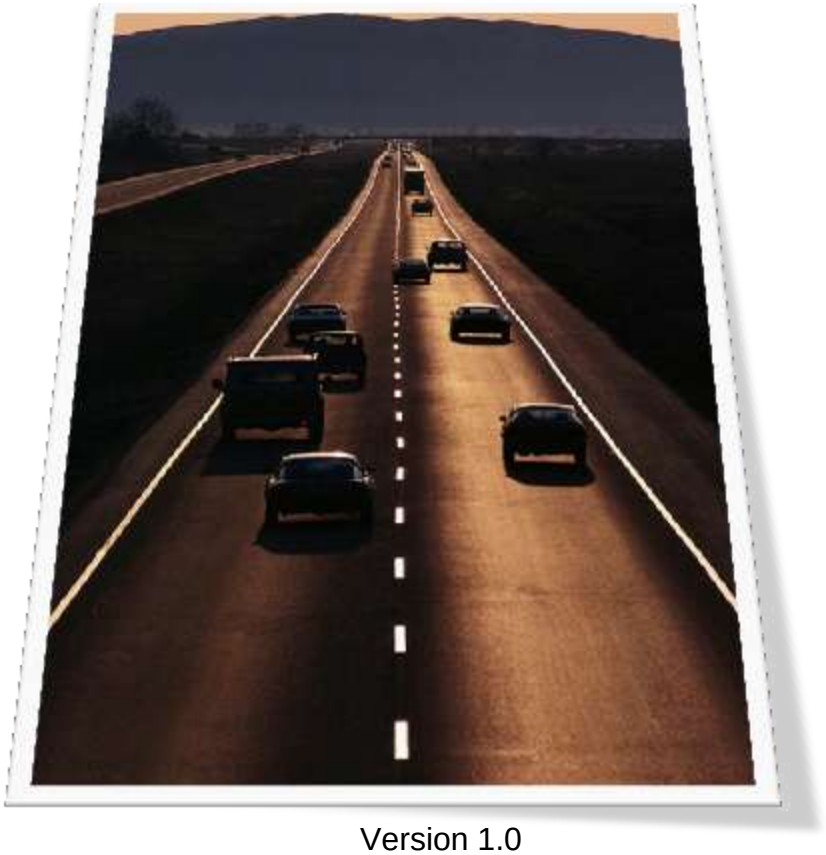
San Joaquin Valley APCD

EMFAC 2011
On-Road Emission Factor Estimator



Version 1.0
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Prepared by

Permit Services Division
Technical Services Department

Preface

The purpose of this document is to provide a process for estimating criteria and toxic pollutant emissions from on-road light and heavy duty vehicles. This process will generate hourly and annual criteria and toxic emissions using project specific information or project location based data combined with emission factors from CARB's web based EMFAC2011 data.

DISCLAIMER

Any mention of trade names or commercial products is not intended to constitute endorsement or recommendation for use.

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1 Introduction

The first step in evaluating a project's impact due to roadways is to estimate the emissions that can reasonably be expected from vehicles traveling on roadways surrounding the project and/or within the industrial and/or commercial property (non-surface street/freeway/highway travel). In the case of on-road vehicles or traffic, data may not be available unless an initial traffic study was performed.

This document will discuss how emissions may be estimated using the California Air Resources Board's (CARB) Emission Factor 2011(EMFAC2011) program to derive countywide, vehicle type, and speed based emission factors. These factors will then be used with project specific or derived traffic data to estimate emissions.

Additionally, emissions from on-road vehicles are not consistent or linear throughout the day. This document will also discuss how hourly variability can be considered and how to develop hourly adjustment factors to account for variability in vehicle type and traffic volume on an hourly basis. This will provide for a better assessment of impacts from freeways, highways, and/or surface streets.

2 CARB's Web Based EMFAC 2011

The first step in the process is to download the required data for the county in which the project will be constructed / operating. This process will require four files 1) the Combined Emissions Rate file, 2) the Speed Based Data for the county, 3) the EMFAC2011-LDV Burden run, and 4) the EMFAC2011 – HD output file. These files will be discussed in detail in the following subsections.

NOTE!!
The EMFAC2011 – HD file is a special output that can only be generated by CARB from a modified version of the EMFAC2011 – HD module. Request for this data should be directed to Chengfeng Wang of CARB @ cwang@arb.ca.gov.

WEB LINK!!
CARB's Online EMFAC2011
http://www.arb.ca.gov/jpub/webapp//EMFAC2011WebApp/rateSelectionPage_1.jsp

2.1 Combined Emission Rate File

The combined emissions rate file provides totals for a given county by vehicle class, fuel type, and aggregated by vehicle speed. This file has several additional data points, but this process will only rely on the Population (Pop) and Vehicle Miles Traveled (VMT) data for each vehicle class and fuel types. This information will be used to derive the vehicle population for a given speed or range of speeds and to develop emission factors based on selected speed(s) i.e. speed based emission factors. Calculation methodologies are discussed in Section 4.0.

NOTE!!
The vehicle classes are based on the 13 vehicle classes used in the EMFAC 2007 program and not the new classes assigned in the EMFAC 2011 program. For convenience, a crosswalk table is provided in Appendix A.

2.1.1 File Options

After opening the EMFAC web page the following options should be set, see Figure 2-1:

- **Region** – select the region (county) in which the project will be constructed / operated.
- **Calendar Year** – select the year that represents the first year of construction or operation.
- **Season** – should be set to "Annual Average".
- All other options should not be changed.
- Under the "**Query By**" select the "EMFAC 2007 Vehicle Categories"

2.1.2 Generating Combined Emission Rate File

Once the above options have been set click either the “View” or the “Download” button. If the user is going to download several years of data, it is recommended that the user click the “Download” button. This will ensure that the options listed above are not reset. If the user clicked the “View” button a new screen will appear displaying the information request. Download the data by clicking the “Download Data” button at the top of the page. Follow the online prompts to save the file.

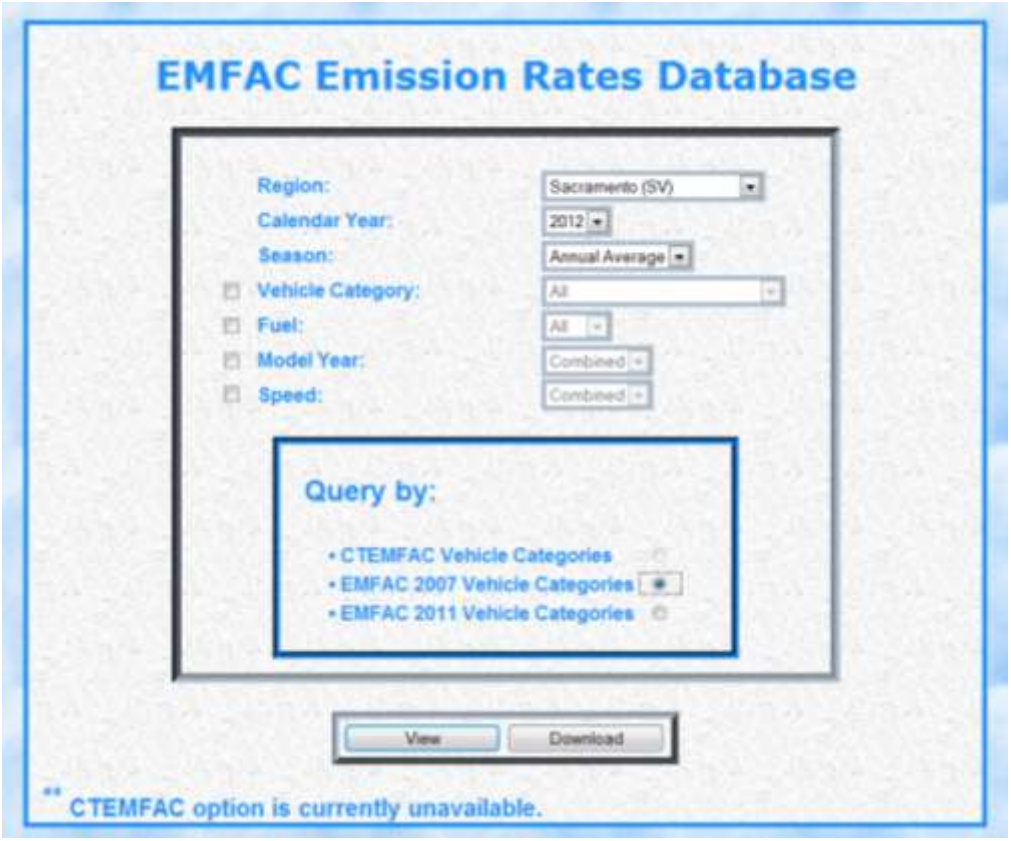


Figure 2-1 County Emission Rates

2.2 Speed Based Data File

The speed based data file provides totals for a given county by vehicle class, fuel types, and vehicle speeds. This file has several additional data points that will be discussed later in this document. This information will be used as the base data for developing speed based emission factors. Calculation methodologies are discussed in Section 4.0.

2.2.1 File Options

After opening the EMFAC web page the following options should be set, see Figure 2-2:

- **Region** – select the region (county) in which the project will be constructed / operated.
- **Calendar Year** – select the year that represents the first year of construction or operation
- **Season** – should be set to “Annual Average”
- **Speed** – select the “All” option. This will generate values for all speeds from 5 to 70 MPH.
- All other options should not be changed
- Under the “Query By” select the “EMFAC 2007 Vehicle Categories”

2.2.2 Generating Speed Based Data File

Once the above options have been set, click either the “View” or the “Download” button. If the user is going to download several years of data, it is recommended that the user click the “Download” button. This will ensure that the options listed above are not reset. If the user clicked the “View” button a new screen will appear displaying the information request. Download the data by clicking the “Download Data” button at the top of the page. Follow the online prompts to save the file.

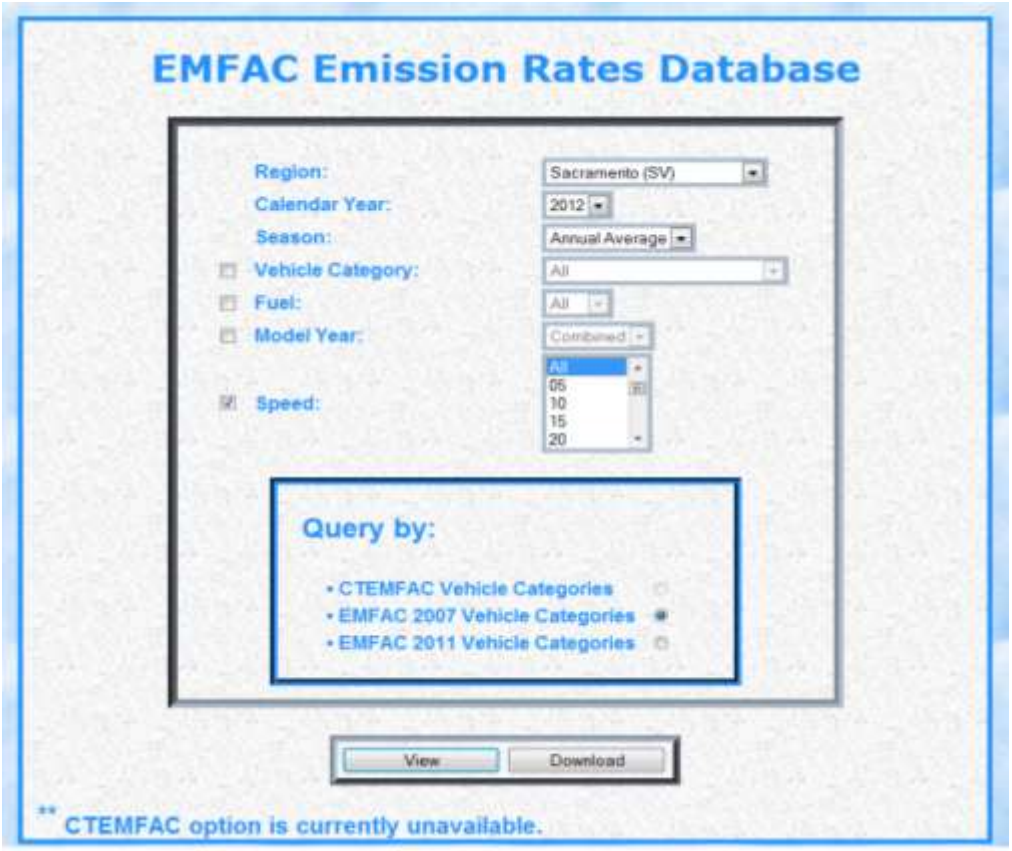


Figure 2-2 Speed Based Data

3 EMFAC 2011 Burden Run

One of last files needed before starting the import process is the EMFAC2011 - LDV burden file. This data will be used to derive hourly vehicle adjustment factors for “All Vehicles and “Diesel Only Vehicles” that can be used in dispersion modeling.

3.1 Generating an EMFAC2011 - LDV Burden Run

To generate a burden run follow these steps:

NOTE!!
The same steps described below for EMFAC2011 can be used in EMFAC2007 to generate a burden file.

1. Start CARB’s EMFAC2011 – LDV program, see Figure 3-1

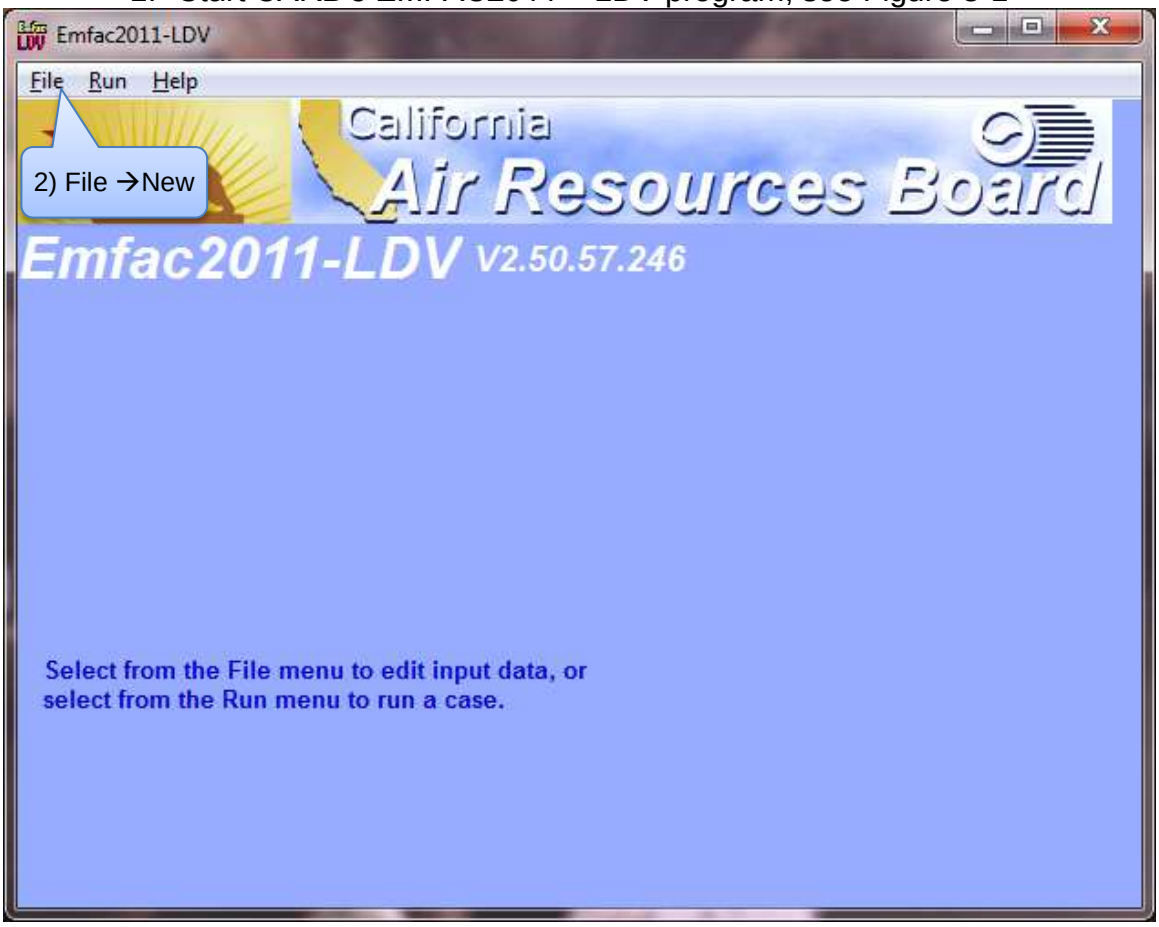


Figure 3-1 EMFAC2011 - LDV Main Menu

2. From the menu click File →New. The screen should change as seen in Figure 3-2.

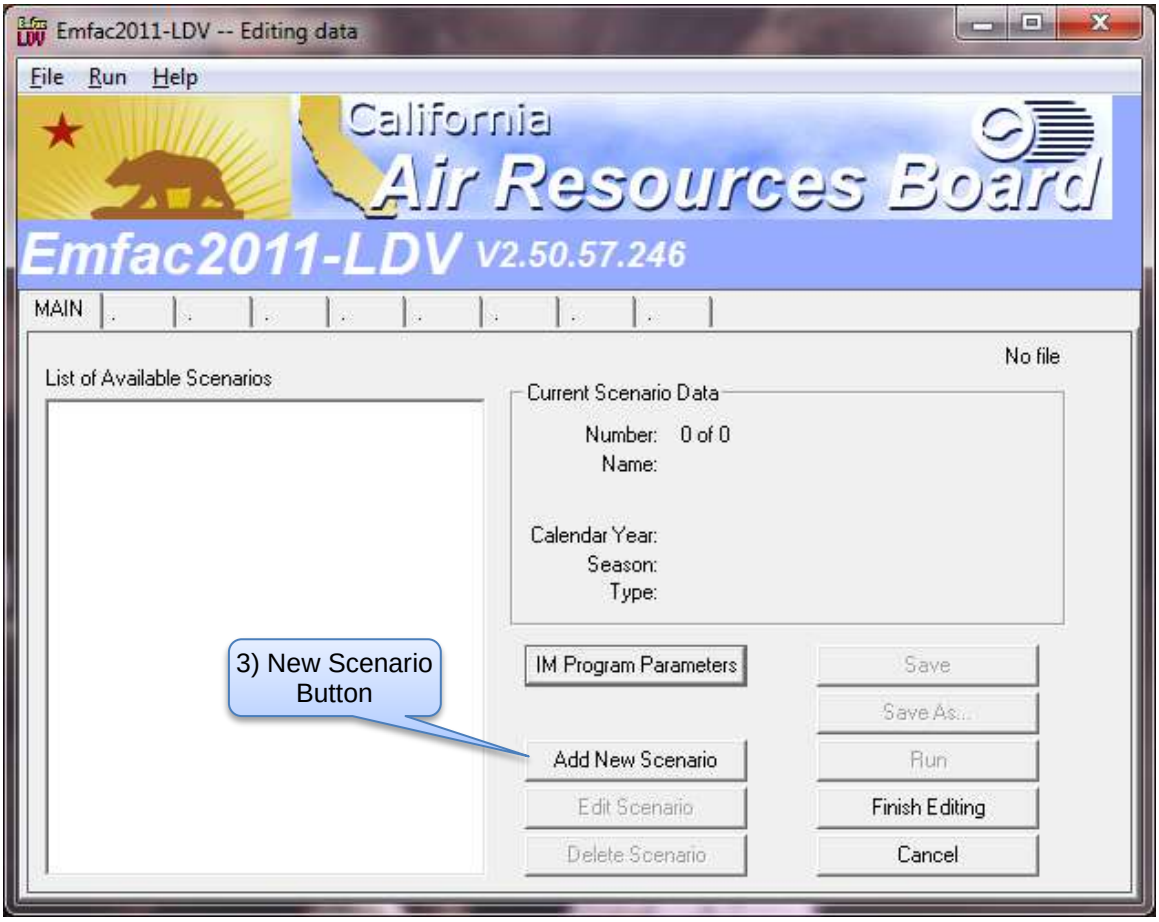


Figure 3-2 EMFAC2011 New Scenario Screen

3. Click the “Add New Scenario” Button. The screen should change, see **Error! Reference source not found.**.

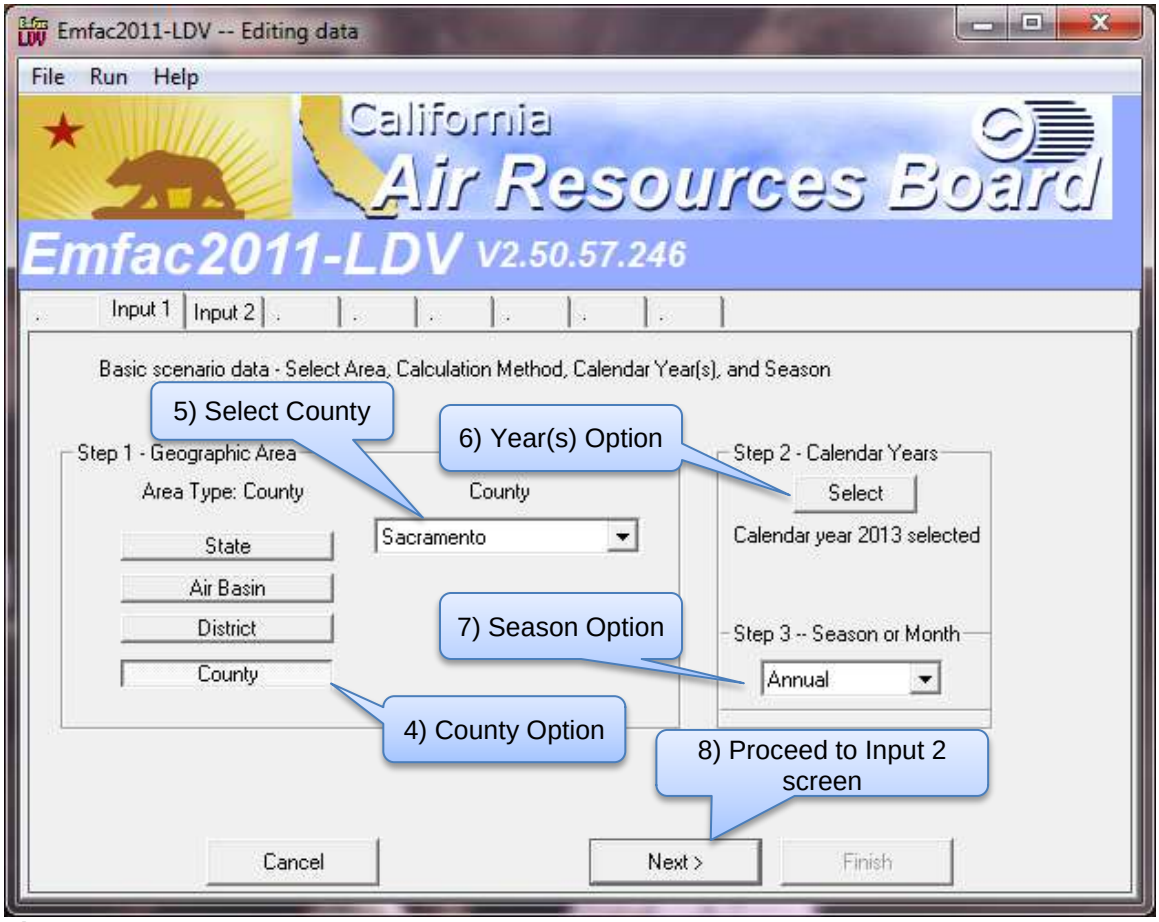


Figure 3-3 EMFAC2011 - Input 1

4. Under “Step 1 - Geographic Area” select the “County” option button
5. From the pull down list select the desired county
6. Under “Step 2 – Calendar Year” click the “Select” button. Select the desired year(s) to be evaluated from the dialog window that appears, see Figure 3-4.
7. Under “Step 3 – Season or Month” select “Annual” from the pull down list.

NOTE!!
The burden run can be run for multiple years at once. This is done by selecting multiple years in step 6 above.

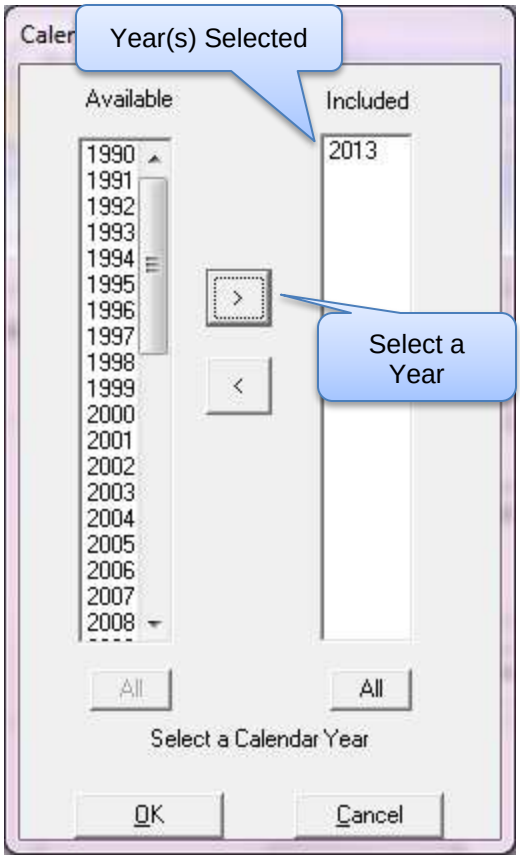


Figure 3-4 EMFAC2011 - Years

8. Click the “Next” button. The screen should change, see Figure 3-5.

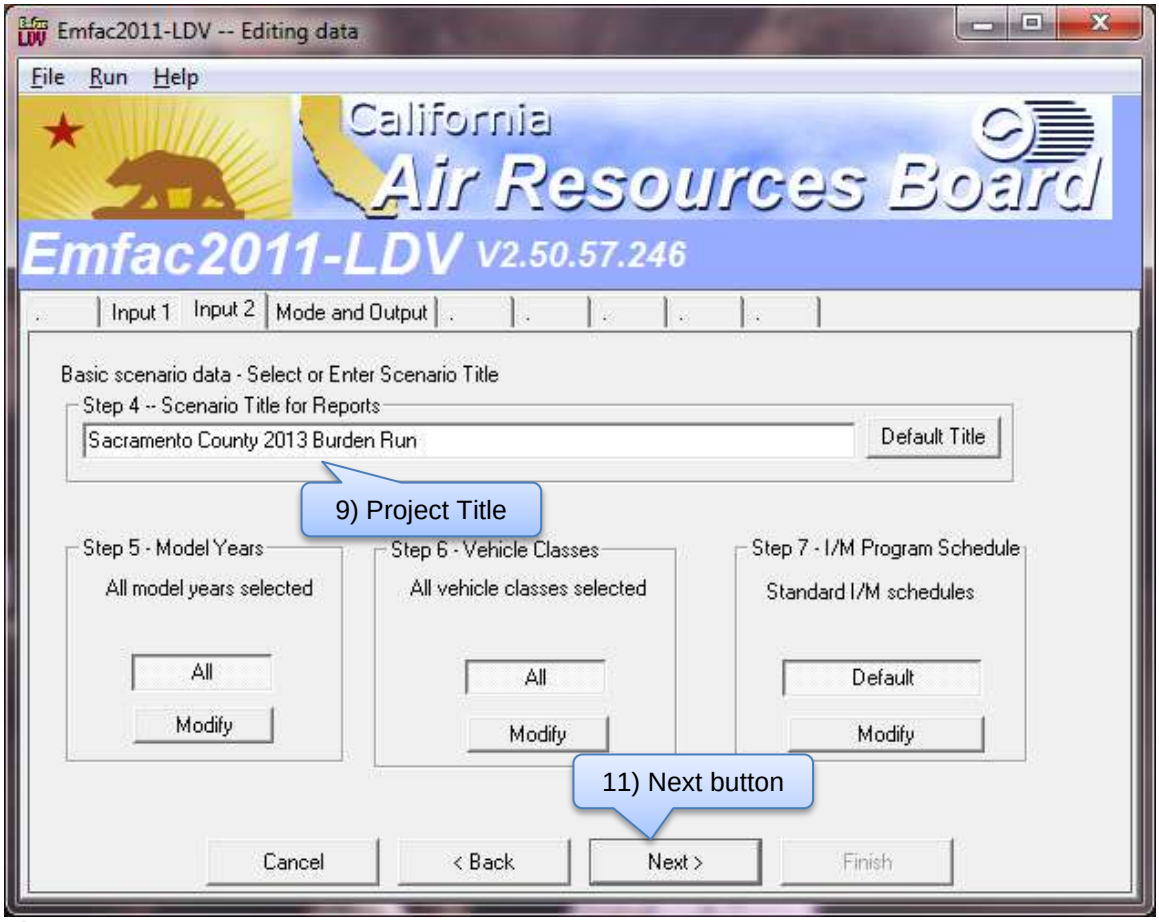


Figure 3-5 EMFAC2011 - Input 2

9. Under “Step 4 – Scenario Title for Reports” enter the desired project title for the run.
10. No other modifications are needed on this screen
11. Click the “Next” button. The screen should change, see Figure 3-6.

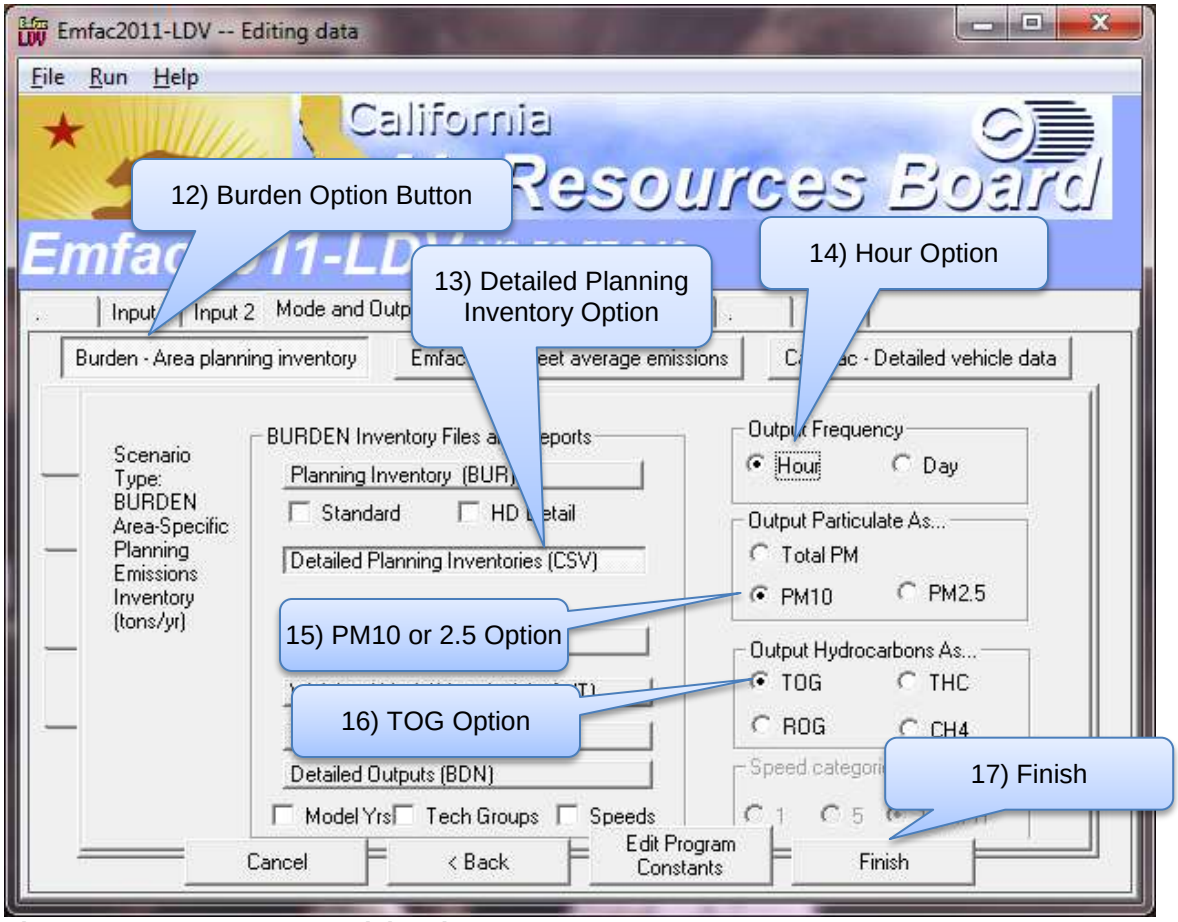


Figure 3-6 EMFAC2011 - Model and Output

12. From the "Model and Output" screen click the "Burden – Area planning inventory" button.

NOTE!!
The initial "Model and Output" screen will be blank. Once the burden option button, Step 12, is clicked the other options will be available as seen in Figure 3-6.

13. Under the "BURDEN Inventory File and Reports" section, click the "Detailed Planning Inventory (CSV)" button.
14. Under the "Output Frequency" section select the "Hour" option.
15. Under the "Output Particulate As…" section select the "PM10" option.
16. Under the "Output Hydrocarbons as.." section select the "TOG" option
17. Click the "Finish" button. The screen should change, see Figure 3-7.

NOTE!!
Only one particulate (PM10 or PM2.5) can be selected per run. If PM2.5 is also needed, a second run should be created.

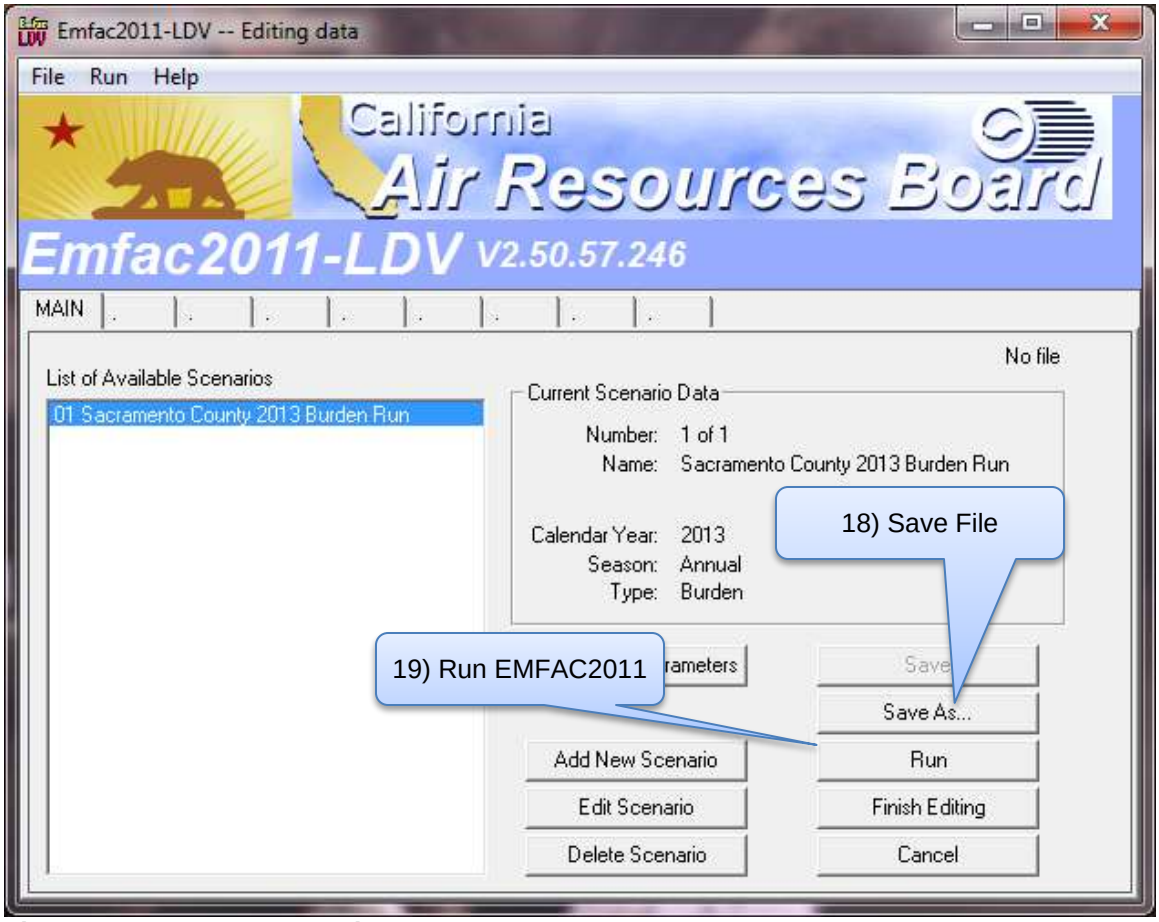


Figure 3-7 EMFAC2011 - Main

18. Save the EMFAC2011 input file by clicking the “Save As” button and following the prompts.
19. Run EMFAC2011 to generate the burden output. The screen should change, see Figure 3-8 and Figure 3-9.

NOTE!!
The EMFAC2011 output file will be placed in the same directory as the input file.

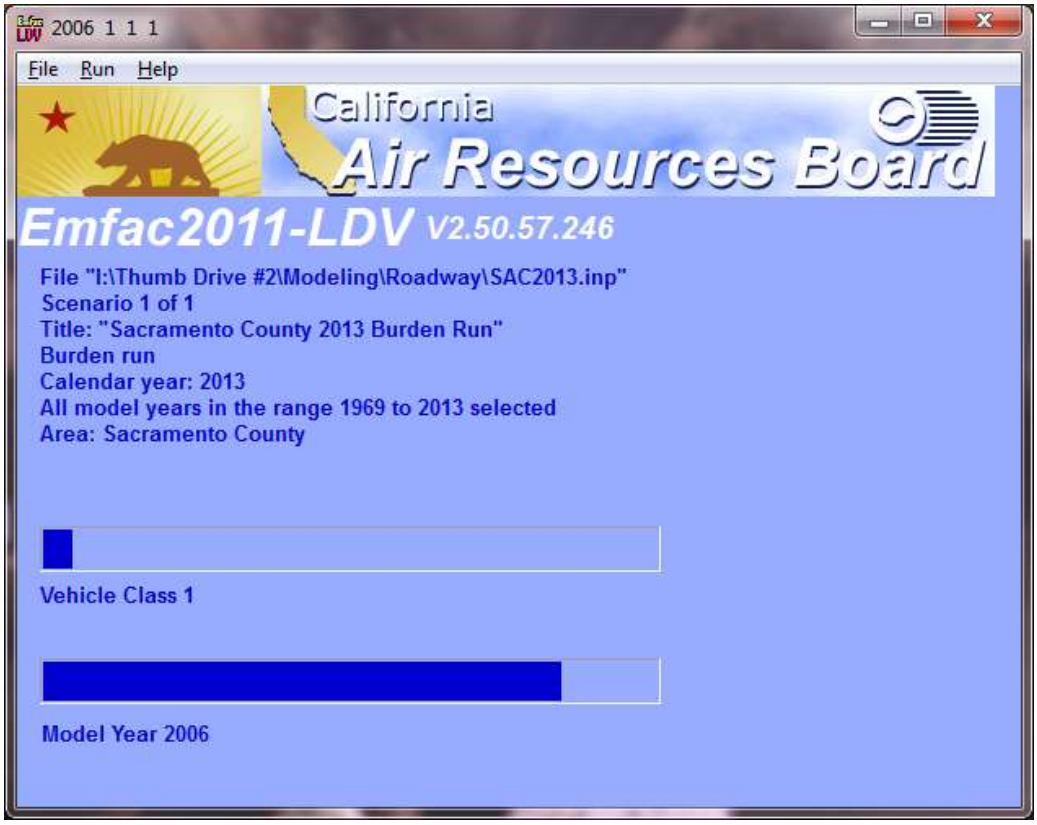


Figure 3-8 EMFAC2011 Run Started

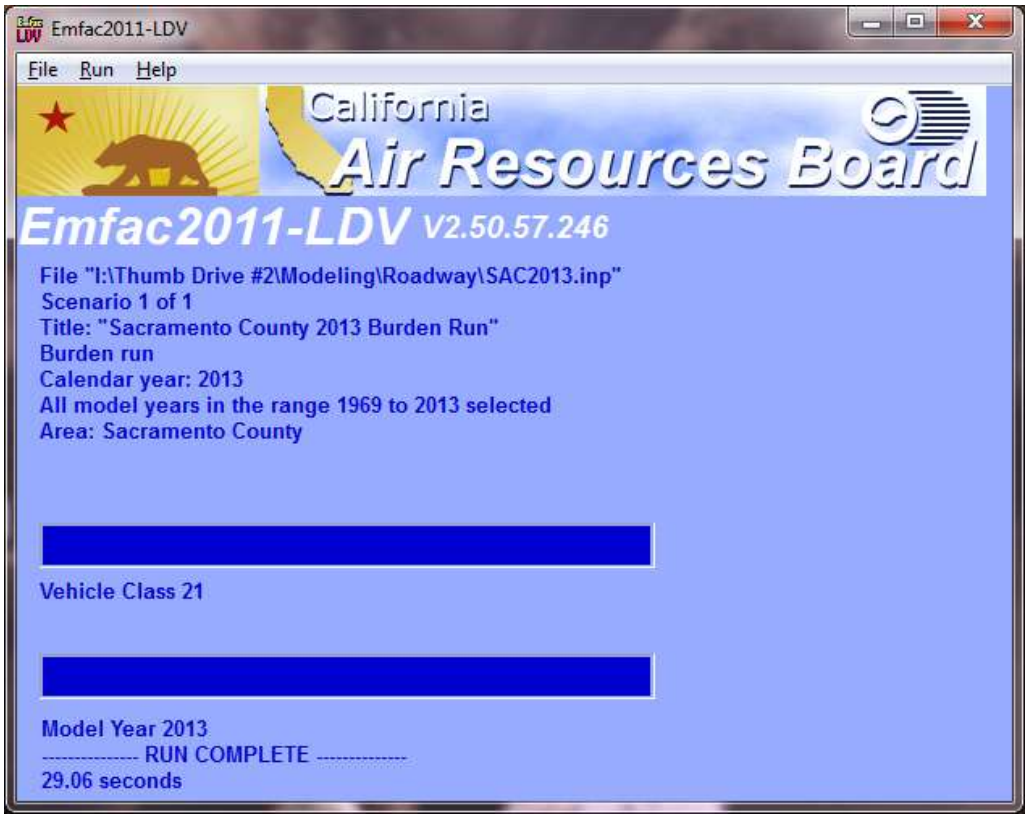


Figure 3-9 EMFAC2011 Run Finished

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Title : Sacramento County 2013 Burden Run												
2	Version : Emfac2011-LDV V2.50.57.246												
3	Run Date : 2012/09/21 08:12:48												
4	Scen Year: 2013 -- All model years in the range 1969 to 2013 selected												
5	Season : Annual												
6	Area : Sacramento County												
7	I/M Stat : Enhanced Interim (2005)												
8	Emissions: Tons Per Hr00												
9	**********												
10		LDA-NCAT	LDA-CAT	LDA-DSL	LDA-TOT	LDT1-NCAT	LDT1-CAT	LDT1-DSL	LDT1-TOT	LDT2-NCAT	LDT2-CAT	LDT2-DSL	LDT2-TOT
11	Vehicles	5274	461975	1888	469137	1517	68054	91	69662	1536	106552	79	108167
12	VMT/1000	1	200	1	202	0	27	0	27	0	71	0	71
13	Trips	171	25587	93	25851	50	3514	4	3568	50	8834	4	8888
14	Total Organic Gas Emissions												
15	Run Exh	0.01	0.01	0	0.01	0	0	0	0	0	0	0	0.01
16	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0
17	Start Ex	0	0.01	0	0.01	0	0	0	0	0	0	0	0
18													
19	Total Ex	0.01	0.02	0	0.02	0	0	0	0.01	0	0.01	0	0.01
20													
21	Diurnal	0	0	0	0	0	0	0	0	0	0	0	0
22	Hot Soak	0	0	0	0.01	0	0	0	0	0	0	0	0
23	Running	0	0.01	0	0.01	0	0	0	0	0	0.01	0	0.01
24	Resting	0	0.01	0	0.01	0	0	0	0	0	0	0	0
25													
26	Total	0.01	0.04	0	0.05	0	0.01	0	0.02	0	0.02	0	0.02
27	Carbon Monoxide Emissions												
28	Run Exh	0.07	0.26	0	0.33	0.02	0.08	0	0.1	0.02	0.13	0	0.15
29	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0
30	Start Ex	0.01	0.12	0	0.12	0	0.03	0	0.03	0	0.06	0	0.06
31													
32	Total Ex	0.07	0.38	0	0.45	0.02	0.11	0	0.13	0.02	0.19	0	0.21
33	Oxides of Nitrogen Emissions												
34	Run Exh	0	0.03	0	0.03	0	0.01	0	0.01	0	0.02	0	0.02
35	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0
36	Start Ex	0	0.01	0	0.01	0	0	0	0	0	0	0	0
37													
38	Total Ex	0	0.04	0	0.04	0	0.01	0	0.01	0	0.02	0	0.03
39	Carbon Dioxide Emissions (000)												
40	Run Exh	0	0.07	0	0.07	0	0.01	0	0.01	0	0.03	0	0.03
41	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0
42	Start Ex	0	0	0	0	0	0	0	0	0	0	0	0
43													

Figure 3-10 EMFAC2011 Burden File

4 District On-Road Emission Factor Methodology

In order to provide assistance to local agencies and consultants performing impact assessments for on-road vehicles, the District has developed a methodology that utilizes the newest version of CARB's EMFAC program in conjunction with site specific data or traffic study data that may have been performed by a project proponent.

Additionally, this methodology allows for different speed based emission factors to be developed depending on the project being assessed. For example, it may be reasonable to assume that all emission factors for speeds from 5 to 70 MPH be included when evaluating freeways / highways, but this same assumption would not be reasonable for surface streets were traffic is traveling at a lower rate of speeds (5-55MPH).

Also, the methodology will discuss issues related to emissions from vehicles traveling within industrial and/or commercial property (non-surface street/freeway/highway travel).

4.1 Speed Based Emission Factors

In order to develop speed based emission factors for each vehicle class, we must first understand how CARB developed their county-wide emission factors (Combined Emission Rate file). The following discussion will utilize data from Sacramento County for calendar year 2013 for both the Combined Emission Rate file and the Speed Based Data file; see Table 4-1, Table 4-2, and Table 4-3 below. The aforementioned data was generated using the procedures found in Sections 2.0.

4.1.1 How Did CARB Generate County-Wide Emission Factors

For ease of discussion, the development of the county-wide emission factors will be limited to light duty automobiles or LDA class of vehicles and the reactive organic gases (ROG) emission factors.

First, if you compare the sum of diesel VMT Table 4-1 with the county-wide value Table 4-3 they are identical out beyond the 100,000th decimal place. The same is true when comparing the sum of gasoline vehicles VMT Table 4-2 with the county-wide value Table 4-3 (Fuel Type: GAS).

Table 4-1 Speed Based Data - Diesel

Area	CalYr	Season	Veh	Fuel	MdlYr	Speed	Pop	VMT	Trips	ROG_RUNEX
						(Miles/hr)	(Vehicles)	(Miles/day)	(Trips/day)	(gms/mile)
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	5	0	26.42850514	0	0.157640781
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	10	0	265.608956	0	0.139030775
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	15	0	753.5053612	0	0.110075694
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	20	0	2885.812127	0	0.089218218
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	25	0	8170.17454	0	0.074020839
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	30	0	5188.565301	0	0.06286416
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	35	0	9335.034634	0	0.054659648
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	40	0	10799.82042	0	0.048671656
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	45	0	5345.131541	0	0.044406526
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	50	0	5456.530567	0	0.041544464
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	55	0	8584.288272	0	0.03990072
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	60	0	8383.330503	0	0.039410024
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	65	0	989.431211	0	0.040134572
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	70	0	327.4528048	0	0.042303874
							Sum	66511.11474		0.983881952

Table 4-2 Speed Based Data - Gasoline

Area	CalYr	Season	Veh	Fuel	MdlYr	Speed	Pop	VMT	Trips	ROG_RUNEX
						(Miles/hr)	(Vehicles)	(Miles/day)	(Trips/day)	(gms/mile)
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	5	0	7542.882183	0	0.250564183
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	10	0	75806.67358	0	0.165623688
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	15	0	215055.7881	0	0.115109989
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	20	0	823631.2274	0	0.083993935
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	25	0	2331825.59	0	0.064570121
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	30	0	1480853.318	0	0.052343577
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	35	0	2664284.65	0	0.044330861
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	40	0	3082345.075	0	0.039430427
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	45	0	1525538.436	0	0.036942745
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	50	0	1557332.488	0	0.036253356
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	55	0	2450016.664	0	0.037166239
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	60	0	2392661.743	0	0.040085961
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	65	0	282390.6731	0	0.045636348
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	70	0	93457.35598	0	0.04926813
							Sum	18982742.56		1.061319561

Secondly, if the same comparison is done with the emission factors you will notice that the values do not match. This is because the county-wide emission factor in Table 4-3 (under the ROG_RUNEX column) is a composite emission factor comprised of adjusted VMT weighted emission factors for each speed within a given vehicle class. Said a different way, the county-wide emission factor is the summation of adjusted emission factors, for each speed, based on its contribution to the total VMT for a given fuel and vehicle class combination. An example is provided later in this section.

Table 4-3 Data from the Combined Emissions Rate File

Area	CalYr	Season	Veh	Fuel	MdlYr	Speed	Pop	VMT	Trips	ROG_RUNEX
						(Miles/hr)	(Vehicles)	(Miles/day)	(Trips/day)	(gms/mile)
Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	AllSpeeds	1888.134378	66511.11474	11061.45922	0.053206946
Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	AllSpeeds	487248.7879	18982742.56	3066149.149	0.047063062

Example for 5 MPH LDA Diesel Vehicle (ROG):

1. Divide 5 MPH VMT by total LDA VMT. This represents the contribution (ratio) that the 5 MPH VMT has to the total VMT and in turn the contribution to the total emissions generated by the vehicle class.
2. Multiply 5 MPH emission factor by its contribution to the total VMT
3. Repeat Steps 1 & 2 for each speed within a vehicle class. The results for each speed may be seen in Table 4-4.
4. Sum the adjusted emission factors to derive a composite (county-wide) emission factor for the vehicle class.
5. Now compare the derived composite emission factor in Table 4-4 with that of the county-wide value in Table 4-3, you will notice they are identical out to the 100,000th decimal place.

Example Calculation for 5 MPH:

Equation1: VMT Ratio (Contribution)

VMT Ratio = VMT for 5 MPH / Sum of VMTs for all speeds
VMT Ratio = 26.42850514 / 66511.11474
VMT Ratio = 0.000397

Equation 2: Adjusted Emission Factor (EF)

Adjusted EF = EF for 5 MPH * VMT Ratio
Adjusted EF = 0.157640781 * 0.000397
Adjusted EF = 6.26393 E-05 gms/mile

Table 4-4 Adjusted Emission Factors (DSL)

Speed (Miles/hr)	ROG_RUNEX (gms/mile)	VMT (Miles/day)	Ratio	Adjusted Emission Factor
5	0.157640781	26.42850514	0.000397	6.26393E-05
10	0.139030775	265.608956	0.003993	0.000555213
15	0.110075694	753.5053612	0.011329	0.001247049
20	0.089218218	2885.812127	0.043388	0.003871037
25	0.074020839	8170.17454	0.122839	0.009092663
30	0.06286416	5188.565301	0.07801	0.004904065
35	0.054659648	9335.034634	0.140353	0.007671646
40	0.048671656	10799.82042	0.162376	0.007903117
45	0.044406526	5345.131541	0.080364	0.003568708
50	0.041544464	5456.530567	0.082039	0.003408282
55	0.03990072	8584.288272	0.129065	0.005149805
60	0.039410024	8383.330503	0.126044	0.004967399
65	0.040134572	989.431211	0.014876	0.000597049
70	0.042303874	327.4528048	0.004923	0.000208274
	Sum	66511.11474	1	0.053206946

NOTE!!

1. This same concept can be applied to the population data to estimate the population for each vehicle speed.
2. The above process can be repeated for each pollutant emission factor to derive county-wide composite emission factor for each pollutant.

4.2 Emission Factor Development

Using the information from Section 4.1.1, it is now possible to develop county-wide speed based emission factors. Additionally, vehicle population estimates can also be developed using the same procedure.

4.2.1 What Type of Roadway Do I Have?

The first step in developing a speed based emission factor is to determine what speeds will be included in the composite emission factor. There are several things that should be considered when determining which speeds should be included in the composite emission factor.

CAUTION!!

Speed based or even county-wide emissions factors should only be used when evaluating traffic that has a mixture of vehicle classes. These values are not appropriate for estimating emissions for a specific vehicle class operating outside of or within a facility boundary without prior approval of the reviewing agency.

Things to Consider

1. Does the roadway under evaluation have a posted speed limit?
2. Does the roadway experience frequent congestion?
3. Where is the roadway located?

Answering these questions will assist in determining which speeds should be included in the final composite emission factor. The following examples use a table format to answer these questions and provide the speed(s) that would be included in a composite emission factor.

Example 1 (Congested Freeways):

Table 4-5 Congested Freeways

Things to Consider	Answer	Speeds
Posted Speed Limit?	55-70 MPH	55-70 MPH
Congested?	Yes	5-55 MPH
Location?	Urban/Rural Minimum Speed	55 MPH
	Speeds to Include	5-70 MPH

Example 2 (Non-Congested Freeway):

Table 4-6 Non-Congested Freeways

Things to Consider	Answer	Speeds
Posted Speed Limit?	55-70 MPH	55-70 MPH
Congested?	No	None
Location?	Urban/Rural Minimum Speed	55 MPH
	Speeds to Include	55-70 MPH

Example 3 (Congested -Surface Streets Non-Residential):

Table 4-7 Congested Surface Streets

Things to Consider	Answer	Speeds
Posted Speed Limit?	35-55 MPH	35-55 MPH
Congested?	Yes	5-55 MPH
Location?	Urban Minimum Speed	25 MPH
	Speeds to Include	5-55 MPH

Example 4 (Non-Congested -Surface Streets Non-Residential):

Table 4-8 Non-Congested Surface Streets

Things to Consider	Answer	Speeds
Posted Speed Limit?	35-55 MPH	35-55 MPH
Congested?	No	None
Location?	Urban Minimum Speed	25 MPH
	Speeds to Include	25-55 MPH

Example 5 (Non-Congested -Surface Streets Rural):

Table 4-9 Non-Congested Surface Streets

Things to Consider	Answer	Speeds
Posted Speed Limit?	55 MPH	55 MPH
Congested?	No	None
Location?	Rural Minimum Speed	45 MPH
	Speeds to Include	45-55 MPH

Caution!!

It may not be appropriate to derive speeds based emission factors when the range of speeds is narrowly defined (~15 MPH) and specific vehicle classes are being assessed. Please contact the reviewing agency for further guidance. Otherwise, it is recommended that the procedure in Section 4.2.1.1 be followed to derive the appropriate emission factor(s).

4.2.1.1 Other Roadway Types

There are other scenarios that may require emission estimates to be performed including but not limited to onsite road travel and travel that is limited to a narrow range of speeds (~15 MPH) and vehicles. These types of roadway travel may not lend themselves to using a speed based county-wide emission factor as discussed above. Therefore, for scenarios where limited speeds and specific vehicle classes are known or are easily determined, a non-adjusted emission factor or an average of emission factors may be more appropriate.

For example, to determine an appropriate emission factor for onsite travel at a distribution center where speeds are limited to 5-15 MPH for the heavy duty truck (HHDT or T7) operating onsite, the average of the three non-adjusted emission factors should be used, see Table 4-10.

Table 4-10 Heavy Heavy Duty Trucks

Area	CalYr	Season	Veh	Fuel	Speed	PM10_RUNEX
Sacramento (SV)	2013	Annual	T7	DSL	5	0.726286
Sacramento (SV)	2013	Annual	T7	DSL	10	0.542945
Sacramento (SV)	2013	Annual	T7	DSL	15	0.400195
					Average (gms/VMT)	0.556

The average grams per VMT would be used in conjunction with the actual miles traveled onsite to derive the estimated emissions for the heavy duty truck.

This method can/should be used when:

- A limited speed range and a single vehicle class are being evaluated.

Or

- When a single, known, vehicle class is being considered
    - Speed based emission factors, as noted in Section 4.1, do not lend themselves to this type of assessment.

5 On-Road Emission Factor Estimator

In order to streamline the process of generating county-wide speed based and average emission factors; the District has created an MS Access database program that will import the Combined Emission Rate and Speed Based Data files. The database was also programed to import both the EMFAC2007 & EMFAC2011 burden and CARB HD files that will summarize hourly vehicle counts in order to develop hourly diurnal factors or hourly scalars. These scalars are used to adjust the maximum hourly emissions rate used in the AERMOD model.

CAUTION!!
Currently the EMFAC2011-LDV burden file does not include all diesel vehicles and, therefore, the hourly scalars developed using only EMFAC2011-LDV will not be accurate. A modified version of the EMFAC2011 – HD module has been developed by CARB that creates an output that provides data similar to that of the burden file. This output can only be generated by CARB. Request for this data should be directed to Chengfeng Wang of CARB @ cwang@arb.ca.gov.

The following walkthrough will provide an example of the steps needed to generate county-wide speed based & average emission factors using the District's On-Road Emission Factor Estimator database program.

5.1 Assumptions

For the purpose of this example walk through the following assumption will be used:

Table 5-1 Project Assumptions

Project County:	Sacramento County
Project Start Year:	2013

5.2 Downloading the Combined Emission Rate File

Following the basic steps provided in Section 2.1 and the parameters below to download the combined emission rate file:

1. Open CARB's EMFAC2011 Website
2. Use the following Settings:
   - **Region** = Sacramento (SV)
   - **Calendar Year** = 2013
   - **Season** = Annual Average.
   - All other options should not be changed.
   - Under the "**Query By**" select the "EMFAC 2007 Vehicle Categories"
3. Click the "Download" button and follow the prompts to save the file.
   a. It is recommended that the user rename the file to allow for easier recognition.
   b. For this example the file was renamed to "Sacramento 2013 Combined.csv"

The data downloaded should look similar to Figure 5-1 below.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	EMFAC 2011																
2	2013 Estimated Annual Emission Rates																
3	EMFAC 2007 Vehicle Categories																
4	Sacramento COUNTY																
5	Sacramento Valley AIR BASIN																
6	Sacramento Metropolitan AQMD																
7	Area	CalYr	Season	Veh	Fuel	MdlYr	Speed (Miles/hr)	Pop (Vehicles)	VMT (Miles/day)	Trips (Trips/day)	ROG_RUNEX (gms/mile)	ROG_IDLEX (gms/vehicle/day)	ROG_STREX (gms/vehicle/day)	ROG_DIURN (gms/vehicle/day)	ROG_HTSK (gms/vehicle/day)	ROG_RUNLS (gms/mile)	ROG_RESTL (gms/vehicle/day)
8																	
9	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	AllSpeeds	487248.7879	1.90E+07	3066149.149	0.047063082	0	1.94712513	0.573304159	1.131034767	0.070839309	0.336080782
10	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	AllSpeeds	1888.134378	66511.11474	11061.45922	0.053206946	0	0	0	0	0	0
11	Sacramento (SV)	2013	Annual	LDT1	GAS	AllMYr	AllSpeeds	69570.93304	2562939.04	424249.2796	0.115644858	0	3.716772936	1.250027692	2.016054642	0.204638725	0.669668599
12	Sacramento (SV)	2013	Annual	LDT1	DSL	AllMYr	AllSpeeds	91.3781436	2875.553198	483.347218	0.081089805	0	0	0	0	0	0
13	Sacramento (SV)	2013	Annual	LDT2	GAS	AllMYr	AllSpeeds	168087.3232	6704831.325	1057568.508	0.055577474	0	2.430773837	0.595066702	1.179091353	0.103801366	0.362645195
14	Sacramento (SV)	2013	Annual	LDT2	DSL	AllMYr	AllSpeeds	79.2331181	2903.40539	446.843187	0.061900609	0	0	0	0	0	0
15	Sacramento (SV)	2013	Annual	LHD1	GAS	AllMYr	AllSpeeds	25910.029	1108156.371	386020.8202	0.256940391	0.544723677	11.09921073	0.068401113	1.610469539	0.228872601	0.024947229
16	Sacramento (SV)	2013	Annual	LHD1	DSL	AllMYr	AllSpeeds	14712.83789	632517.9368	185068.9804	0.25709174	0.109759104	0	0	0	0	0
17	Sacramento (SV)	2013	Annual	LHD2	GAS	AllMYr	AllSpeeds	2222.892768	94735.87003	33117.78678	0.238402455	0.547419135	11.52357442	0.065151278	1.885074004	0.232898415	0.024073684
18	Sacramento (SV)	2013	Annual	LHD2	DSL	AllMYr	AllSpeeds	3517.616444	152017.9133	44247.18872	0.231412107	0.109759101	0	0	0	0	0
19	Sacramento (SV)	2013	Annual	MCY	GAS	AllMYr	AllSpeeds	28044.68065	235689.7488	56083.75611	2.64116365	0	4.745158514	2.149399822	1.132930162	0.507533201	0.981481206
20	Sacramento (SV)	2013	Annual	MDV	GAS	AllMYr	AllSpeeds	143019.4683	5734392.62	896680.9102	0.089403848	0	3.946611227	0.623034381	1.211074813	0.103104631	0.39890327
21	Sacramento (SV)	2013	Annual	MDV	DSL	AllMYr	AllSpeeds	140.8253093	5691.43025	821.438831	0.04782298	0	0	0	0	0	0
22	Sacramento (SV)	2013	Annual	MH	GAS	AllMYr	AllSpeeds	5452.606251	72205.12943	545.4787174	0.337668589	0	0.101972626	0.206153838	0.013336803	0.02017416	0.048553585
23	Sacramento (SV)	2013	Annual	MH	DSL	AllMYr	AllSpeeds	883.5771112	11802.77331	88.35771463	0.257687821	0	0	0	0	0	0
24	Sacramento (SV)	2013	Annual	OBUS	GAS	AllMYr	AllSpeeds	754.5837234	38922.83114	34460.52464	0.233756203	1.889451834	43.45279743	0.049107374	1.384329069	0.233756471	0.014881489
25	Sacramento (SV)	2013	Annual	OBUS	DSL	AllMYr	AllSpeeds	606.8427309	48610.56494	0	0.400102132	3.736702791	0	0	0	0	0
26	Sacramento (SV)	2013	Annual	SBUS	GAS	AllMYr	AllSpeeds	171.0130216	7442.275075	684.0526892	2.404156708	0	16.95847955	0.30413876	1.383153126	0.246085328	0.072173681
27	Sacramento (SV)	2013	Annual	SBUS	DSL	AllMYr	AllSpeeds	396.7550359	14921.49886	0	0.404602247	1.404683749	0	0	0	0	0
28	Sacramento (SV)	2013	Annual	T6	GAS	AllMYr	AllSpeeds	3120.69689	137359.3459	62436.9053	0.41537768	1.16302224	50.23335785	0.125422669	6.175465782	0.495591328	0.046753284
29	Sacramento (SV)	2013	Annual	T6	DSL	AllMYr	AllSpeeds	11511.17116	582805.8141	0	0.347830794	0.274640112	0	0	0	0	0
30	Sacramento (SV)	2013	Annual	T7	GAS	AllMYr	AllSpeeds	327.4854427	32422.52907	6552.328683	1.14739254	0	148.800508	0.211003036	15.05830412	0.569228259	0.082619113
31	Sacramento (SV)	2013	Annual	T7	DSL	AllMYr	AllSpeeds	3673.578018	512539.8333	0	0.436825293	11.98251917	0	0	0	0	0
32	Sacramento (SV)	2013	Annual	UBUS	GAS	AllMYr	AllSpeeds	245.8048969	31746.62322	983.219548	0.724421765	0	15.2263624	0.08185011	1.340315598	0.051201929	0.032219528
33	Sacramento (SV)	2013	Annual	UBUS	DSL	AllMYr	AllSpeeds	455.6612975	58850.37854	1822.645274	0.530928798	0	0	0	0	0	0

Figure 5-1 Combined Emission Rate File

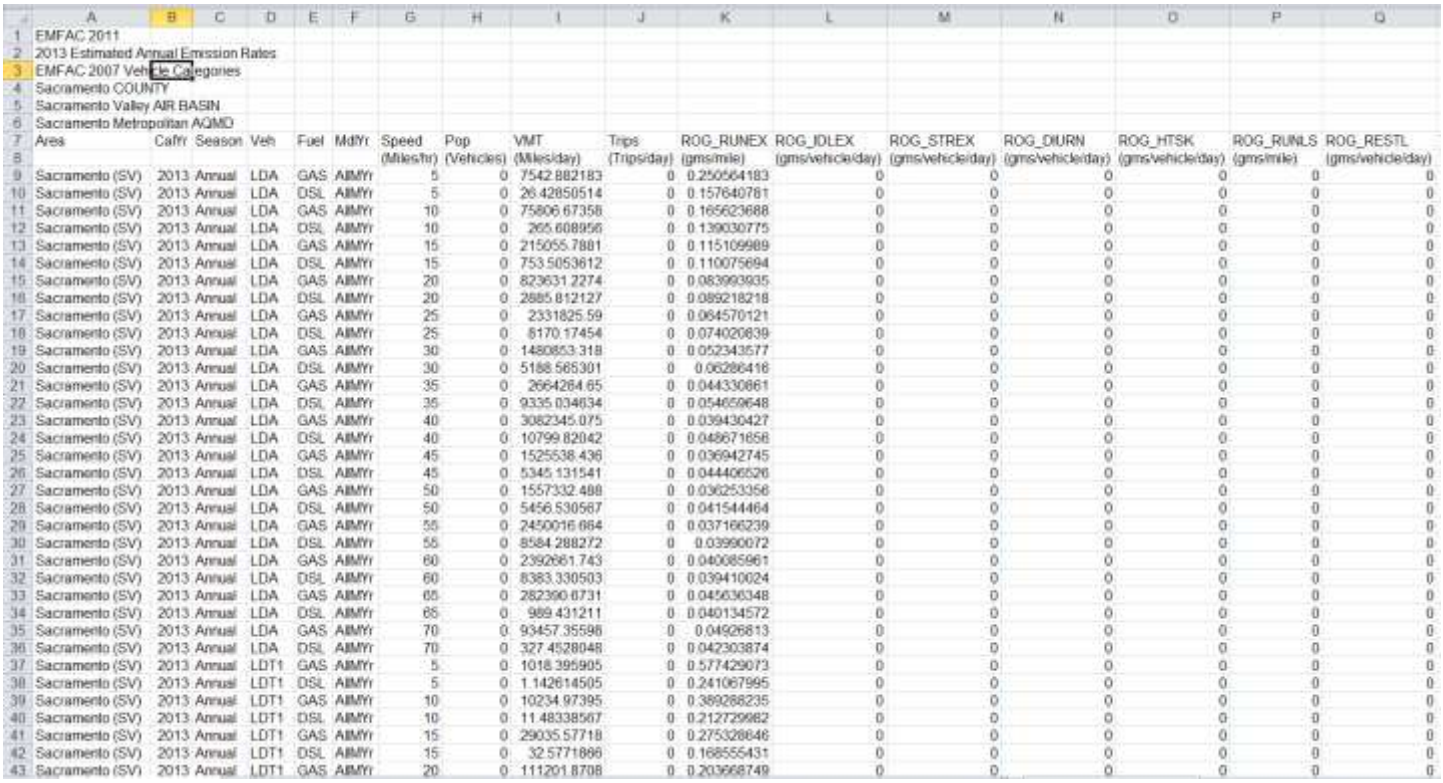
NOTE!!
Figure 5-1 is only a snap shot of the actual data contained within the combined emission rate file. The file has similar data for each criteria pollutant.

5.3 Downloading the Speed Based Data File

Follow the basic steps provided in Section 2.2 and the parameters below to download the speed based data file:

1. Open CARB's EMFAC2011 Website
2. Use the following Settings:
   - **Region** = Sacramento (SV)
   - **Calendar Year** = 2013
   - **Season** = Annual Average.
   - **Speed** – select the "All" option. This will generate values for all speeds from 5 to 70 MPH.
   - All other options should not be changed.
   - Under the "**Query By**" select the "EMFAC 2007 Vehicle Categories"
3. Click the "Download" button and follow the prompts to save the file.
   a. It is recommended that the user rename the file to allow for easier recognition.
   b. For this example the file was renamed "Sacramento 2013 by Speed.csv"

The data downloaded should look similar to Figure 5-2 below.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	EMFAC 2011																
2	2013 Estimated Annual Emission Rates																
3	EMFAC 2007 Vehicle Categories																
4	Sacramento COUNTY																
5	Sacramento Valley AIR BASIN																
6	Sacramento Metropolitan AQMD																
7	Area	CalYr	Season	Veh	Fuel	MdlYr	Speed (Miles/hr)	Pop (Vehicles)	VMT (Miles/day)	Trips (Trips/day)	ROG_RUNEX (gms/mile)	ROG_IDLEX (gms/vehicle/day)	ROG_STREX (gms/vehicle/day)	ROG_DIURN (gms/vehicle/day)	ROG_HTSK (gms/vehicle/day)	ROG_RUNLS (gms/mile)	ROG_RESTL (gms/vehicle/day)
8																	
9	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	5	0	7542.882183	0	0.250564183	0	0	0	0	0	0
10	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	5	0	26.42850514	0	0.157640781	0	0	0	0	0	0
11	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	10	0	75806.67358	0	0.165623688	0	0	0	0	0	0
12	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	10	0	265.608956	0	0.139030775	0	0	0	0	0	0
13	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	15	0	215055.7881	0	0.115109989	0	0	0	0	0	0
14	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	15	0	753.5053612	0	0.110075694	0	0	0	0	0	0
15	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	20	0	823631.2274	0	0.083993935	0	0	0	0	0	0
16	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	20	0	2885.812127	0	0.089218218	0	0	0	0	0	0
17	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	25	0	2331825.59	0	0.064570121	0	0	0	0	0	0
18	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	25	0	8170.17454	0	0.074020839	0	0	0	0	0	0
19	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	30	0	1480853.318	0	0.052343577	0	0	0	0	0	0
20	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	30	0	5188.565301	0	0.06286418	0	0	0	0	0	0
21	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	35	0	2664264.65	0	0.044330861	0	0	0	0	0	0
22	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	35	0	9335.034634	0	0.054659648	0	0	0	0	0	0
23	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	40	0	3082345.075	0	0.039430427	0	0	0	0	0	0
24	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	40	0	10799.82042	0	0.048671858	0	0	0	0	0	0
25	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	45	0	1525538.436	0	0.036942745	0	0	0	0	0	0
26	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	45	0	5345.131541	0	0.044406526	0	0	0	0	0	0
27	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	50	0	1557332.488	0	0.036253356	0	0	0	0	0	0
28	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	50	0	5456.530587	0	0.041544464	0	0	0	0	0	0
29	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	55	0	2450016.664	0	0.037166239	0	0	0	0	0	0
30	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	55	0	8584.288272	0	0.03990072	0	0	0	0	0	0
31	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	60	0	2392661.743	0	0.040085961	0	0	0	0	0	0
32	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	60	0	8383.330503	0	0.039410024	0	0	0	0	0	0
33	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	65	0	282390.6731	0	0.045636348	0	0	0	0	0	0
34	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	65	0	989.431211	0	0.040134572	0	0	0	0	0	0
35	Sacramento (SV)	2013	Annual	LDA	GAS	AllMYr	70	0	93457.35598	0	0.04926813	0	0	0	0	0	0
36	Sacramento (SV)	2013	Annual	LDA	DSL	AllMYr	70	0	327.4528048	0	0.042303874	0	0	0	0	0	0
37	Sacramento (SV)	2013	Annual	LDT1	GAS	AllMYr	5	0	1018.395905	0	0.577429073	0	0	0	0	0	0
38	Sacramento (SV)	2013	Annual	LDT1	DSL	AllMYr	5	0	1.142614505	0	0.241067995	0	0	0	0	0	0
39	Sacramento (SV)	2013	Annual	LDT1	GAS	AllMYr	10	0	10234.97395	0	0.389288235	0	0	0	0	0	0
40	Sacramento (SV)	2013	Annual	LDT1	DSL	AllMYr	10	0	11.48338567	0	0.212729982	0	0	0	0	0	0
41	Sacramento (SV)	2013	Annual	LDT1	GAS	AllMYr	15	0	29035.57718	0	0.275328846	0	0	0	0	0	0
42	Sacramento (SV)	2013	Annual	LDT1	DSL	AllMYr	15	0	32.5771886	0	0.168555431	0	0	0	0	0	0
43	Sacramento (SV)	2013	Annual	LDT1	GAS	AllMYr	20	0	111201.8708	0	0.203668749	0	0	0	0	0	0

Figure 5-2 Speed Based Data File

NOTE!!
Figure 5-2 is only a snap shot of the data contained within the speed base data file. The file has similar data for each criteria pollutant.

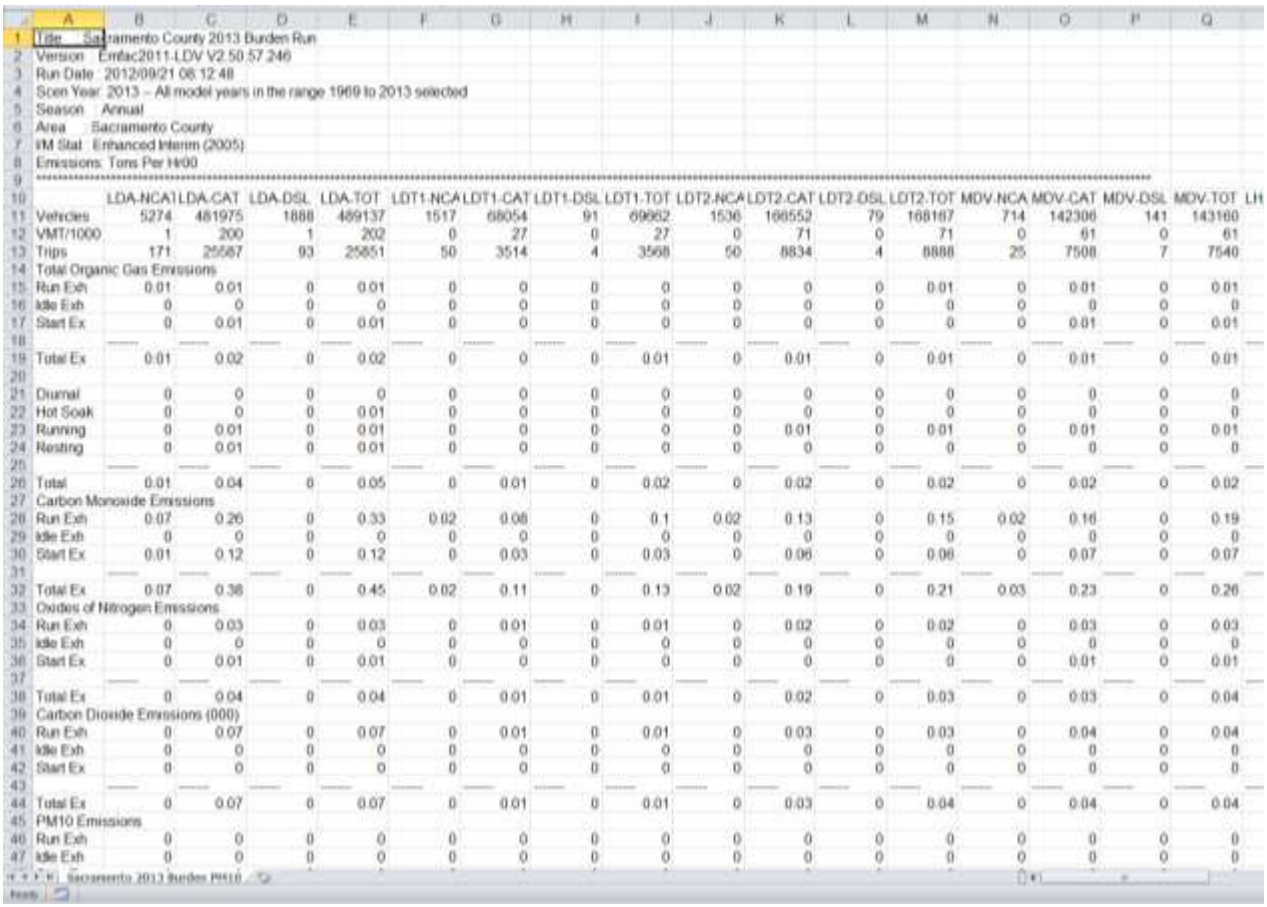
5.4 EMFAC Burden File

Follow the basic steps provided in Section 3 and the parameters below to generate an EMFAC2011 burden files.

- **Geographic Area** = County
- **County** = Sacramento
- **Calendar Year** = 2013
- **Season** = Annual
- **Output Particulate*** = PM10

*A second burden file should be created for PM2.5 as well.

The data generated should look similar to Figure 5-3 below.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Title:	Sacramento County 2013 Burden Run															
2	Version:	Emfac2011-LDV V2.50.57.246															
3	Run Date:	2012/09/21 08:12:48															
4	Scen Year:	2013 -- All model years in the range 1969 to 2013 selected															
5	Season:	Annual															
6	Area:	Sacramento County															
7	I/M Stat:	Enhanced Interim (2005)															
8	Emissions:	Tons Per Hr/00															
9																	
10		LDA-NCAT	LDA-CAT	LDA-DSL	LDA-TOT	LDT1-NCA	LDT1-CAT	LDT1-DSL	LDT1-TOT	LDT2-NCA	LDT2-CAT	LDT2-DSL	LDT2-TOT	MDV-NCA	MDV-CAT	MDV-DSL	MDV-TOT	LH
11	Vehicles	5274	481975	1888	489137	1517	68054	91	69662	1536	166552	79	168167	714	142306	141	143160	
12	VMT/1000	1	200	1	202	0	27	0	27	0	71	0	71	0	61	0	61	
13	Trips	171	25587	93	25851	50	3514	4	3568	50	8834	4	8888	25	7508	7	7540	
14	Total Organic Gas Emissions																	
15	Run Exh	0.01	0.01	0	0.01	0	0	0	0	0	0	0	0.01	0	0.01	0	0.01	
16	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17	Start Ex	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0.01	0	0.01	
18																		
19	Total Ex	0.01	0.02	0	0.02	0	0	0	0.01	0	0.01	0	0.01	0	0.01	0	0.01	
20																		
21	Diurnal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22	Hot Soak	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	
23	Running	0	0.01	0	0.01	0	0	0	0	0	0.01	0	0.01	0	0.01	0	0.01	
24	Resting	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	
25																		
26	Total	0.01	0.04	0	0.05	0	0.01	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02	
27	Carbon Monoxide Emissions																	
28	Run Exh	0.07	0.26	0	0.33	0.02	0.08	0	0.1	0.02	0.13	0	0.15	0.02	0.16	0	0.19	
29	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30	Start Ex	0.01	0.12	0	0.12	0	0.03	0	0.03	0	0.06	0	0.06	0	0.07	0	0.07	
31																		
32	Total Ex	0.07	0.38	0	0.45	0.02	0.11	0	0.13	0.02	0.19	0	0.21	0.03	0.23	0	0.26	
33	Oxides of Nitrogen Emissions																	
34	Run Exh	0	0.03	0	0.03	0	0.01	0	0.01	0	0.02	0	0.02	0	0.03	0	0.03	
35	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
36	Start Ex	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0.01	0	0.01	
37																		
38	Total Ex	0	0.04	0	0.04	0	0.01	0	0.01	0	0.02	0	0.03	0	0.03	0	0.04	
39	Carbon Dioxide Emissions (000)																	
40	Run Exh	0	0.07	0	0.07	0	0.01	0	0.01	0	0.03	0	0.03	0	0.04	0	0.04	
41	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
42	Start Ex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
43																		
44	Total Ex	0	0.07	0	0.07	0	0.01	0	0.01	0	0.03	0	0.04	0	0.04	0	0.04	
45	PM10 Emissions																	
46	Run Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
47	Idle Exh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Figure 5-3 EMFAC Burden File

NOTE!!
Figure 5-23 is only a snap shot of the data contained within the speed base data file. The file has similar data for each criteria pollutant.

5.5 Importing Data

The section will discuss how to import the file(s) downloaded and/or generated into the District's "On-Road Emission Factor Estimator" database in order to develop On-Road vehicle emission factors for use in estimating emissions.

Figure 5-4 display the database's "Main Menu" which provides three options for Importing data into the database; 1) Import EmFAC2011 Online data, 2) Import EMFAC Burden Data (for both EMFAC 2007 & 2011), and 3) Import EMFAC HD Files (data generated by CARB).

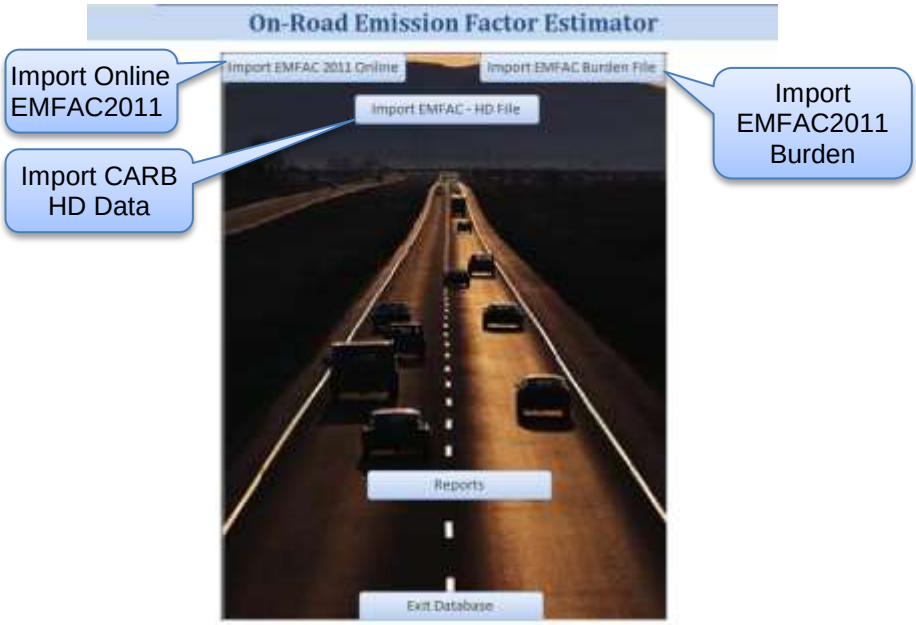


Figure 5-4 Main Menu - Import Options

5.5.1 Importing EMFAC 2011 Online Data

To import files downloaded from CARB's EMFAC2011 online system follow these steps:

- From the Main Menu click the "Import EMFAC 2011 Online" button. The screen should now look like Figure 5-5.
- Depending on the file to be imported (Combined / Speed Based) click the select file dialog icon next to the desired file type, see Figure 5-6.
- From the select file dialog screen navigate to the location where the file is located. The initial/starting directory is set to the location where database is located as a default.
- From the file dialog screen select the file to import and click the "Select" button, see Figure 5-6. The full path of the file selected will be place in the "File Name" field.
- From the Import screen, Figure 5-5, click the "Import File(s)" button under the "File Name" field (Combined or Speed Based).
- This will import the selected file into the database.
    - If the data already exists in the database (Year & Region / Area) the database will display Figure 5-7 indicating that the data exists and provides two options for proceeding.
- Once the import has completed Figure 5-8 will be displayed as confirmation.
- The process is the same for both the Combined and the Speed Based files.
- Repeat for other years and/or regions/areas
- Once complete, Click the "OK" button to return to the "Main Menu"

NOTE!!
Before proceeding ensure that both the Sacramento 2013 Combined.csv & Sacramento 2013 by Speed.csv files have been imported.

Figure 5-5 Import EMFAC 2011 Online Data

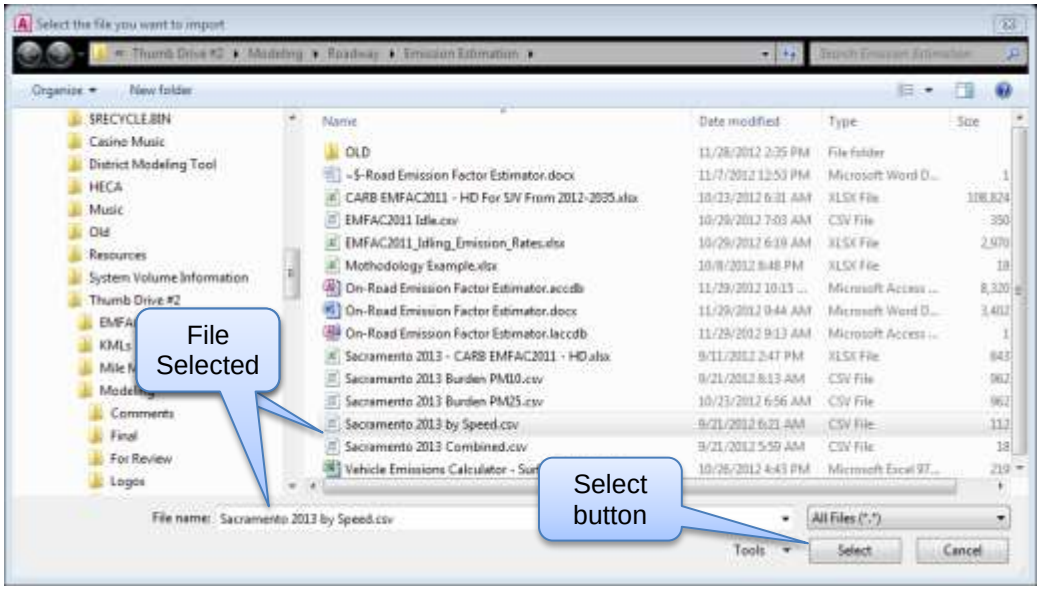


Figure 5-6 Select EMFAC 2011 Online File

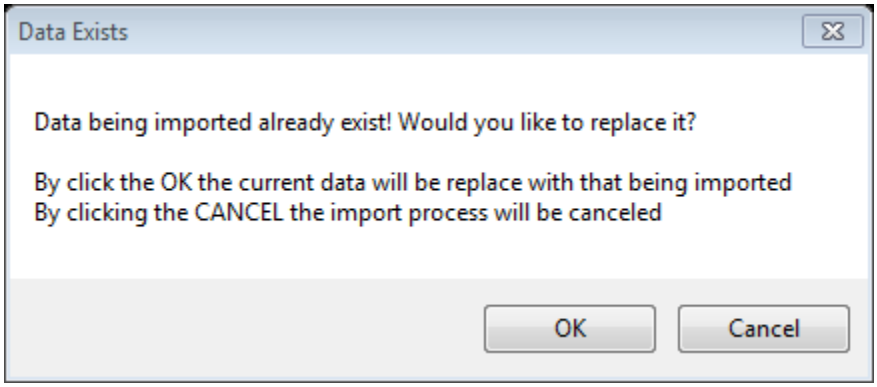


Figure 5-7 Importing Existing Data

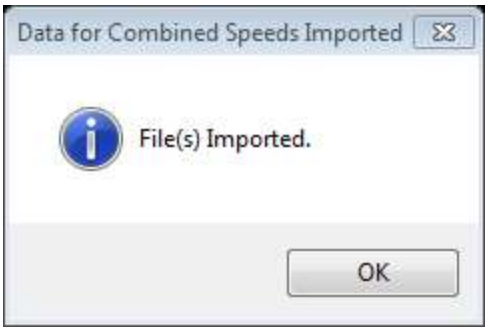


Figure 5-8 Import Completed

5.5.2 Importing EMFAC2011 Burden Data

To import the burden file generated by CARB's EMFAC2011 program follow these steps:

- From the Main Menu click the "Import EMFAC Burden File" button. The screen should now look like Figure 5-9.
- Click the select file dialog icon to select the file to import.
- From the select file dialog screen navigate to the location where the file is located. The initial/starting directory is set to the location where database is located as a default.
- From the file dialog screen select the file to import and click the "Select" button, see Figure 5-10. The full path of the file selected will be placed in the "File Name" field.
- Select the EMFAC version used to generate the burden file.
- Select the type of PM contained in the selected burden file.
- Click the "import Files(s)" button.
- Figure 5-11will display as confirmation message once the burden file has been imported.
- Repeat these steps for other files that are to be imported.
- Click the "OK" button to return to the Main Menu.

NOTE!!
The burden file can be generated for multiple years. The database will import all the data contain with in the file.

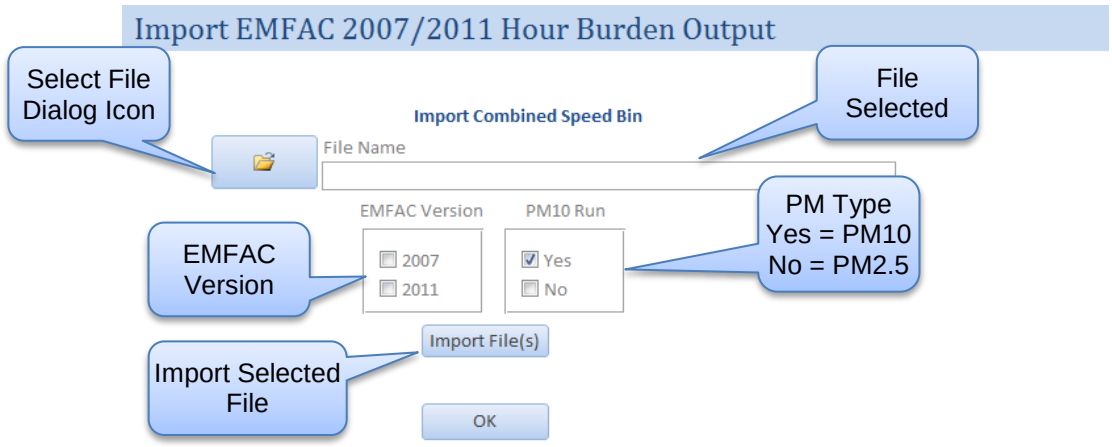


Figure 5-9 Import EMFAC Burden File

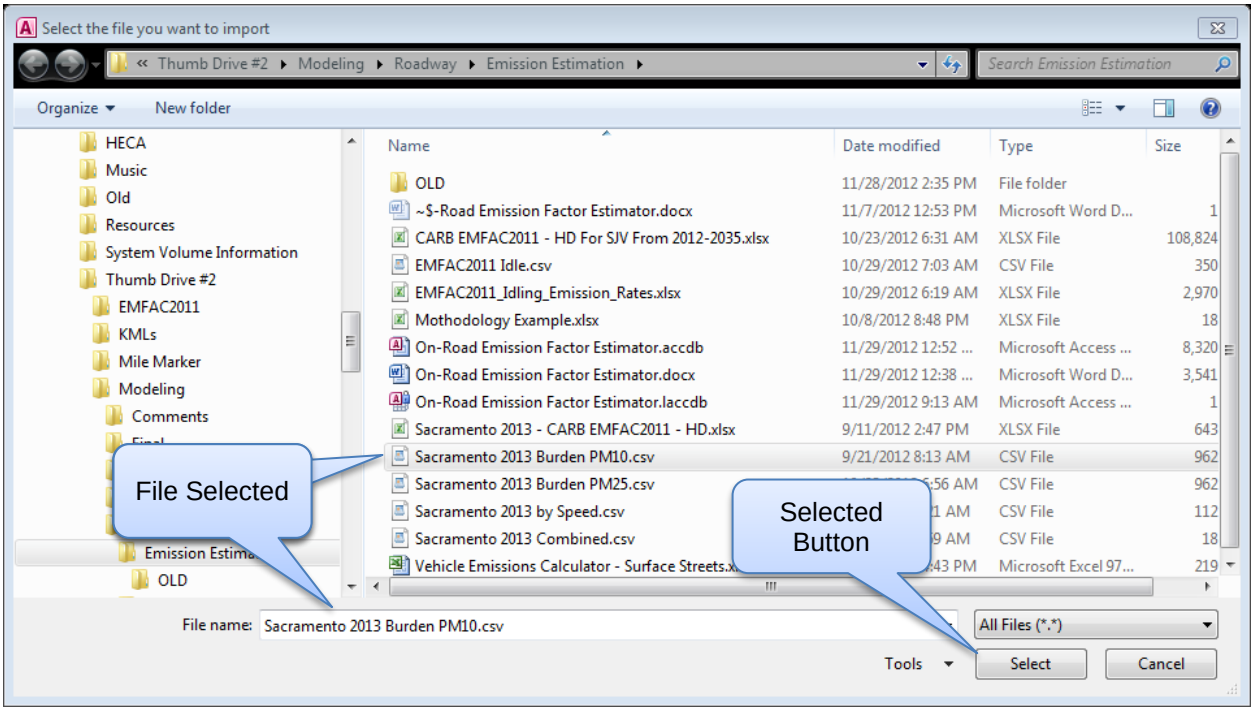


Figure 5-10 Select Burden File

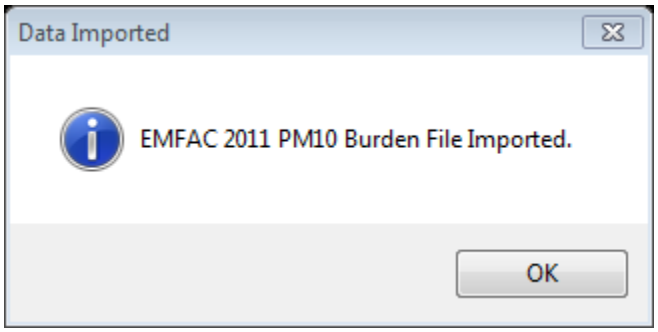


Figure 5-11 Burden File Imported

5.5.3 Import CARB's HD File

To import the EMFAC-HD file generated by CARB follow these steps:

- From the Main Menu click the "Import EMFAC – HD File" button. The screen should now look like Figure 5-12.
- Click the select file dialog icon to select the file to import.
- From the select file dialog screen navigate to the location where the file is located. The initial/starting directory is set to the location where database is located as a default.
- From the file dialog screen select the file to import and click the "Select" button, see Figure 5-13. The full path of the file selected will be placed in the "File Name" field.

CAUTION!!
The database will open and read the Excel workbook tabs within the selected file. This process may take a few minute for very large file.

- From the "Excel Tabs" list box select the tab to be imported
- Click the "Import Selected Tab" button to start the import.
  - If the data already exists in the database (Year & Region / Area) the database will display Figure 5-15 indicating that the data exists and provides two options for proceeding.
- Once the import has been completed Figure 5-14 will be displayed
- Click the "Cancel" button to return to the Main Menu.

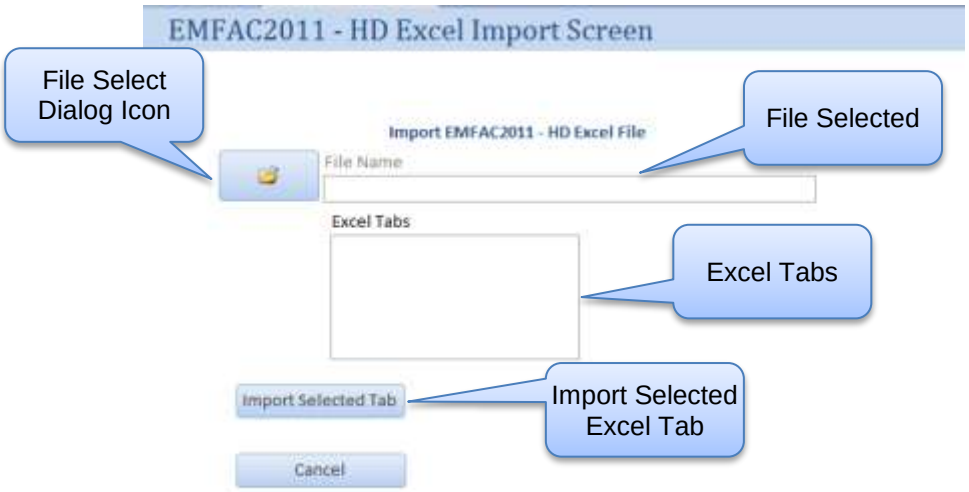


Figure 5-12 Import CARB's HD File

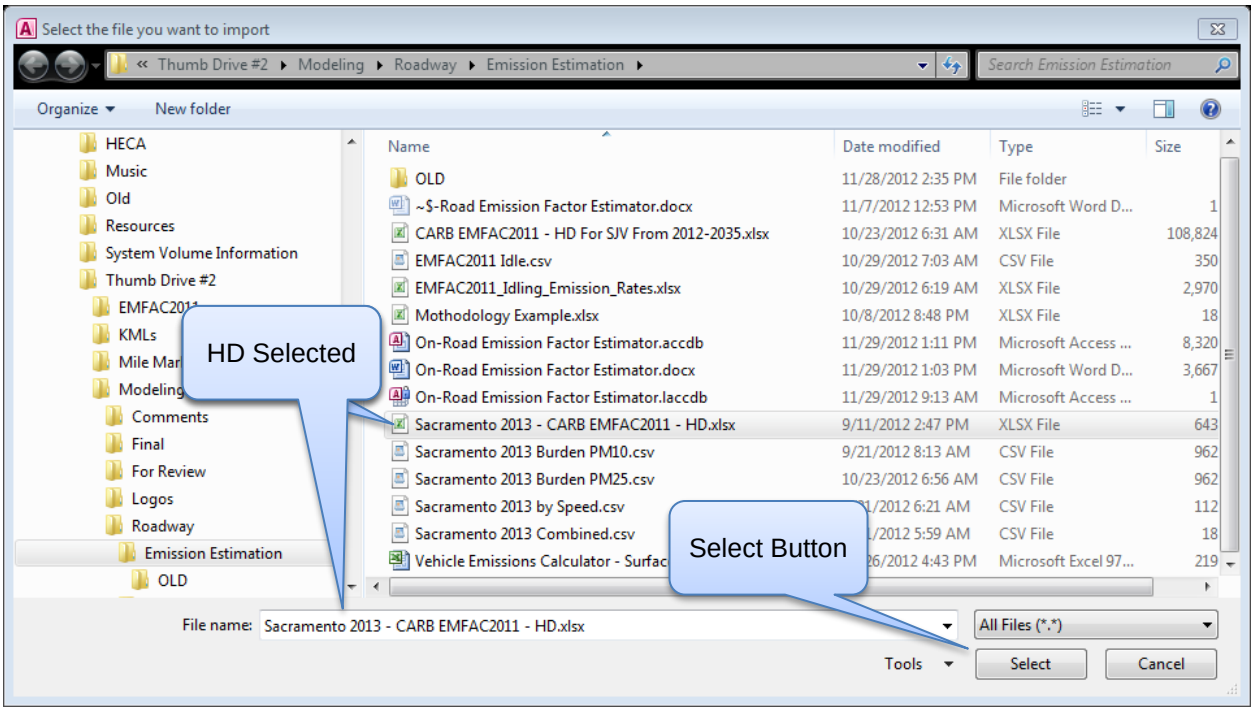


Figure 5-13 Select HD File

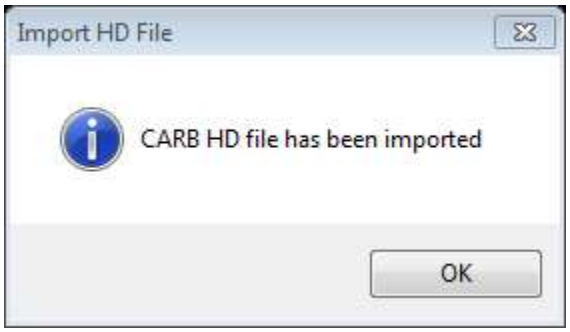


Figure 5-14 Import Completed

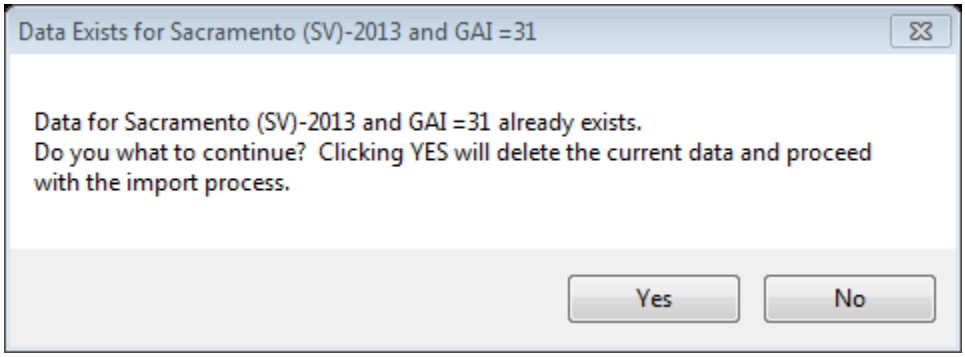


Figure 5-15 HD Data Exists

5.5.4 Generating Emission Factors

The first step in the process is to generate a set of emission factors for the project under evaluation. This section is broken down into three subsection; 1) Speed Based Emission Factors (Weighted Average), 2) Average Emission Factors, and 3) Annual Average Daily VMT by Hour of the Day.

Depending on the type of project being evaluated all or only one of the reports will be needed. Each subsection will discuss in more detail the type of project or the intent of the data.

No matter which report(s) is needed follow this step to open the "Report" screen:

- From the Main Menu click the "Reports" button. The screen should now look like Figure 5-16.

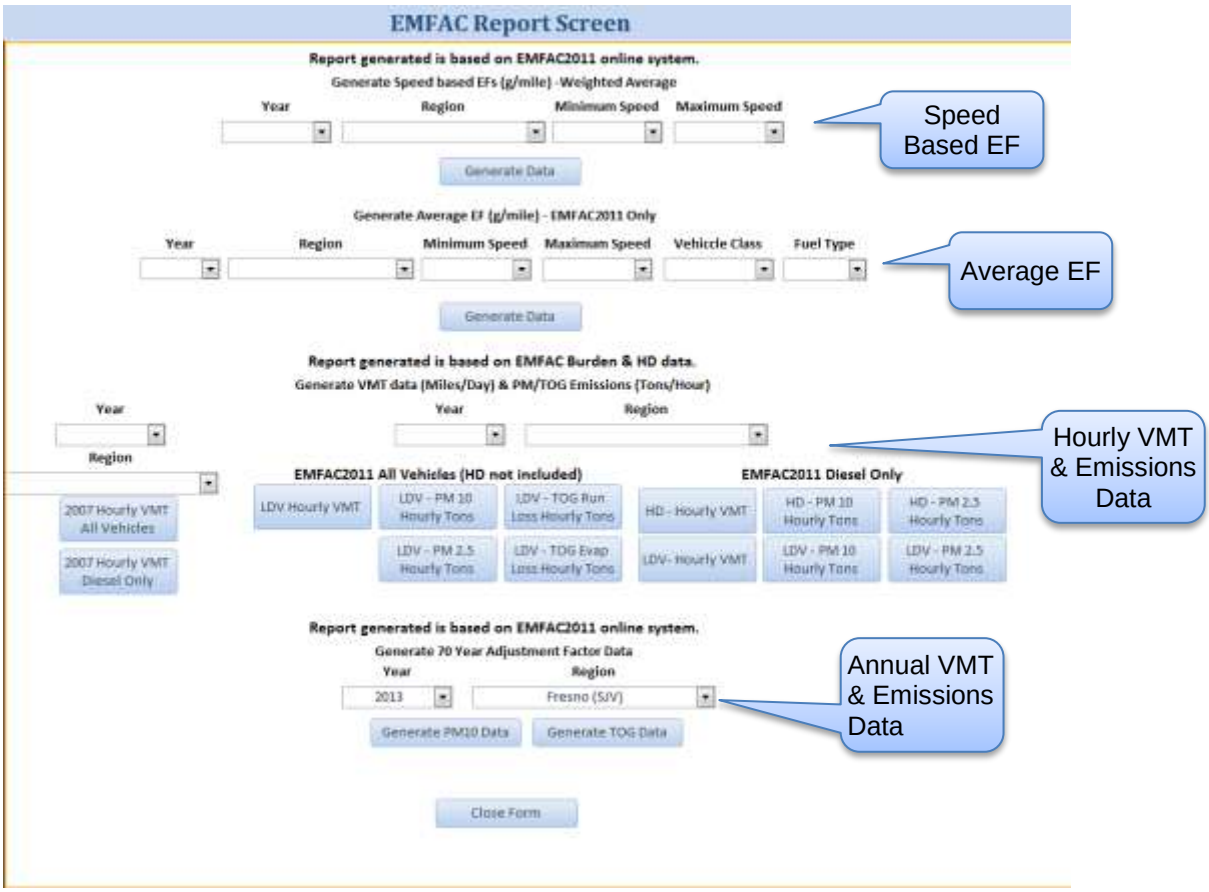


Figure 5-16 Report Screen

5.5.4.1 Speed Based Emission Factors

As discussed earlier a speed based emission factor should only be used to provide an estimate of the emissions from surface streets (non-residential), road, or highways/freeways.

Figure 5-17 displays the options available when generating speed based emission factors.

Figure 5-17 Speed Based EF

Where:

- Year = Year of the emissions estimate.
    - For determining exposure to residential developments (residential/sensitive receptors) the earliest year in which someone would be present onsite should be used.
    - For determining exposure from commercial/industrial development to residential/sensitive receptors the earliest year in which the project would start operation should be used.
- Region = the Area or County in which the project is located in.
- Minimum Speed = Minimum travel speed expected on a given road
- Maximum Speed = Maximum travel speed expected on a given road

Based on the data imported previously use the inputs found in Table 5-2 to generate the speed base emission factors. Once the inputs have been entered click the “Generate Data” button. Figure 5-18 displays the speed based emission factors for each vehicle class and fuel type combination in grams per mile.

Table 5-2 Speed Based EF Inputs	
Year	2013
Region	Sacramento (SV)
Minimum Speed	5 MPH
Maximum Speed	70 MPH

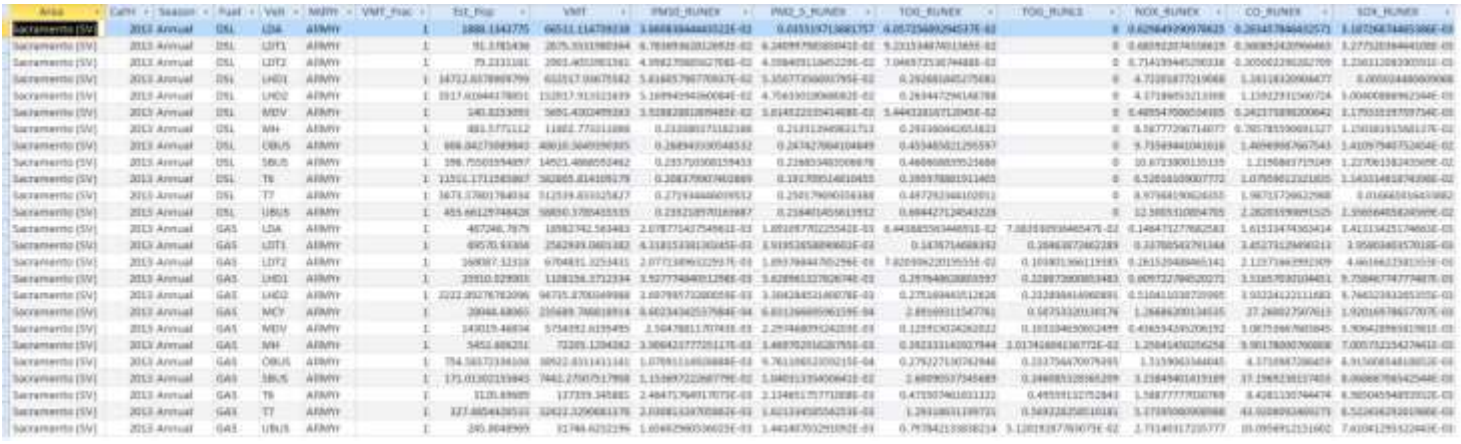


Figure 5-18 Speed Based EF Report

There are two options for closing the report. The first is to simply click the “X” to the right of the report tab and the second is to right click on the report tab and from the contact menu select “Close”.

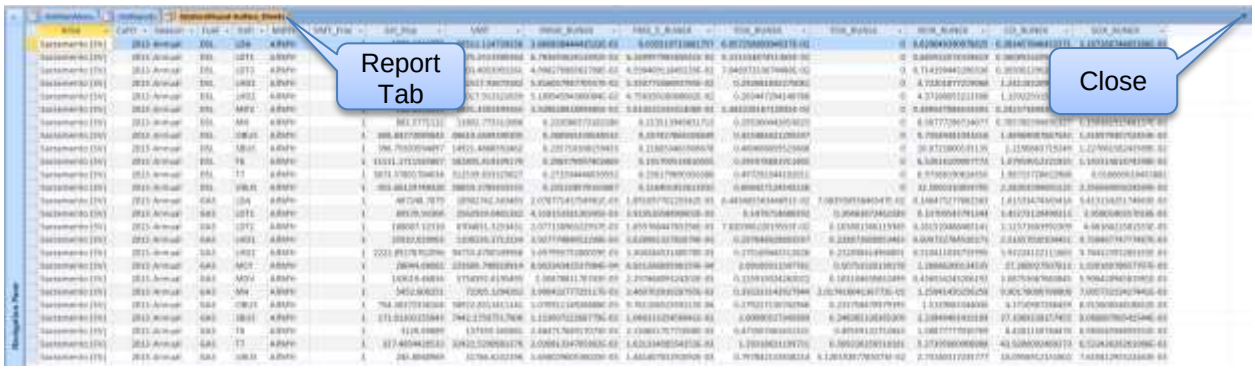


Figure 5-19 Close Report

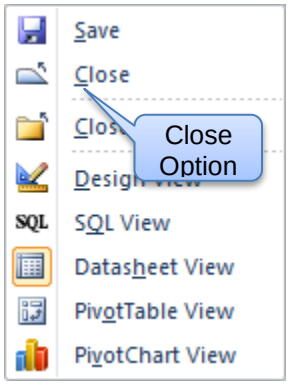


Figure 5-20 Contact Menu

NOTE!!
To assist with estimating emissions from roadways the District has developed an Excel spreadsheet that will absorb the above formatted report data and estimate emissions for each vehicle category and fuel type. This spreadsheet will be discussed in section 6 below.

5.5.4.2 Average Emission Factors

An Average emissions factor is used when a specific vehicle class and speed is known or can be reasonably assumed. A typical use of an average emissions factor is for onsite travel where a vehicle type is known and speed is limited by posted signs, company policy, or by a “Use Permit”.

Figure 5-21 displays the options available when generating average emission factors.

Figure 5-21 Average Emission Factors

Where:

- Year = Year of the emissions estimate.
    - For determining exposure to residential developments (residential/sensitive receptors) the earliest year in which someone would be present onsite should be used.
    - For determining exposure from commercial/industrial development to residential/sensitive receptors the earliest year in which the project would start operation should be used.
- Region = the Area or County in which the project is located in.
- Minimum Speed = Minimum travel speed expected on a given road
- Maximum Speed = Maximum travel speed expected on a given road
- Vehicle Class = Vehicle class under consideration
- Fuel Type = The fuel type (Gasoline / Diesel) of the vehicle under consideration

Based on the data imported previously use the inputs found in Table 5-3 to generate the average emission factors. Once the inputs have been entered click the “Generate Data” button. Figure 5-22 displays the average emission factors for the selected vehicle class and fuel type combination in grams per mile.

Table 5-3 Average EF Inputs	
Year	2013
Region	Sacramento (SV)
Minimum Speed	5 MPH
Maximum Speed	15 MPH
Vehicle Class	T7
Fuel Type	DSL

Figure 5-22 Average Emission Factor Report

There are two options for closing the report. The first is to simply click the “X” to the right of the report tab and the second is to right click on the report tab and from the contact menu select “Close”.

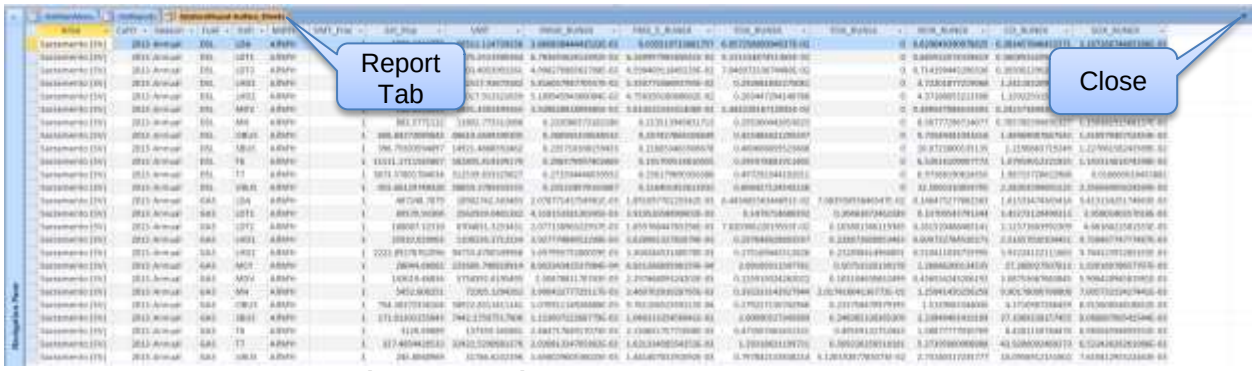


Figure 5-23 Close Report

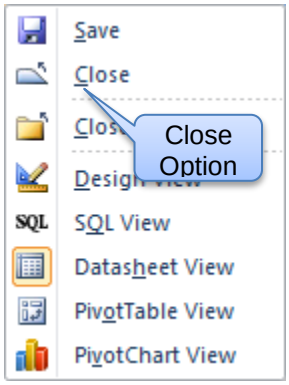


Figure 5-24 Contact Menu

5.5.4.3 Hourly VMT Data

Hourly VMT data is used to develop AERMOD scaling factors in order to consider hourly variability in emissions. The AERMOD model provides an option called Variable Emissions Rates (Hour of the Day) that allows for scalars to be included as model inputs thereby adjusting the maximum hourly emissions rate when estimating concentrations.

Figure 5-25 display the option available to generate Hourly VMT and/or Emissions data.

NOTE!!

This section of the Report screen also provides for emissions to be generated on an hourly basis. These options are not used for estimating exposure, but are provided as additional information that other agencies might find of interest.

Data Origin:

- LDV = EMFAC2011-LDV version
- HD = CARB's Special generated EMFAC2011-HD version

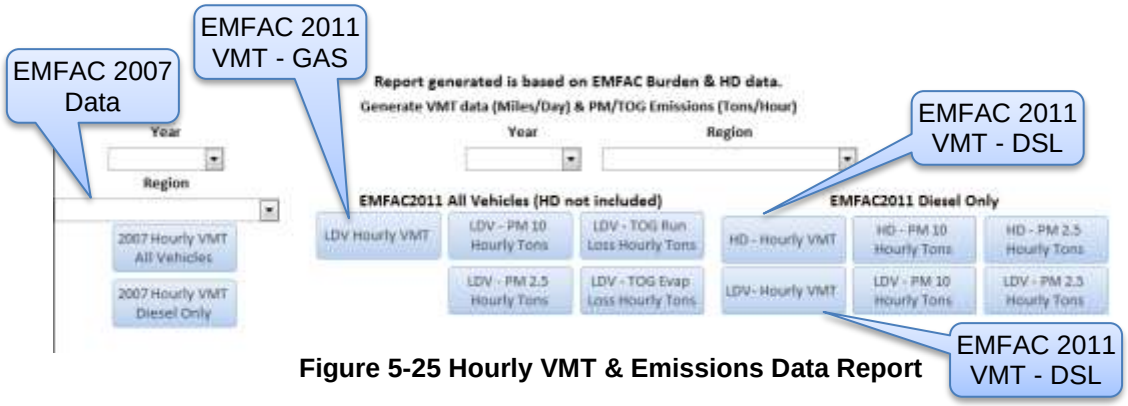


Figure 5-25 Hourly VMT & Emissions Data Report

Where:

- Year = Year of the emissions estimate.
    - For determining exposure to residential developments (residential/sensitive receptors) the earliest year in which someone would be present onsite should be used.
    - For determining exposure from commercial/industrial development to residential/sensitive receptors the earliest year in which the project would start operation should be used.
- Region = the Area or County in which the project is located in.

Based on the data imported previously use the inputs found in Table 5-4 to generate hourly VMT data. Once the inputs have been entered three report should be generated 1) LDV – Hourly VMT (All), 2) HD – Hourly VMT, and 3) LDV – Hourly VMT (DSL) . Figure 5-26 displays an example of Hourly VMT data.

Table 5-4 Hourly VMT & Emissions Inputs	
Year	2013
Region	Sacramento (SV)

frmMainMenu | frmReports | qryHourlyVMTData_2011

Season	Area	Scen Year	HR	VMT
Annual	Sacramento County	2013	0	421000
Annual	Sacramento County	2013	1	191000
Annual	Sacramento County	2013	2	254000
Annual	Sacramento County	2013	3	72000
Annual	Sacramento County	2013	4	195000
Annual	Sacramento County	2013	5	313000
Annual	Sacramento County	2013	6	1310000
Annual	Sacramento County	2013	7	2789000
Annual	Sacramento County	2013	8	2639000
Annual	Sacramento County	2013	9	1616000
Annual	Sacramento County	2013	10	1724000
Annual	Sacramento County	2013	11	2154000
Annual	Sacramento County	2013	12	2223000
Annual	Sacramento County	2013	13	2205000
Annual	Sacramento County	2013	14	2540000
Annual	Sacramento County	2013	15	2623000
Annual	Sacramento County	2013	16	2753000
Annual	Sacramento County	2013	17	3041000
Annual	Sacramento County	2013	18	2097000
Annual	Sacramento County	2013	19	1569000
Annual	Sacramento County	2013	20	1180000
Annual	Sacramento County	2013	21	1172000
Annual	Sacramento County	2013	22	902000
Annual	Sacramento County	2013	23	694000

Figure 5-26 VMT Data Report

There are two options for closing the report. The first is to simply click the “X” to the right of the report tab and the second is to right click on the report tab and from the contact menu select “Close”.

5.5.4.4 Generate Annual VMT & Emissions Data

Annual VMT and emissions data are used to derive a 70 year adjusted emissions rate that is compared to the emission rate used to derive a projects risk. The adjustment is used to account for the change in PM10 & TOG emissions over time.

Figure 5-27 70yr Adjustment Data

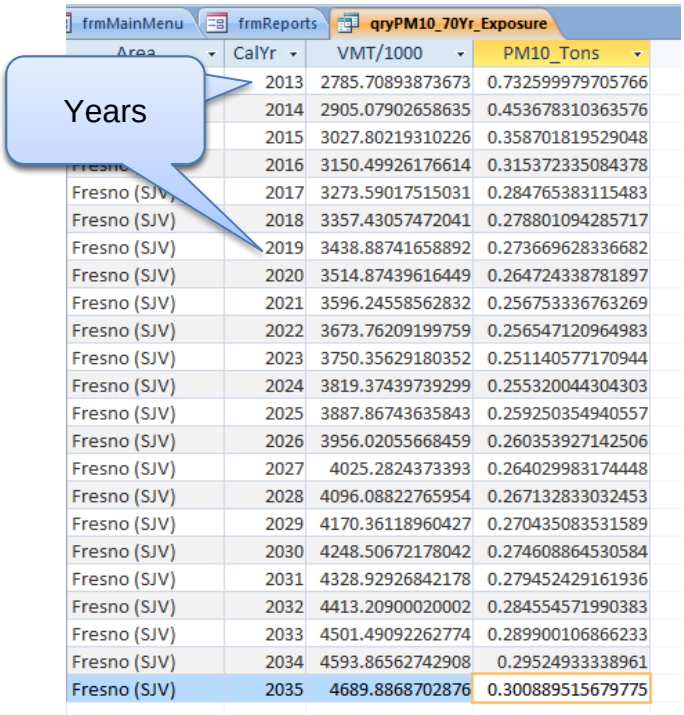
Where:

- Year = Year of the emissions estimate.
  - For determining exposure to residential developments (residential/sensitive receptors) the earliest year in which someone would be present onsite should be used.
  - For determining exposure from commercial/industrial development to residential/sensitive receptors the earliest year in which the project would start operation should be used.
- Region = the Area or County in which the project is located in.

CAUTION!!
These reports are based on annual data. Therefore data from the present to 2035 should be downloaded from CARB's online system "Combined Emission Rate File" and imported into the database to ensure that sufficient data is available.

Based on the data imported previously use the inputs found in Table 5-5 to generate hourly VMT data. Once the inputs have been entered, two reports should be generated: 1) Generate PM10 data and 2) Generate TOG Data. Figure 5-28 displays an example of annual VMT data.

Table 5-5 Hourly VMT & Emissions Inputs	
Year	2013
Region	Fresno (SJV)



Area	CalYr	VMT/1000	PM10_Tons
	2013	2785.70893873673	0.732599979705766
	2014	2905.07902658635	0.453678310363576
	2015	3027.80219310226	0.358701819529048
	2016	3150.49926176614	0.315372335084378
Fresno (SJV)	2017	3273.59017515031	0.284765383115483
Fresno (SJV)	2018	3357.43057472041	0.278801094285717
Fresno (SJV)	2019	3438.88741658892	0.273669628336682
Fresno (SJV)	2020	3514.87439616449	0.264724338781897
Fresno (SJV)	2021	3596.24558562832	0.256753336763269
Fresno (SJV)	2022	3673.76209199759	0.256547120964983
Fresno (SJV)	2023	3750.35629180352	0.251140577170944
Fresno (SJV)	2024	3819.37439739299	0.255320044304303
Fresno (SJV)	2025	3887.86743635843	0.259250354940557
Fresno (SJV)	2026	3956.02055668459	0.260353927142506
Fresno (SJV)	2027	4025.2824373393	0.264029983174448
Fresno (SJV)	2028	4096.08822765954	0.267132833032453
Fresno (SJV)	2029	4170.36118960427	0.270435083531589
Fresno (SJV)	2030	4248.50672178042	0.274608864530584
Fresno (SJV)	2031	4328.92926842178	0.279452429161936
Fresno (SJV)	2032	4413.20900020002	0.284554571990383
Fresno (SJV)	2033	4501.49092262774	0.289900106866233
Fresno (SJV)	2034	4593.86562742908	0.29524933338961
Fresno (SJV)	2035	4689.8868702876	0.300889515679775

Figure 5-28 70yr Adjustment Data

There are two options for closing the report. The first is to simply click the "X" to the right of the report tab and the second is to right click on the report tab and from the contact menu select "Close".

6 District Vehicle Emission Calculator Spreadsheet

In an effort to streamline the process of estimating vehicle emissions and provide consistency when calculating roadways emissions the District has developed a MS Excel spreadsheet that utilizes the formatted data from the District "On-Road Emission Factor Estimator" database discussed in Section 5. The Excel spreadsheet has five tabs; 1) Raw Data, 2) Data Summary, 3) Emissions, 4) Scalar Factors, and 5) 70 Year Exposure Adjustment. Each of the five tabs will be discussed in detail in the subsequent sections.

6.1 Raw Data Tab

The "Raw Data" tab utilizes the data from the "Speed Based Emission Factors" reports generated in Section 5.5.4.1.

To do this:

- Open the On-Road Emission Factor Estimator's database Report screen.
- Run the Speed Based Emission Factors" report with the desired Year, Region, Minimum Speed, and Maximum Speed.
- Highlight the reported data by clicking the top left corner of the report.
- Copy the data by holding down the "Ctrl" key and pressing the "C" key or clicking the Copy option from "Home" ribbon.

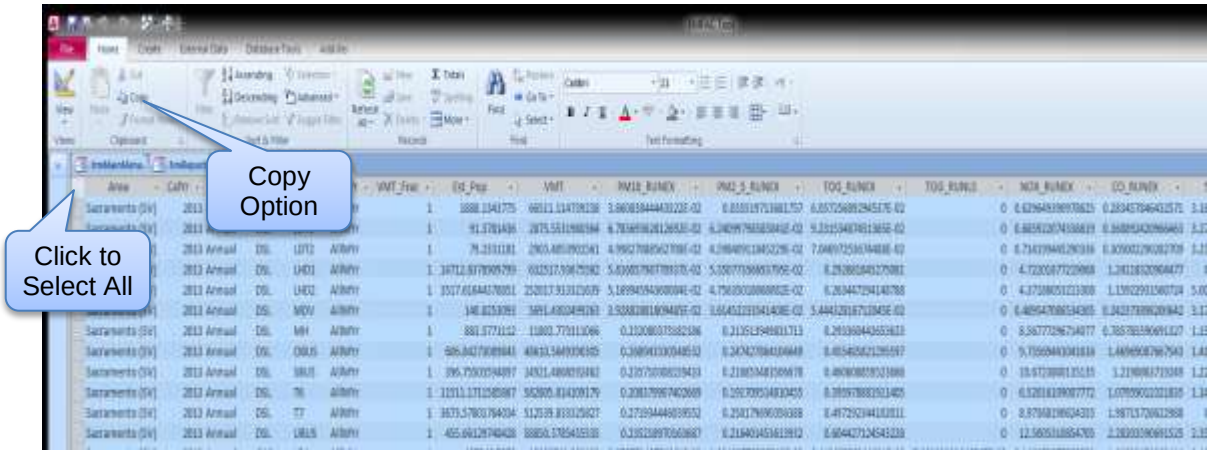


Figure 6-1 Speed Based EF

- Open the "Vehicle Emissions Calculator.xls" file and ensure that you are on the "Raw Data" tab.
- On the "Raw Data" tab click cell "A1", see Figure 6-2
- Paste the data by holding down the "Ctrl" key and pressing the "V" key
- When finished, the user should see something like Figure 6-3.

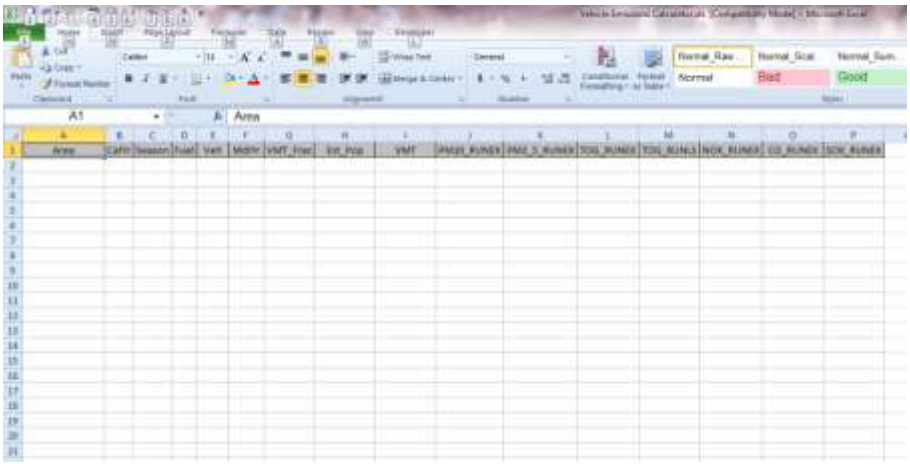


Figure 6-2 Empty Raw Data Tab

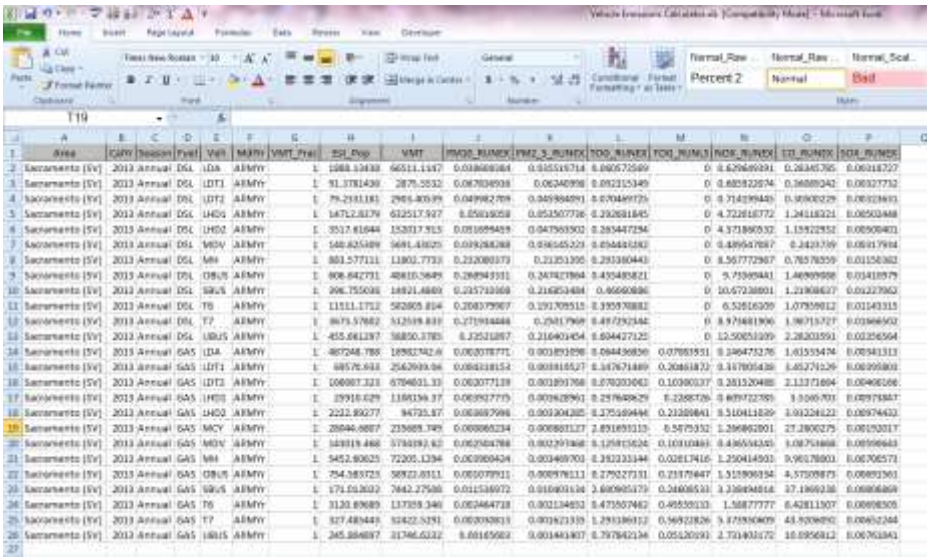


Figure 6-3 Filled Raw Data Tab

6.2 Data Summary Tab

The Data Summary tab is used to reformat the data pasted in the Raw Data tab and provide for user friendly display of the information. Figure 6-4 displays a snap shot of the Data Summary tab and the reformatted data. There are four basic components to the Data Summary tab 1) Vehicle Population (Daily) by Type, 2) Percent By Vehicle Type, 3) Overall Percent by Vehicle Type, and 4) Exhaust Emission Rate (g/mile) by Vehicle Type.

6.2.1 Component 1 - Vehicle Population (Daily) by Type

The “Vehicle Population (Daily) by Type” component displays the population of each of the 13 vehicle classes and fuel types as well as the total number of vehicle.

6.2.2 Component 2 - Percent By Vehicle Type

The “Percent By Vehicle Type” component displays the percent of the population by fuel type for each of the13 vehicle classes.

Example Eq. 1 – Percent of LDA Gas Vehicles:

% LDA (Gas) = (# of LDA vehicles / Total LDA Vehicles) * 100

% LDA (Gas) = (487,249 / 489,137) *100 = 99.61%

6.2.3 Component 3 - Overall Percent by Vehicle Type

The “Overall Percent by Vehicle Type” component displays the overall percentage that each of the 13 vehicle classes and fuel types contribute to the total vehicle population. These values are used to allocate the number of vehicles based on the annual average daily trips AADT entered on the “Emissions” tab.

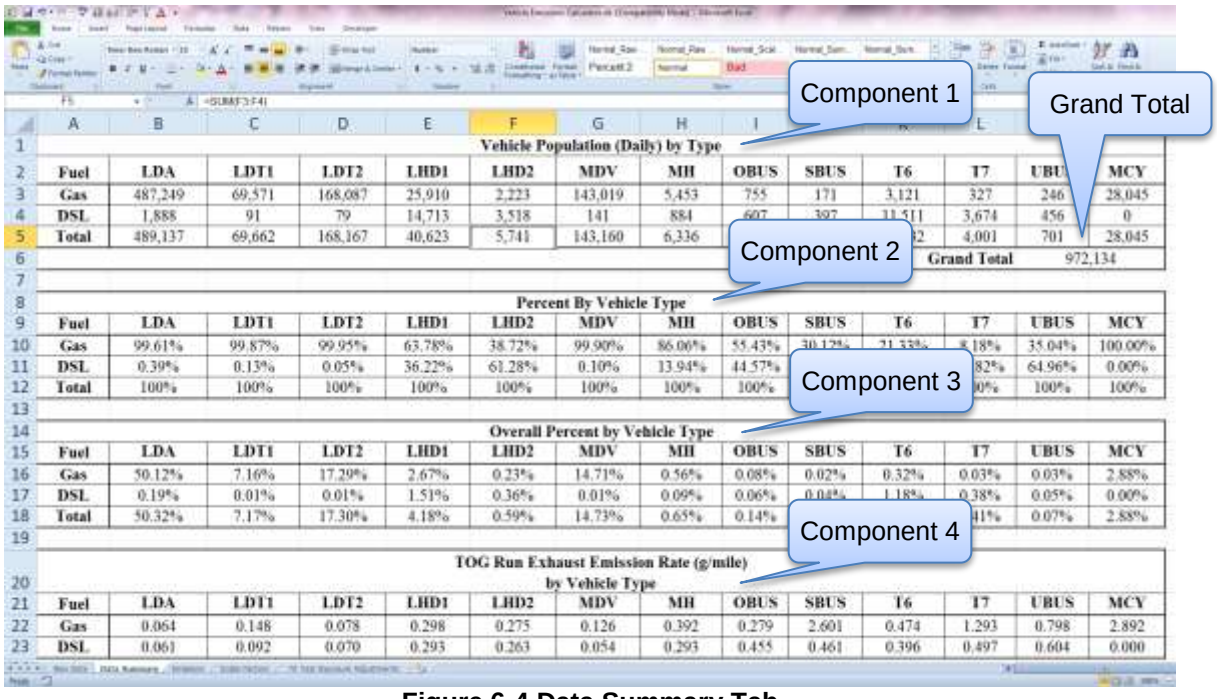
Example Eq. 2 – Overall Percent of LDA Gas Vehicles:

% LDA (Gas) = (# of LDA vehicles / Grand Total # of Vehicles) * 100

% LDA (Gas) = (487,249 / 972,134) *100 = 50.12%

6.2.4 Component 4 - Exhaust Emission Rate (g/mile) by Vehicle Type

The “Exhaust Emission Rate (g/mile) by Vehicle Type” component displays the emission factor (g/mi) for each of the 13 vehicle classes and fuel types. This is repeated for each pollutant.



Vehicle Population (Daily) by Type

Fuel	LDA	LDT1	LDT2	LHD1	LHD2	MDV	MH	OBUS	SBUS	T6	T7	UBUS	MCY
Gas	487,249	69,571	168,087	25,910	2,223	143,019	5,453	755	171	3,121	327	246	28,045
DSL	1,888	91	79	14,713	3,518	141	884	607	397	11,511	3,674	456	0
Total	489,137	69,662	168,167	40,623	5,741	143,160	6,336				4,001	701	28,045

Grand Total 972,134

Percent By Vehicle Type

Fuel	LDA	LDT1	LDT2	LHD1	LHD2	MDV	MH	OBUS	SBUS	T6	T7	UBUS	MCY
Gas	99.61%	99.87%	99.95%	63.78%	38.72%	99.90%	86.06%	55.43%	30.12%	21.33%	8.18%	35.04%	100.00%
DSL	0.39%	0.13%	0.05%	36.22%	61.28%	0.10%	13.94%	44.57%	69.88%	78.67%	91.82%	64.96%	0.00%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Overall Percent by Vehicle Type

Fuel	LDA	LDT1	LDT2	LHD1	LHD2	MDV	MH	OBUS	SBUS	T6	T7	UBUS	MCY
Gas	50.12%	7.16%	17.29%	2.67%	0.23%	14.71%	0.56%	0.08%	0.02%	0.32%	0.03%	0.03%	2.88%
DSL	0.19%	0.01%	0.01%	1.51%	0.36%	0.01%	0.09%	0.06%	0.04%	1.18%	0.38%	0.05%	0.00%
Total	50.32%	7.17%	17.30%	4.18%	0.59%	14.73%	0.65%	0.14%	0.07%	1.50%	0.41%	0.07%	2.88%

TOG Run Exhaust Emission Rate (g/mile) by Vehicle Type

Fuel	LDA	LDT1	LDT2	LHD1	LHD2	MDV	MH	OBUS	SBUS	T6	T7	UBUS	MCY
Gas	0.064	0.148	0.078	0.298	0.275	0.126	0.392	0.279	2.601	0.474	1.293	0.798	2.892
DSL	0.061	0.092	0.070	0.293	0.263	0.054	0.293	0.455	0.461	0.396	0.497	0.604	0.000

Figure 6-4 Data Summary Tab

6.3 *Emissions Tab*

The Emissions tab utilizes the data from the previous Data Summary tab to estimate emissions based on user specific inputs. The minimum data needed in

order to properly estimate emissions are 1) AADT, 2) % Trucks, and 3) Distance Modeled. The other inputs are used to label emissions data being generated and do not affect the estimation of emissions.

6.3.1 AADT Estimation

There are two options when estimating vehicle AADT. The first is to use one of the tools available on the District's Web site at http://www.valleyair.org/busind/pto/Resources/resources_idx.htm. Found under Mapping Tools (KML/KMZ) → Traffic KMLs or utilizing a site/project specific traffic study to fill in the AADT in the spreadsheet.

6.3.2 Percent Trucks

There are two options when determining the percent trucks. The first method is to use one of the tools available on the District's Web site at http://www.valleyair.org/busind/pto/Resources/resources_idx.htm under Mapping Tools (KML/KMZ) → Traffic KMLs to derive the number of trucks on a specific roadway. If this method is used the "Use County Trk %" should be changed to "N". The second method is to use the county derived percent of trucks. This percentage is based on data from the Data Summary tab.

Example Eq. 3 – County Trk Percent:

% Trucks = (Sum of Diesel Truck Population / Total Population) *100

% Trucks = (37,958 / 972,134) *100 = 3.90%

6.3.3 Data Generated

After the minimum data has been entered the spreadsheet will automatically generate the following: 1) Vehicle counts for each of the 13 classes and fuel types, 2) Criteria Emissions (TOG [Exhaust & Evaporative Loss]), PM10, PM2.5, NOx, CO, SOX, and Toxics pollutants. Additionally, the spreadsheet will estimate hourly emissions for TOG, PM10, and PM2.5, for CAL3QHCR input based on the scaling factors generated from the Scalar Factor tab.

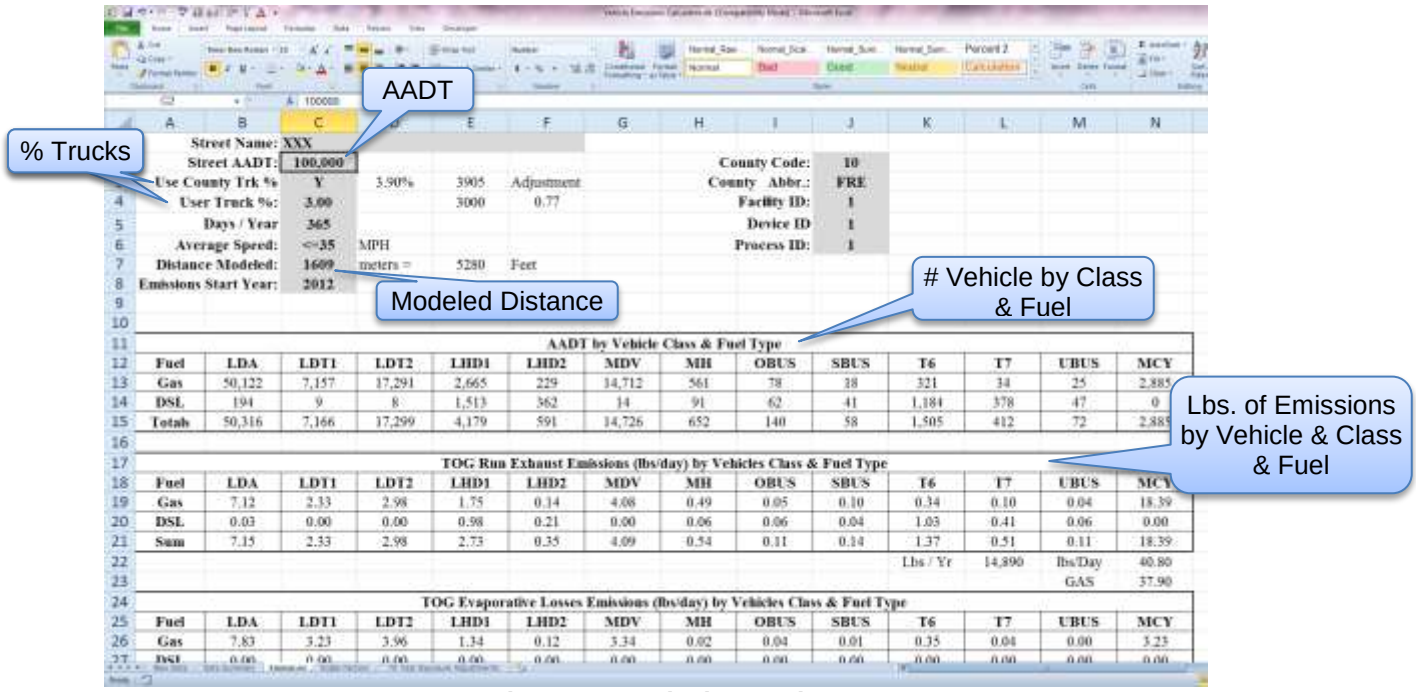


Figure 6-5 Emissions Tab

6.4 Scalar Factors Tab

The Scalar Factors tab utilizes the data from the "Hourly VMT Data" reports from Section 5.5.4.3 to generate scalar factor for use in adjusting the hourly emissions based on hourly traffic density.

To do this:

- Open the On-Road Emission Factor Estimator's database Report screen.
- Above the "EMFAC2011 All Vehicles (HD not included)" header select the desired Year and Region.
- Click the "LDV Hourly VMT" button under the "EMFAC2011 All Vehicles (HD not included) header.
- From the generated report highlight all the data by clicking the top left corner of the report.
- Copy the data by holding down the "Ctrl" key while pressing the "C" key or by clicking the Copy option from "Home" ribbon, see Figure 6-6.

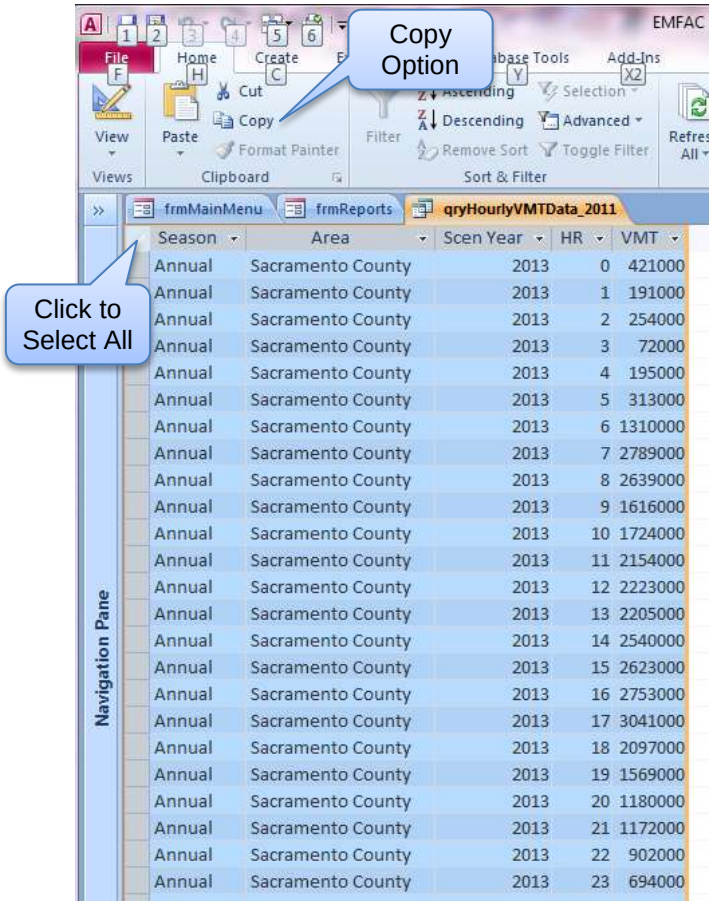


Figure 6-6 Copy VMT Data

- There are two options when pasting the data into the Scalar Factors tab.
  - Option 1 is to paste the data over the top of the formatted cells (A2 thru E26).
    - This option will remove all Cell formatting
    - It will not affect the final results, but the table formatting will be removed.
  - Option 2 keeps the Cell formatting, but requires that data to be pasted and then moved to the appropriate cells. This is done because Excel does not allow for data to be copied directly in.
    - On the “Scalar Factors” tab click cell “O2”
    - Paste the data by holding down the “Ctrl” key while pressing the “V” key, See Figure 6-7.

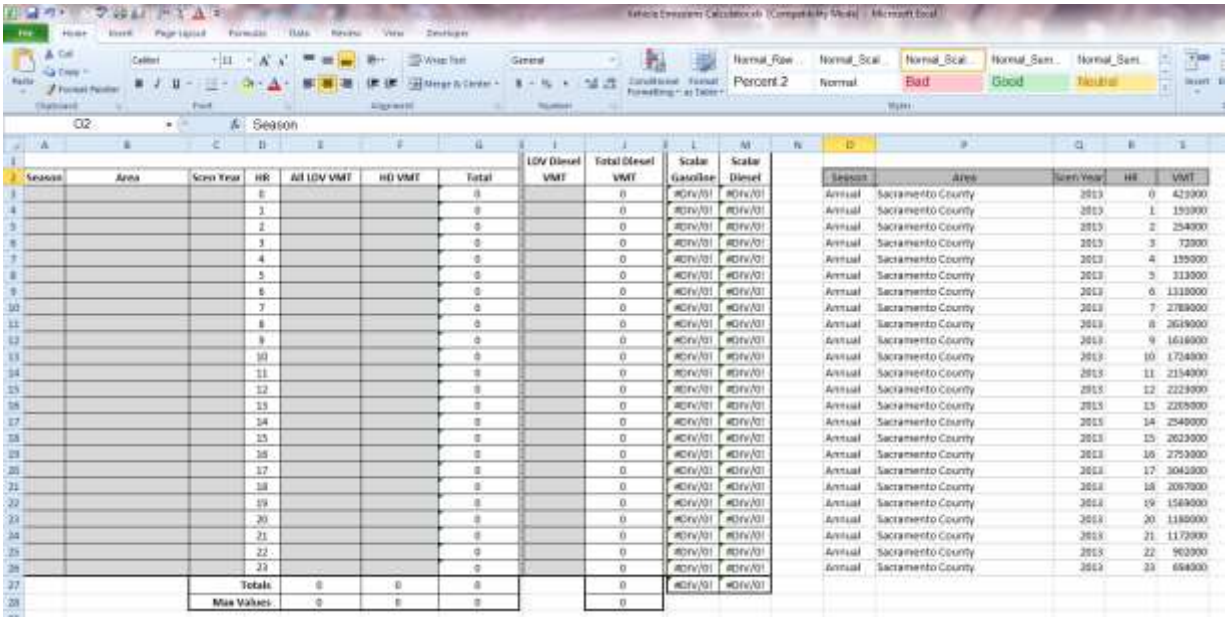


Figure 6-7 Data Copying Option 2

- Highlight & Copy the data from cellsO3 down to S26
- Click on cell A3
- Right click on the mouse. The contact menu seen in Figure 6-8 should appear.
- Click the Values option
    - This will paste the data into the cell and preserve the existing format

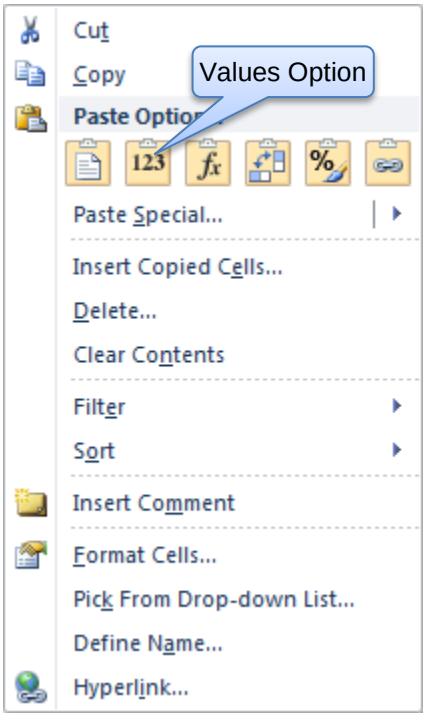


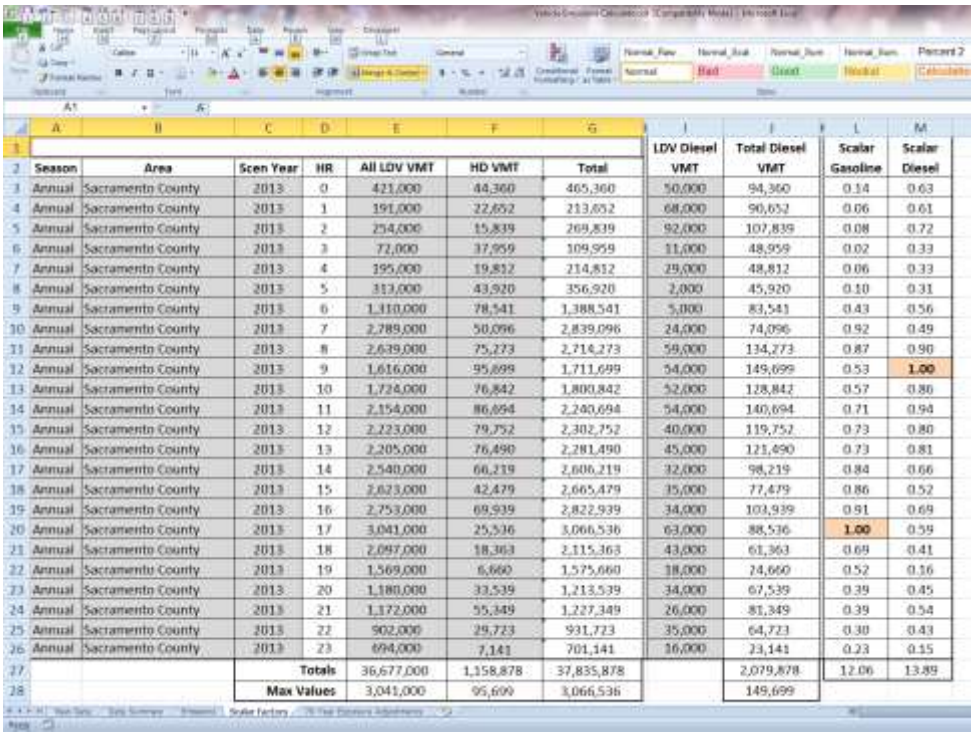
Figure 6-8 Paste Contact Menu

- Highlight columns O thru S and delete them.
- Go back to the database and close the report

- From the Report Screen under the header EMFAC2011 Diesel Only click the HD- Hourly VMT button
- Follow the same basic procedures as before to paste the data into the Excel spreadsheet except that only the VMT column is needed
- Paste the data into column F under the HD VMT header
- If using Option 2 delete Column O
- Go back to the database and close the report

- From the Report Screen under the header EMFAC2011 Diesel Only click the LDV- Hourly VMT button
- Once again only the VMT data is needed.
- Follow the same basic procedures as before to paste the data into the Excel spreadsheet.
- Then paste the data into column I under the LDV Diesel VMT header
- If using Option 2 delete Column O

All the data should now be imported and the Scalars have automatically been generated, see Figure 6-9 columns L & M.



Season	Area	Scen Year	HR	All LDV VMT	HD VMT	Total	LDV Diesel VMT	Total Diesel VMT	Scalar Gasoline	Scalar Diesel
Annual	Sacramento County	2013	0	421,000	44,360	465,360	50,000	94,360	0.14	0.63
Annual	Sacramento County	2013	1	191,000	22,652	213,652	68,000	90,652	0.06	0.61
Annual	Sacramento County	2013	2	254,000	15,839	269,839	92,000	107,839	0.08	0.72
Annual	Sacramento County	2013	3	72,000	37,959	109,959	11,000	48,959	0.02	0.33
Annual	Sacramento County	2013	4	195,000	19,812	214,812	29,000	48,812	0.06	0.33
Annual	Sacramento County	2013	5	313,000	43,920	356,920	2,000	45,920	0.10	0.31
Annual	Sacramento County	2013	6	1,310,000	78,541	1,388,541	5,000	83,541	0.43	0.56
Annual	Sacramento County	2013	7	2,789,000	50,096	2,839,096	24,000	74,096	0.92	0.49
Annual	Sacramento County	2013	8	2,639,000	75,273	2,714,273	59,000	134,273	0.87	0.90
Annual	Sacramento County	2013	9	1,616,000	95,699	1,711,699	54,000	149,699	0.53	1.00
Annual	Sacramento County	2013	10	1,724,000	76,842	1,800,842	52,000	128,842	0.57	0.80
Annual	Sacramento County	2013	11	2,154,000	86,694	2,240,694	54,000	140,694	0.71	0.94
Annual	Sacramento County	2013	12	2,223,000	79,752	2,302,752	40,000	119,752	0.73	0.80
Annual	Sacramento County	2013	13	2,205,000	76,490	2,281,490	45,000	121,490	0.73	0.81
Annual	Sacramento County	2013	14	2,540,000	66,219	2,606,219	32,000	98,219	0.84	0.66
Annual	Sacramento County	2013	15	2,623,000	42,479	2,665,479	35,000	77,479	0.86	0.52
Annual	Sacramento County	2013	16	2,753,000	69,939	2,822,939	34,000	103,939	0.91	0.69
Annual	Sacramento County	2013	17	3,041,000	25,536	3,066,536	63,000	88,536	1.00	0.59
Annual	Sacramento County	2013	18	2,097,000	18,363	2,115,363	43,000	61,363	0.69	0.41
Annual	Sacramento County	2013	19	1,569,000	6,660	1,575,660	18,000	24,660	0.52	0.16
Annual	Sacramento County	2013	20	1,180,000	33,539	1,213,539	34,000	67,539	0.39	0.45
Annual	Sacramento County	2013	21	1,172,000	55,349	1,227,349	26,000	81,349	0.39	0.54
Annual	Sacramento County	2013	22	902,000	29,723	931,723	35,000	64,723	0.30	0.43
Annual	Sacramento County	2013	23	694,000	7,141	701,141	16,000	23,141	0.23	0.15
		Totals		36,677,000	1,158,878	37,835,878		2,079,878	12.06	13.89
		Max Values		3,041,000	95,699	3,066,536		149,699		

Figure 6-9 Scalar Factors Tab

6.5 70 Year Risk Adjustment Factor Tab

The 70 Year Exposure Adjustment tab utilizes the data from the "Generate 70 Year Adjustment Factor Data" reports from Section 5.5.4.4 to generate Annual VMT & emissions data for use in adjusting the estimated 70 year impact to consider how vehicle emissions will change overtime due to better emissions controls and regulations.

To do this:

- Open the On-Road Emission Factor Estimator's database Report screen.
- Below the "Generate 70 Year Adjustment Factor Data" header select the desired Year and Region.
- Click the "Generate PM10 Data" button.
- From the generated report highlight all the data by clicking the top left corner of the report.
- Copy the data by holding down the "Ctrl" key while pressing the "C" key or by clicking the Copy option from "Home" ribbon, see Figure 6-10

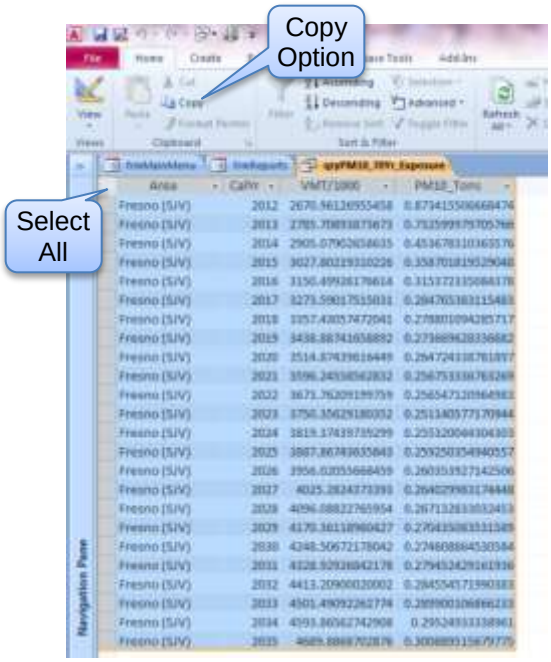


Figure 6-10 PM10 Annual & VMT Data

- There are two options when pasting the data into the 70 Year Exposure Adjustments tab.
    - Option 1 is to paste the data over the top of the formatted cells (F4 & K4 thru L127).
        - This option will remove all Cell formatting
        - It will not affect the final results, but the table formatting will be removed.
    - Option 2 keeps the Cell formatting, but requires that data to be paste and then move to the appropriate cells. This is done because Excel does not allow for data to be copied directly in.

- On the “70 Year Exposure Adjustments” tab click cell “P3”
- Paste the data by holding down the “Ctrl” key while pressing the “V” key, See Figure 6-11.

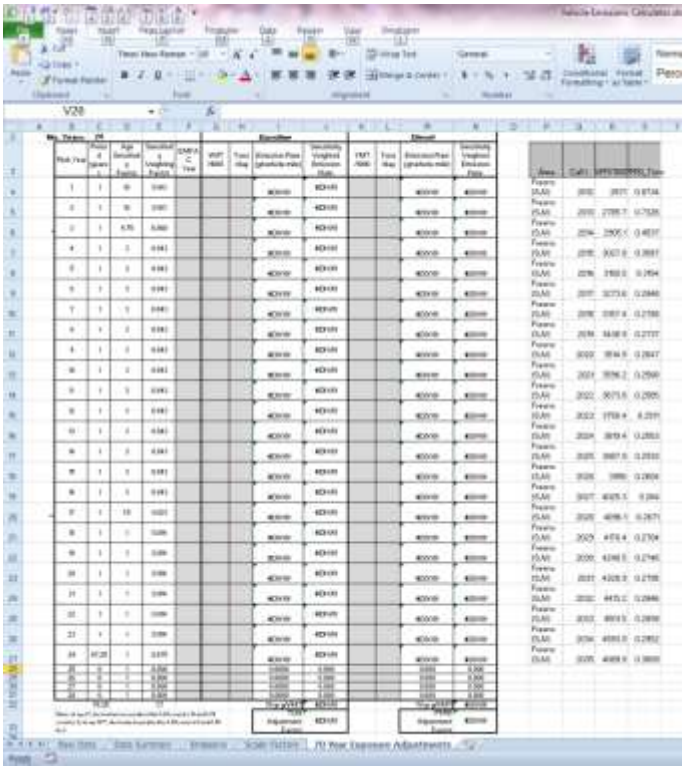


Figure 6-11 70 Year Exposure Adjustments Tab

Copy PM10 Data

- Highlight & Copy the data from cells R4 down to S27
- Click on cell K4
- Right click on the mouse. The contact menu seen in Figure 6-12 should appear.
- Click the Values option
    - This will paste the data into the cell and preserve the existing format

Copy Year

- Highlight & Copy the data from cells Q4 down to Q27
- Click on cell F4
- Right click on the mouse. The contact menu seen in Figure 6-12 should appear.
- Click the Values option
    - This will paste the data into the cell and preserve the existing format

Delete PM10 Data

- Highlight columns P thru S and delete them.
- Go back to the database and close the report

Coping TOG Data – From Access to Excel

- From the Report Screen under the header Generate 70 Year Adjustment Factor Data click the Generate TOG Data button

Copy TOG Data

- Follow the same basic procedures as before to paste the data into the Excel spreadsheet except that only the VMT/1000 & TOG_Tons columns are needed
- Paste the data into columns G & H under the VMT/1000 & Tons/Day headers
- If using Option 2 delete Column P thru S

All the data should now be imported and the 70 year adjustment factors have been automatically generated, see Figure 6-9 columns J33 & N33.

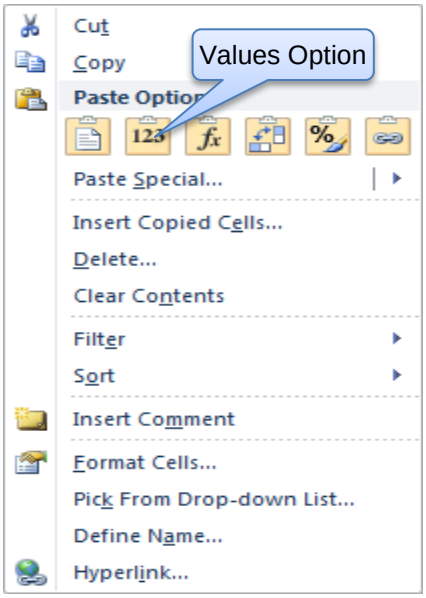


Figure 6-12 Paste Contact Menu

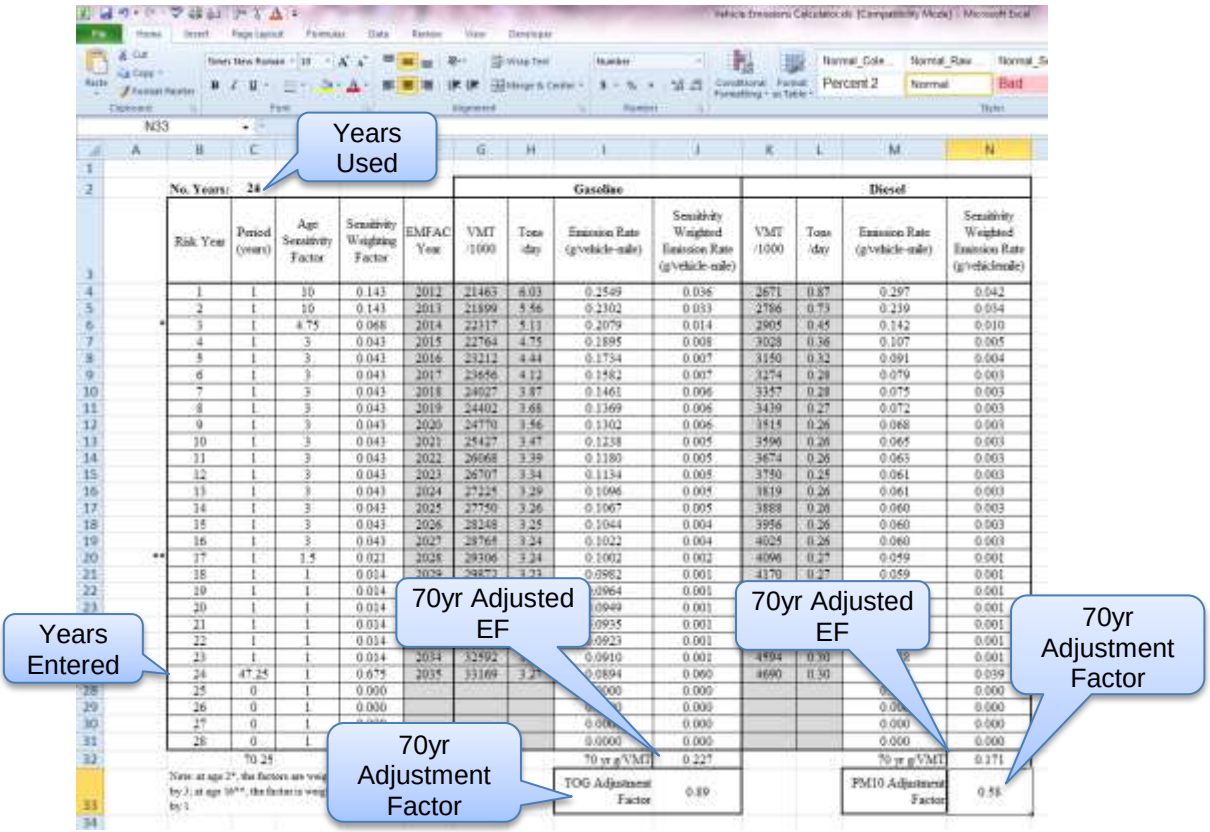


Figure 6-13 70 Year Adjustment Factors

CAUTION!!
The Years used to generate the 70 year adjustment factors are based on the value entered in cell C2. Ensure that the value matches the last row of data entered. Specifically, use the value found in column B in the last row of data, see Figure 6-13.

6.5.1 Using the 70 Year Adjustment Factors

The 70 year adjustment factors are intended to be used to consider long term emissions reduction and not short term reduction. Therefore the adjustment factors should only be used to adjust a 30 year or greater cancer risk. It would not be appropriate to use the adjustment factors when addressing a cancer risk less than 30 year.

There are two options when using the adjustment factors depending if the risk from diesel PM and TOG are estimated separately or are combined.

6.5.1.1 Option 1

If the diesel PM and TOG risk have been estimated separately then simply multiply the risk from each by the appropriate adjustment factor to derive the final adjusted risk.

6.5.1.2 Option 2

If the diesel PM and TOG risk have been combined, for example using the HARP program, then a conservative assumption would be to use the greater of the two values. This would tend to under estimate the reduction being achieved by the future controls and regulations. Additionally, the majority of the estimated cancer risk from roadways comes from diesel PM emission versus that of TOG. Based on these facts, the District recommends the use of the diesel PM adjustment factor when to deriving the final adjusted risk.

Appendix A – Vehicle Class Crosswalk

Index	EMFAC2011 Veh & Tech	EMFAC2011 Vehicle	Description	Source	EMFAC2007 Vehicle	CTEMFAC Vehicle
1	LDA - DSL	LDA	Passenger Cars	EMFAC2011-LDV	LDA	Non-Trucks
2	LDA - GAS			EMFAC2011-LDV		
3	LDT1 - DSL	LDT1	Light-Duty Trucks (0-3750 lbs)	EMFAC2011-LDV	LDT1	
4	LDT1 - GAS		Light-Duty Trucks (0-3750 lbs)	EMFAC2011-LDV		
5	LDT2 - DSL	LDT2	Light-Duty Trucks (3751-5750 lbs)	EMFAC2011-LDV	LDT2	
6	LDT2 - GAS		Light-Duty Trucks (3751-5750 lbs)	EMFAC2011-LDV		
7	LHD1 - DSL	LHD1	Light-Heavy-Duty Trucks (8501-10000 lbs)	EMFAC2011-LDV	LHDT1	Trucks
8	LHD1 - GAS		Light-Heavy-Duty Trucks (8501-10000 lbs)	EMFAC2011-LDV		
9	LHD2 - DSL	LHD2	Light-Heavy-Duty Trucks (10001-14000 lbs)	EMFAC2011-LDV	LHDT2	
10	LHD2 - GAS		Light-Heavy-Duty Trucks (10001-14000 lbs)	EMFAC2011-LDV		
11	MCY - GAS	MCY	Motorcycles	EMFAC2011-LDV	MCY	Non-Trucks
12	MDV - DSL	MDV	Medium-Duty Trucks (5751-8500 lbs)	EMFAC2011-LDV	MDV	Trucks
13	MDV - GAS		Medium-Duty Trucks (5751-8500 lbs)	EMFAC2011-LDV		
14	MH - DSL	MH	Motor Homes	EMFAC2011-LDV	MH	Non-Trucks
15	MH - GAS		Motor Homes	EMFAC2011-LDV		
16	T6 Ag - DSL	T6 Ag	Medium-Heavy Duty Diesel Agriculture Truck	EMFAC2011-HD	MHDT	Trucks
17	T6 CAIRP heavy - DSL	T6 CAIRP heavy	Medium-Heavy Duty Diesel CA International Registration Plan Truck with GVWR>26000 lbs	EMFAC2011-HD		
18	T6 CAIRP small - DSL	T6 CAIRP small	Medium-Heavy Duty Diesel CA International Registration Plan Truck with GVWR<=26000 lbs	EMFAC2011-HD		
19	T6 instate construction heavy - DSL	T6 instate construction heavy	Medium-Heavy Duty Diesel instate construction Truck with GVWR>26000 lbs	EMFAC2011-HD		
20	T6 instate construction small - DSL	T6 instate construction small	Medium-Heavy Duty Diesel instate construction Truck with GVWR<=26000 lbs	EMFAC2011-HD		
21	T6 instate heavy - DSL	T6 instate heavy	Medium-Heavy Duty Diesel instate Truck with GVWR>26000 lbs	EMFAC2011-HD		
22	T6 instate small - DSL	T6 instate small	Medium-Heavy Duty Diesel instate Truck with GVWR<=26000 lbs	EMFAC2011-HD		
23	T6 OOS heavy - DSL	T6 OOS heavy	Medium-Heavy Duty Diesel Out-of-state Truck with GVWR>26000 lbs	EMFAC2011-HD		
24	T6 OOS small - DSL	T6 OOS small	Medium-Heavy Duty Diesel Out-of-state Truck with GVWR<=26000 lbs	EMFAC2011-HD		
25	T6 Public - DSL	T6 Public	Medium-Heavy Duty Diesel Public Fleet Truck	EMFAC2011-HD		
26	T6 utility - DSL	T6 utility	Medium-Heavy Duty Diesel Utility Fleet Truck	EMFAC2011-HD		
27	T6TS - GAS	T6TS	Medium-Heavy Duty Gasoline Truck	EMFAC2011-LDV		

Index	EMFAC2011 Veh & Tech	EMFAC2011 Vehicle	Description	Source	EMFAC2007 Vehicle	CTEMFAC Vehicle
28	T7 Ag - DSL	T7 Ag	Heavy-Heavy Duty Diesel Agriculture Truck	EMFAC2011-HD	HHDT	Trucks
29	T7 CAIRP - DSL	T7 CAIRP	Heavy-Heavy Duty Diesel CA International Registration Plan Truck	EMFAC2011-HD		
30	T7 CAIRP construction - DSL	T7 CAIRP construction	Heavy-Heavy Duty Diesel CA International Registration Plan Construction Truck	EMFAC2011-HD		
31	T7 NNOOS - DSL	T7 NNOOS	Heavy-Heavy Duty Diesel Non-Neighboring Out-of-state Truck	EMFAC2011-HD		
32	T7 NOOS - DSL	T7 NOOS	Heavy-Heavy Duty Diesel Neighboring Out-of-state Truck	EMFAC2011-HD		
33	T7 other port - DSL	T7 other port	Heavy-Heavy Duty Diesel Drayage Truck at Other Facilities	EMFAC2011-HD		
34	T7 POAK - DSL	T7 POAK	Heavy-Heavy Duty Diesel Drayage Truck in Bay Area	EMFAC2011-HD		
35	T7 POLA - DSL	T7 POLA	Heavy-Heavy Duty Diesel Drayage Truck near South Coast	EMFAC2011-HD		
36	T7 Public - DSL	T7 Public	Heavy-Heavy Duty Diesel Public Fleet Truck	EMFAC2011-HD		
37	T7 Single - DSL	T7 Single	Heavy-Heavy Duty Diesel Single Unit Truck	EMFAC2011-HD		
38	T7 single construction - DSL	T7 single construction	Heavy-Heavy Duty Diesel Single Unit Construction Truck	EMFAC2011-HD		
39	T7 SWCV - DSL	T7 SWCV	Heavy-Heavy Duty Diesel Solid Waste Collection Truck	EMFAC2011-HD		
40	T7 tractor - DSL	T7 tractor	Heavy-Heavy Duty Diesel Tractor Truck	EMFAC2011-HD		
41	T7 tractor construction - DSL	T7 tractor construction	Heavy-Heavy Duty Diesel Tractor Construction Truck	EMFAC2011-HD		
42	T7 utility - DSL	T7 utility	Heavy-Heavy Duty Diesel Utility Fleet Truck	EMFAC2011-HD		
43	T7IS - GAS	T7IS	Heavy-Heavy Duty Gasoline Truck	EMFAC2011-LDV		
44	PTO - DSL	PTO	Power Take Off	EMFAC2011-HD		
45	SBUS - DSL	SBUS	School Buses	EMFAC2011-HD	SBUS	Non-Trucks
46	SBUS - GAS	School Buses	School Buses	EMFAC2011-LDV		
47	UBUS - DSL	UBUS	Urban Buses	EMFAC2011-LDV	UBUS	
48	UBUS - GAS	UBUS	Urban Buses	EMFAC2011-LDV		
49	Motor Coach - DSL	Motor Coach	Motor Coach	EMFAC2011-HD	OBUS	
50	OBUS - GAS	OBUS	Other Buses	EMFAC2011-LDV		
51	All Other Buses - DSL	All Other Buses	All Other Buses	EMFAC2011-HD		