Appendix B.
Air Quality Technical Report (HDR, 2015)

NORTH INTERSTATE 25

120TH AVENUE TO SH 7

Air Quality Technical Report

RECORD OF DECISION 2

FINAL September 28, 2015

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Appendices

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1.0 INTRODUCTION AND STUDY AREA

The proposed project is located north of Denver, Colorado, on Interstate 25 (I-25) between 120th Avenue and State Highway 7. The project includes the addition of an Express Lane in each direction between the project limits. It is an interim phase of the multi-modal corridor improvements identified and evaluated in the *North I-25 Final Environmental Impact Statement* (FEIS) (CDOT, 2011).

At the time the 2011 FEIS was issued, funding had not been secured for the entirety of the Preferred Alternative; therefore, the Federal Highway Administration (FHWA) and the Colorado Department of Transportation (CDOT) planned the phased implementation of the 2011 FEIS Preferred Alternative. Details of the phasing components are included in Chapter 8 of the 2011 FEIS and are not repeated here. The proposed project is included in the Denver Regional Council of Governments (DRCOG) fiscally constrained 2040 Regional Transportation Plan, and funding for the project is included in the DRCOG FY 2016 to FY 2019 Transportation Improvement Program and Statewide Improvement Plan.

This report updates air quality analyses prepared as part of the 2011 FEIS for a second Record of Decision (ROD2) in the segment of the I-25 corridor between 120th Avenue and State Highway 7, a distance of about 6.6 miles (see Figure 1). The project includes the addition of an Express Lane in each direction between the project limits and minor ramp modifications at 120th Avenue, 136th Avenue, 144th Avenue, and E-470/Northwest Parkway to accommodate the Express Lanes.

The proposed improvements are consistent with the 2011 FEIS Preferred Alternative. The additional lanes will be managed as Express Lanes. This project will connect with the Express Lanes south of 120th Avenue. No new general purpose lanes will be included in the ROD2 project except for minor ramp modifications to accommodate a wider cross section. The Express Lanes that were included in the 2011 FEIS *Record of Decision1* (ROD1) (CDOT, 2011) south of 120th Avenue are currently under construction.

2.0 CURRENT AIR QUALITY STANDARDS AND GUIDELINES

The U.S. Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. These standards include both primary and secondary standards. Primary standards protect public health, while secondary standards protect public welfare (such as protecting property and vegetation from the effects of air pollution).

The EPA Office of Air Quality Planning and Standards (OAQPS) has set NAAQS for seven principal pollutants, which are called “criteria” pollutants that apply to transportation projects (see Table 1). These pollutants are carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), lead (Pb), PM_{10} (particulate matter smaller than 10 microns in diameter), $PM_{2.5}$ (particulate matter smaller than 2.5 microns in diameter), and sulfur dioxide (SO2). The state of Colorado has adopted the NAAQS as the ambient air quality standards for the state.

Figure 1. ROD2 Selected Alternative

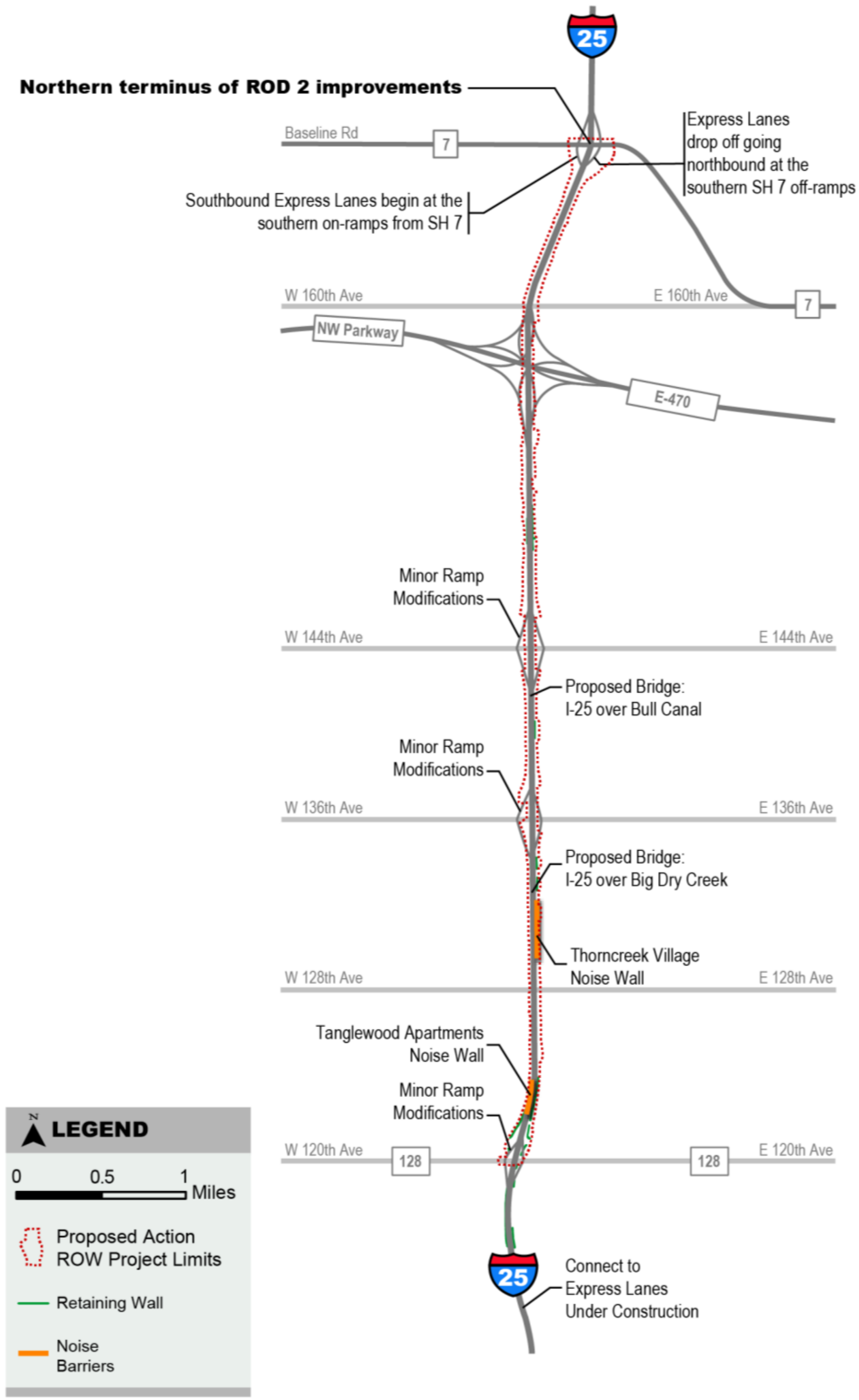


Table 1. NAAQS Criteria Pollutants

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Carbon monoxide (CO)	Primary	8-hour average	9 ppm	Not to be exceeded more than once per year
		1-hour average	35 ppm	
Lead (Pb)	Primary and secondary	Rolling 3-month average	0.15 µg/m^3 [a]	Not to be exceeded
Nitrogen dioxide (NO_2)	Primary	1-hour average	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and secondary	Annual average	53 ppb [b]	Annual mean
Ozone (O_3)	Primary and secondary	8-hour average	0.075 ppm [c]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate matter ($PM_{2.5}$)	Primary	Annual average	12 µg/m^3	Annual mean, averaged over 3 years
	Secondary	Annual average	15 µg/m^3	Annual mean, averaged over 3 years
	Primary and secondary	24-hour average	35 µg/m^3	98th percentile, averaged over 3 years
Particulate matter (PM_{10})	Primary and secondary	24-hour average	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur dioxide (SO_2)	Primary	1-hour average	75 ppb [d]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour average	0.5 ppm	Not to be exceeded more than once per year

Source: www.colorado.gov/airquality

ppm = parts per million

ppb = parts per billion

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

$PM_{2.5}$ =particulate matter 2.5 microns in diameter or less

µg/m3 = micrograms per cubic meter

a Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated non-attainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

b The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

c Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (“anti-backsliding”). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

d Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

In addition to the criteria pollutants, emissions of unregulated mobile source air toxic (MSAT) pollutants from automobile and truck traffic are also of concern. EPA has not established NAAQS for air toxics. Methods for quantifying air toxic impacts from mobile sources are subject to scientific debate, and the analysis of air toxics is an emerging field. A regional MSAT inventory analysis was prepared for the 2011 FEIS using the FHWA guidance that was applicable at that time.

3.0 REGULATORY SETTING

The Clean Air Act (CAA) defines nonattainment areas as geographic regions that have been designated as not meeting one or more of the NAAQS. A maintenance area is an area previously designated as a nonattainment area that has been re-designated as an attainment area and is required by the CAA to have a maintenance plan to demonstrate continuing compliance for a specified number of years. The Denver metropolitan area is designated as a nonattainment area for the 8-hour ozone standard, a maintenance area for CO and PM_{10}, and an attainment area for the other criteria pollutants. Figure 2 shows the limits of the nonattainment and maintenance areas in northern Colorado.

The CAA requires that a State Implementation Plan (SIP) be prepared for each nonattainment and maintenance area. The SIP describes how the State will meet the NAAQS under the deadlines established by the CAA. In addition, EPA's transportation conformity rule requires metropolitan planning organizations and FHWA to make conformity determinations on projects before they are approved.

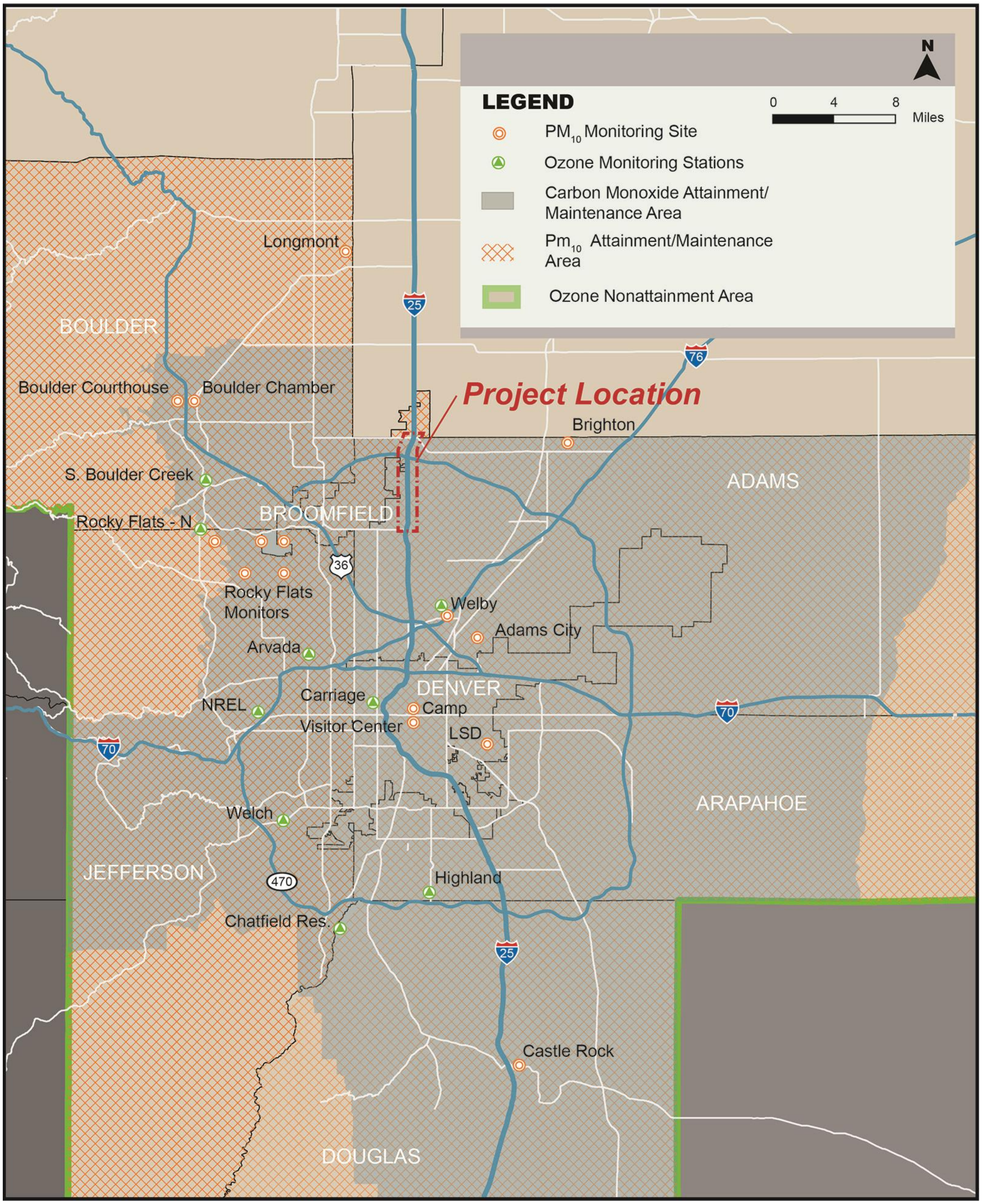
4.0 TRANSPORTATION CONFORMITY REQUIREMENTS

As noted above, state governments are required to develop a SIP, which explains how the state will comply with the requirements of the CAA. Section 176(c) of the CAA requires that transportation plans, programs, and projects that are developed, funded, or approved by FHWA and metropolitan planning organizations must demonstrate that such activities conform to the SIP. Transportation conformity requirements apply to any transportation-related criteria pollutants (for example, carbon monoxide or particulate matter) for which the project area has been designated a nonattainment or maintenance area.

Under Section 176(c) of the CAA, a transportation project is said to "conform" to the provisions and purposes of the SIP if the project, both alone and in combination with other planned projects, does not:

- Cause or contribute to new air quality violations of the NAAQS.
- Worsen existing violations of the NAAQS.
- Delay timely attainment of the NAAQS or required interim milestones.

Figure 2. Nonattainment and Maintenance Areas in Northern Colorado



5.0 POLLUTANTS OF CONCERN

Of the seven criteria pollutants, CO and PM_{10} are pollutants of interest for the 2011 FEIS Preferred Alternative because the area is a designated maintenance area for these pollutants. Ambient concentrations of Pb, SO_2, and NO_2 are not significantly affected by vehicle emissions and therefore are not likely to be substantially affected by the addition of the Express Lanes on I-25 between 120th Avenue and State Highway 7 interchange. Ozone levels are not considered in this analysis because O_3 is a regional pollutant that is evaluated on an area-wide basis; and, because the 2011 FEIS Preferred Alternative is incorporated in the region's planning documents and area-wide dispersion modeling analyses, project-related changes are accounted for in the SIP.

Carbon monoxide is generated primarily by the incomplete combustion of fossil fuels in motor vehicles. Sources include vehicle exhaust and industrial processes. CO affects the central nervous system by depriving the body of oxygen and most affects people with respiratory, cardiovascular, or blood anemia sensitivities.

Particulate matter consists of very small liquid and solid particles floating in the air. These particles can include smoke, soot, dust, salts, acids, and metals. Particulate matter also forms when emissions from industrial sources and gases emitted from motor vehicles undergo chemical reactions in the atmosphere. Major sources of PM_{10} are vehicles; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions.

Sources of $PM_{2.5}$ (i.e., fine particulate matter 2.5 microns in diameter or less) include all types of combustion, including combustion in motor vehicle engines (particularly diesel engines), power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes. These smaller particles penetrate deeper into the cardiovascular system, therefore have a strong association with circulatory (heart disease and strokes) disease.

Ground-level ozone is a gas that is not emitted directly from a source but forms as a secondary pollutant. Its precursors are certain reactive hydrocarbons and nitrogen oxides, which react chemically in sunlight to form ozone. The main sources for these reactive hydrocarbons are automobile exhaust, gasoline, oil-storage and oil-transfer facilities, industrial paint and ink solvents, degreasing agents, and cleaning fluids. Exposure to O_3 has been linked to a number of health effects, including significant decreases in lung function, inflammation of the airways, and increased respiratory symptoms, such as coughing and pain when taking a deep breath.

Carcinogenic pollutants generated by diesel and gasoline-fueled vehicles are classified as MSATs and include, among others, formaldehyde, benzene, acrolein, 1,3 butadiene, acetaldehyde, and diesel particulate matter.

6.0 EXISTING CONDITIONS

Most air quality monitors are located in the Denver metropolitan area. The air quality monitor nearest to the project area is the Welby monitor, which is approximately 5 miles southeast of 120th Avenue. Representative ambient air quality data for the project area are summarized in Table 2. The Welby monitor does not monitor for $PM_{2.5}$, so the Camp monitor in downtown

Denver is included for $PM_{2.5}$ values. The values shown in Table 2 are the maximum concentrations recorded during the calendar year.

Table 2. Representative Ambient Air Quality Data (2014)

Pollutant	Monitor	Averaging Time	Maximum Value	NAAQS
O_3	78th Avenue—Welby	8-hour	0.073 ppm	0.075 ppm
CO	78th Avenue—Welby	8-hour	3.5 ppm	9 ppm
		1-hour	1.8 ppm	35 ppm
NO_2	78th Avenue—Welby	1-hour	106 ppb	100 ppb
SO_2	78th Avenue—Welby	1-hour	46 ppb	75 ppb
PM_{10}	78th Avenue—Welby	24-hour	77 $\mu g/m^3$	150 $\mu g/m^3$
$PM_{2.5}$	2105 Broadway—Camp	Annual	7.6 $\mu g/m^3$	12 $\mu g/m^3$
		24-hour	44.3 $\mu g/m^3$	35 $\mu g/m^3$

Source: EPA Airdata Database: http://www.epa.gov/airdata

ppm = parts per million; ppb = parts per billion; μg/m3 = micrograms per cubic meter

Ozone levels, particularly in and adjacent to Weld County, are influenced by the dramatic increase since 2008 of oil and gas extraction activities. The Cooperative Institute for Research in Environmental Sciences (CIRES) and the National Oceanic and Atmospheric Administration (NOAA) in 2012 measures high levels of methane, benzene, and other volatile organic compounds in Weld County. Oil and gas equipment and associated activities on well pads leaked or vented an estimated 4 percent of all natural gas produced to the atmosphere. This is double the amount previously estimated (CIRES, 2012). Although there are no data from monitoring or modeling that show oil and gas extraction is directly related to ozone formation, volatile organic compounds are a precursor to ozone formation (J. DiLeo, Colorado Department of Public Health and Environment (CDPHE), personal communication, June 18, 2014).

Table 3 shows the maximum O_3 levels at monitors in the Colorado nonattainment area from 2012 to 2014. As shown in Table 3 maximum O_3 concentrations at air quality monitors in the Denver Metro/North Front Range have fluctuated over the years.

Table 3. Maximum O_3 Concentration (ppm), Colorado Nonattainment Area

County	2012	2013	2014
Adams	0.087	0.082	0.073
Arapahoe	0.094	0.085	0.077
Boulder	0.094	0.086	0.075
Denver	0.092	0.080	0.069
Douglas	0.098	0.086	0.077
Jefferson	0.101	0.093	0.082
Larimer	0.094	0.091	0.082
Weld	0.090	0.080	0.078

Source: EPA Airdata Database: http://www.epa.gov/airdata

ppm = parts per million

As noted in Table 1, NAAQS levels are largely set on averaging periods (e.g., ozone levels are based on 3-year average of the annual fourth-highest daily maximum 8-hour concentrations), thus the maximum concentrations shown in Table 2 and Table 3 may not be representative of a violation of the NAAQS. The monitored concentrations near the study area are generally less than the NAAQS.

7.0 SUMMARY OF FINDINGS FROM THE 2011 FEIS

The 2011 FEIS and ROD1 assessed area-wide emissions from the project for CO, volatile organic compounds (VOCs), NOx, PM_{10}, and MSATs. The 2011 FEIS also assessed project-level (i.e., hot-spot) air quality impacts for CO and PM_{10}.

7.1. CO Project-Level (Hot-Spot) Analysis from the 2011 FEIS

For the 2011 FEIS, CO hot-spot modeling was conducted at five interchange locations that were operating at an unacceptable level of service (LOS) (LOS D or worse and with the highest traffic volumes in the I-25 corridor). Two of the interchange locations modeled in the 2011 FEIS bracket the 120th Avenue to State Highway 7 corridor which are reflective of the phased 2011 FEIS Preferred Alternative:

1. State Highway 7 and I-25, north of the E-470/NW Parkway interchange
2. Thornton Parkway and I-25, south of 120th Avenue

CO hot-spot modeling for the I-25 interchanges at these two interchange locations was conducted using the CAL3QHC air quality dispersion model with a number of worst-case inputs including a very low wind speed (1 meter/second) and stable meteorological conditions (stability class D).

The maximum modeled 8-hour CO concentrations at the State Highway 7 and Thornton Parkway interchanges were 5.5 ppm and 7.1 ppm, respectively. Both maximum modeled 8-hour CO concentrations were below the 8-hour NAAQS of 9 ppm.

7.2. PM_{10} Project-Level (Hot-Spot) Analysis

The 2011 FEIS was considered a project of air quality concern for two reasons: (1) it included an express bus station and parking area at State Highway 7 and (2) it modified the existing transit facilities near the Thornton Parkway interchange. These kinds of facilities include a substantial number of idling buses as well as internal parking at discrete locations.

Qualitative hot-spot analysis was conducted at these two locations for the 2011 FEIS and the highest modeled PM_{10} concentrations at the State Highway 7 and Thornton Parkway locations were 89.42 $\mu g/m^3$ and 103 $\mu g/m^3$, respectively, which were below the 24-hour NAAQS of 150 ug/m^3.

8.0 ROD2 AIR QUALITY ANALYSIS

8.1. Quantitative CO Analysis

Detailed CO hotspot analysis was preformed at 120th Avenue and I-25. An assessment of projected 2040 traffic volumes along I-25 concluded that traffic volumes would be similar to those used in the 2011 FEIS 2035 analyses. Therefore, 2011 FEIS traffic data were used in the CO hotspot analysis. A reasonable worst case analysis was performed using the highest traffic volumes expected over the project planning timeline (2035) with the worst emission rates expected over that same timeframe (current 2015 emission rates). Use of the 2015 emission rates is conservative because emission rates will generally decrease in the future due to improved vehicle emission standards.

Emission rates for running and idling vehicles are from the USEPA MOVES model and were generated by the CDPHE Air Pollution Control Division (APCD) staff based on 2011 FEIS traffic data. Microscale dispersion modeling was competed using the USEPA CAL3QHC dispersion model with background CO concentrations provided by APCD.

As shown in Table 4, the maximum predicted 1-hour and 8-hour CO concentrations are less than the NAAQS, therefore project-level conformity has been met for CO and no violation is likely to result from the proposed project.

Table 4. Results of Hot Spot Analysis for Carbon Monoxide at I-25 and 120th Avenue

2035 Traffic Volumes (vpd)[a]	NAAQS 1-hour Standard CO (ppm)	Maximum 1-Hour CO Concentration (ppm)[b]	NAAQS 8-hour Standard CO (ppm)	Maximum 8-Hour CO Concentration (ppm)[c]
184,044	35	7.7	9	4.0

Notes:

[a] Traffic volumes include southbound (92,996) and northbound (91,048) volumes.

[b] Maximum 1-hour concentrations include background concentration of 4.3 ppm.

[c] Maximum 8- hour concentrations are calculated using a persistence factor of 0.52 applied to the 1-hour results. The persistence factor is representative of the project area and was provided by APCD. Maximum 8-hour concentration includes background concentration of 2.2 ppm.

8.2. Qualitative PM_{10} Analysis

A qualitative analysis of PM_{10} was conducted for the project corridor between the 120th Avenue interchange and State Highway 7 using methodologies as directed by CDOT (see Appendix A).

Description of Project

A description of the 2011 FEIS Preferred Alternative is provided in Section 1.0 *Introduction and Study Area* and is detailed in the ROD2.

Description of Existing Conditions and Changes Resulting from Project

The 120th Avenue at I-25 interchange has the highest daily traffic volumes in the project corridor and therefore is the worst-case location for this evaluation. A review of vehicle miles traveled (VMT) by source type (as provided by APCD) indicates that light-duty vehicles represent the majority of vehicle types along the I-25 mainline in the project study area. Approximately 2 percent of VMTs in the 2011 FEIS Preferred Alternative are associated with heavy-duty vehicles.

Re-entrained road dust is also a major source of vehicular PM_{10} and road dust is most prevalent where the largest traffic volume travels at the highest speeds.

Contributing Factors

As discussed in Section 5.0 *Pollutants of Concern*, PM_{10} is one of the air quality criteria pollutants that is generated in part by motor vehicle emissions. The Denver metropolitan area is designated as a maintenance area for PM_{10}. The PM_{10} Maintenance Plan for the Denver Metropolitan Area (CDOT, 2005) includes several control measures to ensure that the 24-hour PM_{10} standard is maintained through 2022. The maintenance plan includes the following federally enforceable control measures:

- Federal fuels and tailpipe standards and regulations
- Woodburning regulations
- Street sanding and sweeping regulations
- Stationary sources of pollution that are regulated by Air Quality Control Commission Regulations

The Preferred Alterative is expected to increase daily VMT by about 149,733 miles compared to the No-Build alternative in 2040. However, the Express Lanes will provide the option for more efficient level of service travel during times of congestion. In addition the 2011 FEIS Preferred Alternative does not change any truck egress, or construct new (or modify existing) bus transfer stations or park-n-ride lots in the project corridor.

As indicated in Table 2, the nearest PM_{10} ambient monitoring site is located at 3174 E. 78th Avenue, Welby, Colorado. According to the Maintenance Plan, there have been no exceedances of the PM_{10} NAAQS since 1999. In addition to the air quality monitoring, APCD also performs regional air quality modeling for a modeling grid that includes most of the Denver metropolitan area. PM_{10} concentrations are modeled in support of the SIP and the model includes emissions from local sources of PM_{10} including vehicle emissions from I-25.

The entire portion of the phase of the 2011 FEIS Preferred Alternative is within the PM_{10} maintenance area APCD modeling domain (CDOT, 2005). However, the area north of E-470 at the I-25 interchange is outside of the PM_{10} maintenance area APCD modeling domain.

Description of Analysis Method Chosen

Since a portion of the study area is outside the PM_{10} SIP modeling domain, this analysis uses the “comparison to another location” approach outlined in Section 4.1 of EPA guidance (EPA, 2006).

The worst case location in the project corridor is the 120th Avenue at the I-25 interchange. This location is included in the PM_{10} SIP modeling domain, and is therefore chosen as the most appropriate comparison locations. Table 5 shows modeled daily traffic volumes in the study area.

Table 5. Daily Traffic Volumes

North of	2011 FEIS 2035 Model Daily Volumes	DRCOG 2040 Model Daily Volumes
E-470	188,502	193,112
144th	162,407	161,850
136th	182,134	173,655
120th	184,044	194,712

Source: CDPHE Concurrence Letter (see Appendix A of this document).

The modeled PM_{10} concentrations at the four closest nodes to the 120th Avenue/I-25 interchange in the Maintenance Plan are shown in Table 6.

Table 6. Maintenance Plan Modeled Results (Sixth Highest PM_{10} Concentrations) ($\mu g/m^3$)

Node	2001	2009	2010	2015	2020	2025	2030
125	81.68	96.11	96.25	96.53	97.96	100.96	103.84
126	85.60	103.37	103.90	105.53	109.45	115.75	123.07
141	75.03	93.41	93.58	91.20	95.88	96.75	101.96
142	72.32	87.32	87.59	93.98	90.80	98.99	97.29

Source: Colorado State Implementation Plan for PM_{10}, Revised Technical Support Document, September 2005. http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=DENPM10+Revised+Dec+12.pdf

Description of Type of Emissions Considered in this Analysis

The air quality modeling for the Maintenance Plan includes all sources (mobile and stationary) of local PM_{10} emissions. Emission inventories were developed by APCD for mobile sources which included emissions from sanding/sweeping and tailpipes, area sources from EPA's National Emission Inventory (NEI), and point sources from the state's inventory system for actual emissions. It is therefore assumed that the analysis method for determining PM_{10} includes all mobile emission sources.

The dispersion modeling conducted for the Maintenance Plan also includes the estimated contributions from secondary precursor pollutants. PM_{10} hotspot analyses are not required to consider these emissions under the conformity rule, thus including those constituents in the dispersion modeling results is more comprehensive (and therefore more conservative) than required.

The Maintenance Plan modeling also includes estimates from general construction activities. The transportation conformity rule only requires consideration of construction emissions in cases where construction activity lasts longer than five years at any individual location, which is not expected for this project.

Description of Analysis Years

The transportation conformity rule and the 2006 qualitative conformity guidelines require that particulate matter hotspot analyses:

1. Cover the entire time frame of the area's Regional Transportation Plan (RTP).
2. Be based on the year or years in which peak emissions are expected to occur.

The currently conforming RTP in the Denver metropolitan region is the 2040 Regional Transportation Plan adopted in February 2015.

Based on trends in the PM_{10} Maintenance Plan, emissions have tended to increase throughout the maintenance period. While stricter tailpipe emissions standards continue to be implemented, increased traffic volumes are likely to contribute to this trend. Since these trends may continue past the 2030 year that was modeled in the Maintenance Plan, this analysis concludes that 2040 represents the year of peak emissions.

Professional Judgment of Impact

To evaluate the potential for a PM_{10} hotspot, the proposed modifications that are not included in the PM_{10} Maintenance Plan were compared to a No-Build interchange that was modeled as part of the PM_{10} Maintenance Plan.

As a comparison location, the 120th Avenue at I-25 interchange was chosen. This interchange reflects similar conditions as the area on the I-25 corridor north of the E-470/ I-25 interchange which is not included in the PM_{10} Maintenance Plan. As shown above in Table 5, the projected traffic volume north of the I-25/120th interchange in the year 2040 are estimated to be 194,712 vehicles per day and 193,112 vehicles per day at the I-25/ E-470 interchange; therefore, the two interchange volumes are comparable for this evaluation

As shown in Table 6, the sixth-highest 2030 PM_{10} concentrations at the four model grid nodes nearest to 120th Avenue interchange are between 97 and 123 μg/m^3 which is below the PM_{10} NAAQS of 150 μg/m^3. The PM_{10} Maintenance Plan extends to 2030 while it was determined that 2040 represents the year of peak emissions. To overcome this difference, the PM_{10} concentrations for 2030 were adjusted to represent a reasonable worst case scenario in 2040. Per the 2011 FEIS 2035 and DRCOG 2040 corridor volume comparison (refer to Attachment A Table 1), the 5-year traffic volume increase from the I-25/120th Avenue interchange (approximately 6 percent) was doubled to account for an expected traffic increase between 2030 and 2040. Applying this 12 percent increase to the results shown in Table 6 results in sixth-highest PM_{10} concentrations between 109 and 138 ug/m^3 at the four closest modeled nodes. Therefore, based on VMT increase, the worst-case condition for the study area would remain below the NAAQS through 2040.

The No-Build alternative should have the lowest total PM_{10} emissions because of lower traffic volumes, lower traffic speeds and greater overall congestion in the study area. However, PM_{10} is the subject of a comprehensive Maintenance Plan for the Denver area and impacts from traffic are major considerations within the Maintenance Plan. The 2011 FEIS Preferred Alternative may increase VMTs compared to the No-Build alternative, however the Express Lanes will provide for more efficient travel during times of congestion. PM_{10} concentrations around Denver have been below the NAAQS even with the past growth in traffic.

Neither the 2011 FEIS Preferred Alternative nor the No-Build alternative is expected to cause or contribute to violations of the PM_{10} NAAQS in the project corridor and are not expected to interfere with the Maintenance Plan or its attainment goals. Therefore, no impacts are expected and no mitigation is required for PM_{10} beyond those already included in the plan.

Evaluate Both Forms of Particulate Matter Standard (24-Hour and Annual)

In late December 2006, EPA revoked the annual PM_{10} standard, therefore it is not included in this discussion. As noted above, the Denver area is a maintenance area for the 24-hour PM_{10} standard. The PM_{10} monitoring data for the Denver area was discussed in *Section 6 Existing Conditions*, and the monitored PM_{10} concentrations are below the NAAQS. Both the Maintenance Plan results and comparison to the worst-case extrapolation results discussed above show that the PM_{10} concentrations are expected to remain below the 24-hour PM_{10} NAAQS in 2040.

Discussion of Mitigation Measures

The 2011 FEIS Preferred Alternative is not anticipated to cause or contribute to violations of the PM_{10} standard nor is the 2011 FEIS Preferred Alternative expected to interfere with the Maintenance Plan or its goals. Therefore, mitigation measures are not required to demonstrate conformity with the PM_{10} NAAQS. Standard particulate control measures will be implemented during construction.

Conclusion of How Project Meets 40 CFR 93.116 and 93.123

As outlined above, a portion of the study area is outside the APCD modeling domain for the PM_{10} maintenance area, but inside the maintenance area. Therefore, a worst-case evaluation was conducted by comparing the 2011 FEIS Preferred Alternative to a comparable traffic volume location that was modeled (that is, the I-25/120th Avenue interchange). The modeling included contributions from roadway traffic, precursor and construction emissions, and emissions from all other sources potentially affecting urban PM_{10} concentrations. The evaluation showed that the 2011 FEIS Preferred Alternative, with comparable I-25 traffic volumes, is not anticipated to cause or contribute to violations of the PM_{10} NAAQS.

8.3. Mobile-Source Air Toxics Analysis

FHWA has developed a tiered approach to analyzing MSATs in environmental documents (FHWA, 2012). Under FHWA's approach, three levels of analysis are identified, depending on the project circumstances and other considerations:

- No analysis required for projects with no potential for meaningful MSAT effects.
- Qualitative analysis for projects with low potential MSAT effects.
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

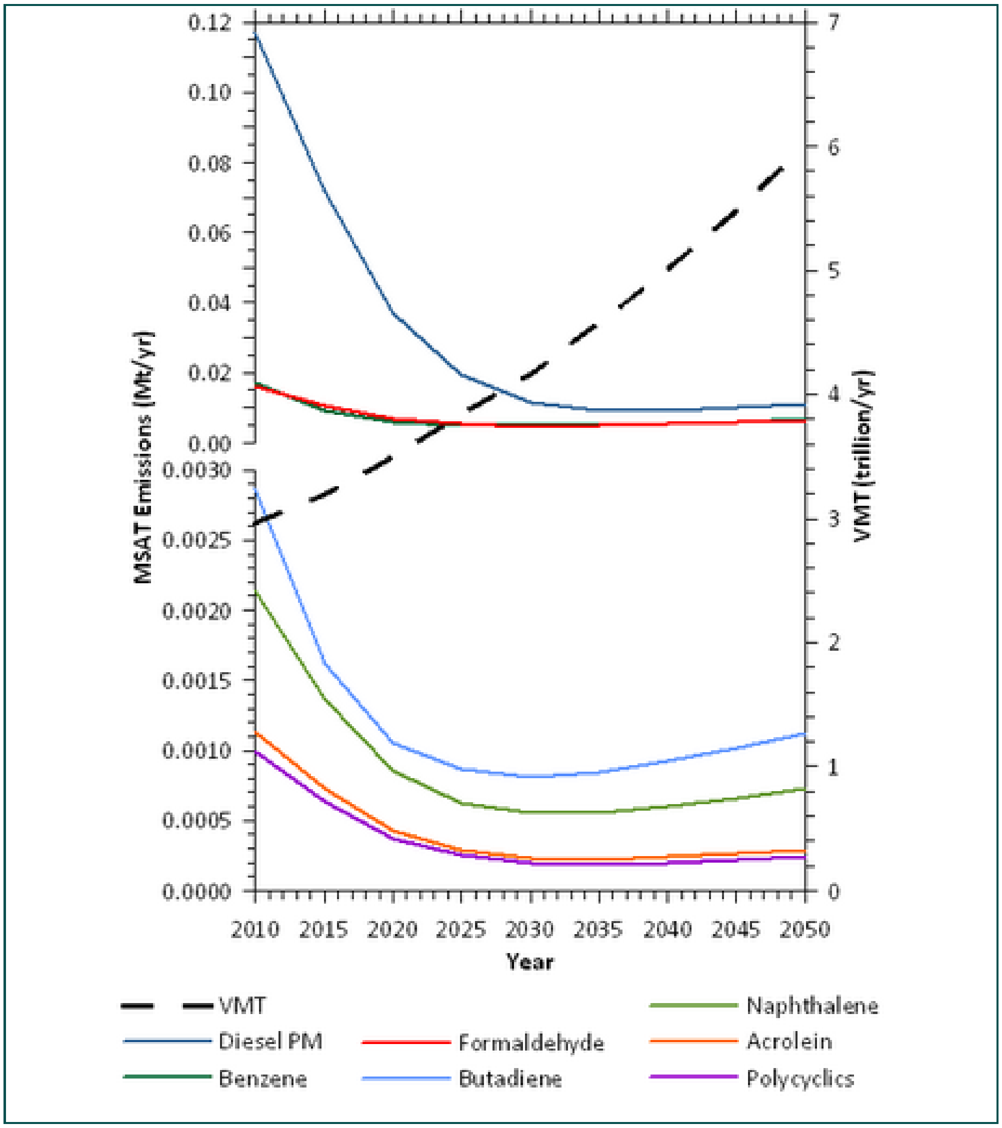
Projects with low potential MSAT effects include those that are intended to improve the operations of highway, transit, or freight facilities without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. Examples of projects with low potential MSAT effects include highway-widening projects, new interchanges, and projects for which the design-year traffic volume is projected to be less than 140,000 to 150,000 vehicles per day.

As shown in Table 5, the proposed project falls in the category for a quantitative MSAT analysis since a portion of the project exceeds the Annual Average Daily Traffic (AADT) threshold of 140,000 vehicles per day in 2040.

MSATs are a subset of the 188 air toxics (Hazardous Air Pollutants, or HAPs) defined by the Clean Air Act (CAA). MSATs are compounds emitted from highway vehicles and non-road equipment that can cause cancer or other health effects. Seven of these compounds have been associated with vehicle emissions and include acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter (POM).

According to an FHWA analysis using EPA's MOVES2010b emission factor model, even if vehicle activity (vehicle-miles travelled [VMT]) increases by 102 percent as assumed, a combined total reduction of 83 percent in the annual emissions for the priority MSATs is projected from 2010 to 2050 as shown in Figure 3.

Figure 3. National MSAT Emissions Trends 2010–2050 for Vehicles operating on Roadways using EPA's MOVES2010b Model



Notes: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Source: EPA MOVES2010b model runs conducted during May - June 2012 by FHWA, retrieved from http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm on April 17, 2015.

A quantitative analysis compared MSAT emissions in the I-25 corridor from the 2011 FEIS Preferred Alternative to those resulting from the No-Build alternative. Emission factors were generated by APCD using MOVES for the design year (2040) for January and July, for seven different Highway Performance Monitoring System (HPMS) vehicle classifications. The daily VMTs associated with each HPMS vehicle classification were used to determine the pounds per year predicted for each MSAT. The average of the two months was used to represent the entire year.

As shown in Table 7, the differences between the two alternative are very small and are inconsequential, especially when set against the background of the long-term trend of declining on-road emissions of air toxics. No meaningful differences in the levels of MSAT emissions are expected between the alternatives. MSAT emissions would be lower than the present levels based on the nationwide reductions forecast by EPA. The forecast shows that MSAT concentrations and associated risks should generally decline in coming decades, even with substantial traffic growth. While local conditions may differ from the projections presented in Figure 3, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors the magnitude of EPA-projected reductions is very high and it can be assumed MSAT areas in the study area will be much lower in the future for both alternatives.

Table 7. Mobile Source Air Toxics Emissions in 2040 for I-25 Project Corridor (pounds/year)

Pollutant	2011 FEIS Preferred Alternative	No-Build Alternative	2011 FEIS Preferred Alternative minus No-Build Alternative
Acrolein	59.3	54.3	5
Benzene	3518.7	3216.8	302
1,3-butidiene	1.6	1.5	0.1
Formaldehyde	1126.1	1030.7	95
Naphthalene	137.4	125.4	12
POM	37.5	32.8	5
Diesel PM	1.1	1.1	0.1

While emissions with the 2011 FEIS Preferred Alternative will be slightly higher than those under the No-Build, the Preferred Alterative would lead to higher speeds and less congestion which will marginally reduce MSAT emissions. On a regional level and based on EPA projections, MSAT emissions are expected to be substantially lower in the future even with substantially increased VMTs in the future.

9.0 GLOBAL CLIMATE CHANGE CUMULATIVE EFFECTS DISCUSSION

Climate change is an important national and global concern. Although the earth has gone through many natural changes in climate in its history, there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to this rapid change.

The transportation sector is the second-largest source of total GHG emissions in the U.S., behind electricity generation. The transportation sector was responsible for about 27 percent of all human-caused GHG emissions in the U.S. in 2010 (EPA, 2010). Carbon dioxide (CO_2) makes up the largest component of these GHG emissions, and other transportation-related GHGs include methane (CH_4) and nitrous oxide (N_2O).

To date, no national standards have been established for GHGs, nor has EPA established criteria or thresholds for ambient GHG emissions. GHGs are different from other air pollutants because their impacts are not localized or regional due to their rapid dispersion into the global atmosphere. As a result, the affected environment for CO_2 and other GHG emissions is the entire planet.

In addition, from a quantitative perspective, global climate change is the cumulative result of numerous and varied emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations. In contrast to broad-scale actions such as actions involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions impacts for an individual transportation project, such as the 6.6-mile I-25 corridor that is the subject of this ROD2.

FHWA has concluded that, based on the nature of GHG emissions described above and the exceedingly small potential for GHG impacts associated with the ROD2 project as discussed below and shown in Table 8, the GHG emissions from the ROD2 Selected Alternative would not be significant.

Table 8. Statewide and Project Emissions Potential Relative to Global Totals

	Global CO_2 Emissions, MMT[a]	Colorado Motor Vehicle CO_2 Emissions, MMT[b]	Colorado Motor Vehicle Emissions, % of global total	Project Study Area VMT, % of statewide VMT	Percent Change in Statewide VMT due to Project
Current conditions (2010)	29,670	26.0	0.0878%	0.98%[c]	(None)
Future projection (2040)	45,500	22.9	0.0504%	2.09%	0.09%

MMT = million metric tons

[a] International Energy Outlook 2010, data for Figure 104, projected to 2040.

[b] Colorado emissions and statewide VMT estimates are from MOVES2014.

[c] Derived from North I-25 Final EIS August 2011, Chapter 4 Transportation Impacts, Table 4.2

The majority of transportation GHG emissions are the result of fossil fuel combustion. CO_2 makes up the largest component of these GHG emissions. U.S. CO_2 emissions from the consumption of energy accounted for about 18 percent of worldwide CO_2 emissions associated with energy consumption in 2010.[1] U.S. transportation CO_2 emissions accounted for about 6 percent of worldwide CO_2 emissions.[2]

Table 8 presents the relationship between current and projected Colorado highway CO_2 emissions and total global CO_2 emissions as well as information on the scale of the ROD2 project relative to statewide travel activity.

Based on emissions estimates from the MOVES model and global CO_2 estimates and projections from the Energy Information Administration, CO_2 emissions from motor vehicles in the entire state of Colorado contributed less than one-tenth of 1 percent of global emissions in 2010 (0.0878 percent). These emissions are projected to contribute an even smaller fraction (0.0504 percent) in 2040 because global emissions would increase at a faster rate, and Colorado Motor Vehicle CO_2e emissions are expected to decrease.

VMT in the ROD2 project study area represents about 2.1 percent of total Colorado travel activity, and the project itself would increase statewide VMT by about 0.09 percent in 2040. As a result, FHWA estimates that the 120th Avenue to State Highway 7 project could result in a potential increase in global CO_2 emissions in 2040 of 0.00004 percent and a corresponding increase in Colorado's share of global emissions in 2040 to 0.0505 percent.

This very small change in global emissions is well within the range of uncertainty associated with future emissions estimates. For example, the Energy Information Administration's *International Energy Outlook 2010* shows that future emissions projections can vary by almost 20 percent, depending on which of several scenarios for future economic growth proves to be most accurate.

The methodologies for forecasting GHG emissions from transportation projects continue to evolve, and the data provided should be considered in light of the constraints affecting the currently available methodologies. As previously stated, tools such as EPA's MOVES model can be used to estimate vehicle exhaust emissions of CO_2 and other GHGs. However, only rudimentary information is available regarding the GHG emissions impacts of highway construction and maintenance. Estimation of GHG emissions from vehicle exhaust is subject to the same types of uncertainty affecting other types of air quality analysis, including imprecise information about current and future estimates of VMT, vehicle travel speeds, and the effectiveness of vehicle emissions control technology. Finally, there presently is no scientific methodology that can identify causal connections between individual source emissions and specific climate impacts at a particular location.

To help address the global issue of climate change, the U.S. Department of Transportation (USDOT) is committed to reducing GHG emissions from vehicles traveling on highways. USDOT and EPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward fuels that are less carbon intensive.

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1 Calculated from data in U.S. Energy Information Administration International Energy Statistics, Total Carbon Dioxide Emissions from the Consumption of Energy, http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8, accessed 2/25/13.

2 Calculated from data in EIA figure 104: http://www.eia.gov/forecasts/archive/ieo10/emissions.html and EPA table ES-3: : http://epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Executive-Summary.pdf

The agencies have jointly established new, more-stringent fuel economy standards and the first-ever GHG emissions standards for model years 2012–2025 cars and light trucks, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. In addition, the increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric hybrid vehicles, will improve air quality and reduce CO_2 emissions in future years.

At the state level, there are also several programs underway in Colorado to address transportation-related GHGs. The Governor's Climate Action Plan, adopted in November 2007, includes measures to adopt vehicle CO_2 emissions 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 (CDOT, 2009). This Policy Directive was developed with input from a number of agencies, including the Colorado Department of Public Health and Environment, EPA, FHWA, the Federal Transit Administration, the Denver Regional Transportation District, and the Denver Regional Air Quality Council. This Policy Directive and implementation document, the CDOT *Air Quality Action Plan*, address unregulated MSATs and GHGs produced from Colorado's state highways, interstates, and construction activities.

As a part of CDOT's commitment to addressing MSATs and GHGs, some of CDOT's program-wide activities include:

- Developing truck routes/restrictions with the goal of limiting truck traffic in proximity to facilities, including schools, with sensitive receptor populations.
- Continue researching pavement durability opportunities with the goal of reducing the frequency of resurfacing and/or reconstruction projects.
- Developing air quality educational materials specific to transportation issues for citizens, elected officials, and schools.
- 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.
- Committing to research additional concrete additives that would reduce the demand for cement.
- 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.
- Exploring congestion and/or right-lane-only restrictions for motor carriers.
- Funding truck parking electrification (note: mostly via exploring external grant opportunities).
- Committed to incorporating ultra-low-sulfur diesel for non-road equipment statewide.
- Implementing low-VOC-emitting tree landscaping specification.

10.0 CONCLUSIONS

10.1. Interagency Consultation Results

CDOT submitted a proposed air quality analysis methodology to EPA and CDPHE on March 11, 2015, for the 2011 FEIS Preferred Alternative. Concurrence from CDPHE on the proposed methodology was received on March 17, 2015 (see Appendix A).

10.2. Conformity Statement

The Transportation Conformity Rule describes criteria and procedures for determining conformity to the SIP of a highway project funded under Title 23, United States Code, or approved by FHWA. The ROD2 study area is designated as nonattainment for O_3 and as a maintenance area for CO and PM_{10}; therefore, a conformity determination is required.

The 2011 FEIS Preferred Alternative has been included in the DRCOG fiscally constrained 2040 Regional Transportation Plan (as of February 2015) and the FY 2016 to FY 2021 Transportation Improvement Program (ID# 2016-055, adopted in April 2015).

At the project level, it has been determined that the ROD2 project:

- Would not cause or exacerbate an exceedance of the CO standard.
- Is not a project of air quality concern for PM_{10} and is not expected to create or worsen a PM_{10} violation.
- Would reduce regional MSAT emissions due to ongoing national control programs.
- Is not a significant source of GHG emissions.

Therefore, the ROD2 project complies with the conformity requirements established by the Clean Air Act.

11.0 REFERENCES

CDOT. 2005. PM_{10} Maintenance Plan For the Denver Metropolitan Area, Approved by Colorado Air Quality Control Commission on December 15, 2005

——. 2005. Colorado State Implementation Plan for PM10 Revised Technical Support Document, September 2005.

——. 2009. Colorado Department of Transportation *Policy Directive on Air Quality*.

——. 2011. *North I-25 Environmental Impact Statement*. 2011.

——. 2012. Colorado Department of Transportation *Air Quality Analysis and Documentation Procedures*, Denver, Colorado.

CIRES. 2012. *Colorado oil and gas wells emit more pollutants than expected*. March 1, 2012.

EPA. 2006. Transportation Conformity Guidance for Qualitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas. EPA420-B-06-902.

——. 2013. Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas.

——. 2014. Air Quality System Data Mart, Monitoring Values, http://www.epa.gov/airdata/.

FHWA. 2012. U.S. Department of Transportation, Federal Highway Administration *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA*.

Appendix A.
Interagency Consultation Documentation

COLORADO
Department of Transportation
Division of Transportation Development

Environmental Programs Branch
4201 E. Arkansas Ave. Shumate Bldg.
Denver, CO 80222-3400

March 11, 2015

Chris Colclasure
Planning and Policy Program Manager
Air Pollution Control Division
Colorado Department of Public Health and Environment
4700 Cherry Creek Drive South
Denver, CO 80901

Dear Dear Mr. Colclasure:

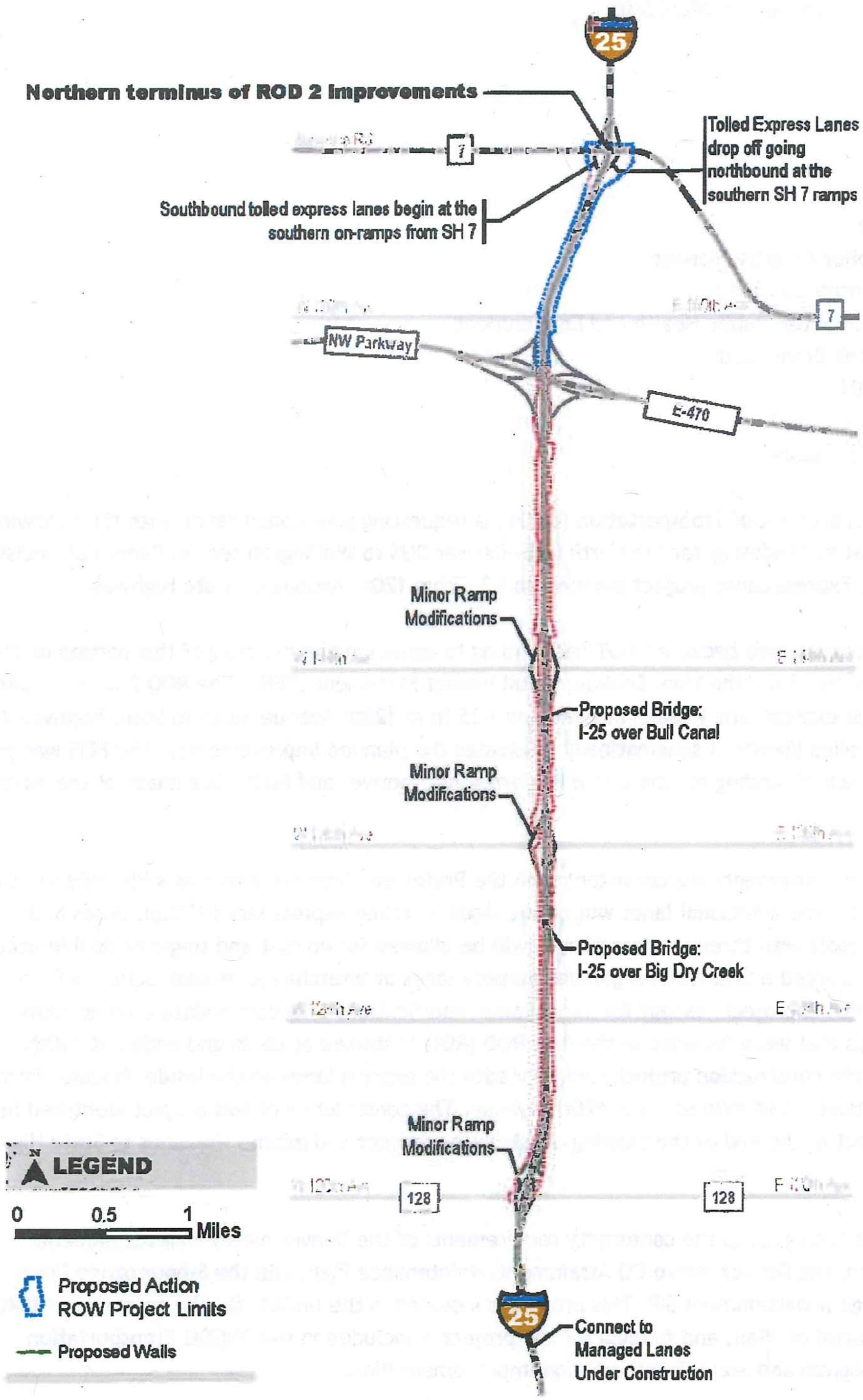
The Colorado Department of Transportation (CDOT) is requesting your concurrence with the following air quality analytical methodology for the North I-25—Denver DUS to Wellington second Record of Decision (ROD 2), for the Express Lanes project planned on I-25 from 120th Avenue to State Highway 7.

The ROD 2 is being pursued because CDOT has funding to construct the majority of this portion of the Preferred Alternative from the Final Environmental Impact Statement (FEIS). The ROD 2 work consists of adding one tolled express lane in each direction on I-25 from 120th Avenue north to State Highway 7, a distance of 6.6 miles (Exhibit 1 schematically illustrates the planned improvements). The FEIS was phased because of the lack of funding for the whole Preferred Alternative, and ROD 2 is a phase of the North I-25 project.

These proposed improvements are consistent with the Preferred Alternative that was identified in the FEIS (CDOT, 2011). The additional lanes will be managed as tolled express lanes (TELs). Buses and carpools or vanpools with three or more people will be allowed for no cost and single or double occupant vehicles will be charged a toll. No new general purpose lanes or interchange reconstruction will be included in the ROD 2 project, except for minor ramp modifications to accommodate a wider cross section. The TELs that were included in the first ROD (ROD 1) started at US 36 and ended at 120th Avenue. An interim construction project currently adds the express lanes on the inside shoulder from US 36 and ending about a half mile south of 120th Avenue. The construction of this project identified in this letter will connect to the end of the existing construction project and extend the lanes to State Highway 7.

The project area is subject to the conformity requirements of the Denver metro PM_{10} Attainment/ Maintenance Plan, the Denver metro CO Attainment/Maintenance Plan, and the 8-hour ozone Denver-North Front Range nonattainment SIP. This project is included in the DRCOG fiscally constrained 2040 Regional Transportation Plan, and funding for the project is included in the DRCOG Transportation Improvement Program and State Transportation Improvement Plan.

Exhibit 1. Planned Improvements



PROJECT BACKGROUND

CDOT and FHWA approved the FEIS completed in August 2011, which evaluated commuter rail, highway improvements, and tolled express lanes on I-25 between the vicinity of Denver Union Station and Fort Collins, a distance of almost 63 miles. The ROD 1 identified partial funding for the Preferred Alternative and was insufficient to complete the entire corridor proposed work. As a part of the FEIS, air quality analyses were performed in consultation with APCD staff, and the results met all applicable air quality requirements under NEPA and transportation conformity for that time.

Project funding has now been secured for another piece of the Preferred Alternative on I-25 between 120th Avenue and State Highway 7 and is ready to move forward. Although the FEIS is less than 4 years old, and there are no significant changes in the affected environment or the results reported in the FEIS, this new project requires a ROD to complete the NEPA process in addition to a project level conformity determination. Therefore, the air quality analyses need to be completed before FHWA can approve the ROD 2. Including the project in DRCOG fiscally constrained, conforming 2040 plan will be adequate for the regional conformity determination.

An air quality analysis was completed for the FEIS, conducted quantitatively utilizing the FHWA EMIT speed-sensitive Mobile6.2 interface and included CO and PM_{10} hotspot and quantitative MSAT analyses. The key project-level conformity results from FEIS analyses which overlap or brackets the ROD 2 project area include:

- Carbon monoxide (CO) hot spot modeling conducted just north and south of the project at State Highway 7 and at Thornton Parkway. In both locations, worse-case CO concentrations were below the 8-hour National Ambient Air Quality Standard (NAAQS) of 9ppm with 5.5ppm and 7.1ppm, respectively.

- PM_{10} qualitative hot spot modeling completed at the same two locations because the Preferred Alternative for the FEIS included building an express bus station and parking area at SH 7 and modifying existing transit facilities near the Thornton Parkway. Idling buses, internal parking travel and parking access, and pass-by vehicles were all considered in the analyses. The results of the modeling at State Highway 7 and Thornton Parkway showed concentrations that are well below the 24-hour NAAQS (150 μg/m3) for PM10 with 89.42 μg/m3 and 103.13 μg/m3, respectively.

- Quantitative inventory/burden analyses for priority MSAT) pollutants completed for the entire regional study area in the FEIS for the purpose of comparing the three build alternatives to the existing and no build future conditions. The quantitative analysis showed that all priority MSAT levels declined appreciatively by 2035, and build alternatives showed no significant inventory emissions differentiation.

CHANGES IN REGIONAL PLANNING CONTEXT

The 2011 FEIS Preferred Alternative was analyzed for a 2035 planning horizon year in the DRCOG regional transportation modeling. The 2015 Proposed Action will need to be consistent with a 2040 planning horizon year. Construction is expected to begin within the next 1 to 2 years.

New preliminary traffic analysis of the 120th Avenue to State Highway 7 segment of I-25 for the year 2040 finds that traffic volumes will be comparable to the 2035 FEIS traffic volumes. Table 1 shows the daily traffic volume comparison between the FEIS 2035 and DRCOG 2040 direct model output.

Table 1. FEIS 2035 and DRCOG 2040 Corridor Volume Comparison

	FEIS 2035 Model Daily Volumes		DRCOG 2040 Model Daily Volumes		Difference	
North of:	SB Total	NB Total	SB Total	NB Total	SB Total	NB Total
E-470	94,198	94,304	97,294	95,818	3%	2%
144th	82,686	79,721	81,776	80,074	-1%	0%
136th	91,604	90,530	87,027	86,628	-5%	-4%
120th	92,996	91,048	98,086	96,626	5%	6%

Sources:
2035 FEIS Model—North I-25 FEIS 2035 PA-4_b—Appendix G (Completed 2011)
DRCOG 2040 Model—HwyForc2040_rtp2040-f14r_coc83ft_shp (Received 01/23/2015)

Table 1 indicates that projected DRCOG 2040 traffic volumes along I-25 are very similar to those used in the FEIS 2035 analyses. Therefore, FHWA and CDOT find that FEIS traffic volumes adequately represent projected 2040 traffic conditions and recommend use of FEIS traffic data for analytical modeling and roadway link input parameters for MOVES and project-limited inventory modeling.

NEW AIR QUALITY EMISSION FACTORS

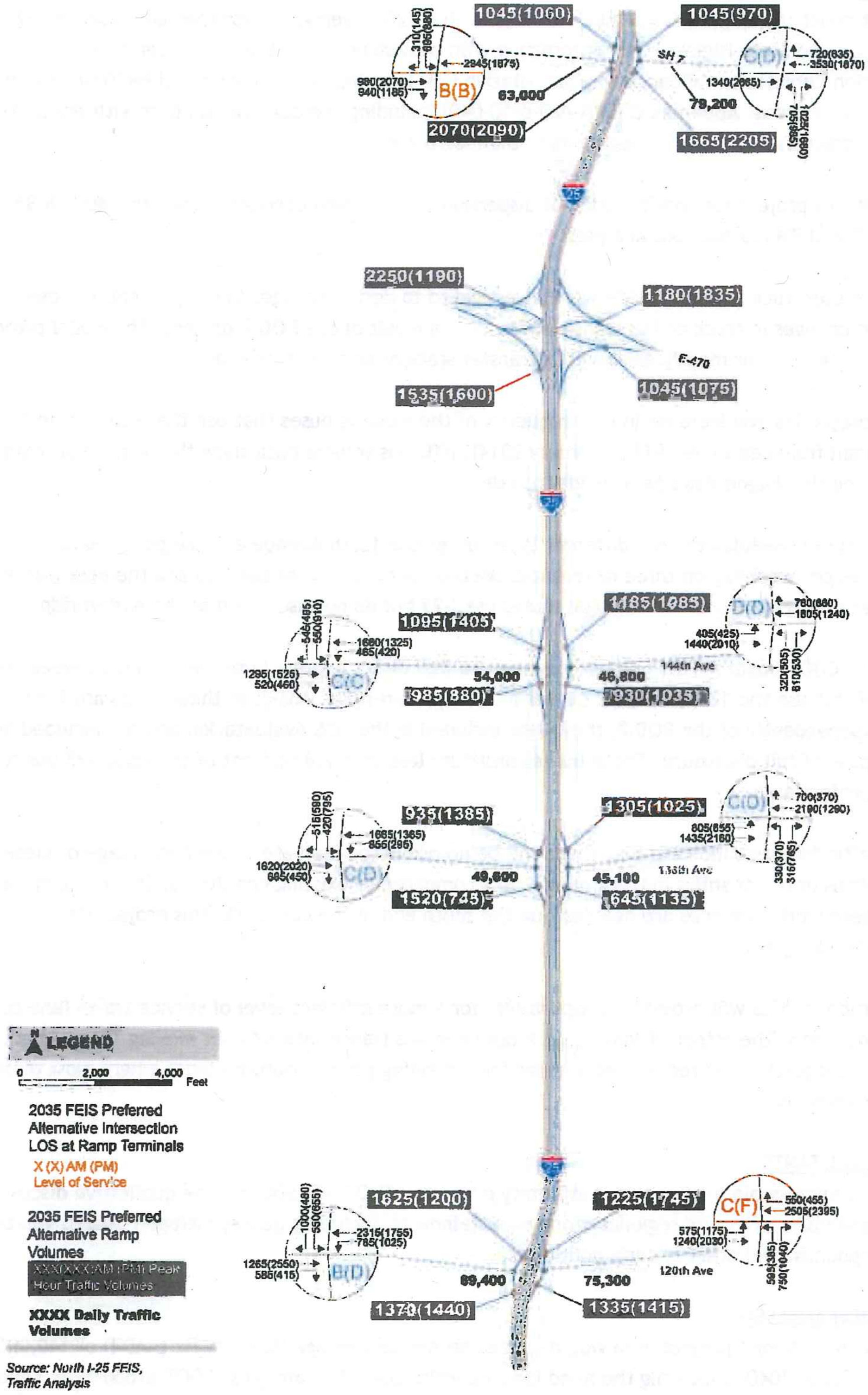
EPA-developed MOVES emission factors are available now to replace the MOBILE6.2 emission factors and EMIT modeling interface that were used in the previous FEIS air quality analysis. These analyses will use the recently released MOVES2014 emissions model. CDOT would acquire revised inventories, emissions factors, and background concentrations from Air Pollution Control Division (APCD) for all new analysis.

CARBON MONOXIDE MICROSCALE ANALYSIS

Although the last violation of the national carbon monoxide standard in the Denver region was in 1995, microscale CO analysis is conducted to show that a proposed action will not cause or contribute to a future violation. As previously noted, the FEIS analyses for the State Highway 7 CO dispersion analysis resulted in a worst case concentration well below the NAAQS at 5.5ppm. Traffic level of service (LOS) analysis indicates that the 120th Avenue interchange is the lowest performing and next highest volume interchange within the planned project area (see Exhibit 2).

The 120th Avenue at I-25 interchange was not modeled in the 2011 FEIS air quality analyses and is recommended as the single site to be evaluated for hotspot dispersion modeling for this project. CDOT also proposes to utilize a worst case analysis, which utilizes the highest traffic volumes expected over the project planning timeline (2035) with the worst emissions rates expected over that same timeframe (current 2015 emission rates). The results of this type of analysis adequately simulate the highest potential carbon monoxide concentrations possible over the 20-year timeframe, eliminating the need for interim year analyses. If the results of a worst-case analysis are less than the NAAQS for CO, then no violation is likely to be caused by the project actions. If the results indicate a higher concentration than the NAAQS, then a more extensive analysis will be required comparing No Build and Build traffic and emissions. EPA approved this approach for the I-70 East Supplemental EIS and C-470 Managed Lanes EA.

Exhibit 2. Level of Service and Volumes



STATE OF COLORADO 1876

PM_{10} MICROSCALE ANALYSIS

The project conduct a qualitative analysis of PM_{10} for the 120th Avenue interchange and mainline I-25 between 120th and State Highway 7 in accordance with provisions of the EPA December 2010 Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas, Appendix C (EPA-420-B-10-040) including comparative analysis with similar traffic volume interchanges and mainline segments in the metro area.

Screening of this project for consideration of dispersion analyses was conducted ustilizing 40 CFR 93. 123(b) PM 10 and PM 2.5 hot-spot analyses.

Changes to diesel truck and bus traffic were investigated to define changes in the percent of diesel vehicles and changes in truck or bus transit patterns as a result of the ROD 2 project. The ROD 2 project will not construct new or modify existing bus transfer stations or park-n-ride lots.

RTD is not projecting any increase in the frequency of the existing buses that use the area around 120th Avenue (e-mail from Lee Cryer, RTD, February 2014). RTD bus volume data show the number of buses currently using the Wagon Road park-n-ride include:

- 193 buses per weekday on four different local routes use 120th Avenue and the park-n-ride
- 197 buses per weekday on three different express or Sky Ride routes use I-25 and the park-n-ride
- 15 buses per weekday on two regional routes use I-25 but do not use 120th or the park-n-ride

Six additional CDOT *Bustang* Fort Collins/Longmont to DUS direct express buses will run daily weekdays on I-25, but will not use the 120th transfer center or local park-n-rides. Although these buses are funded and operated independently of the ROD 2, they were included in the FEIS evaluatation and are included here for the prupose of full disclosure. These buses constitute less than 2.8 percent of the total I-25 bus traffic within the project area.

The FEIS traffic forecasts indicate that there will be no projected increase in the percentage of diesel truck daily trips or major shifts in truck movements compared to existing conditions. Truck volumes are heaviest where traffic volumes are heaviest (on the south end of the corridor). This project does not change any truck egress.

The installation of TELs will provide an opportunity for a more efficient level of service travel lane during times of congestion. The effect of moving light-duty and bus transit into a faster moving TELs will act to relieve some congestion and reduce delay times for remaining general purpose lanes where most diesel truck traffic remains.

CRITERIA POLLUTANTS

In addition to micro-scale analyses for conformity purposes, CDOT will also include qualitative discussion of criteria pollutants affecting regional ozone nonattainment, including ozone, nitrogen oxides, volatile organic compounds, and other criteria pollutants.

MSAT EMISSION ANALYSIS

A portion of the 6.6-mile project area would exceed an Annual Average DailyTraffic (AADT) of 140,000 vehicles per day in 2040, triggering the need for a quantitiative MSAT analysis. CDOT proposes to conduct quantitative inventory of priority MSAT emissions for the proposed action and no-build highway conditions. EPA identified seven priority compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers. These compounds, which will be included in this analysis, are:

- acrolein
- benzene
- 1,3-butidiene
- diesel particulate matter plus diesel exhaust organic gases (diesel PM)
- formaldehyde
- naphthalene
- polycyclic organic matter

CDOT proposes to limit this analysis to the year 2035 using the FEIS data and to only assess interstate traffic for this analysis. Meaningful differences in MSAT emissions for the two alternatives are not anticipated.

GREENHOUSE GAS EMISSIONS

Per current FHWA guidance, CDOT plans to provide a summary assessment of the direct, indirect, and cumulative effects of GHG emissions from the project, including a comparative analyses of global, statewide, and project-generated GHG emissions.

Thank you for your consideration of our proposed analytical approach. For your convenience, a concurrence signature block is provided below for your possible use. If you feel there is a need for an interagency consultation meeting regarding this project, please contact me at (303) 757-9016 (jill.schlaefer@state.co.us) so that a meeting can be scheduled as soon as possible. Again, if you or your staff has any questions regarding this project-level air quality analysis, please let me know.

Cordially,

Jill Schlaefer
Air Quality and Noise Programs Manager

APCD CONCURRENCE:
For the Air Pollution Control Division of the Colorado Department of Public Health and Environment, I concur that the project-level analytical approach described above for the North I-25 ROD 2 is acceptable and appropriate for this project.

Chris Colclasure
Signature

3/17/15
Date

Planning and Policy Program Manager
Title

COLORADO
Department of Transportation
Division of Transportation Development

Environmental Programs Branch
4201 E. Arkansas Ave. Shumate Bldg.
Denver, CO 80222-3400

May 29, 2015

Chris Colclasure
Planning and Policy Program Manager
Air Pollution Control Division
Colorado Department of Public Health and Environment
4700 Cherry Creek Drive South
Denver, CO 80901

RE: Express Lanes project planned on North I-25 from 120th Avenue to State Highway 7, Northglenn, Colorado.

Dear Mr. Colclasure,

Colorado Department of Transportation (CDOT) is preparing a second Record of Decision (ROD 2) for the North I-25—Denver DUS to Wellington, for the Express Lanes project planned on I-25 from 120th Avenue to State Highway 7. CDOT requests your concurrence on air quality transportation conformity for this phase of the project.

The proposed improvements are consistent with the Preferred Alternative identified in the 2011 North I-25 Final EIS. The additional lanes will be managed as Express Lanes. This project will connect with the Express Lanes south of 120th Avenue. No new general purpose lanes will be included in the ROD 2 project except for minor ramp modifications to accommodate a wider cross section. The Express Lanes that were included in the ROD 1 (south of 120th Avenue) are currently under construction.

The project area is subject to the conformity requirements of the Denver Carbon Monoxide (CO) Maintenance Plan, the Denver Particulate Matter less than 10microns (PM10) Maintenance Plan, and the 8-hour Ozone Denver-North Front Range Nonattainment State Implementation Plan. The planned project has been included in the DRCOG fiscally constrained 2040 Regional Transportation Plan (February 2015) and the FY 2016 to FY 2021 Transportation Improvement Program (Identification # 2016-055, adopted April 2015).

The purpose of the project is to improve operational traffic flow and safety, and accommodate high peak-period traffic volumes. To determine the localized air quality impacts of the planned project, CDOT analyzed project affected intersections and specifically identified the 120th Avenue Interchange as the worst performing, high-traffic volume interchange, projected to operate at deficient opeating level of service in future years. This analysis was completed to determine any potential exceedances of the National Ambient Air Quality Standards (NAAQS).

The worse-case modeled 1-hour and 8-hour average carbon monoxide concentrations were 7.7 ppm and 4.0 ppm, respectively, for the completed project conditions in 2040. These results are compared to a one-hour CO NAAQS of 35 ppm and an 8-hour CO NAAQS of 9 ppm. Because modeling of the worse-case emissions concentrations resulted in values below the respective NAAQS, this project will not cause or contribute to an exceedance of the federal carbon monoxide standards and is not expected to interfere with the Denver CO Maintenance Plan or its attainment goals.

The proposed undertaking is not a project of air quality concern for PM10 as defined in 40 CFR 93.123(b)(1). Therefore, the project-level conformity determination requirements of CRF 93.116 have been satisfied with a qualitative PM10 hot spot analysis. The comparison of sixth-highest 2030 PM10 concentrations adjusted proportionally for increased traffic volumes in 2040, result in concentrations between 109 and 138 $\mu g/m^3$ at the four closest modeled grid nodes. This indicates that the study area would remain below the NAAQS through 2040. Therefore, this project is unlikely to cause or contribute to an exceedance of the 24-hour PM10 NAAQS of 150 $\mu g/m^3$ and is not expected to interfere with the Denver PM10 Maintenance Plan or its attainment goals.

Project-wide emissions inventories of the seven priority Mobile Source Air Toxics (MSATs) indicate that the tons per year of pollutants will decline from existing levels by 2040 due primarily to future CAFÉ standards and vehicle fuel and engine efficiencies. A comparison between the individual MSAT emissions inventories for the planned poject and the No Build condition shows that the planned improvements in traffic operations will result is a less than 10% increase over the No Build generated emissions, except for polycyclic compounds which will increase 14%. These increases reflect the overall VMT growth and increase in traffic volume between the planned project lane additions and the future No Build conditions.

Vehicle miles traveled (VMT) in the ROD 2 project study area represents about 2.1% of total Colorado travel activity, and the project itself would increase statewide VMT by about 0.09% in 2040. As a result, FHWA estimates that the 120th Avenue to State Highway 7 project could result in a potential increase in global carbon dioxide emissions in 2040 of 0.00004% and a corresponding increase in Colorado's share of global emissions in 2040 to 0.0505%.

In summary the planned I-25 managed lanes project between 120th Avenue and State Highway 7 is not expected to cause or contribute to an exceedance of the CO or PM10 NAAQS and is not expected to interfere with the respective Denver CO and PM10 Maintenance Plan or attainment goals.

If you concur with the results of the air quality analysis and the conclusions regarding conformity of this project, please sign below and return this letter by June 16, 2015.

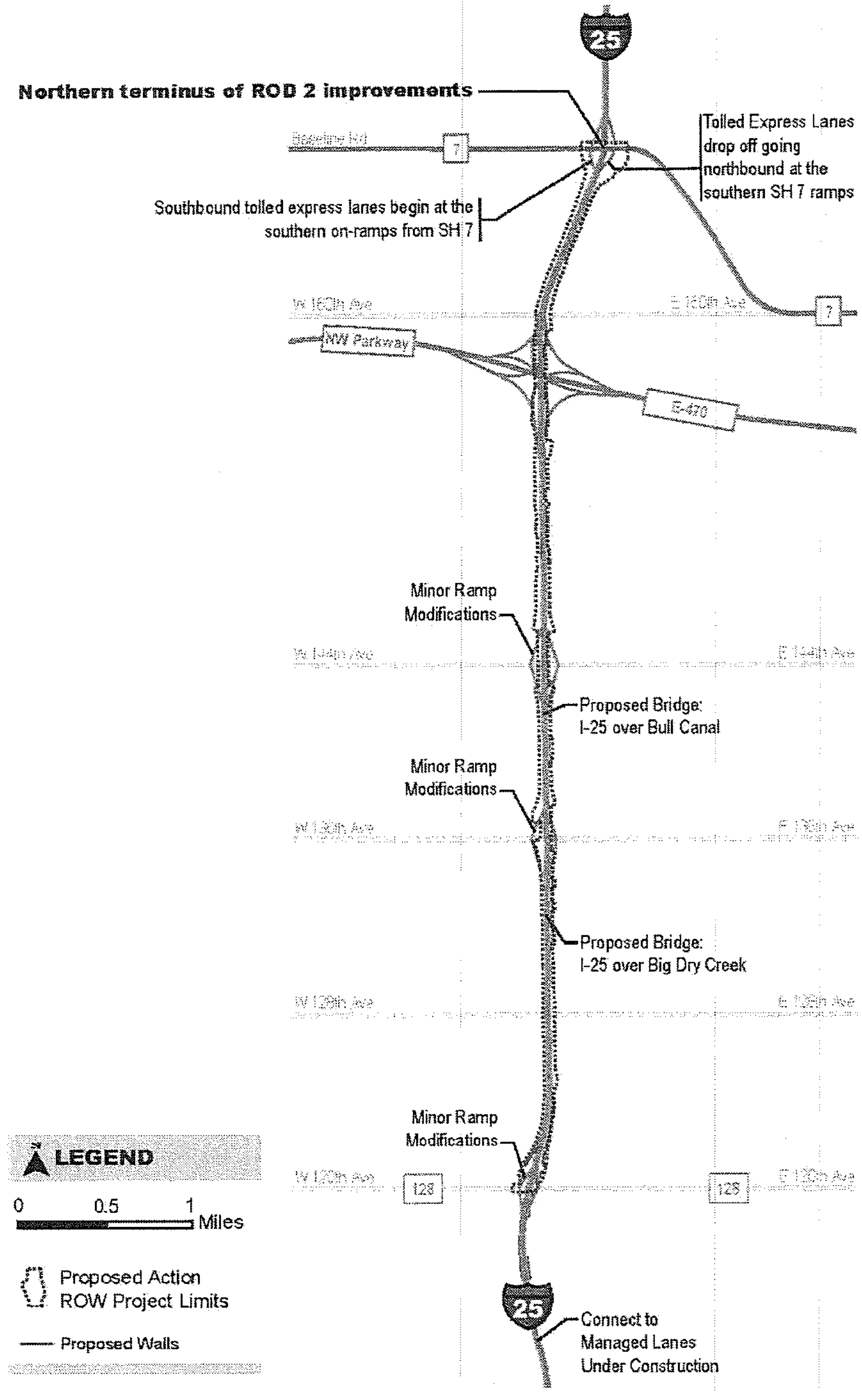
Thank you.
Very truly yours,

Dan Jepson

fo Jane Hann
Manager
Environmental Programs Branch

I Concur: Chris Colclasure, Planning and Policy Program Manager — 6/12/15
Signature, Title — Date

Exhibit 1. Planned Improvements



Appendix B.
Technical Backup

CO Hot Spot Analysis

```
'I-25and120thAveCO_PMPeak' 60.00 175.000 0.00 0.00 53 1.0000 0 0
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'R_003                                    ' 500991.28 4418251.75    1.80
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'R_005                                    ' 500985.85 4418197.07    1.80
'R_006                                    ' 500931.46 4418153.25    1.80
'R_007                                    ' 500937.10 4418163.84    1.80
'R_008                                    ' 500941.17 4418246.19    1.80
'R_009                                    ' 500970.19 4418310.50    1.80
'R_010                                    ' 500971.28 4418263.69    1.80
'R_011                                    ' 501015.27 4418250.84    1.80
'R_012                                    ' 500967.88 4418298.73    1.80
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'R_014                                    ' 500973.85 4418196.87    1.80
'R_015                                    ' 500727.62 4418183.28    1.80
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'R_017                                    ' 500757.58 4418173.59    1.80
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'R_026                                    ' 500948.39 4418185.02    1.80
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'R_037                                    ' 500908.47 4418195.00    1.80
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'R_041                                    ' 500767.54 4418238.95    1.80
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'R_044                                    ' 500851.17 4418242.27    1.80
'R_045                                    ' 500823.91 4418241.08    1.80
'R_046                                    ' 500910.46 4418244.85    1.80
'R_047                                    ' 500929.18 4418245.67    1.80
'R_048                                    ' 500922.45 4418245.39    1.80
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'R_050                                    ' 500779.53 4418239.31    1.80
'R_051                                    ' 500800.08 4418268.87    1.80
'R_052                                    ' 500793.23 4418259.02    1.80
'R_053                                    ' 500837.54 4418241.67    1.80
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'120th EB APP SB Ramp T                   ' 'AG' 500457.54 4418193.16 500791.56
4418204.68 2590.00 4.7115  0.00 24.30
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'120th EB APP SB Ramp R                   ' 'AG' 500457.60 4418183.02 500756.08
4418191.99 395.00 4.7115  0.00  9.70
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'120th EB APP SB Ramp T Q                 ' 'AG' 500774.98 4418204.38 500667.86
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4418200.63  0.00 18.30    5
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4418216.60 1225.00 5.0294  0.00 13.30
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'120th EB APP NB Ramp T                  ' 'AG' 500792.42 4418201.79 500939.87
4418207.79 2075.00 5.0294  0.00 17.00
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'120th EB APP NB Ramp L Q                ' 'AG' 500922.97 4418215.76 500890.15
4418214.61  0.00  7.30    2
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'120th EB APP NB Ramp T Q                ' 'AG' 500923.71 4418207.05 500891.06
4418205.91  0.00 11.00    3
       120   44    2.00 2075 41.8785 1900    1    3
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4418213.20 2885.00 4.3273  0.00 17.00
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'120th EB APP Grant R                    ' 'AG' 501222.88 4418204.37 501256.87
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4418220.55  0.00  7.30    2
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4418232.20 2425.00 4.3273  0.00 24.30
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4418231.91  0.00 18.30    5
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'120th WB APP SB Ramp T                  ' 'AG' 500945.66 4418234.88 500793.59
4418228.19 1735.00 5.0294  0.00 17.00
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'120th WB APP SB Ramp L Q                ' 'AG' 500811.86 4418220.43 500858.42
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'120th WB APP SB Ramp T Q                ' 'AG' 500811.69 4418229.14 500855.56
4418230.98  0.00 11.00    3
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'120th WB APP Melody L                   ' 'AG' 500544.27 4418208.92 500456.49
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'120th WB APP Melody T                   ' 'AG' 500793.15 4418228.23 500456.54
4418217.90 2010.00 4.7115  0.00 17.00
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'120th WB APP Melody L Q               ' 'AG' 500467.67 4418208.79 500515.52
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'120th WB APP Melody T Q               ' 'AG' 500467.69 4418218.27 500536.18
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4418340.26 1200.00 3.4953  0.00  9.70
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'SB Off-Ramp R                         ' 'AG' 500859.16 4418340.09 500783.56
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4418291.39  0.00  7.30    2
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'SB On-Ramp L                          ' 'AG' 500787.76 4418219.29 500783.99
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    2
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4418175.50  0.00 11.00    2
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'NB On-Ramp L                          ' 'AG' 500946.48 4418216.60 500954.96
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'NB On-Ramp R                          ' 'AG' 500975.09 4418244.51 500955.36
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'I-25 SB 1                              ' 'AG' 500986.46 4418584.65 500956.01
4418478.79 5551.00 3.7051  0.00 17.00
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'I-25 SB 2                              ' 'DP' 500956.01 4418478.79 500844.18
4418151.74 5551.00 3.7051 -5.00 17.00
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'I-25 SB 3                              ' 'AG' 500844.18 4418151.74 500814.58
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'I-25 SB 4                              ' 'AG' 500814.58 4418031.33 500797.49
4417948.69 5551.00 3.7051  0.00 17.00
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'I-25 SB 5                              ' 'AG' 500797.49 4417948.69 500785.18
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'I-25 SB TEL 2                          ' 'DP' 500963.35 4418477.30 500853.18
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4418437.19 2051.00 3.55 -5.00  9.70
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'I-25 NB TEL 4                          ' 'AG' 500954.48 4418437.19 500998.90
4418580.27 2051.00 3.55  0.00  9.70
 1.00   0.00 4 1000.00  0.00 'Y'  10   0  36
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♀                          CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated
95221                          PAGE  1

      JOB: I-25and120thAveCO_PMPeak                              RUN:
I-25and120thAveCO_PMPeak

      DATE :  5/12/15
      TIME : 22:15:19

         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 = 175. 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 (M)           *    LENGTH
BRG TYPE   VPH    EF      H   W    V/C QUEUE
                              *   X1        Y1        X2        Y2     *     (M)
(DEG)             (G/MI)   (M) (M)       (VEH)

------------------------*-----------------------------------------*------------------
----------------------------------------
       1. 120th EB APP SB Ramp* 500457.5  ********  500791.6  ******** *     334.
88. AG   2590.   4.7   0.0 24.3
       2. 120th EB APP SB Ramp* 500457.6  ********  500756.1  ******** *     299.
88. AG    395.   4.7   0.0  9.7
       3. 120th EB APP SB Ramp* 500775.0  ********  500712.0  ******** *      63.
268. AG    342. 100.0   0.0 18.3 0.76  10.5
       4. 120th EB APP NB Ramp* 500792.2  ********  500946.5  ******** *     154.
88. AG   1225.   5.0   0.0 13.3
       5. 120th EB APP NB Ramp* 500792.4  ********  500939.9  ******** *     148.
88. AG   2075.   5.0   0.0 17.0
       6. 120th EB APP NB Ramp* 500923.0  ********  500674.7  ******** *     249.
267. AG    150. 100.0   0.0  7.3 1.08  41.4
       7. 120th EB APP NB Ramp* 500923.7  ********  500873.1  ******** *      51.
269. AG    124. 100.0   0.0 11.0 0.61   8.4
       8. 120th EB APP Grant L* 501134.0  ********  501257.4  ******** *     123.
90. AG    175.   4.3   0.0 13.3
       9. 120th EB APP Grant T* 500939.9  ********  501257.9  ******** *     318.
89. AG   2885.   4.3   0.0 17.0
      10. 120th EB APP Grant R* 501222.9  ********  501256.9  ******** *      34.
89. AG     75.   4.3   0.0  9.7
      11. 120th EB APP Grant L* 501241.8  ********  501226.4  ******** *      15.
270. AG    198. 100.0   0.0  7.3 0.55   2.6
      12. 120th EB APP Grant T* 501245.1  ********  501173.7  ******** *      71.
269. AG    124. 100.0   0.0 11.0 0.84  11.9
      13. 120th WB APP NB Ramp* 501258.8  ********  500946.7  ******** *     312.
270. AG   2425.   4.3   0.0 24.3
      14. 120th WB APP NB Ramp* 501024.3  ********  500975.1  ******** *      49.
272. AG    520.   4.3   0.0  9.7
      15. 120th WB APP NB Ramp* 500957.7  ********  501023.3  ******** *      66.
90. AG    365. 100.0   0.0 18.3 0.81  10.9
      16. 120th WB APP SB Ramp* 500944.8  ********  500787.9  ******** *     157.
268. AG   1045.   5.0   0.0 13.3
      17. 120th WB APP SB Ramp* 500945.7  ********  500793.6  ******** *     152.
267. AG   1735.   5.0   0.0 17.0
      18. 120th WB APP SB Ramp* 500811.9  ********  501016.6  ******** *     205.
88. AG    159. 100.0   0.0  7.3 1.07  34.1
      19. 120th WB APP SB Ramp* 500811.7  ********  500854.0  ******** *      42.
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87. AG    124. 100.0   0.0 11.0 0.51   7.1
      20. 120th WB APP Melody * 500544.3  ********  500456.5  ******** *     88.
270. AG    130.   4.7   0.0 13.3
      21. 120th WB APP Melody * 500793.2  ********  500456.5  ******** *    337.
268. AG   2010.   4.7   0.0 17.0
      22. 120th WB APP Melody * 500509.2  ********  500455.7  ******** *     54.
271. AG     85.   4.7   0.0  9.7
      23. 120th WB APP Melody * 500467.7  ********  500479.0  ******** *     11.
90. AG    197. 100.0   0.0  7.3 0.37   1.9
      24. 120th WB APP Melody * 500467.7  ********  500520.2  ******** *     52.
89. AG    132. 100.0   0.0 11.0 0.61   8.7
      25. SB Off-Ramp 1       * 500981.6  ********  500941.5  ******** *    118.
200. AG   1200.   3.5   0.0  9.7
      26. SB Off-Ramp 2       * 500941.5  ********  500862.7  ******** *    156.
210. AG   1200.   3.5   0.0  9.7
      27. SB Off-Ramp L       * 500862.6  ********  500793.1  ******** *    131.
212. AG    710.   3.5   0.0 13.3
      28. SB Off-Ramp R       * 500859.2  ********  500783.6  ******** *    132.
215. AG    490.   3.5   0.0  9.7
      29. SB Off-Ramp L Q     * 500799.7  ********  500824.4  ******** *     47.
32. AG    148. 100.0   0.0  7.3 0.61   7.8
      30. SB On-Ramp L        * 500787.8  ********  500784.0  ******** *     76.
183. AG   1045.   3.1   0.0 13.3
      31. SB On-Ramp R        * 500756.1  ********  500783.5  ******** *     56.
151. AG    395.   3.1   0.0  9.7
      32. SB On-Ramp 1        * 500784.1  ********  500791.8  ******** *    146.
177. AG   1440.   3.1   0.0 13.3
      33. SB On-Ramp 2        * 500791.8  ********  500777.5  ******** *    126.
187. AG   1440.   3.1   0.0 13.3
      34. NB Off-Ramp 1       * 500821.1  ********  500842.4  ******** *    122.
10. AG   1415.   3.5   0.0 13.3
      35. NB Off-Ramp 2       * 500842.4  ********  500871.3  ******** *     79.
21. AG   1415.   3.5   0.0 13.3
      36. NB Off-Ramp L       * 500869.2  ********  500945.4  ******** *    168.
27. AG    355.   3.5   0.0 13.3
      37. NB Off-Ramp R 1     * 500873.8  ********  500940.5  ******** *    142.
28. AG   1060.   3.5   0.0  9.7
      38. NB Off-Ramp R 2     * 500940.5  ********  500973.3  ******** *     37.
63. AG   1060.   3.5   0.0  9.7
      39. NB Off-Ramp L Q     * 500938.0  ********  500927.4  ******** *     23.
207. AG    148. 100.0   0.0 11.0 0.30   3.9
      40. NB On-Ramp L        * 500946.5  ********  500955.0  ******** *     57.
 9. AG   1225.   3.3   0.0  9.7
      41. NB On-Ramp R        * 500975.1  ********  500955.4  ******** *     35.
325. AG    520.   3.3   0.0  9.7
      42. NB On-Ramp          * 500954.9  ********  501013.8  ******** *    306.
11. AG   1745.   3.3   0.0  9.7
      43. I-25 SB 1           * 500986.5  ********  500956.0  ******** *    110.
196. AG   5551.   3.7   0.0 17.0
      44. I-25 SB 2           * 500956.0  ********  500844.2  ******** *    346.
199. DP   5551.   3.7  -5.0 17.0
♀
                             PAGE  2
      JOB: I-25and120thAveCO_PMPeak                             RUN:
I-25and120thAveCO_PMPeak

      DATE :  5/12/15
      TIME : 22:15:19

       LINK VARIABLES
       --------------
         LINK DESCRIPTION     *          LINK COORDINATES (M)           *    LENGTH
BRG TYPE   VPH    EF      H   W    V/C QUEUE
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                                                *   X1          Y1         X2          Y2      *     (M)
(DEG)               (G/MI)    (M)  (M)        (VEH)

------------------------*-----------------------------------------*------------------
----------------------------------------
      45. I-25 SB 3           * 500844.2  ********  500814.6  ******** *     124.
194. AG   5551.   3.7   0.0 17.0
      46. I-25 SB 4           * 500814.6  ********  500797.5  ******** *      85.
192. AG   5551.   3.7   0.0 17.0
      47. I-25 SB 5           * 500797.5  ********  500785.2  ******** *      76.
189. AG   5551.   3.7   0.0 17.0
      48. I-25 NB 1           * 500813.0  ********  500828.1  ******** *     109.
 8. AG   6178.   3.7   0.0 17.0
      49. I-25 NB 2           * 500828.1  ********  500855.1  ******** *     138.
11. AG   6178.   3.7   0.0 17.0
      50. I-25 NB 3           * 500855.1  ********  500961.6  ******** *     341.
18. DP   6178.   3.7  -5.0 17.0
      51. I-25 NB 4           * 500961.6  ********  501005.7  ******** *     149.
17. AG   6178.   3.7   0.0 17.0
      52. I-25 SB TEL 1       * 500993.7  ********  500963.3  ******** *     111.
196. AG   1345.   3.5   0.0  9.7
      53. I-25 SB TEL 2       * 500963.3  ********  500853.2  ******** *     345.
199. DP   1345.   3.5  -5.0  9.7
      54. I-25 SB TEL 3       * 500853.2  ********  500820.5  ******** *     124.
195. AG   1345.   3.5   0.0  9.7
      55. I-25 SB TEL 4       * 500820.5  ********  500804.4  ******** *      86.
191. AG   1345.   3.5   0.0  9.7
      56. I-25 SB TEL 5       * 500804.4  ********  500793.9  ******** *      75.
188. AG   1345.   3.5   0.0  9.7
      57. I-25 NB TEL 1       * 500807.9  ********  500820.5  ******** *     110.
 7. AG   2051.   3.5   0.0  9.7
      58. I-25 NB TEL 2       * 500820.5  ********  500848.1  ******** *     135.
12. AG   2051.   3.5   0.0  9.7
      59. I-25 NB TEL 3       * 500848.1  ********  500954.5  ******** *     341.
18. DP   2051.   3.5  -5.0  9.7
      60. I-25 NB TEL 4       * 500954.5  ********  500998.9  ******** *     150.
17. AG   2051.   3.5   0.0  9.7
♀
                              PAGE  3
      JOB: I-25and120thAveCO_PMPeak                              RUN:
I-25and120thAveCO_PMPeak

      DATE :  5/12/15
      TIME : 22:15:19

       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)

------------------------*---------------------------------------------------------
---------------------
       3. 120th EB APP SB Ramp*     120       73       2.0      2590       1900
41.88     1        3
       6. 120th EB APP NB Ramp*     120       80       2.0      1225       1900
41.88     1        3
       7. 120th EB APP NB Ramp*     120       44       2.0      2075       1900
41.88     1        3
      11. 120th EB APP Grant L*     120      106       2.0       175       1900
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41.88      1        3
      12. 120th EB APP Grant T*     120        44        2.0       2885         1900
41.88      1        3
      15. 120th WB APP NB Ramp*     120        78        2.0       2425         1900
41.88      1        3
      18. 120th WB APP SB Ramp*     120        85        2.0       1045         1900
41.88      1        3
      19. 120th WB APP SB Ramp*     120        44        2.0       1735         1900
41.88      1        3
      23. 120th WB APP Melody *     120       105        2.0        130         1900
41.88      1        3
      24. 120th WB APP Melody *     120        47        2.0       2010         1900
41.88      1        3
      29. SB Off-Ramp L Q     *     120        79        2.0        710         1900
41.88      1        3
      39. NB Off-Ramp L Q     *     120        79        2.0        355         1900
41.88      1        3

       RECEPTOR LOCATIONS
       ------------------
                        *          COORDINATES (M)          *
         RECEPTOR       *      X          Y          Z      *
     -------------------*-----------------------------------*
      1. R_001          *    500979.3   ********       1.8   *
      2. R_002          *    501003.3   ********       1.8   *
      3. R_003          *    500991.3   ********       1.8   *
      4. R_004          *    500942.8   ********       1.8   *
      5. R_005          *    500985.8   ********       1.8   *
      6. R_006          *    500931.5   ********       1.8   *
      7. R_007          *    500937.1   ********       1.8   *
      8. R_008          *    500941.2   ********       1.8   *
      9. R_009          *    500970.2   ********       1.8   *
     10. R_010          *    500971.3   ********       1.8   *
     11. R_011          *    501015.3   ********       1.8   *
     12. R_012          *    500967.9   ********       1.8   *
     13. R_013          *    500965.6   ********       1.8   *
     14. R_014          *    500973.8   ********       1.8   *
     15. R_015          *    500727.6   ********       1.8   *
     16. R_016          *    500751.6   ********       1.8   *
     17. R_017          *    500757.6   ********       1.8   *
     18. R_018          *    500715.6   ********       1.8   *
     19. R_019          *    500739.6   ********       1.8   *
     20. R_020          *    500751.6   ********       1.8   *
     21. R_021          *    500751.6   ********       1.8   *
     22. R_022          *    500751.6   ********       1.8   *
     23. R_023          *    500949.8   ********       1.8   *
     24. R_024          *    500776.3   ********       1.8   *
     25. R_025          *    500961.8   ********       1.8   *
     26. R_026          *    500948.4   ********       1.8   *
     27. R_027          *    500768.4   ********       1.8   *
     28. R_028          *    500774.4   ********       1.8   *
     29. R_029          *    500775.7   ********       1.8   *
     30. R_030          *    500775.0   ********       1.8   *
     31. R_031          *    500923.1   ********       1.8   *
     32. R_032          *    500893.8   ********       1.8   *
     33. R_033          *    500743.6   ********       1.8   *
♀
                     PAGE   4
      JOB: I-25and120thAveCO_PMPeak                             RUN:
I-25and120thAveCO_PMPeak

      DATE :  5/12/15
      TIME : 22:15:19
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        RECEPTOR LOCATIONS
        ------------------
                                   *           COORDINATES (M)           *
          RECEPTOR                 *      X           Y           Z      *
      -----------------------------*-------------------------------------*
      34. R_034                    *    500755.5   ********      1.8    *
      35. R_035                    *    500845.9   ********      1.8    *
      36. R_036                    *    500794.2   ********      1.8    *
      37. R_037                    *    500908.5   ********      1.8    *
      38. R_038                    *    500806.2   ********      1.8    *
      39. R_039                    *    500820.1   ********      1.8    *
      40. R_040                    *    500834.0   ********      1.8    *
      41. R_041                    *    500767.5   ********      1.8    *
      42. R_042                    *    500811.9   ********      1.8    *
      43. R_043                    *    500863.2   ********      1.8    *
      44. R_044                    *    500851.2   ********      1.8    *
      45. R_045                    *    500823.9   ********      1.8    *
      46. R_046                    *    500910.5   ********      1.8    *
      47. R_047                    *    500929.2   ********      1.8    *
      48. R_048                    *    500922.4   ********      1.8    *
      49. R_049                    *    500786.4   ********      1.8    *
      50. R_050                    *    500779.5   ********      1.8    *
      51. R_051                    *    500800.1   ********      1.8    *
      52. R_052                    *    500793.2   ********      1.8    *
      53. R_053                    *    500837.5   ********      1.8    *
♀
                            PAGE  5
      JOB: I-25and120thAveCO_PMPeak                              RUN:
I-25and120thAveCO_PMPeak

        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
  ANGLE *      (PPM)
  (DEGR)* REC1  REC2  REC3  REC4  REC5  REC6  REC7  REC8  REC9  REC10 REC11 REC12
REC13 REC14 REC15 REC16 REC17 REC18 REC19 REC20

------*--------------------------------------------------------------------------------
------------------------------------------
    0.  *   0.4   0.1   0.2   1.0   1.4   0.9   1.0   0.6   0.7   0.5   0.1   0.7
0.7   1.6   1.4   1.4   1.0   1.2   1.4   1.4
   10.  *   0.2   0.0   0.1   0.8   1.2   0.8   0.9   0.4   0.4   0.2   0.0   0.4
0.3   1.3   1.4   1.3   1.0   1.3   1.4   1.3
   20.  *   0.0   0.0   0.0   0.7   1.2   0.7   0.6   0.3   0.1   0.0   0.0   0.1
0.1   1.2   1.4   1.3   1.0   1.4   1.4   1.3
   30.  *   0.0   0.0   0.0   0.8   1.3   0.6   0.7   0.2   0.0   0.0   0.0   0.0
0.0   1.3   1.5   1.4   1.0   1.4   1.4   1.4
   40.  *   0.0   0.0   0.0   0.8   1.1   0.5   0.7   0.1   0.0   0.0   0.0   0.0
0.0   1.3   1.6   1.5   1.0   1.6   1.7   1.5
   50.  *   0.0   0.0   0.0   0.8   0.9   0.5   0.6   0.1   0.0   0.0   0.0   0.0
0.0   1.1   1.7   1.4   1.2   1.7   1.7   1.4
   60.  *   0.0   0.0   0.0   0.4   0.8   0.3   0.4   0.1   0.0   0.0   0.0   0.0
0.0   1.0   1.8   1.5   1.1   1.9   1.7   1.5
```

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  70.  *   0.0   0.0   0.0   0.3   0.7   0.2   0.3   0.2   0.0   0.0   0.0   0.0
0.0   0.8   1.7   1.5   1.1   1.9   1.5   1.5
  80.  *   0.1   0.1   0.1   0.3   0.7   0.1   0.2   0.4   0.0   0.0   0.1   0.0
0.0   0.7   1.5   1.3   0.8   1.6   1.3   1.3
  90.  *   0.4   0.3   0.3   0.1   0.4   0.0   0.1   1.1   0.0   0.1   0.3   0.0
0.0   0.5   0.8   0.6   0.4   0.8   0.6   0.6
 100.  *   0.7   0.4   0.5   0.0   0.1   0.0   0.0   1.6   0.0   0.4   0.4   0.1
0.1   0.2   0.2   0.2   0.3   0.2   0.2   0.2
 110.  *   1.1   0.6   0.9   0.0   0.0   0.0   0.0   1.7   0.2   0.5   0.5   0.2
0.2   0.0   0.2   0.2   0.2   0.2   0.2   0.2
 120.  *   1.3   0.9   1.2   0.0   0.0   0.0   0.0   1.6   0.2   0.7   0.5   0.2
0.3   0.0   0.2   0.3   0.3   0.2   0.3   0.3
 130.  *   1.6   1.0   1.4   0.0   0.0   0.0   0.0   1.4   0.2   0.9   0.6   0.3
0.4   0.0   0.2   0.2   0.2   0.2   0.2   0.2
 140.  *   1.6   1.3   1.6   0.0   0.0   0.0   0.0   1.2   0.3   0.9   0.7   0.4
0.6   0.0   0.2   0.2   0.2   0.2   0.2   0.2
 150.  *   1.4   1.3   1.5   0.0   0.0   0.0   0.0   0.9   0.4   1.1   0.8   0.6
0.6   0.0   0.3   0.3   0.3   0.2   0.3   0.3
 160.  *   1.3   1.3   1.3   0.0   0.0   0.0   0.0   0.6   0.6   1.1   0.8   0.6
0.7   0.0   0.2   0.5   0.5   0.2   0.3   0.5
 170.  *   1.3   1.3   1.3   0.0   0.0   0.0   0.0   0.7   0.6   1.1   1.2   0.6
0.6   0.0   0.0   0.2   0.3   0.0   0.0   0.2
 180.  *   1.3   1.4   1.3   0.0   0.0   0.0   0.0   0.9   0.5   1.1   1.3   0.5
0.6   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 190.  *   1.3   1.3   1.3   0.0   0.0   0.0   0.0   0.8   0.5   1.1   1.4   0.6
0.6   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 200.  *   1.3   1.4   1.3   0.2   0.0   0.2   0.2   1.0   0.5   1.0   1.5   0.5
0.6   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 210.  *   1.3   1.5   1.5   0.3   0.1   0.4   0.3   1.4   0.9   1.2   1.5   0.9
0.8   0.1   0.0   0.0   0.0   0.0   0.0   0.0
 220.  *   1.6   1.6   1.7   0.5   0.1   0.5   0.5   1.7   1.1   1.3   1.8   1.1
1.2   0.3   0.0   0.0   0.0   0.0   0.0   0.0
 230.  *   1.4   1.9   1.7   0.5   0.2   0.4   0.5   1.8   1.0   1.5   1.9   1.0
1.2   0.4   0.0   0.0   0.0   0.0   0.0   0.0
 240.  *   1.7   1.9   1.8   0.4   0.3   0.5   0.4   1.6   1.1   1.3   2.0   1.1
1.0   0.6   0.0   0.0   0.0   0.0   0.0   0.0
 250.  *   1.7   1.9   1.6   0.3   0.3   0.4   0.3   1.8   1.0   1.5   1.8   1.0
1.2   0.4   0.0   0.0   0.0   0.0   0.0   0.0
 260.  *   1.6   1.4   1.4   0.5   0.7   0.3   0.5   1.7   0.6   1.0   1.8   0.8
0.7   0.8   0.1   0.1   0.0   0.1   0.1   0.1
 270.  *   0.9   0.7   0.7   0.7   1.6   0.6   0.5   1.0   0.5   0.4   0.7   0.5
0.5   1.5   0.4   0.6   0.1   0.3   0.5   0.6
 280.  *   0.4   0.2   0.2   0.9   1.8   0.8   0.9   0.5   0.5   0.4   0.2   0.5
0.5   1.9   0.7   0.9   0.3   0.6   0.8   0.9
 290.  *   0.4   0.2   0.2   1.5   1.5   0.9   1.0   0.4   0.5   0.5   0.2   0.5
0.5   1.4   0.8   1.2   0.7   0.7   1.0   1.2
 300.  *   0.3   0.2   0.2   1.4   1.1   0.7   0.9   0.4   0.5   0.2   0.2   0.5
0.5   1.4   1.0   1.3   0.7   0.7   1.1   1.3
 310.  *   0.2   0.2   0.2   1.6   1.1   1.0   1.1   0.4   0.6   0.4   0.2   0.5
0.5   1.1   1.0   1.4   0.9   0.7   1.3   1.4
 320.  *   0.3   0.3   0.3   1.5   1.2   1.0   1.1   0.4   0.6   0.4   0.2   0.6
0.6   1.2   1.1   1.4   1.0   0.7   1.4   1.4
 330.  *   0.3   0.3   0.3   1.4   1.3   1.0   1.2   0.5   0.6   0.4   0.3   0.6
0.6   1.2   1.2   1.4   1.0   0.8   1.4   1.4
 340.  *   0.3   0.3   0.3   1.1   1.4   1.2   1.3   0.5   0.6   0.4   0.4   0.6
0.6   1.2   1.3   1.4   1.0   0.9   1.4   1.4
 350.  *   0.4   0.4   0.4   1.1   1.5   1.2   1.1   0.5   0.8   0.4   0.3   0.7
0.7   1.5   1.4   1.4   1.0   1.1   1.4   1.4
 360.  *   0.4   0.1   0.2   1.0   1.4   0.9   1.0   0.6   0.7   0.5   0.1   0.7
0.7   1.6   1.4   1.4   1.0   1.2   1.4   1.4

------*-------------------------------------------------------------------------
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 MAX   *   1.7   1.9   1.8   1.6   1.8   1.2   1.3   1.8   1.1   1.5   2.0   1.1
1.2   1.9   1.8   1.5   1.2   1.9   1.7   1.5
 DEGR. *  250   240   240   310   280   340   340   250   220   230   240   220
220   280    60    40    50    60    40    40

♀
                              PAGE  6
     JOB: I-25and120thAveCO_PMPeak                             RUN:
I-25and120thAveCO_PMPeak

      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
 ANGLE *      (PPM)
 (DEGR)* REC21 REC22 REC23 REC24 REC25 REC26 REC27 REC28 REC29 REC30 REC31 REC32
REC33 REC34 REC35 REC36 REC37 REC38 REC39 REC40

------*--------------------------------------------------------------------------
-------------------------------------------
   0.  *   1.4   1.4   1.2   0.4   1.4   1.1   0.6   0.6   0.4   0.5   1.5   3.4
0.0   0.0   1.2   1.1   2.1   0.9   1.2   1.1
  10.  *   1.3   1.3   1.2   0.3   1.4   1.0   0.5   0.4   0.5   0.4   1.5   3.2
0.0   0.0   1.6   0.8   1.9   1.1   1.1   1.2
  20.  *   1.3   1.3   1.0   0.4   1.3   0.9   0.5   0.5   0.5   0.4   1.1   2.7
0.0   0.0   2.4   1.0   1.7   1.2   1.2   1.5
  30.  *   1.4   1.4   1.2   0.8   1.3   1.1   0.7   0.7   0.8   0.8   1.1   1.8
0.0   0.0   2.8   1.4   1.2   1.5   1.5   2.0
  40.  *   1.5   1.5   1.3   0.9   1.5   1.0   0.9   0.9   0.9   0.9   1.1   1.4
0.2   0.2   2.7   1.5   1.4   1.6   1.8   1.8
  50.  *   1.4   1.4   1.4   0.9   1.4   1.0   0.8   0.9   0.9   0.9   1.1   1.5
0.2   0.2   2.7   1.6   1.2   1.8   1.7   1.9
  60.  *   1.5   1.5   1.3   0.8   1.3   0.9   0.9   0.7   0.8   0.7   1.3   1.4
0.3   0.3   2.7   1.6   1.2   1.7   1.7   2.1
  70.  *   1.5   1.5   1.2   0.6   1.0   0.6   0.9   0.8   0.7   0.8   1.3   1.5
0.3   0.3   2.8   1.6   1.3   1.7   2.0   2.1
  80.  *   1.3   1.3   1.0   0.5   0.8   0.4   0.6   0.6   0.5   0.5   1.2   1.1
0.6   0.6   2.2   1.6   1.1   1.6   1.5   1.6
  90.  *   0.6   0.6   0.7   0.5   0.5   0.1   0.4   0.3   0.5   0.4   0.8   0.6
1.4   1.4   1.8   1.0   0.8   1.1   1.3   1.3
 100.  *   0.2   0.2   0.4   0.5   0.2   0.0   0.3   0.4   0.4   0.5   0.5   0.2
1.5   1.7   1.3   0.3   0.3   0.4   0.7   0.8
 110.  *   0.2   0.2   0.1   0.6   0.1   0.0   0.5   0.5   0.5   0.4   0.4   0.1
1.2   1.3   1.1   0.2   0.2   0.3   0.5   0.6
 120.  *   0.3   0.3   0.1   0.6   0.0   0.0   0.3   0.4   0.6   0.5   0.4   0.1
1.0   1.1   1.0   0.3   0.2   0.2   0.5   0.6
 130.  *   0.2   0.2   0.1   0.6   0.0   0.0   0.4   0.5   0.6   0.6   0.5   0.0
1.1   1.0   1.1   0.3   0.1   0.3   0.5   0.6
 140.  *   0.2   0.2   0.1   0.7   0.0   0.0   0.5   0.5   0.7   0.7   0.4   0.0
1.2   1.1   1.1   0.4   0.1   0.4   0.6   0.6
 150.  *   0.3   0.3   0.1   0.6   0.0   0.0   0.4   0.6   0.7   0.6   0.4   0.0
1.3   1.2   1.2   0.3   0.0   0.4   0.5   0.7
 160.  *   0.5   0.5   0.1   0.6   0.0   0.0   0.5   0.6   0.6   0.6   0.4   0.0
1.3   1.2   1.4   0.4   0.0   0.4   0.6   0.7
 170.  *   0.2   0.2   0.1   0.5   0.0   0.0   0.3   0.5   0.5   0.5   0.3   0.0
1.2   1.2   1.6   0.5   0.1   0.6   0.6   0.9
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 180.  *   0.0   0.0   0.1   0.4   0.0   0.0   0.1   0.2   0.4   0.3   0.2   0.1
1.2   1.2   1.7   0.6   0.1   0.4   0.5   1.0
 190.  *   0.0   0.0   0.1   0.0   0.1   0.0   0.0   0.0   0.0   0.0   0.2   0.6
1.2   1.2   1.5   0.2   0.1   0.1   0.3   0.6
 200.  *   0.0   0.0   0.3   0.0   0.1   0.1   0.0   0.0   0.0   0.0   0.3   1.5
1.1   1.1   0.8   0.1   0.5   0.1   0.1   0.1
 210.  *   0.0   0.0   0.4   0.0   0.4   0.3   0.0   0.0   0.0   0.0   0.5   1.8
1.1   1.2   0.2   0.1   0.6   0.1   0.0   0.0
 220.  *   0.0   0.0   0.5   0.0   0.4   0.3   0.0   0.0   0.0   0.0   0.4   1.7
1.0   1.1   0.0   0.1   0.7   0.1   0.0   0.0
 230.  *   0.0   0.0   0.7   0.0   0.7   0.4   0.0   0.0   0.0   0.0   0.6   1.4
0.9   1.0   0.0   0.1   0.7   0.1   0.0   0.0
 240.  *   0.0   0.0   0.6   0.0   0.6   0.5   0.0   0.0   0.0   0.0   0.5   1.5
0.8   1.0   0.0   0.1   0.6   0.1   0.0   0.0
 250.  *   0.0   0.0   0.8   0.0   0.7   0.6   0.0   0.0   0.0   0.0   0.4   1.3
0.7   0.8   0.0   0.2   0.6   0.2   0.0   0.0
 260.  *   0.1   0.1   1.1   0.0   1.0   0.7   0.0   0.0   0.0   0.0   0.8   1.6
0.6   0.6   0.4   0.5   1.0   0.5   0.4   0.4
 270.  *   0.6   0.6   1.6   0.0   1.7   1.2   0.1   0.0   0.0   0.0   1.4   1.9
0.4   0.4   0.9   1.1   1.6   1.1   0.9   0.9
 280.  *   0.9   0.9   2.0   0.0   1.9   1.7   0.2   0.1   0.1   0.1   2.0   2.4
0.1   0.1   1.1   1.6   2.2   1.4   1.2   1.1
 290.  *   1.2   1.2   1.6   0.1   1.6   1.6   0.3   0.2   0.1   0.2   2.0   2.6
0.0   0.0   1.1   1.8   2.3   1.5   1.2   1.2
 300.  *   1.3   1.3   1.5   0.2   1.4   1.7   0.5   0.4   0.2   0.2   2.0   2.6
0.0   0.0   1.2   1.4   2.2   1.3   1.0   1.0
 310.  *   1.4   1.4   1.3   0.2   1.2   1.4   0.6   0.5   0.2   0.4   1.8   2.7
0.0   0.0   1.0   1.1   2.0   1.0   1.0   1.0
 320.  *   1.4   1.4   1.1   0.4   1.1   1.5   0.6   0.6   0.4   0.5   1.7   2.5
0.0   0.0   1.2   0.9   1.9   0.6   0.8   0.9
 330.  *   1.4   1.4   1.2   0.5   1.1   1.2   0.7   0.6   0.5   0.5   1.8   2.6
0.0   0.0   1.2   0.7   1.9   0.8   0.8   1.1
 340.  *   1.4   1.4   1.1   0.5   1.2   1.0   0.7   0.6   0.5   0.6   1.8   2.7
0.0   0.0   1.2   0.7   1.9   0.9   1.0   1.2
 350.  *   1.4   1.4   1.2   0.5   1.2   1.0   0.6   0.6   0.5   0.5   1.8   3.1
0.0   0.0   1.1   0.7   2.0   0.9   1.1   1.2
 360.  *   1.4   1.4   1.2   0.4   1.4   1.1   0.6   0.6   0.4   0.5   1.5   3.4
0.0   0.0   1.2   1.1   2.1   0.9   1.2   1.1

------*--------------------------------------------------------------------------
-------------------------------------------
 MAX   *   1.5   1.5   2.0   0.9   1.9   1.7   0.9   0.9   0.9   0.9   2.0   3.4
1.5   1.7   2.8   1.8   2.3   1.8   2.0   2.1
 DEGR. *   40    40   280    40   280   280    40    40    50    40   280     0
100   100    30   290   290    50    70    70

♀
                            PAGE  7
      JOB: I-25and120thAveCO_PMPeak                             RUN:
I-25and120thAveCO_PMPeak

       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
 ANGLE *      (PPM)
```

(DEGR)*	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53
0. *	0.0	0.5	0.1	0.0	0.2	2.0	0.7	0.8	0.0	0.0	0.0	0.0	0.0
10. *	0.0	0.5	0.5	0.1	0.2	2.0	0.6	0.8	0.0	0.0	0.0	0.0	0.0
20. *	0.0	0.4	1.2	0.4	0.1	1.3	0.3	0.4	0.0	0.0	0.0	0.0	0.2
30. *	0.0	0.4	1.8	0.8	0.3	0.5	0.1	0.1	0.1	0.0	0.1	0.1	0.4
40. *	0.2	0.4	1.7	0.8	0.3	0.2	0.1	0.1	0.5	0.5	0.4	0.4	0.5
50. *	0.3	0.3	1.5	0.7	0.5	0.1	0.1	0.0	0.6	0.6	0.4	0.5	0.5
60. *	0.3	0.3	1.4	0.7	0.5	0.0	0.1	0.0	0.6	0.6	0.5	0.6	0.5
70. *	0.4	0.3	1.2	0.6	0.3	0.0	0.1	0.1	0.7	0.6	0.6	0.6	0.5
80. *	0.6	0.6	1.4	1.0	0.7	0.3	0.4	0.4	0.7	1.0	0.6	0.7	0.9
90. *	1.4	1.1	1.8	1.4	1.1	0.8	1.1	1.1	1.2	1.5	0.8	1.1	1.2
100. *	1.5	1.7	2.2	1.8	1.7	1.3	1.5	1.4	1.6	1.9	1.1	1.1	1.9
110. *	1.4	1.8	2.4	2.0	1.8	1.2	1.6	1.6	1.5	1.3	1.2	1.6	1.9
120. *	1.1	1.7	2.2	1.8	1.8	1.1	1.4	1.3	1.5	1.3	1.4	1.4	1.9
130. *	1.0	1.6	2.3	1.8	1.8	0.9	1.1	1.0	1.4	1.1	1.4	1.4	2.0
140. *	0.9	1.6	2.3	1.8	1.7	1.0	1.0	0.7	1.1	1.1	1.3	1.2	2.0
150. *	1.1	1.4	2.3	1.8	1.5	0.9	0.6	0.8	0.9	1.0	1.3	1.3	1.7
160. *	1.0	1.6	2.4	1.7	1.6	1.0	0.9	0.9	0.9	0.9	1.6	1.3	1.7
170. *	1.2	1.4	2.6	1.9	1.6	1.0	0.9	0.8	0.8	1.0	1.2	0.8	1.7
180. *	1.1	1.4	2.6	1.7	1.6	1.1	0.8	1.0	0.7	0.9	0.9	0.8	1.7
190. *	1.1	1.0	2.3	1.7	1.4	1.6	1.1	1.1	0.6	0.9	0.7	0.5	1.4
200. *	1.1	0.7	1.8	1.4	1.2	2.3	1.2	1.4	0.8	1.0	0.5	0.5	1.3
210. *	1.2	1.0	1.3	1.2	1.1	2.7	1.6	1.8	0.9	1.1	0.5	0.6	1.2
220. *	1.2	0.9	1.4	1.3	1.3	3.1	1.8	1.9	1.0	1.2	0.6	0.7	1.3
230. *	1.1	1.1	1.2	1.5	1.1	2.7	1.9	1.9	0.9	1.1	0.5	0.8	1.4
240. *	1.0	1.3	1.5	1.6	1.2	2.5	1.8	1.8	0.7	1.1	0.4	0.7	1.5
250. *	0.8	1.3	1.5	1.4	1.1	2.6	2.0	2.0	0.6	0.9	0.2	0.5	1.3
260. *	0.7	1.1	1.0	1.0	0.9	2.3	2.0	1.8	0.3	0.8	0.2	0.2	1.1
270. *	0.4	0.7	0.7	0.6	0.5	1.9	1.3	1.4	0.2	0.4	0.0	0.1	0.6
280. *	0.1	0.5	0.2	0.2	0.3	1.3	0.6	0.7	0.0	0.1	0.0	0.0	0.2

```
 290.  *   0.0   0.4   0.1   0.1   0.2   1.1   0.5   0.6   0.0   0.0   0.0   0.0
0.2
 300.  *   0.0   0.4   0.1   0.1   0.2   1.1   0.6   0.6   0.0   0.0   0.0   0.0
0.2
 310.  *   0.0   0.5   0.1   0.1   0.2   1.1   0.6   0.6   0.0   0.0   0.0   0.0
0.2
 320.  *   0.0   0.5   0.0   0.1   0.2   1.2   0.6   0.6   0.0   0.0   0.0   0.0
0.2
 330.  *   0.0   0.5   0.0   0.0   0.2   1.3   0.6   0.7   0.0   0.0   0.0   0.0
0.1
 340.  *   0.0   0.5   0.0   0.0   0.2   1.4   0.6   0.8   0.0   0.0   0.0   0.0
0.1
 350.  *   0.0   0.5   0.0   0.0   0.3   1.8   0.6   0.8   0.0   0.0   0.0   0.0
0.0
 360.  *   0.0   0.5   0.1   0.0   0.2   2.0   0.7   0.8   0.0   0.0   0.0   0.0
0.0

------*-----------------------------------------------------------------------------
-
 MAX   *   1.5   1.8   2.6   2.0   1.8   3.1   2.0   2.0   1.6   1.9   1.6   1.6
2.0
 DEGR. *  100   110   170   110   110   220   250   250   100   100   160   110
130

 THE HIGHEST CONCENTRATION OF    3.40 PPM OCCURRED AT RECEPTOR REC32.
♀
                              PAGE  8
      JOB: I-25and120thAveCO_PMPeak                             RUN:
I-25and120thAveCO_PMPeak

      DATE :  5/12/15
      TIME : 22:15:19


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

          *    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 # *   250   240   240   310   280   340   340   250   220   230   240   220
 220   280    60    40    50    60    40    40

-------*----------------------------------------------------------------------------
---------------------------------------------
       1  *   0.1   0.0   0.0   0.0   0.1   0.0   0.0   0.1   0.0   0.0   0.0   0.0
 0.0   0.1   0.3   0.3   0.1   0.3   0.3   0.3
       2  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.1   0.0   0.0   0.1   0.1   0.0
       3  *   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0
 0.0   0.1   0.6   0.6   0.1   0.7   0.7   0.6
       4  *   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.0   0.1   0.0   0.0
 0.1   0.1   0.0   0.0   0.1   0.0   0.0   0.0
       5  *   0.1   0.1   0.1   0.2   0.2   0.1   0.1   0.1   0.1   0.1   0.1   0.1
 0.1   0.2   0.0   0.0   0.1   0.0   0.0   0.0
       6  *   0.2   0.1   0.1   0.2   0.2   0.1   0.1   0.2   0.1   0.1   0.1   0.1
 0.1   0.2   0.3   0.2   0.2   0.3   0.2   0.2
       7  *   0.1   0.0   0.1   0.1   0.1   0.1   0.1   0.0   0.0   0.1   0.0   0.0
 0.1   0.1   0.0   0.0   0.0   0.0   0.0   0.0
       8  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
       9  *   0.0   0.1   0.0   0.0   0.3   0.0   0.0   0.0   0.0   0.0   0.1   0.0
```

```
0.0   0.2   0.0   0.0   0.0   0.0   0.0   0.0
     10  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     11  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     12  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     13  *   0.1   0.2   0.2   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.3   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     14  *   0.0   0.1   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   0.0   0.0
     15  *   0.1   0.7   0.5   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.8   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     16  *   0.1   0.0   0.0   0.1   0.1   0.0   0.0   0.1   0.0   0.1   0.0   0.0
0.0   0.1   0.0   0.0   0.1   0.0   0.0   0.0
     17  *   0.2   0.0   0.1   0.1   0.1   0.1   0.1   0.4   0.1   0.1   0.0   0.1
0.1   0.1   0.1   0.0   0.1   0.1   0.0   0.0
     18  *   0.2   0.3   0.3   0.1   0.2   0.1   0.1   0.3   0.1   0.2   0.3   0.1
0.1   0.2   0.1   0.0   0.1   0.1   0.0   0.0
     19  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0
     20  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     21  *   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.1   0.1   0.1   0.0   0.1   0.1   0.1
     22  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     23  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     24  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     25  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     26  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     27  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     28  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     29  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.1   0.0   0.0   0.1   0.1
     30  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     31  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     32  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     33  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     34  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     35  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     36  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     37  *   0.0   0.0   0.0   0.1   0.0   0.1   0.1   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
     38  *   0.0   0.0   0.0   0.0   0.1   0.0   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
     39  *   0.0   0.0   0.0   0.3   0.0   0.1   0.2   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
     40  *   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.0   0.0
0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0
```

```
      41  *   0.0   0.0   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   0.0   0.0   0.0
      42  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.2   0.0   0.0   0.2
 0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      43  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      44  *   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.0   0.1
 0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1
      45  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.1   0.1   0.1
 0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0
♀
                             PAGE  9
      JOB: I-25and120thAveCO_PMPeak                             RUN:
I-25and120thAveCO_PMPeak

          *    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 # *   250   240   240   310   280   340   340   250   220   230   240   220
 220   280    60    40    50    60    40    40

-------*--------------------------------------------------------------------------
--------------------------------------------
      46  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      47  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      48  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      49  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      50  *   0.1   0.1   0.1   0.2   0.1   0.2   0.2   0.2   0.2   0.2   0.1   0.2
 0.2   0.1   0.1   0.1   0.1   0.1   0.1   0.1
      51  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      52  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      53  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      54  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      55  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      56  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      57  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      58  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      59  *   0.0   0.0   0.0   0.0   0.0   0.1   0.1   0.1   0.1   0.0   0.0   0.1
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      60  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
♀
                             PAGE 10
      JOB: I-25and120thAveCO_PMPeak                             RUN:
I-25and120thAveCO_PMPeak

      DATE :  5/12/15
      TIME : 22:15:19
```

```
      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 REC29 REC30 REC31 REC32
REC33 REC34 REC35 REC36 REC37 REC38 REC39 REC40
   LINK # *    40    40   280    40   280   280    40    40    50    40   280     0
 100   100    30   290   290    50    70    70

-------*------------------------------------------------------------------------------
-------------------------------------------------
       1  *   0.3   0.3   0.1   0.0   0.1   0.1   0.0   0.0   0.0   0.0   0.1   0.0
 0.0   0.0   0.0   0.5   0.0   0.0   0.0   0.0
       2  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
       3  *   0.6   0.6   0.1   0.0   0.1   0.1   0.0   0.0   0.0   0.0   0.1   0.0
 0.0   0.0   0.0   0.7   0.0   0.0   0.0   0.0
       4  *   0.0   0.0   0.1   0.0   0.1   0.1   0.1   0.1   0.0   0.0   0.1   0.1
 0.1   0.1   0.1   0.0   0.1   0.1   0.1   0.1
       5  *   0.0   0.0   0.4   0.1   0.3   0.2   0.1   0.1   0.1   0.1   0.4   0.3
 0.1   0.1   0.3   0.0   0.4   0.4   0.4   0.4
       6  *   0.2   0.2   0.3   0.1   0.2   0.2   0.1   0.1   0.1   0.1   0.3   0.2
 0.2   0.2   0.2   0.3   0.3   0.3   0.2   0.2
       7  *   0.0   0.0   0.2   0.0   0.1   0.1   0.0   0.0   0.0   0.0   0.2   0.3
 0.0   0.0   0.0   0.0   0.3   0.0   0.1   0.1
       8  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
       9  *   0.0   0.0   0.0   0.0   0.2   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   0.1   0.1
      10  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      11  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      12  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      13  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.1   0.0   0.0   0.0   0.0   0.1   0.1
      14  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      15  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.1   0.0   0.0   0.0   0.0   0.1   0.1
      16  *   0.0   0.0   0.1   0.0   0.1   0.0   0.0   0.0   0.0   0.0   0.1   0.1
 0.1   0.1   0.1   0.0   0.1   0.1   0.1   0.1
      17  *   0.0   0.0   0.1   0.0   0.1   0.0   0.1   0.1   0.0   0.1   0.1   0.1
 0.1   0.2   0.1   0.0   0.1   0.1   0.1   0.1
      18  *   0.0   0.0   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.2
 0.2   0.2   0.2   0.0   0.2   0.2   0.2   0.2
      19  *   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0   0.0
 0.1   0.1   0.0   0.0   0.1   0.1   0.0   0.0
      20  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      21  *   0.1   0.1   0.1   0.0   0.1   0.1   0.0   0.0   0.0   0.0   0.1   0.0
 0.3   0.2   0.0   0.2   0.1   0.0   0.0   0.0
      22  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      23  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      24  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      25  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      26  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
```

```
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      27  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      28  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      29  *   0.1   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      30  *   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.1   0.0   0.0
 0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0
      31  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      32  *   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      33  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      34  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      35  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      36  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      37  *   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   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      38  *   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      39  *   0.0   0.0   0.2   0.0   0.1   0.3   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      40  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      41  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      42  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      43  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      44  *   0.1   0.1   0.1   0.2   0.1   0.1   0.1   0.2   0.2   0.2   0.1   0.3
 0.1   0.1   1.3   0.0   0.2   0.2   0.2   0.3
      45  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
♀
                              PAGE 11
      JOB: I-25and120thAveCO_PMPeak                              RUN:
I-25and120thAveCO_PMPeak

          *     CO/LINK  (PPM)
          *     ANGLE (DEGREES)
          *   REC21 REC22 REC23 REC24 REC25 REC26 REC27 REC28 REC29 REC30 REC31 REC32
REC33 REC34 REC35 REC36 REC37 REC38 REC39 REC40
   LINK # *    40    40   280    40   280   280    40    40    50    40   280     0
 100   100    30   290   290    50    70    70

-------*--------------------------------------------------------------------------
--------------------------------------------
      46  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      47  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      48  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      49  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
      50  *   0.1   0.1   0.1   0.2   0.1   0.1   0.1   0.1   0.2   0.1   0.2   1.5
 0.1   0.1   0.2   0.0   0.3   0.2   0.2   0.2
```

51	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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
52	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
54	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1
60	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

♀

PAGE 12

JOB: I-25and120thAveCO_PMPeak RUN: I-25and120thAveCO_PMPeak

DATE : 5/12/15
TIME : 22:15:19

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

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

	*	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53
LINK #	*	100	110	170	110	110	220	250	250	100	100	160	110	130
1	*	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
2	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	*	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
4	*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1
5	*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
6	*	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2
7	*	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
8	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	*	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0
10	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
     12  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     13  *   0.1   0.0   0.0   0.1   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.0
0.0
     14  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     15  *   0.1   0.0   0.0   0.1   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.1
0.0
     16  *   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1
0.1
     17  *   0.2   0.3   0.2   0.3   0.3   0.3   0.4   0.4   0.2   0.3   0.1   0.1
0.3
     18  *   0.2   0.3   0.2   0.3   0.3   0.3   0.3   0.3   0.2   0.3   0.1   0.2
0.3
     19  *   0.1   0.3   0.0   0.0   0.2   0.0   0.0   0.0   0.1   0.1   0.1   0.1
0.3
     20  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     21  *   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.0   0.0
0.0
     22  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     23  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     24  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     25  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     26  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     27  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.0   0.1   0.1
0.0
     28  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.1   0.0
0.0
     29  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.2   0.1   0.3   0.3
0.0
     30  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     31  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     32  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     33  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     34  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     35  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     36  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     37  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     38  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     39  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     40  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     41  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     42  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
     43  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
```

```
 0.0
        44  *   0.1   0.1   1.0   0.3   0.2   0.2   0.2   0.2   0.1   0.1   0.1   0.1
 0.2
        45  *   0.0   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0   0.1   0.0
 0.0
♀
                              PAGE 13
      JOB: I-25and120thAveCO_PMPeak                              RUN:
I-25and120thAveCO_PMPeak

            *    CO/LINK  (PPM)
            *    ANGLE (DEGREES)
            *   REC41 REC42 REC43 REC44 REC45 REC46 REC47 REC48 REC49 REC50 REC51 REC52
REC53
   LINK # *   100   110   170   110   110   220   250   250   100   100   160   110
 130

-------*--------------------------------------------------------------------------
--
        46  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        47  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        48  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        49  *   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
        50  *   0.1   0.1   0.3   0.2   0.1   1.3   0.3   0.3   0.1   0.1   0.1   0.1
 0.2
        51  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        52  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        53  *   0.0   0.0   0.1   0.0   0.0   0.1   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        54  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        55  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        56  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        57  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        58  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
        59  *   0.0   0.0   0.1   0.1   0.0   0.2   0.1   0.1   0.0   0.0   0.0   0.0
 0.1
        60  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
 0.0
```

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	2610	25	130	2010	85	85	25	225	150	20	50
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	1.00	0.91	1.00	0.97	0.91	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.86		1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	5085	1583	3433	5085	1583	1770	1611		1770	1664	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	5085	1583	3433	5085	1583	1770	1611		1770	1664	
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)	65	2837	27	141	2185	92	92	27	245	163	22	54
RTOR Reduction (vph)	0	0	6	0	0	24	0	127	0	0	47	0
Lane Group Flow (vph)	65	2837	21	141	2185	68	92	145	0	163	29	0
Confl. Peds. (#/hr)	3			3			3			3		
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot			Prot		
Protected Phases	7	4	5	3	8	1	5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	7.6	65.7	75.7	9.3	67.4	78.4	10.0	14.0		11.0	15.0	
Effective Green, g (s)	8.6	66.7	77.7	10.3	68.4	80.4	11.0	15.0		12.0	16.0	
Actuated g/C Ratio	0.07	0.56	0.65	0.09	0.57	0.67	0.09	0.12		0.10	0.13	
Clearance Time (s)	5.0	5.0	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		3.0	3.0	
Lane Grp Cap (vph)	127	2826	1078	295	2898	1113	162	201		177	222	
v/s Ratio Prot	0.04	c0.56	0.00	c0.04	0.43	0.01	0.05	c0.09		c0.09	0.02	
v/s Ratio Perm			0.01			0.04						
v/c Ratio	0.51	1.00	0.02	0.48	0.75	0.06	0.57	0.72		0.92	0.13	
Uniform Delay, d1	53.7	26.6	7.6	52.3	19.5	6.8	52.2	50.5		53.5	45.9	
Progression Factor	1.00	1.00	1.00	1.11	0.43	0.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.5	17.9	0.0	1.0	1.0	0.0	4.5	20.0		45.4	1.2	
Delay (s)	57.1	44.5	7.6	59.1	9.3	0.0	56.7	70.5		98.9	47.1	
Level of Service	E	D	A	E	A	A	E	E		F	D	
Approach Delay (s)		44.5			11.8			67.1			82.4	
Approach LOS		D			B			E			F	

Intersection Summary			
HCM Average Control Delay	34.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: 120th Ave & SB Ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	2590	395	1045	1735	0	0	0	0	710	0	490
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
Lane Util. Factor		0.81	1.00	0.97	0.91					0.95	0.95	1.00
Frpb, ped/bikes		1.00	1.00	1.00	1.00					1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00					1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00					1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00					0.95	0.95	1.00
Satd. Flow (prot)		7544	1583	3433	5085					1681	1681	1583
Flt Permitted		1.00	1.00	0.95	1.00					0.95	0.95	1.00
Satd. Flow (perm)		7544	1583	3433	5085					1681	1681	1583
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)	0	2815	429	1136	1886	0	0	0	0	772	0	533
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2815	429	1136	1886	0	0	0	0	386	386	533
Confl. Peds. (#/hr)				2						2		
Turn Type			Free	Prot						Split		Free
Protected Phases		2		1	2 1					4	4	
Permitted Phases			Free									Free
Actuated Green, G (s)		41.0	120.0	29.0	75.0					35.0	35.0	120.0
Effective Green, g (s)		42.0	120.0	30.0	76.0					36.0	36.0	120.0
Actuated g/C Ratio		0.35	1.00	0.25	0.63					0.30	0.30	1.00
Clearance Time (s)		5.0		5.0						5.0	5.0	
Vehicle Extension (s)		3.0		3.0						3.0	3.0	
Lane Grp Cap (vph)		2640	1583	858	3221					504	504	1583
v/s Ratio Prot		c0.37		c0.33	0.37					c0.23	0.23	
v/s Ratio Perm			0.27									0.34
v/c Ratio		1.07	0.27	1.32	0.59					0.77	0.77	0.34
Uniform Delay, d1		39.0	0.0	45.0	12.8					38.2	38.2	0.0
Progression Factor		0.56	1.00	0.77	0.58					1.00	1.00	1.00
Incremental Delay, d2		32.2	0.1	146.6	0.1					6.8	6.8	0.6
Delay (s)		53.9	0.1	181.4	7.5					45.0	45.0	0.6
Level of Service		D	A	F	A					D	D	A
Approach Delay (s)		46.8			72.9			0.0			26.9	
Approach LOS		D			E			A			C	

Intersection Summary			
HCM Average Control Delay	53.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1225	2075	0	0	2425	520	355	0	1060	0	0	0
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			
Lane Util. Factor	0.97	0.91			0.81	1.00	0.97	0.95	0.95			
Frpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00			
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00			
Frt	1.00	1.00			1.00	0.85	1.00	0.85	0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (prot)	3433	5085			7544	1583	3433	1504	1504			
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00			
Satd. Flow (perm)	3433	5085			7544	1583	3433	1504	1504			
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)	1332	2255	0	0	2636	565	386	0	1152	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	286	0	6	6	0	0	0
Lane Group Flow (vph)	1332	2255	0	0	2636	279	386	570	570	0	0	0
Confl. Peds. (#/hr)	2						2					
Turn Type	Prot					Perm	Split		Perm			
Protected Phases	5	6 5			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)	34.0	75.0			36.0	36.0	35.0	35.0	35.0			
Effective Green, g (s)	35.0	76.0			37.0	37.0	36.0	36.0	36.0			
Actuated g/C Ratio	0.29	0.63			0.31	0.31	0.30	0.30	0.30			
Clearance Time (s)	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			
Lane Grp Cap (vph)	1001	3221			2326	488	1030	451	451			
v/s Ratio Prot	c0.39	0.44			c0.35		0.11	c0.38				
v/s Ratio Perm						0.18			0.38			
v/c Ratio	1.33	0.70			1.13	0.57	0.37	1.26	1.26			
Uniform Delay, d1	42.5	14.5			41.5	34.8	33.1	42.0	42.0			
Progression Factor	0.36	1.08			0.74	0.49	1.00	1.00	1.00			
Incremental Delay, d2	149.4	0.2			62.5	2.0	1.0	135.9	135.9			
Delay (s)	164.8	15.8			93.2	19.0	34.2	177.9	177.9			
Level of Service	F	B			F	B	C	F	F			
Approach Delay (s)		71.1			80.1			141.8			0.0	
Approach LOS		E			F			F			A	

Intersection Summary			
HCM Average Control Delay	87.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	175	2885	75	175	2495	50	225	60	275	110	75	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00	0.97	1.00	1.00	0.97	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	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)	3433	5085	1583	3433	5085	1583	3433	1863	1583	3433	3539	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)	3433	5085	1583	3433	5085	1583	3433	1863	1583	3433	3539	1583
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)	190	3136	82	190	2712	54	245	65	299	120	82	245
RTOR Reduction (vph)	0	0	24	0	0	18	0	0	71	0	0	2
Lane Group Flow (vph)	190	3136	58	190	2712	36	245	65	228	120	82	243
Confl. Peds. (#/hr)	2			2			2			2		
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	8.0	70.0	70.0	6.0	68.0	68.0	8.0	20.0	20.0	4.0	16.0	24.0
Effective Green, g (s)	9.0	71.0	70.0	7.0	69.0	68.0	9.0	21.0	21.0	5.0	17.0	26.0
Actuated g/C Ratio	0.08	0.59	0.58	0.06	0.57	0.57	0.08	0.18	0.18	0.04	0.14	0.22
Clearance Time (s)	5.0	5.0	5.0	5.0	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	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	257	3009	923	200	2924	897	257	326	277	143	501	396
v/s Ratio Prot	0.06	c0.62		0.06	0.53		c0.07	0.03		0.03	0.02	c0.05
v/s Ratio Perm			0.04			0.02			c0.14			0.11
v/c Ratio	0.74	1.04	0.06	0.95	0.93	0.04	0.95	0.20	0.82	0.84	0.16	0.61
Uniform Delay, d1	54.4	24.5	10.8	56.3	23.2	11.5	55.3	42.3	47.7	57.1	45.3	42.5
Progression Factor	1.03	0.76	0.72	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.8	24.0	0.0	49.3	5.8	0.0	43.1	1.4	23.4	32.9	0.7	2.8
Delay (s)	60.7	42.5	7.8	105.6	29.0	11.5	98.4	43.7	71.1	90.0	46.0	45.3
Level of Service	E	D	A	F	C	B	F	D	E	F	D	D
Approach Delay (s)		42.7			33.7			79.2			57.4	
Approach LOS		D			C			E			E	

Intersection Summary			
HCM Average Control Delay	43.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

CO Hot Spot Analysis

2015 Background Concentrations and Emission Factors (APCD)

Background 2015 (ppm)

2.2023	8-hr
4.2706	1-hr

NON-Freeway

speed	EF (g/mile)
20	5.188268
21	5.02935
23	4.711516
24	4.552599
25	4.393682
26	4.327339

	grams/hour
IDLE EF	41.87853

Freeway and Ramps

speed	EF (g/mile)
26	3.155493
28	3.135228
30	3.114962
34	3.348237
36	3.450942
37	3.495329
43	3.705123
44	3.730667
51	3.713594
62	3.539159
63	3.544574
64	3.549989

PM_{10} Analysis

	FEIS 2035 Model Daily Volumes		DRCOG 2040 Model Daily Volumes		FEIS 2035 Model Daily Volumes	DRCOG 2040 Model Daily Volumes	
North of:	**SB Total**	**NB Total**	**SB Total**	**NB Total**	**2035 Total**	**2040 Total**	**% Change**
E-470	94,198	94,304	97,294	95,818	188,502	193,112	-2%
144th	82,686	79,721	81,776	80,074	162,407	161,850	0%
136th	91,604	90,530	87,027	86,628	182,134	173,655	5%
120th	92,996	91,048	98,086	96,626	184,044	194,712	-6%

Sixth Highest PM10 Concentrations From Maintenance Plan							
Node	**2001**	**2009**	**2010**	**2015**	**2020**	**2025**	**2030**
125	81.68	96.11	96.25	96.53	97.96	100.96	103.84
126	85.6	103.37	103.9	105.53	109.45	115.75	123.07
141	75.03	93.41	93.58	91.2	95.88	96.75	101.96
142	72.32	87.32	87.59	93.98	90.8	98.99	97.29

Sixth Highest PM10 Concentrations with 12% growth	
Node	**2040**
125	116.30
126	137.84
141	114.20
142	108.96

Mobile Source Air Toxics Analysis

Preferred Alternative	yearID	monthID	HPMSVtypeID	Total	VMT		No Action	Total	VMT
	2040	1	10	6.7803E-06	11,217.41			6.71814E-06	11,067.23
	2040	1	20	1.3311E-05	1,702,462.71			1.26835E-05	1,630,084.06
	2040	1	30	2.6856E-05	1,708,841.69			2.5681E-05	1,634,075.85
	2040	1	40	2.5794E-06	4,188.87			2.56226E-06	4,137.51
	2040	1	50	1.0379E-05	24,025.09			1.01647E-05	23,238.83
	2040	1	60	3.1509E-05	62,731.44			3.09712E-05	61,130.50
			Acrolein	9.1414E-05	3,513,467			8.87808E-05	3,363,734
	2040	7	10	6.7803E-06	11,217.41			6.71814E-06	11,067.23
	2040	7	20	1.446E-05	1,702,462.71			1.376E-05	1,630,084.06
	2040	7	30	2.9066E-05	1,708,841.69			2.776E-05	1,634,075.85
	2040	7	40	2.5794E-06	4,188.87			2.56226E-06	4,137.51
	2040	7	50	1.0379E-05	24,025.09			1.01647E-05	23,238.83
	2040	7	60	3.1509E-05	62,731.44			3.09712E-05	61,130.50
			Acrolein	9.4773E-05	3,513,467			9.19364E-05	3,363,734

	g/mile	VMT/Year	g/year	lb/year
10	6.78E-06	4094355.04	27.76	0.06
20	1.39E-05	621398888.21	8628.32	19.02
30	2.80E-05	623727217.78	17440.03	38.45
40	2.58E-06	1528936.98	3.94	0.01
50	1.04E-05	8769157.57	91.01	0.20
60	3.15E-05	22896974.14	721.46	1.59
			Total	59.33

g/mile	VMT/Year	g/year	lb/year
6.72E-06	4039540.07	27.14	0.06
1.32E-05	594980681.68	7866.67	17.34
2.67E-05	596437683.71	15937.13	35.14
2.56E-06	1510190.60	3.87	0.01
1.02E-05	8482173.08	86.22	0.19
3.10E-05	22312631.08	691.05	1.52
		Total	54.26

Preferred Alternative	yearID	monthID	HPMSVtypeID	Total	VMT		No Action	Total	VMT
	2040	1	10	0.000521257	11,217.41			0.00051669	11,067.23
	2040	1	20	0.001137547	1,702,462.71			0.001090084	1,630,084.06
	2040	1	30	0.00132045	1,708,841.69			0.001259766	1,634,075.85
	2040	1	40	3.9965E-06	4,188.87			3.97017E-06	4,137.51
	2040	1	50	7.61097E-05	24,025.09			7.47065E-05	23,238.83
	2040	1	60	4.06463E-05	62,731.44			3.99529E-05	61,130.50
			Benzene	0.003100006	3,513,467			0.002985169	3,363,734
	2040	7	10	0.000529486	11,217.41			0.000524772	11,067.23
	2040	7	20	0.001227269	1,702,462.71			0.001174512	1,630,084.06
	2040	7	30	0.00142919	1,708,841.69			0.001361615	1,634,075.85
	2040	7	40	4.06404E-06	4,188.87			4.0368E-06	4,137.51
	2040	7	50	8.30571E-05	24,025.09			8.1439E-05	23,238.83
	2040	7	60	4.06463E-05	62,731.44			3.99529E-05	61,130.50
			Benzene	0.003313712	3,513,467			0.003186328	3,363,734

	g/mile	VMT/Year	g/year	lb/year
10	5.25E-04	4094355.04	2151.06	4.74
20	1.18E-03	621398888.21	734746.87	1619.84
30	1.37E-03	623727217.78	857512.66	1890.49
40	4.03E-06	1528936.98	6.16	0.01
50	7.96E-05	8769157.57	697.88	1.54
60	4.06E-05	22896974.14	930.68	2.05
			Total	3518.67

g/mile	VMT/Year	g/year	lb/year
5.21E-04	4039540.07	2103.51	4.64
1.13E-03	594980681.68	673695.31	1485.24
1.31E-03	596437683.71	781745.28	1723.45
4.00E-06	1510190.60	6.05	0.01
7.81E-05	8482173.08	662.23	1.46
4.00E-05	22312631.08	891.45	1.97
		Total	3216.77

Preferred Alternative	yearID	monthID	HPMSVtypeID	Total	VMT		No Action	Total	VMT
	2040	1	10	0	11,217.41			0	11,067.23
	2040	1	20	8.0692E-08	1,702,462.71			7.6889E-08	1,630,084.06
	2040	1	30	9.3662E-07	1,708,841.69			9.04235E-07	1,634,075.85
	2040	1	40	2.0571E-07	4,188.87			2.04337E-07	4,137.51
	2040	1	50	7.6341E-07	24,025.09			7.47404E-07	23,238.83
	2040	1	60	2.5207E-06	62,731.44			2.4777E-06	61,130.50
			1,3-butidiene	4.5071E-06	3,513,467			4.41056E-06	3,363,734
	2040	7	10	0	11,217.41			0	11,067.23
	2040	7	20	8.7655E-08	1,702,462.71			8.34115E-08	1,630,084.06
	2040	7	30	1.0123E-06	1,708,841.69			9.76323E-07	1,634,075.85
	2040	7	40	2.0571E-07	4,188.87			2.04337E-07	4,137.51
	2040	7	50	7.6341E-07	24,025.09			7.47404E-07	23,238.83
	2040	7	60	2.5207E-06	62,731.44			2.4777E-06	61,130.50
			1,3-butidiene	4.5898E-06	3,513,467			4.48917E-06	3,363,734

	g/mile	VMT/Year	g/year	lb/year
10	0.00E+00	4094355.04	0.00	0.00
20	8.42E-08	621398888.21	52.31	0.12
30	9.74E-07	623727217.78	607.79	1.34
40	2.06E-07	1528936.98	0.31	0.00
50	7.63E-07	8769157.57	6.69	0.01
60	2.52E-06	22896974.14	57.72	0.13
			Total	1.60

g/mile	VMT/Year	g/year	lb/year
0.00E+00	4039540.07	0.00	0.00
8.02E-08	594980681.68	47.69	0.11
9.40E-07	596437683.71	560.82	1.24
2.04E-07	1510190.60	0.31	0.00
7.47E-07	8482173.08	6.34	0.01
2.48E-06	22312631.08	55.28	0.12
		Total	1.48

Preferred Alternative	yearID	monthID	HPMSVtypeID	Total	VMT		No Action	Total	VMT
	2040	1	10	0.000119005	11,217.41			0.000117914	11,067.23
	2040	1	20	0.000237998	1,702,462.71			0.000226782	1,630,084.06
	2040	1	30	0.000521044	1,708,841.69			0.000498697	1,634,075.85
	2040	1	40	6.03416E-05	4,188.87			5.99466E-05	4,137.51
	2040	1	50	0.000222128	24,025.09			0.000217538	23,238.83
	2040	1	60	0.000685002	62,731.44			0.000673315	61,130.50
			Formaldehyde	0.001845519	3,513,467			0.001794192	3,363,734
	2040	7	10	0.000119005	11,217.41			0.000117914	11,067.23
	2040	7	20	0.000258533	1,702,462.71			0.000246019	1,630,084.06
	2040	7	30	0.000563804	1,708,841.69			0.000538962	1,634,075.85
	2040	7	40	6.03416E-05	4,188.87			5.99466E-05	4,137.51
	2040	7	50	0.000222128	24,025.09			0.000217538	23,238.83
	2040	7	60	0.000685002	62,731.44			0.000673315	61,130.50
			Formaldehyde	0.001908814	3,513,467			0.001853694	3,363,734

	g/mile	VMT/Year	g/year	lb/year
10	1.19E-04	4094355.04	487.25	1.07
20	2.48E-04	621398888.21	154271.98	340.11
30	5.42E-04	623727217.78	338324.42	745.88
40	6.03E-05	1528936.98	92.26	0.20
50	2.22E-04	8769157.57	1947.88	4.29
60	6.85E-04	22896974.14	15684.46	34.58
			Total	1126.14

g/mile	VMT/Year	g/year	lb/year
1.18E-04	4039540.07	476.32	1.05
2.36E-04	594980681.68	140653.76	310.09
5.19E-04	596437683.71	309449.27	682.22
5.99E-05	1510190.60	90.53	0.20
2.18E-04	8482173.08	1845.19	4.07
6.73E-04	22312631.08	15023.43	33.12
		Total	1030.74

*Data in grey provided by ACPD

Preferred Alternative	yearID	monthID	HPMSVtypeID	Total	VMT		No Action	Total	VMT
	2040	1	10	1.831E-05	11,217.41			1.81449E-05	11,067.23
	2040	1	20	3.442E-05	1,702,462.71			3.28012E-05	1,630,084.06
	2040	1	30	5.94E-05	1,708,841.69			5.6695E-05	1,634,075.85
	2040	1	40	4.22E-06	4,188.87			4.19216E-06	4,137.51
	2040	1	50	1.781E-05	24,025.09			1.7446E-05	23,238.83
	2040	1	60	5.145E-05	62,731.44			5.05693E-05	61,130.50
			Naphthalene	0.0001856	3,513,467			0.000179849	3,363,734
	2040	7	10	1.831E-05	11,217.41			1.81449E-05	11,067.23
	2040	7	20	3.739E-05	1,702,462.71			3.5583E-05	1,630,084.06
	2040	7	30	6.43E-05	1,708,841.69			6.12893E-05	1,634,075.85
	2040	7	40	4.22E-06	4,188.87			4.19216E-06	4,137.51
	2040	7	50	1.781E-05	24,025.09			1.7446E-05	23,238.83
	2040	7	60	5.145E-05	62,731.44			5.05693E-05	61,130.50
			Naphthalene	0.0001935	3,513,467			0.000187225	3,363,734

	g/mile	VMT/Year	g/year	lb/year
10	1.83E-05	4094355.04	74.98	0.17
20	3.59E-05	621398888.21	22313.33	49.19
30	6.19E-05	623727217.78	38579.33	85.05
40	4.22E-06	1528936.98	6.45	0.01
50	1.78E-05	8769157.57	156.17	0.34
60	5.14E-05	22896974.14	1177.98	2.60
			Total	137.37

g/mile	VMT/Year	g/year	lb/year
1.81E-05	4039540.07	73.30	0.16
3.42E-05	594980681.68	20343.65	44.85
5.90E-05	596437683.71	35185.13	77.57
4.19E-06	1510190.60	6.33	0.01
1.74E-05	8482173.08	147.98	0.33
5.06E-05	22312631.08	1128.33	2.49
		Total	125.41

Preferred Alternative	yearID	monthID	HPMSVtypeID	Total	VMT		No Action	Total	VMT
	2040	1	10	6.10076E-06	11,217.41			6.04483E-06	11,067.23
	2040	1	20	1.1051E-05	1,702,462.71			1.05302E-05	1,630,084.06
	2040	1	30	1.49507E-05	1,708,841.69			1.42154E-05	1,634,075.85
	2040	1	40	3.42064E-07	4,188.87			3.39796E-07	4,137.51
	2040	1	50	1.98275E-06	24,025.09			1.94458E-06	23,238.83
	2040	1	60	4.09583E-06	62,731.44			4.02595E-06	61,130.50
			POM	3.8523E-05	3,513,467			3.71008E-05	3,363,734
	2040	7	10	6.10076E-06	11,217.41			6.04483E-06	11,067.23
	2040	7	20	1.20043E-05	1,702,462.71			1.05302E-05	1,630,084.06
	2040	7	30	1.61913E-05	1,708,841.69			1.42154E-05	1,634,075.85
	2040	7	40	3.42064E-07	4,188.87			3.39796E-07	4,137.51
	2040	7	50	1.98275E-06	24,025.09			1.94458E-06	23,238.83
	2040	7	60	4.09583E-06	62,731.44			4.02595E-06	61,130.50
			POM	4.0717E-05	3,513,467			3.71008E-05	3,363,734

	g/mile	VMT/Year	g/year	lb/year
10	6.10E-06	4094355.04	24.98	0.06
20	1.15E-05	621398888.21	7163.25	15.79
30	1.56E-05	623727217.78	9712.04	21.41
40	3.42E-07	1528936.98	0.52	0.00
50	1.98E-06	8769157.57	17.39	0.04
60	4.10E-06	22896974.14	93.78	0.21
			Total	37.50

g/mile	VMT/Year	g/year	lb/year
6.04E-06	4039540.07	24.42	0.05
1.05E-05	594980681.68	6265.26	13.81
1.42E-05	596437683.71	8478.63	18.69
3.40E-07	1510190.60	0.51	0.00
1.94E-06	8482173.08	16.49	0.04
4.03E-06	22312631.08	89.83	0.20
		Total	32.79

			Perferred Alternative							No Action	
yearID	monthID	HPMSVtypeID	Diesel VMT	Diesel VOC	Diesel PM10	TotalDiesel		Diesel VMT	Diesel VOC	Diesel PM10	TotalDiesel
2040	1	10									
2040	1	20	1,069.15	0.000245589	1.01445E-05	0.00025573		1,023.70	0.000235862	9.71445E-06	0.00024558
2040	1	30	2,883.50	0.002224995	8.29314E-05	0.00230793		2,757.31	0.0021418	7.96524E-05	0.00222145
2040	1	40	341.68	0.000463473	1.23743E-05	0.00047585		337.49	0.000459646	1.22741E-05	0.00047192
2040	1	50	1,174.11	0.001346107	3.48271E-05	0.00138093		1,135.51	0.001317945	3.37404E-05	0.00135169
2040	1	60	5,227.62	0.006627527	0.000208314	0.00683584		5,094.21	0.006494176	0.000204493	0.00669867
		PM10	10,696	0.010907691	0.000348591	0.01125628		10,348	0.01064943	0.000339875	0.01098930
2040	7	10									
2040	7	20	1,069.15	0.00024977	8.97916E-06	8.97916E-06		1,023.70	0.000239683	8.59854E-06	0.00024828
2040	7	30	2,883.50	0.002291711	7.40355E-05	7.40355E-05		2,757.31	0.002204351	7.11141E-05	0.00227547
2040	7	40	341.68	0.000465289	1.23564E-05	1.23564E-05		337.49	0.000461425	1.22564E-05	0.00047368
2040	7	50	1,174.11	0.001291956	3.35296E-05	3.35296E-05		1,135.51	0.001263548	3.25011E-05	0.00129605
2040	7	60	5,227.62	0.00681169	0.000208314	0.000208314		5,094.21	0.006672961	0.000204493	0.00687745
		PM10	10,696	0.011110416	0.000337214	0.01144763		10,348	0.010841968	0.000328963	0.01117093

	g/mile	VMT/Year	g/year	lb/year
20	0.000010	390241.28	3.731412957	0.01
30	0.000078	1052477.16	82.602022866	0.18
40	0.000012	124712.01	1.542106789	0.00
50	0.000034	428549.90	14.647129937	0.03
60	0.000208	1908081.18	397.479356089	0.88
			Total	1.102

g/mile	VMT/Year	g/year	lb/year
0.000009	373650.54	3.421328051	0.01
0.000075	1006417.29	75.867041700	0.17
0.000012	123182.89	1.510867750	0.00
0.000033	414460.22	13.727223132	0.03
0.000204	1859385.92	380.231972741	0.84
		Total	1.047

*Data in grey provided by ACPD

GHG Analysis

2040 Cacluations

Colorado State Vehicle CO2e Emissions(2040)		
g/year	**metric tons/year**	**Million Metric Tons**
22948800000000	22948800	22.95
Global Total	**% of global total**	
45500.00	0.0504%	

2040 Project Comparison			
Colorado StateDistance (VMT)	**Project VMTs/Year**	**No Build Project VMTs**	**% of statewide VMT**
61458100000	1282415530	1227762900	2.09%
Change in VMTs due to Project	**% Change due to project**		
54652629	0.08893%		

2010 Cacluations

Colorado State Vehicle CO2e Emissions(2010)		
g/year	**metric tons/year**	**Million Metric Tons**
26037200000000	26037200	26.037
Global Total	**% of global total**	
29,670	0.0878%	

2010 Project Comparison		
Colorado StateDistance (VMT)		**% of statewide VMT**
46226700000		0.98%

Main I-25 Traffic South of:	Existing Daily Volumes
SH 7	96,700
E-470	87,200
144th Ave	87,200
136th Ave	104,600
Average	**93,925**
Source: FEIS, Transportation Impacts Chapter, Table 4.1	

Esitmated Daily VMTs	1239810	**Yearly VMTS**	452530650
*Aprroximately 6.6 mile corridor			

Statewide and Project Emissions Potential Relative to Global Totals

	Global CO_2 Emissions, million metric tons (MMT)[1]	Colorado Motor Vehicle CO_2 Emissions, MMT[2]	Colorado Motor Vehicle Emissions, % of global total	Project Study Area VMT, % of statewide VMT	Percent Change in Statewide VMT due to Project
Current conditions (2010)	29,670	26.0	0.09%	0.98%	(None)
Future projection (2040)	45,500	22.9	0.05%	2.09%	0.09%

[1] International Energy Outlook 2010, data for Figure 104, projected to 2040.
[2] Colorado emissions and statewide VMT estimates are from MOVES2014.

Global Total Estimations Due to the Project

CO2 (Global - 2040) (MMT)	45,500
CO2 Colorado -2040) (MMT)	22.9
VMT (Colorado -2040)	61458100000
Colorado 2040 MMT/Mile	3.73E-10
VMT/Year due to TEL	54,652,629
MMT Due to the TEL	2.04E-02

Increase in CO State Emission with the TEL (MMT)	22.97
TEL CO2e as % of global emissions	0.00004%

Total global Emission with TEL	0.0505%