Appendix E
Mobile Source Emissions Modeling

1.0 Overview

The Georgia Environmental Protection Division (EPD) worked with the Georgia Department of Transportation (GDOT) and the Macon-Bibb County Planning and Zoning Commission, the Metropolitan Planning Organization (MPO) for Macon, to develop mobile source emissions inventories for the Macon 8-Hour Ozone Maintenance State Implementation Plan (SIP), hereinafter called the Maintenance Plan. These inventories reflect the most recent planning assumptions and emission factor model available, and the use of an updated travel demand model. The GDOT travel demand and emissions estimation modeling process was employed to estimate on-road mobile source emissions. The mobile source emission inventories for the Maintenance Plan were calculated in a manner consistent with federal regulations for performing regional emissions analyses used in transportation conformity determinations. The alignment of methodologies for mobile source inventories and transportation conformity emissions analyses reduces the possibility of spurious differences between motor vehicle emission budgets (i.e., the SIP's estimate of future mobile source emissions, plus any additional safety margins) and transportation conformity analyses that must conform to those budgets.

Effective June 15, 2004, the U.S. Environmental Protection Agency (EPA) designated Bibb County and part of Monroe County as nonattainment for the 8-hour ozone National Ambient Air Quality Standard (NAAQS). Nonattainment areas are classified based on the severity of their ozone problem. Nonattainment areas with higher classifications must meet additional control requirements and are given more time to attain the standard. The Macon nonattainment area was classified as a "basic" nonattainment area subject to Subpart 1 of the Clean Air Act, the more general nonattainment area planning and control requirements requirements of the Act. The designation also defined the year 2009 as the deadline for the Macon area to attain the 8-hour ozone standard. Because monitoring data for the 2003 through 2005 ozone seasons indicates that Macon has attained the 8-hour ozone NAAQS, EPD is requesting that the Macon nonattainment area be redesignated under EPA's Clean Data Policy[1] as an area attaining the standard for tropospheric ozone, and that Macon be reclassified to a "maintenance" area.

One component of the Maintenance Plan is the Motor Vehicle Emissions Budget (MVEB). The MVEB will set the maximum amount of emissions of NOx and VOC that can be emitted from highway mobile sources. Following EPA's approval of the Maintenance Plan, this MVEB will be used in the conformity analysis of the transportation plans and programs.

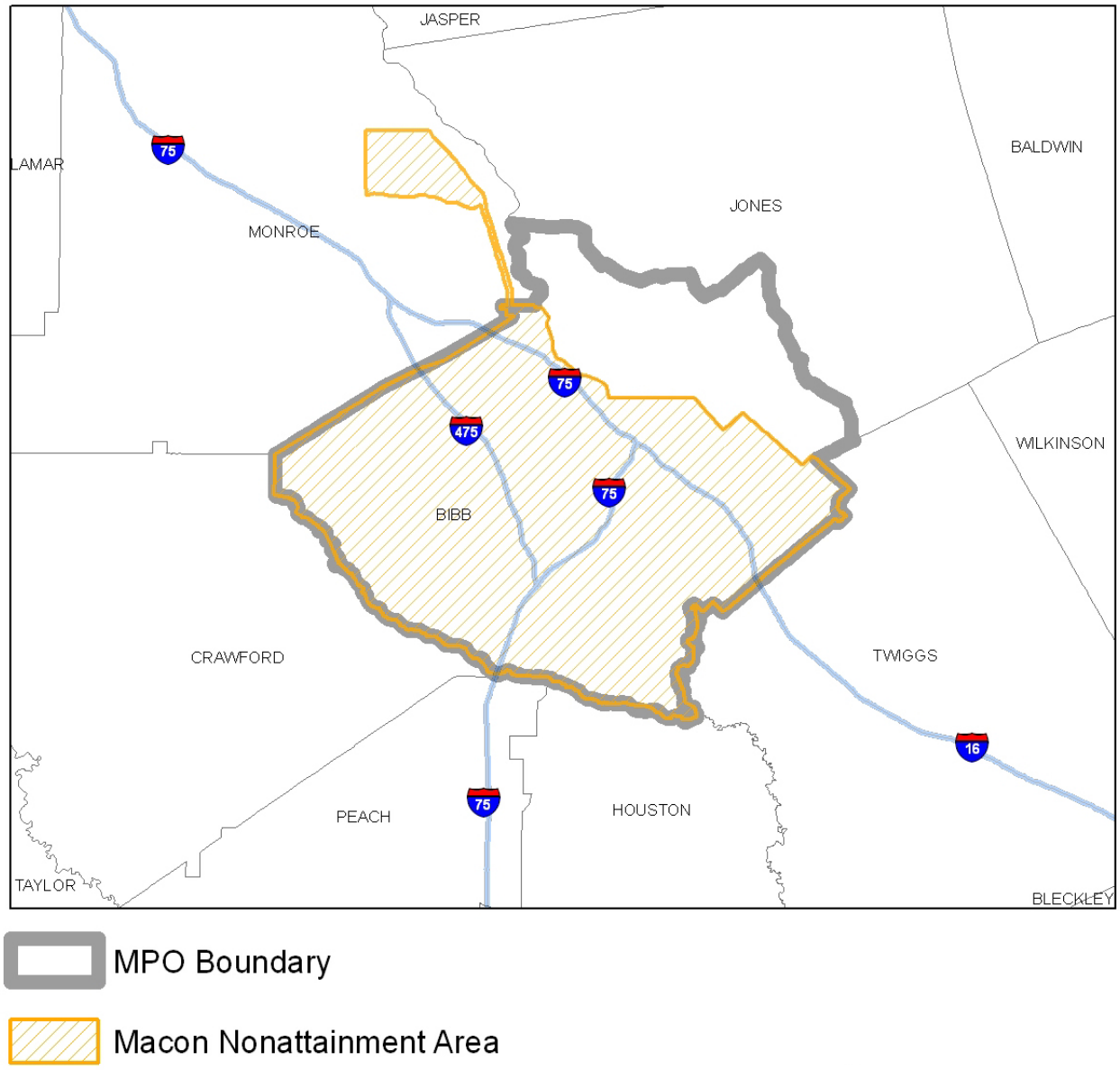
1.1 Planning Boundaries

As the designated MPO for the Macon urbanized area, Macon Area Transportation Study (MATS) is responsible for the continuing, cooperative, and comprehensive metropolitan planning process required by Title 23 U.S.C. 134. Based on the 2000 Census, the Macon MPO boundary includes all of Bibb County plus a third of Jones County. However, the Macon nonattainment boundary includes all of Bibb

[1] http://www.epa.gov/ttn/oarpg/t1/memoranda/clean15.pdf

County, none of Jones County, and a very small segment of Monroe County. Figure 1.1-1 illustrates the two different boundaries.

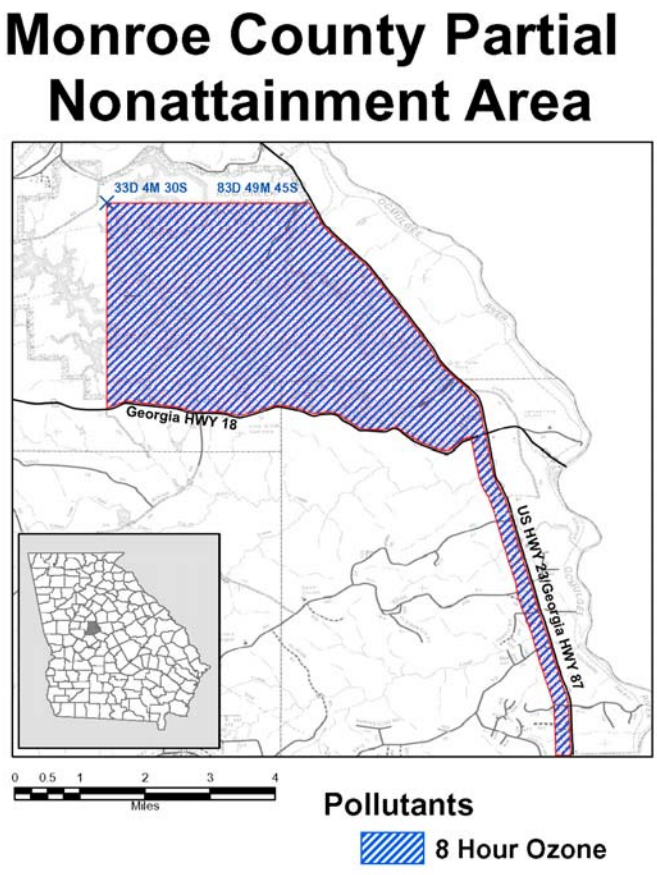
Figure 1.1-1
Macon MPO and Nonattainment Area



An enlargement of the small part of Monroe County designated as nonattainment is shown in Figure 1.1-2. The area encompasses approximately 13.5 square miles and per the 2000 Census contains 69 households and a population of 175. The official nonattainment area description, per the EPA Green Book,[2] is as follows:

> *From the point where Bibb and Monroe Counties meet at U.S. Hwy 23/Georgia Hwy 87 follow the Bibb/Monroe County line westward 150' from the U.S. Hwy 23/Georgia Hwy 87 centerline, proceed northward 150' west of and parallel to the U.S. Hwy 23/Georgia Hwy 87 centerline to 33 degrees, 04 minutes, 30 seconds; proceed westward to 83 degrees, 49 minutes, 45 seconds; proceed due south to 150' north of the Georgia Hwy 18 centerline, proceed eastward 150' north of and parallel to the Georgia Hwy 18 centerline to 1150' west of the U.S. Hwy 23/Georgia Hwy 87 centerline, proceed southward 1150' west of and parallel to the U.S. Hwy 23/Georgia Hwy 87 centerline to the Monroe/Bibb County line; then follow the Monroe/Bibb County line to 150' west of the U.S. Hwy 23/Georgia Hwy 87 centerline.*

Figure 1.1-2
Detailed Map of Ozone Nonattainment Area
Portion of Monroe County



[2] http://www.epa.gov/oar/oaqps/greenbk/7160429.html

Based on consultation between representatives from Monroe County and GDOT, it was determined that GDOT would also represent Monroe County on the interagency committee. Monroe County signed a letter authorizing GDOT to represent their transportation interests throughout the conformity process under both ozone and PM2.5 standards. A copy of the signed letter is in Exhibit 1.

1.2 Emissions Analysis – Models and Assumptions

A detailed listing of the procedures and planning assumptions used for the conformity analysis of the 2030 Long Range Transportation Plan (LRTP) and FY 2006 – FY 2008 Transportation Improvement Program (TIP) is in Exhibit 2, "Macon Interagency Summary of Planning Assumptions Used in Regional Emissions Analysis." This document was distributed to the interagency consultation (IAC) group for review and consensus prior to the Macon area's conformity determinations under the 8-hour ozone standard.

The same assumptions used to develop the conforming LRTP and TIP were also used to develop additional networks and emissions for the Maintenance Plan. In accordance with the transportation conformity rule at 40 CFR Part 93.105(b) and with Sections 106(g) and 106(h) of Georgia's transportation conformity SIP, all of which require interagency consultation for SIP development, the procedures and planning assumptions used for the mobile source emissions inventories supporting the MVEB were discussed by the Interagency Consultation Group on February 16, 2007. The Maintenance Plan required emissions modeling for additional years. The modeling for 2003 and 2020 followed the same process utilized for developing the conformity networks. The demographic data for these years were interpolated from those used for conformity. Emissions for non-modeled SIP years were developed through interpolation between modeled emissions.[3]

The MOBILE6.2 input files reflect all federal and state motor vehicle emission control programs. In addition, the input files were customized to reflect the specific weather conditions and vehicle registration data for the Macon nonattainment area. The MOBILE6.2 input files and emissions factors for ozone are summarized in Exhibits 4 through 6. The complete files are available here:

http://www.gaepd.org/Files_PDF/plans/sip/macon_maintenance_m6_files.zip

[3] Interpolating emissions between available network years is consistent with the transportation conformity rule at 40 CFR Part 93.118(d)(2).

2.0 Travel Demand Modeling Procedures

Georgia DOT is responsible for the development and application of the travel demand models for the urban areas outside of Atlanta. This section summarizes the Macon model's key travel demand modeling attributes listed below, in the Macon model as they relate to the most important factors in estimating emissions for conformity determinations.

1. Socio-economic data based on best available information
2. Consistency between transportation alternatives and land use scenarios
3. Modeled volumes validated against observed counts
4. Reasonable agreement between travel times used for trip-distribution and trip assignment
5. Reasonable sensitivity to time, cost and other factors affecting travel choices
6. Capacity-sensitive traffic assignment methodology

Model Attributes 1 & 2 (Socio-Economic Data)

The primary data inputs to travel demand models are socio-economic data, such as population and employment, and transportation networks. Modeling attributes one and two deal specifically with the socio-economic data inputs to the travel demand modeling process.

The first modeling attribute is that the socio-economic data is based on the best available information. In Georgia, each MPO has the responsibility of preparing socio-economic data. Georgia DOT reviews the socio-economic data for reasonableness and accuracy. The data development process and accuracy checks rely on the best available information, such as US Census data, aerial photography, land use maps, knowledge of proposed new developments and site visits (local knowledge). Other reasonableness and logic checks are made for data at the traffic zone level, such as calculating statistics, including population per household, population density and employment density. The MPOs and GDOT work cooperatively, using the best available data, to insure that the data inputs to travel demand models are accurate and reasonable.

The second modeling attribute is that socio-economic data reflect the transportation alternatives being considered. This relates to the fact that improved transportation accessibility can alter land use patterns. However, it is generally accepted that significant improvements in transportation accessibility are necessary to bring about relatively small changes in land use. Due to their complexity, land use models are generally utilized in only a few large metropolitan areas in the United States. Georgia's MPOs, with the exception of Atlanta, do not use land use models. Instead, usually a single forecast for future socio-economic data is made that takes into consideration planned major transportation improvements. Future forecasts are generally made by first developing regional control totals for expected growth. Allocation of expected growth is then done using known development patterns and proposals as the basis, taking into consideration planned infrastructure improvements (new highways, sewer extensions, etc.). If unanticipated major projects are evaluated during the plan update process, a revised forecast may be developed with guidance from the local Technical Coordinating Committee. The population and employment forecasts for the MATS area are listed in Table 2.0-1.

Table 2.0-1
Population and Employment Forecasts for MATS Area

	2003	2009	2015	2020
Total Population	167,894	170,171	172,910	175,641
Number of Households	65,718	66,550	67,757	69,057
Employment	108,717	117,039	123,960	127,808

Model Attribute 3 (Model Validation)

The next attribute involves the validation of travel demand models against observed traffic counts. Model validation is the process of insuring travel models produce results that reasonably replicate observed travel patterns. Properly validated models not only replicate observed conditions, but they also use accurate inputs and apply reasonable calculations to do so.

Georgia DOT applied multiple validation checks to each of the major steps in the Macon travel demand modeling process. In addition to socio-economic data checks, both the inputs and outputs to the models were checked for accuracy and reasonableness during each step of the process. These inputs and outputs include transportation network attributes, trip generation parameters and results, trip distribution parameters and average trip lengths by purpose, auto occupancy rates, and speed-volume relationships.

Highway Networks – Air Quality Attributes

Georgia DOT develops and maintains highway networks with MATS review and assistance. Highway network attributes are reviewed for accuracy using the state road characteristics database, aerial photography and site visits / local knowledge. Network link attributes include the HPMS functional classification, so that modeled and observed Vehicle Miles Traveled (VMT) can be compared by county. Networks also include GDOT traffic count station numbers, so counts for the base year model can be included in output networks for validation purposes.

Highway Networks - Speed

Since speeds are highly important for mobile emissions estimation, GDOT uses reasonable inputs and validates each of the factors that influence speed estimation; particularly the following:

- Roadway capacities
- Free-flow speeds
- Modeled volumes
- Speed-volume relationships

Link Capacities

Georgia DOT's link capacities were developed using the latest Highway Capacity Manual Software with typical parameters for various roadway classes and area types. The density of population and

employment is used to classify the intensity of development patterns throughout the study area. The Macon model uses the following seven area types to classify land use.

- (1) - Central Business District (CBD) / High Density Urban
- (2) - Urban Commercial
- (3) - Urban Residential
- (4) - Suburban Commercial
- (5) - Suburban Residential
- (6) - Exurban
- (7) - Rural

Table 2.0-2 displays the hourly capacities per lane utilized in the Macon travel demand model.

Table 2.0-2
Macon Model Hourly Per Lane Capacity Matrix

Per Lane Hourly Capacities by Facility Type (FT) and Area Type (AT)								
AT	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Facility Description**
FT								
1	1900	1950	2000	2050	2100	2060	2020	Interstate
2	1600	1660	1730	1790	1850	1820	1780	Freeway
3	1300	1380	1450	1530	1600	1570	1540	Expressway
4	1170	1240	1310	1370	1440	1410	1380	Parkway
6	1400	1530	1650	1780	1900	1860	1820	Freeway-to-Freeway Ramp
7	900	1030	1150	1280	1400	1370	1340	Entrance Ramp
8	800	810	810	820	820	810	790	Exit Ramp
11	1000	1030	1050	1080	1100	1080	1060	Principal Arterial - Class I
12	900	900	900	900	900	880	860	Principal Arterial - Class II
13	800	810	810	820	820	810	790	Minor Arterial - Class I
14	630	630	640	640	640	630	610	Minor Arterial - Class II
15	760	760	770	770	770	760	740	One-Way Arterial
21	520	530	540	550	560	550	540	Major Collector
22	380	390	390	400	400	390	380	Minor Collector
23	460	470	470	480	480	470	460	One-way Collector
30	340	350	360	370	380	370	360	Local Roads
32	0	0	0	0	0	0	0	Centroids

Free-flow Speeds

Assumed free-flow speeds are approximately 5 mph faster than typical speed limits for the various roadway classes and area types, taking into consideration control for delay (i.e. traffic signals) if applicable. Peak and off-peak free-flow speeds were evaluated using observed speeds obtained from a travel time study conducted in the Augusta area. An analysis of the Augusta data determined Augusta's characteristics and data results are appropriate for use in the Macon model since the travel dynamics for these urban areas are very similar. Table 2.0-3 displays the free-flow speeds utilized in the Macon travel demand model.

Table 2.0-3
Macon Model Free-flow Speed Matrix

Speeds by Facility Type (FT) and Area Type (AT)								
AT	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Facility Description**
FT								
1	55	60	60	60	60	70	70	Interstate
2	50	55	55	55	55	60	60	Freeway
3	50	50	50	50	55	55	55	Expressway
4	45	50	50	50	50	55	55	Parkway
6	55	55	55	55	55	55	55	Freeway-to-Freeway Ramp
7	45	50	50	50	50	55	55	Entrance Ramp
8	22	23	30	31	34	40	48	Exit Ramp
11	22	28	33	34	37	47	52	Principal Arterial - Class I
12	23	26	31	32	35	45	49	Principal Arterial - Class II
13	22	23	30	31	34	40	47	Minor Arterial - Class I
14	21	22	27	30	32	38	45	Minor Arterial - Class II
15	23	26	30	32	35	42	48	One-Way Arterial
21	17	18	21	27	29	34	42	Major Collector
22	14	15	18	24	26	30	40	Minor Collector
23	17	18	21	27	29	34	42	One-way Collector
30	14	14	17	18	22	28	35	Local Roads
32	14	14	17	18	22	28	35	Centroids

Modeled Volumes

Output modeled volumes are validated against traffic counts at several levels – regional, corridors (screenlines & cutlines) and link-by-link. Regional evaluations include VMT, Root Mean Squared Error (RMSE) and R-Squared calculations. Corridor evaluations are primarily screenline and cutline comparisons. Nationally recognized maximum desirable deviation standards are applied to analyze model performance at the link level.

Base year external station volumes are based directly on observed traffic counts at each location. Future year external station volumes are estimated from historical trends in traffic counts at each location. Extrapolated future external station volumes are refined to insure use of reasonable annual compounded growth rates.

Speed-Volume Relationships

Georgia DOT uses speed-volume relationships that are different for various roadway types and area types. The speed-volume curves are calibrated to accurately reflect observed traffic volumes, while retaining sensible shapes to insure reasonable congested speeds. Peak-period speed data obtained from the GDOT travel time study was used as a reasonableness check in calibrating GDOT speed-volume curves.

Trip Generation

The GDOT trip generation process primarily uses parameters from the Augusta household survey, the Quick Response Freight Manual and US Census data. Minor adjustments are made to GDOT standard procedures to reflect unique characteristics in each area being modeled (e.g., port, military bases, etc.). Various validation checks are made to insure that trip generation results are reasonable. National data sources are used as reasonableness checks for trip generation results.

Trip Distribution
Trip distribution parameters are calibrated to produce reasonable average trip lengths. Expected average trip lengths are estimated from Census Journey-to-Work data and the population and geographic size of the modeled area. Travel times from trip assignment are used as input to trip distribution (i.e., feedback), which strengthens the validity of the modeled trip lengths.

Model Attribute 4 (Feedback of Travel Times)
The Macon model insures that there is reasonable agreement between travel times used for trip distribution and trip assignment by implementing a feedback loop. Within the feedback loop, all model steps from trip distribution to trip assignment are repeated until trip tables and link volumes change very little from one loop to the next. The Macon model includes a closure criteria for determining whether there is "reasonable agreement" in travel times for trip distribution and trip assignment. Closure is obtained if both of the following criteria are met:

- Less than 5% of O-D pair travel times change by more than 5% (weighted by the O-D pair trips)
- Less than 5% of links have volume changes of more than 5%

The Method of Successive Averages is used to insure that the model reaches stable conditions.

Model Attribute 5 (Mode Choice)
The fifth modeling attribute calls for mode choice models to be reasonably sensitive to changes in travel times and costs. The Macon travel demand model utilizes a trip-end based procedure that determines transit-oriented person trips before the region's person trips are converted to vehicle trips. This trip-end model estimates transit patronage based on socio-economic characteristics such as income or auto-ownership, rather than transportation system characteristics.

Model Attribute 6 (Traffic Assignment)
The sixth modeling attribute calls for the use of capacity sensitive assignment procedures. The Macon model uses equilibrium assignment procedures. The assignment algorithm is a hybrid of a 24-hour assignment and time-of-day assignments. The Macon model was validated using 24-hour counts and modeled volumes.

2.1 Travel Demand Modeling Post-Processing Procedures

The Macon 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.

- 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 accurate 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 information necessary to perform time-of-day emissions modeling, post-processing of the output from the travel demand model was required. Factors derived from the National Cooperative Highway Research Program (NCHRP) 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 2.1-1
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 2.1-1 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 2.1-1. 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 2.1-2 shows the capacity factors that were derived from the hourly factors in Table 2.1-1.

Table 2.1-2
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 using the speed-delay curves from the Macon travel demand model.

The VMT from the travel demand model was then adjusted based on the VMT estimates that GDOT develops for the Highway Performance Monitoring System (HPMS). According to Section 3.4.2.4 of EPA's "Volume IV" guidance,[4] "[T]he detailed VMT estimates produced by the transportation planning process should be made consistent in the aggregate with HPMS." Consistent with this long-standing SIP

[4] *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, EPA-420-R-92-009, US EPA, Office of Air and Radiation, Office of Mobile Sources, 1992, http://www.epa.gov/otaq/invntory/r92009.pdf.

guidance, Section 93.122(b)(3) of the Transportation Conformity Rule, Procedures for Determining Regional Transportation Related Emissions, says:

> *"Highway Performance Monitoring System (HPMS) estimates of vehicle miles traveled (VMT) shall be considered the primary measure of VMT within the portion of the nonattainment or maintenance area and for the functional classes of roadways included in HPMS. For areas with network-based travel models, a factor (or factors) may be developed to reconcile and calibrate the network-based travel model estimates of VMT in the base year of its validation to the HPMS estimates for the same period. These factors may then be applied to model estimates of future VMT."*

There has been a history in Georgia of adjusting the VMT from the regional travel demand model with the HPMS VMT from by functional classification rather than "in the aggregate." This procedure has been used in the preparation of mobile source emissions for the Atlanta nonattainment area and has been incorporated into the procedures for the Macon nonattainment area to be consistent.

Summer is the time of year when most ozone violations occur. Section 3.4.1.3.3 of the Volume IV guidance states that the "HPMS-based annual average daily VMT should also be adjusted for seasonal effects.... VMT for ozone non-attainment areas should be adjusted to the summer season...." To combine the desired HPMS and seasonal adjustments, factors were developed based on the average daily, summer-adjusted HPMS VMT for the year 2002 for the Macon travel demand model area. The year 2002 was used because this is the base year for the calibration and validation of the regional travel demand model. The HPMS adjustment reconciles the observed summer-time travel conditions at the functional class level to the travel demand model link-based VMT. The following equation was used to calculate the HPMS adjustment factors:

$$HPMS\ Adjustment\ Factor_i = (2002\ HPMS\ VMT_i / 2002\ Model\ VMT_i)$$

where $_i$=HPMS functional class)

To determine the "2002 HPMS VMT" adjustment factors, the average daily VMT from the GDOT Office of Transportation Data's "445 Report" for the year 2002 was summarized by the 12 HPMS functional classifications. The data was summarized for the Macon MPO area which consists of all of Bibb County and a third of Jones County. The 445 report summarizes the mileage and VMT by function classification by county. Since only a third of Jones County was included in the Macon regional travel demand model, adjustments to the HPMS VMT summaries for Jones County had to be performed. The highway mileage for Jones County by functional classification was summarized for the area within the Macon model and compared to the county summary. A factor was developed based on the percent of the highway mileage within the model compared to the total mileage for the county by functional classification. This factor was then applied to the summer adjusted HPMS VMT by functional classification to determine the summer adjusted VMT that will be used in the HPMS VMT adjustment process. Table 2.1-3 lists the highway mileage and summer adjusted VMT for the entire Jones County and the portion of the county that is included in the regional travel demand model.

Table 2.1-3
Highway Mileage and Summer Adjusted VMT for Jones County

		Highway Mileage		Summer Adjusted VMT	
Functional Class Name	**Functional Class No.**	**Macon 2002 Model**	**GDOT HPMS**	**Whole County**	**Modeled Portion**
Rural Interstate	1	0.00	0.00	0	0
Rural Principal Arterial	2	2.22	2.39	19,295	17,922
Rural Minor Arterial	6	5.87	57.54	461,320	47,062
Rural Major Collector	7	17.55	68.06	122,555	31,602
Rural Minor Collector	8	7.11	46.32	81,687	12,539
Rural Local	9	37.34	328.39	127,282	14,473
Urbanized Interstate	11	0.00	0.00	0	0
Urban Freeway	12	0.00	0.00	0	0
Urbanized Principal Arterial	14	2.77	3.00	47,515	43,872
Urbanized Minor Arterial	16	2.19	2.56	13,189	11,283
Urbanized Collector	17	4.19	4.05	7,571	7,833
Urbanized Local	19	9.88	32.46	39,277	11,955
		89.12	544.77	919,690	198,541

Table 2.1-4 lists the summer adjusted HPMS VMT for the Macon MPO area.

Table 2.1-4
Summary of 2002 Daily Summer Adjusted VMT for Macon MPO Area

Functional Class Name	Functional Class No.	Bibb County	Jones County	Total
Rural Interstate	1	319,697	0	319,697
Rural Principal Arterial	2	11,373	17,922	29,295
Rural Minor Arterial	6	125,517	47,062	172,579
Rural Major Collector	7	131,257	31,602	162,859
Rural Minor Collector	8	39,421	12,539	51,960
Rural Local	9	116,258	14,473	130,731
Urbanized Interstate	11	1,649,804	0	1,649,804
Urban Freeway	12	0	0	0
Urbanized Principal Arterial	14	808,361	43,872	852,233
Urbanized Minor Arterial	16	1,161,683	11,283	1,172,966
Urbanized Collector	17	261,425	7,833	269,258
Urbanized Local	19	716,635	11,955	728,589
	Grand Total	5,341,430	198,541	5,539,971

Table 2.1-5 lists the adjustment factors based on the comparison between the summer-adjusted HPMS VMT and the VMT from the regional travel demand model. These factors were applied to the VMT on each link in the highway network, based on each link's functional classification, for the years 2003, 2009, 2015, and 2020.

Table 2.1-5
HPMS VMT Daily Summer Adjustment Factors for Macon MPO Area

Functional Class Name	Functional Class No.	2002 HPMS VMT	2002 Model VMT	Adjustment Factor
Rural Interstate	1	319,697	313,391	1.02
Rural Principal Arterial	2	29,295	35,893	0.82
Rural Minor Arterial	6	172,579	228,258	0.76
Rural Major Collector	7	162,859	148,734	1.09
Rural Minor Collector	8	51,960	19,958	2.60
Rural Local	9	130,731	107,225	1.22
Urbanized Interstate	11	1,649,804	1,694,897	0.97
Urban Freeway	12	-	-	-
Urbanized Principal Arterial	14	852,233	864,006	0.99
Urbanized Minor Arterial	16	1,172,966	1,145,265	1.02
Urbanized Collector	17	269,258	288,826	0.93
Urbanized Local	19	728,589	462,068	1.58
	Grand Total	5,539,971	5,308,521	1.04

The VMT adjustment factors were developed for the entire Macon MPO which includes a third of Jones County to reflect the travel activity for the entire area. However, only the travel within Bibb County, the non-attainment area, was used in the preparations of emissions. Table 2.1-6 lists the adjusted modeled VMT by year for Bibb County which was used in the emissions modeling procedures.

Table 2.1-6
Adjusted Modeled VMT for Bibb County
Avg. Summer Weekday for Ozone

Year	VMT
2002	5,256,682
2003	5,576,090
2009	6,043,993
2015	6,669,300
2020	6,997,463

2.2 Development of Mobile Source Emission Factors

The mobile source emission factors used for the Macon analyses reflect all federal and state mobile source control rules, including federal tailpipe standards and gasoline sulfur and volatility limits.

It is vital that the emission rates used in preparation of emission inventories for SIP development and for conformity analysis are consistent. Interagency consultation helps to assure consistency between the two procedures. The MOBILE6 input parameters for the Maintenance Plan mobile source emissions modeling, which are the same as those last used for 8-hour ozone conformity purposes, were established through interagency consultation and are listed below:

- Emission Factor Model: MOBILE6.2.03
- MOBILE6 Inputs
  - Average hourly temperature, humidity, and average barometric pressure for the 10 highest Macon ozone days during 2000 – 2002
  - Fuel
    - Default federal gasoline sulfur requirements for Bibb county; 30 parts per million sulfur limit in Monroe county, which is covered by Georgia's gasoline marketing rule
    - RVP[5] of 9.0 pounds per square inch (psi) in Bibb county; 7.0 psi in Monroe county
  - 2002 regional fleet age distribution[6]
    - Derived from R.L. Polk & Co. registration data for the five counties in the Macon metropolitan statistical area: Bibb, Crawford, Jones, Monroe, and Twiggs.
    - Default for HDDV Class 8B
  - Default VMT fractions

The regional fleet age distribution is documented in more detail in Exhibit 3. MOBILE6.2.03 is the latest version of EPA's motor vehicle emissions model. MOBILE6 produces emissions for four types of "driving cycle" – arterials/collectors, freeways/interstates, ramps, and local roads. It is assumed that all VMT by highway motor vehicles will occur in one of these four driving cycles. In MOBILE6, each driving cycle reflects different assumptions about vehicle activity and different emission estimates. The definitions of the different driving cycles from EPA's *Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation*[7] are listed below.

Freeway Driving Cycle

In MOBILE6, "freeway" VMT refers to driving that occurs on roadways that do not have traffic signals, that usually have limited access (via converging ramps) and have free flow speeds greater than 50 miles

[5] (Reid vapor pressure, a measure of gasoline volatility)

[6] Registration data was from R. L. Polk & Co.'s National Vehicle Population Profile ® current as of October 2002 and from R. L. Polk & Co.'s TIPNet ® current as of March 2003. See Exhibit 3 for more details on this registration distribution by age.

[7] http://www.epa.gov/otaq/models/mobile6/420r04013.pdf

per hour. These roadways are usually divided and have more than one lane in each direction. This definition does not include short sections (less than two miles) of a roadway between signals, but could include longer roadway segments that effectively act as freeways.

Arterials/Collector Driving Cycle

In MOBILE6, "arterial/collector" VMT refers to driving that occurs on roadways that have signalized traffic control. These roadways are not freeways, because they have traffic signals, but they may be divided, multiple lanes, one-way and have high free-flow speeds. However, traffic will be stopped periodically by traffic signals and will be further affected by access to the roadway by driveways and un-signalized intersections. Even in free flow, the driving on arterial/collector roadways will be characterized by cruising periods interrupted by traffic signals.

Local Roadway Driving Cycle

In MOBILE6, "local roadway" VMT refers to driving on roadways which are not normally considered as part of the traffic network. These roadways do not have traffic lights and rarely have more than one lane in each direction. They usually allow vehicle parking on the roadway surface and traffic control is handled via stop/yield signs. Speed limits are normally 30 miles per hour or less. The driving cycle used in MOBILE6 to model local roadways is fixed at an average speed of 12.9 miles per hour. Driving on local roadways is characterized by extremely low speeds and frequent stops at intersections.

Freeway Ramp

In MOBILE6, "freeway ramp" VMT refer to the access roadways for freeways. It includes both traffic movements entering and exiting the freeway. Driving on freeway ramps is characterized by rapid acceleration from stop or low speeds to freeway speeds and decelerations from freeway speeds to low speeds or stop. Freeway ramp activity is not included in the MOBILE6 freeway roadway definition. Therefore, all freeway activity must include a corresponding freeway ramp activity to account for acceleration and deceleration to and from freeway speeds.

Many areas do not explicitly account for freeway ramps as a separate roadway type so EPA developed a default fraction in MOBILE6 to account for this. This procedure does not need to be utilized for Macon's emission estimates because freeway ramps have been explicitly defined in the highway network. Freeway ramps have been defined as separate facilities stratified by the type of design and speed, high, medium and low. High speed ramps represent ramps that connect freeway to freeway travel, such as I-75 to I-16, while the lower speed ramps are for access to a freeway from an arterial or egress from a freeway to an arterial. The high speed ramps in the Macon network have significantly higher free-flow speeds than the lower speed ramps and are not characterized by rapid acceleration, or deceleration from freeway speeds to low speeds or stops. Based on guidance from EPA, emissions for high speed freeway ramps should be estimated using the freeway emissions while emissions for lower speed freeway ramps should be estimated using the freeway ramp emissions.

In MOBILE6, only emissions for arterials/collectors and freeways/interstates are speed sensitive. Emission factors are produced for 2.5 miles per hour and in one mile per hour increments between 3 and 65 for these two roadway types. The emission factors estimated for ramps are based on a default average speed of 34.6 mph, and for local roads on a default average speed of 12.9 mph.

The mapping of FHWA highway functional system classifications to the appropriate MOBILE6 roadway

type used for this modeling is listed in Table 2.2-1.

Table 2.2-1
Listing of FHWA Highway Functional Classifications
Mapped to MOBILE6 Roadway Types

FHWA Highway Functional System	MOBILE6 Roadway Type
Rural interstate	Freeway and freeway ramp
Rural other principal arterial	Freeway and freeway ramp
Rural minor arterial	Arterial/collector
Rural major collector	Arterial/collector
Rural minor collector	Arterial/collector
Rural local	Local
Urban interstate	Freeway and freeway ramp
Urban other freeways	Freeway and freeway ramp
Urban other principal arterial	Arterial/collector
Urban minor arterial	Arterial/collector
Urban collector	Arterial/collector
Urban local	Local

EPA believes that facilities with the HPMS classification of Rural Other Principal Arterial (HPMS code 2) should use a combination of the freeway and ramp emission factors. Per section 4.2.3 of *Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation*, "By default in MOBILE6.2, 8% of VMT in any freeway and freeway ramp category will be the freeway ramp VMT." The remaining 92% is freeway VMT. These default assumptions were used in calculating emissions for Rural Other Principal Arterials. This is the only case in the Macon emissions modeling where a combination of emission factors by type is used for the same facility classification.

Exhibit 4 contains abbreviated versions of the MOBILE6.2 input files used to calculate link-level emission factors for the Bibb county portion of the Macon nonattainment area. In the full versions of these inputs[8] there is a separate scenario for each of 64 speeds, with only the speed varying. Emission factors are produced for 2.5 miles per hour and in one mile per hour increments between 3 and 65. To conserve space, only one speed scenario is included in the example inputs in Exhibit 4. Exhibit 5 contains the MOBILE6 inputs used for the Monroe county emissions modeling. The emission factors by year, driving cycle, and speed are listed in Exhibit 6.

2.3 Procedures to Develop Regional Emissions from the Travel Demand Model

Highway mobile emissions for the Bibb County portion of the Macon nonattainment area were developed using MOBILE6.2 emission factors and GDOT's link-based emissions estimation procedure. Highway mobile activity and emissions were modeled for the years 2003, 2009, 2015, and 2020. Emissions for the other years of interest were interpolated.

[8] (available here: http://www.gaepd.org/Files_PDF/plans/sip/macon_maintenance_m6_files.zip)

Link-Based Emissions Estimation Procedure

The link-based estimation procedure uses the links from the daily highway assignment that contain a variety of attributes such as the number of lanes, speed, capacities and daily volumes. The daily VMT is determined by multiplying the daily volume by the distance for each link. The next step in the emissions procedure is to determine the VMT and congested-flow speed by time-of-day from the daily assignment by link as described in Section 2.1. The VMT by time-of-day is then adjusted by the VMT adjustment factor by HPMS functional classification to reconcile the model VMT to the summer-adjusted HPMS data. The same set of VMT adjustment factors is applied to each network year model for the analysis.

Calculating Link-Based Emissions

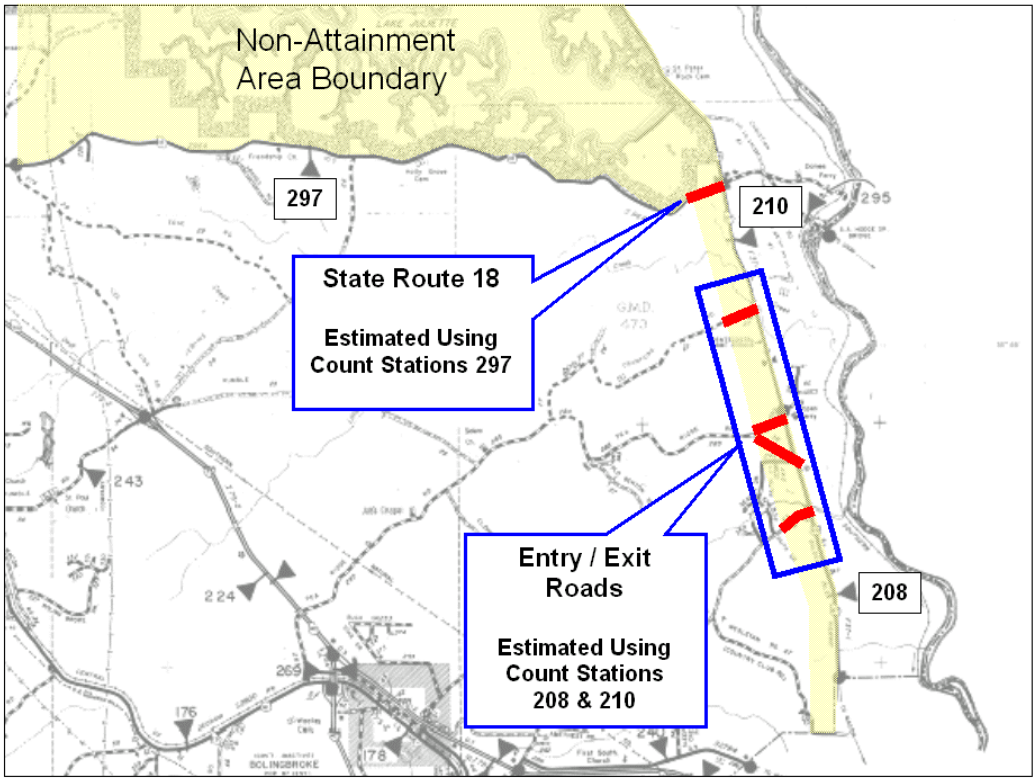
MOBILE6.2 emission factors are applied to the VMT estimates by time-of-day. Emissions factors are applied at the link level for only the Bibb County portion of the Macon travel demand model based on the MOBILE6 driving cycle and the congested speed. The emission factors for a particular driving cycle and speed are multiplied by the VMT for the link for each time-of-day period and summed for the Bibb County area to derive estimates of daily levels of a particular pollutant (or pollutant precursor.) This was done for each analysis year, 2003, 2009, 2015, and 2020. Exhibit 7 contains outputs from the travel model emissions processor summarizing emissions by HPMS functional classification.

2.4 Procedures for Producing Emissions Using Off Model Techniques

The Monroe County portion of the Macon Ozone Nonattainment Area is not included in the Macon MPO's study area nor in the travel demand model. The area encompasses approximately 13.5 square miles and per the 2000 Census contains 69 households and a population of 175. Since the area is not modeled, emissions estimates were produced using off-model techniques. According to the Transportation Conformity Rule at 40 CFR Part 93.122(a)(7), reasonable methods shall be used to estimate nonattainment or maintenance area VMT on off-network roadways within the urban transportation planning area, and on roadways outside the urban transportation planning area. The methodology to produce the mobile emissions for Monroe County, described in this section, uses reasonable methods.

Georgia DOT historical traffic counts were used as the basis for the estimates. Figure 2.4-1, displays the relevant traffic count stations and the applicable roadway segments that are included in the off-model estimation process.

Figure 2.4-1
Traffic Count Stations



As Figure 2.4-1 indicates, VMT forecasts for the segment of State Route 18 were produced using historical traffic counts for GDOT count station 297. Traffic volumes projections are displayed in Table 2.4-2, and were based on a linear extrapolation of the historical counts, which are shown in Table 2.4-1. The 1997 count for station 297 was omitted because it appears to be an outlier. If the 1997 count were included, the linear extrapolation would be declining.

Table 2.4-1
Historical Traffic Counts

	AADT						
Station #	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
208	5128	5467	5836	6660	5701	6560	6930
210	3800	3828	4086	4769	4325	5443	5300
297	2503	1411	1373	1814	1921	1514	1470

Table 2.4-2
Projected Traffic

Station #	Projected Traffic		
	2009	2015	2020
208	8437	10035	11367
210	7069	8776	10199
297	1784	1926	2043

VMT estimates for State Route 18 were calculated assuming a highway segment length of 0.25 miles. The results are displayed in Table 2.4-3.

Table 2.4- 3
Traffic & VMT for SR-18

Name	Length	Year	Traffic	VMT
SR-18	0.25	2003	1,470	368
		2009	1,784	446
		2015	1,926	482
		2020	2,043	511

VMT for several local roads that enter and exit US Route 23 were estimated by analyzing historical traffic volumes for GDOT count stations 208 and 210. The initially planned approach to estimate projected traffic volumes for these roads was to determine the volume difference between count stations 208 and 210 for each year (assuming the difference is due to the traffic from the local access roads). Then a linear extrapolation would be used to extend the differences into the future. However, the annual differences are declining and would result in declining future volumes. Therefore, another approach was applied to estimate the traffic for the local access roads. Another approach was applied for local access roads which used the difference between the volumes for the base year (2003). The percent of the average of these two values was then used. The assumption was that the future volume would maintain this share. The difference in volumes for count stations 208 and 210 is 1630 vehicles per day (vpd), which is 27% of the average of the two counts (6115 vpd). Traffic projections for the local access roads assume they will maintain this share (27%) of the average projections for count stations 208 & 210. VMT estimates for these road segments were calculated assuming a highway segment length of 0.25 miles. The results are displayed in Table 2.4-4.

Table 2.4-4
Traffic & VMT for Entry/Exit Roads

Name	Length	Year	Traffic	VMT
Entry/Exits Between Stations 208 & 210	0.25	2003	1,651	413
		2009	2,093	523
		2015	2,539	635
		2020	2,911	728
Difference in Year 2003 (208 & 210)			1630	
Avg in 2003 (208 & 210)			6115	
% of Avg			27%	

With two exceptions, the Monroe county emission factors used are consistent with those used for the Macon travel demand model based emissions analysis. The exceptions are that, because Monroe County is covered by Georgia's gasoline marketing rule,[9] Georgia gasoline (1) volatility and (2) sulfur limits were modeled instead of the federal limits.

Emission factors for arterials were applied to State Route 18 and factors applicable to local roads were applied to the entry/exit roads. Since the arterial emission factors are speed dependent, an assumed speed had to be used. Since the segment is close to an intersection, a moderate speed of 35 mph was used. Emission factors for local roads are not speed dependent. The applied emission factors are displayed in Table 2.4-5.

Table 2.4-5
Emission Factors for Ozone by Facility Type for Monroe County

For SR-18

Facility Type	Speed	Analysis Year	VOC Emission Factor	NOx Emission Factor
Arterial	35	2003	2.039	2.430
Arterial	35	2009	1.371	1.644
Arterial	35	2015	0.863	0.975
Arterial	35	2020	0.574	0.638

Entry/Exits between Stations 208 & 210

[9] See Rules for Air Quality Control, Chapter 391-3-1: Rule (bbb), Gasoline Marketing

Facility Type	Speed	Analysis Year	VOC Emission Factor	NOx Emission Factor
Local	N/A	2003	2.981	2.576
Local	N/A	2009	1.955	1.801
Local	N/A	2015	1.205	1.060
Local	N/A	2020	0.835	0.695

Tons of emissions were estimated by multiplying the VMT projections by the emission factors, then applying the appropriate conversion factor (grams to tons). The total calculated emissions are displayed in Table 2.4-6.

Table 2.4-6
Total Estimated Off-Model Emissions for 8-Hour Ozone
Partial Area of Monroe County
(Tons per Day)

Year	Off-Model Emissions	
	VOC	NOx
2003	0.0022	0.0022
2005	0.0021	0.0021
2008	0.0019	0.0019
2009	0.0018	0.0018
2011	0.0016	0.0016
2014	0.0014	0.0014
2015	0.0013	0.0013
2017	0.0012	0.0011
2020	0.0010	0.0009

2.5 Nonattainment Area Emissions Summary

The results from the regional emissions analysis produced using both travel demand model and off-model techniques are listed in Table 2.5-1 by year.

Table 2.5-1
Summary of Mobile Source Emissions for Macon Nonattainment Area
(tons per summer day)

Year	Travel Model Emissions		Off-Model Emissions		Final Emission Results	
	VOC	NOx	VOC	NOx	VOC	NOx
2003	16.1583	18.4490	0.0022	0.0022	16.1605	18.4512
2005*	14.7581	16.8640	0.0021	0.0021	14.7602	16.8661
2008*	12.6579	14.4864	0.0019	0.0019	12.6598	14.4883
2009	11.9578	13.6939	0.0018	0.0018	11.9596	13.6957
2011*	10.5199	11.8958	0.0016	0.0016	10.5215	11.8974
2014*	8.3631	9.1986	0.0014	0.0014	8.3645	9.2000
2015	7.6442	8.2995	0.0013	0.0013	7.6455	8.3008
2017*	6.6894	7.2214	0.0012	0.0011	6.6906	7.2225
2020	5.2571	5.6042	0.0010	0.0009	5.2581	5.6051

* Emissions interpolated.
Emissions for 2003, 2009, 2015 and 2020 were directly modeled

Appendix E, Exhibit 1: Monroe County/GDOT Agreement

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Department of Transportation

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September 13, 2004

Ben Spear, Jr., Chairman
Monroe County Board of Commissioners
P.O. Box 189
Forsyth, Georgia 31029-0189

Subject: Agreement for Georgia Department of Transportation to Represent the Interests of Monroe County for Transportation Conformity Purposes under Eight-Hour Ozone and PM2.5 Standards

Dear Chairman Spear:

On September 10, 2004, Ms. Cora Cook of the Office of Planning discussed with you transportation-related ramifications of EPA's designation of a part of Monroe County as nonattainment under the eight-hour ozone standard. EPA also recommends the same area of Monroe County be designated nonattainment under the PM2.5 standard. Although Monroe County's ozone designation and likely PM2.5 designation are due to emissions from a large stationary source, a process called "transportation conformity" will apply to that part of Monroe County designated as nonattainment.

This letter confirms your discussions with Ms. Cook that Monroe County requests the Department serve as its representative throughout the transportation conformity process for ozone and PM2.5 nonattainment. By my signature below, the Department acknowledges it will represent Monroe County and its transportation interests throughout the conformity process under both air quality standards. The Department will bring to the County Chairman's attention, issues of significance that could or would affect Monroe County's transportation interests. I have provided an area below for you to sign your concurrence with these arrangements. Please sign this letter, keep a copy for your records, and return the signed original to the attention of Ms. Cora Cook.

If you have any questions about air quality issues, Ms. Cora Cook will serve as your Department contact. You may reach her at (404) 657-6687. We look forward to representing the County throughout the transportation conformity process under both ozone and PM2.5 standards.

Sincerely,

Harold E. Linnenkohl
Commissioner

HEL:CJC

CONCURRENCE: _____
Ben Spear, Monroe County Commission Chairman

Appendix E, Exhibit 2
Macon Interagency Summary of Planning Assumptions Used in Regional Emissions Analysis

(This document, prepared through the interagency consultation process for Macon ozone conformity determinations, guided development of the Maintenance Plan's mobile modeling assumptions and procedures.)

Macon Interagency Summary of Planning Assumptions
Used in Regional Emissions Analysis
for Eight-Hour Ozone Conformity Determination

On April 15, 2004, The United States Environmental Protection Agency designated Bibb County and part of Monroe County as nonattainment under the eight-hour ozone standard. A transportation conformity analysis under the eight-hour ozone standard is required by June 15, 2005. The goal of the Macon Area Transportation Study (MATS) is to perform the required conformity analysis for the 2030 Long Range Transportation Plan (LRTP) and the FY 2006-2008 Transportation Improvement Program (TIP). The printed TIP document also includes the next three years (FY 2009-2011) for information purposes. This section is called Tier 2 and is consistent with projects depicted in the model network years.

Below is a detailed listing of the procedures and planning assumptions for the upcoming conformity analysis. This summary is submitted to Interagency Consultation (IAC) in accordance with Section 93.105(c)(1)(i) of the Transportation Conformity Rule which requires interagency review of the model(s) and associated methods and assumptions used in the regional emissions analysis. All assumptions apply to both the LRTP, TIP, and Tier 2 documents.Interagency consultation on methods and assumptions that affect the conformity analysis is an ongoing process. All of the planning assumptions listed below have been discussed and agreed upon by the interagency partners, and documented in previous meeting summaries. This briefing provides the following:

1) Synthesis of previous discussions on methods and assumptions used in the conformity process,
2) Formal documentation that there has been Interagency review and concurrence on all methods and assumptions used in the regional emissions analysis.

Section 1: General Methods and Assumptions

1) Modeling Methodology
    a. Eight-Hour Ozone Standard
        i. Existing Macon travel demand and emissions modeling process for Bibb County
        ii. Estimate VMT for partial Monroe County nonattainment area based on existing traffic counts, past growth and calculated emission factors using average speed by functional class from Macon model

2) Conformity Test
    a. Eight-Hour Ozone Standard: Category/Classification – Subpart 1 or Basic
        i. Not greater than Base Year test
        ii. 2002 Base Year
        iii. Base Year emissions (NOx and VOC) will be established using the same methodology as presented in Sections 3 and 4.

3) Conformity Analysis Years
    a. 2009, 2015, 2025, 2030

4) Modeling Start Date: December 12, 2004. This start date is defined as the initiation of the first model run for 2009 for the 2030 Long Range Plan.

5) Final IAC Consensus on Planning Assumptions: March 17, 2005

Section 2: Travel Demand Modeling Assumptions

1) Validation Year: 2002
2) Project Listing: Provided as separate attachment; includes
    a. Regionally Significant and Federally Funded
    b. Regionally Significant and Non-Federally Funded
3) Travel Demand Model is state of the practice and described in a separate document.
4) Demographic Data: Provided in a separate document
5) Transit Modeling
    a. Transit mode split is estimated using trip end mode choice
        i. Estimates trips from the person trips developed in trip generation
        ii. Determines transit-oriented person trips prior to conversion of region's person trips to vehicle trips

Section 3: Emissions Model Assumptions

1) Emission Factor Model: MOBILE6.2.03
2) MOBILE6 Inputs
    a. Average hourly temperature, humidity, and average barometric pressure for the 10 highest Macon ozone days during 2000 – 2002
    b. Fuel
        i. Default federal gasoline sulfur requirements for Bibb county; 30 parts per million sulfur limit in Monroe county, which is covered by Georgia's gasoline marketing rule
        ii. Reid Vapor Pressure (RVP) of 9.0 pounds per square inch (psi) in Bibb county; 7.0 in Monroe county
    c. 2002 regional fleet age distribution
        i. Derived from R.L. Polk & Co. registration data for the five counties in the Macon metropolitan statistical area: Bibb, Crawford, Jones, Monroe, and Twiggs
    d. Default for HDDV Class 8B
    e. Default VMT fractions

Section 4: HPMS Adjustment Factors

1) Calculated for Year 2002

a. Reflects Section 93.122(b)(3) of the Transportation Conformity Rule which recommends that HPMS adjustment factors be developed to reconcile travel model estimates of VMT in base year of validation (2002) to HPMS estimates for the same period.
    i. HPMS adjustments based on all of Macon MPO area

2) Factors applied only to VMT estimates generated by MATS travel demand model for Bibb County
    a. Eight-hour conformity analysis
    b. No HPMS-adjusting factors needed for portion of Monroe County because VMT estimates will be developed directly from HPMS data

Section 5: Off-Model Calculations

1) Portion of Monroe County designated as nonattainment

Section 6: TCMs

1) No TCMs

Appendix E, Exhibit 3: Vehicle Registration Data

Georgia's Revised MOBILE6 Registration Distribution by Age

Overview

R.L. Polk & Co. (Polk) maintains databases encompassing all registered vehicles in operation by state. Polk acquires the source registration data from the states and then processes and enhances the data. Key data elements Polk used for grouping vehicle registered in Georgia by their appropriate composite (i.e., gasoline and diesel) MOBILE6 vehicle types were: vehicle make, vehicle model, engine make, engine model, fuel type, cab type, bed length, wheel configuration, vehicle type, gross vehicle weight rating (GVWR)[10] class, model year, and registration geography (i.e., county).

Vehicle characteristic data elements used by Polk are derived from the unique 17 position vehicle identification number (VIN) assigned to every vehicle. Vehicle geography is assigned based on the registration address linked to each VIN.

In order to assign a MOBILE6 category to all registered vehicles, Polk constructed a master vehicle workfile using data from Polk's TIPNet and NVPP databases. This master vehicle workfile accounts for all registered vehicles, including: cars, vans, sport utility vehicles, trucks, buses, school buses, and motorcycles (GVWR classes 1-8 + motorcycle). The GVWR classes are:

Class 1	0 - 6,000 lbs.
Class 2	6,001 - 10,000 lbs.
Class 3	10,001 - 14,000 lbs.
Class 4	14,001 - 16,000 lbs.
Class 5	16,001 - 19,500 lbs.
Class 6	19,501 - 26,000 lbs.
Class 7	26,001 - 33,000 lbs.
Class 8	33,001 - 150,000 lbs.

The TIPNet database contains vehicles from full-size pickups/vans through class 8 (GVWR classes 1c-8), and is structured to serve the commercial vehicle market. The NVPP database contains vehicles GVWR classes 1-3 and is designed to serve the car, light truck/van, and motorcycle aftermarket.

Using the data elements listed above, Polk assigned one of the 16 MOBILE6 categories to each of the vehicles in the workfile. Care was taken to assure that no makes and models are duplicated between the two databases. Note that the unit volume for same make/model vehicles can be divided among two or more MOBILE6 categories due to varying vehicle types

[10] The GVWR is the maximum weight of the vehicle when it is fully loaded, as specified by the manufacturer.

and GVWR classes within a specific make/model. TIPNet data supplies GVWR classes 1c-8 (full-size pickups/vans & heavier), while NVPP data provides passenger car, motorcycle, light truck, and light vans from GVWR class 1.

The 16 composite MOBILE6 vehicle types are listed and defined below, with examples of the types of vehicles they include.

Number **Abbreviation** **Description**

1 LDV Light-Duty Vehicles (Passenger Cars)

- Class 1 GVWR
- Include: Passenger Cars
- Fuel: All Types
- Source: R.L. Polk NVPP as of October 2002

2 LDT1 Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs. LVW[11])

- Class 1 GVWR
- Trucks, SUVs, & Vans
- Exclude Full-Size Pickups & Vans
- Fuel: All Types
- Source: R.L. Polk NVPP as of October 2002

3 LDT2 Light-Duty Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)

- Class 1 GVWR
- Trucks, SUVs, & Vans
- Fuel: All Types
- Include all Full-Size Pickups & Vans (e.g. 150/1500 series vehicles: F150, C/K 1500, E150, Ram 1500 etc.)
- Include Vehicle Types: Incomplete Pickup + Cab Chassis
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003 & NVPP as of October 2002

4 LDT3 Light-Duty Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs. ALVW[12])

- Class 2 GVWR
- Trucks, SUVs, & Vans
- GVWR: 6,001-8,000 for Ford, Chevy, Dodge, plus all Toyota Tundra Models
- Fuel: All Types
- Exclude: Pickups with Long Bed or Vans with Extended Length (Except Tundra)
-
- Exclude Vehicle Types: Incomplete Pickup + Cab Chassis + Incomplete Vehicle + Straight Truck + School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003 & NVPP as of October 2002

[11] Loaded vehicle weight, the weight of vehicle sitting empty (curb weight) plus 300 pounds.
[12] Adjusted loaded vehicle weight, average of the gross vehicle weight and the curb weight.

Number	Abbreviation	Description

5 LDT4 Light-Duty Trucks 4 (6,001-8,500 lbs. GVWR, >5,750 lbs. ALVW)

- Class 2 GVWR
- Trucks, SUVs, & Vans
- GVWR: 6,001-8,000 for Ford, Chevy, & Dodge
- Exclude: all Toyota Tundra Models
- Fuel: All Types
- Include: Pickups with Long Bed or Vans with Extended Length
- Include Vehicle Types: Incomplete Pickup + Cab Chassis + Incomplete Vehicle + Straight Truck
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003

6 HDV2B Class 2b Heavy-Duty Vehicles (8,501-10,000 lbs. GVWR)

- Class 2 GVWR
- Trucks, SUVs, & Vans
- GVWR: 8,001-10,000 for Ford, Chevy, & Dodge
- Exclude: All Toyota Tundra Models
- Fuel: All Types
- Include: Pickups with Long Bed or Vans with Extended Length
- Include Vehicle Types: Incomplete Pickup + Cab Chassis + Incomplete Vehicle + Straight Truck
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003

7 HDV3 Class 3 Heavy-Duty Vehicles (10,001-14,000 lbs. GVWR)

- Class 3 GVWR
- Trucks, SUVs, & Vans
- Fuel: All Types
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003

8 HDV4 Class 4 Heavy-Duty Vehicles (14,001-16,000 lbs. GVWR)

- Class 4 GVWR
- Trucks, SUVs, & Vans
- Fuel: All Types
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003

9 HDV5 Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs. GVWR)

- Class 5 GVWR
- Trucks, SUVs, & Vans

- Fuel: All Types
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003

Number	Abbreviation	Description

10 HDV6 Class 6 Heavy-Duty Vehicles (19,501-26,000 lbs. GVWR)

- Class 6 GVWR
- Trucks, SUVs, & Vans
- Fuel: All Types
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003

11 HDV7 Class 7 Heavy-Duty Vehicles (26,001-33,000 lbs. GVWR)

- Class 7 GVWR
- Trucks, SUVs, & Vans
- Fuel: All Types
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Source: R.L. Polk TIPNet as of March 2003

12 HDV8A Class 8a Heavy-Duty Vehicles (33,001-60,000 lbs. GVWR)

- Class 8 GVWR
- Trucks, SUVs, & Vans
- Fuel: All Types
- Exclude Vehicle Types: School Bus + Bus Non-School (Coach)
- Include Vehicle Types: 4x2 Non-Tractor Vehicles + All Tractors + Motor Home Chassis
- Source: R.L. Polk TIPNet as of March 2003

13 HDV8B Class 8b Heavy-Duty Vehicles (>60,000 lbs. GVWR)

- Class 8 GVWR
- Trucks, SUVs, & Vans
- Fuel: All Types
- Exclude Vehicle Types: All Tractors + School Bus + Bus Non-School (Coach)
- Exclude Wheels: 4x2
- Source: R.L. Polk TIPNet as of March 2003

14 HDBS School Buses

- Include Vehicle Type: School Bus
- Fuel: All Types
- Source: R.L. Polk TIPNet as of March 2003

15 HDBT Transit & Urban Buses

- Include Vehicle Type: Bus Non-School (Coach)
- Fuel: All Types
- Source: R.L. Polk TIPNet as of March 2003

Number	Abbreviation	Description

16 **MC** **Motorcycles (All)**

- Fuel: All Types
- Source: R.L. Polk NVPP as of October 2002

The data acquired from Polk was queried to determine the number of vehicles registered in the 5-county Macon metropolitan statistical area by age and MOBILE6 vehicle type. Results of this query were used to develop MOBILE6 registration distribution by age inputs. For each of the 16 composite MOBILE6 vehicle types, the fraction of all vehicles of that type which are zero-to-one model year old, two model years old, three model years old, etc., up to the oldest category, 25-model-years-and-older, was determined. The resulting MOBILE6 input data is shown on the following two pages. Note that the Polk-derived distribution for Class 8b vehicles (MOBILE6 vehicle type 13) is commented out; in accordance with EPA guidance, MOBILE6 defaults were used for this vehicle type.

```
REG DIST
*
* The file REGDATA.D contains the default MOBILE6 values for the distribution of
* vehicles by age for July of any calendar year.  There are sixteen (16)
* sets of values representing 16 combined gasoline/diesel vehicle class
* distributions.  These distributions are split for gasoline and diesel
* using the separate input (or default) values for diesel sales fractions.
* Each distribution contains 25 values which represent the fraction of
* all vehicles in that class (gasoline and diesel) of that age in July.
* The first number is for age 1 (calendar year minus model year plus one)
* and the last number is for age 25.  The last age includes all vehicles
* of age 25 or older.  The first number in each distribution is an integer
* which indicates which of the 16 vehicle classes are represented by the
* distribution.  The sixteen vehicle classes are:
*
*  1  LDV    Light-Duty Vehicles (Passenger Cars)
*  2  LDT1   Light-Duty Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)
*  3  LDT2   Light Duty Trucks 2 (0-6,001 lbs. GVWR, 3751-5750 lbs. LVW)
*  4  LDT3   Light Duty Trucks 3 (6,001-8500 lbs. GVWR, 0-3750 lbs. LVW)
*  5  LDT4   Light Duty Trucks 4 (6,001-8500 lbs. GVWR, 3751-5750 lbs. LVW)
*  6  HDV2B  Class 2b Heavy Duty Vehicles (8501-10,000 lbs. GVWR)
*  7  HDV3   Class 3 Heavy Duty Vehicles (10,001-14,000 lbs. GVWR)
*  8  HDV4   Class 4 Heavy Duty Vehicles (14,001-16,000 lbs. GVWR)
*  9  HDV5   Class 5 Heavy Duty Vehicles (16,001-19,500 lbs. GVWR)
* 10  HDV6   Class 6 Heavy Duty Vehicles (19,501-26,000 lbs. GVWR)
* 11  HDV7   Class 7 Heavy Duty Vehicles (26,001-33,000 lbs. GVWR)
* 12  HDV8A  Class 8a Heavy Duty Vehicles (33,001-60,000 lbs. GVWR)
* 13  HDV8B  Class 8b Heavy Duty Vehicles (>60,000 lbs. GVWR)
* 14  HDBS   School Busses
* 15  HDBT   Transit and Urban Busses
* 16  MC     Motorcycles (All)
*
* The 25 age values are arranged in two rows of 10 values followed by a row
* with the last 5 values.  Comments (such as this one) are indicated by
* an asterisk in the first column. Empty rows are ignored.  Values are
* read "free format," meaning any number may appear in any row with as
* many characters as needed (including a decimal) as long as 25 values
* follow the initial integer value separated by a space.
*
* If all 16 vehicle classes do not need to be altered from the default
* values, then only the vehicle classes that need to be changed need to
* be included in this file.  The order in which the vehicle classes are
* read does not matter, however each vehicle class set must contain 25
* values and be in the proper age order.
* ------------------------------------------------------------------------
*
* This file specifies the local registration distribution by age
* (MOBILE6 defaults for heavy-heavy-duties) for the five counties in the
* Macon metropolitan statistical area:
*
* Bibb, Crawford, Jones, Monroe, and Twiggs.
*
* Sources of registration data:  R. L. Polk & Co.'s National Vehicle
* Population Profile (R) as of October 2002 and R. L. Polk & Co.'s
* TIPNet (R) as of March 2003.
*
* LDV
1  0.0112  0.0450  0.0495  0.0605  0.0596  0.0566  0.0620  0.0617  0.0715  0.0634
   0.0576  0.0523  0.0465  0.0444  0.0428  0.0362  0.0317  0.0265  0.0235  0.0191
   0.0114  0.0069  0.0067  0.0053  0.0481

* LDT1
2  0.0218  0.0901  0.0860  0.0933  0.0761  0.0746  0.0658  0.0623  0.0585  0.0564
```

```
   0.0480  0.0354  0.0349  0.0239  0.0292  0.0264  0.0232  0.0202  0.0140  0.0108
   0.0065  0.0040  0.0029  0.0026  0.0333

* LDT2
3  0.0007  0.0030  0.0144  0.0168  0.0174  0.0476  0.0628  0.0002  0.0137  0.0341
   0.0533  0.0499  0.0498  0.0735  0.0745  0.0753  0.0587  0.0718  0.0692  0.0678
   0.0519  0.0431  0.0506  0.0000  0.0000

* LDT3
4  0.0412  0.0996  0.0960  0.0882  0.0987  0.0604  0.0724  0.0689  0.0721  0.0608
   0.0342  0.0257  0.0156  0.0185  0.0196  0.0169  0.0188  0.0235  0.0241  0.0173
   0.0119  0.0080  0.0074  0.0000  0.0002

* LDT4
5  0.0316  0.0350  0.0380  0.0525  0.0518  0.0456  0.0493  0.0532  0.0895  0.0764
   0.0609  0.0513  0.0466  0.0633  0.0641  0.0493  0.0296  0.0288  0.0232  0.0298
   0.0148  0.0096  0.0059  0.0000  0.0000

* HDV2B
6  0.0348  0.0629  0.0631  0.0773  0.0843  0.0320  0.0683  0.0588  0.0657  0.0425
   0.0397  0.0273  0.0263  0.0232  0.0428  0.0451  0.0304  0.0425  0.0428  0.0335
   0.0211  0.0170  0.0160  0.0005  0.0021

* HDV3
7  0.0264  0.0708  0.0895  0.0977  0.1181  0.0302  0.0527  0.0340  0.0461  0.0489
   0.0412  0.0291  0.0132  0.0324  0.0351  0.0362  0.0313  0.0483  0.0258  0.0242
   0.0115  0.0110  0.0038  0.0038  0.0384

* HDV4
8  0.0153  0.0366  0.0543  0.0803  0.0874  0.0366  0.0649  0.0519  0.0673  0.0496
   0.0531  0.0401  0.0366  0.0366  0.0579  0.0661  0.0319  0.0165  0.0213  0.0283
   0.0153  0.0130  0.0059  0.0000  0.0331

* HDV5
9  0.0116  0.0417  0.0625  0.0509  0.0718  0.0301  0.0880  0.0625  0.0440  0.0208
   0.0255  0.0463  0.0093  0.0069  0.0069  0.0139  0.0046  0.0185  0.0139  0.0185
   0.0162  0.0093  0.0162  0.0000  0.3102

* HDV6
10 0.0091  0.0196  0.0309  0.0603  0.0708  0.0400  0.0238  0.0231  0.0372  0.0288
   0.0196  0.0217  0.0224  0.0133  0.0154  0.0330  0.0365  0.0295  0.0295  0.0224
   0.0175  0.0133  0.0112  0.0042  0.3668

* HDV7
11 0.0118  0.0217  0.0355  0.0631  0.0502  0.0315  0.0325  0.0325  0.0562  0.0286
   0.0335  0.0305  0.0365  0.0552  0.0365  0.0571  0.0690  0.0463  0.0512  0.0325
   0.0256  0.0315  0.0207  0.0453  0.0650

* HDV8A
12 0.0190  0.0086  0.0455  0.0516  0.0436  0.0479  0.0516  0.0694  0.0903  0.0792
   0.0805  0.0461  0.0387  0.0461  0.0498  0.0344  0.0461  0.0283  0.0283  0.0283
   0.0123  0.0068  0.0092  0.0061  0.0326

* HDV8B
*13 0.0139  0.0197  0.0557  0.0452  0.0719  0.0406  0.0557  0.0418  0.0719  0.0487
*   0.0557  0.0302  0.0244  0.0371  0.0383  0.0696  0.0371  0.0267  0.0418  0.0244
*   0.0081  0.0070  0.0139  0.0162  0.1044

* HDBS
14 0.0226  0.0661  0.0871  0.0661  0.0403  0.0452  0.0548  0.0613  0.0919  0.0113
   0.0371  0.0532  0.1290  0.0371  0.0323  0.0484  0.0097  0.0194  0.0113  0.0129
   0.0177  0.0081  0.0065  0.0048  0.0258
```

```
* HDBT
15 0.0000  0.0449  0.0000  0.0787  0.1236  0.0112  0.0337  0.0674  0.0225  0.0000
   0.0674  0.0562  0.0225  0.0674  0.0787  0.0449  0.0225  0.0112  0.0674  0.0337
   0.0225  0.0562  0.0674  0.0000  0.0000

* MC
16 0.0005  0.0992  0.1223  0.0907  0.0818  0.0514  0.0500  0.0514  0.0422  0.0381
   0.0321  0.3403  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
```

Appendix E, Exhibit 4
Abbreviated MOBILE6 Input Files
for Bibb County Emissions
for Eight-Hour Ozone

2003 Arterials/Collectors, Ramps and Local Roads

```
*
* 7-1-03, Macon arterials/collectors, '02 Macon MSA reg. dist. (default for Class 8b), default VMT
mix (03artmac.in)
*
MOBILE6 INPUT FILE :
> This won't take long...
*
POLLUTANTS         : HC CO NOx

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
FUEL RVP           : 9.0

*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d


*_____________________________________________________________________
*
SCENARIO REC       : arterial, Macon, 2003, 2.5 mph
> 7-1-03, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (03artmac.in)
*
CALENDAR YEAR      : 2003
EVALUATION MONTH   : 7
* next lines show average hourly rel. humidity for 10 highest Macon ozone days 2000-2002
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
* next line shows average daily barometric pressure for 10 highest Macon ozone days 2000-2002
BAROMETRIC PRES    : 29.58
AVERAGE SPEED      : 2.5 Arterial 0.0 100.0 0.0 0.0
```

2003 Freeways

```
*
* 7-1-03, Macon freeways, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix
(03fwymac.in)
*
MOBILE6 INPUT FILE :
> This won't take long...
*
POLLUTANTS         : HC CO NOx

RUN DATA
*
```

```
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
FUEL RVP           : 9.0

*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*_____________________________________________________________________
*
SCENARIO REC       : freeway, Macon, 2003, 2.5 mph
> 7-1-03, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (03fwymac.in)
*
CALENDAR YEAR      : 2003
EVALUATION MONTH   : 7
* next lines show average hourly rel. humidity for 10 highest Macon ozone days 2000-2002
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
* next line shows average daily barometric pressure for 10 highest Macon ozone days 2000-2002
BAROMETRIC PRES    : 29.58
AVERAGE SPEED      : 2.5 Non-Ramp 100.0 0.0 0.0 0.0

*
```

Year 2009 Arterials/Collectors, Ramps and Local Roads

```
*
* 7-1-09, Macon arterials/collectors, '02 Macon MSA reg. dist. (default for Class 8b), default VMT
mix (09artmac.in)
*
MOBILE6 INPUT FILE :
> This won't take long...
*
POLLUTANTS         : HC CO NOx
*PARTICULATES       :

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
FUEL RVP           : 9.0

*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*_____________________________________________________________________
*
SCENARIO REC       : arterial, Macon, 2009, 2.5 mph
> 7-1-09, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (09artmac.in)
*
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
ALTITUDE           : 1
* next lines show average hourly rel. humidity for 10 highest Macon ozone days 2000-2002
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
* next line shows average daily barometric pressure for 10 highest Macon ozone days 2000-2002
BAROMETRIC PRES    : 29.58
*SULFUR CONTENT     : 150.0
PARTICLE SIZE      : 2.5
*PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43.00
AVERAGE SPEED      : 2.5 Arterial 0.0 100.0 0.0 0.0
```

```
*
```

Year 2009 Freeways

```
*
* 7-1-09, Macon freeways, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix
(09fwymac.in)
*
MOBILE6 INPUT FILE :
> This won't take long...
*
POLLUTANTS         : HC CO NOx
*PARTICULATES       :

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
FUEL RVP           : 9.0

*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*_____________________________________________________________________
*
SCENARIO REC       : freeway, Macon, 2009, 2.5 mph
> 7-1-09, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (09fwymac.in)
*
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
ALTITUDE           : 1
* next lines show average hourly rel. humidity for 10 highest Macon ozone days 2000-2002
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
* next line shows average daily barometric pressure for 10 highest Macon ozone days 2000-2002
BAROMETRIC PRES    : 29.58
*SULFUR CONTENT     : 150.0
PARTICLE SIZE      : 2.5
*PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 43.00
AVERAGE SPEED      : 2.5 Non-Ramp 100.0 0.0 0.0 0.0
*
```

2015 Arterials/Collectors, Ramps and Local Roads

```
*
* 7-1-15, Macon arterials/collectors, '02 Macon MSA reg. dist. (default for Class 8b), default VMT
mix (15artmac.in)
*
MOBILE6 INPUT FILE :
> This won't take long...
*
POLLUTANTS         : HC CO NOx
*PARTICULATES       :

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
FUEL RVP           : 9.0
```

```
*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*-------------------------------------------------------------------------------
*
SCENARIO REC       : arterial, Macon, 2015, 2.5 mph
> 7-1-15, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (15artmac.in)
*
CALENDAR YEAR      : 2015
EVALUATION MONTH   : 7
ALTITUDE           : 1
* next lines show average hourly rel. humidity for 10 highest Macon ozone days 2000-2002
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
* next line shows average daily barometric pressure for 10 highest Macon ozone days 2000-2002
BAROMETRIC PRES    : 29.58
*SULFUR CONTENT     : 150.0
PARTICLE SIZE      : 2.5
*PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 15.00
AVERAGE SPEED      : 2.5 Arterial 0.0 100.0 0.0 0.0
*
```

Year 2015 Freeways

```
*
* 7-1-15, Macon freeways, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix
(15fwymac.in)
*
MOBILE6 INPUT FILE :
> This won't take long...
*
POLLUTANTS         : HC CO NOx
*PARTICULATES       :

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
FUEL RVP           : 9.0

*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*-------------------------------------------------------------------------------
*
SCENARIO REC       : freeway, Macon, 2015, 2.5 mph
> 7-1-15, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (15fwymac.in)
*
CALENDAR YEAR      : 2015
EVALUATION MONTH   : 7
ALTITUDE           : 1
* next lines show average hourly rel. humidity for 10 highest Macon ozone days 2000-2002
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
* next line shows average daily barometric pressure for 10 highest Macon ozone days 2000-2002
BAROMETRIC PRES    : 29.58
*SULFUR CONTENT     : 150.0
PARTICLE SIZE      : 2.5
*PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
DIESEL SULFUR      : 15.00
AVERAGE SPEED      : 2.5 Non-Ramp 100.0 0.0 0.0 0.0
*
```

2020 Arterials/Collectors, Ramps and Local Roads

```
*
* 7-1-20, Macon arterials/collectors, '02 Macon MSA reg. dist. (default for Class 8b), default VMT
mix (20artmac.in)
*
MOBILE6 INPUT FILE :
> This won't take long...
*
POLLUTANTS         : HC CO NOx

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
FUEL RVP           : 9.0

*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*_____________________________________________________________________
*
SCENARIO REC       : arterial, Macon, 2020, 2.5 mph
> 7-1-20, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (20artmac.in)
*
CALENDAR YEAR      : 2020
EVALUATION MONTH   : 7
* next lines show average hourly rel. humidity for 10 highest Macon ozone days 2000-2002
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
* next line shows average daily barometric pressure for 10 highest Macon ozone days 2000-2002
BAROMETRIC PRES    : 29.58
AVERAGE SPEED      : 2.5 Arterial 0.0 100.0 0.0 0.0
*_____________________________________________________________________
```

2020 Freeways

```
*
* 7-1-20, Macon freeways, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix
(20fwymac.in)
*
MOBILE6 INPUT FILE :
> This won't take long...
*
POLLUTANTS         : HC CO NOx

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
FUEL RVP           : 9.0

*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d

*_____________________________________________________________________
*
SCENARIO REC       : freeway, Macon, 2020, 2.5 mph
> 7-1-20, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (20fwymac.in)
*
```

```
CALENDAR YEAR      : 2020
EVALUATION MONTH   : 7
* next lines show average hourly rel. humidity for 10 highest Macon ozone days 2000-2002
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
* next line shows average daily barometric pressure for 10 highest Macon ozone days 2000-2002
BAROMETRIC PRES    : 29.58
AVERAGE SPEED      : 2.5 Non-Ramp 100.0 0.0 0.0 0.0
*
```

Appendix E, Exhibit 5
MOBILE6 Input Files for Monroe County Emissions

2003 Arterials and Collectors

```
* 7-1-03, Monroe arterials/collectors and locals, '02 Macon MSA reg. dist. (default for Class 8b),
default VMT mix (03monroe.in)
*
MOBILE6 INPUT FILE :

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
*
* Reid Vapor Pressure of 7.0 psi is a requirement for Georgia gasoline, Phases 1 and 2
*
FUEL RVP           : 7.0

FUEL PROGRAM       : 4
   150.0  150.0  150.0   90.0   30.0   30.0   30.0   30.0
    30.0   30.0   30.0   30.0   30.0   30.0   30.0   30.0
  1000.0 1000.0 1000.0 1000.0  150.0  150.0   87.0   87.0
    80.0   80.0   80.0   80.0   80.0   80.0   80.0   80.0

*
* In 1999 there were 25 counties with Phase 1 Georgia gasoline.  These counties included
* the 13-county Atlanta ozone 7-county Atlanta area: Cherokee (13057), Clayton (13063),
* Cobb (13067), Coweta (13077), DeKalb (13089), Douglas (13097), Fayette (13113),
* Forsyth (13117), Fulton (13121), Gwinnett (13135), Henry (13151), Paulding (13223),
* and Rockdale (13247);
*
* ...plus 12 attainment area counties:  Barrow (13013), Bartow (13015),
* Butts (13035), Carroll (13045), Dawson (13085), Hall (13139), Haralson (13143),
* Jackson (13157), Newton (13217), Pickens (13227), Spalding (13255), and
* Walton (13297).
*
* In 2003 there will be 20 additional attainment area counties with fuel controls
* (Phase 2):  Banks (13011), Chattooga (13055), Clarke (13059), Floyd (13115),
* Gordon (13129), Heard (13149), Jasper (13159), Jones (13169), Lamar (13171),
* Lumpkin (13187), Madison (13195), Meriwether (13199), Monroe (13207), Morgan (13211),
* Oconee (13219), Pike (13231), Polk (13233), Putnam (13237), Troup (13285), and
* Upson (13293);
*

* ...for a total of 45 counties with 7.0 psi RVP/low sulfur Georgia gasoline.
*
* Georgia gasoline, Phase 1
* 150 ppm average sulfur June 1 through September 15, 352 average rest
* of year until, effectively, June 1, 2003.
*
*
* Georgia gasoline, Phase 2
```

```
* a.  90 ppm average sulfur, 200 ppm per-gallon cap, effective 6-1-03.
*
* b.  30 ppm average sulfur, year round effective 1-1-04; 150 ppm per-gallon cap.
*
* c.  Seasonal 80 ppm per-gallon cap effective 6-1-04 for the period June 1 through
*     September 15.
*
*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*_____________________________________________________________________
*
SCENARIO REC       : arterial, Monroe, 2003, 35 mph
> 7-1-03, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (03monroe.in)
*
CALENDAR YEAR      : 2003
EVALUATION MONTH   : 7
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
BAROMETRIC PRES    : 29.58
AVERAGE SPEED      : 35 Arterial 0.0 100.0 0.0 0.0

*_____________________________________________________________________
*
SCENARIO REC       : local, Monroe, 2003, no speed input
> 7-1-03, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (03monroe.in)
*
CALENDAR YEAR      : 2003
EVALUATION MONTH   : 7
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
BAROMETRIC PRES    : 29.58
*
* Note that 12.9 is the default MOBILE6 average speed for local streets.
*
AVERAGE SPEED      : 12.9 local

END OF RUN
```

2009 Arterials and Collectors

```
* 7-1-09, Macon arterials/collectors, '02 Macon MSA reg. dist. (default for Class 8b), default VMT
mix (09monroe.in)
*
MOBILE6 INPUT FILE :

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
*
* Reid Vapor Pressure of 7.0 psi is a requirement for Georgia gasoline, Phases 1 and 2
*
FUEL RVP           : 7.0

FUEL PROGRAM       : 4
   150.0  150.0  150.0   90.0   30.0   30.0   30.0   30.0
    30.0   30.0   30.0   30.0   30.0   30.0   30.0   30.0
  1000.0 1000.0 1000.0 1000.0  150.0  150.0   87.0   87.0
    80.0   80.0   80.0   80.0   80.0   80.0   80.0   80.0
```

```
*
* In 1999 there were 25 counties with Phase 1 Georgia gasoline.  These counties included
* the 13-county Atlanta ozone 7-county Atlanta area: Cherokee (13057), Clayton (13063),
* Cobb (13067), Coweta (13077), DeKalb (13089), Douglas (13097), Fayette (13113),
* Forsyth (13117), Fulton (13121), Gwinnett (13135), Henry (13151), Paulding (13223),
* and Rockdale (13247);
*
* ...plus 12 attainment area counties:  Barrow (13013), Bartow (13015),
* Butts (13035), Carroll (13045), Dawson (13085), Hall (13139), Haralson (13143),
* Jackson (13157), Newton (13217), Pickens (13227), Spalding (13255), and
* Walton (13297).
*
* In 2003 there will be 20 additional attainment area counties with fuel controls
* (Phase 2):  Banks (13011), Chattooga (13055), Clarke (13059), Floyd (13115),
* Gordon (13129), Heard (13149), Jasper (13159), Jones (13169), Lamar (13171),
* Lumpkin (13187), Madison (13195), Meriwether (13199), Monroe (13207), Morgan (13211),
* Oconee (13219), Pike (13231), Polk (13233), Putnam (13237), Troup (13285), and
* Upson (13293);
*

* ...for a total of 45 counties with 7.0 psi RVP/low sulfur Georgia gasoline.
*
* Georgia gasoline, Phase 1
* 150 ppm average sulfur June 1 through September 15, 352 average rest
* of year until, effectively, June 1, 2003.
*
*
* Georgia gasoline, Phase 2
* a.  90 ppm average sulfur, 200 ppm per-gallon cap, effective 6-1-03.
*
* b.  30 ppm average sulfur, year round effective 1-1-04; 150 ppm per-gallon cap.
*
* c.  Seasonal 80 ppm per-gallon cap effective 6-1-04 for the period June 1 through
*     September 15.
*

*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*_____________________________________________________________________________
*
SCENARIO REC       : arterial, Macon, 2009, 35 mph
> 7-1-09, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (09monroe.in)
*
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
ALTITUDE           : 1
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
BAROMETRIC PRES    : 29.58
AVERAGE SPEED      : 35 Arterial 0.0 100.0 0.0 0.0

*_____________________________________________________________________________
*
SCENARIO REC       : local, Macon, 2009, no speed input
> 7-1-09, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (09monroe.in)
*
CALENDAR YEAR      : 2009
EVALUATION MONTH   : 7
ALTITUDE           : 1
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
BAROMETRIC PRES    : 29.58
*
```

```
* Note that 12.9 is the default MOBILE6 average speed for local streets.
*
AVERAGE SPEED      : 12.9 local

END OF RUN
```

2015 Arterials and Collectors

```
*
* 7-1-15, Macon arterials/collectors, '02 Macon MSA reg. dist. (default for Class 8b), default VMT
mix (15monroe.in)
*
MOBILE6 INPUT FILE :

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                     90  85  81  80  77  75  73  72  71  69  69  68
*
* Reid Vapor Pressure of 7.0 psi is a requirement for Georgia gasoline, Phases 1 and 2
*
FUEL RVP           : 7.0

FUEL PROGRAM       : 4
   150.0  150.0  150.0   90.0   30.0   30.0   30.0   30.0
    30.0   30.0   30.0   30.0   30.0   30.0   30.0   30.0
  1000.0 1000.0 1000.0 1000.0  150.0  150.0   87.0   87.0
    80.0   80.0   80.0   80.0   80.0   80.0   80.0   80.0

*
* In 1999 there were 25 counties with Phase 1 Georgia gasoline.  These counties included
* the 13-county Atlanta ozone 7-county Atlanta area: Cherokee (13057), Clayton (13063),
* Cobb (13067), Coweta (13077), DeKalb (13089), Douglas (13097), Fayette (13113),
* Forsyth (13117), Fulton (13121), Gwinnett (13135), Henry (13151), Paulding (13223),
* and Rockdale (13247);
*
* ...plus 12 attainment area counties:  Barrow (13013), Bartow (13015),
* Butts (13035), Carroll (13045), Dawson (13085), Hall (13139), Haralson (13143),
* Jackson (13157), Newton (13217), Pickens (13227), Spalding (13255), and
* Walton (13297).
*
* In 2003 there will be 20 additional attainment area counties with fuel controls
* (Phase 2):  Banks (13011), Chattooga (13055), Clarke (13059), Floyd (13115),
* Gordon (13129), Heard (13149), Jasper (13159), Jones (13169), Lamar (13171),
* Lumpkin (13187), Madison (13195), Meriwether (13199), Monroe (13207), Morgan (13211),
* Oconee (13219), Pike (13231), Polk (13233), Putnam (13237), Troup (13285), and
* Upson (13293);
*

* ...for a total of 45 counties with 7.0 psi RVP/low sulfur Georgia gasoline.
*
* Georgia gasoline, Phase 1
* 150 ppm average sulfur June 1 through September 15, 352 average rest
* of year until, effectively, June 1, 2003.
*
*
* Georgia gasoline, Phase 2
* a.  90 ppm average sulfur, 200 ppm per-gallon cap, effective 6-1-03.
*
* b.  30 ppm average sulfur, year round effective 1-1-04; 150 ppm per-gallon cap.
*
```

```
* c.  Seasonal 80 ppm per-gallon cap effective 6-1-04 for the period June 1 through
*     September 15.
*
*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*
SCENARIO REC       : local, Macon, 2015, no speed input
> 7-1-15, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (15monroe.in)
*
CALENDAR YEAR      : 2015
EVALUATION MONTH   : 7
ALTITUDE           : 1
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                       45  58  67  67  76  80  83  83  85  88  89  91
BAROMETRIC PRES    : 29.58
*
* Note that 12.9 is the default MOBILE6 average speed for local streets.
*
AVERAGE SPEED      : 12.9 local

END OF RUN
```

2020 Arterials and Collectors

```
*
* 7-1-20, Monroe arterials/collectors and locals, '02 Macon MSA reg. dist. (default for Class 8b),
default VMT mix (20monroe.in)
*
MOBILE6 INPUT FILE :

RUN DATA
>
*
* next lines show average hourly temp. for 10 highest Macon ozone days 2000-2002
HOURLY TEMPERATURES: 70  76  82  87  91  93  95  96  97  98  97  94
                       90  85  81  80  77  75  73  72  71  69  69  68
*
* Reid Vapor Pressure of 7.0 psi is a requirement for Georgia gasoline, Phases 1 and 2
*
FUEL RVP           : 7.0

FUEL PROGRAM       : 4
   150.0  150.0  150.0   90.0   30.0   30.0   30.0   30.0
    30.0   30.0   30.0   30.0   30.0   30.0   30.0   30.0
  1000.0 1000.0 1000.0 1000.0  150.0  150.0   87.0   87.0
    80.0   80.0   80.0   80.0   80.0   80.0   80.0   80.0

*
* In 1999 there were 25 counties with Phase 1 Georgia gasoline.  These counties included
* the 13-county Atlanta ozone 7-county Atlanta area: Cherokee (13057), Clayton (13063),
* Cobb (13067), Coweta (13077), DeKalb (13089), Douglas (13097), Fayette (13113),
* Forsyth (13117), Fulton (13121), Gwinnett (13135), Henry (13151), Paulding (13223),
* and Rockdale (13247);
*
* ...plus 12 attainment area counties:  Barrow (13013), Bartow (13015),
* Butts (13035), Carroll (13045), Dawson (13085), Hall (13139), Haralson (13143),
* Jackson (13157), Newton (13217), Pickens (13227), Spalding (13255), and
* Walton (13297).
*
* In 2003 there will be 20 additional attainment area counties with fuel controls
* (Phase 2):  Banks (13011), Chattooga (13055), Clarke (13059), Floyd (13115),
* Gordon (13129), Heard (13149), Jasper (13159), Jones (13169), Lamar (13171),
```

```
* Lumpkin (13187), Madison (13195), Meriwether (13199), Monroe (13207), Morgan (13211),
* Oconee (13219), Pike (13231), Polk (13233), Putnam (13237), Troup (13285), and
* Upson (13293);
*

* ...for a total of 45 counties with 7.0 psi RVP/low sulfur Georgia gasoline.
*
* Georgia gasoline, Phase 1
* 150 ppm average sulfur June 1 through September 15, 352 average rest
* of year until, effectively, June 1, 2003.
*
*
* Georgia gasoline, Phase 2
* a.  90 ppm average sulfur, 200 ppm per-gallon cap, effective 6-1-03.
*
* b.  30 ppm average sulfur, year round effective 1-1-04; 150 ppm per-gallon cap.
*
* c.  Seasonal 80 ppm per-gallon cap effective 6-1-04 for the period June 1 through
*     September 15.
*
*REG DIST           : 02maccsa.d
REG DIST           : 02macmsa.d
*
SCENARIO REC       : arterial, Monroe, 2020, 35 mph
> 7-1-20, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (20monroe.in)
*
CALENDAR YEAR      : 2020
EVALUATION MONTH   : 7
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
BAROMETRIC PRES    : 29.58
AVERAGE SPEED      : 35 Arterial 0.0 100.0 0.0 0.0

*_____________________________________________________________________________
*
SCENARIO REC       : local, Monroe, 2020, no speed input
> 7-1-20, '02 Macon MSA reg. dist. (default for Class 8b), default VMT mix (20monroe.in)
*
CALENDAR YEAR      : 2020
EVALUATION MONTH   : 7
RELATIVE HUMIDITY  : 88  75  61  51  42  39  35  32  31  30  31  36
                     45  58  67  67  76  80  83  83  85  88  89  91
BAROMETRIC PRES    : 29.58
*
* Note that 12.9 is the default MOBILE6 average speed for local streets.
*
AVERAGE SPEED      : 12.9 local

END OF RUN
```

Appendix E, Exhibit 6
Emission Factors for Eight-Hour Ozone

MOBILE6 Composite Emission Factors for 2003 for Bibb County
By Speed and Facility Type

	Arterial		Freeway		Local		Ramp	
Speed	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
2.5	22.89	4.789	22.889	5.032	4.028	2.671	2.762	2.617
3	18.129	4.602	18.129	4.845	4.028	2.671	2.762	2.617
4	12.178	4.369	12.178	4.612	4.028	2.671	2.762	2.617
5	8.607	4.23	8.607	4.472	4.028	2.671	2.762	2.617
6	7.32	3.99	7.285	4.156	4.028	2.671	2.762	2.617
7	6.4	3.82	6.34	3.93	4.028	2.671	2.762	2.617
8	5.711	3.692	5.632	3.76	4.028	2.671	2.762	2.617
9	5.174	3.592	5.081	3.629	4.028	2.671	2.762	2.617
10	4.745	3.512	4.64	3.523	4.028	2.671	2.762	2.617
11	4.467	3.39	4.356	3.386	4.028	2.671	2.762	2.617
12	4.236	3.288	4.12	3.272	4.028	2.671	2.762	2.617
13	4.04	3.201	3.92	3.175	4.028	2.671	2.762	2.617
14	3.872	3.127	3.748	3.092	4.028	2.671	2.762	2.617
15	3.726	3.063	3.6	3.02	4.028	2.671	2.762	2.617
16	3.58	2.998	3.47	2.989	4.028	2.671	2.762	2.617
17	3.45	2.942	3.356	2.963	4.028	2.671	2.762	2.617
18	3.335	2.891	3.255	2.939	4.028	2.671	2.762	2.617
19	3.233	2.846	3.164	2.917	4.028	2.671	2.762	2.617
20	3.14	2.805	3.082	2.898	4.028	2.671	2.762	2.617
21	3.073	2.767	3.025	2.879	4.028	2.671	2.762	2.617
22	3.012	2.733	2.973	2.863	4.028	2.671	2.762	2.617
23	2.957	2.702	2.926	2.847	4.028	2.671	2.762	2.617
24	2.906	2.673	2.882	2.833	4.028	2.671	2.762	2.617
25	2.859	2.647	2.842	2.82	4.028	2.671	2.762	2.617
26	2.817	2.626	2.804	2.81	4.028	2.671	2.762	2.617
27	2.779	2.606	2.769	2.802	4.028	2.671	2.762	2.617
28	2.743	2.587	2.736	2.794	4.028	2.671	2.762	2.617
29	2.71	2.57	2.705	2.786	4.028	2.671	2.762	2.617
30	2.679	2.554	2.677	2.779	4.028	2.671	2.762	2.617
31	2.646	2.547	2.644	2.776	4.028	2.671	2.762	2.617
32	2.615	2.541	2.614	2.773	4.028	2.671	2.762	2.617
33	2.586	2.535	2.585	2.771	4.028	2.671	2.762	2.617
34	2.558	2.529	2.558	2.769	4.028	2.671	2.762	2.617
35	2.532	2.523	2.532	2.766	4.028	2.671	2.762	2.617
36	2.512	2.532	2.512	2.775	4.028	2.671	2.762	2.617
37	2.493	2.54	2.493	2.783	4.028	2.671	2.762	2.617
38	2.475	2.547	2.475	2.79	4.028	2.671	2.762	2.617
39	2.458	2.554	2.458	2.797	4.028	2.671	2.762	2.617
40	2.442	2.561	2.442	2.804	4.028	2.671	2.762	2.617
41	2.425	2.579	2.425	2.822	4.028	2.671	2.762	2.617
42	2.409	2.595	2.409	2.838	4.028	2.671	2.762	2.617
43	2.393	2.611	2.393	2.854	4.028	2.671	2.762	2.617

Speed	Arterial		Freeway		Local		Ramp	
	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
44	2.379	2.626	2.379	2.869	4.028	2.671	2.762	2.617
45	2.365	2.641	2.365	2.884	4.028	2.671	2.762	2.617
46	2.349	2.667	2.349	2.91	4.028	2.671	2.762	2.617
47	2.335	2.693	2.335	2.936	4.028	2.671	2.762	2.617
48	2.32	2.717	2.32	2.96	4.028	2.671	2.762	2.617
49	2.307	2.741	2.307	2.984	4.028	2.671	2.762	2.617
50	2.293	2.763	2.293	3.006	4.028	2.671	2.762	2.617
51	2.28	2.802	2.28	3.045	4.028	2.671	2.762	2.617
52	2.266	2.839	2.266	3.082	4.028	2.671	2.762	2.617
53	2.254	2.874	2.254	3.117	4.028	2.671	2.762	2.617
54	2.241	2.909	2.241	3.151	4.028	2.671	2.762	2.617
55	2.23	2.942	2.23	3.184	4.028	2.671	2.762	2.617
56	2.219	2.996	2.219	3.239	4.028	2.671	2.762	2.617
57	2.209	3.048	2.209	3.291	4.028	2.671	2.762	2.617
58	2.199	3.099	2.199	3.342	4.028	2.671	2.762	2.617
59	2.19	3.148	2.19	3.39	4.028	2.671	2.762	2.617
60	2.181	3.195	2.181	3.438	4.028	2.671	2.762	2.617
61	2.172	3.271	2.172	3.514	4.028	2.671	2.762	2.617
62	2.164	3.345	2.164	3.588	4.028	2.671	2.762	2.617
63	2.156	3.417	2.156	3.66	4.028	2.671	2.762	2.617
64	2.148	3.486	2.148	3.729	4.028	2.671	2.762	2.617
65	2.141	3.553	2.141	3.796	4.028	2.671	2.762	2.617

MOBILE6 Composite Emission Factors for 2009 for Bibb County
By Speed and Facility Type

	Arterial		Freeway		Local		Ramp	
Speed	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
2.50	15.095	3.186	15.095	3.271	2.570	1.817	1.763	1.760
3.00	11.890	3.059	11.890	3.145	2.570	1.817	1.763	1.760
4.00	7.885	2.901	7.885	2.986	2.570	1.817	1.763	1.760
5.00	5.481	2.806	5.481	2.891	2.570	1.817	1.763	1.760
6.00	4.659	2.645	4.638	2.677	2.570	1.817	1.763	1.760
7.00	4.072	2.530	4.036	2.524	2.570	1.817	1.763	1.760
8.00	3.632	2.444	3.585	2.409	2.570	1.817	1.763	1.760
9.00	3.289	2.377	3.234	2.320	2.570	1.817	1.763	1.760
10.00	3.015	2.323	2.953	2.249	2.570	1.817	1.763	1.760
11.00	2.846	2.241	2.780	2.156	2.570	1.817	1.763	1.760
12.00	2.705	2.172	2.636	2.079	2.570	1.817	1.763	1.760
13.00	2.586	2.114	2.514	2.013	2.570	1.817	1.763	1.760
14.00	2.483	2.064	2.410	1.957	2.570	1.817	1.763	1.760
15.00	2.395	2.021	2.319	1.909	2.570	1.817	1.763	1.760
16.00	2.307	1.977	2.242	1.889	2.570	1.817	1.763	1.760
17.00	2.229	1.939	2.173	1.871	2.570	1.817	1.763	1.760
18.00	2.160	1.905	2.112	1.856	2.570	1.817	1.763	1.760
19.00	2.098	1.875	2.058	1.842	2.570	1.817	1.763	1.760
20.00	2.043	1.847	2.009	1.829	2.570	1.817	1.763	1.760
21.00	2.001	1.822	1.973	1.817	2.570	1.817	1.763	1.760
22.00	1.964	1.799	1.941	1.806	2.570	1.817	1.763	1.760
23.00	1.929	1.778	1.912	1.796	2.570	1.817	1.763	1.760
24.00	1.898	1.759	1.885	1.787	2.570	1.817	1.763	1.760
25.00	1.869	1.741	1.860	1.778	2.570	1.817	1.763	1.760
26.00	1.843	1.727	1.836	1.772	2.570	1.817	1.763	1.760
27.00	1.820	1.713	1.814	1.766	2.570	1.817	1.763	1.760
28.00	1.798	1.701	1.794	1.761	2.570	1.817	1.763	1.760
29.00	1.777	1.689	1.775	1.756	2.570	1.817	1.763	1.760
30.00	1.758	1.678	1.757	1.752	2.570	1.817	1.763	1.760
31.00	1.738	1.674	1.738	1.750	2.570	1.817	1.763	1.760
32.00	1.720	1.669	1.719	1.748	2.570	1.817	1.763	1.760
33.00	1.702	1.665	1.702	1.746	2.570	1.817	1.763	1.760
34.00	1.686	1.662	1.686	1.745	2.570	1.817	1.763	1.760
35.00	1.670	1.658	1.670	1.743	2.570	1.817	1.763	1.760
36.00	1.657	1.663	1.657	1.749	2.570	1.817	1.763	1.760
37.00	1.645	1.669	1.645	1.754	2.570	1.817	1.763	1.760
38.00	1.633	1.674	1.633	1.759	2.570	1.817	1.763	1.760
39.00	1.622	1.678	1.622	1.764	2.570	1.817	1.763	1.760
40.00	1.611	1.683	1.611	1.768	2.570	1.817	1.763	1.760
41.00	1.601	1.694	1.601	1.780	2.570	1.817	1.763	1.760
42.00	1.590	1.705	1.590	1.791	2.570	1.817	1.763	1.760
43.00	1.581	1.716	1.581	1.801	2.570	1.817	1.763	1.760

	Arterial		Freeway		Local		Ramp	
Speed	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
44.00	1.571	1.726	1.571	1.811	2.570	1.817	1.763	1.760
45.00	1.563	1.735	1.563	1.821	2.570	1.817	1.763	1.760
46.00	1.552	1.753	1.552	1.838	2.570	1.817	1.763	1.760
47.00	1.543	1.770	1.543	1.855	2.570	1.817	1.763	1.760
48.00	1.533	1.786	1.533	1.871	2.570	1.817	1.763	1.760
49.00	1.524	1.801	1.524	1.887	2.570	1.817	1.763	1.760
50.00	1.516	1.816	1.516	1.902	2.570	1.817	1.763	1.760
51.00	1.506	1.842	1.506	1.927	2.570	1.817	1.763	1.760
52.00	1.497	1.866	1.497	1.951	2.570	1.817	1.763	1.760
53.00	1.488	1.889	1.488	1.975	2.570	1.817	1.763	1.760
54.00	1.480	1.912	1.480	1.997	2.570	1.817	1.763	1.760
55.00	1.472	1.934	1.472	2.019	2.570	1.817	1.763	1.760
56.00	1.465	1.970	1.465	2.055	2.570	1.817	1.763	1.760
57.00	1.458	2.004	1.458	2.089	2.570	1.817	1.763	1.760
58.00	1.452	2.037	1.452	2.123	2.570	1.817	1.763	1.760
59.00	1.445	2.070	1.445	2.155	2.570	1.817	1.763	1.760
60.00	1.439	2.101	1.439	2.186	2.570	1.817	1.763	1.760
61.00	1.433	2.151	1.433	2.236	2.570	1.817	1.763	1.760
62.00	1.428	2.200	1.428	2.285	2.570	1.817	1.763	1.760
63.00	1.423	2.247	1.423	2.332	2.570	1.817	1.763	1.760
64.00	1.418	2.292	1.418	2.378	2.570	1.817	1.763	1.760
65.00	1.413	2.337	1.413	2.422	2.570	1.817	1.763	1.760

MOBILE6 Composite Emission Factors for 2015 for Bibb County
By Speed and Facility Type

	Arterial		Freeway		Local		Ramp	
Speed	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
2.50	7.586	1.908	7.586	1.941	1.516	1.073	1.066	1.064
3.00	6.067	1.830	6.067	1.863	1.516	1.073	1.066	1.064
4.00	4.167	1.732	4.167	1.765	1.516	1.073	1.066	1.064
5.00	3.027	1.674	3.027	1.706	1.516	1.073	1.066	1.064
6.00	2.609	1.577	2.593	1.572	1.516	1.073	1.066	1.064
7.00	2.310	1.507	2.282	1.476	1.516	1.073	1.066	1.064
8.00	2.086	1.455	2.050	1.404	1.516	1.073	1.066	1.064
9.00	1.912	1.415	1.869	1.348	1.516	1.073	1.066	1.064
10.00	1.773	1.382	1.724	1.303	1.516	1.073	1.066	1.064
11.00	1.677	1.333	1.626	1.246	1.516	1.073	1.066	1.064
12.00	1.598	1.292	1.544	1.199	1.516	1.073	1.066	1.064
13.00	1.530	1.257	1.475	1.159	1.516	1.073	1.066	1.064
14.00	1.472	1.227	1.415	1.125	1.516	1.073	1.066	1.064
15.00	1.422	1.201	1.364	1.096	1.516	1.073	1.066	1.064
16.00	1.371	1.176	1.320	1.087	1.516	1.073	1.066	1.064
17.00	1.325	1.154	1.282	1.079	1.516	1.073	1.066	1.064
18.00	1.285	1.134	1.247	1.072	1.516	1.073	1.066	1.064
19.00	1.249	1.116	1.217	1.066	1.516	1.073	1.066	1.064
20.00	1.216	1.100	1.189	1.061	1.516	1.073	1.066	1.064
21.00	1.193	1.086	1.171	1.055	1.516	1.073	1.066	1.064
22.00	1.173	1.072	1.155	1.050	1.516	1.073	1.066	1.064
23.00	1.154	1.060	1.139	1.046	1.516	1.073	1.066	1.064
24.00	1.137	1.049	1.126	1.042	1.516	1.073	1.066	1.064
25.00	1.121	1.039	1.113	1.038	1.516	1.073	1.066	1.064
26.00	1.107	1.030	1.101	1.035	1.516	1.073	1.066	1.064
27.00	1.094	1.022	1.089	1.032	1.516	1.073	1.066	1.064
28.00	1.082	1.014	1.078	1.030	1.516	1.073	1.066	1.064
29.00	1.071	1.007	1.069	1.028	1.516	1.073	1.066	1.064
30.00	1.061	1.001	1.059	1.026	1.516	1.073	1.066	1.064
31.00	1.050	0.998	1.049	1.024	1.516	1.073	1.066	1.064
32.00	1.040	0.995	1.039	1.023	1.516	1.073	1.066	1.064
33.00	1.030	0.993	1.030	1.022	1.516	1.073	1.066	1.064
34.00	1.021	0.990	1.021	1.021	1.516	1.073	1.066	1.064
35.00	1.013	0.988	1.013	1.021	1.516	1.073	1.066	1.064
36.00	1.006	0.991	1.006	1.023	1.516	1.073	1.066	1.064
37.00	0.999	0.993	0.999	1.026	1.516	1.073	1.066	1.064
38.00	0.993	0.996	0.993	1.029	1.516	1.073	1.066	1.064
39.00	0.987	0.998	0.987	1.031	1.516	1.073	1.066	1.064
40.00	0.982	1.000	0.982	1.033	1.516	1.073	1.066	1.064
41.00	0.976	1.006	0.976	1.039	1.516	1.073	1.066	1.064
42.00	0.971	1.012	0.971	1.044	1.516	1.073	1.066	1.064
43.00	0.966	1.017	0.966	1.050	1.516	1.073	1.066	1.064

	Arterial		Freeway		Local		Ramp	
Speed	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**
44.00	0.961	1.022	0.961	1.055	1.516	1.073	1.066	1.064
45.00	0.956	1.027	0.956	1.060	1.516	1.073	1.066	1.064
46.00	0.951	1.035	0.951	1.068	1.516	1.073	1.066	1.064
47.00	0.946	1.044	0.946	1.076	1.516	1.073	1.066	1.064
48.00	0.941	1.051	0.941	1.084	1.516	1.073	1.066	1.064
49.00	0.937	1.059	0.937	1.092	1.516	1.073	1.066	1.064
50.00	0.932	1.066	0.932	1.099	1.516	1.073	1.066	1.064
51.00	0.928	1.078	0.928	1.111	1.516	1.073	1.066	1.064
52.00	0.923	1.090	0.923	1.123	1.516	1.073	1.066	1.064
53.00	0.919	1.101	0.919	1.134	1.516	1.073	1.066	1.064
54.00	0.915	1.112	0.915	1.145	1.516	1.073	1.066	1.064
55.00	0.912	1.122	0.912	1.155	1.516	1.073	1.066	1.064
56.00	0.908	1.139	0.908	1.172	1.516	1.073	1.066	1.064
57.00	0.905	1.155	0.905	1.188	1.516	1.073	1.066	1.064
58.00	0.902	1.171	0.902	1.204	1.516	1.073	1.066	1.064
59.00	0.900	1.186	0.900	1.219	1.516	1.073	1.066	1.064
60.00	0.897	1.201	0.897	1.234	1.516	1.073	1.066	1.064
61.00	0.894	1.224	0.894	1.257	1.516	1.073	1.066	1.064
62.00	0.892	1.247	0.892	1.280	1.516	1.073	1.066	1.064
63.00	0.890	1.269	0.890	1.302	1.516	1.073	1.066	1.064
64.00	0.888	1.290	0.888	1.323	1.516	1.073	1.066	1.064
65.00	0.885	1.311	0.885	1.343	1.516	1.073	1.066	1.064

MOBILE6 Composite Emission Factors for 2020 for Bibb County
By Speed and Facility Type

	Arterial		Freeway		Local		Ramp	
Speed	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
2.50	5.21	1.273	5.21	1.284	1.042	0.705	0.698	0.71
3.00	4.18	1.219	4.18	1.23	1.042	0.705	0.698	0.71
4.00	2.894	1.152	2.894	1.164	1.042	0.705	0.698	0.71
5.00	2.122	1.112	2.122	1.124	1.042	0.705	0.698	0.71
6.00	1.826	1.046	1.813	1.029	1.042	0.705	0.698	0.71
7.00	1.615	0.998	1.592	0.962	1.042	0.705	0.698	0.71
8.00	1.457	0.963	1.427	0.911	1.042	0.705	0.698	0.71
9.00	1.334	0.935	1.298	0.872	1.042	0.705	0.698	0.71
10.00	1.235	0.913	1.195	0.84	1.042	0.705	0.698	0.71
11.00	1.163	0.88	1.12	0.801	1.042	0.705	0.698	0.71
12.00	1.103	0.852	1.059	0.769	1.042	0.705	0.698	0.71
13.00	1.052	0.828	1.006	0.741	1.042	0.705	0.698	0.71
14.00	1.009	0.808	0.961	0.718	1.042	0.705	0.698	0.71
15.00	0.971	0.79	0.923	0.698	1.042	0.705	0.698	0.71
16.00	0.931	0.773	0.889	0.693	1.042	0.705	0.698	0.71
17.00	0.896	0.759	0.859	0.689	1.042	0.705	0.698	0.71
18.00	0.864	0.745	0.833	0.686	1.042	0.705	0.698	0.71
19.00	0.836	0.734	0.81	0.683	1.042	0.705	0.698	0.71
20.00	0.811	0.723	0.789	0.68	1.042	0.705	0.698	0.71
21.00	0.794	0.713	0.776	0.677	1.042	0.705	0.698	0.71
22.00	0.779	0.704	0.764	0.675	1.042	0.705	0.698	0.71
23.00	0.765	0.696	0.753	0.672	1.042	0.705	0.698	0.71
24.00	0.753	0.689	0.743	0.67	1.042	0.705	0.698	0.71
25.00	0.741	0.682	0.734	0.668	1.042	0.705	0.698	0.71
26.00	0.731	0.676	0.725	0.667	1.042	0.705	0.698	0.71
27.00	0.721	0.67	0.717	0.665	1.042	0.705	0.698	0.71
28.00	0.712	0.665	0.709	0.664	1.042	0.705	0.698	0.71
29.00	0.704	0.661	0.702	0.663	1.042	0.705	0.698	0.71
30.00	0.696	0.656	0.695	0.662	1.042	0.705	0.698	0.71
31.00	0.688	0.654	0.687	0.661	1.042	0.705	0.698	0.71
32.00	0.681	0.652	0.68	0.66	1.042	0.705	0.698	0.71
33.00	0.674	0.65	0.674	0.659	1.042	0.705	0.698	0.71
34.00	0.667	0.648	0.667	0.659	1.042	0.705	0.698	0.71
35.00	0.661	0.647	0.661	0.658	1.042	0.705	0.698	0.71
36.00	0.656	0.649	0.656	0.66	1.042	0.705	0.698	0.71
37.00	0.652	0.65	0.652	0.662	1.042	0.705	0.698	0.71
38.00	0.647	0.652	0.647	0.663	1.042	0.705	0.698	0.71
39.00	0.643	0.653	0.643	0.665	1.042	0.705	0.698	0.71
40.00	0.639	0.655	0.639	0.666	1.042	0.705	0.698	0.71
41.00	0.635	0.658	0.635	0.669	1.042	0.705	0.698	0.71
42.00	0.631	0.661	0.631	0.673	1.042	0.705	0.698	0.71
43.00	0.627	0.665	0.627	0.676	1.042	0.705	0.698	0.71

	Arterial		Freeway		Local		Ramp	
Speed	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**
44.00	0.623	0.668	0.623	0.679	1.042	0.705	0.698	0.71
45.00	0.62	0.671	0.62	0.682	1.042	0.705	0.698	0.71
46.00	0.616	0.676	0.616	0.687	1.042	0.705	0.698	0.71
47.00	0.613	0.68	0.613	0.692	1.042	0.705	0.698	0.71
48.00	0.61	0.685	0.61	0.696	1.042	0.705	0.698	0.71
49.00	0.607	0.689	0.607	0.701	1.042	0.705	0.698	0.71
50.00	0.603	0.693	0.603	0.705	1.042	0.705	0.698	0.71
51.00	0.601	0.7	0.601	0.712	1.042	0.705	0.698	0.71
52.00	0.598	0.707	0.598	0.718	1.042	0.705	0.698	0.71
53.00	0.595	0.713	0.595	0.725	1.042	0.705	0.698	0.71
54.00	0.592	0.719	0.592	0.731	1.042	0.705	0.698	0.71
55.00	0.59	0.725	0.59	0.737	1.042	0.705	0.698	0.71
56.00	0.588	0.735	0.588	0.746	1.042	0.705	0.698	0.71
57.00	0.586	0.744	0.586	0.755	1.042	0.705	0.698	0.71
58.00	0.584	0.752	0.584	0.764	1.042	0.705	0.698	0.71
59.00	0.583	0.761	0.583	0.772	1.042	0.705	0.698	0.71
60.00	0.581	0.769	0.581	0.78	1.042	0.705	0.698	0.71
61.00	0.58	0.782	0.58	0.793	1.042	0.705	0.698	0.71
62.00	0.578	0.794	0.578	0.805	1.042	0.705	0.698	0.71
63.00	0.577	0.806	0.577	0.817	1.042	0.705	0.698	0.71
64.00	0.576	0.818	0.576	0.829	1.042	0.705	0.698	0.71
65.00	0.574	0.829	0.574	0.84	1.042	0.705	0.698	0.71

MOBILE6 Composite Emission Factors by Year for Monroe County
By Speed and Facility Type

Arterial

Facility Type	Speed	Analysis Year	VOC Emission Factor	NOx Emission Factor
Arterial	35	2003	2.039	2.430
Arterial	35	2009	1.371	1.644
Arterial	35	2015	0.863	0.975
Arterial	35	2020	0.574	0.638

Local Road

Facility Type	Speed	Analysis Year	VOC Emission Factor	NOx Emission Factor
Local	N/A	2003	2.981	2.576
Local	N/A	2009	1.955	1.801
Local	N/A	2015	1.205	1.060
Local	N/A	2020	0.835	0.695

Appendix E, Exhibit 7
Link-Level Emissions Processor
Output Summaries

Adjusted VMT and Emissions by HPMS Code for Revised Ozone for 2003 Year for SIP Jan 07
Macon Model - 010807

		AM Peak	Mid-Day	PM Peak	Night	Total
HPMS Code 1	VMT =	70574.4	90215.4	107526.1	64582.2	332898.1
	VHT =	1065.6	1355.6	1651.6	970.4	5043.2
	Average Speed =	66.23	66.55	65.10	66.55	66.01
	VOC =	151977.6	194273.2	231815.5	139073.8	717140.1
	NOX =	260044.5	332415.3	394787.7	237965.3	1225212.8
HPMS Code 2*	VMT =	2288.8	2925.8	3487.2	2094.5	10796.2
	VHT =	60.6	77.3	94.1	55.3	287.4
	Average Speed =	37.80	37.83	37.05	37.84	37.57
	VOC =	5681.5	7260.3	8709.2	5197.4	26848.4
	NOX =	5901.3	7543.2	8989.9	5399.9	27834.3
HPMS Code 6	VMT =	19692.5	25172.9	30003.2	18020.5	92889.1
	VHT =	455.8	573.6	715.6	407.6	2152.6
	Average Speed =	43.21	43.89	41.93	44.21	43.15
	VOC =	47049.9	59892.8	72246.6	42791.4	221980.6
	NOX =	51666.8	66305.2	78279.5	47555.6	243807.1
HPMS Code 7	VMT =	32469.1	41505.4	49469.4	29712.3	153156.1
	VHT =	848.5	1084.3	1293.7	776.1	4002.5
	Average Speed =	38.27	38.28	38.24	38.28	38.26
	VOC =	80237.1	102554.0	122275.4	73415.1	378481.5
	NOX =	83388.7	106593.2	127042.6	76306.6	393331.2
HPMS Code 8	VMT =	8489.4	10852.1	12934.4	7768.7	40044.6
	VHT =	230.6	294.7	351.3	211.0	1087.6
	Average Speed =	36.81	36.82	36.82	36.82	36.82
	VOC =	21712.1	27754.6	33080.3	19868.7	102415.6
	NOX =	21768.8	27827.1	33166.7	19920.5	102683.1
HPMS Code 9	VMT =	21273.3	27193.9	32411.9	19467.2	100346.3
	VHT =	735.8	915.3	1185.5	651.9	3488.4
	Average Speed =	28.91	29.71	27.34	29.86	28.77
	VOC =	83456.9	106683.2	127153.7	76370.9	393664.7
	NOX =	56726.1	72513.1	86427.0	51909.7	267575.9
HPMS Code 11	VMT =	407769.4	521252.3	621271.2	373147.4	1923440.3
	VHT =	6462.0	8185.6	10011.9	5853.4	30513.0
	Average Speed =	63.10	63.68	62.05	63.75	63.04
	VOC =	884381.4	1128553.0	1351932.3	807691.5	4172558.3
	NOX =	1452661.4	1867357.7	2190180.9	1337860.3	6848060.4
HPMS Code 12	VMT =	0	0	0	0	0
	VHT =	0	0	0	0	0
	Average Speed =	0	0	0	0	0
	VOC =	0	0	0	0	0
	NOX =	0	0	0	0	0
HPMS Code 14	VMT =	159547.7	203950.1	243084.3	146001.2	752583.2
	VHT =	5081.8	6223.1	8229.0	4435.1	23969.0

	Average Speed =	31.40	32.77	29.54	32.92	31.40
	VOC =	420083.7	529115.2	654046.7	378176.3	1981421.9
	NOX =	412650.8	525130.0	633173.0	375855.6	1946809.3
HPMS Code 16	VMT =	255876.7	327087.7	389850.0	234151.4	1206965.8
	VHT =	8268.9	10351.7	13186.8	7380.6	39187.9
	Average Speed =	30.94	31.60	29.56	31.73	30.80
	VOC =	677192.9	859356.8	1049168.1	614327.2	3200045.0
	NOX =	659320.3	841250.9	1009848.9	602060.2	3112480.3
HPMS Code 17	VMT =	52571.5	67202.1	80097.1	48108.0	247978.7
	VHT =	2170.3	2694.6	3514.9	1920.9	10300.7
	Average Speed =	24.22	24.94	22.79	25.04	24.07
	VOC =	152933.1	192967.6	241230.0	137861.0	724991.7
	NOX =	140854.4	179010.7	216522.0	128023.4	664410.6
HPMS Code 19	VMT =	151578.2	193762.8	230942.3	138708.3	714991.7
	VHT =	7189.0	9050.8	11137.0	6445.3	33822.0
	Average Speed =	21.08	21.41	20.74	21.52	21.14
	VOC =	580677.9	742281.6	884712.4	531374.9	2739046.7
	NOX =	403736.8	516097.5	615127.5	369457.4	1904419.3
Grand Total	VMT =	1182131.1	1511120.5	1801077.0	1081761.5	5576090.1
	VHT =	32568.7	40806.6	51371.3	29107.6	153854.2
	VOC =	3105383.9	3950692.3	4776370.1	2826148.2	14658594.6
	NOX =	3548719.9	4542044.0	5393545.8	3252314.6	16736624.2
	Average Speed =	36.3	37.0	35.1	37.2	36.2
	VOC in tons =					16.1583
	NOX in tons =					18.4490

Note: EPA requirements for facilities designated as Rural Principle Arterials
* Includes VMT and VHT for facilities re-classfied as Rural Principle Arterials

Adjusted VMT and Emissions by HPMS Code for Revised Ozone for 2009 Year
Macon Model - 010807 for SIP

		AM Peak	Mid-Day	PM Peak	Night	Total
HPMS Code 1	VMT =	88072.9	112583.8	134186.5	80595.0	415438.1
	VHT =	1340.6	1689.7	2084.1	1207.6	6322.1
	Average Speed =	65.69	66.63	64.38	66.74	65.71
	VOC =	125215.3	159939.1	191330.0	114495.1	590979.6
	NOX =	206717.3	264887.0	310867.4	189623.9	972095.7
HPMS Code 2*	VMT =	2518.7	3219.6	3837.4	2304.8	11880.5
	VHT =	65.6	83.3	101.9	59.6	310.5
	Average Speed =	38.39	38.64	37.65	38.65	38.27
	VOC =	4098.1	5229.8	6279.7	3743.8	19351.4
	NOX =	4315.5	5514.1	6573.5	3947.4	20350.6
HPMS Code 6	VMT =	23040.5	29452.8	35104.1	21084.3	108681.7
	VHT =	545.2	670.7	889.4	478.7	2583.9
	Average Speed =	42.26	43.91	39.47	44.05	42.06
	VOC =	36550.5	46268.8	56705.1	33092.2	172616.5
	NOX =	39567.4	51003.8	60153.7	36542.0	187267.0
HPMS Code 7	VMT =	35793.0	45754.3	54533.8	32753.9	168835.0
	VHT =	943.4	1204.8	1443.9	862.5	4454.5
	Average Speed =	37.94	37.98	37.77	37.98	37.90
	VOC =	58481.3	74734.6	89218.6	53499.9	275934.4
	NOX =	60371.6	77195.1	91934.7	55261.4	284762.8
HPMS Code 8	VMT =	8886.4	11359.5	13539.2	8131.9	41916.8
	VHT =	239.8	306.6	365.4	219.5	1131.3
	Average Speed =	37.05	37.05	37.05	37.06	37.05
	VOC =	14906.4	19054.9	22711.1	13640.8	70313.2
	NOX =	14995.9	19169.4	22847.5	13722.7	70735.5
HPMS Code 9	VMT =	25195.1	32207.2	38387.0	23055.9	118845.2
	VHT =	890.9	1108.0	1441.9	789.2	4230.0
	Average Speed =	28.28	29.07	26.62	29.21	28.10
	VOC =	63237.5	80836.5	96347.7	57868.3	298290.0
	NOX =	45672.8	58383.5	69586.4	41794.8	215437.4
HPMS Code 11	VMT =	486258.4	621585.1	740856.0	444972.4	2293672.0
	VHT =	7762.0	9819.2	12189.9	7005.2	36776.4
	Average Speed =	62.65	63.30	60.78	63.52	62.37
	VOC =	697166.2	888902.8	1069039.1	635828.2	3290936.3
	NOX =	1095760.8	1412012.0	1640978.5	1013438.4	5162189.8
HPMS Code 12	VMT =	0	0	0	0	0
	VHT =	0	0	0	0	0
	Average Speed =	0	0	0	0	0
	VOC =	0	0	0	0	0
	NOX =	0	0	0	0	0
HPMS Code 14	VMT =	169701.6	216929.8	258554.7	155292.9	800479.0

	VHT =	5399.1	6554.2	8901.0	4663.1	25517.4
	Average Speed =	31.43	33.10	29.05	33.30	31.37
	VOC =	293525.8	369026.0	459321.5	263659.6	1385532.9
	NOX =	288471.5	366753.5	443647.4	262581.8	1361454.2
HPMS Code 16	VMT =	284028.7	363074.3	432741.5	259912.9	1339757.4
	VHT =	9186.5	11460.4	14743.8	8164.2	43554.8
	Average Speed =	30.92	31.68	29.35	31.84	30.76
	VOC =	493799.2	626314.4	765297.0	447662.7	2333073.2
	NOX =	481120.2	613919.5	737962.6	439425.0	2272427.3
HPMS Code 17	VMT =	55515.8	70965.9	84583.0	50802.2	261866.9
	VHT =	2508.8	2964.6	4035.8	2087.4	11596.7
	Average Speed =	22.13	23.94	20.96	24.34	22.58
	VOC =	111823.4	135374.9	176899.3	96186.7	520284.3
	NOX =	99083.4	125486.7	152304.9	89556.7	466431.7
HPMS Code 19	VMT =	165393.6	211422.8	251990.9	151350.7	780158.0
	VHT =	7852.8	9825.3	12279.0	6990.7	36947.8
	Average Speed =	21.06	21.52	20.52	21.65	21.12
	VOC =	400814.0	512361.5	610673.9	366782.8	1890632.3
	NOX =	298874.5	382051.8	455360.6	273498.3	1409785.2
Grand Total	VMT =	1344404.7	1718555.0	2048314.1	1230256.9	6341530.7
	VHT =	36734.8	45686.8	58476.2	32527.7	173425.4
	VOC =	2299617.6	2918043.3	3543823.2	2086460.2	10847944.2
	NOX =	2634950.9	3376376.4	3992217.2	2419392.5	12422937.1
	Average Speed =	36.6	37.6	35.0	37.8	36.6
	VOC in tons =					11.9578
	NOX in tons =					13.6939

Note: EPA requirements for facilities designated as Rural Principle Arterials
* Includes VMT and VHT for facilities re-classfied as Rural Principle Arterials

Adjusted VMT and Emissions by HPMS Code for Revised Ozone for 2015 Year
Macon Model - 010708 for SIP

		AM Peak	Mid-Day	PM Peak	Night	Total
HPMS Code 1	VMT =	97280.1	124353.4	148214.6	89020.5	458868.6
	VHT =	1508.8	1871.1	2439.9	1335.3	7155.1
	Average Speed =	64.48	66.46	60.75	66.66	64.13
	VOC =	86639.7	110472.6	133144.2	79083.7	409340.1
	NOX =	125981.3	163193.7	185970.1	116825.0	591970.2
HPMS Code 2*	VMT =	9960.0	12731.9	15174.9	9114.3	46981.0
	VHT =	235.6	298.8	365.1	213.9	1113.4
	Average Speed =	42.27	42.61	41.56	42.61	42.20
	VOC =	9652.8	12316.9	14763.9	8817.3	45550.9
	NOX =	10188.5	13022.8	15504.8	9322.6	48038.7
HPMS Code 6	VMT =	28002.2	35795.2	42663.7	25624.6	132085.7
	VHT =	637.7	809.6	986.1	579.6	3012.9
	Average Speed =	43.91	44.22	43.26	44.21	43.84
	VOC =	26905.8	34337.7	41126.7	24581.2	126951.3
	NOX =	28691.1	36731.8	43579.7	26295.1	135297.7
HPMS Code 7	VMT =	35687.5	45619.6	54373.1	32657.5	168337.7
	VHT =	938.8	1197.2	1446.1	856.0	4438.1
	Average Speed =	38.01	38.11	37.60	38.15	37.93
	VOC =	35453.9	45293.1	54159.5	32415.6	167322.1
	NOX =	35783.6	45758.4	54470.7	32767.0	168779.7
HPMS Code 8	VMT =	9167.3	11718.5	13967.1	8388.9	43241.9
	VHT =	246.6	315.2	376.1	225.7	1163.6
	Average Speed =	37.18	37.17	37.13	37.17	37.16
	VOC =	9325.0	11920.1	14210.6	8533.3	43989.0
	NOX =	9195.6	11754.6	14008.9	8414.8	43373.8
HPMS Code 9	VMT =	25198.0	32210.7	38391.3	23058.5	118858.5
	VHT =	911.0	1116.1	1516.1	792.1	4335.3
	Average Speed =	27.66	28.86	25.32	29.11	27.42
	VOC =	37271.7	47644.5	56786.5	34107.1	175809.8
	NOX =	27018.9	34538.3	41165.7	24724.9	127447.8
HPMS Code 11	VMT =	460408.0	588540.4	701470.7	421316.7	2171735.8
	VHT =	7320.1	9242.0	11419.5	6606.7	34588.2
	Average Speed =	62.90	63.68	61.43	63.77	62.79
	VOC =	411331.8	525130.1	628646.0	375828.5	1940936.3
	NOX =	585405.3	752149.0	882279.0	538913.6	2758746.8
HPMS Code 12	VMT =	0	0	0	0	0
	VHT =	0	0	0	0	0
	Average Speed =	0	0	0	0	0
	VOC =	0	0	0	0	0
	NOX =	0	0	0	0	0
HPMS Code 14	VMT =	193985.0	247971.7	295553.0	177514.8	915024.6

	VHT =	6083.2	7381.9	9964.7	5251.2	28680.9
	Average Speed =	31.89	33.59	29.66	33.80	31.90
	VOC =	202044.1	254403.2	314571.2	181787.0	952805.6
	NOX =	196890.5	250359.9	302438.0	179149.3	928837.8
HPMS Code 16	VMT =	318498.4	407137.3	485259.5	291456.2	1502351.5
	VHT =	9948.7	12485.8	15847.0	8917.7	47199.2
	Average Speed =	32.01	32.61	30.62	32.68	31.83
	VOC =	331137.8	421138.9	511194.5	301294.3	1564765.5
	NOX =	323847.3	413266.5	495881.6	295803.8	1528799.3
HPMS Code 17	VMT =	55539.3	70995.9	84618.6	50823.6	261977.4
	VHT =	2407.4	2949.3	3797.4	2090.3	11244.4
	Average Speed =	23.07	24.07	22.28	24.31	23.30
	VOC =	64968.7	80958.2	100343.2	57715.8	303986.0
	NOX =	58745.1	74717.1	90219.1	53391.2	277072.6
HPMS Code 19	VMT =	181714.2	232285.5	276857.2	166285.7	857142.6
	VHT =	8260.0	10383.2	13062.3	7407.0	39112.5
	Average Speed =	22.00	22.37	21.20	22.45	21.91
	VOC =	255089.8	326064.4	388696.4	233418.8	1203269.4
	NOX =	195215.0	249596.0	297300.5	178677.3	920788.8
Grand Total	VMT =	1415440.0	1809360.0	2156543.7	1295261.5	6676605.2
	VHT =	38497.9	48050.1	61220.4	34275.3	182043.6
	VOC =	1469821.1	1869679.6	2257642.8	1337582.6	6934726.1
	NOX =	1596962.2	2045088.2	2422818.0	1464284.7	7529153.1
	Average Speed =	36.8	37.7	35.2	37.8	36.7
	VOC in tons =					7.6442
	NOX in tons =					8.2995

Note: EPA requirements for facilities designated as Rural Principle Arterials
* Includes VMT and VHT for facilities re-classfied as Rural Principle Arterials

Adjusted VMT and Emissions by HPMS Code for Revised Ozone for 2020 Year
Macon Model - 010807 for SIP

		AM Peak	Mid-Day	PM Peak	Night	Total
HPMS Code 1	VMT =	96656.9	123556.7	147264.9	88450.2	455928.6
	VHT =	1496.2	1858.9	2427.5	1326.6	7109.2
	Average Speed =	64.60	66.47	60.67	66.68	64.13
	VOC =	55783.9	71163.6	85806.8	50943.7	263697.9
	NOX =	78707.8	101712.4	116538.7	72812.6	369771.5
HPMS Code 2*	VMT =	27442.6	35080.0	41811.2	25112.6	129446.3
	VHT =	533.8	680.3	827.1	487.0	2528.2
	Average Speed =	51.41	51.57	50.55	51.57	51.20
	VOC =	16470.3	21041.0	25182.5	15062.5	77756.3
	NOX =	20082.5	25676.4	30423.3	18380.9	94563.2
HPMS Code 6	VMT =	29746.7	38025.3	45321.6	27221.1	140314.7
	VHT =	676.8	859.2	1050.9	615.0	3202.0
	Average Speed =	43.95	44.26	43.13	44.26	43.82
	VOC =	18541.7	23666.3	28393.2	16941.9	87543.2
	NOX =	19912.9	25490.2	30215.3	18247.6	93866.0
HPMS Code 7	VMT =	38781.5	49574.5	59086.9	35488.7	182931.6
	VHT =	1025.1	1300.2	1593.6	930.9	4849.7
	Average Speed =	37.83	38.13	37.08	38.12	37.72
	VOC =	25131.4	32058.8	38514.5	22949.7	118654.4
	NOX =	25412.8	32513.9	38719.6	23275.8	119922.1
HPMS Code 8	VMT =	9991.4	12772.1	15222.8	9143.2	47129.4
	VHT =	267.8	342.3	411.9	245.0	1267.0
	Average Speed =	37.31	37.31	36.96	37.31	37.20
	VOC =	6636.7	8483.8	10135.8	6073.3	31329.5
	NOX =	6565.6	8392.9	9991.2	6008.2	30957.9
HPMS Code 9	VMT =	26551.2	33940.5	40453.1	24296.9	125241.7
	VHT =	907.4	1136.8	1444.1	810.9	4299.2
	Average Speed =	29.26	29.86	28.01	29.96	29.13
	VOC =	26601.2	34004.3	40529.0	24342.6	125477.2
	NOX =	18734.1	23948.0	28543.0	17143.2	88368.3
HPMS Code 11	VMT =	479907.6	613466.8	731179.9	439160.7	2263715.0
	VHT =	7658.9	9634.0	11987.0	6882.7	36162.6
	Average Speed =	62.66	63.68	61.00	63.81	62.60
	VOC =	277974.8	354766.0	424787.8	253868.7	1311397.2
	NOX =	383788.1	493334.8	578828.3	353548.8	1809499.9
HPMS Code 12	VMT =	10087.1	12894.4	15368.6	9230.7	47580.8
	VHT =	183.3	233.1	283.0	166.9	866.3
	Average Speed =	55.05	55.31	54.30	55.31	54.92
	VOC =	5963.4	7611.9	9116.3	5449.1	28140.8
	NOX =	7538.4	9647.4	11401.7	6906.3	35493.9
HPMS Code 14	VMT =	192298.5	245815.6	292983.1	175971.2	907068.4

	VHT =	5899.8	7263.1	9714.9	5172.6	28050.3
	Average Speed =	32.59	33.84	30.16	34.02	32.34
	VOC =	130236.1	164535.2	203665.0	117607.6	616043.9
	NOX =	127348.9	162375.6	195740.4	116253.4	601718.3
HPMS Code 16	VMT =	326800.7	417750.1	497908.7	299053.7	1541513.2
	VHT =	10259.2	12814.9	16422.3	9143.5	48640.0
	Average Speed =	31.85	32.60	30.32	32.71	31.69
	VOC =	222925.2	282914.8	345319.2	202319.0	1053478.2
	NOX =	217223.1	276958.6	333112.4	198201.1	1025495.3
HPMS Code 17	VMT =	57845.3	73943.8	88132.2	52933.8	272855.1
	VHT =	2500.0	3056.9	3983.1	2162.8	11702.8
	Average Speed =	23.14	24.19	22.13	24.48	23.32
	VOC =	44837.8	55770.2	69667.0	39712.0	209987.0
	NOX =	40137.7	51000.5	61810.7	36438.9	189387.8
HPMS Code 19	VMT =	187352.5	239493.1	285447.3	171445.1	883737.9
	VHT =	8565.3	10695.6	13616.4	7622.7	40500.0
	Average Speed =	21.87	22.39	20.96	22.49	21.82
	VOC =	179269.8	229153.2	273178.9	164039.6	845641.4
	NOX =	132520.4	169416.7	201802.2	121291.2	625030.5
Grand Total	VMT =	1483462.0	1896312.8	2260180.3	1357507.7	6997462.8
	VHT =	39973.5	49875.4	63761.8	35566.4	189177.2
	VOC =	1010372.1	1285169.1	1554296.0	919309.8	4769147.1
	NOX =	1077972.3	1380467.5	1637126.8	988508.0	5084074.6
	Average Speed =	37.1	38.0	35.4	38.2	37.0
	VOC in tons =					5.2571
	NOX in tons =					5.6042

Note: EPA requirements for facilities designated as Rural Principle Arterials
* Includes VMT and VHT for facilities re-classfied as Rural Principle Arterials