Memorandum

October 13, 2009

To: MOVES Task Force

From: Daivamani Sivasailam
     Principal Transportation Engineer

Subject: MOVES Vehicle Type and Age Distribution

During the August meeting Sunil Kumar and Eulalie Lucas presented an overview of the MOVES model inputs, outputs and procedures and Exhibit 1 is a page from the presentation on MOVES local data needs. This memorandum details work underway on items 4 and 5 of the local data needs. During the September meeting staff presented information on converting Mobile 6 vehicle population to MOVES vehicle population using a draft EPA vehicle convertor.

MOVES Vehicle TYPE Population

Table 1 shows the vehicle types used in Mobile 6 vs. the MOVES vehicle types. DTP staff approached EPA staff for assistance and Attachment A shows the correspondence between COG DTP staff and US EPA regarding a draft convertor. Using the percentages provided in the draft convertor, staff developed a Mobile 6.2 to MOVES equivalency table which is shown as table 2.

The next step was to use the equivalency table in conjunction with the 2008 Mobile 6.2 vehicle population to develop MOVES vehicle population. Tables 3, 4 and 5 show the MOVES vehicle population for the District of Columbia, Montgomery County, and Fairfax County, respectively. The next step is to review the MOVES vehicle population data and validate them with local data wherever available. We have started this effort and a few issues are addressed below.

Issues

o The percentage breakdown in the proposed convertor to subdivide the Mobile 6 transit bus (HDDBT) into intercity bus and city transit bus is 60% to 40%. A review of the decoded data indicates this percentage is very high and does not match the local condition which is in the 1 to 2.5% range. Table 6 shows the percentage of intercity buses, city buses for the three jurisdictions.

o At this time the convertor does not have factors for developing motor home/recreational vehicles. However, using the VIN decoder we were able to develop motor home/recreational vehicle population and table 7 shows the number of vehicles and their percentage of the total fleet under this MOVES category for the three jurisdictions.

Age Distribution

At the September MOVES Task Force meeting, staff presented MOVES age distributions, (0 through 30 years) generated using the Mobile 6.2 age distribution and the MOVES convertor for a couple of MOVES vehicle types. Charts 1 and 2 shows MOVES age distributions for passenger cars, and passenger trucks at the District of Columbia, Maryland, and Virginia 8-hour non-attainment area level. Review of these distributions indicates Maryland and Virginia have a slightly younger fleet than the District of Columbia. The next step will be to test the sensitivity of these variations on emissions.

Attachments
Exhibit 1
Table 1 – 7
Charts 1 & 2
Attachment A

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

Exhibit 1

Table 1 MOBILE 6.2 and MOVES Vehicle Types

MOBILE 6.2 VEHICLE TYPE

SourceTypeID	MOBILE6 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

MOVES VEHICLE TYPE

SourceTypeID	MOVES Abbreviation	SourceTypeName	HMPSVtypeID
11	MC	Motorcycle	10
21	PC	Passenger Car	20
31	PT	Passenger Truck	30
32	LCT	Light Commercial Truck	30
41	IB	Intercity Bus	40
42	TB	Transit Bus	40
43	SB	School Bus	40
51	RT	Refuse Truck	50
52	SUST	Single Unit Short-Haul Truck	50
53	SULT	Single Unit Long-Haul Truck	50
54	MH	Motorhome	50
61	CST	Combination Short-Haul Truck	60
62	CLT	Combination Long-Haul Truck	60

Table 2 MOBILE 6.2 to MOVES EQUIVALENCY TABLE

#	Mob. 6 Vehicle Type	11 Motor Cycle	21 Pass. Car	31 Pass. Truck	32 Lt. Com. Truck	41 Int. Bus	42 Tran. Bus	43 Sch. Bus	51 Ref. Truck	52 Sing.Unit SH. Truck	53 Sing.Unit LH. Truck	54 Motor Home	61 Comb.SH.Truck	62 Comb.LH.Truck	TOTAL
1	LDGV	-	1.00	-	-	-	-	-	-	-	-	-	-	-	1.00
2	LDGT1	-	-	0.89	0.11	-	-	-	-	-	-	-	-	-	1.00
3	LDGT2	-	-	0.89	0.11	-	-	-	-	-	-	-	-	-	1.00
4	LDGT3	-	-	0.89	0.11	-	-	-	-	-	-	-	-	-	1.00
5	LDGT4	-	-	0.89	0.11	-	-	-	-	-	-	-	-	-	1.00
6	HDGV2B	-	-	0.73	0.25	-	-	-	0.00	0.01	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	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	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	-	-	-	-	0.60	0.40	-	-	-	-	-	-	-	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 in the MOVES convertor

Table 3 District of Columbia Vehicle Population MOBILE6 TO MOVES

	Mob. 6 Vehicle Type	Population	MOVES Vehicle Type													TOTAL
			11 Motor Cycle	21 Pass. Car	31 Pass. Truck	32 Lt. Com. Truck	41 Int. Bus	42 Tran. Bus	43 Sch. Bus	51 Ref. Truck	52 Sing.Unit SH. Truck	53 Sing.Unit LH. Truck	54 Motor Home	61 Comb.SH.Truck	62 Comb.LH.Truck	
1	LDGV	156691	-	156,691	-	-	-	-	-	-	-	-	-	-	-	156,691
2	LDGT1	1520	-	-	1,350	162	-	-	-	-	8	0	-	-	-	1,520
3	LDGT2	48109	-	-	42,739	5,117	-	-	-	-	252	1	-	-	-	48,109
4	LDGT3	13178	-	-	11,707	1,402	-	-	-	-	69	0	-	-	-	13,178
5	LDGT4	3757	-	-	3,338	400	-	-	-	-	20	0	-	-	-	3,757
6	HDGV2B	3900	-	-	2,853	967	-	-	0	0	75	5	-	0	-	3,900
7	HDGV3	514	-	-	51	138	-	-	0	0	314	11	-	0	-	514
8	HDGV4	749	-	-	14	216	-	-	3	5	508	3	-	3	-	749
9	HDGV5	28	-	-	0	4	-	-	0	0	21	2	-	0	-	28
10	HDGV6	103	-	-	1	22	-	-	1	0	77	3	-	1	0	103
11	HDGV7	15	-	-	0	2	-	-	1	0	12	0	-	1	0	15
12	HDGV8A	2	-	-	1	0	-	-	0	0	1	0	-	0	0	2
13	HDGV8B	0	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	LDDV	631	-	631	-	-	-	-	-	-	-	-	-	-	-	631
15	LDDT12	12	-	-	6	3	-	-	-	-	3	0	-	-	-	12
16	HDDV2B	946	-	-	544	330	-	-	3	0	69	3	-	0	-	946
17	HDDV3	332	-	-	31	54	-	-	31	1	216	31	-	1	0	332
18	HDDV4	1006	-	-	8	227	-	-	25	7	745	25	-	1	0	1,006
19	HDDV5	315	-	-	9	63	-	-	22	4	212	22	-	-	-	315
20	HDDV6	297	-	-	0	50	-	-	9	4	212	9	-	19	2	297
21	HDDV7	292	-	-	0	17	-	-	3	18	81	3	-	153	33	292
22	HDDV8A	504	-	-	0	12	-	-	4	2	170	4	-	181	117	504
23	HDDV8B	68	-	-	0	2	-	-	1	-	23	1	-	24	16	68
24	MC	2926	2,926	-	-	-	-	-	-	-	-	-	-	-	-	2,926
25	HDGB	0	-	-	-	-	-	-	-	-	-	-	-	-	-	
26	HDDBT	973	-	-	-	-	586	387	-	-	-	-	-	-	-	973
27	HDDBS	297	-	-	-	-	-	-	297	-	-	-	-	-	-	297
28	LDDT34	40	-	-	19	9	-	-	-	-	11	1	-	-	-	40
	TOTAL	237205	2,926	157,322	62,670	9,196	586	387	297	42	3,101	125	-	384	168	237,205

Note: The total includes vehicles since 1981

Table 4 Montgomery County Vehicle Population MOBILE6 TO MOVES

MOVES Vehicle Type

#	Mob. 6 Vehicle Type	Population	11 Motor Cycle	21 Pass. Car	31 Pass. Truck	32 Lt. Com. Truck	41 Int. Bus	42 Tran. Bus	43 Sch. Bus	51 Ref. Truck	52 Sing.Unit SH. Truck	53 Sing.Unit LH. Truck	54 Motor Home	61 Comb.SH.Truck	62 Comb.LH.Truck	TOTAL
1	LDGV	393013	-	393,013	-	-	-	-	-	-	-	-	-	-	-	393,013
2	LDGT1	4704	-	-	4,179	500	-	-	-	-	25	0	-	-	-	4,704
3	LDGT2	177459	-	-	157,650	18,874	-	-	-	-	931	4	-	-	-	177,459
4	LDGT3	43077	-	-	38,269	4,581	-	-	-	-	226	1	-	-	-	43,077
5	LDGT4	14281	-	-	12,687	1,519	-	-	-	-	75	0	-	-	-	14,281
6	HDGV2B	12473	-	-	9,125	3,092	-	-	-	0	240	16	-	0	-	12,473
7	HDGV3	1511	-	-	150	405	-	-	-	1	923	32	-	0	-	1,511
8	HDGV4	928	-	-	17	267	-	-	-	7	629	4	-	4	-	928
9	HDGV5	110	-	-	1	17	-	-	-	0	84	8	-	0	-	110
10	HDGV6	185	-	-	2	39	-	-	-	1	138	5	-	1	0	185
11	HDGV7	30	-	-	0	4	-	-	-	0	25	0	-	1	0	30
12	HDGV8A	4	-	-	2	1	-	-	-	0	2	0	-	0	0	4
13	HDGV8B	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	LDDV	1727	-	1,727	-	-	-	-	-	-	-	-	-	-	-	1,727
15	LDDT12	66	-	-	31	15	-	-	-	-	18	1	-	-	-	66
16	HDDV2B	3570	-	-	2,051	1,246	-	-	-	0	259	13	-	0	-	3,570
17	HDDV3	1541	-	-	144	252	-	-	-	0	1,001	143	-	-	1	1,541
18	HDDV4	1282	-	-	10	289	-	-	-	1	950	31	-	1	0	1,282
19	HDDV5	733	-	-	21	147	-	-	-	16	493	52	-	3	-	733
20	HDDV6	1348	-	-	2	227	-	-	-	16	964	42	-	88	9	1,348
21	HDDV7	509	-	-	0	30	-	-	-	7	142	5	-	266	58	509
22	HDDV8A	1301	-	-	1	32	-	-	-	46	440	12	-	468	302	1,301
23	HDDV8B	341	-	-	0	8	-	-	-	12	115	3	-	123	79	341
24	MC	9957	9,957	-	-	-	-	-	-	-	-	-	-	-	-	9,957
25	HDGB	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	HDDBT	1347	-	-	-	-	812	535	-	-	-	-	-	-	-	1,347
27	HDDBS	1009	-	-	-	-	-	-	1,009	-	-	-	-	-	-	1,009
28	LDDT34	117	-	-	55	27	-	-	-	-	32	3	-	-	-	117
	TOTAL	672623	9,957	394,740	224,396	31,574	812	535	1,009	108	7,712	375	-	956	449	672,623

Note: The total includes vehicles since 1981

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Table 5 Fairfax County Vehicle Population MOBILE6 TO MOVES

#	Mob. 6 Vehicle Type	Population	11 Motor Cycle	21 Pass. Car	31 Pass. Truck	32 Lt. Com. Truck	41 Int. Bus	42 Tran. Bus	43 Sch. Bus	51 Ref. Truck	52 Sing.Unit SH. Truck	53 Sing.Unit LH. Truck	54 Motor Home	61 Comb.SH.Truck	62 Comb.LH.Truck	TOTAL
1	LDGV	445209	-	445,209	-	-	-	-	-	-	-	-	-	-	-	445,209
2	LDGT1	6152	-	-	5,465	654	-	-	-	-	32	0	-	-	-	6,152
3	LDGT2	222857	-	-	197,981	23,702	-	-	-	-	1,170	5	-	-	-	222,857
4	LDGT3	53111	-	-	47,182	5,649	-	-	-	-	279	1	-	-	-	53,111
5	LDGT4	16893	-	-	15,007	1,797	-	-	-	-	89	0	-	-	-	16,893
6	HDGV2B	13189	-	-	9,649	3,270	-	-	-	0	254	16	-	0	-	13,189
7	HDGV3	1962	-	-	195	526	-	-	-	1	1,198	41	-	0	-	1,962
8	HDGV4	1135	-	-	21	327	-	-	-	8	769	5	-	4	-	1,135
9	HDGV5	116	-	-	1	18	-	-	-	0	89	9	-	0	-	116
10	HDGV6	292	-	-	3	61	-	-	-	1	218	7	-	1	0	292
11	HDGV7	61	-	-	1	7	-	-	-	0	51	0	-	2	0	61
12	HDGV8A	4	-	-	2	1	-	-	-	0	2	0	-	0	0	4
13	HDGV8B	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	LDDV	1754	-	1,754	-	-	-	-	-	-	-	-	-	-	-	1,754
15	LDDT12	81	-	-	38	19	-	-	-	-	22	2	-	-	-	81
16	HDDV2B	3414	-	-	1,961	1,192	-	-	-	0	248	13	-	0	-	3,414
17	HDDV3	1771	-	-	165	290	-	-	-	0	1,150	165	-	1	1	1,771
18	HDDV4	1485	-	-	11	335	-	-	-	1	1,100	36	-	3	0	1,485
19	HDDV5	825	-	-	24	166	-	-	-	18	555	58	-	3	-	825
20	HDDV6	1695	-	-	3	285	-	-	-	20	1,212	53	-	111	11	1,695
21	HDDV7	718	-	-	0	43	-	-	-	10	200	7	-	375	82	718
22	HDDV8A	1720	-	-	1	42	-	-	-	61	581	15	-	619	399	1,720
23	HDDV8B	298	-	-	0	7	-	-	-	11	101	3	-	107	69	298
24	MC	13890	13,890	-	-	-	-	-	-	-	-	-	-	-	-	13,890
25	HDGB	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	HDDBT	690	-	-	-	-	416	274	-	-	-	-	-	-	-	690
27	HDDBS	1687	-	-	-	-	-	-	1,687	-	-	-	-	-	-	1,687
28	LDDT34	152	-	-	71	35	-	-	-	-	42	3	-	-	-	152
	TOTAL	791162	13,890	446,963	277,782	38,425	416	274	1,687	133	9,363	440	-	1,227	562	791,162

Note: The total includes vehicles since 1981

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Table 6. MOVES Intercity Bus and Transit Bus From VIN Database

	Intercity Bus	%	Transit Bus	%	HDDBT	%
DC	24	2.47%	949	97.53%	973	100.00%
MTG	15	1.11%	1332	98.89%	1347	100.00%
FFX	16	2.32%	674	97.68%	690	100.00%

Note: Data includes vehicles 1981 and younger
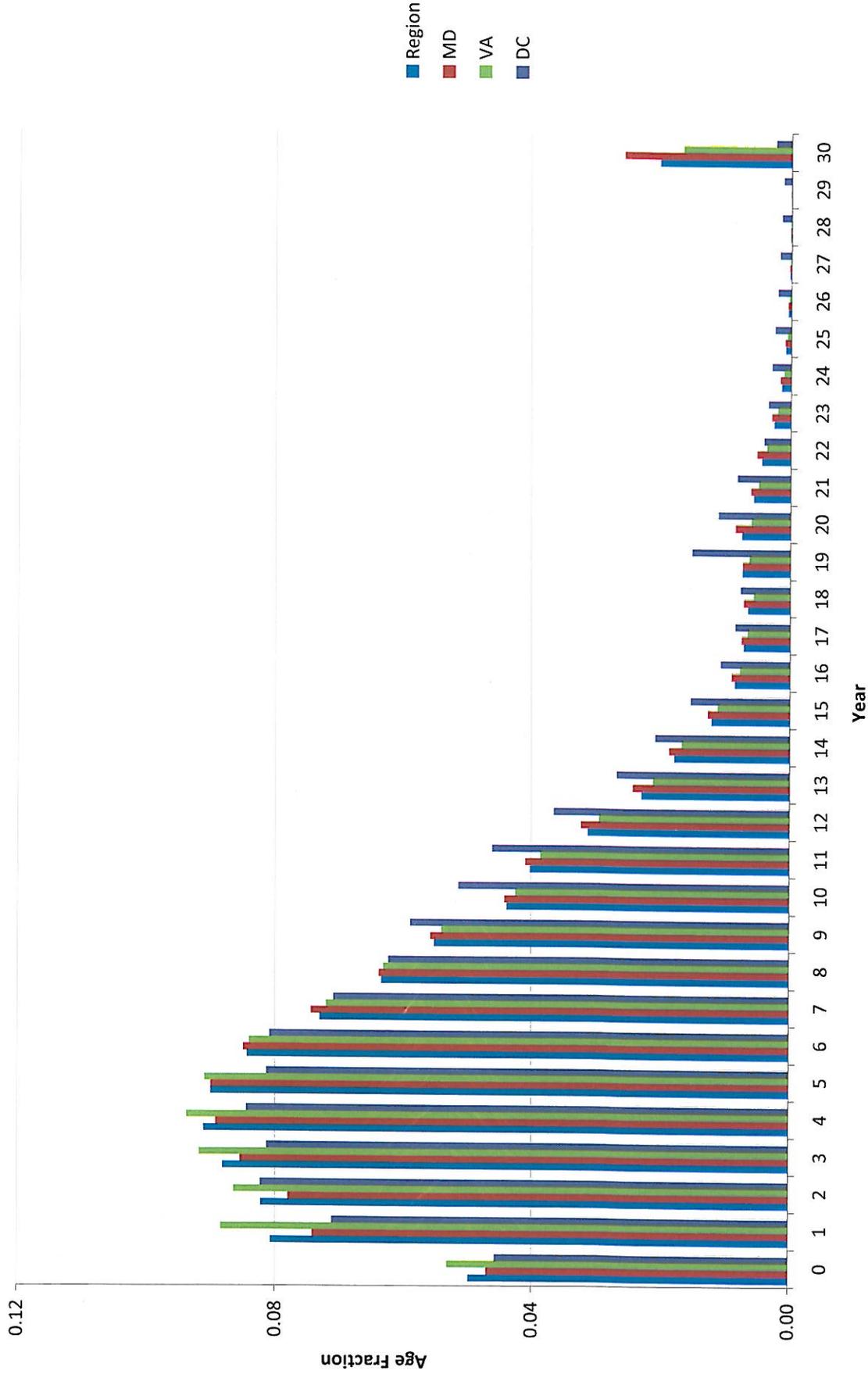
Table 7. MOVES Motorhome From VIN Database

	Motorhome	%
DC	26	0.01%
MTG	152	0.02%
FFX	133	0.02%

Note: Data includes vehicles 1981 and younger

Chart 1 MOVES Vehicle Age Distribution
Vehicle Type = Passenger Car

Legend: Region ■ MD ■ VA ■ DC ■

Axis (left): Age Fraction — 0.00, 0.04, 0.08, 0.12

Axis (bottom): Year — 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30

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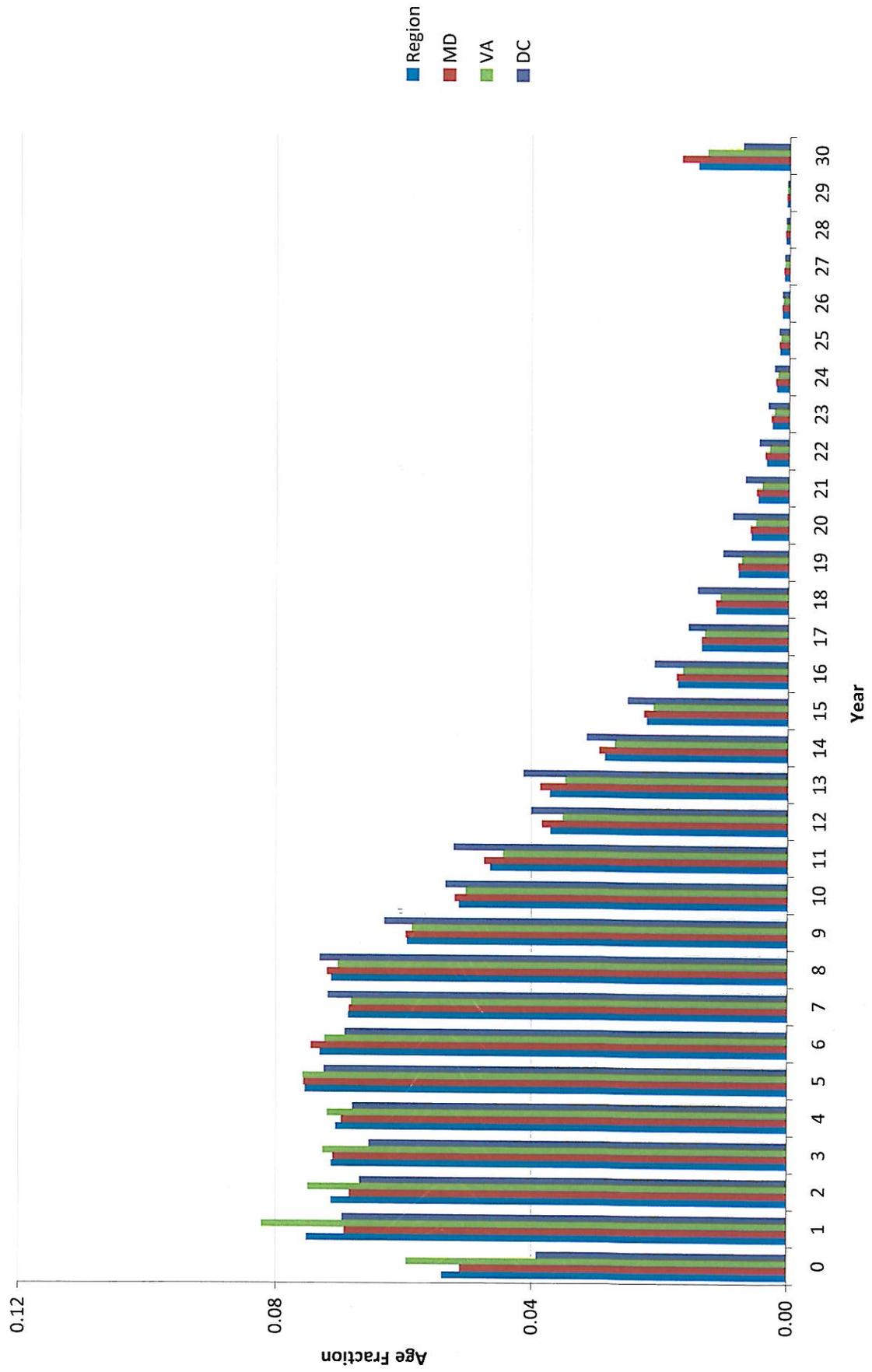
Chart 2 MOVES Vehicle Age Distribution
Vehicle Type = Light Commercial Truck

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Yu Gao

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)

Hi,

Good morning. I have a question about the vehicle types in Moves model.
Is there a method to convert the vehicle types in Mobile 6 model to vehicle types in MOVES?

Thanks a lot!
-
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