TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

AGENDA ITEM REQUEST

for Adoption of State Implementation Plan Revision

AGENDA REQUESTED: 4/24/2024

DATE OF REQUEST: 4/5/2024

INDIVIDUAL TO CONTACT REGARDING CHANGES TO THIS REQUEST, IF NEEDED: Jamie Zech, Agenda Coordinator, (512) 239-3935

CAPTION: Docket No. 2023-1223-SIP. Consideration for adoption of Houston-Galveston-Brazoria Severe Area Attainment Demonstration State Implementation Plan (SIP) Revision for the 2008 Eight-Hour Ozone National Ambient Air Quality Standard.

The SIP revision includes a photochemical modeling analysis, a weight of evidence analysis, a reasonably available control technology analysis, a reasonably available control measures analysis, motor vehicle emissions budgets for 2026, and a contingency plan. (Vanessa T. De Arman, John Minter; Project No. 2023-110-SIP-NR)

Richard C. Chism
Director

Donna F. Huff
Division Deputy Director

Jamie Zech
Agenda Coordinator

Copy to CCC Secretary? NO ☒ YES ☐

Texas Commission on Environmental Quality
Interoffice Memorandum

To: Commissioners **Date:** April 5, 2024

Thru: Laurie Gharis, Chief Clerk
Kelly Keel, Executive Director

From: Richard C. Chism, Director *RCC*
Office of Air

Docket No.: 2023-1223-SIP

Subject: Commission Approval for Adoption of the Houston-Galveston-Brazoria (HGB) Severe Area Attainment Demonstration (AD) State Implementation Plan (SIP) Revision for the 2008 Eight-Hour Ozone National Ambient Air Quality Standard (NAAQS)

HGB 2008 Ozone NAAQS Severe AD SIP Revision
Non-Rule Project No. 2023-110-SIP-NR

Background and reason(s) for the SIP revision:
The HGB 2008 ozone NAAQS nonattainment area, consisting of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, was previously classified as serious nonattainment for the 2008 eight-hour ozone NAAQS of 0.075 parts per million (ppm) with a July 20, 2021, attainment date. Based on 2020 monitoring data, the HGB area did not attain the standard.[1] On April 5, 2021, the Texas Commission on Environmental Quality (TCEQ) submitted a one-year attainment date extension request to the U.S. Environmental Protection Agency (EPA). On October 7, 2022, EPA published a final notice denying the one-year attainment date extension request and reclassifying the area to severe for the 2008 eight-hour ozone NAAQS, effective November 7, 2022 (87 *Federal Register* (FR) 60926).

Since the HGB area has been reclassified by EPA, the area is now subject to the severe nonattainment requirements in the federal Clean Air Act (FCAA), §182(d), and TCEQ is required to submit severe classification AD and reasonable further progress (RFP) SIP revisions to EPA. The attainment date for severe areas is July 20, 2027, with a 2026 attainment year (87 FR 60926).[2] EPA set a May 7, 2024, deadline for states to submit AD and RFP SIP revisions to address the 2008 eight-hour ozone standard severe nonattainment area requirements.

With the severe classification, the HGB 2008 ozone NAAQS nonattainment area is also subject to FCAA, §182(d)(3), which requires states to submit plans to include requirements for the FCAA, §185 penalty fee. EPA set a November 7, 2025, deadline for states to submit a SIP revision to address the FCAA, §185 requirements (87 FR 60926). This requirement will be addressed in a future rulemaking.

Scope of the SIP revision:
As a result of the reclassification, TCEQ is required to submit to EPA an AD SIP revision consistent with FCAA requirements for areas classified as severe nonattainment for the 2008 eight-hour ozone NAAQS. This HGB AD SIP revision is scheduled to be adopted in conjunction with the

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[1] An area that fails to attain the 2008 eight-hour ozone NAAQS by its attainment date would be eligible for the first one-year extension if, for the attainment year, the area's fourth highest daily maximum eight-hour average is at or below the level of the standard (75 parts per billion (ppb)); the HGB area's fourth-highest daily maximum eight-hour average for 2020 was 75 ppb as measured at the Conroe Relocated monitor (C78/A321). The HGB area's design value for 2020 was 79 ppb.

[2] The attainment year ozone season is the ozone season immediately preceding a nonattainment area's attainment date.

Re: Docket No. 2023-1223-SIP

Dallas-Fort Worth (DFW) and HGB 2008 Eight-Hour Ozone Severe Area RFP SIP Revision (Project No. 2023-108-SIP-NR).

A.) Summary of what the SIP revision would do:
This SIP revision includes a photochemical modeling analysis and a weight-of-evidence (WoE) analysis that evaluates the attainment status of the area. This SIP revision also includes a reasonably available control measures (RACM) analysis, a reasonably available control technology (RACT) analysis, and a contingency plan. To ensure that emissions from transportation projects that use federal transportation funding conform to the SIP, this HGB AD SIP revision contains nitrogen oxides (NO_x) and volatile organic compounds (VOC) motor vehicle emissions budgets (MVEB) for the 2026 attainment year.

This SIP revision incorporates concurrently adopted revisions to 30 Texas Administrative Code (TAC) Chapter 115 to correct inadvertent errors made in a previously adopted rulemaking that implemented EPA's 2016 *Control Techniques Guidelines for the Oil and Natural Gas Industry* (Rule Project No. 2020-038-115-AI) and to address SIP contingency measure requirements under the 2008 ozone NAAQS. This SIP revision also incorporates concurrent revisions to 30 TAC Chapter 117 to address a rule petition for stationary diesel engines and associated emissions monitoring requirements.

B.) Scope required by federal regulations or state statutes:
This HGB AD SIP revision is consistent with the requirements of FCAA, §182(d) and 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 on March 6, 2015. The FCAA-required SIP elements include analyses for RACT and RACM, MVEBs, and a contingency plan. Consistent with EPA's November 2018 modeling guidance, this HGB AD SIP revision also includes a modeled attainment demonstration and a WoE analysis.[3]

This SIP revision also includes performance standard modeling for the existing vehicle inspection and maintenance (I/M) program and certification statements to confirm that clean fuel fleet, I/M, and nonattainment new source review requirements have been met for the HGB 2008 eight-hour ozone severe nonattainment area. The severe classification vehicle miles traveled growth offset requirements under FCAA, §182(d)(1) are addressed in the concurrently adopted DFW-HGB severe classification RFP SIP revision for the 2008 eight-hour ozone NAAQS (Project No. 2023-108-SIP-NR).

C.) Additional staff recommendations that are not required by federal rule or state statute:
None.

Statutory authority:
The authority to propose and adopt SIP revisions is derived from the following sections of Texas Health and Safety Code, Chapter 382, Texas Clean Air Act (TCAA), §382.002, which provides that the policy and purpose of the TCAA is to safeguard the state's air resources from pollution; TCAA, §382.011, which authorizes the commission to control the quality of the state's air; and TCAA, §382.012, which authorizes the commission to prepare and develop a general, comprehensive plan for the control of the state's air. This SIP revision is required by FCAA, §110(a)(1) and will also be adopted under the commission's general authority under Texas Water Code, §5.102, General Powers and §5.105, General Policy. States are required to submit SIP revisions that specify the manner in which the NAAQS will be achieved and maintained within each air quality control region

[3] EPA. *Modeling Guidance for Demonstrating Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze.* November 29, 2018. https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf.

of the state by 42 United States Code, §§7420 *et seq.*, and implementing rules in 40 Code of Federal Regulations Part 51.

Effect on the:

A.) Regulated community:
The HGB AD SIP revision contains a contingency plan, as required by FCAA, §172(c)(9) and §182(c)(9), which incorporates new control requirements in a concurrent VOC rulemaking (Rule Project No. 2023-116-115-AI). Contingency measures, as necessary, would be implemented to reduce VOC emissions if EPA determines that the HGB 2008 eight-hour ozone NAAQS nonattainment area did not attain the standard.

This SIP revision also provides compliance flexibility for emissions monitoring for owners or operators of non-exempt stationary diesel engines through the concurrent NO_x rulemaking (Rule Project No. 2023-117-117-AI). Owners or operators of affected units meeting specific criteria at major or minor sources of NO_x will not be required to use an emissions monitor for NO_x, nor will they be required to comply with existing ammonia monitoring requirements. Owners or operators will still be required to demonstrate initial compliance with pollutant emission specifications, which can be done with a stack test.

This SIP revision also impacts the regulated community by changing the SIP base emissions year for emissions banking and trading credit generation for the HGB 2008 ozone NAAQS nonattainment area to 2019 for point sources. On April 9, 2021, TCEQ communicated this change to regulated entities.

B.) Public:
The general public in the HGB ozone NAAQS nonattainment area may benefit from the HGB area ultimately meeting the ozone NAAQS and the area being redesignated as attainment for the 2008 eight-hour ozone NAAQS.

C.) Agency programs:
No additional burden on agency programs is anticipated as a result of this SIP revision.

Stakeholder meetings:
TCEQ hosted and attended multiple meetings for the HGB area related to this SIP revision. Agenda topics included the status of HGB photochemical modeling development, emissions inventories and trends, ozone design values, and planning activities for the HGB 2008 Eight-Hour Ozone Severe Classification AD SIP Revision. Attendees included representatives from industry, county and city government, environmental groups, and the public.

Public Involvement Plan
Yes.

Alternative Language Requirements
Yes. Spanish.

Public comment:
The public comment period opened on December 1, 2023, and closed on January 16, 2024. The commission held a public hearing for the proposed SIP revision in Houston on January 4, 2024, at 7:00 p.m. Notice of the public hearing was published in English in the *Houston Chronicle* newspaper on December 1, 2023, and in Spanish in *La Voz* newspaper on December 13, 2023. Notices in English and Spanish were also distributed to subscribers through GovDelivery and

posted to TCEQ's website, and a notice was published in English in the *Texas Register* on December 15, 2023 (48 TexReg 7643). A plain language summary was provided in both English and Spanish. TCEQ staff were present and opened the hearing for public comment. Spanish language interpreters were available at the hearing, comments were recorded, and a transcript was prepared.

During the comment period, comments were received from Air Alliance Houston, City of Houston At-Large Council Member Dr. Letitia Plummer, Earthjustice, Environment Texas, Environmental Integrity Project, Fort Bend County Environmental Organization, Office of Harris County Attorney, Lone Star Chapter Sierra Club, Progressive Fifth Ward Community Association, Public Citizen, Sierra Club, Texas Environmental Justice Advocacy Services, EPA, and 238 individuals. Generally, the comments focused on requesting a public comment period extension and an additional public hearing, adequacy of the SIP revision, adverse health effects of ozone, environmental justice, contingency measures, and control strategy development. The public comments received are summarized and addressed in this HGB AD SIP Revision.

Significant changes from proposal:
A U.S. Army Corps of Engineers project to deepen and widen the Houston Ship Channel (Project 11), once complete, is expected to reduce NO_x emissions from ocean-going vessels due to improved traffic flow. Comments were received that this project would be completed after the 2026 ozone season for the HGB 2008 ozone NAAQS nonattainment area. In response to these comments, the modeling sensitivity performed for Project 11 was removed from the adopted HGB AD SIP revision. TCEQ also removed the 3% CMV activity adjustment from the total 2026 NO_x emissions for all Category 3 vessels (ocean-going vessels) from the concurrently adopted DFW-HGB RFP SIP revision (Project No. 2023-108-SIP-NR) in response to these comments.

This SIP revision provides the option to apply contingency measures to address either the 2008 ozone NAAQS serious or severe classification for HGB and calculates the 2008 ozone NAAQS serious contingency measure targets as 3% VOC (using base year VOC from the 2020 DFW and HGB Serious Classification RFP SIP revision for the 2008 Eight-Hour Ozone NAAQS (Project No. 2019-079-SIP-NR)).

Staff inadvertently omitted some source categories and incorrectly stated multiple VOC content limits for other source categories in the industrial adhesives contingency measure of the concurrent Chapter 115 rulemaking proposal (Rule Project No. 2023-116-115-AI). This resulted in less emissions reductions available to fulfill contingency requirements in the HGB area. The executive director intends to immediately initiate rulemaking for commission consideration to restore the missing and incorrect VOC content limits to achieve the reductions originally intended.

Potential controversial concerns and legislative interest:
Although EPA finalized its 2015 eight-hour ozone standard SIP requirements rule (83 FR 62998), the final rule did not revoke the 2008 eight-hour ozone standard. EPA stated that revocation of the 2008 eight-hour ozone standard would be addressed in a separate future action. No further actions have been taken by EPA. However, because of the February 16, 2018, United States Court of Appeals for the District of Columbia Circuit opinion in the case *South Coast Air Quality Management District v. EPA, 882 F.3d 1138 (D.C. Cir. 2018)*, the requirement for EPA to reclassify the area and for TCEQ to submit this AD SIP revision is expected to remain even if the 2008 eight-hour ozone standard is revoked.

EPA released new draft guidance on contingency measures, published in the *Federal Register* for public comment on March 23, 2023 (88 FR 17571). The draft guidance proposed an entirely new scheme for determining the amount of emissions reductions necessary to address the contingency

requirement. Since EPA had not issued final guidance to the states regarding the quantity of required reductions from contingency measures at the time this HGB AD SIP revision was developed, this SIP revision relies on the historically approved approach (3% of the 2011 RFP base year emissions) to determine the amount of emissions reductions necessary to address the contingency requirement.

Will this SIP revision affect any current policies or require development of new policies?
No.

What are the consequences if this SIP revision does not go forward? Are there alternatives to SIP revision?
The commission could choose to not comply with requirements to develop and submit an AD SIP revision to EPA. However, if the SIP revision is not submitted, EPA would issue a finding of failure to submit, requiring that TCEQ submit the required SIP revision within a specified time period, and impose sanctions on the state. EPA would be required to promulgate a federal implementation plan (FIP) any time within two years after finding TCEQ failed to make the required submission. Sanctions could include transportation funding restrictions, grant withholdings, and 2-to-1 emissions offsets requirements for new construction and major modifications of stationary sources in the HGB 2008 ozone NAAQS nonattainment area. EPA would impose such sanctions and implement a FIP until the state submitted, and EPA approved, an AD SIP revision for the area.

Key points in the adoption SIP revision schedule:
Anticipated agenda date: April 24, 2024

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REVISIONS TO THE STATE OF TEXAS AIR QUALITY IMPLEMENTATION PLAN FOR THE CONTROL OF OZONE AIR POLLUTION

HOUSTON-GALVESTON-BRAZORIA 2008 EIGHT-HOUR OZONE STANDARD NONATTAINMENT AREA

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
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HOUSTON-GALVESTON-BRAZORIA SEVERE AREA ATTAINMENT DEMONSTRATION STATE IMPLEMENTATION PLAN REVISION FOR THE 2008 EIGHT-HOUR OZONE NATIONAL AMBIENT AIR QUALITY STANDARD

PROJECT NUMBER 2023-110-SIP-NR
SFR-122/2023-110-SIP-NR

Adoption
April 24, 2024

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EXECUTIVE SUMMARY

Eight counties comprise the Houston-Galveston-Brazoria (HGB) 2008 ozone National Ambient Air Quality Standard (NAAQS) (0.075 parts per million) nonattainment area: Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties. Based on monitoring data from 2018, 2019, and 2020, the area did not attain the 2008 eight-hour ozone NAAQS by the attainment date for areas classified as serious, July 20, 2021.[1] On April 5, 2021, the Texas Commission on Environmental Quality (TCEQ) submitted a one-year attainment date extension request to the United States Environmental Protection Agency (EPA). On October 7, 2022, EPA published a final notice denying the one-year attainment date extension request and reclassifying the area from serious to severe for the 2008 eight-hour ozone NAAQS, effective November 7, 2022 (87 *Federal Register* (FR) 60926).

The HGB 2008 ozone NAAQS nonattainment area is now subject to the requirements in FCAA, §182(d) for severe nonattainment areas. The TCEQ is required to submit severe ozone classification attainment demonstration (AD) and reasonable further progress (RFP) state implementation plan (SIP) revisions to EPA. The attainment date for areas classified as severe is July 20, 2027, with a 2026 attainment year (80 FR 60926).[2] The EPA set a May 7, 2024, deadline for states to submit AD and RFP SIP revisions to address the 2008 eight-hour ozone standard severe nonattainment area requirements. With the severe classification, the HGB 2008 ozone NAAQS nonattainment area is subject to the FCAA, §182(d)(3), which requires states to submit plans to include requirements for the §185 penalty fee. EPA set a November 7, 2025, deadline for states to submit a SIP revision to address the FCAA, §185 requirements (87 FR 60926).

This HGB AD SIP revision includes the following required SIP elements: photochemical modeling, a reasonably available control technology (RACT) analysis, a reasonably available control measures (RACM) analysis, a weight-of-evidence (WoE) analysis, a contingency plan, attainment year motor vehicle emissions budgets (MVEB) for transportation conformity purposes, performance standard modeling for the existing vehicle inspection and maintenance (I/M) program, and certification statements to confirm that I/M program requirements, nonattainment new source review, and clean fuel fleet program requirements have been met for the HGB 2008 ozone NAAQS nonattainment area. The severe classification vehicle miles traveled growth offset demonstration required under FCAA, §182(d)(1) is addressed in the concurrent Dallas-Fort Worth (DFW) and HGB severe classification RFP SIP revision for the 2008 eight-hour ozone NAAQS (Project No. 2023-108-SIP-NR).

Contingency measures are control requirements that would take effect and result in emissions reductions if an area fails to attain a NAAQS by the applicable attainment date or fails to demonstrate RFP. EPA has interpreted recent court decisions to have invalidated key aspects of EPA's historical approach to implementing the contingency measure requirement. At the time these contingency measures were being developed, EPA had historically accepted the use of surplus emissions reductions from previously

[1]The HGB area's fourth-highest daily maximum eight-hour average for 2020 was 75 ppb as measured at the Conroe Relocated monitor (C78/A321). The HGB area's design value for 2020 was 79 ppb.
[2] The attainment year ozone season is the ozone season immediately preceding a nonattainment area's attainment date.

implemented control measures to fulfill the contingency measure requirements. However, EPA's new draft guidance on contingency measures, published in the *Federal Register* for public comment on March 23, 2023 (88 FR 17571), indicates that contingency measures must be conditional and prospective (not previously implemented) based on the recent court rulings. The draft guidance also suggests an entirely new scheme for determining the amount of emissions reductions necessary to address the contingency requirement.

The contingency measures in the concurrent Chapter 115 rulemaking (Rule Project No. 2023-116-115-AI) are conditional and prospective (not previously implemented), which follows EPA's interpretation of recent court decisions. These measures do not rely on the historical approach of using surplus emissions reductions from previously implemented measures to fulfill contingency requirements. Since EPA had not issued final guidance to states regarding the amount of required reductions from contingency measures at the time this HGB AD SIP revision was developed, this SIP revision relies on the historically approved approach to determine the amount of emissions reductions necessary to address the contingency requirement.

Staff inadvertently omitted some source categories and incorrectly stated multiple VOC content limits for other source categories in the industrial adhesives contingency measure of the concurrent Chapter 115 rulemaking proposal (Rule Project No. 2023-116-115-AI). This resulted in less emissions reductions available to fulfill contingency requirements in the HGB area. The Executive Director intends to immediately initiate rulemaking for commission consideration to restore the missing and incorrect VOC content limits to achieve the reductions originally intended.

This HGB AD SIP revision is concurrent with the DFW and HGB 2008 Eight-Hour Ozone Severe Classification RFP SIP Revision (Project No. 2023-108-SIP-NR), the 30 Texas Administrative Code (TAC) Chapter 115 rulemaking (Rule Project No. 2023-116-115-AI), and the 30 TAC Chapter 117 rulemaking (Rule Project No. 2023-117-117-AI).

This HGB AD SIP revision includes a photochemical modeling analysis of reductions in nitrogen oxides (NO_X) and volatile organic compounds (VOC) emissions from existing control strategies and a WoE analysis. The peak ozone design value for the HGB 2008 ozone NAAQS nonattainment area is estimated to be 75 parts per billion (ppb) in 2026. The quantitative and qualitative analyses in Chapter 5: *Weight of Evidence* supplement the photochemical modeling analysis presented in Chapter 3: *Photochemical Modeling* to characterize 2026 future year ozone conditions.

For the photochemical modeling analysis, this SIP revision includes a base case modeling episode of April through October of 2019. This modeling episode was chosen because the period is representative of the times of the year that eight-hour ozone levels above 75 ppb have historically been monitored within the nonattainment area. The model performance evaluation of the 2019 base case indicates the modeling is suitable for use in conducting the modeling attainment test. The modeling attainment

test was applied by modeling a 2019 base case and 2026 future case modeling results to estimate 2026 eight-hour ozone design values.[3]

Table ES-1: *Summary of 2019 Base and 2026 Future Case Anthropogenic Modeling Emissions for HGB 2008 Ozone NAAQS Nonattainment Area for June 12 Episode Day* lists the anthropogenic modeled emissions of NO_X and VOC in tons per day (tpd) by source category for a sample episode day of June 12 in the 2019 base and 2026 future case ozone modeling. The differences in modeled emissions between the 2019 base case and the 2026 future case reflect the net of economic growth and reductions from existing controls. The existing controls include both state and federal measures that have already been adopted, as discussed in Chapter 4: *Control Strategies and Required Elements*.

Table ES-1: Summary of 2019 Base and 2026 Future Case Anthropogenic Modeling Emissions for HGB 2008 Ozone NAAQS Nonattainment Area for June 12 Episode Day

Emission Source Category	2019 NO_X (tpd)	2026 NO_X (tpd)	2019 VOC (tpd)	2026 VOC (tpd)
On-Road	81.36	47.91	40.39	28.05
Non-Road	37.00	28.47	37.42	38.54
Off-Road – Airports	9.25	9.13	2.83	2.89
Off-Road – Locomotives	12.37	7.73	0.63	0.38
Off-Road – Commercial Marine	63.41	49.28	3.62	3.76
Area	35.91	37.82	262.43	288.01
Oil and Gas – Drilling	0.30	0.23	0.03	0.02
Oil and Gas – Production	1.48	1.48	41.82	20.74
Point – EGU	30.82	42.78	1.17	6.86
Point – Non-EGU	71.72	94.54	97.39	103.10
HGB Nonattainment Area Total	343.62	319.37	487.73	492.35

The future year on-road mobile source emission inventories for this SIP revision were developed using the version 3 of the EPA Motor Vehicle Emission Simulator (MOVES3) model. These 2026 attainment year inventories establish the NO_X and VOC MVEBs that, once found adequate or approved by EPA, must be used in transportation conformity analyses. The attainment MVEBs represent the 2026 on-road mobile source emissions that have been modeled for the AD and include the on-road control measures. The MVEBs are provided in Table 4-2: *2026 Attainment Demonstration MVEBs for the HGB 2008 Ozone NAAQS Nonattainment Area (tons per day)*.

The eight-hour ozone design values for the 2019 base case design value (DVB) and modeled 2026 future case design value (DVF) for the regulatory ozone monitors in the HGB 2008 ozone NAAQS nonattainment area are shown in Table ES-2: *Summary of 2019 DVBs and Modeled 2026 DVFs for HGB 2008 Ozone NAAQS Nonattainment Area Regulatory Monitors*. In accordance with EPA's November 2018 *Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze*, the

[3] The future case modeling includes projected emissions for the attainment year of 2026 since that is the last full ozone season prior to the attainment date for the nonattainment area.

2026 DVFs presented have been rounded to one decimal place and then truncated.[4] Based on TCEQ's modeling and available data, the HGB area is expected to attain the 2008 ozone NAAQS by the July 20, 2027, attainment date.

Table ES-2: Summary of 2019 DVBs and Modeled 2026 DVFs for HGB 2008 Ozone NAAQS Nonattainment Area Regulatory Monitors

Monitor Name	CAMS Number	2019 DVB (ppb)	Relative Response Factor	2026 DVF (ppb)
Houston Aldine	0008	78.00	0.971	75
Houston Bayland Park	0053	76.67	0.955	73
Channelview	0015	68.00	0.985	66
Clinton	0403	71.00	0.978	69
Conroe Relocated	0078	74.33	0.980	72
Houston Croquet	0409	71.33	0.962	68
Houston Deer Park #2	0035	75.67	0.984	74
Galveston 99th St.	1034	74.00	0.974	72
Baytown Garth	1017	71.33	0.986	70
Houston East	0001	72.67	0.985	71
Lake Jackson	1016	65.00	0.978	63
Lang	0408	72.00	0.964	69
Lynchburg Ferry	1015	64.33	0.985	63
Manvel Croix Park	0084	74.33	0.965	71
Houston Monroe	0406	66.67	0.973	64
Houston North Wayside	0405	65.00	0.975	63
Northwest Harris Co.	0026	72.67	0.975	70
Park Place	0416	73.00	0.977	71
Seabrook Friendship Park	0045	67.67	0.988	66
Houston Westhollow	0410	70.00	0.954	66

This HGB AD SIP revision documents a photochemical modeling analysis and a WoE assessment that meets EPA modeling guidance.

[4] https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

SECTION V-A: LEGAL AUTHORITY

General

The Texas Commission on Environmental Quality (TCEQ) has the legal authority to implement, maintain, and enforce the National Ambient Air Quality Standards (NAAQS) and to control the quality of the state's air, including maintaining adequate visibility.

The first air pollution control act, known as the Clean Air Act of Texas, was passed by the Texas Legislature in 1965. In 1967, the Clean Air Act of Texas was superseded by a more comprehensive statute, the Texas Clean Air Act (TCAA), found in Article 4477-5, Vernon's Texas Civil Statutes. In 1989, the TCAA was codified as Chapter 382 of the Texas Health and Safety Code. The TCAA is frequently amended for various purposes during the biennial legislative sessions.

Originally, the TCAA stated that the Texas Air Control Board (TACB) was the state air pollution control agency and was the principal authority in the state on matters relating to the quality of air resources. In 1991, the legislature abolished the TACB effective September 1, 1993, and its powers, duties, responsibilities, and functions were transferred to the Texas Natural Resource Conservation Commission (TNRCC). In 2001, the 77th Texas Legislature continued the existence of the TNRCC until September 1, 2013. and changed the name of the TNRCC to TCEQ. In 2009, the 81st Texas Legislature, during a special session, amended section 5.014 of the Texas Water Code, changing the expiration date of TCEQ to September 1, 2011, unless continued in existence by the Texas Sunset Act. In 2011, the 82nd Texas Legislature continued the existence of TCEQ until 2023. In 2023, the 88th Regular Session of the Texas Legislature continued the existence of TCEQ until 2035.

With the creation of the TNRCC (and its successor TCEQ), authority over air quality is found in both the Texas Water Code (TWC) and the TCAA. The general authority of TCEQ is found in TWC, Chapter 5 and enforcement authority is provided by TWC, Chapter 7. TWC, Chapter 5, Subchapters A - F, H - J, and L, include the general provisions, organization, and general powers and duties of TCEQ, and the responsibilities and authority of the executive director. TWC, Chapter 5 also authorizes TCEQ to implement action when emergency conditions arise and to conduct hearings. The TCAA specifically authorizes TCEQ to establish the level of quality to be maintained in the state's air and to control the quality of the state's air by preparing and developing a general, comprehensive plan. The TCAA, Subchapters A - D, also authorize TCEQ to collect information to enable the commission to develop an inventory of emissions; to conduct research and investigations; to enter property and examine records; to prescribe monitoring requirements; to institute enforcement proceedings; to enter into contracts and execute instruments; to formulate rules; to issue orders taking into consideration factors bearing upon health, welfare, social and economic factors, and practicability and reasonableness; to conduct hearings; to establish air quality control regions; to encourage cooperation with citizens' groups and other agencies and political subdivisions of the state as well as with industries and the federal government; and to establish and operate a system of permits for construction or modification of facilities.

Local government authority is found in Subchapter E of the TCAA. Local governments have the same power as TCEQ to enter property and make inspections. They also may

make recommendations to the commission concerning any action of TCEQ that affects their territorial jurisdiction, may bring enforcement actions, and may execute cooperative agreements with TCEQ or other local governments. In addition, a city or town may enact and enforce ordinances for the control and abatement of air pollution not inconsistent with the provisions of the TCAA and the rules or orders of the commission.

In addition, Subchapters G and H of the TCAA authorize TCEQ to establish vehicle inspection and maintenance programs in certain areas of the state, consistent with the requirements of the federal Clean Air Act; coordinate with federal, state, and local transportation planning agencies to develop and implement transportation programs and measures necessary to attain and maintain the NAAQS; establish gasoline volatility and low emission diesel standards; and fund and authorize participating counties to implement vehicle repair assistance, retrofit, and accelerated vehicle retirement programs.

Applicable Law

The following statutes and rules provide necessary authority to adopt and implement the state implementation plan (SIP). The rules listed below have previously been submitted as part of the SIP.

Statutes

All sections of each subchapter are included, with the most recent effective date, unless otherwise noted.

TEXAS HEALTH & SAFETY CODE, Chapter 382	September 1, 2023
TEXAS WATER CODE	September 1, 2023

Chapter 5: Texas Natural Resource Conservation Commission
- Subchapter A: General Provisions
- Subchapter B: Organization of the Texas Natural Resource Conservation Commission
- Subchapter C: Texas Natural Resource Conservation Commission
- Subchapter D: General Powers and Duties of the Commission
- Subchapter E: Administrative Provisions for Commission
- Subchapter F: Executive Director (except §§5.225, 5.226, 5.227, 5.231, 5.232, and 5.236)
- Subchapter H: Delegation of Hearings
- Subchapter I: Judicial Review
- Subchapter J: Consolidated Permit Processing
- Subchapter L: Emergency and Temporary Orders (§§5.514, 5.5145, and 5.515 only)
- Subchapter M: Environmental Permitting Procedures (§5.558 only)

Chapter 7: Enforcement
- Subchapter A: General Provisions (§§7.001, 7.002, 7.0025, 7.004, and 7.005 only)
- Subchapter B: Corrective Action and Injunctive Relief (§7.032 only)
- Subchapter C: Administrative Penalties
- Subchapter D: Civil Penalties (except §7.109)
- Subchapter E: Criminal Offenses and Penalties: §§7.177, 7.178-7.183 only

Rules

All of the following rules are found in 30 Texas Administrative Code, as of the following latest effective dates:

Chapter 7: Memoranda of Understanding, §§7.110 and 7.119
December 13, 1996 and May 2, 2002, respectively

Chapter 19: Electronic Reporting — March 1, 2007

- Subchapter A: General Provisions
- Subchapter B: Electronic Reporting Requirements

Chapter 39: Public Notice
- Subchapter H: Applicability and General Provisions, §§39.402(a)(1) - (a)(6), (a)(8), and (a)(10) - (a)(12); §§39.405(f)(3) and (g), (h)(1)(A), (h)(2) - (h)(4), (h)(6), (h)(8) - (h)(11), (i) and (j), §39.407; §39.409; §§39.411(a), (e)(1) - (4)(A)(i) and (iii), (4)(B), (e)(5) introductory paragraph, (e)(5)(A), (e)(5)(B), (e)(6) - (e)(10), (e)(11)(A)(i), (e)(11)(A)(iii) - (vi), (11)(B) - (F), (e)(13), and (e)(15), (e)(16), and (f) introductory paragraph, (f)(1) - (8), (g) and (h); §39.418(a), (b)(2)(A), (b)(3), and (c); §39.419(e), §39.420(c)(1)(A) - (D)(i)(I) and (II), (c)(1)(D)(ii), (c)(2), (d) - (e), and (h), and Subchapter K: Public Notice of Air Quality Permit Applications, §§39.601 - 39.605 — September 16, 2021

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Chapter 101: General Air Quality Rules — May 14, 2020

Chapter 106: Permits by Rule, Subchapter A — April 17, 2014

Chapter 111: Control of Air Pollution from Visible Emissions and Particulate Matter — November 12, 2020

Chapter 112: Control of Air Pollution from Sulfur Compounds — October 27, 2022

Chapter 114: Control of Air Pollution from Motor Vehicles — December 21, 2023

Chapter 115: Control of Air Pollution from Volatile Organic Compounds — May 16, 2024

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    2. Houston-Galveston-Brazoria (Revised)
    3. Beaumont-Port Arthur (No change)
    4. El Paso (No change)
    5. Regional Strategies (No change)
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    7. Austin Area (No change)
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ACT	Alternative Control Techniques
AD	attainment demonstration
AEDT	Aviation Environmental Design Tool
APU	auxiliary power unit
AQRP	Air Quality Research Program
AQS	Air Quality System
auto-GC	Automated Gas Chromatograph
$(BC)^2$	Black and Brown Carbon
BACT	best available control technology
BEIS	Biogenic Emissions Inventory System
BELD5	Biogenic Emissions Landuse Data
CAMS	continuous air monitoring station
CAMx	Comprehensive Air Model with Extensions
CFR	Code of Federal Regulations
CMV	commercial marine vessel
CSAPR	Cross-State Air Pollution Rule
CTG	Control Technique Guidelines
D.C.	District of Columbia
DERA	Diesel Emissions Reduction Act
DERI	Diesel Emissions Reduction Incentive
DMA	Marine Distillate fuel A
DMX	Marine Distillate fuel X
DTIP	Drayage Truck Incentive Program
DV	design value
DVB	base case design value
DVF	future case design value
EE/RE	energy efficiency/renewable energy
EGF	electric generating facility
EGU	electric generating unit
EI	emissions inventory
EPA	United States Environmental Protection Agency
ERC	emission reduction credits

ESL	Energy Systems Laboratory
FAA	Federal Aviation Administration
FCAA	federal Clean Air Act
FIP	federal implementation plan
FR	*Federal Register*
g/l	grams per liter
GEOS-Chem	Goddard Earth Observing System—Chemistry model
GSE	ground support equipment
HB	House Bill
HECT	Highly Reactive Volatile Organic Compound Emissions Cap and Trade
H-GAC	Houston-Galveston Area Council
HGB	Houston-Galveston-Brazoria
HRVOC	highly reactive volatile organic compounds
I/M	inspection and maintenance
IC/BC	Initial and boundary conditions
km	kilometer
LDAR	leak detection and repair
m	meter
MCR	mid-course review
MDA8	maximum daily average eight-hour
MECT	Mass Emissions Cap and Trade
MODIS	Moderate-Resolution Imaging Spectroradiometer
MOVES	Motor Vehicle Emissions Simulator
MPE	model performance evaluation
MVEB	motor vehicle emissions budget
MW	megawatt
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standard
NASA	National Aeronautics and Space Administration
NMB	normalized mean bias
NME	normalized mean error
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NSR	new source review

NTIG	New Technology Implementation Grants
PAMS	Photochemical Assessment Monitoring Station
PHA	Port of Houston Authority
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
ppb	parts per billion
ppbC	parts per billion by carbon
ppbV	parts per billion by volume
ppm	parts per million
PSM	performance standard modeling
RACM	reasonably available control measures
RACT	reasonably available control technology
RAQPAC	Regional Air Quality Planning Advisory Committee
RFP	reasonable further progress
ROP	rate of progress
RRF	relative response factor
RS	redesignation substitute
SB	Senate Bill
SIP	State Implementation Plan
SMOKE	Sparse Matrix Operation Kernel Emissions
SO_2	sulfur dioxide
SPRY	Seaport and Rail Yard Areas Emissions Reduction
STARS	State of Texas Air Reporting System
TAC	Texas Administrative Code
TACB	Texas Air Control Board
TAMIS	Texas Air Monitoring Information System
TCAA	Texas Clean Air Act
TCEQ	Texas Commission on Environmental Quality (commission)
TCFP	Texas Clean Fleet Program
TCM	transportation control measure
TDM	travel demand model
TERP	Texas Emissions Reduction Plan
TexN2	Texas NONROAD utility version 2
TIM	Technical Information Meeting

TNGVGP	Texas Natural Gas Vehicle Grant Program
TNMOC	total non-methane organic compounds
TNRCC	Texas Natural Resource Conservation Commission
tpd	tons per day
tpy	tons per year
TSD	technical support document
TTI	Texas Transportation Institute
TWC	Texas Water Code
TxLED	Texas Low Emission Diesel
U.S.	United States
VMT	vehicle miles traveled
VOC	volatile organic compounds
WoE	weight of evidence
WRF	Weather Research and Forecasting

LIST OF PREVIOUS STATE IMPLEMENTATION PLAN (SIP) REVISIONS AND REPORTS

The following list references SIP revisions and reports that were previously adopted by the commission and submitted to the United States Environmental Protection Agency (EPA). The list identifies how these SIP revisions are referenced in this document and contains the project number, adoption date, and full title. Copies of these SIP revisions are located on the Texas SIP Revisions webpage (https://www.tceq.texas.gov/air quality/sip/sipplans.html).

2000 HGB One-Hour Ozone Attainment Demonstration (AD) and Post-1999 Rate of Progress (ROP) SIP Revision (TCEQ Project No. 2000-011-SIP-AI, adopted December 6, 2000) HGB One-Hour Ozone Post-1999 ROP and Attainment Demonstration SIP Revision

2001 HGB Follow-Up One-Hour Ozone AD and ROP SIP Revision (TCEQ Project No. 2001-007-SIP-AI, adopted September 26, 2001) HGB One-Hour Ozone Post-1999 ROP and Attainment Demonstration Follow-Up SIP Revision

2002 HGB One-Hour Ozone AD Follow-Up SIP Revision (TCEQ Project No. 2002-046a-SIP-AI, adopted December 13, 2002) HGB One-Hour Ozone Post-1999 ROP and Attainment Demonstration SIP Revision

2004 HGB One-Hour Ozone Post-1999 ROP SIP Revision (TCEQ Project No. 2004-049b-SIP-NR, adopted October 27, 2004) HGB One-Hour Ozone Post-1999 ROP SIP Revision

2004 HGB One-Hour Ozone AD Mid-Course Review (MCR) SIP Revision (TCEQ Project No. 2004-042-SIP-NR, adopted December 1, 2004) HGB Mid-Course Review of the One-Hour Ozone Attainment Demonstration SIP Revision

2007 HGB 1997 Eight-Hour Ozone SIP Revision (TCEQ Project No. 2006-027-SIP-NR, adopted May 23, 2007) Houston-Galveston-Brazoria (HGB) 1997 Eight-Hour Ozone Nonattainment Area SIP Revision

2007 HGB 1997 Eight-Hour Ozone Reasonable Further Progress (RFP) SIP Revision (TCEQ Project No. 2006-030-SIP-NR, adopted May 23, 2007) Houston-Galveston-Brazoria (HGB) 1997 Eight-Hour Ozone Nonattainment Area Reasonable Further Progress (RFP) SIP Revision

2010 HGB 1997 Eight-Hour Ozone AD SIP Revision (TCEQ Project No. 2009-017-SIP-NR, adopted March 10, 2010) Houston-Galveston-Brazoria (HGB) 1997 Eight-Hour Ozone Attainment Demonstration SIP Revision

2010 HGB 1997 Eight-Hour Ozone RFP SIP Revision (TCEQ Project No. 2009-018-SIP-NR, adopted March 10, 2010) Houston-Galveston-Brazoria (HGB) 1997 Eight-Hour Ozone Reasonable Further Progress (RFP) SIP Revision

2011 HGB 1997 Eight-Hour Ozone Reasonably Available Control Technology (RACT) Update SIP Revision (TCEQ Project No. 2010-028-SIP-NR, adopted December 7, 2011)

Houston-Galveston-Brazoria (HGB) Reasonably Available Control Technology (RACT) Analysis SIP Revision

2013 HGB 1997 Eight-Hour Ozone Motor Vehicle Emissions Budget (MVEB) Update SIP Revision (TCEQ Project Number 2012-002-SIP-NR, adopted April 23, 2013) Houston-Galveston-Brazoria (HGB) Motor Vehicle Emissions Budget (MVEB) Update SIP Revision

2014 HGB/Dallas-Fort Worth (DFW) 2008 Eight-Hour Ozone Emissions Inventory (EI) SIP Revision (TCEQ Project No. 2013-016-SIP-NR, adopted July 2, 2014) Emissions Inventory (EI) for the 2008 Eight-Hour Ozone Standard for the Houston-Galveston-Brazoria (HGB) and Dallas-Fort Worth (DFW) Areas SIP Revision

2014 HGB One-Hour Ozone Redesignation Substitute (RS) Report (Submitted to EPA on July 22, 2014) Redesignation Substitute Report for the Houston-Galveston-Brazoria (HGB) One-Hour Ozone Standard Nonattainment Area

2015 HGB One-Hour Ozone National Ambient Air Quality Standard (NAAQS) SIP Revision (TCEQ Project No. 2014-011-SIP-NR, adopted July 1, 2015) Houston-Galveston-Brazoria (HGB) Area Redesignation Substitute for the One-Hour Ozone National Ambient Air Quality Standard (NAAQS) State Implementation Plan (SIP) Revision

2015 HGB 1997 Eight-Hour Ozone RS Report (Submitted to EPA on August 18, 2015) 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

2016 HGB 1997 Eight-Hour Ozone Standard RS SIP Revision (TCEQ Project No. 2015-001-SIP-NR, adopted April 27, 2016) Houston-Galveston-Brazoria (HGB) Area Redesignation Substitute (RS) for the 1997 Eight-Hour Ozone National Ambient Air Quality Standard (NAAQS) State Implementation Plan (SIP) Revision

2016 HGB 2008 Eight-Hour Ozone AD Moderate Classification SIP Revision (TCEQ Project No. 2016-016-SIP-NR, adopted December 15, 2016) Houston-Galveston-Brazoria Attainment Demonstration State Implementation Plan Revision for the 2008 Eight-Hour Ozone Standard Nonattainment Area

2016 HGB 2008 Eight-Hour Ozone RFP Moderate Classification SIP Revision (TCEQ Project No. 2016-017-SIP-NR, adopted December 15, 2016) Houston-Galveston-Brazoria (HGB) Reasonable Further Progress (RFP) State Implementation Plan (SIP) Revision for the 2008 Eight-Hour Ozone Standard Nonattainment Area

2018 HGB One-Hour and 1997 Eight-Hour Ozone Redesignation and Maintenance Plan SIP Revision (TCEQ Project No. 2018-026-SIP-NR, adopted December 12, 2018) Houston-Galveston-Brazoria (HGB) Redesignation Request and Maintenance Plan for the One-Hour and 1997 Eight-Hour Ozone Standards SIP Revision

2020 HGB 2008 Eight-Hour Ozone Serious Classification AD SIP Revision (TCEQ Project No. 2019-077-SIP-NR, adopted March 4, 2020) Houston-Galveston-Brazoria

(HGB) Serious Classification Attainment Demonstration (AD) State Implementation Plan (SIP) Revision for the 2008 Eight-Hour Ozone National Ambient Air Quality Standard (NAAQS)

2020 DFW and HGB 2008 Eight-Hour Ozone Serious Classification RFP SIP Revision (TCEQ Project No. 2019-079-SIP-NR, adopted March 4, 2020) Dallas-Fort Worth (DFW) and Houston-Galveston-Brazoria (HGB) Serious Classification Reasonable Further Progress (RFP) State Implementation Plan (SIP) Revision for the 2008 Eight-Hour Ozone Standard Nonattainment Area

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CHAPTER 1: GENERAL

1.1 BACKGROUND

Information on the Texas State Implementation Plan (SIP) and a list of SIP revisions and other air quality plans adopted by the commission can be found on the Texas State Implementation Plan webpage (https://www.tceq.texas.gov/airquality/sip) on the Texas Commission on Environmental Quality's (TCEQ) website (https://www.tceq.texas.gov).

1.2 INTRODUCTION

The following history of the one-hour and eight-hour ozone National Ambient Air Quality Standards (NAAQS) and summaries of the Houston-Galveston-Brazoria (HGB) area one-hour and eight-hour ozone SIP revisions is provided to give context and greater understanding of the complex issues involved in the area's ozone challenge.

1.2.1 One-Hour Ozone NAAQS History (No change)

No change from the 2020 HGB Serious Classification Attainment Demonstration (AD) SIP Revision for the 2008 Eight-Hour Ozone NAAQS (Project Number: 2019-077-SIP-NR).

1.2.2 1997 Eight-Hour Ozone NAAQS History (No change)

No change from the 2020 HGB Serious Classification AD SIP Revision for the 2008 Eight-Hour Ozone NAAQS (Project Number: 2019-077-SIP-NR).

1.2.3 2008 Eight-Hour Ozone NAAQS History

On March 27, 2008, the United States Environmental Protection Agency (EPA) published a final rule revising the eight-hour ozone standard, lowering the primary and secondary eight-hour ozone NAAQS to 0.075 parts per million (ppm) or 75 parts per billion (ppb) (73 *Federal Register* (FR) 16436). Attainment of this standard (expressed as 0.075 ppm) is achieved when an area's design value does not exceed 75 ppb. On May 21, 2012, EPA published initial final designations for the 2008 eight-hour ozone standard with an effective date of July 20, 2012 (77 FR 30088). The EPA's classifications approach rule for the 2008 eight-hour ozone NAAQS, also published on May 21, 2012, established the air quality thresholds assigned to all nonattainment areas, as well as establishing December 31 of each relevant calendar year as the attainment date for all nonattainment area classification categories and revoking the 1997 eight-hour ozone NAAQS for transportation conformity purposes (77 FR 30160).

The United States Court of Appeals for the District of Columbia (D.C. Circuit Court) published an opinion on December 23, 2014, agreeing with two challenges to EPA's May 21, 2012, classifications approach rule for the 2008 eight-hour ozone NAAQS. The court vacated the provisions of the rule relating to attainment deadlines and revocation of the 1997 eight-hour ozone NAAQS for transportation conformity purposes. As part of the final 2008 eight-hour ozone standard SIP requirements rule, published on March 6, 2015, EPA modified 40 Code of Federal Regulations §51.1103 consistent with the D.C. Circuit Court decision to establish attainment dates that run from the effective date of designation, i.e., July 20, 2012, and revoked the 1997 eight-hour ozone NAAQS for all purposes (80 FR 12264).

As a result, the attainment date for the HGB marginal nonattainment area changed from December 31, 2015 to July 20, 2015. In addition, because the attainment year ozone season is the ozone season immediately preceding a nonattainment area's attainment date, the attainment year for the HGB marginal nonattainment area changed from 2015 to 2014.

On July 2, 2014, the commission adopted a SIP revision to satisfy the federal Clean Air Act (FCAA), §172(c)(3) and §182(a)(1) emissions inventory reporting requirements and establish a 2011 emissions inventory base year for the Dallas-Fort Worth and HGB nonattainment areas. EPA published direct final approval of this SIP revision on February 20, 2015 (80 FR 9204).

1.2.3.1 Moderate Classification AD for the 2008 Eight-Hour Ozone NAAQS

The HGB area did not attain the 2008 eight-hour ozone standard in 2014 but qualified for a one-year attainment date extension in accordance with FCAA, §181(a)(5). On May 4, 2016, EPA published final approval of the one-year attainment date extension for the HGB 2008 eight-hour ozone marginal nonattainment area to July 20, 2016, with a 2015 attainment year (81 FR 26697).

Because the HGB area's 2015 design value of 80 ppb exceeded the 2008 eight-hour ozone NAAQS, EPA published a final determination of nonattainment and reclassification of the HGB 2008 eight-hour ozone nonattainment area from marginal to moderate nonattainment on December 14, 2016 (81 FR 90207). The EPA set a January 1, 2017, deadline for the state to submit an attainment demonstration that addressed the 2008 eight-hour ozone NAAQS moderate nonattainment area requirements, including reasonable further progress (RFP). As indicated in EPA's 2008 eight-hour ozone standard SIP requirements rule, the attainment date for moderate classification was July 20, 2018 with an attainment year of 2017.

1.2.3.2 Reclassification to Serious for the 2008 Eight-Hour Ozone NAAQS

Based on monitoring data from 2015, 2016, and 2017, the HGB area did not attain the 2008 eight-hour ozone NAAQS in 2017[5] and did not qualify for a one-year attainment date extension in accordance with FCAA, §181(a)(5).[6] On August 23, 2019, EPA published the final notice reclassifying the HGB nonattainment area from moderate to serious for the 2008 eight-hour ozone NAAQS, effective September 23, 2019 (84 FR 44238). As indicated in EPA's 2008 eight-hour ozone standard SIP requirements rule, the attainment date for a serious classification was July 20, 2021, with a 2020 attainment year. EPA set an August 3, 2020, deadline for states to submit AD and RFP SIP revisions to address the 2008 eight-hour ozone standard serious nonattainment area requirements.

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[5] The attainment year ozone season is the ozone season immediately preceding a nonattainment area's attainment date.

[6] An area that fails to attain the 2008 eight-hour ozone NAAQS by its attainment date would be eligible for the first one-year extension if, for the attainment year, the area's fourth-highest daily maximum eight-hour average is at or below the level of the standard (75 ppb); the HGB area's fourth-highest daily maximum eight-hour average for 2017 was 79 ppb as measured at the Conroe Relocated monitor (C78/A321). The HGB area's design value for 2017 was 81 ppb.

On March 4, 2020, the commission adopted the 2020 HGB 2008 Eight-Hour Ozone AD Serious Classification SIP Revision. Consistent with the requirements of FCAA, 182(b)(1) and EPA's 2008 eight-hour ozone standard SIP requirements rule, the AD SIP revision included photochemical modeling, corroborative WoE analysis, an analysis of RACM, including RACT, and contingency measures that provided additional emissions reductions. To ensure that federal transportation funding conforms to the SIP, the HGB AD SIP revision also contained 2020 attainment year MVEBs.

1.2.3.3 Reclassification to Severe for the 2008 Eight-Hour Ozone NAAQS

Based on monitoring data from 2018, 2019, and 2020, the HGB area did not attain the 2008 eight-hour ozone NAAQS in the 2020 attainment year.[7] On April 5, 2021, TCEQ submitted a one-year attainment date extension request to EPA. On October 7, 2022, EPA published a final notice denying the one-year attainment date extension request and reclassifying the HGB nonattainment area from serious to severe for the 2008 eight-hour ozone NAAQS, effective November 7, 2022 (87 FR 60926). The attainment date for the severe classification is July 20, 2027, with a 2026 attainment year. States must submit AD and RFP SIP revisions to EPA by May 7, 2024, 18 months from the effective date of the reclassification, to address the 2008 eight-hour ozone standard severe nonattainment area requirements.

1.2.4 2015 Eight-Hour Ozone NAAQS History

On October 1, 2015, EPA lowered the primary and secondary eight-hour ozone NAAQS to 0.070 ppm and published the final rule revising the NAAQS in the *Federal Register* on October 26, 2015, effective December 28, 2015 (80 FR 65292). On June 4, 2018, EPA published final designations for areas under the 2015 eight-hour ozone NAAQS. A six-county HGB area including Brazoria, Chambers, Fort Bend, Galveston, Harris, and Montgomery Counties was designated nonattainment and classified as marginal under the 2015 eight-hour ozone NAAQS, effective August 3, 2018 (83 FR 25776).

1.2.4.1 Marginal Classification for the 2015 Eight-Hour Ozone NAAQS

Under a marginal classification, the HGB area was required to attain the 2015 eight-hour ozone standard by the end of 2020 to meet an August 3, 2021, attainment date. On June 10, 2020, the commission adopted the 2015 Eight-Hour Ozone NAAQS EI SIP Revision for the HGB, DFW, and Bexar County Nonattainment Areas (Non-Rule Project No. 2019-111-SIP-NR). The SIP revision satisfied FCAA, §172(c)(3) and §182(a)(1) EI reporting requirements for nonattainment areas under the 2015 eight-hour ozone NAAQS, including the HGB area. The revision also included certification statements to confirm that the emissions statement and nonattainment new source review requirements were met for the HGB, DFW, and Bexar County 2015 eight-hour ozone nonattainment areas. On June 29, 2021, EPA published final approval of the EI for the HGB 2015 ozone nonattainment area (86 FR 34139). On September 9, 2021, EPA published final approval of the nonattainment new source review and emissions statement portions of the SIP revision (86 FR 50456).

[7]The HGB area's fourth-highest daily maximum eight-hour average for 2020 was 75 ppb as measured at the Conroe Relocated monitor (C78/A321). The HGB area's design value for 2020 was 79 ppb.

1.2.4.2 Reclassification for the 2015 Eight-Hour Ozone NAAQS

Based on monitoring data from 2018, 2019, and 2020, the HGB area did not attain the 2015 eight-hour ozone NAAQS in the 2020 attainment year and did not qualify for a one-year attainment date extension in accordance with FCAA, §181(a)(5).[8] On October 7, 2022, EPA published final notice reclassifying the six-county HGB area from marginal to moderate nonattainment for the 2015 eight-hour ozone NAAQS, effective November 7, 2022 (87 FR 60897). The attainment date for the moderate classification is August 3, 2024, with a 2023 attainment year. EPA set a January 1, 2023, deadline for states to submit AD and RFP SIP revisions to address the 2015 eight-hour ozone standard moderate nonattainment area requirements.

On October 12, 2023, Texas Governor Greg Abbott signed and submitted a letter to EPA to reclassify the Bexar County, DFW, and HGB moderate 2015 eight-hour ozone NAAQS nonattainment areas to serious. As indicated in EPA's *Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach*; Final Rule published on March 9, 2018 (83 FR 10376), the attainment date for a serious classification is August 3, 2027, with a 2026 attainment year. EPA's proposal to reclassify these areas to serious in accordance with Governor Abbott's letter was published on January 26, 2024 (89 FR 5145).

1.2.5 Existing Ozone Control Strategies

Existing control strategies implemented to address the 1997 and 2008 eight-hour ozone standards are expected to continue to reduce emissions of ozone precursors in the HGB 2008 ozone NAAQS nonattainment area and positively impact progress toward attainment of the ozone NAAQS. The eight-hour ozone design values for the HGB 2008 ozone NAAQS nonattainment area from 1991 through 2022 are illustrated in Figure 1-1: *Ozone Design Values and Population in the HGB 2008 Ozone NAAQS Nonattainment Area*. Eight-hour ozone design values have decreased over the past 31 years. The 2022 eight-hour ozone design value of 78 ppb represents a 37% decrease from the 1991 value of 124 ppb. This decrease in design value occurred despite a 90% increase in area population from 1991 through 2022.

[8] *Id.*

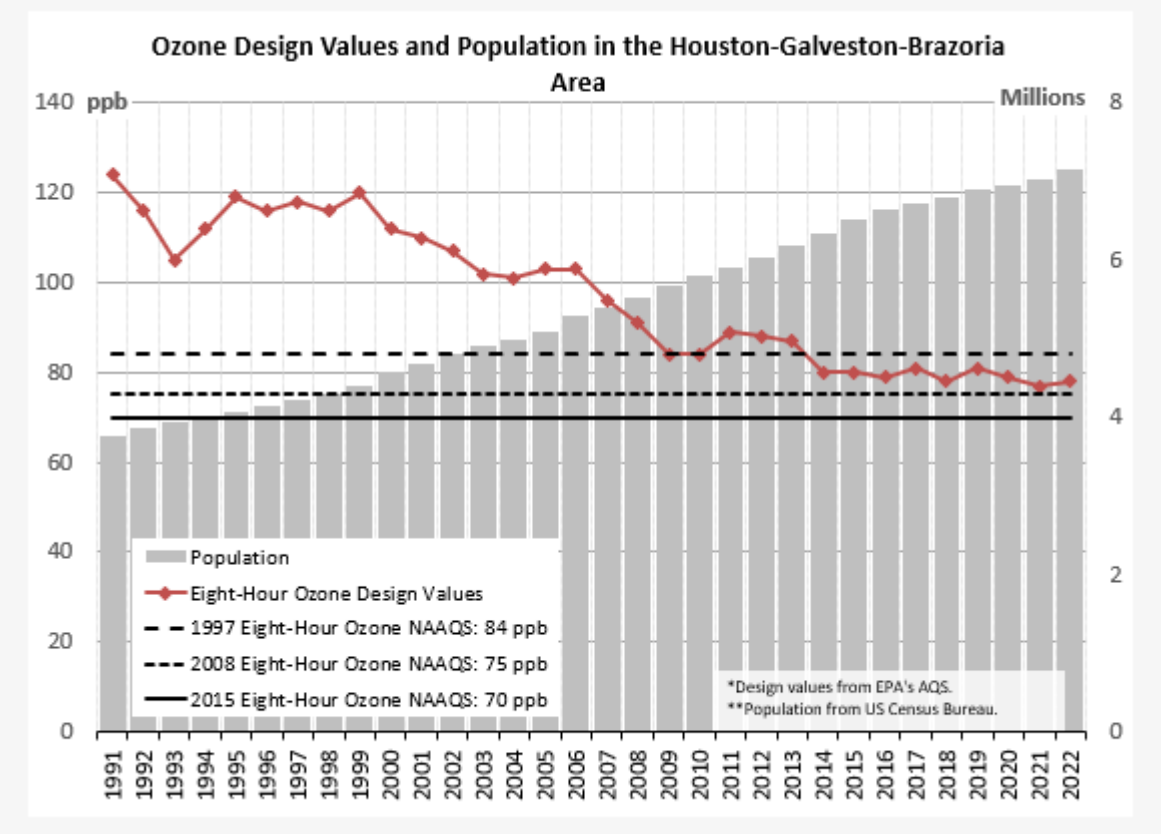

Figure 1-1: Ozone Design Values and Population in the HGB 2008 Ozone NAAQS Nonattainment Area

1.3 HEALTH EFFECTS

In 2008, EPA revised the primary eight-hour ozone NAAQS to 0.075 ppm (75 ppb). To support the 2008 eight-hour primary ozone standard, EPA provided information that suggested that health effects may potentially occur at levels lower than the previous 0.08 ppm (84 ppb) standard. Breathing relatively high levels of ground-level ozone can cause acute respiratory problems like cough and decreases in lung function and can aggravate the symptoms of asthma. Repeated exposures to high levels of ozone can potentially make people more susceptible to allergic responses and lung inflammation.

Children are at a relatively higher risk from exposure to ozone when compared to adults since they breathe more air per pound of body weight than adults and because children's respiratory systems are still developing. Children also spend a considerable amount of time outdoors during summer and during the start of the school year (August through October) when elevated ozone levels are typically measured. Adults most at risk from exposures to elevated ozone levels are people working or exercising outdoors and individuals with preexisting respiratory diseases.

1.4 STAKEHOLDER PARTICIPATION AND PUBLIC MEETINGS

1.4.1 Regional Air Quality Planning Advisory Committee Meetings

The Regional Air Quality Planning Advisory Committee (RAQPAC) is appointed by the Houston-Galveston Area Council (H-GAC) Board of Directors and includes

representatives of local government, public health, transportation, industry, business, environmental organizations, and citizens from the HGB area. The committee assists and advises H-GAC, regional and local governments, transportation organizations and other agencies on air quality issues. The TCEQ SIP Team staff provide air quality planning updates at the RAQPAC monthly meetings. More information about this committee is available on the RAQPAC webpage (https://www.h-gac.com/board-of-directors/advisory-committees/regional-air-quality-planning-advisory-committee).

1.4.2 HGB Virtual Air Quality Technical Information Meetings (TIM)

The HGB Air Quality TIM is provided to present technical and scientific information related to air quality modeling and analysis in the HGB nonattainment area. The TCEQ hosted virtual TIMs on June 23, 2021 and July 28, 2022, and included presentations on ozone planning, conformity analysis, ozone design values, modeling platform updates, marine emissions inventory development, Tracking Aerosol Convection Experiment – Air Quality field study, FCAA, §185 fees, and an update from EPA. More information is available on the HGB Air Quality TIM webpage (https://www.tceq.texas.gov/air quality/airmod/meetings/aqtim-hgb.html).

1.4.3 HGB Stakeholder Meetings

The TCEQ hosted and attended multiple meetings in the HGB area related to the SIP revision. Agenda topics included the status of HGB photochemical modeling development, emissions inventories and trends, ozone design values, FCAA, §185 fees, and planning activities for the HGB 2008 Eight-Hour Ozone Severe Classification AD SIP Revision. Attendees included representatives from industry, county and city government, environmental groups, and the public.

The TCEQ hosted virtual stakeholder outreach meetings on September 7, 2022, and September 8, 2022, to provide an update on planning for the development of the 2008 and 2015 ozone NAAQS SIP submissions. These meetings provided a brief overview of the HGB area's air quality status, the plan requirements for moderate and severe ozone nonattainment areas, and also provided an opportunity for input on existing and potential NO_X and VOC emission reduction measures being implemented within the point, area, and mobile emissions source sectors in the region. Presentation topics included ozone planning, ozone design values, emissions inventories and trends, emission control strategies, contingency measures, FCAA, §185 fees, and RACT.

1.5 PUBLIC HEARING AND COMMENT INFORMATION

The public comment period opened on December 1, 2023, and closed on January 16, 2024. The commission held a public hearing in Houston on January 4, 2024, at 7:00 p.m. Notice for the Houston public hearing was published in English in the *Houston Chronicle* newspaper on December 1, 2023, and in Spanish in the *La Voz* newspaper on December 13, 2023. Notices in English and Spanish were also distributed to subscribers through GovDelivery and posted to TCEQ's website, and notices were published in English in the *Texas Register* on December 15, 2023 (48 TexReg 7643). A plain language summary was provided in both English and Spanish on TCEQ's website.

The public hearing area was opened, with testimony received and transcribed for the record. Spanish language interpreters were available at the hearing.

Written comments were accepted via mail, fax, or through TCEQ's Public Comment system (https://tceq.commentinput.com/). During the comment period, comments were received from Air Alliance Houston, City of Houston At-Large Council Member Dr. Letitia Plummer, Earthjustice, Environment Texas, Environmental Integrity Project, Fort Bend County Environmental Organization, Office of Harris County Attorney, Lone Star Chapter of Sierra Club, Progressive Fifth Ward Community Association, Public Citizen, Sierra Club, Texas Environmental Justice Advocacy Services, EPA, and 238 individuals. The public comments received are summarized and addressed in this HGB AD SIP Revision.

1.6 SOCIAL AND ECONOMIC CONSIDERATIONS

For a detailed explanation of the social and economic issues involved with the concurrent rule revisions associated with this SIP revision (Rule Project Nos. 2023-116-115-AI and 2023-117-117-AI), refer to the preamble that precedes each rule package.

1.7 FISCAL AND MANPOWER RESOURCES

The state has determined that its fiscal and manpower resources are adequate and will not be adversely affected through the implementation of this plan.

CHAPTER 2: ANTHROPOGENIC EMISSIONS INVENTORY DESCRIPTION

2.1 INTRODUCTION

The federal Clean Air Act (FCAA) requires that attainment demonstration (AD) emissions inventories (EI) be prepared for ozone nonattainment areas FCAA, §182(a) and April 16, 1992, 57 *Federal Register* (FR) 13498. Ground-level (tropospheric) ozone is produced when ozone precursors, volatile organic compounds (VOC) and nitrogen oxides (NO_x), undergo photochemical reactions in the presence of sunlight.

The Texas Commission on Environmental Quality (TCEQ) maintains an inventory of current information for anthropogenic sources of NO_x and VOC emissions that identifies the types of emissions sources present in an area, the amount of each pollutant emitted, and the types of processes and emissions control devices at each facility or source category. The total anthropogenic inventory of NO_x and VOC emissions for an area is derived from estimates developed for three general categories of emissions sources: point, area, and mobile (both non-road and on-road).

The EI also provides data for a variety of air quality planning tasks, including establishing baseline emissions levels, calculating emission reduction targets, developing control strategies to achieve emissions reductions, developing emissions inputs for air quality models, and tracking actual emissions reductions against established emissions growth and control budgets.

This chapter discusses general EI development for each of the anthropogenic source categories. Chapter 3: *Photochemical Modeling* details specific EIs and emissions inputs developed for the Houston-Galveston-Brazoria (HGB) 2008 ozone National Ambient Air Quality Standard (NAAQS) nonattainment area photochemical modeling.

2.2 POINT SOURCES

Stationary point source emissions data are collected annually from sites that meet the reporting requirements of 30 Texas Administrative Code (TAC) §101.10. This rule establishes EI reporting thresholds in ozone nonattainment areas that are currently at or less than major source thresholds in the HGB 2008 NAAQS ozone nonattainment area. Therefore, some minor sources in the area report to the point source EI.

To collect the data, TCEQ provides detailed reporting instructions and tools for completing and submitting an EI. Companies submit EI data using a web-based system called the State of Texas Environmental Electronic Reporting System. Companies are required to report emissions data and to provide sample calculations used to determine the emissions. Information characterizing the process equipment, the emissions control devices, and the emission points is also required. As required by FCAA, §182(a)(3)(B), company representatives certify that reported emissions are true, accurate, and fully represent emissions that occurred during the calendar year to the best of the representative's knowledge.

All data submitted in the EI are reviewed for quality assurance purposes and then stored in the State of Texas Air Reporting System (STARS) database. The TCEQ's Point Source Emissions Inventory webpage (https://www.tceq.texas.gov/airquality/point-source-ei/psei.html) contains guidance documents and historical point source

emissions data. Additional information is available upon request from TCEQ's Air Quality Division.

Stationary sources must have state implementation plan (SIP) emissions and meet other requirements to be able to generate emissions credits. SIP emissions are site- or facility-specific values based on the calendar year EI data used to develop the AD SIP revision's projection-base year inventory. The projection-base year is defined in 30 TAC §101.300(23) and refers to the EI year used to forecast future year emissions for modeling point sources.

For this AD SIP revision, TCEQ has designated the projection-base year for point sources as 2019 for electric generating units (EGU) with emissions recorded in the United States Environmental Protection Agency's (EPA) database for Air Markets Program Data and 2019 for all other stationary point sources (non-EGUs) with emissions recorded in the TCEQ STARS database. For more details on the projection-base year for point sources, please see Chapter 3, Section 3.4.2: *Emissions Inputs* and Section 3.3: *Point Sources* of Appendix A: *Modeling Technical Support Document (TSD).*

On April 9, 2021, TCEQ requested regulated entities submit revisions to the 2019 point source EI by July 9, 2021. The point source emissions in this SIP revision reflects updates submitted by the due date. The TCEQ provided notification to regulated entities and the public through its email distribution system and by posting the notice on TCEQ's website.[9]

2.3 AREA SOURCES

Stationary emissions sources that do not meet the reporting requirements of 30 TAC §101.10 for point sources are classified as area sources. Area sources are small-scale stationary industrial, commercial, and residential sources that use materials or perform processes that generate emissions of air pollutants. Examples of typical sources of VOC emissions include oil and gas production sources, printing operations, industrial coatings, degreasing solvents, house paints, gasoline service station underground tank filling, and vehicle refueling operations. Examples of typical fuel combustion sources that emit NO_x include oil and gas production sources, stationary source fossil fuel combustion at residences and businesses, outdoor refuse burning, and structure fires.

Area source emissions are estimated and calculated as county-wide totals rather than as individual sources. Area source emissions are typically calculated by applying EPA- or TCEQ-developed 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 source calculations. Other activity data commonly used include the amount of gasoline sold in an area, employment by industry type, and crude oil and natural gas production.

[9] https://wayback.archive-it.org/414/20220309051946/https://www.tceq.texas.gov/assets/public/implementation/air/ie/pseiforms/OzoneBumpUps_HGB-DFW-SAN.pdf

The emissions data for the different area source categories are developed, reviewed for quality assurance, stored in the Texas Air Emissions Repository database, and compiled to develop the statewide area source EI.

2.4 NON-ROAD MOBILE SOURCES

Non-road vehicles (non-road sources) do not normally operate on roads or highways and are often referred to as off-road or off-highway vehicles. Non-road sources include agricultural equipment, commercial and industrial equipment, construction and mining equipment, lawn and garden equipment, aircraft and airport equipment, locomotives, drilling rigs, and commercial marine vessels (CMV).

For this AD SIP revision, EIs for non-road sources were developed for the following subcategories: non-road model categories (as described further below), airports, locomotives, CMVs, and drilling rigs used in upstream oil and gas exploration activities. The airport subcategory includes estimates for emissions from the aircraft, auxiliary power units (APU), and ground support equipment (GSE) subcategories relevant for airports. The following sections describe the emissions estimates methodologies used for the non-road mobile source subcategories discussed below.

2.4.1 Non-Road Model Categories Emissions Estimation Methodology

The Motor Vehicle Emission Simulator 3 (MOVES3) model was EPA's latest mobile source emissions model available for estimating non-road source category emissions at the time of inventory development for this SIP revision. The MOVES4 model was not used in this SIP revision since there was insufficient time to switch to MOVES4 between proposal and adoption, and since TCEQ had already invested significant resources to develop a non-road mobile source EI using MOVES3. As EPA stated in its notice of availability published in the *Federal Register* on September 12, 2023, "[…] state and local agencies that have already completed significant work on a SIP with a version of MOVES3 (*e.g.,* attainment modeling has already been completed with MOVES3) may continue to rely on this earlier version of MOVES" (88 FR 62567, 62569). TCEQ has invested significant time and resources to develop a Texas-specific version of the non-road component of the MOVES model called Texas non-road utility version 2 (TexN2) that replaces EPA defaults used to determine emissions with county-specific activity data.[10] TCEQ uses TexN2 to calculate emissions from all non-road mobile source equipment and recreational vehicles, with the exception of airports, locomotives, CMVs, and drilling rigs used in upstream oil and gas exploration activities. Because emissions for airports, CMVs, and locomotives are not included in either the MOVES3 model or TexN2 utility, the emissions for these categories are estimated using other EPA-approved methods and guidance. Although emissions for drilling rigs are included in the MOVES3 model and TexN2 utility, alternate emissions estimates were developed for that source category in order to develop more accurate county-level inventories. The equipment populations for drilling rigs were set to zero in the TexN2 utility to avoid double counting emissions from these sources.

[10] https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111300fy2021-20210423-erg-texn2-update.pdf

2.4.2 Drilling Rig Diesel Engine Emissions Estimation Methodology

Drilling rig diesel engines used in upstream oil and gas exploration activities are included in the MOVES3 model category "Other Oilfield Equipment," which includes various types of equipment; however, due to significant growth in the oil and gas exploration and production industry, a 2015 survey of oil and gas exploration and production companies was used to develop updated drilling rig emissions characterization profiles.[11] The drilling rig emissions characterization profiles from this study were combined with drilling activity data obtained from the Railroad Commission of Texas to develop the EI for this source category.

2.4.3 CMV and Locomotive Emissions Estimation Methodology

The locomotive EI was developed from a TCEQ-commissioned study using EPA-accepted EI development methods.[12] The locomotive EI includes line haul and yard emissions activity data from all Class I and Class III (currently, there are no Class II operators in Texas) locomotive activity and emissions by rail segment.

The CMV EI was developed from a TCEQ-commissioned study using EPA-accepted EI development methods. The CMV EI includes at-port and underway emissions activity data from Category 1, 2, and 3 CMVs by county for applicable counties in the HGB 2008 nonattainment area.

A U.S. Army Corps of Engineers project to deepen and widen the Houston Ship Channel (Project 11), once complete, is expected to reduce NO_X emissions from ocean-going vessels due to improved traffic flow. The proposed SIP revision adjusted the CMV EI to account for anticipated NO_X emissions reductions resulting from the completion of Project 11 by 2026 and stated that if information became available prior to adoption that indicated Project 11 would not be completed by 2026, then TCEQ would remove this adjustment for adoption. Comments were received on the proposed SIP revision that this project would be completed after the 2026 ozone season for the HGB 2008 ozone NAAQS nonattainment area. In response to these comments, the modeling sensitivity performed for Project 11 was removed and Section 3.6.6: *Houston Ship Channel Sensitivity Analysis* from the proposed HGB AD SIP revision was removed for adoption. TCEQ also removed the 3% CMV activity adjustment from the total 2026 NO_X emissions for all Category 3 vessels (ocean-going vessels) from the concurrently adopted Dallas-Fort Worth (DFW)-HGB Reasonable Further Progress (RFP) SIP revision (Project No. 2023-108-SIP-NR) in response to these comments.

2.4.4 Airport Emissions Estimation Methodology

The airport EI was developed from a TCEQ-commissioned study using the Federal Aviation Administration's (FAA) Aviation Environmental Design Tool (AEDT) model.[13] AEDT is the most recent FAA model for estimating airport emissions and has replaced

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[11] https://wayback.archive-it.org/414/20210527185246/https://www.tceq.texas.gov/assets/public/implementation/air/am/contracts/reports/ei/5821552832FY1505-20150731-erg-drilling_rig_2014_inventory.pdf

[12] https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111027-20211015-tti-texas-locomotive-railyard-2020-aerr-trend-ei.pdf

[13] https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111196-20211015-tti-texas-airport-2020-aerr-trend-ei.pdf

the FAA's Emissions and Dispersion Modeling System. The airport emissions categories used for this AD SIP revision included aircraft (commercial air carriers, air taxis, general aviation, and military), APU, and GSE operations.

2.5 ON-ROAD MOBILE SOURCES

On-road mobile emissions sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on public roadways. On-road mobile source ozone precursor emissions are usually categorized as 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 from 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.

This SIP revision includes on-road Eis developed using MOVES3. The MOVES4 model was not used in this SIP revision since there was insufficient time to switch to MOVES4 between proposal and adoption, and since TCEQ had already invested significant resources to develop an on-road mobile source EI using MOVES3. As EPA stated in its notice of availability published in the *Federal Register* on September 12, 2023, "[…] state and local agencies that have already completed significant work on a SIP with a version of MOVES3 (*e.g.,* attainment modeling has already been completed with MOVES3) may continue to rely on this earlier version of MOVES" (88 FR 62567, 62569). Updated on-road EIs and emissions factors were developed using EPA's mobile emissions factor model, MOVES3. The MOVES3 model may be run using national default information or the default information may be modified to simulate data specific to the HGB 2008 ozone NAAQS nonattainment area, such as the control programs, driving behavior, meteorological conditions, and vehicle characteristics. The TCEQ parameters reflect local conditions to the extent that local values are available; these local values are reflected in the emissions factors calculated by the MOVES3 model. The localized inputs used for the on-road mobile EI development include vehicle speeds for each roadway link, vehicle populations, vehicle hours idling, temperature, humidity, vehicle age distributions for each vehicle type, percentage of miles traveled for each vehicle type, type of inspection and maintenance program, fuel control programs, and gasoline vapor pressure controls.

To estimate on-road mobile source emissions, emissions factors calculated by the MOVES3 model must be multiplied by the level of vehicle activity. On-road mobile source emissions factors are expressed in units of grams per mile, grams per vehicle (evaporative), and grams per hour (extended idle); therefore, the activity data required to complete the inventory calculation are vehicle miles traveled (VMT) in units of miles per day, vehicle populations, and source hours idling. The level of vehicle travel activity is developed using travel demand models (TDM) run by the Texas Department of Transportation or by the local metropolitan planning organizations. 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 EIs, 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 Vehicles' 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 MOVES3 model, are calculated by using the activity volumes from the TDMs and a post-processor speed model.

2.6 EI IMPROVEMENT

The TCEQ EI reflects years of emissions data improvement, including extensive point and area source inventory reconciliation with ambient emissions monitoring data. Reports detailing recent TCEQ EI improvement projects can be found at TCEQ's Air Quality Research and Contract Projects webpage (https://www.tceq.texas.gov/air quality/airmod/project/pj.html).

CHAPTER 3: PHOTOCHEMICAL MODELING

3.1 INTRODUCTION

This chapter describes attainment demonstration (AD) modeling conducted in support of this state implementation plan (SIP) revision. The Texas Commission on Environmental Quality (TCEQ) followed procedures recommended for AD modeling for the eight-hour ozone National Ambient Air Quality Standard (NAAQS) in the United States Environmental Protection Agency's (EPA) November 2018 *Modeling Guidance for Demonstrating Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze* (EPA, 2018; referred to as the EPA modeling guidance).[14]

For the photochemical modeling analysis, this SIP revision includes a base case modeling episode of April through October of 2019. This modeling episode was chosen because the period is representative of the times of the year that eight-hour ozone levels above 75 ppb have historically been monitored within the nonattainment area. Base case modeling was used to evaluate the photochemical model's ability to replicate measured ozone and precursor concentrations for a past timeframe with monitored high-ozone concentrations and indicates the modeling is suitable for use in conducting the modeling attainment test.

The photochemical modeling analysis also includes a future case modeling analysis. Future case modeling estimates the change in ozone concentrations due to changes in anthropogenic emissions in a future year, the attainment year of 2026, while keeping the meteorological and natural emissions (biogenic and wildfires) inputs from the base case constant. Future case modeling answers the question: what would the estimated ozone concentrations be in the future if the same meteorological conditions (that resulted in a high ozone episode in the past) were to repeat?

Results of the 2019 base case and the 2026 future case photochemical modeling runs are presented, which were used to estimate the 2026 attainment year eight-hour ozone design values. This chapter summarizes the components of the AD modeling, such as episode selection, modeling domain, and model inputs. A detailed description of the various modeling elements can be found in Appendix A: *Modeling Technical Support Document (TSD).*

3.2 MODELING EPISODE

The AD modeling used TCEQ's 2019 modeling platform, which has a modeling episode of April 1 through October 31, 2019. The EPA modeling guidance provides recommendations for choosing a modeling episode that will be appropriate for the modeled attainment test for eight-hour ozone AD SIP revisions. The recommendations are intended to ensure that the selected episode is representative of area-specific conditions that lead to exceedances of the eight-hour ozone NAAQS. This section provides an overview of the April through October 2019 modeling episode in the Houston-Galveston-Brazoria (HGB) 2008 eight-hour ozone NAAQS severe nonattainment area (HGB 2008 ozone NAAQS nonattainment area).

[14] https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

One of the recommended criteria for selecting a modeling episode is that the episode be in the recent past and contain a sufficient number of exceedance days. Exceedance days are defined as days when at least one regulatory monitor in the area had a Maximum Daily Eight-Hour Average (MDA8) ozone concentration that exceeded the 2008 ozone NAAQS of 75 parts per billion (ppb). Figure 3-1: *Exceedance Days in the HGB 2008 Ozone NAAQS Nonattainment Area by Year from 2012 through 2022* shows the number of exceedance days for the 2008 ozone NAAQS over an 11-year period in the HGB 2008 ozone NAAQS nonattainment area. The year 2019 had 22 days with MDA8 ozone above 75 ppb, which is a sufficient number of exceedance days for a modeling episode.

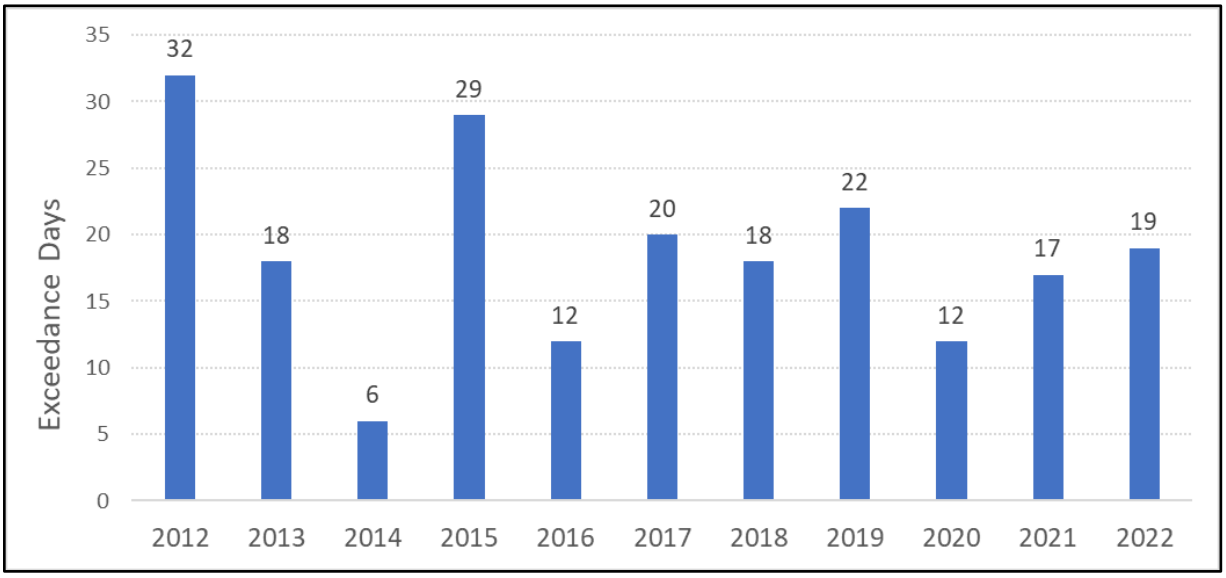

Figure 3-1: Exceedance Days in the HGB 2008 Ozone NAAQS Nonattainment Area by Year from 2012 through 2022

In selecting a modeling episode, EPA recommends that the exceedance days follow historically observed temporal trends. Figure 3-2: *Exceedance Days by Month from 2012 through 2022 in the HGB 2008 Ozone NAAQS Nonattainment Area* shows that ozone exhibits two peaks, one in late spring and another in summer, with the mid-summer minimum occurring in July. High MDA8 ozone values occurred from March through October with a few exceedances in March. Most exceedances occur between April and October, peaking in August.

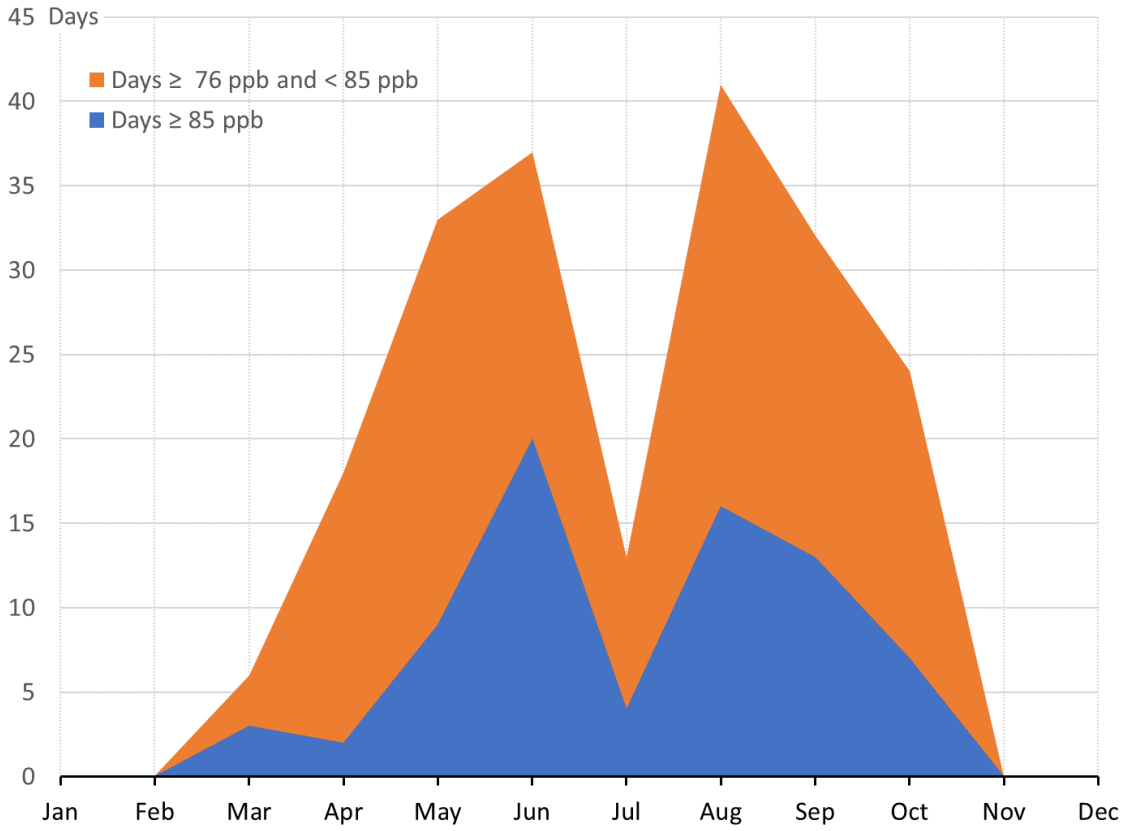

Figure 3-2: Exceedance Days by Month from 2012 through 2022 in the HGB 2008 Ozone NAAQS Nonattainment Area

Another recommendation from the EPA modeling guidance is to choose an episode when each regulatory monitor within the nonattainment area has at least five days during the modeling episode when the MDA8 ozone concentration exceeded 60 ppb, the threshold for being included in the future year modeled attainment test. There are 20 regulatory monitors within the eight counties of the HGB 2008 ozone NAAQS nonattainment area. The regulatory monitors are shown in Figure 3-3: *Map of Ozone Monitoring Sites in the HGB 2008 Ozone NAAQS Nonattainment Area* as blue circles and are labeled with the monitor's short name and continuous air monitoring station (CAMS) number. [15]

[15] Maps in this document were generated by the Air Quality Division of the Texas Commission on Environmental Quality. The products are for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. They do not represent an on-the-ground survey and represent only the approximate relative location of property boundaries. For more information concerning these maps, contact the Air Quality Division at 512-239-1459.

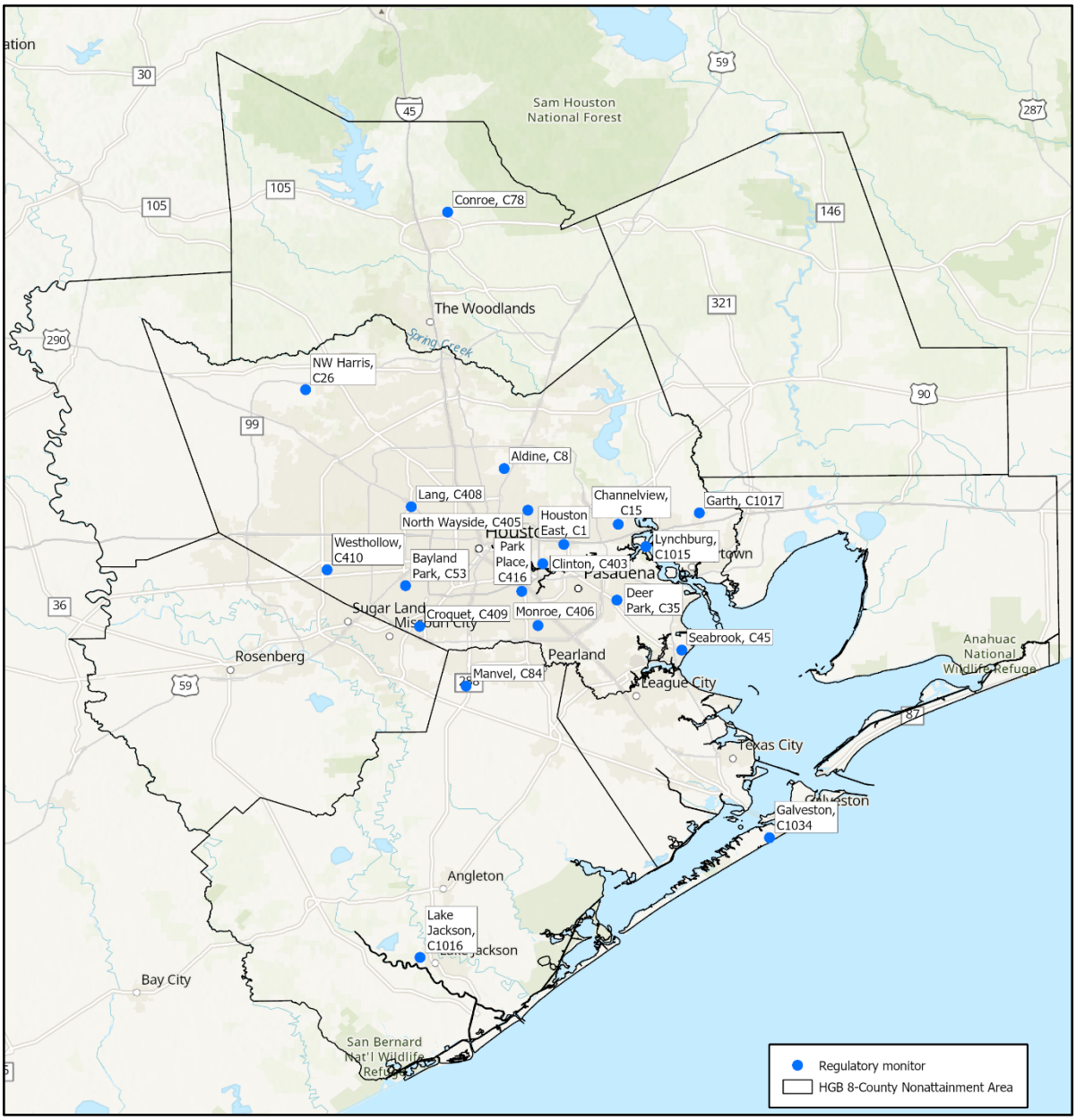

Figure 3-3: Map of Ozone Monitoring Sites in the HGB 2008 Ozone NAAQS Nonattainment Area

Table 3-1: *Exceedance Days and Ozone Conditions from April through October 2019 Modeling Episode at Regulatory Monitors* summarizes ozone exceedances and ozone conditions at each regulatory monitor during the modeling episode. All regulatory monitors in the HGB 2008 ozone NAAQS nonattainment area have at least five days with MDA8 ozone above 60 ppb. The monitor with the highest number of days with MDA8 ozone above 75 ppb is the Houston Bayland Park monitor with eight ozone exceedance days. The monitor with the highest 2019 design value is the Houston Aldine monitor with the design value of 81 ppb. That monitor had four ozone exceedance days. The 2019 design value for the Lynchburg Ferry monitor does not meet the validity requirement and therefore the value is not shown in the table.

Table 3-1: Exceedance Days and Ozone Conditions from April through October 2019 Modeling Episode at Regulatory Monitors

Monitor Short Name	Monitor Name	CAMS Number	Episode Maximum Eight-Hour Ozone (ppb)	Number of Days Above 60 ppb	Number of Days Above 75 ppb	2019 Regulatory Ozone Design Value (ppb)
Aldine	Houston Aldine	0008	93	30	4	81
Bayland Park	Houston Bayland Park	0053	91	28	8	77
Channelview	Channelview	0015	76	10	1	70
Clinton	Clinton	0403	92	7	2	72
Conroe	Conroe Relocated	0078	83	18	1	76
Croquet	Houston Croquet	0409	84	13	3	70
Deer Park	Houston Deer Park #2	0035	107	19	4	75
Galveston	Galveston 99th St.	1034	81	16	3	76
Garth	Baytown Garth	1017	76	12	1	74
Houston East	Houston East	0001	88	11	2	74
Lake Jackson	Lake Jackson	1016	68	5	0	65
Lang	Lang	0408	88	17	2	73
Lynchburg	Lynchburg Ferry	1015	77	7	1	N/A
Manvel	Manvel Croix Park	0084	90	11	5	75
Monroe	Houston Monroe	0406	82	9	3	66
North Wayside	Houston North Wayside	0405	74	7	0	67
NW Harris	Northwest Harris County	0026	86	11	2	74
Park Place	Park Place	4016	88	20	3	73
Seabrook	Seabrook Friendship Park	0045	90	7	1	71
Westhollow	Houston Westhollow	0410	77	23	3	71

The EPA modeling guidance also recommends that the episode include meteorological patterns that represent a variety of conditions that correspond to high ozone. An assessment of the meteorological conditions in the HGB 2008 ozone NAAQS nonattainment area in 2019 showed that the year was not atypical, and therefore was reasonable for modeling ozone. Details of the episode selection process for TCEQ's 2019 modeling platform are provided in Section 1.2: *Modeling Episode Selection* of Appendix A.

3.3 PHOTOCHEMICAL MODELING

TCEQ used the Comprehensive Air Model with Extensions (CAMx) version 7.20 for this AD modeling. The model software and the CAMx user's guide are publicly available

(Ramboll, 2022). TCEQ's choice of CAMx meets the criteria specified in the EPA modeling guidance for model selection.

3.3.1 Modeling Domains

CAMx was configured with three nested domains: a 36-kilometer (km) grid resolution domain (named na_36km) covering most of North America, a 12 km grid resolution domain (named us_12km) covering the continental United States, and a 4 km grid resolution domain (named txs_4km) covering central and east Texas. Dimensions of the CAMx domains are shown in Table 3-2: *CAMx Horizontal Domain Parameters*. The geographical extent of each domain is shown in Figure 3-4: *CAMx Modeling Domains*. The HGB 2008 ozone NAAQS nonattainment area is contained within tx_4km, the finest resolution domain, as shown in Figure 3-5: *HGB 2008 Ozone NAAQS Nonattainment Area and CAMx 4 km Modeling Domain*. In the vertical direction, each CAMx domain reaches up to over 18 km. The resolution of layers decreases with increasing distance from the surface, details of which are presented in Section 3.4.1: *Meteorological Inputs* of this chapter.

Table 3-2: CAMx Horizontal Domain Parameters

Domain Name	Range West to East (km)	Range South to North (km)	Number of Cells West to East	Number of Cells South to North	Cell Size (km)
na_36km	-2,952 to 3,240	-2,772 to 2,556	172	148	36
us_12km	-2,412 to 2,340	-1,620 to 1,332	396	246	12
txs_4km	-324 to 432	-1,584 to -648	189	234	4

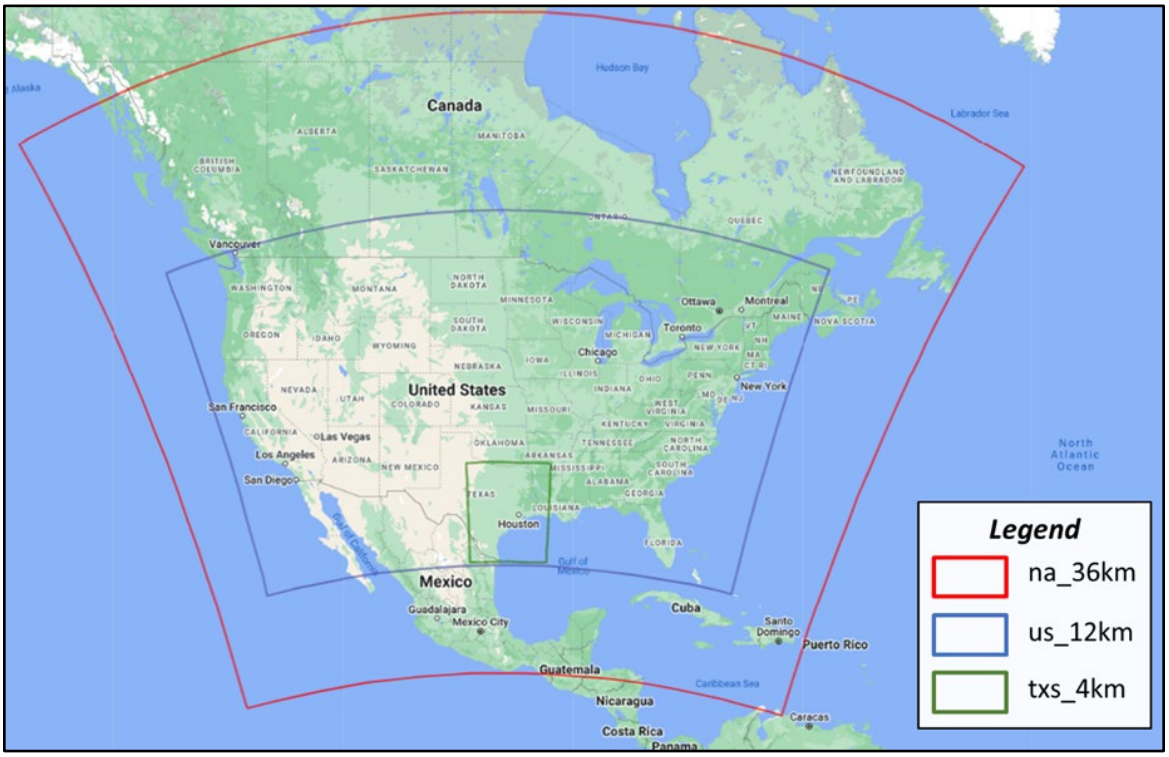

Figure 3-4: CAMx Modeling Domains

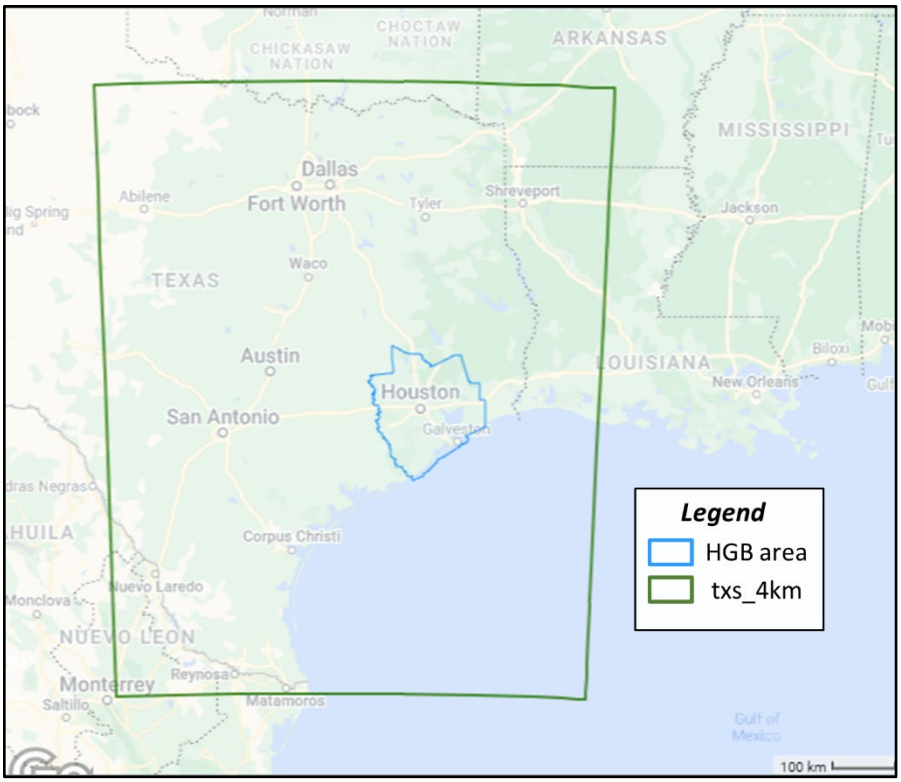

Figure 3-5: HGB 2008 Ozone NAAQS Nonattainment Area and CAMx 4 km Modeling Domain

3.3.2 CAMx Options

TCEQ used the CAMx options summarized in Table 3-3: *CAMx Configuration Options* for this SIP revision. Details regarding the configuration testing conducted by TCEQ to determine the dry deposition and vertical diffusion schemes is provided in Section 5.2.3: *Evaluation of CAMx Configuration Options* of Appendix A.

Table 3-3: CAMx Configuration Options

CAMx Option	Option Selected
Version	Version 7.20
Time Zone	Coordinated Universal Time
Chemistry Mechanism	Carbon Bond version 6 revision 5 gas-phase mechanism (CB6r5)
Photolysis Mechanism	Tropospheric Ultraviolet and Visible radiative transfer model, version 4.8, with Total Ozone Mapping Spectrometer ozone column data
Chemistry Solver	Euler-Backward Iterative
Dry Deposition Scheme	Zhang03
Vertical Diffusion	K-theory
Iodine Emissions	Oceanic iodine emission computed from saltwater masks

3.4 MODELING INPUTS

A photochemical air quality model requires several inputs to be able to simulate chemical and physical processes leading to ozone formation. The main inputs are

meteorological parameters, emission inputs, and initial and boundary conditions. The sections below provide an overview of the inputs used in this modeling. More details are provided in Section 2: *Meteorological Modeling* and Section 3: *Emissions Modeling* of Appendix A.

3.4.1 Meteorological Inputs

TCEQ used the Weather Research and Forecasting (WRF) model, version 4.1.5, to generate the meteorological inputs for the photochemical modeling supporting this SIP revision. The WRF modeling was conducted for March 15 to November 1, 2019, to cover ramp-up and ramp-down days needed by the CAMx modeling platform. A ramp-up period is the period of days that precede the actual time period of interest for modeling. The ramp-up period is used to ensure that the atmospheric conditions in the model are balanced.

WRF was configured with a 12 km horizontal grid resolution domain that covered most of North America, as depicted in Figure 3-6: *CAMx and WRF Domains.* A second 4 km fine grid domain covering the eastern half of Texas, which includes the 2008 ozone NAAQS nonattainment areas of Dallas-Fort Worth and HGB, was also modeled. Each WRF domain embeds a corresponding CAMx domain of the same horizontal resolution. The WRF domains are larger than the corresponding CAMx domains as seen in Figure 3-6, to ensure that the effects of boundary conditions are minimized and large-scale meteorological conditions are better captured. The na_36km and us_12km CAMx domains are centered at the same location as the 12 km WRF domain. The txs_4km CAMx domain is centered at the same point as the 4 km WRF domain. All domains use the Lambert Conformal map projection.

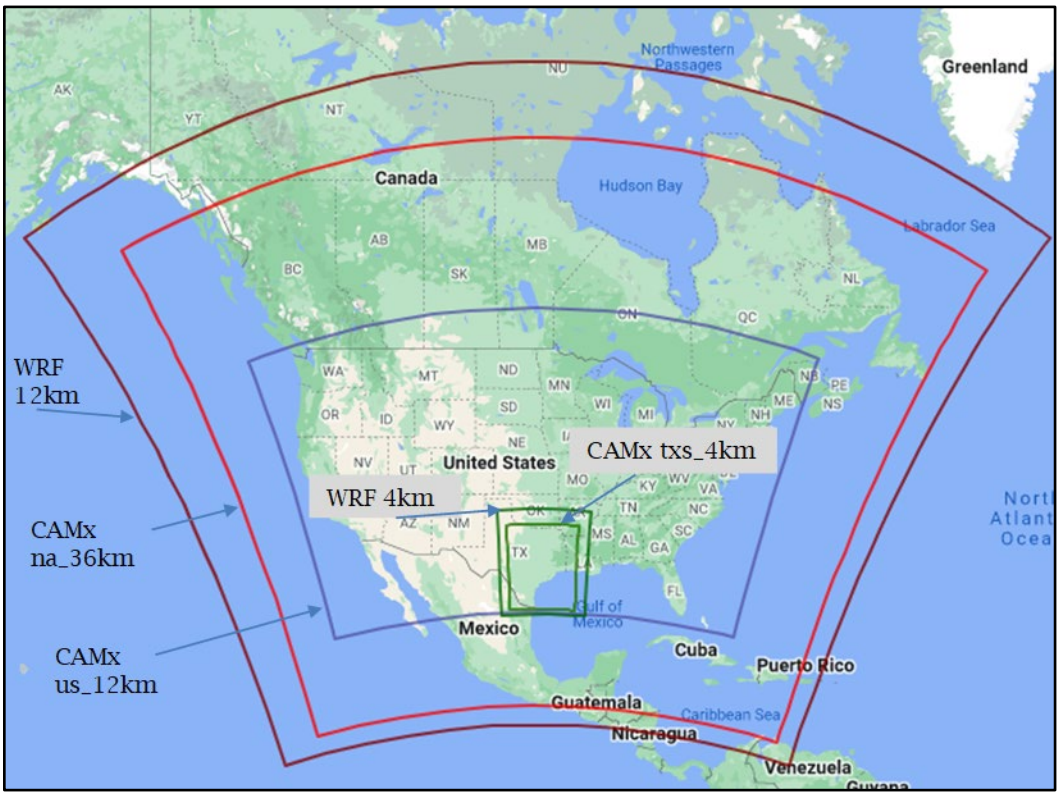

Figure 3-6: CAMx and WRF Domains

The WRF domains have 44 vertical layers extending to over 20 km from the Earth's surface to better capture tropospheric meteorological conditions and vertical mixing that are essential for chemical transport mechanisms. CAMx is set up to have 30 layers. The lowest CAMx layer covers the first two WRF layers. CAMx layers 2 through 21 align with WRF layers 3 through 22. CAMx layers 22 through 30 encompass multiple WRF layers as displayed in Figure 3-7: *WRF and CAMx Vertical Layers for the txs_4km Domain.*

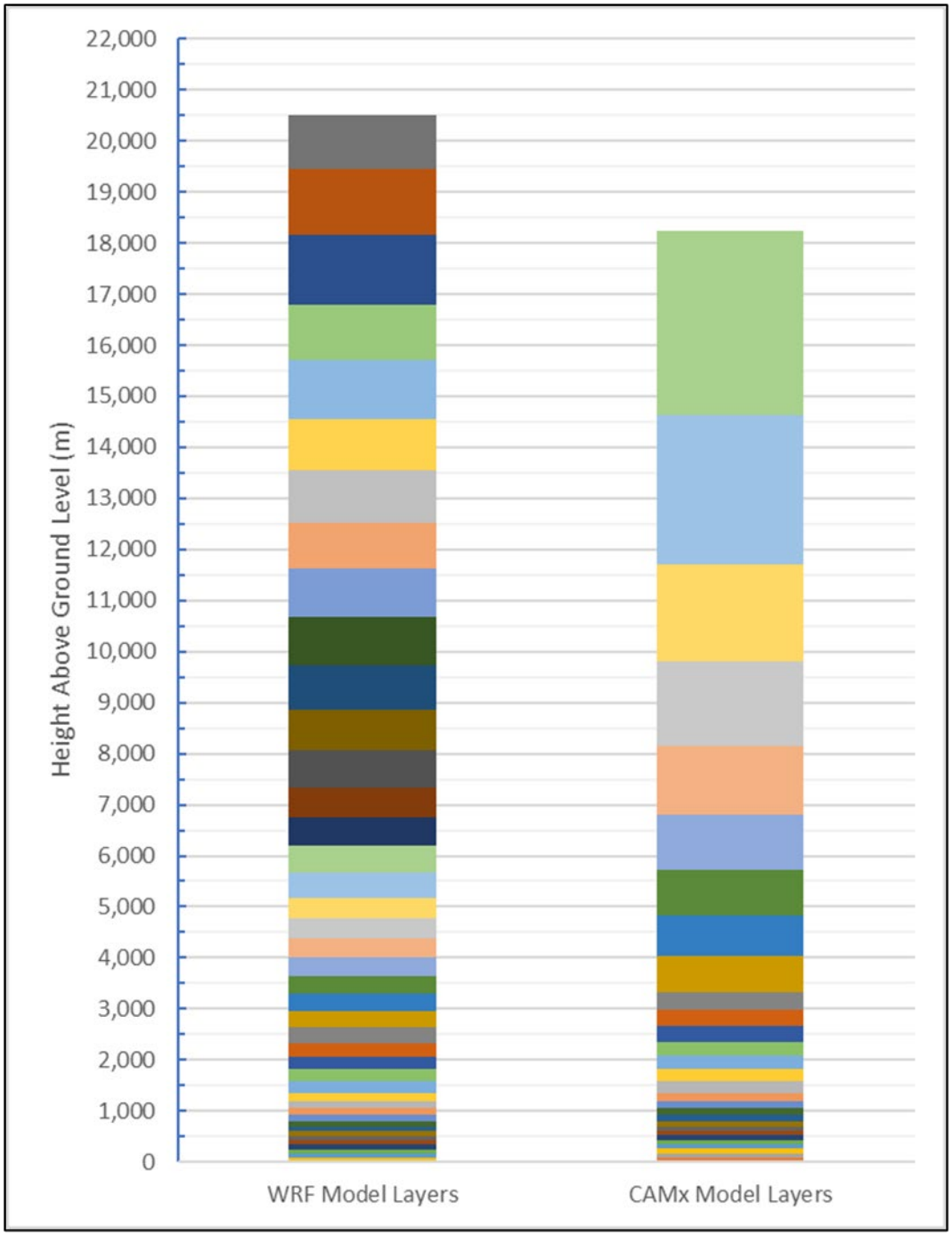

Figure 3-7: WRF and CAMx Vertical Layers for the txs_4km Domain

Details of the map projection, grid boundaries, horizontal and vertical grid cell geometry, land surface data, and meteorological parameterizations are provided in Section 2: *Meteorological Modeling* of Appendix A.

3.4.2 Emissions Inputs

Model-ready hourly speciated emissions were developed for the April through October modeling episode for the 2019 base case and the 2026 future case. This section provides an overview of the emission inputs used in this AD SIP modeling. Details about emissions inventory development are included in Section 3: *Emissions Modeling* of Appendix A.

Emissions inputs, or modeling emissions inventories (EI), include emissions sources from anthropogenic sectors such as point sources (e.g., electric generating units (EGU)), mobile sources (e.g., on-road vehicles), area sources (e.g., population-based emissions estimates), and natural emissions sources (e.g., fires). Based on the EPA modeling guidance, EIs for each sector were developed using various datasets, models, and estimation techniques. The data sources and models used to develop the 2019 base case EI that were used in this SIP revision are listed in Table 3-4: *EI Data Sources for the TCEQ 2019 Base Case*. A variety of datasets and interpolation techniques were used to develop the EIs for the 2026 future case, which are described in Appendix A.

Table 3-4: EI Data Sources for the TCEQ 2019 Base Case

EI Source Category	Sector/Geographic Area	Datasets/Models Used for 2019 EI
Point	EGU	2019 Clean Air Market Program Data[16]
Point	Non-EGU, Texas (TX)	2019 State of Texas Air Reporting System[17]
Point	Non-EGU, Non-TX	EPA 2016v1 Modeling Platform[18]
Non-Point	Oil and Gas, TX	2019 Railroad Commission of Texas
Non-Point	Oil and Gas, Non-TX	EPA 2017 Modeling Platform[19]
Non-Point	Off-Shore	2017 Bureau of Ocean Energy Management[20]
Mobile	On-Road, TX nonattainment areas	Motor Vehicle Emission Simulator (MOVES3)[21] – link-based
Mobile	On-Road, other	MOVES3 – county based
Mobile	Non-Road, TX	TexN2.2
Mobile	Non-Road, Non-TX	MOVES3

[16] https://campd.epa.gov/
[17] https://www.tceq.texas.gov/airquality/point-source-ei/psei.html
[18] https://www.epa.gov/air-emissions-modeling/2016v1-platform
[19] https://www.epa.gov/air-emissions-modeling/2017-emissions-modeling-platform
[20] https://www.boem.gov/environment/environmental-studies/ocs-emissions-inventory-2017
[21] https://www.epa.gov/moves/moves-versions-limited-current-use

EI Source Category	Sector/Geographic Area	Datasets/Models Used for 2019 EI
Mobile	Off-Road Shipping, tx_4km domain	2019 Automatic Identification System and vessel characteristic IHS 2020; MARINER v1
Mobile	Off-Road Shipping, us_12km domain	EPA 2016v1 Modeling Platform
Mobile	Off-Road Airports, TX nonattainment areas	Texas Transportation Institute (TTI) 2020 data
Mobile	Off-Road Airports, other	EPA 2016v1 Modeling Platform
Mobile	Off-Road Locomotives, TX nonattainment areas	TTI 2019 data
Mobile	Off-Road Locomotives, other	EPA 2016v1 Modeling Platform
Area	Area, TX	2020 Air Emissions Reporting Requirements
Area	Area, Non-TX	EPA 2017 Modeling Platform
Natural	Biogenic	Biogenic Emissions Landuse Data (BELD5); BEIS v3.7[22] and SMOKEv4.8
Natural	Fires	2019 MODIS and VIIRS; FINN v2.2
Other	International EI	2019 Community Emission Data System;[23] SMOKEv4.7_CEDS

The MOVES4 model was not used in this SIP revision since there was insufficient time to switch to MOVES4 between proposal and adoption, and since TCEQ had already invested significant resources to develop a non-road mobile source EI using MOVES3. As EPA stated in its notice of availability published in the *Federal Register* on September 12, 2023, "[…] state and local agencies that have already completed significant work on a SIP with a version of MOVES3 (*e.g.,* attainment modeling has already been completed with MOVES3) may continue to rely on this earlier version of MOVES" (88 FR 62567, 62569).

Total anthropogenic emissions for a sample model episode day of June 12 in the 2019 base case and 2026 future case from within the HGB 2008 ozone NAAQS nonattainment area are listed in tons per day (tpd) in Table 3-5: *June 12 Episode Day 2019 Base Case Anthropogenic EI in the HGB 2008 Ozone NAAQS Nonattainment Area* and Table 3-6: *June 12 Episode Day 2026 Future Year Anthropogenic Modeling Emissions for the HGB 2008 Ozone NAAQS Nonattainment Area*. Emissions from some categories differ on a daily basis and therefore a summary was prepared for a sample day from the modeling episode that had high monitored ozone concentrations in the nonattainment area.

Table 3-5 and 3-6 show on-road mobile sources contributed the greatest amount of nitrogen oxides (NO_X) emissions in 2019 and non-EGU point sources contributed the most NO_X emissions in 2026. Area sources contributed the greatest amount of volatile organic compounds (VOC) emissions in both 2019 and 2026. Emissions from

[22] https://drive.google.com/drive/folders/1v3i0iH3lqW36oyN9aytfkczkX5hl-zF0
[23] https://data.pnnl.gov/group/nodes/project/13463

individual categories increased or decreased between the 2019 base case and the 2026 future case; however, the sum of NO_X and carbon monoxide (CO) emissions from all source categories decreased while VOC emissions increased in the 2026 future case.

Table 3-5: June 12 Episode Day 2019 Base Case Anthropogenic EI in the HGB 2008 Ozone NAAQS Nonattainment Area

Emission Source Category	NO_X (tpd)	VOC (tpd)	CO (tpd)
On-Road	81.36	40.39	801.88
Non-Road	37.00	37.42	741.73
Off-Road – Airports	9.25	2.83	23.89
Off-Road – Locomotives	12.37	0.63	2.75
Off-Road – Commercial Marine	63.41	3.62	9.82
Area	35.91	262.43	91.98
Oil and Gas – Drilling	0.30	0.03	0.07
Oil and Gas – Production	1.48	41.82	2.22
Point – EGU	30.82	1.17	22.33
Point – Non-EGU	71.72	97.39	66.95
Eight-County Total	**343.62**	**487.73**	**1,763.62**

Table 3-6: June 12 Episode Day 2026 Future Year Anthropogenic Modeling Emissions for the HGB 2008 Ozone NAAQS Nonattainment Area

Emission Source Category	NO_X (tpd)	VOC (tpd)	CO (tpd)
On-Road	47.91	28.05	624.90
Non-Road	28.47	38.54	834.73
Off-Road – Airports	9.13	2.89	24.33
Off-Road – Locomotives	7.73	0.38	2.48
Off-Road – Commercial Marine	49.28	3.76	10.85
Area	37.82	288.01	103.49
Oil and Gas – Drilling	0.23	0.02	0.02
Oil and Gas – Production	1.48	20.74	2.22
Point – EGU	42.78	6.86	44.60
Point – Non-EGU	94.54	103.10	73.41
HGB Eight-County Total	**319.37**	**492.35**	**1,721.03**
Difference between 2026 and 2019	**-24.25**	**4.62**	**-42.59**

A map showing the spatial distribution changes in anthropogenic emissions of NO_X and VOC between the 2026 future case and the 2019 base case on a sample June 12 episode day is presented in Figure 3-8: *Difference in Anthropogenic NO_X between 2026 Future Case and 2019 Base Case on June 12 Modeled Episode Day* and Figure 3-9: *Difference in Anthropogenic VOC between 2026 Future Case and 2019 Base Case on June 12 Modeled Episode Day*. The largest decrease in NO_X emissions occurs along roads, mainly in and around the downtown area, as well as along shipping lanes. There are a few red and orange grid cells that indicate anticipated future increases in point source emissions. VOC emissions increase mainly in Harris and Fort Bend Counties and decrease in surrounding counties.

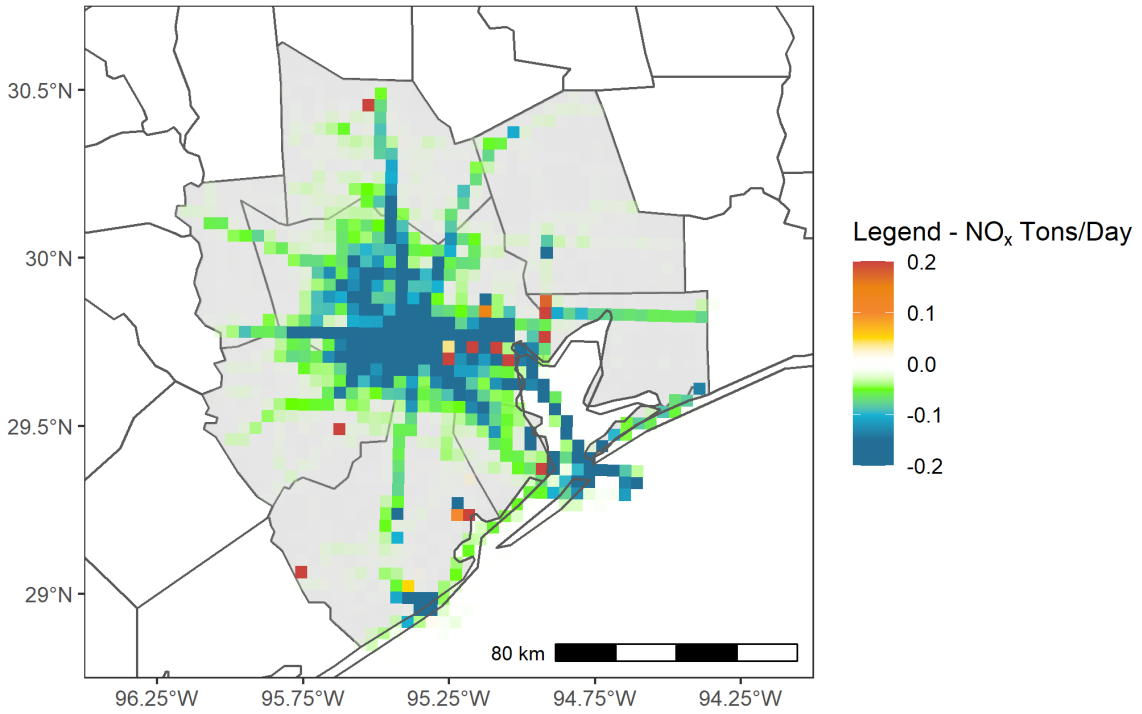

Figure 3-8: Difference in Anthropogenic NO_x between 2026 Future Case and 2019 Base Case on June 12 Modeled Episode Day

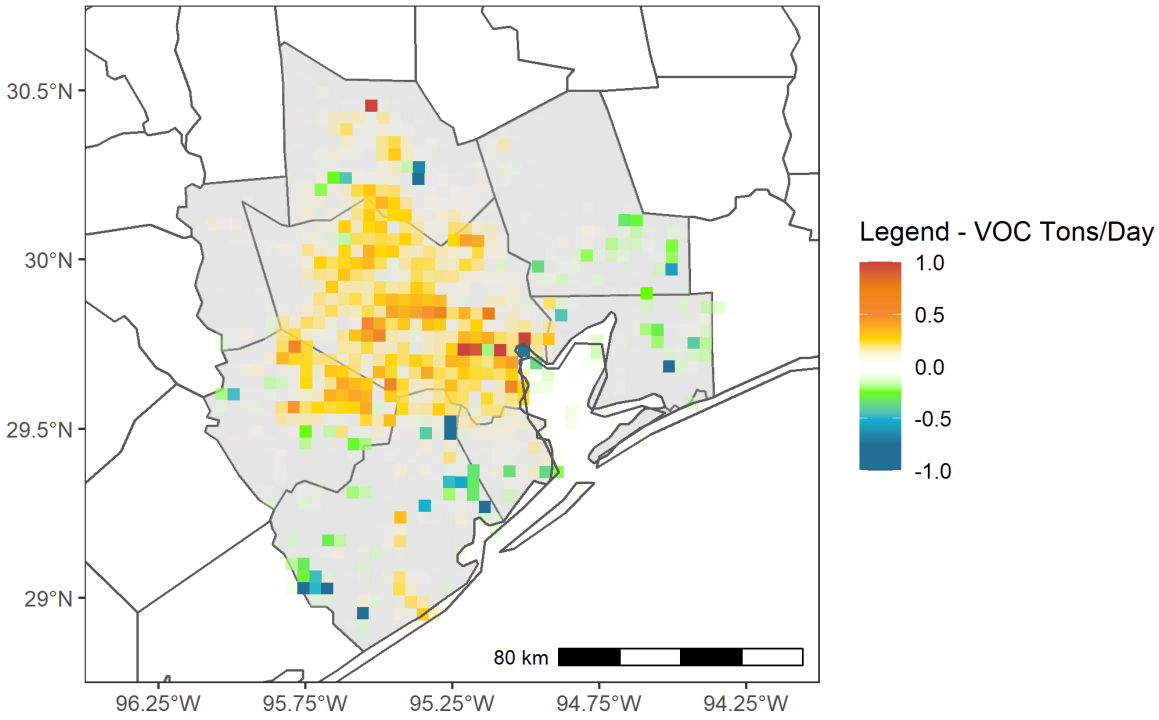

Figure 3-9: Difference in Anthropogenic VOC between 2026 Future Case and 2019 Base Case on June 12 Modeled Episode Day

3.4.3 Initial and Boundary Condition Inputs

In addition to emissions and meteorological inputs, CAMx requires initial and boundary conditions (IC/BC). Initial conditions refer to the state of the atmosphere in the modeling domain at the start of the modeling episode. Boundary conditions refer to the state of the atmosphere at the four lateral edges of a domain (North, South, East, West) and a top of a domain. IC/BC were derived from the Goddard Earth Observing Station global atmospheric model with Chemistry (GEOS-Chem) model runs for 2019 and 2026. Lateral boundary conditions were developed for each grid cell along all four lateral boundaries of the outer 36 km modeling domain. Top boundary conditions were also developed to represent pollutant concentrations from atmospheric layers above the highest CAMx vertical layer.

TCEQ contracted with the University of Houston to complete the GEOS-Chem model runs necessary for IC/BC development. The GEOS-Chem model simulations incorporated an eight-month period from March through October with a two-month ramp-up time (January and February). For both modeled years (2019 and 2026), GEOS-Chem version 12.7.1 was run at $2^{\circ} \times 2.5^{\circ}$ horizontal resolution with tropospheric chemistry with simplified secondary organic aerosols (Tropchem+simpleSOA) and 2019 meteorology from the Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2). The 2026 future anthropogenic emissions were interpolated according to a moderate emission scenario from Representative Concentration Pathways (RCP4.5), with regional scaling for the United States, Canada, Mexico, and Asia. The 2023 and 2025 EI from EPA's 2016v1 modeling platform were used to develop scaling factors at the county-level for the United States and Mexico and the provincial-level for Canada. For Asia, gridded scaling factors were generated based on the latest available version (v6b) of the Evaluating the Climate and Air Quality Impact of Short-Lived Pollutants (ECLIPSE) inventory (Stohl et. al, 2015) from the International Institute for Applied Systems Analysis. Additional details of IC/BC development are presented in Section 4: *Initial and Boundary Conditions* of Appendix A.

3.5 PHOTOCHEMICAL MODELING PERFORMANCE EVALUATION

The purpose of model performance evaluation (MPE) is to determine how well the model reproduces measured concentrations of pollutants. The EPA modeling guidance recommends performing an operational model evaluation consisting of calculating multiple statistical parameters and graphical analyses. In addition, EPA also recommends comparing MPE results against other similar model applications, such as those reported in Emery et al. (2017) paper. The paper provides benchmarks for normalized mean bias (NMB), normalized mean error (NME), and correlation of one-hour and MDA8 ozone based on performance of many modeling applications in the U.S. Table 3-7: *Benchmarks for Photochemical Model Performance Evaluation Statistics* lists these benchmarks. The goal benchmarks correspond to the performance demonstrated by the top third of model runs evaluated and should be viewed as the best a model can be expected to achieve. The criteria benchmarks correspond to the performance achieved by the top two-thirds of model runs evaluated and should be viewed as what a majority of models can be expected to achieve.

In TCEQ's evaluation of the 2019 base case, statistical values near the goal or criteria benchmarks were used as indications that the model performance was good or acceptable, respectively.

Table 3-7: Benchmarks for Photochemical Model Performance Evaluation Statistics

Benchmark	NMB (%)	NME (%)	Correlation
Goal	Within range ± 5	Less than 15	Greater than 0.75
Criteria	Within range ± 15	Less than 25	Greater than 0.50

This section provides a broad overview of modeling performance in the HGB 2008 ozone NAAQS nonattainment area, with a more in-depth analysis available in Section 5: *Photochemical Modeling Performance Evaluation* of Appendix A.

TCEQ performed MPE by comparing 2019 base case CAMx modeling results to measured ozone concentrations at all ozone monitors in the HGB 2008 ozone NAAQS nonattainment area, including regulatory and non-regulatory monitors. For this evaluation, statistical performance measures of NMB and NME were calculated using measured and four-cell bi-linearly interpolated modeled ozone concentrations for all episode days and monitors. These statistical parameters were compared to benchmarks set by Emery et al. (2017).

As discussed in EPA's modeling guidance, operational performance evaluations should be conducted across various temporal and spatial scales. The NMB and NME for high ozone days with MDA8 ozone concentrations at or above 60 ppb for monitoring sites in the HGB 2008 ozone NAAQS nonattainment area is presented in Figure 3-10: *NMB for MDA8 Ozone of at least 60 ppb in April through October 2019* and Figure 3-11: *NME for MDA8 Ozone of at least 60 ppb in April through October 2019*. The Atascocita site is not shown as it did not have MDA8 ozone values above 60 ppb. All regulatory monitors in the HGB 2008 ozone NAAQS nonattainment area have NMB within the criteria range except Lynchburg. Many monitors have NMB values within the goal range. This indicates acceptable to good model performance. All monitors have NME within the criteria range and most monitors fall within goal range indicating acceptable to good model performance. The Aldine monitor, with the highest 2019 DV, has slightly negative NMB, meaning that the model underpredicts MDA8 ozone at that monitor.

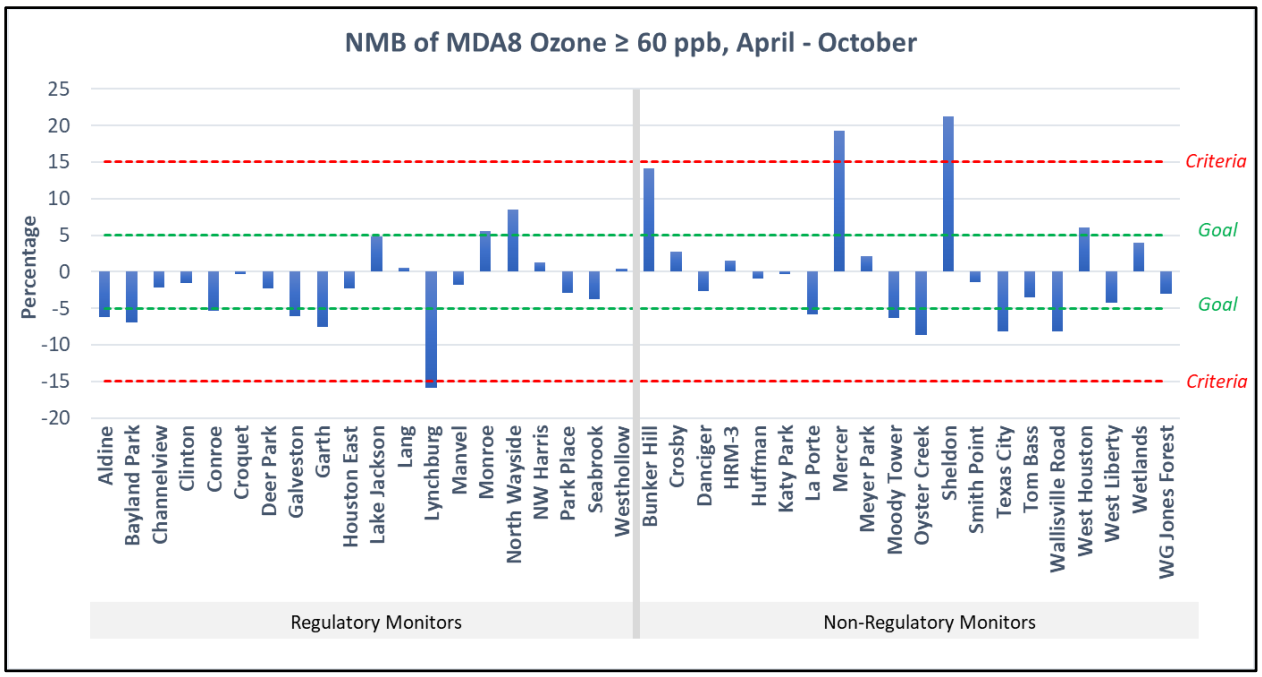

Figure 3-10: NMB for MDA8 Ozone of at least 60 ppb in April through October 2019

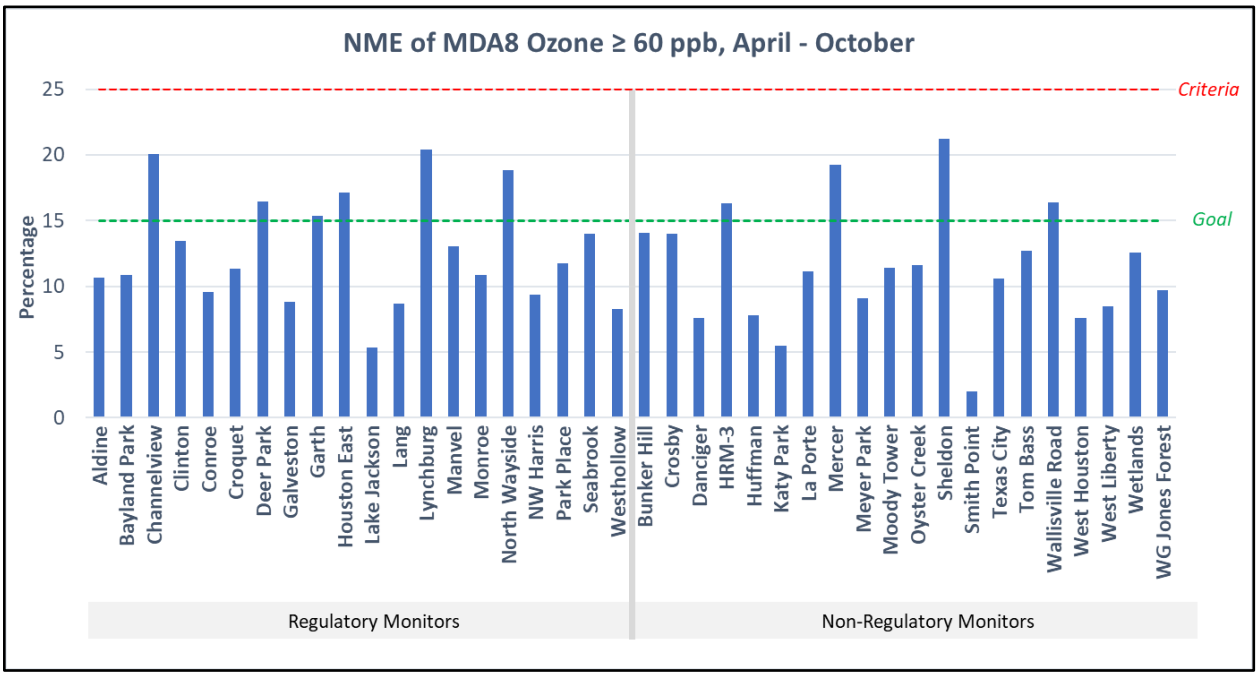

Figure 3-11: NME for MDA8 Ozone of at least 60 ppb in April through October 2019

In addition to the episode-wide evaluation of model performance shown above, an evaluation of modeled eight-hour ozone concentrations for each month and for the entire modeling episode is presented in Table 3-8: *NMB and NME of Eight-Hour Average Ozone in the HGB 2008 Ozone NAAQS Nonattainment Area*. The values represent monthly and seven-month averages from the HGB 2008 ozone NAAQS nonattainment area monitors.

When evaluated for all observations over 40 ppb, both the normalized mean bias and the normalized mean error are within the criteria range for all months in the modeling episode except August. NMB values for the MDA8 ozone are within the criteria range for April and exceed the criteria range for the remaining months of the modeling episode. NMB values for MDA8 observations over 60 ppb are within the goal range for each individual month within the modeling episode except April, which is outside of the goal range but within the criteria range. The NME values for MDA8 ozone are within the criteria range for April, July, September, and October. The NME values for the MDA8 over 60 ppb are within the goal range for each month of the modeling episode. Model performance is acceptable for each month and the entire modeling episode, with August showing the poorest performance.

Table 3-8: NMB and NME of Eight-Hour Average Ozone in the HGB 2008 Ozone NAAQS Nonattainment Area

Month	NMB All Obs ≥ 40 ppb (%)	NME All Obs ≥ 40 ppb (%)	NMB MDA8 Ozone (%)	NME MDA8 Ozone (%)	NMB MDA8 Obs ≥ 60 ppb (%)	NME MDA8 Obs ≥ 60 ppb (%)
Apr	-4.41	12.58	12.82	22.82	-11.38	12.1
May	-4.69	19.56	20.9	27.76	-1.34	9.52
Jun	2.61	17.99	17.92	29.14	-4.15	14.59
Jul	9.66	13.64	21.17	23.52	-1.26	7.71
Aug	17.08	21.58	27.25	29.68	3.92	13.79
Sep	10.63	13.72	15.71	19.59	2.86	7.34
Oct	4.07	13.92	16.65	21.36	-3.66	12.28
Apr through Oct	2.67	15.67	18.66	24.66	-2.74	11.62

Figure 3-12: *Monthly NMB (for observed MDA8 ≥ 60 ppb) in the HGB 2008 Ozone NAAQS Nonattainment Area* shows that the bias changes depending on the monitor location and the month. While in April, MDA8 peaks are slightly underpredicted at most monitors (cool colors); in August and September, most peaks are overpredicted (warm colors).

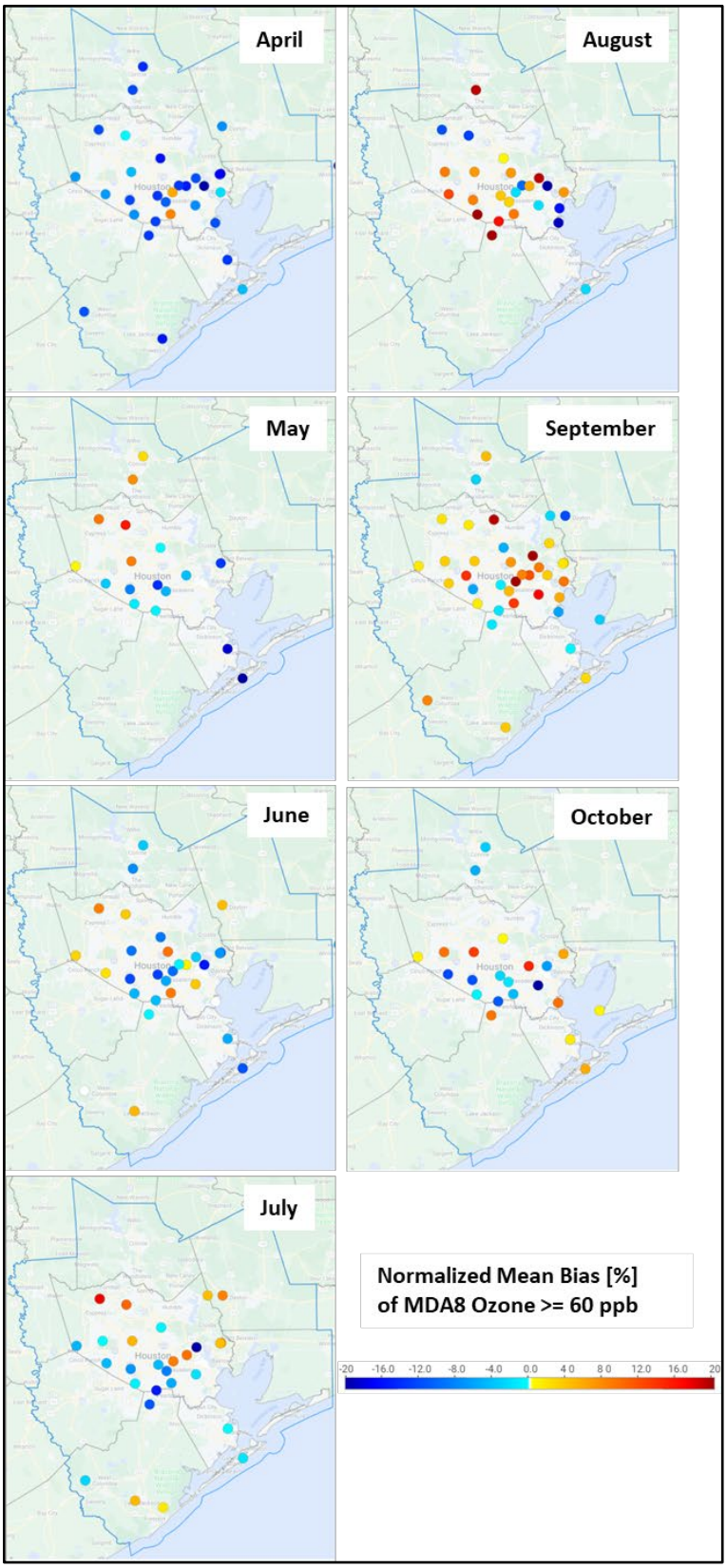

Figure 3-12: Monthly NMB (for observed MDA8 ≥ 60 ppb) in the HGB 2008 Ozone NAAQS Nonattainment Area

The performance evaluation of the base case modeling demonstrates the adequacy of the model to replicate the relationship between ozone levels and the emissions of NO_X and VOC precursors in the atmosphere. The model's ability to suitably replicate this relationship is necessary to have confidence in the model's simulation of the future year ozone and the response to various control measures. Additional detailed evaluations are included in Section 5: *Photochemical Model Performance Evaluation* of Appendix A.

3.6 MODELED ATTAINMENT TEST

3.6.1 Future Year Design Values

In accordance with the EPA modeling guidance, the top 10 base case episode days with modeled eight-hour maximum concentrations above 60 ppb, per monitor, were used for the modeled attainment test. All regulatory ozone monitors in the HGB 2008 ozone NAAQS nonattainment area had 10 modeled base case days above 60 ppb as well as over five days of observed MDA8 over 60 ppb and were included in the modeled attainment test. The Relative Response Factor (RRF) that is used in the modeled attainment test was calculated based on the EPA modeling guidance as follows:

- from the base case modeling, the maximum concentrations of the three-by-three grid cell array surrounding each monitor were averaged over the top-10 modeled days to produce the top-10 day average base case MDA8 values;
- from the future case modeling, the concentrations from the corresponding base case top-10 modeled days and maximum grid cells were averaged to calculate the future case top-10 day average future MDA8 values; and
- the RRF was calculated for each monitor as a ratio of the top-10 day average future MDA8 values to the top-10 day average base case MDA8 values.

The RRF for each monitor is shown in Table 3-9: *Monitor-Specific Relative Response Factors for Modeled Attainment Test.*

Table 3-9: Monitor-Specific Relative Response Factors for Modeled Attainment Test

Monitor Short Name	Monitor Name	CAMS Number	2019 Top 10-Day Modeled MDA8 Mean (ppb)	2026 Top 10-Day Modeled MDA8 Mean (ppb)	Relative Response Factor (RRF)
Aldine	Houston Aldine	0008	79.78	77.47	0.971
Bayland Park	Houston Bayland Park	0053	80.92	77.25	0.955
Channelview	Channelview	0015	78.40	77.20	0.985
Clinton	Clinton	0403	81.88	80.09	0.978
Conroe	Conroe Relocated	0078	75.63	74.14	0.980
Croquet	Houston Croquet	0409	81.43	78.34	0.962
Deer Park	Houston Deer Park #2	0035	82.62	81.26	0.984
Galveston	Galveston 99th St.	1034	75.18	73.20	0.974

Monitor Short Name	Monitor Name	CAMS Number	2019 Top 10-Day Modeled MDA8 Mean (ppb)	2026 Top 10-Day Modeled MDA8 Mean (ppb)	Relative Response Factor (RRF)
Garth	Baytown Garth	1017	75.59	74.56	0.986
Houston East	Houston East	0001	80.06	78.83	0.985
Lake Jackson	Lake Jackson	1016	67.80	66.29	0.978
Lang	Lang	0408	80.40	77.54	0.964
Lynchburg	Lynchburg Ferry	1015	78.48	77.29	0.985
Manvel	Manvel Croix Park	0084	80.35	77.50	0.965
Monroe	Houston Monroe	0406	84.14	81.83	0.973
North Wayside	Houston North Wayside	0405	80.39	78.39	0.975
NW Harris	Northwest Harris County	0026	79.52	77.50	0.975
Park Place	Park Place	4016	83.16	81.26	0.977
Seabrook	Seabrook Friendship Park	0045	80.26	79.28	0.988
Westhollow	Houston Westhollow	0410	78.89	75.26	0.954

The RRF is then multiplied by the 2019 base case design value (DVB) to obtain the 2026 future case design values (DVF) for each ozone monitor. The 2019 DVB is calculated as the average of 2019, 2020, and 2021 regulatory DVs as shown in Figure 3-13: *Example Calculation of 2019 DVB.*

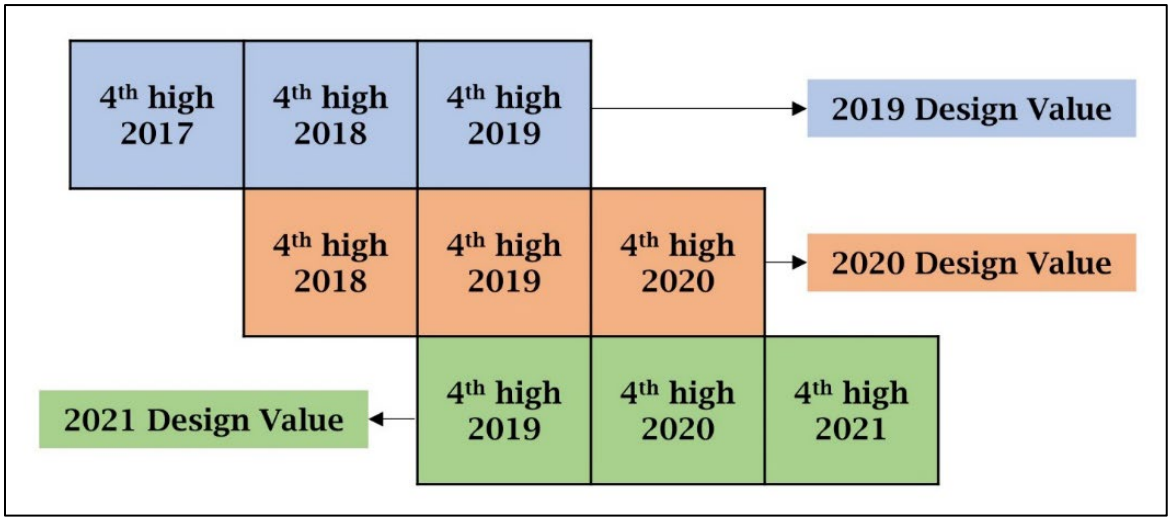

Figure 3-13: Example Calculation of 2019 DVB

As required by the EPA modeling guidance, the final regulatory DVF is obtained by rounding to the tenths digit and truncating to zero decimal places. The 2026 DVF are presented in Table 3-10: *Summary of the 2026 DVF for the Modeled Attainment Test*

and in Figure 3-14: *2026 DVF in the HGB 2008 Ozone NAAQS Nonattainment Area*. Application of the modeled attainment test results in all monitors at or below the 2008 eight-hour ozone standard of 75 ppb in 2026 with the highest DVF value of 75 ppb at the Houston Aldine monitor.

Table 3-10: Summary of the 2026 DVF for the Modeled Attainment Test

Monitor Short Name	Monitor Name	CAMS Number	2019 DVB (ppb)	2026 DVF (ppb)	2026 Truncated DVF (ppb)
Aldine	Houston Aldine	0008	78.00	75.75	75
Bayland Park	Houston Bayland Park	0053	76.67	73.19	73
Channelview	Channelview	0015	68.00	66.96	67
Clinton	Clinton	0403	71.00	69.45	69
Conroe	Conroe Relocated	0078	74.33	72.87	72
Croquet	Houston Croquet	0409	71.33	68.63	68
Deer Park	Houston Deer Park #2	0035	75.67	74.42	74
Galveston	Galveston 99th St.	1034	74.00	72.05	72
Garth	Baytown Garth	1017	71.33	70.35	70
Houston East	Houston East	0001	72.67	71.55	71
Lake Jackson	Lake Jackson	1016	65.00	63.55	63
Lang	Lang	0408	72.00	69.44	69
Lynchburg	Lynchburg Ferry	1015	64.33	63.36	63
Manvel	Manvel Croix Park	0084	74.33	71.70	71
Monroe	Houston Monroe	0406	66.67	64.84	64
North Wayside	Houston North Wayside	0405	65.00	63.38	63
NW Harris	Northwest Harris County	0026	72.67	70.82	70
Park Place	Park Place	4016	73.00	71.33	71
Seabrook	Seabrook Friendship Park	0045	67.67	66.85	66
Westhollow	Houston Westhollow	0410	70.00	66.77	66

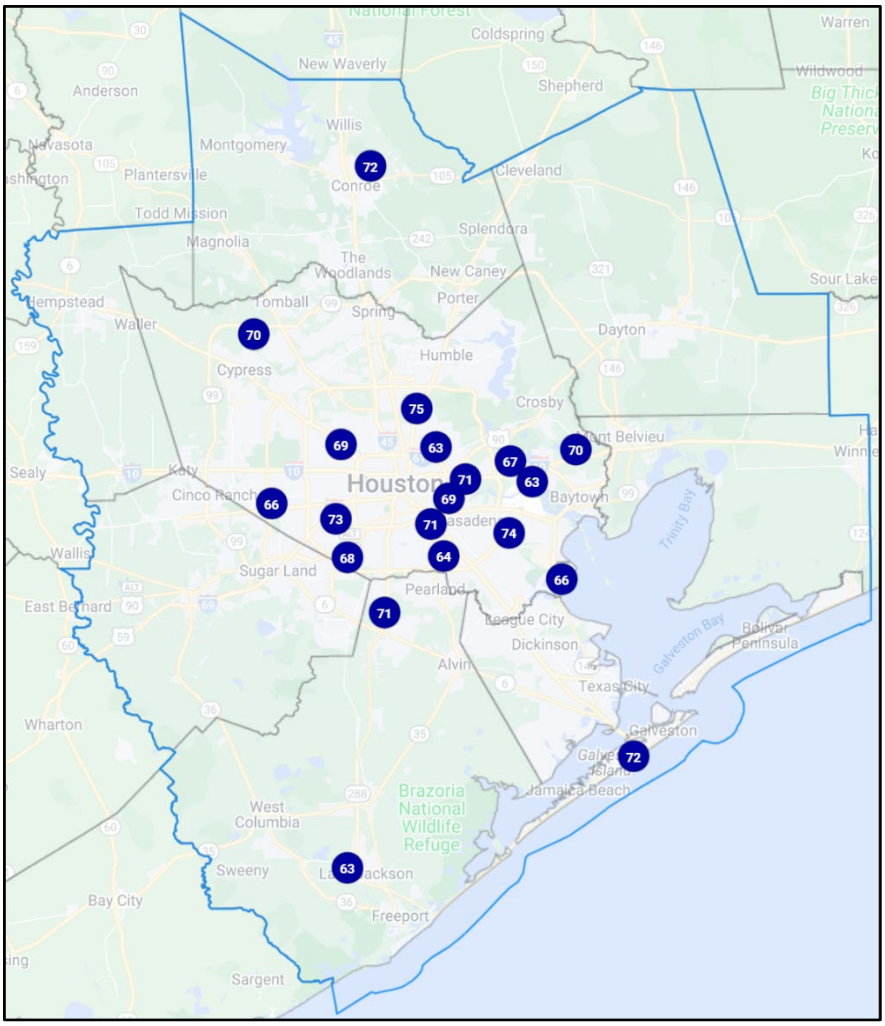

Figure 3-14: 2026 DVF in the HGB 2008 Ozone NAAQS Nonattainment Area

3.6.2 Unmonitored Area Analysis

The standard modeled attainment test is applied only at monitor locations. The EPA modeling guidance recommends that areas not near monitoring locations (unmonitored areas) be subject to an unmonitored area (UMA) analysis. The UMA analysis is intended to demonstrate that unmonitored areas are also expected to reach attainment by the required attainment date or identify any areas outside monitoring location that are at risk of not meeting the ozone standard.

EPA developed Software for the Modeled Attainment Test - Community Edition (SMAT-CE) that allows states to perform the recommended UMA analysis. However, EPA also allows states to develop alternative techniques suitable for states' needs. To conduct the UMA analysis, TCEQ developed its own software, the TCEQ Attainment Test for Unmonitored Areas (TATU), that is integrated into TCEQ's model post-processing stream. Similar to SMAT-CE, TATU incorporates modeled predictions into a spatial interpolation procedure using the Voronoi Neighbor Averaging technique. More information about TATU is provided in Appendix A: *Modeling Technical Support Document (TSD).*

The spatially analyzed 2026 future case design values obtained from the UMA analysis are presented in Figure 3-15: *Spatially Analyzed 2026 DVF in the HGB 2008 Ozone NAAQS Nonattainment Area Using Ozone Value from Each Grid Cell*. The figure shows that all grid cells within or near the nonattainment area are below 75 ppb.

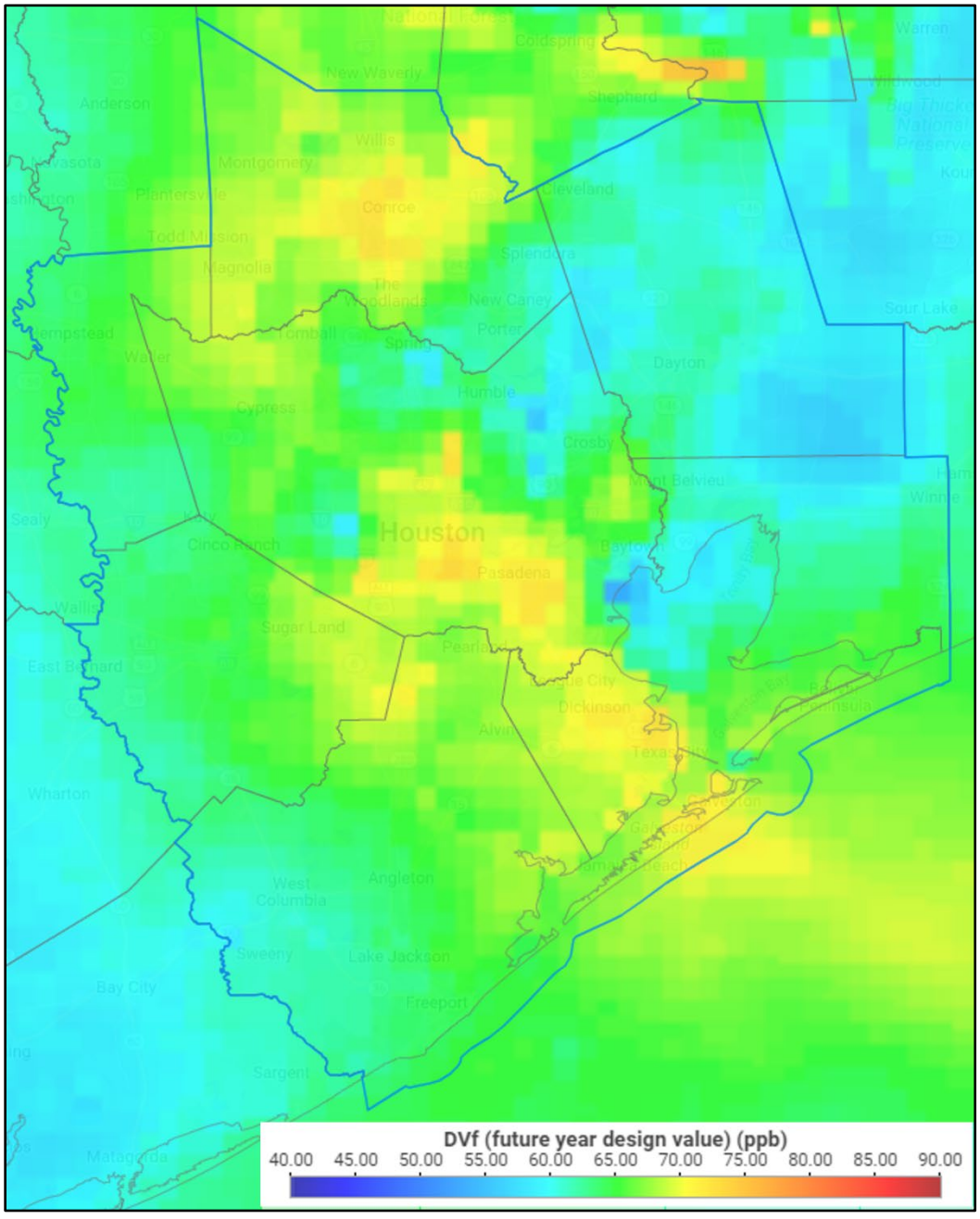

Figure 3-15: Spatially Analyzed 2026 DVF in the HGB 2008 Ozone NAAQS Nonattainment Area Using Ozone Value from Each Grid Cell

3.6.3 Emission Reduction Credits (ERC) Sensitivity Test

A sensitivity modeling run was performed to determine the impact of certified and potential (submitted applications that have not yet been certified) ERCs on the 2026

DVF in the HGB 2008 ozone NAAQS nonattainment area. The sensitivity modeling run was performed to ensure that emissions associated with ERCs remain surplus, as required by 30 Texas Administrative Code Chapter 101, Subchapter H, Division 1.

The ERC sensitivity test resulted in a 0.06 ppb increase to the maximum 2026 DVF in the HGB 2008 ozone NAAQS nonattainment area (from 75.75 ppb to 75.81 ppb at the Aldine monitor) and did not change the maximum truncated 2026 DVF of 75 ppb. The DVF increased across all regulatory monitors, with a maximum DVF increase of 0.15 at the Houston East monitor. After rounding and truncation, the DVF for the ERC sensitivity changed only at the Seabrook monitor from 66 ppb to 67 ppb. Results from the ERC sensitivity test are listed in Table 3-11: *HGB Future Year Design Values for ERC Sensitivity.* Additional details of the ERC sensitivity are provided in Section 3.3.1.3: *Sources in Non-Attainment Areas* of Appendix A.

Table 3-11: HGB Future Year Design Values for ERC Sensitivity

Monitor Short Name	Monitor Name	CAMS Number	ERC Sensitivity 2026 Pre-Truncated DVF (ppb)	Difference in 2026 DVF from ERC Sensitivity (ppb)	ERC Sensitivity 2026 Truncated DVF (ppb)
Aldine	Houston Aldine	0008	75.81	0.06	75
Bayland Park	Houston Bayland Park	0053	73.26	0.07	73
Channelview	Channelview	0015	67.06	0.10	67
Clinton	Clinton	0403	69.58	0.13	69
Conroe	Conroe Relocated	0078	72.91	0.04	72
Croquet	Houston Croquet	0409	68.70	0.07	68
Deer Park	Houston Deer Park #2	0035	74.54	0.12	74
Galveston	Galveston 99th St.	1034	72.10	0.05	72
Garth	Baytown Garth	1017	70.46	0.11	70
Houston East	Houston East	0001	71.70	0.15	71
Lake Jackson	Lake Jackson	1016	63.58	0.03	63
Lang	Lang	0408	69.50	0.06	69
Lynchburg	Lynchburg Ferry	1015	63.49	0.13	63
Manvel	Manvel Croix Park	0084	71.77	0.07	71
Monroe	Houston Monroe	0406	64.93	0.09	64
North Wayside	Houston North Wayside	0405	63.46	0.08	63
NW Harris	Northwest Harris County	0026	70.87	0.05	70
Park Place	Park Place	4016	71.46	0.13	71
Seabrook	Seabrook Friendship Park	0045	66.96	0.11	67
Westhollow	Houston Westhollow	0410	66.82	0.05	66

3.6.4 Texas Low Emission Diesel (TxLED) Program Sensitivity Analysis

The Texas Low Emission Diesel (TxLED) program was initially implemented in May of 2000 to reduce emissions of NO_X from diesel-powered on-road vehicles and non-road engines operating in 110 central and eastern Texas counties.[24] An EPA memorandum from September of 2001 specified the following NO_X emission reductions for TxLED:[25]

- 4.8% for 2002-and-newer diesel on-road vehicles;
- 6.2% for 2001-and-older diesel on-road vehicles;
- 4.8% for non-road engines meeting Tier 3 and Tier 4 emission standards;
- 6.2% for non-road engines meeting Base, Tier 0, Tier 1, and Tier 2 emission standards; and
- 0% for non-road engines less than or equal to 50 horsepower (hp).

These TxLED NO_X reduction benefits from September of 2001 were incorporated into the on-road and non-road AD modeling runs for both the 2019 base case and 2026 future case. In February 2023, EPA released updated guidance (referred to as 2023 EPA Cetane Program guidance) that modifies the way that the TxLED emissions reductions are estimated.[26] EPA specifies a formula in the 2023 EPA Cetane Program guidance that modifies the TxLED NO_X reductions to roughly:

- 0% for 2003-and-newer diesel on-road vehicles;
- 1.5% for 2002-and-older diesel on-road vehicles;
- 0% for non-road engines meeting Tier 3 and Tier 4 emission standards; and
- 1.5% for non-road engines meeting Base, Tier 0, Tier 1, and Tier 2 emission standards.

A sensitivity modeling run was performed to determine the impact of quantifying NO_X benefits for the TxLED program based on the 2023 EPA Cetane Program guidance on the 2026 DVF in the HGB 2008 ozone NAAQS nonattainment area. This sensitivity modeling run required changing the estimated on-road and non-road TxLED NO_X reductions in the 110 central and eastern Texas counties for both the 2019 base case and the 2026 future year.

Results from the TxLED program sensitivity test show that the pre-truncated DVF in the HGB 2008 ozone NAAQS nonattainment decreased across all regulatory monitors, with a maximum decrease of 0.04 ppb at the Aldine and Conroe monitors. The maximum 2026 pre-truncated DVF at the Aldine monitor decreased from 75.75 ppb to 75.71 ppb. After rounding and truncation, the 2026 DVF for the TxLED program sensitivity did not change for any monitor except for the Channelview monitor, which decreased from 67 to 66 ppb. Results from the TxLED program sensitivity test are listed in Table 3-12: *HGB Future Year Design Values for TxLED Sensitivity*. Details about

[24] https://www.tceq.texas.gov/airquality/mobilesource/txled.
[25] https://www.epa.gov/sites/default/files/2016-11/documents/tx-led-fuel-benefit-2001-09-27.pdf
[26] https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1016IFV.pdf

NO_x emissions impacts for the TxLED program sensitivity test for on-road and non-road sources are provided in Section 3.4.1 and 3.5.3 of Appendix A, respectively.

Table 3-12: HGB Future Year Design Values for TxLED Sensitivity

Monitor Short Name	Monitor Name	CAMS Number	TxLED Sensitivity 2026 Pre-Truncated DVF (ppb)	Difference in 2026 DVF from TxLED Sensitivity (ppb)	TxLED Sensitivity 2026 Truncated DVF (ppb)
Aldine	Houston Aldine	0008	75.71	-0.04	75
Bayland Park	Houston Bayland Park	0053	73.16	-0.03	73
Channelview	Channelview	0015	66.94	-0.02	66
Clinton	Clinton	0403	69.43	-0.02	69
Conroe	Conroe Relocated	0078	72.83	-0.04	72
Croquet	Houston Croquet	0409	68.60	-0.03	68
Deer Park	Houston Deer Park #2	0035	74.40	-0.02	74
Galveston	Galveston 99th St.	1034	72.03	-0.02	72
Garth	Baytown Garth	1017	70.34	-0.01	70
Houston East	Houston East	0001	71.53	-0.02	71
Lake Jackson	Lake Jackson	1016	63.52	-0.03	63
Lang	Lang	0408	69.42	-0.02	69
Lynchburg	Lynchburg Ferry	1015	63.34	-0.02	63
Manvel	Manvel Croix Park	0084	71.67	-0.03	71
Monroe	Houston Monroe	0406	64.82	-0.02	64
North Wayside	Houston North Wayside	0405	63.36	-0.02	63
NW Harris	Northwest Harris County	0026	70.79	-0.03	70
Park Place	Park Place	4016	71.32	-0.01	71
Seabrook	Seabrook Friendship Park	0045	66.83	-0.02	66
Westhollow	Houston Westhollow	0410	66.74	-0.03	66

3.6.5 Reasonably Available Control Measures (RACM) Point Sources and Area Sources Sensitivity Analysis

As part of the RACM analysis for this SIP revision, modeling was conducted to estimate the impact of general VOC emissions on future year design values. The results of this modeling were utilized to determine if reductions in general VOC emissions will assist or advance attainment. Additional details of the RACM analysis are provided in Chapter 4.

Two RACM sensitivity modeling runs were conducted: a RACM point sources sensitivity modeling with 10% reductions in the 2026 future case VOC emissions from non-EGU point sources that are not part of the HECT program and a RACM area source sensitivity modeling with 5% reductions in 2026 future case VOC emissions from the non-oil and gas area source emission sector. The area source VOC emissions are predominantly low reactive with only small contribution from highly reactive VOC and therefore the impact of separate VOC classes was not analyzed.

Results from the RACM point sources sensitivity test show that the pre-truncated DVF in the HGB 2008 ozone NAAQS nonattainment decreased across all regulatory monitors, with a maximum decrease of 0.18 ppb at the Houston East monitor. The maximum 2026 pre-truncated DVF at the Aldine monitor decreased from 75.75 ppb to 75.68 ppb. After rounding and truncation, the 2026 DVF for the RACM point sources sensitivity did not change at the DV setting monitor, Aldine, and that DVF remains 75 ppb. The only monitor for which the truncated DVF changed was the Channelview monitor, for which DVF decreased from 67 to 66 ppb. Results from the RACM point sources sensitivity test are listed in Table 3-13: *HGB Future Year Design Values for RACM Point Sources Sensitivity*. Additional details of the RACM point sources sensitivity test are provided in Section 3.3.1.3: *Sources in Non-Attainment Areas* of Appendix A.

Table 3-13: HGB Future Year Design Values for RACM Point Sources Sensitivity

Monitor Short Name	Monitor Name	CAMS Number	RACM Point Sources Sensitivity 2026 Pre-Truncated DVF (ppb)	Difference in 2026 DVF from RACM Point Sources Sensitivity (ppb)	RACM Point Sources Sensitivity 2026 Truncated DVF (ppb)
Aldine	Houston Aldine	0008	75.68	-0.07	75
Bayland Park	Houston Bayland Park	0053	73.11	-0.08	73
Channelview	Channelview	0015	66.84	-0.12	66
Clinton	Clinton	0403	69.30	-0.15	69
Conroe	Conroe Relocated	0078	72.82	-0.05	72
Croquet	Houston Croquet	0409	68.54	-0.09	68
Deer Park	Houston Deer Park #2	0035	74.28	-0.14	74
Galveston	Galveston 99th St.	1034	72.00	-0.05	72
Garth	Baytown Garth	1017	70.23	-0.12	70
Houston East	Houston East	0001	71.37	-0.18	71
Lake Jackson	Lake Jackson	1016	63.53	-0.02	63
Lang	Lang	0408	69.38	-0.06	69
Lynchburg	Lynchburg Ferry	1015	63.20	-0.16	63
Manvel	Manvel Croix Park	0084	71.61	-0.09	71
Monroe	Houston Monroe	0406	64.73	-0.11	64
North Wayside	Houston North Wayside	0405	63.30	-0.08	63
NW Harris	Northwest Harris County	0026	70.77	-0.05	70
Park Place	Park Place	4016	71.19	-0.14	71
Seabrook	Seabrook Friendship Park	0045	66.71	-0.14	66
Westhollow	Houston Westhollow	0410	66.73	-0.04	66

Results from the RACM area sources sensitivity test show that the pre-truncated DVF in the HGB 2008 ozone NAAQS nonattainment decreased across all regulatory monitors, with a maximum decrease of 0.06 ppb. The maximum 2026 pre-truncated

DVF at the Aldine monitor decreased from 75.75 ppb to 75.71 ppb. After rounding and truncation, the 2026 DVF for the RACM area sources sensitivity did not change for any monitor except for the Channelview monitor, which decreased from 67 to 66 ppb. Results from the RACM area sources sensitivity test are listed in Table 3-14: *HGB Future Year Design Values for RACM Area Sources Sensitivity*. Additional details of the RACM area sources sensitivity test are provided in Section 3.7.1.1: *HGB Area Source RACM Sensitivity* of Appendix A.

Table 3-14: HGB Future Year Design Values for RACM Area Sources Sensitivity

Monitor Short Name	Monitor Name	CAMS Number	RACM Area Sources Sensitivity 2026 Pre-Truncated DVF (ppb)	Difference in 2026 DVF from RACM Area Sources Sensitivity (ppb)	RACM Area Sources Sensitivity 2026 Truncated DVF (ppb)
Aldine	Houston Aldine	0008	75.71	-0.04	75
Bayland Park	Houston Bayland Park	0053	73.14	-0.05	73
Channelview	Channelview	0015	66.92	-0.04	66
Clinton	Clinton	0403	69.39	-0.06	69
Conroe	Conroe Relocated	0078	72.85	-0.02	72
Croquet	Houston Croquet	0409	68.58	-0.05	68
Deer Park	Houston Deer Park #2	0035	74.37	-0.05	74
Galveston	Galveston 99th St.	1034	72.03	-0.02	72
Garth	Baytown Garth	1017	70.31	-0.04	70
Houston East	Houston East	0001	71.50	-0.05	71
Lake Jackson	Lake Jackson	1016	63.54	-0.01	63
Lang	Lang	0408	69.41	-0.03	69
Lynchburg	Lynchburg Ferry	1015	63.31	-0.05	63
Manvel	Manvel Croix Park	0084	71.65	-0.05	71
Monroe	Houston Monroe	0406	64.79	-0.05	64
North Wayside	Houston North Wayside	0405	63.35	-0.03	63
NW Harris	Northwest Harris County	0026	70.79	-0.03	70
Park Place	Park Place	4016	71.27	-0.06	71
Seabrook	Seabrook Friendship Park	0045	66.80	-0.05	66
Westhollow	Houston Westhollow	0410	66.74	-0.03	66

3.7 MODELING REFERENCES

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CHAPTER 4: CONTROL STRATEGIES AND REQUIRED ELEMENTS

4.1 INTRODUCTION

The Houston-Galveston-Brazoria (HGB) ozone nonattainment area for the 2008 Eight-Hour Ozone National Ambient Air Quality Standard (NAAQS), which consists of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, includes a wide variety of major and minor industrial, commercial, and institutional entities. The Texas Commission on Environmental Quality (TCEQ) has implemented regulations that address emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOC) from these sources. This chapter describes existing ozone control measures previously adopted for the HGB ozone nonattainment area as well as how Texas meets the following ozone nonattainment area state implementation plan (SIP) requirements for the 2008 eight-hour ozone NAAQS: reasonably available control measures (RACM), including reasonably available control technology (RACT), motor vehicle emissions budgets (MVEB), and contingency measures.

4.2 EXISTING CONTROL MEASURES

Since the early 1990s, a broad range of control measures has been implemented for each emission source category for ozone planning in the HGB nonattainment area(s). For the one-hour ozone NAAQS, the HGB ozone nonattainment area consisted of eight counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller. This same nonattainment area was later designated nonattainment for 1997 eight-hour, and the 2008 eight-hour NAAQS. On June 4, 2018, the United States Environmental Protection Agency (EPA) designated a six-county HGB area including Brazoria, Chambers, Fort Bend, Galveston, Harris, and Montgomery Counties as nonattainment for the 2015 eight-hour ozone NAAQS (83 *Federal Register* (FR) 25776). Liberty and Waller Counties were designated as attainment for the 2015 NAAQS and were not included in the area's nonattainment designation. Table 4-1: *Existing Ozone Control and Voluntary Measures Applicable to the HGB Eight-County Nonattainment Area* lists the existing ozone control strategies implemented for the 1979 one-hour, the 1997 eight-hour and the 2008 eight-hour ozone standards throughout the eight counties comprising the HGB 2008 ozone NAAQS nonattainment area.

Table 4-1: Existing Ozone Control and Voluntary Measures Applicable to the HGB Eight-County Nonattainment Area

Measure	Description	Start Date(s)
Nitrogen Oxides (NO_X) Mass Emissions Cap and Trade (MECT) Program and 30 Texas Administrative Code (TAC) Chapter 117 NO_X Emission Standards for Attainment Demonstration Requirements 30 TAC Chapter 101, Subchapter H, Division 3 30 TAC Chapter 117, Subchapter B, Division 3, Subchapter C, Division 3, and Subchapter D, Division 1	Overall 80% NO_X reduction from existing industrial sources and utility power plants, implemented through a cap and trade program Affects utility boilers, gas turbines, heaters and furnaces, stationary internal combustion engines, industrial boilers, and other industrial sources	April 1, 2003, and phased in through April 1, 2007
NO_X System Cap Requirements for Electric Generating Facilities (EGFs) 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) March 31, 2004 (utility power plants)
Minor Source NO_X Controls for Non-MECT Sites 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 tpy)	March 31, 2005

Measure	Description	Start Date(s)
TxLED for Marine Fuels 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
Stationary Diesel and Dual-Fuel Engines 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
Houston-Galveston-Brazoria (HGB) Major Utility Electric Generation Source Rule 30 TAC Chapter 117, Subchapter C, Division 3	NO_x control requirements for major source (25 tpy of NO_x or more) utility electric generating facilities Applies to utility boilers, auxiliary steam boilers, stationary gas turbines, and duct burners used in turbine exhaust ducts used in electric power generating systems	November 15, 1999
Utility Electric Generation in East and Central Texas 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 30 TAC Chapter 117, Subchapter F	NO_x emission standards for nitric acid and adipic acid manufacturing facilities	November 15, 1999
East Texas Combustion Sources 30 TAC Chapter 117, Subchapter E, Division 4	NO_x emission limits for stationary rich-burn, gas-fired internal combustion engines (240 horsepower and greater) Measure implemented to reduce ozone in the HGB area although controls not applicable in the HGB area	March 1, 2010

Measure	Description	Start Date(s)
Natural Gas-Fired Small Boilers, Process Heaters, and Water Heaters 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 (state-wide rule)	July 1, 2002
VOC Control Measures 30 TAC Chapter 115	VOC control measures adopted to satisfy reasonably available control technology (RACT) and other SIP planning requirements for sources including: vent gas, industrial wastewater, water separation, municipal solid waste landfills, batch processes, loading and unloading operations, VOC leak detection and repair (LDAR), solvent-using processes, fugitive emission control in petroleum refining, natural gas/gasoline processing, and petrochemical processing, cutback asphalt, and pharmaceutical manufacturing facilities	December 31, 2002, and earlier
Highly Reactive Volatile Organic Compounds (HRVOC) Emissions Cap and Trade (HECT) Program and HRVOC Rules 30 Texas 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 affected site in Harris County Seven perimeter counties subject to permit allowable limits and monitoring requirements	Monitoring requirements began January 31, 2006 HECT program implemented January 1, 2007 HECT cap incrementally stepped-down from 2014 through 2017 for a total 25% cap reduction.
HRVOC Fugitive Rules 30 TAC Chapter 115, Subchapter H, Division 3	Leak detection and repair (LDAR) requirements for components in HRVOC service Requirements include more stringent repair times and lower leak detection than general VOC LDAR, and third-party audits	March 31, 2004

Measure	Description	Start Date(s)
Degassing Operations 30 TAC, Chapter 115, Subchapter F, Division 3	Requires vapors from degassing of storage tanks, transport vessels, and marine vessels to be vented to a control device Extended time period required for degassing and lower threshold of storage tanks	March 1, 2012, and earlier
Storage of VOC 30 TAC Chapter 115, Subchapter B, Division 1	Controls on fixed and floating roof tanks storing VOC liquids, including oil and condensate, based on the size of the tank and vapor pressure of the liquid being stored Control efficiency of 95% required on control devices, other than flares and vapor recovery units, for all storage tanks; enhanced inspection, repair, and recordkeeping requirements for fixed roof crude oil or condensate storage tanks with uncontrolled VOC emissions of more than 25 tons per year (tpy) Rule applicability includes fixed roof crude oil or condensate tanks at pipeline breakout stations	July 20, 2018, and earlier
Solvent-Using Processes 30 TAC Chapter 115, Subchapter E	Limits VOC content of coatings and requires work practices for coating processes and cleaning operations Revised to implement RACT requirements per control techniques guidelines published by the United States Environmental Protection Agency (EPA) Seven emission source categories in the 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	March 1, 2013, and earlier

Measure	Description	Start Date(s)
VOC Control Measures – Offset Lithographic Printers 30 TAC Chapter 115, Subchapter E, Division 4	Limits VOC content of inks and cleaning solvents used in offset lithographic printing facilities Revised to lower VOC content limit of solvents and to include smaller sources in the rule	March 1, 2011, for major sources March 1, 2012, for minor sources
Petroleum Dry Cleaning Systems 30 TAC Chapter 115, Subchapter F, Division 4	Control requirements for petroleum dry cleaning system dryers and filters at sources that use less than 2,000 gallons of petroleum solvent per year	May 21, 2011
Rules for the Oil and Natural Gas Industry 30 TAC Chapter 115 Subchapter B Division 7	VOC measures adopted for RACT addressing the emission source categories in the Control Techniques Guidelines for the Oil and Natural Gas Industry published by EPA on October 20, 2016	January 1, 2023
Refueling – Stage I 30 TAC, Chapter 115, Subchapter C, Division 2	Captures gasoline vapors that are released when gasoline is delivered to a storage tank Vapors returned to tank truck as storage tank is filled with fuel, rather than released into ambient air	1979 A SIP revision related to Stage I regulations was approved by EPA, effective June 29, 2015.
Voluntary Texas Emissions Reduction Plan (TERP) 30 TAC Chapter 114, Subchapter K	Voluntary program that provides grant funds for on-road and non-road heavy-duty diesel engine replacement/retrofit	January 2002 See Section 5.3.1.4: *Texas Emissions Reduction Plan (TERP)*
Texas Low Emission Diesel 30 TAC Chapter 114, Subchapter H, Division 2	Requires all diesel fuel for both on-road and non-road use to have a lower aromatic content and a higher cetane number	Phased in from October 31, 2005 through January 31, 2006
Vehicle Inspection/ Maintenance (I/M) 30 TAC Chapter 114, Subchapter C	Yearly computer checks for model year 2-24 gasoline-powered vehicles The HGB area meets the federal Clean Air Act (FCAA), §182(c)(3) requirements to implement an I/M program, and according to 40 Code of Federal Regulations (CFR) §51.350(b)(2), an I/M program is required to cover the entire urbanized area based on the 1990 census	May 1, 2002, in Harris County May 1, 2003, in Brazoria, Fort Bend, Galveston, and Montgomery Counties

Measure	Description	Start Date(s)
Gasoline Engines	Standards for non-road gasoline engines 25 horsepower and larger	May 1, 2004
Transportation Control Measures (TCM)	Various transportation-related, local measures implemented under the previous one-hour and 1997 eight-hour ozone standards (see Appendix F of the 2010 HGB 1997 Eight-Hour Ozone AD SIP Revision) Houston-Galveston Area Council (H-GAC (H-GAC) has implemented all TCM commitments and provides an accounting of TCMs as part of the transportation conformity process	Phased in through 2013
Voluntary Energy Efficiency/Renewable Energy (EE/RE)	Energy efficiency and renewable energy projects enacted by the Texas Legislature outlined in Section 5.3.1.2: *Energy Efficiency and Renewable Energy Measures*	See Section 5.3.1.2
Voluntary Mobile Emissions Reduction Program	Various local on-road and non-road measures committed to as part of the 2010 HGB 1997 Eight-Hour Ozone AD SIP Revision and administered by the H-GAC	Phased in through 2018
Federal Marine Measures	International Marine Diesel Engine and Marine Fuel Standards for Oceangoing Vessels and Emissions Control Areas requires marine diesel fuels used by oceangoing vessels in the North American Emission Control Area to be limited to a maximum sulfur content of 1,000 parts per million, and all new engines on oceangoing vessels operating in these areas must use emission controls that achieve an 80% reduction in NO_x emissions	January 1, 2015, for fuel standards and January 1, 2016, for engine standards
Federal On-Road Measures	Series of emissions limits implemented by EPA for on-road vehicles Included in measures: Tier 1, Tier 2, and Tier 3 light-duty and medium-duty passenger vehicle standards, heavy-duty vehicle standards, low sulfur diesel standards, National Low Emission Vehicle standards, and reformulated gasoline	Phased in through 2010 Tier 3 phase in from 2017 through 2025

Measure	Description	Start Date(s)
Federal Area/Non-Road Measures	Series of emissions limits implemented by EPA for area and non-road sources Examples: diesel and gasoline engine standards for locomotives and leaf-blowers	Phased in through 2018
HGB Area On-Road and Non-Road Reformulated Gasoline (RFG)	Requires all gasoline sold year-round to have low Reid vapor pressure to meet federal RFG requirements	January 1, 1995, in Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties

4.3 UPDATES TO EXISTING CONTROL MEASURES

4.3.1 Updates to Mobile Source Control Measures

On April 15, 2022, TCEQ adopted a rulemaking to update rule language to be consistent with a change to the Texas Transportation Code required by Senate Bill (SB) 604, 86th Legislature, 2019 (SB 604), relating to the display of a vehicle's registration insignia for certain commercial fleet or governmental entity vehicles on a digital license plate in lieu of attaching the registration insignia to the vehicle's windshield (Rule Project No. 2021-029-114-AI). The rulemaking to implement SB 604 did not include any new control measures. On November 29, 2023, the commission adopted the I/M SIP revision (Project No. 2022-027-SIP-NR) which incorporated the adopted rulemaking to implement SB 604. The adopted rulemaking and SIP revision were submitted to EPA on December 18, 2023.

4.3.2 Updates to NO_X Control Measures

In response to a rule petition for changes to existing rule provisions in Chapter 117 (Project No. 2023-127-PET-NR), owners or operators of stationary diesel engines designed, constructed, operated, and certified to meet the requirements of 40 CFR Part 1039 would not be required to use a continuous or predictive emissions monitoring system to monitor NO_X emissions from the affected unit. Owners or operators would furthermore not be required to monitor ammonia emissions pursuant to existing Chapter 117 ammonia emission monitoring requirements. The affected unit would still be subject to a NO_X and an ammonia emission specification, and the owner or operator would still be required to test the unit to demonstrate initial compliance with the respective emission specification. The concurrent Chapter 117 rulemaking (Rule Project No. 2023-117-117-AI) provides the compliance flexibility through rule updates in Subchapter B, Division 3 for major sources of NO_X and in Subchapter D, Division 1 for minor sources of NO_X.

4.3.3 Updates to VOC Control Measures

Control measures addressing FCAA, §172 and §182 for the 2008 HGB ozone nonattainment area were last updated in a rulemaking adopted June 30, 2021 (Rule Project No. 2020-038-115-AI) to implement RACT for the oil and natural gas emission source categories covered in EPA's control techniques guidelines (CTG) document, *Control Techniques Guidelines for the Oil and Natural Gas Industry* published in 2016

(EPA-453/B-16-001 *2016/10*). EPA published final approval of the rule revisions on August 15, 2023, effective September 14, 2023 (88 FR 55379).

Updates were needed to correct errors made in the June 2021 Chapter 115 rulemaking. These updates are included in a concurrent 30 TAC Chapter 115 rulemaking (Rule Project No. 2023-116-115-AI) and more closely align the requirements in Chapter 115 with EPA's CTG. The revisions include exemptions inadvertently omitted from Chapter 115, allowing audio, visual, or olfactory monitoring for equipment in heavy liquid service, and correcting errors in the rule language providing for a reduced monitoring frequency based on good performance. All corrections are consistent with the recommendations in the CTG.

4.4 NEW CONTROL MEASURES

4.4.1 Stationary Sources

Necessary emissions reductions needed for attainment consist of the application of existing rules and, if needed, the implementation of six contingency measures, as described in Section 4.3 *Updates to Existing Control Measures*. The concurrent Chapter 115 rulemaking also includes new contingency measures to satisfy FCAA contingency measure requirements (Rule Project No. 2023-116-115-AI). These contingency measures are described in Section 4.9: *Contingency Plan*.

4.5 RACT ANALYSIS

4.5.1 General Discussion

Ozone nonattainment areas classified as moderate and above are required to meet the mandates of FCAA under §172(c)(1) and §182(b)(2) and (f) to address RACT. According to EPA's *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements: Final Rule* (2008 eight-hour ozone standard SIP requirements rule) published on March 6, 2015, states containing areas classified as moderate ozone nonattainment or higher must submit a SIP revision to fulfill the RACT requirements for all CTG emission source categories and all non-CTG major sources of NO_x and VOC (80 FR 12264). Specifically, this HGB Attainment Demonstration (AD) SIP revision must contain adopted RACT regulations, certifications where appropriate that existing provisions are RACT, and/or negative declarations that there are no sources in the nonattainment area covered by a specific CTG source category.

The HGB area was previously classified as serious ozone nonattainment for the 2008 eight-hour ozone NAAQS with an attainment date of July 20, 2021 (84 FR 44238). Based on monitoring data from 2018 through 2020, the HGB serious ozone nonattainment area did not attain the 2008 eight-hour ozone NAAQS in the 2020 attainment year and TCEQ submitted a one-year attainment date extension request to EPA in accordance with FCAA, §181(a)(5). On October 7, 2022, EPA published the final notice denying TCEQ's one-year attainment date extension request and reclassifying the HGB nonattainment area from serious to severe nonattainment for the 2008 eight-hour ozone NAAQS, effective November 7, 2022 (87 FR 60926).

The major source threshold for severe nonattainment areas is 25 tpy of actual or potential emissions of either NO_x or VOC. Due to the HGB nonattainment area's previous severe classification under the 1997 eight-hour ozone NAAQS, rules to

implement FCAA requirements for nonattainment areas have been in place for the HGB nonattainment area through the existing 30 TAC Chapter 115 and Chapter 117 rules, including a major source threshold of 25 tpy, as of March 10, 2010. The RACT analysis for this SIP revision evaluated RACT requirements at the existing major source threshold of 25 tpy of NO_X or VOC in the HGB 2008 ozone NAAQS nonattainment area.

RACT is defined as the lowest emissions limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility (44 FR 53761, September 17, 1979). RACT requirements for moderate and higher classification nonattainment areas are included in the FCAA to ensure that significant source categories at major sources of ozone precursor emissions are controlled to a reasonable extent but not necessarily to best available control technology (BACT) levels expected of new sources or to maximum achievable control technology levels required for major sources of hazardous air pollutants.

Details of TCEQ's analysis of the sources and the applicable rules to demonstrate that the state is fulfilling the RACT requirements for the HGB 2008 eight-hour severe ozone nonattainment area are in Appendix D.

4.5.2 NO_X RACT Determination

The TCEQ reviewed the 2019 point source emissions inventory (EI) to verify that the NO_X controls and reductions implemented through 30 TAC Chapter 117 for the HGB ozone nonattainment area continue to address RACT requirements for the 2008 ozone NAAQS. The current EPA-approved 30 TAC Chapter 117 rules continue to fulfill RACT requirements for all NO_X source categories identified in EPA alternative control technology (ACT) guidance documents. All NO_X major sources in the HGB 2008 eight-hour severe ozone nonattainment area are covered by existing emission limits in Chapter 117, which EPA previously approved. Details of this analysis are included in Appendix D.

4.5.3 VOC RACT Determination

In the eight HGB-area counties that were reclassified as severe nonattainment under the 2008 eight-hour NAAQS, all VOC emission source categories addressed by CTG and ACT documents in the HGB area are controlled through existing rules in 30 TAC Chapter 115 or other approved regulations that fulfill RACT requirements. Tables D-2: *State Rules Addressing VOC RACT Requirements in CTG Reference Documents* and D-3: *State Rules Addressing VOC RACT Requirements in ACT Reference Documents* of Appendix D provide additional details on the CTG and ACT source categories.

Based on a review of the EPA-approved negative declarations TCEQ previously submitted for the HGB 2008 eight-hour ozone SIP revisions, TCEQ is resubmitting negative declarations for the following CTG or ACT source categories for the HGB 2008 eight-hour severe ozone nonattainment area:

- Fiberglass Boat Manufacturing Materials;
- Leather Tanning and Finishing Operations;
- Surface Coating for Flatwood Coatings;

- Letterpress Printing;
- Automobile and Light-Duty Truck Assembly Coatings; and
- Manufacture of Pneumatic Rubber Tires.

For all non-CTG and non-ACT major VOC emission sources for which VOC controls are technologically and economically feasible, RACT is fulfilled through existing 30 TAC Chapter 115 rules and other federally enforceable measures. Additional VOC controls on certain major sources were determined either not to be economically feasible or not to be technologically feasible. Appendix D, Table D-5: *State Rules Addressing VOC RACT Requirements for Major Emission Sources in the HGB Area* provides additional detail on the non-CTG and non-ACT major emission sources.

4.6 RACM ANALYSIS

4.6.1 General Discussion

FCAA, §172(c)(1) requires states to provide for implementation of all RACM as expeditiously as practicable and to include RACM analyses in the SIP. In the general preamble for implementation of FCAA Amendments published in the April 16, 1992, issue of the *Federal Register*, EPA explained that it interprets FCAA, §172(c)(1) as a requirement that states incorporate into their SIPs all RACM that would advance a region's attainment date; however, states are obligated to adopt only those measures that are reasonably available for implementation in light of local circumstances (57 FR 13498).

When performing RACM analyses, TCEQ uses the general criteria specified by EPA in the proposed approval of the New Jersey RACM analysis published in the January 16, 2009, issue of the *Federal Register* (74 FR 2945) and finalized by EPA in the May 15, 2009, issue of the *Federal Register* (74 FR 22837).

RACM is defined by EPA as any potential control measure for application to point, area, on-road, or non-road emission source categories that meets the following criteria:

- the control measure is technologically feasible;
- the control measure is economically feasible;
- the control measure does not cause "substantial widespread and long-term adverse impacts;"
- the control measure is not "absurd, unenforceable, or impracticable;" and
- the control measure can advance the attainment date by at least one year.

EPA did not provide guidance on how to interpret the criteria "advance the attainment date by at least one year." Considering the July 20, 2027, attainment date for this HGB AD SIP revision, TCEQ evaluated this aspect of RACM based on advancing the attainment date by one year, to July 20, 2026.

4.6.2 Results of the RACM Analysis

TCEQ determined that no potential control measures met the criteria to be considered RACM. As discussed in Chapter 3: *Photochemical Modeling* of this SIP revision, the

current modeling results indicate that the HGB area will demonstrate attainment by its July 20, 2027, attainment date.

To determine if attainment can be reached by July 20, 2026, TCEQ estimated the potential 2025 design value using both modeled 2026 future design value (DVF) of 75 ppb and the preliminary 2023 monitored design value (2023 DV) of 82 ppb as of September 8, 2023. Assuming that changes in design value are linear, the per year change in design value needed to reach the 2026 modeled DVF of 75 ppb from the preliminary monitored 2023 DV of 82 ppb is 2.33 ppb. Using the 2.33 ppb per year change in design value, the estimated potential 2025 design value would be 77.33 ppb, requiring an additional reduction of 1.39 ppb to reach attainment of 2008 eight-hour ozone NAAQS one year earlier. Assuming linear emissions reduction per year, the per year emissions reduction needed to reach a modeled DVF of 75 ppb from the 2019 base year design value (DVB) was calculated to be 3.46 tpd of NO_X emissions. Further assuming a linear relationship between NO_X emissions and design values, the amount of NO_X emissions reductions needed to get the additional 1.39 ppb was calculated to be 2.06 tpd. To advance attainment by one year, to July 20, 2026, with a 2025 attainment year, a control measure would have to be in place by the beginning of ozone season in the 2025 attainment year, January 1, 2025, to be considered RACM and provide a NO_X reduction of 2.06 tpd. Because no control strategies were identified that could provide at least 2.06 tpd of NO_X reductions and be implemented by the January 1, 2025 deadline, it is not possible to advance attainment by one year.

4.7 MOTOR VEHICLE EMISSIONS BUDGETS

An attainment year MVEB represents the maximum allowable emissions from on-road mobile sources for an applicable criteria pollutant or precursor, as defined in the SIP, for the attainment year. Adequate or approved MVEBs must be used in transportation conformity analyses. The MVEB represents the summer weekday on-road mobile source emissions that have been modeled for the AD and includes all of the on-road control measures reflected in Chapter 4: *Control Strategies and Required Elements* of this SIP revision. The on-road NO_X and VOC emissions inventories (EI) establishing these MVEBs were developed with version 3 of the Motor Vehicle Emission Simulator (MOVES3) model. The MOVES4 model was not used in this SIP revision since there was insufficient time to switch to MOVES4 between proposal and adoption, and since TCEQ had already invested significant resources to develop a non-road mobile source EI using MOVES3. As EPA stated in its notice of availability published in the *Federal Register* on September 12, 2023, "[…] state and local agencies that have already completed significant work on a SIP with a version of MOVES3 (*e.g.,* attainment modeling has already been completed with MOVES3) may continue to rely on this earlier version of MOVES" (88 FR 62567, 62569).

The resulting MVEBs are shown in Table 4-2: *2026 Attainment Demonstration MVEB for the HGB 2008 Ozone NAAQS Nonattainment Area (tons per day).*

Table 4-2: 2026 Attainment Demonstration MVEB for the HGB 2008 Ozone NAAQS Nonattainment Area (tons per day)

Description	NO_X (tpd)	VOC (tpd)
2026 On-Road MVEB based on MOVES3	47.91	28.05

For additional details regarding on-road mobile EI development, refer to Section 3: *Emissions Modeling* of Appendix A.

4.8 MONITORING NETWORK

The ambient air quality monitoring network provides data to verify the attainment status for areas under the 2008 eight-hour ozone NAAQS. The TCEQ monitoring network in the HGB nonattainment area consists of 21 regulatory ambient air ozone monitors located in Brazoria, Galveston, Harris, and Montgomery Counties. The TCEQ, and its local partners operate ozone monitors at the following air monitoring sites:

- Baytown Garth (482011017);
- Channelview (482010026);
- Clinton (482011035);
- Conroe Relocated (483390078);
- Galveston 99th Street (481671034);
- Houston Aldine (482010024);
- Houston Bayland Park (482010055);
- Houston Croquet (482010051);
- Houston Deer Park #2 (482011039);
- Houston East (482011034);
- Houston Harvard (482010417);
- Houston Monroe (482010062);
- Houston North Wayside (482010046);
- Houston Westhollow (482010066);
- Lake Jackson (480391016);
- Lang (482010047);
- Lynchburg Ferry (482011015);
- Manvel Croix Park (480391004);
- Northwest Harris County (482010029);
- Park Place (482010416); and
- Seabrook Friendship Park (482011050).

The monitors are managed in accordance with EPA requirements prescribed by 40 CFR Part 58 to verify the area attainment status. The TCEQ commits to maintaining an air monitoring network to meet EPA regulatory requirements in the HGB area. The TCEQ continues to work with EPA through the air monitoring network review process, as required by 40 CFR Part 58, to determine: the adequacy of the ozone monitoring network; additional monitoring needs; and recommended monitor decommissions. Details regarding the annual review of the air monitoring network are located on TCEQ's Air Monitoring Network Plans webpage

(https://www.tceq.texas.gov/airquality/monops/past_network_reviews). Air monitoring data from these monitors continue to be quality assured, reported, and certified according to 40 CFR Part 58.

4.9 CONTINGENCY PLAN

AD SIP revisions for nonattainment areas are required by FCAA, §172(c)(9) and §182(c)(9) to provide for specific contingency measures that would take effect and result in emissions reductions if an area fails to attain a NAAQS by the applicable attainment date or fails to demonstrate reasonable further progress (RFP). EPA has interpreted recent court decisions to have invalidated key aspects of EPA's historical approach to implementing the contingency measure requirement. At the time this AD SIP revision was being developed, EPA had historically accepted the use of surplus emissions reductions from previously implemented control measures to fulfill the contingency measure requirements. However, EPA's new draft guidance on contingency measures, published in the *Federal Register* for public comment on March 23, 2023 (88 FR 17571), indicates that contingency measures must be conditional and prospective (not previously implemented) based on EPA's interpretation of the recent court rulings. The draft guidance also establishes an entirely new scheme for determining the amount of emissions reductions necessary to address the contingency requirement.

The contingency measures in the concurrent 30 TAC Chapter 115 rulemaking (Rule Project No. 2023-116-115-AI) are conditional and prospective (not previously implemented), which follows EPA's interpretation of recent court decisions. These measures do not rely on the historical approach of using surplus emissions reductions to fulfill the contingency measure requirements. Since EPA had not issued final guidance to states regarding the amount of required reductions from contingency measures at the time this SIP revision was developed, this AD SIP revision relies on the historically approved approach (3% of the RFP base year emissions) to determine the amount of emissions reductions necessary to address the contingency requirement. Under the historical approach, in the General Preamble for implementation of the FCAA published in the April 16, 1992, *Federal Register*, EPA interpreted the contingency requirement to mean additional emissions reductions that are sufficient to equal 3% of the emissions in the baseline year inventory (57 FR 13498).

The emission reduction targets associated with the contingency measures were calculated using the HGB-area 2011 RFP base year inventory from the concurrent DFW and HGB Severe Classification RFP SIP Revision for the 2008 Eight-Hour Ozone NAAQS (Project No. 2023-108-SIP-NR). The 3% contingency reduction requirement is based on a 0% reduction in NO_x and a 3% reduction in VOC. The contingency measures would be triggered upon EPA publication of a notice in the *Federal Register* that the HGB area failed to attain the 2008 ozone NAAQS and TCEQ's subsequent publication in the *Texas Register* specifying what contingency measures are being implemented and establishing the compliance date, which is by no later than 270 days after *Texas Register* publication.

During review of comments submitted, TCEQ staff realized that they had omitted a portion of the intended VOC content limit tables from the proposed 30 TAC Chapter 115 rulemaking (Project No. 2023-116-115-AI), as published in the *Texas Register* on December 15, 2023 (48 TexReg 7290). The omitted content limits were included in the emissions reductions calculation in the concurrently proposed HGB AD and DFW-HGB

RFP SIP revisions. In addition, staff inadvertently used inconsistent VOC content limits in the proposed rule language and the emissions reductions calculations.

As proposed and adopted in the 30 TAC Chapter 115 rulemaking and this HGB AD SIP revision, the VOC emissions reductions from the industrial adhesives contingency measure are documented as 0.99 tpd in the HGB area. The Executive Director intends to immediately initiate an Industrial Adhesives Contingency Measure Corrections rulemaking (corrections rulemaking) for commission consideration to amend the adhesive VOC content limits in the concurrently adopted 30 TAC Chapter 115 rulemaking to match the originally intended limits and to add additional source categories that were inadvertently excluded from the industrial adhesives category.

If adopted, the potential corrections rulemaking would result in additional VOC emissions reductions of 2.13 tpd in the HGB area resulting in final emissions reductions of 3.12 tpd in the HGB area. Therefore, if adopted, the corrections rulemaking would restore the emissions reductions to the amounts described in the contingency plan narratives in this HGB AD SIP revision and the DFW-HGB RFP SIP revision (Project 2023-108-SIP-NR).

If proposed and adopted, the corrections rulemaking would amend Table 1 of Figures 30 TAC §115.473(e) and (f) as shown below by adding underlined text, deleting text marked with strikethrough, and revising the first column name for clarity. If proposed and adopted, the corrections rulemaking would also add definitions to 30 TAC §115.470(b) for adhesive categories inadvertently omitted.

Table 1.	
~~Category~~Application Specific Adhesives	Grams of volatile organic compounds (VOC) per liter adhesive
Architectural Applications	
Building Envelope Membrane Adhesive	250
Carpet Pad Adhesive	50
Ceramic Glass, Porcelain, & Stone Tile Adhesive	65
Cove Base Adhesive	50
Dry Wall and Panel Adhesive	50
Multi-Purpose Construction Adhesives	70
Roofing	
Hot Applied Modified Bitumen/Built Up Roof Adhesive	30
EPDM/TPO Single Ply Roof Membrane Adhesive	250
Single Ply Roof Membrane Adhesive (Except EPDM/TPO)	250
Shingle Laminating Adhesive	30
All Other Roof Adhesives	250
Rubber Floor Adhesive	60
Structural Glazing Adhesive	100
Structural Wood Member Adhesive	140
Subfloor Adhesive	50

Table 1.	
~~Category~~Application Specific Adhesives	Grams of volatile organic compounds (VOC) per liter adhesive
VCT and Asphalt Tile Adhesive	50
Wood Flooring Adhesive	20
All Other Indoor Floor Covering Adhesives	50
All Other Outdoor Floor Covering Adhesives	50
Computer Diskette Manufacturing Adhesive	350
Contact Adhesive	80
Edge Glue Adhesive	250
Plastic Welding Cement	
ABS Welding Cement	325
ABS to PVC Transition Cement	425~~510~~
CPVC Welding Cement	400~~490~~
CPVC For Life-Safety Systems	490
Higher Viscosity CPVC	400~~490~~
PVC Welding Cement	425~~510~~
All Other Plastic Welding Cements	100
Rubber Vulcanization Adhesive	250~~850~~
Special Purpose Contact Adhesive	250
Thin Metal Laminating Adhesive	780
Tire Tread Adhesive	100
Top and Trim Adhesive	250~~540~~
Waterproof Resorcinol Glue	170
All Other Adhesives	250

Since the fiscal note information published in the proposal for the 30 TAC Chapter 115 rulemaking (Project No. 2023-116-115-AI), reflected the cost per ton of VOC to achieve the intended emissions reductions, as documented in the concurrently proposed HGB AD and RFP SIP revisions, the public has already been informed of all expected costs to affected businesses that would result if the corrections rulemaking were proposed and adopted.

A summary of the contingency analysis for the severe classification is provided in Table 4-4: *HGB 2008 Ozone NAAQS Nonattainment Area Severe Attainment Contingency Plan as Adopted (tons per day unless otherwise noted)* and Table 4-5: *HGB 2008 Ozone NAAQS Nonattainment Area Severe Attainment Contingency Plan as Adopted and Industrial Adhesives Contingency Measure Corrections Rule (tons per day unless otherwise noted).* The analysis in Table 4-4 demonstrates that reductions from the conditional and prospective contingency measures will not meet the 3% emissions reduction requirement measures as adopted but Table 4-5 shows that contingency measure reductions will meet the 3% emissions reduction after adoption of the corrections rule. The contingency reduction is based on a 3% reduction in VOC

emissions from the 2011 RFP base year for the severe classification under the 2008 eight-hour ozone NAAQS, which equals a 16.49 tpd contingency reduction total target.

Because the triggering statements for these contingency measures are not tied to a particular attainment date for the 2008 eight-hour ozone NAAQS, TCEQ can apply emissions reductions from the concurrent Chapter 115 rulemaking to either a finding for the HGB area of failure to attain the 2008 eight-hour ozone NAAQS for the severe classification or failure to attain for the serious classification. On October 3, 2023, EPA published final disapproval of the contingency measures element of the 2020 DFW and HGB 2008 Eight-Hour Ozone Serious Classification RFP SIP Revision (Project No. 2019-079-SIP-NR) submitted to EPA on May 13, 2020, (88 FR 67957). If TCEQ were to apply some or all of the contingency measures in the concurrent 30 TAC Chapter 115 rulemaking to the 2008 eight-hour ozone NAAQS failure to attain for the serious classification, the calculated amount of reductions required for contingency would be different than the amounts described in Table 4-4. A summary of the contingency analyses for the serious classification is provided in Table 4-6: *HGB 2008 Ozone NAAQS Nonattainment Area Serious Attainment Contingency Plan as Adopted (tons per day unless otherwise noted)* and Table 4-7: *HGB 2008 Ozone NAAQS Nonattainment Area Serious Attainment Contingency Plan as Adopted and Industrial Adhesives Contingency Measure Corrections Rule (tons per day unless otherwise noted)*. The analysis in Table 4-6 shows that although the contingency measures as adopted will not meet the contingency reduction target, the analysis in Table 4-7 shows that the contingency measures with the adopted correction rule will meet the contingency reduction target. The contingency reduction is based on a 3% reduction in VOC emissions from the 2011 RFP base year for the serious classification under the 2008 eight-hour ozone NAAQS, which equals a 16.05 tpd contingency reduction total target. TCEQ's publication in the *Texas Register* will specify the contingency measures, NAAQS, classification, and purpose (failure to attain or failure to achieve an RFP milestone) for which contingency measures will be triggered.

Additional documentation for the attainment contingency demonstration calculation is available in Appendix 2: *Houston-Galveston-Brazoria (HGB) Reasonable Further Progress (RFP) Demonstration Spreadsheet* of the concurrent DFW-HGB 2008 Ozone NAAQS Severe RFP SIP Revision (Project No. 2023-108-SIP-NR).

4.9.1 Area Source and Point Source Contingency Measure Controls

Six area and point source control measures, in a concurrent rulemaking for 30 TAC Chapter 115 (Rule project 2023-116-115-AI) will fulfill SIP contingency requirements in the HGB 2008 ozone NAAQS nonattainment area, if adopted. The rulemaking covers the following source categories: degreasing, industrial maintenance coatings, industrial cleaning solvents, emulsified asphalt paving, traffic marking coatings, and industrial adhesives. Three of these measures target a mix of area and point sources: degreasing, industrial cleaning solvents, and industrial adhesives. The other three; industrial maintenance coatings, emulsified asphalt paving, and traffic marking coatings, are area sources. A summary of the VOC emissions reductions in tpd from each contingency measure is provided in Table 4-3: *Eight-County HGB 2008 Ozone NAAQS Nonattainment Area VOC Contingency Measure Reductions*.

4.9.1.1 Degreasers

This measure would reduce VOC emissions from solvent degreasers by adopting requirements which would establish a new limit for VOC content for the solvents used in these applications of 25 grams per liter (g/l). TCEQ estimates reductions from degreasing contingency measures to be 7.44 tpd for the HGB 2008 ozone NAAQS nonattainment area.

4.9.1.2 Industrial Maintenance Coatings

This measure would reduce VOC emissions from industrial maintenance coatings by adopting requirements which would establish a new limit for VOC content for the coating products used for these applications of 250 g/l of VOC. TCEQ estimates reductions from industrial maintenance coatings contingency measures to be 2.79 tpd for the HGB 2008 ozone nonattainment area.

4.9.1.3 Industrial Cleaning Solvents

This measure would reduce VOC emissions from cleaning solvents by adopting requirements which would establish a more stringent limit for VOC content for cleaning solvents used to clean general materials of 25 g/l of VOC. The existing VOC limit to clean all materials is 50 g/l. The current rule has exemptions for cleaning certain specialty materials, which are assumed to currently be cleaned with very high VOC content cleaners. The contingency measure would remove these exemptions and set limits proven to be feasible in other states and lower than the assumed current use. The measure would remove the existing exemption for stationary source solvent cleaning operations that emit less than 3 tpy of VOC. TCEQ estimates reductions from industrial cleaning solvents contingency measures to be 1.71 tpd for the HGB 2008 ozone nonattainment area.

4.9.1.4 Emulsified Asphalt Paving

This measure would reduce VOC emissions from emulsified asphalt operations by adopting requirements which would establish a more stringent limit for VOC content for emulsified asphalt of 0.5% VOC content by weight. TCEQ estimates reductions from emulsified asphalt contingency measures to be 1.36 tpd for the HGB 2008 ozone nonattainment area.

4.9.1.5 Traffic Marking Coatings

This measure would reduce VOC emissions from traffic marking coatings by adopting requirements which would establish a more stringent limit for VOC content for traffic marking coatings of 100 g/l of VOC. The currently effective HGB VOC limit is the same as the limit in the National Architectural and Industrial Coatings Rule, EPA final rule published September 11, 1998 (63 FR 48848), which is 150 g/l. TCEQ estimates reductions from traffic marking coatings contingency measures to be 0.88 tpd for the HGB 2008 ozone nonattainment area.

4.9.1.6 Industrial Adhesives

This measure would reduce VOC emissions from industrial adhesives by adopting requirements that would establish limits for VOC content of industrial adhesives by category that are overall more stringent. Current 30 TAC Chapter 115 VOC limits are based on EPA's 2008 Control Techniques Guidelines for Miscellaneous Industrial

Adhesives (EPA 453/R-08-005 2008/09). The revised limits, which are based on current rules in other states, would be the same or more stringent for some categories of adhesives and less stringent for others. As originally intended, TCEQ estimates net reductions from industrial adhesives contingency measures to be 3.12 tpd for the HGB 2008 ozone nonattainment area.

Table 4-3: Eight-County HGB 2008 Ozone NAAQS Nonattainment Area VOC Contingency Measure Reductions

Control Measure	VOC Reductions (tpd)	Previous VOC Limits (Percent or g/l of Product)	VOC Limits (Percent or g/l of Product)	Location in Chapter 115
Degreasing	7.44	None	25 g/l	Subchapter E, Division 1
Industrial Maintenance Coatings	2.79	450 g/l	250 g/l	Subchapter E, Division 5
Industrial Cleaning Solvents	1.71	50 g/l	25 g/l general and higher specialty[1]	Subchapter E, Division 6
Emulsified Asphalt Paving	1.36	Use-specific percentages by weight	0.5% VOC by weight	Subchapter F, Division 1
Traffic Marking Coatings	0.88	150 g/l	100 g/l	Subchapter E, Division 5
Industrial Adhesives Adopted	0.99[4]	Use-specific limits[2]	Use-specific limits[3]	Subchapter E, Division 7
Industrial Adhesives Contingency Measure Corrections Rule	2.13[4]	Use-specific limits[2]	Use-specific limits[3]	Subchapter E, Division 7
Total Reductions	**17.30[4]**	**N/A**	**N/A**	**N/A**

Note 1: Limits are based on the material being cleaned.
Note 2: Use-specific limits developed in accordance with Control Techniques Guidelines for Miscellaneous Industrial Adhesives (EPA 453/R-08-005 2008/09).
Note 3: Use-specific limits developed in accordance with rules in other states.
Note 4: Please refer to Section 4.9: *Contingency Plan* for an explanation on the Industrial Adhesives Contingency Measure Corrections Rule.

4.9.2 Contingency Measure Summary

The contingency measure reductions are conditional and prospective (not previously implemented) and will reduce VOC emissions in the HGB 2008 ozone NAAQS nonattainment area if they are triggered. A summary of the contingency measure demonstration is located below in Table 4-4 and Table 4-5.

If, after adopting the Industrial Adhesives Contingency Measure Correction Rule, TCEQ were to trigger all the contingency measures in Table 4-3, except the 0.88 tpd traffic marking coatings measure for failure to attain the 2008 eight-hour ozone NAAQS at

the serious classification, the total reductions would be 16.42 tpd, which would exceed the 16.05 tpd 2008 serious target shown in line 3 of Table 4-5 by 0.37 tpd.

Table 4-4: HGB 2008 Ozone NAAQS Nonattainment Area Severe Attainment Contingency Plan as Adopted (tons per day unless otherwise noted)

Line	Contingency Plan Description	NO_x	VOC
1	Eight-county 2011 controlled base year EI	471.62	549.59
2	Percent for contingency calculation (total of 3%)	0.00	3.00
3	Eight-county HGB required contingency reductions (Line 1 x Line 2 expressed as a percent)	0.00	16.49
	Control Reductions to Meet Contingency Requirements	**NO_x**	**VOC**
4	Total eight-county HGB contingency reductions	0.00	15.17
5	Contingency Excess (+) or Shortfall (-)	0.00	-1.32
6	Are the contingency reductions greater than or equal to the required contingency reductions?	**Yes**	**No**

Table 4-5: HGB 2008 Ozone NAAQS Nonattainment Area Severe Attainment Contingency Plan as Adopted and Industrial Adhesives Contingency Measure Corrections Rule (tons per day unless otherwise noted)

Line	Contingency Plan Description	NO_x	VOC
1	Eight-county 2011 controlled base year EI	471.62	549.59
2	Percent for contingency calculation (total of 3%)	0.00	3.00
3	Eight-county HGB required contingency reductions (Line 1 x Line 2 expressed as a percent)	0.00	16.49
	Control Reductions to Meet Contingency Requirements	**NO_x**	**VOC**
4	Eight-county HGB contingency reductions adopted	0.00	15.17
5	Eight-county HGB contingency reductions from Industrial Adhesives Contingency Measure Corrections Rule	0.00	2.13
6	Total eight-county HGB contingency reductions (Line 4 + Line 5)	0.00	17.30
7	Contingency Excess (+) or Shortfall (-)	0.00	0.81
8	Are the contingency reductions greater than or equal to the required contingency reductions?	**Yes**	**Yes**

Table 4-6: HGB 2008 Ozone NAAQS Nonattainment Area Serious Attainment Contingency Plan as Adopted (tons per day unless otherwise noted)

Line	Contingency Plan Description	NO_x	VOC
1	Eight-county 2011 controlled base year EI	442.92[1]	535.06[1]
2	Percent for contingency calculation (total of 3%)	0.00	3.00
3	Eight-county HGB required contingency reductions (Line 1 x Line 2 expressed as a percent)	0.00	16.05
	Control Reductions to Meet Contingency Requirements	**NO_x**	**VOC**
4	Total eight-county HGB contingency reductions	0.00	15.17
5	Contingency Excess (+) or Shortfall (-)	0.00	-0.88
6	Are the contingency reductions greater than or equal to the required contingency reductions?	**Yes**	**No**

Note 1: Values are from Table 4-18: *HGB RFP Contingency Demonstration for the 2020 Attainment Year (tons per day unless otherwise noted)* in the DFW and HGB 2008 Eight-Hour Ozone Serious Classification RFP SIP Revision (Project No. 2019-079-SIP-NR). The eight-county HGB 2011 controlled base year EI for NO_X and VOC are different for the serious and severe classifications because the latest 2011 inventory at the time of SIP development is used.

Table 4-7: HGB 2008 Ozone NAAQS Nonattainment Area Serious Attainment Contingency Plan as Adopted and Industrial Adhesives Contingency Measure Corrections Rule (tons per day unless otherwise noted)

Line	Contingency Plan Description	NO_X	VOC
1	Eight-county 2011 controlled base year EI	442.92[1]	535.06[1]
2	Percent for contingency calculation (total of 3%)	0.00	3.00
3	Eight-county HGB required contingency reductions (Line 1 x Line 2 expressed as a percent)	0.00	16.05
	Control Reductions to Meet Contingency Requirements	**NO_X**	**VOC**
4	Eight-county HGB contingency reductions adopted	0.00	15.17
5	Eight-county HGB contingency reductions from Industrial Adhesives Contingency Measure Corrections Rule	0.00	2.13
6	Total eight-county HGB contingency reductions (Line 4 + Line 5)	0.00	17.30
7	Contingency Excess (+) or Shortfall (-)	0.00	1.25
8	Are the contingency reductions greater than or equal to the required contingency reductions?	**Yes**	**Yes**

4.10 ADDITIONAL FCAA REQUIREMENTS

FCAA, §182 sets out a graduated control program for ozone nonattainment areas. According to EPA's final 2015 eight-hour ozone standard SIP requirements rule, states must submit a SIP element to meet each FCAA, §182 nonattainment area planning requirement for the 2015 eight-hour ozone NAAQS (83 FR 62998), and the EPA interprets this requirement to also apply to nonattainment area requirements for the 2008 eight-hour ozone NAAQS. Where an air agency determines that an existing regulation is adequate to meet the applicable nonattainment area planning requirements of FCAA, §182 for a revised ozone NAAQS, that air agency's SIP revision may provide a written statement certifying that determination in lieu of submitting new revised regulations. This section certifies that Texas meets all additional FCAA nonattainment area requirements applicable to the HGB 2008 ozone NAAQS nonattainment area for the severe classification, including I/M program requirements, nonattainment new source review (NSR) program requirements, and vehicle miles traveled (VMT) growth offset requirements, along with the clean fuel fleet program requirement for areas classified as serious and above. A SIP revision to address FCAA, §185 fee requirements is due to EPA by November 7, 2025, and is not addressed in this SIP revision.

4.10.1 I/M Program

Texas established a vehicle emissions testing program on January 1, 1995, meeting the EPA's requirements for I/M programs. Enhanced vehicle emissions inspections have been implemented in five of the eight counties in the HGB 2008 ozone NAAQS nonattainment area (in Harris County on May 1, 2002, and in Brazoria, Fort Bend,

Galveston, and Montgomery Counties on May 1, 2003). I/M program requirements are codified in 30 TAC Chapter 114, Subchapter C.

The HGB area meets the FCAA, §182(c)(3) requirements that an I/M program be in place in the HGB area that is consistent with a serious or higher ozone classification. On May 15, 2017, EPA approved the portions of the 2016 HGB 2008 Eight-Hour Ozone Standard AD SIP Revision that describe how FCAA requirements for I/M are met in the HGB area for the 2008 eight-hour ozone NAAQS (82 FR 22291). The TCEQ has determined that the I/M program SIP requirements are met for Texas for the HGB 2008 ozone NAAQS nonattainment area under the severe classification.

A demonstration addressing the EPA's requirement for I/M performance standard modeling for existing I/M programs is provided in Section 4.12: *I/M Program Performance Standard Modeling (PSM)*.

4.10.2 Vehicle Miles Traveled (VMT) Growth Demonstration

For areas designated as severe ozone nonattainment, a VMT growth demonstration is required. The VMT growth demonstration for the HGB 2008 severe ozone NAAQS nonattainment area is provided in the concurrent DFW-HGB severe classification RFP SIP revision for the 2008 eight-hour ozone NAAQS (Project No. 2023-108-SIP-NR).

4.10.3 Nonattainment NSR Program

Ozone nonattainment area SIP revisions must include provisions to require permits for the construction and operation of new or modified major stationary sources. Major stationary sources in severe ozone nonattainment areas are those sources emitting at least 25 tpy of a regulated pollutant. Minor stationary sources are all sources that are not major stationary sources.

An NSR permitting program for nonattainment areas is required by FCAA, §182(a)(2)(C) and further defined in 40 CFR Part 51, Subpart I (Review of New Sources and Modifications). Under these requirements, new major sources, or major modifications at existing sources in an ozone nonattainment area must comply with the lowest achievable emissions rate and obtain sufficient emissions offsets.

Nonattainment NSR permits for ozone authorize construction of new major sources or major modifications of existing sources of NO_x or VOC in an area that is designated nonattainment for the ozone NAAQS. Emissions thresholds and pollutant offset requirements under the nonattainment NSR program are based on the nonattainment area's classification. The NSR offset ratio for severe ozone nonattainment areas is 1.3:1.

The EPA initially approved Texas' nonattainment NSR regulation for ozone on November 27, 1995 (60 FR 49781). The TCEQ has determined that because the Texas SIP already includes 30 TAC §116.12 (Nonattainment and Prevention of Significant Deterioration Review Definitions) and 30 TAC §116.150 (New Major Source or Major Modification in Ozone Nonattainment Areas), the nonattainment NSR SIP requirements are met for Texas for the HGB 2008 ozone NAAQS nonattainment area under the severe classification.

4.10.4 Clean Fuel Fleet Program

The clean fuel fleet program is required by FCAA, §182(c)(4) for serious areas and above. FCAA, §182(c)(4)(B) allows states to opt-out with an adequate substitute program. Texas has a currently approved substitute program in 30 TAC Chapter 114, Subchapter K, Division 5. On January 31, 2014, EPA published direct final approval of revisions to the Texas motor vehicle rules in 30 TAC Chapter 114 that established the substitute program and affirmed that Texas' substitute program continues to meet clean fuel fleet program requirements (79 FR 5287).

4.10.5 FCAA, §185 Fee

With the severe classification, the HGB 2008 ozone NAAQS nonattainment area is subject to FCAA, §182(d)(3), which requires states to submit plans to include the requirements of FCAA, §185, Enforcement for Severe and Extreme Ozone Nonattainment Areas for Failure to Attain.

The FCAA, §185(a) requires each SIP to impose a penalty fee for major stationary sources of VOC located in the nonattainment area if the area fails to attain the ozone NAAQS by the applicable attainment date. The FCAA, §182(f) requires all SIP requirements that apply for VOC emissions to also apply for NO_x emissions, so the fee would apply to both ozone precursors. The fee is required to be imposed for each calendar year after the missed attainment date until EPA redesignates the area as attainment for the 2008 eight-hour ozone NAAQS. If the state does not impose and collect the fee, or if the state's fee provisions do not meet the FCAA requirements, then FCAA, §185(d) requires that EPA impose and collect the fee with interest. The fee and interest would not be returned to the state.

The EPA is requiring states submit a SIP revision to address these requirements to EPA by November 7, 2025 (87 FR 60926, 60931). This SIP revision does not address this requirement.

4.11 EMISSION CREDIT GENERATION

The Emissions Banking and Trading rules in 30 TAC Chapter 101, Subchapter H, Divisions 1 and 4 require sources in nonattainment areas to have SIP emissions to be eligible to generate emission credits. SIP emissions are the actual emissions from a facility or mobile source during the SIP emissions year, not to exceed any applicable local, state, or federal requirement. For point sources, the SIP emissions cannot exceed the amount reported to the state's EI; if no emissions were reported for a point source facility in the SIP emissions year, then the facility is not eligible for credits.

This SIP revision revises the SIP emissions year used for emission credit generation. If adopted and submitted to EPA, the new SIP emissions year will be 2019 for point source electric generating units with emissions recorded in EPA's Air Markets Program Data, 2019 for all other point sources with emissions recorded in TCEQ's STARS

emissions database, 2019 for oil and gas area sources, 2020 for all other area sources, and 2019 for all mobile sources.[27]

On April 9, 2021, TCEQ sent notice to point sources through the agency's e-mail system and posted notice on the TCEQ website that 2019 point source emissions revisions for the STARS database must be provided by July 9, 2021, to be included in this SIP revision; as discussed in Chapter 2: *Anthropogenic Emissions Inventory Description*, those revisions were incorporated into this SIP revision.

4.12 I/M PROGRAM PERFORMANCE STANDARD MODELING (PSM)

On October 7, 2022, EPA published the final *Determinations of Attainment by the Attainment Date, Extensions of the Attainment Date, and Reclassification of Areas Classified as Marginal for the 2015 Ozone National Ambient Air Quality Standards* (87 FR 60897). This rule requires states to provide a demonstration that the existing or proposed I/M program for a newly designated or reclassified ozone nonattainment area meets the emissions reduction benchmarks specified for the area's ozone NAAQS classification level. The EPA interprets the I/M performance requirement to mean upon designation or reclassification that a proposed or existing I/M program must meet the I/M performance benchmark. These I/M emissions reductions should be realized in the attainment year or program implementation year. However, an I/M performance standard demonstration completed for any ozone NAAQS is applicable until a new version of EPA's on-road mobile emissions model is released, as long as the most stringent applicable performance standard is used in the initial assessment.

Texas established a vehicle emissions testing program on January 1, 1995, meeting EPA's requirements for I/M programs. Enhanced vehicle emissions inspections were implemented in Harris County on May 1, 2002, and in Brazoria, Fort Bend, Galveston, and Montgomery Counties on May 1, 2003. I/M program requirements are codified in 30 TAC Section 114, Subchapter C.

The TCEQ performed the required performance standard modeling analysis of the HGB 2008 and 2015 ozone NAAQS nonattainment areas using the requirements in the EPA guidance document *Performance Standard Modeling for New and Existing Vehicle Inspection and Maintenance (I/M) Programs Using the MOVES Mobile Source Emissions Model* (EPA-420-B-22-034, October 2022). Because the performance standard modeling results apply to all ozone NAAQS, the TCEQ specifically used the Enhanced Performance Standard that reflects the I/M program design elements as specified in 40 CFR §51.351(i) that are implemented in the HGB area and are consistent with a serious or higher ozone designation. The assessment uses a 2023 analysis year, an analysis year under both the 2008 and 2015 ozone NAAQS, for the first MOVES3 PSM assessment completed for the HGB ozone nonattainment area. The PSM analysis was performed for each of the five counties within the HGB 2008 ozone NAAQS nonattainment area in which the HGB I/M program is required to operate. Chambers, Liberty, and Waller Counties are not included in the I/M program since the current I/M program in the HGB ozone nonattainment area sufficiently covers a population equal

[27] The total amount of SIP emissions available for credit generation as defined in 30 TAC 101.300(30)(C) will be based on emissions data used as inputs for modeling in this attainment demonstration for each sector.

to the HGB urbanized area, as required by federal law. Summaries of the 2023 I/M enhanced PSM analysis are provided in:

- Table 4-8: *Summary of NO_x Enhanced Performance Standard Evaluation for the HGB Ozone Nonattainment Area Existing I/M Program using MOVES3*; and
- Table 4-9: *Summary of VOC Enhanced Performance Standard Evaluation for the HGB Ozone Nonattainment Area Existing I/M Program using MOVES3.*

Evaluating whether an existing I/M program meets the enhanced performance standard requires demonstrating that the existing program emission rates for NO_x and VOC do not exceed the benchmark program's emission rates. The benchmark program's emission rates include a 0.02 gram per mile buffer for each pollutant, as noted in Tables 4-8 and 4-9. The analysis demonstrates that the existing HGB area I/M program emissions rates do not exceed the performance standard benchmark emission rates for all five counties required to operate an I/M program within the HGB 2008 ozone NAAQS nonattainment area. Therefore, the HGB 2008 ozone nonattainment area I/M program performance requirement is met.

All required documentation for the I/M program performance standard benchmark assessment is available in Appendix C: *Inspection and Maintenance (I/M) Program Performance Standard Modeling (PSM) for the Existing I/M Program in the Houston-Galveston-Brazoria Ozone Nonattainment Area.*

Table 4-8: Summary of NO_x Enhanced Performance Standard Evaluation for the HGB Ozone Nonattainment Area Existing I/M Program using MOVES3

County	I/M Program NO_x Emission Rate	I/M NO_x Performance Standard Benchmark	I/M NO_x Performance Standard Benchmark Plus Buffer	Does Existing Program Meet I/M Performance Standard?
Brazoria	0.29	0.29	0.31	Yes
Fort Bend	0.27	0.27	0.29	Yes
Galveston	0.24	0.24	0.26	Yes
Harris	0.26	0.26	0.28	Yes
Montgomery	0.28	0.28	0.30	Yes

Table 4-9: Summary of VOC Enhanced Performance Standard Evaluation for the HGB Ozone Nonattainment Area Existing I/M Program using MOVES3

County	I/M Program VOC Emission Rate	I/M VOC Performance Standard Benchmark	I/M VOC Performance Standard Benchmark Plus Buffer	Does Existing Program Meet I/M Performance Standard?
Brazoria	0.17	0.17	0.19	Yes
Fort Bend	0.19	0.20	0.22	Yes
Galveston	0.17	0.18	0.20	Yes
Harris	0.14	0.14	0.16	Yes
Montgomery	0.16	0.16	0.18	Yes

CHAPTER 5: WEIGHT OF EVIDENCE

5.1 INTRODUCTION

The corroborative analyses presented in this chapter demonstrate the progress that the Houston-Galveston-Brazoria (HGB) 2008 ozone National Ambient Air Quality Standard (NAAQS) nonattainment area is making towards attainment of the 75 parts per billion (ppb) standard. This corroborative information supplements the photochemical modeling analysis presented in Chapter 3: *Photochemical Modeling*. The United States Environmental Protection Agency's (EPA) *Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone $PM_{2.5}$ and Regional Haze* (EPA, 2018; hereafter referred to as the EPA modeling guidance states that all modeled attainment demonstrations (AD) should include supplemental evidence that the conclusions derived from the basic attainment modeling are supported by other independent sources of information. This chapter details the supplemental evidence, i.e., the corroborative analyses, for this HGB AD State Implementation Plan (SIP) revision.

This chapter describes analyses that corroborate the conclusions of Chapter 3. First, information regarding trends in ozone and ozone precursors in the HGB nonattainment area is presented. Analyses of ambient data corroborate the modeling analyses and independently support the AD. An overview is provided of trends in background ozone levels transported into the HGB 2008 ozone NAAQS nonattainment area, in ozone chemistry, and in meteorological influences on ozone. More detail on ozone and emissions in the HGB 2008 ozone NAAQS nonattainment area is provided in Appendix B: *Conceptual Model for the Houston-Galveston-Brazoria Nonattainment Area for the 2008 Eight-Hour Ozone National Ambient Air Quality Standard*. Second, this chapter describes air quality control measures that are not quantified but are nonetheless expected to yield tangible air quality benefits, even though they were not included in the AD modeling discussed in Chapter 3.

5.2 ANALYSIS OF AMBIENT TRENDS AND EMISSIONS TRENDS

EPA modeling guidance states that examining recently observed air quality and emissions trends is an acceptable method to qualitatively assess progress toward attainment. Declining trends in observed concentrations of ozone and its precursors and emissions, past and projected, are consistent with progress toward attainment. The strength of evidence produced by emissions and air quality trends is increased if an extensive monitoring network exists.

Eight counties in the HGB area were designated as nonattainment: Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller. The HGB 2008 ozone NAAQS nonattainment area is located on the coast of Texas and has exhibited a steadily increasing population, which was over 7.3 million in 2022 (Census Bureau 2022). The area has an extensive continuous air monitoring station (CAMS) network and as of 2022 has 21 regulatory ozone monitors, 21 nitrogen oxides (NO_x) monitors, and 16 automated gas chromatograph (auto-GC) for monitoring volatile organic compounds (VOC). Details for these monitors are listed in Table 5-1: *Monitor Information for the HGB 2008 Ozone NAAQS Nonattainment Area*. Only regulatory ozone monitors are displayed in the table. More detail on monitors, monitor locations, and other parameters measured per monitor can be found on the Texas Commission

on Environmental Quality (TCEQ) Air Monitoring Sites webpage.[28] Monitors will be referenced by their monitor abbreviation for the rest of the section. Ozone data used for the analysis presented in this chapter are only from regulatory monitors that report to EPA's Air Quality System (AQS), which has been quality assured by EPA. All other pollutant data are from Texas Air Monitoring Information System (TAMIS) unless otherwise noted.

Table 5-1: Monitor Information for the HGB 2008 Ozone NAAQS Nonattainment Area

Monitor Name	Abbreviation	AQS No.	CAMS No.	Compounds or Parameters Measured
Manvel Croix Park	Manvel	480391004	0084	Ozone, NO_x
Lake Jackson	Lake Jackson	480391016	1016	Ozone, NO_x, VOC
Oyster Creek	Oyster Creek	480391607	1607	NO_x, VOC
Texas City 34th Street	Texas City	481670056	0620	NO_x, VOC
Galveston 99th Street	Galveston	481671034	1034	Ozone, NO_x
Houston Aldine	Aldine	482010024	0008, 0108, 0150	Ozone, NO_x
Channelview	Channelview	482010026	0015, 0115	Ozone, NO_x, VOC
Northwest Harris County	NW Harris	482010029	0026, 0110, 0154	Ozone, NO_x
Channelview Drive Water Tower	CView Water Tower	482010036	1036	VOC
Houston North Wayside	North Wayside	482010046	0405, 1033	Ozone
Lang	Lang	482010047	0408	Ozone, NO_x
Houston Croquet	Croquet	482010051	0409	Ozone
Houston Bayland Park	Bayland Park	482010055	0053, 0146, 0181	Ozone, NO_x
Galena Park	Galena Park	482010057	0167, 1667	VOC
Houston Monroe	Monroe	482010062	0406	Ozone
Houston Westhollow	Westhollow	482010066	0410, 3003	Ozone
Milby Park	Milby Park	482010069	0169	VOC
Manchester East Avenue N	Manchester	482010307	1029	VOC
Park Place	Park Place	482010416	0416	Ozone, NO_x
Houston Harvard Street	Harvard	482010417	0417	Ozone, NO_x
Wallisville Road	Wallisville	482010617	0617	NO_x, VOC
HRM #3 Haden Rd	HRM 3	482010803	0114, 0603	NO_x, VOC

[28] https://www.tceq.texas.gov/airquality/monops/sites/air-mon-sites

Monitor Name	Abbreviation	AQS No.	CAMS No.	Compounds or Parameters Measured
HRM 7 Baytown	HRM 7	482010807	0607	VOC
Lynchburg Ferry	Lynchburg	482011015	0165, 1015	Ozone, NO_x, VOC
Baytown Garth	Garth	482011017	1017	Ozone
Houston East	Houston East	482011034	0001	Ozone, NO_x
Clinton	Clinton	482011035	0055, 0113, 0304, 0403	Ozone, NO_x, VOC
Houston Deer Park #2	Deer Park	482011039	0035, 0139, 0235, 1001, 3000	Ozone, VOC
Seabrook Friendship Park	Seabrook	482011050	0045	Ozone, NO_x
Houston North Loop	North Loop	482011052	1052	NO_x
Houston Southwest Freeway	Southwest Freeway	482011066	1066	NO_x
HRM 16-Deer Park	HRM 16	482011614	1614	VOC
Cesar Chavez	Cesar Chavez	482016000	0175, 1020	VOC
Conroe Relocated	Conroe	483390078	0078	Ozone, NO_x

This section examines ambient concentrations and precursor emissions trends from the extensive ozone and ozone-precursor monitoring network. Appendix B provides additional details on ozone formation in the region. Results from this section show declining ozone trends despite a continuous increase in the population of the HGB 2008 ozone NAAQS nonattainment area, growth in vehicle miles traveled (VMT), and steady to increasing trends in NO_x and VOC.

5.2.1 Ozone Trends

Because ozone varies both temporally and spatially, there are several ways that trends in ozone concentrations are analyzed. For this analysis, TCEQ examined trends in ozone design value, fourth-highest eight-hour ozone concentrations, and background ozone to assess progress towards attainment.

5.2.1.1 Ozone Design Value Trends

A design value is the statistic used to determine compliance with the NAAQS (40 CFR §50.15(b); 40 CFR Part 50, Appendix P). For the 2008 eight-hour ozone NAAQS, design values are calculated by averaging fourth-highest daily maximum eight-hour average (MDA8) ozone values at each regulatory monitor over three years. The eight-hour ozone design value for a metropolitan area is the maximum design value from all the area's regulatory monitors' individual design values. Design values of 76 ppb and greater exceed the 2008 eight-hour ozone NAAQS.

Figure 5-1: *Eight-Hour Ozone Design Values in the HGB 2008 Ozone NAAQS Nonattainment Area* shows that design values have decreased in the HGB 2008 ozone

NAAQS nonattainment area. The 2022 eight-hour ozone design value for the area is 78 ppb. This design value represents an 11% decrease from the 2012 design value of 88 ppb. Ozone decreases may be due to changes in any or all of the factors that drive ozone formation: meteorology, background ozone, and/or emissions. The largest design value decrease occurred from 2013 through 2014, when the eight-hour ozone design value dropped by 7 ppb.

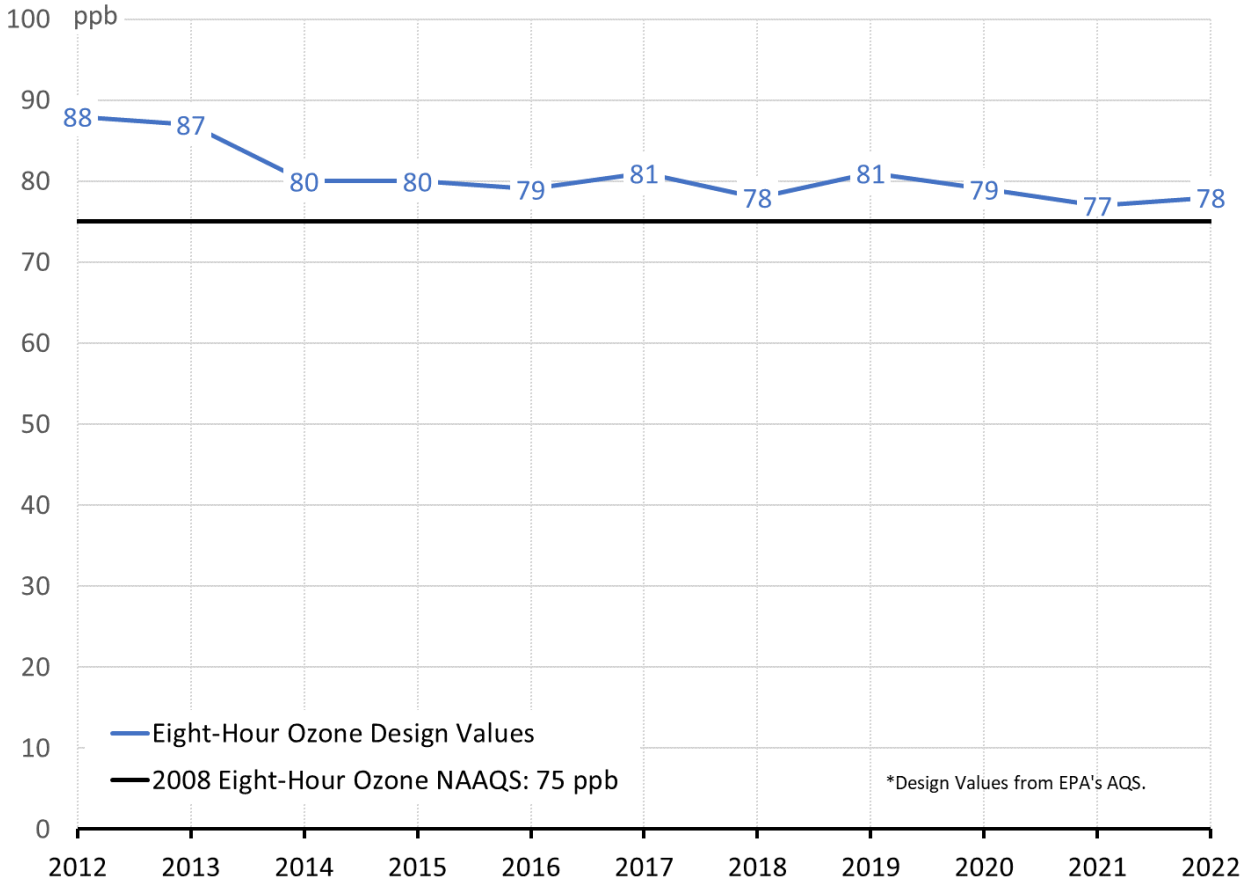

Figure 5-1: Eight-Hour Ozone Design Values in the HGB 2008 Ozone NAAQS Nonattainment Area

Because ozone levels vary spatially, it is also prudent to investigate trends at all monitors in an area. Figure 5-2: *Eight-Hour Ozone Design Values by Monitor in the HGB 2008 Ozone NAAQS Nonattainment Area* displays the eight-hour design values from 2012 through 2022 at each regulatory monitor in the area. The individual monitors' trends are less important for assessing trends than the overall range in design values across the area. Figure 5-2 demonstrates that design values have been decreasing across the HGB 2008 ozone NAAQS nonattainment area and not only at the monitor with the highest design value. As of 2022, only one monitor in the area, Bayland Park, measures above the 2008 eight-hour ozone NAAQS.

Figure 5-2 also shows how the monitor with the highest eight-hour ozone design value in the HGB 2008 ozone NAAQS nonattainment area has changed over time. From 2012 through 2015, Manvel observed eight-hour ozone design values several ppb higher

than other monitors. From 2016 to 2020, the highest design value was at Aldine. Bayland Park observed the highest design value in 2021 and 2022. Most years show a difference of several ppb between the maximum design value and the second highest design value.

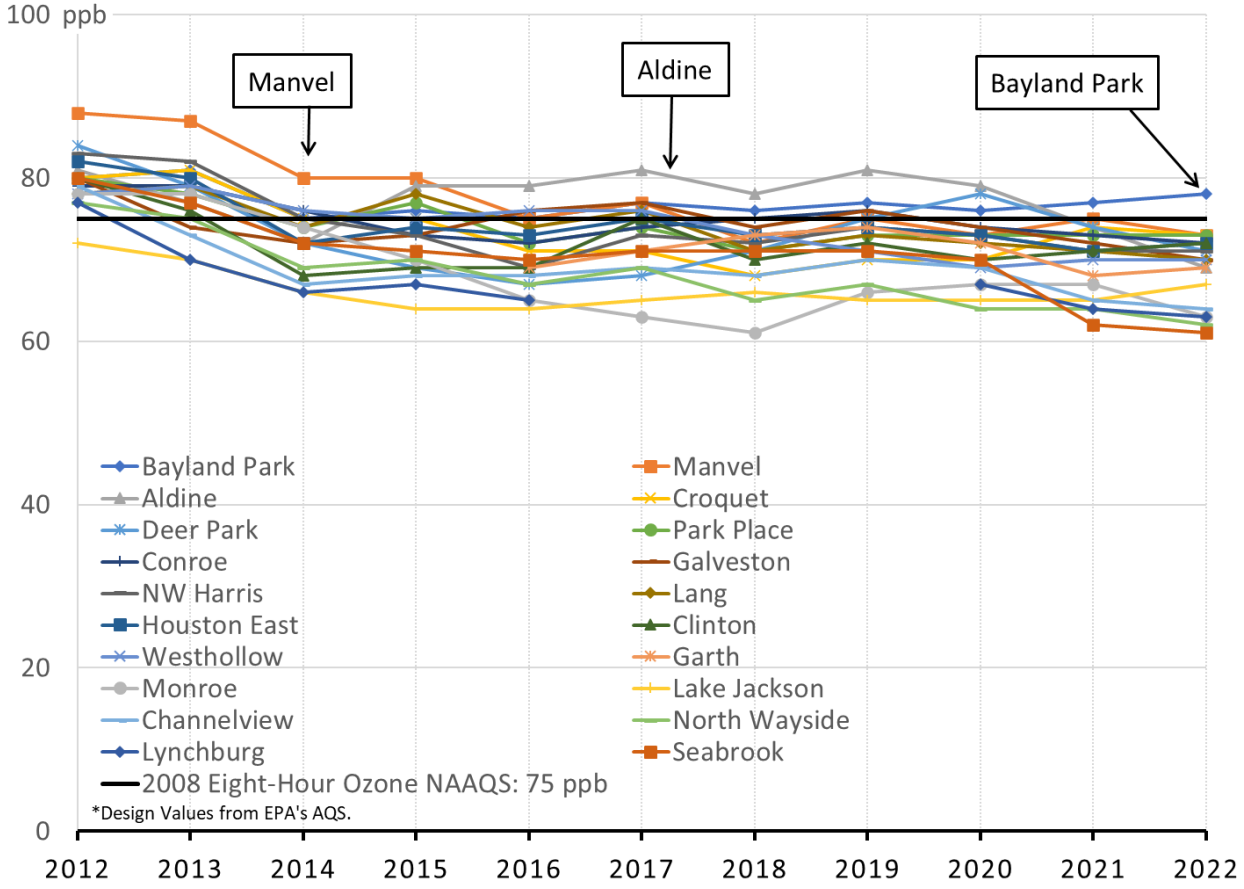

Figure 5-2: Eight-Hour Ozone Design Values by Monitor in HGB 2008 Ozone NAAQS Nonattainment Area

Displaying regulatory monitor level eight-hour ozone design values on a map can give better insight into ozone formation patterns. Kriging interpolation was used to determine the spatial variation of eight-hour ozone design values across the area for 2012, 2017, and 2022. The maps of those values for three different years are displayed in Figure 5-3: *Eight-Hour Ozone Design Value Maps for the HGB 2008 Ozone NAAQS Nonattainment Area.*[29] Only the monitors with the maximum eight-hour ozone design value for each year are labeled on the maps. The maps demonstrate how much eight-hour ozone design values have decreased across the entire HGB 2008 ozone NAAQS

[29] Disclaimer: Maps in this document were generated by the Air Quality Division of the Texas Commission on Environmental Quality. The products are for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. They do not represent an on-the-ground survey and represent only the approximate relative location of property boundaries. For more information concerning these maps, contact the Air Quality Division at 512-239-1459.

nonattainment area. In 2012, only one monitor was below the 2008 ozone NAAQS, but by 2022 only one monitor was above the 2008 ozone NAAQS of 75 ppb.

In addition to the level of the design values, the maps also illustrate the changing location of the minimum and maximum eight-hour ozone design values. The monitor with the maximum design value in 2012, Manvel, is located southwest of the Houston Ship Channel, an area with a large amount of industrial activity. In 2016, the maximum design value was located at Aldine, located north of the Houston Ship Channel. In 2021, the maximum eight-hour ozone design value was located at Bayland Park, north of Manvel and west of the Houston Ship Channel. The location of the minimum eight-hour ozone design value has also changed; however, lower design values for all three of the years shown are observed to the south and in the east central portion of the area. In 2012, higher ozone design values were observed in areas closer to the Houston Ship Channel, such as Deer Park. Design values near the ship channel were much lower in 2017 and 2022, with low design values at Monroe and Lynchburg in 2017 and at Seabrook in 2022. The spatial patterns from 2012, 2017, and 2022 seem consistent with wind flows in the area and ozone formation dynamics, with lower values observed either upwind or closer to emissions sources and high values observed downwind.

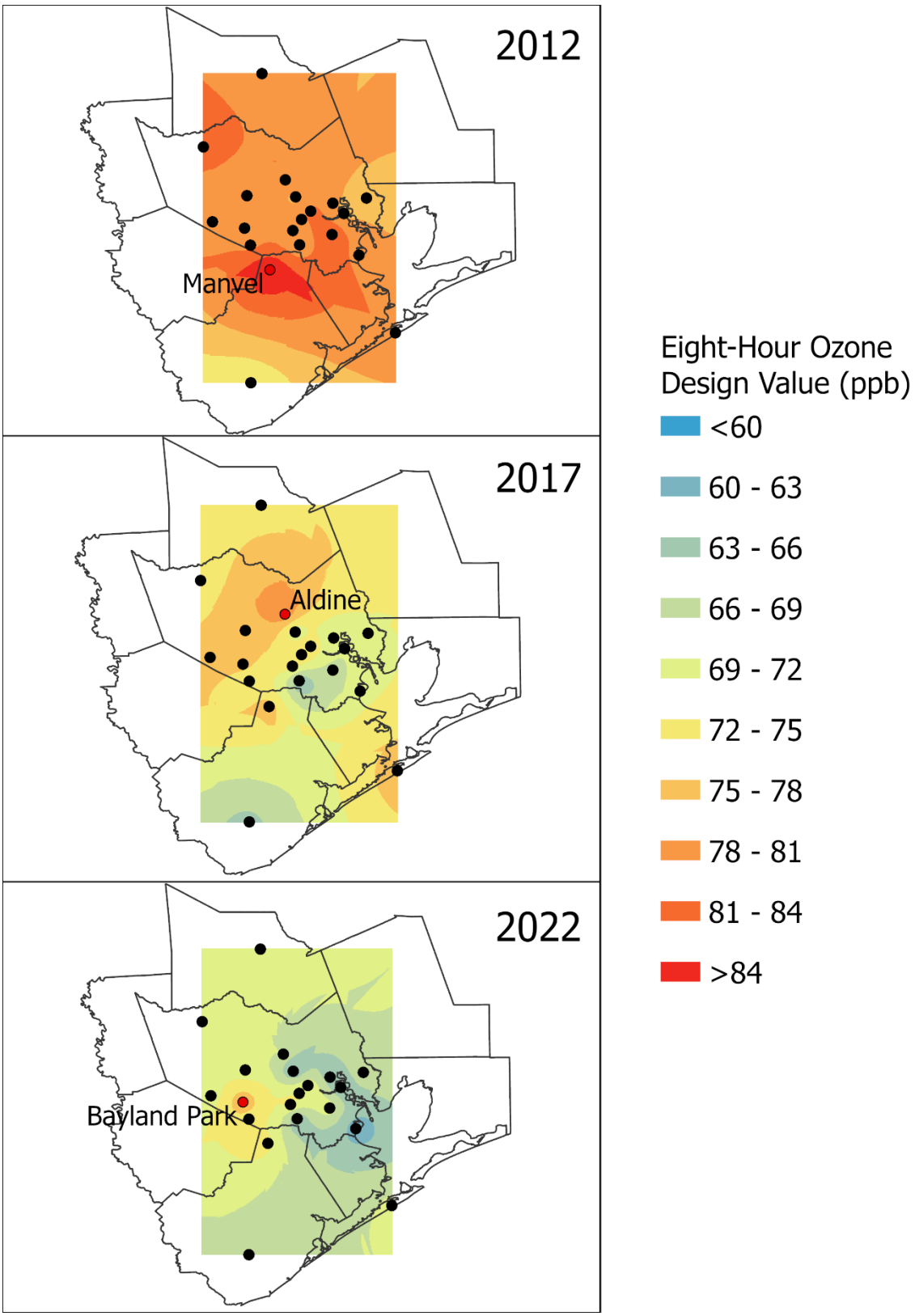

Figure 5-3: Eight-Hour Ozone Design Value Maps for the HGB 2008 Ozone NAAQS Nonattainment Area

5.2.1.2 Fourth-Highest Eight-Hour Ozone Trends

Because eight-hour ozone design values are three-year averages, trends tend to be smoother, making year-to-year variations in ozone concentrations due to factors such as meteorology less apparent. Trends in the yearly fourth-highest MDA8 ozone concentrations provide more insight into each individual year.

Area-wide fourth-highest MDA8 ozone trends would not be instructive because design values are calculated on a per monitor basis. Instead, fourth-highest MDA8 ozone trends are investigated at each regulatory monitor. Figure 5-4: *Fourth-Highest MDA8 Ozone Concentration by Monitor in the HGB 2008 Ozone NAAQS Nonattainment Area* shows data from 2010 through 2022 to examine all years used in 2012 through 2022 design value computations.

Trends show that there is more variability present in fourth-highest MDA8 ozone values compared to design values. Most monitors showed an overall decrease in fourth-highest MDA8 ozone from 2010 through 2022, except for Bayland Park and Westhollow, which showed an increase. Most of those decreases occurred prior to 2014. In 2022, Bayland Park measured the highest fourth-highest MDA8 ozone since 2010. Several of the highest ozone days at Bayland Park are currently under investigation as exceptional events. More details are available in Chapter 6: *Ongoing and Future Initiatives*.

The monitor with the maximum fourth-highest MDA8 ozone concentration changes from year to year and is not always the same as the monitor with the areawide maximum design value. This indicates that overall, ozone in the area is not changing very much and that changes at individual monitors are likely due to changes in shifting wind directions on high ozone days rather than changes in emissions.

For most years, individual monitors did not exhibit similar trends to each other, meaning that different monitors may have had increasing or decreasing fourth-highest MDA8 ozone values from year to year. This indicates that there may be other local factors in addition to meteorological variability that are influencing ozone concentrations. In 2014 and 2015, almost all monitors exhibit similar trends, with values decreasing area-wide in 2014 and increasing area-wide in 2015. This indicates that ozone concentrations in 2014 and 2015 may be strongly influenced by non-local factors such as meteorology. Another notable year in the trend is 2020. Although 2020 did not observe fourth-highest MDA8 ozone values as low as those in 2014, they were still lower than more recent years.

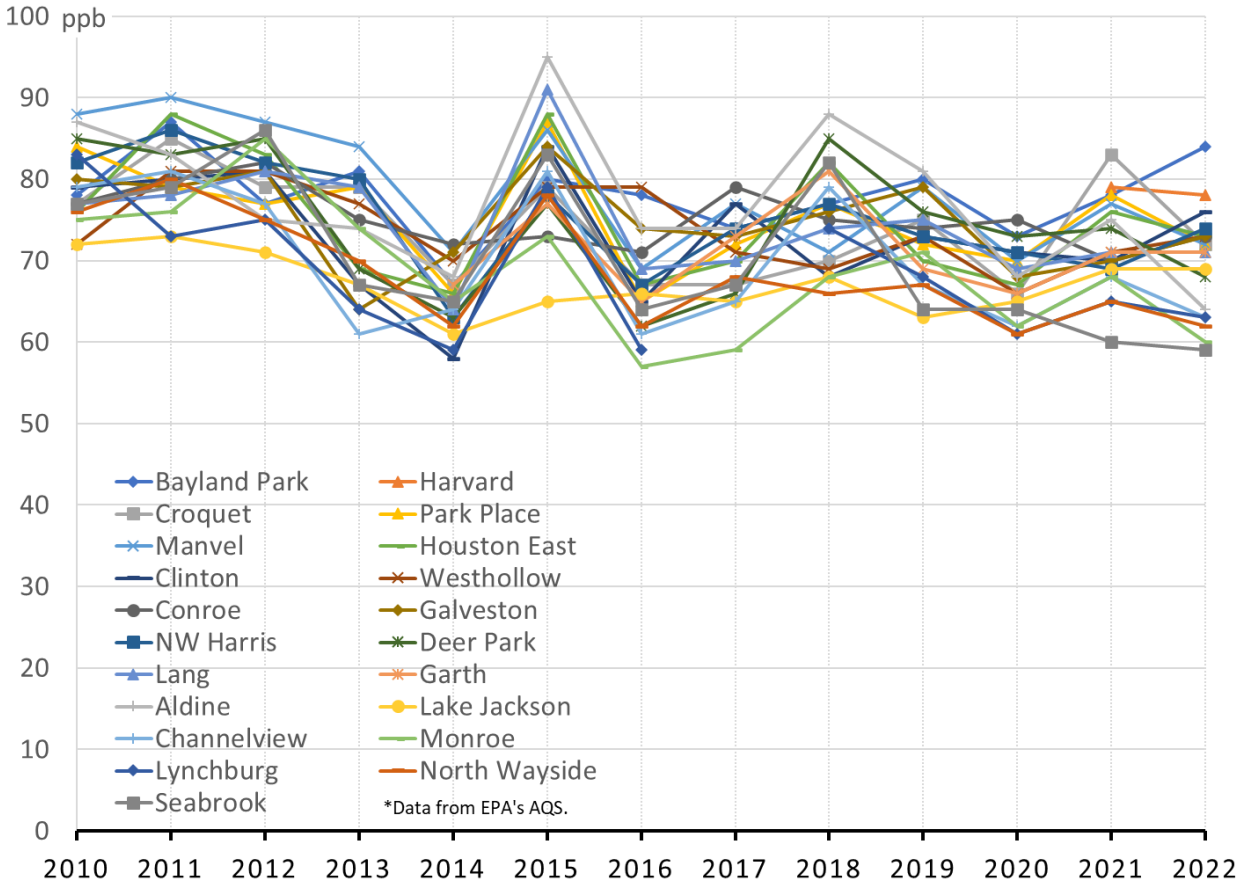

Figure 5-4: Fourth-Highest MDA8 Ozone Concentrations by Monitor in the HGB 2008 Ozone NAAQS Nonattainment Area

5.2.1.3 Background Ozone Trends

Regional background ozone, which will be referred to as background ozone for the remainder of this section, reflects the ozone produced from all sources outside of the eight-county HGB 2008 ozone NAAQS nonattainment area. Examination of background ozone trends provide insight into whether observed ozone changes are from locally produced ozone or from transported ozone. The technique for estimating background ozone concentrations is detailed in Appendix B. The technique uses the lowest MDA8 ozone value from selected sites, which are typically located on the outskirts of the nonattainment area, to determine the background ozone concentrations.

Locally produced ozone (within the HGB 2008 ozone NAAQS nonattainment area) was calculated by subtracting the background ozone concentration from the highest MDA8 ozone value for the area. Results were then separated into low ozone days and high ozone days to investigate if high ozone is due to changes in background ozone or changes in local ozone. For this analysis, high ozone days are any day with a MDA8 ozone value greater than 75 ppb. Low ozone days are any day with a MDA8 ozone value less than or equal to 75 ppb.

Although the HGB 2008 ozone NAAQS nonattainment area has a year-round ozone season, no high ozone days occurred outside of the months of March through October

from 2012 through 2022. To focus on months that observe the highest eight-hour ozone concentrations, this analysis uses ozone data from only the months of March through October. These months will be referred to as ozone season for the rest of this chapter.

Figure 5-5: *Ozone Season Trends in MDA8 Ozone, Background Ozone, and Locally Produced Ozone for High versus Low Ozone Days in the HGB 2008 Ozone NAAQS Nonattainment Area* shows that the area-wide median background ozone is 27 ppb on low ozone days and 48 ppb on high ozone days. Although background ozone is higher on high ozone days, local ozone production also increases at a proportional rate on these days. For both high and low ozone days, background ozone accounts for approximately 60% of the MDA8 ozone and locally produced ozone accounts for approximately 40% of the MDA8 ozone. Background ozone, MDA8 ozone, and locally produced ozone have shown slight increases on low ozone days. On high ozone days, background ozone concentrations have decreased, and locally produced ozone concentrations have increased, resulting in a flat MDA8 ozone trend.

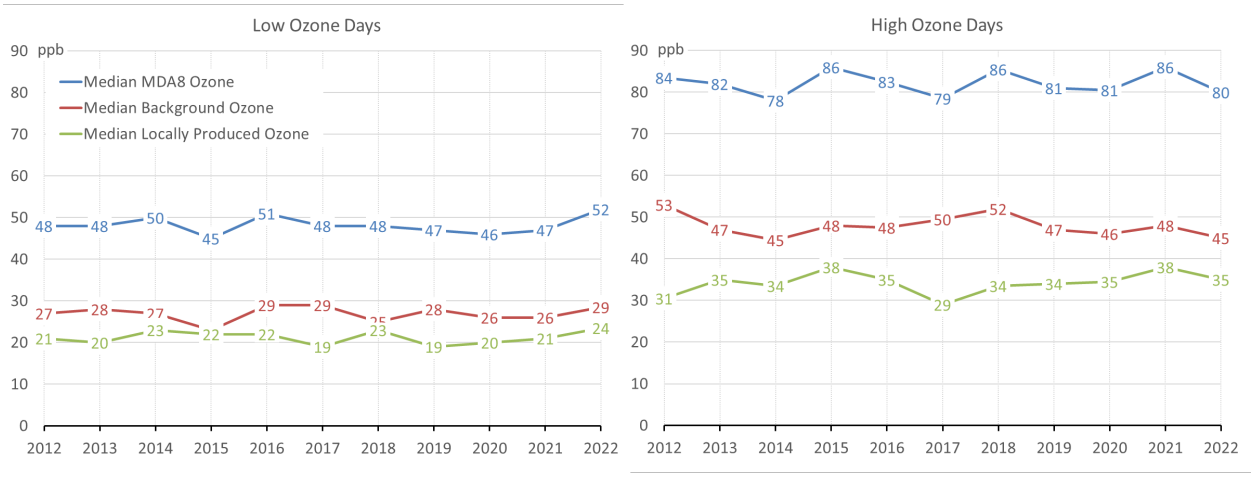

Figure 5-5: Ozone Season Trends in MDA8 Ozone, Background Ozone, and Locally Produced Ozone for High versus Low Ozone Days in the HGB 2008 Ozone NAAQS Nonattainment Area

5.2.2 NO_X Trends

NO_X, a precursor to ozone formation, is a mixture of nitrogen oxide (NO) and nitrogen dioxide (NO_2). NO_X is primarily emitted by fossil fuel combustion, lightning, biomass burning, and soil. Examples of common NO_X emission sources in urban areas are automobiles, diesel engines, other small engines, residential water heaters, industrial heaters, flares, and industrial and commercial boilers. Mobile, residential, and commercial NO_X sources are usually numerous smaller sources distributed over a large geographic area, while industrial sources are usually large point sources, or numerous small sources, clustered in a small geographic area. Because of the large number of NO_X sources, elevated ambient NO_X concentrations can occur throughout the HGB 2008 ozone NAAQS nonattainment area.

Because NO_X reacts in the presence of sunlight, NO_X concentrations tend to be lower in the summer and higher in the winter. To focus on NO_X values that lead to ozone

formation, this analysis used only NO_X concentrations that occurred during the ozone season, from March through October.

There have been 25 NO_X monitors in operation in the HGB 2008 ozone NAAQS nonattainment area at some point from 2012 through 2022, however, only 19 were used to calculate area-wide NO_X trends due to incomplete data at the other monitors.

Only monitors that had eight or more valid years of data for the ozone seasons from 2012 through 2022 were used in this analysis. A year was considered valid if there were at least 75% valid days of NO_X data during the ozone season and a day was considered valid if there were at least 75% of valid hours of NO_X data recorded for that day. Out of the 25 NO_X monitors in operation from 2012 through 2022, only 19 were used to calculate area-wide NO_X trends. The NO_X monitors not included in the area-wide trends due to incomplete data were Mustang Bayou, Oyster Creek, Houston Texas Avenue, Harvard, Deer Park, and North Loop.

All valid hours and years of ozone season NO_X data were used to calculate the yearly median and 95th percentile NO_X trends shown in Figure 5-6: *Ozone Season NO_X Trends in the HGB 2008 Ozone NAAQS Nonattainment Area*. Overall, from 2012 through 2022, 95th percentile NO_X showed an increase of 2% (numbers in Figure 5-6 are rounded) and median NO_X showed a decrease of 4%. There were decreases for both statistics from 2012 through 2017. After 2017, NO_X trends flattened. There is a low for both 95th percentile and median NO_X in 2020 but NO_X concentrations increased in subsequent years. More detailed analysis of NO_X trends, including monitor level trends, is available in Appendix B.

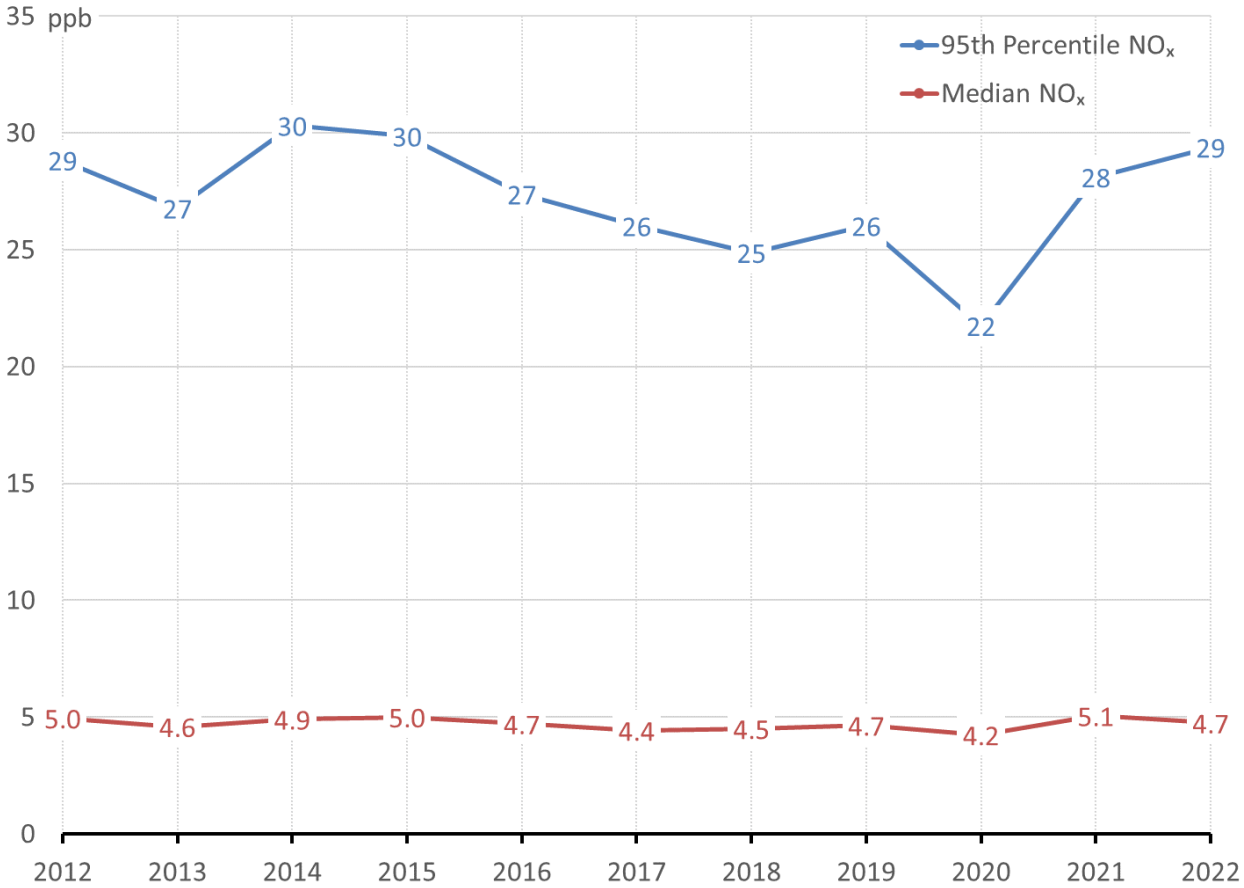

Figure 5-6: Ozone Season NO_x Trends in the HGB 2008 Ozone NAAQS Nonattainment Area

From the late 1990s to the present, federal, state, and local measures have resulted in significant NO_x reductions from on-road and non-road sources within the HGB 2008 ozone NAAQS nonattainment area. The TCEQ funded a study by the Texas A&M Transportation Institute (TTI) to estimate on-road emissions trends throughout Texas from 1999 through 2050 using the 2014a version of the Motor Vehicle Emission Simulator (MOVES2014a) model (TTI, 2015). On-road emissions in the HGB 2008 ozone NAAQS nonattainment area were estimated to decrease significantly from 1999 through 2022 and beyond, even as daily VMT is estimated to have increased. This reduction in on-road NO_x is projected to continue as older, higher-emitting vehicles are removed from the fleet and are replaced with newer, lower-emitting vehicles.

A similar pattern is reflected in a TCEQ non-road emissions trends analysis using the Texas NONROAD (TexN) model. Non-road emissions are estimated to decrease from 1999 through 2022 and beyond even as the number of non-road engines, based on equipment population, is expected to increase. As with the on-road fleet turnover effect, reductions in non-road NO_x emissions are projected to continue as older, higher-emitting equipment is removed from the fleet and replaced with newer, lower-emitting equipment.

Point source NO_X emission trends from the State of Texas Air Reporting System (STARS) were also investigated. These emissions are from sources that meet the reporting requirements under the TCEQ's emissions inventory rule (30 TAC §101.10). The emissions trends analysis uses 10 years of data from 2012 through 2021. Emissions from 2022 were not available in time to be included in this analysis.

Emissions trends in tons per year (tpy) by site are displayed in Figure 5-7: *HGB 2008 Ozone NAAQS Nonattainment Area Point Source NO_X Emissions by Site*. Because the area has many point sources, only the top emitters are displayed on the chart. All other point source emissions were added together and displayed as in the Sum of All Others category in the chart. Point source NO_X emission trends show that the top 10 reporting sites accounted for 52% of the total point source NO_X emissions in the HGB 2008 ozone NAAQS nonattainment area in 2021. Each of these sites reports total NO_X emissions exceeding 800 tpy in 2021. Overall trends in NO_X emissions have increased 7% from 2012 through 2021. This correlates with the ambient NO_X trends, which showed little change from 2012 through 2021.

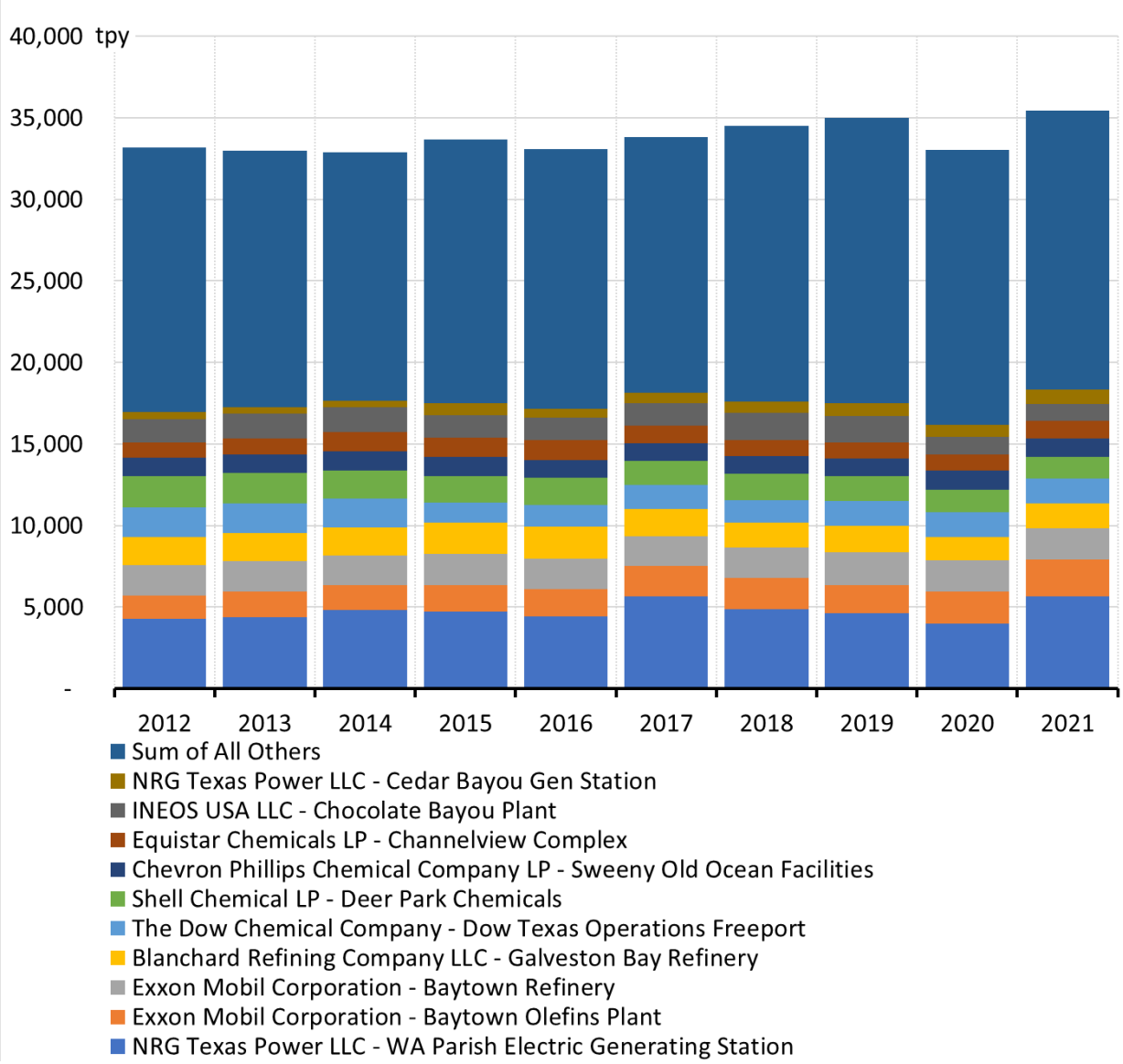

Figure 5-7: HGB 2008 Ozone NAAQS Nonattainment Area Point Source NO_x Emissions by Site

5.2.3 VOC Trends

Total non-methane organic compounds (TNMOC), which is a term used to represent total VOC concentrations, can enhance ozone production in combination with NO_x and sunlight. VOC is emitted from numerous sources including large industrial processes, automobiles, solvents, paints, dry-cleaning, fuels, and even natural sources such as trees. TNMOC is an important precursor to ozone formation, particularly in the HGB area, where the Houston Ship Channel, a large source of industrial VOC emissions, is located. Not all VOC species have the same ozone production potential. A subset of VOC called highly reactive volatile organic compounds (HRVOC) are more likely to produce large amounts of ozone. Because of their ozone formation potential, six of these HRVOC are regulated in the HGB 2008 ozone NAAQS nonattainment area. These HRVOC include ethylene, propylene, 1-butene, c-2-butene, t-2-butene, and 1,3-

butadiene. The following section will discuss trends in ambient concentrations of both TNMOC and HRVOC from the auto-GC monitors.

In addition to the 16 current auto-GC monitors, there was one auto-GC monitor, Danciger (CAMS 0618), that was in operation in 2012 but ceased operations prior to 2022; this monitor was included in the analysis for a total of 17 monitors. To remove effects of incomplete data on VOC trends, the data were first checked for validity. Only monitors that had eight or more valid years of data for the ozone season from 2012 through 2022 were used in this analysis. A year was considered valid if there were at least 75% valid days of data during the ozone season and a day was considered valid if there were at least 75% of valid hours of data recorded for that day. Out of the 16 auto-GC monitors in operation from 2012 through 2022, only 11 (including Danciger) were used to calculate area-wide TNMOC and HRVOC trends. The auto-GC monitors not included in the area-wide trends due to incomplete data were Oyster Creek, CView Water Tower, Manchester, Galena Park, HRM 7, and HRM 16.

All valid hours and years of ozone season data were used to calculate yearly median and 95th percentile TNMOC and HRVOC trends. Ozone season trends for ambient TNMOC and HRVOC concentrations are presented in Figure 5-8: *Ozone Season Median and 95th Percentile TNMOC and HRVOC Trends in the HGB 2008 Ozone NAAQS Nonattainment Area*. TNMOC and HRVOC are displayed on different scales due to their differing units of measurement. TNMOC is recorded in parts per billion carbon (ppbC) and HRVOC is recorded in parts per billion by volume (ppbV), more commonly referred to as ppb.

The 95th percentile TNMOC and HRVOC levels decreased from 2012 through 2022 by 15% and 12%, respectively. Median values show more variability between TNMOC and HRVOC, with a decrease of 12% in median TNMOC and an increase of 10% in median HRVOC. Most decreases occurred prior to 2017. Although most statistics showed overall decreases, there were large increases that occurred in 2021. The high values observed in 2021 appeared to have decreased in 2022. More detailed VOC and HRVOC trends, including monitor level trends, are available in Appendix B.

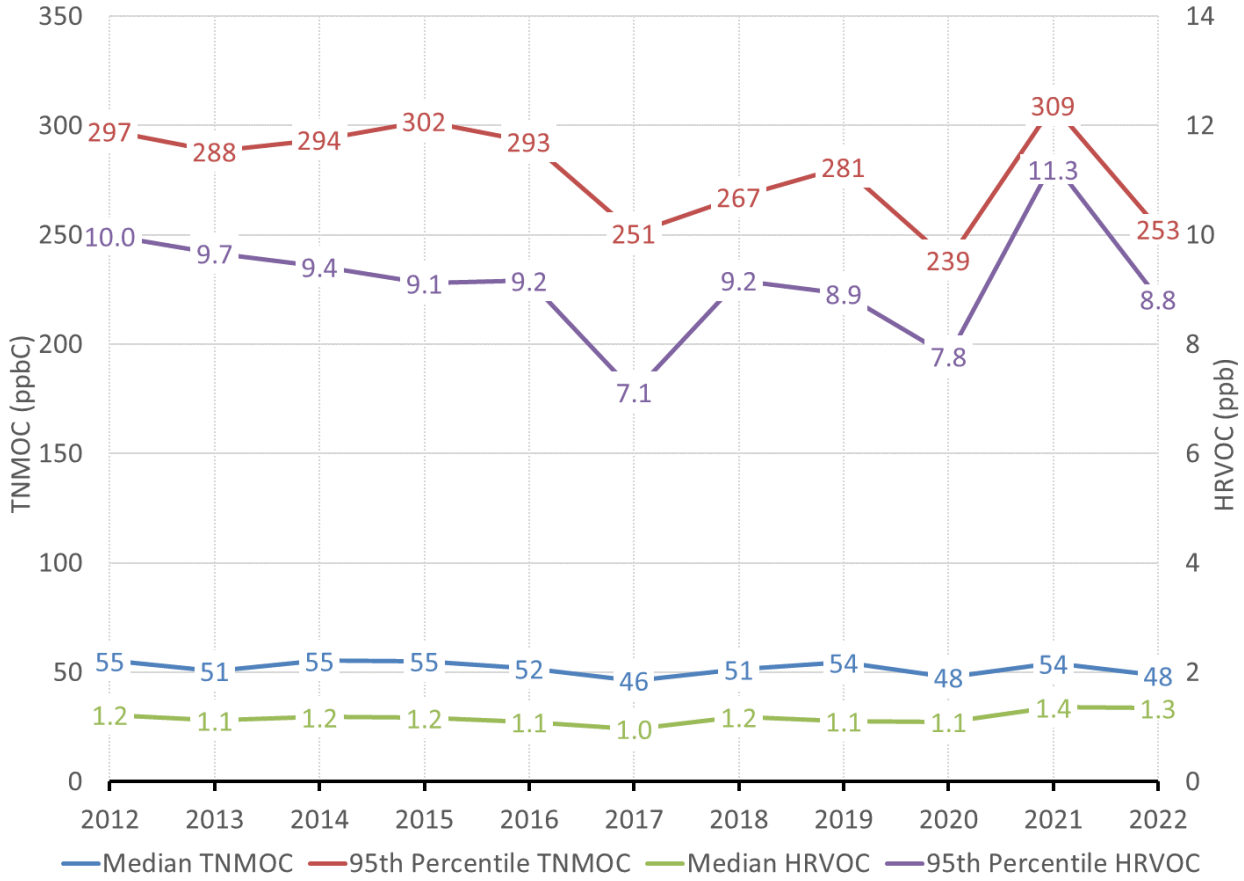

Figure 5-8: Ozone Season Median and 95th Percentile TNMOC and HRVOC Trends in the HGB 2008 Ozone NAAQS Nonattainment Area

From the late 1990s to the present, federal, state, and local measures have resulted in VOC reductions from on-road and non-road sources within the HGB 2008 ozone NAAQS nonattainment area. The TCEQ studies mentioned in Section 5.2.2: *NO_X Trends* showed decreases in on-road and non-road VOC from 1999 through the present as well. These reductions are projected to continue as older, higher-emitting vehicles and equipment are removed from the fleet and replaced with newer, lower-emitting ones.

Point source VOC and HRVOC emission trends from STARS were also investigated. Figure 5-9: *HGB 2008 Ozone Nonattainment Area Point Source VOC Emissions by Site* shows that the top 11 reporting sites accounted for 41% of the total HGB 2008 ozone nonattainment area point source VOC emissions in 2021. Each of these sites reported total VOC emissions exceeding 500 tpy in 2021. Overall, VOC emissions are decreasing, with a 14% decrease from 2012 through 2021, though the 11 sites with the largest VOC emissions showed almost no change. Trends from the top 11 VOC sources corroborate ambient VOC trends, but overall trends in VOC emissions show more decline when compared to ambient TNMHC trends.

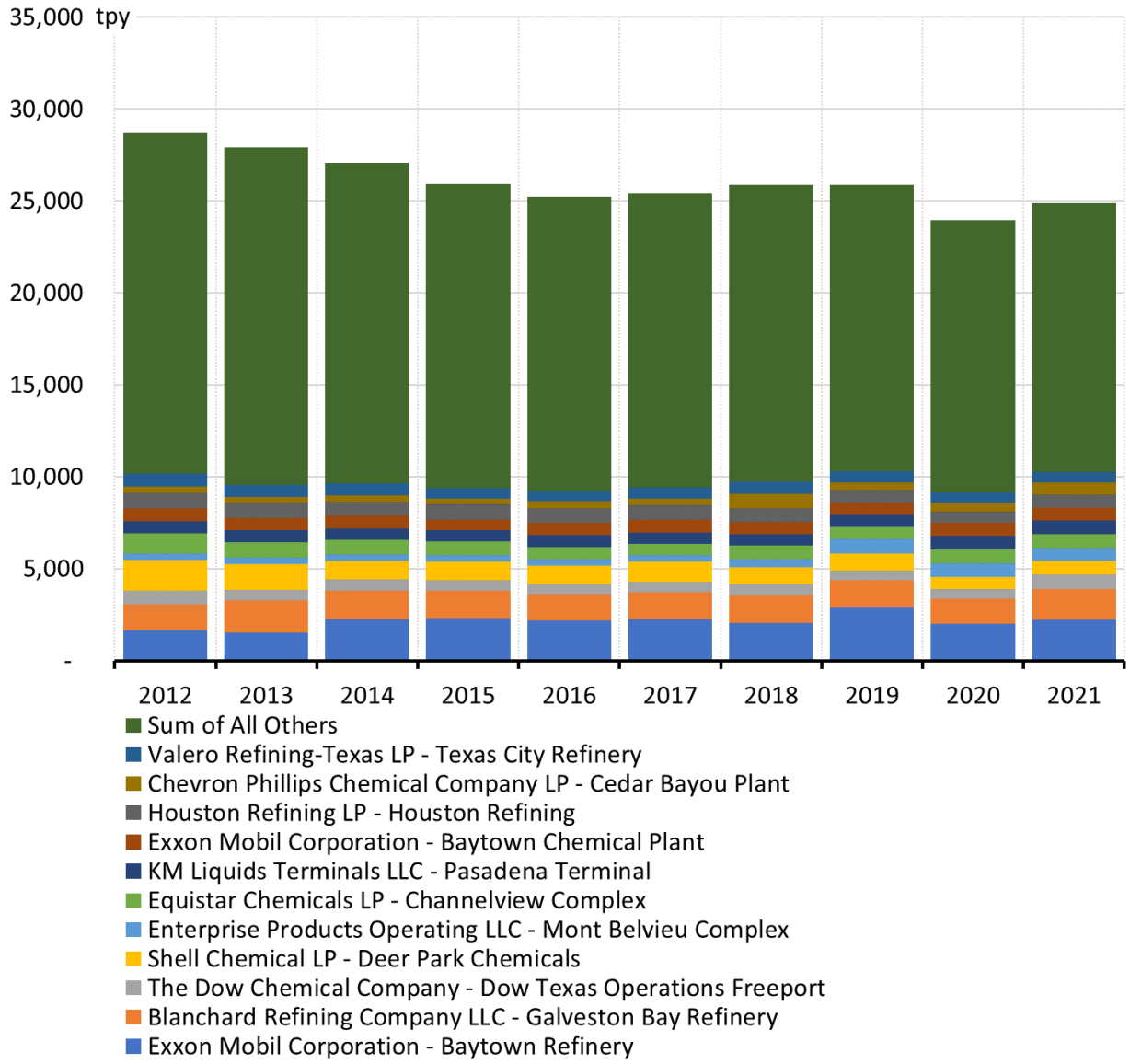

Figure 5-9: HGB 2008 Ozone Nonattainment Area Point Source VOC Emissions by Site

Figure 5-10: *HGB 2008 Ozone Nonattainment Area Point Source HRVOC Emissions by Site* shows that the top nine reporting sites accounted for 51% of the total HGB 2008 ozone NAAQS nonattainment area point source HRVOC emissions in 2021. Each of these sites reports total HRVOC emissions exceeding 100 tpy in 2021. Overall, HRVOC emissions decreased 3% from 2012 through 2021, with increases occurring after 2013. The top nine sources had a 3% increase in HRVOC emissions over that same time. This correlates with the ambient HRVOC trends, which show little change from 2012 through 2021.

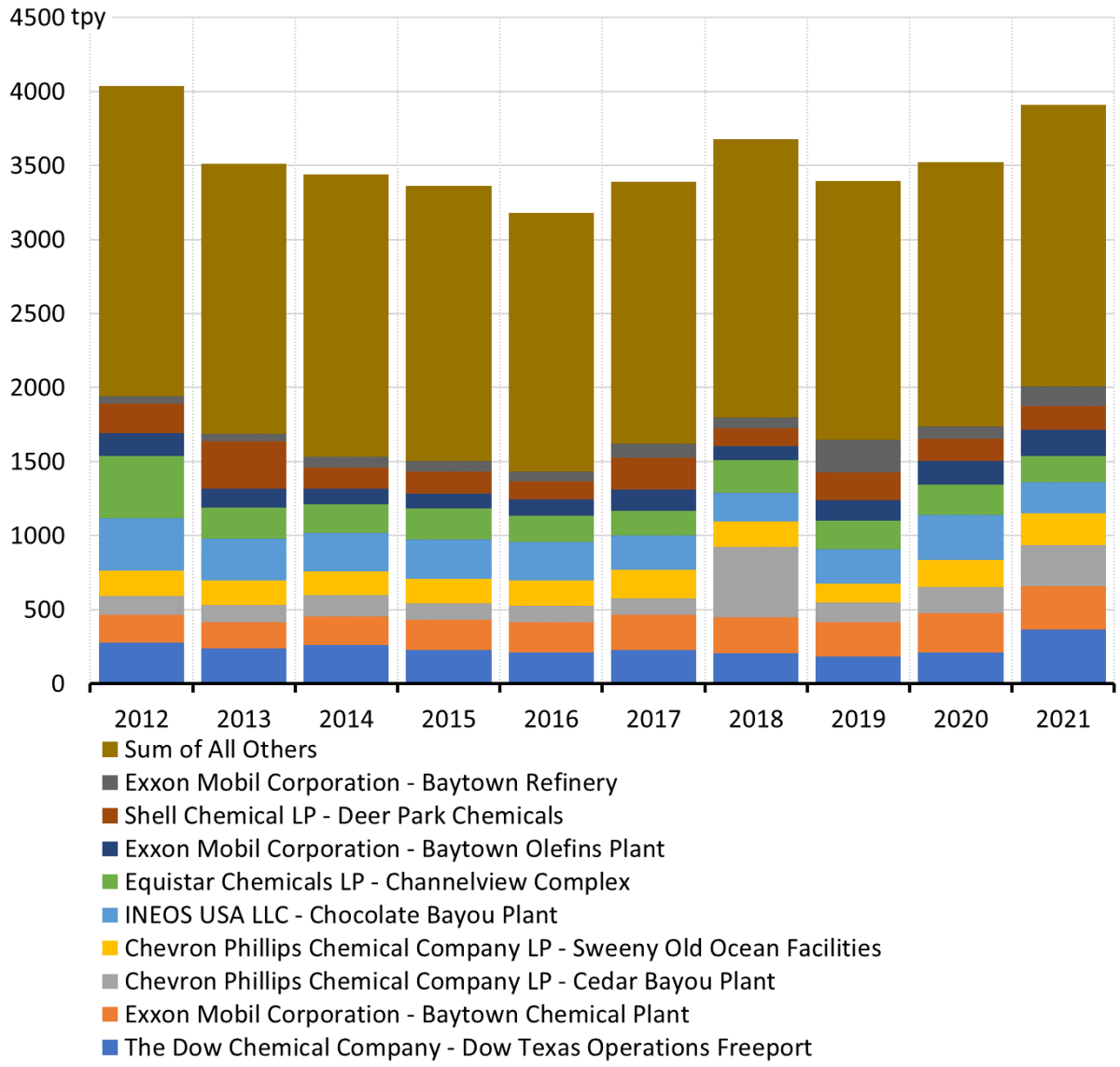

Figure 5-10: HGB 2008 Ozone Nonattainment Area Point Source HRVOC Emissions by Site

5.2.4 VOC and NO_x Limitation

Ozone is formed from the interaction of precursors (NO_x and VOC) in proportions determined by their molecular properties, therefore, unless precursors are present in these exact proportions in an airshed, ozone formation will be governed by whichever precursor is scarcer or limited. If one precursor is present in excess in the atmosphere, that excess will be unused in chemical reactions that form ozone; and ozone formation will be more dependent on the presence of the other precursor.

Because the formation of ozone is due to the interaction of these precursors, the relative proportion of VOC and NO_x in an airshed, the VOC-to-NO_x ratio, is an important indicator of the likely efficacy of different emission control strategies. The VOC or NO_x limitation of an airshed indicates how ozone will change in response to reductions of either VOC or NO_x. A NO_x limited regime occurs when the radicals from

VOC oxidation are abundant, and therefore ozone formation is more sensitive to the amount of NO_X present in the atmosphere. In these regimes, controlling NO_X would be more effective in reducing ozone concentrations. In VOC limited regimes, NO_X is abundant, and therefore ozone formation is more sensitive to the number of radicals from VOC oxidation present in the atmosphere. In VOC limited regimes, controlling VOC emissions would be more effective in reducing ozone concentrations. Areas where ozone formation is not strongly limited by either VOC or NO_X are considered transitional and controlling either VOC or NO_X emissions would reduce ozone concentrations.

VOC-to-NO_X ratios are calculated by dividing hourly TNMOC concentrations in ppbC by hourly NO_X concentrations in ppb. The value of the ratio then determines the limitation of the air mass. While ratio definitions for VOC limited, NO_X limited, or transitional atmospheric conditions vary, this analysis uses the cut points described in the EPA photochemical assessment monitoring stations (PAMS) training workshop (Hafner and Penfold, 2018). Ratios less than 5 ppbC/ppb are considered VOC limited, ratios above 15 ppbC/ppb are considered NO_X limited, and ratios between 5 ppbC/ppb and 15 ppbC/ppb are considered transitional. Calculation of VOC-to-NO_X ratios are limited by the number of collocated auto-GC and NO_X monitors in the area. In addition, auto-GC monitors are often source-oriented, and do not necessarily reflect the conditions of the whole area.

This analysis used seven monitors in the HGB 2008 ozone NAAQS nonattainment area that have collocated VOC and NO_X data: Channelview, Clinton, Lynchburg, HRM 3 (Haden Road), Wallisville, Oyster Creek, and Deer Park. These monitors do not typically measure high ozone values, meaning the VOC/NO_X ratios may not represent the chemical regime that is present at the ozone design value setting monitors. Trends at Deer Park only go through 2018, because the NO_X monitor at that site ceased operations after that year. Because Oyster Creek started operation in December 2016, trends at that monitor start in 2017. All of these monitors are in the area around the Houston Ship Channel except Oyster Creek in Brazoria County near Lake Jackson. Ratios were calculated for each hour of the day for the ozone season and then aggregated to determine the median ratio for each year. Results are shown in Figure 5-11: *Median VOC-to-NO_X Ratios During the Ozone Season in the HGB 2008 Ozone NAAQS Nonattainment Area*.

Most of these monitors show slight variations in VOC-to-NO_X ratios from year to year. Ratios at Channelview have remained in the transitional regime over the past eleven years but have trended from closer to NO_X limited in 2012 to closer to VOC limited in 2022. Lynchburg Ferry has one year that was VOC limited, 2017, which may be due to missing data and does not necessarily represent the true conditions at that monitor during that year.

HRM 3, Wallisville, and Deer Park, which are monitors near the Houston Ship Channel, show a transitional regime, so either NO_X or VOC reductions would reduce ozone concentrations. Clinton has stayed close to the threshold between VOC limited and transitional, but remained mostly in the transitional regime until 2022, when it measured in the VOC limited regime. This could be due to the monitor location on the western edge of the ship channel and close to downtown Houston. This would mean that the Clinton monitor measures more urban emissions compared to the other

monitors, which encounter more industrial emissions. The Oyster Creek Monitor measures transitional conditions but changed to NO_X limited in 2022. Since it is not close to the Houston Ship Channel or urban core, this monitor observes much lower NO_X.

This analysis indicates that monitors located near the urban core measure closer to VOC limited conditions, monitors in industrial areas measure near the mid-point of transitional conditions, and monitors in more suburban areas measure closer to NO_X limited conditions. It appears that the atmospheric chemistry surrounding many monitors in the HGB 2008 ozone NAAQS nonattainment area has not changed from 2012 through 2022. Some combination of VOC and NO_X controls would possibly be effective in reducing ozone concentrations in the HGB 2008 ozone NAAQS nonattainment area. In transitional areas, VOC or NO_X controls may not result in equal ozone reductions, one precursor may reduce ozone more than the other.

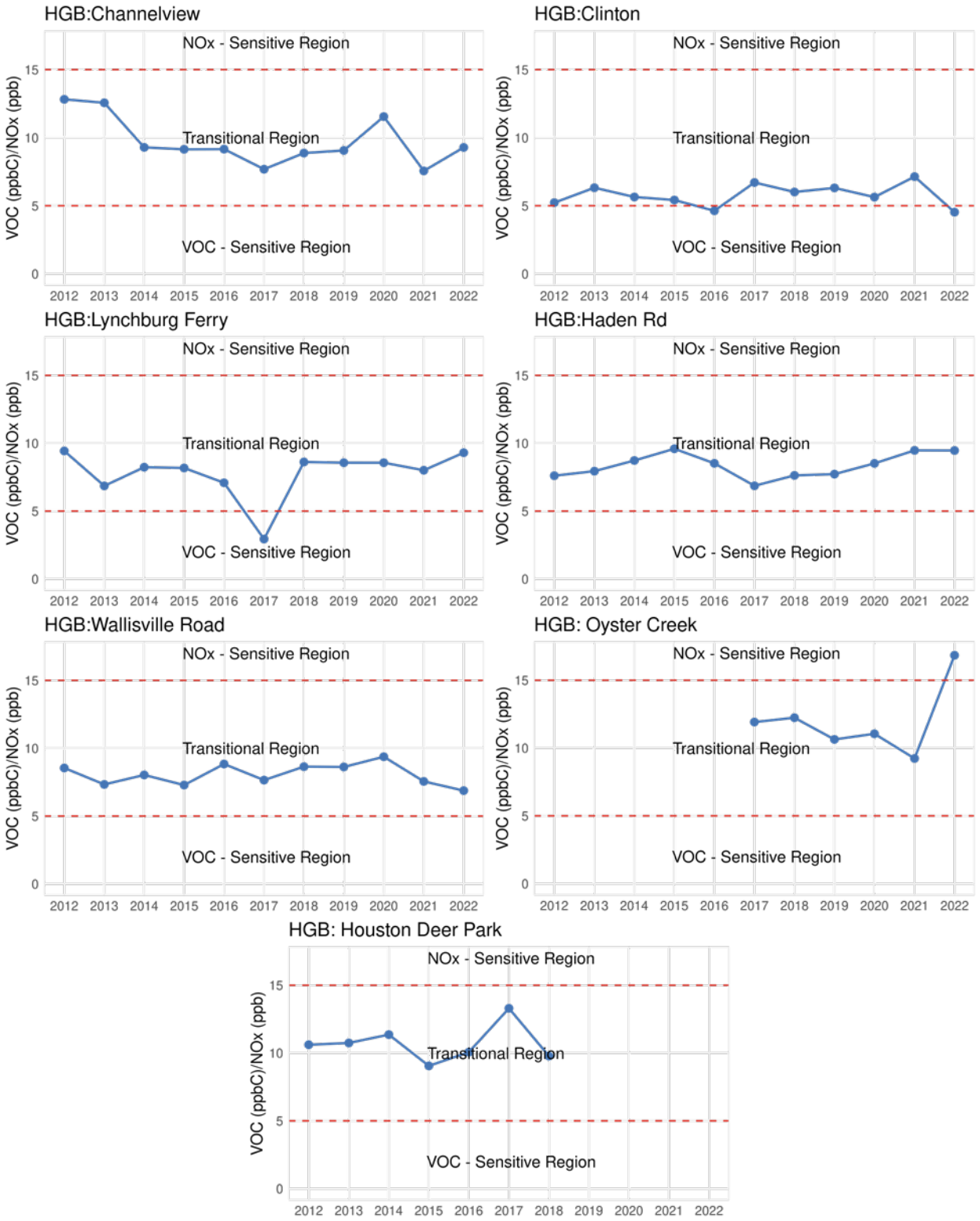

Figure 5-11: Median VOC-to-NO_x Ratios During the Ozone Season in the HGB 2008 Ozone NAAQS Nonattainment Area

5.2.4.1 Modeling Sensitivity Analysis

Photochemical modeling of the 2019 base case was performed with reduced anthropogenic VOC and NO_X emissions in and around the HGB 2008 ozone NAAQS nonattainment area to assess the impact these reduced emissions would have on the 2019 ozone Base Case Design Value (DVB). The DVB calculation and its use in an attainment test is described in Chapter 3: *Photochemical Modeling*. Figure 5-12: *Modeling Domain and Monitors for HGB 2008 Ozone NAAQS Nonattainment Area VOC and NO_X Sensitivity Analysis* shows a map with a red outline surrounding the HGB 2008 ozone NAAQS nonattainment area and parts of adjacent counties that comprises the modeling domain, with the various monitors used for this analysis represented as circles within the modeling domain. Anthropogenic emissions of VOC and NO_X across this modeling domain were reduced by 20% relative to emissions in each grid cell for the sensitivity analysis.

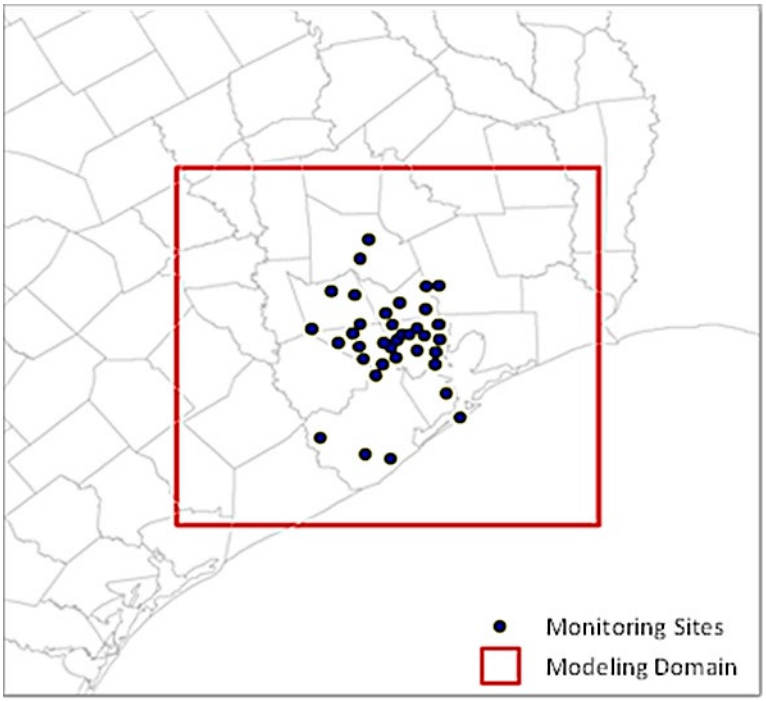

Figure 5-12: Modeling Domain and Monitors for HGB 2008 Ozone NAAQS Nonattainment Area VOC and NO_X Sensitivity Analysis

The impact on the 2019 ozone DVB was estimated for the top modeled 10 days within the months of April through October by completing three model runs—a 2019 base case scenario, a 20% anthropogenic NO_X emissions reduction scenario, and a 20% anthropogenic VOC emissions reduction scenario. The impact was estimated by calculating a ratio of the average MDA8 ozone from the top 10 days from the 20% anthropogenic emissions reduction emission scenario to the base case scenario for each monitor and adjusting the 2019 DVB with the ratio. The results showed that though ozone decreased when VOC or NO_X was decreased, reductions in NO_X were more impactful. Figure 5-13: *Modeled Impact of NO_X and VOC Reductions on 2019 DVB* shows the estimated change in the 2019 ozone DVB at each monitor due to a 20% reduction in anthropogenic NO_X and VOC emissions in and around the HGB 2008 ozone NAAQS nonattainment area. The maximum estimated decrease in ozone base

case design value from a 20% NO_x reduction is 3.1 ppb, about three times greater than decrease of 0.9 ppb from a 20% VOC reductions scenario at the same monitor. The maximum estimated decrease in ozone base case design value from a 20% VOC reduction is 1.3 ppb.

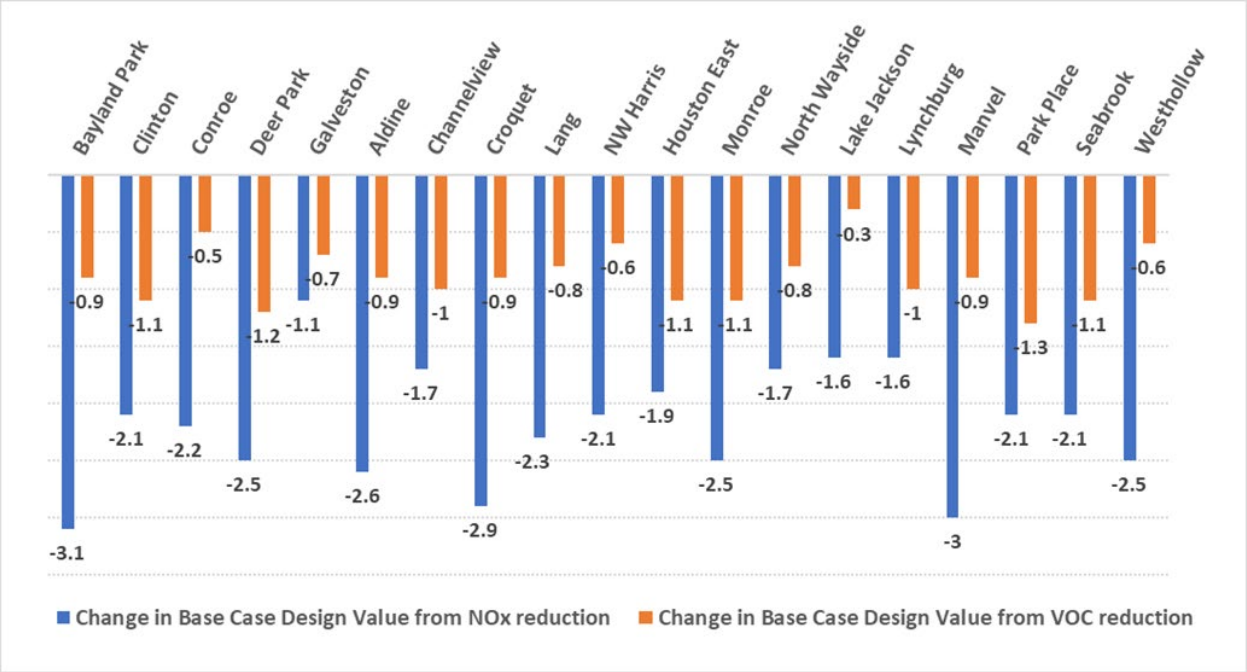

Figure 5-13: Modeled Impact of VOC and NO_x Reductions on 2019 Ozone DVB

The modeling results show that the impact of NO_x reductions on 2019 ozone base case design values is higher than the impact from VOC reductions.

5.2.5 Meteorological Influences on Ozone

Meteorological conditions play an important role in ozone formation. Year-to-year variability in meteorological conditions in turn causes variability in ozone concentration trends. Although design values consider this variability by averaging the fourth-highest MDA8 ozone over three years, this is often not enough to account for years with extreme meteorological conditions such as low wind speeds, drought, or extremely high temperatures. Investigating meteorological influences on ozone trends facilitates analysis of how ozone concentrations respond to changes in emissions rather than changes in the meteorology.

Meteorologically adjusted MDA8 ozone values represent what the ozone would have been if meteorological effects on ozone concentrations are removed. Without the influence of meteorology, changes observed in ozone concentrations are more likely due to emission changes rather than extreme meteorological events. The EPA developed a statistical model that uses local weather data to adjust the ozone trends according to the meteorology for that year (Wells et al., 2021). These trends compare the average, 90th percentile, and 98th percentile MDA8 ozone from May through September to the meteorologically adjusted average, 90th percentile, and 98th percentile MDA8 ozone from May through September. The EPA calculated these trends for 17 ozone monitors in the HGB 2008 ozone NAAQS nonattainment area from 2012

through 2022 (EPA, 2023). The four currently operating ozone monitors not included in this analysis were Galveston, Park Place, Harvard, and Garth. Although results for all statistics were examined, only the 98th percentile trends will be discussed in this document since it most closely relates with the ozone values that are used in the design value calculations.

For each year the maximum, median, and minimum 98th percentile MDA8 value was calculated from all regulatory monitors within the HGB 2008 ozone NAAQS nonattainment area. This allows for easier examination of the results across all monitors. The results for the 98th percentile are displayed in Figure 5-14: *Meteorologically Adjusted Ozone Trends for May through September in the HGB 2008 Ozone NAAQS Nonattainment Area*. These trends confirm that the low ozone in 2014 and the high ozone in 2015 were largely influenced by the meteorology. From 2012 through 2022 the trends show only small decreases in ozone, both measured and meteorologically adjusted. Overall trends are very flat, even more so when ozone is adjusted for meteorology. This correlates well with the trends observed in both NO_x and VOC concentrations.

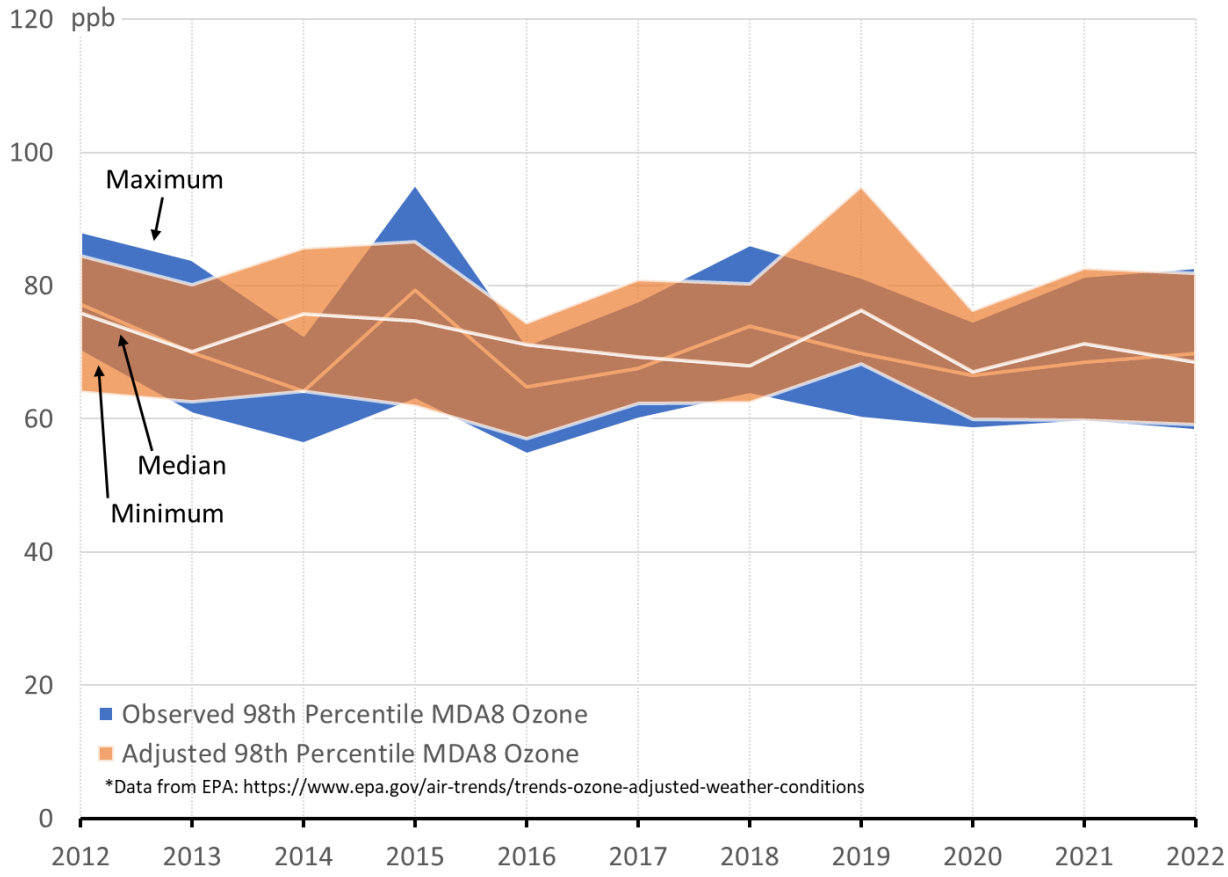

Figure 5-14: Meteorologically-Adjusted Ozone Trends for May through September in the HGB 2008 Ozone NAAQS Nonattainment Area

5.3 QUALITATIVE CORROBORATIVE ANALYSIS

Emission reduction measures that were not included in the photochemical modeling are expected to further reduce ozone levels in the HGB ozone nonattainment area. Various federal, state, and local control measures exist that are anticipated to provide real emissions reductions; however, these measures are not included in the photochemical model because they may not meet all 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.

5.3.1 Additional Measures

5.3.1.1 SmartWay Transport Partnership and the Blue Skyways Collaborative

Among its various efforts to improve air quality in Texas, TCEQ continues to promote two voluntary programs in cooperation with 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 reducing air emissions.

There are nearly 4,000 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 357 million barrels.[30] Since 2004, SmartWay partners have prevented the release of 2,700,000 tons of NO_X and 112,000 tons of particulate matter into the atmosphere.[31] Approximately 247 Texas companies are SmartWay partners, with 48 of them in the HGB area.[32] The SmartWay Transport Partnership will continue to benefit the HGB area by reducing emissions as more companies and affiliates join, and additional idle reduction, trailer aerodynamic kits, low-rolling resistance tire, and retrofit technologies are incorporated into SmartWay-verified technologies.

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 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. The EPA has awarded the PHA with three additional DERA grants. In 2015, the PHA received two grants of nearly $900,000 each, to replace 41 older drayage trucks operating in the Port of Houston with newer, cleaner trucks. In 2017, EPA awarded the PHA with a DERA grant of $143,500 to replace diesel buses with clean diesel-powered vehicles.[33]

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[30] https://www.epa.gov/smartway/smartway-program-successes
[31] *Id.*
[32] https://www.epa.gov/smartway/smartway-partner-list
[33] https://www.epa.gov/ports-initiative/smartway-program-promoting-supply-chain-sustainability-ports

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.[34] The Blue Skyways Collaborative partnerships include international, federal, state, and local governments, non-profit organizations, environmental groups, and private industries.

5.3.1.2 Energy Efficiency and Renewable Energy (EE/RE) 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 light-emitting diode or 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, solar, and battery storage energy projects.

Texas leads the nation in RE generation from wind. As of 2021, Texas has 34,370 megawatts (MW) of installed wind generation capacity, 25.9% of the 132,753 MW installed wind capacity in the U.S. Texas' total net electrical generation from renewable wind generators in 2021 was 99.47 million megawatt-hours (MWh),[35] approximately 26.3% of the 378.2 million MWh total wind net electrical generation for the U.S.[36] In 2021, total net electrical generation from renewable wind generators in Texas was 11.9% more than in 2020.[37]

Texas non-residential solar electricity generation in 2021 totaled 17.2 million MWh, a 69.5% increase from 2020.[38] The 2021 total installed solar electricity generation capacity in Texas was 10,374 MW, a 73% increase from 2020.[39]

While EE/RE measures are beneficial and do result in lower overall emissions from fossil fuel-fired power plants in Texas, emission reductions resulting from these programs are not explicitly included in photochemical modeling for SIP purposes because local efficiency or renewable energy 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.

The Texas A&M Engineering Experiment Station's Energy Systems Laboratory estimates energy savings and emissions reductions from EE/RE measures. House Bill 4885 from the 88th Texas Legislature, Regular Session increased funding up to $500,000 from $216,000 per fiscal year for the Energy Systems Laboratory to evaluate emission reductions from wind and other renewable energy sources, energy efficiency programs of the Public Utility Commission of Texas or the State Energy Conservation Office, and

[34] https://blueskyways.org/
[35] https://www.eia.gov/electricity/annual/html/epa_04_07_b.html
[36] https://www.eia.gov/electricity/annual/xls/epa_03_01_b.xlsx
[37] *Id.*
[38] https://www.eia.gov/electricity/annual/xls/epa_03_21.xlsx
[39] https://www.eia.gov/electricity/annual/html/epa_04_07_b.html

the implementation of advanced building codes. While specific emission reductions from EE/RE measures are not provided in the SIP, persons interested in estimates of energy savings and emission reductions from EE/RE measures can access additional information and reports from the Texas A&M Engineering Experiment Station's Energy Systems Laboratory (ESL) website (https://esl.tamu.edu). Reports submitted to TCEQ regarding EE/RE measures are available on the ESL website.

5.3.1.3 Cross-State Air Pollution Rule (CSAPR)

The EPA originally finalized CSAPR to help eastern states meet federal Clean Air Act (FCAA) interstate transport obligations for the 1997 eight-hour ozone, 1997 fine particulate matter ($PM_{2.5}$), and 2006 $PM_{2.5}$ NAAQS by requiring reductions in electric generating unit (EGU) emissions that cross state lines. The rule required reductions in ozone season NO_X emissions for states under the ozone requirements and in annual sulfur dioxide (SO_2) and NO_2 for states under $PM_{2.5}$ requirements. Texas was included in the original CSAPR program for the 1997 eight-hour ozone and 1997 $PM_{2.5}$ standards. As of 2016, Texas is no longer subject to the original CSAPR trading programs for the 1997 eight-hour ozone and $PM_{2.5}$ standards but became subject to EPA's CSAPR Update Rule to address transport obligations under the 2008 eight-hour ozone standard and EPA's transport FIP for the 2015 eight-hour ozone standard.

On August 8, 2018, the commission adopted the 2015 Ozone NAAQS Transport SIP Revision (Non-Rule Project No. 2017-039-SIP-NR), which included a modeling analysis demonstrating that Texas does not contribute to nonattainment or interfere with maintenance of the 2015 ozone NAAQS in any other state. On March 30, 2021, EPA published final disapproval of the portion of the 2015 Ozone NAAQS Transport SIP Revision relating to visibility transport with a determination that visibility transport requirements for the 2015 ozone NAAQS are met through federal implementation plans (FIP) in place for the Texas Regional Haze program, and no further federal action is required (86 FR 16531). On February 22, 2022, EPA proposed disapproval of the remaining portions of the 2015 Ozone NAAQS Transport SIP Revision (87 FR 9798), which EPA finalized on February 13, 2023 (88 FR 9336).

On June 5, 2023, EPA published a final FIP (the Good Neighbor Plan) to address obligations for 23 states, including Texas, to eliminate significant contribution to nonattainment, or interference with maintenance, of the 2015 ozone NAAQS in other states (88 FR 36654). As part of the final FIP to address interstate transport obligations for the 2015 ozone NAAQS, EPA is including Texas and 21 other states in a revised and strengthened CSAPR NO_X Ozone Season Group 3 Trading Program for EGUs beginning in the 2023 ozone season. EPA is also establishing emissions limitations beginning in 2026 for non-EGU sources located within 20 states, including Texas. The control measures for the identified EGU and non-EGU sources apply to both existing units and any new, modified, or reconstructed units meeting the final rule's applicability criteria.

Multiple parties have challenged the final FIP in multiple federal courts, including Texas, resulting in multiple orders by courts to stay the effectiveness of the FIP in several jurisdictions. As a result of those court orders, on July 31, 2023, EPA published an interim final rule to stay the implementation of the Good Neighbor Plan for certain states, including Texas (88 FR 49295).

5.3.1.4 Texas Emissions Reduction Plan (TERP)

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 (DERI) program. 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 July 2023, TCEQ awarded $1,314,330,754 in DERI grants for projects projected to help reduce a projected 190,070 tons of NO_X in the period over which emissions reductions are reported for each project under the program. This includes $518,892,845 going to activities in the HGB area, with a projected 82,250 tons of NO_X reduced in the HGB area in the period over which emissions reductions are reported for each project under the program.

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), the Texas Clean Fleet Program (TCFP), and the Texas Natural Gas Vehicle Grant Program (TNGVGP). The 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. In 2017, the name of this program was changed to the Seaport and Rail Yard Areas Emissions Reduction Program (SPRY), and replacement and repower of cargo handling equipment was added to the eligible project list. Through July 2023, the program awarded $37,137,756, with a projected 1,643 tons of NO_X reduced in the period over which emissions reductions are reported for each project under the program. In the HGB area $34,601,005 was awarded to projects with a projected 1,534 tons of NO_X reduced in the period over which emissions reductions are reported for each project under the program.

The 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; therefore, applicants must commit to replacing at least 10 eligible diesel-powered vehicles with qualifying alternative fuel or hybrid vehicles. From 2009 through July 2023, $81,617,123 in TCFP grants were awarded for projects to help reduce a projected 750 tons of NO_X in the period over which emissions reductions are reported for each project under the program. In the HGB area, $24,328,637 in TCFP grants were awarded with a projected 202 tons of NO_X reduced in the period over which emissions reductions are reported for each project under the program.

The 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. From 2011 through July 2023, $59,636,804 in TNGVGP grants were awarded for projects to help reduce a projected 1,723 tons of NO_X in the period over which emissions

reductions are reported for each project under the program. In the HGB area, $15,070,383 in TNGVGP grants were awarded to projects with a projected 369 tons of NO_X reduced in the period over which emissions reductions are reported for each project under the program.

Through FY 2017, both the TCFP and TNGVGP required that the majority of the grant-funded vehicle's operation 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. Legislative changes in 2017 expanded the eligible areas into a new Clean Transportation Zone, to include the counties in and between an area bounded by Dallas-Fort Worth, Houston, Corpus Christi, Laredo, and San Antonio.

5.3.1.5 Clean School Bus Program

House Bill 3469, 79th Texas Legislature, 2005, Regular Session, established the Clean School Bus Program, which provides monetary incentives to school districts in the state for reducing emissions of diesel exhaust from school buses through retrofit of older school buses with diesel oxidation catalysts, diesel particulate filters, and closed crankcase filters. As a result of legislative changes in 2017, this program also includes replacement of older school buses with newer, lower-emitting models. Through July 2023, the TCEQ Clean School Bus Program has awarded $76,900,769 in grants for retrofit and replacement activities across the state, resulting in a projected 302 tons of NO_X reduced in the period over which emissions reductions are reported for each project under the program. This amount includes $4,694,101 in federal funds. Of the total amount, $13,480,770 has been awarded for school bus retrofit and replacement activities in the HGB area, resulting in a projected 17 tons of NO_X reduced in the period over which emissions reductions are reported for each project under the program.

5.3.1.6 88th Texas Legislature

The bills passed during the 88th Texas Legislature, 2023, Regular and Special Sessions, that have the potential to impact air quality in the HGB area include HB 4885 and Rider 7 in the General Appropriations Act for TCEQ. For legislative updates regarding EE/RE measures and programs, see Section 5.3.1.2: *Energy Efficiency and Renewable Energy Measures*.

HB 4885, Relating to programs established and funded under the Texas emissions reduction plan.

HB 4885 changes the Texas Emissions Reduction Plan (TERP) programs to establish the Texas hydrogen infrastructure, vehicle, and equipment (THIVE) grant program and add downstream "refining" oil and gas activities to projects eligible for the New Technology Implementation Grant Program (NTIG). These programs are expected to accelerate the replacement of older, more polluting equipment with newer and cleaner equipment. New grant application periods for these programs are expected in Fiscal Year 2024 with public webinars to explain program requirements.

General Appropriations Act for the TCEQ, Rider 7 - Air Quality Planning

Rider 7 of the General Appropriations Act for TCEQ appropriated $2,500,000 for air quality planning activities to reduce fine particulate matter ($PM_{2.5}$) in affected counties not designated nonattainment for $PM_{2.5}$ NAAQS as of September 1, 2023, which

includes the HGB area. Grants will be issued to local governments for inventorying emissions, monitoring of pollution levels, air pollution and data analysis; modeling pollution levels; and administration of the program. Because NO_X and VOC are precursors for both ozone and $PM_{2.5}$, these efforts may also help reduce ozone concentrations in the HGB area.

5.3.1.7 Local Initiatives

The H-GAC has a number of locally implemented strategies in the HGB nonattainment area, including projects, programs, partnerships, and policies. These programs are being implemented in the HGB 2008 ozone NAAQS nonattainment area and are expected to still be active in 2026. Due to the continued progress of these measures, additional air quality benefits will be gained and will further reduce precursors to ground-level ozone formation. A summary of each strategy is included in Appendix E: *Local Initiatives Submitted by the Houston-Galveston Area Council: Existing and Future Houston-Galveston-Brazoria Mobile Emission Reduction Measures*.

5.4 CONCLUSIONS

The TCEQ used several sophisticated technical tools to evaluate the past and present causes of high ozone in the HGB 2008 ozone NAAQS nonattainment area to evaluate the area's future air quality. Historical trends in ozone and ozone precursor concentrations and their causes have been investigated extensively and result in the following conclusions.

The eight-hour ozone design values decreased from 2012 through 2022. The preliminary 2022 eight-hour design value for the HGB 2008 ozone NAAQS nonattainment area was 78 ppb, an 11% decrease from the 2012 design value of 88 ppb. The largest design value decreases occurred prior to 2014. After 2014, ozone declines in the area stagnated. This trend of slight decreases is seen not only in ozone design values, but also in the fourth-highest eight-hour ozone values and background ozone.

In general, background ozone accounts for approximately 60% of ozone in the HGB 2008 ozone NAAQS nonattainment area, and locally produced ozone accounts for approximately 40% of ozone in the area. On high ozone days, background ozone concentrations have decreased, and locally produced ozone concentrations have increased, resulting in a flat MDA8 ozone trend. Ambient concentrations and point source emissions of ozone precursors have variable trends, with increases observed for NO_X, but decreases observed for VOC and HRVOC. Meteorologically adjusted ozone trends are mostly flat from 2012 through 2022.

Trends in VOC-to-NO_X ratios show that areas in Brazoria County are closer to NO_X limited, areas in the Houston Ship Channel are transitional, and areas closer to the downtown urban core of Houston are more VOC limited. With many monitors showing transitional conditions, controls on either NO_X or VOC emissions may be effective in reducing ozone in the HGB 2008 ozone NAAQS nonattainment area; however, controls on either VOC or NO_X may not result in equal reductions in ozone, one precursor may reduce ozone at greater rates than the other. Modeling shows that, although some monitors observe a benefit from VOC reductions, NO_X reductions have a larger impact on ozone concentrations at the design value setting monitors.

This HGB AD SIP revision documents a fully evaluated photochemical modeling analysis and a thorough weight-of-evidence assessment. Based on TCEQ's modeling and available data, the HGB 2008 ozone NAAQS nonattainment area is expected to attain the 2008 ozone NAAQS by the July 20, 2027, attainment date.

5.5 REFERENCES

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CHAPTER 6: ONGOING AND FUTURE INITIATIVES

6.1 INTRODUCTION

The Texas Commission on Environmental Quality (TCEQ) is committed to maintaining healthy air quality in the Houston-Galveston-Brazoria (HGB) 2008 eight-hour ozone NAAQS severe nonattainment area (HGB 2008 ozone NAAQS nonattainment area) and continues to work toward this goal. Texas continues to invest resources in air quality scientific research related to better understanding atmospheric chemical processes, the advancement of pollution control technology, refining quantification of emissions, and improving the science for ozone modeling. Additionally, TCEQ is working with the United States Environmental Protection Agency (EPA), local leaders, and the scientific community to evaluate new measures for addressing ozone precursors. This chapter describes ongoing technical work that will be beneficial for identifying effective and efficient approaches for improving air quality in Texas and the HGB 2008 ozone NAAQS nonattainment area.

6.2 ONGOING WORK

6.2.1 Other Emissions Inventory Improvement Projects

The TCEQ emissions inventory (EI) reflects years of emissions data improvement, including extensive point and area source inventory reconciliation with ambient emissions monitoring data. Reports detailing recent TCEQ EI improvement projects are available at TCEQ's Air Quality Research and Contract Projects webpage (https://www.tceq.texas.gov/airquality/airmod/project/pj.html).

6.2.2 Air Quality Research Program

6.2.2.1 TCEQ Applied Research Projects

The TCEQ sponsors applied research projects to support the State Implementation Plan (SIP) and other agency requirements. Previous project goals have included improving the understanding of ozone and particulate matter formation, developing advanced modeling techniques, enhancing emission estimates, and air quality monitoring during special studies. Final project reports are available at TCEQ's Air Quality Research and Contract Projects webpage (https://www.tceq.texas.gov/airquality/airmod/project/pj.html).

6.2.2.2 Black and Brown Carbon ($(BC)^2$) Monitoring

The $(BC)^2$ monitoring project was created to identify the influence of wildfires and dust events on urban air quality in Texas. The study started in 2019 as a pilot study in El Paso, sampling aerosol properties as indicators of biomass burning and dust impacts. The study expanded in 2020, adding three sites in the HGB area. After continued measurements in 2021 and 2022, the study is being enhanced with two sites in the Dallas-Fort Worth (DFW) area. The $(BC)^2$ project has identified periods when biomass burning events are most likely in eastern Texas and has improved the understanding of dust effects in El Paso. The $(BC)^2$ data contribute to analyses studying the relationship between biomass burning and exceptional ozone and particulate matter air quality events.

6.2.2.3 Tracking Aerosol Convection Interactions Experiment – Air Quality (TRACER-AQ) Field Study

The TRACER-AQ field study in 2021 and 2022 was a collaboration between TCEQ, National Aeronautics and Space Administration (NASA), the Department of Energy, Texas universities, and many others to improve the understanding of coastal air quality challenges through advanced monitoring platforms. Instrumented aircraft, ships, drones, and mobile laboratories complemented ground stations to examine the spatial and temporal patterns of pollutants in the HGB 2008 ozone NAAQS nonattainment area. Unique measurements offshore characterized ozone and other pollutants in the marine environment. Analysis of the TRACER-AQ data is ongoing and expected to contribute to the understanding and improvement of air quality in coastal Texas for many years to come. Details about TRACER-AQ and the collected data are available at the NASA TRACER-AQ website (https://www-air.larc.nasa.gov/missions/tracer-aq).

6.2.2.4 Texas Air Quality Research Program (AQRP)

The AQRP program began in 2010 and has supported research in Houston, Dallas-Fort Worth, San Antonio, and El Paso. Details about the AQRP and past research can be found at the University of Texas at Austin's AQRP website (https://aqrp.ceer.utexas.edu).

The goals of the AQRP are:

- to support scientific research related to Texas air quality in the areas of emissions inventory development, atmospheric chemistry, meteorology, and air quality modeling; and
- to integrate AQRP research with the work of other organizations and to communicate the results of AQRP research to air quality decision-makers and stakeholders.

The AQRP is supporting seven projects during the 2022-2023 biennium. Six projects that could have findings relevant to the HGB 2008 ozone NAAQS nonattainment area are listed below.

Statewide Projects:

- Evaluating the Ability of Statistical and Photochemical Models to Capture the Impacts of Biomass Burning Smoke on Urban Air Quality in Texas (project number 22-003);
- Hydrogen Cyanide for Improved Identification of Fire Plumes in the $(BC)^2$ Network (project number 22-006); and
- Refining Ammonia Emissions Using Inverse Modeling and Satellite Observations Over Texas and the Gulf of Mexico and Investigating its Effect on Fine Particulate Matter (project number 22-019).

The HGB-area projects are:

- Modeling Analysis of TRACER-AQ and Over-Water Measurements to Improve Prediction of On-Land and Offshore Ozone (project number 22-008);

- Quantifying the Emissions and Spatial/Temporal Distributions of Consumer Volatile Chemical Products (VCPs) in the Greater Houston Area to Understand Their Impacts on Summertime Ozone Formation (project number 22-020); and
- Source-Sector Nitrogen Oxides (NO_x) Emissions Analysis with Sub-Kilometer Scale Airborne Observations in Houston During TRACER-AQ (project number 22-023).

6.2.3 Wildfire and Smoke Impact

The TCEQ reviewed ambient air monitoring data from monitors in the HGB 2008 ozone NAAQS nonattainment area and determined that there were ozone episodes in 2022 that appear to have been influenced by smoke from wildfires. Additional information on Texas smoke planning is available in the Texas A&M Forest Service Smoke Management Plan (https://tfsweb.tamu.edu/uploadedFiles/TFS_Main/Manage_Forests_and_Land/Prescribed_Fires/TFS%20SMP.pdf).

On June 20, September 13, September 21, and October 8, 2022, the Houston Bayland Park monitoring site (48201005), and on June 20 and September 21, 2022, the Houston Harvard Street monitoring site (482010417) measured high maximum daily eight-hour average ozone concentrations. Fires adversely influenced these ozone measurements, causing the area to exceed the 2008 eight-hour ozone NAAQS. The TCEQ issued preliminary flags for the ozone data for these two monitoring sites on the days indicated. The TCEQ developed an exceptional event demonstration for these dates, requesting that the affected data be excluded from comparison to any ozone NAAQS, as provided for in the exceptional event rule. The TCEQ provided for public comment on this demonstration for 30 days, as required by federal rules. All comments received will be included in the final version of the exceptional event demonstration, which will be submitted to EPA for consideration. Information concerning this and other ozone exceptional events demonstrations developed by the TCEQ is available on the TCEQ's Ozone Data Exceptional Event Flag Demonstrations webpage (https://www.tceq.texas.gov/airquality/airmod/docs/ozone-data-exceptional-event-flag-demonstrations).

Appendices Available Upon Request

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RESPONSE TO COMMENTS RECEIVED CONCERNING THE HOUSTON-GALVESTON-BRAZORIA (HGB) SEVERE AREA ATTAINMENT DEMONSTRATION (AD) STATE IMPLEMENTATION PLAN (SIP) REVISION FOR THE 2008 EIGHT-HOUR OZONE NATIONAL AMBIENT AIR QUALITY STANDARD (NAAQS)

The Texas Commission on Environmental Quality (commission or TCEQ) offered a public hearing in Houston on January 4, 2023, at 7:00 p.m. During the comment period, which opened on December 1, 2024 and closed on January 16, 2024, the commission received comments from Air Alliance Houston, City of Houston At-Large Council Member Dr. Letitia Plummer (Council Member Plummer), Earthjustice, Environment Texas, Environmental Integrity Project, Fort Bend County Environmental Organization, Office of Harris County Attorney, Lone Star Chapter of Sierra Club, Progressive Fifth Ward Community Association, Public Citizen, Sierra Club, Texas Environmental Justice Advocacy Services (TEJAS), the U.S. Environmental Protection Agency (EPA), and 238 individuals.

In this response to comments, the commission uses "HGB area" to refer to the 2008 eight-hour ozone NAAQS nonattainment area, consisting of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, unless otherwise specified.

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GENERAL COMMENTS

EPA stated Appendix A: *Modeling Technical Support Document (TSD)*, Table 3-22: *2022 Future Case CMW Emissions for June 12 Episode Day in HGB* contains a typo, where "CMW" should be "CMV" to reference Commercial Marine Vessels (CMV).

Table 3-22 was updated to correct the typographical error.

Air Alliance Houston, Earthjustice, Environment Texas, Public Citizen, Sierra Club, TEJAS, and one individual commented requesting a 30-day extension to the comment period. The extension was requested due to the amount of material to be reviewed in the proposed SIP and the coinciding holiday season.

An additional public hearing was also requested to accommodate for the possible impact of the holidays on attendance at the originally scheduled hearing and provide adequate opportunity for public participation.

One individual stated that information about TCEQ processes and public involvement was not publicly available on the TCEQ's website and that the process of making public comments should be widely publicized and promoted.

The commission encourages public participation in the SIP development process and makes every effort to hold hearings in locations and at times that are accessible and convenient to the public. In addition to providing the opportunity to comment at a public hearing, the TCEQ also provides the public with the option to submit written comments by mail, fax, or electronically through TCEQ's Public Comment system. Instructions for the submittal of written comments were provided in the proposed SIP revision documents and public notices.

The commission strives to give all citizens of Texas appropriate prior notification and opportunity to comment. This SIP revision was filed with the TCEQ's Chief Clerk's Office and made available to the public on the TCEQ's website on November 20, 2023. Listserv subscribers received an e-mail notification on November 20, 2023 that this SIP revision was scheduled to be considered by the commission for proposal on November 29, 2023. On November 30, 2023, another e-mail was sent to listserv subscribers notifying the public that the commission had approved publication of, and hearing on, the proposal. These notices also directed the public to the TCEQ's website, where all SIP revision documents and the hearing notice were posted. A hearing notice for this SIP revision was published in English in the *Houston Chronicle* on December 1, 2023, in Spanish in *La Voz* on December 13, 2023, and in English in the *Texas Register* on December 15, 2023 (48 Texas Register 7643). This detailed public hearing participation information was also published on the commission's publicly available events calendar webpage at least 30 days prior to the hearing date.

The public comment period was open from December 1, 2023 through January 16, 2024, providing an additional 15 days beyond the required 30-day comment period in order to account for scheduling around the holidays. During this time, the public had the opportunity to provide both written and oral comment regarding this SIP revision to the TCEQ. A public hearing was offered in Houston on January 4, 2024.

The commission did not extend the comment period or hold additional hearings for this SIP revision. An extension of the public comment period would not allow staff time to adequately consider and respond to comments, route SIP and rule revision documents through the required channels and submit adopted revisions to EPA by the required May 7, 2024 deadline. Commenters were notified of this decision on December 19, 2023, before the close of the comment period.

No changes were made to this SIP revision in response to these comments.

One individual asked why TCEQ did not provide information about the SIP that was easy to understand. The individual listed a number of issues with the TCEQ's webpages, including a lack of updated information about the initial ozone designations and inadequate information about approved SIP requirements for both revoked and current ozone NAAQS. The individual went on to state that the TCEQ should maintain a user-friendly interface for the public to review and understand important documents like the proposed SIP revisions.

The commission values public participation and strives to make information both readily available and accessible. Air Quality Division staff regularly review and edit webpages for clarity, accuracy, and accessibility. Air Quality Division staff maintain thorough and comprehensive webpages that document the history of the state's nonattainment areas, state and federal actions impacting the nonattainment areas, and relevant updates regarding the latest planning activities within the nonattainment areas. The Texas SIP Revisions webpage (https://www.tceq.texas.gov/airquality/sip/sipplans.html) provides quick access to complete texts of Texas air quality plans, including their approval status and whether the plans have been superseded or withdrawn. As mentioned previously in this document, proposed SIP revisions and plain language summaries describing the SIP revisions are posted to multiple locations on the TCEQ's website to increase visibility of the projects.[1] The commission appreciates continued engagement and suggestions on how to improve its webpages.

No changes were made to this SIP revision in response to these comments.

An individual stated that we are moving to a point in history never before contemplated, where products produced by stationary sources may very well have the equivalent of a Methods for the Determination of Hazardous Substances for each product starting with carbon intensity and moving to water and remediation; be it brown fields or abandoned wells, or habits.

This comment is outside the scope of this SIP revision. No changes were made to this SIP revision in response to the comment.

Air Alliance Houston, Earthjustice, Environment Texas, Lone Star Chapter of Sierra Club, Public Citizen, Sierra Club, and TEJAS commented that TCEQ has failed to bring ozone levels in Houston area into compliance with levels protective of public health. The commenters stated that failure to attain the 2008 ozone standard continues to harm communities in these areas, particularly in Houston where certain areas experience greater exposure than other parts of the city. Twelve individuals commented that TCEQ should create a strong ozone plan for the HGB nonattainment areas and stated Texas should do more in its SIP submissions to reduce ozone pollution. Furthermore, the 12 individuals encouraged the agency to reduce pollution and protect public health.

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[1] https://www.tceq.texas.gov/airquality/sip/sipplans.html;
https://www.tceq.texas.gov/airquality/sip/Hottop.html;
https://www.tceq.texas.gov/airquality/sip/hgb/hgb-latest-ozone

The federal Clean Air Act (FCAA) requires EPA to set the primary ozone NAAQS at levels that protect the health of the public, including infants, children, the elderly, and those with pre-existing conditions, such as asthma. EPA considered these health impacts when setting the 2008 eight-hour ozone NAAQS. TCEQ takes the health and concerns of Texans seriously and remains committed to working with area stakeholders to attain the 2008 eight-hour ozone standard as expeditiously as practicable in accordance with EPA rules and guidance and the FCAA.

The purpose of this HGB AD SIP revision is to address the FCAA attainment demonstration SIP requirements for areas classified as severe nonattainment for the 2008 eight-hour ozone NAAQS. The modeling for this SIP revision, further supported by a corroborative weight-of-evidence analysis, demonstrates that the HGB area will attain the 2008 eight-hour ozone NAAQS by the 2026 attainment year.

No changes were made to this SIP revision in response to this comment.

An individual commented that there is a lack of pedestrian infrastructure in Houston and that highway expansions will further reduce the city's walkability. The individual asserted that the City of Houston should invest in transit and not highway expansion.

Transportation planning for the HGB area is not the purpose of this SIP revision and is not a responsibility assigned to TCEQ to administer. This comment is outside the scope of this SIP revision.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ is legally required, and empowered, to alleviate the harm of ground-level ozone as expeditiously as possible. They stated that the HGB AD SIP revision is illegal and arbitrary and must be strengthened in accordance with the law. They stated that without changes to strengthen pollution controls, this SIP will continue to delay attainment of the 2008 ozone NAAQS; relying on the status-quo has failed.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS stated that it is irrational and arbitrary for TCEQ to conclude that no emissions reductions are necessary to reach attainment. They continued that the SIP revision is deficient because it relies on reductions that TCEQ cannot control and has no explanation of how to enforce.

An individual stated that this SIP revision does not adequately address the impact of fugitive and nonpermitted emissions, from leaking equipment, startups, flares, etc. An individual commented that ozone is largely the product of emissions by vehicles as well as large industrial plants, oil refineries, and chemical and petrochemical plants, all of which need to reduce both volatile organic compounds (VOC) and nitrogen oxides (NO_X) emissions in order to improve Houston's air quality. Another individual stated that industrial pollution, increased temperatures, and increased vehicular emissions are creating an even greater problem.

In accordance with FCAA, §182(b)(1)(A) and EPA's *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; Final Rule* (2008 eight-hour ozone standard SIP requirements rule) published on March 6, 2015 (80 FR 12264), TCEQ followed all relevant federal and state statutes, regulations, and guidance in the development of this SIP revision and evaluated all relevant information, including emission sources, in reaching its decision regarding the appropriate control strategies for the HGB nonattainment area.

As discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the attainment date without additional control measures on sources inside or outside the HGB area, and no additional control measures were determined to advance attainment by one year.

No changes were made to this SIP revision in response to this comment.

One individual commented that addressing our air pollution will require a multi-faceted approach that involves a combination of regulatory measures, technological advancements, and public awareness campaigns. The severity and complexity of the problem means that both governmental and non-governmental parties need to play a role and the TCEQ needs to step up and help drive this effort. Another individual stated that improving air quality in Houston will require different approaches and new strategies that take into account the specific opportunities that exist going forward. Unfortunately, the SIP, as submitted, is a step backwards and needs to be revised.

The commission takes its commitment to protect the environment and public health seriously. The air quality in the HGB area has improved dramatically as a result of state, local, and federal air pollution control measures. The commission remains committed to working with area stakeholders and local governments to meet FCAA requirements as expeditiously as practicable.

No changes were made to this SIP revision in response to these comments.

One individual urged TCEQ to challenge House Bill (HB) 1794, which makes it harder for private citizens to sue polluting companies, therefore making it harder to hold polluting companies accountable.

The commission remains neutral on legislative matters as state government agencies may not legally engage in lobbying activities. This comment is outside the scope of this SIP revision. No changes were made to this SIP revision in response to this comment.

Sierra Club, Earthjustice, and 171 individuals stated that they live, work, recreate, own businesses, and breathe the air in the HGB nonattainment area and are directly affected by ground-level smog. These same commenters stated that the decades-long nonattainment crisis has real-world, everyday impacts on families and the local economy. Three individuals commented that the biggest issue facing the HGB area is

poor air quality. Sierra Club, Earthjustice, and three individuals said we need clean air while two individuals commented that clean air is a basic human right. Sierra Club, Earthjustice, and one individual commented that their family would appreciate better air quality. Sierra Club, Earthjustice, and one individual asked TCEQ to stop polluting the air, while another individual said they are not proud that Texas is not doing more to curb ozone pollution. Sierra Club, Earthjustice, and one individual asked TCEQ to do as little harm as possible. Two individuals stated that TCEQ should prioritize the good of the people and the environment over industry.

Sierra Club, Earthjustice, and three individuals asked TCEQ to protect Texas from ozone and other pollutants. One individual said TCEQ should establish regulations in Texas, especially Houston, to protect our environment. Another individual asked for state agencies and governments to step up to the challenge to clean Texas' air. Sierra Club, Earthjustice, and 10 individuals stated that Texans need TCEQ to do more to better regulate air pollution and ozone. Sierra Club, Earthjustice, and one individual said air pollution regulation should become more stringent with increased population.

Air Alliance Houston stated that ozone attainment has become out of reach and that the role of these types of SIPs is critical. Harris County Attorney Office commented that TCEQ has failed to perform its duty to protect the public from the effects of ozone pollution for more than 54 years. They further stated that the HGB area has consistently failed to attain any currently effective federal NAAQS for ozone pollution. Sierra Club, Earthjustice, and one individual said it is unacceptable that TCEQ has failed to submit a SIP that meets federal ozone standards for the last 15 years. One individual stated that Houston has been out of compliance with the FCAA's ozone standards for more than a decade. Another individual commented that TCEQ could be doing more because ozone decreases have stagnated. Sierra Club, Earthjustice, and one individual said that air quality in the Houston area has been getting worse. Air Alliance Houston stated that 3% is the bare minimum for emissions reductions, Air Alliance Houston and two individuals said the Houston area needs more than small, incremental changes and "business as usual" measures to bring down ozone levels.

One individual stated that families in Texas deserve a regulatory agency that does more and that Texas residents cannot afford to have TCEQ silo itself from the rest of the nation while residents watch progress being made in other states. An individual commented they would like to see some significant reductions in ozone to show us that those in charge of reducing ozone are trying and making progress.

Progressive Fifth Ward Community Association, Sierra Club, Earthjustice, and 171 individuals urged TCEQ to implement the most stringent plan possible to bring the HGB area into attainment of the 2008 eight-hour ozone NAAQS. Council Member Plummer and 46 individuals urge the TCEQ to implement the most stringent possible plan to get the HGB nonattainment area into attainment of the 2008 ozone NAAQS and to protect the health of the area's citizens. An individual asked how much longer will it take to meet the goals set by the state and regulators. Sierra Club, Earthjustice, and three individuals asked for urgent action.

The commission takes its commitment to protect the environment and public health of all citizens seriously.

Attainment of the ozone NAAQS is an ongoing challenge, particularly as EPA continues to revise the NAAQS to be more stringent. As shown in Figure 1-1: *Ozone Design Values and Population in the Houston-Galveston-Brazoria Area* of this HGB AD SIP revision, both one-hour and eight-hour design values have decreased over the past 31 years. The 2022 eight-hour ozone design value of 78 ppb represents a 37% decrease from the 1991 eight-hour ozone design value of 124 ppb. The HGB area has attained the 1979 one-hour ozone NAAQS of 0.12 ppm since 2006 and was determined by EPA to be in attainment in 2008. Further, in 2014, the HGB area attained the 1997 eight-hour ozone NAAQS of 0.08 ppm. These decreases in design values occurred despite a 90% increase in area population from 1991 through 2022.

Air quality in the HGB area has improved dramatically as a result of state, local, and federal air pollution control measures. The commission remains committed to working with area stakeholders and local government to attain the 2008 eight-hour ozone standard as expeditiously as practicable in accordance with EPA rules and guidance under the FCAA. As discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the July 20, 2027 attainment date.

No changes were made to this SIP revision in response to these comments.

Sierra Club and one individual commented that the HGB area air quality affects the air quality in Canada.

This comment is outside the scope of this SIP revision. No changes were made to this SIP revision in response to this comment.

Lone Star Chapter of Sierra Club commented that as recently as October 2023, EPA rejected similar state plans proposed by TCEQ as EPA found that TCEQ failed to submit a plan with revisions that effectively address the reclassified moderate nonattainment areas for the 2015 ozone NAAQS for the Dallas-Fort Worth (DFW), HGB, and Bexar county areas. Twelve individuals commented in support of a determination by EPA to reject TCEQ's previous SIP submittal for the HGB nonattainment area under the 2015 eight-hour ozone NAAQS.

These comments are outside the scope of this SIP revision. However, as a point of clarification, TCEQ has submitted one SIP revision to EPA for the HGB nonattainment area with respect to the 2015 eight-hour ozone NAAQS. On June 29, 2021, EPA published final approval of the 2015 Eight-Hour Ozone NAAQS Emissions Inventory (EI) SIP Revision for the HGB, DFW, and Bexar County Nonattainment Areas (86 FR 34139). While the HGB area failed to attain the 2015 eight-hour ozone NAAQS by the marginal classification attainment date, the EPA proposed an action for voluntary reclassification of the area from moderate to serious on January 26, 2024 (89 FR 5145). TCEQ has not submitted additional SIP revisions regarding the HGB 2015 eight-hour ozone NAAQS nonattainment area.

Progressive Fifth Ward Community Association commented that Texas is frequently out of compliance with federal ozone standards, and a better solution would be to adopt the 2015 eight-hour NAAQS and not the 2008 eight-hour ozone NAAQS. They said that this is the equivalent of someone buying a new laptop in 2024 and using Windows 98 to operate it.

Texas must meet both the 2008 and 2015 eight-hour ozone NAAQS. The purpose of this HGB AD SIP revision is to address the FCAA attainment demonstration SIP requirements for areas classified as severe nonattainment for the 2008 eight-hour ozone NAAQS.

No changes were made to this SIP revision in response to this comment.

Twelve individuals commented that Texas recently discontinued safety inspections, which means that vehicles not meeting air pollution standards will go undetected. The commenters stated that Texas must maintain emissions testing in counties where required and must ensure that car companies are not cheating on emissions testing. The individuals also listed emissions tests, the smoking vehicle program, and remote emissions sensing as strategies to combat vehicle pollution.

Safety inspections for noncommercial vehicles in Texas are no longer required on January 1, 2025, due to the passage of House Bill 3297, 88th Texas Legislature, 2023, Regular Session. Texas will continue to implement the vehicle emissions inspection and maintenance (I/M) program in the counties where it is required. The I/M program in the HGB area includes Brazoria, Fort Bend, Galveston, Harris, and Montgomery Counties.

As a part of the HGB area's enhanced I/M program requirement under 40 Code of Federal Regulations (CFR) §51.351, the Texas Department of Public Safety (DPS) uses remote emissions sensing equipment to collect on-road vehicle emissions measurement data and identify high-emitters among the commuting fleet that are contributing disproportionately to air quality in the core metropolitan areas. The remote sensing program is aimed at identification of commuter polluters, raising public awareness, and deterring vehicle tampering and fraudulent inspections.

DPS is the agency in Texas that is responsible for enforcement of the I/M program; while EPA is responsible for enforcing federal engine standards. Texas law enforcement agencies may issue a citation to a driver of a smoking vehicle under the state's smoking vehicle statute in Texas Transportation Code §547.605.

No changes were made to this SIP revision in response to these comments.

Sierra Club, Council Member Plummer, and two individuals stated they are concerned about climate change and increasing temperatures. Sierra Club, Earthjustice, and 173 individuals commented that summers are getting hotter, which leads to ozone formation and then leads to the HGB area having ozone action days. Air Alliance Houston and Office of Harris County commented that the *Houston Chronicle* reported that HGB had the hottest summer on record and a record number of TCEQ-issued

Ozone Action Days. Air Alliance Houston then stated this is due to fossil fuel caused climate change. Sierra Club, Earthjustice, and 173 individuals also stated that the climate crisis is exacerbated by Texas' continued reliance on fossil fuels and failure to appropriately regulate industry. Sierra Club, Earthjustice, and one individual said we must keep all climate changing fossil fuels in the ground and that Texas must achieve 100% clean renewable energy by 2030. Sierra Club, Earthjustice, and one individual said these rules are not enough to lessen the impact of climate change. Two individuals stated that climate change needs to be taken into account.

The purpose of this HGB AD SIP revision is to demonstrate whether the HGB nonattainment area will or will not attain the 2008 eight-hour ozone standard in accordance with EPA's rules and guidance and FCAA requirements. TCEQ does not have authority to eliminate the use of fossil fuels, nor does it have the authority to specify use of a particular fuel. Comments regarding efforts to address global climate change are outside the scope of this SIP revision.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environmental Integrity Project, Environment Texas, Public Citizen, and Council Member Plummer stated communities of color and low-income communities experience high-ozone conditions more frequently. Air Alliance Houston, Earthjustice, Environmental Integrity Project, Environment Texas, Public Citizen, and Council Member Plummer further commented that a study Environmental Integrity Project conducted showed that people of color and low-income residents were more likely to live where ozone concentrations were higher in comparison to other areas of the state. EIP stated that the health, safety, and environmental justice (EJ) of Houston's communities depend on TCEQ taking decisive action. EIP stated that everyone has a right to breathe clean air and that it is a gross oversight by TCEQ to not consider the disproportionate impact of ozone in light of Executive Order 14096. Environmental Integrity Project, Air Alliance Houston, Public Citizen, and Environment Texas commented that TCEQ should acknowledge that in recent years, people of color are more likely to live in areas where violations of the 2008 NAAQS occur more frequently and explain how its proposed SIP revisions will address these inequities.

Office of Harris County and 26 individuals stated that people of color and minorities are more likely to experience high ozone levels in the Houston area. Council Member Plummer stated the HGB area is experiencing critical EJ issues for ozone. Sierra Club and one individual stated that an EIP study found that minority and low-income communities are exposed to high levels of ozone in the Houston area. One individual stated that Texas does not care about the health and well-being of its citizens, particularly the communities of color that are most impacted. Three individuals stated that communities of color and minorities do not deserve to be harmed by ozone and breathe dangerous air. Progressive Fifth Ward Community Association stated TCEQ continues to adopt policies that favor industry over people specifically in marginalized communities. TEJAS expressed concerns that environmental justice communities are overburdened by ozone and other toxins. Air Alliance Houston stated that the revised SIP does not acknowledge the disproportionate impact of ozone exposure on

communities of color. An individual stated communities of color demand better from TCEQ.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, Environment Texas, and TEJAS stated that equitable distribution of the dangerous ozone levels will help reduce ozone pollution levels. Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, Environment Texas, and TEJAS stated that the failure to enact additional controls will allow NO_x and VOC emissions to continue to disproportionately accumulate in low-income communities and communities of color. Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, Environment Texas, and TEJAS further stated that communities, which are populations of people of color, people with low incomes, people who are linguistically isolated, and people with less than a high school diploma, within three miles of the Houston Ship Channel will experience high rates of air pollution.

EPA requested TCEQ carefully review applicable authorities for opportunities to incorporate EJ considerations and ensure they have been adequately and appropriately incorporated in this SIP. In addition, EPA suggested that TCEQ consider the number of pollution sources, major and minor, in a geographic area as part of evaluating community risk during SIP development.

EPA encouraged TCEQ to use both EJScreen and specific area information in developing its SIP to consider potential issues related to civil rights of the communities potentially impacted. EPA commented that using EJScreen would indicate whether a SIP revision has the potential to contribute to significant public health or environmental impacts, if the community may be particularly vulnerable to impacts from the SIP revision, and whether the community is already disproportionately impacted by public health and/or environmental burdens on the basis of demographic factors.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, Public Citizen, and 27 individuals stated ozone exposure is a civil rights, health equity, and EJ issue. Air Alliance Houston, Environmental Integrity Project, Environment Texas, Public Citizen, Sierra Club, and 2 individuals further stated that minority and low-income communities in Houston are more likely to be exposed to ozone concentrations higher than the federal standard.

The purpose of this HGB AD SIP revision is to demonstrate whether the HGB nonattainment area will or will not attain the 2008 eight-hour ozone NAAQS in accordance with EPA's rules and guidance and FCAA requirements. TCEQ followed all relevant federal and state statutes, regulations, and guidance in the development of this SIP revision and evaluated all relevant information, including emission sources, in reaching its decision regarding the appropriate control strategies for the HGB nonattainment area.

The SIP is not the appropriate mechanism to address EJ issues. No federal or state statute, regulation, or guidance provides a process for evaluating or considering the socioeconomic or racial status of communities within an ozone nonattainment area. In a recent proposed approval of a TCEQ submittal for El Paso County, which did

not include an EJ evaluation, EPA stated that the FCAA "and applicable implementing regulations neither prohibit nor require such an evaluation."[2] Further, TCEQ's jurisdiction for air quality permits is limited by statute; for example, TCEQ may not consider location, land use, or zoning when permitting facilities. TCEQ continues to be committed to protecting Texas' environment and the health of its citizens regardless of location. Specific health-related concerns are further addressed elsewhere in this response to comments.

While EPA may encourage states to utilize EJScreen in SIP actions, it is not necessary because the NAAQS are protective of all populations.

TCEQ provided the public equal access in accordance with Title VI of the Civil Rights Act of 1964. This SIP revision was developed in compliance with the policies and guidance delineated in TCEQ's Language Access Plan (LAP)[3] and TCEQ's Public Participation Plan (PPP).[4] The LAP helps ensure individuals with limited English proficiency may meaningfully access TCEQ programs, activities, and services in a timely and effective manner; and the PPP identifies the methods by which TCEQ interacts with the public, provides guidance and best practices for ensuring meaningful public participation in TCEQ activities, and highlights opportunities for enhancing public involvement in TCEQ activities and programs.

In accordance with the PPP, EJScreen was used to conduct a preliminary analysis of the population in the HGB nonattainment area, which was then used to plan public engagement efforts for this SIP revision. Specifically, TCEQ developed plain language summaries, GovDelivery notices, public hearing notices, and SIP Hot Topics notices that were provided in English and Spanish for all projects. The newspaper hearing notice for this SIP revision was also translated and published in a Spanish language newspaper, and it included a statement that Spanish interpretation would be available at the hearing. Additionally, two Spanish language interpreters were available at the hearing.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that this SIP revision will interfere with the Houston area's attainment of the 2008 ozone NAAQS and in turn violates CAA §110(l) due to failure to impose controls on NO_X and VOCs.

The commission used the latest available data, models, and EPA guidance when developing this AD SIP revision.

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[2] 88 Fed. Reg. 14103 (Mar. 7, 2023).
[3] TCEQ, *TCEQ's Language Access Plan*, Sept. 2021, found at https://www.tceq.texas.gov/downloads/agency/decisions/participation/language-access-plan-gi-608.pdf.
[4] TCEQ, *TCEQ's Public Participation Plan*, June 2021, found at https://www.tceq.texas.gov/downloads/agency/decisions/participation/public-participation-plan-gi-607.pdf.

As discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the attainment date without additional control measures, and no additional control measures were determined to advance attainment by one year.

The commission does not agree that this SIP revision violates FCAA, §110(l). This SIP revision provides photochemical modeling, reasonably available control technology (RACT) and reasonably available control measures (RACM) analyses, and a contingency plan as required by the FCAA, strengthening the SIP, which would not violate FCAA, §110(l).

No changes were made to this SIP revision in response to this comment.

An individual commented that there are three liquified natural gas export terminals/pipelines in South Texas that are proposed as well as the current SpaceX heavy booster rocket launch site. These new locations will severely impact the Rio Grande Valley Area, which has no large polluting industries. This same individual also stated that there are no cumulative impact studies being performed by any federal or state agencies for the heavy industrialization of the Brownsville Ship Channel/Navigation District and wondered how that could be possible.

These comments are outside the scope of this SIP revision. No changes were made to this SIP revision in response to this comment.

EMISSIONS INVENTORY

Air Alliance Houston and two individuals commented that the HGB AD SIP revision does not consider the potential emissions impacts of decision making related to highway expansion, asserting that highway expansions encourage demand and congestion and create more ozone-inducing pollution. Air Alliance Houston and one individual suggested that the SIP include a climate-oriented approach to regional transportation planning and offered that the Houston-Galveston Area Council (H-GAC) is responsible for regional transportation planning and conformity for the HGB area. Another individual recommended structural reforms to regional transportation planning.

As documented in Appendix A: *Modeling Technical Support Document*, on-road mobile source emissions estimated for the HGB AD SIP revision accounted for existing control programs, driving behavior, meteorological conditions, and vehicle characteristics. Emission rates were generated and multiplied by hourly transportation activity data to estimate total emissions. The local travel demand model, provided by H-GAC, was the source for the vehicle miles traveled activity datasets used to develop emissions estimates for this SIP revision. The horizon year for this SIP revision is the 2026 attainment year. Future transportation planning decisions, which TCEQ has no authority to make, are considered as part of the FCAA, §176(c) transportation conformity process. Transportation conformity requirements are independent from this SIP revision.

This HGB AD SIP revision addresses attainment demonstration requirements for the HGB 2008 ozone NAAQS severe nonattainment area. As the commenters stated, transportation planning for the HGB area is H-GAC's responsibility. As part of its regional transportation planning responsibilities, H-GAC must demonstrate that its long-range transportation plans conform to the SIP. This HGB AD SIP revision includes motor vehicle emissions budgets (MVEB) for the 2026 attainment year. Should the MVEBs included in this SIP revision be found adequate or approved by EPA for transportation conformity purposes, H-GAC would be required to use them to demonstrate conformity with the SIP.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that TCEQ is not addressing inaccurate and underreporting of emissions of NO_x and VOC and highly reactive volatile organic compounds (HRVOC) stemming from the use of outdated factors and methods. They stated that TCEQ does not examine whether the sources of HRVOC emissions report more accurately now as compared to reporting in 2005 and 2006. They also stated that as a potential ozone control strategy; Texas should evaluate expanding the current definition of HRVOC to include more compounds.

TCEQ point source EI guidance, which is updated annually, requires the use of the best available data and methods to determine emissions, including the use of unit-specific monitoring data for determining VOC and HRVOC emissions from cooling towers, equipment leak fugitives, and other units.

HRVOC emissions determinations have improved from 2005 and 2006 reporting, with 42% of HGB area emissions reported from HRVOC monitoring data in 2022 compared to 8% or less in 2006.

The majority of 2022 HGB area VOC emissions are also determined using unit-specific data directly or as inputs to AP-42 equations, including using unit-specific monitoring data inputs for correlation equations to determine component fugitive emissions from components under instrument or optical gas imaging monitoring.

The vast majority of HGB area NO_x emissions are also measured directly or determined from unit-specific data, 72% of 2022 NO_x emissions were determined using continuous emissions monitors, and another 13% were determined using unit-specific predictive emissions monitors or stack test data.

Regarding the definition of HRVOC, the current definition was based upon both a compound's ozone-forming potential (known as maximum incremental reactivity) and the compound's prevalence in the HGB airshed (the compound's annual emissions from industrial sites in the HGB area). Certain compounds are highly reactive, but are not emitted in significant quantities by HGB area industrial sources (e.g., isoprene); regulating these types of compounds would not significantly contribute to attainment of the 2008 ozone NAAQS. Other highly reactive compounds may also be classified as hazardous air pollutants (e.g., certain aromatic

compounds) and subject to additional regulatory control measures, such as maximum achievable control technology standards.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that reducing HRVOC emissions is critical to reduce ozone levels in or downwind of the Houston Ship Channel and that TCEQ has not addressed the under-reporting of HRVOC emissions.

The commission is committed to developing and applying the best science and technology towards addressing and reducing ozone formation as required in the HGB and other ozone nonattainment areas in Texas. TCEQ continues to use new technology and research to improve emissions inventories, investigate possible emission reduction strategies, and other practical methods to address attainment of the ozone NAAQS. TCEQ has committed significant resources to better understanding of VOC and HRVOC emissions from various sources in the HGB area.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that TCEQ has not evaluated the accuracy of reported HRVOC emission inventories, and TCEQ should require sources to monitor their HRVOC emissions and develop control strategies to reduce their emissions.

The commission agrees HRVOC can be an important component to ozone formation, as noted in Appendix B: *Conceptual Model for the Houston-Galveston-Brazoria Nonattainment Area for the 2008 Eight-Hour Ozone National Ambient Air Quality Standard*. The commission disagrees that the accuracy of reported emission inventories have not been evaluated. TCEQ has and continues to invest significant resources into understanding ozone formation, including evaluating and improving estimates of emissions from many sources. In 2021, 2022, and 2023, TCEQ sponsored special mobile monitoring projects in the Houston area to evaluate the spatial variability of air quality, including monitoring near emission sources that emit HRVOC.[5] In September 2022, emission flux measurements were conducted near Houston emission sources that can be compared to reported emission inventories.[6] Analysis of this field campaign data is ongoing, and the results are expected to be included in future SIP revisions. More information on TCEQ's contracted research is available on the Air Quality Research and Contract Projects webpage.[7]

[5] https://www.tceq.texas.gov/downloads/air-quality/research/reports/data-analysis/582-18-81339-20221130-2011-tracer-aq-data-collection.pdf
[6] https://www.tceq.texas.gov/downloads/air-quality/research/reports/data-analysis/5822232022021-20230314-fluxsense-emission-flux.pdf
[7] https://www.tceq.texas.gov/airquality/airmod/project/

Currently, the commission requires monitoring, emissions limits, and recordkeeping for compliance with the HRVOC emissions cap and trade program.[8] Planning for future SIP revisions may consider this and other suggested strategies to attain the NAAQS, as necessary.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that TCEQ is not recognizing formaldehyde at all.

The commission disagrees with this comment. Formaldehyde emissions are included in the point source EI. Point sources in Texas that are required to submit an EI are also required to report hazardous air pollutant emissions, including formaldehyde. The 2023 *Emissions Inventory Guidelines* specifically states that point sources should report formaldehyde emissions from any unit emitting at least 0.1 ton per year.

No changes were made to this SIP revision in response to this comment.

EPA suggested that specific TCEQ emission inventory improvement projects that made or will make a difference in emissions estimates should be discussed in Section 2.6: *Emissions Inventory Improvement* of the SIP revision.

The commission notes the interest in the emission inventory improvement projects that TCEQ has sponsored. Recent projects that contributed to this SIP revision include the following.

- **2020 Texas Statewide Airport Emissions Inventory and 2011 through 2050 Trend Inventories, Texas A&M Texas Transportation Institute, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111196-20211015-tti-texas-airport-2020-aerr-trend-ei.pdf, 2021.**

- **2020 Texas Statewide Locomotive and Rail Yard Emissions Inventory and 2011 through 2050 Trend Inventories, Texas A&M Texas Transportation Institute, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111027-20211015-tti-texas-locomotive-railyard-2020-aerr-trend-ei.pdf, 2021.**

- **Houston-Galveston-Brazoria On-Road Emissions Inventories, Texas A&M Texas Transportation Institute, https://www.tceq.texas.gov/downloads/air-quality/research/reports/on-road/5822121602023-20211014-tti-hgb-onroad-2019-2023-final.pdf, 2021.**

- **Statewide Non-Link On-Road Emissions Inventories, Texas A&M Texas Transportation Institute, https://www.tceq.texas.gov/downloads/air-**

[8] https://www.tceq.texas.gov/airquality/banking/hrvoc_ept_prog.html

quality/research/reports/on-road/5822121602023-20211014-tti-statewide-onroad-2019-2023-2026-final.pdf, 2021.

- 2020 Texas Commercial Marine Vessel Emissions Inventory and 2011 through 2050 Trend Inventories, Ramboll, https://web.archive.org/web/20220122014359/https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111294fy2021-20210730-ramboll-2020-cmv-ei-trends.pdf, 2021.

- Development of Texas Nonroad Model Mobile Source 2020 Air Emissions Reporting Requirements, Reasonable Further Progress, and Redesignation and Maintenance Emissions Inventories, Eastern Research Group, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822122417fy2021-20210729-erg-texn2_nonroad_aerr_ei.pdf, 2021.

- TexN2.2 Utility Updates for Compatibility with the US EPA MOVES3 Model, Eastern Research Group, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822111300fy2021-20210423-erg-texn2-update.pdf, 2021.

- Commercial Marine Vessel Research – Shore Power and/or Alternative Emissions Controls, Ramboll, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822231436-20220630-ramboll-cmv-shore-power-research.pdf, 2022.

- Enhance MARINER Tool for Commercial Marine Emission Inventories, Ramboll, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822231220030-20220624-ramboll-mariner-enhancement.pdf, 2022.

Projects that are expected to improve future emission inventories include the following.

- Improving Aircraft Emissions Inventory Development, Texas A&M Texas Transportation Institute, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822110369-20230228-improving-aircraft-emissions-inventory-development.pdf, 2023.

- Research and Data Gathering of Port Emissions and Reduction Strategies, Texas A&M Texas Transportation Institute, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822342835fy2023-20230627-tti-cmv-potential-port-emissions-reductions.pdf, 2023.

- Quantifying Potential Emissions Reductions Associated with Federal Phase 3 Nonroad Small spark-ignition Engine Regulatory Compliance and Lawn and Garden Equipment Electrification, Eastern Research Group,

https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822342148fy2023-20230630-erg-emissions-reductions-phase-3-small-spark-ignition-electric-lawn-garden-equipment.pdf, 2023.

- Fire Emission Inventory Processing, Ramboll, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822342440fy2023-20230623-ramboll-fireeitool-and-modelingworkshop.pdf, 2023.

- Improvement of Locomotive and Rail Yard Activity Data Sourcing and Accuracy Project, Texas A&M Texas Transportation Institute, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822110369-20230224-improvement-of-locomotive-and-rail-yard-activity-data-sourcing-and-accuracy-project.pdf, 2023.

- Improving Aircraft Emissions Inventory Development, Texas A&M Texas Transportation Institute, https://www.tceq.texas.gov/downloads/air-quality/research/reports/emissions-inventory/5822110369-20230228-improving-aircraft-emissions-inventory-development.pdf, 2023.

- Emission Flux and Air Quality Data Collection for TRACER-AQ 2 Field Campaign in Houston, FluxSense, https://www.tceq.texas.gov/downloads/air-quality/research/reports/data-analysis/5822232022021-20230314-fluxsense-emission-flux.pdf, 2023.

- Analysis of 2021 TRACER-AQ Field Study Data, The University of Houston, https://www.tceq.texas.gov/downloads/air-quality/research/reports/data-analysis/5821881339-20230515-tracer-aq-2021-analysis.pdf, 2023.

TCEQ expects to continue investing in projects to improve emission estimates. More information on TCEQ's contracted research, including the projects listed above, is available on the TCEQ's Air Quality Research and Contract Projects webpage.

No changes were made to this SIP revision in response to this comment.

Earthjustice commented that TCEQ should take proactive measures to ensure decreases in ozone precursor emissions in the HGB nonattainment area by focusing on industrial emitters rather than relying on the small incremental decreases from mobile source emissions.

The commission disagrees that additional controls are required to be included in the SIP revision. The HGB AD SIP revision meets FCAA requirements by demonstrating attainment of the 2008 ozone NAAQS.

The commission disagrees that focusing on industrial emitters is necessary or that the reductions in mobile source emissions are small or incremental; a review of the emissions summaries in Chapter 2: *Emissions Inventories* of the DFW-HGB RFP SIP revision shows that mobile source NO_X emissions have decreased 54% and VOC emissions have decreased 48% between the 2011 base year and the 2026 attainment year within the HGB area.

No changes were made to this SIP revision in response to this comment.

One individual commented that TCEQ should pay more attention to flares. They stated that emissions from flares were inaccurate because the assumptions for the flare destruction levels were overly optimistic.

The commission's EI guidance addresses under-reporting of VOC emissions from flares. Specifically, the 2022 and 2023 *Emissions Inventory Guidelines* directs point sources to review flare operating data to determine actual flare destruction and removal efficiency (DRE) for EI reporting: "[The TCEQ 2010 Flare Study] also demonstrated that operating an assisted flare in compliance with 40 CFR 60.18 does not ensure that the flare will achieve 98 percent DRE." Flare assist rates and other operating information must be reviewed and assessed to determine whether a flare may be operating at assist ranges that do not achieve the 98 percent DRE. Finally, federal regulations for hazardous air pollutants require flare monitoring at refineries and ethylene plants. These monitoring regulations are designed to ensure flares are achieving required DREs.

No changes were made to this SIP revision in response to this comment.

An individual stated that the projected population growth of the Houston metropolitan area will impact the amount of vehicles on the roadways. EPA also asked whether controls would be necessary to counteract the expected increase in emissions that come along with the expected continued increase in population.

Population growth and related impacts, such as increases in vehicles and vehicle miles traveled, were incorporated into projections for the 2026 attainment year. Emissions growth resulting from population increases was offset by emissions reductions in other sectors, resulting in an overall decline of total ozone precursor emissions from the base case to the attainment case. EPA itself has noted the disconnect between population, economic growth, and emissions trends.[9, 10]

No changes were made to this SIP revision in response to this comment.

One individual commented that TCEQ used drilling rig counts from 2014 or 2015, which is unacceptable when more recent rig counts are readily available.

[9] https://www.epa.gov/transportation-air-pollution-and-climate-change/accomplishments-and-successes-reducing-air
[10] https://www.epa.gov/air-trends/air-quality-national-summary

The drilling rig emissions contained in the HGB AD SIP revision and concurrent DFW-HGB RFP SIP revision (Project No. 2023-108-SIP-NR) are not based on drilling rig counts from 2014 or 2015. TCEQ obtains the amount of feet drilled in a given calendar year from the Texas Railroad Commission (RRC), which provides a more accurate emissions estimate than the drilling rig count. TCEQ developed 2026 emissions based on actual 2020 county-level amounts of feet drilled from the RRC since this was the most recent set of data available at the time of SIP development.

No changes were made to this SIP revision in response to this comment.

Lone Star Chapter of Sierra Club commented that large industrial plants within HGB accounted for approximately 33,145.83 tons of VOC and 24,246.34 tons of NO_x based on TCEQ 2020 point source data.

The commenter appears to have reversed the VOC and NO_x numbers. TCEQ point source emissions inventory data extracted on January 10, 2024 shows 24,153 tons of VOC and 33,135 tons of NO_x emissions for 2020 in the HGB area.

No changes were made to this SIP revision in response to this comment.

HEALTH EFFECTS AND ENVIRONMENTAL IMPACTS

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented on the concerns of the health effects of ozone pollution and how it affects the health and wellbeing of Houston residents. TEJAS stated that it is frustrating to live and work in communities overburdened with cancer causing ozone and air pollution. One individual commented that air quality is a public health issue. Sierra Club, Earthjustice, and 202 individuals highlighted a Sierra Club report that stated about half of Texans are regularly exposed to unsafe ozone pollution; a reported 15 million people.[11] Sierra Club, Earthjustice, and seven individuals also stated they TCEQ needed to address public health before it got worse. Sierra Club, Earthjustice, and 10 individuals expressed the need to protect public and environmental health, and the need and right to breathe clean air to prevent illness. Sierra Club, Earthjustice, Fort Bend County Environmental Organization and 17 individuals commented on their concerns with ozone pollution and air quality on public health in the Houston area.

The Progressive Fifth Ward Community Association provided a list of 14 industry facilities and a superfund site within their borders of Interstate-10 and Highway 59/69 that concerns them. They also stated the Texas Department of Health and Human Services has designated their neighborhood as a lung and bronchial cancer cluster and added that they do not understand why TCEQ is proposing to adopt out-of-date ozone standards without considering the affected sensitive population.

Sierra Club, Earthjustice, and 11 individuals expressed concerns about the ozone pollution affecting their health, their families' and friends' health, and the community's health in the Houston area including vulnerable populations like children,

[11] https://www.sierraclub.org/texas/blog/2023/11/more-half-texans-live-areas-unsafe-ozone-levels-which-rise-temperatures

the elderly. Sierra Club, Earthjustice, and one individual said that reduced air quality caused a sore throat. TEJAS said high ozone concentrations damage human health and may cause shortness of breath, coughing, headaches, nausea, and lung irritation, particularly in children. Three individuals specifically commented on air quality impacting their respiratory health, including asthma and chronic obstructive pulmonary disease (COPD). One individual said that an increase in both industrial and vehicle emissions increased the risk of cardiopulmonary disease. Another individual linked ozone exposure to an increased risk pulmonary disease.

Sierra Club, Earthjustice, and seven individuals worried that ozone exposure in combination with extreme heat advisories and ozone action days limits their outdoor activities/exercise such as running and walking, causes respiratory distress and affects their lungs. TEJAS said that checking ozone levels is a daily health related routine.

TEJAS and two individuals were also concerned about ozone pollution affecting underserved populations disproportionately and specifically people of color and those in low-income neighborhoods. Sierra Club, Earthjustice, and 203 individuals stated that a report published from the Environmental Integrity Project showed residents from six areas in Houston were exposed to ozone levels of 100 ppb (the 2008 standard is 75 ppb). Sierra Club, Earthjustice, and 202 individuals also provided from the report that over 90 percent of the people living in four of the areas are people of color, and approximately 50 percent are low income. According to the report, people of color and low-income Houston residents are at a greater chance of exposure to higher ozone pollution than the current standard and have the lowest chance for improvement since these standards were set in 2008.[12] One individual stated that ozone pollution in the greater Houston area is a major environmental and health problem and that the burden is falling on communities of color and low-income residents.

Sierra Club and 176 individuals also referenced monitoring data in the 2023 Environmental Integrity Project report. That report provided a list of 35 ozone monitors in the HGB area, and 80 percent of the monitors (28 of 35) they identified were located in areas with more than 50 percent people of color within a three-mile radius, with 43 percent of the monitors (15 of 35) located in areas with more than 75 percent people of color within a three-mile radius.

The commission takes the health and concerns of Texans seriously. EPA establishes the ozone NAAQS at levels requisite to protect public health, including sensitive members of the population such as children, the elderly, and those with pre-existing conditions, such as asthma. EPA considered these health impacts when setting the 2008 eight-hour ozone NAAQS.

The FCAA requires EPA to periodically review all the NAAQS to ensure that they provide adequate health and environmental protection, and to update those standards as necessary.[13] Many different health effects have been investigated.to determine whether they are caused by ozone exposure. However, because data

[12] https://subscriber.politicopro.com/eenews/f/eenews/?id=0000018c-17ba-dbbc-a1de-7ffedcd10000
[13] https://www.epa.gov/criteria-air-pollutants/naaqs-table

from minimal or inconsistent studies do not provide the weight of evidence necessary to demonstrate that a pollutant exposure causes a health outcome, only those health outcomes with consistent, robust data are determined to be causally associated with exposure to ozone in EPA's science assessments. The 2006 *Air Quality Criteria for Ozone and Related Photochemical Oxidants* document stated that the overall evidence supported a causal relationship between acute ambient ozone exposures and increased respiratory effects (increased respiratory morbidity outcomes resulting in increased emergency visits and hospitalizations during the warm season) but was inconclusive for long-term ambient ozone exposures. No other causal determinations were made.[14]

Current scientific literature does not provide a definitive link between ambient ozone levels and asthma development. The trends in asthma prevalence and the lack of a definitive link between ambient ozone concentrations and asthma rates are consistent on the national scale. Large, multi-city studies have not indicated a correlation between ambient concentrations of ozone and increased incidence of asthma symptoms.[15, 16] EPA's analysis completed as part of the 2015 ozone NAAQS does not anticipate a statistically significant reduction in asthma exacerbations as a result of a lower standard.[17] Therefore, because asthma rates have remained steady while ambient levels of both ozone and ozone precursors have periods of steady decrease and because asthma rates can be higher in areas with lower ozone, it does not appear that ambient ozone concentrations are a significant contributing factor to asthma rates. The *2010 Texas Asthma Burden Report* noted that lifetime or current asthma prevalence in either Texas adults or children did not change significantly from 2005 to 2009, and the *2014 Texas Asthma Burden Report* noted a similar plateau effect for the 2011 to 2013 period.[18, 19]

Although the causes of asthma are not fully understood, there are many factors that influence the development and exacerbation of asthma. According to the World Health Organization (WHO), asthma is more likely if other family members also have asthma and in people who have other allergic conditions. Asthma is associated with urbanization and is increased in people who have damaging early life events (such as prematurity and low birth weight), and environmental allergens, irritants,

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[14] EPA. *Air Quality Criteria for Ozone and Related Photochemical Oxidants* (Final Report, 2006). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-05/004aF-cF, 2006.
[15] O'Connor GT, Neas L, Vaughn B, Kattan M, Mitchell H, Crain EF. et al. 2008. Acute respiratory health effects of air pollution on children with asthma in US inner cities. *J Allergy Clin Immunol.* 121(5):1133-1139.
[16] Schildcrout JS, Sheppard L, Lumley T, Slaughter JC, Koenig JQ, and Shapiro GG. 2006. Ambient air pollution and asthma exacerbations in children: An eight-city analysis. *American Journal of Epidemiology*, 164:505-517.
[17] EPA. 2015. The National Ambient Air Quality Standards. Overview of EPA's updates to the air quality standards for ground-level ozone. https://www.epa.gov/sites/default/files/2015-10/documents/overview_of_2015_rule.pdf
[18] Texas Department of State Health Services (TDSHS). *2010 Texas Asthma Burden Report*. December 2010.
[19] TDSHS. *2014 Texas Asthma Burden Report*. December 2014.

and obesity are also thought to increase the risk of asthma.[20] It is also more prevalent among some racial and ethnic groups.

When individuals make choices about whether to follow EPA's recommendation to limit exercise outdoors and stay indoors when concentrations of ozone in ambient air are elevated, they must also consider the benefits of outdoor exercise. The WHO ranks physical inactivity as a major risk factor for heart disease, breast cancer, colon cancer, and diabetes. The Centers for Disease Control and Prevention (CDC) found that 27.5 percent of adults in Texas were inactive, based on data from 2017-2022.[21] For children, the risks of obesity are well-documented. Many people engage in physical exercise to prevent disease and obesity. A personal decision to limit outdoor activities should also consider more than ozone levels, because there are other outdoor conditions that can increase health risks, such as high heat and humidity.[22]

The commission does not support the assertion that acute exposure to ambient concentrations of ozone is causing death, because the scientific data do not support the assertion. Clinical studies on hundreds of human subjects have shown only a range of mild, reversible respiratory effects in people who were exposed to between 60 ppb and 120 ppb ozone (representative of ambient concentrations) for up to eight hours while exercising vigorously.[23, 24] Ethical standards preclude scientists from giving human subjects potentially lethal doses of chemicals, and none of the human subjects in these studies were injured or died as a result of their exposure to ozone. Basic toxicological principles indicate that concentrations of ozone (or any other chemical) that only cause a mild, reversible effect cannot also increase the incidence of all causes of death, even in a very sensitive individual. The dose of ozone that is lethal to experimental animals is orders of magnitude higher than ambient levels of ozone and the National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life or Health value for ozone is 5,000 ppb.[25, 26] Therefore, the available information does not support assertions that there is a mechanism for acute exposures to ambient ozone to contribute to mortality.

TCEQ reviewed the 2023 Environmental Integrity Project report that was cited by some of the commenters. Appendix B of that report provides a list of 35 ozone monitors in the HGB area, and 80 percent of the monitors (28 of 35) they identified

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[20] World Health Organization. 2023. Asthma. https://www.who.int/news-room/fact-sheets/detail/asthma
[21] Centers for Disease Control and Prevention. Adult Physical Inactivity Prevalence Maps by Race/Ethnicity. https://www.cdc.gov/physicalactivity/data/inactivity-prevalence-maps/index.html#overall
[22] TCEQ. Ozone: The Facts. https://www.tceq.texas.gov/airquality/monops/ozonefacts.html
[23] Adams, WC. 2006. Comparison of chamber 6.6-h exposures to 0.04-0.08 ppm ozone via square-wave and triangular profiles on pulmonary responses. *Inhal Toxicol* 18(2):127-136.
[24] Schelegle, ES; Morales, CA; Walby, WF; Marion, S; Allen, RP. 2009. 6.6-Hour inhalation of ozone concentrations from 60 to 87 parts per billion in healthy humans. *Am J Respir Crit Care Med* 180(3):265-272.
[25] Stokinger, HE. 1957. Evaluation of the hazards of ozone and oxides of nitrogen. *Arch Ind Health* 15:181-190.
[26] *NIOSH Pocket Guide to Chemical Hazards* (NPG). 2005. Pub No. 2005-149. http://www.cdc.gov/niosh/npg/

were located in areas with more than 50 percent people of color within a three-mile radius, with 43 percent of the monitors (15 of 35) located in areas with more than 75 percent people of color within a three-mile radius. Twenty-five of the monitors have 2021-2023 design values at or below the 2008 eight-hour ozone standard of 75 ppb and 14 monitors have design values at or below the 2015 ozone standard of 70 ppb. The commission remains committed to working with area stakeholders toward attaining both the 2008 and 2015 eight-hour ozone NAAQS across the entire area as expeditiously as practicable and in accordance with EPA rules and guidance under the FCAA.

No changes were made to this SIP revision in response to these comments.

TECHNICAL ANALYSIS

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that this SIP revision is similar to the previous two HGB AD SIP revisions that modeled peak future eight-hour ozone design values of 79 ppb for 2017 (2016-12-15 adoption) and 76 ppb (2020-03-04 adoption) for 2020. The commenters stated that the modeling included in these two SIP revisions was overly optimistic because the monitored peak eight-hour ozone design values in 2017 and 2020 were 81 ppb and 79 ppb, respectively. They further commented that the weight-of-evidence analyses included in these SIP revisions to "explain away modeled nonattainment" were also overly optimistic.

The commission used the November 2018 Modeling *Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze* (EPA, 2018; referred to as the EPA modeling guidance)[27] as well as the latest data, models, and scientific research available at the time of development of the AD photochemical modeling used in each SIP revision cited by the commenters. AD photochemical modeling is used to estimate the relative changes in an area's modeled design value based on expected changes in anthropogenic emissions alone while keeping all other variables, including meteorology and natural emissions, constant.

AD modeling is not used as a forecast to predict the absolute future ozone concentrations and there are several uncertainties associated with AD modeling that may lead to differences between the observed regulatory DV and the modeled future year design value (DVF) presented in these SIP revisions. Though sources of uncertainty arise in emissions inventories (EI), as well as EI future year projection factors, year over year, meteorology is the most influential factor in determining ozone formation. AD modeling uses meteorology from the base year, which can significantly differ from the actual meteorology observed in the attainment year. The impact of meteorology can be seen in the monitor that has the peak ozone design values in the AD modeling versus the monitored design value in the attainment year.

As shown in Table 1: *Peak Eight-Hour Ozone Design Values in the HGB Area from 2003 through 2023*, below, the peak eight-hour ozone design values in the HGB area

[27] https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

have rotated among the Houston Aldine, Houston Bayland Park, and Manvel Croix Park monitors from 2003 through 2023. For each year, the highest design value is bolded and shaded in blue.

Table 1: Peak Eight-Hour Ozone Design Values in the HGB Area from 2003 through 2023

Calendar Year	Houston Aldine (ppb)	Houston Bayland Park (ppb)	Manvel Croix Park(ppb)
2003	100	**102**	91
2004	95	**101**	97
2005	92	**103**	97
2006	88	**103**	96
2007	84	**96**	91
2008	83	**91**	85
2009	83	**84**	**84**
2010	83	82	**84**
2011	83	83	**89**
2012 (Base Case Episode)	81	80	**88**
2013	77	81	**87**
2014	72	75	**80**
2015	79	76	**80**
2016	**79**	75	75
2017 (Future Year for 2016-12-15 SIP)	**81**	77	77
2018	**78**	76	72
2019 (Base Case Episode)	**81**	77	75
2020 (Future Year for 2020-03-04 SIP)	**79**	76	73
2021	74	**77**	75
2022	69	**78**	73
2023	72	**83**	77

As discussed in Appendix B of this SIP revision, this periodic change in the location of the monitored peak ozone design value over time is due to the inevitable variation in meteorological conditions such as wind direction. TCEQ does not discount that long term changes in emissions could also play a role. Since the meteorological inputs are held constant, a limitation of AD modeling is that the peak design value modeled for a future year will usually be located at the monitor with the peak design value modeled in the base case episode year. EPA modeling guidance asserts that even when the base case episode is a suitable candidate for ozone modeling (e.g., 2012, 2019), it is unavoidable that the locations of the peak ozone design values may not remain at the same location over time, and such differences are expected due to the uncertainties inherent in the modeling.

This difference between modeled and monitored values is not unique to TCEQ but is encountered by all states and EPA when modeling future ozone design values at specific monitors. In EPA's modeling guidance, EPA acknowledges this challenge as shown in the following excerpt: "The modeling analyses used to assess whether emission reduction measures will bring an individual area into attainment for the NAAQS contain many elements that are uncertain (e.g., emission projections,

meteorological inputs, science formulations, etc.). These uncertain aspects of the analyses prevent definitive assessments of future attainment status." Since modeling alone is not sufficient, EPA goes on to say that "supplemental evidence should accompany all model attainment demonstrations." Therefore, the weight-of-evidence analyses included with this, and other SIP revisions are necessary supplements because modeling alone has inevitable limitations. This is contrary to the view expressed by the commenters that TCEQ simply included weight-of-evidence analyses to "explain away modeled nonattainment."

The commission contends the monitored design values shown in the Table 1 as well as the weigh-of-evidence analysis included in this SIP revision shows that the HGB area is making slow but steady progress towards attainment and that the modeling results *and* weight-of-evidence analysis support the conclusion of this SIP revision that the HGB area is expected to attain the 2008 ozone standard by the severe classification attainment date.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ's conclusion of area attainment "is not credible" because the modeling underestimates ozone and measured ozone is not decreasing. The commenters further stated that relying on air quality modeling is "irrational" and cited the model performance evaluation (MPE) discussion included by TCEQ in Section 3.5: *Photochemical Modeling Performance Evaluation* of the SIP revision. The commenters stated that the model "underpredicts ozone levels at most regulatory monitors in the Houston-Galveston Brazoria nonattainment area, with several underpredictions falling outside the normalized mean bias (NMB) range indicating good model performance," and noted that ozone is underpredicted by more than 5% at the Aldine, Bayland Park, Conroe, and Galveston 99th Street monitors that have typically captured the highest ozone levels in the HGB area. The commenters also state that an average underestimation of 5% for modeled ozone at the Aldine monitor is not acceptable for demonstrating attainment of the 75 ppb standard. The commenters concluded that the 2026 future year design value modeled for the Aldine monitor must also be underestimated since 5% of 75 ppb is 3.75 ppb. The commenters also noted that monitoring methods would change next year, but this was not accounted for in the AD SIP revision.

The commission evaluated the model performance and compared the statistical parameters to benchmarks reported in the Emery et al., 2017 paper recommended in EPA modeling guidance. The commenters are incorrect in stating that the model "underpredicts ozone levels at most regulatory monitors in the Houston-Galveston-Brazoria nonattainment area, with several underpredictions falling outside the normalized mean bias (NMB) range indicating good model performance."

Figure 3-10: *NMB for MDA8 Ozone of at least 60 ppb in April through October 2019* and Table 3-7: *Benchmarks for Photochemical Model Performance Evaluation Statistics* in Section 3.5 clearly shows that 19 of the 20 regulatory monitors meet the 15% target with the NMB while 13 of the monitors are within 5%, and six

monitors within a range of 6-8%. These metrics show that in most instances TCEQ's model performance is in the top one-third of modeling applications. Further, on page 3-15, the SIP revision explicitly states that "all regulatory monitors in the HGB 2008 ozone NAAQS nonattainment area have NMB within the criteria range except Lynchburg." For purposes of demonstrating attainment, the Lynchburg Ferry monitor is not of concern because it has historically measured relatively low ozone levels and has had a design value of 70 ppb or less since 2013. As of 2023, the Lynchburg Ferry monitor has an ozone design value of 70 ppb and follows the 2008 eight-hour ozone NAAQS of 75 ppb. This overall pattern constitutes good model performance.

The attainment test for the future year is done by taking the relative change in modeled ozone between the future year (e.g., 2026) and the base case (e.g., 2019) and applying that ratio (called the relative response factor) to the monitored base case design value (DVB). This is discussed in more detail in Section 3.6: *Modeled Attainment Test* of the SIP revision and is in accordance with EPA modeling guidance that recommends using "model estimates in a relative rather than absolute sense to estimate future year design values." By applying modeling results in this relative fashion to "real world" monitored data, the impacts are minimized of underestimating or overestimating ozone in the base case.

TCEQ's attainment modeling for this SIP revision, which shows attainment of the ozone standard of 75 ppb in 2026, is further supported by analysis of measured ozone trends as presented in Chapter 2: *Ozone Concentrations and Trends* of Appendix B of this SIP revision: "From 2012 through 2022, ozone concentrations in the HGB area decreased by 11%, with only one monitor measuring above the 2008 eight-hour ozone NAAQS of 75 ppb in 2022." Details of the trends are shown in Figure 2-2: *Eight-Hour Ozone Design Values by Monitor in HGB Area* of Appendix B and ozone design values for 2012, 2017, and 2022 are presented on maps.

The change in monitoring methods is not expected to impact design values. As EPA stated in the October 12, 2023, excerpt in the final rule summary, "The adoption of this updated ozone absorption cross-section could result in increases in measured ozone concentrations but given the existing sources of potential variability in monitoring data, it is unlikely that there will be any consistent measurable and predictable effect on reported data" (88 FR 196). Further, changes in monitoring methods are outside the scope of this SIP revision.

No changes were made to this SIP revision in response to these comments.

Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ referenced outdated analyses in Chapter 5: *Weight of Evidence* about the ongoing emission reduction benefits from fleet turnover for on-road and non-road sources using the MOVES2014a and TexN2 model, respectively.

The commission agrees that the trend studies referenced for on-road and non-road sources rely on older model versions such as the MOVES2014a and TexN2 models, respectively. However, it should be noted that these studies are referenced in a

qualitative fashion to describe the overall fleet turnover trends where emissions generally decrease over time as older vehicles/equipment are removed from the fleet and replaced with newer versions that have lower emissions. Specific on-road and non-road emission estimates from these analyses are not mentioned or utilized in any analyses in Chapter 5.

It should also be emphasized that these types of on-road and non-road trend inventories are not a required component of an AD SIP revision. When newer versions of the MOVES and TexN models are released, TCEQ appropriately places higher priority on the development of EIs required for AD modeling (such as those discussed in Chapter 3: *Photochemical Modeling* of this SIP revision) and lower priority on multi-decade trend inventories that are not required for SIP submissions.

The commission contracts with the Texas A&M Transportation Institute (TTI) to develop on-road trend EIs each time a major revision to the MOVES model has been released by EPA. For example, prior to the MOVES2014 trend EIs from 2015 referenced in this SIP revision, a MOVES2010 EI trend study was conducted. While this SIP narrative was under development, a MOVES3 EI trend study was conducted by TTI for 1990 and 1999 through 2060 and was completed in April 2023. The study is publicly available at the MOVES Texas Statewide MOVES3 Trends EI (https://www.tceq.texas.gov/downloads/air-quality/research/reports/on-road/5822232476-20231012-moves3-trends-ei-fi.pdf) webpage.

Similar to the previous trend studies, the MOVES3 EI trend study shows an on-road fleet turnover pattern leading to lower on-road emissions over time. Therefore, the conclusions drawn by TCEQ using older MOVES model still hold with newer MOVES model as well.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that the ambient NO_X concentration levels have hardly budged since 2012, citing Figure 5-6: *Ozone Season NO_X Trends in the HGB 2008 Ozone NAAQS Nonattainment Area* on page 5-12 of the SIP narrative. The commenters also stated that the on-road and non-road fleet turnover benefits for NO_X emissions referenced in Chapter 5 of this SIP revision have been subsumed by a 7% increase in point source NO_X emissions from 2012 to 2021, citing Figure 5-7: *HGB 2008 Ozone NAAQS Nonattainment Area Point Source NO_X Emissions by Site* on page 5-14 of the SIP narrative and page 3-1 in Appendix B.

TCEQ disagrees with the implied conclusion that trends in annual 95th percentile and median NO_X concentrations are the primary determinant of annual ozone design values. Ozone is highly variable and is formed in a complex system with many interconnected factors, such as emissions, meteorology, and chemistry. From 2012 through 2022, 95th percentile NO_X showed a modest increase of 2% (numbers in the figure are rounded) and median NO_X showed a decrease of 4%. There were decreases in NO_X for both statistics from 2012 through 2017. There were no large

changes in NO_x in 2014 and 2015, but the fourth highest maximum daily 8-hour average (MDA8) ozone change was significant. This SIP clearly demonstrates that NO_x is only one such factor and cannot be considered in isolation. It should also be noted that impacts of emissions reductions from different sectors cannot be directly compared since ozone formation is sensitive to location, magnitude, etc.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that ambient total non-methane volatile organic compounds (TNMOC) and HRVOC concentration levels are stagnated or increased from 2012 to 2022 based on the Figure 5-6 of SIP narrative and cites page 5-16 of the SIP narrative where it is stated that the 11 largest VOC emitters in the HGB area had "almost no change" in emissions from 2012 through 2022. The commenter cites an increase of 4.62 tons per day (tpd) in modeled VOC from 2019 to 2026 in Table 3-6: *June 12 Episode Day 2026 Future Year Anthropogenic Modeling Emissions for the HGB 2008 Ozone NAAQS Nonattainment Area* on page 3-12 of the proposed SIP revision and stated the 2019 and 2026 VOC emissions increase is due primarily to the non-road, area, and point source categories. The commenter cited pages 5-15 and 5-17 of this SIP revision to support the statement that HRVOC emissions are stagnated or increased. The commenter concluded that these trends reinforce that ozone improvements in the Houston area have ceased in the last decade.

The commission disagrees with the commenter's assessment of VOC TNMOC and HRVOC concentrations stagnated or increased. As can be seen in Appendix B of this SIP revision, TNMOC and HRVOC concentrations show variable trends. The 95th percentile TNMOC and HRVOC decreased from 2012 through 2022 by 15% and 12%, respectively. Median TNMOC values decreased by 12% but median HRVOC values increased by 10% over that same time.

The commission agrees with the commenter that the 11 largest VOC emitters in the HGB area had "almost no change" in emissions from 2012 through 2021 but analysis shows that the top 11 reporting sites accounted for only 41% of the total HGB 2008 ozone nonattainment area point source VOC emissions in 2021. Overall, VOC emissions from all point sources decreased by 14% from 2012 through 2021. Similarly, the top nine emission sources contributed 51% of HRVOC in the region in 2021 and overall HRVOC emissions from all point sources decreased by 3% from 2012 through 2021.

The commission disagrees with the commenter that ozone improvements have ceased in the last decade. The HGB area design value decreased by 11% from 2012 through 2022, with only one monitor having a design value above the 2008 ozone standard in 2021 and 2022. These decreasing trends in design values in the HGB area suggest slow yet steady progress toward attainment by the 2027 attainment date.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that the abrupt, temporary drop in ozone and precursor levels that TCEQ repeatedly notes (e.g., AD at 5-8, 5-11; Appendix B at 2-7, 3-2 to 3-4; and Figures 3-1 to 3-4, 3-7 to 3-8) occurred in 2020, but does not seek to explain, what is almost certainly explained by changes in commuting and other patterns stemming from the onset of the COVID-19 pandemic in the United States in March-April 2020.

In the SIP revision, both in Appendix B and Chapter 5 of the SIP narrative, TCEQ evaluated ozone in 2020 at both annual and monthly time scales, but neither identified any impacts specifically attributable to COVID-19. Section 5-5: *Meteorologically-Adjusted Ozone Concentrations* of Appendix B identified 2020 as a year with meteorology that was less conducive to ozone formation than a typical year. This meteorology was likely a greater influence on ozone that year than any changes during the response to COVID-19 that curtailed commuting.

A thorough evaluation of COVID-19 is beyond the scope of this SIP revision. No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS stated that TCEQ acknowledges that VOC reductions in 2020 were not caused by the biggest industrial polluters in the Houston Ship Channel. They also stated that TCEQ relies on unusually low pollution levels in 2020 to support its AD, which is irrational because there is no reasonable basis to expect those pollution reductions to be permanent.

The commission disagrees with the commenters' characterization of TCEQ's statements in Appendix B regarding VOC concentrations around the Houston Ship Channel. The statement referred to is part of a larger analysis regarding the overall relative aerial distributions of TNMOC and HRVOC and that 2020 decreases in HRVOC concentrations are not as widespread as seen in TNMOC. TCEQ also disagrees with the commenters that TCEQ relies on unusually low pollution levels in 2020 to support its AD SIP revision. TCEQ followed EPA modeling guidance in choosing a base case modeling episode of April through October 2019 (not the year of 2020) to estimate the 2026 future case eight-hour ozone design values using projection factors. These projection factors used to develop the 2026 future case emissions from the 2019 base case were developed prior to 2020 and therefore did not take any COVID-19 impacts into account. The specifics of the projection factors, also called growth factors, differ by sector, and are described in detail throughout the Appendix A.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that the reduction of 14.13 tpd of NO_X for commercial marine vessels from 2019 to 2026 is "overstated." The commenter further noted that this level of NO_X reduction was extracted from Tables 3-5: *June 12 Episode Day 2019 Base Case Anthropogenic EI in the HGB 2008 Ozone NAAQS Nonattainment Area* and 3-6: *June 12 Episode Day 2026 Future Year Anthropogenic Modeling Emissions for the HGB 2008 Ozone NAAQS Nonattainment Area* on page 3-12 of the SIP revision.

The commission does not agree that the 14.13 tpd of NO_x emissions reductions for CMV are overstated. The best available information was used to develop the commercial marine NO_x emissions estimates of 63.41 tpd for the 2019 base case and 49.28 tpd for the 2026 future year.

Development of the CMV inventory is documented in Section 3.6: *Off-Road Mobile Sources* on pages A-44 through A-46 of Appendix A, which states that "the emission estimates were projected to 2026 based on expected changes in shipping activity and reductions in emission rates from engine turnover as detailed in Ramboll's report 2020 Texas CMV Emissions Inventory and 2011 through 2050 Trend Inventories." This study is available on TCEQ's Air Quality Research and Contract Reports: Other Emissions Sources webpage. Section 4.2: *Emissions Forecasting*, on pages 28-32 of the report includes a set of scaling factors from EPA that accounts for changes in commercial marine engine rates through 2050 for pollutants such as NO_x, VOC, carbon monoxide (CO), sulfur dioxide (SO_2), fine particulate matter ($PM_{2.5}$), and coarse particulate matter (PM_{10}).These factors were applied in conjunction with other factors that account for expected growth in vessel activity to yield the estimate of 14.13 tpd of NO_x reductions in CMV for HGB.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ should factor in any NO_x and VOC emissions resulting from construction on the Houston Ship Channel expansion project into the AD and noted that the proposed SIP revision does not state if the construction equipment included in this expansion is included in the non-road EI and that emissions from the project are likely to be contributors to ozone levels from 2024 through 2026. Further the commenters stated that TCEQ improperly reduced the 2026 NO_x emissions by 3% for ocean-going vessels due to the expansion in the attainment modeling. The commenters also stated that TCEQ must explain how achievement of the reductions it claims from the Houston Ship Channel project will be enforceable for the purposes of demonstrating attainment.

Section 3.5: *Non-Road Mobile Sources* of Appendix A includes details of AD modeling emissions from construction equipment being included under the non-road category of emission sources. The source of the non-road emissions estimates for all Texas counties is version 2.2 of the Texas NONROAD (TexN2.2) model that includes estimates for construction equipment by county. Equipment used for the Houston Ship Channel expansion and all other construction activities in HGB for the modeled years of 2019 and 2026 are included in these estimates. Part of the Houston Ship Channel expansion involves dredging, and emissions for this activity are included as a vessel type with the commercial marine source category for the modeled years of 2019 and 2026 in HGB. The 2026 future case emission estimates incorporate growth due to construction and related activities.

The commenter is incorrect in stating that TCEQ relied on reductions from the Houston Ship Channel project in demonstrating attainment. On page 3-29 of the proposed SIP revision, TCEQ specifically states that "the modeling sensitivity is not

relied upon to meet AD requirements for the HGB 2008 ozone NAAQS severe nonattainment area but was completed to assess potential ozone impacts from improved traffic flow for ocean-going vessels once Project 11 is complete." Therefore, emissions from the Houston Ship Channel project were not relied on for the AD SIP revision.

Further, since the latest completion date for this project has moved to "late 2026," the details of the Houston Ship Channel sensitivity were removed from this SIP revision in response to these comments. It should be noted that the removal of the Houston Ship Channel sensitivity did not change results or conclusion of the AD modeling since emissions reductions from the Houston Ship Channel expansion were never relied upon for the AD modeling.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that due to the violations of the 75 ppb standard in 2023, TCEQ should re-evaluate if the models used in the proposed SIP revisions are reliable enough to ensure that the HGB area will attain the 2008 ozone standard by July of 2027. The commenters compared monitored ozone values in 2019 and 2023 and stated that the [2019] baseline and models used in TCEQ's SIP revisions may no longer suffice. The commenters stated that 2023 would be considered an outlier in terms of meteorology.

The commission disagrees that the preliminary 2023 design value in the HGB area is an appropriate measure to evaluate the base case or models used in the SIP revision. The attainment date for the HGB 2008 ozone NAAQS severe nonattainment area is July 20, 2027, which will require incorporation of ambient ozone data from 2024 through 2026 to compute design values. Monitored ozone data from 2023 will not be used to determine compliance for the HGB area and is, therefore, by itself unsuitable for evaluating the baseline or models used in this SIP revision.

Regarding photochemical model performance, TCEQ used EPA-recommended methodology, statistics, and documentation. As discussed in Section 5: *Photochemical Model Performance Evaluation* of Appendix A, TCEQ compared model results to observed data during periods where MDA8 was at or above 60 ppb. Using benchmarks reported in the Emery et al., 2017 paper recommended in EPA modeling guidance, TCEQ found that all monitors in the HGB area had a normalized mean error (NME) within either the criteria or goal range and most of the monitors had a NMB within either criteria or goal range. TCEQ finds that the chosen base year has acceptable performance in replicating high ozone.

The commenters are correct about 2023 meteorology being an outlier. Meteorology in 2023 was markedly different from most other years in the HGB area. National Weather Service's annual regional climate summary for the 2023 HGB area climate showed above normal temperatures, below normal precipitation, and drought for extended period of time in the HGB area.[28] Trends in design values in the HGB area

[28] https://www.weather.gov/media/hgx/climate/summary/Annual_2023_Regional_Climate_Summary.pdf

suggest slow yet steady progress towards attainment by the 2027 attainment date. In 2022, only one monitor in the HGB area was above standard.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that TCEQ's HGB conceptual model understates emissions, especially HRVOC emissions. The commenters further stated that a balanced approach controlling both NO_X and VOC emissions is needed and that TCEQ is relying solely on NO_X reductions in this SIP revision based on a single modeling analysis. They commented that VOC and HRVOC emissions needed to be reduced especially in VOC-sensitive areas such as the Houston Ship Channel. The commenters requested that TCEQ consider maximum incremental reactivity (MIR)-weighted VOC-to-NO_X ratios, and further requested that TCEQ do multiple sensitivities reducing VOC and HRVOC to evaluate options for achieving attainment.

The commission acknowledges that there are multiple ways of analyzing VOC-to-NO_X ratios and multiple definitions for VOC limited, NO_X limited, or transitional atmospheric conditions. The analysis in TCEQ's HGB conceptual model uses the method and cut points described in EPA's photochemical assessment monitoring stations (PAMS) training workshop (Hafner and Penfold, 2018). Overall, the VOC-to-NO_X ratio analysis indicates that monitors located closer to the urban core measure ratios closer to VOC limited conditions, monitors near more industrial areas measure closer to transitional conditions, and monitors in more suburban areas measure closer to NO_X limited conditions. These findings are corroborated by other research that shows a NO_X limited regime over much of the HGB area and a VOC limited regime in and near the Houston Ship Channel (Goldberg et al. 2022).[29] In addition, automated gas chromatograph (auto-GC) monitors are often source-oriented, and therefore do not necessarily reflect the conditions of the whole area.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that extremely hot weather in the HGB area contributed to frequent and severe exceedances in 2023 of the 75-ppb level of the 2008 eight-hour ozone standard. The commenters stated that TCEQ should acknowledge that global warming models show that temperatures will continue rising in the HGB area, and that an attainment plan should be proposed to reflect this.

The AD modeling in the SIP revision relies on meteorological modeling for a recent base case episode from April through October of 2019. For the purposes of estimating the impacts of a 2026 future year EI on modeled ozone levels, the meteorological inputs from the 2019 base case must remain unchanged. For the purposes of an AD, it is not appropriate or practical to forecast different

[29] Goldberg, Daniel L., Monica Harkey, Benjamin de Foy, Laura Judd, Jeremiah Johnson, Greg Yarwood, and Tracey Holloway. 2022. "Evaluating NO_X emissions and their effect on O3 production in Texas using TROPOMI NO2 and HCHO." Atmos. Chem. Phys. 22, 10875–10900. https://doi.org/10.5194/acp-22-10875-2022.

meteorological inputs for the future year, especially when there is a relatively short difference of seven years between the base case episode and future year.

This specific issue is further addressed in Section 2.6.2: *Assessing Impacts of Future Year Meteorology* from EPA SIP modeling guidance, which states that "there are significant uncertainties regarding the precise location and timing of climate change impacts on air quality. Generally, climate projections are more robust for periods at least several decades in the future because the forcing mechanisms that drive near term natural variability in climate patterns (e.g., El Niño, North American Oscillation) have substantially larger signals over short time spans than the driving forces related to long-term climate change. In contrast, projections for SIP purposes are generally for time spans of less than 20 years. Given the relatively short time span between base and future year meteorology in most SIP demonstrations, EPA does not recommend that air agencies explicitly account for long-term climate change in attainment demonstrations."

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen suggested that TCEQ identify upwind sources that caused an increase in the median HRVOC value in 2021-2022 compared to 2012 in the HGB area.

The commission contends that its analysis, cited by the commenter, cannot identify a specific source. While the analysis may point in the specific direction of sources, it cannot identify or confirm the locations of new or existing sources. The known sources of propylene within the HGB area are large petrochemical facilities that are already included in the point source EI. If the commenters or others can demonstrate that additional sources of propylene or other reactive VOC species are being excluded from TCEQ point source inventory, TCEQ will evaluate such data submissions.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that the HGB conceptual model does not include Emission Events/Scheduled Maintenance/Startup/Shutdown (EE/SMSS) emissions in its analysis of point source emissions trends of VOC and HRVOC. The commenters provided details of several EE in 2019 and 2023, and stated that the proposal should consider the impact of EE releasing HRVOCs of large quantities in a short time period on ozone levels in HGB.

The commission acknowledges that the impact of EE/SMSS might be detected at monitors but notes that conducive meteorological conditions are required for high ozone formation. The rapid ozone formation analysis in the HGB area presented in Section 2.7: *Rapid Ozone Formation* of Appendix B did not find clear and conclusive evidence that high ozone formation in the region is always directly related to EE/SMSS conditions. EE/SMSS are not regular events and vary from year to year. The commission did not include EE/SMSS emissions in its point source emissions

trend analysis because doing so may misrepresent actual long-term trends in VOC and HRVOC. The commission followed EPA guidance, which does not require EE/SMSS analysis in a conceptual model.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen noticed that temperatures during ozone season have an increasing trend and lead to high ozone design values. They further commented that the episode year should include more days with high ozone.

The commission followed EPA modeling guidance in choosing the base year (episode year) that is in a recent past and has a sufficient number of high ozone days that follow historically observed patterns. In choosing a base year, TCEQ focuses on both exceedance days per episode, as shown in Figure 3-1: *Exceedance Days in the HGB 2008 Ozone NAAQS Nonattainment Area by Year from 2012 through 2022* of the SIP revision, as well as total exceedances shown in Figure 1-1: *Number of Exceedances by Year in Texas Area* of Appendix A. The HGB nonattainment area had 22 exceedance days in 2019, which is the most since 2015 (29). DFW had 13 in 2019, and while 2018 had a higher number of exceedance days (21), TCEQ must choose a base year that satisfies all areas (HGB, DFW, and Bexar County) for ozone AD purposes.

In accordance with EPA's modeling guidance, a base year must reflect "a variety of meteorological conditions that *frequently* [emphasis added] correspond with observed eight-hour daily maxima concentrations greater than the level of the NAAQS at monitoring sites." Although 2018 was considered, during its summer the polar jet stream trajectory took an atypical, strong southerly path towards the Gulf of Mexico in late July, leading to stagnant winds and high ozone. Typically, July experiences relatively low ozone compared with June and August because impact of the Bermuda High on Texas is at its peak during this time, resulting in steady offshore winds from the Gulf of Mexico that tend to bring low background ozone concentrations. Therefore, the summer of 2018 did not follow historically observed temporal patterns for ozone formation. TCEQ found that the 2019 temporal distribution of exceedances for all areas was more representative of the 10-year average. TCEQ presented this information on June 23, 2021, at an Air Quality Technical Information Meeting for the HGB area. More information about episode selection is available at the Modeling Base Year Selection (https://www.tceq.texas.gov/downloads/air-quality/modeling/meetings/hgb/2021/20210623-modelingepisode-tceq-scalpone.pdf) webpage and in Section 1.2: *Modeling Episode Selection* of Appendix A.

More recent years, such as 2020 and 2021, cannot be selected because emission inputs might be atypical due to the COVID-19 pandemic. In addition, development and documentation of an AD involves extensive work spanning several years. To accommodate SIP due dates imposed by EPA, newer years such as 2021, 2022, and 2023 cannot be selected because of the time and resources required to incorporate

changes in emission inputs for all Texas and non-Texas areas as well as unavailability of key datasets in a timely manner.

Regarding photochemical model performance, TCEQ used EPA-recommended methodology, statistics, and documentation. As discussed in Section 5 of Appendix A, TCEQ compared model results to observed data during periods where MDA8 ozone was at or above 60 ppb. Using benchmarks reported in the Emery et al., 2017 paper recommended in EPA modeling guidance, TCEQ found that all monitors in the DFW area had a NMB and NME within either the criteria or goal range. Similarly, all monitors in the HGB area had NME within either criteria or goal range and most of the monitors had NMB within those ranges. TCEQ finds that the choice of base year and model performance in replicating high ozone in the chosen base year are in line with EPA modeling guidance.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen commented that the meteorological analysis included in TCEQ's HGB conceptual model, specifically wind patterns show the influence of local sources on the region's ozone and the importance of addressing locally produced precursor emissions from industrial point sources.

The commission agrees that local sources play a role in the HGB area's ozone levels, and reductions in local precursor emissions would be helpful in attaining the standard. Therefore, this SIP revision accounts for anticipated local reductions from all HGB anthropogenic sources to demonstrate attainment.

No changes were made to this SIP revision in response to this comment.

EPA commented that there are concerns that the modeling projections of the 2026 future ozone design value (2026 DVF) for the HGB area in this SIP revision is underestimated. EPA commented that their concern was based on the recent 2022 and 2023 monitored design values of 78 and 83 ppb, respectively; that the 2022 and 2023 monitored design values were higher than the modeled 2023 design value in the previously proposed HGB 2015 Ozone NAAQS Moderate AD SIP Revision; and that the historically observed rate of decrease of monitored design value is 1 to 1.2 ppb/year whereas a decrease of 3 ppb/year is needed in the next three years to reach 75 ppb from the 2023 monitored design value of 83 ppb. EPA further commented that the proposed SIP revision did not include a discussion of why the modeled 2026 DVF is realistic considering the monitored 2023 design value for the HGB area is 83 ppb.

The preliminary monitored 2023 design value in the HGB area, comparison of those values to the 2015 eight-hour ozone NAAQS, and modeling conducted for the HGB 2015 Ozone NAAQS Moderate AD SIP Revision are not appropriate measures of whether modeled 2026 DVF values contained in this SIP are underestimated. The SIP revision is for the severe classification for the 2008 ozone NAAQS of 75 ppb for the HGB area, which has an attainment date of July 20, 2027, and an attainment year of 2026. Attainment of the 2008 ozone NAAQS by the severe classification

attainment date will be based on monitored ambient ozone data from 2024 through 2026. Monitored ozone data from 2023 will not be used to determine compliance for the HGB area and are, therefore, by themselves inappropriate for assessing projections of future attainment. Details of AD modeling from the previously proposed HGB 2015 Ozone NAAQS Moderate SIP Revision are irrelevant to evaluating the AD modeling for a different standard with a later attainment date than documented in this SIP revision.

EPA inappropriately attempted to estimate a per year decrease of three ppb needed in three years from a 2023 monitored design value of 83 ppb to reach 75 ppb when, as explained above, attainment of the 2008 ozone standard by the attainment year of 2026 does not depend on the 2023 monitored design value at all.

In addition, meteorology in 2023 was markedly different from most other years in the HGB area. The National Weather Service's annual regional climate summary for the 2023 HGB area climate showed above normal temperatures, below normal precipitation, and drought for an extended period of time in the HGB area.[30]

Complete validated monitored data for 2023 was unavailable at the time the proposed SIP revision was developed and will still not yet be available for a thorough assessment by the time this SIP revision has to be adopted to meet EPA imposed deadlines.

No changes were made to this SIP revision in response to these comments.

EPA commented that TCEQ did not provide Model Performance Evaluation (MPE) data with sufficient time for EPA and the general public to review, and that the MPE material was "lacking" and does not comport with EPA's modeling guidance.

The commission disagrees with EPA's assertion that the MPE for this SIP revision does not comport with EPA's modeling guidance. TCEQ used EPA-recommended methodology, statistics, graphs, and documentation in preparation of this SIP revision. Table 3-7 shows the benchmarks reported in the Emery et al., 2017 paper that were used to evaluate the performance of the photochemical model. Page 3-15 of the HGB AD SIP revision discusses temporal and spatial scales used to conduct the operational performance evaluation in accordance with EPA's modeling guidance.

Performance statistics recommended by EPA are displayed graphically in Figures 3-10 and 3-11 *NME for MDA8 Ozone of at least 60 ppb in April through October 2019*, located in the HGB AD SIP revision, for each regulatory monitor in the HGB nonattainment area and are also shown for each month of the episode in Table 3-8: *NBM and NME of Eight-Hour Average Ozone in the HGB 2008 Ozone NAAQS Nonattainment Area.* A spatial plot (Figure 3-12: Monthly NMB (for observed MDA8 ≥ 60 ppb) in the HGB Ozone NAAQS Nonattainment Area) recommended by EPA's modeling guidance displays the NMB percentage at each monitor for each month of

[30] https://www.weather.gov/media/hgx/climate/summary/Annual_2023_Regional_Climate_Summary.pdf

the episode. Appendix A contains additional performance statistics recommended by EPA, such as mean observed ozone, mean modeled ozone, mean bias, mean error, and correlation coefficient for each month of the episode, as well as monitor-specific soccer plots (Figure 5-8).

The commission notes that modeling files were made available to EPA, stakeholders, and/or the general public in November 2023. Details on how to access the files are provided in Chapter 6: *Modeling Data Archive* of Appendix A as well as at the Texas Air Quality Modeling (2019 Platform) (https://www.tceq.texas.gov/airquality/airmod/data/tx2019) webpage.

Further, EPA did not specify how TCEQ's MPE was "lacking" and did not reference specific areas that needed improvement. Therefore, given the information in the SIP revision adheres to EPA's modeling guidance, TCEQ has no basis to make any substantive changes.

No changes were made to this SIP revision in response to this comment.

EPA commented that the meteorological modeling Model Performance Evaluation (MPE) was "limited" and suggested that a more robust analysis is needed to help determine why the photochemical modeling may not be replicating high monitored ozone values.

To evaluate the Weather Research and Forecasting (WRF) model performance, TCEQ used EPA-recommended methodology, statistics, graphs, and documentation in preparation of this SIP revision. As stated on page A-13 of the Modeling TSD (Appendix A), TCEQ compared model results to observed data during periods within the 2019 modeling episode months that had overlapping exceedance days for DFW and HGB to account for the long ozone season and evaluate WRF model performance for high ozone days. TCEQ used benchmarks reported in Emery et al., 2001 as recommended in EPA's modeling guidance to evaluate "simple" conditions, while benchmarks reported in McNally, 2009 and Kemball-Cook et al., 2005 were used to evaluate "complex" conditions. Appendix A pages A-13 through A-20 explain the monthly performance of the model for wind speed, wind direction, temperature, and humidity. As stated on pages A-15 through A-16 and A-18 through A-19, all performance statistics were within the "simple" and/or "complex" benchmarks except for humidity, which exhibited greater error likely due to the limited number of monitors that record humidity in the HGB area. TCEQ presented this data in soccer plots recommended in EPA's modeling guidance. Given the ability of the model to replicate ozone exceedance days with acceptable error, TCEQ considers the model reasonably robust.

TCEQ devoted significant time and effort to develop appropriate modeling inputs and configurations. Meteorological files for the platform were made publicly available on June 7, 2021, and were open for comment until July 23, 2021. TCEQ also presented the meteorological MPE for 2019 at the HGB Air Quality Technical Information Meeting (AQ TIM) on June 23, 2021. Various components of the WRF MPE were discussed, as well as additional information such as the choice of a vertical coordinate system, alternative WRF configurations, and use of

observational nudging. This information is publicly available on TCEQ's website at Meteorological Model Performance Evaluation for 2019 (https://www.tceq.texas.gov/downloads/air-quality/modeling/meetings/hgb/2021/20210623-meteorologicalmodelperformance-tceq-dornblaser.pdf). WRF Modeling files are available to EPA and/or stakeholders upon request.

Further, EPA did not specify how TCEQ's WRF MPE was "limited" and did not reference areas that needed improvement. Therefore, given the data and information in the SIP revision adheres to EPA's modeling guidance, TCEQ has no basis to make any substantive changes. The TSD (Appendix A), however, was updated to include references used for the complex benchmarks.

EPA commented that some of the episode days used in the attainment test calculations had low observed ozone in the 2019 base case while having relatively high modeled ozone. EPA cited examples of this for the DFW monitors of Grapevine Fairway, Frisco, and Denton Airport South and stated that similar concerns apply to the HGB area as well. EPA stated that the future design value calculations could be impacted by inclusion of these days with significant differences between observed and modeled ozone.

In performing the attainment test for each monitor, TCEQ followed EPA's modeling guidance, as outlined in Section 4.2: *Modeled Attainment Test for the Primary Ozone Standard*. This approach required including the top 10 days in the episode that had the highest modeled ozone in the base case simulation in the Relative Response Factor (RRF) calculation which resulted in inclusion of some episode days where modeled ozone in the 2019 base case was higher than observed ozone.

TCEQ performed a sensitivity analysis where any of the top 10 days that had NMB beyond +/- 15% were removed from the attainment test calculation and the observed MDA8 was at or above 60 ppb.

Table 2: *Impact of Filtering Out Episode Days on 2026 Future Design Values in HGB* below summarizes the impacts that these filtering approaches have on the 2026 future design values at the HGB area regulatory ozone monitors.

Table 2: Impact of Filtering Out Episode Days on 2026 Future Design Values in HGB

HGB Area Monitor Name	2026 DVF: No Filter	2026 DVF: 15% NMB Filter	Impacts on 2026 DVF due to NMB Filter	2026 DVF: Observed MDA8 >= 60 Filter	Impacts on 2026 DVF due to Observed MDA8 Filter
Houston Aldine	75	75	0	75	0
Houston Deer Park 2	74	74	0	74	0
Houston Bayland Park	73	73	0	73	0
Conroe Relocated	72	73	+1	73	+1

HGB Area Monitor Name	2026 DVF: No Filter	2026 DVF: 15% NMB Filter	Impacts on 2026 DVF due to NMB Filter	2026 DVF: Observed MDA8 >= 60 Filter	Impacts on 2026 DVF due to Observed MDA8 Filter
Galveston 99th Street	72	72	0	72	0
Manvel Croix Park	71	72	+1	71	0
Houston East	71	71	0	71	0
Park Place	71	71	0	71	0
Northwest Harris County	70	71	1	70	+1
Baytown Garth	70	69	-1	69	-1
Clinton	69	69	0	69	0
Lang	69	69	0	69	0
Houston Croquet	68	69	1	68	0
Channelview	66	67	0	67	+1
Seabrook Friendship Park	66	66	0	66	0
Houston Westhollow	66	67	-1	66	0
Houston Monroe	64	64	0	64	0
Lake Jackson	63	62	-1	62	-1
Houston North Wayside	63	63	0	63	0
Lynchburg Ferry	63	63	0	63	0

Further, though Section 4.2.1: *Model Values to Use in the RRF Calculation*, does say that some episode days with poor performance can be removed from the attainment test and then replaced with the next highest modeled day(s) to ensure that at least 10 days are included in the test for each monitor, EPA's modeling guidance does not specify any criteria that should be used when selecting episode days for removal from the attainment test.

Since there is no change to the conclusions of the proposed SIP revision that the HGB area will attain the 2008 ozone NAAQS by the severe classification attainment date, and since there is no specific guidance in EPA modeling guidance on which criteria should be used to filter the top 10 days included in the RRF used in the attainment test, no changes were made to the SIP revision in response to this comment.

EPA commented that the weight-of-evidence analyses did not provide evidence that the modeling is a "fully reliable predictor of future ozone levels," that modeling is overestimating anticipated reductions in design values, and that the HGB area does not seem likely to reach attainment of the 2008 ozone standard by 2026.

It is impossible for any computer-based model to be a "fully reliable predictor of future ozone levels," and EPA clearly states this in the SIP modeling guidance when discussing the need for analyses that supplement the modeling. Section 6.0: *How Can Additional Analyses Be Used to Support an Ozone or $PM_{2.5}$ Attainment Demonstration?* begins with the following excerpt: "By definition, models are simplistic approximations of complex phenomena. The modeling analyses used to assess whether emission reduction measures will bring an individual area into attainment for the NAAQS contain many elements that are uncertain (e.g., emission projections, meteorological inputs, science formulations, etc.). These uncertain aspects of the analyses prevent definitive assessments of future attainment status."

In the same section of the SIP modeling guidance, EPA goes on to say that "all attainment demonstrations will be strengthened by additional analyses that can supplement the modeling to enhance the assessment of whether the planned emissions reductions are likely to result in attainment." In accordance with EPA guidance, additional analyses that constitute the weight-of-evidence in this SIP revision supplement attainment modeling rather than prove that the modeling is a "fully reliable predictor of future ozone levels." As EPA clearly states in the excerpt from above, modeling alone cannot definitively assess future attainment status.

No changes were made to this SIP revision in response to this comment.

EPA commented that the proposed HGB AD SIP revision for the 2008 eight-hour ozone NAAQS used "basically all the same modeling files, etc." as for the previously proposed HGB 2015 ozone NAAQS Moderate SIP revision. EPA noted that the peak 2023 future design value modeled for HGB was 76 ppb, which is 7 ppb lower than the peak 2023 monitored design value of 83 ppb for HGB. Based on these differences between the monitored and modeled future design values for 2023, EPA believes the modeling projections for 2026 will likely underestimate future design values that will occur in 2026. EPA stated that "TCEQ should investigate what seems to be a systematic problem and offer potential solutions to improve future model projections."

EPA is incorrect in stating that "basically all the same modeling files" were used for the AD modeling in the previously proposed HGB 2015 Ozone NAAQS Moderate SIP Revision. While the same meteorological files for the 2019 base case episode were used, updates were made to some EI files as time permitted. Further, clearly there were different EI input files modeled for the 2023 and 2026 future years for modeling attainment of the 2015 and 2008 eight-hour ozone NAAQS, respectively.

While peak monitored and modeled future design values for 2023 cited by EPA are correct for the HGB area, it is inappropriate to use modeling from a previously proposed SIP revision for a lower standard with an earlier attainment date as an evaluation criterion for this SIP revision solely based on the incorrect assumption that "basically all the same modeling files" were used. It should be noted that in the previously proposed HGB 2015 Ozone NAAQS Moderate SIP Revision, TCEQ did not model attainment of the 2015 ozone NAAQS. However, on October 12, 2023, Texas Governor Greg Abbott signed and submitted a letter to EPA to reclassify the DFW

moderate 2015 ozone NAAQS nonattainment area to serious. In both cases, TCEQ appropriately used the AD modeling results.

Further, EPA did not provide any specific details or information on why it believes there is a systematic problem with the proposed AD modeling, other than the difference between the monitored and modeled design values for 2023. As explained above, the monitored design values were heavily influenced by outlier meteorology and are not an appropriate metric for determining if the modeling in this SIP revision is reasonable.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, TEJAS, and EPA commented that TCEQ did not use the most up-to-date data from EPA in developing emissions inventories for non-Texas areas. They also noted that version 1 of EPA's 2016 modeling platform was available in March 2021, but was updated by version 2 in February 2022 and version 3 in January 2023. EPA stated that use of these updated versions of the 2016 modeling platform may improve model performance and resolve emission inventory issues.

When conducting AD modeling, TCEQ always strives to incorporate the complete sets of the most recent modeling files available from EPA or any other sources. Publication dates for EPA technical support documents for versions 1, 2, and 3 of their 2016 modeling platform are March 2021, February 2022, and January 2023, respectively. However, these dates typically reflect the initial release of some but not all modeling files associated with that version of the modeling platform. For example, a review of various directories with modeling files will show that EPA was updating version 2 through April of 2023, and was updating version 3 through June of 2023 when EPA also provided the modeled design values for this version of the modeling platform as part of the Good Neighbor Federal Implementation Plan (FIP).

Table 3: *Comparison of 2026 Future Design Values for HGB between TCEQ and EPA* below shows a comparison of the 2026 future design values for version 3 of EPA's modeling with TCEQ's current modeling. When averaged across all monitors, the 2026 future design values from EPA were 3.3 ppb lower in the HGB area when compared with TCEQ's efforts, making it unclear that inclusion of version 3 of the 2016 modeling platform would necessarily improve model performance and/or resolve emission inventory issues as EPA suggests.

Table 3: Comparison of 2026 Future Design Values for HGB between TCEQ and EPA

HGB Site ID	HGB Ozone Monitor Name	TCEQ 2026 DVF (ppb)	EPA 2026 DVF (ppb)	TCEQ - EPA DVF (ppb)
482010055	Houston Bayland Park	73	69	+4
482011017	Baytown Garth	70	66	+4
482011035	Clinton	69	66	+3
483390078	Conroe Relocated	72	65	+7
482011039	Houston Deer Park #2	74	64	+10
481671034	Galveston 99th St.	72	70	+2
482010024	Houston Aldine	75	73	+2
482010026	Channelview	66	64	+2
482010051	Houston Croquet	68	64	+4
482010047	Lang	69	67	+2
482010029	Northwest Harris Co.	70	63	+7
482011034	Houston East	71	68	+3
482010062	Houston Monroe	64	60	+4
482010046	Houston North Wayside	63	62	+1
480391016	Lake Jackson	63	58	+5
482011015	Lynchburg Ferry	63	61	+2
480391004	Manvel Croix Park	71	69	+2
482010416	Park Place	71	67	+4
482011050	Seabrook Friendship Park	66	65	+1
482010066	Houston Westhollow	66	67	-1

Further, other than speculating that using data from the latest version of EPA's 2016 modeling platform might improve model performance, EPA did not provide any justification or reasons why inclusion of a slightly updated EI for non-Texas areas in the modeling domain will improve model performance.

TCEQ used the most up-to-date data available at the time of SIP development, and based on TCEQ's comparison in Table 2, above, it appears that EPA's latest version of its 2016 modeling platform would not have addressed the concern that the modeled 2026 DVF in TCEQ's modeling is underestimated. Regardless, incorporating major changes such as emissions inputs for all non-Texas areas in the modeling domain is not feasible during late stages of attainment SIP development.

No changes were made to this SIP revision in response to this comment.

EPA commented that 2021 should have been evaluated as a suitable base case episode year for HGB, rather than relying on a 2019 base case episode. EPA stated that the discussion associated with Figure 3-1 in Chapter 3 of this SIP revision is not adequate to justify relying on 2019 for the base case episode because more exceedance days

occurred in both 2021 and 2022 compared with 2019. EPA stated that using a 2022 episode would be unlikely because of proximity to the 2023 proposal date for the attainment SIP revision.

The commission disagrees with EPA's suggestion that considering a 2021 base case episode would be a practical option for an AD SIP revision proposed during 2023; nor is it required by EPA rules or guidance. By advancing such a suggestion, EPA is significantly underestimating the extensive time, resources, and efforts needed for states to complete the required modeling and technical analysis components of an AD SIP revision required by EPA's rules and guidance. For comparison, the latest complete modeling platform, one that includes base case and future case emissions inventories, available from EPA is for a 2016 base case episode, and version 1 of this platform was not released until 2021—almost five years after the conclusion of 2016. After version 1 was released, EPA did not opt to advance this base case episode year (e.g., to 2021) and instead chose to revise the 2016 platform with versions 2 and 3 being released in 2022 and 2023, respectively. To date, the latest complete modeling platform available from EPA and relied upon for a major regulatory effort such as the Good Neighbor FIP is this 2016 base case episode from eight years ago. By arbitrarily suggesting that TCEQ advance base years, EPA is placing excessive; and unnecessary expectations on states that EPA itself is not following.

It should be noted that the EPA modeling guidance relied upon by states does not require advancing base years frequently. Further, EPA implies in its comments that the number of exceedance days alone is a suitable metric for choosing one base case episode versus another. EPA's comment is not in accordance with Section 2.3.1: *Choosing Time Periods to Model*, of EPA modeling guidance that recommends choosing "time periods which reflect a variety of meteorological conditions that frequently correspond with observed eight-hour daily maxima concentrations greater than the level of the NAAQS at monitoring sites in the nonattainment area." For episode selection, the total number of exceedance days in a given year is less important than how representative those exceedance days are at capturing the historical pattern of high ozone levels throughout the area, and 2021 is not an appropriate choice for a base case episode. There was only one exceedance of the 75-ppb standard in HGB during all of August 2021 (78 ppb measurement at the Houston Harvard Street monitor on August 25) while historically August has typically been the month with the large number of ozone exceedance days in DFW, HGB, and other Texas areas. Another reason 2021 is not an appropriate choice for a base case episode is that impacts of the COVID-19 shutdown were still occurring throughout much of 2021. Whenever possible, years with significant reductions in economic activity (e.g., 2008, 2020, 2021) should be avoided in base case episode selection because modeling them would require use of atypical emissions for important source categories such as on-road, non-road construction, generation of electricity, etc.

The commission disagrees with EPA's statement that the discussion associated with Figure 3-1 is not adequate. Section 3.2: *Modeling Episode* of this SIP revision

provides a sufficient overview of the episode selection process and ends with a reference to Section 1.2: *Modeling Episode Selection* of Appendix A for more detail.

No changes were made to this SIP revision in response to this comment.

EPA commented on a concern that TCEQ is not advancing to a more recent year ('future base') to project electric generating unit (EGU) emissions to the future case year.

TCEQ does not use the term 'future base'; instead, 'projection base' is used when referring to a year from which future case modeling emissions are derived. Using an advanced year for the projection base is not a requirement in EPA modeling guidance and EPA did not identify any benefits that would be obtained from taking such an approach. For the EGU sector it is beneficial to preserve the relation of meteorological conditions with hourly EGU emissions. Thus, to develop the future case EGU emissions, TCEQ uses the base year hourly EGU emissions and augments them with the most recent information regarding units that may shutdown in the future, and new units planned to come online prior to 2026. Additionally, TCEQ conservatively includes the fixed Cross-State Air Pollution Rule (CSAPR) cap while developing future case EGU emissions, which makes any benefit gained from advancing the projection year less impactful and unnecessary.

No changes were made to this SIP revision in response to this comment.

EPA commented on a concern that TCEQ is not advancing to a more recent year ('future base') to project non-EGU emissions to the future case year.

The commission does not use the term 'future base'; instead, 'projection base' is used when referring to a year from which future case modeling emissions are derived. Using an advanced year for the projection base is not a requirement in EPA modeling guidance and EPA did not provide reasons why such an advancement is required. Further, State of Texas Air Reporting System (STARS) data available subsequent to the 2019 base year such as 2020 and 2021 would have been potentially affected by changes due to COVID-19, thus introducing inaccurate data for future case projection.

EPA commented on the maximum and minimum values depicted in the legend in Figure 3-8: *Difference in Anthropogenic NO_x between 2026 Future Case and 2019 Base Case on June 12 Modeled Episode Day*, located in this SIP revision, and wanted to make sure that emissions values in each grid cell are contained within the legend values.

The maximum and minimum legend values in Figure 3-8 indicate concentrations greater than or equal to +0.2 tpd and less than or equal to -0.2 tpd respectively. For example, dark blue depicts grid cells that experience a negative change of at least 0.2 tpd between 2019 and 2026, and dark red depicts grid cells that experience a positive change of at least 0.2 tpd between 2019 and 2026. So, it is likely that grid cells shown in either color have values much greater than the 0.2 tpd or much less than the -0.2 tpd.

A footnote will be added to Figure 3-6 in Appendix A to clarify this information about the figure legends.

EPA pointed out that Table ES-1: *Summary of 2019 Base and 2026 Future Case Anthropogenic Modeling Emissions for HGB 2008 Ozone NAAQS Nonattainment Area for June 12 Episode Day* shows no change in oil and gas production NO_X emissions between 2019 and 2026 in the HGB area, while VOC emissions for the same sector show a considerable decrease. They also mentioned significant growth in the EGU sector. EPA requested that TCEQ address all significant EI changes with adequate discussion and provide tables of newly permitted EGU emissions.

Details about oil and gas production emissions in Texas can be found in the Modeling Technical Support Document, Appendix A of this SIP revision, Section 3.8.1.1: *Within Texas*. Regarding the change in oil and gas production NO_X and VOC emissions between 2019 and 2026, NO_X values did not change between base and future year because oil and gas production emissions were assumed to remain constant between base and future year in the HGB area. Similarly, as explained in Appendix A, the reason VOC emissions for oil and gas production in the HGB area reflect a considerable decrease between 2019 and 2026 is because a Chapter 115 rule for fugitive VOC emissions related to some oil and gas productions source category codes was applied to future year emissions using appropriate reduction factors.

Since details on how oil and gas emission estimates were obtained are described in in section 3.8.1.1 of Appendix A, no additional discussion about these EI changes were added to this SIP revision.

Regarding EGUs, TCEQ develops future case EGU emissions using the base year hourly EGU emissions and augments them with the most recent information regarding units that may shutdown in the future, and new units planned to come online prior to 2026. Additionally, TCEQ includes the fixed CSAPR cap while developing future case EGU emissions. Utilization of this cap typically increases EGU NO_X emissions for the future year. Table 3-2 listing the new EGUs included in the 2026 future year has been added to Section 3.3.1.1: *EGU Point Sources* of Appendix A.

No changes were made to this SIP revision in response to this comment.

EPA commented that only six of the 20 monitors in the HGB nonattainment area were not negatively biased and five did not meet the performance goal. EPA states that TCEQ did not address the likelihood of systematic error and simply concludes that the model performance is good without further discussion.

To evaluate the photochemical model performance, TCEQ used EPA-recommended methodology, statistics, graph, and documentation. As discussed in Section 5 of Appendix A, TCEQ compared model results to observed data during periods where MDA8 was at or above 60 ppb to evaluate the model's ability to replicate high ozone. Using benchmarks reported in the Emery et al., 2017 paper recommended in

EPA's modeling guidance, Table 3-7 in Section 3.5 of this SIP revision clearly presents a criteria benchmark of plus-or-minus 15% for NMB and a goal of plus-or-minus 5%. This section cites research that shows the goal of 5% for NMB is typically achieved by the top third of model runs, while the criteria of 15% is achieved by the top two-thirds of model runs.

Figure 3-10 in Section 3.5 shows that 19 of the 20 regulatory monitors clearly meet the 15% target with the NMB for 13 of the monitors within 5%, and six monitors within a range of 6-8%. On page 3-15, the SIP revision explicitly states that "all regulatory monitors in the HGB 2008 ozone NAAQS nonattainment area have NMB within the criteria range except Lynchburg." For purposes of demonstrating attainment, the Lynchburg Ferry monitor is not of concern because it has historically measured relatively low ozone levels and has had a design value of 70 ppb or less since 2013. As of 2023, Lynchburg Ferry has an ozone design value of 70 ppb, and follows the 2008 eight-hour ozone NAAQS of 75 ppb.

This overall pattern constitutes good model performance, and there was no need to address the likelihood of systematic error. EPA is incorrect in stating that TCEQ simply concludes that model performance is good without discussion. TCEQ presented discussion of model performance in the SIP narrative using EPA-recommended statistics and graphics. Further, TCEQ also included a more extensive discussion of the operational model performance conducted in Section 5.1: *HGB Model Performance Evaluation* of Appendix A.

No changes were made to this SIP revision in response to this comment.

EPA applied a number of its comments on the concurrent DFW 2008 ozone NAAQS severe nonattainment area AD SIP revision (Project No. 2023-107-SIP-NR) to this HGB AD SIP revision.

The comments that could be applied to this HGB SIP revision are addressed in this Response to Comments document; however, the commission is unable to respond to EPA's referenced comments 3r (i-iv) and 3s because they were not included in EPA's comment letter.

No changes were made to this SIP revision in response to these comments.

EPA commented that the "soccer plots" included with the meteorological performance evaluation were very helpful. Comparing the meteorological modeling output between the DFW and HGB areas, EPA noted that: (1) HGB had better wind speed bias; (2) DFW had better wind direction bias and error; (3) DFW had less temperature error, but a bit more bias; (4) HGB had a tight temperature bias of +0.5 Kelvin; and (5) DFW humidity was slightly more negatively biased. EPA noted that it would have been more helpful in the written discussion to compare the meteorological modeling results between DFW and HGB, and to meteorological modeling for past episodes.

The commission disagrees with EPA that the written narrative would be enhanced by comparing these results with meteorological modeling for past ozone episodes

used by TCEQ, such as for a 2006 base case, 2012 base case, etc. The meteorological modeling for those episodes relied on the latest versions of the meteorological models (e.g., WRF, MM5, etc.) available at the time that work was done, and the latest versions of meteorological models used in this SIP revision include significant scientific improvements. Also, the meteorological modeling for those previous episodes is appropriately documented in previous AD SIP revisions for the DFW and HGB areas. Discussion of older work would be neither valuable nor is required in this current SIP revision.

Similarly comparing meteorological modeling results between the DFW and HGB areas is neither required nor illuminating. The performance differences noted by EPA between the DFW and HGB areas exist, but such differences are trivial. For example, the wind speed accuracy for DFW and HGB are provided in Tables 2-6: *DFW Meteorological Modeling Percent Accuracy for Wind* and 2-4: *HGB Meteorological Modeling Percent Accuracy for Wind* of Appendix A, respectively. For wind speeds less than two meters per second (m/s), Table 4: *Modeled Wind Speed Accuracy at 2 m/s for DFW and HGB by Month in 2016*, below, compares the results between the DFW and HGB areas by month. For the four months of April through July, the results for HGB are slightly better, but the results for the DFW area are slightly better for the three months of August through October. Across all seven months of the 2016 episode, the average performance difference between the DFW and HGB areas is a mere 0.3%.

Table 4: Modeled Wind Speed Accuracy at 2 m/s for DFW and HGB by Month in 2016

Month	DFW	HGB	Difference
April	82.2%	83.8%	1.6%
May	82.8%	86.4%	3.6%
June	87.2%	88.3%	1.1%
July	90.0%	90.1%	0.1%
August	94.0%	92.3%	-1.7%
September	91.3%	89.0%	-2.3%
October	86.0%	85.6%	-0.4%
Average	87.6%	87.9%	0.3%

In all its modeling efforts, TCEQ strives for optimal performance and chooses the WRF modeling that provides robust performance across multiple areas. As EPA clearly stated in EPA modeling guidance when discussing uncertainty in modeling analyses, perfection is an impossible goal to achieve. Expectations of such unnecessary details, comparisons, and analysis does not enhance the SIP revision and only places undue burden on the state to expend limited resources on unnecessary requirements.

No changes were made to this SIP revision in response to this comment.

EPA commented on discussion of point source growth factors and emission reduction credits (ERCs) in Section 3.3.1.3: *Non-EGU Point Sources* of Appendix A. In the discussion of the ERC sensitivity figures in Table 3-4, EPA suggests that it should be

explained that higher NO_x and VOC emission figures from Table 3-3: *Comparison of the 2026 Modelable Bank and Predicted Growth* were used.

The commission understands that EPA would present and discuss these ERC sensitivity results in a slightly different manner but pertinent information regarding ERCs is clearly and succinctly presented as is. It is evident that the NO_x and VOC values in the third and fourth columns of Table 3-4: *Comparison of the 2026 Modelable Bank and Predicted Growth for Emission Reduction Credit Modeling Sensitivity* of Appendix A match those from the third and sixth columns of Table 3-3, respectively. In addition, the last column of each table has the heading "Future Year Characterized By" to indicate whether growth, ERCs, etc., are driving the final values modeled. There is no need to overly explain what is evident from a simple comparison of two tables close to each other in Appendix A.

No changes were made to this SIP revision in response to this comment.

EPA commented that it is skeptical of the 40% reduction in June on-road NO_x emissions between 2019 and 2026 in the DFW area because of population growth during that period. The 30% reduction in VOC emissions and 25% reduction in CO emissions from June 2019 to June 2026 in DFW were also highlighted. EPA encouraged TCEQ to run MOVES4 sensitivities prior to potential adoption of this SIP revision. EPA further commented that these concerns applied to the HGB area as well.

The commission utilized the latest MOVES3 model and the latest activity data available at the time of SIP development. Further, the on-road emissions presented in this SIP revision are comparable to on-road emissions developed and made available in EPA's 2016v3 modeling platform which EPA encouraged TCEQ to use in another comment.

TCEQ compared the 2026 on-road emissions of NO_x, VOC, and CO to EPA's latest 2016v3 on-road NO_x, VOC, and CO emissions for the DFW and HGB areas. Table 5: *Comparison of June 2026 On-road Emissions Estimates between TCEQ Modeling Platform and EPA's Modeling Platform* below provides a comparison of 2026 on-road emissions values for the month of June between TCEQ and EPA. While TCEQ's June 2026 NO_x and VOC values for the HGB area were marginally less than EPA's corresponding June 2026 total (9% and 2% less respectively), TCEQ's June 2026 VOC and CO emissions for the DFW area were slightly larger than EPA's 2016v3 corresponding totals (18% and 11% greater respectively) suggesting TCEQ's 2026 on-road emissions are likely not underestimated. Additionally, the change in TCEQ on-road emissions from June 2019 to June 2026 (41% NO_x decrease, 29% VOC decrease, 21% CO decrease for the HGB area) appears proportional to the change in EPA on-road emissions from June 2016 to June 2026 (63% NO_x decrease, 46% VOC decrease, 36% CO decrease for the HGB area). This conclusion is also supported when comparing other summer months covering the height of ozone season.

Table 5: Comparison of June 2026 On-road Emissions Estimates between TCEQ Modeling Platform and EPA's Modeling Platform

Area	Pollutant	TCEQ 2026 June (tons per month)	EPA 2026 June (tons per month)	TCEQ-EPA Diff (tons)	% Diff to EPA	% Change from 2019 to 2026 in TCEQ Modeling	% Change from 2016 to 2026 in EPA Modeling
DFW	NO_x	1,626.53	1,760.49	-133.96	-8%	41%	62%
	VOC	968.40	821.02	147.38	18%	31%	47%
	CO	20,788.09	18,672.53	2,115.56	11%	22%	36%
HGB	NO_x	1,303.48	1,434.66	-131.19	-9%	41%	63%
	VOC	813.36	827.42	-14.06	-2%	29%	46%
	CO	17,878.41	17,778.28	100.13	1%	21%	36%

It should be noted that EPA 2016v3 modeling platform also utilized the MOVES3 model. Some differences in future year emissions should be expected since TCEQ used link-based inventories for these areas, while EPA used county-based inventories.

EPA's expectation that TCEQ should have discussed the potential impacts of the new MOVES4 model released two months prior to this proposal of this SIP revision in this SIP revision as well as the expectation that TCEQ perform MOVES4 sensitivities prior to adoption of this SIP revision are both unnecessary and unreasonable due to the time and resources needed to develop emissions inventories and conduct sensitivity model runs. EPA policy guidance on use of MOVES4 for SIP purposes outlines that state agencies should use the latest version of MOVES available at the time of SIP development. The guidance also further states that "state and local agencies that have already completed significant work on a SIP with MOVES3 (e.g., attainment modeling has already been completed with MOVES3) may continue to rely on MOVES3".[31] Therefore, it is reasonable for this SIP revision to rely on MOVES3 for its on-road EI, and investigating whether MOVES4 makes a difference in the on-road emissions is not plausible nor required.

No changes were made to this SIP revision in response to these comments.

EPA commented that the method used to incorporate emission events (EE) and scheduled maintenance, start-up, and shutdown (SMSS) emissions into ozone season emissions does not provide the resolution required for daily or hourly model input, and TCEQ should consider procedural changes for point source EE/SMSS EI reporting. EPA stated the EE and SMSS should be calculated based on the timeframe of the events instead of adding the EE and SMSS annual tons per year and converting to an ozone season tons per day.

[31] See page 8 of Policy Guidance on Use of MOVES4 for State Implementation Plan Development, Transportation Conformity, General Conformity, and Other Purposes; https://www.epa.gov/system/files/documents/2023-08/420b23009.pdf

According to 40 CFR Part 51, Subpart A, the Air Emissions Reporting Requirements (AERR) rule, EPA does not require reporting of EE and SMSS emissions. Additionally, the commission disagrees that changing TCEQ's current emissions inventory reporting to hourly or event-based EE/SMSS reporting would constitute a simple "procedural" change to the current database. Instead, these changes would be a complicated undertaking involving significant funds, time, and staff resources.

No changes were made to this SIP revision in response to this comment.

EPA commented that in Appendix A, TCEQ did not use negative values to denote the difference between 2026 and 2019 in Table 3-8: *2026 Future Case On-Road Emissions for June 12 Episode Day in DFW* for DFW in the HGB Technical Support Document (TSD), Appendix A, but TCEQ used negative values in Table 3-10: *2026 Future Case On-Road Emissions for June 12 Episode Day in HGB* for HGB.

The commission agrees with EPA's suggestion to make the tables in Appendix A consistent and made the corresponding updates in Appendix A.

EPA recommended that TCEQ provide a reference to where the RACM sensitivity is discussed in detail in Section 3.7.1.1: *HGB Area Source RACM Sensitivity* of Appendix A.

A reference was added to Appendix A.

EPA pointed out that Gulf of Mexico emissions used for base and future years for this SIP revision were from a 2017 gulf-wide EI (GWEI). EPA inquired whether TCEQ determined if these emissions were expected to change in the future, and if any discussions had occurred with the Federal Bureau of Ocean Energy Management (BOEM) which developed the inventory. EPA also asked if any trends were analyzed.

The 2017 GWEI emissions dataset was the most up-to-date emissions dataset available at the time of SIP development. The 2017 gulf-wide emissions were kept as is for the base year 2019 and future year 2026 because no projection factors are available for these sources. TCEQ did not have discussions with BOEM, and a trend analysis was not done as it is not required.

No changes were made to this SIP revision in response to these comments.

EPA commented on the HGB area ozone model performance results in Section 5.1.1: *Area-Wide Statistics* of Appendix A. EPA notes that the results in Figure 5-3: *NME of MDA8 Ozone at or Above 60 ppb for HGB Monitors* show that 14 of the 20 regulatory monitors had negative under-prediction bias, but only one more than 15%.

EPA refers to Figure 5-3 in its comment; however, EPA's observations are consistent with the NME by monitor rather than the NMB results by monitor presented in Figure 5-2: *NMB of MDA8 Ozone at or Above 60 ppb for HGB Monitors*. TCEQ concurs that six of the 20 regulatory monitors in the HGB area have over-

predictions bias, with 14 of the HGB area ozone monitors having under-prediction and only one under-predicting by more than the criteria benchmark of 15%.

Lynchburg Ferry is the one monitor with under-prediction bias of slightly more than 15%. As of 2023, Lynchburg Ferry has an ozone design value of 70 ppb, in compliance with the 2008 eight-hour ozone NAAQS of 75 ppb. As Figure 5-2 clearly shows, 13 of the 20 regulatory monitors have NMB within a range of 5%, with six of the regulatory monitors within a range of 6 to 8%. Since the criteria for NMB is +/- 15%, these overall results are more than satisfactory.

No changes were made to this SIP revision in response to this comment.

EPA commented on the HGB soccer plots included in Section 5.1.2: *Monitor-Specific Statistics*, of Appendix A and emphasized that a statement, "indicates acceptable performance," was the only discussion provided by TCEQ. EPA stated that these results should be discussed in more detail. EPA commented on the overall model performance by month stating that August has the highest positive bias and "April generally has the least bias (closest to zero), with almost no underprediction." EPA stated that September has the lowest error, while June and August have the highest error. EPA noted that performance data for the four highest HGB monitors show positive bias in Figure 5-4: *Soccer plots showing NME and NMB of MDA8 Ozone* but negative bias in Figure 5-2, and stated that this is likely due to MDA8>60 ppb data being included in the latter but not the former. EPA stated that this difference should be made clearer to the reader.

EPA's comment that the phrase, "indicates acceptable performance," both misquotes Section 5.1.2 and takes it out of appropriate context. The full last sentence of Section 5.1.2 on page A-96 refers to Figure 5-4: "The inner rectangle marks the Emery et al. (2017) criteria benchmarks and symbols within those rectangles indicate acceptable performance." In this instance, TCEQ is informing the reader that marks within the NMB and NME boundaries demonstrate desired performance. Three of the marks in Figure 5-4 are clearly outside of the soccer plot boundaries for the Conroe Relocated monitor, and one mark is outside for the Galveston 99th Street monitor. TCEQ is clearly showing with Figure 5-4 that most of the marks at the four highest HGB monitors are within the boundaries, while a few are outside. TCEQ is clearly not condensing the entire discussion to a simple statement that everything presented "indicates acceptable performance."

EPA is correct that the monthly performance statistics in Table 5-4 show that August has the highest positive bias, September has the lowest error, and both June and August have the highest error. However, EPA is not correct in its statement that "April generally has the least bias (closest to zero), with almost no underprediction." Table 5-4 clearly shows that April has bias parameters further from zero than all of the other months, with mean bias at -7.60 ppb and NMB at -11.54%. The equivalent values for the other months are much closer to zero than those for April in Table 5-4.

EPA is correct that MDA8>60 ppb data were used for the NMB data by monitor presented in Figure 5-2 but not for the NMB/NME data presented in the Figure 5-4 soccer plots. This is made clear since the captions for Figures 5-2 and 5-3 reference use of data above 60 ppb, while Figure 5-4 does not. TCEQ understands that EPA would present and discuss these results in a slightly different manner, but TCEQ contends that results of MPE are clearly and succinctly presented as is.

No changes were made to this SIP revision in response to these comments.

EPA requested that TCEQ explain why the months of June, August, and September were chosen as test months for the Comprehensive Air Quality Model with Extensions version 7.20 (CAMx) options (at the top of page A-102 of Appendix A).

June, August, and September were chosen as the three test months for the CAMx options based on the higher number of ozone exceedances (compared with other months) of the 2008 ozone NAAQS of 75 ppb at monitors in three Texas ozone nonattainment areas and WRF model performance evaluation.

This explanation was added to Appendix A.

EPA stated that TCEQ should provide additional detail concerning emission tileplots. EPA observed that no difference plots were provided for the Area source category in Appendix A and stated that since the difference [in Area Source emissions] presented in Tables 3-36: *2026 Future Case Oil & Gas VOC Emissions in the txs_4km CAMx Domain for June 12 Episode Day* and 3-38: *2019 Base and 2026 Future Case Offshore Non-Platform VOC Emissions for June 12 Episode Day in Gulf of Mexico* are small and readers might be confused or not catch that sources are grown in place and that there will be no spatial differences between base and future case emissions.

TCEQ acknowledges that EPA would choose to include different figures if it was preparing similar documentation. As observed by EPA, the differences between base and future case emissions and information about this is documented by TCEQ using tables as well as figures in Appendix A. Further details on how the 2026 future case emissions were derived are also provided in Appendix A.

No changes were made to this SIP revision in response to this comment.

EPA commented that the HGB area conceptual model for this current SIP revision did not have the same bullet points included in the Executive Summary as HGB area conceptual models from previous SIP revisions. EPA specifically commented that the second bullet point related to background ozone in the HGB area from previous SIP revisions was not included in the HGB conceptual model for this current SIP revision.

The commission does not agree that identical bullet points are required in the Executive Summary of each conceptual model. The Executive Summary highlights the most important aspects of all the analyses conducted as part of conceptual model development. Regarding background ozone in the HGB area, detailed analysis was done and presented in Section 2.6 of Appendix B of this SIP revision.

No changes were made to this SIP revision in response to this comment.

EPA mentioned the following excerpt from a paragraph on page 2-5 of Appendix B of the HGB SIP revision: "The monitor with the maximum fourth highest MDA8 ozone concentration changes from year to year and is not always the same as the monitor with the areawide maximum design value. This indicates that overall, ozone in the area is not changing very much and that changes at individual monitors are likely due to changes in shifting wind directions on high ozone days rather than changes in emissions." Further, EPA asserted that the effect of the first sentence is not the cause of the second sentence, that "the case has not been made" and that more explanation is required.

The commission disagrees with EPA's conclusion that "the case has not been made" that wind direction determines the location of the monitor with the maximum fourth highest MDA8 ozone concentration because that location changes from year to year. TCEQ provided extensive analysis of meteorological parameters as part of the conceptual model, which supports TCEQ's conclusion. EPA's skepticism about TCEQ's conclusions fails to take into account the wind roses analysis and its results shown in Figure 5-6: *Ozone Season Wind Roses on High and Low Ozone Days in the HGB Area from 2012 through 2022*. Wind roses were presented in Figure 5-6 for high ozone days and low ozone days for ozone seasons from 2012 to 2022. It was found that on high ozone days, winds are slower, with more variable direction compared to low ozone days. This supports the finding that wind direction shifts more on high ozone days, which could change the ozone value at individual monitors. Further, EPA did not provide any details explaining why it believes that this finding is unsupported.

No changes were made to this SIP revision in response to this comment.

EPA mentioned the following excerpt from the middle of the paragraph just above Figure 2-4: *Fourth-Highest MDA8 Ozone Concentrations by Monitor in the HGB Area* of Appendix B: "Since local emissions tend not to vary significantly from year to year, this indicates that ozone concentrations in those years may be strongly influenced by non-local factors such as meteorology." EPA asserted that this is only an assumption. EPA also mentioned that TCEQ has not performed sensitivity analysis on EE/SMSS events and argued that rapid ozone formation generally happens during emission events.

The commission disagrees with EPA that the conceptual model should include a sensitivity analysis of EE/SMSS activity and contends this is out of scope for the conceptual model.

Based on areawide and multi-year trends presented in the conceptual model, the commission disagrees with EPA's characterization that the observation that local emissions do not tend to vary significantly from year to year is an assumption.

Without any evidence, EPA commented that "a few EE/SMSS in a year can affect 4th high" ozone concentrations, neglecting the established understanding that ozone-conducive meteorological conditions are also required for ozone formation. EPA's

own statistical modeling of meteorologically adjusted 98th percentile MDA8 ozone, excerpted and summarized in Section 5-5, shows the magnitude of changes in MDA8 ozone concentrations at monitoring sites due to variations in meteorology.

Further, the commission disagrees with EPA that rapid ozone formation can take place only during EE/SMSS since these could occur during permitted intermittent emissions under the right meteorological conditions.

No changes were made to this SIP revision in response to these comments.

EPA chose two years with low fourth-highest ozone values, 2014 and 2020, included in the HGB conceptual model and speculated that those low values may be due to changes in traffic patterns or COVID-19. EPA suggested TCEQ should consult with H-GAC for more information about this.

The commission disagrees with EPA and contends that this is a speculative suggestion and an unnecessary request for additional analysis. The year 2020 did not observe fourth-highest MDA8 ozone values as low as those in 2014, but they were lower compared to recent years. There is more variability present in annual fourth-highest MDA8 ozone values compared to design values due to year-to-year variations in meteorology. One of the reasons a three-year average is used to calculate design values is to mitigate some of the year-to-year variations in ozone concentrations due to factors such as meteorology. The 2020 annual fourth-highest value is comparable to (equal to or higher than) the 2016 value at most monitors in the HGB area. EPA's own research on meteorologically adjusted 98th percentile MDA8 ozone, excerpted and summarized in Section 5-5 of this document, also shows how meteorologically adjusted ozone differs from observed values. TCEQ coordinates with the H-GAC on the travel demand model (TDM) needed to develop on-road mobile EI and transportation conformity, but TCEQ maintains that it is not necessary to consult H-GAC for this suggestion and that reviewing EPA-provided meteorologically adjusted ozone concentrations is sufficient.

No changes were made to this SIP revision in response to this comment.

EPA commented that use of the word "stagnated" should be replaced with "leveled off" in Section 2.3, *Ozone Exceedance Days* on page 2-6 of Appendix B. EPA also commented that use of the word "sunlight" in Section 3.1: *Ambient NO_x Trends* on page 3-2 of Appendix B should be replaced with "solar insolation".

TCEQ acknowledges that EPA would make different word choices if it was preparing similar documentation. Wherever possible, when presenting highly complex technical information, TCEQ prefers to use plain language for ease of understanding for non-technical readers. For example, simply saying "these cooler months have less sunlight" on page 3-2 is just as clear and is more readable than saying "these cooler months have less solar insolation." If anything stated in the SIP documentation is either unclear or incorrect, TCEQ appreciates having it noted.

Since these editorial comments by EPA do not bring more clarity to the reader, no changes were made to this SIP revision in response to these comments.

EPA commented that it was unclear if there was a cut-off used to identify the "low ozone days" in Section 2.5: *Time of Peak Ozone* of Appendix B.

The commission did not use a low-end cutoff to define low ozone days, and all non-exceedance days are considered low ozone days. A clarifying sentence was added to Appendix B, Section 2.5.

In the HGB Appendix B, EPA observed that median and 95th percentile values for ozone season NO_x trends declined at almost every monitor from 2012 through 2020 but increased in 2021 and 2022. EPA further commented that increases in 2021 and 2022 for the median and 95th percentile were of different magnitudes.

The commission agrees with EPA's observations about the increase in the 95th percentile ozone season NO_x concentrations in 2021 and 2022 but disagrees with EPA's characterization that almost all monitors saw an increase in the median ozone season NO_x concentration in 2021 and 2022 since several monitors showed decreases in 2022. EPA did not provide any further details regarding the concerns about these observations.

No changes were made to this SIP revision in response to these comments.

EPA stated that TCEQ offered no insight or hypothesis to explain either the peaks or the valleys in its discussion of Figure 3-5*: Ozone Season Median and 95th Percentile TNMOC and HRVOC Trends in the HGB Area* in the HGB Appendix B.

Figure 3-5 shows the ozone season 95th percentile and median trends of TNMOC and HRVOC in the HGB area from 2012 through 2022. There are always some variations in concentrations from year to year. Focusing on every detail may distract from the main trends and patterns that emerge over time. TCEQ contends that it is not necessary to explain every peak and valley in a trend analysis.

No changes were made to this SIP revision in response to these comments.

EPA commented that in the middle of the paragraph after Figure 3-6: *Monthly TNMOC (top) and HRVOC (bottom) Trends in the HGB Area* (page 3-7 of Appendix B), TCEQ makes the claim that NO_x is mostly from mobile sources and perhaps ignores that NO_x can increase significantly from industrial combustion sources that are scattered all over HGB during malfunctions.

TCEQ's characterization of mobile source NO_x emissions was made to differentiate the source category associated with the majority of NO_x emissions in the HGB area from that of VOC emissions in the HGB area. Mobile sources in the 2019 base case inventory accounted for about 59% of NO_x emissions, which TCEQ interprets as most. Whether NO_x increases significantly due to industrial combustion sources is unrelated to the discussion in the referenced section of Appendix B. Further, EPA

provided no additional information on why there could be significant increases in NO_x emissions from industrial combustion source malfunctions other than its speculation that TCEQ ignores such significant increases.

No changes were made to this SIP revision in response to this comment.

EPA commented positively on the inclusion of Section 3.2.3: *VOC Composition Trends*, in the HGB conceptual model included as Appendix B. EPA suggested experiments where additional emissions of HRVOC species could be injected into the model to estimate how ozone would be impacted. An approach suggested by EPA was to replace alkanes with alkenes. For analysis, EPA specifically referenced propylene as a highly reactive type of alkene and noted that TCEQ has potentially discovered new sources of propylene.

Following through on this set of suggestions would be labor intensive and very likely lead to erroneous results because the model would likely output excessively high ozone levels well above the benchmark criteria of 15% for NMB. EPA suggests replacing alkanes that have relatively low reactivity for forming ozone (such as butanes and pentanes) with alkenes that have relatively high reactivity for forming ozone (such as ethylene and propylene). Alkanes with low reactivity tend to be abundant in many metropolitan areas, so artificially raising their reactivity to higher levels (e.g., equivalent to ethylene or propylene) would significantly increase the overall reactivity of modeled VOC for the HGB area.

As shown in Section 5.1: *HGB Model Performance Evaluation* of Appendix A, the current 2019 base case episode has NMB for estimating ozone well within or near the 5% range for 19 of the 20 regulatory monitors in the HGB area. Artificially increasing the VOC reactivity could likely result in most or all of these monitors having excessively high NMB values well beyond the benchmark criteria of 15%. It is unclear what could be determined by sensitivity tests that would significantly overestimate modeled ozone.

EPA posits that new propylene sources have potentially been discovered by TCEQ but does not specify what these new propylene sources are. TCEQ did not state in the HGB conceptual model that new propylene sources were identified. The known sources of propylene within HGB are large petrochemical facilities that are already included in the point source EI. If EPA or others can demonstrate that additional sources of propylene or other reactive VOC species are being excluded from TCEQ point source inventory, TCEQ may evaluate such data submissions.

No changes were made to this SIP revision in response to this comment.

One individual stated they were disappointed that the SIP does not account for climate change and the annual increases in wildfires in the state. The individual stated that in 2023, the Texas A&M Forest Service registered 6,534 wildfires, and that was more than half from 2022. The individual stated that if this trend continues through to 2027, this SIP will have done nothing to reduce ozone precursors from wildfire smoke.

The commission does not look into the relationship between wildfires and climate change, nor is it possible to account for the increased number of wildfires in TCEQ's technical analysis. Generally, attainment demonstration SIP revisions are not the mechanism by which the commission addresses the impact of wildfires trends but rather through exceptional events demonstrations made to exclude monitoring data influenced by wildfires from being used for regulatory determinations related to the NAAQS. Comments regarding efforts to address global warming are outside the scope of this SIP revision.

No changes were made to this SIP revision in response to these comments.

Earthjustice commented that TCEQ is putting more weight on modeling to justify that the HGB area will come into compliance. The commenter stated that more emphasis should be put on actual data, which does not support the conclusion that HGB will comply because precursors have sort of stagnated.

The commission's AD modeling is supported by weight-of-analyses in Chapter 5 of the SIP revision, which relies on monitored data. This data show that eight-hour ozone design values in the HGB area have declined 11% from 2012 through 2022, from 88 ppb to 78 ppb, and in 2022 only one monitor measured above the 2008 eight-hour NAAQS. From 2012 through 2022, 95th percentile values of NO_X increased by 2%, and median values of NO_X decreased by 4%. Over that same period, 95th percentile values of total VOC (TNMOC) decreased by 15%, and median TNMOC decreased by 12%. Ozone can decline with increasing precursor concentrations because ozone formation is a non-linear process that is not only affected by precursor concentrations but is also affected by meteorology. Overall, the HGB area shows progress towards the attainment of the 2008 eight-hour ozone NAAQS.

No changes were made to this SIP revision in response to this comment.

Lone Star Chapter of Sierra Club commented that the episode year should include more days with high ozone and noted that 2018, 2021, 2022, and 2023 had a greater number of exceedances than 2019. Lone Star asserted that 2019-episode selection is "pale" in comparison to ozone exceedances in these suggested years and commented that it suspected that 2019 base year selection may lead to underpredicting ozone in the photochemical model.

The commission followed EPA modeling guidance in choosing the base year (episode year) that is both in the recent past and has a sufficient number of high ozone days that follow historically observed patterns. In choosing a base year, TCEQ focuses on both exceedance days per episode as shown in Figure 3-1 of the SIP revision, as well as total exceedances that the commenter refers to and are shown in Figure 1-1 of Appendix A. The HGB nonattainment area had 22 exceedance days in 2019, which is the most since 2015 (29). DFW had 13 in 2019, and while 2018 had a higher number of exceedance days (21), TCEQ must choose a base year that satisfies all areas (HGB, DFW, and Bexar County) for ozone AD purposes.

In accordance with EPA modeling guidance, a base year must reflect "a variety of meteorological conditions that frequently correspond with observed eight-hour daily maxima concentrations greater than the level of the NAAQS at monitoring sites." Although 2018 was considered, during its summer, the polar jet stream trajectory took an atypical, strong southerly path towards the Gulf of Mexico in late July, leading to stagnant winds and high ozone.[32] Typically, July experiences relatively low ozone compared with June and August because impact of the Bermuda High on Texas is at its peak during this time, resulting in steady offshore winds from the Gulf of Mexico that tend to bring low background ozone concentrations. Therefore, the summer of 2018 did not follow historically observed temporal patterns for ozone formation. TCEQ found that the 2019 temporal distribution of exceedances for all areas was more representative of the 10-year average. TCEQ presented this information on June 23, 2021, at an Air Quality Technical Information Meeting for the HGB area. More information about episode selection is available at the Modeling Base Year Selection webpage (https://www.tceq.texas.gov/downloads/air-quality/modeling/meetings/hgb/2021/20210623-modelingepisode-tceq-scalpone.pdf) and in Section 1.2 of the TSD.

More recent years, such as 2020 and 2021, cannot be selected because emission inputs might be atypical due to the COVID-19 pandemic. In addition, development and documentation of an AD involves extensive work spanning several years. To accommodate SIP due dates imposed by EPA, newer years such as 2021, 2022, and 2023 cannot be selected because of the time and resources required to incorporate changes in emission inputs for all Texas and non-Texas areas.

Regarding photochemical model performance, TCEQ used EPA-recommended methodology, statistics, and documentation. As discussed in Section 5 of the TSD, TCEQ compared model results to observed data during periods where MDA8 was at or above 60 ppb. Using benchmarks reported in the Emery et al., 2017 paper recommended in EPA's modeling guidance, TCEQ found that all monitors in the HGB and DFW areas had a NMB and NME within either the criteria or goal range. TCEQ finds that the chosen base year has acceptable performance in replicating high ozone. TCEQ finds that the choice of base year and model performance in replicating high ozone in the chosen base year are in line with EPA modeling guidance.

No changes were made to this SIP revision in response to this comment.

Lone Star Chapter of Sierra Club used different ozone metrics such as the number of monitors exceeding the 2008 ozone NAAQS in 2023, preliminary 2023 eight-hour ozone design values, and maximum annual daily fourth highest eight-hour ozone concentrations in the HGB area to suggest that 2023 was the "worst" year for ozone "violations" over the 2014 through 2023 period in the HGB area. The commenter then

[32] 'Extreme' jet stream pattern has spurred a week of wild weather in U.S. available at: https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/07/25/extreme-jet-stream-pattern-has-spurred-a-week-of-wild-weather-in-u-s/

stated that this does not support the forecast of attainment of the 2008 ozone NAAQS by the attainment date of July 20, 2027.

The commission disagrees that the preliminary 2023 design value and number of monitors that exceeded the 2008 ozone NAAQS are appropriate measures of whether projections contained in this SIP are realistic. The attainment date for the HGB 2008 ozone NAAQS severe nonattainment area is July 20, 2027, and incorporation of ambient ozone data from 2024 through 2026 will be required to compute design values for the area. Ozone data from 2023 will not be used to determine compliance for the HGB area and are, therefore, inappropriate for assessing projections of future attainment. Further, due to the submission schedule imposed on TCEQ by EPA for this effort, complete validated data for 2023 were not available at the time these documents were prepared and are still not yet available for a thorough assessment.

Regarding efforts to project future ozone design values, it is well known that ozone is highly variable across many time scales and is formed in a complex system with many interconnected factors. One of the most, if not the most, important factors is meteorology. Meteorology is highly variable, like ozone. Meteorology in 2023 was markedly different from most other years in the HGB area. HGB meteorological data from 2023 obtained from National Weather Service monitoring stations in context with other recent years confirms that 2023 showed above normal temperatures, below normal precipitation, and drought for extended period of time in the HGB area.[33] For this reason, too, it is inappropriate to use 2023 as a year of comparison for compliance determinations.

Regarding the number of monitors recording exceedances of the 2008 ozone NAAQS, it is unsurprising that numerous monitors in the HGB area recorded exceedances during ozone season 2023, or any other year. Excursions of ambient ozone concentrations above 75 ppb are not "violations" in any legal sense but are only exceedances of the numerical level of the 2008 ozone NAAQS, which are a complex set of requirements. Many other calculations and considerations are involved in computing design values to determine actual violations, for example, three-year averaging. However, while many of these exceedances may be unremarkable for assessment of compliance with federal regulations, they are still valuable for understanding factors that influence where and when ozone is formed or transported.

Because this SIP revision was prepared before data from 2023 were available, it encompasses data through 2022 only. In 2022, only one of 21 monitors in the HGB area recorded design values above the 2008 ozone NAAQS. Beginning in 2012, 18 monitors exceeded the 2008 ozone standard, and in 2013, 14 monitors. The number of monitors exceeding the standard fell to three in 2014, five in 2015, three in 2016, six in 2017, two in 2018, four in 2019, three in 2020, and one in 2021 for the period 2012 through 2021.

[33] https://www.weather.gov/media/hgx/climate/summary/Annual_2023_Regional_Climate_Summary.pdf

Finally, the commenter used the term "peak at" in reference to the maximum among areawide annual fourth highest daily maximum eight-hour ozone concentrations in the HGB area. These values may or may not occur at the areawide design value setting monitor, which is the monitor of interest for compliance determinations. Further, compliance with the eight-hour ozone NAAQS is determined with the design value, which averages three years of annual fourth highest daily maximum eight-hour ozone concentrations at the same monitor. This multi-year averaging is intended to account for some of the year-to-year variability in meteorology and its effect on ozone formation. Design values show that eight-hour ozone design values in the HGB area have declined 11% from 2012 through 2022, from 88 ppb to 78 ppb suggesting the HGB area is making steady progress towards attainment by the 2027 attainment date.

No changes were made to this SIP revision in response to these comments.

CONTROL STRATEGIES

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS stated that fleet turnover is not enforceable asked TCEQ to clarify how reductions from fleet turnover are enforceable.

The commission disagrees that the mobile source emissions reductions from fleet turnover are not enforceable. FCAA, Title II directs EPA to establish emissions standards to control pollution from engines and vehicles and requires manufacturers to demonstrate that their vehicles and engines comply with these standards by obtaining certificates from EPA. These newer vehicles that must meet stricter, and federally enforceable emissions standards will replace older vehicles.

EPA certification specifications require compliance with emissions standards throughout the useful life of the engine.

The commission's rules in 30 TAC Chapter 114, Control of Air Pollution from Motor Vehicles, regarding anti-tampering provisions and vehicle inspection and maintenance programs also assist with ensuring on-road vehicles are complying with EPA requirements. Remote sensing elements of the vehicle inspection and maintenance program randomly inspect vehicle emissions.

As part of regulatory analyses, EPA studies the impacts of fleet turnover and the implications for the age and size of the vehicle fleet. EPA incorporates the impacts of fleet turnover into its mobile source emissions model, MOVES, which TCEQ is required to use for SIP EI development.

TCEQ conducted AD photochemical modeling in accordance with EPA modeling guidance, as well as used the latest data, models, and scientific research available at the time of the SIP development for this as well as for past SIP revisions.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ must clarify that sources cannot use interprecursor trading to meet new source review (NSR) requirements, as interprecursor trading is unlawful under the D.C. Circuit's decision in *Sierra Club*, 21 F.4th 815. The commentor indicated that existing regulations under 30 TAC §116.12 and §116.150 could be read to authorize interprecursor trading and commented that TCEQ must make clear that any state implementation plan it will submit for EPA's approval does not authorize sources to meet NSR requirements by relying on interprecursor trading.

The commission's Emission Credit Program and Discrete Emission Credit Program regulations require approval from TCEQ's executive director and EPA prior to interprecursor (interpollutant) use of credits.

As noted in the comment, the decision in *Sierra Club v. EPA*, 21 F.4th 815 (D.C. Circuit 2021), vacated certain provisions of EPA's *Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements* at 83 FR 62998 (December 6, 2018). As a result of this court decision, EPA no longer supports approval of interprecursor trading (IPT) requests under TCEQ's previously approved IPT SIP revisions; therefore, since IPT provisions cannot function without approval from both TCEQ and EPA, no IPT requests will be approved.

No changes were made to this SIP revision in response to these comments.

An individual commented that focusing on the Texas Emissions Reduction Plan (TERP) programs and the Port of Houston would help in meeting the EPA standard.

The commission administers the TERP in accordance with Texas Health and Safety Code (THSC), Chapter 386. The TERP includes programs that provide financial incentives for individuals, businesses, governmental entities, and organizations to transition to vehicles and equipment that produce fewer emissions than the vehicles or equipment they currently operate.

Since September 1, 2021, the THSC, §386.252(a–1), has required that TCEQ remit no less than 35% of TERP funding to the state highway fund for use by the Texas Department of Transportation (TXDOT) on congestion mitigation and air quality improvement projects each state fiscal biennium. Since 2021, $184,176,215 in TERP funding has been transferred to TXDOT for congestion mitigation and air quality improvement projects. TCEQ estimates that an additional $181,352,150 will be transferred to TXDOT for congestion mitigation and air quality improvement projects in the current state fiscal biennium (Fiscal Year (FY) 2024-2025). More information about TERP funding and the TXDOT congestion mitigation projects can be found in the FY 2022-2023 TERP Trust Annual Report.[34]

No changes were made to this SIP revision in response to these comments.

[34] https://www.tceq.texas.gov/downloads/air-quality/terp/publications/sfr/128-23.pdf

An individual urged TCEQ to implement fuel quality standards for cleaner gasoline and diesel, which can lead to significant reductions in vehicle emissions.

Clean gasoline and diesel are already required in the HGB area. The HGB area is required by the FCAA Amendments of 1990 to use federally-implemented reformulated gasoline (RFG) to control ozone and air toxic emissions. RFG is designed to reduce air toxins and emissions of VOC by decreasing the amount of toxic compounds, such as benzene, and lowering the evaporation rate of the fuel. Additionally, the HGB area is within the 110 central and eastern Texas county area required to implement the Texas Low Emission Diesel (TxLED) program that reduces emissions of NO_x from diesel-powered motor vehicles and non-road equipment.

Also, as discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the attainment date without additional control measures and no additional control measures were determined to advance attainment by one year.

No changes were made to this SIP revision in response to these comments.

EPA, Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, TEJAS and one individual commented that this SIP revision relies on previous RACT analyses and is based exclusively on old CTG and ACT guidance documents published by EPA. The commenters cited the implementation rules for 2008 and 2015, ozone NAAQs, noting that for RACT analysis, states should refer not only to the latest CTGs and ACTs, but also recent technical information available at the time of SIP development and information received in the public comment period. The commenters further commented that TCEQ should provide adequate documentation showing analysis of current and relevant economic and technological feasibility data for emission controls that were considered and examined.

TCEQ has evaluated RACT for this HGB 2008 ozone NAAQS severe AD SIP based on the EPA's 2008 eight-hour ozone standard SIP requirements rule (80 FR 12264).

The SIP requirements rule does not require states to perform exhaustive research of recent technical information when evaluating RACT, as claimed by the commenters. Section 51.1112(a) of the 2008 eight-hour ozone standard SIP requirements rule requires states to "submit a SIP revision that meets the VOC and NO_x RACT requirements in CAA sections 182(b)(2) and 182(f)." The remainder of §51.1112 only speaks to deadlines for RACT SIP submittal and RACT implementation and the determination of major stationary sources for RACT.

The language referenced by the commenters is from the preamble of the 2008 eight-hour ozone standard SIP requirements rule and, as such, is only guidance. Additionally, the guidance provided in EPA's 2015 eight-hour ozone standard SIP requirements rule (83 FR 62998) referred to the same prior guidance from the preamble of the 2008 eight-hour ozone standard SIP requirements rule. However, EPA omits other guidance from the same preamble of the 2008 eight-hour ozone

standard SIP requirements rule that is specifically relevant to TCEQ RACT analysis in this case, as follows:

> **"The EPA is finalizing the approach allowing in some cases for states to conclude that sources already addressed by RACT determinations for the 1-hour and/or 1997 ozone NAAQS do not need to implement additional controls to meet the 2008 ozone NAAQS RACT requirement. We believe that, in some cases, a new RACT determination under the 2008 standard would result in the same or similar control technology as the initial RACT determination under the 1-hour or 1997 standard because the fundamental control techniques, as described in the CTGs and ACTs, are still applicable. In cases where controls were applied due to the 1-hour or 1997 NAAQS ozone RACT requirement, we expect that any incremental emissions reductions from application of a second round of RACT controls may be small and, therefore, the cost for advancing that small additional increment of reduction may not be reasonable (80 FR 12279)."**

Nothing in the 2015 eight-hour ozone standard SIP requirements rule preamble or rule negates this prior guidance that states might determine that sources addressed by prior RACT determinations do not need to implement additional controls. EPA did not provide any specific guidance by which states must make such determinations.

Furthermore, when developing attainment demonstrations, state resources would be better spent on RACM analyses and developing effective control strategies when they are necessary to reach attainment. Resources spent searching for and evaluating technical information on each and every emission source covered by a previous CTG or ACT document are not available for more productive pursuits.

No changes were made to this SIP revision in response to this comment.

EPA commended TCEQ's inclusion of contingency measures that fall in line with the January 2021 U.S. Court of Appeals for the District of Columbia Circuit vacatur of EPA's interpretation of the federal Clean Air Act (FCAA).

The commission appreciates the support. No changes were made to this SIP revision in response to this comment.

EPA requested TCEQ to review and incorporate the controls on EGUs and non-EGUs in EPA's Good Neighbor FIP into the SIP for nonattainment areas. EPA commented that NO_x and VOC controls in nonattainment areas should be at least as stringent as the Good Neighbor rule. EPA also commented that because the 2015 ozone NAAQS poses a greater need for emission reductions than the 2008 ozone NAAQS, TCEQ should conduct a robust analysis of emission controls and include documentation and analyses for CTG RACT, major source non-CTG VOC RACT and major source NO_x RACT.

The commission notes that EPA's Good Neighbor FIP rules are under judicial stay. If the Good Neighbor FIP rules come into force, their effect in the nonattainment areas

may be analyzed like other applicable rules in future AD SIP revisions. Additionally, for all applicable units in the HGB area during the ozone season, current TCEQ emission limits are as low or lower than the corresponding limits in the Good Neighbor FIP. A RACT analysis for the 2015 ozone NAAQS would be required for AD SIP revisions developed to address the 2015 ozone NAAQS and is outside the scope of this SIP revision.

No changes were made to this SIP revision in response to these comments.

EPA commented that TCEQ should explain in the attainment demonstration SIP revision for the HGB area how compliance by certain sources participating in the mass emissions cap-and-trade (MECT) program would result in actual emission reductions in the HGB area that are equal to or greater than the emission reductions that would result if RACT were applied to an individual source or source category within the nonattainment area.

The MECT program was established in 2002 with program cap step downs. The most recent step-down occurred in 2008 and resulted in significant actual reductions of NO_X emissions from subject sources. Further, EPA has previously approved the MECT program as RACT for the 1979 one-hour ozone standard, the 1997 eight-hour ozone standard, and the 2008 eight-hour ozone standard.

No changes were made to this SIP revision in response to these comments.

Lone Star Chapter of Sierra Club commented that there are no new RACT control requirements proposed and that TCEQ must strengthen the proposed SIP revision to require new control requirements to generate emissions reductions to achieve attainment in the HGB area.

Chapter 3 of this HGB AD SIP Revision indicates that the HGB area will reach attainment of the 2008 ozone NAAQS of 75 ppb ozone by the attainment date for severe nonattainment areas. Because the HGB area modeled attainment in the future year, no additional control measures were necessary for the HGB AD SIP Revision.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS argued that stronger RACT Standards for NO_X are necessary based on comparisons with standards in other jurisdictions and the performance of an emission source. The commenters requested that TCEQ set RACT at the lowest limit found in other jurisdictions. The commenters noted the following source categories: gas-fired stationary engines, stationary gas turbines, gas-fired boilers and process heaters, utility boilers, and various electric generating units.

TCEQ evaluated RACT for this HGB severe AD SIP revision based on the 2008 eight-hour ozone standard SIP requirements rule (84 FR 12264). The SIP requirements rule does not require the commission to choose the lowest RACT limits in other states. TCEQ may continue to evaluate limits from other states for technical

feasibility and economic reasonableness, but will focus on considerations specific to the affected sources located in Texas.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS referenced the RACT rules established by TCEQ in 2007, stating that such rules need updating as they are 17-years old. The push for the update to the RACT rules comes from the South Coast's updated RACT limits, as stated by the commenters. They recommended that the commission utilize information from the South Coast's RACT to determine RACT for the Houston area specifically. The commenters stated that more stringent RACT would aid in controlling NO_x emissions, specifically from the W.A. Parish Electric Generating Station in Houston, which has installed selective catalytic reduction (SCR) systems on four units that are not consistently operated at their full potential to reduce NO_x.

For affected sources located in ozone nonattainment areas in Texas, the commission contends that a RACT determination does not need to result in the lowest emission limits found elsewhere that other states may have concluded as RACT for their sources, but rather evaluate limits for technical feasibility and economic reasonableness that can be specific to the affected sources located in Texas. In addition, the compliance requirement for NO_x emissions from affected sourced in the HGB area is the surrender of MECT NO_x allowances equal to the annual NO_x emissions from the site. Therefore, the W.A. Parish plant may be able to emit NO_x up to its MECT allowance holdings.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ's NO_x emission limit for Houston's one glass furnace is above EPA's limit for glass furnaces, at 1.48 lb/ton compared to the lower bound of the 1994 EPA ACT at 0.812 lb/ton. The commenters recommended that TCEQ revise the glass furnace's permitted NO_x limit to align with EPA's level or, otherwise, implement RACT standards for the furnace.

For this SIP revision, TCEQ evaluated RACT based on the EPA's 2008 eight-hour ozone standard SIP requirements rule (80 FR 12264).

The glass furnace to which commenters referred was first included in a RACT determination for the 1997 eight-hour ozone NAAQS. The RACT determination is in Appendix D: *Reasonably Available Control Technology Analysis*, Section 3.2.2: *Glass Furnace RACT*, of the HGB 1997 Eight-Hour Ozone Severe AD SIP (Project No. 2009-017-SIP-NR). This glass furnace uses oxy-firing, which is the control technology specified in EPA's 1994 ACT document for glass furnaces (EPA-453/R-94-037). The commenters correctly claimed that the lower bound of the ACT document NO_x values is 0.812 lb/ton. However, the upper bound of NO_x values in the same Table 5-6: *NO_x Emissions from Oxy-Firing*, is 2.1 lb/ton. The 1.48 lb/ton value determined

as RACT by TCEQ is within the range cited in the ACT document and can be presumed to be RACT.

Language from the preamble of the 2008 eight-hour ozone standard SIP requirements rule that is specifically relevant to TCEQ's RACT analysis in this case, as follows:

> **"The EPA is finalizing the approach allowing in some cases for states to conclude that sources already addressed by RACT determinations for the 1-hour and/or 1997 ozone NAAQS do not need to implement additional controls to meet the 2008 ozone NAAQS RACT requirement. We believe that, in some cases, a new RACT determination under the 2008 standard would result in the same or similar control technology as the initial RACT determination under the 1-hour or 1997 standard because the fundamental control techniques, as described in the CTGs and ACTs, are still applicable. In cases where controls were applied due to the 1-hour or 1997 NAAQS ozone RACT requirement, we expect that any incremental emissions reductions from application of a second round of RACT controls may be small and, therefore, the cost for advancing that small additional increment of reduction may not be reasonable (80 FR 12279)."**

In addition, nothing in the 2015 eight-hour ozone standard SIP requirements rule preamble or rule negates this prior guidance that states might determine that sources addressed by prior RACT determinations do not need to implement additional controls. EPA did not provide any specific guidance by which states must make such determinations.

Furthermore, when developing attainment demonstrations, state resources would be better spent on RACM analyses and developing effective control strategies when they are necessary to reach attainment. Resources spent searching for and evaluating technical information on each and every emission source covered by a previous CTG or ACT document are not available for more productive pursuits.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ incorrectly concluded that it did not need to evaluate and establish VOC limits to satisfy RACT for the control of VOC from agricultural applications of pesticides because the relevant ACT guidance for pesticides lacks presumptive controls (Appendix D at 12 and Table. D-2) of the proposed SIP revision. Even though TCEQ does not regulate the use of agricultural pesticides, TCEQ is still mandated by the FCAA to adopt all RACT for all source categories addressed in CTG guidance and all major sources of VOC – U.S.C. §7511a(b)(2).

The comment refers to a March 1993 EPA Alternative Control Technology Document for Control of VOC Emissions from the Application of Agricultural Pesticides (EPA-453/R-92-011). FCAA, §182(b)(2) requires states to implement RACT that addresses each category of VOC sources covered by a CTG or ACT document and all other major stationary sources of VOC located in the ozone nonattainment

area. As stated in Appendix D of this SIP revision, no RACT determination is required for this source category because the ACT document does not provide presumptive controls.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club and 171 individuals, TEJAS, Environmental Integrity Project, and 27 additional individuals commented that more controls on VOC and NO_x were needed within the HGB area to attain the 2008 ozone NAAQS. Earthjustice, Air Alliance Houston, Environment Texas, Public Citizen, Sierra Club, and TEJAS commented that it is unreasonable for TCEQ to expect the HGB area to attain due to stagnant monitored ozone levels and the lack of additional controls. Sierra Club and 174 individuals specifically requested controls on industry and the use of fossil fuels. The Environmental Integrity Project, Air Alliance Houston, Public Citizen, and Environment Texas specifically requested more controls on local industrial point sources. Lone Star Chapter of Sierra Club requested NO_x controls on major and minor sources. Earthjustice, Air Alliance Houston, Environment Texas, Public Citizen, Sierra Club and 174 individuals, and TEJAS requested more controls on power plants, chemical facilities, and refineries.

Twenty-seven individuals also singled out the W.A. Parish power plant, the ExxonMobil Baytown complex, and the oil refining, chemical, and petrochemical sectors as some of the largest ozone precursor emitters and requested NO_x and VOC emission reductions from these sources. Earthjustice, Air Alliance Houston, Environment Texas, Public Citizen, Sierra Club, and TEJAS commented that TCEQ needs to clarify what was included in the RACM analysis before concluding that "no control strategies were identified that could provide at least 2.06 tpd of NO_x emissions." These commenters noted that TCEQ had included an appendix of evaluated control measures in the 2020 HGB AD SIP revision, as well as their reasons for rejecting different control measures. These commenters argued that without this information, reviewing agencies and the public are precluded from assessing whether TCEQ's met its RACM obligations. These commenters concluded by noting that the failure to provide the RACM analysis is not only arbitrary, per the Sierra Club vs EPA case, but does not comply with the longstanding EPA guidance or follow previous TCEQ practice.

The commission followed all relevant federal and state statutes, regulations, and guidance in the development of this SIP revision and evaluated all relevant information to reach its decision regarding the appropriate control strategies for the HGB nonattainment area. This included major and minor emission sources from industrial, fossil fuel burning units, oil refining, and petrochemical sectors and sites such as the W.A. Parish power plant and the ExxonMobil Baytown complex.

As discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the attainment date without additional control measures, and no additional control measures were determined to advance attainment by one year. Therefore, no additional control measures were needed as RACM to meet attainment.

In Section 4.6.2: *Results of the RACM Analysis* of this HGB AD SIP revision, TCEQ showed that a potential NO_x control measure would need to generate 2.06 tpd of NO_x reductions by January 1, 2025, in order be considered as RACM by advancing attainment by one year. TCEQ typically provides more than eight months from the effective date of a rule for sites to come into compliance when equipment changes are required, which is the typical situation for NO_x controls. The anticipated effective date of the concurrent 30 TAC Chapter 117 rulemaking (Project No. 2023-117-117-AI) is May 16, 2024. This would be less than eight months before the January 1, 2025, deadline. Because no control strategies were identified that could provide at least 2.06 tpd of NO_x reductions and be implemented by the January 1, 2025, deadline, it is not possible to advance attainment by one year.

Because no control measures could meet the RACM requirements, TCEQ did not publish a list of such measures with analyzed reduction amounts.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ failed to provide analysis of and adopt RACM, advocating for the adoption of SCR technology on four coal-fired units of the W.A Parish power plant in the Houston area. The commenters disagreed with TCEQ's assessment that no RACM exists for NO_x that can advance attainment by one year, which would require sites to be in compliance by a January 1, 2025, deadline. Commenters argued that considerable NO_x emission reductions could occur with implementation of SCR at the Parish plant. The commenters quoted an analysis demonstrating a 1,091 tpy reduction with installation on Unit 6 alone and argued that substantial reductions would be achieved with optimization of SCR on all four units consisting of replacing and/or re-activating their catalysts. The commenters stated that SCR only has moderate costs, can be accomplished quickly, and adoption of the technology would hasten attainment.

The commission typically provides more than eight months from the effective date of a rule for sites to come into compliance when equipment changes are required, which is the typical situation for NO_x controls. The anticipated effective date of the concurrent 30 TAC Chapter 117 rulemaking (Project No. 2023-117-117-AI) is likely to be in May 2024. This would be less than eight months before the January 1, 2025, deadline necessary for compliance with a RACM rule that would advance attainment by a year. Therefore, the commission concludes that a RACM measure to require optimum operation of SCR on the coal-fired units of the W.A. Parish power plant is not feasible to include in this HGB AD SIP revision.

No changes were made to this SIP revision in response to this comment.

Lone Star Chapter of Sierra Club commented that TCEQ must revise rules to ensure VOC reductions from minor sources in the oil and gas industry in the HGB area. Lone Star Chapter of Sierra Club also commented that TCEQ must propose more measures to further reduce VOC emissions from major and minor industrial sources and HRVOC emissions. One individual commented that HRVOCs are a driving force in ozone formation, are mainly emitted by large industrial point source facilities, and that ozone

nonattainment days are often correlated with emission events that emit large quantities of HRVOCs. The commenter suggested turnaround operations planning to minimize flaring can be used to reduce HRVOC and other VOC emissions, monitoring flare operations to prevent over-steaming which reduces combustion efficiency, requiring flare minimization plans for facilities within the nonattainment area, and encouraging the scheduling of major maintenance during cooler seasons as an additional tool to reduce ozone formation.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that the proposal fails to properly analyze absence of RACM for VOC. The commenters noted that the analysis from TCEQ suggests urban areas are VOC limited, while industrial areas are more transitional, suggesting VOC reduction in both areas would likely reduce ozone levels. The commenters observed that TCEQ contingency plans are focused on VOC reductions, further emphasizing the importance of RACM analysis for VOC.

Air Alliance Houston, Environmental Integrity Project, Environment Texas, and Public Citizen recommended that TCEQ implement controls that reduce the emissions of HRVOC since the reactivity-weighted composition of VOC in the HGB area shows that reductions in emissions of HRVOC would be expected to cause a larger decrease in surface ozone levels when compared to an equivalent reduction in less reactive VOC species.

As discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the attainment date without additional control measures, and no additional control measures were determined to advance attainment by one year.

As shown in Appendix B of this SIP Revision, the design value-setting monitor, Bayland Park, is NO_x-limited. In Chapter 6: *Conclusions*, the conceptual model states: "It is likely that controlling NO_x would be more effective at influencing the HGB area design value than controlling VOC." Therefore, TCEQ focused its RACM evaluation efforts for this SIP revision on NO_x control measures rather than VOC or HRVOC control measures.

Additionally, the contingency measures included in this HGB AD SIP revision were not chosen solely to reduce ozone. These particular VOC emission reductions were chosen because they were readily available, not considered to be RACT because they go beyond RACT, and could be implemented quickly enough to meet the requirements for contingency measures.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ should require RACM controls on sources outside the HGB area in general and specifically require SCR NO_x control on large coal-fired EGUs outside the HGB area to help the HGB area reach attainment with the 2008 ozone NAAQS.

EPA recently stated their interpretation of the FCAA relating to evaluation of potential controls on sources outside the DFW area:

> **"The EPA believes our interpretation of [F]CAA section 172(c)(6), under certain circumstances, establishes a mandatory requirement for states to consider and implement emission controls for sources inside the state but outside of a designated nonattainment area.**
>
> **. . .**
>
> **only in circumstances where that is necessary or appropriate to provide for attainment by the attainment date, because the emission controls required on sources within the nonattainment area are not sufficient to provide for attainment by that date." (83 FR 63015)**

As discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the attainment date without additional control measures, and no additional control measures were determined to advance attainment by one year.

No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS stated that the proposed rule updates to Chapters 115 and 117 would relax the monitoring requirements for NO_x and VOC sources, which are currently required to provide emissions measurements via instrument monitoring specified under 42 U.S.C. §7410(a)(2)(B)(i). The commenters added that reduced monitoring would make it difficult for the commission to accurately determine reductions in ambient ozone levels due to reductions in emissions set by the commission.

In the concurrent 30 TAC Chapter 115 rulemaking (Project No. 2023-116-115-AI), the commission is adopting an exemption for fugitive components in heavy liquid service from routine instrument monitoring requirements provided they are monitored weekly by a visual, audio, and olfactory (OVA) survey as the EPA's 2016 Oil and Gas CTG recommends. Rather than weakening monitoring, the OVA monitoring surveys will identify heavy liquid service leaks quicker than instrument monitoring because they will occur more frequently, and the surveys typically document leak evidence before an instrument reading above the 10,000 ppm leak definition is observed. The adopted exemption in §115.172(a)(9) will enable heavy liquid service fugitive component leaks to be identified and repaired sooner to reduce natural gas processing plant VOC emissions. Contrary to what the commenters assert, faster required leak repair will make attainment of the ozone NAAQS more likely.

The commission disagrees that continuous or predictive emissions monitoring for stationary diesel engines using a chemical reagent for control of NO_x emissions as a post-combustion control technique is necessary. In concurrent 30 TAC Chapter 117 rulemaking (Project No. 2023-117-117-AI) the commission is adopting new

§117.340(c)(2)(C) for sources located in the HGB area, and new §117.440(c)(2)(A)-(B) for sources located in the DFW area, specifying that an owner or operator of a stationary diesel engine using an SCR system must use a system that conforms to the criteria and requirements of the rule provisions. These adopted provisions in Chapter 117 were based on the existing rule requirements in 40 CFR §1039.110 for stationary engines equipped with SCR systems. These requirements specify that the SCR system must incorporate a diagnostic system to allow the owner or operator the ability to track the SCR's system ability to control NO_x emissions from the stationary engine. The diagnostic and other monitoring requirements are provided in federal rule and if adhered to eliminate the need to monitor NO_x or ammonia emissions from stationary diesel engines per 40 CFR Part 1039. The adopted new provisions in Chapter 117 follow the same approach also eliminating the need for an owner or operator to monitor NO_x or ammonia emissions from stationary diesel engines, which use SCR systems and a chemical reagent to control NO_x emissions, covered by Chapter 117. The Chapter 117 rulemaking contains the required demonstration showing that this change will not "interfere with an applicable requirement concerning attainment."

No changes were made to this SIP revision in response to these comments.

Fort Bend County Environmental Organization requested that TCEQ impose stricter controls and accountability on high-emitting sources, specifically the W.A. Parish coal-fired plant. The individual suggested that the imposition of harsher financial penalties may be a means of holding sources accountable and reducing air pollution. Earthjustice asked TCEQ to implement more controls on point and area sources. A second individual recommended TCEQ aid in coordinating HGB traffic flows in addition to current stationary source regulations. A third individual commented that the HGB area population is increasing, and more emphasis needs to be placed on reducing mobile source pollutants, including cars, trucks, locomotives, barges, and ships. A fourth individual suggested restrictions on activities such as transportation, refining, coal fired-power generation, and industrial flaring, emphasizing the need for stringent control measures to combat air pollution and improve environmental conditions. Sierra Club, Earthjustice, and 172 individuals commented that TCEQ needed to properly regulate polluting industries.

As discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the attainment date without additional control measures, and no additional control measures were determined to advance attainment by one year.

No changes were made to this SIP revision in response to these comments.

Lone Star Chapter of Sierra Club commented that TCEQ provisions within Chapter 30 TAC, Chapter 115 authorize more emissions than are allowed under the FCAA. Commenters also stated that elevated surface ozone levels are partly due to weak enforcement by TCEQ and weak compliance by regulated entities.

The commission does not agree that 30 TAC Chapter 115 authorizes more emissions than are allowed under the FCAA or that enforcement is weak, nor has the commenter provided specific information for this allegation that is relevant to this SIP revision.

No changes were made to this SIP revision in response to this comment.

One individual commented that TCEQ did well regulating NO_x and VOC from stationary sources from 2002-2012, using best available control technology (BACT) and pricing controls.

The commission appreciates the individual's support.

No changes were made to this SIP revision in response to this comment.

EPA commented that TCEQ must provide and implement additional contingency measures to address the DFW and HGB areas' failure to attain by the 2008 ozone NAAQS serious attainment date in addition to the proposed new contingency measures that would be implemented in the event of failure to attain or make RFP by the severe attainment date. EPA requested clarification on which contingency measures will be triggered in the event of a failure to attain by the serious date. EPA was also seeking a clear identification of the specific measures that will be implemented under each scenario.

Details of the contingency plan, including triggering and available measures for the finding of failure to attain for the serious and severe classifications, can be found in Section 4.9: *Contingency Plan* of the HGB AD SIP Revision. TCEQ would implement enough contingency measures in the area to meet or exceed the required contingency reductions for whichever purpose may arise first. Table 4-3: *Eight-County HGB 2008 Ozone NAAQS Nonattainment Area VOC Contingency Measure Reductions* of this HGB AD SIP revision contains a list of the contingency measures and the VOC reduction amount associated with each measure for the HGB area.

Staff inadvertently omitted some source categories and incorrectly stated multiple VOC content limits for other source categories in the industrial adhesives contingency measure of the concurrent Chapter 115 rulemaking proposal (Rule Project No. 2023-116-115-AI). This resulted in less emissions reductions available to fulfill contingency requirements in the HGB area. The Executive Director intends to immediately initiate an Industrial Adhesives Contingency Measure Corrections rulemaking (corrections rulemaking) for commission consideration to restore the missing and incorrect VOC content limits to achieve the reductions originally intended.

Table 4-5: *HGB 2008 Ozone NAAQS Nonattainment Area Severe Attainment Contingency Plan as Adopted and Industrial Adhesives Contingency Measure Corrections Rule (tons per day unless otherwise noted)* of the HGB AD SIP revision shows how the VOC reduction amounts from Table 4-3 would satisfy the required contingency measure reductions for the HGB area upon adoption of the corrections

rulemaking. The FCAA requirement and EPA's 2008 eight-hour ozone standard SIP requirements rule (80 FR 12264) states that contingency measures sufficient to reach the contingency reduction target must be implemented, which is expressed in Line 3 of Table 4-4: *HGB 2008 Ozone NAAQS Nonattainment Area Severe Attainment Contingency Plan as Adopted (tons per day unless otherwise noted)* of the HGB AD SIP revision as 3% of the VOC emissions in the baseline year inventory. Therefore, TCEQ contingency measures are selected and implemented in agreement with the 2008 eight-hour ozone standard SIP requirements rule, which EPA claims is consistent with the FCAA.

TCEQ added Table 4-1: *HGB 2008 Ozone NAAQS Nonattainment Area Serious Attainment Contingency Plan as Adopted and Industrial Adhesives Contingency Measure Corrections Rule (tons per day unless otherwise noted)* to the HGB AD SIP revision to show the amount of contingency measure reductions required for the serious classification and how the reductions shown in Table 4-3 can meet them upon adoption of the corrections rulemaking.

The triggering language in the concurrent 30 TAC Chapter 115 rulemaking (Project No. 2023-116-115-AI) states that the *Texas Register* notice would specify which contingency measures, NAAQS, classification, and purpose (failure to attain or failure to achieve an RFP milestone) for which contingency measures will be triggered. For example, the triggering language for the industrial cleaning solvents contingency measure in the HGB area states:

> **"The owner or operator of a solvent cleaning operation in Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties shall be in compliance with the requirements of §115.463(e) of this title no later than 270 days after the commission publishes notification in the Texas Register of its determination that the contingency requirements are necessary as a result of EPA publication of a notice in the Federal Register that the specified area failed to attain the applicable National Ambient Air Quality Standard for ozone by the attainment deadline or failed to demonstrate reasonable further progress as set forth in the 1990 Amendments to the federal Clean Air Act."**

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that the contingency measures contained in the proposed attainment demonstration SIP revision under the severe classification for the 2008 ozone NAAQS are deficient in three ways. First, none of the contingency measures are for the control of NO_x. Second, the proposed contingency measure for industrial adhesives would impose requirements that are less stringent than existing control measures for four categories of adhesives. Third, TCEQ lists a contingency measure for industrial cleaning solvents that is required as RACT. Commenters cite existing rules in California with the proposed TCEQ limit.

In the concurrent 30 TAC Chapter 115 rulemaking (Project No. 2023-116-115-AI), the commission adopts contingency measures which would reduce VOC emissions consistent with EPA's contingency measure requirements described in the 2008 eight-hour ozone standard SIP requirements rule (80 FR 12264) in 40 CFR, Part 51,

Subpart CC, §51.1112. The SIP requirements rule does not require that contingency measures be NO_x reductions only. These VOC emission reductions were chosen because they were readily available, not considered to be RACT because they go beyond RACT, and could be implemented quickly enough to meet the requirements for contingency measures.

In the concurrent 30 TAC Chapter 115 rulemaking (Project No. 2023-116-115-AI), the commission adopts a contingency measure to reduce VOC emissions from industrial adhesives which is based on South Coast Air Quality Management District (SCAQMD) Rule 1168, as amended November 4, 2022. Current TCEQ RACT limits on industrial adhesives are based on the 2008 EPA Control Techniques Guideline (CTG) for Industrial Adhesives. The emission limit recommended in the CTG is based on the 2006 version of SCAQMD Rule 1168. Since 2006, SCAQMD Rule 1168 has been amended twice to establish emission limits for bonding specific substrates. These amendments have accommodated stated industry concerns with the limits in the 2006 version of Rule 1168. Four of the SCAQMD Rule 1168 changes since 2006 have increased the emission limit beyond the limit in current TCEQ rules. These changes are for pressure sensitive adhesive primers, adhesives to join two specialty plastics, adhesives used in the manufacturing of computer diskettes, and adhesives for structural wood components. TCEQ chose its industrial adhesive contingency measure VOC content limits to equal the SCAQMD Rule 1168 limits adopted November 4, 2022 because TCEQ agrees with SCAQMD's analysis on technological feasibility for these limits. SCAQMD's analysis can be found in SCAQMD's *Preliminary Draft Staff Report for Rule 1168 – Adhesive and Sealant Applications* dated August 2022. Calculated emissions reductions for this measure in the HGB area sums the reductions in some adhesive categories and the increases in other categories to produce net emission reductions.

Staff inadvertently omitted some source categories and incorrectly stated multiple VOC content limits for other source categories in the industrial adhesives contingency measure of the concurrent Chapter 115 rulemaking proposal (Rule Project No. 2023-116-115-AI). This resulted in less emissions reductions available to fulfill contingency requirements in the HGB area. The Executive Director intends to immediately initiate an Industrial Adhesives Contingency Measure Corrections rulemaking (corrections rulemaking) for commission consideration to restore the missing and incorrect VOC content limits to achieve the reductions originally intended.

In the concurrent 30 TAC Chapter 115 rulemaking (Project No. 2023-116-115-AI), the commission adopts contingency measure emission limits for industrial cleaning solvents which are consistent with limits in SCAQMD Rule 1171, as amended in 2009. This rule has a general limit of 25 grams of VOC per liter (g/l) of cleaner. In its 2006 CTG for Industrial Cleaning Solvents, EPA evaluated the SCAQMD Rule 1171 limit and set the recommended VOC content limit at 50 g/l, which defined RACT for this source category. TCEQ has adopted the beyond-RACT limit of 25 g/l to generate VOC emission reductions for contingency purposes.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented by stating emission limits should be expanded to all industrial cleaning solvent facilities that produce at least 2.7 tons/year of VOC (down from 3.0 tons/year at present).

In the concurrent 30 TAC Chapter 115 rulemaking (Project No. 2023-116-115-AI), the commission adopts contingency measure emission limits for industrial cleaning solvents. This measure, when triggered, would remove the exemption in 30 TAC §115.461(a) which provides the current exemption for solvent cleaning operations emitting less than 3.0 tons per year, effectively requiring compliance with the industrial cleaning solvent VOC content limits for all sites. The current exemption for sites with less than 3.0 tons of VOC emissions from cleaning solvents is a valid application of presumptive RACT as written in the EPA Industrial Cleaning Solvent CTG and has been approved by EPA.

No changes were made to this SIP revision in response to this comment.

Office of the Harris County Attorney commented that the six proposed VOC contingency measures are insignificant, not sufficient to enable the DFW and/or HGB 2008 ozone nonattainment areas to attain the 2008 ozone NAAQS, and only sufficient to fulfill the FCAA requirement to include contingency measures in an AD SIP revision. They additionally requested that since the proposed contingency measures do not conform to EPA guidance, they should be revised to be more effective.

The commission contends that the proposed contingency measures do not require revision because they conform to EPA contingency measure requirements, as specified in the 2008 eight-hour ozone standard SIP requirements rule (80 FR 12264), which requires measures to achieve sufficient VOC reductions to meet the calculated target amount. The SIP requirements rule sets the emission reduction amount at a level that EPA claims is sufficient to assist progress toward attainment which fulfills the FCAA requirement for contingency measures.

Staff inadvertently omitted some source categories and incorrectly stated multiple VOC content limits for other source categories in the industrial adhesives contingency measure of the concurrent Chapter 115 rulemaking proposal (Rule Project No. 2023-116-115-AI). This resulted in less emissions reductions available to fulfill contingency requirements in the HGB area. The Executive Director intends to immediately initiate an Industrial Adhesives Contingency Measure Corrections rulemaking (corrections rulemaking) for commission consideration to restore the missing and incorrect VOC content limits to achieve the reductions originally intended.

No changes were made to this SIP revision in response to these comments.

The Office of the Harris County Attorney commented regarding the timeframe and scope of TCEQ contingency measures. They stated that after EPA publishes a notice of finding of failure to attain or meeting RFP in the *Federal Register*, the TCEQ must publish a notice in the *Texas Register* stating that compliance with contingency

measures is required. The commenter further noted that TCEQ's proposed rules require compliance with these contingency measures no more than nine months after the *Texas Register* publication, whereas new EPA guidance, published in March 2023, recommends contingency measures implementation within 60 days of EPA's publication. Harris County also requested that the rules are revised to align with EPA's guidance and the intended purpose of contingency measures. Lone Star Chapter of the Sierra Club also requested more effective contingency measures.

The commission disagrees with the commentor's assertion that EPA guidance requires contingency measure implementation and compliance within 60 days of EPA publication of a finding of failure to attain or meet RFP.

EPA draft continency measure guidance dated March 16, 2023, states "As discussed in Section 2, in the 1992 General Preamble, EPA did address the question of how soon the [contingency measures] for ozone should take effect, and acknowledged that certain actions, such as notification of sources, modification of permits, etc., would probably be needed before a measure could be implemented effectively. There, EPA concluded that in general, actions needed to affect full implementation of the measures should occur within 60 days after EPA notifies the State of its failure (to attain or meet RFP)."[35] The draft guidance also states, "EPA continues to believe that 1 year is generally the appropriate timeframe for [contingency measures] to achieve reductions because of the intended purpose of [contingency measures] to provide emissions reductions to bridge the gap between the failure and the subsequent corrective action." The commission is adopting compliance schedules requiring compliance with the contingency measures within 270 days of TCEQ notice in the *Texas Register*. TCEQ chose to require compliance within 270 days rather than a year to allow time between the EPA notification and the TCEQ notification while assuring compliance within one year of EPA notification.

No changes were made to this SIP revision in response to this comment.

COMPLIANCE AND ENFORCEMENT

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS commented that TCEQ must reduce NO_X and VOC emissions to ensure that the imminent update to ozone monitoring methods will not cause failure to attain.

The commission acknowledges that recent changes were made to federally required ozone monitoring methods, as required under 40 CFR Part 50, Appendix D. The commission notes that in the final rule, EPA stated that the adoption of the new cross-section will improve the accuracy of measured ozone values and was unlikely to have a measurable, predictable influence on any given monitor or design value (88 FR 70595-70597). Comments related to federally required changes in ozone monitoring methods are outside the scope of this SIP revision.

No changes were made to this SIP revision in response to this comment.

[35] https://www.regulations.gov/document/EPA-HQ-OAR-2023-0063-0002

Environmental Integrity Project, Air Alliance Houston, Public Citizen, and Environment Texas commented that TCEQ should expand its formaldehyde monitoring throughout the HGB area.

The commission performs Photochemical Assessment Monitoring Stations (PAMS) federally required monitoring of formaldehyde along with 16 additional carbonyl parameters. The commission meets the federally required PAMS formaldehyde monitoring requirements at Houston Deer Park #2 and exceeds this requirement with a second monitor at Clinton.

In addition to exceeding carbonyl monitoring requirements in the HGB area, TCEQ monitors for speciated VOC, which are known ozone precursors. TCEQ exceeds PAMS requirements with the operation of three PAMS auto-GCs for speciated VOC at Channelview, Clinton, and Houston Deer Park #2. TCEQ also operates a robust network of non-federal state-initiative auto-GC monitors and expanded that coverage in 2021 and 2022 by adding three additional auto-GC monitors to the HGB area. These auto-GC monitors were deployed at new air monitoring sites at Channelview Drive Water Tower, Manchester East Avenue N, and Pasadena Richey Elementary School. With the addition of these three units, the HGB area currently has 17 auto-GC monitors operated by TCEQ and its monitoring partners (city, county, private, and industry). These monitors measure both TNMOC, which is a surrogate for total VOC, and speciated VOC concentrations, which include HRVOC, and provides sufficient monitoring data to assess ozone formation in the HGB area.

No changes were made to this SIP revision in response to this comment.

EPA commented that TCEQ should provide information to the reader regarding NO_X monitors that ceased operations prior to 2022 as listed in Section 3.1, Ambient NO_X Trends, 2023-110-SIP-NR (HGB Attainment Designation) Appendix B: Conceptual Models.

TCEQ Houston Deer Park #2 and Houston Texas Avenue sites are federal air monitoring sites. The Houston Texas Avenue air monitoring site was temporarily shut down due to siting criteria issues caused by building construction adjacent to the site. The site was relocated as the Houston Harvard Street site in 2021. The Houston Deer Park #2 NO_x monitor (providing NO_x, nitrogen oxide, and nitrogen dioxide [NO_2]) was replaced with a direct NO_2 monitor in 2019 to fulfill PAMS requirements.

TCEQ hosts air monitoring data from TCEQ monitors and non-regulatory data from monitoring partners (city, county, private, and industry). Voluntary non-regulatory air monitoring supported and operated by TCEQ monitoring partners may be deactivated at the owner's discretion. The NO_X monitors at Mustang Bayou and Danciger were discontinued when the sites were deactivated by the site owners in 2015 and 2020, respectively.

No changes were made to this SIP revision in response to this comment.

Twelve commenters stated TCEQ could strictly enforce the FCAA and the permits it issues under the act. The commenters noted air pollution violations in Texas occur with no corrective action at all and that TCEQ has a crucial role to play in using enforcement to give companies an economic incentive to obey the law.

Proper implementation of the NSR program is an important element in attaining and maintaining the NAAQS, and TCEQ enforces this program as specified in the Texas Water Code (TWC), THSC, and commission rules. The commission does not agree that most air pollution violations in Texas occur with no corrective action, nor has the commenter provided specific information for this allegation that is relevant to this SIP revision.

No changes were made to this SIP revision in response to these comments.

An individual commented that TCEQ can rectify mistakes and penalize facilities and prevent deaths and toxic exposure if there is an explosion near the Gulf Coast.

This comment is outside the scope for this SIP revision. No changes were made to this SIP revision in response to this comment.

An individual commented that TCEQ's greatest failure is not following through with oversight and enforcement. The commenter also stated there needs to be more focus on enforcement and increases in penalties. Sierra Club, Earthjustice, and an individual commented that TCEQ's enforcement of noncompliance issues is a joke and asked how can it regain public confidence and trust.

Comments regarding enforcement are outside the scope of this SIP revision. However, the commission agrees that enforcement is an important element in assisting in the attainment and maintenance of the NAAQS and enforces all air quality requirements as specified in the TWC, THSC, and commission rules.

No changes were made to this SIP revision in response to this comment.

Sierra Club, Earthjustice, and one individual submitted a comment on behalf of another individual, stating that there should be strong publication of frequent excursion monitoring to raise public awareness of the polluted air.

The commission clarifies that excursion or non-stationary monitoring is not used to support federal air monitoring requirements and is outside the scope of this SIP revision. TCEQ investigators conduct non-stationary monitoring in response to complaints and to ensure regulatory compliance. Complainants receive a response detailing the resolution and findings are provided on the Web Access to Complaint Information website (https://www.tceq.texas.gov/compliance/complaints/waci.html). In addition, investigation and violation information is available on the Texas Open Data Portal (https://data.texas.gov/browse?Dataset-Category_Agency=Texas+Commission+on+Environmental+Quality&Dataset-Category_Category-Tile=Energy+and+Environment). Lastly, unauthorized releases

over reporting thresholds are publicly available on the TCEQ website (https://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.searchForm&newsearch=yes) and TCEQ evaluates all reports received.

No changes were made to this SIP revision in response to this comment.

Sierra Club, Earthjustice, and one individual submitted a comment on behalf of a citizen that a recent facility fire made TCEQ look ridiculous when stating it is safe to breathe with an air monitor while there are visible particulates coming from the fire. The individual also stated they would like to see reporting of what is in the smoke, possible exposure and impact, and honesty and transparency in monitoring.

Comments regarding enforcement are outside the scope of this SIP revision. However, the commission agrees that enforcement is an important element in assisting in the attainment and maintenance of the NAAQS and enforces all air quality requirements as specified in the TWC, THSC, and commission rules. Emission event reporting requirements are specified in 30 TAC Chapter 101, Subchapter F.

No changes were made to this SIP revision in response to this comment.

Sierra Club submitted a comment on behalf of a citizen that facilities release emissions early in the morning or late at night to avoid enforcement penalties. The individual would like TCEQ to enforce and have harsher penalties for these facilities and provide funding for the departments that regulate them.

Comments regarding enforcement are outside the scope of this SIP revision. However, the commission agrees that enforcement is an important element in assisting in the attainment and maintenance of the NAAQS and enforces all air quality requirements as specified in the TWC, THSC, and commission rules. For specific concerns about a facility's operations, please contact the TCEQ's Houston Regional Office. No changes were made to this SIP revision in response to this comment.

Lone Star Chapter of Sierra Club commented that it is impossible for TCEQ to thoroughly inspect large facilities even with well-trained staff conducting Comprehensive Compliance Investigations.

Comments regarding enforcement generally, and inspector training specifically, are outside the scope of this SIP revision. However, the commission agrees that enforcement is an important element in assisting in the attainment and maintenance of the NAAQS and enforces all air quality requirements as specified in the TWC, THSC, and commission rules.

No changes were made to this SIP revision in response to this comment.

Lone Star Chapter of Sierra Club, Sierra Club, and 174 individuals expressed concern regarding reports of fraud in TCEQ's vehicle emissions I/M program. The comment

noted the use of devices that can simulate a car's onboard diagnostic system and can guarantee a passing test result. Additionally, the commenters note that Texas investigators believe millions of cars never pass the state-required safety or emissions tests. The commenters expressed concern that the state's inspection computer system is not programmed to immediately stop fake inspections and urged TCEQ to work more closely with local law enforcement and DPS to stop fraudulent tailpipe inspections. Lone Star also stated TCEQ's I/M vehicle emissions reductions are likely not being achieved due to potential fraud in the I/M program.

DPS is responsible for the enforcement of the I/M program, and TCEQ's role is to support DPS in its administration and enforcement of the program. TCEQ routinely audits the program's effectiveness, including providing data to DPS to assist in its efforts to identify or confirm fraud. Additionally, TCEQ and DPS are working together to evaluate legal, technical, and procedural considerations with stopping potential fraud. TCEQ also conducts the federally required biennial I/M program evaluation to assess the overall effectiveness of the Texas I/M program. The commission disagrees with the claim that emissions reductions are likely not being achieved due to potential fraud in the program. The biennial I/M program evaluation includes an analysis of potential inspection fraud and an analysis of emissions reductions for vehicles inspected under program requirements. The analysis pairs remote sensing data with I/M program data to calculate the annual I/M benefit using guidance from EPA. This study has repeatedly concluded that the Texas I/M program is effective and in compliance with EPA's program requirements.

No changes were made to this SIP revision in response to these comments.

Lone Star Chapter of Sierra Club quoted a TV report by the Dallas NBC News affiliate in which DPS stated TCEQ's database must be manually analyzed and that there are no automatic triggers, red flags, or thresholds. They further quoted TCEQ stating it does not have a trigger that flags stations producing a large volume of inspections.

TCEQ's vehicle inspection database cannot confirm whether a vehicle was fraudulently inspected or clean scanned. The data must be analyzed by DPS. The triggers referenced in the quote do not run automatically but are available to DPS for enforcement research. TCEQ's vehicle inspection database does not have a trigger that flags inspection stations producing a high volume of inspections.

No changes were made to this SIP revision in response to this comment.

Lone Star Chapter of Sierra Club referenced a TV report that stated an estimate of 4-5 million cars may have been fraudulently inspected.

The commission disagrees with the estimate that 4-5 million cars may have been fraudulently inspected. There are legitimate reasons for some discrepancies in vehicle inspection data that could appear to law enforcement to be fraudulent inspections.

No changes were made to this SIP revision in response to this comment.

PERMITTING

Air Alliance Houston and three individuals expressed concerns regarding the Nonattainment New Source Review (NNSR) program and whether the NNSR regulations from 1995 were sufficient for today, referencing a report from *Inside Climate News* discussing regularly occurring circumvention of major source thresholds by large polluters and requesting the SIP (and TCEQ rules, if necessary) address such circumvention.

Comments concerning the scope and content of the NNSR program are beyond the scope of this SIP revision. However, the commission agrees that proper implementation of the New Source Review (NSR) program is an important element in assisting in the attainment and maintenance of the NAAQS, and enforces this program as specified in the TWC, THSC, and commission rules.

The State of Texas is SIP-approved pursuant to 40 CFR 52, Subpart SS to implement all major NSR permitting programs (PSD, Nonattainment, and Plantwide Applicability Limit permits) as well as minor NSR permits. The Texas nonattainment permitting program contained in 30 TAC §116.150 is based on the requirements contained in 40 CFR §51.165. TCEQ ensures compliance with the requirements of 30 TAC Chapters 106 and 116, Division 1 for minor NSR and 30 TAC Chapter 116, Divisions 5 and 6 for implementation of major NSR.

For every application that is received, TCEQ performs an applicability analysis for new major sources and modifications to existing major sources to determine if major NSR is triggered. Pursuant to 30 TAC Chapter 116, when undergoing a physical or operational change (project), an existing major source must determine major NSR applicability through a two-step process that first considers whether the increased emissions alone are significant, followed by a calculation of the particular project's net emissions increase considering all contemporaneous increases and decreases at the source to determine if a major modification has occurred.

The process to determine whether a proposed project is subject to major NSR is determined based on a case-by-case evaluation based on available information. TCEQ relies on, and applies, EPA rules and guidance to determine when nominally separate activities should be combined into a single project for purposes of major NSR applicability.

Comments regarding specific NSR permits are outside the scope of this SIP revision. No changes were made to this SIP revision in response to these comments.

Air Alliance Houston, Earthjustice, Environment Texas, Sierra Club, and TEJAS expressed concern over companies possibly evading NSR requirements.

The commission agrees that compliance with the FCAA and compliance with NSR requirements is an important element in assisting in the attainment and maintenance of the NAAQS. The State of Texas is SIP-approved pursuant to 40 CFR

52, Subpart SS to implement all major NSR permitting programs (PSD, Nonattainment, and Plantwide Applicability Limit permits). The Texas nonattainment permitting program contained in 30 TAC §116.150 is based on the requirements contained in 40 CFR §51.165. TCEQ ensures compliance with the requirements of 30 TAC Chapter 116, Divisions 5 and 6 for implementation of major NSR.

No changes were made to this SIP revision in response to these comments.

Twenty-seven individuals expressed the need for greater community outreach and education of the permitting process.

The commission acknowledges the importance of community involvement in the permitting process. However, comments regarding the content and scope of Texas' NSR program, including public participation requirements, are outside the scope of this SIP revision.

No changes were made to this SIP revision in response to this comment.

Air Alliance Houston and three individuals expressed concern about unaddressed loopholes for fugitive emissions and unscheduled maintenance and emissions upsets. The commenters requested that TCEQ implement stronger controls aimed at reducing emissions from flaring events. They also elaborated that flaring events result in large spikes in emissions that contribute to high surface ozone levels.

Lone Star Chapter of Sierra Club commented that TCEQ provides "loophole" provisions in 30 TAC, Chapter 115 that allow HRVOC emissions to exceed acceptable limits and allows sites to combine emissions from multiple sources to circumvent additional HRVOC reductions.

Twenty-four individuals commented that TCEQ must implement more stringent controls to address excess NO_x emissions from the W.A. Parish coal-fired power plant.

The commission does not agree that there are loopholes. TCEQ's Air Permits Division does not authorize these activities/events. As discussed elsewhere in this response to comments, this SIP revision demonstrates that the HGB area will attain the 2008 ozone NAAQS by the attainment date without additional control measures, and no additional control measures were determined to advance attainment by one year. Requirements to reduce excessive NO_x and VOC emission events, including flaring, are covered by 30 TAC §101.222 and §101.223 and are outside the scope of this AD SIP revision.

No changes were made to this SIP revision in response to these comments.

Twelve individuals encouraged implementation of EPA's proposed Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review ("methane rule") and additional requirements specific to the Petroleum and Natural Gas sector.

EPA had not finalized the methane rule when this SIP revision was proposed; therefore, the commission was not able to consider its potential impact on ozone in the HGB area. The methane rule establishes specific timelines for compliance with new source performance standards (NSPS) and emission guidelines for existing facilities in the oil and natural gas sector. States may choose to implement emission guidelines in state plans as specified in FCAA, §111(d), which are similar to, but not the same as SIPs required under FCAA, §110 for the control of criteria pollutants such as ozone. TCEQ may implement the NSPS according to the timelines established by the final rule upon its promulgation; the commission may consider the proposal and adoption of a state plan to implement the emission guideline in the future. If interested in future commission actions, the commission encourages the public to sign up for informational notices on the TCEQ (https://public.govdelivery.com/accounts/TXTCEQ/subscriber/new) website and review upcoming commission agendas on the Agenda Meetings and Work Sessions (https://www.tceq.texas.gov/agency/decisions/agendas) webpage.

No changes were made to this SIP revision in response to these comments.

Twelve individuals provided comments regarding concerns about major sources circumventing major NSR through various means, such as undercounting emissions and the improper aggregation of projects, as well as TCEQ allowing such circumvention.

Ensuring circumvention of requirements does not occur is an important element of the air permitting program. Permit applicants are required to represent the maximum hourly and annual emission rates for new or modified facilities, including emission rates for planned MSS facilities and related activities. All supporting calculations based on established methods and the technical basis for the emission rates are required to be included. Emissions are calculated based on the maximum hourly operations and annual average operations being authorized for the facility. The submitted application information must enable the permit reviewer to duplicate all emission calculations to verify and confirm emissions data and rates represented in the application. An applicant is bound by its representations in the application and those representations become an enforceable part of the permit, including production rates, authorized emission rates, and equipment. If the applicant deviates from the representations made in the application, the applicant may be subject to enforcement action.

For every application that is received, the TCEQ performs an applicability analysis for new major sources and modifications to existing major sources to determine if major new source review is triggered. As required by commission rules in 30 TAC Chapter 116, when undergoing a physical or operational change (project), an existing major source must determine major NSR applicability through a two-step process that first considers whether the increased emissions alone are significant, followed by a calculation of the particular project's net emissions increase considering all contemporaneous increases and decreases at the source to determine if a major modification has occurred.

The process to determine whether a proposed project is subject to major NSR is determined based on a case-by-case evaluation based on available information. The TCEQ relies on, and applies, EPA rules and guidance to determine when nominally separate activities should be combined into a single project for purposes of major NSR applicability.

Comments regarding specific NSR permits are outside the scope of the SIP revision. No changes were made to this SIP revision in response to these comments.

An individual commented that there are several regulatory loopholes that allow excess NO_X emissions from the WA Parish Plant in Fort Bend County, including that many facilities in the Greater Houston area are classifying major polluting sources as minor sources, allowing them to evade regulation. The individual also expressed the need for stricter limits on fugitive emissions, and that TCEQ may be required to set and enforce stricter limits on fugitive emissions due to a recently released EPA Methane Rule. Lone Star Chapter of Sierra Club also expressed concern over possible mis-categorization of minor and major pollution sources.

The commission does not agree that there are regulatory loopholes that are allowing excess NO_X emissions from the W.A. Parish Plant in Fort Bend County, nor has the commenter provided specific information for this allegation. The commission agrees that proper implementation of the NSR program is an important element in assisting in the attainment and maintenance of the NAAQS, and enforces this program as specified in the TWC, THSC, and commission rules. Lastly, the commission does not agree that many facilities in the Greater Houston area are evading regulation by misclassifying them as minor sources, nor has the commenter provided specific information for this allegation that is relevant to this SIP revision.

VOC and other air contaminant emissions from fugitive piping components and associated equipment including, but not limited to valves, connectors, pumps, agitators, compressor seals, relief valves, process drains, and open-ended lines are estimated by counting the number of fugitive components, applying appropriate emission factors based on component type and service, and utilizing a reduction factor based on a monitoring program as applicable. An average leak factor is used to determine what the fugitive emission rate is for an area, a facility, or an entire plant. Estimates are based on the assumption that all piping components are leaking vapors into the atmosphere at all times and thus represent a worst-case approximation. Fugitive emissions are estimated based on emission factors with the assumption that all fugitive components are leaking. Permit authorizations contain leak detection and repair LDAR requirements for equipment leak fugitives as applicable. These requirements include construction requirements, instrument monitoring, and stipulates repair schedules for leaking components. Emissions from unplanned releases and upset events are addressed in 30 TAC, Chapter 101 and are not addressed in permits.

For every application that is received, TCEQ performs an applicability analysis for new major sources and modifications to existing major sources to determine if

major NSR is triggered. Pursuant to 30 TAC Chapter 116, when undergoing a physical or operational change (project), an existing major source must determine major NSR applicability through a two-step process that first considers whether the increased emissions alone are significant, followed by a calculation of the particular projects net emissions increase considering all contemporaneous increases and decreases at the source to determine if a major modification has occurred.

The process to determine whether a proposed project is subject to major NSR is determined based on a case-by-case evaluation based on available information. TCEQ relies on, and applies, EPA rules and guidance to determine when nominally separate activities should be combined into a single project for purposes of major NSR applicability.

The commission may address implementation of the EPA Methane Rule in a future rulemaking. Since it was not included in the public notice for this SIP revision and concurrent rulemaking, it cannot be included in this SIP revision.

Comments regarding specific NSR permits are outside the scope of this SIP revision. No changes were made to this SIP revision in response to these comments.

One individual commented that there are several regulatory loopholes that allow excess NO_x emissions from the W.A. Parish Plant in Fort Bend County, including the "1-mile rule" which is an "unwritten rule" that prohibits citizens who live more than one mile away from a polluting facility from challenging that facility's air quality permits. The individual requested TCEQ to create a framework for evaluating distance from polluting sites that would allow people who are meaningfully affected to participate. The individual also commented that there are several regulatory loopholes including abuse of affirmative defense and allowing excess NO_x emissions from the W.A. Parish Plant in Fort Bend County without being penalized.

The commission does not agree that there are regulatory loopholes that are allowing excess NO_x emissions from the W.A. Parish Plant in Fort Bend County, nor has the commenter provided specific information for this allegation. The commission agrees that proper implementation of the NSR program is an important element in assisting in the attainment and maintenance of the NAAQS, and enforces this program as specified in the TWC, THSC, and commission rules. The commission also disagrees that the affirmative defense provision inappropriately allows excessive air pollution. Lastly, the commission does not agree that many facilities in the Greater Houston area are evading regulation by misclassifying them as minor sources, nor has the commenter provided specific information for this allegation that is relevant to this SIP revision. Comments regarding the contested case hearing process, affected person status, and requests for changes to that process are beyond the scope of this SIP revision.

No changes were made to this SIP revision in response to these comments.