Appendix 9.2

Applicable SIP Excerpts

The SIP excerpts contained within this appendix are from the ROP and AD SIPs. These SIPs can be found on the TCEQ Web site:
ROP - http://www.tnrcc.state.tx.us/oprd/sips/oct2004hgb.html
AD - http://www.tnrcc.state.tx.us/oprd/sips/june2004hgb_EDrec.html

ROP Excerpts

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EPA requires all ROP and attainment demonstration SIPs to establish motor vehicle emissions budgets (MVEB) for transportation conformity purposes. Because this SIP demonstrates the updated Texas plan for meeting the post-1999 ROP requirements, it sets MVEBs for transportation conformity for the milestone years 2002, 2005 and 2007. An MVEB is the on road mobile source allocation of the total allowable emissions for each applicable criteria pollutant or precursor, as defined in the SIP. Transportation conformity determinations must be performed using the budget test, once EPA determines the budget(s) adequate for transportation conformity purposes. To pass the budget test, areas must demonstrate that the estimated emissions from transportation plans, programs and projects do not cause the motor vehicle emissions budget(s) to be exceeded.

If the commission adopts additional control measures to reduce on road motor vehicle emissions as a SIP revision, or if the commission submits a SIP update that includes modification of the on road mobile inventory or control reduction values used to demonstrate ROP, the commission will concurrently revise the motor vehicle emissions budget(s) for the SIP and submit such revised budget(s) to EPA as a revision to the SIP. Although no new on road mobile source controls have been adopted for the updated ROP plan presented in this SIP update, the on road mobile emission inventories and control reduction values were updated using the latest EPA on road mobile source inventory development tool, MOBILE6. Since the inventories and the control reductions values have changed, the MVEBs are updated as part of this SIP revision. Chapter 5 documents the details of the development of revised ROP MVEBs for the 8-county HGB ozone nonattainment area. A summary of the revised MVEBs is presented in Table ES-2.

Table ES-2 ROP Motor Vehicle Emission Budgets for HGB

Description	NO_x tons per day	VOC tons per day
2002 ROP MVEB	326.6	132.0
2005 ROP MVEB	257.3	104.2
2007 ROP MVEB	210.0	90.0

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2.1 Overview of Methodologies and Assumptions

On road mobile sources.

On road mobile sources of emissions consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on public roadways in the nonattainment area. 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 U.S. EPA provides guidance on the development of emission factors and activity levels.

Emission factors are developed using the EPA's mobile emission factor model, MOBILE (current version MOBLE6.2.03). The model allows substantial input in order to simulate the driving behavior, meteorological conditions and vehicle characteristics specific to the HGB area. Inputs used for Texas ROP on road mobile emission inventory development are: vehicle speeds for each roadway link, 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. 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.

To estimate on road mobile emissions, emission factors calculated by the MOBILE model described above must be multiplied by the level of vehicle activity. For on -road mobile, the emission factors are in units of grams per mile. Therefore the activity information that is required to complete the inventory calculation is vehicle miles traveled. The level of vehicle travel activity is developed using travel demand models (TDM) run by the Texas Department of Transportation or the local metropolitan planning organizations. Travel demand models are validated against a large amount of ground counts, i.e., traffic passing over counters placed in various locations throughout a county. Estimates of vehicle-miles-traveled are often calibrated to outputs from the federal Highway Performance Monitoring System, which is a model built from a smaller number of traffic counters. Roadway speeds, which are required as input for the MOBILE model, are calculated by using the activity volumes from the TDM and a post-processor speed model.

In order to complete the ROP calculations a set of mobile inventories is required.
• The 1990 base year is the starting point for 1-hour ROP. This starting point establishes the inventory as it existed upon implementation of the 1990 CAAA.
• The adjusted base year inventories (ABY) are the basis for calculating the percent reductions as required in the ROP guidance and as a basis for determining the non-creditable reductions due to control programs implemented prior to the 1990 CAAA. Because the ABY inventory adjusts the 1990 Base Year inventory for the fleet turn over effects of pre-1990 FMVCP and the 1992 RVP control, only the emission rates are different than the 1990 Base Year. The activity levels for both the base year and the adjusted base year inventories are speed and VMT consistent with the travel demand model output for the 1990 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 mst be completed.
• The ROP analysis also requires an uncontrolled inventory with growth for each milestone year. These uncontrolled inventories serve as the basis for determining how much emissions reduction is required in order to meet the ROP target. The control strategy inventories serve as the basis for calculating on road mobile source control strategy reductions for each milestone year.
• The ROP analysis requires the calculation of a controlled inventory to subtract from the uncontrolled inventory in order to determine the effectiveness of control strategies. ROP requires direct calculation of the control reduction which may then be subtracted from the inventory in order to determined the controlled inventory value. For HGB on road mobile control scenarios with and without the Texas Low Emission Diesel Program (TxLED) were calculated. Both control emission levels are presented in the on road mobile inventory summary table, Table 2-1. The TCEQ determined that the ROP demonstration for HGB did not require the use of TxLED. Therefore the ROP calculations and MVEB determinations do not include the TxLED emission reduction.

Because the I/M program for the three rural counties in Houston has not been implemented, and repeal of the I/M requirement is under consideration in those counties, two control strategy scenarios were developed for the milestone years of 2005 and 2007, with and without rural

county I/M. Complete documentation of the development of the on road mobile inventories for the HGB ROP is available in Appendix 2. The complete set of input and output files are available upon request from the TCEQ's Technical Analysis Division.

A summary of the on road mobile HGB ROP inventories is presented in Table 2-1.

Table 2-1 HGB All Counties 1-Hr Rate-of-Progress Ozone Season Weekday Onroad Mobile Source VMT, and Emissions (tons per day)

Emissions Inventory	VMT	VOC	NO_x
1990 Base Year	98,710,454	321.7	391.1
1996 Adjusted Base Year (ABY)	98,710,454	182.4	319.6
1999 ABY	98,710,454	156.1	303.1
2002 ABY	98,710,454	141.2	286.9
2005 ABY	98,710,454	130.2	253.9
2007 ABY	98,710,454	129.3	247.6
2002 Pre-1990 Control (Pre90C)	131,839,614	187.8	383.6
2005 Pre90C	142,067,256	186.2	366.9
2007 Pre90C	148,552,482	193.1	374.3
2002 Control Strategy (CS)	131,839,614	132.0	326.6
2005 CS	142,067,256	103.6	249.0
2005 CS, No Rural County I/M	142,067,256	104.2	249.3
2005 CS, Nor Rural County I/M and no TxLED	142,067,256	104.2	257.3
2007 CS	148,552,482	89.4	203.2
2007 CS, No Rural County I/M	148,552,482	90.0	203.6
2007 CS, No Rural County I/M and No TxLED	148,552,482	90.0	210.0

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2.2 Updated 1990-ROP Base Year Inventory

On road mobile sources.

The 1990 base year emission inventory for on road mobile sources was updated using emission factors calculated using the latest version of the MOBILE model, MOBILE6.2. Additional updates were made in order to incorporate the latest activity estimates from the HGB travel demand model 1990 network. Only control strategies implemented prior to 1990 were included in the input to the inventory development for the 1990 on road mobile source base year inventory.. These controls include: Pre-90 FMVCP, and the1990 state Anti-Tampering Program (ATP) in Harris County. The activity levels used to calculate the inventory reflect the 1990 roadway network, with 1990 vehicle miles of travel and speeds. A summary of the inventory is presented in Table 2-2. Complete documentation of the development of the inventory and the details of MOBILE inputs is available for review in Appendix 2.

Table 2-2 1990 Base Year ROP Onroad Mobile Emission Inventory HGB, 1-Hr Rate-of-Progress, Ozone Season, Weekday On road Mobile Source VMT, and Emissions (tons per day)

Emissions Inventory	VMT	VOC	NOx
1990 Base Year	98,710,454	321.7	391.1

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4.5 Onroad-Mobile Source Control

The projected mobile source emissions inventories documented in Appendix 2 reflect all federal and state mobile source control rules required to demonstrate ROP for 2002, 2005 and 2007 for

the 8-county HGB. The on road mobile controls used to demonstrate ROP include: an annual vehicle inspection and maintenance (I/M) program with onboard diagnostics system checks on 1996 and newer model year cars and light trucks (passenger vehicles and light duty trucks); a two speed idle test for heavy duty gas vehicles, a 2-mode ASM test, an anti-tampering program, and a gas cap pressure test; reformulated gasoline; the Federal Motor Vehicle Control Program; and low emission diesel fuel. Because the control requirement to demonstrate attainment of the NAAQS is more stringent than the requirement to reduce emissions by 3 percent per year, the amount of control reduction for ROP is less than the amount of control reduction required for attainment demonstration. The list of on road mobile controls used in the ROP plan therefore does not include TERP, VMEP, or TCMs. These programs continue to have an important role in HGB attainment demonstration. See Appendix 2 for a complete discussion of mobile source modeling and the control programs included in the inventory development. Table 4-4 summarizes the on road mobile controls modeled for each milestone year.

Table 4-4 Control Programs Modeled in MOBILE6 Emissions Factors For 1990, 2002, 2005, and 2007 ROP Controlled Emissions Inventories

Milestone Year	Controls Modeled
1990 Base Year	Pre-90 FMVCP 1990 State program: ATP in Harris County, (estimated actual RVP applied).
2002 Control Strategy	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, 2002 State Programs: I/M in Harris County ATP in Harris County
2005 Control Strategy	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, 2005 State Programs: I/M in Brazoria, Fort Bend, Galveston, Harris and Montgomery Counties ATP in Brazoria, Fort Bend, Galveston, Harris and Montgomery Counties
2007 Control Strategy	Pre-90 FMVCP, Post-1990 FMVCP, Summer Reformulated Gasoline, 2007 State Programs: I/M in Brazoria, Fort Bend, Galveston, Harris and Montgomery Counties ATP in Brazoria, Fort Bend, Galveston, Harris and Montgomery Counties

The HGB area was modeled with two control strategy scenarios, with and without rural county (Chambers, Liberty and Waller) I/M. The results of both analysis indicate that the benefit for the rural county I/M program is less than 1 ton of either NOx or VOC for both 2005 and 2007. The program is not required in order to meet the target levels of emissions. Therefore, the HGB control scenario used to develop the inventories for the ROP controlled milestone emission inventories do not have rural county I/M. Table 4-5 summarizes the amount of control reduction for on road mobile sources for each milestone year.

Table 4-5 Onroad Mobile Control Strategy Reductions ROP Milestone Year HGB 1-Hr Rate-of-Progress Ozone Season Weekday With and Without Rural County I/M

Emissions Inventory Year	Uncontrolled		Controlled		Control Strategy Reductions	
	VOC	NOx	VOC	NOx	VOC	NOx
2002	187.8	383.6	132.0	326.6	55.8	57.0
2005 Control Strategy (CS)	186.2	366.9	103.6	249.0	82.6	117.9
2005 CS, Without Rural County I/M Without Texas LED	186.2	366.9	104.2	257.3	82.0	109.6
2007 Control Strategy (CS)	193.1	374.3	89.4	203.2	103.7	171.1
2007 CS, Without Rural County I/M Without Texas LED	193.1	374.3	90.0	210.0	103.1	164.3

Page 5-1 to 5-2

5.1 Overview of Methodologies and Assumptions

Because ROP demonstrations are control strategy SIP revisions, they establish motor vehicle emission budgets, which set caps on emissions. Projected emissions from transportation plans and programs must be equal to or less than these caps, under the federal transportation conformity rule.

5.2 Motor Vehicle Emissions Budgets for Milestone and Attainment Years 2002, 2005, 2007

EPA requires all ROP and attainment demonstration SIPs to establish motor vehicle emissions budgets for transportation conformity purposes. If the commission adopts additional control measures to reduce on road motor vehicle emissions as a SIP revision, the commission will concurrently revise the motor vehicle emissions budget(s) for the SIP and submit such revised budget(s) to EPA as a revision to the SIP. With regard to on road mobile source control measures, the state understands from EPA that only technology related measures, such as I/M, cleaner fuels, and use restrictions/incentives may be included. Measures that could limit future highway construction, such as growth restrictions, may not be included.

A motor vehicle emission budget is the on road mobile source allocation of the total allowable emissions for each applicable criteria pollutant or precursor, as defined in the SIP. Transportation conformity determinations must be performed using the budget test, once EPA determines the budget(s) can be used for conformity. In order to pass the budget test, areas must demonstrate that the estimated emissions from transportation plans, programs and projects do not exceed the motor vehicle emissions budget(s).

The ROP motor vehicle emissions budgets for the 8-county HGB ozone nonattainment area are listed below in the Tables 5-1, 5-2, and 5-3. The ROP budgets in these three tables represent the 2002, 2005 and 2007 projected on road mobile source VOC and NO_x emissions that demonstrate post-1999 rate-of-progress. Because the control requirement to demonstrate attainment of the NAAQS is more stringent than the requirement to reduce emissions by 3 percent per year, the amount of control reduction for ROP is less than the amount of control reduction required for attainment demonstration. The list of on road mobile controls used in the ROP plan therefore does not include, TxLED, TERP, VMEP or TCMs. These programs continue to have an important role in HGB attainment demonstration. The MVEBs for HGB therefore do not include the effects of these three programs.

Table 5-1 2002 ROP Motor Vehicle Emission Budgets for HGB

Description	NO_x tons per day	VOC tons per day
2002 On road Emissions Projection Without Post-1990 CAAA Controls	383.6	187.8
2002 On road Mobile Rate-of-Progress Controls: FMVCP, Reformulated Gasoline (all counties), and I/M, Gas Cap Check and ATP in Harris County	57.0	55.8
2002 ROP MVEB (uncontrolled inventory minus controls)	326.6	132.0

Table 5-2 2005 ROP Motor Vehicle Emission Budgets for HGB

Description	NO_x tons per day	VOC tons per day
2005 On road Emissions Projection Without Post-1990 CAAA Controls	366.9	186.2
2005 On road Mobile Rate-of-Progress Controls: FMVCP, Reformulated Gasoline (all counties), and I/M, Gas Cap Check and ATP in Five Counties TxLED	117.59	82.00
TxLED Only	7.99	0.00
2005 ROP MVEB (uncontrolled inventory minus controls, plus TxLED benefit)	257.3	104.2

Table 5-3 2007 ROP Motor Vehicle Emission Budgets for HGB

Description	NO_x tons per day	VOC tons per day
2007 On road Emissions Projection Without Post-1990 CAAA Controls	374.3	193.1
2007 On road Mobile Rate-of-Progress Controls: FMVCP, Reformulated Gasoline (all counties), and I/M, Gas Cap Check and ATP in Five Counties TxLED	170.73	103.1
TxLED Only	6.43	0.00
2007 ROP MVEB (uncontrolled inventory minus controls, plus TxLED benefit)	210.0	90.0

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The HGB SIP no longer relies solely on NO_x based strategies. A combination of point source HRVOC controls and NO_x reductions appears to be the most effective means of reducing ozone in the HGB area and there is no longer a NO_x shortfall in the HGB SIP. As a result, the commission also evaluated a number of the existing control strategies that were put in place in the December 2000 revision. The photochemical modeling shows that some of these strategies are no longer necessary to attain the one-hour ozone standard. This SIP revision included the repeal of the commercial lawn and garden equipment restrictions, the repeal of the heavy-duty vehicle idling restrictions, and the removal of the motor vehicle inspection and maintenance program requirements from Chambers, Liberty, and Waller Counties. In addition, this SIP proposal included revisions to the environmental speed limit strategy. In September 2002, the commission revised the existing speed limit strategy to suspend the 55 mile per hour (mph) speed limit until

May 1, 2005, and, where posted speeds were 65 mph or higher before May 1, 2002, to increase speeds to five mph below what was posted. The 78th Legislature, 2003, removed the commission's authority to determine speed limits for environmental purposes; therefore, this rulemaking removes the reinstatement of the 55 mph speed limit on May 1, 2005, and maintains the currently posted speed limits at five mph below the posted limit before May 1, 2002. Also, as part of this SIP revision, the commission adopts new statewide portable fuel container rules. Historically, the commission has expressed a preference to implement technology-based strategies over behavior-altering strategies, and these changes embody that philosophy.

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1.5 MOTOR VEHICLE EMISSIONS BUDGET (MVEB)

The MVEB refers to the maximum allowable emissions from onroad mobile sources, and are determined for each applicable criteria pollutant or precursor as defined in the SIP. These budgets must be used in transportation conformity analyses. In order to pass the budget test, areas must demonstrate that the estimated emissions from transportation plans, programs, and projects do not exceed the MVEB(s). The attainment budgets represent the mobile source emissions that have been modeled for the attainment demonstration, and reflect all the onroad control measures used in that demonstration. Attainment MVEBs are shown in Table 1.5-1, *2007 Attainment Demonstration Motor Vehicle Emissions Budget for HGB*. These figures have been calculated by subtracting all onroad mobile source reductions from the 1-11 projected, uncontrolled onroad mobile source emissions forecast for the attainment year of 2007. For additional detail, see Table 3.5-48.

Table 1.5-1: 2007 Attainment Demonstration Motor Vehicle Emissions Budget for HGB

Year	NO_x (tpd)	VOC (tpd)
2007	186.13	89.99

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3.5.3 2000 & 2007 Onroad Mobile Source Emission Inventories for 8-County HGB Area

The purpose of this section is to provide a brief overview of the 8-county HGB area onroad mobile source emission inventory data which were input into the photochemical model for both the 2000 base case and the 2007 future case. These inventory data were developed under contract by the Texas Transportation Institute (TTI). The TTI couples MOBILE6.2 emission rate output with travel demand model VMT data from the HGAC. The net result is referred to as a "link-based" inventory due to the fact that both hourly VMT and emissions estimates are developed for each roadway segment or "link." Separate inventories were developed for each of the 20 days stretching from August 18 to September 6 based on the 2000 ozone episode. Greater detail covering both the development and processing of these inventory data can be found in the following SIP Appendices:

• F.1 - *Summary of Development and Processing of Onroad Mobile Source Inventories Used for Photochemical Modeling Efforts in Texas*

• F.2 - *2000 Onroad Mobile Source Modeling Emissions Inventories for the Houston/Galveston Ozone Nonattainment Area, TTI Report*

• F.3 - *2007 Onroad Mobile Source Modeling Emissions Inventories for the Houston/Galveston Ozone Nonattainment Area, TTI Report*

Tables 3.5-32, *VMT, NOx, VOC, & CO Summary for 2000 MOBILE6.2 8-County HGB Inventory* and 3.5- 33,*VMT, NOx, VOC, & CO Summary for 2007 MOBILE6.2 8-County HGB Inventory* provide summaries of the total VMT, NOx, VOC, and CO MOBILE6.2 emissions for the entire 8-county HGB area for each day of the episode for the 2000 base case and the 2007 future case, respectively. For this modeling episode, the Monday-Thursday periods have the same VMT totals and are considered to be "average weekdays." The two Fridays have the highest total VMT of the week and the Saturdays and Sundays have the least amount of VMT. Because Labor Day occurred on Monday, September 4 in 2000, the VMT for this Monday does not have a typical weekday VMT. Instead, its overall VMT is similar to that of a typical Sunday. Also, even though Fridays have the highest VMT of the week, the estimated NOx emissions are actually lower on Fridays than on weekdays. This NOx reduction occurs because the relative contribution of VMT from the "18-wheeler" categories (i.e., HDDV8a and HDDV8b classes from MOBILE6.2) is lower on Fridays than on weekdays. For onroad mobile source inventories, overall VMT increases with future growth, while total emissions decrease from 2000 to 2007. This reduction is a result of more stringent emissions standards for the onroad fleet and the simultaneous attrition of older, higher emitting vehicles. Consistent with current federal and state rules, the onroad inventories from TTI for 2007 include the benefits of RFG, the I/M Program in all eight HGB counties, and the use of TxLED. In addition, the 2007 onroad emissions inventory was modeled based on a maximum posted speed limit of 65 mph on appropriate freeway segments….

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For onroad inventory descriptive purposes, Wednesday, August 30 was selected as the most representative "average weekday." For both the 2000 and 2007 Wednesday, August 30 inventories, Table 3.5-34, *Summary of 2000 HGB Onroad Wednesday, August 30 Inventory by County,* and Table 3.5- 35, *Summary of 2007 HGB Onroad Wednesday, August 30 Inventory by County,* present respective summaries of the VMT, NOx, VOC, and CO MOBILE6 emissions for each of the eight counties in the HGB area. Harris County accounts for roughly 70 to 75 percent of the estimated VMT, NOx, VOC, and CO from the HGB nonattainment area.

Table 3.5-34: Summary of 2000 HGB Onroad Wednesday, August 30 Inventory by Count

County	*8-County VMT*		*Total Emissions (tpd)*		
	Total	*Distribution*	NO_x	*VOC*	*CO*
Brazoria	5,591,008	4.39%	14.92	6.79	101.41
Chambers	2,202,239	1.73%	7.76	3.09	50.90
Fort Bend	6,790,771	5.33%	18.91	8.73	124.38
Galveston	6,160,053	4.83%	16.27	7.55	110.07
Harris	95,707,669	75.09%	265.46	110.49	1,503.35
Liberty	2,034,665	1.60%	6.18	2.89	42.36
Montgomery	7,253,818	5.69%	21.34	8.98	137.52
Waller	1,720,671	1.35%	5.85	2.54	40.86
Total	127,460,894	100.00%	356.70	151.07	2,110.85

Table 3.5-35: Summary of 2007 HGB Onroad Wednesday, August 30 Inventory by County

County	*VMT*		*Total Emissions (tpd)*		
	Total	*Distribution*	NO_x	*VOC*	*CO*
Brazoria	6,216,326	4.26%	8.86	3.81	58.22
Chambers	2,689,680	1.84%	4.70	1.65	29.90
Fort Bend	10,110,632	6.92%	13.66	5.63	85.65
Galveston	5,839,485	4.00%	7.94	3.68	53.49
Harris	105,704,622	72.39%	141.21	65.62	906.16
Liberty	2,398,364	1.64%	3.86	1.71	24.53
Montgomery	10,742,491	7.36%	15.74	6.52	97.72
Waller	2,317,615	1.59%	4.13	1.80	27.30
Total	146,019,214	100.00%	200.09	90.44	1282.97

The onroad emissions inventory data provided by TTI were prepared for input into the photochemical model using the Emissions Preprocessor System version 2 with extensions (EPS2x). When input into the EPS2x system, the inventory data are in a "readable" text-based format. However, once within the EPS2x system, the emissions data are maintained in a binary format. Table 3.5-36, *EPS2x Modules Used to Process 8-County HGB Onroad Emissions Data*, summarizes the EPS2x modules which were used to process the 8-county HGB link-based inventories.

Table 3.5-36: EPS2x Modules Used to Process 8-County HGB Onroad Emissions Data

EPS2x Module	*Description*
LBASE	"Link-Base" - Spatially allocate link emissions among grid cells
PREPNT	"Pre-Point" - Prepare stationary extended idling emissions for further processing
CHMSPL	"Chemistry Split" - Speciate emissions into NO, NO_2, Parrafins, Olefins, etc.
TMPRL	"Temporal" - Apply temporal profile to extended idling emissions
CNTLEM	"Control Emissions" - Apply controls to model strategies, adjustments, etc.
CNTLHR	"Control Hourly" - Apply adjustments that vary by hour per vehicle type
GRDEM	"Grid Emissions" - Sum emissions by grid cell for photochemical model input
MRGUAM	Merge and adjust multiple gridded emission files for photochemical model input

As described above in Table 3.5-36, adjustments to the inventory are made with either the CNTLEM or CNTLHR modules. The CNTLEM module was used to:

• Remove 3.4 percent of the HDDV8a and HDDV8b ("18-wheeler") emissions for separate processing as "extended idling" emissions in accordance with the January 2004 EPA *Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions in StateImplementation Plans and Transportation Conformity*;

• Apply benefits to accrue from January 15, 2004 EPA *Final Rule for Control of Emissions From Highway Motorcycles*; and

• Remove benefits to accrue from I/M Program for Chambers, Liberty, and Waller Counties.

According to the January 15, 2004 motorcycle rule, new NOx and VOC emission standards for motorcycles are scheduled to take place beginning with the 2006 model year. According to EPA, these benefits have not been included in MOBILE6.2, but are expected to yield a 3.47 percent NOx reduction and 2.61 percent VOC reduction from the 2007 motorcycle (MC) emission rate output from MOBILE6.2. Because total motorcycle emissions are relatively low, the overall NOx and VOC benefits for 2007 are both less than 0.01 tpd in the 8-county HGB area as shown in Table 3.5-37, *Eight County HGB NOx & VOC Benefits from New Motorcycle Rule for August 30*.

Table 3.5-37: Eight County HGB NO_x & VOC Benefits from New Motorcycle Rule for August 30

Calendar Year	*Units Reported*	*NO_x Emissions*	*VOC Emissions*
2007	*tpd*	0.006	0.011
	Pounds Per Day	12.800	21.800

For each of the eight counties within the HGB nonattainment area, the 2007 onroad mobile source inventories received from TTI included the effects of the I/M program which was either already in place or scheduled to be implemented. This revision removes Chambers, Liberty, and Waller Counties from the I/M program which was scheduled to begin in May of 2005. In order to remove the I/M program benefits from the 2007 onroad inventory,"with I/M" and "without I/M" MOBILE6.2 scenarios were performed for each of these three counties. By comparing these two scenarios, the net change in NOx, VOC, and CO emission rates for each county and affected vehicle type was determined. These differences were used as adjustment factors with the EPS2x CNTLEM module. Table 3.5-38, *2007 Chambers, Liberty, & Waller County I/M Program Benefits Removed for August 30*, contains a summary of the 2007 I/M benefits removed from Chambers, Liberty, and Waller Counties.

Table 3.5-38: 2007 Chambers, Liberty, & Waller County I/M Program Benefits Removed for August 30

I/M Program County	*Emissions Benefits (tpd)*		
	NO_x	*VOC*	*CO*
Chambers	0.28	0.22	4.79
Liberty	0.30	0.23	4.46
Waller	0.29	0.23	4.47
3-County Total	0.87	0.68	13.72

3.5.3.1 Temperature/Humidity NOx corrections

The MOBILE6.2 model accounts for the effects that changes in hourly temperature and humidity have on NOx emissions for only 6 of the 28 total vehicle types. These vehicle types are the MOBILE6.2 LDGV, LDGT1-4, and MC classes. There is no temperature/humidity NOx correction in MOBILE6.2 for the remaining 22 vehicle classes, which include all 13 of the diesel-powered vehicle classes and the 9 heavyduty gasoline vehicle classes. Under contract to the Houston Advanced Research Center (HARC), ENVIRON worked with the Southwest Research Institute to develop temperature/humidity NOx correction equations to apply to both the 13 diesel and 9 heavy-duty gasoline vehicle classes in MOBILE6.2. These equations reflect the fact that as ambient temperature increases, tailpipe NOx emissions increase. However, as ambient humidity increases, tailpipe NOx emissions decrease. Greater detail on the development of these correction equations can be found in the following Appendices:

• F.4 - *Humidity and Temperature Correction Factors for NOx Emissions From Diesel Engines,June 2003, ENVIRON/SwRI Report*
• F.5 - *Humidity and Temperature Correction Factors for NOx Emissions From Spark IgnitedEngines, October 2003, ENVIRON/SwRI Report*

ENVIRON also developed the CNTLHR module referenced above in Table 3.5-36, which allows the user to apply a different NOx, VOC, and/or CO correction for each hour, episode day, county, and vehicle type combination. SAS code was developed to calculate the appropriate CNTLHR adjustment factors for each vehicle type by obtaining hourly inputs for temperature, relative humidity, and barometric pressure data for each county and episode day combination. The hourly temperature, relative humidity, and barometric pressure inputs used by the SAS software are also used by TTI in its development of the 2000 and 2007 HGB onroad inventories. These meteorological data were obtained from National Weather Service and the TCEQ monitors in the HGB area during the August 18-September 6, 2000 time period.

Table 3.5-39, *Summary of Temperature/Humidity NOx Correction by County for 2000 Inventory,* and Table 3.5-40, *Summary of Temperature/Humidity NOx Correction by County for 2007 Inventory,* are 2000 and 2007 summaries, respectively, of this correction procedure by county for the Wednesday, August 30 episode day. In general, the relatively cooler and more humid counties, such as Galveston and Chambers Counties, have a greater reduction of NOx emissions on a 24-hour basis. Conversely, the relatively hotter and drier counties, such as Liberty and Montgomery Counties, have very slight changes to 24-hour NOx emission totals. Within each county, there are greater NOx reductions during the overnight and early morning hours when the temperature is at its minimum and the relatively humidity is at its maximum. However, during the hottest hours of the afternoon when the relative humidity is at its lowest, the temperature/ humidity NOx correction either decreases NOx very slightly or increases it somewhat, depending upon the specific conditions for that hour. Overall, the temperature/humidity NOx correction procedure allows not only for improved estimates of the total onroad NOx emissions, but also for improved spatial and temporal allocation of those emissions. Greater detail on this correction procedure can be found in Appendix F.1.

Table 3.5-39: Summary of Temperature/Humidity NO_x Correction by County for 2000 Inventory

County	*NO_x Emissions (tpd)*			
	Input	*Output*	*Difference*	*Change*
Brazoria	14.72	13.95	-0.77	-5.23%
Chambers	7.96	7.33	-0.63	-7.91%
Fort Bend	19.18	18.61	-0.57	-2.97%
Galveston	16.11	14.33	-1.78	-11.05%
Harris	264.17	253.76	-10.41	-3.94%
Liberty	6.18	6.20	0.02	0.32%
Montgomery	21.75	21.62	-0.13	-0.60%
Waller	6.18	5.98	-0.20	-3.24%
8-County Total	356.25	341.78	-14.47	-4.06%

Table 3.5-40: Summary of Temperature/Humidity NO_x Correction by County for 2007 Inventory

County	*NO_x Emissions (tpd)*			
	Input	*Output*	*Difference*	*Change*
Brazoria	8.75	8.29	-0.46	-5.26%
Chambers	4.79	4.42	-0.37	-7.72%
Fort Bend	13.73	13.34	-0.39	-2.84%
Galveston	7.88	7.01	-0.87	-11.04%
Harris	140.67	135.53	-5.14	-3.65%
Liberty	3.85	3.87	0.02	0.52%
Montgomery	15.88	15.83	-0.05	-0.31%
Waller	4.27	4.16	-0.11	-2.58%
8-County Total	199.82	192.45	-7.37	-3.69%

3.5.3.2 Low Emission Diesel

Based on a September 27, 2001 EPA Memorandum entitled *Texas Low Emission Diesel (LED) Fuel Benefits*, a 4.8 percent NOx LED benefit should be claimed for 2002-and-newer diesel vehicles and a 6.2 percent NOx LED benefit should be claimed for 2001-and-older diesel vehicles. In order to determine the specific LED adjustment factors that should apply to each of the 13 diesel vehicle types from MOBILE6.2, MOBILE6.2 runs were performed for the HGB area to determine both VMT and NOx emission rates by model year. By using these data, the 4.8 percent and 6.2 percent reduction factors were weighted according to NOx model year contributions for each vehicle type. The resulting LED adjustment factors and benefits for 2007 are summarized in Table 3.5-41, *LED Fuel NOx Adjustments Applied to 2007 Onroad HGB Inventory*. These LED factors were incorporated by TTI into the onroad inventories by post-processing the MOBILE6.2 diesel NOx emission rates. Because the LED rule does not go into effect until 2005, the adjustment factors do not apply to the 2000 onroad inventory.

Table 3.5-41: LED Fuel NO_x Adjustments Applied to 2007 Onroad HGB Inventory

Diesel Vehicle Type	*2007 LED Adjustments*		
	NO_x Reduction	*Adjustment Factor*	*Benefit (tpd)*
LDDV	6.09%	0.9391	0.004
LDDT12	6.20%	0.9380	0.001
HDDV2b	5.09%	0.9491	0.204
HDDV3	5.29%	0.9471	0.135
HDDV4	5.37%	0.9463	0.099
HDDV5	5.27%	0.9473	0.069
HDDV6	5.43%	0.9457	0.316
HDDV7	5.53%	0.9447	0.247
HDDV8a	5.84%	0.9416	0.722
HDDV8b	5.61%	0.9439	3.783
HDDBT	5.81%	0.9419	0.157
HDDBS	5.82%	0.9418	0.198
LDDT34	5.40%	0.9460	0.007
Total Diesel	5.60%	0.9440	5.940

3.5.3.3 Idling

EPA issued a document in January 2004 entitled *Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions in State Implementation Plans and Transportation Conformity.* This EPA guidance states that "extended idling" emissions account for 3.4 percent of the total emissions calculated with MOBILE6.2 for the HDDV8a and HDDV8b vehicle classes. As previously stated, the CNTLEM module was used to remove 3.4 percent of the hourly NOx, VOC, and CO emissions from the link-based "running" emissions prepared for photochemical model input from the HDDV8a and HDDV8b classes. Using a combination of SAS and UNIX code, these extended idling emissions from each hour were grouped into an 8-county 24-hour total and spatially assigned to known truck stop locations. The extended idling emissions were then processed through EPS2x as if they were stationary low-level point sources. The emissions were temporally allocated as the inverse of HDDV8a/HDDV8b VMT. Consequently, more of the extended idling emissions were allocated during overnight hours rather than daytime hours. The extended idling emissions were also run through the CNTLHR module to receive a temperature/humidity NOx correction. Provided in Table 3.5-42, *2000 HDDV8a & HDDV8b "Extended Idling" Emissions for 8-County HGB Area,* and Table 3.5-43, *2007 HDDV8a & HDDV8b "Extended Idling" Emissions for 8-County HGB Area*, are summaries of the total NOx, VOC, and CO extended idling emissions for both the 2000 and 2007 Wednesday, August 30 episode days, respectively.

Table 3.5-42: 2000 HDDV8a & HDDV8b "Extended Idling" Emissions for 8-County HGB Area

County	*Total Emissions (tpd)*		
	NO_x	*VOC*	*CO*
Brazoria	0.024	0.001	0.004
Chambers	0.292	0.007	0.047
Fort Bend	0.490	0.012	0.075
Galveston	0.076	0.002	0.013
Harris	2.942	0.071	0.461
Liberty	0.080	0.002	0.012
Montgomery	0.666	0.015	0.100
Waller	0.363	0.009	0.058
8-County Total	4.933	0.119	0.770

Table 3.5-43: 2007 HDDV8a & HDDV8b "Extended Idling" Emissions for 8-County HGB Area

County	*Total Emissions (tpd)*		
	NO_x	*VOC*	*CO*
Brazoria	0.011	0.001	0.003
Chambers	0.140	0.006	0.034
Fort Bend	0.236	0.010	0.054
Galveston	0.036	0.002	0.009
Harris	1.416	0.061	0.333
Liberty	0.039	0.002	0.009
Montgomery	0.322	0.013	0.072
Waller	0.175	0.008	0.042
8-County Total	2.375	0.103	0.556

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3.5.4 TCMs, TERP, VMEP

For the 2007 inventory, additional post-processing adjustments were necessary to model the onroad inventory benefits to accrue from TCMs, TERP, and VMEP.

Table 3.5-45, *2007 Onroad TCM, TERP, & VMEP Benefits for 8-County HGB Area,* summarizes the 2007 8-county HGB onroad TCM, TERP, and VMEP benefits. Appendix F.6 is an Excel spreadsheet from HGAC detailing the 2007 onroad TCM benefits for the 8-county HGB area. Appendix F.7 is a report from HGAC detailing the 2007 VMEP benefits for the 8-county HGB area. For additional information on the TERP program benefits, refer to Section 5.3.17 of this SIP revision.

Table 3.5-45: 2007 Onroad TCM, TERP, & VMEP Benefits for 8-County HGB Area

8-County HGB Area	*Total Emissions (tpd)*		
	NO_x	*VOC*	*CO*
TCM	0.85	0.52	0.00
TERP	3.00	0.00	0.00
VMEP	3.60	0.60	0.00
8-County Total	7.45	1.12	0.00

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3.5.4.1 Development of 2007 Attainment Demonstration Motor Vehicle Emissions Budget for HGB By definition, the onroad emissions inventory input into the final attainment demonstration photochemical modeling run should establish the MVEB. However, use of the EPS2x processor introduces unique adjustments to the onroad emissions inventory which are necessary for photochemical modeling efforts. One of the primary adjustments relates to the speciation performed by the EPS2x CHMSPL module referred to in Table 3.5-36. CHMSPL categorizes the total VOCs reported into various groupings based on their reactivity with respect to forming ozone. Because each of these reactivity groupings has a different molecular weight, the VOC totals input to CHMSPL differ from those output. In a similar fashion, NOx emissions are divided by CHMSPL into 90 percent NO and 10 percent NO2, each with a distinct molecular weight.

Another processing step necessary for photochemical model input involves the use of Central Standard Time (CST) instead of Central Daylight Time (CDT). All photochemical modeling inventory files must be in CST to be consistent with how meteorological data are reported and modeled. However, emission inventory files are typically developed in CDT. As an example, the onroad emissions inventory data for the 2007 Wednesday, August 30 episode day is received from TTI in CDT. However, the onroad inventory data input into EPS2x begins at 1:00 a.m. CDT on August 30 and ends at 1:00 a.m. on August 31, which is 12:00 a.m. CST on August 30 and 12:00 a.m. CST on August 31, respectively.

When governmental organizations need to demonstrate conformity to the MVEB, they will not be developing photochemical modeling inventories and therefore will not apply these necessary speciation and time-shift steps. Consequently, the 2007 MVEB for the 8-county HGB area will start with the Wednesday, August 30 onroad inventory as received from TTI in CDT format. Then, adjustments for the federal motorcycle requirements, I/M program revision, temperature/humidity NOx correction, and TCM/TERP/VMEP will be applied outside of EPS2x, but in a manner consistent with the descriptions included above. Table 3.5-48, *2007 Attainment Demonstration Motor Vehicle Emissions Budget for HGB,* summarizes this approach. The

appropriate reference is noted for each inventory description/adjustment. The slight differences between the 8-county NOx, VOC, and CO totals in Tables 3.5-47 and 3.5-48 are due solely to the manner in which the EPS2x system converts text-based, nonspeciated inventory data in CDT into a binary, gridded, and speciated format in CST appropriate for photochemical model input.

Table 3.5-48: 2007 Attainment Demonstration Motor Vehicle Emissions Budget for HGB

8-County HGB Area	*Total Emissions (tpd)*		
	NO_x	*VOC*	*CO*
Onroad Inventory From TTI (Table 3.5-33) Includes RFG, I/M, LED, & 65 mph Speed Limit for 8 Counties	200.09	90.44	1,282.97
Motorcycle Rule (Table 3.5-37)	-0.01	-0.01	0.00
Removal of Chambers, Liberty, & Waller Counties from the I/M Program (Table 3.5-38)	0.87	0.68	13.72
Temperature/Humidity NO_x Correction (Table 3.5-40)	-7.37	0.00	0.00
TCM (Table 3.5-45 & Appendix F.6)	-0.85	-0.52	0.00
TERP (Table 3.5-45 & Section 5.3.17)	-3.00	0.00	0.00
VMEP (Table 3.5-45 & Appendix F.7)	-3.60	-0.60	0.00
Final 8-County HGB MVEB	186.13	89.99	1,296.69

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5.3.3 Vehicle Inspection/Maintenance Program

In the December 2000 Attainment Demonstration, the commission adopted an enhanced vehicle I/M program for the entire HGB area with a May 1, 2004 implementation date for Chambers, Liberty, and Waller Counties. On October 8, 2003, the commission delayed the implementation date of the program in the three counties until May 1, 2005. As part of this revision, the TCEQ evaluated this control strategy and the photochemical modeling shows that this strategy is no longer necessary to attain the 1-hour ozone standard. As a result, the commission adopted the removal of Chambers, Liberty, and Waller Counties from the Vehicle I/M Program on September 15, 2004.

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5.3.7 Voluntary Mobile Emission Reduction Program

For a revised program description, see the Houston/Galveston Area Council's (HGAC) Report Detailing the 2007 VMEP benefits for the 8-County HGB Area in Appendix O, Section O.7.

5.3.9 Speed Limit Strategy

In September 2002, the commission revised the existing speed limit strategy to suspend the 55 mph speed limit until May 1, 2005 and to increase speeds to 5 mph below what was posted before May 1, 2002, where speeds were 65 mph or higher. In 2003, the 78th Texas Legislature removed authority to determine speed limits for environmental purposes. Therefore, this revision removes

the reinstatement of the 55 mph speed limit on May 1, 2005. The currently posted speed limits remain at 5mph below the posted limit before May 1, 2002.

5.3.12 Vehicle Idling Restriction

As part of this revision, the TCEQ evaluated this control strategy and the photochemical modeling shows that this strategy is no longer necessary to attain the 1-hour ozone standard. As a result, this revision repeals the Vehicle Idling Restriction.

5.3.14 Transportation Control Measures (TCMs)

The HGAC is revising the region's TCMs. Appendix F6 is a list of the revised measures, with reductions of .519 tpd of VOC and .847 tpd of NOx in 2007.

Appendix I of the HGB December 2000 SIP revision, lists the TCMs in place (2.13 of VOC reductions and 1.06 tpd of NOx) until EPA approves this revision. TCMs can be modified upon EPA approval of SIP revisions or through the TCM substitution process outlined in 30 TAC §114.270. EPA approval thru the substitution process could expedite equivalent or better emission reduction measures in the region, as well as provide a public involvement process that focuses on these measures.

The list of revised measures in Appendix F6 is divided into two groups. The first group lists TCMs completed prior to 2000, as well as 25 projects that will not be completed by 2007 and are therefore removed. The second group lists TCMs in 2000 and later that are complete or to-be-completed. This group includes 19 projects replacing the removed projects.

The 25 removed projects, which include rail, bicycle and pedestrian, and park-and-ride lots, are deleted because they will not be completed by 2007, have been withdrawn by project sponsors, or have been incorporated into other programs such as VMEP. The cumulative emission reductions to be replaced are .044 tpd of VOC and .084 tpd of NOx. Nineteen projects replace these, with reductions of .056 VOC and .100 NOx. The completed projects are the commitments that have met and reporting requirements fulfilled. Full documentation of TCMs are found in the region's transportation conformity determination.

Emission reductions for TCM projects completed before 2000 are captured in the 2000 episode modeling. Emission reductions for projects to be completed in the year 2000 and after, are captured in the 2007 attainment year analysis and, therefore, reflected in the motor vehicle emissions budget. (See Chapter 3.)