

With Houston's growth,

WHAT'S HAPPENING TO OUR AIR QUALITY?

2013

HOUSTON AIR QUALITY TRENDS



IT'S GETTING BETTER.

Air quality in the greater Houston area has improved significantly since 1987 and continues to improve.

Monitoring by Houston Regional Monitoring (HRM) and state and federal organizations in 2013 confirms that air quality continues to improve throughout the Houston area.

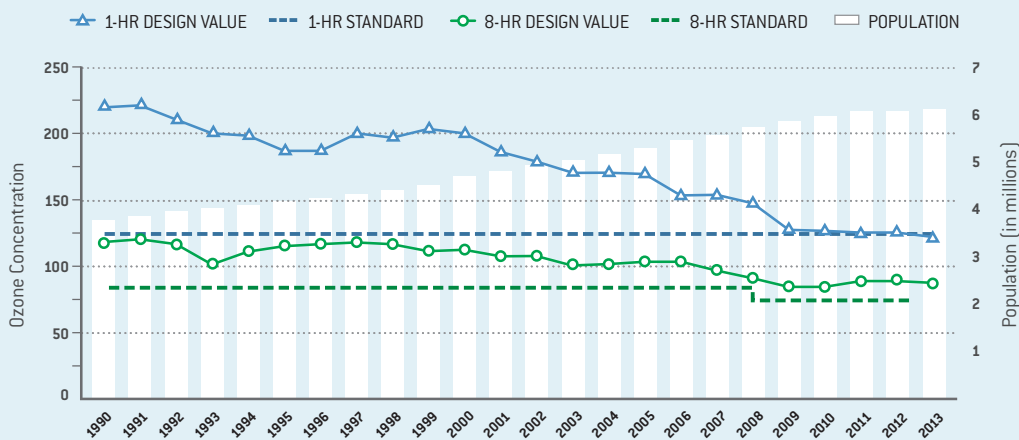
To determine air quality, measurements are taken of the six major air pollutants for which the federal government sets National Ambient Air Quality Standards (NAAQS):

- Ozone
- Particulate matter
- Nitrogen dioxide
- Carbon monoxide
- Sulfur dioxide
- Lead

Greater Houston's air quality currently meets five of the six standards—all except the ozone standard. In 2013, there were only two days when the 1-hour ozone standard was exceeded at one or more monitoring stations. In 1987, there were 66 days when the standard was exceeded.

Ozone Levels and Population¹

There are two federal standards by which ozone is measured in the greater Houston area. In 2013, for the first time, the Houston ozone nonattainment area met the older EPA 1-hour standard for ozone.



Source: TCEQ

19 ozone monitors in 1987

25 ozone monitors in 2000

48 ozone monitors in 2013

Even with Houston's growth in population, transportation and manufacturing, we have far fewer days when ozone levels exceed federal standards.

HOUSTON REGIONAL MONITORING NETWORK

The HRM network is an important part of Houston's air monitoring system. We are committed to the scientific monitoring and understanding of air quality in the greater Houston area. HRM's historical commitment supports the greater Houston area's goal of demonstrating attainment with all air quality standards.

HRM's Measurement Process

Since 1980, HRM-member companies have invested nearly \$48 million in HRM's ambient air monitoring network. HRM operates 10 ambient air monitoring sites in the region and has an annual operating budget of \$2.3 million.

HRM provides its members with the best scientific air quality data available so it can be used to make the best decisions about ways to effectively reduce air emissions.

HRM collects air samples throughout the year to measure the concentration of individual compounds in the ambient air. Together with the monitoring conducted by state and federal agencies, the HRM monitoring data provides an ongoing comprehensive understanding of the state of air quality in the greater Houston area.

Air samples are collected at all 10 HRM monitoring sites, in full compliance with EPA-approved methods.

In addition to measuring the six major air pollutants, HRM monitors 155 volatile organic compounds (VOCs) emitted by vegetation, utilities, industrial sources, small businesses, motor vehicles and household sources. Over the past 27 years, more than 10,864 VOC samples from monitoring sites have been collected. We have compiled and reported more than 1.68 million individual VOC measurement values.

We also monitor weather conditions that affect ozone concentrations. These include temperature, wind speed, wind direction, rainfall and net solar radiation (solar energy).

Analyzing the Monitoring Data

HRM data is analyzed and the results are compared to:

- EPA's National Ambient Air Quality Standards (NAAQS)
- Known benchmark concentrations, including Texas Commission on Environmental Quality (TCEQ) Air Monitoring Comparison Values (AMCVs)
- Computer modeling results
- Data from other cities

HRM-member companies meet several times per year to review the data and to identify trends for potential action. Representatives from TCEQ, Harris County and the City of Houston are invited to participate in these meetings. HRM also shares summary air monitoring results with the general public, and participates in educational outreach activities and in numerous studies and committees that have a common goal of understanding and improving air quality in the greater Houston area.

Highly Reactive Volatile Organic Compounds (HRVOCs)

Based on TCEQ and industry data from continuous automatic gas chromatographs.



Since 2003, the Houston area has experienced a 74% reduction in HRVOCs, highly reactive compounds that contribute to ozone formation.

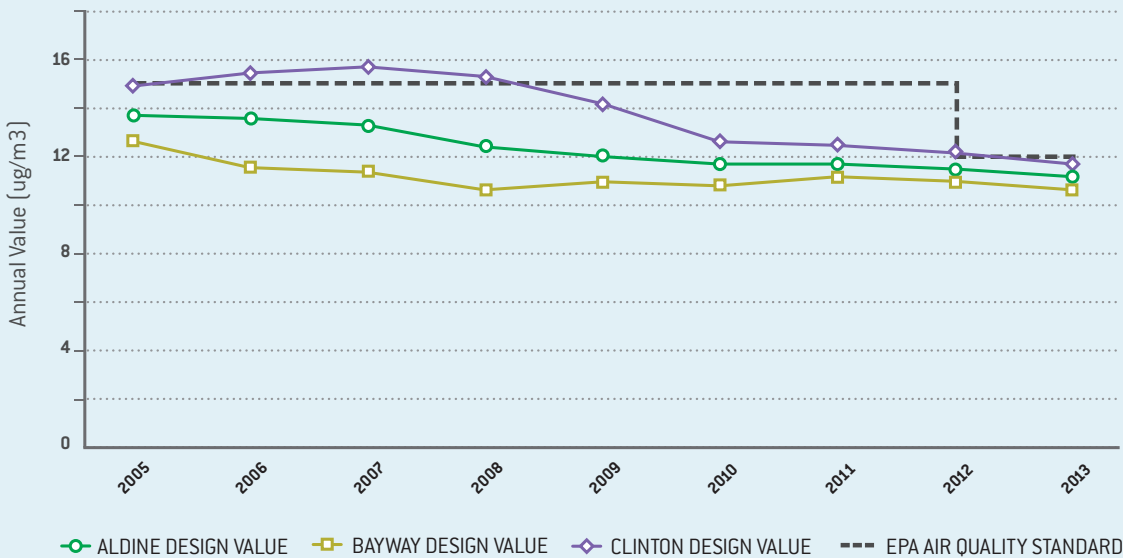
REDUCTIONS IN FINE PARTICULATE MATTER MEAN BREATHING EASIER

Ozone is the main air pollutant of concern in the Houston area, but “fine” particulate matter is another form of pollution. These tiny particles can pass through the throat and nose when inhaled, and enter deep into the lungs where they can potentially cause serious health effects.

In late 2012, EPA changed the acceptable air quality standard for fine particulate matter to be even more protective of public health. Results from TCEQ monitoring sites show that the Houston area met this more protective standard in 2013.

Results show that in 2013 the greater Houston area met the new, more protective EPA standard for fine particulates.

Fine Particulate Levels

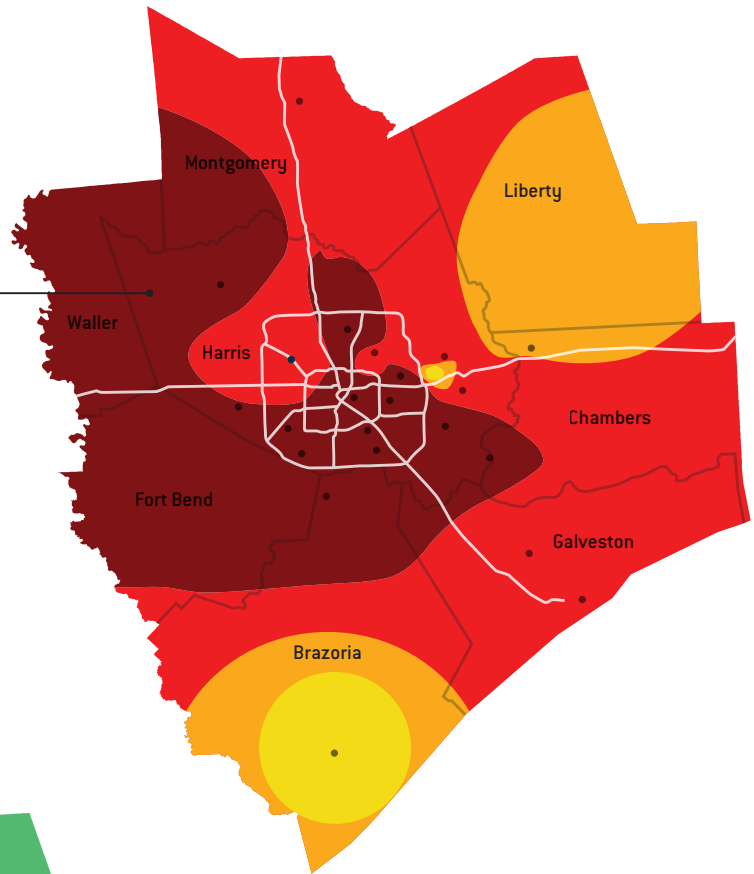


8-HOUR OZONE DESIGN VALUES

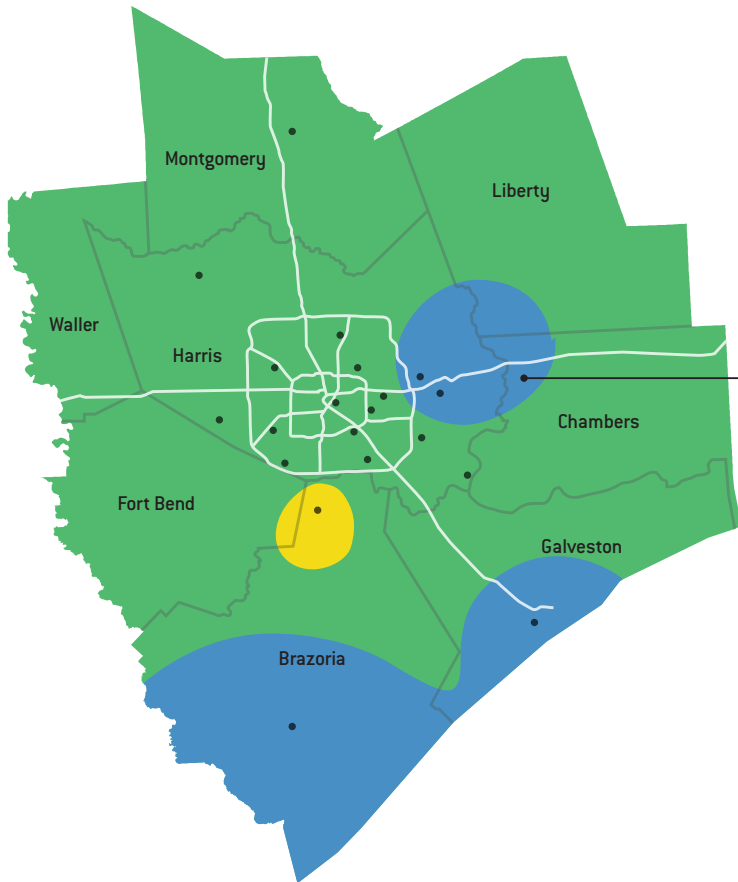
Based on TCEQ and City of Houston regulatory monitoring sites (denoted by • on the maps)

1985

A large part of the greater Houston area used to experience high levels of ozone.



GREATER HOUSTON OZONE NONATTAINMENT AREA



2013

In 2013, ozone levels were the lowest since air monitoring began.

Ozone Concentration (ppb)

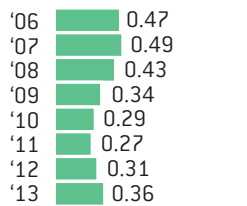


In 1997, EPA set the 8-hour ozone standard at 84 ppb and lowered it to 75 ppb in 2008.

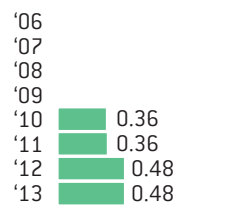
BENZENE LEVELS (ppb)

Based on continuous automatic gas chromatograph samples
 = TCEQ Annual Air Monitoring Comparison Value (AMCV) = 1.4 ppb

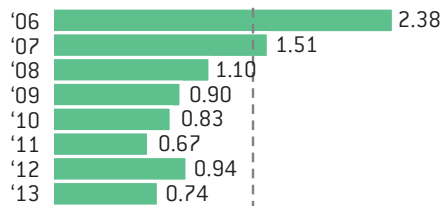
Cesar Chavez (TCEQ)



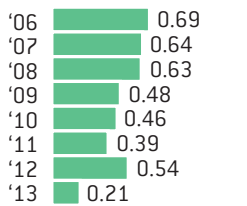
Deer Park (HRM)



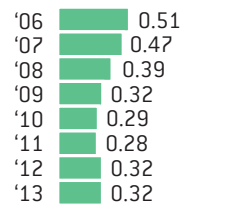
Lynchburg Ferry (HRM)



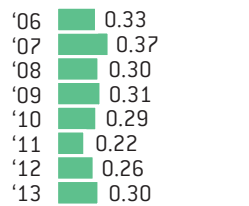
Channelview (TCEQ)



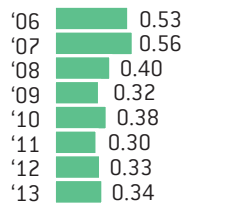
Deer Park (TCEQ)



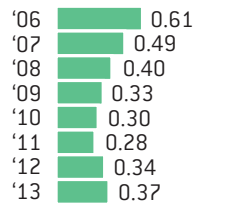
Milby Park (TCEQ)



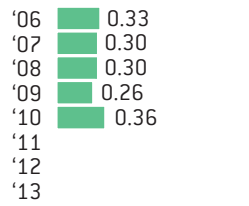
Clinton Drive (TCEQ)



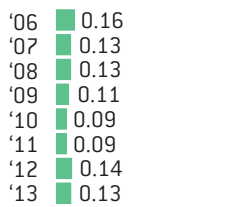
Haden Road (HRM)



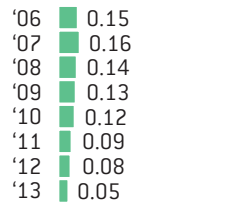
Mustang Bayou (URS)



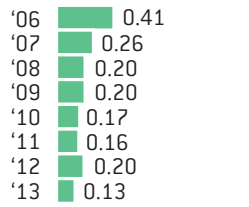
Danciger (URS)



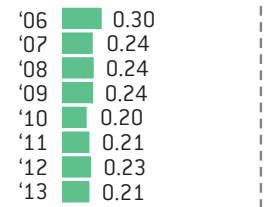
Lake Jackson (URS)



Texas City (TCEQ)



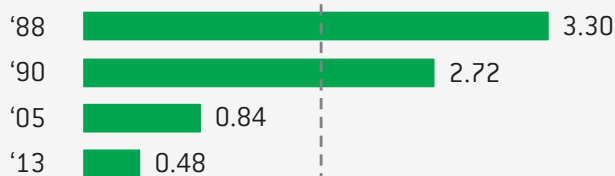
Wallisville Road (HRM)



Benzene and butadiene are air toxics that contribute to ozone formation and are among the VOCs that HRM and governmental agencies monitor.

Benzene Annual Average Across Monitoring Network

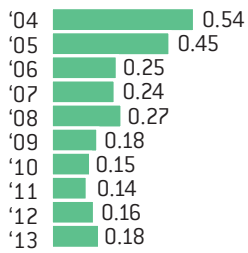
A significant reduction in benzene levels has occurred since 1988. Measurement is based on 24-hour canister samples.



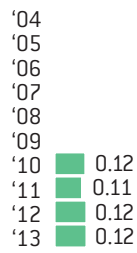
BUTADIENE LEVELS (ppb)

Based on continuous automatic gas chromatograph samples
TCEQ Annual Air Monitoring Comparison Value (AMCV) = 9.1 ppb

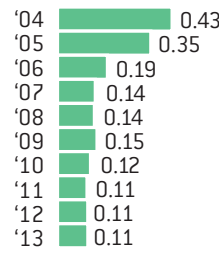
Cesar Chavez (TCEQ)



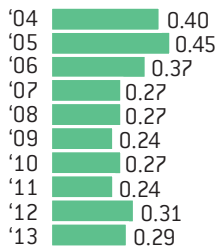
Deer Park (HRM)



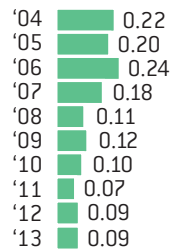
Lynchburg Ferry (HRM)



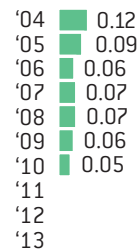
Channelview (TCEQ)



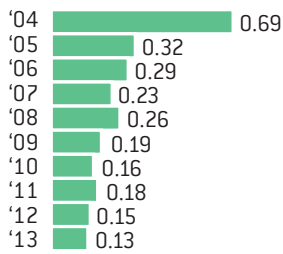
Deer Park (TCEQ)



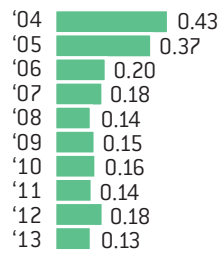
Mustang Bayou (URS)



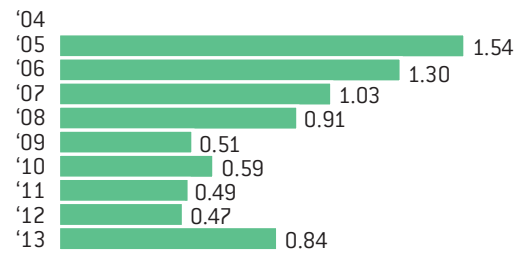
Clinton Drive (TCEQ)



Haden Road (HRM)



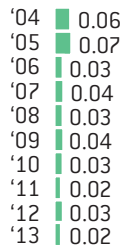
Milby Park (TCEQ)



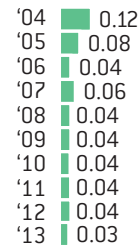
Danciger (URS)



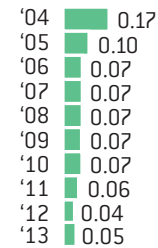
Lake Jackson (URS)



Texas City (TCEQ)



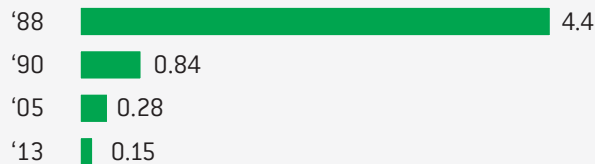
Wallisville Road (HRM)



TCEQ and industry operated 12 VOC monitoring sites with continuous automatic gas chromatographs in 2013, each one monitoring for benzene, butadiene and about 40 additional compounds.

Butadiene Annual Average Across Monitoring Network

Butadiene levels have remained below the Air Monitoring Comparison Value of 9.1 ppb since measurement began in 1988. Measurement is based on 24-hour canister samples.



GLOSSARY

Ambient Air

The outside air all around us.

Air Monitoring Comparison Values

AMCVs are chemical-specific air concentrations set to protect human health and welfare. Exposure to an air concentration at or below the AMCV is not likely to cause adverse health effects. AMCVs are a collective term that refers to all values used by TCEQ to review ambient air monitoring data.

Benzene

Benzene is an organic chemical compound, a natural constituent of crude oil and a constituent in gasoline. Benzene is classified as a human carcinogen. Long-term exposure to excessive levels of benzene in the air may cause leukemia.

Butadiene

This industrial chemical is used in the production of synthetic rubber. Typically, butadiene refers to 1,3-butadiene, which is listed as a known carcinogen by EPA.

Design Value for the 1-Hour Ozone Standard

A value calculated according to a formula from EPA, based on three-year averages of the fourth-highest value at each monitor. To attain the 1-Hour Ozone Standard, the average number of exceedances of the standard over a 3-year period must not exceed 1.0.

Design Value for the 8-Hour Ozone Standard

A value calculated according to a formula from EPA, based on three-year averages of the fourth-highest value at each monitor.

Fine Particulate Matter

Often referred to as PM_{2.5}, it is a complex mixture of small particles and liquid droplets smaller than 2.5 microns in diameter, composed of acids (such as nitrates and sulfates), organic chemicals, metals, and soil and dust particles. A micron is one millionth of a meter. For comparison, a human hair is 30 microns in diameter.

Fine Particulate Matter Design Value

A value calculated according to a formula from EPA, based on the annual arithmetic mean of the measurements averaged over three years.

Ozone

Ground-level ozone is an air pollutant that can harm lung function and irritate the respiratory system. It is formed by the reaction of sunlight on air containing hydrocarbons and nitrogen oxides.

ppm

Parts per million. One ppm has the time equivalent of 32 seconds in a year.

ppb

Parts per billion. One ppb has the time equivalent of 3 seconds in 100 years.

TCEQ

Texas Commission on Environmental Quality, the government agency that regulates environmental matters in Texas.

Volatile Organic Compounds

VOCs are emitted as gases to the air. They include a variety of chemicals, some of which may have short- and long-term adverse health effects.

Q&A

HOW EXTENSIVE IS THE AIR MONITORING SYSTEM IN THE HOUSTON AREA?

Houston has more air monitors than any other area of the United States. Air monitoring in the region is performed by EPA, TCEQ, HRM and others.

ARE ALL AIR QUALITY MONITORS IN AGREEMENT ABOUT HOUSTON'S PROGRESS IN AIR QUALITY IMPROVEMENTS?

While individual monitors differ in the year-to-year results they report, collectively they demonstrate the substantial, long-term progress Houston has made in meeting air quality standards, including ozone standards.

HOW DOES HOUSTON'S AIR QUALITY COMPARE WITH THE AIR QUALITY OF OTHER LARGE U.S. CITIES?

Favorably. Houston meets five of six air quality standards set by EPA. Los Angeles, Washington D.C., Chicago, New York, Philadelphia, Phoenix, Sacramento, St. Louis and Salt Lake City meet four or fewer of the six air quality standards.

¹Population data for the years 1990–2007 are for the 8-county Houston-Galveston-Brazoria ozone nonattainment area. Population data after 2007 is for the Houston-Sugar Land-Baytown Metropolitan Statistical Area, consisting of Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, San Jacinto and Waller counties.

Note: "Greater Houston area" refers to the Houston-Galveston-Brazoria 8-county ozone nonattainment area consisting of Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller counties.

IS THERE AN AIR QUALITY FORECAST FOR WHERE I LIVE?

Yes. For today's air quality and a forecast for the next three days, look under the "How Do I" section of the TCEQ website:

tceq.state.tx.us.

WHERE CAN I FIND MORE INFORMATION ABOUT HOUSTON AIR QUALITY?

For more information about Houston air quality issues, visit On Air: Houston at **houstonairquality.com**.

CONTACT US

Learn more about Houston Regional Monitoring at **hrm.radian.com**.

More copies of this brochure are available from **HoustonRegionalMonitoring@URS.com**.