Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

# TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

August 18, 2015

Mr. Ron Curry
Regional Administrator
Environmental Protection Agency, Region 6
Fountain Place 12th Floor, Suite 1200
1445 Ross Avenue
Dallas, Texas 75202-2733

Subject: Redesignation Substitute Reports for the Houston-Galveston-Brazoria (HGB) 1997 Eight-Hour Ozone Standard Nonattainment Area and the Dallas-Fort Worth (DFW) One-Hour and 1997 Eight-Hour Ozone Standard Nonattainment Areas

Dear Mr. Curry:

The Texas Commission on Environmental Quality (TCEQ) submits the enclosed *Redesignation Substitute Report for the Houston-Galveston-Brazoria 1997 Eight-Hour Ozone Standard Nonattainment Area* and the *Redesignation Substitute Report for the Dallas-Fort Worth One-Hour and 1997 Eight-Hour Ozone Standard Nonattainment Areas* for your consideration and concurrence that the HGB area has met the requirements for the 1997 eight-hour ozone National Ambient Air Quality Standard (NAAQS) and that the DFW areas have met the requirements for both the one-hour and 1997 eight-hour ozone NAAQS.

These redesignation substitute reports include: monitoring data showing attainment of the relevant ozone NAAQS; a showing that attainment was due to permanent and enforceable emissions reductions; and, a demonstration that the areas can maintain the standards through 2028 based on emission inventory trends and projections of future emissions.

The United States Environmental Protection Agency's (EPA) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; Final Rule* (2008 ozone standard SIP requirements rule) published in the March 6, 2015 *Federal Register* (80 FR 12264), includes a mechanism for lifting anti-backsliding obligations under a revoked ozone NAAQS. According to the rule, a state can provide a showing, termed a redesignation substitute, based on Federal Clean Air Act (FCAA), §107(d)(3)(E) redesignation criteria to demonstrate that an area qualifies for lifting anti-backsliding obligations under a revoked standard. The enclosed reports fulfill the requirements for a redesignation substitute, as described in the 2008 ozone standard SIP requirements rule, for the HGB 1997 eight-hour ozone nonattainment area and the DFW one-hour and 1997 eight-hour ozone nonattainment areas.

The DFW one-hour ozone nonattainment area comprises Collin, Dallas, Denton, and Tarrant Counties. The DFW four-county area monitored attainment of the one-hour ozone NAAQS based on certified monitoring data from 2004 through 2006 and has continued to monitor attainment since that time. On October 16, 2008, the EPA published final determination (73 FR 61357) that the DFW four-county nonattainment area had attained the one-hour ozone standard. The DFW four-county area has continued to monitor attainment of the one-hour ozone NAAQS since 2006.

The DFW 1997 eight-hour ozone nonattainment area comprises Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, and Tarrant Counties. The HGB 1997 eight-hour ozone nonattainment area comprises Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties. The TCEQ submitted early certification of 2014 ozone air monitoring data to the EPA on February 24, 2015, and a request for a determination of attainment for both the DFW and HGB eight-hour ozone nonattainment areas on February 27, 2015. On April 28, 2015, the EPA published a proposed clean data determination for the DFW 1997 eight-hour ozone nonattainment area (80 FR 23487). On June 10, 2015, the EPA verified that the 2014 ambient ozone monitoring data for the HGB area met all data quality requirements for attaining the 1997 eight-hour ozone NAAQS. As of August 18, 2015, the DFW and HGB areas continue to monitor attainment of the 1997 eight-hour ozone standard.

Title 40 Code of Federal Regulations §51.1105(b)(2) allows the EPA to remove the provisions for nonattainment new source review for the revoked one-hour and 1997 eight-hour ozone NAAQS upon the EPA's approval of the 1997 eight-hour ozone HGB redesignation substitute and the DFW one-hour and 1997 eight-hour redesignation substitute. With these redesignation substitutes, the TCEQ requests that the EPA concur that the HGB and DFW areas are attaining and will continue to attain the revoked one-hour and revoked 1997 eight-hour ozone NAAQS, and that the relevant nonattainment NSR provisions no longer apply to the areas.

If you have questions or need additional information, please contact David Brymer, Director of the Air Quality Division, at (512) 239-1725.

Sincerely,

Richard A. Hyde, P.E., Executive Director
Texas Commission on Environmental Quality

RH/DB/lb/mr

Enclosures: *Redesignation Substitute Report for the Houston-Galveston-Brazoria 1997 Eight-Hour Ozone Standard Nonattainment Area*
*Redesignation Substitute Report for the Dallas-Fort Worth One-Hour and 1997 Eight-Hour Ozone Standard Nonattainment Areas*

# REDESIGNATION SUBSTITUTE REPORT FOR THE HOUSTON-GALVESTON-BRAZORIA 1997 EIGHT-HOUR OZONE STANDARD NONATTAINMENT AREA

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
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## SECTION 1: GENERAL

### 1.1 Purpose of this Redesignation Substitute Report

This redesignation substitute (RS) report for the Houston-Galveston-Brazoria (HGB) Area 1997 eight-hour ozone National Ambient Air Quality Standard (NAAQS) supports the requirements described in the EPA's *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; Final Rule* (2008 ozone standard SIP requirements rule), published in the *Federal Register* (FR) on March 6, 2015 (80 FR 12264). Certified monitoring data for 2012 through 2014 show the HGB area, which includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, monitored attainment of the 1997 eight-hour ozone NAAQS with a design value of 80 parts per billion (ppb). The TCEQ submitted early certification of 2014 ozone air monitoring data to the EPA on February 24, 2015, and a request for a finding of attainment for the HGB area for the revoked 1997 eight-hour ozone NAAQS on February 27, 2015. On June 10, 2015, the EPA verified that the 2014 ambient air monitoring data for ozone met all data quality requirements for attaining the 1997 eight-hour ozone NAAQS. On August 3, 2015, the EPA Region 6 Administrator, Ron Curry, signed the proposed determination of attainment of the 1997 eight-hour ozone standard for the HGB area. As of August 4, 2015, the HGB area continues to monitor attainment of the revoked 1997 eight-hour ozone NAAQS.

The EPA's 2008 ozone standard SIP requirements rule includes a mechanism for lifting anti-backsliding obligations under a revoked ozone NAAQS. According to the EPA's 2008 ozone standard SIP requirements rule, a state can provide a showing, termed a redesignation substitute, based on Federal Clean Air Act (FCAA), §107(d)(3)(E) redesignation criteria to demonstrate that an area qualifies for lifting anti-backsliding obligations under a revoked standard.

This HGB RS report is intended to satisfy the EPA's requirements to lift anti-backsliding obligations for the revoked 1997 eight-hour ozone NAAQS by ensuring that specific redesignation requirements are met for the HGB area. This HGB RS report will be submitted to the EPA as provided in the 2008 ozone standard SIP requirements rule instead of a redesignation request and maintenance plan, which the FCAA required to remove anti-backsliding obligations under a standard that has not been revoked.

Title 40 Code of Federal Regulations (CFR) §51.1105(b)(2) allows the EPA to remove the provisions for nonattainment new source review (NSR) for the revoked 1997 eight-hour ozone NAAQS upon the EPA's approval of the 1997 eight-hour ozone HGB redesignation substitute. With this redesignation substitute, the TCEQ requests that the EPA concur that the HGB area is attaining and will continue to attain the revoked 1997 ozone NAAQS, and that the relevant nonattainment NSR provisions no longer apply to the area.

Certified ambient air quality monitoring data for 2012 through 2014 demonstrate that the HGB area is monitoring attainment of the 1997 eight-hour ozone NAAQS with a design value of 80 ppb. This HGB RS report further supports the demonstration that the HGB area will continue to attain the 1997 eight-hour ozone NAAQS due to permanent and enforceable emission reductions and demonstrates continued attainment of the 1997 eight-hour ozone NAAQS through 2028 via emission inventory trends, 2012 attainment inventory, and projected future emissions. Since removing anti-backsliding obligations is contingent upon the EPA's approval, the TCEQ has set a horizon year of 2028. This 10-year period also aligns with the EPA's requirement of maintenance plans to demonstrate attainment for a 10-year period following the date of redesignation.

This HGB RS report for the 1997 eight-hour ozone NAAQS is based on the EPA's 2008 ozone standard SIP requirements rule. This HGB RS report includes the following elements.

*Monitoring Data Showing Attainment of the Revoked 1997 Eight-Hour Ozone NAAQS*

Chapter 2: *Air Quality Data* includes monitoring network and reporting requirements as well as ozone data and trend analyses. The certified 2012 through 2014 monitoring data demonstrate that the HGB area is monitoring attainment of the 1997 eight-hour ozone NAAQS of 0.08 parts per million (ppm) or 84 ppb with a design value of 80 ppb. Ozone concentrations have decreased nearly 33% in the HGB area from 1990 through 2014. Examination of the trends in eight-hour ozone design values reveals substantial downward trends in monitored ozone levels.

*Showing That Attainment Was Due to Permanent and Enforceable Emissions Reductions*

Chapter 3: *Permanent and Enforceable Emissions Reductions* identifies permanent and enforceable control measures that have resulted in reductions in nitrogen oxides ($NO_X$) and volatile organic compounds (VOC) emissions, and air quality improvements in the HGB 1997 eight-hour ozone nonattainment area. The 30 Texas Administrative Code (TAC) Chapter 115, Control of Air Pollution from Volatile Organic Compounds and 30 TAC Chapter 117, Control of Air Pollution from Nitrogen Compounds regulations along with implementation of the Highly-Reactive Volatile Organic Compounds Emissions Cap and Trade (HECT) Program and the Mass Emissions Cap and Trade (MECT) Program have significantly reduced overall ozone precursor emissions at both major and minor stationary sources in the HGB ozone nonattainment area. The HGB area has attained the 1997 eight-hour ozone NAAQS as the result of implemented federal, state, and local controls. These enforceable measures will remain in place to ensure continued maintenance of the 1997 eight-hour ozone NAAQS in the HGB area.

*Demonstration That the Area Can Maintain the Standard Over the Next 10 Years*

Chapter 4: *Maintenance Demonstration* provides emissions inventory trends, the 2012 attainment inventory, projected future emissions, and demonstrates continued attainment of the 1997 eight-hour ozone standard through 2028. Analysis of projected ozone precursor emissions from 2012 through 2028 shows an overall projected decrease of 152.49 tons per day (tpd) in combined $NO_X$ and VOC emissions for the HGB area. This net change includes a projected 8.43 tpd increase in VOC and a 160.92 tpd decrease in $NO_X$ from 2011 through 2028. Based on emissions projections and previous photochemical analysis, continued attainment of the 1997 eight-hour ozone standard is shown for the HGB area through 2028.

## 1.2 1997 Eight-Hour Ozone NAAQS History

On July 18, 1997, the EPA published the revised NAAQS for ground-level ozone in the *Federal Register* (62 FR 38856), and it became effective on September 16, 1997. The EPA phased out and replaced the previous one-hour ozone NAAQS with an eight-hour NAAQS set at 0.08 ppm based on the three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentrations measured at each monitor within an area.

Effective June 15, 2004, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties were designated nonattainment in the first phase of the EPA's implementation rule for the 1997 eight-hour ozone NAAQS (69 FR 23951). The HGB area was classified moderate nonattainment for the standard, with an attainment deadline of June 15, 2010. The TCEQ was required to submit a state implementation plan (SIP) revision for the 1997 eight-hour ozone NAAQS to the EPA by June 15, 2007. The EPA addressed the control obligations that apply to areas designated nonattainment for the 1997 eight-hour ozone NAAQS in the second phase of the implementation rule (70 FR 71612).

The commission adopted the 2007 HGB 1997 Eight-Hour Ozone Nonattainment Area SIP revision on May 23, 2007 as the first step in addressing the 1997 eight-hour ozone NAAQS in the HGB area. The revision included additional Voluntary Mobile Source Emissions Reduction Program (VMEP) commitments, an analysis of reasonably available control technology (RACT), and the Texas 2002 Periodic Emissions Inventory for the HGB ozone nonattainment area. The SIP revision also incorporated amendments to 30 TAC Chapter 114, relating to the Texas low emission diesel (TxLED) rule for certain marine fuels and 30 TAC Chapter 115, relating to the control of emissions of VOC from storage and degassing operations in the HGB area. On April 2, 2013, the EPA published approval of portions of the RACT analysis for certain VOC categories and the VMEP commitments (applicable through 2009) in the 2007 SIP revision (78 FR 19599). The EPA published approval of the remaining source categories that were not previously approved as meeting RACT requirements on April 15, 2014 and March 27, 2015 (79 FR 21144 and 80 FR 16291).

The commission also adopted the 2007 HGB 1997 Eight-Hour Ozone Nonattainment Area Reasonable Further Progress (RFP) SIP revision on May 23, 2007, which demonstrated that a required 15% emissions reduction in ozone precursors (VOC and $NO_X$) would be met for the 2001 through 2008 RFP analysis period. On April 22, 2009, the EPA published approval of this SIP revision, the associated motor vehicle emission budgets (MVEB), and the 2002 base year emissions inventory (74 FR 18298).

On June 15, 2007, the state requested that the HGB area be reclassified from a moderate to a severe nonattainment area for the 1997 eight-hour ozone NAAQS, with an attainment deadline of June 15, 2019. On December 31, 2007, the EPA published its proposal to grant the governor's request and took comments on a range of dates for the state to submit a revised SIP (72 FR 74252). The TCEQ provided comments to the EPA that supported the reclassification and justification for an April 2010 SIP submission date. On October 1, 2008, the EPA published approval of the governor's request to voluntarily reclassify the HGB ozone nonattainment area from a moderate to a severe nonattainment area for the 1997 ozone NAAQS (73 FR 56983) effective October 31, 2008. The EPA set April 15, 2010 as the date for the state to submit a revised SIP addressing the severe-ozone nonattainment requirements and set a new attainment deadline of June 15, 2019.

On March 10, 2010, the commission adopted two revisions to the Texas SIP for the HGB ozone nonattainment area. The 2010 HGB Attainment Demonstration SIP Revision for the 1997 Eight-Hour Ozone Standard (2010 HGB AD SIP Revision) included a photochemical modeling analysis and a weight of evidence analysis to demonstrate attainment of the 1997 eight-hour ozone NAAQS by the June 15, 2019 deadline. This SIP revision also included MVEBs, VOC and $NO_X$ RACT analyses, reasonably available control measures analysis, and a contingency plan. In addition, this SIP revision incorporated revisions to 30 TAC Chapters 101 and 115, also adopted on March 10, 2010, which include the MECT Program Cap Integrity, the HECT Program Cap Reduction and Allowance Reallocation, and the VOC Control Techniques Guidelines (CTG) Update for offset lithographic printing. On April 2, 2013, April 15, 2014, August 4, 2014, and March 27, 2015, the EPA published its approvals of the RACT analysis for all affected VOC and $NO_X$ emissions sources in the HGB area for the 1997 eight-hour ozone NAAQS (78 FR 19599, 79 FR 21144, 79 FR 45105, and 80 FR 16291). On January 2, 2014, the EPA published its approval of the 2010 HGB AD SIP Revision and revisions to the MECT and HECT Programs (79 FR 57).

The 2010 HGB RFP SIP Revision for the 1997 Eight-Hour Ozone Standard, as required by the EPA, demonstrated that an 18% emissions reduction requirement will be met for the 2002 through 2008 RFP analysis period and that an average of 3% per year emissions reduction will occur between each of the milestone years 2008, 2011, 2014, 2017, and 2018. This SIP revision established baseline emission levels, calculated reduction targets, identified control strategies to meet emission target levels, and tracked actual emission reductions against established emissions growth. This revision also included an MVEB for each milestone year and a contingency plan. On January 25, 2011, the EPA published a notice of its determination that the MVEBs in the March 10, 2010 SIP revisions, which were developed using the on-road mobile source emissions inventories based on the EPA's MOBILE 6.2 model, were adequate for transportation conformity purposes (76 FR 4342). On January 2, 2014, the EPA published approval of this RFP SIP revision (79 FR 51).

On December 7, 2011, the commission adopted the 2011 HGB RACT Analysis Update SIP Revision for the 1997 Eight-Hour Ozone Standard. This SIP revision updated the RACT analysis for VOC emission sources to include the seven CTG documents issued by the EPA from 2006 through 2008 that were not addressed in the 2010 HGB AD SIP Revision. This SIP revision incorporated concurrent CTG-related rulemaking that revised Chapter 115, Subchapter E to implement RACT for those CTG emission source categories in the HGB area. On March 27, 2015, the EPA published its approval of this SIP update revision (80 FR 16291).

On April 23, 2013, the commission adopted the 2013 HGB 1997 Eight-Hour Ozone Standard Nonattainment Area MVEB Update SIP Revision. This SIP revision updated on-road mobile source emissions inventories and MVEBs for the HGB area using the Motor Vehicle Emissions Simulator (MOVES) 2010a version of the EPA's mobile emissions estimation model. The 2013 SIP revision also met the primary obligation of the mid-course review commitment in the 2010 HGB AD SIP Revision by demonstrating that the outstanding 3% contingency requirement was fulfilled. Updated on-road inventories and emissions analysis based on the EPA's August 30, 2012 vehicle miles traveled offset guidance and a modified version of the MOVES model demonstrated compliance with FCAA requirements for transportation control measures in severe nonattainment areas. On January 2, 2014, the EPA published approval of this MVEB SIP update revision to the 2010 HGB AD SIP Revision (79 FR 57).

### 1.3 One-Hour Ozone NAAQS Redesignation Substitute

In 1997, the one-hour ozone NAAQS was replaced by the eight-hour ozone NAAQS. Although the one-hour standard has been revoked, states must continue to meet one-hour ozone anti-backsliding requirements described in 40 CFR §51.905(a). The HGB area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties) is also classified as severe nonattainment for the one-hour ozone NAAQS with a June 15, 2007 attainment date; however, the HGB area did not monitor attainment by that date. The EPA published a failure-to-attain determination in the February 1, 2012 *Federal Register* (77 FR 3640).

As part of the transition to the 1997 eight-hour ozone standard, the EPA created a submittal termed a termination determination to address anti-backsliding requirements for the one-hour ozone standard. In May 2010, the TCEQ requested a determination regarding termination of the one-hour ozone anti-backsliding obligations associated with the transition from the one-hour ozone standard to the 1997 eight-hour ozone standard. As a result of court action, the EPA was unable to propose approval of the request.[1] Consequently, on May 22, 2013, the commission

[1] On July 1, 2011, the District Court of Columbia Circuit Court of Appeals vacated EPA's memorandum "Guidance on Developing Fee Programs Required by Clean Air Act Section 185 for the one-hour ozone NAAQS," ruling that the EPA's suggested alternative relating to attainment of the eight-hour ozone standard was not consistent with the FCAA.

adopted the Severe Ozone Nonattainment Area Failure to Attain Fees rulemaking (Rule Project No. 2009-009-101-AI) to implement the §185 penalty fee.

Based on 2011 through 2013 monitoring data, the average number of exceedances of the 0.12 ppm one-hour ozone NAAQS for each monitor in the HGB area is less than 1.0 days per year, and therefore, the area is attaining the one-hour ozone standard. On March 7, 2014, the TCEQ submitted to the EPA a certification evaluation and concurrence report for early certification of 2013 ambient air monitoring data for ozone along with a request for a finding of attainment for the HGB area for the revoked one-hour ozone NAAQS. On May 30, 2014, the EPA verified that the 2013 ambient air monitoring data for ozone met all data quality requirements for attaining the one-hour ozone standard[2]. The HGB area continued to monitor attainment of the standard in 2014. As of August 4, 2015, the HGB area continues to monitor attainment of the one-hour ozone standard.

A one-hour ozone HGB RS demonstration was submitted to the EPA on July 22, 2014 in the form of a letter and attached report[3]. The EPA Region 6 Administrator, Ron Curry, signed the proposed approval of the one-hour ozone HGB RS demonstration on July 29, 2015. Although the EPA's 2008 ozone standard SIP requirements rule indicates that public notice and comment are not required, the commission adopted an HGB RS SIP revision for the one-hour ozone NAAQS (Non-Rule Project No. 2014-011-SIP-NR) on July 1, 2015.

## SECTION 2: AIR QUALITY DATA

### 2.1 Monitoring Network and Reporting Requirements

The ambient air quality monitoring network provides data to verify continued attainment of the 1997 eight-hour ozone National Ambient Air Quality Standard (NAAQS).

The Houston-Galveston-Brazoria (HGB) nonattainment area monitoring network in 2015 consists of 20 regulatory ambient air ozone monitors located in Brazoria, Galveston, Harris, and Montgomery Counties. The City of Houston operates seven of the monitors: Clinton (C403/C113/C304); Houston North Wayside (C405); Houston Monroe (C406); Lang (C408); Houston Croquet (C409); Houston Westhollow (C410); and Park Place (C416). The Texas Commission on Environmental Quality (TCEQ) operates the remaining 13 ozone monitors: Houston East (C1); Houston Aldine (C8/C108/C150); Channelview (C15/C115); Northwest Harris County (C26), Houston Deer Park #2 (C35/C139), Seabrook Friendship Park (C45); Houston Bayland Park (C53); Conroe Relocated (C78); Manvel Croix Park (C84); Lynchburg Ferry (C1015); Lake Jackson (C1016); Baytown Garth (C1017); and Galveston 99th Street (C1034).

The monitors are managed in accordance with 40 Code of Federal Regulations (CFR) Part 58 to verify the attainment status of the area. The TCEQ commits to keep operating an appropriate air monitoring network in the HGB area and will continue to work with the United States Environmental Protection Agency (EPA) through the air monitoring network review process, as required by 40 CFR Part 58, to determine: the adequacy of the ozone monitoring network; if

[2] Mark Hansen, Acting Associate Director for Air Programs, EPA. Letter to Richard A. Hyde, Executive Director, TCEQ. 30 May 2014.
[3] See TCEQ's HGB: Latest Ozone Planning Activities Web page (http://www.tceq.state.tx.us/airquality/sip/hgb/hgb-latest-ozone).

additional monitoring is needed; and when monitoring can be discontinued. Air monitoring data from these monitors will continue to be quality assured according to the requirements in the EPA's regulations until the end of the maintenance period (2028), certified, and reported to the EPA on the schedule required by 40 CFR Part 58.

## 2.2 Ozone Data

This section provides an analysis of air quality observational data in the HGB area. While the 1997 eight-hour ozone NAAQS is expressed as 0.08 parts per million (ppm), the familiar convention of expressing concentrations in parts per billion (ppb), as 84 ppb, is also used in this section. A design value of 84 ppb or less demonstrates attainment of the NAAQS. Data for ozone and nitrogen oxides ($NO_X$) were retrieved from the EPA's Air Quality System database, and volatile organic compounds (VOC) data were retrieved from TCEQ's automated gas chromatograph (auto-GC) database. Analyses of ozone data from federal reference method monitors and federal equivalent method monitors, those used by the EPA to compare to the NAAQS, are included in this section.

## 2.3 Ozone Trend Analysis

Trends in ozone are used to demonstrate the substantial progress the HGB area has made in improving air quality. The trend in design values for the eight-hour ozone NAAQS in the HGB area is seen clearly in Figure 2-1: *Eight-Hour Ozone Design Values for the HGB Area*. Although the HGB area exceeded the 1997 eight-hour ozone NAAQS at of the end of 2013, the HGB area monitored a design value 4 ppb below the NAAQS of 0.08 ppm (or 84 ppb) in 2014. The design value for the eight-hour ozone standard is the truncated three-year average of the fourth highest value, given three years of complete data. A complete year of data must include at least three valid calendar quarters of data, a valid quarter must contain at least two months of valid data, a valid month must have at least 75% of days with valid data, and finally, a valid day must have at least 18 hours with valid one-hour ozone concentrations. The eight-hour ozone design value in the HGB area has decreased nearly 33% over the past 24 years, from a design value of 119 ppb in 1990 to a design value of 80 ppb in 2014.

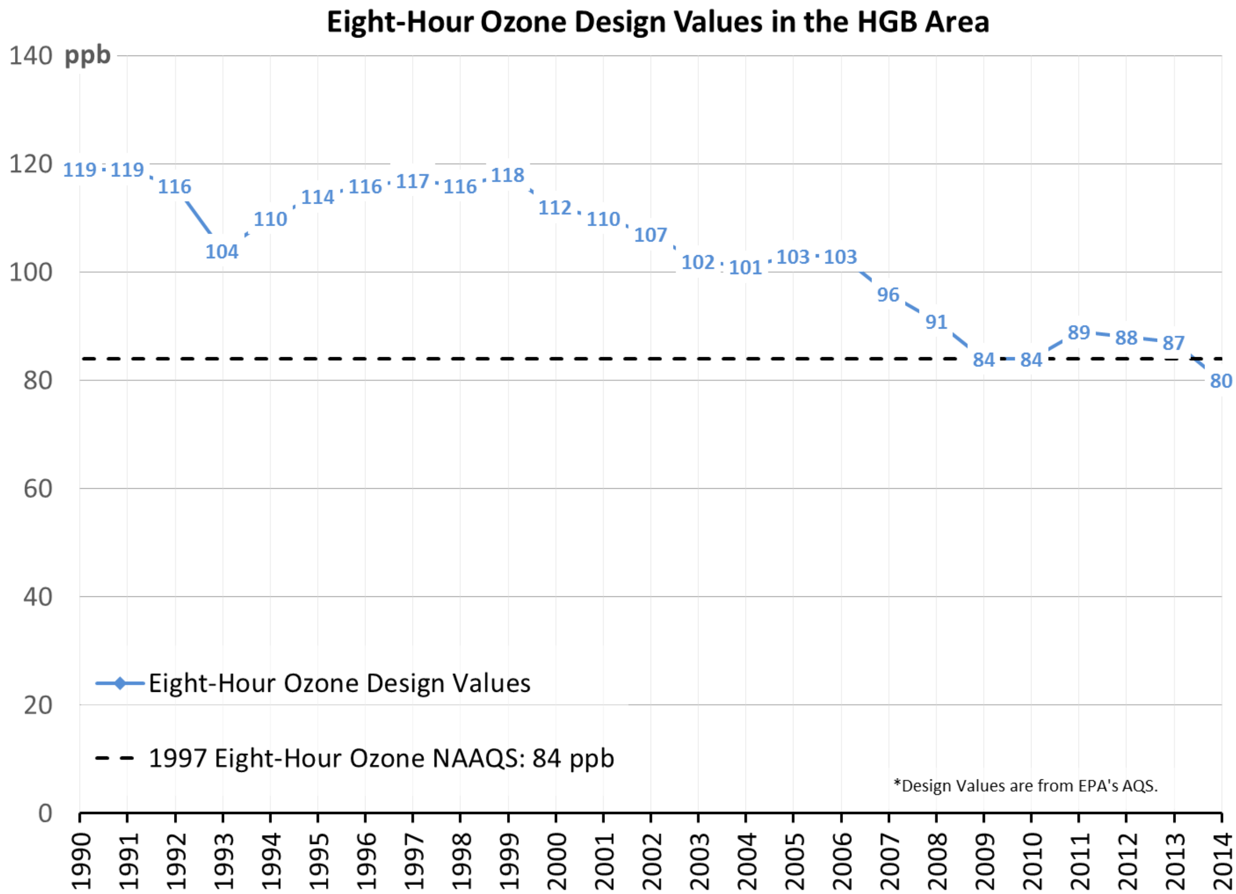


**Figure 2-1: Eight-Hour Ozone Design Values for the HGB Area**

The design value of a metropolitan area is the maximum design value of all of the area's regulatory monitors' individual design values. Because ozone varies spatially, it is also prudent to investigate trends at all monitors in an area. Table 2-1: *Eight-Hour Ozone Design Values by Monitor* contains eight-hour ozone design values at all regulatory monitors in the HGB area from 2000 through 2014. More monitors than those listed in Table 2-1 operate in the HGB area, but the design values at those additional monitors are not appropriate for compliance determinations because the monitors' data do not meet the EPA's quality assurance criteria and cannot be used for regulatory purposes. Only one of the 21 monitors in the HGB area, Manvel Croix Park (C84), exceeded the 1997 eight-hour ozone standard in 2011 through 2013; it did not exceed the standard in 2014. The other 19 regulatory HGB area ozone monitors measured an average 2014 design value of 72 ppb, demonstrating that the area overall is well below 84 ppb.

**Table 2-1: Eight-Hour Ozone Design Values by Monitor**

| Site Name | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Manvel Croix Park C84** | | | | 91 | 97 | 97 | 96 | 91 | 85 | 84 | 84 | 89 | 88 | 87 | 80 |
| **Houston East C1** | 102 | 103 | 101 | 100 | 95 | 87 | 83 | 78 | 80 | 76 | 76 | 81 | 82 | 80 | 72 |
| **Northwest Harris County C26** | 108 | 105 | 101 | 100 | 94 | 93 | 91 | 91 | 85 | 84 | 81 | 84 | 83 | 82 | 75 |
| **Houston Bayland Park C53** | 111 | 110 | 100 | 102 | 101 | 103 | 103 | 96 | 91 | 84 | 82 | 83 | 80 | 81 | 75 |
| **Houston Monroe C406** | 106 | 93 | 90 | 90 | 95 | 97 | 99 | 91 | 81 | 71 | 72 | 74 | 78 | 78 | 74 |
| **Seabrook Friendship Park C45** | | | | 85 | 94 | 92 | 90 | 86 | 80 | 78 | 75 | 78 | 80 | 77 | 72 |
| **Galveston 99th St C1034** | | | | | | | | | | 77 | | 78 | 80 | 74 | 72 |
| **Park Place C416** | | | | | | | | | 89 | 78 | 77 | 78 | 80 | 78 | 74 |
| **Houston Aldine C8/C108/C150** | 111 | 108 | 107 | 100 | 95 | 92 | 88 | 84 | 83 | 83 | 83 | 83 | 81 | 77 | 72 |
| **Houston Croquet C409** | 110 | 104 | 102 | 99 | 99 | 98 | 94 | 87 | 80 | 76 | 77 | 80 | 80 | 81 | 75 |
| **Houston Texas Avenue C411** | | | | 88 | 89 | 88 | 84 | 78 | 76 | 75 | 74 | 77 | 78 | 77 | 70 |
| **Clinton C403/C113/C304** | 101 | 97 | 93 | 96 | 96 | 95 | 85 | 79 | 73 | 74 | 76 | 79 | 80 | 76 | 68 |
| **Houston North Wayside C405** | 105 | 98 | 89 | 86 | 85 | 82 | 78 | 76 | 75 | 72 | 71 | 75 | 77 | 75 | 69 |
| **Houston Regional Office C81** | | | 95 | 94 | 88 | 88 | 84 | 81 | 74 | 72 | 73 | 77 | | | |
| **Channelview C15/C115** | | | | 87 | 90 | 89 | 85 | 83 | 80 | 78 | 78 | 80 | 79 | 73 | 67 |

| Site Name | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lynchburg Ferry C1015** | | | | | | 96 | 89 | 82 | | | | 76 | 77 | 70 | 66 |
| **Houston Deer Park 2 C35/C139** | 112 | 108 | 103 | 102 | 101 | 100 | 96 | 93 | 87 | 81 | 81 | 83 | 84 | 79 | 72 |
| **Lang C408** | 96 | 91 | 83 | 78 | 79 | 79 | 80 | 77 | 76 | 75 | 76 | 78 | 78 | 79 | 72 |
| **Lake Jackson C1016** | | | | | | 79 | 79 | 76 | 76 | 74 | 74 | 73 | 72 | 70 | 66 |
| **Houston Westhollow C410** | 102 | 104 | 95 | 87 | 87 | 89 | 96 | 92 | 89 | 79 | 75 | 74 | 78 | 79 | 76 |
| **Conroe Relocated C78** | | | | 78 | 85 | 86 | 85 | 84 | 80 | 71 | 71 | 74 | 79 | 79 | 76 |
| **Galveston Airport C34/C109** | 108 | 98 | 89 | 89 | 91 | 87 | 83 | | | | | | | | |
| **Texas City C10** | 98 | 91 | 83 | 80 | | | | | | | | | | | |
| **Clute C11** | 93 | 91 | 86 | 87 | | | | | | | | | | | |
| **Conroe C65** | | 91 | | | | | | | | | | | | | |
| **Houston Crawford C407** | 100 | 81 | | | | | | | | | | | | | |
| **Total Number of Regulatory Monitors** | 18 | 22 | 23 | 25 | 23 | 23 | 22 | 22 | 22 | 21 | 21 | 21 | 22 | 21 | 21 |

Figure 2-2: *Eight-Hour Ozone Design Value Statistics for All Monitors in the HGB Area* displays the statistically summarized maximum, median, and minimum eight-hour ozone design values computed across all monitors in the HGB area as well as how these distributions changed over time. The eight-hour ozone design value exhibited a noticeable downward trend from 2000 until about 2003, and again after 2004. Before 2001, no monitors in the HGB area met the 1997 eight-hour ozone NAAQS; since then, the area has seen a steady increase in the number of monitors attaining the standard. Since 2014, all monitors in the HGB area have been below the 1997 eight-hour ozone NAAQS of 84 ppb.

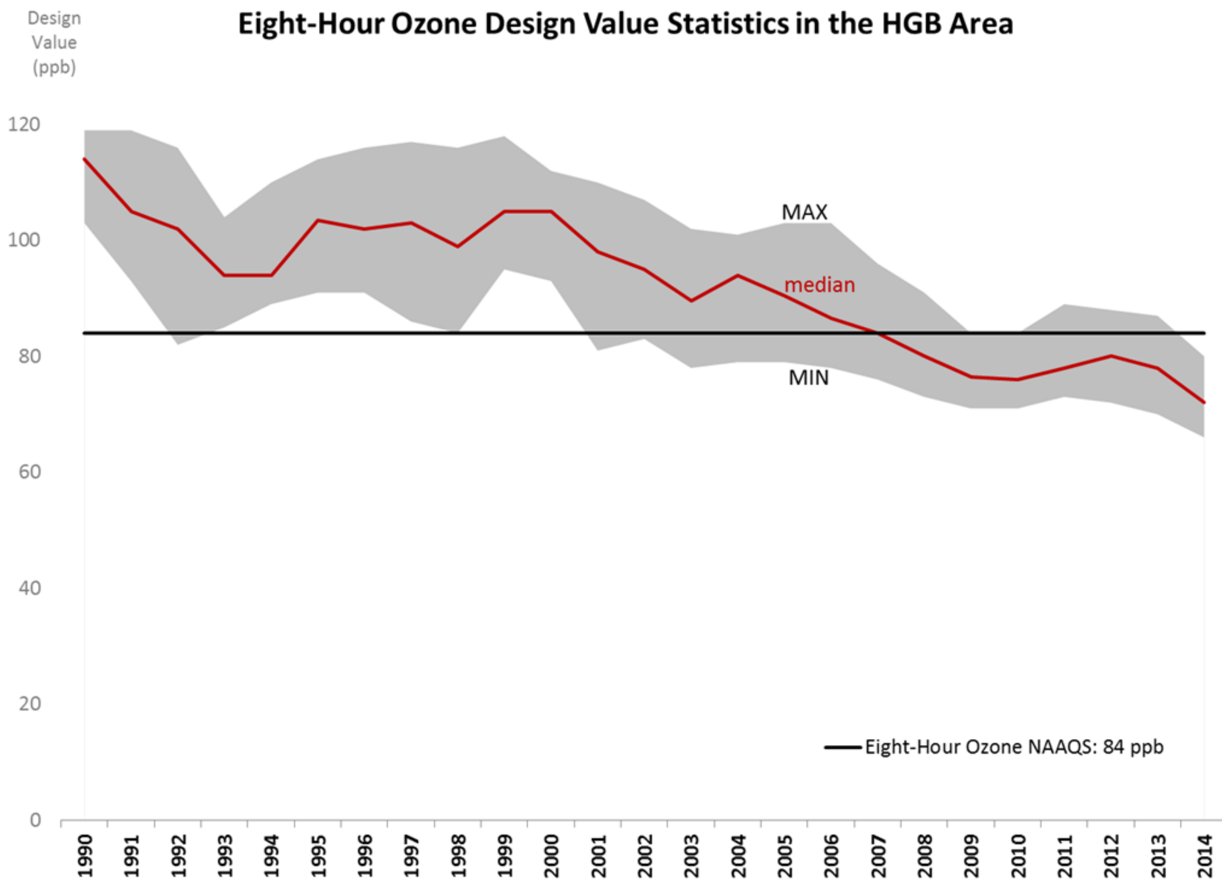


**Figure 2-2: Eight-Hour Ozone Design Value Statistics for All Monitors in the HGB Area**

Other useful information regarding ozone trends can also be obtained by examining the number of days where the daily eight-hour ozone maximum concentration was greater than 84 ppb in a year. This information is an important indicator of expected future ozone attainment in an area. The number of days over 84 ppb analysis demonstrates both that the area remains in current attainment, in addition to the distribution of exceedances over time, which provides evidence that existing control strategies for ozone are effective. Figure 2-3: *Number of 1997 Eight-Hour Ozone Exceedance Days by Monitor in the HGB Area* shows the number of days where the eight-hour ozone was greater than 84 ppb by year for each currently operating HGB monitor from 1990 through 2014. The number of days is the total number of unique days on which any monitor in the HGB area registered a daily peak eight-hour ozone concentration greater than 84 ppb. In 2014, only one day had an eight-hour ozone concentration greater than 84 ppb. Since 1990, the number of days with ozone concentrations above 84 ppb has decreased; a decrease that is especially pronounced from 1999 through 2002, then again from 2005 through 2008. The number of days with ozone concentrations above 84 ppb occurring in the HGB area fell 98% from 56 days in 1990 to one day in 2014.

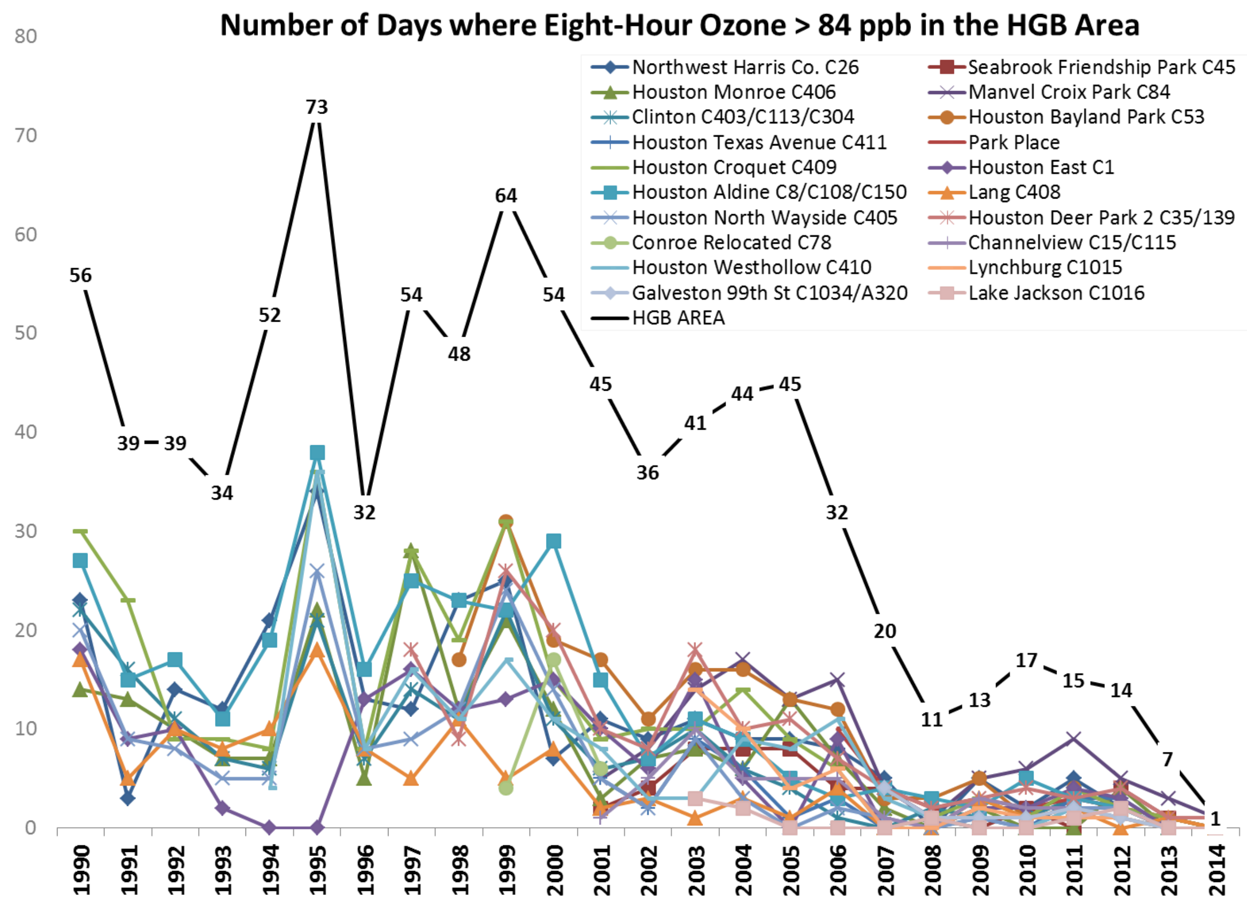


**Figure 2-3: Number of 1997 Eight-Hour Ozone Exceedance Days by Monitor in the HGB Area**

## 2.4 Trend Analysis for Ozone Precursors

Decreases in $NO_X$ and VOC, precursors to ozone formation, demonstrate the effectiveness of control measures in reducing $NO_X$ and VOC emissions, generally support declining ozone values, and indicate that ozone emission reductions are due to $NO_X$ and VOC emission reductions in the eight-county HGB area; however, ozone may not always exhibit trends identical to its precursors due to other variables such as meteorological conditions. This section evaluates trends in concentrations of $NO_X$ and VOC. Only data that met data completeness checks are used in this section. To meet the completeness check, each day must contain at least 18 valid hours of data, each month must contain at least 75% of days with data, each quarter must have at least two months of data, and each year must contain at least three quarters of data.

$NO_X$ emissions are a variable mixture of nitric oxide and nitrogen dioxide and are critical precursors to ozone formation. As $NO_X$ emissions decrease, ambient concentrations of these compounds should also decrease. $NO_X$ emissions are primarily created by fossil fuel combustion, lightning, biomass burning, and microbial action in soil.

Annual maxima, annual 90th percentile, and annual average daily peak one-hour $NO_X$ values observed in the HGB area are plotted in Figure 2-4: *Annual Maxima, 90th Percentile and Average of Daily Peak NOx Values (ppb) in the HGB Area, 2000 through 2014*. The figure uses a logarithmic scale so that all three statistics are visible, and a linear regression line was added to each statistic. The linear regression line of the yearly maximum shows a negative slope of 20.5 ppb per year with a correlation coefficient ($r^2$) of 0.65, and the regression line of the yearly 90th percentile shows a negative slope of 3.6 ppb per year with an $r^2$ of 0.80. The linear regression line of the yearly average shows a negative slope of 1.7 ppb per year with an $r^2$ of 0.82. All three measures decreased markedly over the period from 2000 through 2014, falling 40% (maximum), 29% (90th percentile), and 27% (mean). Strong downward trends in ambient $NO_X$ concentrations depicted in the emission-trend data are evidence of the effectiveness of emission controls implemented in the HGB area and would be expected to support declining ozone values, as observed in the HGB area.

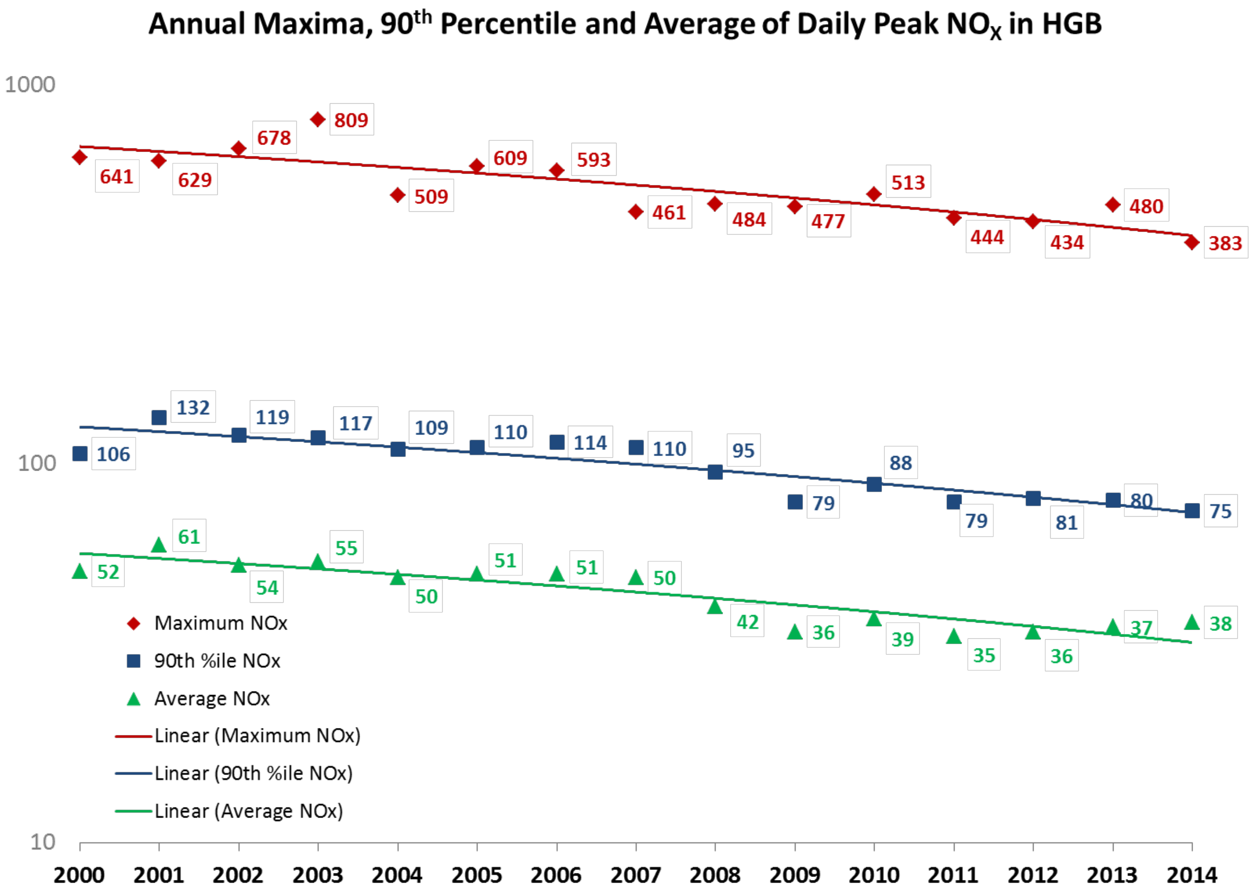


**Figure 2-4: Annual Maxima, 90th Percentile and Average of Daily Peak $NO_X$ Values (ppb) in the HGB Area, 2000 through 2014**

The other major class of ozone precursors is VOC. Since the mid-1990s, the TCEQ has collected 40-minute measurements, on an hourly basis, of over 40 species of VOC using auto-GC instruments. This section focuses on two prevalent VOC compounds that are associated with rapid and efficient ozone formation, ethylene and propylene. Since the majority of the petrochemical industry with VOC production in the HGB area is located along the Houston Ship Channel, the eight auto-GC instruments near the area were examined. Yearly geometric means were computed from valid ambient hourly measurements. A geometric mean was calculated by taking the natural logarithm of each measurement, averaging these logs, and then calculating the antilog of this mean log value. The geometric mean is a preferable statistic to median or arithmetic (ordinary) mean for evaluating the central tendency of data when the data are skewed, i.e., when the data are not symmetrically, or normally, distributed, but instead clustered around extreme high or low values. A geometric mean is more robust than an ordinary average, in that its value is not greatly influenced by one or a few very high or very low values. Many distributions of pollutant measurements, especially VOC, in the HGB area are skewed, thus, the geometric mean was evaluated to provide an assessment of VOC emissions in the HGB area.

The annual geometric mean of ethylene concentrations in parts per billion carbon (ppbC) is shown in Figure 2-5: *Yearly Geometric Mean Ethylene Concentrations (ppbC) at the Eight Houston Ship Channel Monitors, 2000 through 2014*. Prior to 2004, only three of the eight monitors had enough valid data to calculate annual geometric mean ethylene. Generally, the geometric mean ethylene concentrations at all of the auto-GC monitors have decreased. While trends are variable from year to year, generally, the geometric mean ethylene concentrations at all of the auto-GC monitors have decreased. Ethylene at the Channelview monitor (C15/C115) observed an increase from 2012 to 2013, then a decrease from 2013 to 2014. Concentrations at 50% of the monitoring sites studied (Clinton (C403/C113/C304), Houston Deer Park 2 (C35/C139), Lynchburg Ferry (C1015) and Cesar Chavez (C1020) monitors) saw small increases from 2013 through 2014; however, the overall trend from 2000 through 2014 is decreasing.

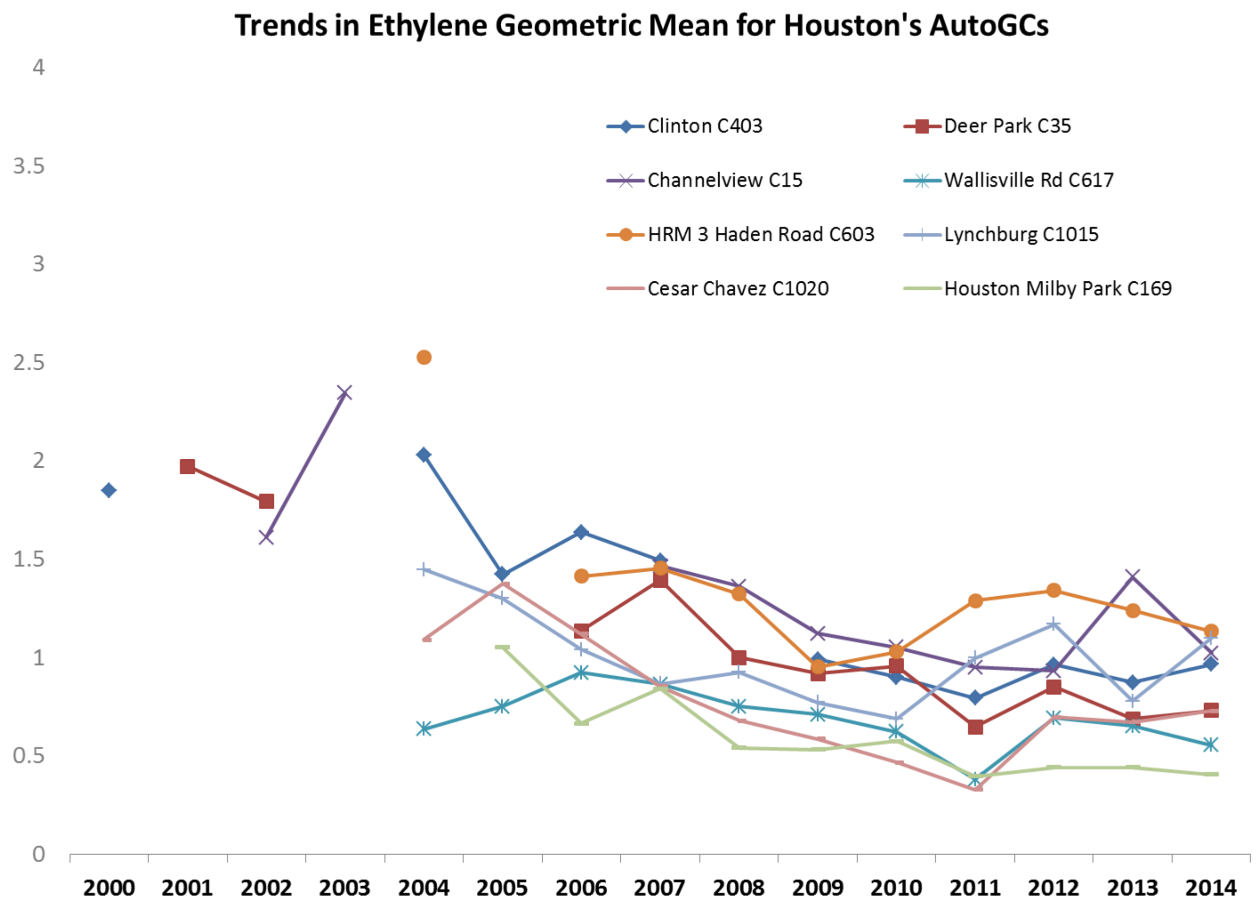


**Figure 2-5: Yearly Geometric Mean Ethylene Concentrations (ppbC) at the Eight Houston Ship Channel Monitors, 2000 through 2014**

Figure 2-6: *Yearly Geometric Mean Propylene Concentrations (ppbC) at the Eight Houston Ship Channel Monitors, 2000 through 2014* shows the annual geometric mean for propylene. Like ethylene, only three of the eight monitors had enough data to calculate annual geometric mean propylene prior to 2004. Note that the y-axis in this figure is the same as in Figure 2-5.

The geometric means for propylene are lower than the geometric means for ethylene for all the years. All monitors showed a steady decrease in geometric mean propylene from 2000 through 2014, although three of the eight monitors, Clinton (C403/C113/C304), Lynchburg Ferry (C1015), and Houston Milby Park(C169) saw increases in 2014. Though decreasing at different rates, these long-term decreases in ambient concentrations of ethylene and propylene suggest overall industrial emissions of these compounds have decreased considerably since 2000.

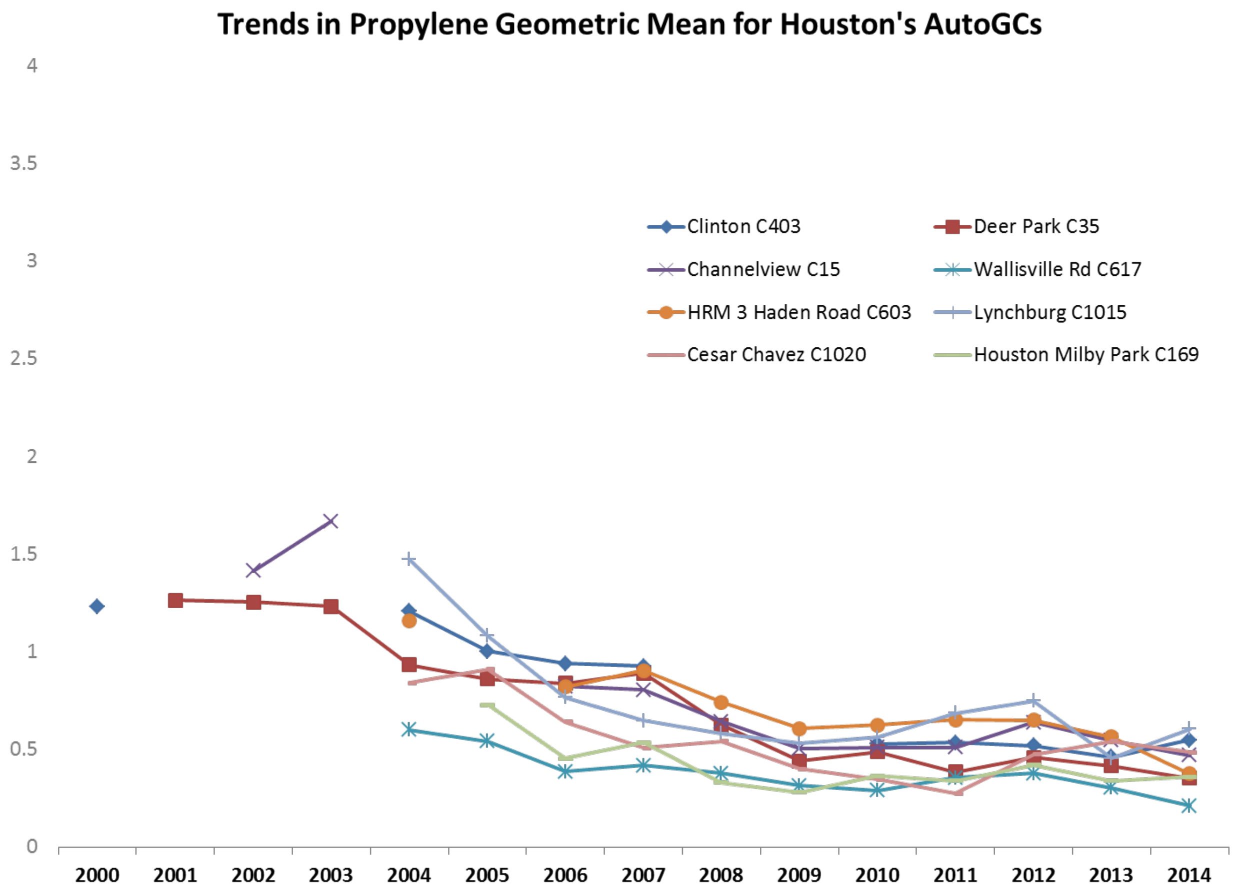


**Figure 2-6: Yearly Geometric Mean Propylene Concentrations (ppbC) at the Eight Houston Ship Channel Monitors, 2000 through 2014**

## 2.5 Ozone Data Summary

Ozone concentrations have decreased nearly 33% in the HGB area from 1990 through 2014. In 2014, the eight-hour ozone design value met the 1997 eight-hour ozone NAAQS of 0.08 ppm. Examination of the number of days where eight-hour ozone concentrations exceeded 0.08 ppm reveals substantial downward trends. Evaluation of local changes of ozone precursors showed similar significant downward trends. These results suggest that the significant ozone reductions achieved in the HGB area are primarily due to $NO_X$ and VOC emission reductions in the eight-county HGB area, the emission reduction control strategies are effective, and that projections for future attainment status are well-founded.

## SECTION 3: PERMANENT AND ENFORCEABLE EMISSIONS REDUCTIONS

### 3.1 Control Measures

The Houston-Galveston-Brazoria (HGB) nonattainment area for the 1997 eight-hour ozone National Ambient Air Quality Standard (NAAQS), which consists of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, includes some of the most comprehensively controlled industrial sources in the world. The Texas Commission on Environmental Quality (TCEQ) has developed stringent and innovative regulations that address nitrogen oxides ($NO_X$), volatile organic compounds (VOC), and highly reactive volatile organic compounds (HRVOC).

### 3.2 List of Existing Control Measures

Over decades of air quality planning to improve ozone levels in the HGB area, a broad range of control measures have been implemented for each emission source category. Table 3-1: *Existing Ozone Control Measures Applicable to the HGB Eight-County Nonattainment Area* lists the existing ozone control strategies that have been implemented for the one-hour and 1997 eight-hour ozone standards in the HGB area. The measures listed in Table 3-1 are permanent and enforceable and are included in the applicable implementation plan for the one-hour and 1997 eight-hour ozone standards in accordance with Federal Clean Air Act (FCAA), §107(d)(3)(E)(iii).

**Table 3-1: Existing Ozone Control Measures Applicable to the HGB Eight-County Nonattainment Area**

| Measure | Description | Start Date(s) |
|---|---|---|
| Highly Reactive Volatile Organic Compounds Emissions Cap and Trade (HECT) Program and Highly Reactive Volatile Organic Compounds (HRVOC) Rules<br><br>30 Texas Administrative Code (TAC) Chapter 101, Subchapter H, Division 6 and 30 TAC Chapter 115, Subchapter H, Divisions 1 and 2 | Affects cooling towers, process vents, and flares, and establishes an annual emissions limit with a cap and trade for each applicable site in Harris County<br><br>Seven perimeter counties subject to permit allowable limits and monitoring requirements | Monitoring requirements began January 31, 2006<br><br>Cap and trade program implemented January 1, 2007<br><br>HECT cap incrementally stepped-down from 2014 through 2017 for a total 25% cap reduction |
| HRVOC Fugitive Rules<br><br>30 TAC Chapter 115, Subchapter D, Division 3 | More stringent leak detection and repair (LDAR) requirements for components in HRVOC service<br><br>Additional components included in LDAR program: more stringent repair times, lower leak detection, and third-party audit requirements | March 31, 2004 |

| Measure | Description | Start Date(s) |
| --- | --- | --- |
| Volatile Organic Compounds (VOC) Control Measures – Storage Tanks<br><br>30 TAC Chapter 115, Subchapter B, Division 1 | Requires controls for slotted guide poles and more stringent controls for other fittings on floating roof tanks, and control requirements or operational limitations on landing floating roof tanks<br><br>Eliminates exemption for storage tanks for crude oil or natural gas condensate, and regulates flash emissions from these tanks | January 1, 2009<br><br>Compliance with revised monitoring and testing requirements required by March 1, 2013 |
| VOC Control Measures – Degassing Operations<br><br>30 TAC Chapter 115, Subchapter F, Division 3 | Requires vapors from degassing to be vented to a control device for a longer time period, and removes exemption from degassing to control for tanks with capacity of 75,000 to 1,000,000 gallons<br><br>Clarification of rule and monitoring and testing requirements, additional control options, and notification requirements | January 1, 2009<br><br>February 17, 2011 |
| VOC Control Measures<br><br>30 TAC Chapter 115 | Additional control technology requirements for batch processes and bakeries by December 31, 2002<br><br>Additional VOC measures adopted earlier for reasonably available control technology (RACT) and other state implementation plan (SIP) planning purposes: general vent gas control, industrial wastewater, loading and unloading operations, general VOC LDAR, solvent using process, etc. | December 31, 2002 and earlier |
| VOC Control Measures – Offset Lithographic Printers<br><br>30 TAC Chapter 115, Subchapter E, Division 4 | Revised to limit VOC content of solvents used by offset lithographic printing facilities and to include smaller sources in rule applicability (see Appendix D: *Reasonably Available Control Technology Analysis* of the Houston-Galveston-Brazoria Attainment Demonstration State Implementation Plan Revision for the 1997 Eight-Hour Ozone Standard adopted March 10, 2010 (2010 HGB AD SIP Revision) for more details) | March 1, 2011 for major sources<br><br>March 1, 2012 for minor sources |

| Measure | Description | Start Date(s) |
|---|---|---|
| VOC Control Measures – Solvent-Using Processes<br><br>30 TAC Chapter 115, Subchapter E | Revised to implement RACT requirements per control technique guidelines published by the United States Environmental Protection Agency (EPA)<br><br>Seven emission source categories in the Houston-Galveston-Brazoria (HGB) area: industrial cleaning solvents; flexible package printing; paper, film, and foil coatings; large appliance coatings; metal furniture coatings; miscellaneous metal and plastic parts coatings; and miscellaneous industrial adhesives (see Houston-Galveston-Brazoria Reasonably Available Control Technology Analysis Update State Implementation Plan Revision for the 1997 Eight-Hour Ozone Standard adopted December 7, 2011 for more details) | March 1, 2013 |
| Refueling – Stage I<br><br>30 TAC Chapter 115, Subchapter C, Division 2 | Captures gasoline vapors that are released when gasoline is delivered to a storage tank<br><br>Vapors returned to the tank truck as the storage tank is being filled with fuel, rather than released into the ambient air | 1990<br><br>A SIP revision related to Stage I regulations was approved by the EPA, effective June 29, 2015 |
| Refueling – Stage II<br><br>30 TAC Chapter 115, Subchapter C, Division 4 | Captures gasoline vapors when a vehicle is being fueled at the pump<br><br>Vapors returned through the pump hose to the petroleum storage tank, rather than released into the air | 1992<br><br>A SIP revision authorizing the decommissioning of Stage II vapor control equipment was approved by the EPA on March 17, 2014. Facilities may continue operating Stage II until August 31, 2018 |

| Measure | Description | Start Date(s) |
|---|---|---|
| Nitrogen Oxides ($NO_X$) Mass Emissions Cap and Trade (MECT) Program and Chapter 117 NOx Emission Standards for Attainment Demonstration Requirements<br><br>30 TAC Chapter 101, Subchapter H, Division 3 and 30 TAC Chapter 117, Subchapter B, Division 3 and Subchapter C, Division 3 | Overall 80% $NO_X$ reduction from existing industrial sources and utility power plants, implemented through a cap and trade program<br><br>Affects utility boilers, gas turbines, heaters and furnaces, stationary internal combustion engines, industrial boilers, and many other industrial sources | April 1, 2003 and phased in through April 1, 2007 |
| $NO_X$ System Cap Requirements for Electric Generating Facilities (EGFs)<br><br>30 TAC Chapter 117, Subchapter B, Division 3 and Subchapter C, Division 3 | Mandatory daily and 30-day system cap emission limits (independent of the MECT Program) for all EGFs at utility power plants and certain industrial/commercial EGFs that also provide power to the electric grid | March 31, 2007 (industrial/commercial EGFs)<br><br>March 31, 2004 (utility power plants) |
| Utility Electric Generation in East and Central Texas<br><br>30 TAC Chapter 117, Subchapter E, Division 1 | $NO_X$ control requirements (approximately 55 %) on utility boilers and stationary gas turbines at utility electric generation sites in East and Central Texas | May 1, 2003 through May 1, 2005 |
| $NO_X$ Emission Standards for Nitric Acid and Adipic Acid Manufacturing<br><br>30 TAC Chapter 117, Subchapter F | $NO_X$ emission standards for nitric acid and adipic acid manufacturing facilities in the HGB area | November 15, 1999 |
| Stationary Diesel Engines<br><br>30 TAC Chapter 117, Subchapter B, Division 3 and Subchapter D, Division 1 | Prohibition on operating stationary diesel and dual-fuel engines for testing and maintenance purposes between 6:00 a.m. and noon | April 1, 2002 |

| Measure | Description | Start Date(s) |
|---|---|---|
| Natural Gas-Fired Small Boilers, Process Heaters, and Water Heaters<br><br>30 TAC Chapter 117, Subchapter E, Division 3 | $NO_X$ emission limits on small-scale residential and industrial boilers, process heaters, and water heaters equal to or less than 2.0 million British thermal units per hour | 2002 |
| Minor Source $NO_X$ Controls for Non-MECT Sites<br><br>30 TAC Chapter 117, Subchapter D, Division 1 | $NO_X$ emission limits on boilers, process heaters, stationary engines, and turbines at minor sites not included in the MECT Program (uncontrolled design capacity to emit less than 10 tons per year) | March 31, 2005 |
| Texas Low Emission Diesel (TxLED)<br><br>30 TAC Chapter 114, Subchapter H, Division 2 | Requires all diesels for both on-road and non-road use to have a lower aromatic content and a higher cetane number | October 31, 2005 and phased in through January 31, 2006 |
| TxLED for Marine Fuels<br><br>30 TAC Chapter 114, Subchapter H, Division 2 | Adds marine distillate fuels X and A, commonly known as DMX and DMA, or Marine Gas Oil, into the definition of diesel fuels, requiring them to be TxLED compliant | October 1, 2007 and phased in through January 1, 2008 |
| Vehicle Inspection/ Maintenance<br><br>30 TAC Chapter 114, Subchapter C | Yearly computer checks for 1996 and newer vehicles and dynamometer testing for pre-1996 vehicles | May 1, 2002 in Harris County<br><br>May 1, 2003 in Brazoria, Fort Bend, Galveston, and Montgomery Counties |
| Texas Low Reid Vapor Pressure (RVP) Gasoline<br><br>30 TAC Chapter 114, Subchapter H, Division 1 | Requires all gasoline for both on-road and non-road use to have an RVP of 7.8 pounds per square inch or less from May 1 through October 1 each year | April 2000 |
| Texas Emissions Reduction Plan (TERP)<br><br>30 TAC Chapter 114, Subchapter K | Provides grant funds for on-road and non-road heavy-duty diesel engine replacement/retrofit | January 2002 |
| Voluntary Mobile Emission Reduction Program | Voluntary measures administered by the Houston-Galveston Area Council (H-GAC) (see Appendix F: *Evaluation of Mobile Source Control Strategies for the Houston-Galveston-Brazoria State Implementation Plan (With Detailed Strategies)*, prepared for H-GAC by ENVIRON International Corporation, of the 2010 HGB AD SIP Revision) | Phase in through 2018 |

| Measure | Description | Start Date(s) |
|---|---|---|
| Federal Area/Non-Road Measures | Series of emissions limits, implemented by the EPA, for area and non-road sources<br>Examples: diesel and gasoline engine standards for locomotives and leaf-blowers | Phase in through 2018 |
| Federal On-Road Measures | Series of emissions limits, implemented by the EPA, for on-road vehicles<br><br>Examples: Tiers 1, 2, and 3 vehicle standards, low sulfur diesel standards, National Low Emission Vehicle standards, and reformulated gasoline | Phase in through 2025 |
| Speed Limit Reduction<br><br>43 TAC Chapter 25, Subchapter B | Five miles per hour (mph) below what was posted before May 1, 2002, on roadways where speeds were 65 mph or higher | September 2003 |
| California Standards for Certain Gasoline Engines | California standards for non-road gasoline engines 25 horsepower and larger | May 1, 2004 |
| Transportation Control Measures | Various measures in H-GAC's long-range transportation plans (see Appendix F of the 2010 HGB AD SIP Revision for more details) | Phase in through 2018 |
| Voluntary Energy Efficiency/Renewable Energy | Energy efficiency and renewable energy projects enacted by the Texas Legislature outlined in Section 3.3.5: *Energy Efficiency and Renewable Energy Measures* | See Section 3.3.5 |

The following control measures being implemented in the HGB area are permanent and enforceable, but the emissions reductions from these control measures were not included in previous one-hour and 1997 eight-hour HGB attainment demonstration (AD) state implementation plan (SIP) revisions.

### 3.2.1 Highly Reactive Volatile Organic Compounds Emissions Cap and Trade Program

The Highly Reactive Volatile Organic Compounds Emission Cap and Trade (HECT) Program rules in 30 Texas Administrative Code (TAC) Chapter 101, Subchapter H, Division 6 established a mandatory annual HRVOC emission cap on sites in the HGB 1997 eight-hour ozone nonattainment area with the potential to emit greater than 10 tons per year (tpy) of HRVOC from facilities subject to 30 TAC Chapter 115, Subchapter H, Division 1 or Division 2. These facilities include vent gas streams, flares, and cooling tower heat exchange systems. Sites in Harris County are required to participate in the HECT Program. The program was implemented on January 1, 2007.

The HECT Program cap is enforced by the allocation, trading, and banking of allowances. An allowance is the equivalent of one 1.0 ton of HRVOC emissions. The HECT Program cap was established at a level demonstrated as necessary to allow the HGB area to attain the one-hour ozone standard along with a 5% compliance margin to account for potential emissions variations. The total initial cap was 3,451.5 tpy.

Allowances allocated from 2007 through 2010 were based on historical levels of activity reported by affected sites. For 2011 and beyond, a site's allocation was determined by multiplying the total HECT cap by an industry-sector factor and a site-specific factor. The industry-sector factor was determined by grouping sites into sectors and determining each site's proportion based on actual emissions. The site-specific factor was based on a site's uncontrolled emissions as a proportion of the total uncontrolled emissions from all sites in that industry sector. The reallocation includes a mandatory 10% cap reduction implemented during 2014, with additional 5% reductions implemented at the start of each control period for 2015, 2016, and 2017. The final HECT Program cap is set at 2,588.6 tpy for 2017 and all subsequent control periods. Affected sites that do not receive an allocation of allowances must use allowances allocated to sites already participating in the program to cover annual HRVOC emissions.

### 3.2.2 Mass Emissions Cap and Trade Program

The Mass Emissions Cap and Trade (MECT) Program rules in 30 TAC Chapter 101, Subchapter H, Division 3 established a mandatory annual $NO_X$ emission cap on sites in the HGB 1997 eight-hour ozone nonattainment area that are either a major source of $NO_X$ with facilities subject to the $NO_X$ emissions specifications in 30 TAC §117.310 or §117.1210, or have an uncontrolled design capacity to emit at least 10 tpy of $NO_X$ from facilities subject to 30 TAC §117.2010. Affected facilities include: utility boilers, auxiliary steam boilers, or stationary gas turbines; industrial, commercial, or institutional boilers and process heaters; stationary gas turbines; stationary internal combustion engines; fluid catalytic cracking units (including carbon monoxide boilers, carbon monoxide furnaces, and catalyst regenerator vents); boilers and industrial furnaces that were regulated as existing facilities by the United States Environmental Protection Agency (EPA) under 40 Code of Federal Regulations (CFR) Part 266, Subpart H (as in effect on June 9, 1993); duct burners used in turbine exhaust ducts; pulping liquor recovery furnaces; lime kilns; lightweight aggregate kilns; heat treating furnaces and reheat furnaces; magnesium chloride fluidized bed dryers; and incinerators.

The MECT Program cap is enforced by the allocation, trading, and banking of allowances. An allowance is the equivalent of 1.0 ton of $NO_X$ emissions. The MECT Program cap was implemented on January 1, 2002 at historical emission levels with mandatory $NO_X$ reductions increasing over time until achieving the final cap on April 1, 2007. Affected facilities that do not meet the criteria for receiving an allocation of allowances must use allowances allocated to facilities already participating in the program to cover annual $NO_X$ emissions.

The photochemical modeling for the Houston-Galveston-Brazoria Attainment Demonstration State Implementation Plan Revision for the 1997 Eight-Hour Ozone Standard adopted March 10, 2010 (2010 HGB AD SIP Revision) included 120.0 tons per day (tpd) of $NO_X$ emissions in 2018 based on the October 2009 MECT cap. The modeled MECT cap is a function of the actual allowance allocations, allowable allowance allocations, and the conversion of emission reduction credits to allowance allocations. The projected 2018 MECT cap, as of May 2015 is 109.6 tpd of $NO_X$ emissions, which is a reduction of 10.4 tpd of $NO_X$ emissions from the modeled MECT cap. This reduction can be attributed to facilities revising allowance allocations based on permit limits to allocations based on actual operating data since typically most facilities operate below their permit limits. Further MECT cap reductions are expected in the future due to sources that have yet to convert their allowable allowances into actual allowances.

### 3.2.3 Tier 3 Motor Vehicle Emission and Gasoline Sulfur Fuel Standards

On April 28, 2014, the EPA finalized the *Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards* (79 FR 23413). Starting in 2017, Tier 3 sets new vehicle emissions standards and lowers the sulfur content of gasoline, considering the vehicle and its fuel as an integrated system.

Tier 3 motor vehicle emission standards will reduce both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles beginning model year 2017 and will be fully phased in by model year 2025. The Tier 3 motor vehicle emission standards also extend the regulatory useful life period during which the standards apply from 120,000 miles to 150,000 miles.

When fully implemented, the Tier 3 motor vehicle exhaust emission standards for light-duty vehicles will provide approximately an 80% reduction in non-methane organic gases (NMOG) and $NO_X$ ($NMOG+NO_X$) standards and a 70% reduction in per-vehicle particulate matter (PM) standards when compared to the current fleet average. The Tier 3 motor vehicle exhaust standards for heavy-duty vehicles provide about a 60% reduction in both fleet average $NMOG+NO_X$ vehicle emissions standards and per-vehicle PM standards when compared to the current vehicle emissions standards.

The Tier 3 gasoline sulfur standards will limit gasoline sulfur to no more than 10 parts per million (ppm) of sulfur on an annual average basis beginning January 1, 2017, a reduction of approximately 66% when compared to the current standard. The current gasoline sulfur standards specifying an 80 ppm refinery gate cap and 95 ppm downstream cap are maintained under the new Tier 3 gasoline sulfur standards. Removing sulfur from gasoline allows a vehicle's catalyst to work more efficiently. The Tier 3 fuel standards will make emission control systems more effective for both existing and new vehicles, and will enable automobile manufacturers to meet the Tier 3 motor vehicle emissions standards.

#### 3.2.4 New International Marine Diesel Engine and Marine Fuel Standards for Oceangoing Vessels and Emissions Control Areas

In March 2009, the United States (U.S.) government submitted a request to the International Maritime Organization (IMO) for the creation of an emissions control area (ECA) around the nation's coastlines. The request was granted and the North American ECA was officially designated by the IMO on March 26, 2010 and became enforceable in August 2012. All marine diesel fuels used by oceangoing vessels (OGV) in the North American ECA will be limited to a maximum sulfur content of 1,000 ppm beginning January 1, 2015, and all new engines on OGV operating in these areas must use emission controls that achieve an 80% reduction in $NO_X$ emissions beginning January 1, 2016.

The EPA regulations for marine diesel fuel and new marine engines less than 30 liters per cylinder displacement and the new International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI standards for marine residual fuels and new marine diesel engines above 30 liters per cylinder displacement will apply to all OGV flagged and registered in the U.S. The EPA's regulations for new Category 3 marine engines and new sulfur limits for marine diesel fuel will also apply to all OGV flagged and registered in the U.S. In addition, the new MARPOL Annex VI standards will apply to all new marine diesel engines and fuels on foreign marine vessels that operate near U.S. coasts and ports.

The new marine diesel engine and fuel standards will provide a 96% reduction in sulfur in marine diesel fuels, as well as an 85% reduction in PM emissions and an 80% reduction in $NO_X$ emissions, when compared to current standards[4].

[4] EPA, 2009. Oceangoing Vessels, Emission Control Area Designation, http://www.epa.gov/otaq/oceanvessels.htm#emissioncontrol, Office of Transportation and Air Quality.

Cumulatively, these new marine diesel engine and fuel standards are estimated by the EPA to result in a 0.5 to 1.0 parts per billion reduction of ozone in the ambient air of the HGB ozone nonattainment area by 2020[5].

## 3.3 Additional Measures

Additional air quality improvement measures being implemented in the HGB area are described in this section. These additional measures are beneficial toward reducing ozone and assure that the HGB area will continue to maintain the 1997 eight-hour ozone standard.

### 3.3.1 SmartWay Transport Partnership and the Blue Skyways Collaborative

Among its various efforts to improve air quality in Texas, the TCEQ continues to promote two voluntary programs in cooperation with the EPA: SmartWay Transport Partnership and Blue Skyways Collaborative.

The SmartWay Transport Partnership is a market-driven partnership aimed at helping businesses move goods in the cleanest most efficient way possible. This is a voluntary EPA program primarily for the freight transport industry that promotes strategies and technologies to help improve fleet efficiency while also reducing air emissions.

There are over 3,000 SmartWay partners in the U.S., including most of the nation's largest truck carriers, all the Class 1 rail companies, and many of the top Fortune 500 companies. Since its founding, SmartWay has reduced oil consumption by 120.7 million barrels and prevented the release of 738,000 tons of $NO_X$ and 37,000 tons of PM into the atmosphere[6]. Ports in the U.S. rely on SmartWay's Port Drayage Truck program to help reduce pollution in and around major national ports. The Port of Houston Authority's (PHA) partnership with the Environmental Defense Fund and the Houston-Galveston Area Council (H-GAC) in the Port Drayage Truck Bridge Loan Program received $9 million from the EPA's Diesel Emissions Reduction Act (DERA) SmartWay Program in 2009. On average, four trucks a month, or about 50 trucks a year, were approved for replacement funding.

In April 2015, the EPA awarded the PHA with a DERA grant of nearly $900,000. This newest grant, which will have matching funds of $1,680,142, will have a total commitment of more than $2.5 million. A total of 25 drayage trucks will replace trucks operating in the Port of Houston. The latest funding will provide for new trucks powered by certified engines that are model year 2011 or newer, which are estimated to be 90% cleaner. These drayage trucks operate in the Port of Houston and along the Houston Ship Channel. The new trucks will also have Global Positioning System units to collect data on idling and port operations, which will allow fleet owners and operators to gauge opportunities for additional fuel savings and emissions reduction[7].

Approximately 170 Texas companies are SmartWay partners. The SmartWay Transport Partnership will continue to benefit the HGB area by reducing emissions as more companies and

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[5] EPA, 2009. Regulatory Announcement: Proposal of Emission Control Area Designation for Geographic Control of Emissions from Ships, EPA-420-F-09-015, Figure 4: Potential Benefits of U.S. ECA Ozone Reductions in 2020, March 2009.
[6] EPA, 2014. SmartWay Program Highlights 2014, EPA-420-F-14-003, February 2014. http://www.epa.gov/smartway/about/documents/basics/420f14003.pdf
[7] http://www.portofhouston.com/inside-the-port-authority/communications/business-news/epa-administrator-visits-port-of-houston-authority-to-make-formal-announcement/

affiliates join, and additional idle reduction, trailer aerodynamic kits, low-rolling resistance tire, and retrofit technologies are incorporated into SmartWay-verified technologies.

The Blue Skyways Collaborative was created to encourage voluntary air emission reductions by planning or implementing projects that use innovations in diesel engines, alternative fuels, and renewable energy technologies applicable to on-road and non-road sources. The Blue Skyways Collaborative partnerships include international, federal, state, and local governments, non-profit organizations, environmental groups, and private industries.

### 3.3.2 American Waterways Operators Tank Barge Emissions Best Management Practices

Using infrared gas imaging technology in field studies conducted in the summer of 2005, the TCEQ detected inadvertent VOC emissions from tank barges operating in the HGB area. The Louisiana Department of Environmental Quality (LDEQ) also detected inadvertent emissions from tank barges in similar field studies conducted in the same time period. In response to these field studies, the American Waterways Operators (AWO) voluntarily developed industry best management practices (BMP) to reduce VOC emissions from tank barges. The BMP include procedures to reduce VOC emissions from equipment and operations on tank barges. The recommendations are a combination of inspection, corrective action, preventative maintenance, and operational, procedural, and training practices.

The BMP were reviewed by the Chemical Transportation Advisory Committee, United States Coast Guard, LDEQ, and TCEQ. The BMP document was distributed to AWO members in 2006 for implementation on a voluntary basis. While the BMP are voluntary measures and do not impose an enforceable commitment on AWO members, the implementation of the BMP, where applicable, may contribute to reducing inadvertent VOC emissions from barges during dock operations and during transit, which will help improve air quality in the HGB area. A copy of the 2006 BMP document is provided in the 2010 HGB AD SIP Revision as Appendix J: *Recommendations for Best Management Practices to Control and Reduce Inadvertent Cargo Vapor Emissions in the Tank Barge Community*.

### 3.3.3 Consent Decrees with Refineries

The EPA's National Petroleum Refinery Initiative[8] has resulted in multi-issue settlement agreements with the nation's major petroleum refineries. As of May 2014, 109 refineries representing more than 90% of total domestic refining capacity are under settlement, and negotiations are underway with other refiners not currently under settlement. The EPA consent decrees limit emissions from fluidized catalytic cracking units, sulfur recovery units, heaters and boilers, and flares. The EPA estimates that full implementation of the current settlements will result in more than 93,000 tpy of $NO_X$ emission reductions. The EPA also anticipates VOC emission reductions will result from consent decree requirements that reduce hydrocarbon flaring including:

- installing continuous emissions monitoring systems (CEMS) or predictive emissions monitoring systems;
- operating a flare gas recovery system to control continuous or routine flaring;
- limiting flaring to only process upset gases, fuel gas released as a result of relief valve leakage, or gas released due to a malfunction; and
- eliminating the routes of generated fuel gases and monitoring the flare with CEMS or a flow meter.

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[8] http://www2.epa.gov/enforcement/petroleum-refinery-national-case-results

Although some of the estimated $NO_X$ and VOC emission reductions may have occurred prior to 2006, full implementation of the settlements is not expected until the end of 2015. Since approximately 14% of the nation's petrochemical refining capacity is located in the HGB area[9], the commission expects the HGB area will benefit from the $NO_X$ and VOC emission reductions required by these settlements.

### 3.3.4 Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

The TCEQ previously adopted $NO_X$ emission standards for stationary diesel reciprocating internal combustion engines in 30 TAC Chapter 117 for the HGB area. The $NO_X$ emission standards for stationary diesel engines in §117.310 and §117.2010 are used in conjunction with the MECT Program for sources subject to MECT. For sources subject to §117.2010 that are not in MECT, the $NO_X$ emission standards apply on a unit-by-unit basis. Additionally, the TCEQ adopted requirements in the exemption criteria for stationary diesel reciprocating internal combustion engines in §117.303 and §117.2003 that require engines installed, modified, reconstructed, or relocated on or after October 1, 2001 to meet the corresponding emission standards for non-road engines in 40 CFR Part 89, §89.112(a), Table 1: *Emission Standards* to be in effect at the time of the installation, modification, reconstruction, or relocation of the engine.

The combination of the emission standards, the MECT Program, and the provisions to meet the EPA's Tier standards (Tiers 1, 2, and 3) in 40 CFR Part 89 to qualify for exemption makes the Chapter 117 requirements for stationary diesel reciprocating internal combustion engines equivalent to, or more stringent than, most of the requirements in the EPA's New Source Performance Standards in 40 CFR Part 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. However, the $NO_X$ emission standards in 40 CFR §60.4204(c)(3) for large-cylinder non-emergency stationary compression ignition internal combustion engines (i.e., diesel-fired engines) installed on or after January 1, 2016 are more stringent than the lowest $NO_X$ emission standards for stationary diesel reciprocating internal combustion engines in §117.310 and §117.2010 and 40 CFR Part §89.112(a), Table 1.

The exact amount of $NO_X$ reductions resulting from 40 CFR §60.4204(c)(3) will be dependent on the turnover of existing engines and new installations after 2015 and cannot be estimated at this time. However, the requirements for new non-emergency stationary diesel-fired engines in the large-cylinder category starting in 2016 should ultimately result in additional $NO_X$ reductions beyond that already relied upon in the 2010 HGB AD SIP Revision.

### 3.3.5 Energy Efficiency and Renewable Energy Measures

Energy efficiency (EE) measures are typically programs that reduce the amount of electricity and natural gas consumed by residential, commercial, industrial, and municipal energy consumers. Examples of EE measures include increasing insulation in homes, installing compact fluorescent light bulbs, and replacing motors and pumps with high efficiency units. Renewable energy (RE) measures include programs that generate energy from resources that are replenished or are otherwise not consumed as with traditional fuel-based energy production. Examples of RE include wind energy and solar energy projects.

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[9] U.S. Energy Information Administration. *Refinery Capacity Report*. June 21, 2013. http://www.eia.gov/petroleum/refinerycapacity/

Texas leads the nation in RE generation from wind. As of December 2014, Texas has 14,098 megawatts (MW) of installed wind generation capacity[10]; more than double that of California, the state with the next highest amount of installed wind generation capacity. Texas' total net electrical generation from renewable wind generators for 2014 is estimated to be approximately 39 million megawatt-hours (MWh)[11], approximately 22% of the total wind net electrical generation for the U.S.

While EE/RE measures are beneficial and can result in lower overall emissions from fossil fuel-fired power plants in Texas, emission reductions resulting from these programs are not explicitly included in the photochemical modeling for SIP purposes because local efficiency efforts may not result in local emissions reductions or may be offset by increased demand in electricity. The complex nature of the electrical grid makes accurately quantifying emission reductions from EE/RE measures difficult. At any given time, it is impossible to determine exactly where a specific user's electricity was produced. The electricity for users in a nonattainment may not necessarily be generated solely within that nonattainment area. For example, some of the electricity used within a nonattainment area in East Texas could be generated by a power plant in a nearby attainment county or even in West Texas. If electrical demand is reduced in a nonattainment area due to local efficiency measures, the resulting emission reductions from power generation facilities may occur in any number of locations around the state. Similarly, increased RE generation may not necessarily replace electrical generation from local fossil fuel-fired power plants within a particular nonattainment area.

The Texas Legislature has enacted a number of EE/RE measures and programs. The following is a summary of Texas EE/RE legislation since 1999.

- 76th Texas Legislature, 1999
  - Senate Bill (SB) 7
  - House Bill (HB) 2492
  - HB 2960
- 77th Texas Legislature, 2001
  - SB 5
  - HB 2277
  - HB 2278
  - HB 2845
- 78th Texas Legislature, 2003
  - HB1365 (Regular Session)
- 79th Texas Legislature, 2005
  - SB 20 (1st Called Session)
  - HB 2129 (Regular Session)
  - HB 2481 (Regular Session)
- 80th Texas Legislature, 2007
  - SB 12
  - HB 66
  - HB 3070
  - HB 3693

[10] U.S. Department of Energy, National Renewable Energy Laboratory, http://apps2.eere.energy.gov/wind/windexchange/wind_installed_capacity.asp

[11] U.S. Department of Energy, Energy Information Administration, Form EIA-923 data, http://www.eia.gov/electricity/data/eia923/

- 81st Texas Legislature, 2009
  - None
- 82nd Texas Legislature, 2011
  - SB 898 (Regular Session)
  - SB 924 (Regular Session)
  - SB 981 (Regular Session)
  - SB 1125 (Regular Session)
  - SB 1150 (Regular Session)
  - HB 51 (Regular Session)
  - HB 362 (Regular Session)
- 83rd Texas Legislature, 2013
  - None
- 84th Texas Legislature, 2015
  - SB 1626
  - HB 1736

#### *3.3.5.1 Renewable Energy*

SB 5, 77th Texas Legislature, 2001, set goals for political subdivisions in affected counties to implement measures to reduce energy consumption from existing facilities by 5% each year for five years from January 1, 2002 through January 1, 2006. In 2007, the 80th Texas Legislature passed SB 12, which extended the timeline set in SB 5 through 2007 and made the annual 5% reduction a goal instead of a requirement. The State Energy Conservation Office (SECO) is charged with tracking the implementation of SB 5 and SB 12. Also during the 77th Texas Legislature, the Energy Systems Laboratory (ESL), part of the Texas Engineering Experiment Station, Texas A&M University System, was mandated to provide an annual report on EE/RE efforts in the state as part of the Texas Emissions Reduction Plan (TERP) under Texas Health and Safety Code (THSC), §388.003(e).

The 79th Texas Legislature, 2005, Regular and 1st Called Sessions, amended SB 5 through SB 20, HB 2129, and HB 2481 to add, among other initiatives, renewable energy initiatives that require: 5,880 MW of generating capacity from renewable energy by 2015; the TCEQ to develop a methodology for calculating emission reductions from renewable energy initiatives and associated credits; the ESL to assist the TCEQ in quantifying emissions reductions from EE/RE programs; and the Public Utility Commission of Texas (PUCT) to establish a target of 10,000 MW of installed renewable technologies by 2025. Wind power producers in Texas exceeded the renewable energy generation target by installing over 10,000 MW of wind electric generating capacity by 2010.

HB 2129, 79th Texas Legislature, 2005, Regular Session, directed the ESL to collaborate with the TCEQ to develop a methodology for computing emission reductions attributable to use of renewable energy and for the ESL to annually quantify such emission reductions. HB 2129 directed the Texas Environmental Research Consortium to use the Texas Engineering Experiment Station to develop this methodology. With the TCEQ's guidance, the ESL produces an annual report, *Statewide Air Emissions Calculations from Energy Efficiency, Wind and Renewables*, detailing these efforts.

In addition to the programs discussed and analyzed in the ESL report, local governments may have enacted measures beyond what has been reported to SECO and the PUCT. The TCEQ encourages local political subdivisions to promote EE/RE measures in their respective communities and to ensure these measures are fully reported to SECO and the PUCT.

SB 981, 82nd Texas Legislature, 2011, Regular Session, allows a retail electric customer to contract with a third party to finance, install, or maintain a distributed renewable generation system on the customer's side of the electric meter, regardless of whether the customer owns the installed system. SB 981 also prohibits the PUCT from requiring registration of the system as an electric utility if the system is not projected to send power to the grid.

HB 362, 82nd Texas Legislature, 2011, Regular Session, helps property owners install solar energy devices such as electric generating solar panels by establishing requirements for property owners associations' approval of installation of solar energy devices. HB 362 specifies the conditions that property owners associations may and may not deny approval of installing solar energy devices.

SB 1626, 84th Texas Legislature, 2015, modified the provisions established by HB 362 from the 82nd Texas Legislature, 2011, Regular Session, regarding property owners associations' authority to approve and deny installations of solar energy devices such as electric generating solar panels. HB 362 included an exception that allowed developers to prohibit installation of solar energy devices during the development period. SB 1626 limits the exception during the development period to developments with 50 or fewer units.

#### *3.3.5.2 Residential and Commercial Building Codes and Programs*

THSC, Chapter 388, Texas Building Energy Performance Standards, as adopted in SB 5 of the 77th Texas Legislature, 2001, states in §388.003(a) that single-family residential construction must meet the energy efficiency performance standards established in the energy efficiency chapter of the International Residential Code. The Furnace Pilot Light Program includes energy savings accomplished by retrofitting existing furnaces. Also included is a January 2006 federal mandate raising the minimum Seasonal Energy Efficiency Ratio for air conditioners in single-family and multi-family buildings from 10 to 13.

THSC, Chapter 388, as adopted in SB 5 of the 77th Texas Legislature, 2001, states in §388.003(b) that non-single-family residential, commercial, and industrial construction must meet the energy efficiency performance standards established in the energy efficiency chapter of the International Energy Conservation Code.

HB 51, 82nd Legislature, 2011, Regular Session, requires municipalities to report implementation of residential and commercial building codes to SECO.

HB 1736, 84th Texas Legislature, 2015, updated THSC, §388.003 to adopt, effective September 1, 2016, the energy efficiency chapter of the International Residential Code as it existed on May 1, 2015. HB 1736 also established a schedule by which SECO could adopt updated editions of the International Residential Code in the future, not more often than once every six years.

#### *3.3.5.3 Federal Facility Energy Efficiency and Renewable Energy Projects*

Federal facilities are required to reduce energy use by Presidential Executive Order 13123 and the Energy Policy Act of 2005 (Public Law 109-58 EPACT20065). The ESL compiled energy reductions data for the federal EE/RE projects in Texas.

#### *3.3.5.4 Political Subdivisions Projects*

SECO funds loans for energy efficiency projects for state agencies, institutions of higher education, school districts, county hospitals, and local governments. Political subdivisions in nonattainment and affected counties are required by SB 5, 77th Texas Legislature, 2001, to report EE/RE projects to SECO. These projects are typically building systems retrofits, nonbuilding lighting projects, and other mechanical and electrical systems retrofits such as municipal water and waste water treatment systems.

#### *3.3.5.5 Electric Utility Sponsored Programs*

Utilities are required by SB 7, 76th Texas Legislature, 1999, and SB 5, 77th Texas Legislature, 2001, to report demand-reducing energy efficiency projects to the PUCT (see THSC, §386.205 and Texas Utilities Code (TUC), §39.905). These projects are typically air conditioner replacements, ventilation duct tightening, and commercial and industrial equipment replacement.

SB 1125, 82nd Texas Legislature, 2011, Regular Session, amended the TUC, §39.905 to require energy efficiency goals to be at least 30% of annual growth beginning in 2013. The metric for the energy efficiency goal remains at 0.4% of peak summer demand when a utility program accrues that amount of energy efficiency. SB 1150, 82nd Texas Legislature, 2011, extended the energy efficiency goal requirements to utilities outside the Electric Reliability Council of Texas area.

#### *3.3.5.6 State Energy Efficiency Programs*

HB 3693, 80th Texas Legislature, 2007, amended the Texas Education Code, Texas Government Code, THSC, and TUC. The bill:

- requires state agencies, universities, and local governments to adopt energy efficiency programs;
- provides additional incentives for electric utilities to expand energy conservation and efficiency programs;
- includes municipal-owned utilities and cooperatives in efficiency programs;
- increases incentives and provides consumer education to improve efficiency programs; and
- supports other programs such as revision of building codes and research into alternative technology and renewable energy.

HB 51, 82nd Texas Legislature, 2011, Regular Session, requires new state buildings and major renovations to be constructed to achieve certification under an approved high-performance design evaluation system. HB 51 also requires, if practical, that certain new and renovated state-funded university buildings comply with approved high-performance building standards.

SB 898, 82nd Texas Legislature, 2011, Regular Session, extended the existing requirement for state agencies, state-funded universities, local governments, and school districts to adopt energy efficiency programs with a goal of reducing energy consumption by at least 5% per state fiscal year (FY) for 10 state FYs from September 1, 2011 through August 31, 2021.

SB 924, 82nd Texas Legislature, 2011, Regular Session, requires all municipally owned utilities and electric cooperatives that had retail sales of more than 500,000 MWh in 2005 to report each year to SECO information regarding the combined effects of the energy efficiency activities of the utility from the previous calendar year, including the utility's annual goals, programs enacted to achieve those goals, and any achieved energy demand or savings goals.

### <u>3.3.6 Clean Air Interstate Rule and Cross-State Air Pollution Rule</u>

In March 2005, the EPA issued the Clean Air Interstate Rule (CAIR) to address electric generating unit (EGU) emissions that transport from one state to another. The rule incorporated the use of three cap and trade programs to reduce sulfur dioxide ($SO_2$) and $NO_X$: the ozone-season $NO_X$ trading program, the annual $NO_X$ trading program, and the annual $SO_2$ trading program.

For CAIR, Texas was not included in the ozone season $NO_X$ program but was included for the annual $NO_X$ and $SO_2$ programs. As such, Texas was required to make necessary reductions in annual $SO_2$ and $NO_X$ emissions from new and existing EGUs to demonstrate that emissions from Texas do not contribute to nonattainment or interfere with maintenance of the 1997 particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$) NAAQS in another state. CAIR consisted of two phases for implementing necessary $NO_X$ and $SO_2$ reductions. Phase I addressed required reductions from 2009 through 2014. Phase II was intended to address reductions in 2015 and thereafter.

In July 2006, the commission adopted a SIP revision to address how the state would meet emissions allowance allocation budgets for $NO_X$ and $SO_2$ established by the EPA to meet the federal obligations under CAIR. The commission adopted a second CAIR-related SIP revision in February 2010. This revision incorporated various federal rule revisions that the EPA had promulgated since the TCEQ's initial submittal. It also incorporated revisions to 30 TAC Chapter 101 resulting from legislation during the 80th Texas Legislature, 2007.

A December 2008 court decision found flaws in CAIR but kept CAIR requirements in place temporarily while directing the EPA to issue a replacement rule. In July 2011, the EPA finalized the Cross-State Air Pollution Rule (CSAPR) to meet FCAA requirements and respond to the court's order to issue a replacement program. Texas was included in CSAPR for ozone season $NO_X$, annual $NO_X$, and annual $SO_2$ due to the EPA's determination that Texas significantly contributes to nonattainment or interferes with maintenance of the 1997 eight-hour ozone NAAQS and the 1997 $PM_{2.5}$ NAAQS in other states. As a result of numerous EGU emission reduction strategies already in place in Texas, the annual and ozone season $NO_X$ reduction requirements from CSAPR were relatively small but still significant. CSAPR required an approximate 7% reduction in annual $NO_X$ emissions and less than 5% reduction in ozone season $NO_X$ emissions.

On August 21, 2012, the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit vacated CSAPR. Under the D.C. Circuit Court's ruling, CAIR would remain in place until the EPA develops a valid replacement. On October 5, 2012, the EPA filed a petition seeking an *en banc* rehearing of the U.S. Court of Appeals' decision regarding CSAPR, but the appeal was denied.

The EPA and various environmental groups petitioned the Supreme Court of the United States to review the D.C. Circuit Court's decision on CSAPR. On June 24, 2013, the Supreme Court granted the petitions and heard oral arguments on December 10, 2013. On April 29, 2014, a decision by the Supreme Court reversed the D.C. Circuit Court's decision and remanded the case. On June 26, 2014, the EPA filed a motion with the U.S. Court of Appeals for the D.C. Circuit to lift the stay of CSAPR, which was granted on October 23, 2014. On November 21, 2014, the EPA issued rulemaking that shifted the effective dates of CSAPR requirements to account for the time that had passed after the rule was stayed in 2011. As a result, the EPA is implementing the CSAPR federal implementation plan for Texas. Phase 1 of CSAPR took effect January 1, 2015 and Phase 2 is scheduled to begin January 1, 2017. Oral arguments on the remanded case were held on February 25, 2015. On July 28, 2015, the D.C. Circuit Court ruled that the 2014 annual $SO_2$ budgets and the 2014 ozone season $NO_X$ budgets for Texas were invalid because they required overcontrol of Texas emissions, and remanded these budgets back to the EPA without vacatur.

#### 3.3.7 Clean School Bus Program

HB 3469, 79th Texas Legislature, 2005, Regular Session, established the Clean School Bus Program, which provides monetary incentives for school districts in the state for reducing emissions of diesel exhaust from school buses. As of May 2015, the TCEQ Clean School Bus Program has reimbursed approximately $28.5 million in grants for over 7,200 school buses across the state, with $6.9 million being used for 2,535 school buses in the HGB area.

### 3.3.8 Texas Emission Reduction Plan

The TERP program was created in 2001 by the 77th Texas Legislature to provide grants to offset the incremental costs associated with reducing $NO_X$ emissions from high-emitting heavy-duty internal combustion engines on heavy-duty vehicles, non-road equipment, marine vessels, locomotives, and some stationary equipment.

The primary emissions reduction incentives are awarded under the Diesel Emissions Reduction Incentive Program (DERI). DERI incentives are awarded to projects to replace, repower, or retrofit eligible vehicles and equipment to achieve $NO_X$ emission reductions in Texas ozone nonattainment areas and other counties identified as affected counties under the TERP program where ground-level ozone is a concern.

From 2001 through August 2014, $905 million in DERI grants were awarded for projects estimated to help reduce 160,836 tons of $NO_X$. Over $380 million in DERI grants were awarded to projects in the HGB area, with a projected 71,211 tons of $NO_X$ reduced. These projects were estimated to reduce up to 20.5 tpd of $NO_X$ in the HGB area in 2015. This estimate will change yearly as older project reach the end of the project life and new projects begin achieving emissions reductions. Also, of the $380 million awarded in the HGB area, $11 million were awarded to H-GAC through third-party grants to administer subgrants in the HGB area. H-GAC has used this funding to target the replacement of drayage trucks operating in and from the Port of Houston with newer models with lower emission ratings.

The latest DERI Emissions Reduction Incentive Grants program grant round closed December 16, 2014. Over $188 million in applications were received. The grant selections totaled 393 projects for $63.8 million. Final grant awards and contracting will be completed by August 2015. Subject to final contracting, these projects are estimated to reduce 8,547 tons of $NO_X$, including 4,075 tons in the HGB area. This represents an additional 1.65 tpd of $NO_X$ reduced in the HGB area beginning in 2017. An additional $10 million will be awarded under the DERI Rebate Grants program, with contracts completed by August 2015.

Three other incentive programs under the TERP program will result in the reduction in $NO_X$ emissions in the HGB area.

The Drayage Truck Incentive Program (DTIP) was established in 2013 to provide grants for the replacement of drayage trucks operating in and from seaports and rail yards located in nonattainment areas. The program has awarded grants to nine projects totaling $3.95 million. These projects are estimated to reduce 233 tons of $NO_X$, including 208 tons in the HGB area. This represents an additional 0.17 tpd of $NO_X$ projected to be reduced in the HGB area beginning in 2017.

The Texas Clean Fleet Program (TCFP) was established in 2009 to provide grants for the replacement of light-duty and heavy-duty diesel vehicles with vehicles powered by alternative fuels, including: natural gas, liquefied petroleum gas, hydrogen, methanol (85% by volume), or electricity. This program is for larger fleets. Applicants must commit to replacing at least 20 eligible diesel-powered vehicles with qualifying alternative fuel or hybrid vehicles over a 12-month period. From 2009 through August 2014, almost $23.6 million in TCFP grants were awarded for projects to help reduce a projected 314.5 tons of $NO_X$. Almost $6.8 million in TCFP grants were awarded to projects in the HGB area, with a projected 61.9 tons of $NO_X$ reduced. The latest TCFP grant application period ended October 3, 2014, with five projects totaling $8.85 million selected for funding. These projects are estimated to result in 124 tons of $NO_X$ reduced, including 30 tons in the HGB area. This represents an additional 0.024 tpd of $NO_X$ projected to be reduced in the HGB area beginning in 2017.

The Texas Natural Gas Vehicle Grant Program (TNGVGP) was established in 2011 to provide grants for the replacement of medium-duty and heavy-duty diesel vehicles with vehicles powered by natural gas. This program may include grants for individual vehicles or multiple vehicles. The majority of the vehicle's operation must occur in the Texas nonattainment areas, other counties designated as affected counties under the TERP, and the counties in and between the triangular area between Houston, San Antonio, and Dallas-Fort Worth. From 2011 through August 2014, over $36.4 million in TNGVGP grants were awarded for projects to help reduce a projected 1,137 tons of $NO_X$. Over $14.8 million in TNGVGP grants were awarded to projects where the applicant indicated the primary operation of the vehicle would occur in and around the HGB area, with a projected 377 tons of $NO_X$ reductions. These projects are estimated to reduce up to 0.32 tpd of $NO_X$ in the HGB area starting in 2015. The latest grant application period ended. An additional$14.5 million in projects were approved for funding, including $2.5 million for projects in the HGB area. The emissions reductions for these projects will be determined after the grants are finalized and final calculations are completed.

HB 1, General Appropriations Bill, 84th Texas Legislature, 2015, appropriated $118.1 million per year for implementation of the TERP in FYs 2016 and 2017. This represents an increase of $40.5 million per year over the appropriation amount in FYs 2014 and 2015. This additional funding will be available to fund future grant projects that should result in $NO_X$ reductions in the eligible TERP areas, including the HGB area.

### 3.3.9 Low Income Vehicle Repair Assistance, Retrofit, and Accelerated Vehicle Retirement Program

The TCEQ established a financial assistance program for qualified owners of vehicles that fail the emissions test. The purpose of this voluntary program is to repair or remove older, higher emitting vehicles from use in certain counties with high ozone. The Low-Income Vehicle Repair Assistance, Retrofit, and Accelerated Vehicle Retirement Program (LIRAP) provisions of HB 2134, 77th Texas Legislature, 2001, created the program. In 2005, HB 1611, 79th Texas Legislature, Regular Session, modified the program to apply only to counties that implement a vehicle inspection and maintenance (I/M) program and have elected to implement LIRAP fee provisions. Five counties in the HGB area, Brazoria, Fort Bend, Galveston, Harris, and Montgomery, are currently participating in the LIRAP.

SB 12, 80th Texas Legislature 2007, expanded LIRAP participation criteria by increasing the income eligibility to 300% of the federal poverty rate and increasing the amount of assistance toward the replacement of a retired vehicle. HB 3272, 82nd Texas Legislature 2011, Regular Session, expanded the class of vehicles eligible for a $3,500 voucher to include hybrid, electric, natural gas, and federal Tier 2, Bin 3 or cleaner Bin certification vehicles. The program provides $3,500 for a replacement hybrid, electric, natural gas, and federal Tier 2, Bin 3 or cleaner Bin certification vehicle of the current model year or the previous three model years; $3,000 for cars of the current or three model years; and $3,000 for trucks of the current or previous two model years. The retired vehicle must be 10 years old or older or must have failed an emissions test. From December 12, 2007 through May 31, 2015, the program has retired and replaced 22,448 vehicles in the HGB area at a cost of $67,404,312.80. During the same period, an additional 17,813 vehicles in the HGB area have had emissions-related repairs at a cost of $9,918,439.09.

The total retirement/replacement and repair expenditure for the HGB area from December 12, 2007 through May 31, 2015 is $77,322,751.89.

HB 1, General Appropriations Bill, 84th Texas Legislature, 2015, appropriated $43.5 million per year for FYs 2016 and 2017 to continue this clean air strategy in the 16 participating counties. The five counties that participate in the program in the HGB area were allocated approximately $20 million per year for the LIRAP for FYs 2016 and 2017. This is an increase of approximately $17.5 million per year over the previous biennium.

3.3.10 Local Initiative Projects

Funds are provided to counties participating in the LIRAP for implementation of air quality improvement strategies through local projects and initiatives. In the HGB area, Local Initiative Projects (LIP) funding is available to the five counties participating in the LIRAP: Brazoria; Fort Bend; Galveston; Harris; and Montgomery. HB 1, General Appropriations Bill, 84th Texas Legislature, 2015, appropriated $4.8 million per year for FYs 2016 and 2017 to continue this clean air strategy. The five HGB area counties were allocated approximately $2.2 million per year for FYs 2016 and 2017. This is an increase of approximately $1.9 million per year over the previous biennium.

Brazoria, Fort Bend, and Galveston Counties used LIP funds to purchase buses and initiate a new park-and-ride transit service in 2010. LIP continues to maintain the park-and-ride funding as of 2015. The transit service links county residents with the Texas Medical Center area and creates immediate and long-term benefits for reducing emissions and congestion by supporting approximately 9,000 commuter trips per month.

Harris County used LIP funds in 2010 to establish the Harris County Clean Air Emissions Task Force and initiate an emissions enforcement program. For its first five years, the enforcement program targeted high-emitting vehicles, smoking vehicles, and suspicious vehicles to verify that the state safety and emissions inspection windshield certificates on these vehicles were legitimate and in compliance with air quality standards. The task force's objective is to reduce the number of fraudulent, fictitious, or improperly issued safety and emissions inspection windshield certificates. Beginning in March 2015, the task force adjusted its objectives to concentrate on the identification of vehicles with counterfeit registration insignia and the reduction of fraudulent vehicle inspection reports. The task force has partnered with local and state agencies to enforce state laws, codes, rules, and regulations regarding air quality and mobile emissions in Harris County. The citizens of Harris County and the entire southeast Texas region benefit from this program as a result of the reduction in $NO_X$ emissions from each vehicle brought into emissions compliance.

Montgomery County used LIP funds for signal light synchronization projects in FY 2010, 2012, and 2014. Synchronizing traffic signalization reduces idling by decreasing the number of times a vehicle must stop at a traffic light. The "Exhaust Phase" of an engine emits the most emissions during starting, idling, and breaking stationary inertia. Synchronizing traffic signalization reduces both idling and the number of times a vehicle must resume travel, i.e., break stationary inertia. The project increases the emissions reduction benefits by synchronizing the traffic signalization upon real-time traffic flow instead of a stagnate model to better manage peak-hour congestion, while minimizing cross-traffic congestion, and reducing emissions.

3.3.11 84th Texas Legislature

Bills passed during the 84th Texas Legislature, 2015, that have the potential to impact the HGB area are discussed in Section 3.3.5: *Energy Efficiency and Renewable Energy Measures* and

Section 3.3.9: *Low Income Vehicle Repair Assistance, Retrofit, and Accelerated Vehicle Retirement Program*. As discussed in Section 3.3.9, HB 1 appropriated $43.5 million per year for FYs 2016 and 2017 to continue the LIRAP in the 16 participating counties. The five counties that participate in this clean air strategy in the HGB area were allocated approximately $20 million per year for the LIRAP for FYs 2016 and 2017, which can be expected to contribute toward progress in meeting air quality goals. This is an increase of approximately $17.5 million per year over the previous biennium.

## 3.4 Control Strategies Summary

The permanent and enforceable VOC and $NO_X$ control measures contained in Section 3.2: *List of Existing Control Measures* have resulted in air quality improvement in the HGB area. These enforceable measures will remain in place to ensure continued maintenance of the 1997 eight-hour ozone NAAQS in the HGB area. In addition, Section 3.3: *Additional Measures* lists control measures that may not meet all of the EPA's standard tests of SIP creditability (permanent, enforceable, surplus, and quantifiable) but are crucial to the success of the air quality plan in the HGB area. Implementation of these control measures will contribute to the continued maintenance of the 1997 eight-hour ozone NAAQS and attainment of the 2008 eight-hour ozone NAAQS. The TCEQ continues to seek innovative air quality improvement measures and technologies to implement in the HGB area.

# SECTION 4: MAINTENANCE DEMONSTRATION

## 4.1 General

This Houston-Galveston-Brazoria (HGB) Area Redesignation Substitute Report for the 1997 Eight-Hour Ozone National Ambient Air Quality Standard (NAAQS) is intended to demonstrate that the HGB area will remain in attainment of the 1997 eight-hour ozone NAAQS for the 10-year period following the date that anti-backsliding obligations under the revoked standard would be lifted. Since removing anti-backsliding obligations is contingent upon the United States Environmental Protection Agency's (EPA) approval, the Texas Commission on Environmental Quality (TCEQ) has set a horizon year of 2028. This 10-year period also aligns with the EPA's requirement of maintenance plans to demonstrate attainment for a 10-year period following the date of redesignation.

The most current emissions inventory (EI) data were analyzed as part of this maintenance demonstration. The year 2012 was chosen as the base year for the analyses presented in this section because it is one of the three years (2012, 2013, and 2014) used to determine the design value for the 2014 attainment year and due to periodic inventory data availability. At the time of this HGB RS report, the TCEQ was developing the 2014 periodic EI for the HGB area in accordance with the EPA's Air Emissions Reporting Requirements (40 Code of Federal Regulations Part 51, Subpart A). The calendar year 2011 periodic inventory was the most recent periodic inventory available to develop this HGB RS report inventory. Since 2011 was not one of three years used to determine the design value for the 2014 attainment year, the TCEQ developed a 2012 base year inventory from available data for area and mobile sources, and used the reported calendar year 2012 data for point sources.

Additionally, the 10 years prior to the 2012 base year (2002 through 2011) were analyzed to develop historical trend data. During this time, the HGB-area EI showed a significant decrease in ozone precursor emissions from all source categories, which contributed to the attainment of the 1997 eight-hour ozone NAAQS. These reductions were accomplished through a variety of federal, state, and local regulations and programs as detailed below.

## 4.2 Historical Emissions Inventory Trends

For the historical period prior to the 2012 base year, 2002 through 2011, overall anthropogenic ozone precursor emissions in the HGB nonattainment area declined substantially as a result of regulations implemented at the federal, state, and local levels and innovative programs implemented by the TCEQ. As demonstrated in Figure 4-1: *HGB Eight-County Nonattainment Area Historical $NO_X$ Emissions Trends* and Figure 4-2: *HGB Eight-County Nonattainment Area Historical VOC Emissions Trends*, anthropogenic volatile organic compounds (VOC) emissions have decreased 30%, and anthropogenic nitrogen oxides ($NO_X$) emissions have decreased 46%. Both 30 Texas Administrative Code (TAC) Chapter 115*: Control of Air Pollution from Volatile Organic Compounds* and 30 TAC Chapter 117: *Control of Air Pollution from Nitrogen Compounds* regulations along with implementation of the Mass Emissions Cap and Trade (MECT) Program have significantly reduced overall ozone precursor emissions at both major and minor (point and area) industrial, commercial, and institutional sources in the HGB ozone nonattainment area. Innovative emissions reduction programs such as the Texas Emissions Reduction Plan and the AirCheckTexas Drive a Clean Machine program in 30 TAC Chapter 114: *Control of Air Pollution from Motor Vehicles* have also reduced mobile source emissions, the primary source of $NO_X$ emissions in the HGB area.

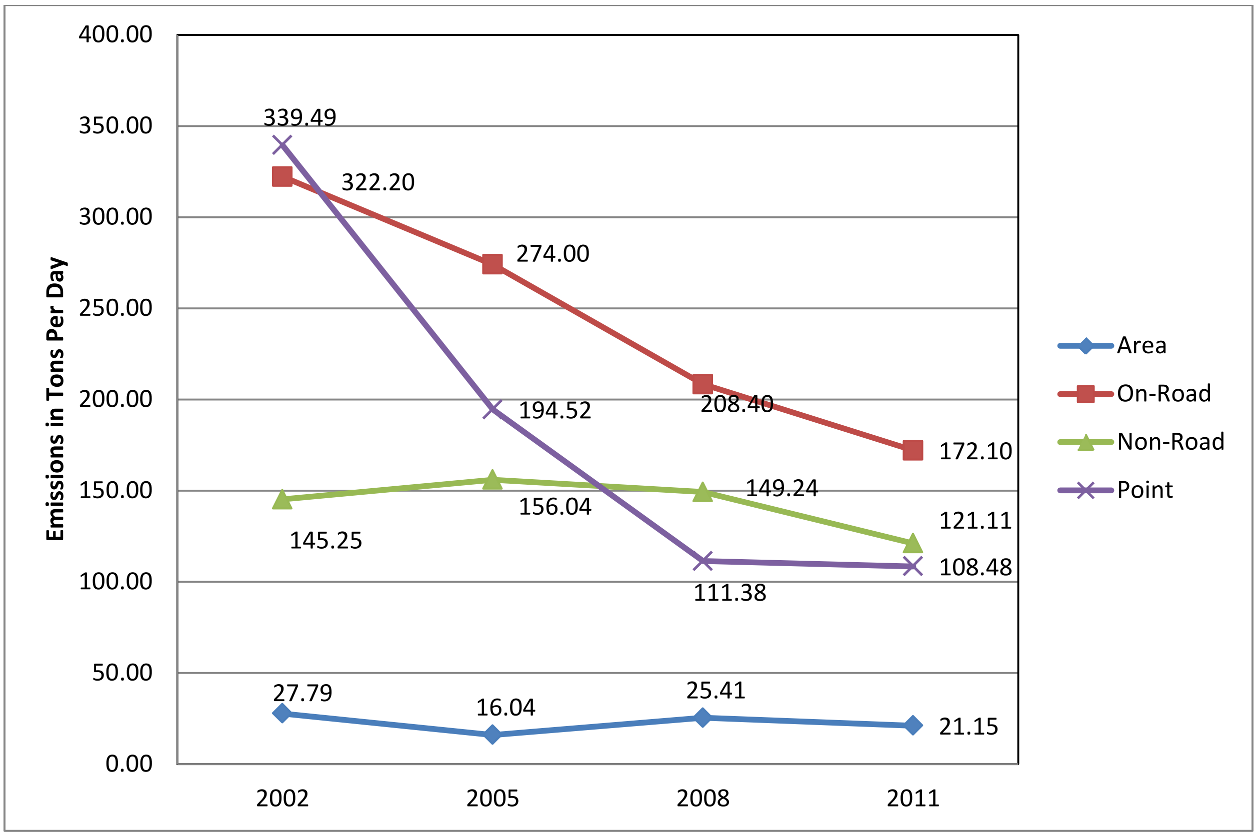


**Figure 4-1: HGB Eight-County Nonattainment Area Historical $NO_X$ Emissions Trends**

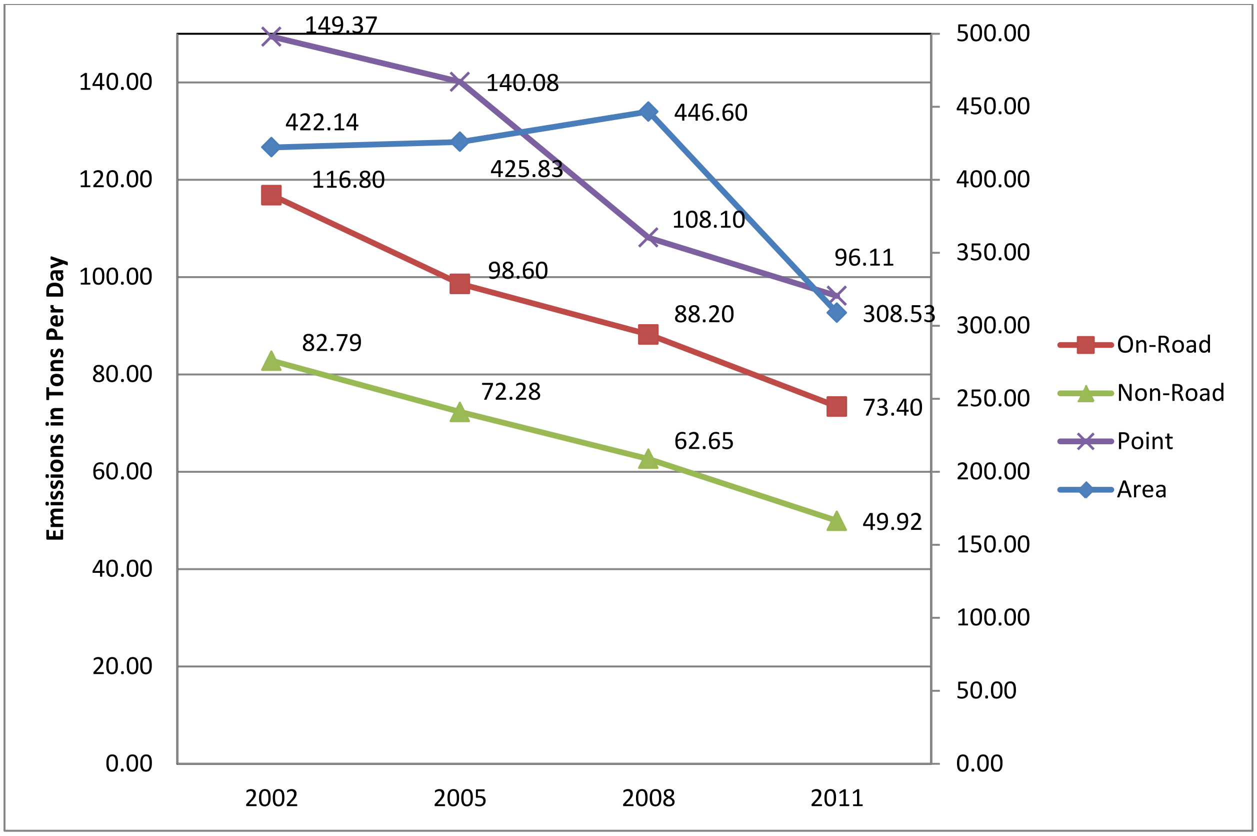


**Figure 4-2: HGB Eight-County Nonattainment Area Historical VOC Emissions Trends**

## 4.3 Attainment Inventory Base Year

The 1990 Federal Clean Air Act Amendments require that EIs be prepared for ozone nonattainment areas. Because ozone is photochemically produced in the atmosphere when VOC mixes with $NO_X$ in the presence of sunlight, the TCEQ must compile information on the sources of these precursor pollutant emissions. The EI must identify the source types present in an area, the amount of each pollutant emitted, and the types of processes and control devices employed at stationary sources or other source categories. The EI provides data for a variety of air quality planning tasks, including establishing baseline emission levels, calculating reduction targets, control strategy development for achieving the required emission reductions, emission inputs into air quality simulation models, and tracking actual emission reductions against the established emissions growth and control budgets.

The 2012 base year inventory for the HGB area is based on the VOC and $NO_X$ emissions that occur on a typical summer weekday. Consistent with a September 4, 1992 EPA memorandum entitled *Procedures for Processing Requests to Redesignate Areas to Attainment*, the attainment EI base year may be any one of the three years used to determine the design value for the attainment year. For this HGB RS report, the attainment EI base year is 2012 and it is one of the three years used to determine the design value for the 2014 attainment year. The total VOC and $NO_X$ EI for the HGB area is summarized from the estimates developed for four general categories of anthropogenic emissions sources, which are each explained in Section 4.4.1: *Area Sources*, Section 4.4.2: *On-Road Mobile Sources*, Section 4.4.3: *Non-Road Mobile Sources*, and

Section 4.4.4: *Stationary Point Sources*. Summaries of the 2012 VOC and $NO_X$ emissions by source type are provided in Section 4.5: *Emissions Summary*.

## 4.4 Future Emissions and Verification of Continued Attainment

To track progress of the HGB area toward continued attainment of the 1997 eight-hour ozone NAAQS, the TCEQ will continue to develop and submit periodic emissions inventories (PEIs) to the EPA every three years as required by the federal Air Emissions Reporting Requirements (AERR) rule. The 2011 inventory was the first PEI submitted under the AERR. As required by the AERR, the 2011 PEI was reported to the EPA's National Emissions Inventory (NEI) as a comprehensive and detailed estimate of air emissions, including ozone precursors ($NO_X$ and VOC). As directed by the AERR, the 2011 Texas PEI includes annual emissions for the entire state and summer weekday emissions for the 2008 eight-hour ozone nonattainment areas in Texas, including the HGB area. Per the EPA's *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; Final Rule* (2008 ozone standard SIP requirements rule), published in the March 6, 2015 *Federal Register* (80 FR 12264), states can rely on periodic AERR EI submittals to satisfy ongoing state implementation plan (SIP) EI submission requirements every three years.

Because the EPA has not made guidance available for how to demonstrate continued attainment in an RS, the TCEQ is using the method outlined in the EPA's redesignation guidance[12]. Future emissions for the HGB area were projected from the base year inventory (2012) to a future year (horizon year) of 2028. Projecting emissions to 2028 aligns with the EPA's requirement of maintenance plans to demonstrate attainment for a 10-year period following the date of redesignation. The requirement for demonstration of continued attainment is satisfied when the state demonstrates that future VOC and $NO_X$ emissions levels are not expected to result in exceedances of the 1997 eight-hour ozone NAAQS.

Future emissions were projected to the horizon year 2028 using two- and three-year intervals to align milestone years with periodic AERR EI years as appropriate. A summary of the base year inventory and the future year inventories for ozone precursor emissions is presented in Section 4.5.

### 4.4.1 Area Sources

Stationary source emissions data from sites and processes that do not meet the reporting requirements for point sources are classified as area sources. Area sources are small-scale industrial, commercial, and residential sources that generate emissions. Emissions are calculated and reported at the county level. Examples of area sources include: printing operations; industrial coatings; degreasing solvents; architectural coatings; gasoline service station underground tank filling; vehicle refueling operations; stationary source fossil fuel combustion; outdoor refuse burning; and structural fires. With some exceptions, area source emissions are calculated by multiplying an established emissions factor (emissions per unit of activity) by the appropriate activity or activity surrogate responsible for generating emissions. Population is one of the more commonly used activity surrogates for area sources. Other activity data include the amount of gasoline sold in an area, employment by industry type, and crude oil and natural gas production.

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[12] Memorandum from John Calcagni, Director of Air Quality Management Division, September 4, 1992, *Procedures for Processing Requests to Redesignate Areas to Attainment.* EPA Office of Air Quality Planning and Standards.

#### *4.4.1.1 Updated 2012 Base Year Inventories*

The updated 2012 base year inventory was formed from the 2011 periodic AERR EI. The periodic 2011 inventory was developed per the AERR reporting requirements and was created using a combination of methodologies and data: EPA-generated EIs; TCEQ-contracted projects; TCEQ staff projects; and categories grown from the 2008 EI using factors derived from study data compiled by Eastern Research Group (ERG), the Economic and Consumer Credit Analytics website (http://www.economy.com/default.asp), and the United States Energy Information Administration's (EIA) annual energy outlook publication. The documentation for the development of the ERG study factors can be found in Attachment A: *Projection Factors for Point and Area Sources.*

The EPA developed EIs for states to use for many source categories as part of the NEI. The states access these individual inventories through the EPA's NEI website (ftp://ftp.epa.gov/EmisInventory/2011nei/doc/). These source categories include but are not limited to: industrial coatings; degreasing; residential, commercial/institutional, and industrial fuel use; commercial cooking; aviation fuel use; and consumer products. For some source categories, the TCEQ developed state-specific emissions estimates by acquiring current state-specific activity data and applying appropriate emissions factors. These source categories include but are not limited to: storage tanks, structural fires, dry cleaners, and automobile fires. The 2012 base year inventory was grown from the 2011 periodic AERR EI using factors derived from Attachment A.

In particular, the TCEQ focused on refining the oil and gas area source inventory production categories for the EI. The improvements included the development and refinement of a state-specific oil and gas area source emissions calculator. This oil and gas area source emissions calculator uses county-level production and local equipment activity data with local emissions requirements to estimate emissions from individual production categories including compressor engines, condensate and oil storage tanks, loading operations, mud degassing, pump engines, heaters, and dehydrators. The documentation for the development of the oil and gas emissions calculator can be found in Attachment B: *Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions*. A significant improvement made to the oil and gas calculator was the development of refined emission factors for VOC emissions from condensate storage tanks. The documentation for the refined emission factors can be found in Attachment C: *Condensate Tank Oil and Gas Activities*.

In addition, further improvements were made to the oil and gas calculator through the development of region-specific emission factors for mud degassing, updated region-specific equipment profiles, and year-specific engine emissions factors for hydraulic pump engines. The documentation for these refined factors can be found in Attachment D: *Specified Oil and Gas Well Activities Emissions Inventory Update. The 2012 base year inventory for oil and gas area sources was developed using 2012 activity data and production information from the Railroad Commission of Texas (RRC).*

For those area source categories affected by TCEQ rules, rule effectiveness factors are applied to the baseline or uncontrolled emissions to estimate controlled emissions. These factors address the efficiency of the controls and the percentage of the category's population affected by the rule. Quality assurance of area source emissions involves ensuring that the activity data used for each separate category is current and valid. Data such as current population figures, fuel usage, and material usage were updated and the EPA guidance on emissions factors was used. Other routine efforts such as checking calculations for errors and conducting completeness and reasonableness checks were implemented.

#### *4.4.1.2 Updated Milestone Years Inventories*

The updated base year (2012), milestone years (2014, 2017, 2020, 2023, and 2026) and horizon year (2028)EIs for the area source categories were developed using factors derived from Attachment A, the Economic and Consumer Credit Analytics website (http://www.economy.com/default.asp), and the EIA's annual energy outlook publication. The ERG-derived factors contain individual growth factors for each category and for each forecasting year. This projection method is the EPA standard and accepted method for developing future year EIs.

#### *4.4.1.3 Area Source Emissions Inventories*

The area source $NO_X$ and VOC 2012, 2014, 2017, 2020, 2023, 2026, and 2028 emissions totals for the eight-county HGB 1997 eight-hour ozone nonattainment area are presented in Table 4-1: *HGB Area Source $NO_X$ and VOC Emissions (tons per day)*.

**Table 4-1: HGB Area Source $NO_X$ and VOC Emissions (tons per day)**

| Pollutant | 2012 | 2014 | 2017 | 2020 | 2023 | 2026 | 2028 |
|---|---|---|---|---|---|---|---|
| $NO_X$ | 21.91 | 22.52 | 23.23 | 23.61 | 23.47 | 23.50 | 23.59 |
| VOC | 310.07 | 317.75 | 328.20 | 335.07 | 337.81 | 341.16 | 344.75 |

### 4.4.2 On-Road Mobile Sources

On-road mobile emission 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 (emissions factors) and the number of units of activity must be determined. The emissions factors for on-road mobile sources are determined using models developed and approved by the EPA. The models allow for input of local conditions and vehicle characteristics. The activity information corresponding to the emissions factors is obtained using local travel demand models (TDMs), the output from the highway performance monitoring system, and speed models.

In March 2010, the EPA released the Motor Vehicle Emissions Simulator (MOVES) model as the official emissions factor model for developing on-road mobile source category EIs. Although MOVES represented a new approach to assessing on-road emissions, the sources are the same, and the opportunity to use local inputs for meteorological conditions, control programs, and fleet characteristics remains. When using MOVES in emission-rates mode, emission rates are produced for subsets of the on-road fleet, and the emission rates are multiplied by the activity level of each vehicle type or source-use type to calculate emissions.

The on-road mobile source category EIs for this HGB RS report were developed using the latest version of the MOVES model that is available, MOVES2014. The EPA made MOVES2014 available on July 31, 2014; officially released the MOVES2014 version of the model as a replacement to MOVES2010b for SIP applications on October 7, 2014 (70 FR 60343); and released an update to the model on October 27, 2014. The TCEQ, working with the Texas Transportation Institute (TTI), recently completed MOVES2014-based 2012, 2014, 2017, 2020, 2023, 2026, and 2028 on-road emission inventories for the HGB area. The planning assumptions, fleet characteristics and vehicle miles traveled (VMT) estimates were updated to incorporate the latest available information at the time the inventories were developed.

To estimate on-road mobile source emissions, emissions rates calculated by the MOVES model are multiplied by the level of vehicle activity. On-road mobile source emissions factors are expressed in units of grams per mile, grams per vehicles (evaporative), and grams per hour (extended idle mode); therefore, the activity data required to complete the inventory calculation are VMT in units of miles per day, vehicle populations, and source hours idling. The level of vehicle travel activity is developed using a TDM run by the Texas Department of Transportation or by the local metropolitan planning organization. The 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. For SIP and reporting inventories, VMT estimates are calibrated against outputs from the federal highway performance monitoring system, a model built from a different set of traffic counters. Vehicle populations by source type are derived from the Texas Department of Motor Vehicle registration database and, as needed, national estimates for vehicle source type population.

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 an on-road EI. Roadway speeds, required inputs for the MOVES model, are calculated by using the activity volumes from the TDM and a post-processor speed model.

#### *4.4.2.1 On-Road Mobile Source Emissions Inventories*

The 2012, 2014, 2017, 2020, 2023, 2026, and 2028 on-road mobile source EIs for this HGB RS report were developed using the latest available data, current emissions factors and models, and the most current planning assumptions. The inventories include the eight HGB-area counties designated as nonattainment for the 1997 eight-hour ozone NAAQS. On-road inventory estimates were developed under contract by the TTI.

Consistent with on-road inventory development procedures for reporting requirements and reasonable further progress demonstrations, the on-road inventories for each of these calendar years are based on VMT estimates and emission rates for an average summer weekday. MOVES2014, which is the latest available version of the EPA's MOVES model, was used to estimate the summer weekday emission rates in units of grams per mile for $NO_X$ and VOC.

Two methods are used to establish VMT: a federal system, the Highway Performance Monitoring System (HPMS); and a local system, a TDM. For historical years, the HPMS data constitutes the official measurement of highway performance, including VMT. The TDM represents the best method for distributing VMT to the roadway links within the local travel network and for predicting future year VMT. To provide consistency between the estimates for the two systems, the TDM-forecasted VMT estimates are adjusted using a VMT ratio based on an historical year for which the TDM was validated and the HPMS data has been made available. The 2012 VMT is based upon historical HPMS VMT data and is also the validation year. The HPMS data was not available for 2014 or any of the future years; therefore, the VMT for these years was forecast using the HGB TDM and adjusted using the 2012 HPMS-to-TDM VMT ratio. Year-to-year historical VMT data fluctuates and does not follow a smooth upward trend. The decline in VMT between 2012 and 2014 reflects an historical decline in VMT following 2011, magnified by the inherent differences between the two VMT estimation methods. A summary of the on-road mobile source VMT used to develop the various $NO_X$ and VOC emissions levels is presented in Table 4-2: *HGB VMT (miles per average summer weekday).*

**Table 4-2: HGB VMT (miles per average summer weekday)**

| Year | Vehicle Miles Traveled |
|---|---|
| 2012 | 151,333,456 |
| 2014 | 144,546,685 |
| 2017 | 156,018,423 |
| 2020 | 167,051,752 |
| 2023 | 178,917,689 |
| 2026 | 190,707,272 |
| 2028 | 197,675,678 |

The HGB on-road mobile source 2012, 2014, 2017, 2020, 2023, 2026, and 2028 EIs for $NO_X$ and VOC are summarized in Table 4-3: *HGB Average Summer Weekday $NO_X$ and VOC Emissions for On-Road Mobile Sources (tons per day)*. For complete documentation of the development of the on-road mobile source EIs for this HGB RS report including the inventory development methods, MOVES inputs, and the results, refer to Attachment E: *Development of HGB On-Road Emissions Inventories for the Years 2012, 2014, 2017, 2020, 2023, 2026, and 2028*. The complete set of input and output files are available from the Emissions Assessment Section of the TCEQ Air Quality Division upon request.

**Table 4-3: HGB Average Summer Weekday $NO_X$ and VOC Emissions for On-Road Mobile Sources (tons per day)**

| Pollutant | 2012 | 2014 | 2017 | 2020 | 2023 | 2026 | 2028 |
|---|---|---|---|---|---|---|---|
| $NO_X$ | 159.08 | 124.64 | 82.96 | 61.06 | 48.94 | 40.24 | 37.04 |
| VOC | 74.51 | 61.48 | 47.36 | 40.38 | 36.12 | 31.71 | 28.99 |

*4.4.2.2 On-Road Mobile Source Control Strategies*

The on-road mobile EIs for each analysis year were developed using MOVES2014 emissions factors that reflect all control strategies used to demonstrate maintenance of the 1997 eight-hour ozone NAAQS. The controls that were modeled include: pre-1990 Federal Motor Vehicle Control Program (FMVCP), fleet turnover to Tier 1 of the FMVCP, fleet turnover to Tier 2 of the FMVCP, the 2007 heavy duty diesel FMVCP, fleet turnover to Tier 3 of the FMVCP, the lower sulfur gasoline associated with Tier 3 FMVCP, National Low Emission Vehicle (NLEV) program, summer reformulated gasoline (RFG), the HGB vehicle inspection and maintenance (I/M) program, the HGB anti-tampering program, and Texas Low Emission Diesel (TxLED). A summary of the HGB on-road mobile source control strategies used for this HGB RS report are presented in Table 4-4: *HGB On-Road Mobile Control Strategies Summary*.

**Table 4-4: HGB On-Road Mobile Control Strategies Summary**

| Control Program Description | Year Control Program Started | Control Scenario Notes |
|---|---|---|
| Pre-1990 FMVCP | Pre-1990 | Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| Anti-Tampering Program | 1986 | Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| 1992 Federal Controls on Gasoline Volatility | 1992 | Maximum Reid Vapor Pressure of 7.8 pounds per square inch<br>Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| Tier 1 FMVCP | 1994 | Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| RFG Phase 1 | 1995 for Phase 1 | Superseded by RFG Phase 2 |
| I/M Program, Phase 1 | 1997 | Harris County<br>Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| RFG Phase 2 | 2000 for Phase 2 | Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| NLEV Program | 2001 | Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| I/M Program, Phase 2 | 2003 | Expanded to include: Brazoria, Fort Bend, Galveston, and Montgomery Counties (five counties total)<br>Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| Tier 2 FMVCP | 2004 | Phased in from 2004 to 2009<br>Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| TxLED | 2006 | Low aromatic hydrocarbon and high cetane number to control $NO_X$<br>Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| Federal Low-Sulfur Highway Diesel | 2006 | 15 parts per million (ppm) maximum sulfur content<br>Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| 2007 Heavy Duty FMVCP | 2007 | Phased in from 2007 to 2010<br>Included for 2012, 2014, 2017, 2020, 2023, 2026, and 2028 |
| Tier 3 FMVCP | 2017 | Will be phased in from 2017 to 2025 |
| Lower sulfur gasoline associated with Tier 3 FMVCP | 2017 | 10 ppm maximum for sulfur |

#### *4.4.2.3 On-Road Mobile Source Control Strategy Reductions*

Due to the on-road mobile source control programs in place for each analysis year in conjunction with fleet turnover, the on-road $NO_X$ and VOC emissions are steadily decreasing from the base year of 2012 to each milestone year and the 2028 horizon year despite projected growth for milestone years 2017, 2020, 2023, 2026, and 2028 in VMT. A summary of the tons per day (tpd) change from the 2012 base year to each milestone year and the horizon year are summarized in Table 4-5: *Estimated Reductions from 2012 Baseline Due to FMVCP, I/M, RFG, and TxLED (tons per day)*. A summary of the percent change in $NO_X$ and VOC from the 2012 base year to each milestone year and the horizon year are summarized in Table 4-6: *Estimated Percent Reductions from 2012 Baseline Due to FMVCP, I/M, RFG, and TxLED.*

**Table 4-5: Estimated Reductions from 2012 Baseline Due to FMVCP, I/M, RFG, and TxLED (tons per day)**

| Inventory Year | $NO_X$ (tons per day) | VOC (tons per day) |
|---|---|---|
| 2012 | 0 | 0 |
| 2014 | -34.44 | -13.03 |
| 2017 | -76.12 | -27.15 |
| 2020 | -98.02 | -34.13 |
| 2023 | -110.14 | -38.39 |
| 2026 | -118.84 | -42.80 |
| 2028 | -122.04 | -45.52 |

**Table 4-6: Estimated Percent Reductions from 2012 Baseline Due to FMVCP, I/M, RFG, and TxLED**

| Inventory Year | $NO_X$ % Reductions | VOC % Reductions |
|---|---|---|
| 2012 | 0.0 | 0.0 |
| 2014 | -21.6 | -17.5 |
| 2017 | -47.9 | -36.4 |
| 2020 | -61.6 | -45.8 |
| 2023 | -69.2 | -51.5 |
| 2026 | -74.7 | -57.4 |
| 2028 | -76.7 | -61.1 |

### 4.4.3 Non-Road Mobile Sources

Non-road vehicles do not typically operate on roads or highways and are often referred to as off-road or off-highway vehicles. The non-road source category is composed of a diverse collection of equipment. Non-road emissions sources include but are not limited to: agricultural equipment, construction and mining equipment, lawn and garden equipment, aircraft and airport equipment, locomotives, commercial marine vessels (CMV), and drilling rigs. EIs for non-road sources developed as subcategories include: NONROAD model categories, airports, CMVs, drilling rigs, and locomotives. The following sections describe the emissions calculation methods used for the non-road mobile source subcategories.

#### *4.4.3.1 Updated 2012 Base Year Inventories*

A Texas-specific version of the EPA's latest NONROAD 2008a model, called the Texas NONROAD (TexN) model, was used to calculate emissions for all non-road mobile source equipment and recreational vehicles, with the exception of airports, locomotives, CMVs, and drilling rigs. Several equipment survey studies have been conducted that focused on various equipment categories operating in different areas in Texas. The resulting survey data are used as inputs to the TexN model to more accurately estimate non-road emissions for the State of Texas instead of using the national default values in the EPA's NONROAD 2008a model. Documentation of methods and procedures used in developing NONROAD model category EIs can be found in Attachment F: *Development of Air Emissions Inventories for NONROAD Model Category Mobile Sources (Task 3).*

The United States Federal Aviation Administration's Emissions and Dispersion Modeling System, Version 5.1.3 (EDMS) was used with updated activity data to calculate airport source emissions. These airport emission sources include aircraft engines, auxiliary power units, and ground support equipment. To estimate the emissions from the airport sources, a survey was conducted by ERG under contract with the TCEQ to collect updated information on aircraft activity, fleet mix, and other EDMS model input parameters. Documentation of methods and procedures used in developing airport EIs can be found in Attachment G: *Airport Emissions Inventories for Houston-Galveston-Brazoria and Dallas-Fort Worth Areas for Select Years 2012, 2014, 2017, 2020, 2023, 2026, and 2028*.

The 2012 Texas locomotive EI includes Class I, II, and III locomotive activity and emissions by rail segment for all counties within Texas. Locomotive line-haul and yard activity data were compiled from companies operating in Texas and from additional resources identified by contractor ERG to create a county-level Class I line-haul inventory. Data developed by Eastern Regional Technical Advisory Committee in collaboration with the Federal Railroad Administration, the American Short Line and Regional Railroad Association (ASLRRA), and members of the Class II and III railroad communities used 2008 activity and emissions profiles for Class II and Class III railroads. To calculate annual gallons of fuel used by railroads, data compiled by ASLRRA from the Class II and III railroads, including total industry fuel use in 2008 for locomotives and total Class II/III route miles, were used. Based on the EIA's latest annual energy outlook publication, 2008 fuel usage values were grown to estimate 2012 emissions. Documentation of methods and procedures used in developing the locomotive EIs can be found in Attachment H*: Controlled and Uncontrolled Average Summer Weekday Locomotive Inventories for Houston-Galveston-Brazoria and Dallas-Fort Worth Areas for Select Years 2012, 2014, 2017, 2020, 2023, 2026, and 2028.*

The 2012 CMV EI was based on 2013 activity data compiled using local port data and data from the United States Department of Transportation Maritime Administration. Emissions factors provided from the EPA's Office of Transportation and Air Quality were used to account for vessel turnover and compliance with marine vessel air quality regulations. The emissions factors were applied to the 2013 activity values and then back-casted to calculate 2012 emissions. Documentation of methodologies and procedures used in developing the CMV EIs can be found in Attachment I: *Controlled and Uncontrolled Average Summer Weekday Commercial Marine Vessel Inventories for Houston-Galveston-Brazoria Area for Select Years 2012, 2014, 2017, 2020, 2023, 2026, and 2028.*

The 2012 inventory for drilling rig diesel engines was developed based on a statewide EI improvement study and updated with 2012 activity data. A survey of oil and gas exploration and production companies was used to develop improved drilling rig emissions characterization profiles. Documentation of methods and procedures used in developing the drilling rig diesel engine EIs can be found in Attachment J: *Development of Texas Statewide Drilling Rigs Emissions Inventories for the Years 1990, 1993, 1996, and 1999 through 2040* or online at http://www.tceq.texas.gov/assets/public/implementation/air/am/contracts/reports/ei/5821199776FY1105-20110815-ergi-drilling_rig_ei.pdf. The drilling rig emissions characterization profiles from this study were combined with 2012 drilling activity data obtained from the RRC to develop the 2012 inventory.

#### *4.4.3.2 Updated Milestone Years Inventories*

The updated milestone year inventories for the NONROAD model categories were developed by ERG using the latest version of the TexN model (version 1.7.1), which incorporates all of the latest available data updates. ERG developed average summer weekday emissions for VOC and $NO_X$ for the analysis years 2012, 2014, 2017, 2020, 2023, 2026, and 2028. The TexN model contains unique population files for all 254 Texas counties that have been developed for every possible analysis year (1970 to 2050) within the TexN model, using county and source category classification-specific growth factors. Due to fluctuations in engine activity and their associated surrogates, the TexN population files are periodically updated using the most recent growth factors such as those available on the Economic and Consumer Credit Analytics website (https://www.economy.com) to allow for more accurate forecasting and back-casting of emissions.

The updated milestone year inventories for the following source categories can be found in the attachments listed below.

- NONROAD model category mobile sources inventories were based on the ERG study found in Attachment F.
- Airport source inventories were based on the ERG study found in Attachment G.
- Locomotive inventories were based on the ERG study found in Attachment H.
- CMV source inventories were based on the ERG study found in Attachment I.

The updated milestone year inventories for drilling rigs were based on the 2012 inventory developed using the drilling rig emissions characterization profiles from the ERG report in Attachment J combined with 2012 drilling rig activity data from the RRC. The 2012 inventory was then projected to future years using growth factors. Documentation on the development of growth factors can be found in Attachment A.

#### *4.4.3.3 Non-Road Mobile Source Emissions Inventories*

The 2012 through 2028 milestone year non-road category source $NO_X$ and VOC emissions totals for the eight-county HGB area are presented in Table 4-7: *HGB $NO_X$ Emissions for Non-Road EI Categories (tons per day)* and Table 4-8: *HGB VOC Emissions for Non-Road EI Categories (tons per day)*.

**Table 4-7: HGB $NO_X$ Emissions for Non-Road EI Categories (tons per day)**

| Category | 2012 | 2014 | 2017 | 2020 | 2023 | 2026 | 2028 |
|---|---|---|---|---|---|---|---|
| NONROAD Model | 51.88 | 45.68 | 36.01 | 28.36 | 24.30 | 22.06 | 21.21 |
| Airport | 6.19 | 6.48 | 6.99 | 7.51 | 7.89 | 8.65 | 8.91 |
| Locomotive | 17.27 | 16.82 | 14.63 | 13.44 | 12.10 | 10.24 | 9.18 |
| Commercial Marine Vessels | 56.00 | 31.03 | 28.77 | 26.08 | 24.68 | 22.89 | 21.36 |
| Drilling Rigs | 0.90 | 0.89 | 0.92 | 0.95 | 0.94 | 0.94 | 0.96 |
| Total | 132.24 | 100.90 | 87.32 | 76.34 | 69.91 | 64.78 | 61.62 |

**Table 4-8: HGB VOC Emissions for Non-Road EI Categories (tons per day)**

| Category | 2012 | 2014 | 2017 | 2020 | 2023 | 2026 | 2028 |
|---|---|---|---|---|---|---|---|
| NONROAD Model | 39.38 | 34.45 | 29.40 | 26.71 | 25.75 | 25.49 | 25.57 |
| Airport | 2.09 | 2.24 | 2.16 | 2.30 | 2.40 | 2.48 | 2.54 |
| Locomotive | 0.99 | 0.91 | 0.73 | 0.62 | 0.56 | 0.47 | 0.41 |
| Commercial Marine Vessels | 1.49 | 1.15 | 1.15 | 1.19 | 1.27 | 1.33 | 1.34 |
| Drilling Rigs | 0.06 | 0.06 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Total | 44.01 | 38.81 | 33.51 | 30.89 | 30.05 | 29.84 | 29.93 |

### 4.4.4 Stationary Point Sources

#### *4.4.4.1 Emissions Inventory Development*

Stationary point source emissions data are collected annually from sites that meet the reporting requirements of 30 TAC §101.10. This rule, referred to as the TCEQ emissions inventory reporting rule, establishes EI reporting thresholds in ozone nonattainment areas that are currently at or less than major source thresholds in the HGB ozone nonattainment area. Therefore, some minor sources in the HGB ozone nonattainment area report to the point source EI.

To collect the data, the TCEQ sends notices to all sites identified as potentially meeting the reporting requirements. Companies are required to report emissions data and to provide sample calculations used to determine the emissions. Information characterizing the process equipment, the abatement units, and the emission points is also required.

All data submitted in the emissions inventory questionnaire (EIQ) are reviewed for quality-assurance purposes and then stored in the State of Texas Air Reporting System (STARS) database. EIQ guidance documents and historical point source emissions of criteria pollutants are available on the TCEQ's Point Source Emissions Inventory Web page (https://www.tceq.texas.gov/airquality/point-source-ei/psei.html). Additional information is available upon request from the TCEQ's Air Quality Division.

#### *4.4.4.2 Updated 2012 Base Year Inventory*

The TCEQ extracted the 2012 point source inventory data from STARS on February 13, 2015. The extracted data included reported annual and ozone season daily emissions of $NO_X$ and VOC for each site in the HGB area that submitted a 2012 EIQ and reflected revisions made on or before the extract date.

#### *4.4.4.3 Updated Milestone Years Inventories*

The TCEQ designated the 2013 EI as the starting point for emission inventory projections for each of the milestone years because it was the most recent EI data available. Using the most recent point source EI data captures the most recent economic conditions and any recent applicable controls, which can improve the accuracy of emissions projections. The TCEQ extracted the 2013 point source inventory data from STARS on February 26, 2015. The extracted data included reported annual and ozone season daily emissions of $NO_X$ and VOC for each site in the HGB area that submitted a 2013 EIQ and reflected revisions made on or before the extract date.

In the development of the milestone year inventories for each ozone precursor ($NO_X$ and VOC), the TCEQ projected future emissions from major and minor sources separately when appropriate and then added unused emissions reductions credits to the inventories. Further details are explained below. Title V operating permit data were reviewed to identify sites that were major for ozone precursors.

For both major and minor sources, $NO_X$ emissions from equipment applicable to the MECT Program were projected using MECT data. MECT data were retrieved from the emissions banking and trading database and reviewed to identify sites with applicable units. For both major and minor sources, it was assumed that the significant majority of $NO_X$ emissions are from MECT-applicable units. Since the MECT cap is an annual value, it was prorated by the ratio of the aggregate of the 2013 ozone season daily emissions to the aggregate of the 2013 annual emissions for applicable sites to project future daily emissions for the HGB area. To maintain a conservative approach, the entire cap was applied to the aggregate of the site-level emissions in the first milestone year inventory.

Title V operating permit data from 2014 were reviewed to identify major sources of VOC emissions. VOC emissions from these sites were projected by adding emissions growth allowed under the major modification thresholds for marginal ozone nonattainment areas. For each site, the annual 40-ton major modification threshold was prorated by the site-wide ratio of ozone season to annual emissions to provide a one-time growth in emissions that was added to the site’s 2013 emissions. To maintain a conservative approach, all growth was taken into account by 2014, the first milestone year inventory.

$NO_X$ emissions from sites not listed in the MECT Program and VOC emissions from sources not identified as major sources of VOC emissions were assumed to be minor source emissions and were projected using emissions trend data and growth factors for each milestone year. The documentation for the development of the emissions growth factors can be found in Attachment A. Emission trends for each site were established using 2009 through 2013 annual emissions data. For sites with decreasing emission trends, milestone year inventories were set equal to the 2013 baseline inventory. For sites with increasing emission trends, milestone year inventories were determined by applying growth factors to the 2013 baseline inventory. The growth factor information can be found in Attachment A. To maintain a conservative approach, any growth factors that projected a decrease in future emissions (i.e., negative growth) were modified so that emissions for these source categories remained equal to the 2013 baseline inventory through future years.

Finally, each of the milestone year inventories were adjusted to account for available (unused) emissions credits. Emissions credits are banked emissions reductions that may return to the air shed in the future through the use of these emissions credits either to modify existing facilities, construct new facilities, or by facilities to demonstrate compliance with emissions limit obligations where provided for in commission rules. To account for the possible use of the banked $NO_X$ and VOC emissions, available emissions reduction credit (ERC) and discrete emissions reduction credit (DERC) data were added to the inventories as discussed below.

Projected ERC use was determined by assuming that banked ERCs would be used for offsets in permitting new or modified sources. In ozone nonattainment areas, ERCs used to permit new or modified sources must be reduced by a factor called the offset ratio to assist with ensuring progress towards attaining air quality standards. Therefore, available ERCs were reduced by 15% (i.e., divided by 1.15) to account for the Nonattainment New Source Review permitting offset ratio for marginal ozone nonattainment areas. All available ERCs listed in the emissions banking and trading database as of February 13, 2015 were added to each milestone year starting with 2017. This includes transactions with available information from 2008 through 2014 to account for credits taken from the bank and applied to projects that may not have been completed in time for the 2013 inventory.

Projected DERC use was determined by assuming that all available credits would be used over the 2017 through 2028 timespan. The resulting credits were averaged over the 2017 through 2028 projected timespan to obtain a daily contribution and added to the projected inventories. This approach is conservative and simplified; historical use has been considerably less (less than 10% of the projected rate)[13] and this is not anticipated to change significantly. The DERC transactions between 2008 and 2014 were not added as they were used for one-time compliance projects applicable to, and reflected in, emissions for those years only. A summary of the 2012, 2014, 2017, 2020, 2023, 2026, and 2028 point source EIs is presented in Table 4-9*: HGB Point Source $NO_X$ and VOC Emissions (tons per day).*

**Table 4-9: HGB Point Source $NO_X$ and VOC Emissions (tons per day)**

| Pollutant | 2012 | 2014 | 2017 | 2020 | 2023 | 2026 | 2028 |
|---|---|---|---|---|---|---|---|
| $NO_X$ | 98.50 | 119.67 | 127.39 | 127.71 | 128.03 | 128.35 | 128.56 |
| VOC | 84.06 | 110.72 | 115.02 | 115.65 | 116.26 | 116.94 | 117.41 |

### 4.5 Emissions Summary

The 2012 base year and the 2014, 2017, 2020, 2023, 2026, and 2028 future year EI summaries by source categories for the HGB area are shown in Table 4-10: *HGB $NO_X$ Emissions by Source Category (tons per day)* and Table 4-11: *HGB VOC Emissions by Source Category (tons per day)*. These tables illustrate that in the horizon year of 2028, point sources contribute the most $NO_X$ emissions and area sources contribute the most VOC emissions. Contributions from biogenic emissions are not included in the summary because this analysis is limited to anthropogenic sources.

[13] Texas Commission on Environmental Quality. "Discrete Emission Credit Banking and Trading Program Audit." Accessed March 6, 2014. http://www.tceq.texas.gov/assets/public/implementation/air/banking/reports/2013decprogramaudit.pdf.

**Table 4-10: HGB $NO_X$ Emissions by Source Category (tons per day)**

| Category | 2012 | 2014 | 2017 | 2020 | 2023 | 2026 | 2028 |
|---|---|---|---|---|---|---|---|
| Point Sources | 98.50 | 119.67 | 127.39 | 127.71 | 128.03 | 128.35 | 128.56 |
| Area Sources | 21.91 | 22.52 | 23.23 | 23.61 | 23.47 | 23.50 | 23.59 |
| On-Road Mobile Sources (MOVES2014) | 159.08 | 124.64 | 82.96 | 61.06 | 48.94 | 40.24 | 37.04 |
| Non-Road Mobile Sources | 132.24 | 100.90 | 87.32 | 76.34 | 69.91 | 64.78 | 61.62 |
| Total | 411.73 | 367.73 | 320.90 | 288.72 | 270.35 | 256.87 | 250.81 |

**Table 4-11: HGB VOC Emissions by Source Category (tons per day)**

| Category | 2012 | 2014 | 2017 | 2020 | 2023 | 2026 | 2028 |
|---|---|---|---|---|---|---|---|
| Point Sources | 84.06 | 110.72 | 115.02 | 115.65 | 116.26 | 116.94 | 117.41 |
| Area Sources | 310.07 | 317.75 | 328.20 | 335.07 | 337.81 | 341.16 | 344.75 |
| On-Road Mobile Sources (MOVES2014) | 74.51 | 61.48 | 47.36 | 40.38 | 36.12 | 31.71 | 28.99 |
| Non-Road Mobile Sources | 44.01 | 38.81 | 33.51 | 30.89 | 30.05 | 29.84 | 29.93 |
| Total | 512.65 | 528.76 | 524.09 | 521.99 | 520.24 | 519.65 | 521.08 |

## 4.6 Maintenance Demonstration Conclusion

Trend analysis using the 2028 future year emissions shows an overall decrease of 152.49 tpd in combined $NO_X$ and VOC emissions for the HGB area. This net change includes a projected 8.43 tpd increase in VOC and a 160.92 tpd decrease in $NO_X$.

Previous photochemical modeling analysis for the HGB area shows that reducing $NO_X$ emissions is expected to be more effective in reducing the ozone design value than VOC reductions. Therefore, the projected 160.92 tpd decrease of $NO_X$ is expected to reduce ozone design values effectively despite the small projected 8.43 tpd increase in VOC emissions. Based on future expected trends and previous photochemical analysis, the HGB area is projected to show continued attainment of the 1997 eight-hour ozone standard through 2028.