

## **CHAPTER 2: EMISSIONS INVENTORIES**

### **2.1 INTRODUCTION**

The 1990 FCAA require that RFP emissions inventories (EIs) be prepared for ozone nonattainment areas. Ozone is photochemically produced in the atmosphere when VOCs are mixed with NO<sub>x</sub> in the presence of sunlight. The TCEQ maintains an EI of up-to-date information on NO<sub>x</sub> and VOC sources. The EI identifies the source types present in an area, the amount of each pollutant emitted, and the types of processes and control devices employed at each plant or source category. The inventory provides data for a variety of air quality planning tasks, including establishing baseline emission levels, calculating reduction targets, developing control strategies to achieve the emission reductions, developing emission inputs into air quality models, and tracking actual emission reductions against established emissions growth and control budgets. The total inventory of VOC and NO<sub>x</sub> emissions for an area is summarized from the estimates developed for the five general categories of emission sources: point, area, on-road mobile, non-road mobile, and biogenics.

Since the previous Houston-Galveston-Brazoria (HGB) Rate-of-Progress (ROP) SIP revision was submitted to EPA in 2004 more accurate data has been made available and improved calculation methods have been developed. Because of these changes, this HGB RFP SIP revision updates emissions data for the eight-hour ozone RFP base year (2002) and for the milestone year (2008). Because of the updates to the base year and milestone year inventories, the emissions reductions due to control strategies have been reevaluated. This SIP revision updates both the reductions and the control strategies used to fulfill the RFP and contingency requirements.

#### **2.1.1 Updated Uncontrolled Milestone Year - 2008**

The uncontrolled milestone year EI represents the inventory for the milestone year if no further action to control emissions is taken beyond the controls already accounted for in the 2002 base year inventory. The inventory is first calculated for each major source category using EPA-approved methodologies and then combined to obtain the total uncontrolled milestone year inventory for VOC and NO<sub>x</sub>. The uncontrolled milestone inventory includes pre-2002 FCAA controls and growth in activity from 2002 to the milestone year, but it does not contain post-2002 FCAA controls.

#### **2.1.2 Updated Controlled Milestone Year - 2008**

The controlled milestone year EI represents the inventory for the milestone year with growth from the 2002 base year and with all RFP controls taken into account. The inventory is first calculated for each major source category using EPA-approved methodologies, and then combined to obtain the total controlled milestone year inventory for VOC and NO<sub>x</sub>. The controlled milestone year inventory includes pre-2002 FCAA controls, growth in activity from 1990 to the milestone year, and post-2002 FCAA controls used to meet the RFP target emissions level but does not include post-2002 FCAA controls that are not used to meet the RFP target emissions level.

### **2.2 POINT SOURCES**

#### **2.2.1 Emissions Inventory Development**

Point source emissions and industrial process operating data are collected annually from sites that meet the reporting requirements of 30 Texas Administrative Code, §101.10. To collect data, the commission mails EI questionnaires (EIQs) to all sources identified as meeting these reporting requirements. Companies are required to report emissions data for all emissions generating units and emissions points and to provide representative samples of calculations used to estimate the emissions. Information is also required on process equipment descriptions, operating schedules,

emission control devices, abatement device control efficiencies, and emission point discharge parameters, such as location, height, and exhaust gas flow rate. All data submitted in the EIQ are quality assured by TCEQ staff. The data are then stored in the State of Texas Air Reporting System (STARS) database.

### **2.2.2 Updated 2002 Base Year Inventory**

The 2002 base year inventory data were retrieved on June 20, 2006, from STARS. The inventory includes all sites that reported in the HGB area and reflects revisions made on or before that date. County-level VOC emissions were revised to account for non-reported VOC discovered in the Texas Air Quality Study 2000 (TexAQS 2000). The following TCEQ web page contains EI guidance documents and 2002 HGB base year inventory and other historical point source inventories of criteria pollutants (e.g., NO<sub>x</sub>, VOC, sulfur dioxide, etc.):  
<http://www.tceq.state.tx.us/implementation/air/industei/psei/psei.html>.

### **2.2.3 Updated Uncontrolled 2008 Milestone Year Inventory**

The TCEQ used the 2002 base year inventory to develop the uncontrolled 2008 future year point source inventory. The 2002 inventory was projected by applying growth factors and adding emissions credits and non-reported VOC identified during the TexAQS 2000. The emissions growth in sources was determined by multiplying the 2002 inventory by growth factors that represent the projection of industrial expansion to 2008. Emissions were then added to account for non-reported VOC emissions and unused emissions credits.

The growth in emissions from 2002 to 2008 is based on projection factors that were derived from the following sources: the Texas Industrial Production Index (TIPI) factors; the Economic Growth Analysis System (EGAS) 5.0; the Regional Economic Modeling, Inc. (REMI) Texas model; and the Moody's Economy, Inc. factors. Sets of factors from each source were obtained for each Standard Industrial Classification (SIC) at the county level. These sets of factors were then compared to the actual growth factor from 2002 to 2004. The projection factor set closest to the actual growth was then used to project the 2002 base inventory to 2008.

The growth in NO<sub>x</sub> and VOC emissions in the HGB area was adjusted to account for the emissions credits banked in the Emissions Banking and Trading database. Emission Reduction Credits (ERCs) and Discrete Emission Reduction Credits (DERCs), unused as of July 2006, were added to the 2008 inventory, because these banked emissions are able to return to the air shed in the future. Additional adjustments were made to county level VOC emissions to account for non-reported VOC emissions identified during TexAQS 2000.

### **2.2.4 Updated Controlled 2008 Milestone Year Inventory**

The 2008 controlled inventory accounts for controls in the HGB area. The NO<sub>x</sub> controls are reflected in the Mass Emissions Cap and Trade Program (MECT) 2008 NO<sub>x</sub> cap. The NO<sub>x</sub> emissions in this program take into account all NO<sub>x</sub> controls, including controls applied to electric generating units (EGUs) and large stationary engines. The uncontrolled emissions include all of the non-MECT capped sources and all VOC sources. The uncontrolled emissions were developed by applying growth factors to the non-MECT sources in the 2002 base year inventory. Emissions were then added to account for non-reported VOC emissions from TexAQS 2000 and unused emissions credits. The following TCEQ Web page contains more information about the Mass Emissions Cap and Trade Program:  
[http://www.tceq.state.tx.us/permitting/air/banking/mass\\_ect\\_prog.html](http://www.tceq.state.tx.us/permitting/air/banking/mass_ect_prog.html).

A summary of the point source RFP inventories is presented in Table 2-1: *HGB Eight-County RFP Point Source NO<sub>x</sub> Emissions* and Table 2-2: *HGB Eight-County RFP Point Source VOC Emissions*.

**Table 2-1: HGB Eight-County RFP  
Point Source NO<sub>x</sub> Emissions**

<b>Emissions Inventory</b>	<b>NO<sub>x</sub> (tons per day)</b>
2002 Base Year	339.48
2008 Uncontrolled	381.59
2008 Controlled	174.89

**Table 2-2: HGB Eight-County RFP  
Point Source VOC Emissions**

<b>Emissions Inventory</b>	<b>VOC (tons per day)</b>
2002 Base Year	297.12
2008 Uncontrolled	322.04
2008 Controlled	186.25

For more details on the point source projection method, refer to Appendix 2: *Point Source Inventory Projection Methodology*.

## **2.3 AREA SOURCES**

### **2.3.1 Emissions Inventory Development**

Area sources are commercial, small-scale industrial and residential sources that use materials or operate processes that can generate emissions. Area sources are too small to meet the reporting criteria for major point sources, so emissions are calculated as county-wide totals rather than as individual facilities. Area sources can be divided into two groups characterized by the emission mechanism: hydrocarbon evaporative emissions or fuel combustion emissions. Examples of evaporative sources include printing operations, industrial coatings, degreasing solvents, house paints, leaking underground storage tanks, gasoline service station underground tank filling, and vehicle refueling operations. Fuel combustion sources include stationary source fossil fuel combustion at residences and businesses, outdoor refuse burning, structural fires, and wildfires. With some exceptions, these emissions may be calculated by multiplying an established emission factor (emissions per unit of activity) by the appropriate activity or activity surrogate responsible for generating emissions. Population is the most commonly used activity surrogate for many area sources, while other activity data include the amount of gasoline sold in an area, employment by industry type, and acres of cropland.

### **2.3.2 Updated 2002 Base Year Inventory**

The 2002 base year EI was developed in 2003. Since the TCEQ was required to submit this inventory to EPA as the Periodic Emissions Inventory, considerable effort went into its development. Since that time, there have been additional updates to the 2002 area source inventory. Improvements resulted from “bottom-up” surveys for some categories, such as gasoline stations. Surveys produce data that more accurately depict facility activity levels than do “top-down” methodologies that usually rely on default surrogates such as county populations and numbers of employees associated with appropriate EPA emission factors. Activity data for other categories were available from various sources. The Energy Information Administration maintains state level fuel use data for the residential, industrial, and commercial sectors for fuels ranging from coal to natural gas. This data is useful in calculating emissions from home cooking,

water heating, and similar use at the industrial and commercial levels. Actual oil and gas production data is available from the Texas Railroad Commission. State and local governments also provided data on asphalt usage in on-road paving projects. In addition, data for small coating sources (e.g., auto refinishing, coil coatings, and marine coatings) came from actual businesses in the individual counties. The EPA's Emissions Inventory Improvement Program produced approved methodologies for several area source categories. The latest version of the EPA's growth factor system, EGAS 5.0, was used to grow emissions from the 1999 area source emissions inventory for some sources.

### 2.3.3 Updated Uncontrolled 2008 Milestone Year Inventory

For most area source categories, the 2002 base year EI was projected to 2008 using improved growth factors. A major contracted project developed a complete set of updated EGAS growth factors using REMI and other economic data. For a few categories, census populations were used to grow the emissions.

### 2.3.4 Updated Controlled 2008 Milestone Year Inventory

The controlled 2008 inventory was developed by first projecting the 2002 base year inventory to 2008 and then applying controls. The only rule affecting area sources in the HGB area that came into effect between 2002 and 2008 is the portable fuel container rule. The EPA default factor of 80 percent was used as the rule effectiveness factor for the portable fuel container rule. Many rules concerning industrial coatings and gasoline station underground tank filling (Stage I) and vehicle refueling (Stage II) were accounted for in the base year numbers.

A summary of the area source RFP inventories is presented in Table 2-3: *HGB Eight-County RFP Area Source NO<sub>x</sub> Emissions*, and Table 2-4: *HGB Eight-County RFP Area Source VOC Emissions*.

**Table 2-3: HGB Eight-County RFP  
Area Source NO<sub>x</sub> Emissions**

<b>Emissions Inventory</b>	<b>NO<sub>x</sub> (tons per day)</b>
2002 Base Year	40.15
2008 Uncontrolled	55.18
2008 Controlled	55.18

**Table 2-4: HGB Eight-County RFP  
Area Source VOC Emissions**

<b>Emissions Inventory</b>	<b>VOC (tons per day)</b>
2002 Base Year	219.51
2008 Uncontrolled	262.08
2008 Controlled	258.19

## **2.4 NON-ROAD MOBILE SOURCES**

### **2.4.1 Emissions Inventory Development**

Non-road mobile sources include a large assortment of off-highway equipment, from 600-horsepower engines mounted on construction equipment to one-horsepower string trimmers. EPA's NONROAD model was developed to calculate emissions from all non-road mobile source categories, except aircraft, commercial marine, and locomotives. The equipment classes in the model include equipment associated with the following areas: recreational, construction, industrial, lawn and garden, agricultural, commercial, logging, railroad maintenance, recreational boating, oil exploration, and airport ground support. Emissions from these NONROAD model sources are based on information about equipment population, engine horsepower and load factor, emission factors, and annual usage. Aircraft emissions are calculated using the Environmental Data Management System (EDMS) model, which uses aircraft types and actual airport operations as calculation activities. Data on locomotives, such as actual fuel use and track distances, were obtained from rail lines and used in emissions calculations. The EI for commercial marine vessels has been developed from two surveys of vessel types and activities in the Port of Houston and surrounding ports. Recently, several projects using improved methodologies have revised the non-road mobile emissions inventory for some categories.

### **2.4.2 Updated 2002 Base Year Inventory**

Since the 2002 base year EI was originally developed in 2003, some updates in non-road mobile source emissions have occurred. Input data in the NONROAD model were updated using the results of two major contracted projects. Surveys of diesel construction equipment produced an improved EI for this category. Selected industrial equipment types were also surveyed, resulting in further improvements to the inventory. Using the new data, revised 2002 non-road EIs for the NONROAD model categories revisions were developed.

For the major non-road mobile categories not included in the model, there were also improvements to the original 2002 inventory. Commercial aircraft emissions estimates were improved using updated information on actual aircraft types. This data was input into the EDMS aircraft model. Locomotive emissions estimates were updated from a contracted survey of HGB area activities of line haul and yard engines. Commercial marine vessel emissions were developed by updating the 1999 EI with current shipping and waterway commerce activity data.

### **2.4.3 Updated Uncontrolled 2008 Milestone Year Inventory**

The uncontrolled 2008 inventory for non-road mobile sources was developed by combining the output of the NONROAD model with independently-developed emissions estimates for locomotives, aircraft, and commercial marine vessels. To produce the NONROAD portion of the inventory, the NONROAD model was run with federal control measures disengaged. Emissions for locomotives and commercial marine vessels were projected from the 2002 base year to 2008 using recently developed REMI EGAS growth factors for the appropriate categories. Aircraft emissions were modeled using the EDMS model.

### **2.4.4 Updated Controlled 2008 Milestone Year Inventory**

Similar to the uncontrolled 2008 inventory, the controlled 2008 inventory for non-road mobile sources was developed by combining the output of the NONROAD model with independently-developed emissions estimates for locomotives, aircraft, and commercial marine vessels. The NONROAD portion of the inventory was produced by running the NONROAD model with federal controls in place. The locomotives and commercial marine vessel portions of the controlled 2008 inventory were developed by reviewing federal standards affecting these categories and then calculating the inventory with controls in place. Aircraft emissions were modeled using the EDMS model.

A summary of the non-road mobile source RFP inventories is presented in Table 2-5: *HGB Eight-County RFP Non-Road Mobile Source NO<sub>x</sub> Emissions* and Table 2-6: *HGB Eight-County RFP Non-Road Mobile Source VOC Emissions*.

**Table 2-5: HGB Eight-County RFP  
Non-Road Mobile Source NO<sub>x</sub> Emissions**

<b>Emissions Inventory</b>	<b>NO<sub>x</sub> (tons per day)</b>
2002 Base Year	167.74
2008 Uncontrolled	243.03
2008 Controlled	146.66

**Table 2-6: HGB Eight-County RFP  
Non-Road Mobile Source VOC Emissions**

<b>Emissions Inventory</b>	<b>VOC (tons per day)</b>
2002 Base Year	112.37
2008 Uncontrolled	182.92
2008 Controlled	81.82

## **2.5 ON-ROAD MOBILE SOURCES**

### **2.5.1 Emissions Inventory Development**

On-road mobile emissions sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on public roadways. On-road mobile source emissions are usually categorized as either combustion-related emissions or evaporative hydrocarbon emissions. Combustion-related emissions are estimated for vehicle engine exhaust. Evaporative hydrocarbon emissions are estimated for the fuel tank and other evaporative leak sources on the vehicle. To calculate emissions, both the rate of emissions per unit of activity (emission factors) and the number of units of activity must be determined. The EPA provides guidance on the development of emission factors and activity levels.

Emission factors are developed using EPA's mobile emission factor model MOBILE. The model may be run using national default information or input may be provided to modify the model calculations to simulate the driving behavior, meteorological conditions, and vehicle characteristics specific to the HGB area. Because inputs influence the emission factors calculated by the MOBILE model, every effort is made to input parameters reflecting local conditions, rather than national default values. The localized inputs used for the HGB RFP on-road mobile EI development include vehicle speeds for each roadway link, temperature, humidity, vehicle age distributions for each vehicle type, percentage of miles traveled for each vehicle type, type of inspection-maintenance program, fuel control programs, and gasoline vapor pressure.

To estimate on-road mobile emissions, emission factors calculated by the MOBILE model described above must be multiplied by the level of vehicle activity. On-road mobile source emission factors are expressed in units of grams per mile. Therefore, the activity information that is required to complete the inventory calculation is vehicle miles traveled (VMT) in units of miles per day. The level of vehicle travel activity is developed using travel demand models (TDMs)

run by the Texas Department of Transportation or the local metropolitan planning organizations. TDMs are validated against a large number of ground counts, i.e., traffic passing over counters placed in various locations throughout a county or area. VMT estimates are often calibrated against outputs from the federal Highway Performance Monitoring System, a federal model built from a different set of traffic counters.

In addition to the number of miles traveled on each roadway link, the speed on each roadway type or segment is also needed to complete on-road inventory development. Roadway speeds, required inputs for the MOBILE model, are calculated by using the activity volumes from the TDM and a post-processor speed model.

In order to perform the RFP calculations, a state must determine the base inventory from which the calculations begin, the amount of control achieved from controls that were implemented prior to the 1990 FCAAA and therefore not creditable toward FCAAA RFP requirements, the uncontrolled milestone year inventory, and the emission reduction controls to demonstrate that RFP is met for the milestone year. To determine all the information required for RFP calculations, a set of on-road mobile source inventories and control reduction estimates are required to complete the RFP calculations.

- The 2002 base year is the starting point for the eight-hour ozone RFP demonstration. This starting point establishes the inventory as it existed in 2002, the RFP base year established by EPA for areas designated as nonattainment for the eight-hour ozone standard.
- The adjusted base year (ABY) inventories are the basis for calculating the percent reductions, as required in the RFP guidance documented in 40 CFR Parts 51, 52, and 80, Final Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard; Final Rule, November 29, 2005, and as a basis for determining the non-creditable reductions due to control programs implemented prior to the FCAAA. Because the ABY inventory adjusts the 2002 base year inventory for the fleet turnover effects of the pre-1990 Federal Motor Vehicle Control Program (FMVCP) and the 1992 Reid Vapor Pressure (RVP) control, only the emission rates are different than the 2002 base year. Speed and VMT activity levels for both the 2002 base year and ABY inventories are consistent with both the TDM output for the 2002 roadway network and demographic demands.
- An on-road mobile ABY inventory is required for each milestone year and for any year for which a percent reduction requirement calculation must be completed. The ABY inventory is used to determine the level of non-creditable reductions for each RFP milestone year.
- The RFP analysis also requires an uncontrolled inventory with growth between the base year and the milestone year. These uncontrolled inventories serve as the basis for determining how much emissions reduction is required to meet the RFP target.
- The RFP analysis requires the calculation of a controlled inventory to subtract from the uncontrolled inventory to determine the effectiveness of control strategies. RFP requires direct calculation of the emission reductions from control strategies that are then subtracted from the uncontrolled emission reduction, to determine the controlled inventory value. Both the total from on-road mobile control strategies and the emission reductions from each individual control strategy are calculated.

A summary of the on-road mobile source vehicle miles traveled used to develop the various NO<sub>x</sub> and VOC emissions levels in subsequent tables is presented in Table 2-7: *HGB Eight-County RFP Ozone Season Weekday On-Road Mobile Source VMT*, Table 2-8: *HGB Eight-County RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> Emissions*, and Table 2-9: *HGB Eight-County RFP Ozone Season Weekday On-Road Mobile Source VOC Emissions*. For complete documentation of the development of the on-road mobile source inventories for the HGB RFP demonstration, refer to Appendix 3: *Development of HGB RFP On-Road Mobile Source*

*Emissions Inventories.* The complete set of input and output files are available upon request from the TCEQ's Air Quality Division.

**Table 2-7: HGB Eight-County RFP Ozone Season  
Weekday On-Road Mobile Source VMT**

<b>Emissions Inventory</b>	<b>VMT (miles per day)</b>
2002 Base Year	118,741,309
2002 Adjusted Base Year (ABY)	118,741,309
2008 ABY	118,741,309
2008 Uncontrolled	140,957,487
2008 Controlled	140,957,487

**Table 2-8: HGB Eight-County RFP Ozone Season  
Weekday On-Road Mobile Source NO<sub>x</sub> Emissions**

<b>Emissions Inventory</b>	<b>NO<sub>x</sub> (tons per day)</b>
2002 Base Year	283.20
2002 Adjusted Base Year (ABY)	335.20
2008 ABY	293.00
2008 Uncontrolled	346.83
2008 Controlled	171.65

**Table 2-9: HGB Eight-County RFP Ozone Season  
Weekday On-Road Mobile Source VOC Emissions**

<b>Emissions Inventory</b>	<b>VOC (tons per day)</b>
2002 Base Year	114.30
2002 Adjusted Base Year (ABY)	162.20
2008 ABY	152.20
2008 Uncontrolled	180.99
2008 Controlled	78.88

### **2.5.2 Updated 2002 Base Year Inventory**

The 2002 base year EI for on-road mobile sources was updated using emission factors calculated using the latest version of the MOBILE model, MOBILE6.2.03. Additional updates were made in order to incorporate the latest activity estimates from the HGB travel demand model 2002 network. Only control strategies implemented prior to 2002 were included in the input to the inventory development for the 2002 on-road mobile source base year inventory. These controls include: Pre-1990 FMVCP, fleet turnover to Tier 1 FMVCP, reformulated gasoline, and the

HGB vehicle inspection and maintenance (I/M) program. The activity levels used to calculate the inventory reflect the 2002 roadway network with 2002 VMT and speeds. A summary of the inventory is presented in Table 2-10. For complete documentation of the development of the inventory and details on MOBILE model inputs, refer to Appendix 3: *Development of HGB RFP On-Road Mobile Source Emissions Inventories*.

**2.5.3 Updated 2002 Adjusted Base Year Inventories for Base and Milestone Years 2002 and 2008**

The RFP planning process includes calculating the adjusted base year EI, from which required percent emission reductions are calculated. As specified by the FCAAA, certain on-road mobile source emissions reductions are not creditable toward these required percentage reductions. The non-creditable reductions include reductions that would occur by the target years due to the pre-1990 FCAAA state controls, pre-1990 FMVCP, and pre-1990 promulgated federal fuel volatility regulations (summertime gasoline RVP limits beginning in 1992). Because the defeat device for heavy-duty diesel vehicles (HDDVs) was affecting a FMVCP that was implemented prior to the 1990 FCAAA, the HDDV NO<sub>x</sub> off-cycle emissions effects and associated mitigation program effects are also considered non-creditable. For this HGB RFP demonstration, pre-1990 non-creditable emission factor reductions include pre-1990 FCAAA FMVCP, 1992 summertime RVP limits, and HDDV NO<sub>x</sub> off-cycle emissions and mitigation programs.

An adjusted base year EI for on-road mobile sources is developed for each milestone year using emission factors from the MOBILE model that reflect only control strategies implemented prior to 1990. By projecting the pre-1990 FMVCP into future years, the effects of additional fleet turn over benefit because of the new standards is reflected in the emission factors. The controls included in the ABY inventory development include Pre-1990 FMVCP and the 1992 low-RVP control. The activity levels used to calculate the ABY inventories reflect the 2002 roadway network with 2002 VMT and speeds. The estimated non-creditable emissions reductions due to pre-1990 controls are calculated by subtracting the 2002 ABY inventory, relative to the target year, from the actual 2002 base year inventory. A summary of the inventories and associated non-creditable emissions reductions is presented in Table 2-10: *Summary of HGB Non-Creditable Reductions, Ozone Season Weekday On-Road Mobile Source VMT and Emissions*. For complete documentation of the development of the inventory and details on MOBILE model inputs, refer to Appendix 3: *Development of HGB RFP On-Road Mobile Source Emissions Inventories*.

**Table 2-10: Summary of HGB Non-Creditable Reductions, Ozone Season Weekday On-Road Mobile Source VMT and Emissions (tons per day)**

Calendar Year	VMT	2002 Base/Adjusted Base Year Inventory		Non-Creditable Emissions Reductions	
		NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC
2002 Base Year	118,741,309	283.20	114.30	N/A	N/A
2002 Adjusted Base Year (ABY)	118,741,309	335.20	162.20	N/A	N/A
2008 ABY	118,741,309	293.00	152.20	42.20	10.00

**2.5.4 Updated Uncontrolled 2008 Milestone Year Emission Inventory**

The milestone year uncontrolled EI for on-road mobile sources was developed using emission factors from the MOBILE model that reflect only control strategies implemented prior to 2002. The latest version of MOBILE, MOBILE6.2.03 was used to develop the inventories for this SIP revision. The activity levels were updated to include the latest output from the HGB transportation demand model. These controls include Pre-1990 FMVCP, the 1992 RVP control, fleet turnover to Tier 1 FMVCP, reformulated gasoline, and the HGB vehicle I/M program. The

activity levels used to calculate the inventory reflect the milestone roadway network, with milestone year VMT and speeds. A summary of the inventories is presented in Tables 2-8 and 2-9. For complete documentation of the development of the inventory and details on MOBILE model inputs, refer to Appendix 3: *Development of HGB RFP On-Road Mobile Source Emissions Inventories*.

### 2.5.5 Updated Controlled 2008 Milestone Year Emission Inventory

The milestone year controlled EI for on-road mobile sources was developed using emission factors from the MOBILE model that reflect both control strategies implemented prior to 2002 and the control strategies used to demonstrate compliance with RFP requirements. These controls include Pre-1990 FMVCP, fleet turnover to Tier 1 of the FMVCP, fleet turnover to Tier 2 of the FMVCP, the 2007 heavy duty diesel FMVCP standards, summer reformulated gasoline, the HGB vehicle I/M program, anti-tampering program, and Texas Low Emission Diesel (TxLED). Control scenario inventory values include both the controlled inventory value and the quantification of reductions for each control strategy. A summary of the uncontrolled on-road mobile inventory, the individual on-road mobile control reductions, and the resulting controlled on-road mobile inventory for 2008 are summarized in Table 2-11: *HGB RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> Emissions and Control Strategy Reductions* and Table 2-12: *HGB RFP Ozone Season Weekday On-Road Mobile Source VOC Emissions and Control Strategy Reductions*.

**Table 2-11: HGB RFP Ozone Season Weekday On-Road Mobile Source NO<sub>x</sub> Emissions and Control Strategy Reductions**

<b>Emissions Inventory</b>	<b>NO<sub>x</sub> (tons per day)</b>
2008 Uncontrolled	346.83
Tier 1 Federal Motor Vehicle Control Program (FMVCP)	63.30
I/M in Harris County	12.08
Federal Reformulated Gasoline (RFG)	44.40
National Low Emission Vehicle Program (NLEV)	9.65
Tier 2 FMVCP	28.67
2007 Heavy Duty Diesel FMVCP	8.24
Expanded I/M	3.58
TxLED	5.26
2008 Control Strategy	171.65*

\*Calculations have been rounded to the hundredth's place to maintain consistency between all values.

**Table 2-12: HGB RFP Ozone Season Weekday On-Road Mobile Source VOC Emissions and Control Strategy Reductions**

Emissions Inventory	VOC (tons per day)
2008 Uncontrolled	180.99
Tier 1 Federal Motor Vehicle Control Program (FMVCP)	41.77
I/M in Harris County	10.15
Federal Reformulated Gasoline (RFG)	31.64
National Low Emission Vehicle Program (NLEV)	5.25
Tier 2 FMVCP	10.33
2007 Heavy Duty Diesel FMVCP	0.13
Expanded I/M	2.80
TxLED	0.04
2008 Control Strategy	78.88*

\*Calculations have been rounded to the hundredth's place to maintain consistency between all values.

The MVEBs for each milestone year is derived from the on-road mobile source uncontrolled inventory and the amount of emissions reduction for each mobile source control used in the demonstration of the RFP requirements. MVEB calculations are documented in Chapter 5.

The activity levels used to calculate the inventory reflect the milestone roadway network, with milestone year VMT and speeds. A summary of the inventories is presented in Table 2-8: *HGB Eight-County RFP Ozone Season, Weekday On-Road Mobile Source NO<sub>x</sub> Emissions*, and Table 2-9: *HGB Eight-County RFP Ozone Season Weekday On-Road Mobile Source VOC Emissions*. For complete documentation of the development of the inventory and details on MOBILE model inputs, refer to Appendix 3: *Development of HGB RFP On-Road Mobile Source Emissions Inventories*.

## **2.6 BIOGENIC SOURCES**

Biogenic sources include hydrocarbon emissions from crops, lawn grass, and trees as well as a small amount of NO<sub>x</sub> emissions from soils. Plants are sources of VOC such as isoprene, monoterpene, and alpha-pinene. Tools for estimating biogenic emissions include satellite imaging for mapping of vegetative types, field biomass surveys, and computer modeling of emission estimates based on emission factors by plant species using the GLOBEIS model. The biogenic emissions are important in determining the overall emissions profile of an area and therefore are required for regional air quality modeling and to meet periodic EPA reporting requirements. Since the 2002 base year EI is based upon the inventory developed to meet EPA periodic reporting requirements, the 2002 base year EI includes biogenic emissions.

The RFP methodology does not include biogenic emissions. Therefore, the first step in the RFP methodology subtracts the biogenic emissions from the 2002 base year EI. The resulting 2002 total anthropogenic EI is called the 2002 RFP base year EI. The calculation of the 2002 HGB RFP base year EI is documented in Appendix 1, Sheet 2.

Since the RFP methodology excludes biogenic emissions, biogenic RFP EIs are not developed for RFP milestone years.

## 2.7 EMISSIONS SUMMARY

The 2002 base year EI summary for the HGB ozone nonattainment area is shown in Table 2-13: *HGB Eight-County RFP 2002 Base Year Ozone Season Weekday NO<sub>x</sub> Emissions* and Table 2-14: *HGB Eight -County RFP 2002 Base Year Ozone Season Weekday VOC Emissions*.

The 2008 future year EI without controls for the HGB area is summarized in Table 2-15: *HGB Eight-County RFP 2008 Uncontrolled Ozone Season Weekday NO<sub>x</sub> Emissions* and Table 2-16: *HGB Eight-County RFP 2008 Uncontrolled Ozone Season Weekday VOC Emissions*.

The 2008 future year EI with controls for the HGB area is summarized in Table 2-17: *HGB Eight-County RFP 2008 Controlled Ozone Season Weekday NO<sub>x</sub> Emissions* and Table 2-18: *HGB Eight-County RFP 2008 Controlled Ozone Season Weekday VOC Emissions*.

**Table 2-13: HGB Eight-County RFP 2002 Base Year  
Ozone Season Weekday NO<sub>x</sub> Emissions**

<b>Emissions Inventory</b>	<b>NO<sub>x</sub> (tons per day)</b>
Point Source - 2002 RFP Base Year	339.48
Area Source - 2002 RFP Base Year	40.15
Non-Road Mobile Source - 2002 RFP Base Year	167.74
On-Road Mobile Source - 2002 RFP Base Year	283.20
Total Anthropogenic - 2002 RFP Base Year	830.57

**Table 2-14: HGB Eight-County RFP 2002 Base Year  
Ozone Season Weekday VOC Emissions**

<b>Emissions Inventory</b>	<b>VOC (tons per day)</b>
Point Source - 2002 RFP Base Year	297.12
Area Source - 2002 RFP Base Year	219.51
Non-Road Mobile Source - 2002 RFP Base Year	112.37
On-Road Mobile Source - 2002 RFP Base Year	114.30
Total Anthropogenic - 2002 RFP Base Year	743.30

**Table 2-15: HGB Eight-County RFP 2008 Uncontrolled  
Ozone Season Weekday NO<sub>x</sub> Emissions**

Emissions Inventory	NO <sub>x</sub> (tons per day)
Point Source - 2008 RFP Uncontrolled	381.59
Area Source - 2008 RFP Uncontrolled	55.18
Non-Road Mobile Source - 2008 RFP Uncontrolled	243.03
On-Road Mobile Source - 2008 RFP Uncontrolled	346.83*
Total Anthropogenic - 2008 RFP Uncontrolled	1026.63*

\*Calculations have been rounded to the hundredth's place to maintain consistency between all values.

**Table 2-16: HGB Eight-County RFP 2008 Uncontrolled  
Ozone Season Weekday VOC Emissions**

Emissions Inventory	VOC (tons per day)
Point Source - 2008 RFP Uncontrolled	322.04
Area Source - 2008 RFP Uncontrolled	262.08
Non-Road Mobile Source - 2008 RFP Uncontrolled	182.92
On-Road Mobile Source - 2008 RFP Uncontrolled	180.99
Total Anthropogenic - 2008 RFP Uncontrolled	948.03

**Table 2-17: HGB Eight-County RFP 2008 Controlled  
Ozone Season Weekday NO<sub>x</sub> Emissions**

Emissions Inventory	NO <sub>x</sub> (tons per day)
Point Source – 2008 RFP Controlled	174.89
Area Source - 2008 RFP Controlled	55.18
Non-Road Mobile Source - 2008 RFP Controlled	146.66
On-Road Mobile Source - 2008 RFP Controlled	171.65*
Total Anthropogenic - 2008 RFP Controlled	548.38*

\*Calculations have been rounded to the hundredth's place to maintain consistency between all values.

**Table 2-18: HGB Eight-County RFP 2008 Controlled  
Ozone Season Weekday VOC Emissions**

<b>Emissions Inventory</b>	<b>VOC (tons per day)</b>
Point Source – 2008 RFP Controlled	186.25
Area Source - 2008 RFP Controlled	258.19
Non-Road Mobile Source - 2008 RFP Controlled	81.82
On-Road Mobile Source - 2008 RFP Controlled	78.88
Total Anthropogenic - 2008 RFP Controlled	605.14