%
                                    Olefins: 11.50 vol%
                                    Benzene:  1.08 vol%
                                       MTBE:  0.00 vol% (market fraction: 0.000)
                                       ETBE:  0.00 vol% (market fraction: 0.000)
                                    Ethanol:  9.50 vol% (market fraction: 1.000)
                                       TAME:  0.00 vol% (market fraction: 0.000)

     Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC    All Veh
             GVWR:               <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------     ------
  VMT Distribution:   0.3915    0.4003    0.1366              0.0189    0.0011    0.0022    0.0467    0.0028     1.0000
-----------------------------------------------------------------------------------------------------------------------
Exhaust Emission Factors (mg/mi):
          Benzene:     38.74     40.46     77.74     49.94     52.83     23.05     16.62     12.31    147.98     44.027
             MTBE:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    1,3 Butadiene:      5.09      4.22      9.13      5.47      7.29     10.37      7.48      7.15     54.33      5.582
     Formaldehyde:      9.45     11.82     37.11     18.25     40.26     44.48     32.07     91.69    130.05     19.022
     Acetaldehyde:      8.54     10.35     28.37     14.93     20.39     14.17     10.22     33.77     66.11     13.545
         Acrolein:      0.54      0.56      1.35      0.76      3.22      4.03      2.91      4.10      3.17      0.889
-----------------------------------------------------------------------------------------------------------------------
Evaporative Emission Factors (mg/mi):
 Benzene Hot Soak :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
 Benzene Diurnal  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
 Benzene Running  :      1.33      0.76      1.07      0.84      1.14      0.00      0.00      0.00      0.00      0.992
 Benzene Resting  :      0.74      0.39      1.24      0.61      0.80      0.00      0.00      0.00      8.66      0.655
 Benzene Refueling:      0.47      0.74      1.45      0.92      2.42      0.00      0.00      0.00      0.00      0.722
 Benzene Total Evp:      2.53      1.89      3.76      2.37      4.36      0.00      0.00      0.00      8.66      2.369
    MTBE Hot Soak :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Diurnal  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Running  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Resting  :      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
    MTBE Refueling:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.000
```

```
    MTBE Total Evp:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
 -----------------------------------------------------------------------------------------------------------------------
 Exhaust + Evaporative Emission Factors (mg/mi):
  Benzene Exh + Evp:     41.27     42.36     81.50     52.31     57.20     23.05     16.62     12.31    156.64    46.396
    MTBE Exh + Evp:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
 -----------------------------------------------------------------------------------------------------------------------

* # # # # # # # # # # # # # # # # # # # # # # # # #
* Rural
* File 1, Run 2, Scenario 5.
* # # # # # # # # # # # # # # # # # # # # # # # # #

                               Calendar Year:  2005
                                       Month:  Jan.
                Market Weighted Oxygen Level: 3.314 wt%
                Gasoline Fuel Sulfur Content:  160. ppm
                         Maximum Temperature:  40.0 F
                         Minimum Temperature:  20.0 F
                               Weathered RVP:  12.5 psi
                                        E200: 55.10 %
                                        E300: 83.10 %
                                   Aromatics: 24.90 vol%
                                     Olefins: 11.50 vol%
                                     Benzene:  1.08 vol%
                                        MTBE:  0.00 vol% (market fraction: 0.000)
                                        ETBE:  0.00 vol% (market fraction: 0.000)
                                     Ethanol:  9.50 vol% (market fraction: 1.000)
                                        TAME:  0.00 vol% (market fraction: 0.000)

      Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
              GVWR:               <6000     >6000     (All)
                       ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
  VMT Distribution:    0.4003    0.3893    0.1328              0.0203    0.0012    0.0021    0.0486    0.0054    1.0000
 -----------------------------------------------------------------------------------------------------------------------
 Exhaust Emission Factors (mg/mi):
           Benzene:     38.74     40.46     77.75     49.95     51.69     23.05     16.62     12.18    147.98    44.088
              MTBE:      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     1,3 Butadiene:      5.09      4.22      9.14      5.47      6.92     10.37      7.48      7.07     54.33     5.700
      Formaldehyde:      9.45     11.82     37.13     18.26     38.58     44.48     32.07     90.69    130.05    19.327
      Acetaldehyde:      8.54     10.35     28.37     14.94     19.80     14.17     10.22     33.40     66.11    13.637
          Acrolein:      0.54      0.56      1.35      0.76      3.02      4.03      2.91      4.06      3.17     0.897
 -----------------------------------------------------------------------------------------------------------------------
 Evaporative Emission Factors (mg/mi):
  Benzene Hot Soak :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
  Benzene Diurnal  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
  Benzene Running  :     1.33      0.76      1.07      0.84      1.11      0.00      0.00      0.00      0.00     0.992
  Benzene Resting  :     0.74      0.39      1.24      0.61      0.78      0.00      0.00      0.00      8.66     0.676
  Benzene Refueling:     0.47      0.74      1.45      0.92      2.40      0.00      0.00      0.00      0.00     0.716
  Benzene Total Evp:     2.53      1.89      3.76      2.37      4.29      0.00      0.00      0.00      8.66     2.384
     MTBE Hot Soak :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     MTBE Diurnal  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     MTBE Running  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     MTBE Resting  :     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     MTBE Refueling:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
     MTBE Total Evp:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
 -----------------------------------------------------------------------------------------------------------------------
 Exhaust + Evaporative Emission Factors (mg/mi):
  Benzene Exh + Evp:    41.27     42.36     81.51     52.32     55.99     23.05     16.62     12.18    156.64    46.472
     MTBE Exh + Evp:     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000
 -----------------------------------------------------------------------------------------------------------------------
```

Appendix 10
Criteria Pollutants and MSAT Emissions for 2035 — Daily, Package 1

Appendix 10
Criteria Pollutants and MSAT Emissions for 2035 - Daily, Package 1

Corridor

Winter — Pounds Per Day:

goup	SumOfcVMT	CO	NOX	VOC	1,3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde	PM10
Arter	9,203,693	217,410.10	4,390.03	5,914.27	20.26	42.64	3.54	177.42	75.88	685.36
I-25	2,495,806	57,323.11	1,401.91	1,538.02	6.13	15.18	1.43	44.88	31.33	198.37
Other	2,190,675	50,821.66	1,247.83	1,383.07	5.52	13.70	1.29	40.12	28.39	173.79
US 36	2,296,746	53,598.53	1,313.49	1,377.41	5.54	13.48	1.25	40.88	27.54	182.26
Total	16,186,920	379,153	8,353	10,213	37.5	85.0	7.5	303.3	163.1	1,240

Summer — Pounds Per Day:

goup	SumOfcVMT	CO	NOX	VOC	1,3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde	PM10
Arter	9,203,693	108,383.55	4,200.71	7,801.65	19.90	38.96	2.90	175.03	74.26	519.79
I-25	2,495,806	29,448.39	1,327.64	1,938.38	6.02	14.23	1.26	43.44	30.87	152.63
Other	2,190,675	26,262.63	1,184.92	1,749.39	5.42	12.87	1.15	38.99	28.00	133.67
US 36	2,296,746	27,696.00	1,238.56	1,725.57	5.43	12.61	1.10	39.31	27.10	140.17
Total	16,186,920	191,791	7,952	13,215	37	79	6	297	160	946

Regional
Note: US36 does not include ramps.

SummerUS36na No Action

Name	pounds	SumOfcVMT
CO	1,369,160	113,244,870
NOX	56,017	113,244,870
VOC	93,680	113,244,870
1,3 Butadiene	255	113,244,870
Acetaldehyde	536	113,244,870
Acrolein	43	113,244,870
Benzene	2,109	113,244,870
Formaldehyde	1,075	113,244,870
PM10	6,576	113,244,870

WinterUS36na No Action

Name	pounds	SumOfcVMT
CO	2,694,573	113,244,870
NOX	58,776	113,244,870
VOC	72,238	113,244,870
1,3 Butadie	260	113,244,870
Acetaldehy	580	113,244,870
Acrolein	51	113,244,870
Benzene	2,151	113,244,870
Formaldeh	1,094	113,244,870
PM10	8,626	113,244,870

COUNTIES:
ADAMS
ARAPAHOE
BOULDER
BROOMFIELD
DENVER
DOUGLAS
JEFFERSON

Appendix 11
Criteria Pollutants and MSAT Emissions for 2035 — Daily, Combined Alternative Package (Preferred Alternative)

Appendix 11

Criteria Pollutants and MSAT Emissions for 2035 - Daily, Combined Alternative Package (Preferred Alternaitve)

Corridor

Winter — Pounds Per Day:

goup	VMT/day	CO	NOX	VOC	1,3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde	PM10
Arter	9,109,082	214,264.77	4,372.84	5,851.85	20.18	43.00	3.61	175.06	77.45	680.84
I-25	2,511,064	57,714.63	1,411.39	1,555.76	6.19	15.33	1.44	45.28	31.66	199.60
Other	2,198,786	51,081.44	1,254.85	1,396.62	5.56	13.84	1.30	40.44	28.69	174.42
US 36	2,748,198	65,091.10	1,580.40	1,625.56	6.66	15.70	1.44	48.83	31.73	217.47
Total	16,567,129	388,152	8,619	10,430	39	88	8	310	170	1,272

Summer — Pounds Per Day:

goup	VMT/day	CO	NOX	VOC	1,3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde	PM10
Arter	9,109,082	106,858.28	4,185.38	7,706.93	19.83	39.37	2.97	172.65	75.84	516.80
I-25	2,511,064	29,664.20	1,337.11	1,962.25	6.07	14.38	1.28	43.87	31.19	153.58
Other	2,198,786	26,422.07	1,192.34	1,768.26	5.47	13.00	1.16	39.34	28.30	134.15
US 36	2,748,198	33,829.80	1,482.88	2,035.83	6.52	14.64	1.26	46.83	31.18	167.16
Total	16,567,129	196,774	8,198	13,473	38	81	7	303	167	972

Regional

Note: US36 does not include ramps.

SummerUS36p

Name	Name	Pounds/Day	VMT/day
CO	CO	1,375,481	113,605,913
NOX	NOX	56,573	113,605,913
VOC	VOC	94,956	113,605,913
1,3 Butadiene	1,3 Butadiene	263	113,605,913
Acetaldehyde	Acetaldehyde	552	113,605,913
Acrolein	Acrolein	45	113,605,913
Benzene	Benzene	2,125	113,605,913
Formaldehyde	Formaldehyde	1,118	113,605,913
PM10	PM10	6,623	113,605,913

WinterUS36p

Name	pounds	SumOfcVMT
CO	2,698,663.38	113,605,913
NOX	59,387.71	113,605,913
VOC	73,074.25	113,605,913
1,3 Butadiene	267.19	113,605,913
Acetaldehyde	596.99	113,605,913
Acrolein	52.31	113,605,913
Benzene	2,164.01	113,605,913
Formaldehyde	1,138.03	113,605,913
PM10	8,681.07	113,605,913

COUNTIES:

ADAMS
ARAPAHOE
BOULDER
BROOMFIELD
DENVER
DOUGLAS
JEFFERSON

Appendix 12
Criteria Pollutants and MSAT Emissions for 2035 – Peak Hour, Package 1

Appendix 12
Criteria Pollutants and MSAT Emissions for 2035 - Peak Hour, Package 1

Corridor

Winter 2=Am2, 5=Pm2 Pounds Per Peak Hour

goup	period	SumOfcVMT	CO	NOX	VOC	1,3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde	PM10
Arter	2	846,895	20,971.18	429.72	657.53	2.10	4.43	0.37	18.56	7.95	62.80
Arter	5	863,036	21,041.19	424.19	620.72	2.02	4.11	0.33	18.12	7.11	63.61
I-25	2	186,000	4,400.61	98.15	131.85	0.48	1.18	0.11	3.72	2.40	14.39
I-25	5	188,332	4,348.57	94.74	127.35	0.47	1.11	0.10	3.66	2.22	14.42
Other	2	166,772	3,945.99	89.43	122.00	0.45	1.13	0.11	3.41	2.32	12.90
Other	5	165,671	3,915.83	86.46	118.97	0.44	1.05	0.10	3.38	2.11	12.69
US 36	2	175,301	4,080.34	90.85	114.55	0.43	1.04	0.10	3.32	2.10	13.56
US 36	5	172,559	4,021.92	87.15	111.78	0.42	0.97	0.09	3.28	1.91	13.21

Summer

goup	period	SumOfcVMT	CO	NOX	VOC	1,3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde	PM10
Arter	2	846,895	10,772.25	421.47	892.36	2.09	4.10	0.31	18.98	7.86	47.62
Arter	5	863,036	10,658.99	413.49	839.03	2.00	3.77	0.27	18.30	7.00	48.17
I-25	2	186,000	2,259.96	94.60	171.11	0.48	1.11	0.10	3.70	2.37	11.01
I-25	5	188,332	2,193.19	91.10	166.42	0.46	1.04	0.09	3.63	2.19	11.01
Other	2	166,772	2,034.88	86.81	158.89	0.44	1.06	0.09	3.41	2.30	9.87
Other	5	165,671	2,004.75	83.81	156.23	0.43	0.98	0.08	3.38	2.08	9.69
US 36	2	175,301	2,074.19	86.77	147.29	0.42	0.97	0.08	3.26	2.07	10.38
US 36	5	172,559	2,031.60	83.12	144.61	0.41	0.90	0.08	3.21	1.88	10.09

Appendix 13
Criteria Pollutants and MSAT Emissions for 2035 – Peak Hour, Combined Alternative Package (Preferred Alternative)

Appendix 13

Criteria Pollutants and MSAT Emissions for 2035 - Peak Hour, Combined Alternative Package (Preferred Alternative)

Corridor

Winter 2=AM, 5=PM Pounds Per Peak Hour

goup	period	SumOfcVMT	CO	NOX	VOC	1,3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde	PM10
Arter	2	834,670	20,567.64	423.83	642.16	2.07	4.42	0.37	18.16	8.00	62.04
Arter	5	848,551	20,612.63	417.51	606.60	1.99	4.08	0.33	17.71	7.13	62.69
I-25	2	187,371	4,438.21	98.65	136.53	0.49	1.20	0.11	3.79	2.43	14.49
I-25	5	188,637	4,369.65	95.21	128.44	0.47	1.12	0.10	3.68	2.24	14.44
Other	2	167,969	3,982.81	90.28	124.19	0.45	1.14	0.11	3.46	2.36	12.99
Other	5	166,107	3,944.92	87.11	120.96	0.44	1.06	0.10	3.42	2.13	12.72
US 36	2	234,584	5,482.41	120.70	140.60	0.54	1.25	0.11	4.23	2.46	18.14
US 36	5	230,703	5,438.83	116.99	139.16	0.54	1.19	0.10	4.21	2.30	17.68

Summer

goup	period	SumOfcVMT	CO	NOX	VOC	1,3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde	PM10
Arter	2	834,670	10,554.78	415.31	869.63	2.06	4.09	0.31	18.53	7.91	47.07
Arter	5	848,551	10,435.72	406.64	818.03	1.97	3.75	0.27	17.87	7.02	47.49
I-25	2	187,371	2,281.05	95.16	177.83	0.48	1.13	0.10	3.79	2.40	11.09
I-25	5	188,637	2,208.04	91.61	167.92	0.47	1.05	0.09	3.65	2.21	11.03
Other	2	167,969	2,056.79	87.73	162.02	0.45	1.08	0.10	3.46	2.34	9.94
Other	5	166,107	2,024.98	84.54	159.07	0.44	1.00	0.09	3.42	2.11	9.71
US 36	2	234,584	2,779.91	113.53	178.40	0.53	1.16	0.10	4.08	2.41	13.87
US 36	5	230,703	2,757.67	109.89	178.25	0.53	1.10	0.09	4.07	2.25	13.49

Appendix 14
Corridor-Wide Criteria Pollutant Emission Estimates – Peak Hour for Package 2 and Package 4, 2035

Appendix 14
Corridor-Wide Criteria Pollutant Emission Estimates – Peak Hour for Package 2 and Package 4, 2035

	Package 1 (2030)	Package 2 (2030)	Package 4 (2030)	Package 1 (2035)	Derived Package 2 (2035)	Derived Package 4 (2035)
Total Peak Hour VMT	1,384,020	1,433,280	1,447,840	1,393,441	1,443,036	1,457,695
Speed (mile/hour)	20.5	21.7	21.5	21.1	22.3	22.1
Emissions: VOC (lb/day)	1,486	1,539	1,554	1,370	1,382	1,402
Emissions: CO (lb/day)	36,137	37,345	37,727	33,398	34,135	34,556
Emissions: NO_x (lb/day)	1,104	1,149	1,161	708	723	733
Emissions: PM_{10} (lb/day)	80	83	84	104	108	109

VMTs for P2 and P4 in 2035 were calculated by applying the same percentage VMT growth rate as modeled in DEIS relative to P1 in 2030
Vehicle speed of P2 and P4 in 2035 were calculated by applying the same percentage speed change as modeled in DEIS relative to P1 in 2030
Emissions of P2 and P4 in 2035 were estimates by adjusting the VMT and speed in 2035 based on P1 VMT and speed in 2035.

VMT adjustment factors	P1 2035 to 2030	1.01
	P2 2030 to P1 2030	1.04
	P4 2030 to P1 2030	1.05
Speed Adjustment factors	P2 2030 to P1 2030	1.06
	P4 2030 to P1 2030	1.05

Emission adjustment due to speed changes:

	P2	P4
	21.1 to 22.3 mph	21.1 to 22.1 mph
VOC	0.974	0.978
CO	0.987	0.989
NOX	0.987	0.989
PM10	1.000	1.000
SO2	1.000	1.000

Appendix 15
Corridor-Wide Criteria Pollutant and MSAT Emission Estimates — Daily for Package 2 and Package 4, 2035

Appendix 15
Corridor-Wide Criteria Pollutant and MSAT Emission Estimates – Daily for Package 2 and Package 4, 2035

	Package 1 (2030)	Package 2 (2030)	Package 4 (2030)	Package 1 (2035)	Derived Package 2 (2035)	Derived Package 4 (2035)
Total VMT	15,669,800	16,059,900	16,260,100	16,186,920	16,589,894	16,796,701
Speed	30.8	31.6	31.7	30.4	31.2	31.3
Emissions: VOC (lb/day)	16,826	17,243	17,458	13,215	13,408	13,575
Emissions: CO (lb/day)	409,484	419,288	424,530	379,153	388,154	392,959
Emissions: NO_x (lb/day)	12,468	12,811	12,969	8,353	8,536	8,643
Emissions: PM_{10} (lb/day)	909	933	944	1240	1,271	1,287
Emissions: Benzene (lb/day)	507.3	519.8	526.3	303.3	310.9	314.7
Emissions: 1,3-Butadiene (lb/day)	58.9	60.5	61.3	37.5	38.2	38.6
Emissions: Formaldehyde (lb/day)	199.5	207.6	210.1	163.1	166.0	168.1
Emissions: Acetaldehyde (lb/day)	127.7	132	133.6	85.0	85.9	86.8
Emissions: Acrolein (lb/day)	9.7	10.1	10.2	7.5	7.6	7.7

VMTs for P2 and P4 in 2035 were calculated by applying the same percentage VMT growth rate as modeled in DEIS relative to P1 in 2030
Vehicle speed of P2 and P4 in 2035 were calculated by applying the same percentage speed change as modeled in DEIS relative to P1 in 2030
Emissions of P2 and P4 in 2035 were estimates by adjusting the VMT and speed in 2035 based on P1 VMT and speed in 2035.

VMT adjustment factors	P1 2035 to 2030	1.03
	P2 2030 to P1 2030	1.02
	P4 2030 to P1 2030	1.04
Speed Adjustment factors	P2 2030 to P1 2030	1.03
	P4 2030 to P1 2030	1.03

Emission adjustment due to speed changes:

	P2	P4
	30.4 to 31.2 mph	30.4 to 31.3 mph
VOC	0.990	0.990
CO	0.999	0.999
NOX	0.997	0.997
PM10	1.000	1.000
SO2	1.000	1.000
Benzene	0.993	0.993
1,3-Butadiene	0.993	0.993
Formaldehyde	0.986	0.984
Acetaldehyde	0.989	0.987
Acrolein	1.000	1.000
Diesel PM	1.000	1.000

Appendix 16
Regional Criteria Pollutants and MSAT Emission Estimates – Daily for Package 2 and Package 4, 2035

Appendix 16
Regional Criteria Pollutants and MSAT Emission Estimates – Daily for Package 2 and Package 4, 2035

	Package 1 (2030)	Package 2 (2030)	Package 4 (2030)	Package 1 (2035)	Derived Package 2 (2035)	Derived Package 4 (2035)
Total VMT	99,162,200	99,354,000	99,742,500	113,244,870	113,463,909	113,907,582
Speed	30.9	31.1	31.0	32.4	32.6	32.5
Emissions: VOC (lb/day)	106,409	106,615	107,032	93,680	93,620	93,986
Emissions: CO (lb/day)	2,596,385	2,601,407	2,611,579	2,694,573	2,699,081	2,710,106
Emissions: NO_x (lb/day)	78,916	79,069	79,378	58,776	58,890	59,120
Emissions: PM_{10} (lb/day)	5750	5761	5784	8,626	8,643	8,676
Emissions: Benzene (lb/day)	3,213.20	3,219.40	3,232.00	2,151.5	2,155.6	2,164.1
Emissions: 1,3-Butadiene (lb/day)	372	373	374	259.5	259.8	260.8
Emissions: Formaldehyde (lb/day)	1248	1251	1256	1,094.5	1,096.6	1,100.9
Emissions: Acetaldehyde (lb/day)	804	805	808	580.2	579.7	582.8
Emissions: Acrolein (lb/day)	61	61	61	50.6	50.6	50.8

VMTs for P2 and P4 in 2035 were calculated by applying the same percentage VMT growth rate as modeled in DEIS relative to P1 in 2030
Vehicle speed of P2 and P4 in 2035 were calculated by applying the same percentage speed change as modeled in DEIS relative to P1 in 2030
Emissions of P2 and P4 in 2035 were estimates by adjusting the VMT and speed in 2035 based on P1 VMT and speed in 2035.

VMT adjustment factors	P1 2035 to 2030	1.14
	P2 2030 to P1 2030	1.002
	P4 2030 to P1 2030	1.01
Speed Adjustment factors	P2 2030 to P1 2030	1.01
	P4 2030 to P1 2030	1.00

Emission adjustment due to speed changes:

	P2	P4
	32.4 to 32.6 mph	32.4 to 32.5 mph
VOC	0.997	0.997
CO	1.000	1.000
NOX	1.000	1.000
PM10	1.000	1.000
SO2	1.000	1.000
Benzene	0.999	0.999
1,3-Butadiene	1.000	1.000
Formaldehyde	0.997	0.999
Acetaldehyde	0.997	0.997
Acrolein	1.000	1.000
Diesel PM	1.000	1.000

Appendix 17
Speed Adjustment Factors, 2035

Appendix 17
Speed Adjustment Factors, 2035

Mobile6.2 Results 2035

Speed	VOC	CO	NOX	PM10	SO2	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Diesel PM
mph	g/mile	g/mile	g/mile	g/mile	g/mile	mg/mile	mg/mile	mg/mile	mg/mile	mg/mile	g/mile
21	0.465	12.345	0.373	0.0283	0.009	13.6	1.73	8.7	4.47	0.41	0.022997
21.1	0.464	12.331	0.372	0.0283	0.009	13.57	1.73	8.68	4.46	0.41	0.022997
21.2	0.463	12.317	0.372	0.0283	0.009	13.55	1.72	8.65	4.45	0.41	0.022997
21.3	0.462	12.303	0.371	0.0283	0.009	13.52	1.72	8.63	4.44	0.41	0.022997
21.4	0.461	12.289	0.371	0.0283	0.009	13.5	1.72	8.6	4.43	0.41	0.022997
21.5	0.46	12.275	0.37	0.0283	0.009	13.48	1.71	8.58	4.42	0.4	0.022997
21.6	0.459	12.262	0.37	0.0283	0.009	13.45	1.71	8.55	4.41	0.4	0.022997
21.7	0.458	12.248	0.37	0.0283	0.009	13.43	1.71	8.53	4.4	0.4	0.022997
21.8	0.457	12.235	0.369	0.0283	0.009	13.41	1.7	8.51	4.39	0.4	0.022997
21.9	0.456	12.222	0.369	0.0283	0.009	13.39	1.7	8.48	4.37	0.4	0.022997
22	0.455	12.209	0.368	0.0283	0.009	13.36	1.7	8.46	4.36	0.4	0.022997
22.1	0.454	12.196	0.368	0.0283	0.009	13.34	1.69	8.44	4.35	0.4	0.022997
22.2	0.453	12.183	0.368	0.0283	0.009	13.32	1.69	8.41	4.34	0.4	0.022997
22.3	0.452	12.17	0.367	0.0283	0.009	13.3	1.69	8.39	4.33	0.4	0.022997
30.4	0.398	11.546	0.345	0.0283	0.009	12.16	1.5	7.03	3.73	0.33	0.022997
30.5	0.398	11.545	0.345	0.0283	0.009	12.15	1.5	7.02	3.73	0.33	0.022997
30.6	0.397	11.543	0.345	0.0283	0.009	12.14	1.5	7.01	3.72	0.33	0.022997
30.7	0.397	11.541	0.345	0.0283	0.009	12.13	1.5	6.99	3.72	0.33	0.022997
30.8	0.396	11.54	0.345	0.0283	0.009	12.12	1.49	6.98	3.71	0.33	0.022997
30.9	0.396	11.538	0.345	0.0283	0.009	12.11	1.49	6.97	3.7	0.33	0.022997
31	0.395	11.536	0.344	0.0283	0.009	12.1	1.49	6.96	3.7	0.33	0.022997
31.1	0.395	11.535	0.344	0.0283	0.009	12.09	1.49	6.94	3.69	0.33	0.022997
31.2	0.394	11.533	0.344	0.0283	0.009	12.08	1.49	6.93	3.69	0.33	0.022997
31.3	0.394	11.532	0.344	0.0283	0.009	12.07	1.49	6.92	3.68	0.33	0.022997
31.4	0.393	11.53	0.344	0.0283	0.009	12.06	1.48	6.91	3.68	0.33	0.022997
31.5	0.393	11.529	0.344	0.0283	0.009	12.05	1.48	6.9	3.67	0.33	0.022997
31.6	0.392	11.527	0.344	0.0283	0.009	12.04	1.48	6.88	3.67	0.33	0.022997
31.7	0.392	11.526	0.344	0.0283	0.009	12.04	1.48	6.87	3.66	0.33	0.022997
31.8	0.391	11.524	0.344	0.0283	0.009	12.03	1.48	6.86	3.66	0.33	0.022997
31.9	0.391	11.523	0.344	0.0283	0.009	12.02	1.48	6.85	3.65	0.33	0.022997
32	0.39	11.521	0.344	0.0283	0.009	12.01	1.48	6.84	3.65	0.32	0.022997
32.1	0.39	11.52	0.344	0.0283	0.009	12	1.47	6.82	3.64	0.32	0.022997
32.2	0.389	11.518	0.343	0.0283	0.009	11.99	1.47	6.81	3.64	0.32	0.022997
32.3	0.389	11.517	0.343	0.0283	0.009	11.98	1.47	6.8	3.63	0.32	0.022997
32.4	0.389	11.515	0.343	0.0283	0.009	11.97	1.47	6.79	3.63	0.32	0.022997
32.5	0.388	11.514	0.343	0.0283	0.009	11.96	1.47	6.78	3.62	0.32	0.022997
32.6	0.388	11.512	0.343	0.0283	0.009	11.96	1.47	6.77	3.62	0.32	0.022997

Appendix 17
Speed Adjustment Factors, 2035

Emission Adjustment Factors:

mph change	VOC	CO	NOX	PM10	SO2	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Diesel PM
30.4 to 31.2	0.990	0.999	0.997	1.000	1.000	0.993	0.993	0.986	0.989	1.000	1.000
30.4 to 31.3	0.990	0.999	0.997	1.000	1.000	0.993	0.993	0.984	0.987	1.000	1.000
21.1 to 22.3	0.974	0.987	0.987	1.000	1.000	0.980	0.977	0.967	0.971	0.976	1.000
21.1 to 22.1	0.978	0.989	0.989	1.000	1.000	0.983	0.977	0.972	0.975	0.976	1.000
32.4 to 32.6	0.997	1.000	1.000	1.000	1.000	0.999	1.000	0.997	0.997	1.000	1.000
32.4 to 32.5	0.997	1.000	1.000	1.000	1.000	0.999	1.000	0.999	0.997	1.000	1.000

Appendix 18
Intersection LOS and Delay —
2035 Package 1 and the Combined Alternative Package
(Preferred Alternative)

Appendix 18

Intersection LOS and Delay - 2035 Package 1 and Combined Alternative Packge

		2035 P1 (No Action)			2035 CAP (Preferred Alternative)			
Intersection	**Peak Hour**	**LOS**	**Delay/Veh**	**Volume**	**LOS**	**Delay/Veh**	**Volume**	**Note**
Federal/74th	PM	F	88.4	6530	E	78.0	8145	
Federal/74th	AM	D	43.3	5640	E	66.9	6750	
Federal/80th	**PM**	**F**	**123.5**	**7345**	**F**	**121.7**	**7375**	**Worst-Case Delay (CAP), Non-Phase 1**
Federal/80th	AM	F	129.6	6350	F	116.0	5975	
Wadsworth/Midway	PM	E	59.6	5685	E	78.0	7230	
Wadsworth/Midway	AM	E	69.0	5315	E	59.6	6620	
Dillon/McCaslin	PM	F	140.1	7055	F	94.6	7555	
Dillon/McCaslin	**AM**	**F**	**173.2**	**8150**	**F**	**108.5**	**6735**	**Worst-Case Delay (No Action)**
Church Ranch/Westminster Blvd	PM	F	111.0	7215	F	96.9	7425	
Church Ranch/Westminster Blvd	AM	F	102.1	6620	F	92.9	6520	
Sheridan/92nd	**PM**	**F**	**108.8**	**9325**	**E**	**68.0**	**8615**	**Highest Volume (CAP and Phase 1)**
Sheridan/92nd	AM	E	73.2	8330	E	66.5	8495	
Sheridan/88th	AM	D	40.3	5415	D	35.5	7300	
Sheridan/88th	PM	D	53.2	5750	D	35.3	7220	
Pecos/72nd	PM	E	53.0	4970	E	60.1	5355	
Pecos/72nd	AM	F	91.2	5265	E	77.8	5540	
Pecos/76th	PM	C	29.1	4485	D	37.2	4480	
Pecos/76th	AM	F	82.6	4080	E	75.5	4425	
Church Ranch/EB Ramps	PM	E	71.3	5100	D	43.6	5060	
Church Ranch/EB Ramps	AM	B	19.9	3920	B	17.2	4180	

Note: Data for Federal/74th, Federal/80th, and Wadsworth/Midway represent the mitigated traffic conditions at these intersections.

Appendix 19
2005 CO Emission Factors and Background Concentrations for CO Hot-Spot Analysis

Appendix 19

2005 CO Emission Factors and Background Concentrations for CO Hot Spot Analysis

Free Flow Emission Factors 2005

DRCOGid2030	street	Direction	Speed (mph)	emission factor (g/mile)
10402	92nd Ave	east	28	22.554
10379	92nd Ave	west	33	22.495
10434	80th Ave	east	22	23.163
10433	80th Ave	west	33	22.495
10432	Federal Blvd	north	33	22.500
9949	Federal Blvd	south	31	22.461
10403	Sheridan Blvd	north	16	24.525
10400	Sheridan Blvd	south	29	22.495
27033	120th Ave35	east	11	26.804
4435	120th Ave35	west	21	23.323
11911	Arapahoe	east	26	22.686
11912	Arapahoe	west	33	22.500
11913	Foothills	north	31	22.293
11610	Foothills	south	38	22.423
10706	Wadsworth Pkw5	north	10	27.531
10704	Wadsworth Pkw5	south	29	22.495

Idle Emission Factors 2005

DRCOGid2030	street	Direction	Speed (mph)	emission factor (g/mile)	Emission Factor (grams/hour)
11610	Foothills		2.5	57.335	143.337
10402	92nd Ave	east	2.5	56.825	142.062

CO Background Concentrations 2005		ppm
Sheridan Blvd.and 92nd	8-hr	1.738
	1-hr	5.032
Federal Blvd.and 80th	8-hr	1.947
	1-hr	3.519
Wadsworth Parkway/120th Avenue	8-hr	1.749
	1-hr	4.116
Foothills Parkway/Arapahoe Road int	8-hr	1.090
	1-hr	1.863

Note: Data provided by APCD in August 2009, October 2009

Appendix 20
CO Hot-Spot Modeling Files — Package 2, 2035

```
'120_WW_P2-2035_PM'   60.00 75.000 0.00 0.00 28 0.3048 1 1
'R1'    100     82      5.9
'R2'    182     82      5.9
'R3'    264     82      5.9
'R4'    346     82      5.9
'R5'    100     164     5.9
'R6'    100     246     5.9
'R7'    100     328     5.9
'R8'    -46     76      5.9
'R9'    -128    76      5.9
'R10'   -210    76      5.9
'R11'   -292    76      5.9
'R12'   -46     158     5.9
'R13'   -46     240     5.9
'R14'   -46     322     5.9
'R15'   -22.88  -70     5.9
'R16'   -104.88 -70     5.9
'R17'   -186.88 -70     5.9
'R18'   -268.88 -70     5.9
'R19'   13.79151614     -143.343029     5.9
'R20'   50.46303227     -216.686058     5.9
'R21'   87.13454841     -290.029087     5.9
'R22'   154     -64     5.9
'R23'   236     -64     5.9
'R24'   318     -64     5.9
'R25'   400     -64     5.9
'R26'   190.6715161     -137.343029     5.9
'R27'   227.3430323     -210.686058     5.9
'R28'   264.0145484     -284.029087     5.9
'120_WW_P2-2035_PM'             16      1       1       'C'
2
'EBL'   'AG'    -54     6       -1054   6       0.00    36      3
120     96      2.00    890     142.06  1663    2       3
2
'EBT'   'AG'    -54     -30     -1054   -30     0.00    36      3
120     101     2.00    520     142.06  1695    2       3
2
'WBL'   'AG'    114     6       1114    6       0.00    36      3
120     102     2.00    440     142.06  1663    2       3
2
'WBT'   'AG'    114     42      1114    42      0.00    36      3
120     107     2.00    190     142.06  1695    2       3
2
'NBL'   'AG'    54      -66     534     -1026   0.00    36      3
120     91      2.00    960     142.06  1663    2       3
2
'NBT'   'AG'    104     -65     584     -1025   0.00    36      3
120     70      2.00    1540    142.06  1695    2       3
2
'SBL'   'AG'    30      72      30      1072    0.00    36      3
120     103     2.00    610     142.06  1663    2       3
2
'SBT'   'AG'    -6      72      -6      1072    0.00    36      3
120     82      2.00    1300    142.06  1695    2       3
1
'EBA'   'AG'    -1200.00        -30.00  0.00    -30.00  2530.00 26.80   0.00    56.00
1
'EBD'   'AG'    0.00    -30.00  1200.00 -30.00  2030.00 26.80   0.00    68.00
1
'WBA'   'AG'    1200.00 42.00   0.00    42.00   980.00  23.32   0.00    56.00
1
```

```
'WBD'   'AG'    0.00    42.00   -1200.00        42.00   1790.00 23.32   0.00    68.00
1
'NBA'   'AG'    1072.00 -2000.00        72.00   0.00    3400.00 27.53   0.00    56.00
1
'NBD'   'AG'    72.00   0.00    72.00   800.00  2780.00 27.53   0.00    56.00
1
'SBA'   'AG'    -6.00   800.00  -6.00   0.00    2550.00 23.16   0.00    56.00
1
'SBD'   'AG'    -24.00  -6.00   464.00  -966.00 2860.00 23.16   0.00    56.00
1 0 4 1000 0 'y' 10 0 36
```

```
          CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                  PAGE  1

JOB: 120_WW_P2-2035_PM                                    RUN: 120_WW_P2-2035_PM

DATE : 10/ 6/ 9
TIME : 14:45:12

   The MODE flag has been set to C for calculating CO averages.

 SITE & METEOROLOGICAL VARIABLES
 -------------------------------
 VS =   0.0 CM/S      VD =   0.0 CM/S      Z0 =  75. CM
  U =  1.0 M/S        CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  0.0 PPM  BRG =   0. DEGREES

 LINK VARIABLES
 --------------
   LINK DESCRIPTION      *         LINK COORDINATES (FT)         *    LENGTH  BRG TYPE   VPH    EF      H   W    V/C QUEUE
                         *   X1       Y1        X2        Y2     *     (FT)  (DEG)            (G/MI)  (FT) (FT)        (VEH)
-------------------------*---------------------------------------*----------------------------------------------------------
 1. EBL                  *    -54.0       6.0    -458.3       6.0 *     404.   270. AG    915. 100.0    0.0 36.0 1.07  20.5
 2. EBT                  *    -54.0     -30.0    -156.1     -30.0 *     102.   270. AG    962. 100.0    0.0 36.0 0.82   5.2
 3. WBL                  *    114.0       6.0     196.4       6.0 *      82.    90. AG    972. 100.0    0.0 36.0 0.75   4.2
 4. WBT                  *    114.0      42.0     150.9      42.0 *      37.    90. AG   1019. 100.0    0.0 36.0 0.50   1.9
 5. NBL                  *     54.0     -66.0     137.3    -232.7 *     186.   153. AG    867. 100.0    0.0 36.0 0.92   9.5
 6. NBT                  *    104.0     -65.0     191.8    -240.6 *     196.   153. AG    667. 100.0    0.0 36.0 0.79  10.0
 7. SBL                  *     30.0      72.0      30.0     466.8 *     395.   360. AG    981. 100.0    0.0 36.0 1.13  20.1
 8. SBT                  *     -6.0      72.0      -6.0     284.3 *     212.   360. AG    781. 100.0    0.0 36.0 0.90  10.8
 9. EBA                  *  -1200.0     -30.0       0.0     -30.0 *    1200.    90. AG   2530.  26.8    0.0 56.0
10. EBD                  *      0.0     -30.0    1200.0     -30.0 *    1200.    90. AG   2030.  26.8    0.0 68.0
11. WBA                  *   1200.0      42.0       0.0      42.0 *    1200.   270. AG    980.  23.3    0.0 56.0
12. WBD                  *      0.0      42.0   -1200.0      42.0 *    1200.   270. AG   1790.  23.3    0.0 68.0
13. NBA                  *   1072.0   -2000.0      72.0       0.0 *    2236.   333. AG   3400.  27.5    0.0 56.0
14. NBD                  *     72.0       0.0      72.0     800.0 *     800.   360. AG   2780.  27.5    0.0 56.0
15. SBA                  *     -6.0     800.0      -6.0       0.0 *     800.   180. AG   2550.  23.2    0.0 56.0
16. SBD                  *    -24.0      -6.0     464.0    -966.0 *    1077.   153. AG   2860.  23.2    0.0 56.0
                                                                                                   PAGE  2
JOB: 120_WW_P2-2035_PM                                    RUN: 120_WW_P2-2035_PM

DATE : 10/ 6/ 9
TIME : 14:45:12

 ADDITIONAL QUEUE LINK PARAMETERS
 --------------------------------
   LINK DESCRIPTION      *    CYCLE    RED    CLEARANCE  APPROACH  SATURATION   IDLE    SIGNAL   ARRIVAL
                         *    LENGTH   TIME   LOST TIME    VOL     FLOW RATE   EM FAC   TYPE     RATE
                         *     (SEC)   (SEC)    (SEC)     (VPH)      (VPH)    (gm/hr)
-------------------------*--------------------------------------------------------------------------------
 1. EBL                  *      120      96      2.0       890       1663     142.06      2        3
 2. EBT                  *      120     101      2.0       520       1695     142.06      2        3
 3. WBL                  *      120     102      2.0       440       1663     142.06      2        3
 4. WBT                  *      120     107      2.0       190       1695     142.06      2        3
 5. NBL                  *      120      91      2.0       960       1663     142.06      2        3
 6. NBT                  *      120      70      2.0      1540       1695     142.06      2        3
 7. SBL                  *      120     103      2.0       610       1663     142.06      2        3
 8. SBT                  *      120      82      2.0      1300       1695     142.06      2        3

 RECEPTOR LOCATIONS
 ------------------
                         *         COORDINATES (FT)         *
   RECEPTOR              *      X          Y          Z     *
-------------------------*----------------------------------*
```

1. R1	*	100.0	82.0	5.9	*
2. R2	*	182.0	82.0	5.9	*
3. R3	*	264.0	82.0	5.9	*
4. R4	*	346.0	82.0	5.9	*
5. R5	*	100.0	164.0	5.9	*
6. R6	*	100.0	246.0	5.9	*
7. R7	*	100.0	328.0	5.9	*
8. R8	*	-46.0	76.0	5.9	*
9. R9	*	-128.0	76.0	5.9	*
10. R10	*	-210.0	76.0	5.9	*
11. R11	*	-292.0	76.0	5.9	*
12. R12	*	-46.0	158.0	5.9	*
13. R13	*	-46.0	240.0	5.9	*
14. R14	*	-46.0	322.0	5.9	*
15. R15	*	-22.9	-70.0	5.9	*
16. R16	*	-104.9	-70.0	5.9	*
17. R17	*	-186.9	-70.0	5.9	*
18. R18	*	-268.9	-70.0	5.9	*
19. R19	*	13.8	-143.3	5.9	*
20. R20	*	50.5	-216.7	5.9	*
21. R21	*	87.1	-290.0	5.9	*
22. R22	*	154.0	-64.0	5.9	*
23. R23	*	236.0	-64.0	5.9	*
24. R24	*	318.0	-64.0	5.9	*
25. R25	*	400.0	-64.0	5.9	*
26. R26	*	190.7	-137.3	5.9	*
27. R27	*	227.3	-210.7	5.9	*
28. R28	*	264.0	-284.0	5.9	*

JOB: 120_WW_P2-2035_PM RUN: 120_WW_P2-2035_PM

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	4.4	0.5	0.1	0.0	4.2	3.8	3.5	2.9	0.3	0.0	0.0	2.4	1.7	1.5	9.0	7.0	4.0	3.9	8.2	9.0
10.	*	2.0	0.1	0.0	0.0	1.8	1.7	1.6	6.0	1.1	0.3	0.1	4.9	3.7	3.0	10.2	8.4	4.7	4.2	7.8	8.2
20.	*	0.7	0.0	0.0	0.0	0.7	0.7	0.6	7.4	2.4	0.9	0.5	6.7	5.0	4.0	8.7	9.6	6.0	4.7	6.6	7.4
30.	*	0.3	0.0	0.0	0.0	0.3	0.3	0.3	7.7	3.3	1.8	1.0	7.1	5.6	4.4	6.8	9.7	7.3	5.6	6.2	6.9
40.	*	0.3	0.0	0.0	0.0	0.3	0.3	0.3	7.2	3.7	2.3	1.6	7.0	5.9	4.6	6.0	8.3	8.2	6.2	6.4	6.5
50.	*	0.2	0.0	0.0	0.0	0.2	0.2	0.2	6.7	3.6	2.6	1.9	6.6	6.1	4.5	6.0	7.1	8.3	6.7	6.8	6.4
60.	*	0.2	0.0	0.0	0.0	0.2	0.2	0.2	6.2	3.7	2.7	2.1	6.2	6.0	4.2	6.7	6.2	8.3	6.8	6.9	6.5
70.	*	0.2	0.1	0.1	0.1	0.1	0.1	0.1	6.0	3.5	2.7	2.3	5.9	5.8	4.1	7.0	6.0	7.2	6.8	7.0	6.4
80.	*	0.4	0.3	0.3	0.3	0.0	0.0	0.0	6.2	3.9	3.1	2.8	6.0	6.0	4.2	7.0	5.6	6.5	6.3	6.6	6.0
90.	*	1.1	1.1	1.0	0.9	0.2	0.0	0.0	6.9	4.9	4.3	4.2	6.4	6.2	4.2	6.7	4.9	4.8	4.5	6.0	5.3
100.	*	2.1	1.8	1.8	1.8	0.7	0.4	0.2	7.1	5.4	5.2	5.9	6.8	6.5	4.4	6.2	3.9	3.2	2.9	5.9	4.7
110.	*	2.8	2.0	2.0	1.9	1.1	0.7	0.6	6.8	5.7	6.2	6.7	7.4	6.7	4.7	6.4	3.6	2.6	2.0	6.1	4.4
120.	*	3.6	1.8	1.8	1.8	1.3	1.0	0.8	6.5	5.8	7.3	7.3	8.0	7.2	5.2	6.7	3.3	2.2	1.5	6.0	4.5
130.	*	4.3	1.6	1.6	1.6	1.2	0.9	0.8	6.9	7.0	7.9	6.7	8.2	7.7	6.0	6.8	3.0	1.8	1.4	5.8	4.9
140.	*	5.2	1.6	1.5	1.5	1.8	1.0	1.0	8.3	8.3	7.4	5.7	9.1	9.1	7.5	6.7	2.5	1.6	1.1	5.9	5.6
150.	*	6.6	2.2	1.7	1.5	3.1	1.9	1.5	8.8	7.3	5.6	4.6	9.4	10.1	9.4	5.3	1.4	0.8	0.4	5.0	4.7

160.	*	8.3	3.5	2.3	1.9	5.1	3.7	3.1	7.0	5.7	4.4	3.8	7.6	9.1	9.7	2.5	0.4	0.2	0.0	2.4	2.3
170.	*	8.8	4.7	2.9	2.5	6.6	5.3	4.7	4.8	5.0	3.8	3.8	5.1	6.2	7.3	0.8	0.0	0.0	0.0	0.7	0.7
180.	*	8.1	5.5	3.1	2.7	6.9	6.3	6.1	4.1	4.9	3.8	3.8	3.4	3.6	4.0	0.3	0.0	0.0	0.0	0.3	0.3
190.	*	7.1	6.2	3.3	2.7	6.3	6.5	7.2	4.2	4.6	3.8	3.8	2.9	2.3	2.1	0.2	0.0	0.0	0.0	0.2	0.2
200.	*	6.3	6.4	3.6	2.8	5.7	7.0	8.2	4.6	4.1	3.7	3.7	2.7	2.1	1.5	0.2	0.0	0.0	0.0	0.2	0.2
210.	*	5.7	6.1	4.1	3.0	6.4	7.9	8.4	4.8	4.0	3.8	3.7	2.7	1.8	1.4	0.2	0.0	0.0	0.0	0.1	0.1
220.	*	5.9	6.0	4.5	3.5	7.3	8.4	8.5	4.9	4.1	4.1	4.0	2.5	1.7	1.3	0.1	0.0	0.0	0.0	0.1	0.1
230.	*	6.1	5.8	4.8	3.6	8.1	8.2	7.7	5.0	4.4	4.3	4.2	2.5	1.8	1.3	0.0	0.0	0.0	0.0	0.0	0.0
240.	*	6.8	5.8	5.0	4.3	8.3	7.7	6.9	5.0	4.7	4.6	4.3	2.4	1.5	1.1	0.0	0.0	0.0	0.0	0.0	0.0
250.	*	7.7	6.1	5.6	4.7	8.2	7.1	5.9	5.1	5.0	4.7	4.2	2.2	1.2	0.7	0.2	0.2	0.2	0.2	0.0	0.0
260.	*	8.3	6.3	5.4	5.1	7.5	6.6	5.5	4.7	4.5	4.1	3.7	1.5	0.6	0.3	1.1	0.9	0.8	0.8	0.1	0.0
270.	*	7.7	5.2	4.3	3.6	6.6	6.1	5.0	3.0	2.8	2.6	2.5	0.5	0.2	0.0	3.4	2.7	2.4	2.3	0.8	0.4
280.	*	6.3	3.8	2.9	2.5	6.0	5.7	4.9	1.1	1.1	1.0	1.0	0.1	0.0	0.0	6.2	4.7	4.3	3.9	2.0	1.1
290.	*	5.7	3.3	2.4	2.0	5.7	5.2	4.8	0.3	0.3	0.3	0.3	0.0	0.0	0.0	7.4	5.7	4.9	4.5	2.9	1.8
300.	*	6.0	3.4	2.5	1.8	6.0	5.2	4.9	0.2	0.2	0.2	0.2	0.0	0.0	0.0	7.4	6.0	4.9	4.7	3.5	2.1
310.	*	6.4	3.2	2.3	1.7	6.1	5.4	5.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	6.6	6.2	4.6	4.5	3.7	2.7
320.	*	6.9	3.3	2.1	1.4	6.4	5.8	5.6	0.1	0.1	0.1	0.1	0.0	0.0	0.0	5.7	6.3	4.2	4.1	4.0	3.1
330.	*	7.2	3.1	1.7	1.0	6.5	6.2	5.7	0.1	0.1	0.1	0.1	0.0	0.0	0.0	5.2	6.3	4.0	4.0	4.3	3.9
340.	*	7.3	2.5	1.1	0.5	6.7	6.3	5.5	0.1	0.0	0.0	0.0	0.1	0.1	0.1	5.2	5.9	3.7	3.7	5.2	5.3
350.	*	6.6	1.5	0.4	0.1	6.1	5.6	4.9	1.0	0.0	0.0	0.0	0.6	0.5	0.5	6.5	6.2	3.9	3.9	7.0	7.5
360.	*	4.4	0.5	0.1	0.0	4.2	3.8	3.5	2.9	0.3	0.0	0.0	2.4	1.7	1.5	9.0	7.0	4.0	3.9	8.2	9.0

JOB: 120_WW_P2-2035_PM RUN: 120_WW_P2-2035_PM

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	*	8.8	5.3	2.2	2.0	2.0	2.3	1.5	1.0
10.	*	8.0	3.7	1.8	1.8	1.8	1.4	0.8	0.7
20.	*	7.1	3.2	1.8	1.8	1.8	1.2	0.8	0.6
30.	*	6.1	2.8	1.9	1.9	1.9	1.1	0.8	0.7
40.	*	5.4	2.6	2.1	2.1	2.1	1.2	0.8	0.7
50.	*	5.0	2.6	2.4	2.4	2.4	1.2	0.9	0.7
60.	*	4.7	2.7	2.7	2.7	2.7	1.3	0.9	0.7
70.	*	4.2	3.1	3.0	3.0	3.0	1.4	0.9	0.5
80.	*	3.6	3.4	3.4	3.3	3.2	1.1	0.5	0.2
90.	*	3.4	2.7	2.6	2.6	2.5	0.5	0.1	0.0
100.	*	3.5	1.2	1.2	1.2	1.1	0.1	0.0	0.0
110.	*	3.8	0.4	0.4	0.4	0.4	0.0	0.0	0.0
120.	*	4.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0
130.	*	4.9	0.3	0.2	0.2	0.2	0.1	0.1	0.1
140.	*	5.4	0.8	0.3	0.2	0.2	0.6	0.6	0.6
150.	*	4.5	2.6	0.8	0.4	0.2	2.3	2.3	2.2
160.	*	2.2	5.0	1.9	1.1	0.7	4.3	4.0	4.0
170.	*	0.6	6.3	2.4	1.5	1.1	5.4	4.7	4.7
180.	*	0.3	6.4	2.4	1.6	1.3	5.4	4.3	4.3
190.	*	0.2	6.5	2.5	1.7	1.3	5.4	3.9	3.9
200.	*	0.2	6.5	3.0	1.7	1.4	5.4	3.7	3.6
210.	*	0.1	6.3	3.2	1.8	1.3	5.6	3.6	3.4
220.	*	0.1	6.0	3.6	2.2	1.4	5.6	3.5	3.1

230.	*	0.0	6.0	3.7	2.5	1.6	5.8	3.8	3.1
240.	*	0.0	6.0	3.7	2.8	2.0	5.9	4.4	3.2
250.	*	0.0	5.9	3.9	3.1	2.5	5.8	4.8	3.1
260.	*	0.0	6.9	4.9	4.1	3.6	5.8	5.3	3.1
270.	*	0.2	8.9	6.7	6.0	5.5	7.0	6.1	3.4
280.	*	0.6	9.7	7.4	7.1	6.5	8.6	7.6	4.5
290.	*	1.3	8.6	6.5	6.2	5.7	9.2	8.6	6.0
300.	*	1.5	7.2	6.2	5.6	4.6	8.5	8.9	7.3
310.	*	2.0	6.6	6.7	5.0	4.1	7.2	8.1	8.0
320.	*	2.4	7.0	6.4	4.2	3.6	6.5	6.8	7.5
330.	*	4.0	7.5	5.6	3.5	2.9	5.9	5.8	5.7
340.	*	5.8	7.6	4.2	2.9	2.2	5.2	4.3	3.8
350.	*	8.1	6.8	2.9	2.2	1.9	4.1	2.8	2.1
360.	*	8.8	5.3	2.2	2.0	2.0	2.3	1.5	1.0

THE HIGHEST CONCENTRATION OF 10.20 PPM OCCURRED AT RECEPTOR REC15.

JOB: 120_WW_P2-2035_PM RUN: 120_WW_P2-2035_PM

DATE : 10/ 6/ 9
TIME : 14:45:12

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 170	REC2 200	REC3 250	REC4 260	REC5 240	REC6 220	REC7 220	REC8 150	REC9 140	REC10 130	REC11 120	REC12 150	REC13 150	REC14 160	REC15 10	REC16 30	REC17 50	REC18 60	REC19 0	REC20 0
1	0.0	0.0	0.5	0.6	0.9	0.5	0.5	0.0	1.2	1.6	1.7	0.0	0.0	0.0	0.0	0.9	1.4	1.5	0.0	0.0
2	0.0	0.0	0.3	0.2	0.2	0.3	0.2	0.0	0.5	0.9	0.7	0.0	0.0	0.0	0.0	2.3	1.8	0.5	0.0	0.0
3	0.8	1.5	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1
4	0.7	0.3	0.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
5	0.6	0.7	0.1	0.0	0.0	0.0	0.0	0.9	0.6	0.4	0.4	0.5	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.9
6	0.8	0.6	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.3	0.2	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.1
7	0.0	0.0	0.0	0.1	1.6	1.8	1.9	0.0	0.0	0.0	0.0	0.4	1.3	1.3	1.6	1.1	0.6	0.4	1.1	0.9
8	0.0	0.0	0.0	0.1	0.8	0.9	1.1	0.0	0.0	0.0	0.0	1.6	2.2	2.1	0.9	0.7	0.4	0.3	0.6	0.4
9	0.0	0.0	0.7	0.8	0.8	0.5	0.5	0.3	0.9	1.0	1.0	0.1	0.0	0.1	1.7	1.9	2.2	2.4	0.3	0.1
10	0.8	0.8	0.5	0.3	0.0	0.0	0.0	0.5	0.2	0.1	0.2	0.5	0.4	0.3	0.2	0.0	0.0	0.1	0.6	0.5
11	0.6	0.6	0.8	0.8	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.2
12	0.0	0.0	0.3	0.5	0.7	0.4	0.3	1.2	1.4	1.5	1.7	0.2	0.0	0.1	0.3	0.6	0.6	0.6	0.2	0.1
13	2.8	1.3	0.3	0.2	0.0	0.0	0.0	2.0	1.5	1.1	0.8	2.2	1.7	1.4	0.0	0.0	0.0	0.0	0.1	0.6
14	0.8	0.0	0.5	0.4	2.4	3.0	3.0	0.0	0.0	0.0	0.0	0.4	0.8	0.7	1.3	0.9	0.6	0.5	1.2	1.3
15	0.0	0.0	0.2	0.2	0.9	0.9	1.0	1.4	0.1	0.0	0.0	1.9	2.1	2.2	2.0	1.1	0.6	0.4	1.3	0.8
16	0.9	0.6	0.3	0.2	0.0	0.1	0.0	2.0	1.6	1.0	0.6	0.9	0.5	0.7	2.0	0.1	0.0	0.0	2.7	2.9

JOB: 120_WW_P2-2035_PM RUN: 120_WW_P2-2035_PM

DATE : 10/ 6/ 9
TIME : 14:45:12

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 0	REC22 280	REC23 280	REC24 280	REC25 280	REC26 290	REC27 300	REC28 310

1	*	0.0	1.1	0.8	0.6	0.5	0.8	0.6	0.4
2	*	0.0	0.5	0.3	0.2	0.2	0.4	0.3	0.2
3	*	0.2	0.0	0.1	0.4	0.4	0.0	0.0	0.0
4	*	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
5	*	1.4	0.3	0.2	0.1	0.1	1.0	1.2	1.0
6	*	0.4	0.4	0.2	0.1	0.1	1.6	1.7	1.2
7	*	0.6	0.0	0.0	0.1	0.1	0.0	0.0	0.1
8	*	0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.1
9	*	0.0	1.5	1.0	0.8	0.6	1.0	0.6	0.4
10	*	0.4	1.9	2.2	2.5	2.6	0.3	0.2	0.2
11	*	0.1	0.0	0.1	0.1	0.2	0.0	0.0	0.0
12	*	0.0	0.7	0.7	0.6	0.5	0.5	0.4	0.3
13	*	1.0	2.5	1.1	0.7	0.4	2.7	3.0	3.2
14	*	1.0	0.0	0.1	0.2	0.2	0.0	0.0	0.1
15	*	0.5	0.1	0.2	0.2	0.2	0.1	0.1	0.1
16	*	2.9	0.7	0.4	0.3	0.2	0.8	0.8	0.7

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'AR_FH_P2-2035_PM'   60.00 75.000 0.00 0.00 28 0.3048 1 1
'R1'    46      58      5.9
'R2'    128     58      5.9
'R3'    210     58      5.9
'R4'    292     58      5.9
'R5'    46      140     5.9
'R6'    46      222     5.9
'R7'    46      304     5.9
'R8'    -58     58      5.9
'R9'    -140    58      5.9
'R10'   -222    58      5.9
'R11'   -304    58      5.9
'R12'   -58     140     5.9
'R13'   -58     222     5.9
'R14'   -58     304     5.9
'R15'   -46     -58     5.9
'R16'   -128    -58     5.9
'R17'   -210    -58     5.9
'R18'   -292    -58     5.9
'R19'   -46     -140    5.9
'R20'   -46     -222    5.9
'R21'   -46     -304    5.9
'R22'   58      -58     5.9
'R23'   140     -58     5.9
'R24'   222     -58     5.9
'R25'   304     -58     5.9
'R26'   58      -140    5.9
'R27'   58      -222    5.9
'R28'   58      -304    5.9
'AR_FH_P2-2035_PM'              18      1       1       'C'
2
'EBL'   'AG'    -48     0       -1048   0       0.00    24      2
120     112     2.00    270     143.34  1717    2       3
2
'EBT'   'AG'    -48     -30     -1048   -30     0.00    36      3
120     87      2.00    1130    143.34  1630    2       3
2
'WBL'   'AG'    48      0       1048    0       0.00    24      2
120     109     2.00    540     143.34  1717    2       3
2
'WBT'   'AG'    48      30      1048    30      0.00    36      3
120     84      2.00    1970    143.34  1569    2       3
2
'NBL'   'AG'    0       -48     0       -1048   0.00    24      2
120     115     2.00    120     143.34  1717    2       3
2
'NBT'   'AG'    24      -48     24      -1048   0.00    24      2
120     69      2.00    2290    143.34  1770    2       3
2
'NBR'   'AG'    42      -48     42      -1048   0.00    12      1
120     69      2.00    260     143.34  1583    2       3
2
'SBL'   'AG'    0       48      0       1048    0.00    24      2
120     111     2.00    420     143.34  1717    2       3
2
'SBT'   'AG'    -24     48      -24     1048    0.00    24      2
120     66      2.00    1850    143.34  1770    2       3
2
'SBR'   'AG'    -42     48      -42     1048    0.00    12      1
120     66      2.00    210     143.34  1583    2       3
1
'EBA'   'AG'    -1000.00        -30.00  0.00    -30.00  1400.00 22.69   0.00    56.00
```

```
1
'EBD'   'AG'    0.00    -30.00  1200.00 -30.00  1570.00 22.69   0.00    56.00
1
'WBA'   'AG'    1000.00 30.00   0.00    30.00   2510.00 22.50   0.00    56.00
1
'WBD'   'AG'    0.00    30.00   -1000.00        30.00   1420.00 22.50   0.00    56.00
1
'NBA'   'AG'    24.00   -1000.00        24.00   0.00    2670.00 22.29   0.00    44.00
1
'NBD'   'AG'    24.00   0.00    24.00   1000.00 3440.00 22.29   0.00    44.00
1
'SBA'   'AG'    -24.00  1000.00 -24.00  0.00    2480.00 22.42   0.00    44.00
1
'SBD'   'AG'    -24.00  0.00    -24.00  -1000.00        2630.00 22.42   0.00    44.00
1 0 4 1000 0 'y' 10 0 36
```

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                    CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                        PAGE  1

JOB: AR_FH_P2-2035_PM                                          RUN: AR_FH_P2-2035_PM

DATE : 10/ 7/ 9
TIME :  9:56:56

   The MODE flag has been set to C for calculating CO averages.

 SITE & METEOROLOGICAL VARIABLES
 -------------------------------
 VS =   0.0 CM/S      VD =   0.0 CM/S      Z0 =  75. CM
  U =  1.0 M/S        CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  0.0 PPM  BRG =   0. DEGREES

 LINK VARIABLES
 --------------
   LINK DESCRIPTION     *         LINK COORDINATES (FT)         *    LENGTH  BRG TYPE   VPH    EF     H   W    V/C QUEUE
                        *   X1        Y1        X2        Y2    *     (FT)  (DEG)          (G/MI)  (FT) (FT)        (VEH)
------------------------*---------------------------------------*----------------------------------------------------------
 1. EBL                 *   -48.0       0.0    -966.5      -0.1 *     919.   270. AG    718. 100.0   0.0 24.0 2.37  46.7
 2. EBT                 *   -48.0     -30.0    -268.5     -30.0 *     220.   270. AG    836. 100.0   0.0 36.0 0.96  11.2
 3. WBL                 *    48.0       0.0    1982.2       0.2 *    1934.    90. AG    698. 100.0   0.0 24.0 2.70  98.3
 4. WBT                 *    48.0      30.0    2801.9      30.3 *    2754.    90. AG    807. 100.0   0.0 36.0 1.57 139.9
 5. NBL                 *     0.0     -48.0       0.0    -602.5 *     555.   180. AG    737. 100.0   0.0 24.0 4.29  28.2
 6. NBT                 *    24.0     -48.0      24.0   -5076.1 *    5028.   180. AG    442. 100.0   0.0 24.0 1.65 255.4
 7. NBR                 *    42.0     -48.0      42.0    -146.1 *      98.   180. AG    221. 100.0   0.0 12.0 0.42   5.0
 8. SBL                 *     0.0      48.0       0.0    1637.6 *    1590.   360. AG    711. 100.0   0.0 24.0 2.96  80.8
 9. SBT                 *   -24.0      48.0     -24.0    2347.9 *    2300.   360. AG    423. 100.0   0.0 24.0 1.26 116.8
10. SBR                 *   -42.0      48.0     -42.0     123.8 *      76.   360. AG    211. 100.0   0.0 12.0 0.32   3.8
11. EBA                 * -1000.0     -30.0       0.0     -30.0 *    1000.    90. AG   1400.  22.7   0.0 56.0
12. EBD                 *     0.0     -30.0    1200.0     -30.0 *    1200.    90. AG   1570.  22.7   0.0 56.0
13. WBA                 *  1000.0      30.0       0.0      30.0 *    1000.   270. AG   2510.  22.5   0.0 56.0
14. WBD                 *     0.0      30.0   -1000.0      30.0 *    1000.   270. AG   1420.  22.5   0.0 56.0
15. NBA                 *    24.0   -1000.0      24.0       0.0 *    1000.   360. AG   2670.  22.3   0.0 44.0
16. NBD                 *    24.0       0.0      24.0    1000.0 *    1000.   360. AG   3440.  22.3   0.0 44.0
17. SBA                 *   -24.0    1000.0     -24.0       0.0 *    1000.   180. AG   2480.  22.4   0.0 44.0
18. SBD                 *   -24.0       0.0     -24.0   -1000.0 *    1000.   180. AG   2630.  22.4   0.0 44.0
                                                                                                          PAGE  2
JOB: AR_FH_P2-2035_PM                                          RUN: AR_FH_P2-2035_PM

DATE : 10/ 7/ 9
TIME :  9:56:56

 ADDITIONAL QUEUE LINK PARAMETERS
 --------------------------------
   LINK DESCRIPTION     *    CYCLE    RED     CLEARANCE  APPROACH  SATURATION   IDLE   SIGNAL   ARRIVAL
                        *    LENGTH   TIME    LOST TIME    VOL     FLOW RATE   EM FAC   TYPE     RATE
                        *    (SEC)   (SEC)     (SEC)      (VPH)      (VPH)    (gm/hr)
------------------------*--------------------------------------------------------------------------------
 1. EBL                 *     120     112       2.0        270       1717     143.34      2        3
 2. EBT                 *     120      87       2.0       1130       1630     143.34      2        3
 3. WBL                 *     120     109       2.0        540       1717     143.34      2        3
 4. WBT                 *     120      84       2.0       1970       1569     143.34      2        3
 5. NBL                 *     120     115       2.0        120       1717     143.34      2        3
 6. NBT                 *     120      69       2.0       2290       1770     143.34      2        3
 7. NBR                 *     120      69       2.0        260       1583     143.34      2        3
 8. SBL                 *     120     111       2.0        420       1717     143.34      2        3
 9. SBT                 *     120      66       2.0       1850       1770     143.34      2        3
10. SBR                 *     120      66       2.0        210       1583     143.34      2        3

 RECEPTOR LOCATIONS
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RECEPTOR	X (FT)	Y (FT)	Z (FT)
1. R1	46.0	58.0	5.9
2. R2	128.0	58.0	5.9
3. R3	210.0	58.0	5.9
4. R4	292.0	58.0	5.9
5. R5	46.0	140.0	5.9
6. R6	46.0	222.0	5.9
7. R7	46.0	304.0	5.9
8. R8	-58.0	58.0	5.9
9. R9	-140.0	58.0	5.9
10. R10	-222.0	58.0	5.9
11. R11	-304.0	58.0	5.9
12. R12	-58.0	140.0	5.9
13. R13	-58.0	222.0	5.9
14. R14	-58.0	304.0	5.9
15. R15	-46.0	-58.0	5.9
16. R16	-128.0	-58.0	5.9
17. R17	-210.0	-58.0	5.9
18. R18	-292.0	-58.0	5.9
19. R19	-46.0	-140.0	5.9
20. R20	-46.0	-222.0	5.9
21. R21	-46.0	-304.0	5.9
22. R22	58.0	-58.0	5.9
23. R23	140.0	-58.0	5.9
24. R24	222.0	-58.0	5.9
25. R25	304.0	-58.0	5.9
26. R26	58.0	-140.0	5.9
27. R27	58.0	-222.0	5.9
28. R28	58.0	-304.0	5.9

JOB: AR_FH_P2-2035_PM RUN: AR_FH_P2-2035_PM

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

CONCENTRATION (PPM)

WIND ANGLE (DEGR)	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	6.9	1.5	0.6	0.2	6.9	6.7	6.5	4.9	1.3	0.6	0.2	4.6	4.5	4.3	9.9	6.7	5.7	2.9	7.9	7.3
10.	3.0	0.3	0.0	0.0	3.0	3.0	2.9	7.4	2.7	1.5	0.8	7.0	6.8	6.8	10.6	8.2	6.6	3.7	9.0	8.9
20.	0.9	0.0	0.0	0.0	0.9	0.9	0.9	7.7	3.3	2.1	1.5	7.1	7.1	7.0	8.8	8.7	7.4	4.6	8.0	8.5
30.	0.5	0.1	0.1	0.1	0.4	0.4	0.4	7.1	3.3	2.4	1.8	6.3	6.3	6.3	7.3	8.6	7.5	5.4	7.3	8.3
40.	0.5	0.2	0.2	0.2	0.3	0.3	0.3	6.6	3.1	2.4	1.8	5.8	5.8	5.8	6.6	8.5	8.0	6.1	8.0	8.2
50.	0.4	0.2	0.2	0.2	0.2	0.2	0.2	6.0	3.0	2.0	1.7	5.3	5.3	5.3	7.0	8.2	8.2	6.6	8.4	7.8
60.	0.3	0.2	0.2	0.2	0.1	0.1	0.1	5.8	2.9	2.0	1.7	5.1	5.1	5.1	7.9	8.4	8.8	7.7	8.2	7.3
70.	0.9	0.8	0.8	0.8	0.1	0.1	0.1	6.0	3.2	2.4	2.0	4.8	4.8	4.8	9.3	8.8	9.2	8.8	8.4	7.3
80.	3.2	3.2	3.1	3.1	0.4	0.1	0.0	8.2	5.0	4.0	3.6	5.4	5.1	5.0	10.6	9.3	9.3	9.4	8.2	6.8
90.	7.5	7.5	7.3	7.2	1.9	0.8	0.4	11.2	7.7	6.6	6.2	6.8	5.8	5.3	9.6	7.3	7.3	7.3	6.8	5.8
100.	9.8	9.7	9.7	9.7	3.4	2.0	1.3	11.9	7.9	7.0	6.9	8.5	7.1	6.3	6.7	4.3	3.9	3.8	5.4	5.0
110.	9.1	9.0	9.0	9.0	3.9	2.6	1.9	9.2	6.0	6.0	6.3	8.7	7.3	6.6	5.4	2.9	2.3	1.8	4.9	4.9
120.	8.0	7.9	7.9	7.9	3.7	2.6	2.1	7.0	5.4	6.1	6.3	8.5	7.5	7.1	5.4	2.9	2.1	1.6	5.1	5.1
130.	7.2	7.1	7.1	7.1	3.5	2.5	2.1	6.0	5.6	6.1	6.0	8.2	7.6	7.2	5.8	2.9	2.1	1.8	5.5	5.5

140.	*	6.5	6.4	6.4	6.4	3.3	2.4	2.1	5.8	6.5	6.2	5.8	7.8	7.7	7.4	6.2	3.0	2.1	1.7	6.0	6.0
150.	*	6.1	6.0	6.0	6.0	3.2	2.5	2.0	6.4	6.7	6.0	5.2	7.4	7.7	7.6	6.8	3.3	2.3	1.6	6.7	6.7
160.	*	6.0	5.6	5.6	5.6	3.6	2.9	2.4	7.8	6.8	5.6	4.2	7.9	7.9	7.9	7.5	3.2	1.8	1.1	7.5	7.4
170.	*	7.6	6.0	5.8	5.7	5.6	4.6	4.2	8.5	6.3	5.1	3.5	7.8	7.5	7.7	7.8	2.4	1.1	0.6	7.7	7.5
180.	*	10.8	7.3	6.3	6.0	8.6	7.9	7.9	7.0	5.0	4.3	3.0	6.0	5.3	5.6	5.7	1.1	0.5	0.2	5.6	5.5
190.	*	11.5	8.4	7.1	6.4	9.7	9.3	9.6	5.0	4.1	3.8	2.7	3.5	2.9	2.7	2.3	0.2	0.0	0.0	2.2	2.2
200.	*	9.7	9.0	7.7	6.9	8.5	9.1	9.3	3.9	3.8	3.5	2.6	2.4	1.8	1.4	0.6	0.0	0.0	0.0	0.6	0.6
210.	*	8.2	9.2	8.3	7.6	8.1	8.7	8.6	3.9	3.9	3.3	2.7	2.3	1.6	1.1	0.4	0.1	0.1	0.1	0.3	0.3
220.	*	7.4	9.2	8.6	8.1	8.2	8.2	7.8	4.2	4.1	3.1	2.9	2.3	1.4	1.0	0.3	0.1	0.1	0.1	0.2	0.2
230.	*	7.7	8.7	9.0	8.7	8.4	7.7	7.0	4.5	4.2	3.3	3.2	2.2	1.4	1.0	0.3	0.1	0.1	0.1	0.2	0.2
240.	*	8.3	8.8	9.2	9.3	8.0	7.0	6.5	4.6	4.1	3.5	3.5	2.0	1.3	1.0	0.2	0.1	0.1	0.1	0.1	0.1
250.	*	9.1	9.1	9.6	9.8	7.7	6.6	6.1	4.8	4.3	4.0	4.0	1.8	1.0	0.6	0.4	0.4	0.3	0.3	0.0	0.0
260.	*	9.7	8.5	9.0	9.7	7.0	6.0	5.7	4.3	4.0	4.0	3.7	1.4	0.6	0.2	1.8	1.6	1.2	1.0	0.0	0.0
270.	*	8.6	6.6	6.9	6.9	6.1	5.7	5.5	2.8	2.8	2.6	2.5	0.5	0.2	0.0	4.4	3.9	2.9	2.5	0.5	0.2
280.	*	6.9	4.5	3.9	3.6	5.4	5.4	5.4	1.2	1.1	1.1	1.0	0.0	0.0	0.0	6.8	6.2	4.9	3.7	1.5	0.6
290.	*	5.8	3.3	2.5	2.1	5.3	5.3	5.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	7.3	7.0	5.6	3.9	2.2	1.0
300.	*	5.9	3.0	2.2	1.8	5.5	5.5	5.5	0.1	0.1	0.1	0.1	0.0	0.0	0.0	6.9	6.7	5.8	3.5	2.7	1.5
310.	*	6.2	3.1	2.3	1.9	5.9	5.9	5.9	0.1	0.1	0.1	0.1	0.0	0.0	0.0	6.3	6.1	5.8	3.2	3.0	1.9
320.	*	6.7	3.3	2.4	2.0	6.6	6.6	6.6	0.1	0.1	0.1	0.1	0.0	0.0	0.0	5.7	5.7	5.5	2.9	2.9	1.9
330.	*	7.4	3.5	2.5	1.9	7.3	7.3	7.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	5.2	5.2	5.2	2.7	2.9	2.1
340.	*	8.4	3.6	2.3	1.6	8.4	8.4	8.4	0.2	0.0	0.0	0.0	0.2	0.2	0.2	5.1	4.8	4.8	2.5	3.1	2.5
350.	*	9.1	3.0	1.5	0.8	9.0	9.0	8.8	1.7	0.3	0.0	0.0	1.5	1.5	1.4	6.9	5.2	4.9	2.6	5.0	4.3
360.	*	6.9	1.5	0.6	0.2	6.9	6.7	6.5	4.9	1.3	0.6	0.2	4.6	4.5	4.3	9.9	6.7	5.7	2.9	7.9	7.3

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	*	7.4	8.2	5.8	5.0	4.6	6.7	6.2	5.9
10.	*	9.1	5.7	4.6	4.4	4.4	4.0	3.3	3.2
20.	*	8.5	4.4	4.2	4.2	4.2	2.5	2.0	1.8
30.	*	8.2	4.5	4.5	4.5	4.5	2.6	2.0	1.6
40.	*	7.5	4.7	4.7	4.7	4.7	2.6	2.0	1.6
50.	*	7.2	5.1	5.1	5.1	5.1	3.0	2.2	1.7
60.	*	6.9	5.8	5.8	5.7	5.7	3.0	2.2	1.8
70.	*	6.6	6.3	6.3	6.3	6.3	3.3	2.3	1.7
80.	*	6.2	6.7	6.5	6.5	6.4	3.0	1.7	1.1
90.	*	5.4	4.6	4.6	4.5	4.3	1.4	0.6	0.3
100.	*	5.0	1.7	1.7	1.7	1.7	0.3	0.0	0.0
110.	*	4.9	0.3	0.3	0.3	0.3	0.0	0.0	0.0
120.	*	5.1	0.2	0.2	0.2	0.2	0.0	0.0	0.0
130.	*	5.5	0.1	0.1	0.1	0.1	0.0	0.0	0.0
140.	*	6.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0
150.	*	6.6	0.1	0.1	0.1	0.1	0.0	0.0	0.0
160.	*	7.3	0.2	0.0	0.0	0.0	0.2	0.2	0.2
170.	*	7.2	1.6	0.2	0.1	0.0	1.4	1.3	1.3
180.	*	5.1	4.7	1.1	0.4	0.2	4.2	4.0	3.8
190.	*	2.1	7.2	2.4	1.1	0.7	6.5	6.3	6.1
200.	*	0.6	7.6	3.1	1.8	1.2	6.7	6.7	6.6
210.	*	0.3	7.0	3.1	2.1	1.6	6.2	6.2	6.2

220. *	0.2	6.5	3.1	2.2	1.7	5.7	5.7	5.7
230. *	0.2	5.9	2.8	2.1	1.7	5.3	5.2	5.2
240. *	0.1	5.6	2.9	2.0	1.7	5.1	4.9	4.9
250. *	0.0	5.8	3.1	2.3	1.8	5.1	4.8	4.8
260. *	0.0	7.0	4.2	3.3	2.9	5.2	4.8	4.8
270. *	0.0	9.0	5.9	5.1	5.0	6.0	5.0	4.8
280. *	0.2	9.8	6.6	5.9	6.3	7.2	5.4	5.2
290. *	0.7	8.3	6.0	6.2	6.5	8.1	6.3	5.6
300. *	1.1	6.5	5.4	6.4	6.6	8.2	6.6	6.0
310. *	1.3	6.0	6.4	6.9	6.6	8.0	7.1	6.5
320. *	1.4	6.2	7.0	6.8	6.5	7.6	7.4	7.1
330. *	1.6	7.0	7.4	6.7	6.3	7.6	7.4	7.5
340. *	1.9	8.6	7.7	6.5	5.8	8.3	7.9	8.2
350. *	3.8	9.8	7.1	5.9	5.2	8.5	8.2	8.1
360. *	7.4	8.2	5.8	5.0	4.6	6.7	6.2	5.9

THE HIGHEST CONCENTRATION OF 11.90 PPM OCCURRED AT RECEPTOR REC8 .

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JOB: AR_FH_P2-2035_PM RUN: AR_FH_P2-2035_PM

DATE : 10/ 7/ 9
TIME : 9:56:56

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)
* ANGLE (DEGREES)

LINK # *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	190	100	100	250	190	190	190	100	100	100	100	110	160	160	10	80	80	80	10	10
1 *	0.0	0.0	0.0	0.3	0.0	0.1	0.1	0.0	0.1	0.4	0.8	0.0	0.0	0.0	0.2	0.0	0.4	0.7	0.1	0.1
2 *	0.0	0.0	0.0	0.3	0.0	0.1	0.2	0.0	0.0	0.1	0.4	0.0	0.0	0.0	0.5	1.4	2.4	2.7	0.2	0.1
3 *	0.2	1.7	1.7	1.2	0.1	0.1	0.1	1.6	1.2	0.9	0.7	0.9	0.2	0.2	0.0	1.3	1.0	0.8	0.0	0.1
4 *	0.4	4.0	4.0	3.3	0.2	0.1	0.1	2.3	1.5	1.1	0.9	1.4	0.2	0.3	0.0	1.6	1.3	1.1	0.0	0.1
5 *	1.5	0.0	0.0	0.2	1.0	0.7	0.5	0.0	0.0	0.1	0.1	0.0	0.4	0.2	0.0	0.2	0.1	0.1	0.2	0.8
6 *	1.2	0.0	0.0	0.1	0.8	0.6	0.5	0.0	0.0	0.0	0.1	0.0	0.3	0.2	0.0	0.1	0.1	0.1	0.0	0.2
7 *	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8 *	0.0	0.0	0.0	0.0	0.2	0.8	1.1	0.6	0.2	0.1	0.1	1.1	0.9	1.2	1.7	0.0	0.0	0.1	1.2	0.9
9 *	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.6	0.2	0.1	0.1	1.0	1.1	1.2	1.1	0.0	0.0	0.0	0.7	0.5
10 *	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0
11 *	0.1	0.0	0.0	0.3	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.0	0.1	0.0	1.0	1.1	1.4	1.6	0.4	0.2
12 *	0.5	0.7	0.7	0.5	0.3	0.1	0.1	0.7	0.7	0.6	0.5	0.5	0.2	0.2	0.0	0.9	0.6	0.4	0.1	0.1
13 *	1.7	3.3	3.3	2.7	0.7	0.3	0.2	2.2	1.3	0.9	0.6	1.0	0.3	0.3	0.1	1.1	0.9	0.8	0.2	0.2
14 *	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.7	1.2	1.5	1.6	0.0	0.1	0.1	0.5	0.0	0.1	0.2	0.2	0.1
15 *	2.3	0.0	0.0	0.3	1.3	0.8	0.6	0.0	0.1	0.2	0.2	0.0	0.6	0.4	0.0	0.5	0.3	0.2	0.2	0.4
16 *	2.1	0.0	0.0	0.1	3.4	4.0	4.3	1.2	0.6	0.4	0.2	1.3	0.9	1.2	1.7	0.2	0.2	0.2	1.6	1.2
17 *	0.0	0.0	0.0	0.1	0.2	0.4	0.6	1.5	0.6	0.3	0.2	1.5	2.0	2.2	2.1	0.1	0.1	0.2	1.2	0.8
18 *	1.3	0.0	0.0	0.3	1.2	0.9	0.7	0.0	0.1	0.2	0.2	0.0	0.4	0.2	1.6	0.8	0.4	0.2	2.6	3.1

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JOB: AR_FH_P2-2035_PM RUN: AR_FH_P2-2035_PM

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RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)
* ANGLE (DEGREES)
* REC21 REC22 REC23 REC24 REC25 REC26 REC27 REC28

LINK # *	10	350	340	310	300	350	350	340
1 *	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2
2 *	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
3 *	0.1	0.6	1.1	1.3	1.4	0.2	0.1	0.0
4 *	0.2	0.5	1.2	1.2	1.2	0.2	0.1	0.0
5 *	1.1	0.0	0.0	0.0	0.0	0.1	0.5	1.3
6 *	0.3	0.0	0.0	0.0	0.0	0.4	0.8	1.3
7 *	0.1	0.0	0.0	0.0	0.0	0.5	0.3	0.1
8 *	0.7	1.6	0.9	0.5	0.3	1.2	0.9	0.3
9 *	0.4	0.8	0.5	0.3	0.2	0.7	0.6	0.2
10 *	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11 *	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2
12 *	0.1	1.1	1.0	1.4	1.5	0.5	0.2	0.1
13 *	0.2	0.9	1.0	1.0	1.0	0.5	0.3	0.1
14 *	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.2
15 *	0.7	0.5	0.0	0.0	0.0	1.3	1.7	2.3
16 *	0.9	2.7	1.3	0.7	0.5	1.7	1.2	0.3
17 *	0.6	1.1	0.7	0.5	0.4	1.0	0.9	0.4
18 *	3.3	0.0	0.0	0.0	0.0	0.1	0.3	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰↰	↑↑↑	↱	↰↰↰	↑↑↑	↱	↰↰↰	↑↑↑	↱	↰↰↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.94	0.91	1.00	0.94	0.91	1.00	0.94	0.91	1.00	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	4990	5085	1583	4990	5085	1583	4990	5085	1583	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	4990	5085	1583	4990	5085	1583	4990	5085	1583	4990	5085	1583
Volume (vph)	890	520	1120	440	190	350	960	1540	900	610	1300	640
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	967	565	1217	478	207	380	1043	1674	978	663	1413	696
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	967	565	1217	478	207	380	1043	1674	978	663	1413	696
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	23.0	18.5	120.0	16.7	12.2	120.0	27.9	48.7	120.0	16.1	36.9	120.0
Effective Green, g (s)	24.0	19.5	120.0	17.7	13.2	120.0	28.9	49.7	120.0	17.1	37.9	120.0
Actuated g/C Ratio	0.20	0.16	1.00	0.15	0.11	1.00	0.24	0.41	1.00	0.14	0.32	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	998	826	1583	736	559	1583	1202	2106	1583	711	1606	1583
v/s Ratio Prot	c0.19	0.11		0.10	0.04		0.21	0.33		0.13	c0.28	
v/s Ratio Perm			c0.77			0.24			0.62			0.44
v/c Ratio	0.97	0.68	0.77	0.65	0.37	0.24	0.87	0.79	0.62	0.93	0.88	0.44
Uniform Delay, d1	47.6	47.3	0.0	48.2	49.5	0.0	43.7	30.7	0.0	50.9	38.9	0.0
Progression Factor	1.00	1.00	1.00	0.93	0.92	1.00	1.00	1.00	1.00	0.82	0.77	1.00
Incremental Delay, d2	21.0	2.4	3.7	1.9	0.4	0.3	6.8	3.2	1.8	11.7	4.0	0.5
Delay (s)	68.7	49.7	3.7	46.7	46.1	0.3	50.6	33.9	1.8	53.6	34.1	0.5
Level of Service	E	D	A	D	D	A	D	C	A	D	C	A
Approach Delay (s)		36.0			30.0			30.1			30.3	
Approach LOS		D			C			C			C	

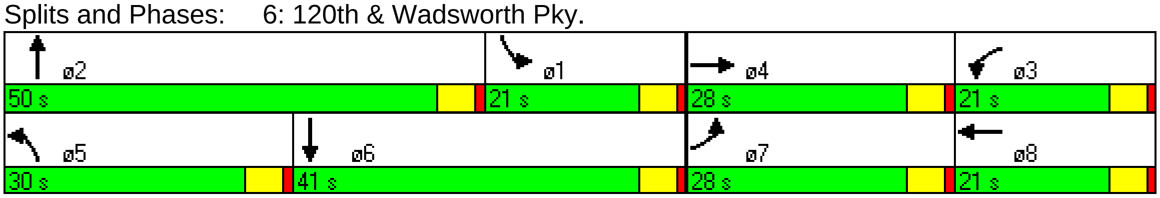
Intersection Summary			
HCM Average Control Delay	31.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Phase Number	1	2	3	4	5	6	7	8
Movement	SBL	NBT	WBL	EBT	NBL	SBT	EBL	WBT
Lead/Lag	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	None	C-Max	None	None
Maximum Split (s)	21	50	21	28	30	41	28	21
Maximum Split (%)	17.5%	41.7%	17.5%	23.3%	25.0%	34.2%	23.3%	17.5%
Minimum Split (s)	9	21	9	21	9	21	9	21
Yellow Time (s)	4	4	4	4	4	4	4	4
All-Red Time (s)	1	1	1	1	1	1	1	1
Minimum Initial (s)	4	4	4	4	4	4	4	4
Vehicle Extension (s)	3	3	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		5		5		5		5
Flash Dont Walk (s)		11		11		11		11
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	89	39	18	110	39	69	110	18
End Time (s)	110	89	39	18	69	110	18	39
Yield/Force Off (s)	105	84	34	13	64	105	13	34
Yield/Force Off 170(s)	105	73	34	2	64	94	13	23
Local Start Time (s)	20	90	69	41	90	0	41	69
Local Yield (s)	36	15	85	64	115	36	64	85
Local Yield 170(s)	36	4	85	53	115	25	64	74

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	100

Offset: 69 (58%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Splits and Phases: 6: 120th & Wadsworth Pky.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91		0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	0.96		1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	4890		3433	4708		3433	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	4890		3433	4708		3433	3539	1583	3433	3539	1583
Volume (vph)	270	890	240	540	1090	880	120	2290	260	420	1850	210
Peak-hour factor, PHF	0.77	0.88	0.69	0.89	0.86	0.71	0.67	0.96	0.73	0.92	0.91	0.77
Adj. Flow (vph)	351	1011	348	607	1267	1239	179	2385	356	457	2033	273
RTOR Reduction (vph)	0	44	0	0	102	0	0	0	97	0	0	46
Lane Group Flow (vph)	351	1316	0	607	2404	0	179	2385	259	457	2033	227
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases									6			2
Actuated Green, G (s)	6.8	30.7		9.8	33.7		4.0	48.5	48.5	7.5	52.0	52.0
Effective Green, g (s)	8.0	33.0		11.0	36.0		5.5	51.0	51.0	9.0	54.5	54.5
Actuated g/C Ratio	0.07	0.28		0.09	0.30		0.05	0.42	0.42	0.08	0.45	0.45
Clearance Time (s)	5.2	6.3		5.2	6.3		5.5	6.5	6.5	5.5	6.5	6.5
Vehicle Extension (s)	1.0	6.0		1.0	6.0		1.0	6.0	6.0	1.0	6.0	6.0
Lane Grp Cap (vph)	229	1345		315	1412		157	1504	673	257	1607	719
v/s Ratio Prot	0.10	0.27		c0.18	c0.51		0.05	c0.67		c0.13	0.57	
v/s Ratio Perm									0.16			0.14
v/c Ratio	1.53	0.98		1.93	2.15dr		1.14	1.59	0.38	1.78	1.27	0.32
Uniform Delay, d1	56.0	43.1		54.5	42.0		57.2	34.5	23.7	55.5	32.8	20.9
Progression Factor	1.02	0.74		0.94	1.07		0.81	0.68	0.51	0.98	0.69	0.40
Incremental Delay, d2	255.7	16.5		428.4	319.1		109.4	266.4	1.4	351.6	119.8	0.1
Delay (s)	312.8	48.6		479.9	364.0		155.7	289.9	13.6	406.2	142.5	8.5
Level of Service	F	D		F	F		F	F	B	F	F	A
Approach Delay (s)		102.9			386.6			248.0			172.8	
Approach LOS		F			F			F			F	

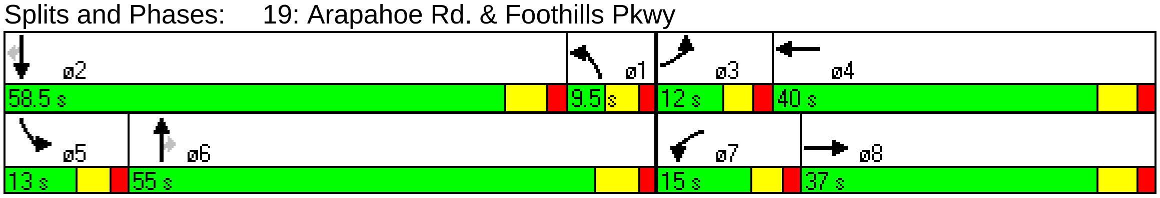
Intersection Summary			
HCM Average Control Delay	245.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	137.1%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Phase Number	1	2	3	4	5	6	7	8
Movement	NBL	SBT	EBL	WBT	SBL	NBT	WBL	EBT
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	None	C-Max	None	None
Maximum Split (s)	9.5	58.5	12	40	13	55	15	37
Maximum Split (%)	7.9%	48.8%	10.0%	33.3%	10.8%	45.8%	12.5%	30.8%
Minimum Split (s)	9.5	34.5	9.2	26.3	9.5	34.5	9.2	26.3
Yellow Time (s)	3.5	4.5	3.2	4.3	3.5	4.5	3.2	4.3
All-Red Time (s)	2	2	2	2	2	2	2	2
Minimum Initial (s)	4	15	4	6	4	15	4	6
Vehicle Extension (s)	1	6	1	6	1	6	1	6
Minimum Gap (s)	3	4	3	4	3	4	3	4
Time Before Reduce (s)	0	20	0	10	0	20	0	10
Time To Reduce (s)	0	20	0	10	0	20	0	10
Walk Time (s)		5		5		5		5
Flash Dont Walk (s)		23		15		23		15
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	9.5	71	19	31	71	84	19	34
End Time (s)	19	9.5	31	71	84	19	34	71
Yield/Force Off (s)	13.5	3	25.8	64.7	78.5	12.5	28.8	64.7
Yield/Force Off 170(s)	13.5	100	25.8	49.7	78.5	109.5	28.8	49.7
Local Start Time (s)	6.5	68	16	28	68	81	16	31
Local Yield (s)	10.5	0	22.8	61.7	75.5	9.5	25.8	61.7
Local Yield 170(s)	10.5	97	22.8	46.7	75.5	106.5	25.8	46.7

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	150
Offset: 3 (3%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow	

Splits and Phases: 19: Arapahoe Rd. & Foothills Pkwy



Appendix 21
CO Hot-Spot Modeling Files — Package 4, 2035

```
'120_WW_P4-2035_PM'   60.00 75.000 0.00 0.00 28 0.3048 1 1
'R1'    100     82      5.9
'R2'    182     82      5.9
'R3'    264     82      5.9
'R4'    346     82      5.9
'R5'    100     164     5.9
'R6'    100     246     5.9
'R7'    100     328     5.9
'R8'    -46     76      5.9
'R9'    -128    76      5.9
'R10'   -210    76      5.9
'R11'   -292    76      5.9
'R12'   -46     158     5.9
'R13'   -46     240     5.9
'R14'   -46     322     5.9
'R15'   -22.88  -70     5.9
'R16'   -104.88 -70     5.9
'R17'   -186.88 -70     5.9
'R18'   -268.88 -70     5.9
'R19'   13.79151614     -143.343029     5.9
'R20'   50.46303227     -216.686058     5.9
'R21'   87.13454841     -290.029087     5.9
'R22'   154     -64     5.9
'R23'   236     -64     5.9
'R24'   318     -64     5.9
'R25'   400     -64     5.9
'R26'   190.6715161     -137.343029     5.9
'R27'   227.3430323     -210.686058     5.9
'R28'   264.0145484     -284.029087     5.9
'120_WW_P4-2035_PM'             16      1       1       'C'
2
'EBL'   'AG'    -54     6       -1054   6       0.00    36      3
110     82      2.00    1060    142.06  1663    2       3
2
'EBT'   'AG'    -54     -30     -1054   -30     0.00    36      3
110     86      2.00    830     142.06  1695    2       3
2
'WBL'   'AG'    114     6       1114    6       0.00    36      3
110     92      2.00    660     142.06  1663    2       3
2
'WBT'   'AG'    114     42      1114    42      0.00    36      3
110     96      2.00    330     142.06  1695    2       3
2
'NBL'   'AG'    54      -66     534     -1026   0.00    36      3
110     86      2.00    1040    142.06  1663    2       3
2
'NBT'   'AG'    104     -65     584     -1025   0.00    36      3
110     76      2.00    1140    142.06  1695    2       3
2
'SBL'   'AG'    30      72      30      1072    0.00    36      3
110     93      2.00    540     142.06  1663    2       3
2
'SBT'   'AG'    -6      72      -6      1072    0.00    36      3
110     82      2.00    1230    142.06  1695    2       3
1
'EBA'   'AG'    -1200.00        -30.00  0.00    -30.00  3760.00 26.80   0.00    56.00
```

```
1
'EBD'   'AG'    0.00    -30.00  1200.00 -30.00  2260.00 26.80   0.00    68.00
1
'WBA'   'AG'    1200.00 42.00   0.00    42.00   1360.00 23.32   0.00    56.00
1
'WBD'   'AG'    0.00    42.00   -1200.00        42.00   2010.00 23.32   0.00    68.00
1
'NBA'   'AG'    1072.00 -2000.00        72.00   0.00    3070.00 27.53   0.00    56.00
1
'NBD'   'AG'    72.00   0.00    72.00   800.00  2570.00 27.53   0.00    56.00
1
'SBA'   'AG'    -6.00   800.00  -6.00   0.00    2410.00 23.16   0.00    56.00
1
'SBD'   'AG'    -24.00  -6.00   464.00  -966.00 3760.00 23.16   0.00    56.00
1 0 4 1000 0 'y' 10 0 36
```

JOB: 120_WW_P4-2035_PM RUN: 120_WW_P4-2035_PM

DATE : 10/ 6/ 9
TIME : 14:45:13

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 75. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM BRG = 0. DEGREES

LINK VARIABLES

LINK DESCRIPTION	X1 (FT)	Y1 (FT)	X2 (FT)	Y2 (FT)	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. EBL	-54.0	6.0	-263.7	6.0	210.	270.	AG	852.	100.0	0.0	36.0	0.98	10.7
2. EBT	-54.0	-30.0	-203.3	-30.0	149.	270.	AG	894.	100.0	0.0	36.0	0.90	7.6
3. WBL	114.0	6.0	367.7	6.0	254.	90.	AG	956.	100.0	0.0	36.0	1.04	12.9
4. WBT	114.0	42.0	172.5	42.0	59.	90.	AG	998.	100.0	0.0	36.0	0.71	3.0
5. NBL	54.0	-66.0	351.8	-661.7	666.	153.	AG	894.	100.0	0.0	36.0	1.15	33.8
6. NBT	104.0	-65.0	174.9	-206.8	159.	153.	AG	790.	100.0	0.0	36.0	0.82	8.1
7. SBL	30.0	72.0	30.0	188.0	116.	360.	AG	966.	100.0	0.0	36.0	0.92	5.9
8. SBT	-6.0	72.0	-6.0	733.9	662.	360.	AG	852.	100.0	0.0	36.0	1.11	33.6
9. EBA	-1200.0	-30.0	0.0	-30.0	1200.	90.	AG	3760.	26.8	0.0	56.0		
10. EBD	0.0	-30.0	1200.0	-30.0	1200.	90.	AG	2260.	26.8	0.0	68.0		
11. WBA	1200.0	42.0	0.0	42.0	1200.	270.	AG	1360.	23.3	0.0	56.0		
12. WBD	0.0	42.0	-1200.0	42.0	1200.	270.	AG	2010.	23.3	0.0	68.0		
13. NBA	1072.0	-2000.0	72.0	0.0	2236.	333.	AG	3070.	27.5	0.0	56.0		
14. NBD	72.0	0.0	72.0	800.0	800.	360.	AG	2570.	27.5	0.0	56.0		
15. SBA	-6.0	800.0	-6.0	0.0	800.	180.	AG	2410.	23.2	0.0	56.0		
16. SBD	-24.0	-6.0	464.0	-966.0	1077.	153.	AG	3760.	23.2	0.0	56.0		

JOB: 120_WW_P4-2035_PM RUN: 120_WW_P4-2035_PM

DATE : 10/ 6/ 9
TIME : 14:45:13

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
1. EBL	110	82	2.0	1060	1663	142.06	2	3
2. EBT	110	86	2.0	830	1695	142.06	2	3
3. WBL	110	92	2.0	660	1663	142.06	2	3
4. WBT	110	96	2.0	330	1695	142.06	2	3
5. NBL	110	86	2.0	1040	1663	142.06	2	3
6. NBT	110	76	2.0	1140	1695	142.06	2	3
7. SBL	110	93	2.0	540	1663	142.06	2	3
8. SBT	110	82	2.0	1230	1695	142.06	2	3

RECEPTOR LOCATIONS

RECEPTOR	X (FT)	Y (FT)	Z (FT)

1. R1	*	100.0	82.0	5.9	*
2. R2	*	182.0	82.0	5.9	*
3. R3	*	264.0	82.0	5.9	*
4. R4	*	346.0	82.0	5.9	*
5. R5	*	100.0	164.0	5.9	*
6. R6	*	100.0	246.0	5.9	*
7. R7	*	100.0	328.0	5.9	*
8. R8	*	-46.0	76.0	5.9	*
9. R9	*	-128.0	76.0	5.9	*
10. R10	*	-210.0	76.0	5.9	*
11. R11	*	-292.0	76.0	5.9	*
12. R12	*	-46.0	158.0	5.9	*
13. R13	*	-46.0	240.0	5.9	*
14. R14	*	-46.0	322.0	5.9	*
15. R15	*	-22.9	-70.0	5.9	*
16. R16	*	-104.9	-70.0	5.9	*
17. R17	*	-186.9	-70.0	5.9	*
18. R18	*	-268.9	-70.0	5.9	*
19. R19	*	13.8	-143.3	5.9	*
20. R20	*	50.5	-216.7	5.9	*
21. R21	*	87.1	-290.0	5.9	*
22. R22	*	154.0	-64.0	5.9	*
23. R23	*	236.0	-64.0	5.9	*
24. R24	*	318.0	-64.0	5.9	*
25. R25	*	400.0	-64.0	5.9	*
26. R26	*	190.7	-137.3	5.9	*
27. R27	*	227.3	-210.7	5.9	*
28. R28	*	264.0	-284.0	5.9	*

JOB: 120_WW_P4-2035_PM RUN: 120_WW_P4-2035_PM

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND * CONCENTRATION (PPM)

WIND ANGLE (DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	4.0	0.6	0.1	0.0	3.9	3.6	3.5	3.5	0.6	0.0	0.0	3.3	3.0	2.8	10.5	7.8	7.0	3.9	9.1	9.6
10.	*	1.8	0.1	0.0	0.0	1.6	1.6	1.5	5.9	1.7	0.5	0.2	5.5	5.3	5.0	11.4	9.3	7.9	4.7	8.5	9.0
20.	*	0.6	0.0	0.0	0.0	0.6	0.6	0.6	6.5	2.6	1.4	0.6	6.2	6.1	5.8	9.7	10.0	8.8	5.7	7.3	8.4
30.	*	0.3	0.0	0.0	0.0	0.3	0.3	0.3	6.7	3.0	2.0	1.3	5.8	5.7	5.7	8.1	10.0	9.4	6.6	7.1	8.1
40.	*	0.2	0.0	0.0	0.0	0.2	0.2	0.2	6.6	2.9	2.1	1.7	5.3	5.3	5.3	7.1	9.2	9.7	7.2	7.5	7.9
50.	*	0.2	0.0	0.0	0.0	0.2	0.2	0.2	6.4	3.2	2.2	1.7	5.1	4.9	4.9	7.3	8.1	9.8	8.0	8.1	7.7
60.	*	0.1	0.0	0.0	0.0	0.1	0.1	0.1	6.2	3.3	2.2	1.8	5.1	4.6	4.6	8.0	7.8	9.5	8.8	8.7	7.7
70.	*	0.2	0.1	0.1	0.1	0.1	0.1	0.1	6.1	3.4	2.5	2.0	5.4	4.5	4.5	8.7	7.8	9.0	9.3	8.4	7.2
80.	*	0.5	0.4	0.4	0.4	0.0	0.0	0.0	6.4	4.2	3.4	2.9	5.7	4.4	4.4	8.9	7.3	7.8	8.3	7.6	6.4
90.	*	1.7	1.4	1.3	1.3	0.4	0.2	0.0	7.8	5.7	5.2	5.0	6.4	4.7	4.5	7.9	5.8	5.8	5.9	6.8	5.9
100.	*	3.5	2.7	2.2	2.2	0.9	0.4	0.2	8.3	6.4	6.5	6.6	7.2	5.1	4.7	7.1	4.5	3.9	3.4	6.6	5.7
110.	*	5.0	3.3	2.6	2.4	1.5	0.9	0.6	7.6	6.3	6.8	7.7	8.2	5.8	5.2	7.2	4.0	3.0	2.4	6.8	6.2
120.	*	5.7	3.7	2.9	2.3	1.9	1.2	0.8	6.8	6.5	8.0	8.4	8.6	6.8	5.6	7.7	4.0	2.8	2.2	7.2	6.8
130.	*	5.9	3.6	3.1	2.0	2.4	1.4	1.0	7.2	8.0	9.1	8.4	8.8	7.6	6.3	8.1	4.0	2.6	2.0	7.8	7.6
140.	*	6.0	3.5	3.2	1.9	2.6	1.7	1.1	9.1	9.4	8.8	6.8	9.6	9.3	7.5	8.6	3.5	2.1	1.4	8.5	8.3
150.	*	7.3	4.0	3.5	2.2	4.1	2.7	2.0	10.2	8.8	7.1	5.1	10.3	10.8	9.5	7.2	2.1	0.9	0.5	7.0	6.6

160.	*	9.1	5.1	4.2	2.9	6.2	4.5	3.6	8.5	6.5	5.6	3.7	8.7	10.0	10.3	3.6	0.6	0.2	0.0	3.4	3.2
170.	*	9.8	6.4	5.0	3.9	7.6	6.1	5.3	6.3	5.4	5.0	3.1	5.8	6.9	7.7	1.0	0.0	0.0	0.0	1.0	0.9
180.	*	8.9	7.3	5.6	4.8	7.3	6.8	6.4	4.8	5.5	4.8	3.1	3.9	4.0	4.3	0.5	0.0	0.0	0.0	0.4	0.4
190.	*	7.6	7.9	5.7	5.0	6.7	6.8	7.1	4.9	5.3	4.4	2.8	3.3	2.7	2.5	0.3	0.0	0.0	0.0	0.3	0.3
200.	*	6.6	8.2	5.9	5.2	6.1	7.1	7.4	5.1	5.2	4.1	2.8	3.0	2.4	1.8	0.3	0.0	0.0	0.0	0.3	0.2
210.	*	6.1	8.0	5.9	5.4	6.5	7.7	7.2	5.4	5.1	4.0	2.9	3.3	2.2	1.7	0.2	0.0	0.0	0.0	0.2	0.2
220.	*	6.3	7.5	6.0	5.4	7.3	8.1	6.8	5.7	5.0	3.7	3.0	3.0	1.8	1.3	0.1	0.0	0.0	0.0	0.1	0.1
230.	*	6.6	6.9	6.0	5.7	8.4	7.5	6.1	5.9	5.0	3.7	3.4	2.8	1.6	1.1	0.0	0.0	0.0	0.0	0.0	0.0
240.	*	7.6	7.0	6.4	5.8	8.5	6.4	5.3	5.7	4.8	3.8	3.7	2.4	1.5	1.1	0.0	0.0	0.0	0.0	0.0	0.0
250.	*	8.2	6.9	6.6	6.1	7.9	5.4	4.9	5.6	4.8	4.2	4.2	2.2	1.3	0.9	0.2	0.2	0.2	0.2	0.0	0.0
260.	*	8.5	6.9	6.5	5.9	7.3	4.9	4.5	4.9	4.4	4.2	4.1	1.5	0.8	0.4	1.4	1.2	1.2	1.2	0.2	0.0
270.	*	7.6	5.2	4.7	4.4	6.4	4.4	4.3	3.2	2.9	2.9	2.8	0.7	0.2	0.0	4.3	3.5	3.2	3.1	1.1	0.5
280.	*	6.2	3.7	3.1	2.5	5.3	4.0	4.0	1.2	1.2	1.2	1.1	0.1	0.0	0.0	7.4	6.0	5.0	4.9	2.4	1.4
290.	*	5.6	3.2	2.3	1.7	4.7	3.9	3.9	0.4	0.4	0.4	0.4	0.0	0.0	0.0	8.7	7.1	5.2	5.1	3.4	2.1
300.	*	5.7	3.1	1.9	1.5	4.5	4.1	4.1	0.2	0.2	0.2	0.2	0.0	0.0	0.0	8.5	7.7	4.7	4.5	4.0	2.6
310.	*	6.1	2.9	1.8	1.5	4.7	4.6	4.6	0.2	0.2	0.2	0.2	0.0	0.0	0.0	7.7	7.8	4.9	4.1	4.4	2.9
320.	*	6.2	2.7	1.9	1.5	4.9	4.8	4.8	0.1	0.1	0.1	0.1	0.0	0.0	0.0	6.7	7.4	5.1	3.7	4.5	3.6
330.	*	6.3	2.6	1.8	1.1	5.4	5.4	5.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	6.4	7.1	5.4	3.5	5.0	4.8
340.	*	6.4	2.4	1.2	0.5	5.8	5.7	5.4	0.2	0.0	0.0	0.0	0.2	0.2	0.2	6.6	6.7	5.8	3.3	6.3	6.4
350.	*	5.8	1.5	0.5	0.1	5.5	5.3	5.0	1.2	0.0	0.0	0.0	1.0	1.0	0.8	8.0	7.0	6.4	3.5	8.1	8.5
360.	*	4.0	0.6	0.1	0.0	3.9	3.6	3.5	3.5	0.6	0.0	0.0	3.3	3.0	2.8	10.5	7.8	7.0	3.9	9.1	9.6

JOB: 120_WW_P4-2035_PM RUN: 120_WW_P4-2035_PM

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	*	9.7	6.0	4.2	4.0	2.4	3.1	2.3	1.6
10.	*	9.2	4.6	3.8	3.8	2.2	2.4	1.7	1.2
20.	*	8.2	4.1	3.8	3.6	2.2	2.2	1.5	1.0
30.	*	7.7	4.0	3.9	3.4	2.3	2.2	1.5	0.8
40.	*	7.0	4.2	4.2	3.2	2.5	2.2	1.2	0.7
50.	*	6.6	4.5	4.3	3.0	2.7	2.0	1.1	0.8
60.	*	6.3	4.8	4.3	3.2	3.1	1.8	1.1	0.8
70.	*	6.0	4.9	4.2	3.5	3.5	1.7	0.9	0.7
80.	*	5.6	4.5	4.0	3.8	3.7	1.2	0.6	0.3
90.	*	5.4	3.2	2.9	2.9	2.8	0.6	0.2	0.0
100.	*	5.6	1.4	1.3	1.3	1.3	0.1	0.0	0.0
110.	*	6.2	0.5	0.5	0.5	0.5	0.0	0.0	0.0
120.	*	6.8	0.2	0.2	0.2	0.2	0.0	0.0	0.0
130.	*	7.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1
140.	*	8.0	0.7	0.3	0.2	0.2	0.5	0.5	0.5
150.	*	6.2	2.8	0.8	0.4	0.2	2.4	2.3	2.2
160.	*	3.0	5.6	2.0	1.0	0.6	4.8	4.6	4.3
170.	*	0.8	7.4	3.1	1.7	1.1	6.3	5.9	5.7
180.	*	0.4	7.6	3.3	2.2	1.5	6.4	5.8	5.8
190.	*	0.2	7.4	3.4	2.4	1.9	6.5	5.5	5.5
200.	*	0.2	7.0	3.6	2.4	2.0	6.4	5.0	5.0
210.	*	0.2	6.6	3.7	2.5	2.0	6.4	4.7	4.7
220.	*	0.1	6.5	4.0	2.6	2.1	6.2	4.5	4.5

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230.  *   0.0   6.3   3.9   2.8   2.0   6.1   4.4   4.4
240.  *   0.0   6.4   4.0   3.0   2.4   6.2   4.5   4.5
250.  *   0.0   6.6   4.1   3.1   2.8   6.2   4.6   4.5
260.  *   0.0   7.5   5.5   4.3   4.0   6.3   4.8   4.4
270.  *   0.2   9.7   7.3   6.7   6.3   7.7   5.8   4.8
280.  *   0.9  10.5   8.1   7.8   7.5   9.3   7.3   5.6
290.  *   1.4   8.8   6.9   7.2   7.3   9.9   8.9   6.7
300.  *   1.8   7.3   6.8   7.1   6.7   8.8   9.1   7.7
310.  *   2.3   7.0   7.3   6.7   6.1   7.2   8.6   7.8
320.  *   2.9   7.1   7.3   6.1   5.2   6.2   7.3   7.2
330.  *   4.7   7.5   6.7   5.5   4.4   5.7   5.7   5.5
340.  *   6.9   7.8   5.8   4.8   3.3   5.5   4.6   4.1
350.  *   9.1   7.2   4.9   4.2   2.5   4.4   3.3   2.5
360.  *   9.7   6.0   4.2   4.0   2.4   3.1   2.3   1.6
THE HIGHEST CONCENTRATION OF   11.40 PPM OCCURRED AT RECEPTOR REC15.
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JOB: 120_WW_P4-2035_PM RUN: 120_WW_P4-2035_PM

DATE : 10/ 6/ 9
TIME : 14:45:13

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

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        *    CO/LINK  (PPM)
        *    ANGLE (DEGREES)
        *   REC1  REC2  REC3  REC4  REC5  REC6  REC7  REC8  REC9  REC10 REC11 REC12 REC13 REC14 REC15 REC16 REC17 REC18 REC19 REC20
 LINK # *    170   200   250   250   240   220   200   150   140   130   130   150   150   160    10    20    50    70     0     0
 -------*------------------------------------------------------------------------------------------------------------------------
    1   *    0.0   0.0   0.3   0.2   0.7   0.5   0.2   0.0   1.1   1.5   1.6   0.0   0.0   0.0   0.0   1.2   1.3   1.0   0.0   0.0
    2   *    0.0   0.0   0.3   0.2   0.4   0.4   0.2   0.0   0.4   0.9   0.9   0.0   0.0   0.0   0.0   2.1   2.4   1.7   0.0   0.0
    3   *    0.8   1.5   0.6   1.2   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.3   0.2   0.0   0.0   0.0   0.3   0.0   0.1
    4   *    0.6   1.6   0.9   0.3   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.0   0.0   0.1   0.0   0.1
    5   *    1.3   0.9   0.1   0.1   0.0   0.0   0.1   1.6   1.2   0.8   0.7   1.1   0.7   0.7   0.0   0.0   0.0   0.0   0.0   0.9
    6   *    0.9   0.6   0.0   0.1   0.0   0.0   0.0   0.4   0.2   0.2   0.1   0.4   0.3   0.2   0.0   0.0   0.0   0.0   0.0   0.1
    7   *    0.0   0.0   0.0   0.0   1.6   1.3   0.8   0.0   0.0   0.0   0.0   0.4   1.2   0.8   0.8   0.3   0.4   0.2   0.5   0.4
    8   *    0.0   0.0   0.0   0.0   0.9   1.0   0.6   0.0   0.0   0.0   0.0   1.7   2.4   2.5   1.5   1.3   0.5   0.2   1.2   0.8
    9   *    0.0   0.0   1.1   0.8   1.2   0.8   0.4   0.5   1.3   1.5   1.6   0.1   0.0   0.1   2.5   2.5   3.2   3.7   0.4   0.1
   10   *    0.9   0.9   0.5   0.7   0.0   0.0   0.1   0.6   0.2   0.2   0.0   0.6   0.5   0.3   0.2   0.0   0.0   0.4   0.6   0.6
   11   *    0.8   0.8   1.2   1.2   0.0   0.0   0.1   0.1   0.0   0.0   0.0   0.3   0.3   0.2   0.2   0.0   0.1   0.3   0.2   0.2
   12   *    0.0   0.0   0.3   0.2   0.7   0.4   0.2   1.3   1.5   1.7   1.7   0.2   0.0   0.1   0.4   0.7   0.6   0.4   0.2   0.1
   13   *    2.5   1.1   0.3   0.4   0.0   0.0   0.1   1.8   1.3   1.0   0.8   2.0   1.5   1.3   0.0   0.0   0.0   0.1   0.1   0.5
   14   *    0.8   0.0   0.4   0.2   2.2   2.7   3.5   0.0   0.0   0.0   0.0   0.4   0.8   0.7   1.2   0.8   0.6   0.4   1.1   1.2
   15   *    0.0   0.0   0.2   0.1   0.8   0.9   0.7   1.3   0.1   0.0   0.0   1.8   2.0   2.1   1.9   1.1   0.6   0.3   1.3   0.7
   16   *    1.2   0.8   0.4   0.4   0.0   0.1   0.4   2.6   2.1   1.3   1.0   1.2   0.7   1.0   2.7   0.0   0.1   0.2   3.5   3.8
```


JOB: 120_WW_P4-2035_PM RUN: 120_WW_P4-2035_PM

DATE : 10/ 6/ 9
TIME : 14:45:13

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

```
        *    CO/LINK  (PPM)
        *    ANGLE (DEGREES)
        *   REC21 REC22 REC23 REC24 REC25 REC26 REC27 REC28
 LINK # *     0   280   280   280   280   290   300   310
 -------*------------------------------------------------
```

1	*	0.0	0.7	0.5	0.4	0.3	0.5	0.4	0.3
2	*	0.0	0.6	0.4	0.3	0.2	0.5	0.3	0.2
3	*	0.2	0.0	0.1	0.6	0.9	0.0	0.0	0.0
4	*	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0
5	*	1.5	0.3	0.2	0.1	0.1	1.1	1.2	1.2
6	*	0.4	0.5	0.2	0.1	0.1	1.8	1.8	0.9
7	*	0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.0
8	*	0.5	0.0	0.0	0.1	0.1	0.0	0.0	0.1
9	*	0.0	2.2	1.6	1.2	0.9	1.5	0.9	0.6
10	*	0.5	2.1	2.5	2.7	2.9	0.3	0.2	0.2
11	*	0.2	0.0	0.1	0.2	0.2	0.0	0.0	0.0
12	*	0.0	0.8	0.7	0.6	0.5	0.6	0.4	0.3
13	*	0.9	2.3	1.0	0.6	0.4	2.5	2.7	2.9
14	*	0.9	0.0	0.1	0.2	0.2	0.0	0.0	0.1
15	*	0.5	0.1	0.2	0.2	0.2	0.1	0.1	0.1
16	*	3.8	0.9	0.5	0.3	0.2	1.0	1.1	0.9

```
'AR_FH_P4-2035_PM'   60.00 75.000 0.00 0.00 28 0.3048 1 1
'R1'    46      58      5.9
'R2'    128     58      5.9
'R3'    210     58      5.9
'R4'    292     58      5.9
'R5'    46      140     5.9
'R6'    46      222     5.9
'R7'    46      304     5.9
'R8'    -58     58      5.9
'R9'    -140    58      5.9
'R10'   -222    58      5.9
'R11'   -304    58      5.9
'R12'   -58     140     5.9
'R13'   -58     222     5.9
'R14'   -58     304     5.9
'R15'   -46     -58     5.9
'R16'   -128    -58     5.9
'R17'   -210    -58     5.9
'R18'   -292    -58     5.9
'R19'   -46     -140    5.9
'R20'   -46     -222    5.9
'R21'   -46     -304    5.9
'R22'   58      -58     5.9
'R23'   140     -58     5.9
'R24'   222     -58     5.9
'R25'   304     -58     5.9
'R26'   58      -140    5.9
'R27'   58      -222    5.9
'R28'   58      -304    5.9
'AR_FH_P4-2035_PM'              18      1       1       'C'
2
'EBL'   'AG'    -48     0       -1048   0       0.00    24      2
120     112     2.00    270     143.34  1717    2       3
2
'EBT'   'AG'    -48     -30     -1048   -30     0.00    36      3
120     87      2.00    1130    143.34  1630    2       3
2
'WBL'   'AG'    48      0       1048    0       0.00    24      2
120     109     2.00    560     143.34  1717    2       3
2
'WBT'   'AG'    48      30      1048    30      0.00    36      3
120     84      2.00    2010    143.34  2236    2       3
2
'NBL'   'AG'    0       -48     0       -1048   0.00    24      2
120     115     2.00    120     143.34  1717    2       3
2
'NBT'   'AG'    24      -48     24      -1048   0.00    24      2
120     69      2.00    2290    143.34  1770    2       3
2
'NBR'   'AG'    42      -48     42      -1048   0.00    12      1
120     69      2.00    260     143.34  1583    2       3
2
'SBL'   'AG'    0       48      0       1048    0.00    24      2
120     111     2.00    420     143.34  1717    2       3
2
'SBT'   'AG'    -24     48      -24     1048    0.00    24      2
120     66      2.00    1890    143.34  1770    2       3
2
'SBR'   'AG'    -42     48      -42     1048    0.00    12      1
120     66      2.00    210     143.34  1583    2       3
1
'EBA'   'AG'    -1000.00        -30.00  0.00    -30.00  1400.00 22.69   0.00    56.00
```

```
1
'EBD'   'AG'    0.00    -30.00  1200.00 -30.00  1570.00 22.69   0.00    56.00
1
'WBA'   'AG'    1000.00 30.00   0.00    30.00   2570.00 22.50   0.00    56.00
1
'WBD'   'AG'    0.00    30.00   -1000.00        30.00   1440.00 22.50   0.00    56.00
1
'NBA'   'AG'    24.00   -1000.00        24.00   0.00    2670.00 22.29   0.00    44.00
1
'NBD'   'AG'    24.00   0.00    24.00   1000.00 3460.00 22.29   0.00    44.00
1
'SBA'   'AG'    -24.00  1000.00 -24.00  0.00    2520.00 22.42   0.00    44.00
1
'SBD'   'AG'    -24.00  0.00    -24.00  -1000.00        2690.00 22.42   0.00    44.00
1 0 4 1000 0 'y' 10 0 36
```

```
                 CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                        PAGE  1

JOB: AR_FH_P4-2035_PM                                         RUN: AR_FH_P4-2035_PM

DATE : 10/ 7/ 9
TIME :  9:56:56

   The MODE flag has been set to C for calculating CO averages.

 SITE & METEOROLOGICAL VARIABLES
 -------------------------------
 VS =   0.0 CM/S       VD =   0.0 CM/S       Z0 =  75. CM
  U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  0.0 PPM  BRG =   0. DEGREES

 LINK VARIABLES
 --------------
   LINK DESCRIPTION     *         LINK COORDINATES (FT)         *    LENGTH  BRG TYPE   VPH    EF      H   W    V/C QUEUE
                        *   X1        Y1        X2        Y2    *     (FT)  (DEG)            (G/MI)  (FT) (FT)        (VEH)
------------------------*---------------------------------------*----------------------------------------------------------
 1. EBL                 *    -48.0       0.0    -966.5      -0.1 *     919.   270. AG    718. 100.0   0.0 24.0 2.37  46.7
 2. EBT                 *    -48.0     -30.0    -268.5     -30.0 *     220.   270. AG    836. 100.0   0.0 36.0 0.96  11.2
 3. WBL                 *     48.0       0.0    2090.2       0.2 *    2042.    90. AG    698. 100.0   0.0 24.0 2.80 103.7
 4. WBT                 *     48.0      30.0    1174.2      30.1 *    1126.    90. AG    807. 100.0   0.0 36.0 1.12  57.2
 5. NBL                 *      0.0     -48.0       0.0    -602.5 *     555.   180. AG    737. 100.0   0.0 24.0 4.29  28.2
 6. NBT                 *     24.0     -48.0      24.0   -5076.1 *    5028.   180. AG    442. 100.0   0.0 24.0 1.65 255.4
 7. NBR                 *     42.0     -48.0      42.0    -146.1 *      98.   180. AG    221. 100.0   0.0 12.0 0.42   5.0
 8. SBL                 *      0.0      48.0       0.0    1637.6 *    1590.   360. AG    711. 100.0   0.0 24.0 2.96  80.8
 9. SBT                 *    -24.0      48.0     -24.0    2554.5 *    2507.   360. AG    423. 100.0   0.0 24.0 1.28 127.3
10. SBR                 *    -42.0      48.0     -42.0     123.8 *      76.   360. AG    211. 100.0   0.0 12.0 0.32   3.8
11. EBA                 *  -1000.0     -30.0       0.0     -30.0 *    1000.    90. AG   1400.  22.7   0.0 56.0
12. EBD                 *      0.0     -30.0    1200.0     -30.0 *    1200.    90. AG   1570.  22.7   0.0 56.0
13. WBA                 *   1000.0      30.0       0.0      30.0 *    1000.   270. AG   2570.  22.5   0.0 56.0
14. WBD                 *      0.0      30.0   -1000.0      30.0 *    1000.   270. AG   1440.  22.5   0.0 56.0
15. NBA                 *     24.0   -1000.0      24.0       0.0 *    1000.   360. AG   2670.  22.3   0.0 44.0
16. NBD                 *     24.0       0.0      24.0    1000.0 *    1000.   360. AG   3460.  22.3   0.0 44.0
17. SBA                 *    -24.0    1000.0     -24.0       0.0 *    1000.   180. AG   2520.  22.4   0.0 44.0
18. SBD                 *    -24.0       0.0     -24.0   -1000.0 *    1000.   180. AG   2690.  22.4   0.0 44.0
                                                                                                 PAGE  2
JOB: AR_FH_P4-2035_PM                                         RUN: AR_FH_P4-2035_PM

DATE : 10/ 7/ 9
TIME :  9:56:56

 ADDITIONAL QUEUE LINK PARAMETERS
 --------------------------------
   LINK DESCRIPTION     *    CYCLE    RED     CLEARANCE  APPROACH  SATURATION   IDLE   SIGNAL   ARRIVAL
                        *    LENGTH   TIME    LOST TIME    VOL     FLOW RATE   EM FAC   TYPE     RATE
                        *    (SEC)   (SEC)     (SEC)      (VPH)      (VPH)    (gm/hr)
------------------------*--------------------------------------------------------------------------------
 1. EBL                 *     120     112       2.0        270       1717     143.34      2         3
 2. EBT                 *     120      87       2.0       1130       1630     143.34      2         3
 3. WBL                 *     120     109       2.0        560       1717     143.34      2         3
 4. WBT                 *     120      84       2.0       2010       2236     143.34      2         3
 5. NBL                 *     120     115       2.0        120       1717     143.34      2         3
 6. NBT                 *     120      69       2.0       2290       1770     143.34      2         3
 7. NBR                 *     120      69       2.0        260       1583     143.34      2         3
 8. SBL                 *     120     111       2.0        420       1717     143.34      2         3
 9. SBT                 *     120      66       2.0       1890       1770     143.34      2         3
10. SBR                 *     120      66       2.0        210       1583     143.34      2         3

 RECEPTOR LOCATIONS
```

RECEPTOR	X	Y	Z
1. R1	46.0	58.0	5.9
2. R2	128.0	58.0	5.9
3. R3	210.0	58.0	5.9
4. R4	292.0	58.0	5.9
5. R5	46.0	140.0	5.9
6. R6	46.0	222.0	5.9
7. R7	46.0	304.0	5.9
8. R8	-58.0	58.0	5.9
9. R9	-140.0	58.0	5.9
10. R10	-222.0	58.0	5.9
11. R11	-304.0	58.0	5.9
12. R12	-58.0	140.0	5.9
13. R13	-58.0	222.0	5.9
14. R14	-58.0	304.0	5.9
15. R15	-46.0	-58.0	5.9
16. R16	-128.0	-58.0	5.9
17. R17	-210.0	-58.0	5.9
18. R18	-292.0	-58.0	5.9
19. R19	-46.0	-140.0	5.9
20. R20	-46.0	-222.0	5.9
21. R21	-46.0	-304.0	5.9
22. R22	58.0	-58.0	5.9
23. R23	140.0	-58.0	5.9
24. R24	222.0	-58.0	5.9
25. R25	304.0	-58.0	5.9
26. R26	58.0	-140.0	5.9
27. R27	58.0	-222.0	5.9
28. R28	58.0	-304.0	5.9

(COORDINATES (FT))

JOB: AR_FH_P4-2035_PM RUN: AR_FH_P4-2035_PM

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR) * CONCENTRATION (PPM)

WIND ANGLE (DEGR)	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	6.9	1.5	0.7	0.2	6.9	6.7	6.6	5.0	1.3	0.6	0.2	4.6	4.6	4.4	10.0	6.7	5.7	2.9	8.0	7.3
10.	3.1	0.3	0.0	0.0	3.0	3.0	2.9	7.5	2.7	1.5	0.8	7.0	7.0	6.8	10.8	8.2	6.6	3.7	9.1	8.9
20.	1.0	0.1	0.1	0.1	0.9	0.9	0.9	7.7	3.3	2.2	1.5	7.1	7.1	7.1	8.8	8.7	7.4	4.6	8.1	8.8
30.	0.5	0.1	0.1	0.1	0.4	0.4	0.4	7.2	3.3	2.4	1.8	6.3	6.3	6.3	7.4	8.7	7.5	5.4	7.6	8.5
40.	0.5	0.2	0.2	0.2	0.3	0.3	0.3	6.6	3.1	2.4	1.9	5.8	5.8	5.8	6.6	8.5	8.0	6.2	8.1	8.3
50.	0.4	0.2	0.2	0.2	0.2	0.2	0.2	6.0	3.0	2.0	1.7	5.3	5.3	5.3	7.0	8.3	8.2	6.6	8.4	7.8
60.	0.5	0.3	0.3	0.3	0.2	0.2	0.2	5.8	2.9	2.0	1.7	5.1	5.1	5.1	8.0	8.5	8.8	7.7	8.3	7.4
70.	0.8	0.7	0.7	0.7	0.1	0.1	0.1	6.1	3.1	2.4	2.0	4.9	4.9	4.9	9.4	9.0	9.1	8.8	8.3	7.3
80.	3.0	3.0	3.0	2.9	0.3	0.0	0.0	8.0	5.0	3.8	3.4	5.3	5.0	5.0	10.4	9.0	9.1	9.3	7.9	6.5
90.	7.3	7.1	7.1	6.8	1.6	0.5	0.2	11.0	7.4	6.3	5.9	6.6	5.6	5.2	9.4	7.0	7.1	7.1	6.6	5.7
100.	9.6	9.6	9.6	9.4	3.2	1.8	1.0	11.7	7.8	7.1	6.8	8.4	6.8	6.0	6.6	4.2	3.9	3.7	5.3	5.0
110.	9.1	9.1	9.1	9.1	3.8	2.5	1.8	9.3	6.0	6.0	6.3	8.7	7.4	6.6	5.5	2.9	2.3	1.8	5.0	5.0

120.	*	8.1	8.0	8.0	7.9	3.8	2.7	2.1	7.1	5.4	6.1	6.3	8.5	7.6	7.1	5.5	2.9	2.1	1.6	5.2	5.2
130.	*	7.2	7.1	7.1	7.1	3.5	2.5	2.1	6.0	5.6	6.2	6.2	8.1	7.6	7.2	5.8	2.9	2.1	1.8	5.5	5.5
140.	*	6.5	6.4	6.4	6.4	3.4	2.4	2.1	5.8	6.5	6.2	5.8	7.8	7.8	7.5	6.3	3.1	2.1	1.7	6.1	6.1
150.	*	6.1	6.0	6.0	6.0	3.2	2.5	2.1	6.4	6.7	6.0	5.2	7.4	7.7	7.6	6.9	3.3	2.3	1.6	6.7	6.7
160.	*	6.0	5.7	5.7	5.7	3.6	2.9	2.4	8.0	6.8	5.6	4.2	7.9	8.0	7.9	7.6	3.3	1.8	1.1	7.6	7.5
170.	*	7.6	6.0	5.8	5.7	5.6	4.6	4.2	8.6	6.3	5.1	3.5	7.8	7.6	7.8	7.9	2.4	1.1	0.6	7.8	7.6
180.	*	10.9	7.4	6.4	6.1	8.6	7.9	8.0	7.2	5.1	4.4	3.1	6.1	5.4	5.7	5.8	1.1	0.5	0.2	5.7	5.5
190.	*	11.6	8.4	7.1	6.4	9.7	9.4	9.6	5.0	4.1	3.8	2.7	3.5	2.9	2.7	2.4	0.2	0.0	0.0	2.3	2.2
200.	*	9.7	9.1	7.9	7.1	8.6	9.2	9.4	3.9	3.8	3.5	2.6	2.4	1.8	1.4	0.6	0.0	0.0	0.0	0.6	0.6
210.	*	8.4	9.3	8.3	7.6	8.1	8.8	8.6	3.9	3.9	3.3	2.7	2.3	1.6	1.2	0.4	0.1	0.1	0.1	0.3	0.3
220.	*	7.5	9.3	8.6	8.2	8.2	8.2	7.8	4.2	4.1	3.1	2.9	2.3	1.4	1.0	0.3	0.1	0.1	0.1	0.2	0.2
230.	*	7.8	8.8	9.0	8.7	8.4	7.7	7.1	4.6	4.3	3.4	3.3	2.2	1.4	1.0	0.3	0.1	0.1	0.1	0.2	0.2
240.	*	8.3	8.8	9.3	9.3	8.0	7.0	6.5	4.6	4.1	3.5	3.5	2.0	1.3	1.0	0.2	0.1	0.1	0.1	0.1	0.1
250.	*	9.4	9.1	9.7	9.9	7.7	6.6	6.1	4.8	4.3	4.0	4.0	1.8	1.0	0.6	0.4	0.4	0.3	0.3	0.0	0.0
260.	*	9.8	8.6	9.1	9.8	7.0	6.0	5.7	4.3	4.0	4.0	3.8	1.4	0.6	0.2	1.8	1.6	1.2	1.0	0.0	0.0
270.	*	8.7	6.7	6.9	7.0	6.1	5.7	5.5	2.8	2.8	2.7	2.5	0.5	0.2	0.0	4.4	3.9	2.9	2.6	0.5	0.2
280.	*	6.9	4.5	4.0	3.8	5.4	5.4	5.4	1.2	1.1	1.1	1.0	0.0	0.0	0.0	6.8	6.2	4.9	3.7	1.5	0.6
290.	*	5.8	3.3	2.5	2.2	5.3	5.3	5.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	7.3	7.0	5.6	3.9	2.2	1.1
300.	*	5.9	3.0	2.2	1.8	5.5	5.5	5.5	0.1	0.1	0.1	0.1	0.0	0.0	0.0	6.9	6.7	5.8	3.6	2.7	1.5
310.	*	6.3	3.1	2.3	1.9	6.0	6.0	6.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	6.3	6.1	5.8	3.2	3.0	1.9
320.	*	6.9	3.3	2.4	2.0	6.7	6.7	6.7	0.1	0.1	0.1	0.1	0.0	0.0	0.0	5.7	5.7	5.6	3.0	2.9	1.9
330.	*	7.5	3.5	2.5	1.9	7.4	7.4	7.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	5.3	5.3	5.3	2.8	3.0	2.1
340.	*	8.5	3.7	2.5	1.7	8.4	8.4	8.4	0.2	0.0	0.0	0.0	0.2	0.2	0.2	5.2	4.8	4.8	2.5	3.2	2.6
350.	*	9.1	3.0	1.5	0.8	9.1	9.0	8.9	1.7	0.3	0.0	0.0	1.5	1.5	1.4	6.9	5.2	4.9	2.6	5.0	4.3
360.	*	6.9	1.5	0.7	0.2	6.9	6.7	6.6	5.0	1.3	0.6	0.2	4.6	4.6	4.4	10.0	6.7	5.7	2.9	8.0	7.3

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	*	7.5	8.5	5.9	5.1	4.7	6.7	6.2	6.0
10.	*	9.2	5.9	4.8	4.5	4.5	4.0	3.5	3.2
20.	*	8.6	4.4	4.3	4.3	4.3	2.5	2.0	1.8
30.	*	8.2	4.5	4.5	4.5	4.5	2.6	2.0	1.6
40.	*	7.6	4.8	4.8	4.8	4.8	2.7	2.0	1.6
50.	*	7.2	5.1	5.1	5.1	5.1	3.0	2.2	1.7
60.	*	7.0	5.8	5.8	5.8	5.8	3.0	2.2	1.7
70.	*	6.6	6.4	6.4	6.3	6.3	3.2	2.1	1.5
80.	*	5.9	6.4	6.2	6.1	6.1	2.7	1.4	0.8
90.	*	5.3	4.4	4.2	4.2	3.8	1.2	0.4	0.1
100.	*	5.0	1.6	1.6	1.6	1.5	0.2	0.0	0.0
110.	*	5.0	0.3	0.3	0.3	0.3	0.0	0.0	0.0
120.	*	5.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0
130.	*	5.5	0.1	0.1	0.1	0.1	0.0	0.0	0.0
140.	*	6.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
150.	*	6.6	0.1	0.1	0.1	0.1	0.0	0.0	0.0
160.	*	7.4	0.2	0.0	0.0	0.0	0.2	0.2	0.2
170.	*	7.3	1.6	0.2	0.1	0.0	1.4	1.3	1.3
180.	*	5.2	4.7	1.1	0.4	0.2	4.2	4.0	3.8

190.	*	2.1	7.2	2.4	1.1	0.7	6.5	6.4	6.1
200.	*	0.6	7.6	3.1	1.9	1.2	6.8	6.8	6.6
210.	*	0.3	7.0	3.1	2.1	1.6	6.2	6.2	6.2
220.	*	0.2	6.5	3.1	2.2	1.7	5.7	5.7	5.7
230.	*	0.2	5.9	2.8	2.1	1.7	5.3	5.2	5.2
240.	*	0.1	5.6	2.9	2.0	1.7	5.1	4.9	4.9
250.	*	0.0	5.8	3.1	2.3	1.8	5.1	4.8	4.8
260.	*	0.0	7.0	4.2	3.4	2.9	5.2	4.8	4.8
270.	*	0.0	9.1	5.9	5.1	5.0	6.0	5.0	4.8
280.	*	0.3	9.8	6.6	6.0	6.3	7.2	5.4	5.2
290.	*	0.7	8.3	6.0	6.2	6.6	8.1	6.3	5.6
300.	*	1.1	6.5	5.6	6.4	6.7	8.3	6.6	6.0
310.	*	1.3	6.0	6.4	6.9	6.7	8.0	7.1	6.5
320.	*	1.4	6.2	7.1	6.8	6.5	7.7	7.5	7.1
330.	*	1.6	7.0	7.4	6.7	6.3	7.6	7.6	7.5
340.	*	2.0	8.6	7.7	6.5	5.8	8.3	7.9	8.2
350.	*	3.8	9.9	7.3	6.0	5.3	8.6	8.2	8.1
360.	*	7.5	8.5	5.9	5.1	4.7	6.7	6.2	6.0

THE HIGHEST CONCENTRATION OF 11.70 PPM OCCURRED AT RECEPTOR REC8 .

JOB: AR_FH_P4-2035_PM RUN: AR_FH_P4-2035_PM

DATE : 10/ 7/ 9
TIME : 9:56:56

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	190	100	250	250	190	190	190	100	100	100	100	110	160	160	10	70	80	80	10	10
1	0.0	0.0	0.4	0.3	0.0	0.1	0.1	0.0	0.1	0.4	0.8	0.0	0.0	0.0	0.2	0.2	0.4	0.7	0.1	0.1
2	0.0	0.0	0.5	0.3	0.0	0.1	0.2	0.0	0.0	0.1	0.4	0.0	0.0	0.0	0.5	2.2	2.4	2.7	0.2	0.1
3	0.2	1.7	0.8	1.2	0.1	0.1	0.1	1.6	1.2	1.0	0.8	0.9	0.2	0.2	0.0	0.8	1.0	0.8	0.0	0.1
4	0.4	3.8	3.0	3.3	0.2	0.1	0.1	2.1	1.3	1.0	0.7	1.3	0.2	0.3	0.0	1.1	1.1	0.9	0.0	0.1
5	1.5	0.0	0.2	0.2	1.0	0.7	0.5	0.0	0.0	0.1	0.1	0.0	0.4	0.2	0.0	0.1	0.1	0.1	0.2	0.8
6	1.2	0.0	0.1	0.1	0.8	0.6	0.5	0.0	0.0	0.0	0.1	0.0	0.3	0.2	0.0	0.0	0.1	0.1	0.0	0.2
7	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.2	0.8	1.1	0.6	0.2	0.1	0.1	1.1	0.9	1.2	1.7	0.1	0.0	0.1	1.2	0.9
9	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.6	0.2	0.1	0.1	1.0	1.1	1.2	1.1	0.0	0.0	0.0	0.7	0.5
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0
11	0.1	0.0	0.4	0.3	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.0	0.1	0.0	1.0	1.3	1.4	1.6	0.4	0.2
12	0.5	0.7	0.4	0.5	0.3	0.1	0.1	0.7	0.7	0.6	0.5	0.5	0.2	0.2	0.0	0.5	0.6	0.4	0.1	0.1
13	1.7	3.4	2.7	2.8	0.7	0.3	0.2	2.2	1.3	0.9	0.6	1.1	0.3	0.3	0.1	1.1	0.9	0.8	0.2	0.2
14	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.7	1.2	1.5	1.6	0.0	0.1	0.1	0.5	0.1	0.1	0.2	0.2	0.1
15	2.3	0.0	0.3	0.3	1.3	0.8	0.6	0.0	0.1	0.2	0.2	0.0	0.6	0.4	0.0	0.3	0.3	0.2	0.2	0.4
16	2.1	0.0	0.3	0.1	3.4	4.0	4.3	1.2	0.6	0.4	0.2	1.3	0.9	1.2	1.7	0.4	0.2	0.2	1.6	1.2
17	0.0	0.0	0.1	0.1	0.2	0.4	0.6	1.5	0.7	0.4	0.2	1.5	2.1	2.2	2.2	0.2	0.1	0.2	1.2	0.8
18	1.4	0.0	0.3	0.3	1.2	1.0	0.7	0.0	0.1	0.2	0.2	0.0	0.4	0.2	1.7	0.6	0.4	0.3	2.7	3.1

JOB: AR_FH_P4-2035_PM RUN: AR_FH_P4-2035_PM

DATE : 10/ 7/ 9
TIME : 9:56:56

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 10	REC22 350	REC23 340	REC24 310	REC25 300	REC26 350	REC27 350	REC28 340
1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2
2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
3	0.1	0.6	1.1	1.3	1.4	0.2	0.1	0.0
4	0.2	0.5	1.2	1.2	1.2	0.2	0.1	0.0
5	1.1	0.0	0.0	0.0	0.0	0.1	0.5	1.3
6	0.3	0.0	0.0	0.0	0.0	0.4	0.8	1.3
7	0.1	0.0	0.0	0.0	0.0	0.5	0.3	0.1
8	0.7	1.6	0.9	0.5	0.3	1.2	0.9	0.3
9	0.4	0.8	0.5	0.3	0.2	0.7	0.6	0.2
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2
12	0.1	1.1	1.0	1.4	1.5	0.5	0.2	0.1
13	0.2	0.9	1.0	1.0	1.1	0.5	0.3	0.1
14	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.2
15	0.7	0.5	0.0	0.0	0.0	1.3	1.7	2.3
16	0.9	2.8	1.3	0.7	0.5	1.7	1.2	0.3
17	0.6	1.1	0.7	0.5	0.4	1.1	0.9	0.4
18	3.4	0.0	0.0	0.0	0.0	0.1	0.3	0.9

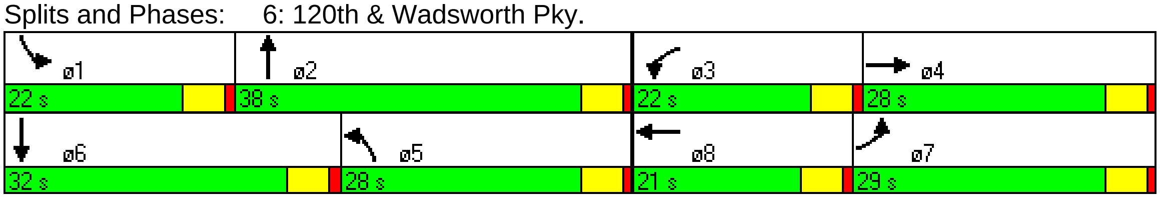
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.94	0.91	1.00	0.94	0.91	1.00	0.94	0.91	1.00	0.94	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	4990	5085	1583	4990	5085	1583	4990	5085	1583	4990	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	4990	5085	1583	4990	5085	1583	4990	5085	1583	4990	5085	1583
Volume (vph)	1060	830	1870	660	330	370	1040	1140	890	540	1230	640
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1152	902	2033	717	359	402	1130	1239	967	587	1337	696
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	1152	902	2033	717	359	402	1130	1239	967	587	1337	696
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Actuated Green, G (s)	26.9	23.0	110.0	17.0	13.1	110.0	23.0	33.5	110.0	16.5	27.0	110.0
Effective Green, g (s)	27.9	24.0	110.0	18.0	14.1	110.0	24.0	34.5	110.0	17.5	28.0	110.0
Actuated g/C Ratio	0.25	0.22	1.00	0.16	0.13	1.00	0.22	0.31	1.00	0.16	0.25	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1266	1109	1583	817	652	1583	1089	1595	1583	794	1294	1583
v/s Ratio Prot	0.23	0.18		0.14	0.07		0.23	0.24		0.12	0.26	
v/s Ratio Perm			c1.28			0.25			0.61			0.44
v/c Ratio	0.91	0.81	1.28	0.88	0.55	0.25	1.04	0.78	0.61	0.74	1.03	0.44
Uniform Delay, d1	39.8	40.9	55.0	44.9	45.0	0.0	43.0	34.3	0.0	44.1	41.0	0.0
Progression Factor	1.00	1.00	1.00	1.03	0.98	1.00	1.00	1.00	1.00	1.22	1.08	1.00
Incremental Delay, d2	9.7	4.7	132.9	10.1	1.0	0.4	37.5	3.8	1.8	2.0	27.9	0.5
Delay (s)	49.6	45.5	187.9	56.5	44.9	0.4	80.5	38.0	1.8	55.8	72.2	0.5
Level of Service	D	D	F	E	D	A	F	D	A	E	E	A
Approach Delay (s)		117.5			38.4			41.9			49.5	
Approach LOS		F			D			D			D	

Intersection Summary			
HCM Average Control Delay	70.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Phase Number	1	2	3	4	5	6	7	8
Movement	SBL	NBT	WBL	EBT	NBL	SBT	EBL	WBT
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	None	C-Max	None	None
Maximum Split (s)	22	38	22	28	28	32	29	21
Maximum Split (%)	20.0%	34.5%	20.0%	25.5%	25.5%	29.1%	26.4%	19.1%
Minimum Split (s)	9	21	9	21	9	21	9	21
Yellow Time (s)	4	4	4	4	4	4	4	4
All-Red Time (s)	1	1	1	1	1	1	1	1
Minimum Initial (s)	4	4	4	4	4	4	4	4
Vehicle Extension (s)	3	3	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		5		5		5		5
Flash Dont Walk (s)		11		11		11		11
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	33	55	93	5	65	33	4	93
End Time (s)	55	93	5	33	93	65	33	4
Yield/Force Off (s)	50	88	0	28	88	60	28	109
Yield/Force Off 170(s)	50	77	0	17	88	49	28	98
Local Start Time (s)	88	0	38	60	10	88	59	38
Local Yield (s)	105	33	55	83	33	5	83	54
Local Yield 170(s)	105	22	55	72	33	104	83	43

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	120
Offset: 55 (50%), Referenced to phase 2:NBT and 6:SBT, Start of Green	

Splits and Phases: 6: 120th & Wadsworth Pky.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91		0.97	0.91		0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	0.96		1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	4890		3433	4707		3433	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	4890		3433	4707		3433	3539	1583	3433	3539	1583
Volume (vph)	270	890	240	560	1110	900	120	2290	260	420	1890	210
Peak-hour factor, PHF	0.77	0.88	0.69	0.89	0.86	0.71	0.67	0.96	0.73	0.92	0.91	0.77
Adj. Flow (vph)	351	1011	348	629	1291	1268	179	2385	356	457	2077	273
RTOR Reduction (vph)	0	44	0	0	102	0	0	0	97	0	0	45
Lane Group Flow (vph)	351	1316	0	629	2457	0	179	2385	259	457	2077	228
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases									6			2
Actuated Green, G (s)	6.8	30.7		9.8	33.7		4.0	48.5	48.5	7.5	52.0	52.0
Effective Green, g (s)	8.0	33.0		11.0	36.0		5.5	51.0	51.0	9.0	54.5	54.5
Actuated g/C Ratio	0.07	0.28		0.09	0.30		0.05	0.42	0.42	0.08	0.45	0.45
Clearance Time (s)	5.2	6.3		5.2	6.3		5.5	6.5	6.5	5.5	6.5	6.5
Vehicle Extension (s)	1.0	6.0		1.0	6.0		1.0	6.0	6.0	1.0	6.0	6.0
Lane Grp Cap (vph)	229	1345		315	1412		157	1504	673	257	1607	719
v/s Ratio Prot	0.10	0.27		c0.18	c0.52		0.05	c0.67		c0.13	0.59	
v/s Ratio Perm									0.16			0.14
v/c Ratio	1.53	0.98		2.00	2.20dr		1.14	1.59	0.38	1.78	1.29	0.32
Uniform Delay, d1	56.0	43.1		54.5	42.0		57.2	34.5	23.7	55.5	32.8	20.9
Progression Factor	1.02	0.74		0.94	1.07		0.81	0.68	0.51	0.98	0.70	0.41
Incremental Delay, d2	255.7	16.5		459.5	335.9		109.4	266.4	1.4	351.6	132.1	0.1
Delay (s)	312.8	48.6		511.0	380.7		155.7	289.9	13.6	406.2	154.9	8.7
Level of Service	F	D		F	F		F	F	B	F	F	A
Approach Delay (s)		102.9			406.4			248.0			181.6	
Approach LOS		F			F			F			F	

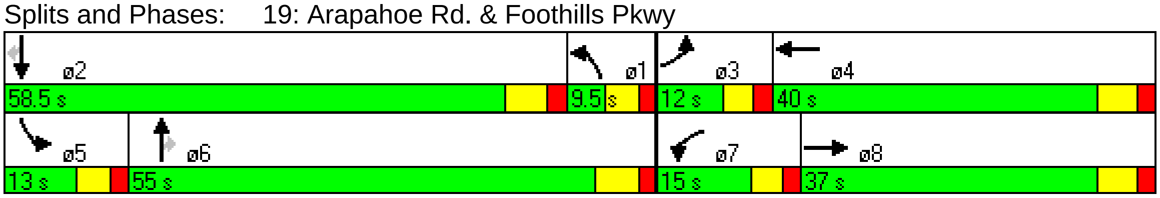
Intersection Summary			
HCM Average Control Delay	254.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	138.0%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Phase Number	1	2	3	4	5	6	7	8
Movement	NBL	SBT	EBL	WBT	SBL	NBT	WBL	EBT
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	None	C-Max	None	None
Maximum Split (s)	9.5	58.5	12	40	13	55	15	37
Maximum Split (%)	7.9%	48.8%	10.0%	33.3%	10.8%	45.8%	12.5%	30.8%
Minimum Split (s)	9.5	34.5	9.2	26.3	9.5	34.5	9.2	26.3
Yellow Time (s)	3.5	4.5	3.2	4.3	3.5	4.5	3.2	4.3
All-Red Time (s)	2	2	2	2	2	2	2	2
Minimum Initial (s)	4	15	4	6	4	15	4	6
Vehicle Extension (s)	1	6	1	6	1	6	1	6
Minimum Gap (s)	3	4	3	4	3	4	3	4
Time Before Reduce (s)	0	20	0	10	0	20	0	10
Time To Reduce (s)	0	20	0	10	0	20	0	10
Walk Time (s)		5		5		5		5
Flash Dont Walk (s)		23		15		23		15
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	9.5	71	19	31	71	84	19	34
End Time (s)	19	9.5	31	71	84	19	34	71
Yield/Force Off (s)	13.5	3	25.8	64.7	78.5	12.5	28.8	64.7
Yield/Force Off 170(s)	13.5	100	25.8	49.7	78.5	109.5	28.8	49.7
Local Start Time (s)	6.5	68	16	28	68	81	16	31
Local Yield (s)	10.5	0	22.8	61.7	75.5	9.5	25.8	61.7
Local Yield 170(s)	10.5	97	22.8	46.7	75.5	106.5	25.8	46.7

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	150
Offset: 3 (3%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow	

Splits and Phases: 19: Arapahoe Rd. & Foothills Pkwy



Appendix 22
CO Hot-Spot Modeling Files —
2035 Combined Alternative Package (Preferred Alternative)

```
'80th and Federal'    60   75.0      0       0     20 0.3048  1 1     0
'R1'                -234     58    5.9
'R2'                -152     58    5.9
'R3'                 -70     58    5.9
'R4'                 -70    140    5.9
'R5'                 -70    222    5.9
'R6'                  58    234    5.9
'R7'                  58    152    5.9
'R8'                  58     70    5.9
'R9'                 140     70    5.9
'R10'                222     70    5.9
'R11'                234    -46    5.9
'R12'                152    -46    5.9
'R13'                 70    -46    5.9
'R14'                 70   -128    5.9
'R15'                 70   -210    5.9
'R16'                -58   -222    5.9
'R17'                -58   -140    5.9
'R18'                -58    -58    5.9
'R19'               -140    -58    5.9
'R20'               -222    -58    5.9
'PM Build 2005 Mitigated'        17   1      0       'C'
1
'EBA'               'AG'   -1000     -6       0     -6  1025 23.163    0   32
1
'EBD'               'AG'       0     -6    1000     -6   330 23.163    0   32
1
'WBA'               'AG'    1000     18       0     18   215 22.495    0   32
1
'WBD'               'AG'       0     24   -1000     24  1075 22.495    0   44
1
'NBA'               'AG'      30  -1000      30      0  3850 22.500    0   56
1
'NBD'               'AG'      30      0      30   1000  3720 22.500    0   56
1
'SBA'               'AG'     -30   1000     -30      0  2285 22.461    0   56
1
'SBD'               'AG'     -30      0     -30  -1000  2250 22.461    0   56
2
'EBL'               'AG'     -48      6    -148      6     0    12    1
120                     97      2    545  142.061  1770     2     3
2
'EBT'               'AG'     -48     -6    -148     -6     0    12    1
120                     79      2     30  142.061  1863     2     3
2
'EBR'               'AG'     -48    -18    -148    -18     0    12    1
120                     79      2    450  142.061  1583     2     3
2
'WBL'               'AG'      48      6     148      6     0    12    1
120                    103      2    100  142.061  1770     2     3
2
'WBT'               'AG'      48     18     148     18     0    12    1
120                    103      2    115  142.061  1632     2     3
2
'NBL'               'AG'       0    -12       0   -112     0    24    2
120                     98      2    605  142.061  1717     2     3
2
'NBT'               'AG'      30    -12      30   -112     0    36    3
120                     52      2   1245  142.061  1682     2     3
2
'SBL'               'AG'      -6     36      -6    136     0    12    1
120                    112      2    135  142.061  1770     2     3
```

```
2
'SBT'                   'AG'     -30     36     -30    136     0    36    3
120                         66      2   2150  142.061  1643     2     3
1                           0      4   1000       0   'Y'     10     0   36
```

JOB: 80th and Federal RUN: PM Build 2005 Mitigated

DATE : 8/21/ 9
TIME : 8:51:29

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 75. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. EBA	-1000.0	-6.0	0.0	-6.0	1000.	90.	AG	1025.	23.2	0.0	32.0		
2. EBD	0.0	-6.0	1000.0	-6.0	1000.	90.	AG	330.	23.2	0.0	32.0		
3. WBA	1000.0	18.0	0.0	18.0	1000.	270.	AG	215.	22.5	0.0	32.0		
4. WBD	0.0	24.0	-1000.0	24.0	1000.	270.	AG	1075.	22.5	0.0	44.0		
5. NBA	30.0	-1000.0	30.0	0.0	1000.	360.	AG	3850.	22.5	0.0	56.0		
6. NBD	30.0	0.0	30.0	1000.0	1000.	360.	AG	3720.	22.5	0.0	56.0		
7. SBA	-30.0	1000.0	-30.0	0.0	1000.	180.	AG	2285.	22.5	0.0	56.0		
8. SBD	-30.0	0.0	-30.0	-1000.0	1000.	180.	AG	2250.	22.5	0.0	56.0		
9. EBL	-48.0	6.0	-3058.4	6.0	3010.	270.	AG	308.	100.0	0.0	12.0	1.95	152.9
10. EBT	-48.0	-6.0	-61.0	-6.0	13.	270.	AG	251.	100.0	0.0	12.0	0.05	0.7
11. EBR	-48.0	-18.0	-268.7	-18.0	221.	270.	AG	251.	100.0	0.0	12.0	0.92	11.2
12. WBL	48.0	6.0	104.3	6.0	56.	90.	AG	327.	100.0	0.0	12.0	0.52	2.9
13. WBT	48.0	18.0	112.8	18.0	65.	90.	AG	327.	100.0	0.0	12.0	0.65	3.3
14. NBL	0.0	-12.0	0.0	-682.6	671.	180.	AG	622.	100.0	0.0	24.0	1.18	34.1
15. NBT	30.0	-12.0	30.0	-130.0	118.	180.	AG	495.	100.0	0.0	36.0	0.46	6.0
16. SBL	-6.0	36.0	-6.0	933.6	898.	360.	AG	356.	100.0	0.0	12.0	2.29	45.6
17. SBT	-30.0	36.0	-30.0	703.1	667.	360.	AG	629.	100.0	0.0	36.0	1.05	33.9

JOB: 80th and Federal RUN: PM Build 2005 Mitigated

DATE : 8/21/ 9
TIME : 8:51:29

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
9. EBL	120	97	2.0	545	1770	142.06	2	3
10. EBT	120	79	2.0	30	1863	142.06	2	3
11. EBR	120	79	2.0	450	1583	142.06	2	3
12. WBL	120	103	2.0	100	1770	142.06	2	3
13. WBT	120	103	2.0	115	1632	142.06	2	3
14. NBL	120	98	2.0	605	1717	142.06	2	3
15. NBT	120	52	2.0	1245	1682	142.06	2	3
16. SBL	120	112	2.0	135	1770	142.06	2	3
17. SBT	120	66	2.0	2150	1643	142.06	2	3

RECEPTOR LOCATIONS

* COORDINATES (FT) *

RECEPTOR	X	Y	Z
1. R1	-234.0	58.0	5.9
2. R2	-152.0	58.0	5.9
3. R3	-70.0	58.0	5.9
4. R4	-70.0	140.0	5.9
5. R5	-70.0	222.0	5.9
6. R6	58.0	234.0	5.9
7. R7	58.0	152.0	5.9
8. R8	58.0	70.0	5.9
9. R9	140.0	70.0	5.9
10. R10	222.0	70.0	5.9
11. R11	234.0	-46.0	5.9
12. R12	152.0	-46.0	5.9
13. R13	70.0	-46.0	5.9
14. R14	70.0	-128.0	5.9
15. R15	70.0	-210.0	5.9
16. R16	-58.0	-222.0	5.9
17. R17	-58.0	-140.0	5.9
18. R18	-58.0	-58.0	5.9
19. R19	-140.0	-58.0	5.9
20. R20	-222.0	-58.0	5.9

JOB: 80th and Federal RUN: PM Build 2005 Mitigated

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	0.2	0.8	3.6	3.5	3.4	5.0	5.2	5.3	0.9	0.2	0.5	1.1	4.6	4.4	4.4	5.5	5.5	6.8	2.8	2.0
10.	0.9	2.0	6.2	5.9	5.6	2.2	2.3	2.3	0.1	0.0	0.3	0.4	2.3	1.6	1.7	6.7	7.1	8.3	4.2	2.9
20.	1.7	2.9	6.4	6.4	6.3	0.7	0.7	0.8	0.0	0.0	0.3	0.3	1.2	0.5	0.3	6.7	6.3	7.2	5.1	3.7
30.	2.1	3.0	6.0	6.0	6.0	0.4	0.4	0.4	0.0	0.0	0.3	0.3	0.9	0.1	0.1	6.1	5.8	5.7	4.9	4.0
40.	2.0	2.9	5.5	5.5	5.5	0.3	0.3	0.3	0.0	0.0	0.3	0.3	0.6	0.2	0.1	5.3	5.5	4.5	4.5	3.9
50.	2.0	2.7	4.9	4.9	4.9	0.2	0.2	0.2	0.0	0.0	0.3	0.3	0.4	0.2	0.1	4.7	5.4	4.6	3.9	3.7
60.	1.9	2.7	4.7	4.7	4.7	0.2	0.2	0.2	0.0	0.0	0.3	0.3	0.3	0.2	0.1	4.3	5.0	4.6	3.7	3.4
70.	1.8	2.5	4.5	4.5	4.5	0.1	0.1	0.1	0.0	0.0	0.3	0.3	0.3	0.2	0.1	4.1	4.8	4.8	3.1	3.4
80.	1.9	2.5	4.5	4.5	4.5	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.1	0.0	3.9	4.4	5.2	3.2	2.8
90.	2.5	3.0	5.0	4.6	4.6	0.0	0.0	0.2	0.2	0.2	0.3	0.3	0.3	0.0	0.0	4.0	4.2	4.9	2.7	2.2
100.	3.2	3.4	5.0	4.7	4.5	0.0	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	3.9	4.0	4.6	2.6	1.8
110.	3.8	3.8	5.2	4.7	4.6	0.2	0.3	0.4	0.3	0.3	0.0	0.0	0.0	0.0	0.0	4.0	4.0	4.7	2.5	1.7
120.	4.0	3.9	5.0	5.1	4.8	0.3	0.4	0.5	0.2	0.2	0.0	0.0	0.0	0.0	0.0	4.1	4.1	4.7	2.3	1.7
130.	3.8	4.2	5.1	5.4	5.0	0.3	0.4	0.7	0.2	0.2	0.0	0.0	0.0	0.0	0.0	4.4	4.4	4.8	2.4	1.7
140.	3.7	4.3	5.6	5.9	5.7	0.4	0.5	1.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	4.8	4.8	5.0	2.5	1.9
150.	3.7	4.5	6.1	6.2	6.5	0.5	0.6	1.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	5.3	5.3	5.4	2.7	1.9
160.	3.2	4.1	6.6	6.7	6.8	0.9	1.1	1.6	0.2	0.2	0.0	0.0	0.2	0.2	0.2	5.7	5.8	5.9	2.6	1.5
170.	2.4	3.5	6.5	6.0	6.2	2.8	3.0	3.5	0.3	0.2	0.0	0.1	1.1	1.1	1.1	5.5	5.7	5.8	1.8	0.7
180.	2.0	2.4	4.5	3.9	4.0	5.9	6.2	6.8	1.2	0.5	0.1	0.7	3.4	3.2	3.0	3.6	3.9	3.9	0.6	0.2
190.	1.6	1.8	2.5	1.8	1.7	7.8	7.8	8.8	2.4	1.2	0.8	1.8	5.8	5.3	5.2	1.5	1.5	1.6	0.1	0.0
200.	1.6	1.7	1.8	1.0	0.9	7.2	6.8	7.8	3.5	2.0	1.6	2.6	6.4	5.8	5.7	0.4	0.5	0.5	0.0	0.0
210.	1.6	1.8	1.8	0.9	0.7	6.7	6.4	6.4	3.9	2.3	1.9	2.7	6.2	5.2	5.2	0.2	0.2	0.2	0.0	0.0

220. *	1.6	1.9	1.9	1.1	0.7	6.4	6.2	5.4	3.9	2.4	1.8	2.6	6.0	4.8	4.8	0.2	0.2	0.2	0.0	0.0
230. *	1.8	2.0	2.1	1.1	0.6	6.0	6.0	5.3	3.7	2.3	1.7	2.5	5.7	4.4	4.4	0.1	0.1	0.1	0.0	0.0
240. *	2.0	2.1	2.3	1.0	0.7	5.4	5.9	5.3	3.5	2.5	1.7	2.7	5.3	4.2	4.1	0.1	0.1	0.1	0.0	0.0
250. *	2.1	2.2	2.4	1.1	0.7	5.3	5.7	6.0	3.6	2.9	1.8	2.7	5.1	4.1	3.9	0.0	0.0	0.0	0.0	0.0
260. *	2.2	2.2	2.3	0.9	0.5	5.1	5.4	6.4	3.9	3.3	2.4	3.4	5.6	4.4	3.9	0.0	0.0	0.3	0.3	0.2
270. *	1.5	1.5	1.5	0.4	0.1	4.9	5.2	6.0	3.6	2.8	3.0	4.1	6.6	5.1	4.1	0.1	0.4	1.1	1.1	1.0
280. *	0.6	0.6	0.6	0.1	0.0	4.7	4.7	5.1	3.0	2.1	3.3	4.3	7.1	5.8	4.4	0.4	0.7	2.0	1.8	1.6
290. *	0.1	0.1	0.1	0.0	0.0	4.6	4.6	4.6	2.6	1.9	2.7	3.8	6.8	6.2	4.6	0.6	1.0	2.2	2.0	1.7
300. *	0.0	0.0	0.0	0.0	0.0	4.8	4.8	4.8	2.7	1.9	2.5	3.6	5.8	6.4	4.8	0.7	1.1	2.2	2.0	1.7
310. *	0.0	0.0	0.0	0.0	0.0	5.3	5.3	5.3	2.8	2.0	2.3	3.4	5.7	6.7	5.2	0.8	1.2	1.9	1.8	1.5
320. *	0.0	0.0	0.0	0.0	0.0	5.7	5.7	5.7	3.0	2.1	2.4	3.6	5.8	6.7	5.7	0.9	1.2	1.9	1.7	1.6
330. *	0.0	0.0	0.0	0.0	0.0	6.4	6.4	6.4	3.2	2.1	2.4	3.6	6.3	7.0	6.5	0.9	1.2	1.9	1.7	1.7
340. *	0.0	0.0	0.2	0.2	0.2	7.0	7.2	7.2	3.0	1.8	2.1	3.3	6.8	7.3	7.2	1.3	1.3	2.2	1.7	1.7
350. *	0.0	0.1	1.1	1.1	1.0	7.0	7.1	7.5	2.1	0.9	1.2	2.3	6.7	6.8	7.0	2.6	2.9	3.8	1.9	1.7
360. *	0.2	0.8	3.6	3.5	3.4	5.0	5.2	5.3	0.9	0.2	0.5	1.1	4.6	4.4	4.4	5.5	5.5	6.8	2.8	2.0
MAX *	4.0	4.5	6.6	6.7	6.8	7.8	7.8	8.8	3.9	3.3	3.3	4.3	7.1	7.3	7.2	6.7	7.1	8.3	5.1	4.0
DEGR. *	120	150	160	160	160	190	190	190	210	260	280	280	280	340	340	20	10	10	20	30

THE HIGHEST CONCENTRATION OF   8.80 PPM OCCURRED AT RECEPTOR REC8 .

```
'92nd and Sheridan'    60   75.0      0       0     20 0.3048  1 1     0
'R1'                 -234     58    5.9
'R2'                 -152     58    5.9
'R3'                  -70     58    5.9
'R4'                  -70    140    5.9
'R5'                  -70    222    5.9
'R6'                   58    234    5.9
'R7'                   58    152    5.9
'R8'                   58     70    5.9
'R9'                  140     70    5.9
'R10'                 222     70    5.9
'R11'                 234    -46    5.9
'R12'                 152    -46    5.9
'R13'                  70    -46    5.9
'R14'                  70   -128    5.9
'R15'                  70   -210    5.9
'R16'                 -58   -222    5.9
'R17'                 -58   -140    5.9
'R18'                 -58    -58    5.9
'R19'                -140    -58    5.9
'R20'                -222    -58    5.9
'PM Build 2005'        20   1      0      'C'
1
'EBA'               'AG'   -1000    -24       0    -24  1910 22.554    0   44
1
'EBD'               'AG'       0    -24    1000    -24  2245 22.554    0   44
1
'WBA'               'AG'    1000     30       0     30  1840 22.495    0   56
1
'WBD'               'AG'       0     30   -1000     30  1570 22.495    0   56
1
'NBA'               'AG'      30  -1000      30      0  2680 24.525    0   56
1
'NBD'               'AG'      30      0      30   1000  2400 24.525    0   56
1
'SBA'               'AG'     -30   1000     -30      0  2185 22.495    0   56
1
'SBD'               'AG'     -30      0     -30  -1000  2400 22.495    0   56
2
'EBL'               'AG'     -48      0    -148      0     0    24    2
120                      79      2    895  142.061  1717     2     3
2
'EBT'               'AG'     -48    -24    -148    -24     0    24    2
120                      86      2    855  142.061  1770     2     3
2
'EBR'               'AG'     -48    -42    -148    -42     0    12    1
120                      86      2    160  142.061  1583     2     3
2
'WBL'               'AG'      48      0     148      0     0    24    2
120                      84      2    980  142.061  1717     2     3
2
'WBT'               'AG'      48     30     148     30     0    36    3
120                      91      2    600  142.061  1695     2     3
2
'WBR'               'AG'      48     54     148     54     0    12    1
120                      91      2    260  142.061  1583     2     3
2
'NBL'               'AG'       0    -36       0   -136     0    24    2
120                     106      2    335  142.061  1717     2     3
2
'NBT'               'AG'      30    -36      30   -136     0    36    3
120                      87      2   1245  142.061  1695     2     3
```

```
2
'NBR'                'AG'      54    -36      54   -136     0    12    1
120                      87      2   1100  142.061  1583     2     3
2
'SBL'                'AG'      -0     48       0    148     0    24    2
120                     107      2    290  142.061  1717     2     3
2
'SBT'                'AG'     -30     48     -30    148     0    36    3
120                      88      2   1260  142.061  1695     2     3
2
'SBR'                'AG'     -54     48     -54    148     0    12    1
120                      88      2    635  142.061  1583     2     3
1                         0      4   1000        0   'Y'    10     0   36
```

JOB: 92nd and Sheridan RUN: PM Build 2005

DATE : 8/21/ 9
TIME : 8:51:28

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 75. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. EBA	-1000.0	-24.0	0.0	-24.0	1000.	90.	AG	1910.	22.6	0.0	44.0		
2. EBD	0.0	-24.0	1000.0	-24.0	1000.	90.	AG	2245.	22.6	0.0	44.0		
3. WBA	1000.0	30.0	0.0	30.0	1000.	270.	AG	1840.	22.5	0.0	56.0		
4. WBD	0.0	30.0	-1000.0	30.0	1000.	270.	AG	1570.	22.5	0.0	56.0		
5. NBA	30.0	-1000.0	30.0	0.0	1000.	360.	AG	2680.	24.5	0.0	56.0		
6. NBD	30.0	0.0	30.0	1000.0	1000.	360.	AG	2400.	24.5	0.0	56.0		
7. SBA	-30.0	1000.0	-30.0	0.0	1000.	180.	AG	2185.	22.5	0.0	56.0		
8. SBD	-30.0	0.0	-30.0	-1000.0	1000.	180.	AG	2400.	22.5	0.0	56.0		
9. EBL	-48.0	0.0	-242.2	0.0	194.	270.	AG	502.	100.0	0.0	24.0	0.84	9.9
10. EBT	-48.0	-24.0	-296.6	-24.0	249.	270.	AG	546.	100.0	0.0	24.0	0.97	12.6
11. EBR	-48.0	-42.0	-123.2	-42.0	75.	270.	AG	273.	100.0	0.0	12.0	0.41	3.8
12. WBL	48.0	0.0	675.7	0.0	628.	90.	AG	533.	100.0	0.0	24.0	1.07	31.9
13. WBT	48.0	30.0	147.5	30.0	100.	90.	AG	867.	100.0	0.0	36.0	0.57	5.1
14. WBR	48.0	54.0	177.4	54.0	129.	90.	AG	289.	100.0	0.0	12.0	0.79	6.6
15. NBL	0.0	-36.0	0.0	-419.7	384.	180.	AG	673.	100.0	0.0	24.0	1.17	19.5
16. NBT	30.0	-36.0	30.0	-362.5	326.	180.	AG	829.	100.0	0.0	36.0	1.01	16.6
17. NBR	54.0	-36.0	54.0	-7819.6	7784.	180.	AG	276.	100.0	0.0	12.0	2.88	395.4
18. SBL	0.0	48.0	0.0	347.0	299.	360.	AG	680.	100.0	0.0	24.0	1.13	15.2
19. SBT	-30.0	48.0	-30.0	568.3	520.	360.	AG	838.	100.0	0.0	36.0	1.06	26.4
20. SBR	-54.0	48.0	-54.0	3085.4	3037.	360.	AG	279.	100.0	0.0	12.0	1.72	154.3

JOB: 92nd and Sheridan RUN: PM Build 2005

DATE : 8/21/ 9
TIME : 8:51:28

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
9. EBL	120	79	2.0	895	1717	142.06	2	3
10. EBT	120	86	2.0	855	1770	142.06	2	3
11. EBR	120	86	2.0	160	1583	142.06	2	3
12. WBL	120	84	2.0	980	1717	142.06	2	3
13. WBT	120	91	2.0	600	1695	142.06	2	3
14. WBR	120	91	2.0	260	1583	142.06	2	3
15. NBL	120	106	2.0	335	1717	142.06	2	3
16. NBT	120	87	2.0	1245	1695	142.06	2	3
17. NBR	120	87	2.0	1100	1583	142.06	2	3
18. SBL	120	107	2.0	290	1717	142.06	2	3

19. SBT	*	120	88	2.0	1260	1695	142.06	2	3
20. SBR	*	120	88	2.0	635	1583	142.06	2	3

RECEPTOR LOCATIONS

RECEPTOR	X	Y	Z
1. R1	-234.0	58.0	5.9
2. R2	-152.0	58.0	5.9
3. R3	-70.0	58.0	5.9
4. R4	-70.0	140.0	5.9
5. R5	-70.0	222.0	5.9
6. R6	58.0	234.0	5.9
7. R7	58.0	152.0	5.9
8. R8	58.0	70.0	5.9
9. R9	140.0	70.0	5.9
10. R10	222.0	70.0	5.9
11. R11	234.0	-46.0	5.9
12. R12	152.0	-46.0	5.9
13. R13	70.0	-46.0	5.9
14. R14	70.0	-128.0	5.9
15. R15	70.0	-210.0	5.9
16. R16	-58.0	-222.0	5.9
17. R17	-58.0	-140.0	5.9
18. R18	-58.0	-58.0	5.9
19. R19	-140.0	-58.0	5.9
20. R20	-222.0	-58.0	5.9

(COORDINATES (FT))

JOB: 92nd and Sheridan RUN: PM Build 2005

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	0.2	0.9	4.7	4.3	4.0	3.6	4.0	4.3	0.6	0.2	3.7	5.0	7.9	6.1	6.0	6.2	7.1	10.3	5.0	4.2
10.	0.9	2.0	7.5	6.8	6.5	1.6	1.6	1.8	0.1	0.0	3.4	3.9	6.0	3.8	3.1	7.7	7.9	11.1	6.5	5.0
20.	1.6	3.1	8.0	7.8	7.2	0.5	0.5	0.5	0.0	0.0	3.4	3.6	5.2	2.5	1.9	7.6	7.0	9.3	7.5	6.0
30.	2.1	3.4	7.8	7.5	7.1	0.3	0.3	0.3	0.0	0.0	3.5	3.5	5.1	2.1	1.4	7.5	6.6	7.4	7.8	6.4
40.	2.4	3.5	7.1	7.0	6.8	0.2	0.2	0.2	0.0	0.0	3.8	3.8	5.0	2.0	1.3	7.5	7.2	6.5	7.5	6.6
50.	2.4	3.3	6.6	6.5	6.4	0.2	0.2	0.2	0.0	0.0	4.2	4.2	4.9	1.9	1.3	7.1	7.6	6.5	7.2	6.6
60.	2.5	3.3	6.3	6.2	6.2	0.1	0.1	0.1	0.0	0.0	4.6	4.6	4.9	2.1	1.4	6.6	7.3	7.4	7.3	7.0
70.	2.6	3.3	6.5	5.9	5.9	0.1	0.1	0.2	0.1	0.1	5.1	5.2	5.3	2.0	1.1	6.3	7.1	8.4	7.6	7.1
80.	3.5	4.4	7.4	6.0	5.9	0.0	0.0	0.8	0.6	0.6	5.1	5.4	5.5	1.5	0.6	5.8	6.7	8.4	7.2	6.8
90.	5.1	5.9	9.3	6.5	6.1	0.1	0.4	2.7	2.0	1.8	3.7	3.9	4.0	0.5	0.1	5.5	5.9	7.6	5.6	5.1
100.	6.1	6.7	10.0	7.5	6.5	0.5	1.2	4.7	3.5	3.2	1.7	1.7	1.7	0.1	0.0	5.2	5.3	6.1	4.0	3.1
110.	6.1	5.9	8.3	8.5	7.1	1.1	1.9	6.0	4.2	3.6	0.5	0.5	0.5	0.0	0.0	5.2	5.2	5.3	3.1	2.3
120.	6.2	5.8	6.9	8.9	7.8	1.4	2.1	6.3	4.1	3.4	0.2	0.2	0.2	0.0	0.0	5.3	5.3	5.3	3.2	2.2
130.	6.1	6.5	6.4	8.9	8.1	1.4	2.3	6.3	3.9	3.1	0.2	0.2	0.2	0.0	0.0	5.7	5.8	5.8	3.3	2.3
140.	6.1	6.9	6.8	8.6	8.6	1.6	2.4	6.0	3.7	2.8	0.2	0.2	0.2	0.0	0.0	5.9	6.2	6.3	3.3	2.2
150.	5.5	6.8	7.7	8.4	9.1	1.7	2.8	5.9	3.7	2.7	0.1	0.1	0.1	0.0	0.0	5.9	6.5	6.7	3.0	1.8

```
160.  *   4.8   6.2   8.6   8.7   9.3   2.5   3.5   6.0   3.9   2.5   0.0   0.0   0.4   0.2   0.2   5.9   6.5   7.0   2.7   1.4
170.  *   4.1   5.2   8.3   8.1   8.5   4.1   5.1   8.2   4.8   2.8   0.0   0.2   1.7   1.5   1.4   5.3   5.9   6.3   1.7   0.8
180.  *   3.4   4.0   6.4   5.4   5.6   7.0   7.8  11.4   6.4   3.1   0.3   0.8   4.8   4.3   3.9   3.7   3.9   4.2   0.8   0.2
190.  *   2.9   3.4   4.4   2.8   2.6   8.0   8.7  12.1   8.1   3.9   0.9   2.0   7.9   7.2   6.4   1.5   1.6   1.7   0.1   0.0
200.  *   2.6   3.2   3.5   2.1   1.6   7.6   7.2  10.0   9.3   4.5   1.6   3.0   8.5   8.1   7.5   0.5   0.5   0.5   0.0   0.0
210.  *   2.3   3.3   3.5   2.0   1.3   7.2   6.4   7.6   9.5   5.1   2.0   3.7   8.2   8.0   7.7   0.2   0.2   0.2   0.0   0.0
220.  *   2.2   3.4   3.6   1.9   1.2   7.2   6.6   6.5   9.0   5.6   2.6   3.9   7.5   7.3   7.3   0.2   0.2   0.2   0.0   0.0
230.  *   2.3   3.6   3.9   1.7   1.0   6.8   7.1   6.1   8.2   5.8   2.6   3.6   7.1   6.9   6.9   0.2   0.2   0.2   0.0   0.0
240.  *   2.5   3.4   4.1   1.4   0.8   6.1   6.8   6.7   7.9   6.3   2.6   3.6   6.7   6.5   6.5   0.1   0.1   0.1   0.0   0.0
250.  *   2.7   3.1   3.8   1.1   0.7   5.7   6.5   7.3   7.5   7.1   2.8   3.8   6.7   6.1   6.1   0.0   0.0   0.1   0.1   0.1
260.  *   2.9   3.0   3.4   0.8   0.4   5.5   5.9   7.3   6.4   6.3   4.0   4.8   7.8   6.2   6.1   0.0   0.0   0.9   0.7   0.6
270.  *   2.1   2.1   2.2   0.3   0.1   5.3   5.5   6.6   4.9   4.7   6.0   6.7  10.0   6.8   6.4   0.1   0.3   2.5   1.9   1.6
280.  *   0.9   0.9   1.0   0.0   0.0   5.1   5.1   5.6   3.5   2.8   7.3   7.2  10.2   7.6   6.6   0.4   1.0   4.6   3.4   2.7
290.  *   0.3   0.3   0.3   0.0   0.0   5.0   5.0   5.1   3.0   2.1   7.4   7.1   8.6   8.4   7.0   0.7   1.3   5.5   4.2   3.2
300.  *   0.2   0.2   0.2   0.0   0.0   5.2   5.2   5.2   3.0   2.2   7.4   7.1   7.3   8.8   7.8   1.0   1.9   5.7   4.3   3.4
310.  *   0.1   0.1   0.1   0.0   0.0   5.6   5.6   5.6   3.2   2.2   7.1   7.9   6.9   8.8   8.4   1.2   2.1   5.5   4.3   3.4
320.  *   0.1   0.1   0.1   0.0   0.0   6.0   6.2   6.2   3.4   2.1   6.6   8.4   7.6   8.6   8.8   1.5   2.3   5.1   4.1   3.3
330.  *   0.1   0.1   0.1   0.0   0.0   6.1   6.5   6.7   3.1   2.0   5.8   8.3   8.5   8.9   9.3   1.6   2.5   4.9   3.9   3.3
340.  *   0.0   0.0   0.3   0.3   0.3   6.2   6.8   7.2   2.8   1.4   5.1   7.8   9.6   9.1   9.8   2.2   2.8   5.4   3.9   3.5
350.  *   0.0   0.1   1.6   1.5   1.5   5.3   6.1   6.6   1.8   0.8   4.3   6.3   9.7   8.9   8.9   3.7   4.4   7.1   3.9   3.5
360.  *   0.2   0.9   4.7   4.3   4.0   3.6   4.0   4.3   0.6   0.2   3.7   5.0   7.9   6.1   6.0   6.2   7.1  10.3   5.0   4.2
------*------------------------------------------------------------------------------------------------------------------------
MAX   *   6.2   6.9  10.0   8.9   9.3   8.0   8.7  12.1   9.5   7.1   7.4   8.4  10.2   9.1   9.8   7.7   7.9  11.1   7.8   7.1
DEGR. *  120   140   100   130   160   190   190   190   210   250   300   320   280   340   340    10    10    10    30    70
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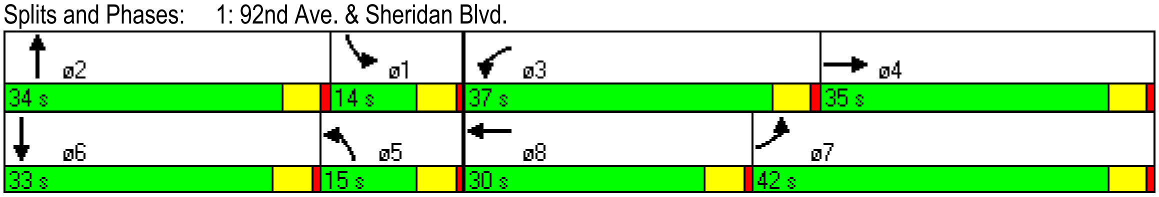
THE HIGHEST CONCENTRATION OF   12.10 PPM OCCURRED AT RECEPTOR REC8 .

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	895	855	160	980	600	260	335	1245	1100	290	1260	635
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	400		0	375		250	300		0
Storage Lanes	1		0	2		0	2		1	2		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.97	0.95	1.00	0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	3433	5085	1583	3433	5085	1583	3433	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	5085	1583	3433	5085	1583	3433	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			117			283			641			454
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		618			1118			540			691	
Travel Time (s)		14.0			25.4			12.3			15.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	973	929	174	1065	652	283	364	1353	1196	315	1370	690
Shared Lane Traffic (%)												
Lane Group Flow (vph)	973	929	174	1065	652	283	364	1353	1196	315	1370	690
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free			Free			Free			Free
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	21.0		9.0	21.0		9.0	21.0		9.0	21.0	
Total Split (s)	42.0	35.0	0.0	37.0	30.0	0.0	15.0	34.0	0.0	14.0	33.0	0.0
Total Split (%)	35.0%	29.2%	0.0%	30.8%	25.0%	0.0%	12.5%	28.3%	0.0%	11.7%	27.5%	0.0%
Maximum Green (s)	37.0	30.0		32.0	25.0		10.0	29.0		9.0	28.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag		Lead	Lead		Lag	Lead		Lag	Lead	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max		None	Min		None	Min	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	38.0	31.0	120.0	33.0	26.0	120.0	11.0	30.0	120.0	10.0	29.0	120.0
Actuated g/C Ratio	0.32	0.26	1.00	0.28	0.22	1.00	0.09	0.25	1.00	0.08	0.24	1.00
v/c Ratio	0.90	1.02	0.11	1.13	0.59	0.18	1.16	1.06	0.76	1.10	1.11	0.44
Control Delay	60.8	85.0	0.1	111.5	44.8	0.2	134.8	79.5	5.4	133.6	105.4	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.8	85.0	0.1	111.5	44.8	0.2	134.8	79.5	5.4	133.6	105.4	0.9
LOS	E	F	A	F	D	A	F	E	A	F	F	A
Approach Delay		66.6			74.0			56.0			78.8	
Approach LOS		E			E			E			E	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.16	
Intersection Signal Delay: 68.0	Intersection LOS: E
Intersection Capacity Utilization 98.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: 92nd Ave. & Sheridan Blvd.

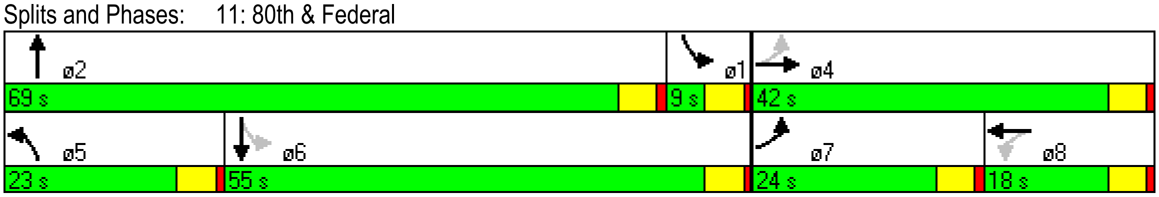


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	545	30	450	100	20	95	605	3080	165	135	1700	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	125		0	250		0	150		200
Storage Lanes	1		1	1		0	2		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.91	0.91	1.00	0.91	0.91
Frt			0.850		0.876			0.992			0.969	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1632	0	3433	5045	0	1770	4928	0
Flt Permitted	0.361			0.736			0.950			0.087		
Satd. Flow (perm)	672	1863	1583	1371	1632	0	3433	5045	0	162	4928	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			471		60			11			69	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		494			507			1190			505	
Travel Time (s)		11.2			11.5			27.0			11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	592	33	489	109	22	103	658	3348	179	147	1848	489
Shared Lane Traffic (%)												
Lane Group Flow (vph)	592	33	489	109	125	0	658	3527	0	147	2337	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1	1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50		50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt		Free	Perm			Prot			pm+pt		
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4		Free	8						6		
Detector Phase	7	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	21.0		21.0	21.0		9.0	21.0		9.0	21.0	
Total Split (s)	24.0	42.0	0.0	18.0	18.0	0.0	23.0	69.0	0.0	9.0	55.0	0.0
Total Split (%)	20.0%	35.0%	0.0%	15.0%	15.0%	0.0%	19.2%	57.5%	0.0%	7.5%	45.8%	0.0%

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Maximum Green (s)	19.0	37.0		13.0	13.0		18.0	64.0		4.0	50.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0
Lead/Lag	Lead			Lag	Lag		Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		5.0		5.0	5.0			5.0			5.0	
Flash Dont Walk (s)		11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0		0	0			0			0	
Act Effct Green (s)	37.1	37.1	120.0	13.1	13.1		19.9	65.9		51.0	51.0	
Actuated g/C Ratio	0.31	0.31	1.00	0.11	0.11		0.17	0.55		0.42	0.42	
v/c Ratio	1.51	0.06	0.31	0.73	0.54		1.16	1.27		1.08	1.10	
Control Delay	273.9	29.0	0.5	78.2	35.9		116.6	143.5		144.1	83.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	273.9	29.0	0.5	78.2	35.9		116.6	143.5		144.1	83.6	
LOS	F	C	A	E	D		F	F		F	F	
Approach Delay		146.7			55.6			139.3			87.2	
Approach LOS		F			E			F			F	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 80 (67%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.51	
Intersection Signal Delay: 121.7	Intersection LOS: F
Intersection Capacity Utilization 117.5%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 11: 80th & Federal



Appendix 23
CO Hot-Spot Modeling Files — Package 1 (No Action), 2035

```
'80th and Federal'    60   75.0      0       0     20 0.3048  1 1     0
'R1'                -234     58    5.9
'R2'                -152     58    5.9
'R3'                 -70     58    5.9
'R4'                 -70    140    5.9
'R5'                 -70    222    5.9
'R6'                  58    234    5.9
'R7'                  58    152    5.9
'R8'                  58     70    5.9
'R9'                 140     70    5.9
'R10'                222     70    5.9
'R11'                234    -46    5.9
'R12'                152    -46    5.9
'R13'                 70    -46    5.9
'R14'                 70   -128    5.9
'R15'                 70   -210    5.9
'R16'                -58   -222    5.9
'R17'                -58   -140    5.9
'R18'                -58    -58    5.9
'R19'               -140    -58    5.9
'R20'               -222    -58    5.9
'PM No Build 2005 Mitigated'        17   1      0      'C'
1
'EBA'              'AG'   -1000     -6       0     -6  1000 23.163    0   32
1
'EBD'              'AG'       0     -6    1000     -6   375 23.163    0   32
1
'WBA'              'AG'    1000     18       0     18   230 22.495    0   32
1
'WBD'              'AG'       0     24   -1000     24  1060 22.495    0   44
1
'NBA'              'AG'      30  -1000      30      0  3985 22.500    0   56
1
'NBD'              'AG'      30      0      30   1000  3660 22.500    0   56
1
'SBA'              'AG'     -30   1000     -30      0  2130 22.461    0   56
1
'SBD'              'AG'     -30      0     -30  -1000  2250 22.461    0   56
2
'EBL'              'AG'     -48      6    -148      6     0    12    1
120                    101      2    465  142.061  1770     2     3
2
'EBT'              'AG'     -48     -6    -148     -6     0    12    1
120                     80      2     30  142.061  1863     2     3
2
'EBR'              'AG'     -48    -18    -148    -18     0    12    1
120                     80      2    505  142.061  1583     2     3
2
'WBL'              'AG'      48      6     148      6     0    12    1
120                    100      2    130  142.061  1770     2     3
2
'WBT'              'AG'      48     18     148     18     0    12    1
120                    100      2    100  142.061  1639     2     3
2
'NBL'              'AG'       0    -12       0   -112     0    24    2
120                     94      2    640  142.061  1717     2     3
2
'NBT'              'AG'      30    -12      30   -112     0    36    3
120                     53      2   3345  142.061  1678     2     3
2
'SBL'              'AG'      -6     36      -6    136     0    12    1
```

```
120                    110      2    115  142.061  1770     2     3
2
'SBT'                'AG'     -30     36     -30    136     0    36    3
120                     68      2   2015  142.061  1644     2     3
1                        0      4   1000       0   'Y'     10     0   36
```

```
                    CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                 PAGE  1

JOB: 80th and Federal                                    RUN: PM No Build 2005 Mitigated

DATE :  8/21/ 9
TIME :  8:51:30

   The MODE flag has been set to C for calculating CO averages.

 SITE & METEOROLOGICAL VARIABLES
 -------------------------------
 VS =   0.0 CM/S      VD =   0.0 CM/S      Z0 =  75. CM
  U =  1.0 M/S        CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  0.0 PPM

 LINK VARIABLES
 --------------
   LINK DESCRIPTION     *         LINK COORDINATES (FT)          *    LENGTH  BRG TYPE   VPH    EF      H   W    V/C QUEUE
                        *   X1        Y1        X2        Y2     *     (FT)  (DEG)           (G/MI)  (FT) (FT)        (VEH)
------------------------*----------------------------------------*-------------------------------------------------------------
 1. EBA                 * -1000.0      -6.0       0.0      -6.0 *    1000.    90. AG  1000.  23.2   0.0 32.0
 2. EBD                 *     0.0      -6.0    1000.0      -6.0 *    1000.    90. AG   375.  23.2   0.0 32.0
 3. WBA                 *  1000.0      18.0       0.0      18.0 *    1000.   270. AG   230.  22.5   0.0 32.0
 4. WBD                 *     0.0      24.0   -1000.0      24.0 *    1000.   270. AG  1060.  22.5   0.0 44.0
 5. NBA                 *    30.0   -1000.0      30.0       0.0 *    1000.   360. AG  3985.  22.5   0.0 56.0
 6. NBD                 *    30.0       0.0      30.0    1000.0 *    1000.   360. AG  3660.  22.5   0.0 56.0
 7. SBA                 *   -30.0    1000.0     -30.0       0.0 *    1000.   180. AG  2130.  22.5   0.0 56.0
 8. SBD                 *   -30.0       0.0     -30.0   -1000.0 *    1000.   180. AG  2250.  22.5   0.0 56.0
 9. EBL                 *   -48.0       6.0   -2816.6       6.0 *    2769.   270. AG   321. 100.0   0.0 12.0 2.10 140.6
10. EBT                 *   -48.0      -6.0     -61.1      -6.0 *      13.   270. AG   254. 100.0   0.0 12.0 0.05   0.7
11. EBR                 *   -48.0     -18.0    -653.3     -18.0 *     605.   270. AG   254. 100.0   0.0 12.0 1.07  30.8
12. WBL                 *    48.0       6.0     119.1       6.0 *      71.    90. AG   318. 100.0   0.0 12.0 0.55   3.6
13. WBT                 *    48.0      18.0     102.7      18.0 *      55.    90. AG   318. 100.0   0.0 12.0 0.46   2.8
14. NBL                 *     0.0     -12.0       0.0    -297.9 *     286.   180. AG   597. 100.0   0.0 24.0 1.02  14.5
15. NBT                 *    30.0     -12.0      30.0   -2779.4 *    2767.   180. AG   505. 100.0   0.0 36.0 1.27 140.6
16. SBL                 *    -6.0      36.0      -6.0     416.6 *     381.   360. AG   349. 100.0   0.0 12.0 1.31  19.3
17. SBT                 *   -30.0      36.0     -30.0     512.8 *     477.   360. AG   648. 100.0   0.0 36.0 1.02  24.2
                                                                                                      PAGE  2
JOB: 80th and Federal                                    RUN: PM No Build 2005 Mitigated

DATE :  8/21/ 9
TIME :  8:51:30

 ADDITIONAL QUEUE LINK PARAMETERS
 --------------------------------
   LINK DESCRIPTION     *    CYCLE    RED    CLEARANCE  APPROACH  SATURATION   IDLE   SIGNAL   ARRIVAL
                        *    LENGTH   TIME   LOST TIME    VOL     FLOW RATE   EM FAC   TYPE     RATE
                        *    (SEC)   (SEC)    (SEC)      (VPH)      (VPH)    (gm/hr)
------------------------*--------------------------------------------------------------------------
 9. EBL                 *     120     101      2.0       465        1770     142.06      2         3
10. EBT                 *     120      80      2.0        30        1863     142.06      2         3
11. EBR                 *     120      80      2.0       505        1583     142.06      2         3
12. WBL                 *     120     100      2.0       130        1770     142.06      2         3
13. WBT                 *     120     100      2.0       100        1639     142.06      2         3
14. NBL                 *     120      94      2.0       640        1717     142.06      2         3
15. NBT                 *     120      53      2.0      3345        1678     142.06      2         3
16. SBL                 *     120     110      2.0       115        1770     142.06      2         3
17. SBT                 *     120      68      2.0      2015        1644     142.06      2         3

 RECEPTOR LOCATIONS
 ------------------
                        *          COORDINATES (FT)          *
   RECEPTOR             *      X          Y          Z       *
```

1. R1	-234.0	58.0	5.9
2. R2	-152.0	58.0	5.9
3. R3	-70.0	58.0	5.9
4. R4	-70.0	140.0	5.9
5. R5	-70.0	222.0	5.9
6. R6	58.0	234.0	5.9
7. R7	58.0	152.0	5.9
8. R8	58.0	70.0	5.9
9. R9	140.0	70.0	5.9
10. R10	222.0	70.0	5.9
11. R11	234.0	-46.0	5.9
12. R12	152.0	-46.0	5.9
13. R13	70.0	-46.0	5.9
14. R14	70.0	-128.0	5.9
15. R15	70.0	-210.0	5.9
16. R16	-58.0	-222.0	5.9
17. R17	-58.0	-140.0	5.9
18. R18	-58.0	-58.0	5.9
19. R19	-140.0	-58.0	5.9
20. R20	-222.0	-58.0	5.9

JOB: 80th and Federal RUN: PM No Build 2005 Mitigated

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	0.2	0.6	3.2	3.0	2.7	4.4	4.7	4.9	0.6	0.2	0.5	0.9	4.2	4.1	4.3	5.2	5.1	6.4	2.5	1.8
10.	0.7	1.6	5.6	5.3	4.9	2.0	2.1	2.1	0.1	0.0	0.3	0.4	2.0	1.6	1.6	6.4	6.7	7.9	3.8	2.7
20.	1.4	2.6	6.2	6.0	5.8	0.7	0.7	0.7	0.0	0.0	0.3	0.3	1.2	0.6	0.3	6.6	5.9	7.0	4.8	3.4
30.	1.8	2.9	5.7	5.7	5.6	0.4	0.4	0.4	0.0	0.0	0.3	0.3	0.9	0.3	0.1	6.2	5.7	5.5	4.8	3.9
40.	2.0	2.8	5.3	5.3	5.3	0.3	0.3	0.3	0.0	0.0	0.3	0.3	0.7	0.2	0.1	5.7	5.5	4.7	4.4	3.8
50.	2.0	2.7	4.9	4.9	4.9	0.2	0.2	0.2	0.0	0.0	0.3	0.3	0.5	0.2	0.1	5.3	5.4	4.6	3.9	3.7
60.	1.9	2.6	4.6	4.6	4.6	0.2	0.2	0.2	0.0	0.0	0.4	0.4	0.5	0.2	0.1	4.9	5.1	4.7	3.7	3.5
70.	1.7	2.3	4.5	4.5	4.5	0.1	0.1	0.1	0.0	0.0	0.4	0.4	0.4	0.2	0.1	4.8	4.9	5.0	3.1	3.4
80.	1.8	2.4	4.4	4.4	4.4	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.1	0.0	4.7	4.8	5.1	3.1	2.7
90.	2.4	3.0	4.9	4.5	4.5	0.0	0.0	0.2	0.2	0.2	0.3	0.3	0.3	0.0	0.0	4.8	4.8	5.0	2.7	2.3
100.	3.2	3.5	5.0	4.6	4.4	0.0	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.0	0.0	4.7	4.7	4.7	2.6	1.9
110.	3.7	3.7	4.9	4.6	4.6	0.2	0.3	0.4	0.3	0.3	0.0	0.0	0.0	0.0	0.0	4.7	4.7	4.7	2.7	2.0
120.	4.0	4.1	5.0	5.0	4.8	0.3	0.4	0.5	0.3	0.3	0.0	0.0	0.0	0.0	0.0	4.7	4.8	4.8	2.8	2.0
130.	4.1	4.4	5.1	5.3	5.0	0.3	0.4	0.7	0.3	0.3	0.0	0.0	0.0	0.0	0.0	5.0	5.2	5.2	2.9	2.0
140.	3.9	4.7	5.7	5.8	5.7	0.4	0.5	1.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	5.2	5.6	5.6	2.9	2.0
150.	3.9	4.8	6.6	6.5	6.2	0.4	0.6	1.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	5.3	5.9	6.0	2.9	1.9
160.	3.5	4.5	7.1	6.9	7.0	1.0	1.3	1.8	0.2	0.2	0.0	0.0	0.3	0.3	0.3	5.6	6.2	6.5	2.7	1.7
170.	2.8	3.8	7.0	6.5	6.6	3.1	3.6	4.0	0.4	0.3	0.0	0.2	1.6	1.5	1.5	5.6	6.0	6.4	2.0	1.0
180.	2.2	2.6	4.8	4.1	4.3	6.5	6.9	7.7	1.7	0.8	0.4	1.1	4.4	4.3	4.1	3.9	4.1	4.3	0.8	0.4
190.	1.7	1.9	2.6	1.9	1.8	8.0	8.2	9.4	3.2	1.7	1.2	2.4	6.9	6.6	6.4	1.6	1.6	1.6	0.2	0.0
200.	1.7	1.7	1.8	1.0	0.9	7.2	6.8	8.0	4.0	2.3	1.9	3.0	7.2	6.9	6.5	0.4	0.5	0.5	0.0	0.0
210.	1.9	1.9	1.9	1.0	0.7	6.6	6.2	6.3	4.1	2.4	2.1	3.1	6.8	6.6	6.1	0.2	0.2	0.2	0.0	0.0
220.	1.9	1.9	1.9	1.0	0.7	6.4	6.1	5.3	4.0	2.6	2.0	3.2	6.2	6.1	5.8	0.2	0.2	0.2	0.0	0.0
230.	2.1	2.1	2.1	1.2	0.8	6.0	6.0	5.2	3.6	2.4	2.0	3.0	5.7	5.7	5.6	0.1	0.1	0.1	0.0	0.0

240.	*	2.3	2.4	2.4	1.2	0.8	5.4	5.9	5.3	3.4	2.6	2.1	2.8	5.5	5.5	5.5	0.1	0.1	0.1	0.0	0.0
250.	*	2.5	2.6	2.6	1.3	0.8	5.3	5.7	6.0	3.6	2.9	2.0	2.8	5.1	5.1	5.1	0.0	0.0	0.0	0.0	0.0
260.	*	2.4	2.5	2.5	1.0	0.5	5.0	5.6	6.4	3.9	3.3	2.5	3.4	5.9	5.3	5.2	0.0	0.0	0.4	0.4	0.3
270.	*	1.6	1.6	1.6	0.4	0.1	4.9	5.2	6.2	3.6	2.6	3.2	4.3	6.8	5.8	5.4	0.1	0.4	1.4	1.3	1.2
280.	*	0.6	0.6	0.6	0.1	0.0	4.6	4.6	5.0	3.0	2.1	3.4	4.5	7.3	6.3	5.8	0.4	1.0	2.1	2.1	2.1
290.	*	0.1	0.1	0.1	0.0	0.0	4.5	4.5	4.5	2.6	1.9	2.8	3.7	6.7	6.4	6.0	0.8	1.1	2.3	2.3	2.3
300.	*	0.0	0.0	0.0	0.0	0.0	4.8	4.8	4.8	2.6	1.9	2.4	3.5	5.9	6.6	6.3	0.9	1.3	2.2	2.1	2.1
310.	*	0.0	0.0	0.0	0.0	0.0	5.2	5.2	5.2	2.6	2.0	2.3	3.6	5.5	6.9	6.5	0.9	1.2	2.0	1.9	1.9
320.	*	0.0	0.0	0.0	0.0	0.0	5.7	5.7	5.7	2.9	1.9	2.3	3.4	5.9	6.7	7.0	1.0	1.3	1.9	1.7	1.7
330.	*	0.0	0.0	0.0	0.0	0.0	6.0	6.2	6.2	2.8	1.8	2.1	3.4	6.1	7.2	7.6	1.0	1.2	1.9	1.7	1.7
340.	*	0.0	0.0	0.2	0.1	0.1	6.4	6.6	6.8	2.6	1.4	1.9	3.1	6.8	7.2	7.7	1.3	1.3	2.2	1.7	1.7
350.	*	0.0	0.0	0.9	0.9	0.8	6.1	6.6	6.8	1.7	0.7	1.0	2.1	6.3	6.4	7.1	2.6	2.7	3.9	1.8	1.7
360.	*	0.2	0.6	3.2	3.0	2.7	4.4	4.7	4.9	0.6	0.2	0.5	0.9	4.2	4.1	4.3	5.2	5.1	6.4	2.5	1.8
MAX	*	4.1	4.8	7.1	6.9	7.0	8.0	8.2	9.4	4.1	3.3	3.4	4.5	7.3	7.2	7.7	6.6	6.7	7.9	4.8	3.9
DEGR.	*	130	150	160	160	160	190	190	190	210	260	280	280	280	330	340	20	10	10	20	30

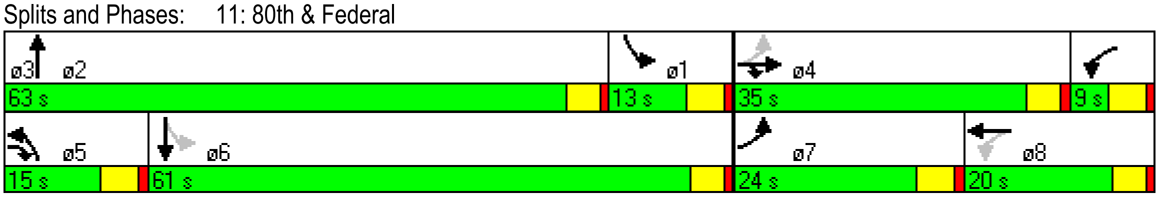
THE HIGHEST CONCENTRATION OF 9.40 PPM OCCURRED AT RECEPTOR REC8 .

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	470	20	585	160	35	140	370	1515	75	95	2310	575
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	75		0	125		0	150		0	150		200
Storage Lanes	1		1	1		0	2		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.91	0.91	1.00	0.91	0.91
Frt			0.850		0.880			0.993			0.970	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1639	0	3433	5050	0	1770	4933	0
Flt Permitted	0.348			0.743			0.950			0.090		
Satd. Flow (perm)	648	1863	1583	1384	1639	0	3433	5050	0	168	4933	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			11		124			9			68	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		494			507			1185			505	
Travel Time (s)		11.2			11.5			26.9			11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	511	22	636	174	38	152	402	1647	82	103	2511	625
Shared Lane Traffic (%)												
Lane Group Flow (vph)	511	22	636	174	190	0	402	1729	0	103	3136	0
Number of Detectors	1	1	1	1	1		1	1		1	1	
Detector Template												
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	50	50	50	50	50		50	50		50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	pm+pt		pt+ov	pm+pt			Prot			pm+pt		
Protected Phases	7	4	4 5	3	8		5	2		1	6	
Permitted Phases	4			8						6		
Detector Phase	7	4	4 5	3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	20.0		9.0	20.0		9.0	20.0		9.0	20.0	
Total Split (s)	24.0	35.0	50.0	9.0	20.0	0.0	15.0	63.0	0.0	13.0	61.0	0.0
Total Split (%)	20.0%	29.2%	41.7%	7.5%	16.7%	0.0%	12.5%	52.5%	0.0%	10.8%	50.8%	0.0%
Maximum Green (s)	19.0	30.5		4.0	15.5		10.0	58.5		8.0	56.5	
Yellow Time (s)	4.0	3.5		4.0	3.5		4.0	3.5		4.0	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-1.0	-0.5	0.0	-1.0	-0.5	0.0	-1.0	-0.5	0.0	-1.0	-0.5	-0.5
Total Lost Time (s)	4.0	4.0	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	31.0	31.0	41.0	16.0	16.0		11.0	59.0		57.0	57.0	
Actuated g/C Ratio	0.26	0.26	0.34	0.13	0.13		0.09	0.49		0.48	0.48	
v/c Ratio	1.44	0.05	1.16	0.87	0.58		1.28	0.70		0.52	1.32	
Control Delay	247.7	33.9	120.0	88.2	26.0		182.3	25.6		47.0	174.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	247.7	33.9	120.0	88.2	26.0		182.3	25.6		47.0	174.9	
LOS	F	C	F	F	C		F	C		D	F	
Approach Delay		174.2			55.8			55.2			170.8	
Approach LOS		F			E			E			F	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 109 (91%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.44	
Intersection Signal Delay: 129.6	Intersection LOS: F
Intersection Capacity Utilization 117.9%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 11: 80th & Federal



Appendix 24
APCD Vehicle Emission Modeling Files — Package 1 and the Combined Alternative Package (Preferred Alternative) (on CD)