January 8, 2010 ITEM # 7

Memorandum

To: TPB Technical Committee

From: Daivamani Sivasailam
Principal Transportation Engineer

Subject: Local Inputs for the 2010 MOVES Model

Background

During TPB's testing phase of the draft MOVES model, staff worked on developing local input data representing vehicle age distribution, vehicle population, annual vehicle miles of travel by vehicle type, and vehicle VMT percentage by facility type. The local data were developed using a combination of draft MOVES data convertors and staff-developed spread sheet programs. The methodology is discussed in a memorandum from Daivamani Sivasailam to the MOVES Task Force dated November 17, 2009, updated December 4, 2009 and distributed during the December TPB Technical Committee meeting.

MOVES 2010 Local Data Needs

The final version of the Motor Vehicle Emissions Simulator (MOVES) model was released on December 23, 2009. Staff reviewed the local input data needs of the new model versus the draft model and our preliminary findings are listed below.

- There are no changes to the convertor used to develop vehicle age distribution, so there will be no changes to these previously developed local data.

- The data requirement for vehicle population did not change so the methodology staff developed to estimate MOVES vehicle population will remain the same and so will the previously developed local data.

- *There are changes to the annual vehicle miles of travel input. In addition to the annual VMT by vehicle type which was in the draft MOVES 2009, we need three additional inputs associated with VMT. These inputs are local factors to convert the annual VMT to monthly VMT, month to weekday and weekend VMT, and weekday/weekend VMT to hourly VMT.*

- There are no changes to vehicle VMT percentage by facility type, so staff will use the same previously developed methodology for this input as well.

A local input that staff had not previously visited is the average speed distribution. EPA has provided a convertor that will take locally available VMT by speed bins and convert them to vehicle hours of travel by speed bins. The following paragraphs will discuss in detail the two new local data needs that staff will be working on in the following months.

Annual VMT

Since MOVES 2010 still requires annual VMT we will follow the same methodology to estimate annual VMT. The following three tables show an example of the type of local data that have to be developed along with the annual VMT in order to execute the MOVES 2010 model using local VMT. The following three tables show the example of motorcycle VMT (MOVES vehicle type 11) factors needed along with annual VMT. Similar data are needed for every MOVES vehicle type and facility type.

Table 1 Monthly Fractions

Source Type ID	Month ID	Month VMT Fraction
11	1	0.0730856
11	2	0.0697126
11	3	0.0817315
11	4	0.0823022
11	5	0.0875028
11	6	0.0882716
11	7	0.0923251
11	8	0.0934297
11	9	0.0846806
11	10	0.086516
11	11	0.0802282
11	12	0.0802141

Table 2 Weekday/Weekend Fractions

Source Type ID	Month ID	Road Type ID	Day ID	Day VMT Fraction
11	1	1	2	0.237635
11	1	1	5	0.762365
11	1	2	2	0.27882
11	1	2	5	0.72118
11	1	3	2	0.27882
11	1	3	5	0.72118
11	1	4	2	0.237635
11	1	4	5	0.762365
11	1	5	2	0.237635
11	1	5	5	0.762365

Day ID 2= weekend; 5=weekday

Road Type 1=Freeway 2=Arterial 3=Local 4=Fwy Ramp 5=None

Table 3 Hourly Fractions

Source Type ID	Road Type ID	Day ID	Hour ID	Hour VMT Fraction
11	1	2	1	0.021474
11	1	2	2	0.014443
11	1	2	3	0.010968
11	1	2	4	0.007495
11	1	2	5	0.006839
11	1	2	6	0.010359
11	1	2	7	0.01843
11	1	2	8	0.026812
11	1	2	9	0.036385
11	1	2	10	0.047541
11	1	2	11	0.057466
11	1	2	12	0.065079
11	1	2	13	0.071323
11	1	2	14	0.071492
11	1	2	15	0.071723
11	1	2	16	0.072006
11	1	2	17	0.071149
11	1	2	18	0.067887
11	1	2	19	0.061772
11	1	2	20	0.051688
11	1	2	21	0.042866
11	1	2	22	0.03803
11	1	2	23	0.032207
11	1	2	24	0.024568

Average Speed Distribution

MOVES convertor will provide the data based on local VMT based speed distribution percentages for every hour of the day and for 16 speed bins for urban and rural areas by two facility types. The convertor converts the VMT data to vehicle hours of travel (VHT) for every MOVES vehicle type, and facility type for every hour of the day. Staff proposes to use locally developed data currently used in the Mobile 6.2 emissions post processor. Table 4 shows a sample input requirement for the convertor.

Next Steps

We will test the MOVES 2010 model using the local inputs described above.

Table 4: Input to the average speed convertor (VMT Percentages)

		Speed Bins													
Road	**Hour**	**2.5**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65.0+**
fwy	1	0.0083	0.0272	0.0210	0.0224	0.0217	0.0381	0.0344	0.0536	0.0614	0.0700	0.2507	0.1150	0.2550	0.0212
fwy	2	0.0260	0.0066	0.0076	0.0156	0.0282	0.0326	0.0344	0.0361	0.0360	0.0435	0.2453	0.1729	0.3023	0.0129
fwy	3	0.0259	0.0033	0.0064	0.0057	0.0126	0.0281	0.0342	0.0349	0.0407	0.0369	0.2181	0.1066	0.4399	0.0127
fwy	4	0.0145	0.0096	0.0021	0.0022	0.0041	0.0166	0.0232	0.0373	0.0418	0.0449	0.2248	0.1190	0.4422	0.0177
fwy	5	0.0083	0.0086	0.0052	0.0032	0.0040	0.0163	0.0232	0.0364	0.0375	0.0420	0.2352	0.1170	0.4454	0.0177
fwy	6	0.0072	0.0034	0.0042	0.0098	0.0121	0.0244	0.0289	0.0327	0.0401	0.0392	0.2294	0.1011	0.4538	0.0137
fwy	7	0.0103	0.0023	0.0064	0.0087	0.0147	0.0281	0.0335	0.0328	0.0345	0.0354	0.2294	0.0964	0.4547	0.0128
fwy	8	0.0083	0.0075	0.0052	0.0043	0.0054	0.0182	0.0257	0.0381	0.0380	0.0421	0.2258	0.1118	0.4512	0.0184
fwy	9	0.0113	0.0065	0.0052	0.0023	0.0039	0.0206	0.0279	0.0358	0.0383	0.0517	0.2147	0.1151	0.4484	0.0183
fwy	10	0.0155	0.0075	0.0034	0.0042	0.0081	0.0272	0.0324	0.0363	0.0315	0.0390	0.2124	0.0644	0.5000	0.0181
fwy	11	0.0156	0.0411	0.0225	0.0199	0.0284	0.0316	0.0500	0.0488	0.0446	0.0555	0.2223	0.1092	0.2957	0.0148
fwy	12	0.0186	0.0113	0.0046	0.0110	0.0183	0.0261	0.0488	0.0383	0.0314	0.0534	0.2235	0.1237	0.3736	0.0174
fwy	13	0.0176	0.0064	0.0010	0.0024	0.0034	0.0155	0.0191	0.0315	0.0357	0.0515	0.2134	0.0674	0.5178	0.0173
fwy	14	0.0135	0.0043	0.0031	0.0010	0.0012	0.0094	0.0177	0.0258	0.0264	0.0550	0.2060	0.0980	0.5209	0.0177
fwy	15	0.0094	0.0031	0.0025	0.0007	0.0012	0.0069	0.0166	0.0216	0.0257	0.0476	0.2169	0.1048	0.5228	0.0202
fwy	16	0.0054	0.0018	0.0018	0.0004	0.0011	0.0045	0.0155	0.0175	0.0250	0.0401	0.2277	0.1117	0.5246	0.0229
fwy	17	0.0027	0.0010	0.0014	0.0002	0.0011	0.0028	0.0147	0.0147	0.0245	0.0352	0.2350	0.1162	0.5259	0.0246
fwy	18	0.0013	0.0006	0.0012	0.0001	0.0011	0.0020	0.0144	0.0133	0.0242	0.0327	0.2386	0.1185	0.5265	0.0255
fwy	19	0.0000	0.0001	0.0010	0.0000	0.0011	0.0012	0.0140	0.0119	0.0240	0.0302	0.2422	0.1208	0.5271	0.0264
fwy	20	0.0000	0.0013	0.0000	0.0000	0.0000	0.0010	0.0115	0.0097	0.0200	0.0241	0.2450	0.1285	0.5271	0.0318
fwy	21	0.0000	0.0003	0.0010	0.0000	0.0000	0.0008	0.0103	0.0086	0.0181	0.0206	0.2464	0.1321	0.5271	0.0347
fwy	22	0.0000	0.0013	0.0000	0.0000	0.0000	0.0008	0.0107	0.0081	0.0170	0.0199	0.2451	0.1341	0.5271	0.0359
fwy	23	0.0021	0.0003	0.0000	0.0010	0.0000	0.0010	0.0118	0.0100	0.0205	0.0224	0.2452	0.1274	0.5271	0.0312
fwy	24	0.0031	0.0003	0.0000	0.0010	0.0001	0.0011	0.0134	0.0124	0.0240	0.0267	0.2404	0.1226	0.5271	0.0278