

# Integration of CAL3QHCR into FHWA's CAL3Interface

**Northern Transportation and  
Air Quality Summit 2010**

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FHWA Resource Center

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## **CAL3Interface Functions**

**Integrates EPA's CALINE3, CAL3QHC, and CAL3QHCR models into one computer program package**

**Provides interactive graphical forms for entering data**

**Extends the utility of the models**

**Facilitates model operation in a Microsoft® Windows® environment**

File Edit View Help

Application Description

Job: Metro Transit Facility  
Run: Northside Interchange Access

Model Selection

CALINE3     CAL3QHC     CAL3QHCR

Screening Level

User Enters All Data     EPA Default Data Values     Tier I Approach  
 Tier II Approach

Input / Output Control

Length Units of Input Data:  Feet     Meters  
 Specify the Scale Conversion Factor to Meters:

Length Units in Output:  Feet     Meters

Model Output Options:  Link Contributions     Add Background

Pollutant (Concentration Units): PM-2.5 (ug/m3)

Generate a Simplified Receptor / Highway Layout for Screening - Optional

Add Travel Lanes

Total Number of Lanes

Northbound/Southbound

6

Refine the Receptor / Highway Layout

Eastbound/Westbound

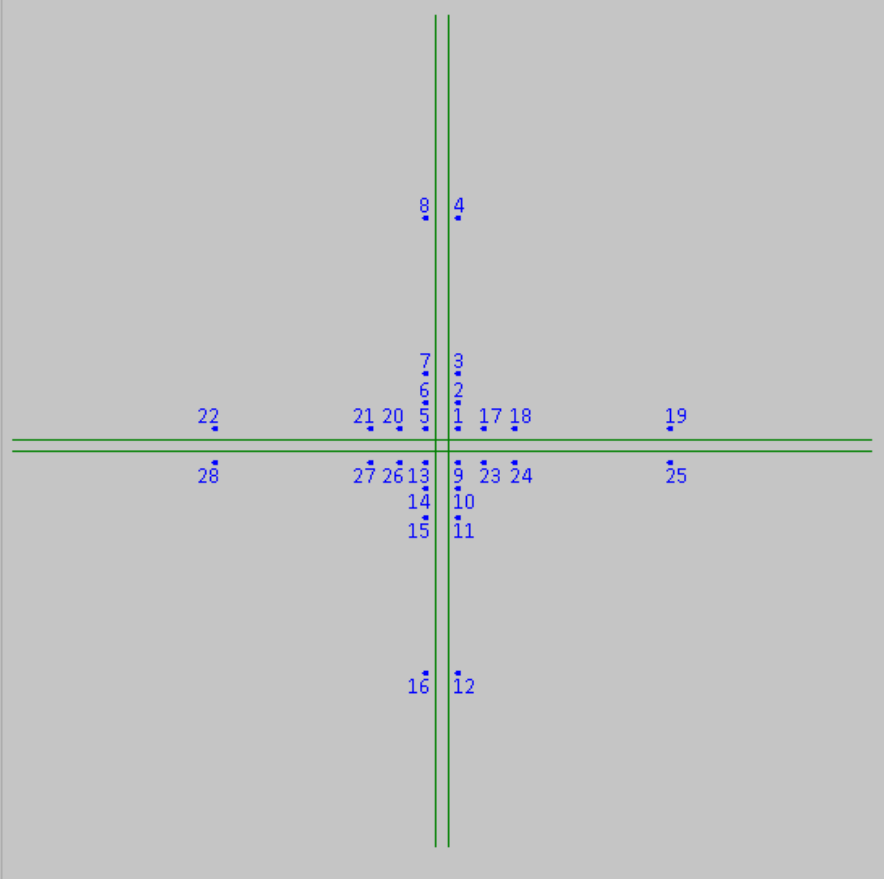
6

T-Type Intersection

Add Traffic Signal

Change the Traffic Signal Data

Receptor / Highway Layout Map (feet)



File Edit View Help

Application Description

Job: Metro Transit Facility  
Run: Northside Interchange Access

Model Selection

CALINE3     CAL3QHC     CAL3QHCR

Screening Level

User Enters All Data     EPA Default Data Values     Tier I Approach  
 Tier II Approach

Input / Output Control

Length Units of Input Data:  Feet     Meters  
 Specify the Scale Conversion Factor to Meters:

Length Units in Output:  Feet     Meters

Model Output Options:  Link Contributions     Add Background

Pollutant (Concentration Units): PM-2.5 (ug/m3)

Generate a Simplified Receptor / Highway Layout for Screening - Optional

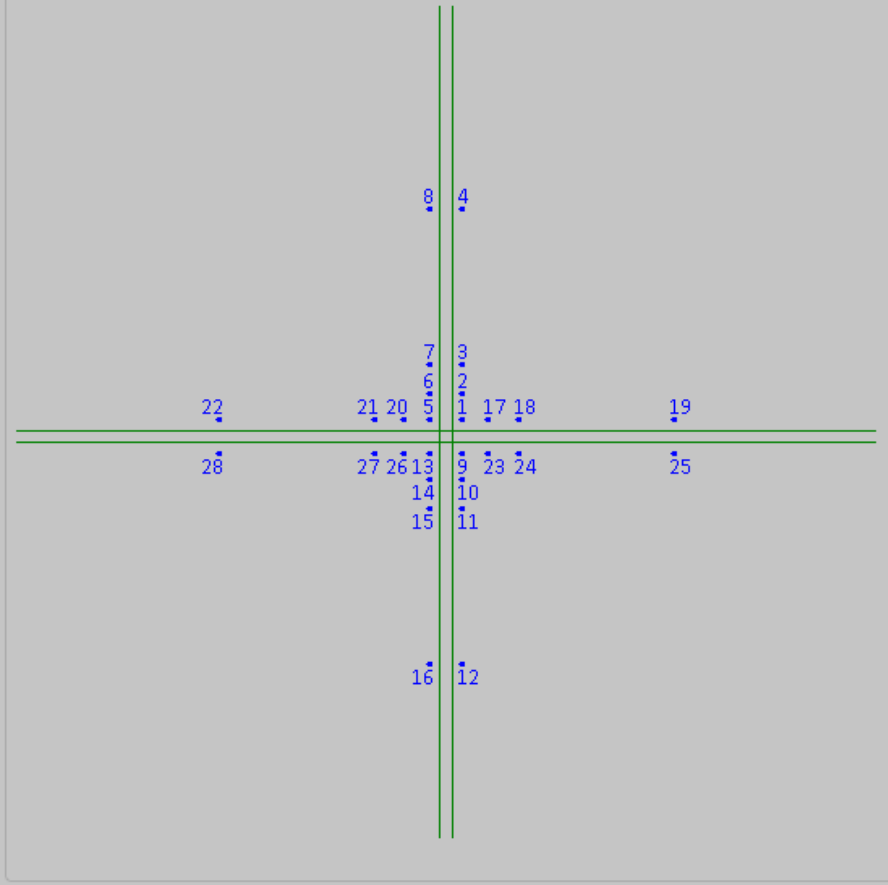
Add Travel Lanes    Total Number of Lanes

Northbound/Southbound   

Eastbound/Westbound   

T-Type Intersection     Add Traffic Signal   

Receptor / Highway Layout Map (feet)



STATUS: CAL3QHCR | EPA Default | Receptors = 28 | Links - Free-Flow = 8; Queue = 0 | Met - Fixed Dir = 0; Vary Dir = 0



Application Description

Job: Metro Transit Facility  
Run: Northside Interchange Access

Model Selection

CALINE3     CAL3QHC     CAL3QHCR

Screening Level

User Enters All Data     EPA Default Data Values     Tier I Approach  
 Tier II Approach

Input / Output Control

Length Units of Input Data:  Feet     Meters  
 Specify the Scale Conversion Factor to Meters:

Length Units in Output:  Feet     Meters

Model Output Options:  Link Contributions     Add Background

Pollutant (Concentration Units): PM-2.5 (ug/m3)

Generate a Simplified Receptor / Highway Layout for Screening - Optional

Add Travel Lanes    Total Number of Lanes

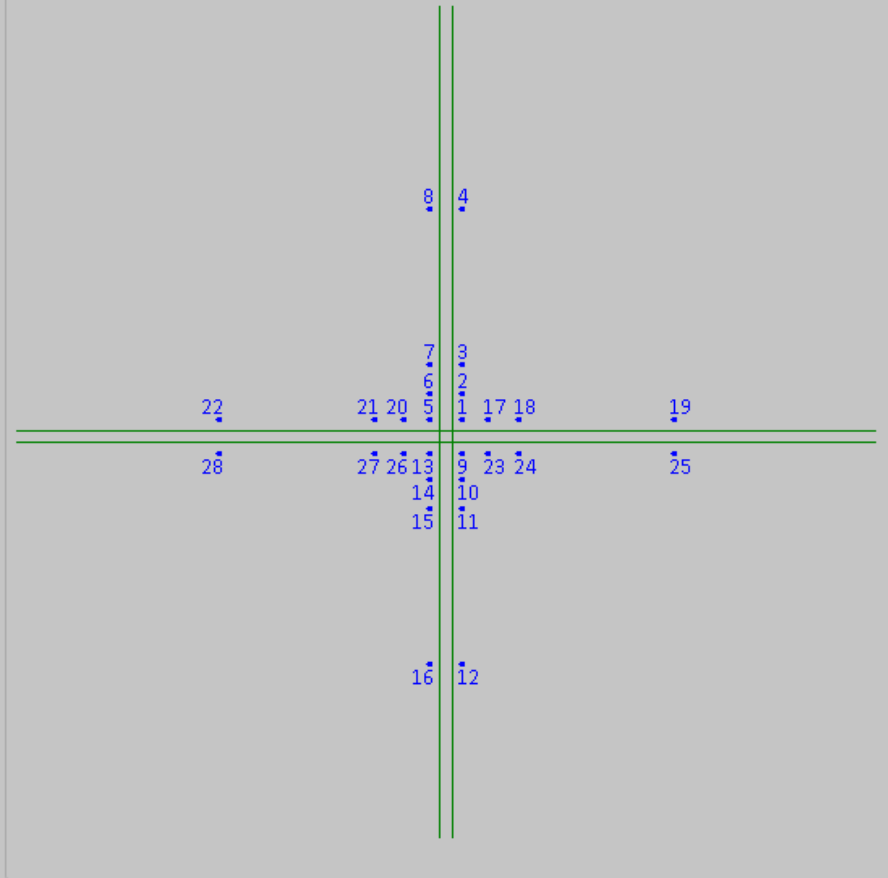
Northbound/Southbound   

Eastbound/Westbound   

T-Type Intersection   

Add Traffic Signal

Receptor / Highway Layout Map (feet)



File Edit View Help

Application Description

Job: Metro Transit Facility  
Run: Northside Interchange Access

Model Selection

CALINE3  CAL3QHC  CAL3QHCR

Screening Level

User Enters All Data  EPA Default Data Values  Tier I Approach  Tier II Approach

Input / Output Control

Length Units of Input Data:  Feet  Meters  
 Specify the Scale Conversion Factor to Meters:   
 Length Units in Output:  Feet  Meters  
 Model Output Options:  Link Contributions  Add Background  
 Pollutant (Concentration Units): PM-2.5 (ug/m3)

Generate a Simplified Receptor / Highway Layout for Screening - Optional

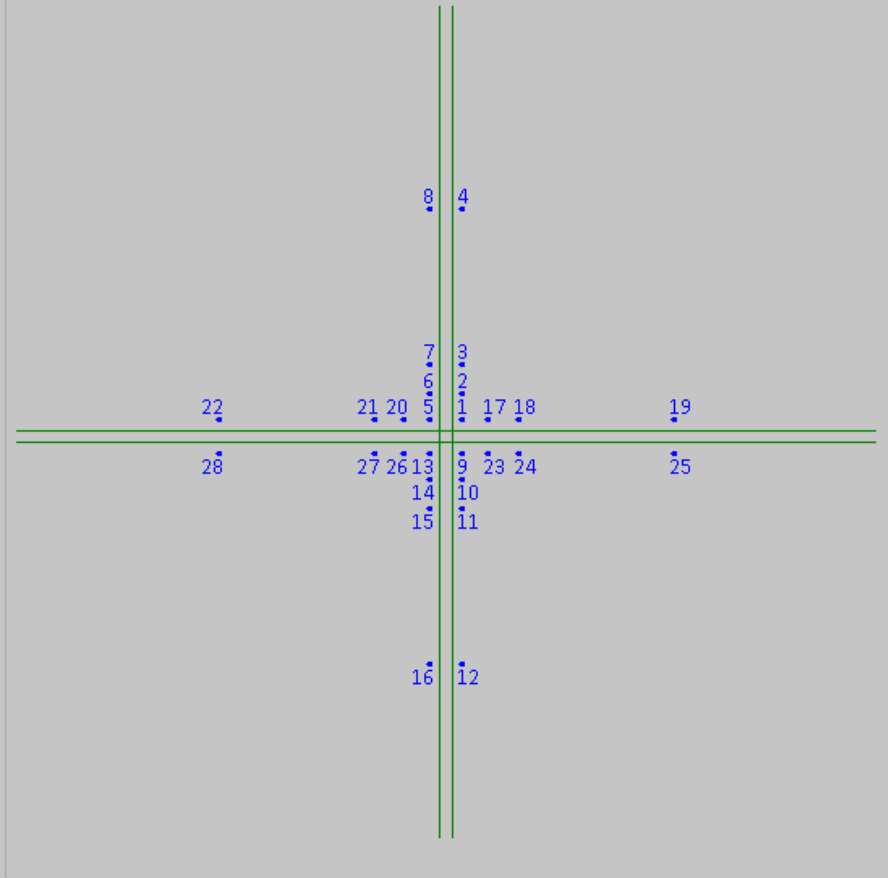
Add Travel Lanes Total Number of Lanes

Northbound/Southbound  [Refine the Receptor / Highway Layout](#)

Eastbound/Westbound

T-Type Intersection  Add Traffic Signal [Change the Traffic Signal Data](#)

Receptor / Highway Layout Map (feet)



STATUS: CAL3QHCR EPA Default Receptors = 28 Links - Free-Flow = 8; Queue = 0 Met - Fixed Dir = 0; Vary Dir = 0

# Data Forms

Data entered via forms organized by:

1. Program control
2. Receptors
3. Highway links
4. Meteorology

**Application Description**

Job: Metro Transit Facility  
Run: Northside Interchange Access

**Model Selection**

CALINE3     CAL3QHC     CAL3QHCR

**Screening Level**

User Enters All Data     EPA Default Data Values     Tier I Approach  
 Tier II Approach

**Input / Output Control**

Length Units of Input Data:  Feet     Meters  
 Specify the Scale Conversion Factor to Meters:

Length Units in Output:  Feet     Meters

Model Output Options:  Link Contributions     Add Background

Pollutant (Concentration Units): PM-2.5 (ug/m3)

**Generate a Simplified Receptor / Highway Layout for Screening - Optional**

Add Travel Lanes    Total Number of Lanes

Northbound/Southbound      
 Eastbound/Westbound   

T-Type Intersection     Add Traffic Signal

[Refine the Receptor / Highway Layout](#)  
[Change the Traffic Signal Data](#)

**Application Description**

Job: Metro Transit Facility  
Run: Northside Interchange Access

**Edit Data for an Existing Receptor Location (1 of 28)**

Record View     Grid View

Receptor Name:	N Leg, E Side-Corner
X Coordinate (feet):	46.0
Y Coordinate (feet):	46.0
Receptor Height (feet):	5.9

Go To:  1 of 28

**Application Description**

Job: Metro Transit Facility  
Run: Northside Interchange Access

**Edit Data for an Existing Link Configuration (1 of 8)**

Traffic Flow:	1 - Free Flow Link
Link Description:	N Leg App - FreeFlow
Link Type:	AG - At Grade
X Coordinate of Endpt 1 (feet):	-18
Y Coordinate of Endpt 1 (feet):	0
X Coordinate of Endpt 2 (feet):	-18
Y Coordinate of Endpt 2 (feet):	1200
Traffic Volume (vph):	6600
EFL - Emission Factor (g/VMT):	
Source Height (feet):	0.0
Mixing Zone Width (feet):	55.7

Go To:  1 of 8

**Application Description**

Job: Metro Transit Facility  
Run: North Interchange Access

**Edit Data for an Existing Meteorological Condition (1 of 1)**

Averaging Time (min):	60.
Surface Roughness (cm):	108 - Single Family Residential
Settling Velocity (cm/s):	0.0
Deposition Velocity (cm/s):	0.0
Background Concentration (ug/m3):	0.0
Land Use Type:	<input checked="" type="radio"/> Rural <input type="radio"/> Urban
Filename of Meteorological Data:	MetroMet.asc
Surface Station No.   Year (yy):	99999   99
Upper Air Station No.   Year (yy):	99999   99
Process Start (mm dd)   End (mm dd):	01 99   12 99

Wind Speed (m/s):	3.1
Wind Direction (degrees from North):	187
Atmospheric Stability Class:	4 - D (Neutral)
Mixing Height (m):	352

Go To:  1 of 1

## Extended Functionality

### Offers two screening options:

- User enters all data required
- Interface supplies EPA-recommended default data values

### Incorporates a utility for generating a receptor / highway layout, allowing changes to:

- Default configuration data
- Default signal data

### Conducts data quality assurance/quality control checks

- Missing data
- Valid number verification
- Out of range values

## Extended Functionality

### **Substantially increases the capacity for receptor and link analysis**

- 100 receptors / 1200 links
  - Up from 20 receptors / 20 links for CALINE3
  - Up from 60 receptors / 120 links for CAL3QHC
  - Up from 60 receptors / 120 links for CAL3QHCR

### **Provides screening results for multiple averaging times, i.e.,**

- 1-hour and 8-hour CO concentrations
- 1-hour, 24-hour, and annual PM concentrations

# Windows® Operation

## 1. Program execution

## 2. Displaying results

- Summary table
- Bar chart
- Model printout

## 3. Data file operations

- Open and save data files
- Import receptor data, link data, and/or meteorological data
- Save results table and/or model output
- Print data forms, data files, summary table, bar chart, and model output

# Program Control

## Application Description

## Model Selection

## Screening Level

- Tier approach

## Input / Output Control

## Generate a Simplified Receptor / Highway Layout for Screening

**Application Description**

Job: Metro Transit Facility  
Run: Northside Interchange Access

**Model Selection**

CALINE3       CAL3QHC       CAL3QHCR

**Screening Level**

User Enters All Data       EPA Default Data Values       Tier I Approach  
 Tier II Approach

**Input / Output Control**

Length Units of Input Data:  Feet       Meters  
 Specify the Scale Conversion Factor to Meters:

Length Units in Output:  Feet       Meters

Model Output Options:  Link Contributions       Add Background

Pollutant (Concentration Units): PM-2.5 (ug/m3)

**Generate a Simplified Receptor / Highway Layout for Screening - Optional**

Add Travel Lanes      Total Number of Lanes

Northbound/Southbound     

Eastbound/Westbound     

T-Type Intersection

Add Traffic Signal

[Refine the Receptor / Highway Layout](#)

[Change the Traffic Signal Data](#)

# Refine the Receptor / Highway Layout

**Refine the Receptor / Highway Layout | CAL3Interface**

Northbound / Southbound Travel Lanes

	Northbound	Southbound
Number of Lanes:	3	3
Approach Traffic Volume (vph):	6600	6600
Departure Traffic Volume (vph):	6600	6600
Width per Lane (feet):	12.0	12.0
Right-of-Way Distance from Road Edge	10.0	10.0
Approach Segment Length (feet):	1200.0	1200.0
Approach Segment Median Width (feet):	0.0	0.0
Approach Segment Alignment wrt N/S (deg):	0	-15
Option - Free-Flow Emission Factor (g/VMT):	1	1

Eastbound / Westbound Travel Lanes

	Eastbound	Westbound
Number of Lanes:	3	3
Approach Traffic Volume (vph):	6600	6600
Departure Traffic Volume (vph):	6600	6600
Width per Lane (feet):	12.0	12.0
Right-of-Way Distance from Road Edge	10.0	10.0
Approach Segment Length (feet):	1200.0	1200.0
Approach Segment Median Width (feet):	0.0	0.0
Approach Segment Alignment wrt E/W (deg):	0	0
Option - Free-Flow Emission Factor (g/VMT):	1	1

Control | CAL3Interface

Receptor / Highway Layout Map (feet)

Flow = 8; Queue = 0; Met - Fixed Dir = 0; Vary Dir = 0

# Change the Traffic Signal Data

STEP 1: Enter / Edit Program Control | CAL3Interface

File Edit View Help

Application Description

Job: Metro Transit Facility  
Run: Northside Interchange Access

Change the Traffic Signal Data | CAL3Interface

Northbound / Southbound Travel Lanes

	Northbound	Southbound
Avg. Total Cycle Length (s):	120	120
Avg. Red Cycle Length (s):	62	62
Clearance Lost Time (s):	2	2
Saturation Flow Rate (vphpl):	1600	1600
Signal Type:	1 - Pretimed	1 - Pretimed
Arrival Rate:	3 - Average	3 - Average

Eastbound / Westbound Travel Lanes

	Eastbound	Westbound
Avg. Total Signal Cycle	120	120
Avg. Red Cycle Length (s):	62	62
Clearance Lost Time (s):	2	2
Saturation Flow Rate (vphpl):	1600	1600
Signal Type:	1 - Pretimed	1 - Pretimed
Arrival Rate:	3 - Average	3 - Average

OK Cancel Apply

Receptor / Highway Layout Map (feet)

low = 8; Queue = 4; Met - Fixed Dir = 0; Vary Dir = 0

# Receptors

## Data Record View

## Data Grid View

## Controls Provided for Navigating through Records







### Application Description

Job	Metro Transit Facility
Run	Northside Interchange Access

### Edit Data for an Existing Receptor Location (1 of 28)

Record View  Grid View

Receptor Name:	N Leg, E Side-Corner
X Coordinate (feet):	46.0
Y Coordinate (feet):	46.0
Receptor Height (feet):	5.9

Go To:    1 of 28    

# Receptors

## Data Record View

## Data Grid View

## Controls Provided for Navigating through Records

**Application Description**

Job: Metro Transit Facility  
Run: Northside Interchange Access

Enter Data for a New Receptor Location (1 of 1)

Record View  Grid View

RCP - Receptor Name	XR (ft)	YR (ft)	ZR (ft)
N Leg, E Side-Corner	46.0	46.0	5.9
N Leg, E Side - 25 m	46.0	118.0	5.9
N Leg, E Side - 50 m	46.0	200.0	5.9
N Leg, E Side-Midblk	46.0	636.0	5.9
N Leg, W Side-Corner	-46.0	46.0	5.9
N Leg, W Side - 25 m	-46.0	118.0	5.9
N Leg, W Side - 50 m	-46.0	200.0	5.9
N Leg, W Side-Midblk	-46.0	636.0	5.9
S Leg, E Side-Corner	46.0	-46.0	5.9
S Leg, E Side - 25 m	46.0	-118.0	5.9
S Leg, E Side - 50 m	46.0	-200.0	5.9
S Leg, E Side-Midblk	46.0	-636.0	5.9
S Leg, W Side-Corner	-46.0	-46.0	5.9
S Leg, W Side - 25 m	-46.0	-118.0	5.9
S Leg, W Side - 50 m	-46.0	-200.0	5.9
S Leg, W Side-Midblk	-46.0	-636.0	5.9

Go To:  1 of 1

# Receptors

## Error tests are conducted to check for:

- Missing data fields,
- Invalid numbers, or
- Out of range values

STEP 2: Enter / Edit Receptor

File Edit View Help

Application Description

Job Merto Transit Facility


Run Northside Interchange Access

Edit Data for an Existing Receptor Location (1 of 28)







Record View  Grid View

Receptor Name:	N Leg, E Side-Corner
X Coordinate (feet):	46.0
Y Coordinate (feet):	46.0
Receptor Height (feet):	5.9

**INPUT ERROR**

 The Receptor Y-Coordinate (YR) Entered is Not a Valid Number - Check Input

OK

Go To:    1 of 28    

STATUS: CAL3QHCR EPA Default Receptors = 28 Links - Free-F

# Highway Links – Tier I

Data Record View

Data Grid View

Controls Provided for  
Navigating through  
Records

## Application Description

Job	Metro Transit Facility
Run	Northside Interchange Access

## Edit Data for an Existing Link Configuration (1 of 8)

Traffic Flow:	1 - Free Flow Link
Link Description:	N Leg App - FreeFlow
Link Type:	AG - At Grade
X Coordinate of Endpt 1 (feet):	-18
Y Coordinate of Endpt 1 (feet):	0
X Coordinate of Endpt 2 (feet):	-18
Y Coordinate of Endpt 2 (feet):	1200
Traffic Volume (vph):	6600
Emission Factor (g/VMT):	
Source Height (feet):	0.0
Mixing Zone Width (feet):	55.7

# Highway Links – Tier II

## Data Record View

## Data Grid View







## Controls Provided for Navigating through Records

### Application Description

Job	Metro Transit Facility
Run	Northside Interchange Access

### Enter Data for a New Link Configuration (1 of 1)

Static Parameters		Hourly Parameters	
Traffic Flow:	1 - Free Flow Link		
Link Description:	N Leg App - FreeFlow		
Link Type:	AG - At Grade		
X Coordinate of Endpt 1 (feet):	-18		
Y Coordinate of Endpt 1 (feet):	0		
X Coordinate of Endpt 2 (feet):	-18		
Y Coordinate of Endpt 2 (feet):	1200		
Source Height (feet):	0.0		
Mixing Zone Width (feet):	55.7		

Go To:    1 of 1    

# Highway Links – Tier II

## Data Record View

## Data Grid View

## Controls Provided for Navigating through Records

Application Description

Job: Metro Transit Facility  
Run: Northside Interchange Access

Enter Data for a New Link Configuration (1 of 1)

Static Parameters | Hourly Parameters | Emission Factors (g/VMT) ▾

Hour	Day1	Day2	Day3	Day4	Day5	Day6	Day7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Go To:  [Navigation icons: Home, Left, 1 of 1, Right, End, Refresh, Close]

# Meteorology

## Data Record View

## Data Grid View

## Access to CAL3QHCR Meteorological Data File

## Controls Provided for Navigating through Records

### Application Description

Job	Metro Transit Facility
Run	North Interchange Access

[Edit Data for an Existing Meteorological Condition \(1 of 1\)](#)

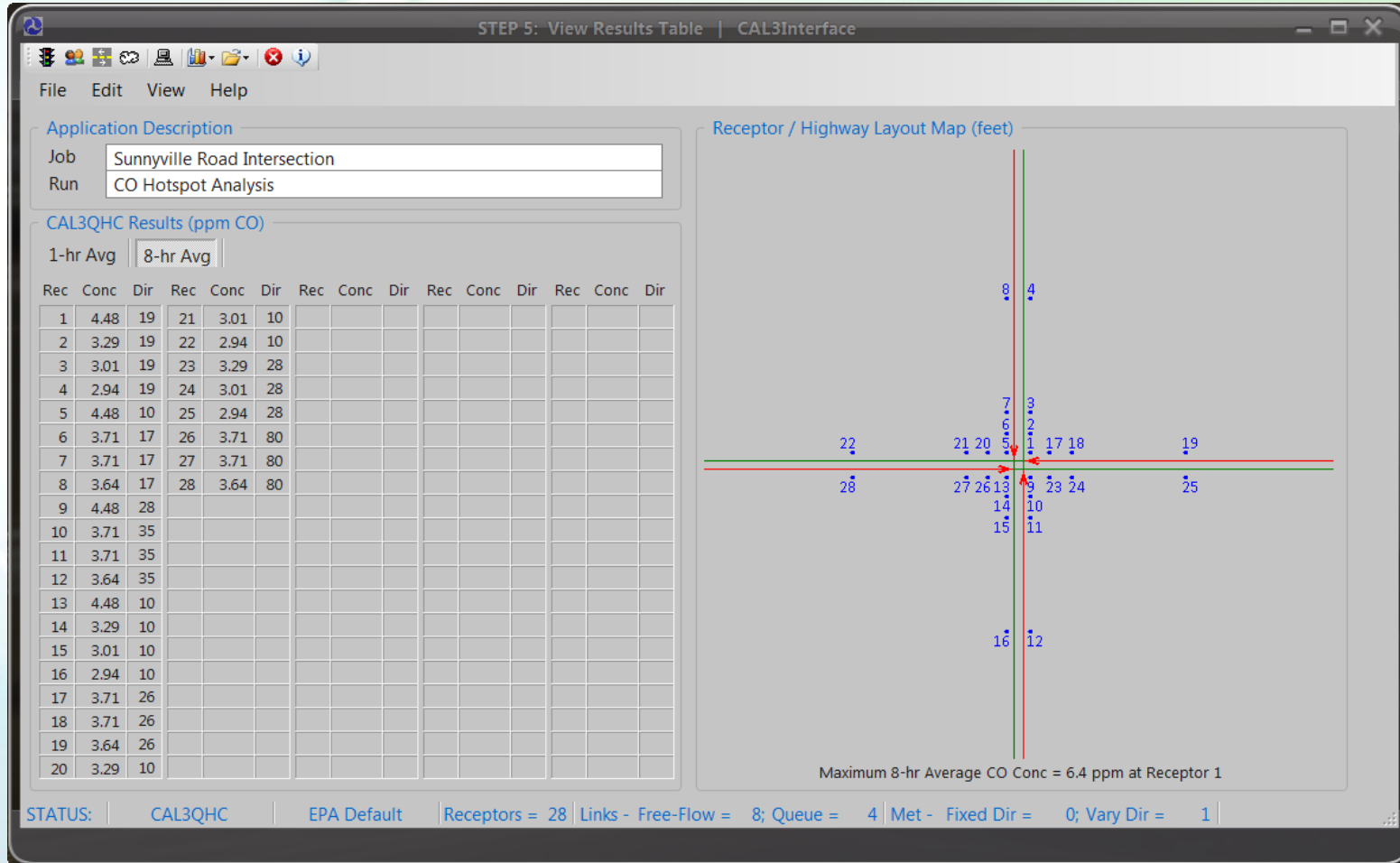
Averaging Time (min):	60.
Surface Roughness (cm):	108 - Single Family Residential ▾
Settling Velocity (cm/s):	0.0
Deposition Velocity (cm/s):	0.0
Background Concentration (ug/m3):	0.0
Land Use Type:	<input checked="" type="radio"/> Rural <input type="radio"/> Urban
Filename of Meteorological Data:	MetroMet.asc
Surface Station No.   Year (yy):	99999   99
Upper Air Station No.   Year (yy):	99999   99
Process Start (mm dd)   End (mm dd):	01 99   12 99

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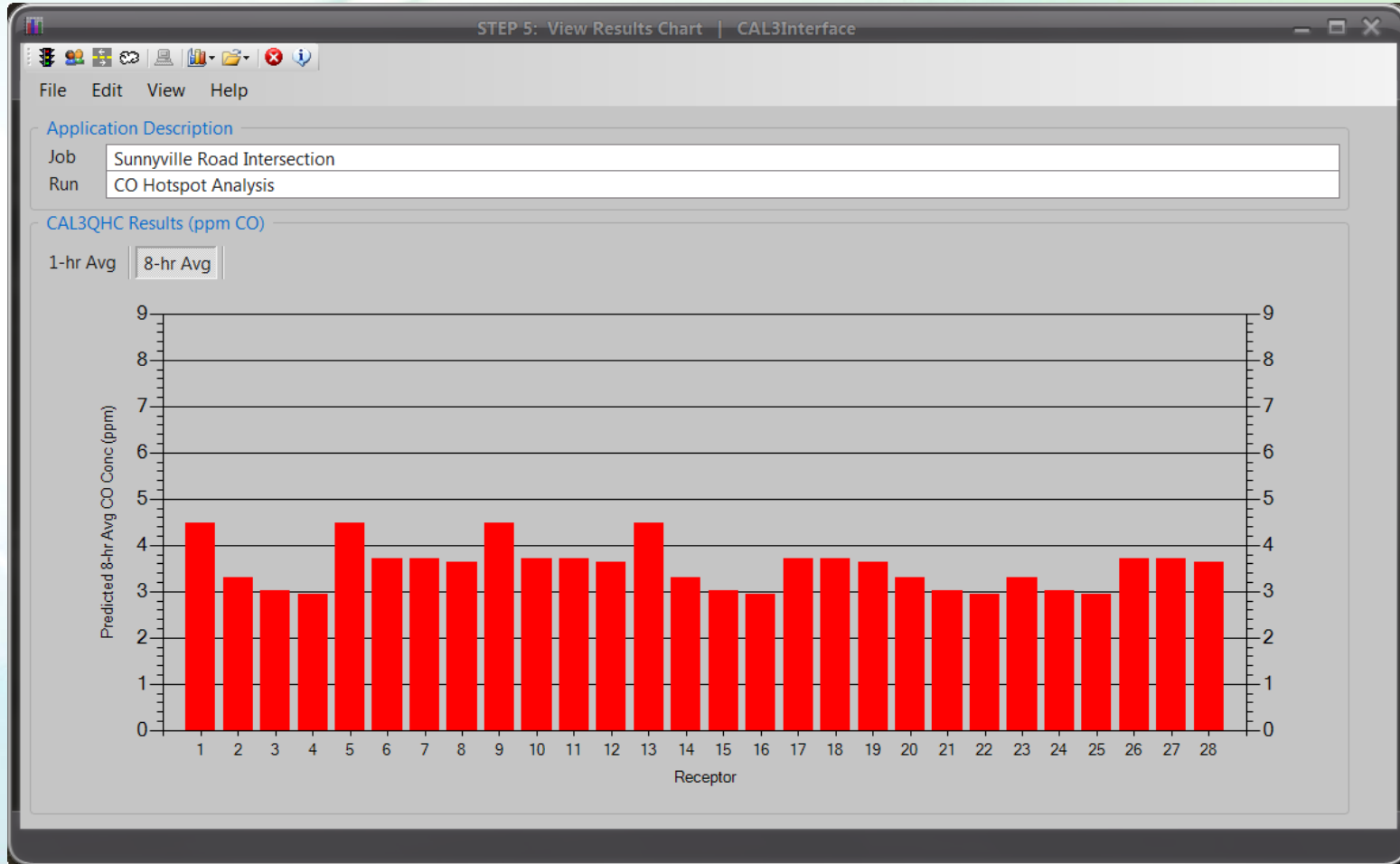
Wind Speed (m/s):	3.1
Wind Direction (degrees from North):	187
Atmospheric Stability Class:	4 - D (Neutral) ▾
Mixing Height (m):	352

Go To: 
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1 of 1
▶ ⏪
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# Model Results – Summary Table



# Model Results – Chart



# Model Results – Output

STEP 5: View Model Printout | CAL3Interface

File Edit View Help

Application Description

Job: EXAMPLE OF PM-10 ROADWAY HOT SPOT

Run: MAIN ST. BETWEEN DISTANT INTERSECTIONS

CAL3QHCR Results (ug/m3 PM10)

CAL3QHCR (Dated: 04181)

DATE : 7/ 1/ 4  
TIME : 14:36:29

PAGE: 1

JOB: EXAMPLE OF PM-10 ROADWAY HOT SPOT  
RUN: MAIN ST. BETWEEN DISTANT INTERSECTIONS

=====  
General Information  
=====

Run start date: 1/ 1/64 Julian: 1  
end date: 12/31/64 Julian: 366

A Tier 1 approach was used for input data preparation.  
The MODE flag has been set to p for calculating PM averages.  
Ambient background concentrations are included in the averages below.

Site & Meteorological Constants

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VS = 0.0 CM/S VD = 0.0 CM/S ZO = 175. CM ATIM = 60.

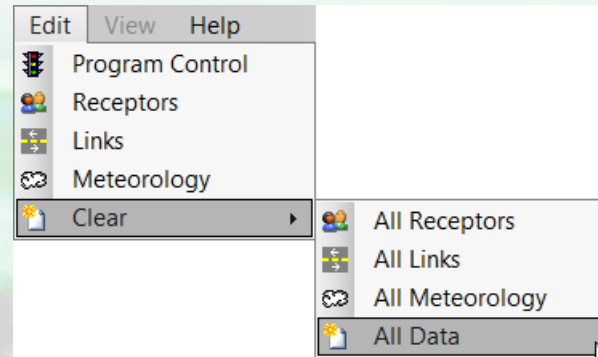
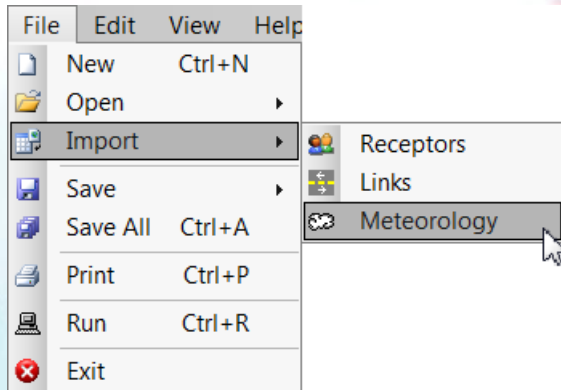
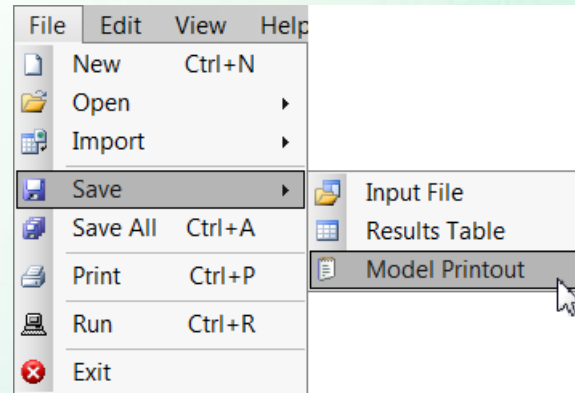
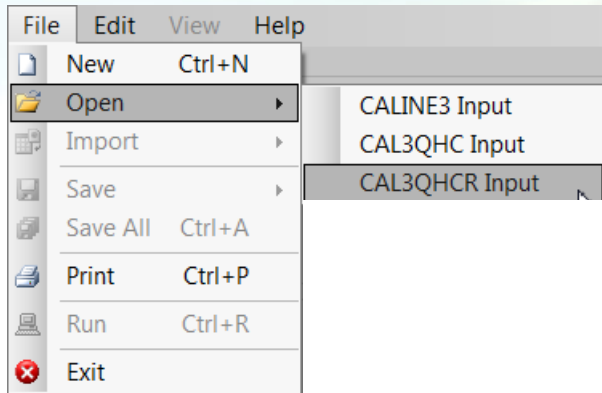
Met. sfc. Sta. Id & Yr = 94823 64  
Upper Air Sta. Id & Yr = 94823 64

Urban mixing heights were processed.  
In 1964, Julian day 1 is a wednesday.

Link Data Constants - (Variable data in \*.LNK file)

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# File Operations



## Contact Information

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