

TCEQ Interoffice Memorandum

To: Susan Clewis, Regional Director, R14
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Toxicology, Risk Assessment, and Research Division
Office of the Executive Director
Date: August 24, 2023
Subject: Health Effects Review of 2021 Ambient Air Network Monitoring Data in
Region 14, Corpus Christi

Conclusions

- Reported concentrations of hydrogen sulfide (H₂S) 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 TCEQ 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 concentration of ethylene dichloride (EDC) at the Point Comfort City Hall, Training Center, Park, and Plant sites, were below their respective TCEQ AMCVs. Exposure to 24-hour and annual average VOC and metals concentrations would not be expected to result in adverse health or vegetation effects. The long-term concentrations of EDC at the Point Comfort Plant site are discussed below:
 - At the Point Comfort City Hall, Training Center, Park, and Plant sites, the EDC annual average exceeded the long-term (i.e., lifetime) AMCV up to 2.3 times. Formosa notified the TCEQ Toxicology, Risk Assessment, and Research Division (TD) that their facility underwent upgrades during their ongoing sitewide maintenance program as an explanation for the higher concentrations of EDC. However, because of Formosa's proximity to residential areas, the TD encourages efforts aimed at mitigating ambient EDC concentrations in Point Comfort such that both nearer-term annual averages and the long-term (e.g., 70-year) averages at these sites are below the long-term (i.e., lifetime) AMCV.

Background

The primary purpose of this memorandum is to convey the TD's evaluation of ambient air toxics sampling conducted at ambient air monitoring sites in Region 14, Corpus Christi during 2021. 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 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_{2.5}), and 30-minute rolling averages of hydrogen sulfide (H₂S) 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). Twenty-four-hour air samples collected every 2nd, 6th, and 12th 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
- 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 24-hour 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 H₂S data). The annual averages from 1-hour autoGC and 24-hour samples (VOCs 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 and GCGV, Valero, and Formosa Plastics Corporation, data are collected by a third-party contractor and should also meet a 75% data completeness objective. Only long-term data that met the 75% completeness objective were evaluated in this memorandum.

Table 1. Monitoring Site Information for TCEQ Region 14, Corpus Christi

Site Name and Location	EPA Site ID	Network	County	Monitored Compounds
Corpus Christi Hillcrest 1802 Nueces Bay Blvd	48-355-0029	TCEQ	Nueces	VOCs (every 6 th -day 24-hr canister)
Corpus Christi Palm 1511 Palm Drive	48-355-0083	TCEQ	Nueces	VOCs (autoGC)
Dona Park 5707 Up River Rd	48-355-0034	TCEQ	Nueces	VOCs (every 6 th -day 24-hr canister) & PM _{2.5} Metals
Corpus Christi Huisache 3810 Huisache St	48-355-0032	TCEQ	Nueces	VOCs (every 6 th -day 24-hr canister) & H ₂ S
Oak Park Elementary School (27.79940, -97.43255)	N/A	Valero	Nueces	VOCs (every 6 th -day for first quarter and every 12 th -day thereafter 24-hr canister) ^a
Point Comfort Plant Site (28.68161, -96.55162)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 2 nd -day 24-hr canister)
Point Comfort City Hall Site (28.67776, -96.55440)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6 th -day 24-hr canister)
Point Comfort Training Center Site (28.67806, -96.55776)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6 th -day 24-hr canister)
Point Comfort Park Site (28.68183, -96.56072)	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6 th -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)
Gregory Fresnos Site Stephen F. Austin Elementary; 401 Fresnos St	N/A	Gregory- Portland ^b	San Patricio	VOCs (AutoGC)
Portland Buddy Ganem Site Gregory Portland High School; 307 Buddy Ganem St	N/A	Gregory- Portland ^b	San Patricio	VOCs (AutoGC), EtO ^c (every 6 th -day 24-hr canister)
Portland Broadway Site Old East Cliff Elementary; 175 Broadway Blvd	N/A	Gregory- Portland ^b	San Patricio	VOCs (AutoGC), EtO ^c (every 6 th -day 24-hr canister)

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

^b Gregory Portland – Cheniere Energy and GCGV

^c Reported concentrations of EtO are semi-quantitative and experimental.

Abbreviations: H₂S – hydrogen sulfide; PM_{2.5} – 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 short-term or 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 (H₂S)

All reported 30-minute rolling averages at the Corpus Christi Huisache site were below the level of the state 30-minute H₂S standard (80 ppb).

Long-Term Data

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 EDC, evaluated at the TCEQ and industry-sponsored canister monitoring sites 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 EDC concentrations is provided below.

Ethylene Dichloride (EDC)

During 2021, four out of the five sites in the Formosa Network reported annual averages of EDC concentrations that exceeded the EDC long-term (i.e., lifetime) AMCV of 0.72 ppb. These sites included the City Hall site (0.82 ppb), the Training Center site (0.89 ppb), the Park site (0.95 ppb), and the Plant site (1.70 ppb). All annual average exceedances of the EDC long-term AMCV, even if representative of longer-term (i.e., lifetime) averages, would be within EPA's acceptable excess cancer risk range.¹ However, because of Formosa's proximity to residential areas, the TD continues to encourage efforts to mitigate ambient EDC concentrations in Point Comfort so that both nearer-term annual averages and the long-term (e.g., 70-year) averages at these sites are below the long-term (i.e., lifetime) AMCV. With this longer-term goal in mind, it is noted that in TD's preliminary review of available 2022 data, the calculated EDC annual averages for 2022 are below the long-term AMCV at all sites.

The TD contacted Formosa to discuss what contributed to the 2021 increases in measured EDC levels. Formosa representatives attributed the higher levels to their site-wide maintenance program (i.e., mechanical inspections, repairs) that is being implemented at their facility in Point Comfort, Texas. This ongoing maintenance program started three years ago with an initial

¹ In general, TCEQ's long-term AMCVs are based on lifetime (e.g., 70-year) exposure and are set at one in 100,000 excess cancer risk, which is 10 times less than the upper end of USEPA's acceptable excess cancer risk range (USEPA's acceptable excess risk range is one in 1,000,000 to one in 10,000). So, even if the highest exceedance (1.70 ppb) were representative of a lifetime exposure concentration, it would be within the USEPA's acceptable cancer risk range (i.e., lower than the upper end excess risk value of 7.2 ppb).

Susan Clewis, Regional Director, Region 14

August 24, 2023

Page 6 of 8

focus on addressing their EDC units and that focus ended the latter part of 2021.

Metals

All annual average PM_{2.5} 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 Darrell McCant by phone at (512) 239-4477 or via email at Darrell.McCant@tceq.texas.gov, or Lisa Westbrook by phone at (512-239-1160) or via email at Lisa.Westbrook@tceq.texas.gov, or Michael Wei by phone at (512-239-0540) or via email at Michael.Wei@tceq.texas.gov.

Attachment A

List 1. Target VOC Canister

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

¹ Formosa Plastics Corporation

² Valero- Oak Park site only

³ Gregory-Portland (Portland-Buddy Ganem & -Broadway sites only)

List 2. Target Metal Analytes

Aluminum (PM _{2.5})	Chromium (PM _{2.5})	Molybdenum (PM _{2.5})
Antimony (PM _{2.5})	Cobalt (PM _{2.5})	Nickel (PM _{2.5})
Arsenic (PM _{2.5})	Copper (PM _{2.5})	Selenium (PM _{2.5})
Barium (PM _{2.5})	Lead (PM _{2.5})	Tin (PM _{2.5})
Cadmium (PM _{2.5})	Manganese (PM _{2.5})	Vanadium (PM _{2.5})
		Zinc (PM _{2.5})

List 1. Target Analytes at AutoGC Sites

1-Butene	Benzene	N-Heptane
1-Pentene	C-2-Butene	N-Hexane
1,2,3-Trimethylbenzene	C-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	T-2-Butene
2,4-Dimethylpentane	Methylcyclohexane	T-2-Pentene
3-Methylheptane	Methylcyclopentane	Toluene
3-Methylhexane	N-Butane	
Acetylene	N-Decane	