

Testimony to the Texas House Environmental Regulation Committee

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Testimony of

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to the

Texas House Environmental Regulation Committee

Interim Charge Hearing
Houston, Texas

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Professional Background

I am a professor of Civil and Environmental Engineering at Rice University and an atmospheric scientist by training, with a B.A. in applied mathematics (atmospheric science specialization) from Harvard University and a Ph.D. in atmospheric sciences from Georgia Tech. Prior to joining the Rice faculty in 2006, I worked for the Georgia Environmental Protection Division for two years, serving on the team that help develop Georgia's state implementation plans for ozone and particulate matter. I have published more than 50 peer-reviewed publications, many of them focused on computer modeling of ozone and particulate matter in Texas and other regions.

Interim Charge

This testimony addresses the following interim charge as requested by the committee:

- *Charge 2: Evaluate and address the implications of recent EPA regulations proposed and promulgated rules to assess their collective impact on air quality in Texas. Examine the necessity for a new State Implementation Plan and explore potential legislative measures to ensure a balanced approach that promotes regulatory compliance while preserving economic vitality, especially in counties identified as at risk of violation.*

Recent and existing EPA regulations that impact Texas

The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six air pollutants, including ozone and particulate matter (PM). EPA must periodically review its standards to ensure that they “protect public health with an adequate margin of safety” based on the latest available science. Those reviews led EPA to update its standards for ozone in 2015 and for PM in 2024 after finding that previous standards did not sufficiently protect public health. EPA also administers the Regional Haze Program to improve visibility in national parks and wilderness areas.

The role of states is to monitor air pollutants and develop state implementation plans for attaining the air quality standards and reducing regional haze.

This testimony addresses the implications of recent EPA regulations and rules that impact air quality in Texas in three ways:

- (1) **Ozone:** Standards were last updated in 2015 and continue to be exceeded in several Texas regions, leading to escalations of nonattainment status.
- (2) **Particulate matter:** Standards were updated in 2024 and are exceeded by 12 Texas counties, necessitating PM attainment plans for the first time.
- (3) **Regional haze:** EPA rejected TCEQ's state implementation plan and proposed a federal plan that would require PM and SO₂ controls at 6 coal power plants.

1. Ozone

Ozone is an air pollutant that causes respiratory disease and increased death rates. Several Texas regions exceed national standards for ozone, which EPA tightened to 70 parts per billion (ppb) in 2015. Because the Houston-Galveston-Brazoria and Dallas-Fort Worth regions continue to exceed the 75-ppb standard from 2008, their nonattainment status was reclassified to “Severe” for that standard in 2022 (Table 1). El Paso, Austin, and Waco have all observed upticks in ozone after originally being classified as attainment regions, making it possible that they could be reclassified as nonattainment regions unless they reduce their ozone levels (Table 1).

Table 1. Ozone design values and attainment status of Texas regions

Region	Design Value (2021-23)	Nonattainment Status	Attainment Deadline
Houston-Galveston-Brazoria	83 ppb	Severe (2008) Serious (2015)	2027 2027
Dallas-Fort Worth	81 ppb	Severe (2008) Serious (2015)	2027 2027
San Antonio	76 ppb	Serious (2015)	2027
El Paso	74 ppb		
Austin	71 ppb		
Waco	71 ppb		

After decades of progress, ozone levels have stopped declining and may be rebounding (Figure 1), making it highly unlikely Houston, Dallas, or San Antonio will achieve their 2027 attainment deadlines. Attaining the standards will require substantial reductions in the two air pollutants that react in the atmosphere to form ozone – nitrogen oxides (NO_x) and volatile organic compounds (VOCs). Failure to attain the standards could lead EPA to reclassify Texas regions, triggering important consequences for industrial sources of emissions (Table 2).

Table 2. Consequences of each nonattainment status for ozone standards¹

	Serious	Severe	Extreme
Emissions offset per ton of new sources	1.2	1.3	1.5
Major source threshold (tons per year)	50	25	10
Penalty fee program for major sources	No	Yes	Yes

¹ <https://www.epa.gov/ground-level-ozone-pollution/required-sip-elements-nonattainment-classification>

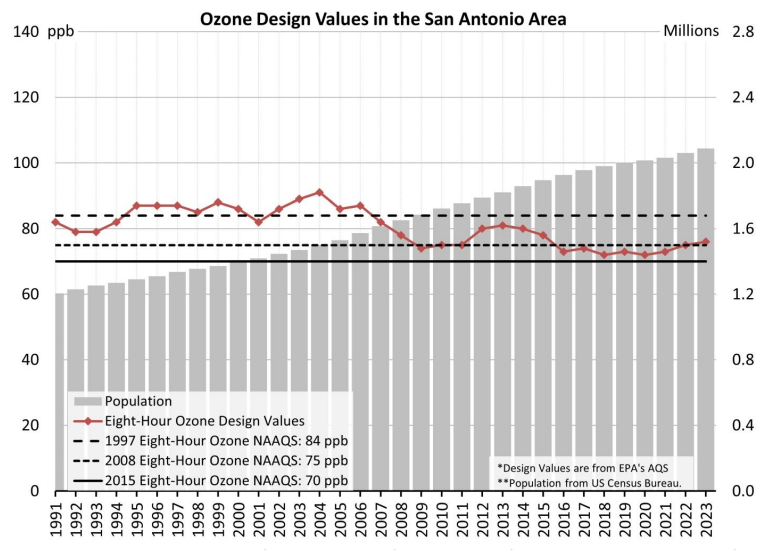
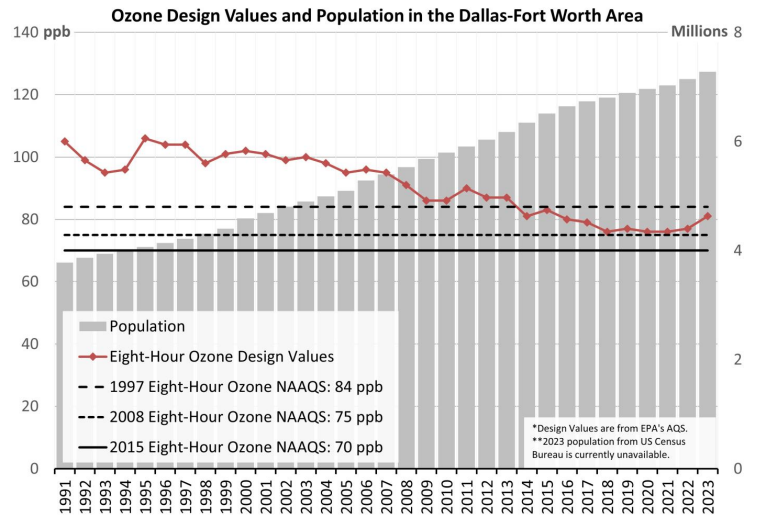
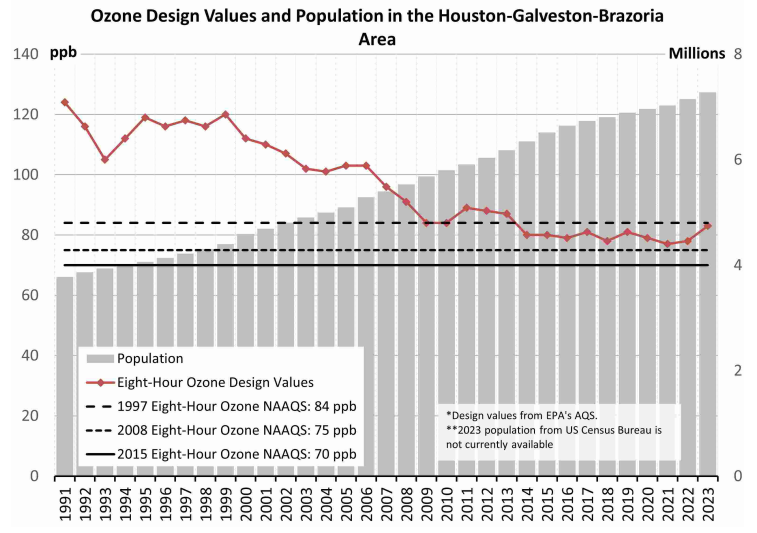


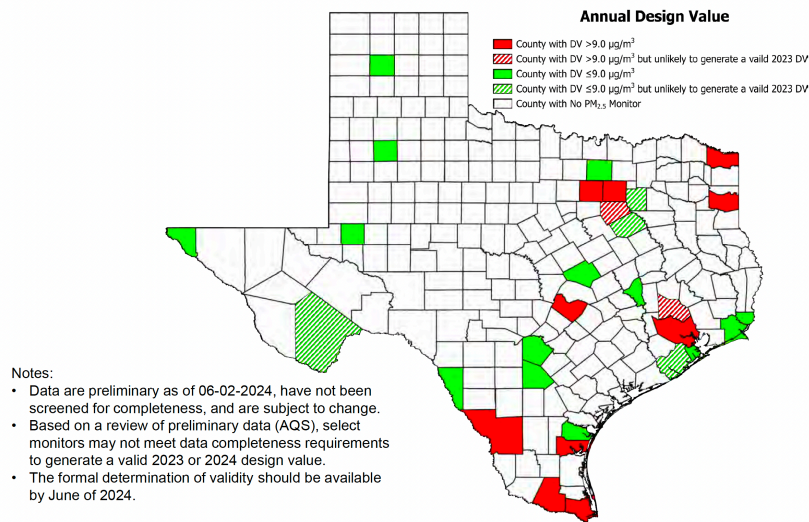
Figure 1. Ozone design values in the Houston-Galveston-Brazoria, Dallas-Fort Worth, and San Antonio regions (<https://www.tceq.texas.gov/airquality/airsuccess/airsuccessmetro>)

Particulate Matter

Fine particulate matter causes more illnesses and deaths than all other air pollutants combined. Long-term exposure to PM increases the rates of respiratory illnesses, cardiovascular disease, neurological impairments, and death. Growing evidence of these health impacts led EPA to tighten the annual PM standard from 15 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to 12 $\mu\text{g}/\text{m}^3$ in 2012 and to 9 $\mu\text{g}/\text{m}^3$ in 2024. Twelve Texas counties have particulate matter levels that exceed the new 9 $\mu\text{g}/\text{m}^3$ standard (Figure 2).

Now that the new standards have been finalized, TCEQ must make recommendations for the boundaries of nonattainment regions. EPA will consider those recommendations when it officially designates nonattainment regions in 2026. Once designations are finalized, TCEQ will have 18 months to issue a state implementation plan for attaining the standards in each region. Attainment must be achieved by a deadline that will be no earlier than 2032. However, since attainment is based on a 3-year average, it will be important to reduce particulate matter concentrations by the end of this decade.

Potentially Affected Counties



County	Preliminary 2023 Annual DV ($\mu\text{g}/\text{m}^3$)
Harris	12.5
Cameron	11.0
Bowie	10.3
Montgomery	10.0*
Dallas	9.9
Kleberg	9.9
Hidalgo	9.7
Webb	9.7
Tarrant	9.6
Travis	9.6
Harrison	9.5
Ellis	9.2**
Atascosa	9.0
El Paso	9.0
Bexar	8.9
Jefferson	8.8
Navarro	8.7**
Nueces	8.4
Brazoria	8.3**
Galveston	8.3
Orange	8.3
Kaufman	8.1*
Brazos	8.0
Maverick	7.9
Denton	7.7
Bell	7.4
Ector	7.3
Brewster	6.2*
Potter	6.0
Lubbock	5.7

*unlikely to generate a valid 2023 DV but may generate a valid 2024 DV
 **unlikely to generate a valid 2023 or 2024 DV

Figure 2. TCEQ map and table of the most recent particulate matter levels in Texas counties. Counties in red exceed the 9 $\mu\text{g}/\text{m}^3$ standard; counties in white do not have a monitor.

Cost-effective control of PM requires knowing what the PM is made of. Each component of PM has different sources, including:

- Sulfate forms from SO₂ emitted from coal power plants and industrial facilities
- Nitrate forms from the nitrogen oxide (NO_x) emissions that also cause ozone
- Organic carbon is both emitted directly and forms from VOCs released from various natural and anthropogenic sources
- Elemental carbon is emitted from incomplete combustion of fossil fuels or biomass
- Crustal material includes soil and dust, including releases from concrete batch plants or rock crushing facilities
- Sea salt is emitted naturally from oceans

Speciation monitors are needed to identify the substances that comprise PM (Figure 3). Such information is crucial to informing cost-effective control strategies. For example, the high levels of sulfate (yellow) indicate the importance of controlling SO₂ emissions from coal power plants and other sources.

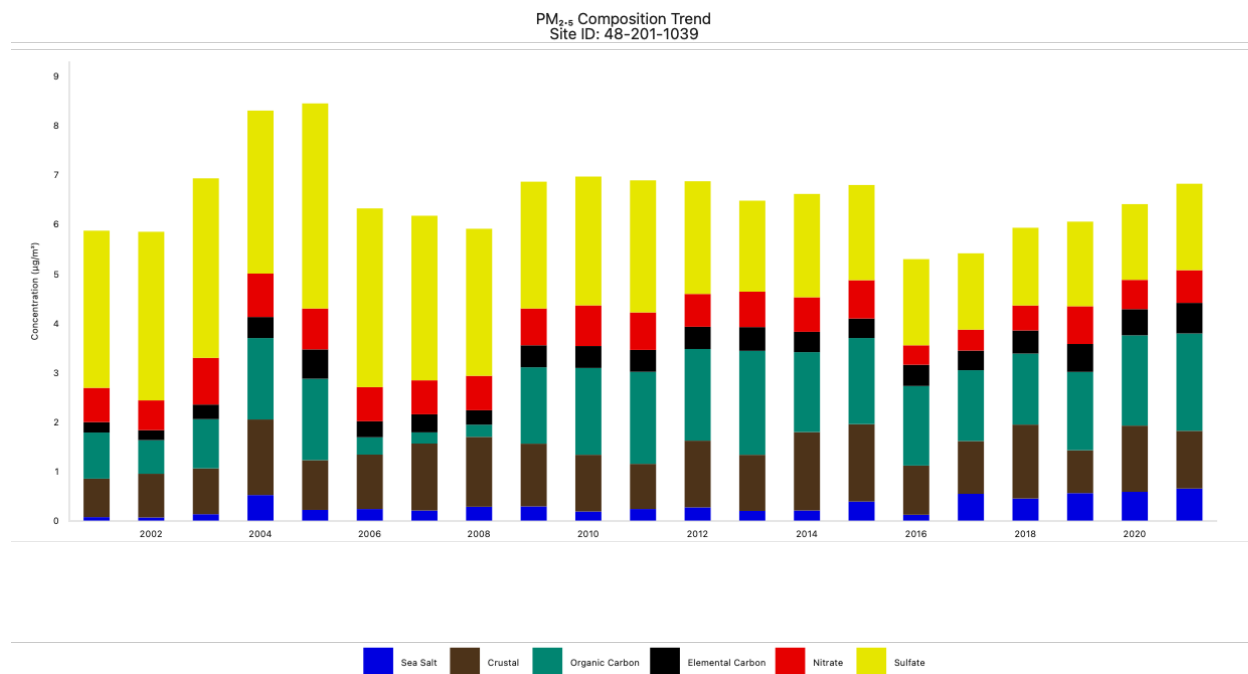


Figure 3. Composition of fine particulate matter at the Deer Park monitor near Houston (plotted at https://gispub.epa.gov/air/trendsreport/2023/#naaqs_trends)

Unfortunately, only a handful of monitors in Texas report speciation data for PM (Figure 4). In Harris County, speciation is reported only at Deer Park, whose proximity to the Houston Ship Channel may make it unrepresentative of more centrally located

monitors where higher particulate matter concentrations are observed (Figure 5). The Dallas-Fort Worth region also has just one speciation monitor. Most other Texas counties that exceed the new EPA standard, including three counties along the Texas-Mexico border (Cameron, Hidalgo, and Webb), do not have any speciation monitors to determine the composition of their PM.

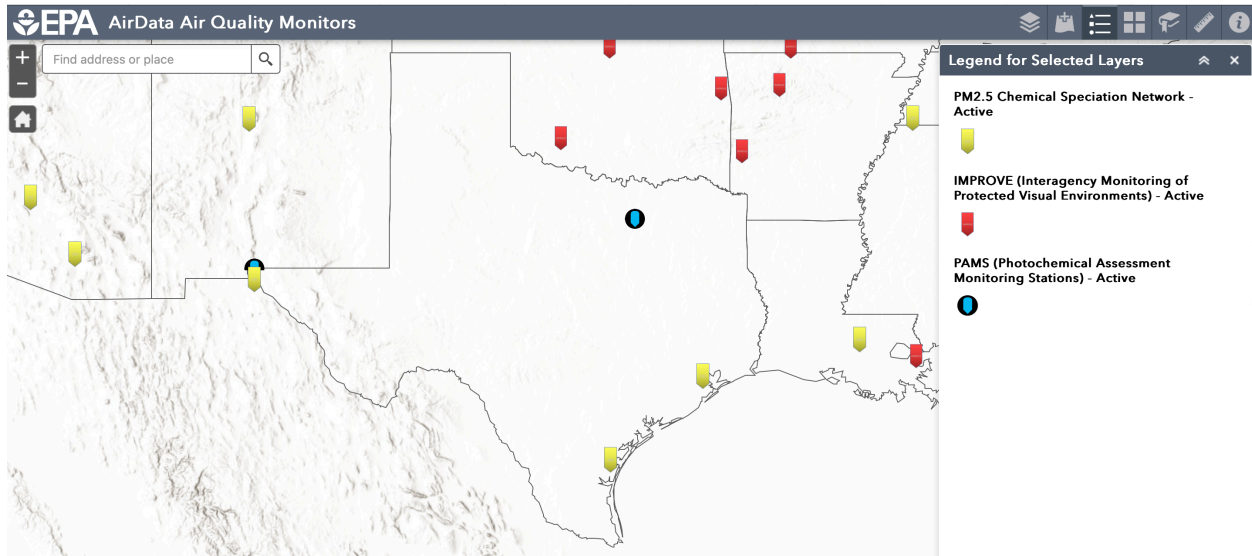


Figure 4. Locations of particulate matter speciation monitors (plotted at <https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=5f239fd3e72f424f98ef3d5def547eb5&extent=-146.2334,13.1913,-46.3896,56.5319>)

Harris County Monitors Map

Harris County Design Values	
Preliminary 2023 Design Value Setting Monitor	Houston North Wayside
2022 Annual PM _{2.5} Design Value (µg/m ³)	11.4
Preliminary 2023 Annual PM _{2.5} Design Value (µg/m ³)	12.5

Note: The 2022 annual PM_{2.5} design value setting monitor was Houston North Loop.

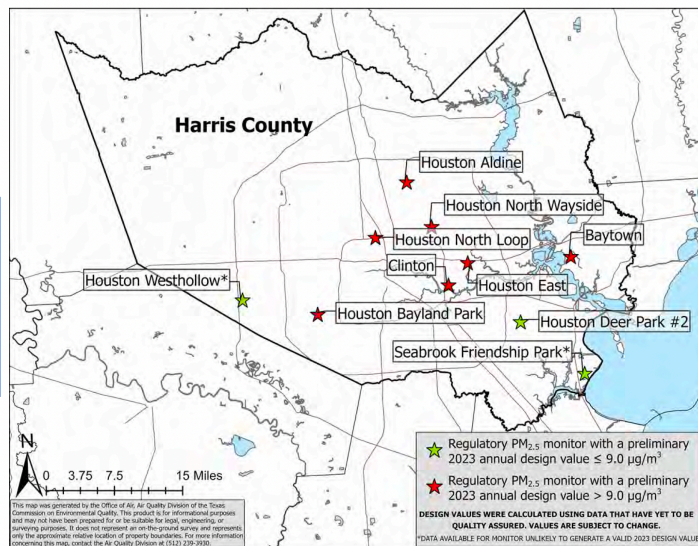


Figure 5. TCEQ map of particulate matter monitors in Harris County. Speciation is measured only at Deer Park, but highest concentrations have been measured at the North Wayside and North Loop monitors.

More speciation measurements are needed to inform the development of cost-effective control strategies to attain the new standards and protect public health. This could be achieved most readily by adding speciation monitors to existing TCEQ air quality monitoring sites, capitalizing on existing infrastructure and expertise.

In addition, the state could fund scientific field campaigns to obtain more detailed information about PM composition. Field campaigns are especially valuable for determining the origins of organic carbon, which is often the largest component of PM. TCEQ and the Texas Air Quality Research Program have helped fund numerous field campaigns over the years, including in the Houston, Dallas, San Antonio, and Corpus Christi regions.² However, most of those campaigns focused on summer months and border counties have been relatively neglected. Thus, **there is a need for more scientific studies to understand the composition and origin of particulate matter across seasons in Texas counties that are likely to exceed the new PM standard.**

² e.g., see https://www.tceq.texas.gov/airquality/airmod/project/pj_report_da.html

Regional Haze

The regional haze rule requires states to issue state implementation plans to reduce haze that impairs visibility in national parks and wilderness areas. Haze is mainly caused by particulate matter. Thus, measures implemented to reduce haze also help protect human health and attain PM standards.

In 2021, TCEQ issued an updated regional haze plan that required virtually no new emissions control for the rest of the decade. By contrast, most other states issued more stringent regional haze plans in the early 2000s. For example, in 2006 I worked with Georgia and neighboring states to develop plans that required scrubbers on coal power plants.

After determining that the Texas regional haze plan was inadequate, EPA in 2023 proposed a federal implementation plan that would require SO₂ and PM controls at six coal-fired power plants in Texas.³ Some of those power plants had already announced retirement dates, and the rest could comply with the rule by converting to natural gas or installing scrubbers that have been required at all new coal plants built since 1979. Research by my group has shown that unscrubbed coal power plants are the leading sources of SO₂ and contribute substantially to PM and haze in Texas. The deadliest of the power plants is W.A. Parish in Fort Bend County, where three of the four coal units lack any control devices for SO₂.⁴

A vigorous regional haze plan would require long overdue controls of SO₂ and PM emissions from coal power plants in Texas, thereby protecting public health and helping the state comply with the Regional Haze Rule and PM standards.

³ <https://www.epa.gov/newsreleases/epa-proposes-texas-regional-haze-rule-protect-visibility-national-parks-and-wilderness>

⁴ Strasert, B., S.C. Teh, and D.S. Cohan (2019). Air quality and health benefits from potential coal power plant closures in Texas. *Journal of the Air and Waste Management Association*, 69(3), 333-350.