Appendix H

Mobile Source Emissions Modeling for Chattanooga PM2.5 Attainment Demonstration Motor Vehicle Emissions Budget

- Socioeconomic, special generator, and external trip data were interpolated to the year 2009 using 2002 and 2010 datasets already available. A summary of the interpolated total population, employment, and school enrollment compared among model years is provided in Figures 1, 2, and 3, respectively.

- The latest TransCAD travel demand model was used.

- The 2009 emissions factors used were based on the single-run, annual-average-conditions approach described in EPA's August 9, 2005, *Guidance for Creating Annual On-Road Mobile Source Emission Inventories for PM2.5 Nonattainment Areas for Use in SIPs and Conformity*.[1]

- For the remaining portions of the nonattainment area not included in the travel demand model (commonly referred to as donut areas), VMT was estimated using off-model techniques that began with the HPMS data for Georgia and Alabama. Estimations of emissions for the Alabama (Jackson County) and Georgia (Walker County) donut areas are the responsibility of the air and transportation agencies for Alabama and Georgia, respectively. However, the TPO assisted the State of Alabama with calculating emissions for the Jackson County donut area.

- The emissions for the donut areas in Alabama and Georgia were estimated by applying the emission factors to the VMT estimates for the donut area. The calculation of the speeds for the modeled portions of Georgia is described in Appendix C.

- The 2009 emissions will be used to develop the 2009 attainment year budgets as part of the SIPs. Consistent with the August 9, 2005 guidance cited above, once these budgets are found adequate or approved by EPA, subsequent emissions analyses for transportation conformity will also use the single-run, annual-average-conditions approach used to establish the budgets.

[1] http://epa.gov/otaq/stateresources/transconf/policy/420b05008.pdf

Figure 1: Comparison of Total Population among Model Years (Entire TPO Model)

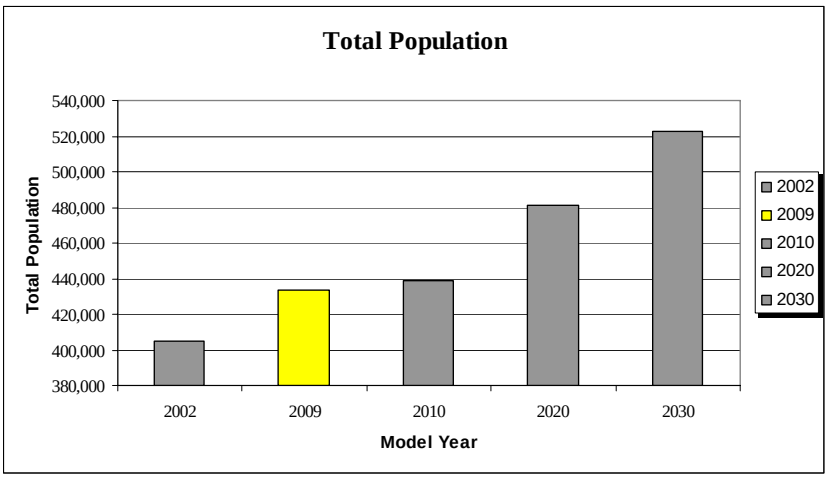


Figure 2: Comparison of Total Employment among Model Years (Entire TPO Model)

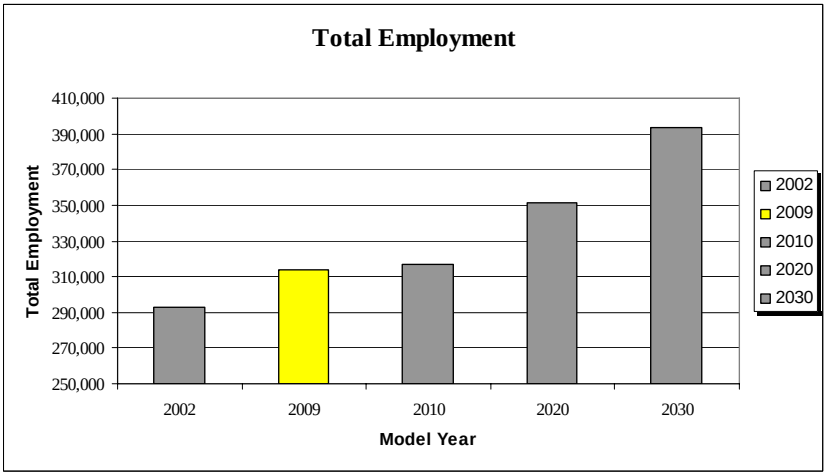
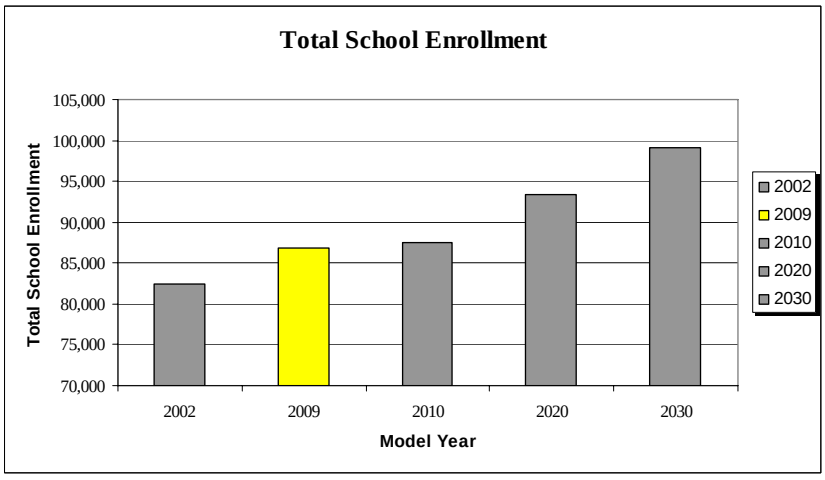


Figure 3: Comparison of Total School Enrollment among Model Years (Entire TPO Model)



2009 EMISSION RESULTS

Emission estimates for the year 2009 for each state are provided below.

Tennessee

Table 1 below demonstrates the model vehicle miles traveled (VMT), speed, and HPMS adjustment factors for Hamilton County, TN in the year 2009.

Table 1: 2009 Model VMT, Model Speed, Adjustment Factors
Hamilton County

County	Functional Class(es)	2009 Daily Model VMT	Model Average Speed (MPH)	Daily 2002 HPMS	2002 HPMS Adjustment Factor	2009 Adjusted Daily Model VMT
Hamilton County, Tennessee						
All Local	0 & 9 & 19[a]	1,092,132	9.5	955,414	0.99	1,081,211
Rural Interstate	1	227,234	36.2	116,769	0.57	129,523
Rural Principal Arterial	2	243,690	40.1	220,514	1.13	275,370
Rural Minor Arterial	6	199,057	42.3	130,096	0.76	151,283
Rural Collector	7 & 8[b]	139,437	33.0	116,311	0.93	129,676
Urban Interstate	11	2,572,106	41.9	2,516,974	1.13	2,906,480
Urban Freeway	12	910,419	42.6	1,253,803	1.5	1,365,629
Urban Other Arterial	14	2,304,299	36.3	1,789,711	0.87	2,004,740
Urban Minor Arterial	16	2,237,339	31.4	2,381,303	1.15	2,572,940
Urban Collector	17	347,507	32.3	460,260	1.51	524,736
Total		**10,273,220**	**28.2**	**9,941,155**		**11,141,587**

[a] Most local roads (Functional Classifications (FC) 9 and 19) were not included in the TPO travel demand model. Travel on these roads in the travel demand model was approximated by travel on centroid connectors, which are coded as facility type 99 in the model. Due to their similar purposes, VMT and emissions on FCs 9 and 19 are compared to those on facility type 99 in the TPO travel demand model. Ramps also were included in the travel demand model with a facility type of 7. Ramps are not included in the HPMS data.

[b] FC 7 (Rural Major Collectors) and FC 8 (Rural Minor Collectors) were combined in the HPMS VMT summary report for the County into a single total for Rural Collectors.

Table 2 shows the Hamilton County, TN emissions by HPMS functional class.

Table 2: Summary of Emissions Estimates
Hamilton County

		2009	
County	**Functional Class(es)**	**Daily Model $PM_{2.5}$ (Grams)**	**Daily Model NO_x (Grams)**
Hamilton County, Tennessee			
All Local	0 & 9 & 19[a]	30,359	1,410,941
Rural Interstate	1	3,627	165,272
Rural Principal Arterial	2	7,711	347,747
Rural Minor Arterial	6	4,236	190,010
Rural Collector	7 & 8[b]	3,636	164,207
Urban Interstate	11	81,382	3,983,643
Urban Freeway	12	38,238	1,865,088
Urban Other Arterial	14	56,118	2,528,591
Urban Minor Arterial	16	72,048	3,228,846
Urban Collector	17	14,720	683,258
Total		**312,073**	**14,567,602**

[a] Most local roads (Functional Classifications (FC) 9 and 19) were not included in the TPO travel demand model. Travel on these roads in the travel demand model was approximated by travel on centroid connectors, which are coded as facility type 99 in the model. Due to their similar purposes, VMT and emissions on FCs 9 and 19 are compared to those on facility type 99 in the TPO travel demand model. Ramps also were included in the travel demand model with a facility type of 7. Ramps are not included in the HPMS data.

[b] FC 7 (Rural Major Collectors) and FC 8 (Rural Minor Collectors) were combined in the HPMS VMT summary report for the County into a single total for Rural Collectors.

Georgia

Table 3 below lists the 2009 VMT-weighted average speeds for Catoosa County and the TPO portion of Walker County.

Table 3: 2009 VMT-Weighted Average Speeds
Catoosa County & the TPO Portion of Walker County

Catoosa County & TPO Portion of Walker County	Functional Class(es)	Sum of VMT	VMT Speed	VMT-Weighted Average Speed
Rural Interstate	1	438,368	25,392,126	58
Rural Principal Arterial	2	151,024	6,572,203	44
Rural Minor Arterial	6	135,677	5,003,054	37
Rural Major Collector	7	152,502	5,656,795	37
Rural Minor Collector	8	36,471	1,268,072	35
Local	9	57,843	1,952,762	34
Urban Interstate	11	740,548	38,851,399	52
Urban Freeway	12	-	-	-
Urban Other Arterial	14	275,742	10,795,179	39
Urban Minor Arterial	16	629,796	22,915,773	36
Urban Collector	17	156,063	5,467,751	35
Local	19	66,522	2,483,857	37

Table 4 lists the average annual daily VMT and VMT-weighted average speed for the Walker County Donut Area.

Table 4: 2009 Average Annual Daily VMT by Functional Class & VMT-Weighted Average Speeds
Walker County Donut Area

Functional Class(es)	2002 VMT	2009 Growth Factor from 2002	2009 VMT	VMT - Weighted Average Speed
0+9+19	435,211	1.16	504,845	33
2	101,302	1.19	120,549	44
6	92,195	1.01	93,117	37
7	196,383	1.09	214,057	37
8	49,633	1.16	57,574	35
14	172,453	1.85	319,037	39
16	10,339	1.10	11,372	36
17	31,487	1.03	32,431	35
Total	**1,089,002**	**1.17**	**1,352,982**	

Tables 5 and 6 below list the model vehicle miles traveled (VMT), speed, and HPMS adjustment factors for the TPO portions of Georgia in the year 2009.

Table 5: 2009 Model and Adjusted VMT and Adjustment Factors
Catoosa County

Catoosa County	Functional Class(es)	2002 Daily Model VMT	Daily 2002 HPMS	2002 HPMS Adjustment Factor	2009 Daily Model VMT	2009 Daily Adjusted VMT
All Local	0 & 9 & 19[a]	228,806	319,656	1.80	280,884	506,026
Rural Interstate	1	398,559	461,244	1.16	438,370	508,510
Rural Principal Arterial	2	22,296	19,019	0.85	30,846	26,219
Rural Minor Arterial	6	122,553	173,656	1.42	121,968	173,194
Rural Major Collector	7	96,986	103,572	1.07	108,073	115,639
Rural Minor Collector	8	30,346	56,530	1.86	35,222	65,512
Urban Interstate	11	675,483	465,486	0.69	740,548	510,978
Urban Other Principal Arterial	14	69,736	43,207	0.62	96,847	60,045
Urban Minor Arterial	16	416,053	369,962	0.89	469,546	417,896
Urban Collector	17	100,863	45,164	0.45	114,133	51,360
Total		**2,161,682**	**2,057,495**		**2,436,435**	**2,435,379**

[a] Most local roads (Functional Classifications (FC) 9 and 19) were not included in the TPO travel demand model. Travel on these roads in the travel demand model was approximated by travel on centroid connectors, which are coded as facility type 99 in the model. Due to their similar purposes, VMT and emissions on FCs 9 and 19 are compared to those on facility type 99 in the TPO travel demand model. Ramps also were included in the travel demand model with a facility type of 7. Ramps are not included in the HPMS data. The "All Local" HPMS adjustment factor shown in Table 5 is a composite, reflecting factors of 5.10 and 1.40 applied to FCs 9 and 19, respectively.

Table 6: 2009 Model VMT and Adjustment Factors
TPO Portion of Walker County

Walker County (TPO Portion)	Functional Class(es)	2002 Daily Model VMT	Daily 2002 HPMS	2002 HPMS Adjustment Factor	2009 Daily Model VMT	2009 Daily Adjusted VMT
All Local	0 & 9 & 19[a]	134,254	66,282	0.49	141,272	69,223
Rural Principal Arterial	2	104,753	90,683	0.87	120,177	104,554
Rural Minor Arterial	6	11,279	9,667	0.86	13,711	11,791
Rural Major Collector	7	43,462	26,296	0.61	44,427	27,101
Rural Minor Collector	8	1,021	873	0.85	1,250	1,063
Urban Other Principal Arterial	14	78,988	75,894	0.96	178,895	171,739
Urban Minor Arterial	16	158,280	158,312	1.00	160,253	160,253
Urban Collector	17	50,708	40,795	0.80	41,931	33,544
Total		**582,744**	**424,908**		**701,916**	**579,268**

[a] Most local roads (Functional Classifications (FC) 9 and 19) were not included in the TPO travel demand model. Travel on these roads in the travel demand model was approximated by travel on centroid connectors, which are coded as facility type 99 in the model. Due to their similar purposes, VMT and emissions on FCs 9 and 19 are compared to those on facility type 99 in the TPO travel demand model. Ramps also were included in the travel demand model with a facility type of 7. Ramps are not included in the HPMS data.

Tables 7, 8, and 9 list the average annual daily emissions for 2009 for the Georgia portions of the nonattainment area.

Table 7: Summary of Average Annual Daily Emissions
Catoosa County

Catoosa County	Functional Class(es)	2009	
		$PM_{2.5}$ (Grams)	NO_x (Grams)
All Local	0 & 9 & 19[a]	16,484	997,967
Rural Interstate	1	16,537	1,270,565
Rural Principal Arterial	2	852	49,931
Rural Minor Arterial	6	5,639	390,161
Rural Major Collector	7	3,765	236,613
Rural Minor Collector	8	2,131	124,456
Urban Interstate	11	16,611	1,131,196
Urban Freeway	12	0	0
Urban Other Arterial	14	1,955	134,905
Urban Minor Arterial	16	13,611	969,057
Urban Collector	17	1,673	113,284
Total		**79,258**	**5,418,135**

[a] Most local roads (Functional Classifications (FC) 9 and 19) were not included in the TPO travel demand model. Travel on these roads in the travel demand model was approximated by travel on centroid connectors, which are coded as facility type 99 in the model. Due to their similar purposes, VMT and emissions on FCs 9 and 19 are compared to those on facility type 99 in the TPO travel demand model. Ramps also were included in the travel demand model with a facility type of 7. Ramps are not included in the HPMS data.

Table 8: Summary of Average Annual Daily Emissions
TPO Portion of Walker County

Walker County (TPO Portions)	Functional Class(es)	2009	
		$PM_{2.5}$ (Grams)	NO_x (Grams)
All Local	0 & 9 & 19[a]	2,254	142,037
Rural Interstate	1	0	0
Rural Principal Arterial	2	3,401	207,726
Rural Minor Arterial	6	384	23,654
Rural Major Collector	7	881	51,785
Rural Minor Collector	8	35	1,988
Urban Interstate	11	0	0
Urban Freeway	12	0	0
Urban Other Arterial*	14	5,590	385,170
Urban Minor Arterial	16	5,219	363,937
Urban Collector	17	1,091	64,242
Total		**18,855**	**1,240,539**

[a] Most local roads (Functional Classifications (FC) 9 and 19) were not included in the TPO travel demand model. Travel on these roads in the travel demand model was approximated by travel on centroid connectors, which are coded as facility type 99 in the model. Due to their similar purposes, VMT and emissions on FCs 9 and 19 are compared to those on facility type 99 in the TPO travel demand model. Ramps also were included in the travel demand model with a facility type of 7. Ramps are not included in the HPMS data.

Table 9: Summary of Average Annual Daily Emissions
Walker County Donut Area

		2009	
Walker County (Donut Area)	**Functional Class(es)**	**$PM_{2.5}$ (Grams)**	**NO_x (Grams)**
All Local	0 & 9 & 19[a]	14,085	850,690
Rural Principal Arterial	2[b]	3,604	224,915
Rural Principal Arterial	2[c]	313	19,346
Rural Minor Arterial	6	3,026	174,316
Rural Major Collector	7	6,957	400,715
Rural Minor Collector	8	1,871	106,973
Urban Other Principal	14	10,369	601,385
Urban Minor Arterial	16	370	21,210
Urban Collector	17	1,054	60,258
Total		**41,649**	**2,459,807**

[a] Most local roads (Functional Classifications (FC) 9 and 19) were not included in the TPO travel demand model. Travel on these roads in the travel demand model was approximated by travel on centroid connectors, which are coded as facility type 99 in the model. Due to their similar purposes, VMT and emissions on FCs 9 and 19 are compared to those on facility type 99 in the TPO travel demand model. Ramps also were included in the travel demand model with a facility type of 7. Ramps are not included in the HPMS data.

[b] Freeway VMT and emissions per U.S. EPA guidance.

[c] Ramp VMT and emissions per U.S. EPA guidance.

Table 10 provides a summary of $PM_{2.5}$ and NOx emissions for the Georgia portion of the Chattanooga nonattainment area in the year 2009.

Table 10: Total 2009 Emissions for Georgia

	$PM_{2.5}$ (Grams)	**NOx (Grams)**	**$PM_{2.5}$ (Tons)**	**NOx (Tons)**
Catoosa County	79,258	5,418,135	0.0874	5.9725
TPO Portion of Walker County	18,855	1,240,539	0.0208	1.3675
Walker County Donut Area	41,649	2,459,807	0.0459	2.7115
Total Georgia	139,762	9,118,481	0.1541	10.0515

Alabama

Table 11 provides the VMT and emissions for the entirety of Jackson County, AL, and the Jackson County, AL, donut area.

Table 11: 2009 VMT and Emissions Estimates
Jackson County, Alabama, & Jackson County Donut Area

			All of Jackson County			Jackson County Donut Area		
County	**Functional Class(es)**	**Model Average Speed (MPH)**	**Daily VMT**	**Daily $PM_{2.5}$ (Grams)**	**Daily NO_x (Grams)**	**Daily VMT (Grams)**	**Daily $PM_{2.5}$ (Grams)**	**Daily NO_x (Grams)**
Jackson County, AL								
Rural Principal Arterial	2	42	694,122	19,644	950,948	7,934	225	10,869
Rural Minor Arterial	6	33	172,369	4,878	228,561	1,970	56	2,612
Rural Collector	7	34	214,980	6,105	307,636	2,457	70	3,516
Rural Collector	8	34	74,482	2,115	106,583	851	24	1,218
Local	9	13	302,536	8,592	432,929	3,458	98	4,948
Urban Other Arterial	14	42	286,902	8,119	393,055	3,279	93	4,493
Urban Minor Arterial	16	36	103,548	2,930	137,512	1,184	33	1,572
Urban Collector	17	35	19,326	549	27,655	221	6	316
Local	19	13	173,800	4,936	248,708	1,987	56	2,843
Total			**2,042,064**	**57,869**	**2,833,587**	**23,341**	**661**	**32,388**

Table 12 shows emissions for the entirety of Jackson County, AL, by HPMS functional class.

Table 12: Summary of Emissions Estimates
Jackson County, Alabama

		2009	
County	**Functional Class(es)**	**Daily $PM_{2.5}$ (Grams)**	**Daily NO_x (Grams)**
Jackson County, Alabama			
Rural Principal Arterial	2	19,644	950,948
Rural Minor Arterial	6	4,878	228,561
Rural Collector	7	6,105	307,636
Rural Collector	8	2,115	106,583
Local	9	8,592	432,929
Urban Other Arterial	14	8,119	393,055
Urban Minor Arterial	16	2,930	137,512
Urban Collector	17	549	27,655
Local	19	4,936	248,708
Total		**57,869**	**2,833,587**

Table 13 shows emissions for the Jackson County, AL, donut area by HPMS functional class.

Table 13: Summary of Emissions Estimates
Jackson County, Alabama, Donut Area

		2009	
County	**Functional Class(es)**	**Daily $PM_{2.5}$ (Grams)**	**Daily NO_x (Grams)**
Jackson County Donut Area			
Rural Principal Arterial	2	225	10,869
Rural Minor Arterial	6	56	2,612
Rural Collector	7	70	3,516
Rural Collector	8	24	1,218
Local	9	98	4,948
Urban Other Arterial	14	93	4,493
Urban Minor Arterial	16	33	1,572
Urban Collector	17	6	316
Local	19	56	2,843
Total		**661**	**32,388**

Summary

The purpose of developing a 2009 TransCAD travel demand model and calculating emissions for the year 2009 was to assist the States with developing their SIP budgets for the 2009 attainment year. Tables 14 and 15 provide a summary of the total 2009 emissions for $PM_{2.5}$ and NOx, respectively.

Table 14: Summary 2009 Emissions Estimates for $PM_{2.5}$ (Grams/Day)

Area	2009
Hamilton County, TN	312,073
Catoosa County, GA	79,258
Walker County, GA	
TPO Portion of Walker County	18,855
Walker County Donut Area	41,649
Jackson County, AL Donut Area	661
Total Chattanooga TN-GA-AL Nonattainment Area	**452,496**

Table 15: Summary 2009 Emissions Estimates for NO_x (Grams/Day)

Area	2009
Hamilton County, TN	14,567,602
Catoosa County, GA	5,418,135
Walker County, GA	
TPO Portion of Walker County	1,240,539
Walker County Donut Area	2,459,807
Jackson County, AL Donut Area	32,388
Total Chattanooga TN-GA-AL Nonattainment Area	**23,718,471**

Appendix A includes the MOBILE6 input files for the year 2009 for each state. Appendix B includes the MOBILE6 output emission factors for the year 2009 for each state. Appendix C includes the travel demand post processing procedures for Georgia.

Appendix A

MOBILE6 Inputs for 2009

Appendix A: MOBILE6 Inputs for 2009

Tennessee - Arterials/Collectors, Ramps and Local Roads

```
*
* 7-1-09, Chattanooga arterials/collectors, default reg. dist., default VMT mix
(09AchaTN.in)
*
MOBILE6 INPUT FILE :
>
POLLUTANTS         : NOx
PARTICULATES       :

RUN DATA
>
* next lines show average annual hourly temp. for Chattanooga, 2000-2002
HOURLY TEMPERATURES: 54  55  58  61  64  66  68  69  70  70  70  68
                     66  63  61  59  58  57  56  56  55  54  54  53

* see "Chattanooga_average_annual_sulfur and_rvp2.xls" for information on average annual
RVP
FUEL RVP           : 9.8

I/M DESCRIPT FILE  : HaCoIM.d

ANTI-TAMP PROG     :
05 75 95 22222 21111111 1 11 099 12211112
*_____________________________________________________________________________
*
SCENARIO REC       : arterial, Chattanooga, 2009, 2.5 mph
> 7-1-09, default reg. dist., default VMT mix (09AchaTN.in)
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
* next lines show average annual hourly rel. humidity for Chattanooga, 2000-2002
RELATIVE HUMIDITY  : 85  82  76  69  62  58  55  52  50  50  51  54
                     60  66  71  75  78  80  82  83  84  85  86  86
* next line shows average annual daily barometric pressure for Chattanooga, 2000-2002
BAROMETRIC PRES    : 29.36
PARTICLE SIZE      : 2.5
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43.0
AVERAGE SPEED      : 2.5 Arterial 0.0 100.0 0.0 0.0
```

Tennessee - Freeways

```
*
* 7-1-09, Chattanooga freeways, default reg. dist., default VMT mix (09FchaTN.in)
*
MOBILE6 INPUT FILE :
>
POLLUTANTS         : NOx
PARTICULATES       :

RUN DATA
>
* next lines show average annual hourly temp. for Chattanooga, 2000-2002
HOURLY TEMPERATURES: 54  55  58  61  64  66  68  69  70  70  70  68
                     66  63  61  59  58  57  56  56  55  54  54  53
```

```
* see "Chattanooga_average_annual_sulfur and_rvp2.xls" for information on average annual
RVP
FUEL RVP           : 9.8

I/M DESCRIPT FILE  : HaCoIM.d

ANTI-TAMP PROG     :
05 75 95 22222 21111111 1 11 099 12211112
*_____________________________________________________________________________
*
SCENARIO REC       : freeway, Chattanooga, 2009, 2.5 mph
> 7-1-09, default reg. dist., default VMT mix (09FchaTN.in)
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
* next lines show average annual hourly rel. humidity for Chattanooga, 2000-2002
RELATIVE HUMIDITY  : 85  82  76  69  62  58  55  52  50  50  51  54
                     60  66  71  75  78  80  82  83  84  85  86  86
* next line shows average annual daily barometric pressure for Chattanooga, 2000-2002
BAROMETRIC PRES    : 29.36
PARTICLE SIZE      : 2.5
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43.0
AVERAGE SPEED      : 2.5 Non-Ramp 100.0 0.0 0.0 0.0
```

Alabama - Arterials/Collectors, Ramps and Local Roads

```
*
* 7-1-09, Chattanooga arterials/collectors in Alabama, default reg. dist., default VMT
mix (09AchaAL.in)
*
MOBILE6 INPUT FILE :
>
POLLUTANTS         : NOx
PARTICULATES       :

RUN DATA
>
* next lines show average annual hourly temp. for Chattanooga, 2000-2002
HOURLY TEMPERATURES: 54  55  58  61  64  66  68  69  70  70  70  68
                     66  63  61  59  58  57  56  56  55  54  54  53

* see "Chattanooga_average_annual_sulfur and_rvp2.xls" for information on average annual
RVP
FUEL RVP           : 9.8

*No I/M program in Alabama
*I/M DESCRIPT FILE  : HaCoIM.d

*ANTI-TAMP PROG     :
*05 75 95 22222 21111111 1 11 099 12211112
*_____________________________________________________________________________
*
SCENARIO REC       : arterial, Chattanooga, 2009, 2.5 mph
> 7-1-09, default reg. dist., default VMT mix (09AchaAL.in)
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
* next lines show average annual hourly rel. humidity for Chattanooga, 2000-2002
RELATIVE HUMIDITY  : 85  82  76  69  62  58  55  52  50  50  51  54
                     60  66  71  75  78  80  82  83  84  85  86  86
* next line shows average annual daily barometric pressure for Chattanooga, 2000-2002
BAROMETRIC PRES    : 29.36
PARTICLE SIZE      : 2.5
```

```
PARTICULATE EF      : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR       : 43.0
AVERAGE SPEED       : 2.5 Arterial 0.0 100.0 0.0 0.0
```

Alabama - Freeways

```
*
* 7-1-09, Chattanooga freeways in Alabama, default reg. dist., default VMT mix
(09FchaAL.in)
*
MOBILE6 INPUT FILE :
>
POLLUTANTS          : NOx
PARTICULATES        :

RUN DATA
>
* next lines show average annual hourly temp. for Chattanooga, 2000-2002
HOURLY TEMPERATURES: 54  55  58  61  64  66  68  69  70  70  70  68
                     66  63  61  59  58  57  56  56  55  54  54  53

* see "Chattanooga_average_annual_sulfur and_rvp2.xls" for information on average annual
RVP
FUEL RVP            : 9.8

* no I/M program in AL
*I/M DESCRIPT FILE   : HaCoIM.d

*ANTI-TAMP PROG      :
*05 75 95 22222 21111111 1 11 099 12211112
*_____________________________________________________________________________
*
SCENARIO REC        : freeway, Chattanooga, 2009, 2.5 mph
> 7-1-09, default reg. dist., default VMT mix (09FchaAL.in)
CALENDAR YEAR       : 2009
EVALUATION MONTH    : 7
* next lines show average annual hourly rel. humidity for Chattanooga, 2000-2002
RELATIVE HUMIDITY   : 85  82  76  69  62  58  55  52  50  50  51  54
                      60  66  71  75  78  80  82  83  84  85  86  86
* next line shows average annual daily barometric pressure for Chattanooga, 2000-2002
BAROMETRIC PRES     : 29.36
PARTICLE SIZE       : 2.5
PARTICULATE EF      : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR       : 43.0
AVERAGE SPEED       : 2.5 Non-Ramp 100.0 0.0 0.0 0.0
```

Georgia - Arterials/Collectors, Ramps and Local Roads

```
*
* 7-1-09, Chattanooga arterials/collectors, '02 Chattanooga MSA reg. dist. (default for
Class 8b), default VMT mix (09AchaGA.in)
*
MOBILE6 INPUT FILE :
>
POLLUTANTS          : NOx
PARTICULATES        :

RUN DATA
>
* next lines show average annual hourly temp. for Chattanooga, 2000-2002
```

```
HOURLY TEMPERATURES: 54  55  58  61  64  66  68  69  70  70  70  68
                     66  63  61  59  58  57  56  56  55  54  54  53

* see "Chattanooga_average_annual_sulfur and_rvp2.xls" for information on average annual
RVP
FUEL RVP           : 9.8

* registration distribution for Catoosa, Dade, and Walker counties
REG DIST           : 02chamsa.d
*-------------------------------------------------------------------------------
*
SCENARIO REC       : arterial, Chattanooga, 2009, 2.5 mph
> 7-1-09, '02 Chattanooga MSA reg. dist. (default for Class 8b), default VMT mix
(09AchaGA.in)
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
* next lines show average annual hourly rel. humidity for Chattanooga, 2000-2002
RELATIVE HUMIDITY  : 85  82  76  69  62  58  55  52  50  50  51  54
                     60  66  71  75  78  80  82  83  84  85  86  86
* next line shows average annual daily barometric pressure for Chattanooga, 2000-2002
BAROMETRIC PRES    : 29.36
PARTICLE SIZE      : 2.5
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43.0
AVERAGE SPEED      : 2.5 Arterial 0.0 100.0 0.0 0.0
```

Georgia - Freeways

```
*
* 7-1-09, Chattanooga freeways, '02 Chattanooga MSA reg. dist. (default for Class 8b),
default VMT mix (09FchaGA.in)
*
MOBILE6 INPUT FILE :
>
POLLUTANTS         : NOx
PARTICULATES       :

RUN DATA
>
* next lines show average annual hourly temp. for Chattanooga, 2000-2002
HOURLY TEMPERATURES: 54  55  58  61  64  66  68  69  70  70  70  68
                     66  63  61  59  58  57  56  56  55  54  54  53

* see "Chattanooga_average_annual_sulfur and_rvp2.xls" for information on average annual
RVP
FUEL RVP           : 9.8

* registration distribution for Catoosa, Dade, and Walker counties
REG DIST           : 02chamsa.d
*-------------------------------------------------------------------------------
*
SCENARIO REC       : freeway, Chattanooga, 2009, 2.5 mph
> 7-1-09, '02 Chattanooga MSA reg. dist. (default for Class 8b), default VMT mix
(09FchaGA.in)
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
* next lines show average annual hourly rel. humidity for Chattanooga, 2000-2002
RELATIVE HUMIDITY  : 85  82  76  69  62  58  55  52  50  50  51  54
                     60  66  71  75  78  80  82  83  84  85  86  86
* next line shows average annual daily barometric pressure for Chattanooga, 2000-2002
BAROMETRIC PRES    : 29.36
PARTICLE SIZE      : 2.5
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43.0
AVERAGE SPEED      : 2.5 Non-Ramp 100.0 0.0 0.0 0.0
```

Appendix B

MOBILE6 Output Emission Factors for 2009

Tennessee

	Composite Arterial (All Veh)		Composite Freeway (All Veh)		Composite Local (All Veh)		Composite Ramp (All Veh)	
Speed	direct PM	NOx	direct PM	NOx	direct PM	NOx	direct PM	NOx
2.50	0.0281	2.203	0.0281	2.27	0.0281	1.313	0.028	1.283
3.00	0.0281	2.126	0.0281	2.194	0.0281	1.313	0.028	1.283
4.00	0.0281	2.03	0.0281	2.098	0.0281	1.313	0.028	1.283
5.00	0.0281	1.973	0.0281	2.04	0.0281	1.313	0.028	1.283
6.00	0.0281	1.866	0.0281	1.898	0.0281	1.313	0.028	1.283
7.00	0.0281	1.79	0.0281	1.796	0.0281	1.313	0.028	1.283
8.00	0.0281	1.733	0.0281	1.72	0.0281	1.313	0.028	1.283
9.00	0.0281	1.689	0.0281	1.66	0.0281	1.313	0.028	1.283
10.00	0.0281	1.653	0.0281	1.613	0.0281	1.313	0.028	1.283
11.00	0.0281	1.596	0.0281	1.549	0.0281	1.313	0.028	1.283
12.00	0.0281	1.549	0.0281	1.496	0.0281	1.313	0.028	1.283
13.00	0.0281	1.509	0.0281	1.451	0.0281	1.313	0.028	1.283
14.00	0.0281	1.475	0.0281	1.412	0.0281	1.313	0.028	1.283
15.00	0.0281	1.445	0.0281	1.379	0.0281	1.313	0.028	1.283
16.00	0.0281	1.415	0.0281	1.364	0.0281	1.313	0.028	1.283
17.00	0.0281	1.389	0.0281	1.352	0.0281	1.313	0.028	1.283
18.00	0.0281	1.365	0.0281	1.34	0.0281	1.313	0.028	1.283
19.00	0.0281	1.344	0.0281	1.33	0.0281	1.313	0.028	1.283
20.00	0.0281	1.325	0.0281	1.321	0.0281	1.313	0.028	1.283
21.00	0.0281	1.308	0.0281	1.313	0.0281	1.313	0.028	1.283
22.00	0.0281	1.292	0.0281	1.305	0.0281	1.313	0.028	1.283
23.00	0.0281	1.278	0.0281	1.298	0.0281	1.313	0.028	1.283
24.00	0.0281	1.264	0.0281	1.292	0.0281	1.313	0.028	1.283
25.00	0.0281	1.252	0.0281	1.286	0.0281	1.313	0.028	1.283
26.00	0.028	1.243	0.028	1.282	0.0281	1.313	0.028	1.283
27.00	0.028	1.234	0.028	1.279	0.0281	1.313	0.028	1.283
28.00	0.028	1.226	0.028	1.276	0.0281	1.313	0.028	1.283
29.00	0.028	1.219	0.028	1.273	0.0281	1.313	0.028	1.283
30.00	0.028	1.212	0.028	1.27	0.0281	1.313	0.028	1.283
31.00	0.028	1.209	0.028	1.27	0.0281	1.313	0.028	1.283
32.00	0.028	1.207	0.028	1.27	0.0281	1.313	0.028	1.283
33.00	0.028	1.206	0.028	1.27	0.0281	1.313	0.028	1.283
34.00	0.028	1.204	0.028	1.27	0.0281	1.313	0.028	1.283
35.00	0.028	1.202	0.028	1.27	0.0281	1.313	0.028	1.283
36.00	0.028	1.208	0.028	1.276	0.0281	1.313	0.028	1.283
37.00	0.028	1.213	0.028	1.281	0.0281	1.313	0.028	1.283
38.00	0.028	1.219	0.028	1.286	0.0281	1.313	0.028	1.283
39.00	0.028	1.224	0.028	1.291	0.0281	1.313	0.028	1.283
40.00	0.028	1.228	0.028	1.296	0.0281	1.313	0.028	1.283
41.00	0.028	1.239	0.028	1.307	0.0281	1.313	0.028	1.283
42.00	0.028	1.25	0.028	1.317	0.0281	1.313	0.028	1.283
43.00	0.028	1.259	0.028	1.327	0.0281	1.313	0.028	1.283

	Composite Arterial (All Veh)		Composite Freeway (All Veh)		Composite Local (All Veh)		Composite Ramp (All Veh)	
Speed	direct PM	NOx	direct PM	NOx	direct PM	NOx	direct PM	NOx
44.00	0.028	1.269	0.028	1.336	0.0281	1.313	0.028	1.283
45.00	0.028	1.278	0.028	1.345	0.0281	1.313	0.028	1.283
46.00	0.028	1.293	0.028	1.361	0.0281	1.313	0.028	1.283
47.00	0.028	1.309	0.028	1.376	0.0281	1.313	0.028	1.283
48.00	0.028	1.323	0.028	1.391	0.0281	1.313	0.028	1.283
49.00	0.028	1.337	0.028	1.405	0.0281	1.313	0.028	1.283
50.00	0.028	1.351	0.028	1.418	0.0281	1.313	0.028	1.283
51.00	0.028	1.373	0.028	1.441	0.0281	1.313	0.028	1.283
52.00	0.028	1.395	0.028	1.462	0.0281	1.313	0.028	1.283
53.00	0.028	1.416	0.028	1.483	0.0281	1.313	0.028	1.283
54.00	0.028	1.436	0.028	1.503	0.0281	1.313	0.028	1.283
55.00	0.028	1.455	0.028	1.522	0.0281	1.313	0.028	1.283
56.00	0.028	1.486	0.028	1.554	0.0281	1.313	0.028	1.283
57.00	0.028	1.516	0.028	1.584	0.0281	1.313	0.028	1.283
58.00	0.028	1.546	0.028	1.613	0.0281	1.313	0.028	1.283
59.00	0.028	1.574	0.028	1.641	0.0281	1.313	0.028	1.283
60.00	0.028	1.601	0.028	1.668	0.0281	1.313	0.028	1.283
61.00	0.028	1.645	0.028	1.712	0.0281	1.313	0.028	1.283
62.00	0.028	1.687	0.028	1.754	0.0281	1.313	0.028	1.283
63.00	0.028	1.728	0.028	1.795	0.0281	1.313	0.028	1.283
64.00	0.028	1.768	0.028	1.835	0.0281	1.313	0.028	1.283
65.00	0.028	1.806	0.028	1.874	0.0281	1.313	0.028	1.283

Alabama

	Composite Arterial (All Veh)		Composite Freeway (All Veh)		Composite Local (All Veh)		Composite Ramp (All Veh)	
Speed	direct PM	NOx	direct PM	NOx	direct PM	NOx	direct PM	NOx
2.50	0.0284	2.418	0.0284	2.485	0.0284	1.431	0.0283	1.418
3.00	0.0284	2.331	0.0284	2.399	0.0284	1.431	0.0283	1.418
4.00	0.0284	2.223	0.0284	2.291	0.0284	1.431	0.0283	1.418
5.00	0.0284	2.158	0.0284	2.226	0.0284	1.431	0.0283	1.418
6.00	0.0284	2.042	0.0284	2.069	0.0284	1.431	0.0283	1.418
7.00	0.0284	1.959	0.0284	1.956	0.0284	1.431	0.0283	1.418
8.00	0.0284	1.896	0.0284	1.872	0.0284	1.431	0.0283	1.418
9.00	0.0284	1.848	0.0284	1.806	0.0284	1.431	0.0283	1.418
10.00	0.0284	1.809	0.0284	1.753	0.0284	1.431	0.0283	1.418
11.00	0.0284	1.748	0.0284	1.684	0.0284	1.431	0.0283	1.418
12.00	0.0284	1.696	0.0284	1.626	0.0284	1.431	0.0283	1.418
13.00	0.0284	1.653	0.0284	1.577	0.0284	1.431	0.0283	1.418
14.00	0.0284	1.616	0.0284	1.535	0.0284	1.431	0.0283	1.418
15.00	0.0284	1.584	0.0284	1.498	0.0284	1.431	0.0283	1.418
16.00	0.0284	1.551	0.0284	1.484	0.0284	1.431	0.0283	1.418
17.00	0.0284	1.523	0.0284	1.471	0.0284	1.431	0.0283	1.418
18.00	0.0284	1.498	0.0284	1.460	0.0284	1.431	0.0283	1.418
19.00	0.0284	1.475	0.0284	1.450	0.0284	1.431	0.0283	1.418
20.00	0.0284	1.455	0.0284	1.441	0.0284	1.431	0.0283	1.418
21.00	0.0284	1.436	0.0284	1.433	0.0284	1.431	0.0283	1.418
22.00	0.0283	1.419	0.0283	1.425	0.0284	1.431	0.0283	1.418
23.00	0.0283	1.404	0.0283	1.418	0.0284	1.431	0.0283	1.418
24.00	0.0283	1.390	0.0283	1.412	0.0284	1.431	0.0283	1.418
25.00	0.0283	1.377	0.0283	1.406	0.0284	1.431	0.0283	1.418
26.00	0.0283	1.367	0.0283	1.402	0.0284	1.431	0.0283	1.418
27.00	0.0283	1.357	0.0283	1.399	0.0284	1.431	0.0283	1.418
28.00	0.0283	1.349	0.0283	1.396	0.0284	1.431	0.0283	1.418
29.00	0.0283	1.340	0.0283	1.393	0.0284	1.431	0.0283	1.418
30.00	0.0283	1.333	0.0283	1.390	0.0284	1.431	0.0283	1.418
31.00	0.0283	1.330	0.0283	1.390	0.0284	1.431	0.0283	1.418
32.00	0.0283	1.328	0.0283	1.390	0.0284	1.431	0.0283	1.418
33.00	0.0283	1.326	0.0283	1.390	0.0284	1.431	0.0283	1.418
34.00	0.0283	1.324	0.0283	1.390	0.0284	1.431	0.0283	1.418
35.00	0.0283	1.322	0.0283	1.390	0.0284	1.431	0.0283	1.418
36.00	0.0283	1.328	0.0283	1.396	0.0284	1.431	0.0283	1.418
37.00	0.0283	1.334	0.0283	1.401	0.0284	1.431	0.0283	1.418
38.00	0.0283	1.339	0.0283	1.406	0.0284	1.431	0.0283	1.418
39.00	0.0283	1.344	0.0283	1.411	0.0284	1.431	0.0283	1.418
40.00	0.0283	1.349	0.0283	1.416	0.0284	1.431	0.0283	1.418
41.00	0.0283	1.360	0.0283	1.427	0.0284	1.431	0.0283	1.418
42.00	0.0283	1.370	0.0283	1.438	0.0284	1.431	0.0283	1.418
43.00	0.0283	1.380	0.0283	1.447	0.0284	1.431	0.0283	1.418
44.00	0.0283	1.389	0.0283	1.457	0.0284	1.431	0.0283	1.418
45.00	0.0283	1.398	0.0283	1.466	0.0284	1.431	0.0283	1.418
46.00	0.0283	1.414	0.0283	1.482	0.0284	1.431	0.0283	1.418
47.00	0.0283	1.430	0.0283	1.497	0.0284	1.431	0.0283	1.418

	Composite Arterial (All Veh)		Composite Freeway (All Veh)		Composite Local (All Veh)		Composite Ramp (All Veh)	
Speed	direct PM	NOx	direct PM	NOx	direct PM	NOx	direct PM	NOx
48.00	0.0283	1.444	0.0283	1.512	0.0284	1.431	0.0283	1.418
49.00	0.0283	1.458	0.0283	1.526	0.0284	1.431	0.0283	1.418
50.00	0.0283	1.472	0.0283	1.539	0.0284	1.431	0.0283	1.418
51.00	0.0283	1.495	0.0283	1.562	0.0284	1.431	0.0283	1.418
52.00	0.0283	1.516	0.0283	1.584	0.0284	1.431	0.0283	1.418
53.00	0.0283	1.537	0.0283	1.605	0.0284	1.431	0.0283	1.418
54.00	0.0283	1.558	0.0283	1.625	0.0284	1.431	0.0283	1.418
55.00	0.0283	1.577	0.0283	1.645	0.0284	1.431	0.0283	1.418
56.00	0.0283	1.608	0.0283	1.676	0.0284	1.431	0.0283	1.418
57.00	0.0283	1.639	0.0283	1.706	0.0284	1.431	0.0283	1.418
58.00	0.0283	1.668	0.0283	1.736	0.0284	1.431	0.0283	1.418
59.00	0.0283	1.697	0.0283	1.764	0.0284	1.431	0.0283	1.418
60.00	0.0283	1.724	0.0283	1.792	0.0284	1.431	0.0283	1.418
61.00	0.0283	1.768	0.0283	1.836	0.0284	1.431	0.0283	1.418
62.00	0.0283	1.810	0.0283	1.878	0.0284	1.431	0.0283	1.418
63.00	0.0283	1.852	0.0283	1.919	0.0284	1.431	0.0283	1.418
64.00	0.0283	1.892	0.0283	1.959	0.0284	1.431	0.0283	1.418
65.00	0.0283	1.930	0.0283	1.998	0.0284	1.431	0.0283	1.418

Georgia

	Composite Arterial (All Veh)		Composite Freeway (All Veh)		Composite Local (All Veh)		Composite Ramp (All Veh)	
Speed	direct PM	NOx	direct PM	NOx	direct PM	NOx	direct PM	NOx
2.50	0.0326	3.322	0.0326	3.41	0.0326	1.969	0.0325	2.006
3.00	0.0326	3.202	0.0326	3.29	0.0326	1.969	0.0325	2.006
4.00	0.0326	3.053	0.0326	3.141	0.0326	1.969	0.0325	2.006
5.00	0.0326	2.963	0.0326	3.051	0.0326	1.969	0.0325	2.006
6.00	0.0326	2.808	0.0326	2.838	0.0326	1.969	0.0325	2.006
7.00	0.0326	2.696	0.0326	2.686	0.0326	1.969	0.0325	2.006
8.00	0.0326	2.613	0.0326	2.572	0.0326	1.969	0.0325	2.006
9.00	0.0326	2.548	0.0326	2.483	0.0326	1.969	0.0325	2.006
10.00	0.0326	2.497	0.0326	2.412	0.0326	1.969	0.0325	2.006
11.00	0.0326	2.415	0.0326	2.32	0.0326	1.969	0.0325	2.006
12.00	0.0326	2.348	0.0326	2.243	0.0326	1.969	0.0325	2.006
13.00	0.0326	2.291	0.0326	2.178	0.0326	1.969	0.0325	2.006
14.00	0.0326	2.242	0.0326	2.122	0.0326	1.969	0.0325	2.006
15.00	0.0326	2.199	0.0326	2.073	0.0326	1.969	0.0325	2.006
16.00	0.0326	2.157	0.0326	2.056	0.0326	1.969	0.0325	2.006
17.00	0.0326	2.12	0.0326	2.041	0.0326	1.969	0.0325	2.006
18.00	0.0326	2.087	0.0326	2.028	0.0326	1.969	0.0325	2.006
19.00	0.0326	2.058	0.0326	2.016	0.0326	1.969	0.0325	2.006
20.00	0.0326	2.031	0.0326	2.006	0.0326	1.969	0.0325	2.006
21.00	0.0326	2.007	0.0326	1.996	0.0326	1.969	0.0325	2.006
22.00	0.0326	1.985	0.0326	1.987	0.0326	1.969	0.0325	2.006
23.00	0.0326	1.965	0.0326	1.979	0.0326	1.969	0.0325	2.006
24.00	0.0326	1.947	0.0326	1.972	0.0326	1.969	0.0325	2.006
25.00	0.0326	1.93	0.0326	1.965	0.0326	1.969	0.0325	2.006
26.00	0.0326	1.917	0.0326	1.961	0.0326	1.969	0.0325	2.006
27.00	0.0326	1.905	0.0326	1.957	0.0326	1.969	0.0325	2.006
28.00	0.0326	1.893	0.0326	1.953	0.0326	1.969	0.0325	2.006
29.00	0.0326	1.882	0.0326	1.95	0.0326	1.969	0.0325	2.006
30.00	0.0326	1.872	0.0326	1.947	0.0326	1.969	0.0325	2.006
31.00	0.0326	1.869	0.0326	1.947	0.0326	1.969	0.0325	2.006
32.00	0.0326	1.866	0.0326	1.947	0.0326	1.969	0.0325	2.006
33.00	0.0325	1.863	0.0325	1.946	0.0326	1.969	0.0325	2.006
34.00	0.0325	1.861	0.0325	1.946	0.0326	1.969	0.0325	2.006
35.00	0.0325	1.858	0.0325	1.946	0.0326	1.969	0.0325	2.006
36.00	0.0325	1.865	0.0325	1.953	0.0326	1.969	0.0325	2.006
37.00	0.0325	1.872	0.0325	1.96	0.0326	1.969	0.0325	2.006
38.00	0.0325	1.879	0.0325	1.967	0.0326	1.969	0.0325	2.006
39.00	0.0325	1.885	0.0325	1.973	0.0326	1.969	0.0325	2.006
40.00	0.0325	1.891	0.0325	1.978	0.0326	1.969	0.0325	2.006
41.00	0.0325	1.904	0.0325	1.992	0.0326	1.969	0.0325	2.006
42.00	0.0325	1.916	0.0325	2.004	0.0326	1.969	0.0325	2.006
43.00	0.0325	1.928	0.0325	2.016	0.0326	1.969	0.0325	2.006
44.00	0.0325	1.94	0.0325	2.028	0.0326	1.969	0.0325	2.006
45.00	0.0325	1.951	0.0325	2.039	0.0326	1.969	0.0325	2.006
46.00	0.0325	1.97	0.0325	2.058	0.0326	1.969	0.0325	2.006

	Composite Arterial (All Veh)		Composite Freeway (All Veh)		Composite Local (All Veh)		Composite Ramp (All Veh)	
Speed	direct PM	NOx	direct PM	NOx	direct PM	NOx	direct PM	NOx
47.00	0.0325	1.989	0.0325	2.077	0.0326	1.969	0.0325	2.006
48.00	0.0325	2.006	0.0325	2.094	0.0326	1.969	0.0325	2.006
49.00	0.0325	2.023	0.0325	2.111	0.0326	1.969	0.0325	2.006
50.00	0.0325	2.04	0.0325	2.128	0.0326	1.969	0.0325	2.006
51.00	0.0325	2.067	0.0325	2.155	0.0326	1.969	0.0325	2.006
52.00	0.0325	2.093	0.0325	2.181	0.0326	1.969	0.0325	2.006
53.00	0.0325	2.119	0.0325	2.206	0.0326	1.969	0.0325	2.006
54.00	0.0325	2.143	0.0325	2.231	0.0326	1.969	0.0325	2.006
55.00	0.0325	2.166	0.0325	2.254	0.0326	1.969	0.0325	2.006
56.00	0.0325	2.204	0.0325	2.292	0.0326	1.969	0.0325	2.006
57.00	0.0325	2.241	0.0325	2.329	0.0326	1.969	0.0325	2.006
58.00	0.0325	2.276	0.0325	2.364	0.0326	1.969	0.0325	2.006
59.00	0.0325	2.31	0.0325	2.398	0.0326	1.969	0.0325	2.006
60.00	0.0325	2.343	0.0325	2.431	0.0326	1.969	0.0325	2.006
61.00	0.0325	2.396	0.0325	2.484	0.0326	1.969	0.0325	2.006
62.00	0.0325	2.447	0.0325	2.535	0.0326	1.969	0.0325	2.006
63.00	0.0325	2.496	0.0325	2.584	0.0326	1.969	0.0325	2.006
64.00	0.0325	2.544	0.0325	2.632	0.0326	1.969	0.0325	2.006
65.00	0.0325	2.591	0.0325	2.678	0.0326	1.969	0.0325	2.006

Appendix C

Travel Demand Modeling Post-Processing Procedures for Georgia

Appendix C: Travel Demand Modeling Post-Processing Procedures for Georgia

The Chattanooga regional travel demand model produces daily estimates of VMT and vehicle hours traveled (VHT) and a peak hour speed for each link in the highway network. In order to account for travel conditions throughout the day, VMT estimates and speeds by the four time-of-day periods listed below were produced. This is to ensure that the procedures used in estimating emissions for the Georgia portion of the Chattanooga model area are consistent with the procedures used for emissions modeling (including conformity analyses) in the other nonattainment areas in Georgia.

- AM Period – (6:00 am – 10:00 am) – 4 hours
- Midday Period – (10:00 am – 3:00 pm) – 5 hours
- PM Period – (3:00 pm – 7:00 pm) – 4 hours
- Night Period – (7:00 pm – 6:00 am) – 11 hours

The stratification of the VMT and speeds by time-of-day provides more detailed information to use in estimating emissions. The following sections describe the procedures used to produce VMT and speeds by the four time-of-day periods from the daily assignment for input to the emissions modeling.

VMT Estimation By Time-of-Day

In order to develop the necessary information to perform the emissions modeling, post-processing of the output from the travel demand model was required. Factors derived from the National Cooperative Highway Research Program (NCHRP) Report 187 – Quick Response Urban Travel Estimation Techniques and Transferable Parameters – Users Guide were used to develop VMT estimates by time of day from the daily estimates. The following factors, from Table 22 – Hourly Distribution on Internal Auto Driver Travel by Trip Purpose: Urbanized area Population, 100,000 – 250,000, were used.

Table 1-1
Hourly Distribution on Internal Auto Driver Travel

Hour #	Hour	All Purposes
0	Midnight	0.80
1	1 AM	0.40
2	2 AM	0.20
3	3 AM	0.10
4	4 AM	0.40
5	5 AM	1.00
6	6 AM	4.30
7	7 AM	8.20
8	8 AM	4.60
9	9 AM	4.10
10	10 AM	4.70
11	11 AM	4.90
12	Noon	6.30
13	1 PM	5.40
14	2 PM	5.80
15	3 PM	7.20
16	4 PM	9.90
17	5 PM	9.50
18	6 PM	5.70
19	7 PM	5.40
20	8 PM	4.10
21	9 PM	3.00
22	10 PM	2.20
23	11 PM	1.80
		100.00

The percent of trips occurring in each time period was estimated from Table 1-1 by summing the appropriate hourly values. This results in the following factors:

- AM Period – 21.2%
- Midday Period – 27.1%
- PM Period – 32.3%
- Night Period – 19.4%

Time-of-day volumes were estimated by multiplying the daily volumes by these factors. VMT by time-of-day could then be derived from the time period volumes and link distances.

Speed By Time-of-Day

Since highway speeds vary over the course of a day (due to changes in traffic volume), it is necessary to estimate traffic peaking patterns before speeds by time-of-day can be estimated from a daily travel

demand model. To represent peaking characteristics within each period either volumes or capacities must be adjusted. In this case, capacities were adjusted. Time period capacity factors were derived using the factors in Table 1-1. Capacity factors for each period were estimated as:

*Peaking Factor = % Trips in Period / (Maximum Hourly % in Period * Hours in Period)*

A period Capacity Factor was then calculated as:

*Capacity Factor = Hours in Period * Peaking Factor*

A capacity for each period could then be calculated as:

*Period Capacity = Hourly Capacity * Capacity Factor*

Table 1-2 shows the capacity factors that were derived from the hourly factors in Table 1-1.

Table 1-2
Time of Day Capacity Factors

Period	Hours of Period	Max Percentage per Period	Peaking Factor	Capacity Factors	% of Capacity
AM	4	8.2	0.6463	2.6	18.8
MD	5	6.3	0.8603	4.3	31.3
PM	4	9.9	0.8157	3.3	23.7
NT	11	5.4	0.3266	3.6	26.1

Link volume-capacity ratios were calculated for each period using the estimated volumes by time period and the capacity by time period. Congested speeds by period were then estimated. The VMT from the travel demand model was then adjusted based on the VMT estimates from the Highway Performance Monitoring System (HPMS).