November 17, 2009

Memorandum

To: MOVES Task Force

From: Daivamani Sivasailam
            Principal Transportation Engineer

Subject: Local Inputs for the MOVES Model and Scenario Testing

The first part of this memorandum describes the methodology used to develop MOVES input items # 4, 5, 6, and 7 (see "attachment A" showing MOVES local data needs) using local data for two analysis years 2005 and 2030. Once staff created the input data we reviewed them and identified issues which should be discussed/addressed by the committee or directed to EPA for guidance. The second part of the memorandum discusses the different scenarios that are to be tested using local data to identify the impact of each local transportation input.

I. PREPARATION OF LOCAL INPUT DATA

Vehicle Age Distribution (Input # 4):   The MOVES model requires vehicle age distribution (less than 1 year old through 30 years) for 13 vehicle types. Mobile 6.2 on the other hand required age distribution (1 year old through 25 years) for 16 vehicle types. In 2005 and 2008 DTP staff developed vehicle age distributions for the Mobile 6.2 model using July 1, 2005 and 2008 vehicle registration data. Using the 2005 and 2008 age distributions and the MOVES "convertor" provided by EPA see attachment B, staff developed MOVES age distribution for analysis year 2005 and analysis year 2030.

Relevant pages of the convertor are shown as attachment C. The convertor which is like a black box takes in the local age distribution in Mobile 6.2 format (16 vehicle types) and outputs local age distribution in MOVES format (13 vehicle types). Review of the documentation and the software indicates that the "convertor" performs three steps. First it converts the Mobile 6.2 age distribution percentages for 25 years into six Highway Performance Monitoring System (HPMS) {motor cycles, passenger cars, light trucks, buses, single unit trucks, and combination trucks}vehicle counts for 25 years using built in national vehicle type counts factor. It then estimates HPMS age fractions from HPMS vehicle counts for the six HPMS vehicle types. It then proceeds to distribute year 25 fractions through years 26 through 30. The final step it converts the six vehicle types to 13 vehicle types (motor cycles, passenger cars, passenger trucks, light commercial trucks, intercity buses, transit buses, school buses, single unit short-haul trucks, single unit long-haul trucks, combination short-haul trucks, and combination long-haul trucks). The equivalencies between Mobile 6.2 vehicle types, HPMS vehicle types and MOVES vehicle types are shown in table C1 and C2.

Even though the convertor produces age distribution for 13 vehicle types, in reality it develops the age distribution for 6 HPMS (table C1) vehicle types and assigns the same age distribution for HPMS subclass vehicle types. For example even though MOVES vehicle type "passenger truck", and MOVES vehicle type "light commercial truck" are different they have the same age distribution since they both are subclasses of HPMS vehicle type 30 (table C2).

The age distribution developed using local data was then compared with the MOVES default age distribution; we have identified two issues. Attachment C shows the charts for Fairfax County (for illustration purposes) for MOVES vehicle type 21 (passenger cars) and vehicle type 32 (light commercial truck).

Issue 1
The MOVES default distribution has a higher percentage for the "0" year as compared to our local data for a majority of the vehicle types. From the documentation it is not clear if this due to a definitional change for "0" year as compared to the older definition in Mobile 6.2. Also under Mobile 6.2 year 1 percentage was always lower compared to year 2 which is carried over to the MOVES age distribution by the MOVES convertor, whereas the MOVES default '0' year is higher than the following year for a majority of the vehicle types.

Issue2
Since all vehicles older than 30 years are combined in the 30+ year, the final year always has a higher percentage than the prior years. This is true for the Mobile 6.2 age distribution, Mobile 6.2 default distribution and MOVES age distribution using local data. However, the MOVES default age distribution generally has zero percentages for years 26 thorough 30. This is the second issue that needs clarification from EPA as the current MOVES documentation has no explanation.

Vehicle Population (Input # 5): Unlike the Mobile 6.2 model which never required vehicle population, the MOVES model requires vehicle population by 6 MOVES vehicle types. We were able to develop local vehicle population by Mobile 6.2 vehicle types using the VIN decoded data. Attachment D has the relevant tables illustrating the procedure for Fairfax County.

For base year 2005, using Mobile 6.2 vehicle population and the Mobile 6.2 to MOVES vehicle type fraction table provided by EPA as input we are able to convert the 2005 vehicle population data to MOVES vehicle population. Table D1 is a table created by staff using the equivalency factors provided by EPA. Table D2 shows the MOVES vehicle type population results for Fairfax County for 13 vehicle types created by using the 2005 total vehicle population for Fairfax County and the equivalency table. Table D3 shows the consolidated 6 vehicle type population for Fairfax County.

So far the only issue we have identified in this input is the high percentage for the intercity bus (60% of transit bus population) which was adjusted (2% of transit bus population) to reflect the local decoded data.

For forecast years such as 2030 the need for vehicle population was met by using 2030 vehicle population forecast based on the 2008 vehicle registration data, used in the diurnal/resting loss

calculation of the conformity assessment. Staff followed the same steps in converting the 2030 forecast in to the consolidated 6 vehicle type format described above.

Annual VMT by Vehicle Type (item # 6)

The MOVES model requires annual VMT by the 6 MOVES vehicle types. VMT results from the conformity assessment provide the basis for developing this input using local data.

Step1
Staff developed annual VMT for each jurisdiction by restricted (freeways and expressways) and unrestricted facility types.

Step2
Using the VMT mix percentages from the Mobile 6.2 model and the total annual VMT staff estimated VMT by the 28 Mobile 6.2 vehicle types. Since the region models buses off-line, staff had to manually enter the bus VMT.

Step3
Using the Mobile to MOVES vehicle type fractions (used in the estimation of vehicle population) staff converted the 28 Mobile vehicle type VMT to the 13 MOVES vehicle type VMT.

Step 4
The final step was to consolidate the 13 MOVES vehicle type VMT to 6 MOVES vehicle type VMT.

The VMT developed using the above process was compared with the annual VMT for 3 vehicle types (passenger vehicles, commercial vehicles and heavy duty trucks) generated by the travel demand model and found the comparisons reasonable. Attachment E shows the relevant tables from the steps involved in developing this input item including the comparison table.

Vehicle VMT Percentage by Facility Type (item # 7)

The final input to the MOVES model is vehicle VMT percentage by four facility types. The four facility types are urban restricted (freeways and expressways), urban unrestricted (arterial, collector and local), rural restricted and rural unrestricted.

We developed this input item using input data from a number of sources. The primary source was developed from the travel demand model. Using the travel demand model staff was able to generate restricted and unrestricted highways share of VMT for three vehicle types namely passenger cars, commercial vehicles and heavy duty trucks. Urban, rural split was developed using the split percentages used for developing the national emissions inventory (NEI). Another source was the default percentages in the MOVES model.

Using the above mentioned sources staff was able to develop vehicle VMT percentage by facility type for the 13 MOVES vehicle types. For motorcycle, passenger car, passenger truck, single

unit short-haul, single unit long-haul, combination short-haul, combination long-haul we used percentages developed from the travel demand model. Since refuse trucks and motor homes are primarily on unrestricted roads, we used MOVES default instead of the travel demand model which in our opinion had higher percentages on restricted roads. For the three bus categories we used percentages developed for NEI. Attachment F shows the relevant input tables used in the development of this input item for Montgomery County (illustration purpose only), Maryland.

SCENARIOS FOR TESTING

Once the local input data items # 4, 5, 6, and 7 have been developed staff prepared the following scenario tests to test the sensitivity of the MOVES model to the input items.

This represents the analysis plan for DC, Montgomery and Fairfax counties for the year 2005; similar tests will be performed for analysis year 2030. We are currently testing ozone season for pollutants VOC and NOx. Similar tests would be performed for annual pollutants PM 2.5, precursor NOx, and CO_2, and for wintertime CO.

Attachments A-F

Table of Scenario Testing

Input Item	Test 1 Def.	Test 1 Loc.	Test 2 Def.	Test 2 Loc.	Test 3 Def.	Test 3 Loc.	Test 4 Def.	Test 4 Loc.	Test 5 Def.	Test 5 Loc.
Vehicle Age Distribution (#4)	X			X		X		X		X
Vehicle Population (#5)		X		X		X		X		X
Ann. VMT by Vehicle Type (#6) – Jurisdiction	X		X			X		X		X
Ann. VMT by Vehicle Type (#6)-Distributed by Veh. type	X		X		X			X		X
Vehicle Type VMT Percentages by Facility Type (#7)	X		X		X		X			X

MOVES Local Data Needs

➢ **Required Local Datasets**

1. Fuel Characteristics

2. Meteorology

3. I/M Program

4. Age Distribution (Registration data)

5. Population of MOVES Vehicle Types
   (for each county or region in a calendar year)

6. Total Base Year VMT for HPMS Vehicle Types
   (for each county or region in a calendar year)

7. VMT Fraction across MOVES Road Types for each MOVES Vehicle Types

Yu Gao

From:	Brzezinski.David@epamail.epa.gov on behalf of Mobile@epamail.epa.gov
Sent:	Thursday, June 04, 2009 8:50 AM
To:	Yu Gao
Cc:	Maciag.Ted@epamail.epa.gov
Subject:	Re: Moves vehicle type
Attachments:	Convertors.zip; SourceTypeFractionsTable.xls

Tthe current plan is to have a draft of the technical guidance by the end of this month (June that will address how to develop inputs for MOVES. However, I'm not sure this means that we will be distributing the draft for comments right away or whether some additional internal review will be needed. This may depend on what our management thinks at that point.

We are also developing tools (which we call "convertors") that are designed to assist MOBILE6 users in translating their MOBILE6-style inputs into tables that can be used by MOVES. Attached is a ZIP file with some of our draft convertor spreadsheets. The results in the spreadsheet can be directly read by MOVES using the Pre-Processing menu County Data Manager importers. More convertors are in development for other MOBILE6 input files.

I am working on a spreadsheet that will be the basis for the technical part of the conversion of the MOBILE6 vehicle classifications to the MOVES source use types. Attached is my initial mapping of the vehicle classifications using national average fractions. I want to stress that this is only an initial draft and we may change the values. The mapping of the HPMS vehicle types should be easier, since the MOVES source use types are based on the HPMS classifications. However, there will need to be default fractions to split into "short haul" and "long haul" and guidance on how to make the splits better match your local area.

David Brzezinski
EPA OTAQ ASD

(See attached file: Convertors.zip)(See attached file:
SourceTypeFractionsTable.xls)

MOBILE 6.2 to MOVES Age Distribution Convertor

Worksheet Description:

This Excel file takes a MOBILE6-formatted registration distribution file and converts it to the format needed by the MOVES SourceTypeAgeDistribution table. The file applies the MOBILE6 VCount number of vehicles in the selected calendar year, distributes these according to the registration distributions, and then sums the number of vehicles by age for each of the 6 HPMS vehicle IDs. It renormalizes the distributions for these 6 vehicle categories, and expands the distribution from 25 years to 31 years. An explanation of each of the pages of the spreadsheet is provided below, with pages grouped by input, output, default data, calculation sheets, and mapping data.

IMPORTANT NOTE:

This converter only works with registration data in the 10/10/5 format (i.e., years 0-9 of data on the first line, years 10-19 on the second line, and years 20-24 on the third line) for each vehicle type. This should be relatively simple for users with other formats to accomplish, simply by editing their registration distribution text file, adding or deleting returns as needed, prior to importing it into the Excel file. Programmers editors such as Note Pad Plus (free programmers editor) or Ultra Edit, and the use of a "Fixed Font" like Lucida Console, may make working with columns much easier and less likely for users to make errors if the data are not already in the 10/10/5 format. The vehicle types can be in any order and any number of the vehicle types may be excluded.

User Input Pages:

Base Year

The user needs to enter the year of the registration distribution in Cell A2 of this page. This page also identifies potential errors in the user input registration data.

MOBILE6 USER Reg Dist

On this page, the user needs to enter his registration distribution. First, clear the contents on this page, click yes if prompted by Excel about whether you want to delete the existing query. Then click on the "Data" tab, then "Import External Data", and "Import Data". Using the file browser, select the appropriate file. When the Text Import Wizard pops up, click on "Fixed width" and then "Next." In step 2 of the Wizard, fix the column breaks so that the vehicle identifiers will be in the first column and the registration data in each of the next 10 columns. Click "Finish" and when prompted on where you want to put the data, click on "Existing worksheet" with "=A1" in the box and then click "OK."

Output Page:

SourceTypeAgeDistribution   This page includes the converted registration data formatted for MOVES.

MOBILE6 Default Data Pages:

MOBILE6 DEFAULT Reg Dist

This page contains the default MOBILE6 registration distribution. This is used for vehicle types that are not included in the user's registration distribution file. This page should not need to be updated MOBILE6 MvCount--This sheet contains the data from Block Data 20 of the MOBILE6 source code of the vehicle counts by year and vehicle type. This should not need to be updated.

MOBILE6 MvCount

This page contains the data from Block Data 20 of the MOBILE6 source code of the vehicle counts by year and vehicle type. This should not need to be updated.

Calculation Pages: These pages should not be updated by the user.

Combined User+Default Reg Data   This page pulls in the registration data from the user-supplied registration distribution, and supplies the MOBILE6 default registration distribution for categories not included in the user-supplied registration distribution.

M6vTypeAllocation   This page allocates the vehicle counts (vCount) according to the registration distribution for each of the 16 MOBILE6 vehicle types from the registration distribution.

Sum VTypes   This page sums the data from M6vTypeAllocation by HPMSVtypeID and age

HPMS 31 Yr Reg Dist   This page converts the 25-year distributions by HPMSVtypeID to 31-year distributions.

31 Yr Reg Dist by Source Type   This page applies the distributions developed at the HPMSVtypeID level to the 13 MOVES Source Types.

**Mapping Page:**

Vehicle Type Mapping

This sheet contains the mapping from the MOBILE 16 vehicle types used with registration distribution to the 6 HPMS Vehicle Type IDS and the mapping from the 13 MOVES Source Types to the 6 HPMS Vehicle Types.

MOVES Age Distribution Combinations

Table C-1. Composite Vehicle Classes for Vehicle Registration Data from MOBILE6			
M6Vtype16ID	Abbreviation	Description	HPMSVtypeID
1	LDV	Light-Duty Vehicles (Passenger Cars)	20
2	LDT1	Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW)	30
3	LDT2	Light-Duty Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)	30
4	LDT3	Light-Duty Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW)	30
5	LDT4	Light-Duty Trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)	30
6	HDV2B	Class 2b Heavy-Duty Vehicles (8,501-10,000 lbs. GVWR)	30
7	HDV3	Class 3 Heavy-Duty Vehicles (10,001-14,000 lbs. GVWR)	50
8	HDV4	Class 4 Heavy-Duty Vehicles (14,001-16,000 lbs. GVWR)	50
9	HDV5	Class 5 Heavy-Duty Vehicles (16,001-19,500 lbs. GVWR)	50
10	HDV6	Class 6 Heavy-Duty Vehicles (19,501-26,000 lbs. GVWR)	50
11	HDV7	Class 7 Heavy-Duty Vehicles (26,001-33,000 lbs. GVWR)	50
12	HDV8A	Class 8a Heavy-Duty Vehicles (33,001-60,000 lbs. GVWR)	60
13	HDV8B	Class 8b Heavy-Duty Vehicles (>60,000 lbs. GVWR)	60
14	HDBS	School Buses	40
15	HDBT	Transit and Urban Buses	40
16	MC	Motorcycles (All)	10

Table C-2. MOVES SourceUseType Vehicle Categories		
SourceTypeID	SourceTypeName	HMPSVtypeID
11	Motorcycle	10
21	Passenger Car	20
31	Passenger Truck	30
32	Light Commercial Truck	30
41	Intercity Bus	40
42	Transit Bus	40
43	School Bus	40
51	Refuse Truck	50
52	Single Unit Short-Haul Truck	50
53	Single Unit Long-Haul Truck	50
54	Motorhome	50
61	Combination Short-Haul Truck	60
62	Combination Long-Haul Truck	60

Chart C-1. Comparison of Vehicle Age Distribution (MOVES Default vs Local Data) Jurisdiction = FFX Vehicle Type = Passenger Car
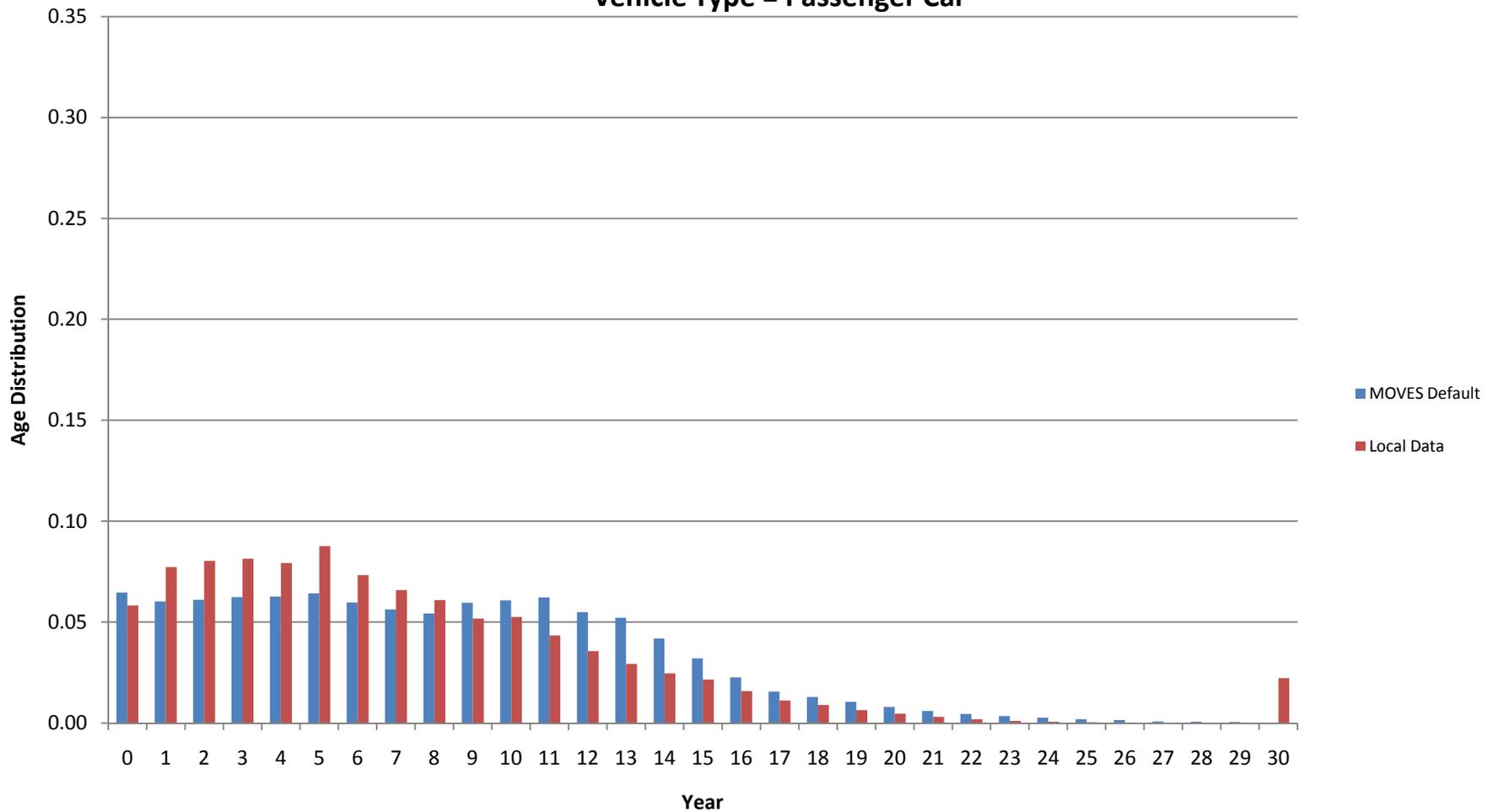
Chart C-2. Comparison of Vehicle Age Distribution (MOVES Default vs Converter Default vs Vin Decodes) Jurisdiction = FFX Vehicle Type = Light Commercial Truck
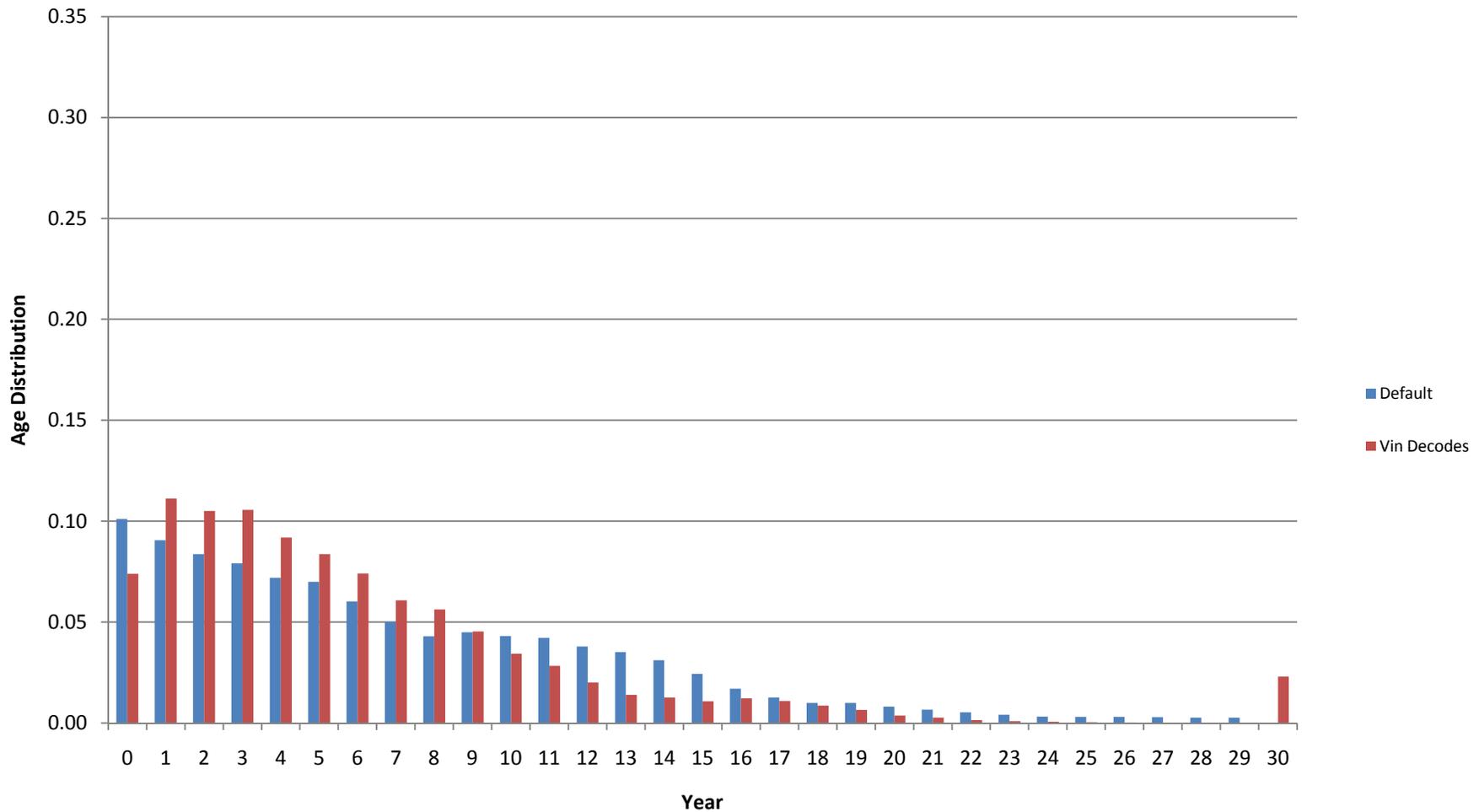
Table D-1. MOBILE 6.2 to MOVES EQUIVALENCY TABLE

Mobile 6 Vehicle Type		MOVES Vehicle Type													TOTAL
		11 MC 1	21 PC 2	31 PT 3	32 LCT 4	41 IB 5	42 TB 6	43 SB 7	51 RT 8	52 SUST 9	53 SULT 10	54 MH 11	61 CST 12	62 CLT 13	
1	LDGV	-	1.00	-	-	-	-	-	-	-	-	-	-	-	1.00
2	LDGT1	-	-	0.89	0.11	-	-	-	-	0.01	0.00	-	-	-	1.00
3	LDGT2	-	-	0.89	0.11	-	-	-	-	0.01	0.00	-	-	-	1.00
4	LDGT3	-	-	0.89	0.11	-	-	-	-	0.01	0.00	-	-	-	1.00
5	LDGT4	-	-	0.89	0.11	-	-	-	-	0.01	0.00	-	-	-	1.00
6	HDGV2B	-	-	0.73	0.25	-	-	-	0.00	0.02	0.00	-	0.00	-	1.00
7	HDGV3	-	-	0.10	0.27	-	-	-	0.00	0.61	0.02	-	0.00	-	1.00
8	HDGV4	-	-	0.02	0.29	-	-	-	0.01	0.68	0.00	-	0.00	-	1.00
9	HDGV5	-	-	0.01	0.15	-	-	-	0.00	0.76	0.08	-	0.00	-	1.00
10	HDGV6	-	-	0.01	0.21	-	-	-	0.00	0.75	0.03	-	0.00	0.00	1.00
11	HDGV7	-	-	0.01	0.12	-	-	-	0.00	0.83	0.00	-	0.03	-	1.00
12	HDGV8A	-	-	0.39	0.14	-	-	-	0.00	0.45	0.01	-	0.01	0.00	1.00
13	HDGV8B	-	-	0.39	0.14	-	-	-	0.00	0.45	0.01	-	0.01	0.00	1.00
14	LDDV	-	1.00	-	-	-	-	-	-	-	-	-	-	-	1.00
15	LDDT12	-	-	0.47	0.23	-	-	-	-	0.28	0.02	-	-	-	1.00
16	HDDV2B	-	-	0.57	0.35	-	-	-	-	0.07	0.00	-	0.00	-	1.00
17	HDDV3	-	-	0.09	0.16	-	-	-	0.00	0.65	0.09	-	-	0.00	1.00
18	HDDV4	-	-	0.01	0.23	-	-	-	0.00	0.74	0.02	-	0.00	0.00	1.00
19	HDDV5	-	-	0.03	0.20	-	-	-	0.02	0.67	0.07	-	0.00	-	1.00
20	HDDV6	-	-	0.00	0.17	-	-	-	0.01	0.72	0.03	-	0.07	0.01	1.00
21	HDDV7	-	-	0.00	0.06	-	-	-	0.01	0.28	0.01	-	0.52	0.11	1.00
22	HDDV8A	-	-	0.00	0.02	-	-	-	0.04	0.34	0.01	-	0.36	0.23	1.00
23	HDDV8B	-	-	0.00	0.02	-	-	-	0.04	0.34	0.01	-	0.36	0.23	1.00
24	MC	1.00	-	-	-	-	-	-	-	-	-	-	-	-	1.00
25	HDGB	-	-	-	-	-	0.09	0.91	-	-	-	-	-	-	1.00
26	HDDBT	-	-	-	-	0.02	0.98	-	-	-	-	-	-	-	1.00
27	HDDBS	-	-	-	-	-	-	1.00	-	-	-	-	-	-	1.00
28	LDDT34	-	-	0.47	0.23	-	-	-	-	0.28	0.02	-	-	-	1.00

Note: Based on EPA's MOVES Vehicle Type Fraction Table

Table D-2. 2005 FAIRFAX VEHICLE POPULATION FROM MOBILE6 TO MOVES

Mobile 6 Vehicle Type		Population	MOVES Vehicle Type													TOTAL
			11 MC	21 PC	31 PT	32 LCT	41 IB	42 TB	43 SB	51 RT	52 SUST	53 SULT	54 MH	61 CST	62 CLT	
1	LDGV	458937	-	458,937	-	-	-	-	-	-	-	-	-	-	-	458,937
2	LDGT1	6522	-	-	5,794	694	-	-	-	-	34	0	-	-	-	6,522
3	LDGT2	213635	-	-	189,788	22,721	-	-	-	-	1,121	5	-	-	-	213,635
4	LDGT3	48364	-	-	42,966	5,144	-	-	-	-	254	1	-	-	-	48,364
5	LDGT4	13962	-	-	12,404	1,485	-	-	-	-	73	0	-	-	-	13,962
6	HDGV2B	12214	-	-	8,935	3,028	-	-	-	0	235	15	-	0	-	12,214
7	HDGV3	1592	-	-	158	427	-	-	-	1	972	33	-	0	-	1,592
8	HDGV4	1209	-	-	23	348	-	-	-	8	820	5	-	5	-	1,209
9	HDGV5	82	-	-	0	13	-	-	-	0	63	6	-	0	-	82
10	HDGV6	199	-	-	2	42	-	-	-	1	149	5	-	1	0	199
11	HDGV7	104	-	-	1	13	-	-	-	0	87	0	-	3	-	104
12	HDGV8A	5	-	-	2	1	-	-	-	0	2	0	-	0	0	5
13	HDGV8B	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	LDDV	2003	-	2,003	-	-	-	-	-	-	-	-	-	-	-	2,003
15	LDDT12	53	-	-	25	12	-	-	-	-	15	1	-	-	-	53
16	HDDV2B	3221	-	-	1,851	1,124	-	-	-	-	234	12	-	0	-	3,221
17	HDDV3	1523	-	-	142	249	-	-	-	0	989	142	-	-	1	1,523
18	HDDV4	1381	-	-	10	311	-	-	-	1	1,023	34	-	1	0	1,381
19	HDDV5	687	-	-	20	138	-	-	-	15	463	48	-	3	-	687
20	HDDV6	1570	-	-	3	264	-	-	-	19	1,123	49	-	103	10	1,570
21	HDDV7	947	-	-	0	57	-	-	-	14	264	10	-	495	108	947
22	HDDV8A	680	-	-	1	17	-	-	-	24	230	6	-	245	158	680
23	HDDV8B	1645	-	-	1	41	-	-	-	59	556	15	-	592	382	1,645
24	MC	11768	11,768	-	-	-	-	-	-	-	-	-	-	-	-	11,768
25	HDGB	1403	-	-	-	-	-	121	1,283	-	-	-	-	-	-	1,403
26	HDDBT	1366	-	-	-	-	32	1,334	-	-	-	-	-	-	-	1,366
27	HDDBS	1903	-	-	-	-	-	-	1,903	-	-	-	-	-	-	1,903
28	LDDT34	100	-	-	47	23	-	-	-	-	28	2	-	-	-	100
	MH	133											133			133
TOTAL		787210	11,768	460,941	262,172	36,151	32	1,455	3,186	143	8,733	390	133	1,449	659	787,210

Table D-3. 2005 FFX Vehicle Population in HPMS Vehicle Types

10	20	30	40	50	60
11,768	460,941	298,323	4,672	9,399	2,107

Page D-2

Input Tables

Table E-1. Annual Network VMT
from Travel Demand Model (000's)

Facility Type	Annual VMT
Freeway+Exp.Way	2,703,029
Arterial	4,619,297

Table E-2. VMT Fractions by Vehicle Types (28 Vehicle Types in Mobile 6)

LDGV	LDGT1	LDGT2	LDGT3	LDGT4	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6
0.4101	0.0769	0.2813	0.0957	0.0460	0.0202	0.0007	0.0002	0.0009	0.0016
HDGV7	**HDGV8A**	**HDGV8B**	**LDDV**	**LDDT12**	**HDDV2B**	**HDDV3**	**HDDV4**	**HDDV5**	**HDDV6**
0.0006	0.0000	0.0000	0.0013	0.0013	0.0063	0.0019	0.0020	0.0012	0.0046
HDDV7	**HDDV8A**	**HDDV8B**	**MC**	**HDGB**	**HDDBT**	**HDDBS**	**LDDT34**		
0.0049	0.0070	0.0284	0.0048	0.0000	0.0000	0.0000	0.0021		

Table E-3. Rural/Urban Split

Rural	0.1
Urban	0.9

Table E-4. 2005 HDBT and HDBS Annual VMT(000's)

HDBT	19,318
HDBS	22,307

Table E-5. Actual Annual VMT by MOVES Vehicle Type(000's)

Facility Type	% VMT	VMT	11 MC	21 PC	31 PT	32 LCT	41 IB	42 TB	43 SB	51 RT	52 SUSH	53 SULH	54 MH	61 CS	62 CL
Rural															
Restricted	0.04	271,840	1,297	111,203	125,542	17,542	14	699	823	386	7,428	291	0	4,232	2,381
Unrestricted	0.06	464,556	2,217	190,038	214,542	29,978	24	1,194	1,407	660	12,694	498	0	7,233	4,069
Urban															
Restricted	0.33	2,446,556	11,677	1,000,824	1,129,874	157,876	128	6,290	7,411	3,478	66,855	2,622	0	38,090	21,429
Unrestricted	0.57	4,181,000	19,955	1,710,341	1,930,879	269,800	219	10,749	12,665	5,943	114,250	4,481	0	65,093	36,620
Total	1.00	7,363,951	35,147	3,012,405	3,400,837	475,196	386	18,932	22,307	10,467	201,227	7,892	0	114,647	64,499

Table E-6. Actural VMT by HPMS Vehicle Type (000's)

10	20	30	40	50	60
35,147	3,012,405	3,876,034	41,625	219,587	179,146

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Table E-7. Comparison of 2005 Montgomery County Annual Model VMT and Local VMT   (in millions)

	Commercial Vehicles(LCT)			Med/Hvy Trucks(40 50 60)			Cars (PC PT MC)			Total		
	Model VMT	Local VMT	Diff%	Model VMT	Local VMT	Diff%	Model VMT	Local VMT	Diff%	Model VMT	Local VMT	Diff%
Freeway+Exp.Way	91	175	92.46%	245	163	-33.70%	2,367	2,380	0.58%	2,703	2,718	0.57%
Arterial	249	300	20.46%	168	236	40.73%	4,203	4,068	-3.21%	4,619	4,604	-0.34%
Total	340	475	39.76%	413	398	-3.48%	6,570	6,448	-1.84%	7,322	7,322	-0.01%

Table F-1. MOVES Default VMT Fractions Value

Vehicle Type	Road Type	VMT Fraction
Refuse Truck	Off-Network	0.0000
Refuse Truck	Rural Restricted Access	0.1149
Refuse Truck	Rural Unrestricted Access	0.3972
Refuse Truck	Urban Restricted Access	0.1715
Refuse Truck	Urban Unrestricted Access	0.3165
MotorHome	Off-Network	0.0000
MotorHome	Rural Restricted Access	0.1149
MotorHome	Rural Unrestricted Access	0.3972
MotorHome	Urban Restricted Access	0.1715
MotorHome	Urban Unrestricted Access	0.3165

Table F-2. 2005 Montgomery County MD Annual VMT by Facility Type and Vehicle Type in 2009 CLRP with Purple Line Amendment

	Commercial Vehicles		Med/Hvy Trucks		Cars		
	VMT	VMT%	VMT	VMT%	VMT	VMT%	Total
Freeway+Exp.Way	91,146,698	3.37%	245,169,673	9.07%	2,366,713,098	87.56%	2,703,029,469
Arterial	248,869,034	5.39%	167,550,952	3.63%	4,202,876,866	90.99%	4,619,296,852
Total	340,015,732	4.64%	412,720,625	5.64%	6,569,589,964	89.72%	7,322,326,321

Table F-3. PEI Annual VMT by Faclility Type for Montgomery County

Facility Type		
Rural	HDDBT	HDDBS
Interstate	0	0
Other Principal Arterial	0	0
Minor Arterial	0	0
Major Collector	0	1041
Minor Collector	0	1041
Local	0	1388
Urban		
Interstate	383	0
Other Frwy & Expwy	191	0
Other Principal Arterial	4859	7576
Minor Arterial	4859	4282
Collector	9568	4282
Local	1340	16799
Total	21,199	36,410

Table F-4. MOVES VMT Fractions by Vehicle and Road Type

	11 MC	21 PC	31 PT	32 LCT	41 IB	42 TB	43 SB	51 RT	52 SUSH	53 SULH	54 MH	61 CS	62 CL
Off-Network	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rural Restricted	0.0360	0.0360	0.0360	0.0268	0.1268	0.0000	0.0000	0.1149	0.0594	0.0594	0.1149	0.0594	0.0594
Rural Unrestricted	0.0640	0.0640	0.0640	0.0732	0.4821	0.0000	0.0953	0.3971	0.0406	0.0406	0.3971	0.0406	0.0406
Urban Restricted	0.3242	0.3242	0.3242	0.2413	0.1385	0.0271	0.0000	0.1715	0.5346	0.5346	0.1715	0.5346	0.5346
Urban Unrestricted	0.5758	0.5758	0.5758	0.6587	0.2526	0.9729	0.9047	0.3165	0.3654	0.3654	0.3165	0.3654	0.3654
Total	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

	TDM Passenger Car
	TDM Commercial
	default
	NEI
	TDM Med/Heavy Truck
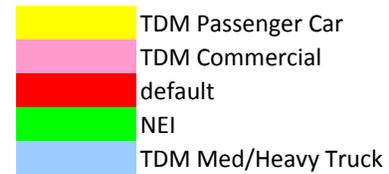
*Off-Network means parking lot or other non-road.