

# Corpus Christi Refinery Row

## Corpus Christi, Nueces County, Texas

August 2016

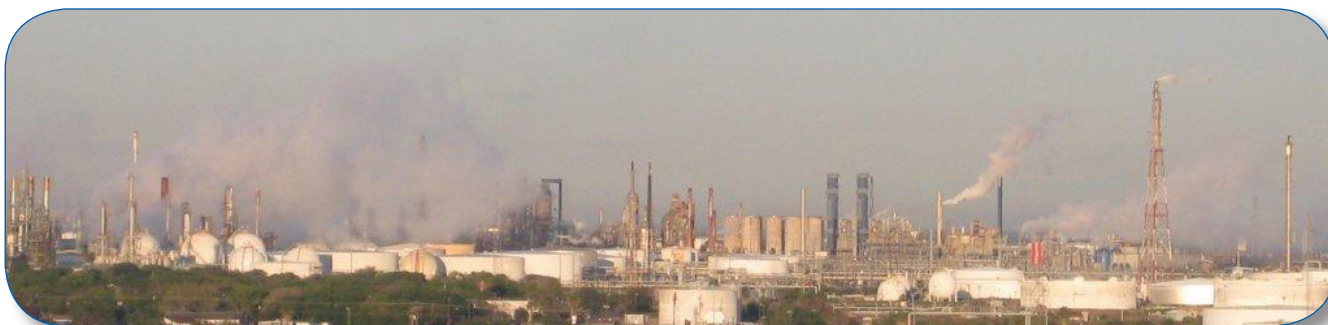


Photo: Corpus Christi Refinery Row

**This brochure lists the Agency for Toxic Substances and Disease Registry's (ATSDR's) findings and recommendations for the Corpus Christi Refinery Row Report.**

## Introduction

People who live and work near "Refinery Row," on the north side of Corpus Christi, Texas, have been concerned about chemicals in the air from nearby petrochemical refineries. ATSDR, a federal public health agency, reviewed available environmental and health information to find out whether chemicals detected in outdoor air along Refinery Row are or have been at levels high enough to harm the health of area residents.

## The Bottom Line

- Benzene, hydrogen sulfide, particulate matter, and sulfur dioxide in Refinery Row outdoor air rarely reached levels high enough in the past and present to potentially cause health problems for short-term (or acute) exposures. Sensitive populations are especially at risk.
- The chance of getting cancer is low from long-term exposure to individual chemicals found in outdoor air in the past and present. Breathing a mixture of chemicals found in outdoor air for many years increases the risk of cancer.
- Long-term exposure to chemicals found in outdoor air is not expected to increase the risk for illnesses not related to cancer.
- The Corpus Christi Refinery Row area showed higher rates of asthma, two types of birth defects, and certain cancers compared with other areas. Our review cannot directly link illnesses to chemicals found in Refinery Row air.

## Background

Refineries and petrochemical facilities in northern Corpus Christi release chemicals into the outdoor air through stack emissions, general maintenance, startups and shutdowns, and accidental releases. People living, working, and visiting in the Refinery Row area come in contact with chemicals when breathing the air.

Refinery Row consists of about 10 miles of petrochemical facilities, surrounded by neighborhoods. Area residents have long been concerned about the potential dangers of breathing chemicals released from industrial activities at Refinery Row. In 2003, ATSDR agreed to look into community health concerns about polluted air.

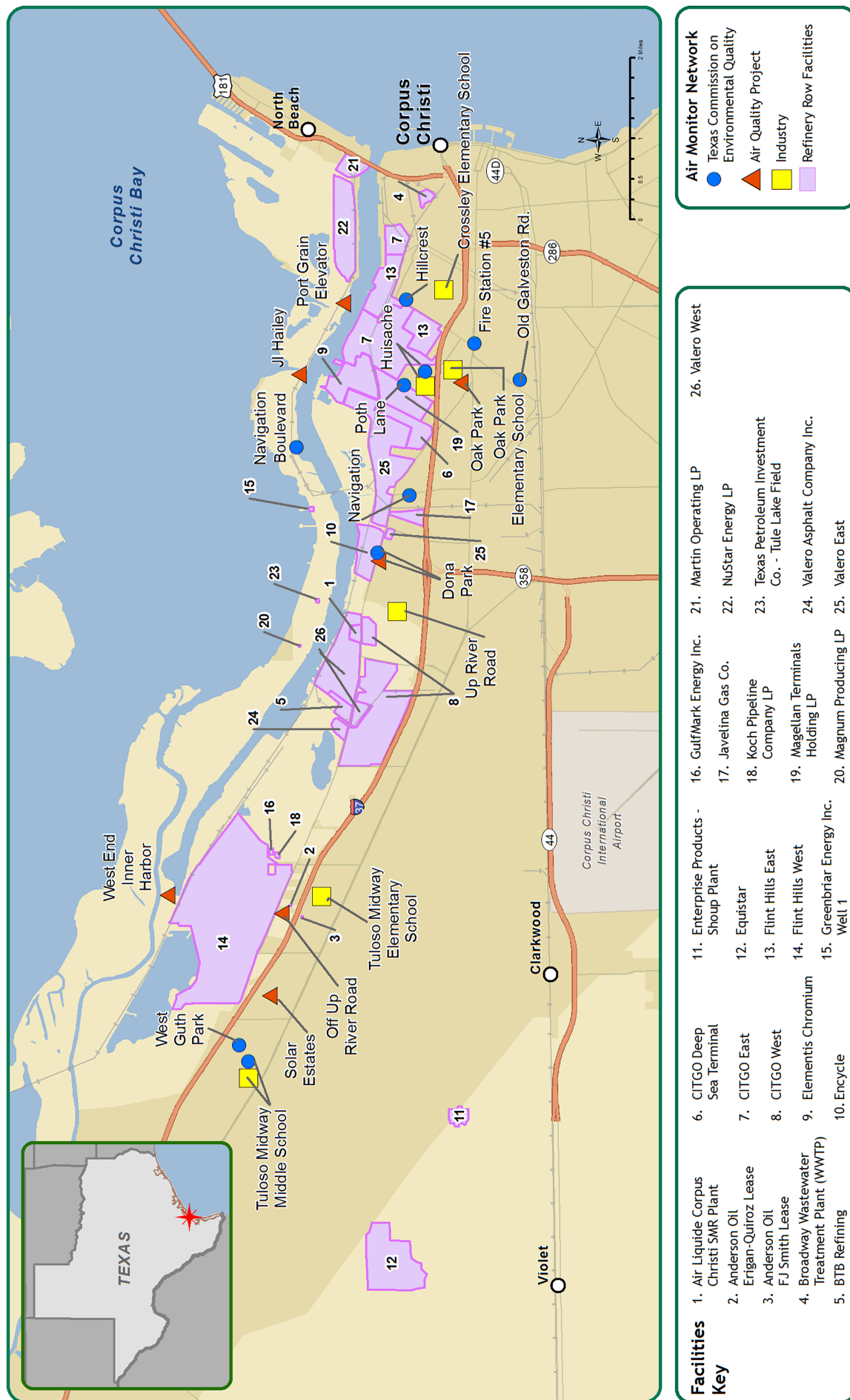
To learn about the air quality of Refinery Row, ATSDR gathered several years of air monitoring data from three stationary air monitoring programs:

- Corpus Christi Air Quality Project network (2005–2010)
- Industry network (1996–2010)
- Texas Commission on Environmental Quality network (1980–2010)

We also reviewed air data from 24 Refinery Row-area mobile monitoring events that occurred between July 1993 and March 2008, and data on wind speed and direction. **Figure 1** shows the locations of the Refinery Row facilities and stationary air monitors.

ATSDR's report focused on an evaluation of the stationary and mobile air data, but the agency also completed several other activities as part of the public health evaluation process. For example, we compared concurrent data from the three networks, which used different measurement devices and analytical methods, to evaluate data quality. We also analyzed trends for time of day, season, and location that influence chemical air levels along Refinery Row.

**Figure 1. Refinery Row Facilities and Stationary Air Monitor Locations, Corpus Christi, TX**



# Findings

## Environmental Data

After reviewing more than 150 chemicals detected in Refinery Row outdoor air, ATSDR reached these health-based conclusions.

Compound	Exposure Period	Finding
Benzene	Short-term	Could potentially cause respiratory irritation and a decrease in various types of blood cells at the highest levels detected in Refinery Row air. Workers and people walking, running, and biking near the facilities and the ship channel are more likely to be exposed to these infrequent, higher levels of benzene.
Hydrogen sulfide	Short-term	Could potentially cause respiratory effects in people with asthma at the highest levels detected in Refinery Row air. Workers and people walking, running, and biking near the facilities and the ship channel are more likely to be exposed to these infrequent, higher levels of hydrogen sulfide.
Particulate matter	Short-term	Could have potentially worsened heart and lung problems, especially for children, older adults, and those with heart or lung diseases, if exposed to the highest levels detected in the past. Before 2005, two recorded levels of fine particulate matter (called PM <sub>2.5</sub> ) were above regulatory standards designed to protect human health. Although current levels are below regulatory standards, the data are limited to only two stationary air monitors along Refinery Row. Particulate matter is the name of a mixture of very small solid or liquid particles found in air.
Sulfur dioxide	Short-term	Could potentially worsen respiratory problems in children, older adults, and people with asthma or related conditions when breathing harder such as during exercise at the highest levels detected in Refinery Row air. Before 1996, maximum levels—although detected on rare occasions during mobile monitoring events—suggested the potential to cause harmful health effects in the general population.
Benzene, hydrogen sulfide, particulate matter, and sulfur dioxide	Short-term	Could lead to temporary respiratory effects such as nose and throat irritation and shortness of breath; and neurological effects such as headaches and other effects related to odors in the community, if exposed to the maximum levels of the chemicals at the same time. Note that simultaneous exposure to the maximum levels of these compounds was not observed in the available air monitoring data.
All compounds detected in Refinery Row	Long-term	Long-term exposures to the average concentrations of chemicals detected in Refinery Row outdoor air have been and are currently below levels known to cause illnesses not related to cancer.
Benzene, cadmium, chromium, 1,2-dibromoethane, and naphthalene	Long-term	Cancer risk estimates were each at least 1 additional case of cancer per 100,000 persons. The chance of getting cancer from breathing each chemical alone is low.
All cancer causing compounds detected in Refinery Row air	Long-term	Combined cancer risk for a mixture of Refinery Row chemicals is about 2 additional cancer cases per 10,000 people, which means there is an increased risk of cancer. The main contributors to this combined cancer risk are benzene (31%), 1,2-dibromoethane (26%), and chromium (11%).

## Health Outcome Data

Although ATSDR's review cannot directly link illnesses to chemicals found in Refinery Row air, asthma hospitalization, birth defect, and cancer rates for the Corpus Christi Refinery Row area were compared to the rates for other areas.

Health Outcome	Finding
Asthma	Nueces County has a higher rate of asthma hospitalizations among children than Texas as a whole.
Birth defects	Two heart defects (ventricular septal defect and "other anomalies of the aorta") were slightly more common in children of mothers living within 2 miles of Refinery Row compared with children of mothers living 10 or more miles away <sup>1</sup> .
Cancer	Comparisons based on statewide cancer rates show the number of male colon and rectum, bladder, kidney, and liver cancer cases reported for the Corpus Christi Refinery Row area <sup>2</sup> was statistically greater than expected. No increase in cancer rates was observed in women.

<sup>1</sup> Refers to children of mothers living more than 10 miles from Refinery Row but still within the tri-county (Nueces, San Patricio, and Kleberg) Corpus Christi area.

<sup>2</sup> The Corpus Christi Refinery Row area for the cancer rate analyses is defined by ZIP codes 78401, 78402, 78404, 78405, 78406, 78407, 78408, 78409, 78410, 78411, 78416, 78417 and 78370, which approximates a 5-mile buffer surrounding Refinery Row.

## Questions and Answers

### Do the stationary monitors capture all Refinery Row air releases?

Stationary monitoring might not catch all of the releases from the facilities because air data are not available for all pollutants, all time frames, or all locations of interest. Still, we believe the locations of the past and current monitors provide good coverage, especially when combined with the mobile monitoring air data.



Photo: Refinery Row air monitoring station by playground



### Are the air monitors collecting data on all chemicals of potential concern?

Outdoor air data are available for most pollutants released from the refineries. Overall, ATSDR reviewed data for more than 150 chemicals found in the air. Our evaluation also noted data limitations. For example, refineries release polycyclic aromatic hydrocarbons (PAHs) from a variety of sources. However, data on PAHs are not routinely collected.

### How did ATSDR review the test results?

ATSDR examined the chemical test results to see if breathing air with the levels found could cause health problems. ATSDR did this by comparing the levels of each chemical found in the air to health screening values. A health screening value is the amount of a chemical that people can get into their bodies before it is expected to cause health problems.

Chemicals found in air at levels lower than their health screening values should not cause health problems in people and were not reviewed further. Chemicals found at levels higher than their health screening values were evaluated more closely to see if they could cause health problems.





*Photo: Corpus Christi Refinery Row Fence Line Community*

## **Can ATSDR link cancer to air pollution released from the refineries?**

No, ATSDR is not able to link cancer to refinery releases. Even if a person gets cancer, ATSDR would not be able to say the cancer in that person was caused by breathing chemicals in the outdoor air in the Corpus Christi Refinery Row area.

As part of its evaluation, ATSDR calculated cancer risk estimates. The cancer risk estimates for benzene, cadmium, chromium, 1,2-dibromoethane, and naphthalene were each at least 1 additional case of cancer per 100,000 persons. The combined cancer risk for a mixture of Refinery Row chemicals is about 2 additional cancer cases per 10,000 people.

At ATSDR's request, the Texas Department of State Health Services evaluated cancer rates from the Texas

Cancer Registry database. Comparisons based on statewide cancer rates show the number of male colon and rectum, bladder, kidney, and liver cancer cases reported for the Corpus Christi Refinery Row area was statistically greater than expected. Although benzene is associated with one of the elevated types of cancer (i.e., liver cancer), we cannot determine if these increases are due to air pollution from industries along Refinery Row. No increase in cancer rates was observed in women.

## **Can ATSDR link birth defects to air pollution released from the refineries?**

No, ATSDR cannot directly link birth defects to chemicals found in the air.

ATSDR looked at 63 types of birth defects to see if any were more common in children of mothers living within 2 miles of Refinery Row compared with children of mothers living 10 or more miles away. Overall, we found that two heart defects (ventricular septal defect and "other anomalies of the aorta") were slightly more common in children who lived near Refinery Row. These birth defect increases could be by chance or caused by other risk factors unavailable for review in this analysis.

Although these types of comparisons cannot be used to directly link birth defects to chemicals found in the air, they can help health agencies focus on prevention efforts. ATSDR supports ongoing public health efforts such as:

- Continued monitoring by the Texas Birth Defects Registry of birth defect rates in the Corpus Christi area.
- Meetings between the Regional Health Awareness Board (RHAB), March of Dimes, and others to develop community intervention strategies to prevent birth defects.
- RHAB partnering with public schools to inform young girls about the importance of good nutrition and health care.
- Research by the U.S. Environmental Protection Agency on environmental exposures and birth defects.

## **Do you know what is causing the odors in our community?**

Recurring odors throughout Refinery Row might be associated with hydrogen sulfide. Stationary air monitors and the mobile monitoring events found hydrogen sulfide regularly above levels at which people can smell the odor. People who live and work in the Refinery Row area might experience odor-related symptoms such as eye irritation, headaches, cough, difficulties in breathing, negative mood states, and stress or annoyance. Note that these symptoms are not specific to only odors and can be the result of other health problems such as allergies and asthma.



## What does ATSDR recommend?

Based on its review of outdoor air in the Corpus Christi Refinery Row area, ATSDR recommends the following:

1. Industry, The University of Texas (UT), and Texas Commission on Environmental Quality (TCEQ) continue stationary and mobile monitoring efforts.
2. Industry, UT, and TCEQ consider adding polycyclic aromatic hydrocarbons to stationary monitoring efforts.
3. Refinery Row facilities use the best available pollution control technology to reduce chemical air releases.
4. Local organizations and government agencies promote asthma education and distribute asthma information.
5. Texas Department of State Health Services (DSHS) continue monitoring birth defect rates and work with local organizations to develop community intervention strategies.
6. Texas DSHS conduct an updated cancer investigation.
7. U.S. Environmental Protection Agency continue conducting research on environmental exposures and birth defects.



## What are the next steps?

- At this time, the 2016 Corpus Christi Refinery Row report is being reviewed by experts outside ATSDR.
- Every person in the community has the chance to look at the report and comment on the results.
- ATSDR will look at the comments from the community, and will make sure both the comments and our responses to them are included in the final report.

## Learn More about Refinery Row

Call ATSDR at 1-800-CDC-INFO (232-4636) and ask for information on the Corpus Christi Refinery Row site.

**You can also find useful information at these websites:**

- ATSDR: [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov)
- Corpus Christi: <http://www.atsdr.cdc.gov/sites/corpuschristi/>
- ATSDR's Toxic Substances Web Portal: <http://www.atsdr.cdc.gov/substances/index.asp>