July 2018

Air Quality Analysis Report

Sunport Boulevard Extension and Woodward Road Improvements

NMDOT CN: A300160 and A300161

Bernalillo County Project No.: TS-09-06

Prepared for:

Bernalillo County, New Mexico

On behalf of:

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Abbreviations/Acronyms

AQAR	Air Quality Analysis Report
CAAA	Clean Air Act of 1970 and subsequent amendments
CO	carbon monoxide
County	Bernalillo County
EHD	Environmental Health Department
FFY	Federal Fiscal Year
FHWA	Federal Highway Administration
I-25	Interstate 25
MOVES2014	Motor Vehicles Emission Simulator
MRMPO	Mid-Region Metropolitan Planning Organization
MSAT	mobile source air toxics
MTB	Metropolitan Transportation Board
MTP	Metropolitan Transportation Plan
NAAQS	National Ambient Air Quality Standards
NMDOT	New Mexico Department of Transportation
NO_2	Nitrogen Dioxide
O_3	Ozone
PM_{10}	particulate matter equal to and less than 10 microns in diameter
$PM_{2.5}$	particulate matter equal to and less than 2.5 microns in diameter
ppm	parts per million
SIP	State Implementation Plans
TIP	Transportation Improvement Program
USEPA	U.S. Environmental Protection Agency
VMT	vehicle miles of travel

1. Introduction

The following Air Quality Analysis Report (AQAR) was prepared to evaluate potential traffic-related air quality effects of the proposed Sunport Boulevard Extension and Woodward Road Improvements, in Bernalillo County, New Mexico (Figure 1). The Bernalillo County (County) Public Works Division, in cooperation with the New Mexico Department of Transportation (NMDOT) and Federal Highway Administration (FHWA), propose to extend Sunport Boulevard from its current terminus at Interstate 25 (I-25) to the Broadway Boulevard (NM 47)/Woodward Road intersection and improve Woodward Road along its existing alignment from Broadway Boulevard to Second Street (together these two undertakings are referred as the Project). The Project is located within the County and portions of the city of Albuquerque, New Mexico. The FHWA and NMDOT are providing funding.

The current Sunport Boulevard Extension and Woodward Road Improvements are included as part of the future transportation system for the Albuquerque area in the Mid-Region Metropolitan Planning Organization's (MRMPO's) 2040 Metropolitan Transportation Plan (MTP), approved by the Metropolitan Transportation Board (MTB) on April 17, 2015 (MRMPO 1015). Because the Project is part of the future "build" scenario of the MTP, it is considered a committed improvement for planning purposes, with Project funding identified. The Sunport Boulevard Extension and Woodward Road Improvements are also included in the MRMPO's Federal Fiscal Year (FFY) 2018-2023 Transportation Improvement Program (TIP) (MRMPO 2017a), which was approved on May 19, 2017 by the MTB. The TIP conforms to the current State Implementation Plan (SIP) (Albuquerque-Bernalillo County Air Quality Control Board 2010) for air quality management as required by the Clean Air Act of 1970, as amended (CAAA). The Project design is in conformity with the plan.

In the FFY 2018-2023 TIP, the Sunport Boulevard Extension from Woodward to I-25 Exit 221 at Sunport Boulevard is identified by control number (CN) A300160, with the County as the lead agency. It is described as a new four-lane divided facility with bike lanes, signage, drainage, and other necessary appurtenances. The Woodward Road Improvements are also included in the FFY 2018-2023 TIP by CN A300161, with the County as the lead agency. This element of the Project is described as complete reconstruction of Woodward Road to address vehicle, drainage, bicycle, and pedestrian needs.

The following AQAR addresses the potential traffic-related air quality effects of the Project, including the combined Sunport Boulevard Extension: Broadway Boulevard to Interstate 25 and the Woodward Road Improvements: Second Street to Broadway Boulevard. It utilizes revised 2040 traffic forecasts documented in the Sunport Boulevard Extension: Traffic Volume Forecasts Technical Memorandum (AECOM 2017). The AQAR is an update to the previous Project-level Carbon Monoxide Analysis prepared for the Sunport Boulevard Extension (Ecosphere Environmental Services, Inc. [Ecosphere] 2015). It includes a carbon monoxide (CO) quantitative analysis at the major intersections that would be improved as part of the Project (this type of project-specific analysis is termed a CO "hot spot" analysis). It also discusses air toxics and other criteria pollutants regulated under the National Ambient Air Quality Standards (NAAQS).

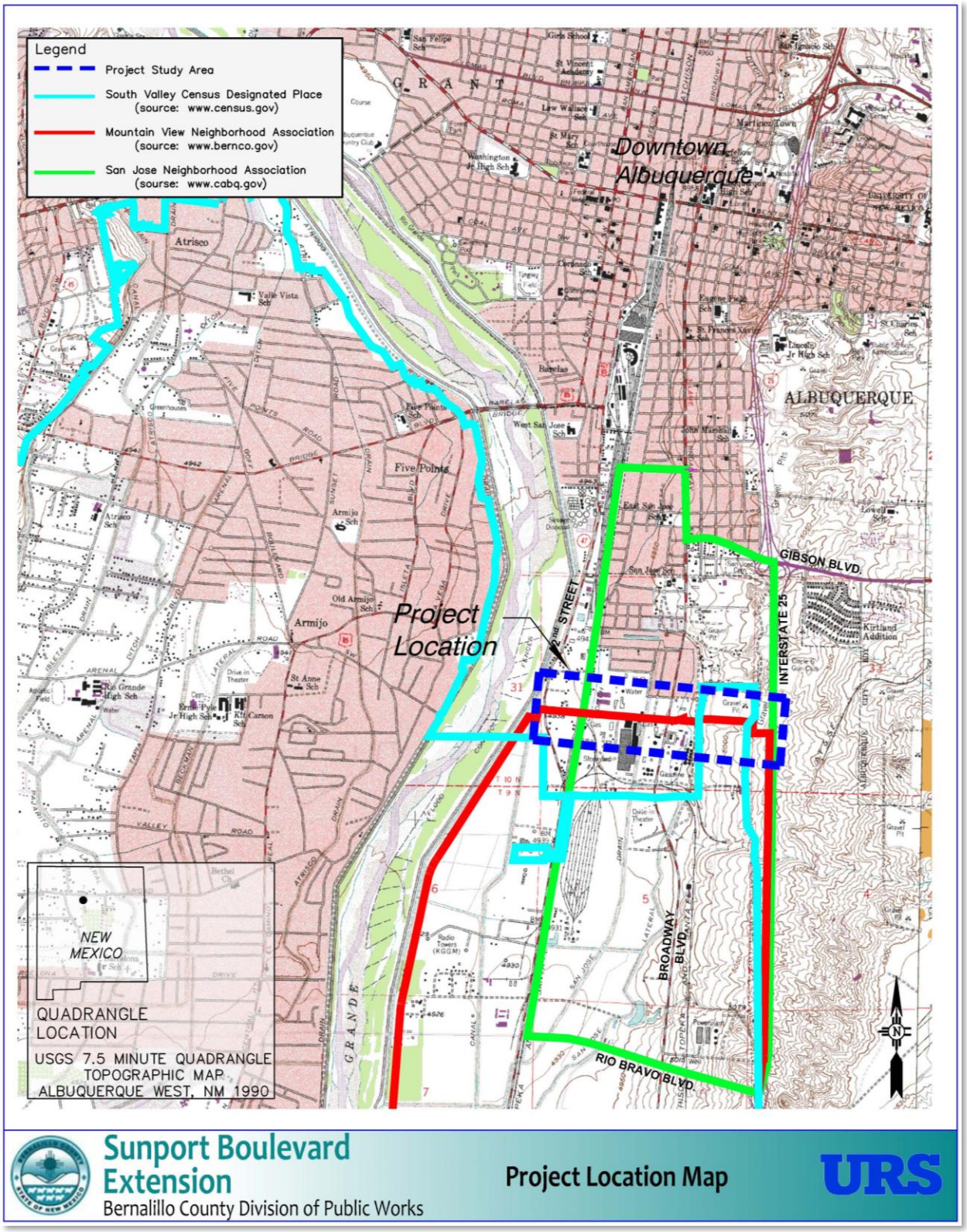

Figure 1. Project Location Map

2. Transportation-Related Air Quality Regulations

Under the CAAA, the U.S. Environmental Protection Agency (USEPA) initially developed the NAAQS for six "criteria" pollutants: Sulfur Dioxide, Particulate Matter equal to and less than 10 microns in diameter (PM_{10}), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Ozone (O_3), and Lead, and subsequently developed NAAQS for Particulate Matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$). Areas designated as being in violation of the NAAQS (nonattainment areas) were required to provide SIPs to improve air quality. Of critical interest to transportation agencies was the determination of emission reduction targets for transportation conformity to the NAAQS. In New Mexico, the agencies affected by these rules include the FHWA and state and local agencies responsible for transportation planning and air quality management.

Bernalillo County is currently designated by the USEPA as an attainment area for all air pollutants identified in the NAAQS. However, in 1978 it was designated as a moderate nonattainment area for CO. The County remained under this designation until 1996, when it was re-designated as an attainment area under limited maintenance for CO. In 2016, after 20 years without violations of the CO standards, the County was re-designated from a limited maintenance area to an attainment area.

3. Air quality monitoring data

Air quality monitoring data in Bernalillo County are available from monitoring sites operated by the City of Albuquerque. The closest site to the Project is located on Prosperity Avenue SE just south of Rio Bravo Boulevard (Table 1). Data from this location indicate that CO and other air pollutant levels are below the NAAQS of 35 parts per million (ppm) for the 1-hour value and 9 ppm for the 8-hour value. The monitoring values at the Prosperity Avenue site are similar to the average background air pollutant values at monitoring sites across the County, indicating that pollution levels are relatively uniform in the urban area.

Table 1. Five Years of Monitoring Data for Carbon Monoxide at 201 Prosperity SE

Year	1-Hour (ppm)	8-Hour (ppm)
2016	2.2	1.9
2015	2.4	1.0
2014	2.8	1.2
2013	2.4	1.1
2012	2.3	1.2
Average	12.1/5=2.4	6.4/5=1.28

4. CO Analysis

4.1 Modeling Methodology

Principal sources of CO in the Project study area are vehicular traffic on the street system as well as emissions from air traffic, industrial activities, and other sources. Under certain conditions, high traffic volumes result in localized CO impacts—or hot spots—which are detrimental to the health of people who are exposed. CO hot spots are typically found near major intersections in areas immediately adjacent to driving lanes. Although there is no requirement for Project-level, quantitative CO analysis in attainment areas, a CO hot spot analysis was performed with revised 2040 traffic projections as an update of the previous air quality analysis for the Project (Ecosphere 2015).

Computer models were used to estimate the concentrations of CO in the project vicinity. The modeling process includes predictions of CO emission rates for the projected mix of vehicles at given speeds during the 2040 study year and analysis of CO dispersion from the street network, resulting in CO concentrations at identified receptors. Receptors are sites near the street where members of the public may be vulnerable to CO exposure. The Project was evaluated using the USEPA's Motor Vehicle Emission Simulator (MOVES2014) emissions model and the CAL3QHC air quality dispersion model.

The inputs to the MOVES2014 model were based on USEPA default model data and local air quality information developed in conjunction with the City of Albuquerque Environmental Health Department (EHD) Air Quality Division staff. Local data included meteorological conditions (average temperature and humidity in January), the age distribution and composition of the vehicle fleet, and information on the EHD's vehicle inspection and maintenance program. As recommended in USEPA guidance material (USEPA 2015), the default MOVES2014 fuel information was used for the analysis. Emission rates were developed from MOVES2014 for free flow and idle conditions on roadway links in the Project area.

To model CO dispersion, the USEPA-approved CAL3QHC model was used. This model relies on assumptions about worst-case meteorological, site, and traffic conditions. It produces hourly CO concentrations at specific receptor locations. Each of the major intersections in the Project area was analyzed, including Sunport Boulevard/Broadway Boulevard, Sunport Boulevard/I-25 West Ramps and East Ramps, and Woodward Road/Second Street. The receptors were located according to the criteria in the Guidelines for Modeling Carbon Monoxide from Roadway Intersections (USEPA 1992). Traffic data were taken from the Sunport Boulevard Extension—Traffic Volume Forecasts Technical Memorandum (AECOM 2017), which provides an update of the 2040 traffic forecasts for the Project based on the Administrative Modification to Futures 2040 Metropolitan Transportation Plan (MRMPO 2017b). CAL3QHC performs a wind angle search in 5-degree increments to determine which angles will produce the worst-case CO concentrations at the receptors. Other meteorological assumptions include one meter-per-second wind speed, Class D atmospheric stability classification, and a mixing height of 1000 meters. Background CO levels were derived from local monitoring data and a persistence factor to convert between 1-hour and 8-hour CO levels.

4.2 Conclusions of the Modeling

The results from the CAL3QHC modeling are summarized in Table 2 for receptors at each of the three intersections (CAL3QHC output data are included in Exhibit A). The modeled results are evaluated in relation to the NAAQS (9.0 ppm over eight-hours and 35.0 ppm during the worst one-hour period). All the modeled results are well below the NAAQS; therefore, the conclusion of this report is that the proposed Project will not cause or contribute to CO exceedances of the NAAQS.

Table 2. Northbound I-25 Ramps and Sunport Carbon Monoxide Levels*

Receptor #	Analysis Performed for 2040 P.M. Peak Hour Volumes					
	Sunport/Woodward/ Broadway		I-25/West and East Ramps		Woodward/Second	
	1-Hr	8-Hr	1-Hr	8-Hr	1-Hr	8-Hr
1	3.1	2.3	3.2	2.4	3.1	2.3
2	3.1	2.3	3.2	2.4	3.1	2.3
3	3.2	2.4	3.2	2.4	3.1	2.3
4	3.1	2.3	3.1	2.3	3.1	2.3
5	3.1	2.3	3.1	2.3	3.1	2.3
6	3.1	2.3	3.1	2.3	3.1	2.3
7	3.1	2.3	3.0	2.3	3.2	2.4
8	3.2	2.4	3.1	2.3	3.2	2.4
9	3.2	2.4	3.0	2.3	3.2	2.4
10	3.1	2.3	3.2	2.4	3.1	2.3
11	3.1	2.3	3.2	2.4	NA	NA
12	3.2	2.4	3.2	2.4	NA	NA
Average	**3.13**	**2.33**	**3.13**	**2.33**	**3.13**	**2.33**

All concentrations are in ppm.

1-Hour background level is 3.00 ppm.

8-Hour values are calculated by multiplying 1-hour values by a persistence factor of 0.75.

5. Other Pollutants

Transportation-related emissions contribute to the formation of O_3 and levels of PM_{10}, $PM_{2.5}$, and NO_2; however, the region has historically been in attainment for these pollutants. The SIP (Albuquerque-Bernalillo County Air Quality Control Board 2010) contains elements that address O_3, PM_{10}, $PM_{2.5}$, and NO_2, including measures such as enforceable limitations on vehicle emissions through the inspection and maintenance program, mandatory air quality monitoring and data analysis, and stationary source permitting. The MRMPO's MTP also includes a conformity analysis designed to help mitigate congestion and air pollution; therefore, project-specific transportation control measures and analysis have never been established for these pollutants.

Mobile source air toxics (MSATs) are compounds emitted from highway vehicles and non-road equipment that are known or suspected to cause cancer and irritation to the respiratory tract, including the exacerbation of asthma. The FHWA has developed a tiered approach with three categories for analyzing MSATs, depending on specific project circumstances (FHWA 2012):

- No analysis 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

The Project is considered to have low potential MSAT effects, requiring a qualitative assessment. The types of projects included in this category are minor widening projects, new interchanges, replacing a signalized intersection on a surface street, new roadway segments connecting to an existing limited access highway, and projects where design year traffic is projected to be less than 140,000 to 150,000 annual average daily traffic. The maximum Year 2040 projected annual average daily traffic in the Project corridor, including all approaches to the Sunport Boulevard/Woodward Road/Broadway Boulevard intersection, is approximately 39,000 vehicles per day (AECOM 2017).

The amount of MSAT emitted is proportional to the vehicle miles traveled (VMT) if other variables such as fleet mix are the same for each alternative. The Project may result in localized areas where VMT would increase and other areas where it would decrease; therefore, it is possible that localized increases and decreases in MSAT emissions may occur. According to the FHWA, however, future MSAT emissions would likely be lower than present levels because of USEPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent from 2010 to 2050 (FHWA 2012). Local conditions may differ from these national projections; however, the magnitude of USEPA-projected reductions is so great that MSAT emissions in the Project area are likely to be lower in the future in virtually all locations.

6. Conclusions

The preceding analysis supports the conclusion that transportation related CO emissions from the Project are not a significant factor affecting NAAQS exceedances. The quantitative hot spot analysis shows that CO levels will be well below the NAAQS standards. Although transportation facilities contribute to other criteria pollutants, particularly O_3, NO_2, PM_{10}, and $PM_{2.5}$, other factors are more critical and transportation control measures and predictive modeling procedures have not been established in the Albuquerque Metropolitan Planning Area. The magnitude of the USEPA-projected MSAT reductions are so great that MSAT emissions are likely to be lower in the future.

7. References

AECOM. 2017. Sunport Boulevard Extension: Traffic Volume Forecasts Technical Memorandum. Bernalillo County Project Number TS09-06: NMDOT Control Number A300160. Prepared for Bernalillo County, Public Works Division.

Albuquerque-Bernalillo County Air Quality Control Board. 2010. State Implementation Plan (SIP) for Air Quality.

Ecosphere Environmental Services Inc. (Ecosphere) 2015. Project Level Carbon Monoxide Analysis: Sunport Boulevard Extension. Prepared for AECOM.

Federal Highway Administration (FHWA). 2012. Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA. Available online at: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm.

Mid-Region Metropolitan Planning Organization (MRMPO). 2015. Futures 2040 Metropolitan Transportation Plan (MTP).

MRMPO. 2017a. Federal Fiscal Year 2018-2023 Transportation Improvement Program (TIP) for the Albuquerque Metropolitan Planning Area: Extracted from the 2040 Futures MTP.

MRMPO. 2017b. Administrative Modification to Futures 2040 Metropolitan Transportation Plan.

U. S. Environmental Protection Agency (USEPA). 1992. Guideline for Modeling Carbon Monoxide from Roadway Intersections. EPA-454/R-92-005.

USEPA. 2015. Using MOVES2014 in Project Level Carbon Monoxide Analyses, EPA-420-B-15-028. Available online at: www.epa.gov/otaq/models/moves/.

Appendix A: CAL3QHC Modeling Output

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

JOB: Sunport-Woodward-Broadway 2040
RUN: CAL3QHC RUN

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 = 100. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

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

1. EB Approach * -400.00 -15.00 0.00 -15.00 * 400. 90. AG 290. 1.0 0.0 44.0
2. EB Depart * 0.00 -15.00 400.00 -15.00 * 400. 90. AG 380. 0.9 0.0 44.0
3. EB Left * -200.00 -1.00 0.00 -1.00 * 200. 90. AG 80. 1.0 0.0 32.0
4. WB Approach * 400.00 15.00 0.00 15.00 * 400. 270. AG 610. 0.9 0.0 44.0
5. WB Depart * 0.00 15.00 -400.00 15.00 * 400. 270. AG 400. 1.0 0.0 32.0
6. WB Left * 400.00 1.00 0.00 1.00 * 400. 270. AG 310. 0.9 0.0 32.0
7. SB Approach * -25.00 400.00 -25.00 0.00 * 400. 180. AG 850. 0.9 0.0 56.0
8. EB Depart * -25.00 0.00 -25.00 -400.00 * 400. 180. AG 1070. 0.9 0.0 44.0
9. SB Left * -1.00 400.00 -1.00 0.00 * 400. 180. AG 150.

```
0.9   0.0   32.0
      10. NB Approach                                  *      25.00
-400.00       25.00         0.00 *     400.   360. AG    500.
0.9   0.0   56.0
      11. NB Depart                                    *      25.00
0.00       25.00       400.00 *     400.   360. AG    400.   0.9
0.0   44.0
      12. NB Left                                      *       1.00
-400.00        1.00         0.00 *     400.   360. AG    100.
0.9   0.0   32.0
      13. EBT Q                                        *     -65.00
-19.00     -481.39       -19.00 *     416.   270. AG     24.
100.0   0.0   12.0 2.40  21.2
      14. EBL Q                                        *     -65.00
-1.00      -96.50        -1.00 *      31.   270. AG     24. 100.0
0.0   12.0 0.33   1.6
      15. EBR Q                                        *     -65.00
-25.00     -124.06       -25.00 *      59.   270. AG     24.
100.0   0.0   12.0 0.62   3.0
      16. WBT Q                                        *      75.00
13.00      173.31        13.00 *      98.    90. AG     24. 100.0
0.0   12.0 0.87   5.0
      17. WBL Q                                        *      75.00
1.00      110.43         1.00 *      35.    90. AG     24. 100.0
0.0   12.0 0.37   1.8
      18. WBR Q                                        *      75.00
25.00      114.37        25.00 *      39.    90. AG     24. 100.0
0.0   12.0 0.41   2.0
      19. SBT Q                                        *     -19.00
55.00      -19.00       867.52 *     813.   360. AG     48. 100.0
0.0   24.0 1.26  41.3
      20. SBL Q                                        *      -1.00
55.00       -1.00        90.43 *      35.   360. AG     24. 100.0
0.0   12.0 0.37   1.8
      21. SBR Q                                        *     -37.00
55.00      -37.00       114.06 *      59.   360. AG     24. 100.0
0.0   12.0 0.62   3.0
      22. NBT Q                                        *      19.00
-40.00       19.00       -85.28 *      45.   180. AG     48.
100.0   0.0   24.0 0.48   2.3
      23. NBL Q                                        *       1.00
-40.00        1.00       -79.37 *      39.   180. AG     24.
100.0   0.0   12.0 0.41   2.0
      24. NBR Q                                        *      37.00
-40.00       37.00      -106.93 *      67.   180. AG     24.
100.0   0.0   12.0 0.70   3.4
```

JOB: Sunport-Woodward-Broadway 2040
RUN: CAL3QHC RUN

DATE : 7/ 2/18
TIME : 21:54:40

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	CYCLE LENGTH (SEC)	ARRIVAL RATE
13. EBT Q	72	4.5	60	199	11.14	2	90	3
14. EBL Q	72	4.5	80	1900	11.14	2	90	3
15. EBR Q	72	4.5	150	1900	11.14	2	90	3
16. WBT Q	72	4.5	210	1900	11.14	2	90	3
17. WBL Q	72	4.5	90	1900	11.14	2	90	3
18. WBR Q	72	4.5	100	1900	11.14	2	90	3
19. SBT Q	72	4.5	610	1900	11.14	2	90	3
20. SBL Q	72	4.5	90	1900	11.14	2	90	3
21. SBR Q	72	4.5	150	1900	11.14	2	90	3
22. NBT Q	72	4.5	230	1900	11.14	2	90	3
23. NBL Q	72	4.5	100	1900	11.14	2	90	3
24. NBR Q	72	4.5	170	1900	11.14	2	90	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z

```
      1. R_001                                        *        -79.00
35.00        6.0   *
      2. R_002                                        *        -59.00
35.00        6.0   *
      3. R_003                                        *        -59.00
55.00        6.0   *
      4. R_004                                        *         49.00
67.00        6.0   *
      5. R_005                                        *         49.00
47.00        6.0   *
      6. R_006                                        *         69.00
47.00        6.0   *
      7. R_007                                        *         79.00
-47.00        6.0   *
      8. R_008                                        *         59.00
-47.00        6.0   *
      9. R_009                                        *         59.00
-67.00        6.0   *
     10. R_010                                        *        -47.00
-67.00        6.0   *
     11. R_011                                        *        -47.00
-47.00        6.0   *
     12. R_012                                        *        -67.00
-47.00        6.0   *
```

PAGE 3
JOB: Sunport-Woodward-Broadway 2040
RUN: CAL3QHC RUN

MODEL RESULTS

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

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) * REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	* 0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
5.	* 0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
10.	* 0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
15.	* 0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
20.	* 0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
25.	* 0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
30.	* 0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35.	* 0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40.	* 0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.	* 0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.	* 0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55.	* 0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.	* 0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65.	* 0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.	* 0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

75.	*	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80.	*	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
85.	*	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
90.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
95.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
100.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
105.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
110.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
115.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130.	*	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
135.	*	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
140.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
160.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
165.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
170.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
175.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
180.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
185.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
190.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
195.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

205. * 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0

JOB: Sunport-Woodward-Broadway 2040
RUN: CAL3QHC RUN

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
210.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
215.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
220.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
225.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
230.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
235.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
240.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
245.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0
250.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.0
255.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.0
260.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.0
265.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.0
270.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.0
275.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.1
280.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.1
285.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.1
290.	*	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.1
295.	*	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.2	0.0	0.1	0.1
300.	*	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.2	0.0	0.1	0.1
305.	*	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.2

```
 310.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.2
 315.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.2
 320.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.2
 325.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.1   0.0   0.0
0.0   0.0   0.1
 330.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.1   0.1   0.0
0.0   0.0   0.1
 335.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.1   0.1   0.1
0.0   0.0   0.1
 340.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.1   0.1   0.1
0.0   0.0   0.0
 345.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.1   0.1   0.1
0.0   0.0   0.0
 350.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.1   0.1   0.1
0.0   0.0   0.0
 355.  *   0.0   0.1   0.1   0.1   0.1   0.1   0.0   0.1   0.1
0.1   0.1   0.0
 360.  *   0.1   0.1   0.1   0.0   0.0   0.0   0.0   0.0   0.0
0.1   0.1   0.1
 ------
*-----------------------------------------------------------------
--------
 MAX   *   0.1   0.1   0.2   0.1   0.1   0.1   0.1   0.2   0.2
0.1   0.1   0.2
 DEGR. *    0     0    30   270   290   130   245   225   250
0     0   305
```

THE HIGHEST CONCENTRATION OF 0.10 PPM OCCURRED AT RECEPTOR REC12.

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

      JOB: Sunport-I25Ramps

                         RUN: CAL3QHC RUN

         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 = 100. CM
        U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60.
MINUTES     MIXH =  1000. M   AMB =  0.0 PPM

       LINK VARIABLES
       --------------
                   LINK DESCRIPTION                *
LINK COORDINATES (FT)              *    LENGTH  BRG TYPE   VPH
EF      H     W    V/C QUEUE
                                                   *       X1
Y1            X2          Y2   *     (FT)  (DEG)
(G/MI)  (FT)   (FT)       (VEH)
      ---------------------------------------------
*-----------------------------------------------
*-----------------------------------------------------------
       1. Link_1                                   *    -600.00
-24.00     -200.00       -24.00 *     400.    90. AG    330.
1.0   0.0   44.0
       2. Link_2                                   *    -200.00
-24.00      200.00       -24.00 *     400.    90. AG    750.
1.0   0.0   44.0
       3. Link_3                                   *    -400.00
-42.00     -200.00       -42.00 *     200.    90. AG     60.
1.0   0.0   32.0
       4. Link_4                                   *    -200.00
-6.00      200.00        -6.00 *     400.    90. AG    140.   1.0
0.0   32.0
       5. Link_5                                   *     200.00
-24.00      600.00       -24.00 *     400.    90. AG    710.
1.0   0.0   44.0
       6. Link_6                                   *     600.00
24.00      200.00        24.00 *     400.   270. AG    820.   1.0
0.0   44.0
       7. Link_7                                   *     200.00
24.00     -200.00        24.00 *     400.   270. AG    400.   1.0
0.0   44.0
       8. Link_8                                   *     400.00
42.00      200.00        42.00 *     200.   270. AG    600.   1.0
0.0   32.0
       9. Link_9                                   *     200.00
```

```
6.00     -200.00         6.00 *     400.   270. AG    270.   1.0
0.0   32.0
      10. Link_10                                   *    -200.00
24.00     -600.00        24.00 *     400.   270. AG    620.   1.0
0.0   44.0
      11. Link_11                                   *    -200.00
600.00     -200.00         0.00 *     600.   180. AG    650.
1.0   0.0   68.0
      12. Link_12                                   *    -194.00
0.00     -194.00      -400.00 *     400.   180. AG    240.   1.0
0.0   32.0
      13. Link_13                                   *    -182.00
200.00     -182.00         0.00 *     200.   180. AG    420.
1.0   0.0   32.0
      14. Link_14                                   *    -212.00
200.00     -212.00         0.00 *     200.   180. AG    220.
1.0   0.0   44.0
      15. Link_15                                   *     200.00
-600.00      200.00         0.00 *     600.   360. AG    170.
1.0   0.0   44.0
      16. Link_16                                   *     200.00
0.00      200.00       600.00 *     600.   360. AG    960.   1.0
0.0   44.0
      17. Link_17                                   *    -224.00
-24.00     -270.01       -24.00 *      46.   270. AG     40.
100.0   0.0   24.0 0.34   2.3
      18. Link_18                                   *    -224.00
-42.00     -240.73       -42.00 *      17.   270. AG     20.
100.0   0.0   12.0 0.12   0.9
      19. Link_19                                   *    -176.00
24.00     -147.57        24.00 *      28.    90. AG     20. 100.0
0.0   24.0 0.18   1.4
      20. Link_20                                   *    -176.00
6.00      -85.16         6.00 *      91.    90. AG     22. 100.0
0.0   12.0 0.81   4.6
      21. Link_21                                   *    -194.00
36.00     -194.00        39.28 *       3.   360. AG     23. 100.0
0.0   12.0 0.04   0.2
      22. Link_22                                   *    -212.00
36.00     -212.00        72.09 *      36.   360. AG     47. 100.0
0.0   24.0 0.42   1.8
      23. Link_23                                   *    -188.00
36.00     -188.00       112.90 *      77.   360. AG     47. 100.0
0.0   24.0 0.81   3.9
      24. Link_24                                   *     188.00
-24.00      144.64       -24.00 *      43.   270. AG     20.
100.0   0.0   24.0 0.28   2.2
      25. Link_25                                   *     188.00
-6.00      135.47        -6.00 *      53.   270. AG     24. 100.0
0.0   12.0 0.76   2.7
      26. Link_26                                   *     212.00
24.00      285.82        24.00 *      74.    90. AG     35. 100.0
```

```
0.0   24.0 0.48   3.8
      27. Link_27                                  *     212.00
36.00      312.89        36.00 *     101.    90. AG     35. 100.0
0.0   24.0 0.65   5.1
      28. Link_28                                  *     194.00
-36.00      194.00       -39.28 *       3.   180. AG     23.
100.0   0.0   12.0 0.04   0.2
      29. Link_29                                  *     206.00
-36.00      206.00       -68.81 *      33.   180. AG     23.
100.0   0.0   12.0 0.39   1.7
```

JOB: C:\Lakes\CALRoads View\Tutorial\CAL3QHC\Sunport-I25Ramps RUN: CAL3QHC RUN

DATE : 7/17/18
TIME : 15:32:58

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	CYCLE LENGTH (SEC)	ARRIVAL RATE
17. Link_17	51	4.5	330	1900	11.14	2	77	3
18. Link_18	51	4.5	60	1900	11.14	2	77	3
19. Link_19	26	4.5	400	1900	11.14	2	77	3
20. Link_20	57	4.5	270	1900	11.14	2	77	3
21. Link_21	60	4.5	10	1900	11.14	2	77	3
22. Link_22	60	4.5	220	1900	11.14	2	77	3
23. Link_23	60	4.5	420	1900	11.14	2	77	3
24. Link_24	26	4.5	610	1900	11.14	2	77	3
25. Link_25	63	4.5	140	1900	11.14	2	77	3
26. Link_26	45	4.5	600	1900	11.14	2	77	3
27. Link_27	45	4.5	820	1900	11.14	2	77	3
28. Link_28	60	4.5	10	1900	11.14	2	77	3
29. Link_29	60	4.5	100	1900	11.14	2	77	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z

```
     ---------------------------------------------
*-----------------------------------------*
      1. R_001                                   *       -240.00
72.00        6.0   *
      2. R_002                                   *       -240.00
52.00        6.0   *
      3. R_003                                   *       -260.00
52.00        6.0   *
      4. R_004                                   *       -260.00
-56.00        6.0   *
      5. R_005                                   *       -228.00
-56.00        6.0   *
      6. R_006                                   *       -228.00
-76.00        6.0   *
      7. R_007                                   *        228.00
-72.00        6.0   *
      8. R_008                                   *        228.00
-52.00        6.0   *
      9. R_009                                   *        248.00
-52.00        6.0   *
     10. R_010                                   *        248.00
66.00        6.0   *
     11. R_011                                   *        228.00
66.00        6.0   *
     12. R_012                                   *        228.00
86.00        6.0   *
```

PAGE 3
JOB: C:\Lakes\CALRoads View\Tutorial\CAL3QHC\Sunport-I25Ramps RUN: CAL3QHC RUN

MODEL RESULTS

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

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
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
5.	*	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40.	*	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.	*	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.	*	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55.	*	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.	*	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65.	*	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.	*	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
  75.  *   0.1   0.2   0.2   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0
  80.  *   0.1   0.2   0.2   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0
  85.  *   0.1   0.2   0.2   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0
  90.  *   0.2   0.2   0.2   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0
  95.  *   0.2   0.2   0.1   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0
 100.  *   0.2   0.2   0.1   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0
 105.  *   0.2   0.1   0.1   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.0   0.0
 110.  *   0.2   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0   0.1   0.0
 115.  *   0.2   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.1   0.1   0.0
 120.  *   0.2   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.1   0.1   0.0
 125.  *   0.1   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.1   0.1   0.0
 130.  *   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.1   0.1   0.1
 135.  *   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.1   0.2   0.1
 140.  *   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.1   0.2   0.1
 145.  *   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.1
 150.  *   0.1   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.1
 155.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.2
 160.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.2
 165.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.2
 170.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.2
 175.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.1
 180.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.1
 185.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.0
 190.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.2   0.0
 195.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.1   0.0
 200.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.2   0.1   0.0
```

205. * 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.2 0.0 0.0

JOB: C:\Lakes\CALRoads View\Tutorial\CAL3QHC\Sunport-I25Ramps RUN: CAL3QHC RUN

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
210.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
215.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
220.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
225.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
230.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
235.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
240.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
245.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
250.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
255.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
260.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
265.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
270.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
275.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
280.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
285.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
290.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
295.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300.	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
305.	*	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
 310.  *   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0
0.0   0.0   0.0
 315.  *   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0
0.0   0.0   0.0
 320.  *   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0
0.0   0.0   0.0
 325.  *   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0
0.0   0.0   0.0
 330.  *   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.0
 335.  *   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.0
 340.  *   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.0
 345.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.0
 350.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.0
 355.  *   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0   0.0
0.0   0.0   0.0
 360.  *   0.0   0.0   0.0   0.1   0.1   0.0   0.0   0.0   0.0
0.0   0.0   0.0
 ------
*-------------------------------------------------------------------
--------
 MAX   *   0.2   0.2   0.2   0.1   0.1   0.1   0.0   0.1   0.0
0.2   0.2   0.2
 DEGR. *   90    50    75     0     0   330     0   265     0
145   135   155
```

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

      JOB: Woodward/Second Street

      RUN: CAL3QHC RUN

         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 = 100. CM
        U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60.
MINUTES     MIXH =  1000. M   AMB =  0.0 PPM

       LINK VARIABLES
       --------------
                   LINK DESCRIPTION                *
LINK COORDINATES (FT)              *    LENGTH  BRG TYPE   VPH
EF      H     W    V/C QUEUE
                                                   *       X1
Y1            X2          Y2   *     (FT)  (DEG)
(G/MI)  (FT)   (FT)       (VEH)
      ---------------------------------------------
*-----------------------------------------------
*-----------------------------------------------------------
       1. EBD                                      *     -18.00
0.00      -18.00      -400.00 *     400.   180. AG    590.   1.0
0.0   32.0
       2. WBA                                      *       0.00
-400.00        0.00         0.00 *     400.   360. AG    430.
1.0   0.0   44.0
       3. SBA                                      *     400.00
12.00        0.00        12.00 *     400.   270. AG    430.   1.0
0.0   44.0
       4. SBD                                      *       0.00
12.00     -400.00        12.00 *     400.   270. AG    980.   1.0
0.0   44.0
       5. SBL                                      *     400.00
6.00        0.00         6.00 *     400.   270. AG     30.   1.0
0.0   32.0
       6. NBA                                      *    -400.00
-6.00        0.00        -6.00 *     400.    90. AG    460.   1.0
0.0   44.0
       7. NBD                                      *       0.00
-6.00      400.00        -6.00 *     400.    90. AG    250.   1.0
0.0   32.0
       8. WBTL Q                                   *       0.00
-65.00        0.00     -1071.47 *    1006.   180. AG     50.
100.0   0.0   24.0 1.69  51.1
       9. SBT Q                                    *      40.00
```

```
18.00      131.86        18.00 *      92.    90. AG     13. 100.0
0.0   12.0 0.65   4.7
      10. SBL Q                                  *      40.00
6.00       47.87         6.00 *       8.    90. AG     21. 100.0
0.0   12.0 0.08   0.4
      11. NBTR Q                                 *     -65.00
-6.00    -1321.60        -6.00 *    1257.   270. AG     21. 100.0
0.0   12.0 1.30  63.8
```

```
PAGE  2
      JOB: C:\Lakes\CALRoads View\Tutorial\CAL3QHC\
RUN: CAL3QHC RUN

      DATE :  7/ 4/18
      TIME : 10:31:57

       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)
      ---------------------------------------------
*-----------------------------------------------------------------
----------------
       8. WBTL Q                                   *      67
56       4.5       430       1900      11.14      2        3
       9. SBT Q                                    *      67
30       4.5       560       1900      11.14      2        3
      10. SBL Q                                    *      67
48       4.5        30       1900      11.14      2        3
      11. NBTR Q                                   *      67
48       4.5       460       1900      11.14      2        3

       RECEPTOR LOCATIONS
       ------------------
                                                   *
COORDINATES (FT)            *
                   RECEPTOR                        *         X
Y            Z      *
     ---------------------------------------------
*-----------------------------------------*
      1. R_001                                     *        -36.00
40.00        6.0   *
      2. R_002                                     *        -16.00
40.00        6.0   *
      3. R_003                                     *         16.00
40.00        6.0   *
      4. R_004                                     *         36.00
40.00        6.0   *
      5. R_005                                     *        -60.00
-28.00        6.0   *
      6. R_006                                     *        -40.00
-28.00        6.0   *
      7. R_007                                     *        -40.00
-48.00        6.0   *
      8. R_008                                     *         28.00
-48.00        6.0   *
```

```
      9. R_009                                          *          28.00
-28.00        6.0   *
     10. R_010                                          *          48.00
-28.00        6.0   *
```

PAGE 3
JOB: C:\Lakes\CALRoads View\Tutorial\CAL3QHC\
RUN: CAL3QHC RUN

MODEL RESULTS

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

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10
0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.	0.0	0.0	0.0	0.0	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
15.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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
25.	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	0.0	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
40.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.	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
60.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

```
0.0
  80.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
  85.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
  90.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
  95.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 100.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 105.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 110.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 115.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.0   0.0
0.0
 120.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.1   0.0   0.0
0.0
 125.  *   0.0   0.0   0.0   0.0   0.1   0.0   0.1   0.0   0.0
0.0
 130.  *   0.0   0.0   0.0   0.0   0.1   0.0   0.1   0.0   0.0
0.0
 135.  *   0.0   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0
0.0
 140.  *   0.0   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0
0.0
 145.  *   0.0   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0
0.0
 150.  *   0.0   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0
0.0
 155.  *   0.1   0.0   0.0   0.0   0.1   0.1   0.1   0.0   0.0
0.0
 160.  *   0.1   0.1   0.0   0.0   0.1   0.1   0.1   0.0   0.0
0.0
 165.  *   0.1   0.1   0.0   0.0   0.1   0.1   0.2   0.0   0.0
0.0
 170.  *   0.1   0.1   0.1   0.0   0.1   0.1   0.1   0.1   0.1
0.0
 175.  *   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1
0.1
 180.  *   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1   0.1
0.1
 185.  *   0.1   0.1   0.1   0.1   0.0   0.1   0.1   0.2   0.2
0.1
 190.  *   0.0   0.1   0.1   0.1   0.0   0.0   0.0   0.2   0.2
0.1
 195.  *   0.0   0.0   0.1   0.1   0.0   0.0   0.0   0.2   0.2
0.1
 200.  *   0.0   0.0   0.1   0.1   0.0   0.0   0.0   0.2   0.2
0.1
 205.  *   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.2   0.1
```

0.1

PAGE 4
JOB: C:\Lakes\CALRoads View\Tutorial\CAL3QHC\
RUN: CAL3QHC RUN

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10
210.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1
215.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
220.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
225.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
230.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
235.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
240.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
245.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
250.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
255.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
260.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
265.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
270.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
275.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
280.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
285.	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
290.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
295.	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
300.	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
305.	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
310.	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	

```
0.0
 315.  *   0.0   0.0   0.0   0.0   0.1   0.0   0.0   0.0   0.0
0.0
 320.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 325.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 330.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 335.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 340.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 345.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 350.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 355.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 360.  *   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
0.0
 ------
*-------------------------------------------------------------
 MAX   *   0.1   0.1   0.1   0.1   0.1   0.1   0.2   0.2   0.2
0.1
 DEGR. *  155   160   170   175   270   270   165   185   185
175
```