PM Hot-spot Course Handout Packet
(Revised November 2013)

Agenda
Completing Quantitative Hot-Spot Analyses: 3-Day Course

-- Day One --

8:00 – 8:30	**Course Introduction/Logistics**
8:30 – 9:45	**Module 1. General Requirements and Analysis Overview**
9:45 – 10:00	Break
10:00 – 12:00	**Module 2. Using MOVES at the Project Level**
12:00 – 1:00	Lunch
1:00 – 3:00	**Module 2. Using MOVES at the Project Level (cont'd) (Including mini-MOVES run)**
3:00 – 3:15	Break
3:15 – 5:00	**Module 2: Using MOVES in the Example Analysis**

-- Day Two --

8:00 – 9:45	**Module 3. Selecting an Air Quality Model, Data Inputs, and Receptors**
9:45 – 10:00	Break
10:00 – 12:00	**Module 4. Using AERMOD for PM Hot-Spot Analyses**
12:00 – 1:00	Lunch
1:00 – 3:00	**Module 4. Using AERMOD for PM Hot-Spot Analyses (cont'd) (Including mini-AERMOD run)**
3:00 – 3:15	Break
3:15 – 5:00	**Module 4. Using AERMOD in the Example Analysis**

-- Day Three --

8:00 – 10:00	**Module 5. Using CAL3QHCR for PM Hot-Spot Analyses**
10:00 – 10:15	Break
10:15 – 12:00	**Module 5. Using CAL3QHCR for PM Hot-Spot Analyses (cont'd) (Including CAL3QHCR mini-exercise and Example Analysis)**
12:00 – 1:00	Lunch
1:00 – 1:45	**Module 6. Determining Background Concentrations**
1:45 – 3:00	**Module 7. Calculating Design Values (DVs) and Determining Conformity**
3:00 – 3:15	Break
3:15 – 5:00	**Module 7. Calculating Design Values and Determining Conformity (cont'd) (Including DV calculations for Example Analysis)**

Acronym List

AADT	annual average daily traffic
ADT	average daily traffic
AERMOD	American Meteorological Society/EPA Regulatory MODel
AQ	air quality
AVFT	Alternative Vehicle Fuels and Technologies (a MOVES panel)
CAA	Clean Air Act
CFR	Code of Federal Regulations
CNG	compressed natural gas
CO	carbon monoxide
CTM	chemical transport model
DOT	U.S. Department of Transportation
DV	design value
EF	emission factor
EMFAC	EMission FACtors model (California)
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HCM	Highway Capacity Manual
HD	heavy duty
HOV	high-occupancy vehicle
HPMS	Highway Performance Monitoring System
I/M	inspection and maintenance
LD	light duty
LDV	light duty vehicle
LOS	level of service
MATS	Modeled Attainment Test Software (EPA)
MOVES	MOtor Vehicle Emission Simulator
MPO	metropolitan planning organization
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NWS	National Weather Service
OAQPS	Office of Air Quality Planning and Standards (EPA)
OTAQ	Office of Transportation and Air Quality (EPA)
PDM	Project Data Manager (a MOVES function)
PM	particulate matter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
RFS	Renewable Fuel Standard
RVP	Reid Vapor Pressure
SCRAM	Support Center for Regulatory Atmospheric Modeling (EPA)
SIP	state (air quality) implementation plan
TMIP	Travel Model Improvement Program
V/C ratio	volume/capacity ratio
VHT	vehicle hours traveled
VPH	vehicles per hour
VMT	vehicle miles traveled
VSP	vehicle specific power

What year or years might be analyzed in a hot-spot analysis?

Assumptions for Exercises

- All three cases are projects of local air quality concern
- Cases are illustrative only
- Cases do not include additional information about project or interagency consultation that would be used in an actual PM hot-spot analysis

Guidance Recap (Guidance reference: Section 2.8)

Need to choose an analysis year or years within the transportation plan during when:

- Peak emissions from the project are expected
- A new or worsened violation would most likely occur due to cumulative impacts of project and background concentrations

Need to consider the following factors:

- Changes in vehicle fleets
- Changes in traffic volumes, speeds, and VMT
- Expected trends in background concentrations in the project area and the impacts of any nearby sources (e.g., those affected by the project)

Case 1: New Interchange

- A new interchange connecting a 4-lane principle arterial with a 6-lane freeway through entrance/exit ramps to provide truck access to local warehouses and other business
- Project will be completed October 2015
- Distribution centers and warehouses will be locating on the arterial and in place by 2017
- Air quality in the area has been improving
- No nearby sources need to be included in air quality modeling

What factors influence the analysis year(s)?

What are potential analysis year(s)?

Case 2: Highway Expansion

- An existing 4-lane arterial (2 lanes in each direction) is to be expanded to 8 lanes (4 each direction) from its end point at a shipping port to an interstate a few miles away
- Purpose is to accommodate a 50% increase in truck round trips to the port projected to result from increased future activity at the port
- Project will be completed October 2015
- Port authority's financial forecasts show the port's volume will continue to rise until the 4th quarter of 2020
- Truck traffic anticipated to rise to keep pace with increasing port activity

What factors influence the analysis year(s)?

What are potential analysis year(s)?

Case 3: New Bus Terminal

- A new bus terminal is planned that will be approved now and built in two phases:
- Phase I will be completed September 2016 and will comprise the terminal building and be able to accommodate 50 buses at one time
- Phase II will be completed in June 2018 and include another 50 bus bays
- Terminal will operate from 6 am to 10 pm and will generate 2 bus trips per hour per bay
- Transit operator will initially operate terminal with existing diesel buses
- Has committed to replace diesels with CNG buses beginning 2020 – Will replace 10 per year
- Area missed its 2010 attainment date; has been given extension to 2015

What factors influence the analysis year(s)?

What are potential analysis year(s)?

MOVES "Decoder"

(From MOVES User Guide, Appendix J)

MOVES "Decoder"

SourceType	
sourcetypeid	sourcetypename
11	Motorcycle
21	Passenger Car
31	Passenger Truck
32	Light Commercial Truck
41	Intercity Bus
42	Transit Bus
43	School Bus
51	Refuse Truck
52	Single Unit Short-haul Truck
53	Single Unit Long-haul Truck
54	Motor Home
61	Combination Short-haul Truck
62	Combination Long-haul Truck

Process	
processid	processName
1	Running Exhaust
2	Start Exhaust
9	Brakewear
10	Tirewear
11	Evap Permeation
12	Evap Fuel Vapor Venting
13	Evap Fuel Leaks
15	Crankcase Running Exhaust
16	Crankcase Start Exhaust
17	Crankcase Extended Idle Exhaust
18	Refueling Displacement Vapor Loss
19	Refueling Spillage Loss
90	Extended Idle Exhaust

Pollutant	
pollutantid	pollutantname
1	Total Gaseous Hydrocarbons
2	Carbon Monoxide (CO)
3	Oxides of Nitrogen
5	Methane (CH4)
6	Nitrous Oxide (N2O)
20	Benzene
21	Ethanol
22	MTBE
23	Naphthalene
24	1,3-Butadiene
25	Formaldehyde
26	Acetaldehyde
27	Acrolein
30	Ammonia (NH3)
31	Sulfur Dioxide (SO2)
32	Nitrogen Oxide
33	Nitrogen Dioxide
79	Non-Methane Hydrocarbons
80	Non-Methane Organic Gases
86	Total Organic Gases
87	Volatile Organic Compounds
90	Atmospheric CO2
91	Total Energy Consumption
92	Petroleum Energy Consumption
93	Fossil Fuel Energy Consumption
98	CO2 Equivalent
100	Primary Exhaust PM10 - Total
101	Primary PM10 - Organic Carbon
102	Primary PM10 - Elemental Carbon
105	Primary PM10 - Sulfate Particulate
106	Primary PM10 - Brakewear Particulate
107	Primary PM10 - Tirewear Particulate
110	Primary Exhaust PM2.5 - Total
111	Primary PM2.5 - Organic Carbon
112	Primary PM2.5 - Elemental Carbon
115	Primary PM2.5 - Sulfate Particulate
116	Primary PM2.5 - Brakewear Particulate
117	Primary PM2.5 - Tirewear Particulate

Day	
dayID	dayName
2	Weekend
5	Weekdays

Road Type	
roadtypeid	roaddesc
1	Off-Network
2	Rural Restricted Access
3	Rural Unrestricted Access
4	Urban Restricted Access
5	Urban Unrestricted Access

FuelType	
fuelTypeID	fuelTypeDesc
1	Gasoline
2	Diesel Fuel
3	Compressed Natural Gas
9	Electricity

Activity		
activityTypeID	activityType	activityTypeDesc
1	distance	Distance traveled
2	sourcehours	Source Hours
3	extidle	Extended Idle Hours
4	sho	Source Hours Operating
5	shp	Source Hours Parked
6	population	Population
7	starts	Starts

SCCV Type		
SCCVtypeID	PART5SCCV typeDesc	MOBILE6SCCVtypeDesc
1	LDGV	1, 'LDGV', 'Light Duty Gasoline Vehicles (LDGV)'
2	LDGT1	Light Duty Gasoline Trucks 1 & 2
3	LDGT2	Light Duty Gasoline Trucks 3 and 4
4	HDGV	Heavy Duty Gasoline Vehicles 2B thru 8B and Gasoline Buses
5	MC	Motorcycles (MC)
6	LDDV	Light Duty Diesel Vehicles (LDDV)
7	LDDT	Light Duty Diesel Trucks 1 thru 4 (LDDT)
8	2BHDDV	Heavy Duty Diesel Vehicles (HDDV) Class 2B
9	LHDDV	Heavy Duty Diesel Vehicles (HDDV) Class 3, 4, and 5
10	MHDDV	Heavy Duty Diesel Vehicles (HDDV) Class 6 and 7
11	HHDDV	Heavy Duty Diesel Vehicles (HDDV) Class 8A and 8B
12	BUSES	Heavy Duty Diesel Buses (School and Transit)

MOVES Retrofit Parameter Abbreviations

(From MOVES User Guide, Appendix D)

Table D-1
Retrofit Parameter File Pollutants

PollutantID	Full MOVES Pollutant Name	Pollutant Abbreviation
1	Total Gaseous Hydrocarbons	HC
2	Carbon Monoxide (CO)	CO
3	Oxides of Nitrogen	NO_X
5	Methane (CH_4)	CH_4
6	Nitrous Oxide (N_2O)	N_2O
90	Atmospheric CO_2	AT CO_2
91	Total Energy Consumption	TotEnergy
92	Petroleum Energy Consumption	PetEnergy
93	Fossil Fuel Energy Consumption	FossilEnergy
98	CO_2 Equivalent	CO2EQ
101	Primary PM10 - Organic Carbon	PM10OC
102	Primary PM10 - Elemental Carbon	PM10EC
105	Primary PM10 - Sulfate Particulate	PM10Sulfate
106	Primary PM10 - Brakewear Particulate	PM10Brake
107	Primary PM10 - Tirewear Particulate	PM10Tire
111	Primary PM2.5 - Organic Carbon	PM25OC
112	Primary PM2.5 - Elemental Carbon	PM25EC
115	Primary PM2.5 - Sulfate Particulate	PM25Sulfate
116	Primary PM2.5 - Brakewear Particulate	PM25Brake
117	Primary PM2.5 - Tirewear Particulate	PM25Tire

Table D-2
Retrofit Parameter File Processes

ProcessID	Full MOVES Process Name	Process Abbreviation
1	Running Exhaust	Running
2	Start Exhaust	Start
90	Extended Idle Exhaust	Extended Idle
9	Brakewear	Brake
10	Tirewear	Tire

Table D-3
Retrofit Parameter File Fuel Types

FuelTypeID	Full MOVES Fuel Type Name	Fuel Type Abbreviation
1	Gasoline	Gas
2	Diesel Fuel	Diesel
5	Ethanol (E85)	Ethanol

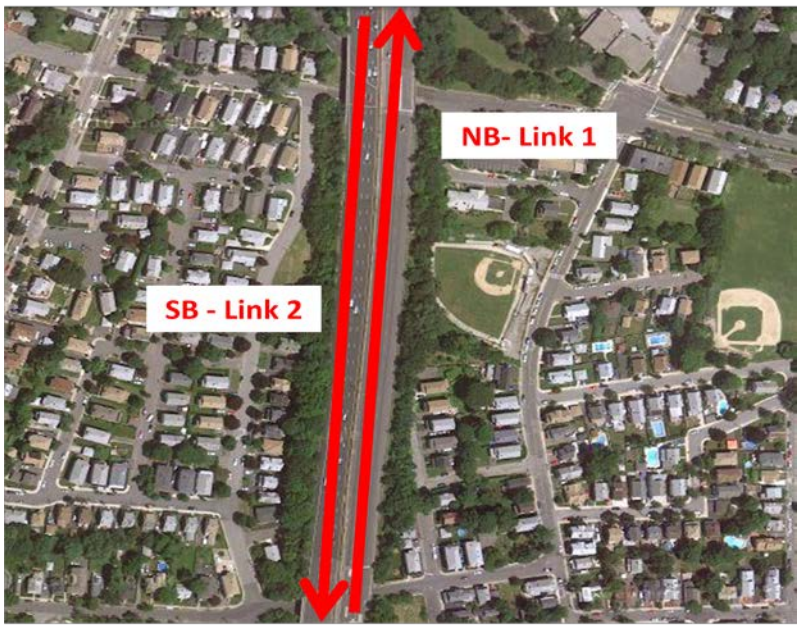
Table D-4
Retrofit Parameter File Source Types

SourceTypeID	Full MOVES Vehicle SourceType Name	SourceType Abbreviation
11	Motorcycle*	MC
21	Passenger Car*	Car
31	Passenger Truck*	PTruck
32	Light Commercial Truck	ComTruck
51	Refuse Truck	RefuseTruck
52	Single Unit Short-Haul Truck	SUShortTruck
53	Single Unit Long-Haul Truck	SULongTruck
54	Motor Home	MH
43	School Bus	SBus
42	Transit Bus	TBus
41	Intercity Bus	IBus
61	Combination Short-haul Truck	CShortTruck
62	Combination Long-haul Truck	CLongTruck

* These sourcetypes should not be used in retrofit input files.

A Simple, Hypothetical PM_{10} MOVES Highway-only Analysis

Project consists of a two-lane highway in Washtenaw County, Michigan
Analysis period is July 2011, and the hour to be modeled is 12 a.m.- 1 a.m.



Two links, both with 0° grade:

- Northbound – Link 1
  - 1.25 miles in length
  - 765 vehicles in analysis hour
  - 62.5 mph average speed
  - 95% gasoline passenger cars, 5% diesel combination long-haul trucks
- Southbound – Link 2
  - 1.25 miles in length
  - 690 vehicles in analysis hour
  - 61.0 mph average speed
  - 95% gasoline passenger cars, 5% diesel combination long-haul trucks

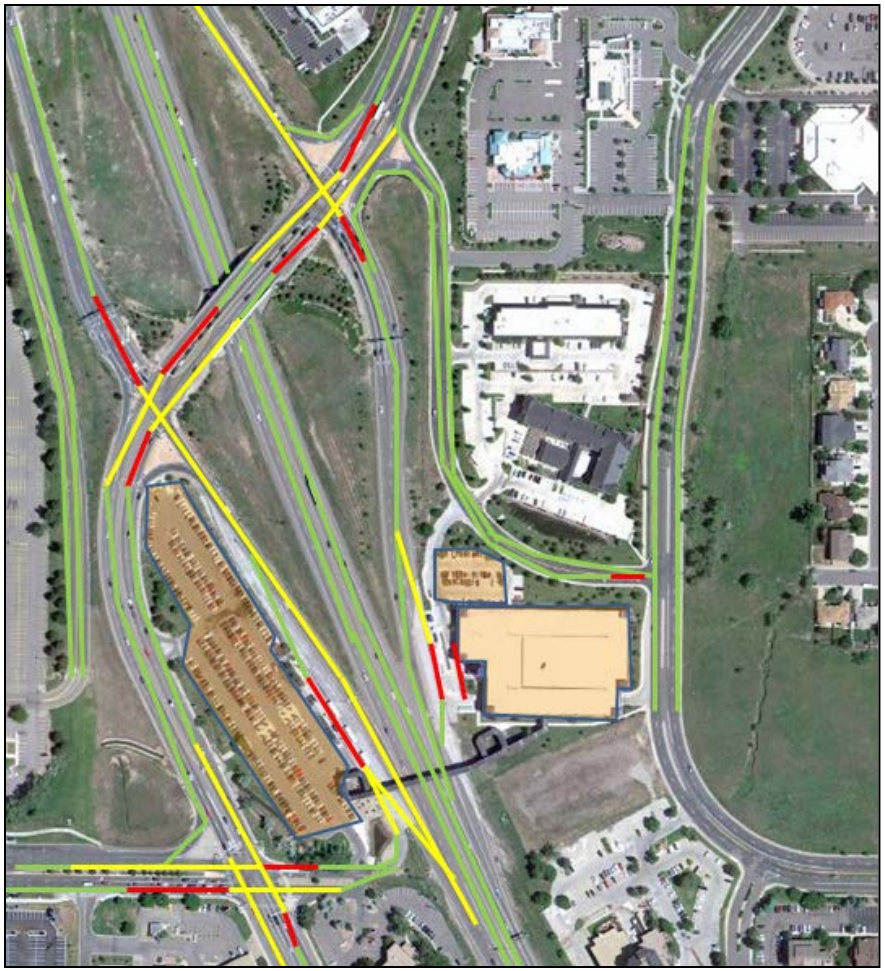
- Road type is urban restricted.
- Only gasoline passenger cars and diesel combination long-haul trucks travel on this highway at this hour.
- Half of the cars and half of the trucks are less than one year old; the other half of the cars and trucks are between one and two years old.
- Average temperature for this hour is 78°F, relative humidity is 65%

Example Analysis Details

- The project is a lane expansion of the existing highway and the addition of an interchange (on/off ramps) to access two new park-and-ride lot and bus terminals
- MOVES will be run to generate emission rates
- The air quality analysis for the project will be done with AERMOD
- Location: Washtenaw County, MI
- The project is expected to be completed in 2019
  - Year of expected peak emissions (analysis year): 2020
- Determined through interagency consultation to be a project of local air quality concern
- The area surrounding the project is primarily residential and commercial, with no nearby sources that need to be included in modeling

Revised 3/22/2012

MOVES Links and AERMOD Sources



Revised 7/7/2011

MySQL Query Browser Commands
A Tip Sheet for MOVES Users

Command	Basic Function	Example
SELECT	Selects one or more data fields, separated by commas. A "*" following the SELECT command indicates "all fields"	SELECT sourcetypeID, activity
SUM	Adds up the data in the field indicated in parentheses and creates a new field for the results (note required spacing)	SUM(activity)
AS	Used with the SUM command to name the new field containing the results of the SUM command (optional).	AS grams
FROM	Indicates the database and table the SELECT command is pulling from. Database and table must be separated by period.	FROM 'Lake_2010_out'. 'movesoutput'
WHERE	Used to specify the value(s) of the field to be selected	WHERE sourcetypeID=21
AND	Used to specify more than one field when using the WHERE command	WHERE sourcetypeID=21 AND dayid=2
GROUP BY	Groups data together by the field indicated	GROUP BY movesrunid
ORDER BY	Specifies the order of data presented in the field(s) following the command (e.g., will rank data high to low).	ORDER BY pollutantid

Tips:

- Commands must be used in the order given above. Not all commands are needed to complete a query.
- Commas can be used to separate multiple fields following a command
- Comma must follow selected fields when using SUM command (see examples)
- AS command is useful to name a new fields created with the SUM command
- See Appendix H of MOVES User Manual for more details

Examples of Simple Queries:

```
SELECT * FROM 'Lake_2010_out'.'movesactivityoutput'
```

- Selects all fields from the movesactivityoutput table of the Lake_2010_out database. (This is the same query executed when the table is selected and dragged into the data area of the query browser.)

```
SELECT *, SUM(emissionQuant) FROM `county_training_out`.`movesoutput`
Group by movesrunid
```

- Selects all fields from the movesoutput table and adds up the emissionQuant field across all source types, pollutant types, etc. Groups the results by movesrunid.

```
SELECT movesrunid, emissionquant, SUM(emissionQuant) FROM `county_training_out`.`movesoutput`
Group by movesrunid
```

- Same result as above, but only selects two fields instead of all data.

```
SELECT movesrunid, emissionquant, SUM(emissionQuant) FROM `county_training_out`.`movesoutput`
WHERE pollutantid=1
GROUP BY movesrunid
```

- Same result as above, but only adds up emissions quantity for pollutantid 1 (total gaseous hydrocarbons)

```
SELECT movesrunid, emissionquant, processid, SUM(emissionQuant) AS grams
FROM `county_training_out`.`movesoutput` WHERE pollutantid=1 AND processid=2
GROUP BY movesrunid, processid
ORDER BY movesrunid
```

- Sums the emissions quantity in a new field named "grams" for pollutantid 1 and processid 2 (start exhaust). Groups results by movesrunid and processid and orders query results by movesrunid (run 1 will be listed in a row before run 2, etc.)

```
**To run this example input file, copy it as "AERMOD.INP" and type:
**
**    AERMOD
**
** The results for this example are found in file "ae_PMhotspot_test.out"
** In this example, an area source is illustrated, which is relevant for
** both highway and transit projects.
** This example is for illustration purposes only.  6/15/2011
**-----------------------------------------------------------------

CO STARTING
   TITLEONE  An Example Transportation Project
   MODELOPT  FLAT  CONC
   POLLUTID  PM10
   AVERTIME  24
   URBANOPT  200000
   FLAGPOLE  1.8
   RUNORNOT  RUN
CO FINISHED

**-------------------------------------

SO STARTING
   LOCATION     PROJECT   AREA    0  0  0

   SRCPARAM     PROJECT   0.00005    2      50        25        0       1

   URBANSRC  PROJECT
   SRCGROUP  ALL

SO FINISHED

**-------------------------------------

RE STARTING
RE GRIDCART INNER STA
                 XYINC -100   11    25    -100   10   25
RE GRIDCART INNER END


RE GRIDCART OUTER STA
                 XPNTS  -500   -400   -300   -200  -100 0 100 150 250 350 450 550
                 YPNTS  -500   -400   -300   -200  -100 0 100 125 225 325 425 525
RE GRIDCART OUTER END

RE FINISHED

**-------------------------------------

ME STARTING
   SURFFILE  aermet2.sfc
   PROFFILE  aermet2.pfl
   SURFDATA  14735  1988  ALBANY,NY
   UAIRDATA  14735  1988  ALBANY,NY
   SITEDATA  99999  1988  HUDSON
   PROFBASE  0.0  METERS
ME FINISHED

**-------------------------------------

OU STARTING
   RECTABLE 24 FIRST
   POSTFILE  24 ALL PLOT PROJECT_24hr.pst
OU FINISHED
```

```
**To run this example input file, copy it as "AERMOD.INP" and type:
**
**    AERMOD
**
** The results for this example are found in file "ae_PMhotspot_test.out"
** In this example, an area source is illustrated, which is relevant for
** both highway and transit projects.
** This example is for illustration purposes only.  6/15/2011
**---------------------------------------------------------------------
CO STARTING
   TITLEONE  An Example Transportation Project
   MODELOPT  FLAT  CONC
   POLLUTID  PM10
   AVERTIME  24
   URBANOPT  200000
   FLAGPOLE  1.8
   RUNORNOT  RUN
CO FINISHED
**-------------------------------------
SO STARTING
**              Srcid     Srctyp  X  Y (Z)
**              ------    ------  -- -- --
   LOCATION     PROJECT   AREA    0  0  0

** Area source parameters
** User guide:  Srcid     Aremis  Relhgt   Xinit    Yinit     Angle  Szinit
**                        g/s/m2          length-X  length-y
**              -------   ------  ------  -------   -------   -----  ------
   SRCPARAM     PROJECT   0.00005    2      50        25        0       1
   URBANSRC  PROJECT
   SRCGROUP  ALL
SO FINISHED
** Area source called "Project" is a 50 X 25 rectangle,
** With its southwest corner sitting at coordinates 0, 0 (the origin)
** Source parameters are illustrative only -- consult PM hot-spot guidance
**-------------------------------------
RE STARTING
RE GRIDCART INNER STA
** User guide:          Xinit Xnum Xdelta Yinit Ynum Ydelta
**                      ----- ---- ------ ----- ---- ------
                  XYINC -100   11    25    -100   10   25
RE GRIDCART INNER END

** "Inner" receptor grid extends 100 meters beyond the project
** in both X and Y directions, at 25 meter spacing
** Some receptors will be at locations within the source

RE GRIDCART OUTER STA
** User guide:    XPNTS Gridx1 Gridx2 Gridx3 Gridx4 ...
**                YPNTS Gridy1 Gridy2 Gridy3 Gridy4 ...
**                      ------ ------ ------ ------
                  XPNTS  -500   -400   -300   -200  -100 0 100 150 250 350 450 550
                  YPNTS  -500   -400   -300   -200  -100 0 100 125 225 325 425 525
RE GRIDCART OUTER END

** "Outer" receptor grid extends 500 meters beyond the project
** in both X & Y directions, 100 m apart (except X @ 100-150, and Y @ 100-125)
** Some receptors will be at locations within the source
RE FINISHED
**-------------------------------------
ME STARTING
   SURFFILE  aermet2.sfc
   PROFFILE  aermet2.pfl
   SURFDATA  14735  1988  ALBANY,NY
   UAIRDATA  14735  1988  ALBANY,NY
   SITEDATA  99999  1988  HUDSON
   PROFBASE  0.0  METERS
ME FINISHED
**-------------------------------------
OU STARTING
   RECTABLE 24 FIRST
** (There are only 4 days of met data in the met data file, so model cannot
** provide 6th highest concentration)
   POSTFILE  24 ALL PLOT PROJECT_24hr.pst
OU FINISHED
```

A Simple, Hypothetical PM_{10} MOVES Highway-only Analysis

CO: Control File Information

- Flat terrain is appropriate
- Concentrations are to be modeled
- Highway is located in an urban area, population 100,000

SO: Source Information

Link	Desc.	(Xs1,Ys1)	(Xs2,Ys2)	Rel Hgt (m)	Szinit	Link Length (m)	Link Width (m)	Area (m^2)
1	NB Highway	(-833.0, -284.8)	(600.8, 1097.0)	1.3	1.2	2000	3	6000
2	SB Highway	(-836.7, -288.0)	(597.1, 1106.4)	1.3	1.2	2000	3	6000

Link	Description	Area (m2)	Emission Rate (grams/hour), from MOVES Run 2	Emission Rate (grams/sec)	Emissions Rate (grams/sec/m^2)
1	NB Highway	6000	6.932517788	0.001925699	**3.2095E-07**
2	SB Highway	6000	6.383009186	0.001773058	**2.9551E-07**

RE: Receptor Information

- Copy discrete receptors from external file: “receptors.txt” in Mini-AERMOD folder, and paste them into the input file

ME: Meteorological Information

- Surface File: msn00.sfc
- Profile File: msn00.pfl
- Surface ID: 14837
- Surface year: 2000
- Upper Air Data ID: 00014898
- Upper Air Data year: 2000
- Base Elevation: 0 meters

OU: Output Information

- Define output as a RECTABLE
- 24 hour average
- 6th highest

TABLE F-1

SUMMARY OF CONTROL PATHWAY KEYWORDS AND PARAMETERS

Keyword	**Parameters**
TITLEONE	Title1
TITLETWO	Title2
MODELOPT	DFAULT BETA CONC AREADPLT FLAT NOSTD NOCHKD NOWARN SCREEN SCIM PVMRM PSDCREDIT DEPOS and/or ELEV or WARNCHKD or OLM DDEP and/or WDEP FASTALL DRYDPLT WETDPLT URBTRANS or or or FASTAREA NODRYDPLT NOWETDPLT
AVERTIME	Time1 Time2 . . . TimeN MONTH PERIOD or ANNUAL
URBANOPT	For multiple urban areas: UrbanID Urbpop (Urbname) (UrbRoughness) For single urban areas: Urbpop (Urbname) (UrbRoughness)
POLLUTID	Pollut
HALFLIFE	Haflif
DCAYCOEF	Decay
GASDEPDF	React F_Seas2 F_Seas5 (Refpoll)
GASDEPVD	Uservd
GDLANUSE	Sec1 Sec2 ... Sec36
GDSEASON	Jan Feb ... Dec
NO2EQUIL	NO2Equil
NO2STACK	NO2Ratio
OZONEFIL	O3FileName (O3Units) (O3Format)
OZONEVAL	O3Value (O3Units)
O3VALUES	O3Flag O3values(i), i=1,n
OZONUNIT	(OzoneUnits)
FLAGPOLE	(Flagdf)
RUNORNOT	RUN or NOT
EVENTFIL	(Evfile) (Evopt)
SAVEFILE	(Savfil) (Dayinc) (Savfl2)
INITFILE	(Inifil)
MULTYEAR	(H6H) Savfil (Inifil)
DEBUGOPT	MODEL (Dbgfil) and/or METEOR (Dbmfil) and/or PVMRM (Dbpvfil) and/or DEPOS
ERRORFIL	(Errfil)

TABLE F-2

SUMMARY OF SOURCE PATHWAY KEYWORDS AND PARAMETERS

Keyword	**Parameters**
ELEVUNIT	METERS or FEET
LOCATION	SrcID Srctyp Xs Ys (Zs) or (FLAT) [for 'FLAT & ELEV' option]
SRCPARAM	SrcID Ptemis Stkhgt Stktmp Stkvel Stkdia (POINT,POINTCAP, POINTHOR source) Vlemis Relhgt Syinit Szinit (VOLUME source) Aremis Relhgt Xinit (Yinit) (Angle) (Szinit) (AREA source) Aremis Relhgt Nverts (Szinit) (AREAPOLY source) Aremis Relhgt Radius (Nverts) (Szinit) (AREACIRC source) Opemis Relhgt Xinit Yinit Pitvol (Angle) (OPENPIT source)
BUILDHGT	SrcID (or SrcRange) Dsbh(i), i=1,36
BUILDLEN	SrcID (or SrcRange) Dsbl(i), i=1,36
BUILDWID	SrcID (or SrcRange) Dsbw(i), i=1,36
XBADJ	SrcID (or SrcRange) Xbadj(i), i=1,36
YBADJ	SrcID (or SrcRange) Ybadj(i), i=1,36
AREAVERT	SrcID Xv(1) Yv(1) Xv(2) Yv(2) ... Xv(i) Yv(i)
URBANSRC	For multiple urban areas: UrbanID SrcID's and/or SrcRng's For single urban areas: SrcID's and/or SrcRng's
EMISFACT	SrcID (or SrcRange) Qflag Qfact(i), i=1,n
EMISUNIT	Emifac Emilbl Outlbl
CONCUNIT	Emifac Emilbl Conlbl
DEPOUNIT	Emifac Emilbl Deplbl
PARTDIAM	SrcID (or SrcRange) Pdiam(i), i=1,Npd
MASSFRAX	SrcID (or SrcRange) Phi(i), i=1,Npd
PARTDENS	SrcID (or SrcRange) Pdens(i), i=1,Npd
METHOD_2	SrcID (or SrcRange) FineMassFraction Dmm
GASDEPOS	SrcID (or SrcRange) Da Dw rcl Henry
NO2RATIO	SrcID (or SrcRange) NO2Ratio
HOUREMIS	Emifil SrcID's SrcRange's
BACKGRND	BGflag BGvalue(i), i=1,n and/or HOURLY BGfilnam (BGformat)
BACKUNIT	BGunits
INCLUDED	Incfil
OLMGROUP	OLMGrpID SrcID's SrcRange's
PSDGROUP	PSDGrpID SrcID's SrcRange's
SRCGROUP	SrcGrpID SrcID's SrcRange's

TABLE F-3

SUMMARY OF RECEPTOR PATHWAY KEYWORDS AND PARAMETERS

Keyword	**Parameters**
ELEVUNIT	METERS or FEET
GRIDCART	Netid STA XYINC Xinit Xnum Xdelta Yinit Ynum Ydelta, or XPNTS Gridx1 Gridx2 Gridx3 .... GridxN, and YPNTS Grid1 Grid2 Grid3 .... GridyN ELEV Row Zelev1 Zelev2 Zelev3 ... ZelevN HILL Row Zhill1 Zhill2 Zhill3 ... ZhillN FLAG Row Zflag1 Zflag2 Zflag3 ... ZflagN END
GRIDPOLR	Netid STA ORIG Xinit Yinit, or ORIG Srcid DIST Ring1 Ring2 Ring3 ... RingN DDIR Dir1 Dir2 Dir3 ... DirN, or GDIR Dirnum Dirini Dirinc ELEV Dir Zelev1 Zelev2 Zelev3 ... ZelevN HILL Dir Zhill1 Zhill2 Zhill3 ... ZhillN FLAG Dir Zflag1 Zflag2 Zflag3 ... ZflagN END
DISCCART	Xcoord Ycoord (Zelev Zhill) (Zflag)
DISCPOLR	Srcid Dist Direct (Zelev Zhill) (Zflag)
EVALCART	Xcoord Ycoord Zelev Zhill Zflag Arcid (Name)
INCLUDED	RecIncFile

TABLE F-4

SUMMARY OF METEOROLOGY PATHWAY KEYWORDS AND PARAMETERS

Keyword	**Parameters**
SURFFILE	Sfcfil
PROFFILE	Profil
SURFDATA	Stanum Year (Name) (Xcoord Ycoord)
UAIRDATA	Stanum Year (Name) (Xcoord Ycoord)
SITEDATA	Stanum Year (Name) (Xcoord Ycoord)
PROFBASE	BaseElev (Units)
STARTEND	Strtyr Strtmn Strtdy (Strthr) Endyr Endmn Enddy (Endhr)
DAYRANGE	Range1 Range2 Range3 ... RangeN
SCIMBYHR	NRegStart NRegInt (SfcFilnam PflFilnam)
WDROTATE	Rotang
WINDCATS	Ws1 Ws2 Ws3 Ws4 Ws5

TABLE F-5

SUMMARY OF EVENT PATHWAY KEYWORDS AND PARAMETERS

Keyword	**Parameters**
EVENTPER	Evname Aveper Grpid Date
EVENTLOC	Evname XR= Xr YR= Yr (Zelev Zhill) (Zflag) or RNG= Rng DIR= Dir (Zelev Zhill) (Zflag)
INCLUDED	EventIncFile

Note: EVENT locations can be input as either discrete Cartesian receptors (XR=, YR=) or as discrete polar receptors (RNG=, DIR=). Events that are specified in the file generated by the AERMOD model (CO EVENTFIL card) are always given as discrete Cartesian coordinates. Discrete polar receptors are assumed to be relative to an origin of (0,0).

TABLE F-6

SUMMARY OF OUTPUT PATHWAY KEYWORDS AND PARAMETERS

Keyword	**Parameters**
RECTABLE	Aveper FIRST SECOND . . . SIXTH . . . TENTH and/or Aveper 1ST 2ND . . . 6TH . . . 10TH and/or Aveper 1 2 . . . 6 . . . 10 . . . *N* . . . 999
MAXTABLE	Aveper Maxnum
DAYTABLE	Avper1 Avper2 Avper3 . . .
MAXIFILE	Aveper GrpID Thresh Filnam (Funit)
POSTFILE	Aveper GrpID Format Filnam (Funit)
PLOTFILE	Aveper GrpID Hivalu Filnam (Funit) (Short Term values) Aveper GrpID Filnam (Funit) (PERIOD or ANNUAL averages)
TOXXFILE	Aveper Cutoff Filnam (Funit)
RANKFILE	Aveper Hinum Filnam (Funit)
EVALFILE	SrcID Filnam (Funit)
SEASONHR	GrpID FileName (FileUnit)
MAXDAILY	GrpID FileName (FileUnit)
MXDYBYYR	GrpID FileName (FileUnit)
MAXDCONT	GrpID UpperRank LowerRank FileName (FileUnit) or GrpID UpperRank THRESH ThreshValue FileName (FileUnit)
SUMMFILE	SummFileName
FILEFORM	EXP or FIX
NOHEADER	FileType1 FileType2 FileType3 . . . FileType*N* or ALL
EVENTOUT	SOCONT or DETAIL [EVENT Only]

Character:	A string of alphanumeric characters that are bracketed by single quotes (e.g., 'SR 1 – NB Lanes')
Integer:	A number with no decimal point (e.g., 12)
Real:	A number with a decimal point separating the whole number portion from the fractional number portion (e.g., 234.16)

File Management		
MET:	-	Pathway label
'*.met'	Character	Name of file containing preprocessed meteorology[a]
OUT:	-	Pathway label
'*.out'	Character	Name of file containing model printout[b]
ETS:	-	Pathway label
'*.ets'	Character	Name of file containing ETS data[b]
MSG:	-	Pathway label
'*.msg'	Character	Name of file containing simulation errors and other messages[b]
PST1	-	Pathway label
'*.pst'	Character	Name of file containing concurrent model results in post format of 24-hour averages for $PM_{2.5}$, PM_{10}, and OTHER or 1-hour averages for CO and NO_2[b]
PST2	-	Pathway label
'*.pst'	Character	Name of file containing concurrent model results in post format of annual averages for $PM_{2.5}$, PM_{10}, NO_2, and OTHER or 8-hour averages for CO[b]
PLT1	-	Pathway label
'*.plt'	Character	Name of file containing high value model results in plot format of average quarterly 24-hour for PM2.5; 6th highest 24-hour for PM-10; 24-hour for OTHER; 2nd highest 1-hour for CO; or average 8th highest 1-hour for NO2[b]
PLT2	-	Pathway label
'*.plt'	Character	Name of file containing high value model results in plot format of average annual for PM2.5, PM-10, and OTHER or 2nd highest 8-hour for CO[b]
[a]User-created file; [b]CAL3QHCR-generated file – distinct file names including the extension must be used for the CAL3QHCR-generated files or the model run will end in error		

NOTES:

- File Management
  - Use a descriptive root file name
  - Enter the full name of the path for files outside the CAL3QHCR application folder (e.g., C:\DIR\SUBDIR\NAME.EXT)
  - The full path name is optional for files within the CAL3QHCR application folder
  - To instruct the program not to produce a specific post or plot file, specify ' ' as the name

Program Control & Site Variables		
#1:	-	Pathway label
'JOB'	Character	Job title/description, up to 40 characters
ATIM	Real	Run averaging time (min)
Z0	Real	Surface roughness (or roughness length) (cm)
VS	Real	Settling velocity (cm/s)
VD	Real	Deposition velocity (cm/s)
NR	Integer	Number of receptors
SCAL	Real	Scale conversion factor, user units to meters
IOPT	Integer	Output units, 1 = feet; 0 = meters
#2:	-	Pathway label
'RUN'	Character	Run title/description, up to 40 characters
NL	Integer	Number of links
JTIER	Integer	Tier approach, 1 = Tier I; 2 = Tier II
'MODE'	Character	Pollutant (units), 'CO' = CO (ppm); 'PM2.5' = $PM_{2.5}$ ($\mu g/m^3$); 'PM-10' = PM_{10} ($\mu g/m^3$); 'NO2' = NO_2 ($\mu g/m^3$); 'OTHER' = OTHER ($\mu g/m^3$)
FLINK	Integer	Print link contributions, 1 = YES; 0 = NO
FAMB	Integer	Include background concentrations in results, 1 = YES; 0 = NO
'RU'	Character	Land use selection, 'R' = Rural; 'U' = Urban
#3:	-	Pathway label
STRMO	Integer	Processing start month
STRDY	Integer	Processing start day
STRYR	Integer	Processing start year
ENDMO	Integer	Processing end month
ENDDY	Integer	Processing end day
ENDYR	Integer	Processing end year

NOTES:

- Pathway #1:
  - Averaging time should be 60 min, since predictions are performed for a 1-hour period
  - Surface roughness should be within the range of 3 cm to 400 cm
  - Settling velocity should be 0 cm/s to reflect negligible gravitational settling
  - Deposition velocity should be 0 cm/s to reflect negligible deposition effects

Pathway #2:

- Specify a Tier II approach (JTIER = 2) to account for hourly variations in emissions and meteorology
- Specify MODE = 'PM2.5' for $PM_{2.5}$ analysis or 'PM-10' for PM_{10} analyses
- Do not include background PM concentrations in the model runs
- Background concentrations are determined separately as described in Module 6
- Background concentrations are then added to model results to calculate design values
- For determining whether land use is rural or urban, refer to PM Hot-spot Guidance, Section 7.5.5

- Pathway #3:
  - Processing start and end dates should match the start and end dates of the preprocessed meteorology
  - Typically, the start month and day are January 1 (01,01) and the end month and day are December 31 (12,31)
  - 5 years of off-site meteorology are generally required, which can be processed in a single simulation (e.g., 01,01,06,12,31,10)
  - If available, use met files prepared for regulatory applications by the air agency
  - Wind speeds should be at least 1 m/s

Receptor Locations		
#4:	-	Pathway label
'RCP'	Character	Receptor name, up to 20 characters
XR	Real	X-coordinate of receptor (user units)
YR	Real	Y-coordinate of receptor (user units)
ZR	Real	Z-coordinate of receptor (user units)
***** Repeat in succession for each Receptor = 1 to NR *****		

NOTES:

- Pathway #4:
  - User units are defined by the SCAL parameter entered on the Pathway #1 record
  - Receptors should always be located outside of the mixing zone (link width)
  - Receptor height should represent the typical ground-level breathing height of 1.8 m (5.9 ft) or less
  - Guidance on the placement of receptors is described in Module 3

Emissions, Traffic, & Signalization Patterns		
#5:	-	Pathway label
PMOY1 to PMOY12	Integer	Month of year patterns for ETS values; assigned in the order: Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec An example distinguishing four seasonal patterns by quarter: 1,1,1,2,2,2,3,3,3,4,4,4 Up to 12 monthly patterns may be assigned
#6:	-	Pathway label
PHOD1 to PHOD24	Integer	Hour of day patterns for ETS values; assigned in the order: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 An example distinguishing four hourly patterns to represent the morning peak, midday, afternoon peak, and overnight: 1,1,1,1,1,1,2,2,2,3,3,3,3,3,3,3,4,4,4,1,1,1,1,1 Up to 24 hourly patterns may be assigned
#7:	-	Pathway label
PDOW1 to PDOW7	Integer	Day of week patterns for ETS values; assigned in the order: Mon Tue Wed Thu Fri Sat Sun An example distinguishing weekday and weekend travel: 1,1,1,1,1,2,2 Up to 7 daily patterns may be assigned

NOTES:

- Pathway #5:
  - For PM hot-spot analyses, quarterly emissions and traffic activities are generally defined; e.g., MOVES output for:

MOVES Month	MOVES monthID	CAL3QHCR PMOY Range
January	1	PMOY1 – PMOY3
April	4	PHOD4 – PMOY6
July	7	PMOY7 – PMOY9
October	10	PMOY10 – PMOY12

  - If MOVES was run for more than the four representative months for each calendar quarter as suggested in the PM Hot-spot Guidance, the data should be assigned to the appropriate months using PMOY

- Pathway #6:
  - For PM hot-spot analyses, morning peak, midday, afternoon peak, and overnight emissions and traffic activities are generally defined; e.g., MOVES output for:

MOVES Hour Begining	MOVES hourID	CAL3QHCR PHOD Range
12 am	1	PHOD1 – PHOD6; PHOD20 – PHOD24
6 am	7	PHOD7 – PHOD9
12 pm	13	PHOD10 – PHOD16
6 pm	19	PHOD17 – PHOD19

  - If MOVES was run for more than the four representative hours for each different time period as suggested in the PM Hot-spot Guidance, the data should be assigned to the appropriate hours using PHOD
- Pathway #7:
  - For PM hot-spot analyses, emissions and traffic activities are generally defined for a typical weekday; i.e., one pattern for all seven days
  - If MOVES was run to differentiate weekday and weekend emissions, the data should be assigned to the appropriate days using PDOW

Background Concentrations		
#8:	-	Pathway label
BKG	Real	Hourly ambient background concentrations (ppm for CO; µg/m^3 for $PM_{2.5}$, PM_{10}, NO_2, and OTHER) for each month of year ETS pattern
***** Repeat in succession for each of hour of day ETS pattern, then for each day of week ETS pattern *****		

NOTES:

- Pathway #8:
  - Hourly ambient background concentration should be set to zero
  - Background concentrations are determined separately as described in Module 6
  - Background concentrations are then added to model results to calculate design values as described in Module 7

Link Configurations		
#9:	-	Pathway label
'LNK'	Character	Link name, up to 20 characters
'IQ'	Character	Traffic flow, 'F' = free-flow link; 'Q' = queue link
'TYP'	Character	Link type, 'AG' = at-grade; 'FL' = fill; 'BR' = bridge; and 'DP' = depressed
XL1	Real	Link X-coordinate start point (user units)
YL1	Real	Link Y-coordinate start point (user units)
XL2	Real	Link X-coordinate end point (user units)
YL2	Real	Link Y-coordinate end point (user units)
SH	Real	Source height (user units)
WL	Real	Mixing zone width (user units)
NLANES	Integer	Number of travel lanes for queue link (required only if IQ = 'Q')
#10:	-	Pathway label
VPHL	Real	Hourly traffic volume (veh/hr) for each month of year ETS pattern
EFL	Real	Hourly emission factor (g/veh-mi) for each month of ETS pattern
***** Repeat in succession for each of hour of day ETS pattern, then for each day of week ETS pattern *****		
#11:	-	Pathway label (required only if IQ = 'Q')
CAVG	Real	Average total signal cycle length (s) for each month of year ETS pattern
RAVG	Real	Average red signal cycle length (s) for each month of ETS pattern
YFAC	Real	Clearance lost time (s) for each month of ETS pattern
***** Repeat in succession for each of hour of day ETS pattern, then for each day of week ETS pattern *****		
#12:	-	Pathway label (required only if IQ = 'Q')
SFR	Real	Saturation flow rate (vphpl) for each month of year ETS pattern
ST	Real	Signal type for each month of ETS pattern, 1 = pre-timed; 2 = average; and 3 = semi-actuated
AT	Real	Arrival rate for each month of ETS pattern, 1 = worst; 2 = below average; 3 = average; 4 = above average; and 5 = best
***** Repeat in succession for each of hour of day ETS pattern, then for each day of week ETS pattern *****		
***** Repeat #9 & #10 in succession for each Link = 1 to NL; include #11 & #12 in the sequence for queue links *****		

NOTES:

- Pathway #9:
  - A new link is required when there is a change in link width, link orientation, traffic volume, travel speed, or emission factor
  - For a succession of links, the start coordinates of the next link usually equals the end coordinates of the prior link, i.e., no gaps or overlaps
  - In most cases, a link type of at-grade ('AG') and a source height of 0 m should be used
  - Source height should be within ± 10 m (± 32 ft)
  - Mixing zone width is defined as the width of the travelled roadway plus 3 m (10 ft) on either side
  - Link length must always be greater than the mixing zone width
  - Specify free-flow link traffic flow (IQ = 'F')
  - Do not specify queue link traffic flow (IQ = 'Q') as the queuing algorithm in CAL3QHCR should not be used for PM hot-spot analyses
  - Idling vehicles should be accounted for by reflecting idle activity patterns in the MOVES modeling
- Pathway #10:
  - Hourly traffic volume and emission factors are applied uniformly to the entire link length
  - Emission factors are defined as g/veh-mi
    - Use the latest version of MOVES; specify the “Emission Rates” option
  - All relevant pollutants and processes should be summed for a single “rateperdistance” emission factor per link
    - MOVES post-processing scripts are available to complete this step as described in Module 2
- Pathway #11 (not recommended for PM hot-spot analyses):
  - For clearance lost time, a default value of 2 s may be used in the absence of locally derived values
- Pathway #12 (not recommended for PM hot-spot analyses):
  - For saturation flow rate, a default value of ~1800 vehicles per hour (based on the *Highway Capacity Manual 2010* for an urban intersection) may be used in the absence of locally derived values
  - For signal type, a default value of 1 (pre-timed) may be used in the absence of locally derived values
  - For arrival rate, a default value of 3 (average progression) may be used in the absence of locally derived values

Directions:

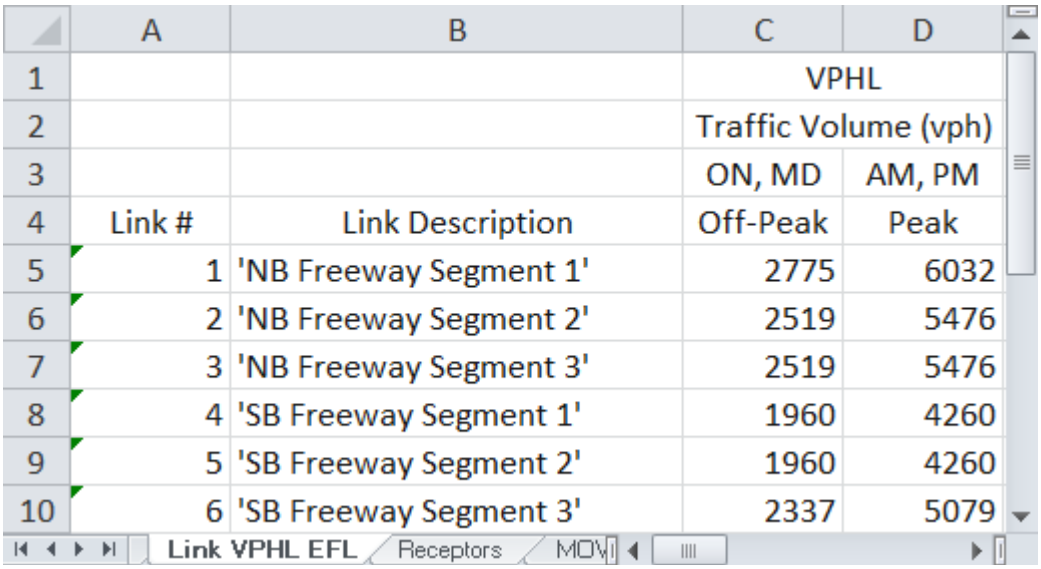
- Based on the information provided, run CAL3QHCR for a subset of receptors and highway links from the Example Analysis (see next page)
- Select meteorology from St. Louis, MO for 2006 – 2010
- Simulate a typical day using traffic volumes and MOVES emission factors from information for four time periods and four quarters (refer to Class Exercise Data.xlsx)

Receptor / Link Map (coordinates are in feet):

Link configurations:

- Four 12 ft lanes in each direction
- All segments at-grade

Link traffic volumes (refer to Class Exercise Data.xlsx):



	A	B	C	D
1			VPHL	
2			Traffic Volume (vph)	
3			ON, MD	AM, PM
4	Link #	Link Description	Off-Peak	Peak
5	1	'NB Freeway Segment 1'	2775	6032
6	2	'NB Freeway Segment 2'	2519	5476
7	3	'NB Freeway Segment 3'	2519	5476
8	4	'SB Freeway Segment 1'	1960	4260
9	5	'SB Freeway Segment 2'	1960	4260
10	6	'SB Freeway Segment 3'	2337	5079

Link VPHL EFL | Receptors | MOV

ON Off-Peak = 7 p.m. – 6 a.m.
MD Off-Peak = 9 a.m. – 4 p.m.
AM Peak = 6 a.m. – 9 a.m.
PM Peak = 4 p.m. – 7 p.m.

MOVES Emission Factors – Q1 (refer to Class Exercise Data.xlsx):

	A	B	C	D	E	F	G
1	movesRun	yearID	monthID	hourID	linkID	pollutant	Grams/veh-mile
2	1	2020	1	1	1	Total PM2.5	0.044152
3	1	2020	1	1	2	Total PM2.5	0.044179
4	1	2020	1	1	3	Total PM2.5	0.044179
5	1	2020	1	1	4	Total PM2.5	0.044214
6	1	2020	1	1	5	Total PM2.5	0.044214
7	1	2020	1	1	6	Total PM2.5	0.028208
8	2	2020	1	7	1	Total PM2.5	0.049007
9	2	2020	1	7	2	Total PM2.5	0.047895
10	2	2020	1	7	3	Total PM2.5	0.047895
11	2	2020	1	7	4	Total PM2.5	0.046441
12	2	2020	1	7	5	Total PM2.5	0.046441
13	2	2020	1	7	6	Total PM2.5	0.030816
14	3	2020	1	13	1	Total PM2.5	0.040609
15	3	2020	1	13	2	Total PM2.5	0.040632
16	3	2020	1	13	3	Total PM2.5	0.040632
17	3	2020	1	13	4	Total PM2.5	0.040661
18	3	2020	1	13	5	Total PM2.5	0.040661
19	3	2020	1	13	6	Total PM2.5	0.024339
20	4	2020	1	19	1	Total PM2.5	0.043451
21	4	2020	1	19	2	Total PM2.5	0.042375
22	4	2020	1	19	3	Total PM2.5	0.042375
23	4	2020	1	19	4	Total PM2.5	0.040970
24	4	2020	1	19	5	Total PM2.5	0.040970
25	4	2020	1	19	6	Total PM2.5	0.024820

Receptors | MOVES Output

hourID 1 = ON Off-Peak = 7 p.m. – 6 a.m.
hourID 7 = AM Peak = 6 a.m. – 9 a.m.
hourID 13 = MD Off-Peak = 9 a.m. – 4 p.m.
hourID 19 = PM Peak = 4 p.m. – 7 p.m.

MOVES Emission Factors – Q2 (refer to Class Exercise Data.xlsx):

	A	B	C	D	E	F	G
1	movesRun	yearID	monthID	hourID	linkID	pollutant	Grams/veh-mile
26	5	2020	4	1	1	Total PM2.5	0.034592
27	5	2020	4	1	2	Total PM2.5	0.034608
28	5	2020	4	1	3	Total PM2.5	0.034608
29	5	2020	4	1	4	Total PM2.5	0.034630
30	5	2020	4	1	5	Total PM2.5	0.034630
31	5	2020	4	1	6	Total PM2.5	0.017769
32	6	2020	4	7	1	Total PM2.5	0.038779
33	6	2020	4	7	2	Total PM2.5	0.037735
34	6	2020	4	7	3	Total PM2.5	0.037735
35	6	2020	4	7	4	Total PM2.5	0.036371
36	6	2020	4	7	5	Total PM2.5	0.036371
37	6	2020	4	7	6	Total PM2.5	0.019780
38	7	2020	4	13	1	Total PM2.5	0.031273
39	7	2020	4	13	2	Total PM2.5	0.031286
40	7	2020	4	13	3	Total PM2.5	0.031286
41	7	2020	4	13	4	Total PM2.5	0.031303
42	7	2020	4	13	5	Total PM2.5	0.031303
43	7	2020	4	13	6	Total PM2.5	0.014145
44	8	2020	4	19	1	Total PM2.5	0.033724
45	8	2020	4	19	2	Total PM2.5	0.032714
46	8	2020	4	19	3	Total PM2.5	0.032714
47	8	2020	4	19	4	Total PM2.5	0.031394
48	8	2020	4	19	5	Total PM2.5	0.031394
49	8	2020	4	19	6	Total PM2.5	0.014325

Receptors | MOVES Output

hourID 1 = ON Off-Peak = 7 p.m. – 6 a.m.
hourID 7 = AM Peak = 6 a.m. – 9 a.m.
hourID 13 = MD Off-Peak = 9 a.m. – 4 p.m.
hourID 19 = PM Peak = 4 p.m. – 7 p.m.

MOVES Emission Factors – Q3 (refer to Class Exercise Data.xlsx):

	A	B	C	D	E	F	G
1	movesRun	yearID	monthID	hourID	linkID	pollutant	Grams/veh-mile
50	9	2020	7	1	1	Total PM2.5	0.029325
51	9	2020	7	1	2	Total PM2.5	0.029336
52	9	2020	7	1	3	Total PM2.5	0.029336
53	9	2020	7	1	4	Total PM2.5	0.029350
54	9	2020	7	1	5	Total PM2.5	0.029350
55	9	2020	7	1	6	Total PM2.5	0.012018
56	10	2020	7	7	1	Total PM2.5	0.032628
57	10	2020	7	7	2	Total PM2.5	0.031625
58	10	2020	7	7	3	Total PM2.5	0.031625
59	10	2020	7	7	4	Total PM2.5	0.030314
60	10	2020	7	7	5	Total PM2.5	0.030314
61	10	2020	7	7	6	Total PM2.5	0.013142
62	11	2020	7	13	1	Total PM2.5	0.028601
63	11	2020	7	13	2	Total PM2.5	0.028611
64	11	2020	7	13	3	Total PM2.5	0.028611
65	11	2020	7	13	4	Total PM2.5	0.028624
66	11	2020	7	13	5	Total PM2.5	0.028624
67	11	2020	7	13	6	Total PM2.5	0.011221
68	12	2020	7	19	1	Total PM2.5	0.031193
69	12	2020	7	19	2	Total PM2.5	0.030199
70	12	2020	7	19	3	Total PM2.5	0.030199
71	12	2020	7	19	4	Total PM2.5	0.028901
72	12	2020	7	19	5	Total PM2.5	0.028901
73	12	2020	7	19	6	Total PM2.5	0.011588

Receptors | MOVES Output

hourID 1 = ON Off-Peak = 7 p.m. – 6 a.m.
hourID 7 = AM Peak = 6 a.m. – 9 a.m.
hourID 13 = MD Off-Peak = 9 a.m. – 4 p.m.
hourID 19 = PM Peak = 4 p.m. – 7 p.m.

MOVES Emission Factors – Q4 (refer to Class Exercise Data.xlsx):

	A	B	C	D	E	F	G
1	movesRun	yearID	monthID	hourID	linkID	pollutant	Grams/veh-mile
74	13	2020	10	1	1	Total PM2.5	0.033436
75	13	2020	10	1	2	Total PM2.5	0.033451
76	13	2020	10	1	3	Total PM2.5	0.033451
77	13	2020	10	1	4	Total PM2.5	0.033470
78	13	2020	10	1	5	Total PM2.5	0.033470
79	13	2020	10	1	6	Total PM2.5	0.016506
80	14	2020	10	7	1	Total PM2.5	0.037276
81	14	2020	10	7	2	Total PM2.5	0.036242
82	14	2020	10	7	3	Total PM2.5	0.036242
83	14	2020	10	7	4	Total PM2.5	0.034890
84	14	2020	10	7	5	Total PM2.5	0.034890
85	14	2020	10	7	6	Total PM2.5	0.018157
86	15	2020	10	13	1	Total PM2.5	0.030603
87	15	2020	10	13	2	Total PM2.5	0.030615
88	15	2020	10	13	3	Total PM2.5	0.030615
89	15	2020	10	13	4	Total PM2.5	0.030631
90	15	2020	10	13	5	Total PM2.5	0.030631
91	15	2020	10	13	6	Total PM2.5	0.013413
92	16	2020	10	19	1	Total PM2.5	0.033724
93	16	2020	10	19	2	Total PM2.5	0.032714
94	16	2020	10	19	3	Total PM2.5	0.032714
95	16	2020	10	19	4	Total PM2.5	0.031394
96	16	2020	10	19	5	Total PM2.5	0.031394
97	16	2020	10	19	6	Total PM2.5	0.014325

Receptors | MOVES Output

hourID 1 = ON Off-Peak = 7 p.m. – 6 a.m.
hourID 7 = AM Peak = 6 a.m. – 9 a.m.
hourID 13 = MD Off-Peak = 9 a.m. – 4 p.m.
hourID 19 = PM Peak = 4 p.m. – 7 p.m.

Meteorology:

- St. Louis, Missouri, 2006 – 2010 Meteorology
  - STL2006-2010.met
  - Surface Station Number – 13994
  - Upper Air Station Number – 4833

Run CAL3QHCR:

- Step 1 – Create an Input File, *.INP
  - May use CheaterExcelTemplateFile.xlsx or CheaterInputFile.inp provided
- Step 2 – Create a Batch File for executing the CAL3QHCR run, *.BAT
- Step 4 – Execute the Batch File created in Step 2
- Summarize the Highest $PM_{2.5}$ Concentrations
  - 5-yr average highest 24-hour by quarter
  - 5-yr average annual

1997 Annual PM2.5 NAAQS

- Level of NAAQS: 15.0 µg/m^3
- DV is calculated as the average of 3 years' annual averages
- Round to the nearest *tenth* µg/m^3
- Refer to Guidance Section 9.3.2, Appendix K.3

DV = ([Y1] avg + [Y2] avg + [Y3] avg) ÷ 3

24-hour PM2.5 NAAQS

- Level of NAAQS: 35 µg/m^3
- DV is calculated as the average of 3 consecutive years' 98th percentile concentration
- Round to the nearest *whole* µg/m^3
- Refer to Guidance Section 9.3.3, Appendix K.4

DV = ([Y1] 98th + [Y2] 98th + [Y3] 98th) ÷ 3

24-hour PM10 NAAQS

- Level of NAAQS: 150 µg/m^3
- NAAQS is met when the Average expected number of exceedances over 3 years is less than or equal to 1
- Round to the nearest *10* µg/m^3
- Refer to Guidance Section 9.3.4, Appendix K.5

Expected exceedances = [Total exceedances in 3 yrs] ÷ 3