

# TCEQ Interoffice Memorandum

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**To:** Melanie Edwards, Interim Regional Director, R14

**From:** Lisa Westbrook, MS *LU*  
Toxicology, Risk Assessment, and Research Division, Office of the Executive Director

**Date:** July 3, 2024

**Subject:** Health Effects Review of 2022 Ambient Air Network Monitoring Data in Region 14, Corpus Christi

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## Conclusions

- Reported concentrations of hydrogen sulfide (H<sub>2</sub>S) were below the numerical value of the 30-minute state standard for residential areas.
- All hourly and annual average concentrations of volatile organic compounds (VOCs) reported at automated gas chromatograph (autoGC) monitoring sites were below their short-term and long-term air monitoring comparison values (AMCVs) and would not be expected to cause acute or chronic adverse health effects, vegetation effects, or odor concerns.
- All 24-hour and annual average concentrations of metals, and VOCs reported at canister monitoring sites, with the exception of the annual average concentration of benzaldehyde at Valero's Oak Park Elementary School monitoring site, were below their respective TCEQ AMCVs. Exposure to all 24-hour and annual average VOC and metals concentrations would not be expected to result in long-term adverse health or vegetation effects.
  - The long-term concentration of benzaldehyde at Valero's Oak Park Elementary School monitoring site exceeded the long-term (i.e., lifetime) AMCV up to 2.1 times.

## Background

The primary purpose of this memorandum is to convey the Toxicology, Risk Assessment, and Research Division's (TD's) evaluation of ambient air toxics sampling conducted at ambient air monitoring sites in Region 14, Corpus Christi during 2022. The TCEQ Monitoring Division reported the data for the TCEQ-operated monitoring sites evaluated in this memorandum; other data were received from the industry sponsored ambient air networks: Cheniere Energy and Gulf Coast Growth Ventures (GCGV), Valero, and Formosa, in San Patricio, Nueces, and Calhoun Counties, respectively.

The TCEQ Toxicology, Risk Assessment, and Research Division (TD) evaluated ambient air sampling data for VOCs from 24-hour canister samples and 1-hour autoGC samples, 24-hour speciated metals samples from filters designed to collect particulate matter with an

aerodynamic diameter of 2.5 micrometers or less (PM<sub>2.5</sub>), and 30-minute rolling averages of hydrogen sulfide (H<sub>2</sub>S) samples from 13 monitoring sites in TCEQ Region 14, Corpus Christi (see Table 1 for the specific monitored compounds at each of the 13 sites). Except for lead, data for criteria pollutants (i.e., compounds having a National Ambient Air Quality Standard) were not evaluated for this memorandum. For a complete list of all chemicals evaluated, please see List 1, List 2, and List 3 in Attachment A.

One-hour autoGC VOC data were evaluated for potential acute health, odor, and vegetation concerns, as were any 24-hour samples (e.g., VOCs, metals) that exceeded short-term AMCVs. 30-minute H<sub>2</sub>S was accessed to evaluate state standards. Twenty-four-hour air samples (canister) collected every 2<sup>nd</sup>, 6<sup>th</sup> or 12<sup>th</sup> day or once a month on a yearly basis are designed to provide representative long-term average concentrations. In order to be able to evaluate 24-hour monitoring data more fully, the TCEQ has developed 24-hour AMCVs for specific chemicals. As such, 24-hour samples were compared to the available TCEQ 24-hour AMCVs for the following:

- 1,3-butadiene
- 2,2-dimethylbutane
- 2,3-dimethylbutane
- 2-methylpentane
- 3-methylpentane
- aluminum
- arsenic
- benzene
- cadmium
- carbon tetrachloride
- chromium
- cobalt
- ethylene dibromide
- ethylene dichloride
- manganese
- molybdenum
- nickel
- n-hexane
- vanadium

However, because short-term or peak concentrations may be significantly different than 24-hour sample concentrations, daily concentrations have limited use in evaluating the potential for acute health effects, unlike the shorter-term data reviewed herein (e.g., 1-hour autoGC data, 30-minute H<sub>2</sub>S data). The annual averages from 1-hour autoGC and 24-hour samples (VOCs, carbonyls, and metals) were evaluated for potential chronic health and vegetation concerns. Measured chemical concentrations were compared to appropriate comparison values (e.g., the National Ambient Air Quality Standards (NAAQS) value for lead, TCEQ health-, odor-, and vegetation-based AMCVs). More information about AMCVs is available online at:

<https://www.tceq.texas.gov/toxicology/amcv/about>.

All data collected at TCEQ monitors are analyzed by the TCEQ laboratory and should meet a 75% data completeness objective. At industry sponsored monitors such as Cheniere Energy, GCGV, Valero, and Formosa Plastics Corporation, data are collected by a third-party contractor and should also meet a 75% data completeness objective. Thus, only long-term data that met the 75% completeness objective were evaluated in this memorandum.

**Table 1. Air Monitoring Sites in Region 14, Corpus Christi**

Site Name and Location	EPA Site ID	Network	County	Monitored Compounds
<a href="#">Corpus Christi Hillcrest</a> 1802 Nueces Bay Blvd	48-355-0029	TCEQ	Nueces	VOCs (every 6 <sup>th</sup> -day 24-hr canister)
<a href="#">Corpus Christi Palm</a> 1511 Palm Drive	48-355-0083	TCEQ	Nueces	VOCs (autoGC)
<a href="#">Dona Park</a> 5707 Up River Rd	48-355-0034	TCEQ	Nueces	VOCs (every 6 <sup>th</sup> -day 24-hr canister) & PM <sub>2.5</sub> Metals
<a href="#">Corpus Christi Huisache</a> 3810 Huisache St	48-355-0032	TCEQ	Nueces	VOCs (every 6 <sup>th</sup> -day 24-hr canister) & H <sub>2</sub> S
Oak Park Elementary School (27.79940, -97.43255)	N/A	Valero	Nueces	VOCs (every 6 <sup>th</sup> -day for first quarter and every 12 <sup>th</sup> -day thereafter 24-hr canister) <sup>a</sup>
Point Comfort Plant Site (28.68161, -96.55162)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 2 <sup>nd</sup> -day 24-hr canister)
Point Comfort City Hall Site (28.67776, -96.55440)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6 <sup>th</sup> -day 24-hr canister)
Point Comfort Training Center Site (28.67806, -96.55776)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6 <sup>th</sup> -day 24-hr canister)
Point Comfort Park Site (28.68183, -96.56072)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6 <sup>th</sup> -day 24-hr canister)

Site Name and Location	EPA Site ID	Network	County	Monitored Compounds
Point Comfort North Site (28.71832, -96.55507)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (once a month 24-hr canister)
<a href="#">Gregory Fresno Site</a> Stephen F. Austin Elementary; 401 Fresno St. Gregory	N/A	Gregory-Portland <sup>b</sup>	San Patricio	VOCs (AutoGC)
<a href="#">Portland Buddy Ganem Site</a> Gregory Portland High School; 307 Buddy Ganem St.	N/A	Gregory-Portland <sup>b</sup>	San Patricio	VOCs (AutoGC), EtO <sup>c</sup> (every 6 <sup>th</sup> -day 24-hr canister)
<a href="#">Portland Broadway Site</a> Old East Cliff Elementary; 175 Broadway Blvd.	N/A	Gregory-Portland <sup>b</sup>	San Patricio	VOCs (AutoGC), EtO <sup>c</sup> (every 6 <sup>th</sup> -day 24-hr canister)

<sup>a</sup> Sample schedule changed seasonally to account for changes in seasonal weather patterns and to make monitoring at this location more economical for the industry sponsored monitor.

<sup>b</sup> Gregory-Portland – Cheniere Energy and GCGV

<sup>c</sup> Reported concentrations of EtO are semi-quantitative and experimental

Abbreviations: H<sub>2</sub>S – hydrogen sulfide; PM<sub>2.5</sub> – particulate matter of 2.5 micrometers or less in diameter; VOC – volatile organic compound; EtO – ethylene oxide

## Evaluation

### Short-Term Data (30-minute, Hourly, and 24-hour)

#### *VOCs and Metals*

The reported hourly average concentrations of the targeted VOCs measured were either not detected or were below their respective short-term AMCVs. Similarly, all available 24-hour VOC canister and metals concentrations were below their respective 24-hour AMCVs. Therefore, acute adverse health or vegetation effects and odors are not expected to occur as a result of short-term exposure to the reported levels of these chemicals.

#### *Hydrogen Sulfide (H<sub>2</sub>S)*

All reported 30-minute rolling averages at the Corpus Christi Huisache site were below the level of the state 30-minute H<sub>2</sub>S standard (80 ppb).

## **Long-Term Data (Annual Averages)**

### **VOCs**

The TD compared the calculated annual average concentrations for each target VOC to their respective long-term (i.e., lifetime) AMCVs to evaluate the potential for chronic health and vegetation effects. Annual average concentrations of all the targeted VOCs, except for benzaldehyde at the Oak Park Elementary School site were below their respective long-term AMCVs. Exposure to all annual average VOC concentrations would not be expected to result in long-term adverse health or vegetation effects. A discussion of reported annual benzaldehyde concentrations is provided below.

### **Benzaldehyde**

During 2022, the Oak Park Elementary School exceeded the benzaldehyde long-term (i.e., lifetime) AMCV of 2.1 ppb with an annual average of 4.5 ppb. While the magnitude of this exceedance is low (no more than 2.1-fold), this monitor is located in a residential area, so further evaluation was conducted as described below.

The Oak Park Elementary School monitor has a canister sampler that collects samples every 6<sup>th</sup> day for the first quarter (January – March) and every 12<sup>th</sup> day for the remainder of the year (April – December). These 24-hour samples are designed to provide a representative annual average concentration. The annual average of the canister sampler results was assessed using the EPA's 2022 calendar for the 12-day schedule (i.e., for the first quarter of the year every other sample was used for calculating the annual average, to prevent bias from over-representation of the first quarter of the year).

Annual averages are calculated using 1-year's worth of data for comparison to a long-term AMCV. However, longer-term data would be even more appropriate for comparison to a long-term AMCV because the long-term AMCV is designed to protect an individual over a lifetime of exposure (e.g., 70 years). In this case, 2022 was the first year that the Oak Park Elementary School sampler reported benzaldehyde. Therefore, a longer average calculation was not available for evaluation.

Benzaldehyde is a colorless to yellowish liquid with a bitter almond odor. It is used as a solvent and to make dyes, flavors, and perfumes. The odor threshold for benzaldehyde is reported as 42 ppb<sup>1</sup>. Exposure to, or inhalation of, high enough air concentrations of the vapor may irritate the eyes, nose, and throat. The long-term AMCV for benzaldehyde is based on a thousand-fold higher, 8-hour time weighted average (TWA) workplace environmental exposure limit (WEEL) developed by the American Industrial Hygiene Association (AIHA). The WEEL is set at a concentration where there is a strong odor without irritation (2.1 ppm), so exposures to

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<sup>1</sup> Source: New Jersey Department of Health and Senior Services Benzaldehyde Hazard Summary (<https://nj.gov/health/eoh/rtkweb/documents/fs/0196.pdf>)

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benzaldehyde concentrations at or below the WEEL should prevent respiratory tract and eye irritation in worker populations. The TCEQ very conservatively reduced the benzaldehyde occupational value by a thousand-fold to derive the long-term AMCV (2.1 ppb) for the general public. Such a reduction assumes that there are members of the general public who are a thousand times more sensitive to benzaldehyde than occupational workers, which is highly unlikely to be the case. Based on the available information for benzaldehyde and the low magnitude of the exceedance, we would not expect any adverse health effects from exposure to this concentration.

***Metals***

All annual average PM<sub>2.5</sub> metals concentrations collected at the Corpus Christi Dona Park monitoring site were below their respective long-term comparison values. Exposure to these reported concentrations would not be expected to result in long-term adverse health effects.

If you have any questions regarding the content of this review, please do not hesitate to contact Lisa Westbrook (512-239-1160) or [Lisa.Westbrook@tceq.texas.gov](mailto:Lisa.Westbrook@tceq.texas.gov).

## Attachment A

### List 1. Target VOC Analytes at Canister Sites

1,1,2,2-Tetrachloroethane	Benzene <sup>1,2</sup>	M/P-Xylene <sup>2</sup>
1,1,1-Trichloroethane <sup>2</sup>	Bromomethane	Methyl Chloroform (1,1,1-Trichloroethane)
1,1,2-Trichloroethane	Butyraldehyde <sup>2</sup>	Methylcyclohexane
1,1-Dichloroethane <sup>2</sup>	Carbon Tetrachloride <sup>2</sup>	Methylcyclopentane
1,2-Dichloroethane <sup>2</sup>	Chlorobenzene	Methyl tert-Butyl ether <sup>2</sup>
1,1-Dichloroethylene <sup>2</sup>	Chloroform	Naphthalene <sup>2</sup>
1,2,3-Trimethylbenzene	Chloromethane (Methyl Chloride) <sup>2</sup>	N-Butane
1,2,4-Trimethylbenzene <sup>2</sup>	Cis-1,3-Dichloropropene <sup>2</sup>	N-Decane
1,2-Dichloropropane	Cis-2-Butene	N-Heptane
1,3,5-Trimethylbenzene	Cis-2-Hexene	N-Hexane <sup>2</sup>
1,3-Butadiene <sup>1,2</sup>	Cis-2-Pentene	N-Nonane
1-Butanol <sup>2</sup>	Cyclohexane <sup>2</sup>	N-Octane
1-Butene	Cyclopentane	N-Pentane
1-Hexene+2-Methyl-1-Pentene	Cyclopentene	N-Propylbenzene <sup>3</sup>
1-Pentene	Dichlorodifluoromethane	N-Undecane
2,2,4-Trimethylpentane	Dichloromethane (Methylene Chloride)	O-Ethyltoluene
2,2-Dimethylbutane (Neohexane)	Ethane	O-Xylene <sup>2</sup>
2,3,4-Trimethylpentane	Ethylbenzene <sup>2</sup>	P-Diethylbenzene
2,3-Dimethylbutane	Ethylene <sup>1,2</sup>	P-Ethyltoluene
2,3-Dimethylpentane	Ethylene Dibromide (1,2-Dibromoethane)	Propane
2,4-Dimethylpentane	Ethylene Dichloride (1,2-Dichloroethane) <sup>1</sup>	Propylene <sup>2</sup>
2-Chloropentane	Ethylene Oxide <sup>3</sup>	Styrene <sup>2</sup>
2-Methyl-2-Butene	Isobutane	Tetrachloroethylene <sup>2</sup>
2-Methylheptane	Isopentane (2-Methylbutane)	Toluene <sup>2</sup>
2-Methylhexane	Isoprene	Trans-1,3-Dichloropropene <sup>2</sup>
2-Methylpentane (Isohexane)	Isopropylbenzene (Cumene)	Trans-2-Butene
3-Methyl-1-Butene	M-Diethylbenzene	Trans-2-Hexene
3-Methylheptane	M-Ethyltoluene	Trans-2-Pentene
3-Methylhexane		Trichloroethylene <sup>2</sup>
3-Methylpentane		Trichlorofluoromethane
4-Methyl-1-Pentene		Vinyl Chloride <sup>1</sup>
Acetylene		
Benzaldehyde <sup>2</sup>		

<sup>1</sup> Formosa Plastics Corporation

<sup>2</sup> Valero- Oak Park site

<sup>3</sup> Gregory-Portland (Portland-Buddy Ganem & -Broadway sites only)

**List 1. Target Metal Analytes**

Aluminum (PM <sub>2.5</sub> )	Chromium (PM <sub>2.5</sub> )	Molybdenum (PM <sub>2.5</sub> )
Antimony (PM <sub>2.5</sub> )	Cobalt (PM <sub>2.5</sub> )	Nickel (PM <sub>2.5</sub> )
Arsenic (PM <sub>2.5</sub> )	Copper (PM <sub>2.5</sub> )	Selenium (PM <sub>2.5</sub> )
Barium (PM <sub>2.5</sub> )	Lead (PM <sub>2.5</sub> )	Tin (PM <sub>2.5</sub> )
Cadmium (PM <sub>2.5</sub> )	Manganese (PM <sub>2.5</sub> )	Vanadium (PM <sub>2.5</sub> )
		Zinc (PM <sub>2.5</sub> )

**List 2. Target Analytes at AutoGC Sites**

1-Butene	Benzene	N-Heptane
1-Pentene	Cis-2-Butene	N-Hexane
1,2,3-Trimethylbenzene	Cis-2-Pentene	N-Nonane
1,2,4-Trimethylbenzene	Cyclohexane	N-Octane
1,3-Butadiene	Cyclopentane	N-Pentane
1,3,5-Trimethylbenzene	Ethane	N-Propylbenzene
2-Methylheptane	Ethyl Benzene	O-Xylene
2-Methylhexane	Ethylene	P-Xylene + M-Xylene
2,2-Dimethylbutane	Isobutane	Propane
2,2,4-Trimethylpentane	Isopentane	Propylene
2,3-Dimethylpentane	Isoprene	Styrene
2,3,4-Trimethylpentane	Isopropyl Benzene – Cumene	Trans-2-Butene
2,4-Dimethylpentane	Methylcyclohexane	Trans-2-Pentene
3-Methylheptane	Methylcyclopentane	Toluene
3-Methylhexane	N-Butane	
Acetylene	N-Decane	