

# TCEQ Interoffice Memorandum

---

**To:** Susan Clewis, Regional Director  
Kelly Keel, Coastal and East Texas Area Director

**From:** Neeraja Erraguntla, Ph.D., D.A.B.T. *NKE*  
Darrell McCant, B.S. *DM*  
Ross Jones, MS, MPH, PhD *RFJ*  
Toxicology Division, Office of the Executive Director

**Date:** October 8, 2014

**Subject:** Health Effects Review of 2013 Ambient Air Network Monitoring Data in Region 14, Corpus Christi

---

## Conclusions

- All hourly average and annual average concentrations of volatile organic compounds (VOCs) reported at Texas Commission on Environmental Quality (TCEQ) Region 14 automated gas chromatograph (autoGC) monitoring sites, the Corpus Christi Air Quality Project (CCAQP) monitoring sites, and the Corpus Christi Industrial Monitoring Network (CCNET) 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 odors.
- All 24-hour average and annual average concentrations of VOCs from canister samples and all speciated metals were below their respective TCEQ AMCVs and would not be expected to cause acute or chronic adverse health effects, vegetation effects, or odors.

## Background

The Toxicology Division (TD) has reviewed ambient air sampling data collected from 22 network monitoring sites in TCEQ Region 14, Corpus Christi. This memorandum conveys the TD's evaluation of ambient air sampling measurements from:

- 1 AutoGC and 3 canister samplers from TCEQ's Community Air Toxics Monitoring Network (CATMN) sites,
- 1 Event triggered canister sampler from CATMN sites
- 2 AutoGCs from CCAQP network monitoring sites,
- 1 AutoGC, 5 canister samplers, and 3 Event triggered canister samplers from CCNET,
- 5 Canister samplers from the Formosa Plastic Corporation Monitoring sites in Point Comfort, Texas.

Table 1 lists the sampling locations and provides links to more information on the TCEQ and CCAQP sites. Lists of target analytes at these monitoring locations are also included in Attachment A. Figure 1 is a map indicating the specific locations of the TCEQ, CCAQP, and CCNET air monitoring sites. Figure 2 is a map indicating the specific locations of the Formosa

Plastic Corporation air monitoring sites in Point Comfort, Texas. For additional information on other VOC canister sampling data from the CCAQP network, please see [http://www.utexas.edu/research/ceer/ccaqp/canister\\_data.htm](http://www.utexas.edu/research/ceer/ccaqp/canister_data.htm).

The TCEQ Monitoring Division reported the data for TCEQ sites evaluated in this memorandum and the TD reviewed all air monitoring summary results. From the CATMN sites, the TD reviewed data for: 84 VOCs from three 24-hour every sixth-day canister samplers, 15 speciated metals (as PM<sub>2.5</sub>) from 24-hour filter samples collected from one 24-hour every sixth-day canister sampler, and 46 VOCs from one autoGC. Except for lead, data for criteria pollutants (i.e., compounds having National Ambient Air Quality Standards) were not evaluated for this memorandum.

From the CCAQP network, the TD reviewed data for 46 VOCs from two autoGCs and 49 VOCs from the three event triggered canister samplers. For the short-term health and welfare evaluations, the TD compared the hourly measured concentrations of the VOCs collected from four autoGC sites to their respective short-term AMCVs. More information about AMCVs is available online at: <http://www.tceq.state.tx.us/implementation/tox/AirToxics.html#amcv>.

The CCNET included an autoGC (Huisache autoGC) which targeted one VOC (benzene) and is collocated with one of TCEQ's every sixth-day canister sampler (Huisache) and three every sixth-/or 12<sup>th</sup>- day canister samplers that measure 15 VOCs. The Formosa Plastics Corporation in Point Comfort involves a network of five air monitoring sites which includes every third-day, every-sixth day, and once a month samplers for six targeted VOCs that are included in List 1.

In an attempt to better evaluate 24-hour monitoring data more fully, TCEQ has developed 24-hour AMCVs for specific chemicals. As such, 24-hour samples were compared to the available TCEQ 24-hour AMCVs (1,3-butadiene and benzene). Generally, 24-hour air samples are designed to provide representative long-term average concentrations, annual averages from 24-hour samples were only evaluated for the potential to contribute to chronic health and welfare concerns. Short-term or peak concentrations are not captured by 24-hour sample duration; therefore, daily maximum concentrations have limited use in evaluating the potential to cause acute health effects.

All the data met TCEQ's 75 percent annual data completeness objective; therefore, all annual averages are considered representative of long-term ambient air conditions and potential subsequent exposure.

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

Site Location	Monitor ID	Monitoring Sites	County	Monitored Chemicals
<a href="#">Huisache</a> <a href="#">3810 Huisache St</a>	48-355-0032	TCEQ	Nueces	VOCs (every 6th-day 24-hr canister)
<a href="#">Hillcrest</a>	48-355-	TCEQ	Nueces	VOCs (every 6th-day

Site Location	Monitor ID	Monitoring Sites	County	Monitored Chemicals
<a href="#">1802 Nueces Bay Blvd</a>	0029			24-hr canister)
<a href="#">Dona Park 5707 Up River Rd</a>	48-355-0034	TCEQ	Nueces	VOCs (every 6th-day 24-hr canister) Metals (every 6th-day 24-hr PM <sub>2.5</sub> )
<a href="#">Palm 1515 Palm Drive</a>	48-355-0083	TCEQ	Nueces	VOCs (hourly autoGC)
<a href="#">Williams Park</a>	48-355-1024	TCEQ	Nueces	VOCs (Event Triggered hourly )
<a href="#">Solar Estates 9122 Leopard St</a>	48-355-0041	CCAQP	Nueces	VOCs (hourly autoGC))
<a href="#">Oak Park 842 Erwin St</a>	48-355-0035	CCAQP	Nueces	VOCs (hourly autoGC)
<a href="#">Grain Elevator</a>	48-355-0036	CCAQP	Nueces	VOCs (Event Triggered 20 minutes)
<a href="#">J.I. Hailey Site</a>	48-355-0037	CCAQP	Nueces	VOCs (Event Triggered 20 minutes)
<a href="#">Dona Park</a>	48-355-0034	CCAQP	Nueces	VOCs (Event Triggered 20 minutes)
Point Comfort, Park Site	N/A	Formosa Plastics Corporation	Calhoun	VOCs <sup>1</sup> (every 6th-day 24-hr canister)
Point Comfort, City Hall site	N/A	Formosa Plastics Corporation	Calhoun	VOCs <sup>1</sup> (every 6th-day 24-hr canister)
Point Comfort, School Site	N/A	Formosa Plastics Corporation	Calhoun	VOCs <sup>1</sup> every 6th-day 24-hr canister)
Point Comfort, Plant Site	N/A	Formosa Plastics Corporation	Calhoun	VOCs <sup>1</sup> (every 3rd-day 24-hr canister)

Site Location	Monitor ID	Monitoring Sites	County	Monitored Chemicals
Point Comfort, North Site	N/A	Formosa Plastics Corporation	Calhoun	VOCs <sup>1</sup> (Once a month)
Crossley School	N/A	Corpus Christi Industrial Monitoring Network Air Quality Program (CCNET)	Nueces	VOCs <sup>2</sup> (every 6th-day 24-hr canister)
Oak Park School	N/A	CCNET	Nueces	VOCs <sup>2</sup> (every 6th-day 24-hr canister)
Up River Road	N/A	CCNET	Nueces	VOCs <sup>2</sup> (every 6th-day 24-hr canister)*
Tuloso Midway Middle School- Site 1	N/A	CCNET (Flint Hill Resources Air Monitoring Program)	Nueces	VOCs <sup>2</sup> (every 6th-day 24-hr canister)
Tuloso Midway Elementary School- Site 2	N/A	CCNET (Flint Hill Resources Air Monitoring Program)	Nueces	VOCs <sup>2</sup> (every 6th-day 24-hr canister)
Huisache AutoGC_URS	N/A	CCNET	Nueces	Benzene <sup>3</sup> (autoGC)

## Evaluation

### Short-Term (Hourly, 24-hour, and Event Triggered) Data

#### VOCs

The reported hourly average concentrations of each of the 46 VOCs, including benzene, reviewed from CCAQP (Oak Park and Solar Estates), CCNET (Huisache autoGC), and the TCEQ (Palm) autoGC monitoring sites were below their respective short-term AMCVs. Similarly, all 24-hour canister VOC concentrations were below respective odor thresholds. The reported 24-hour benzene and 1,3-butadiene concentrations from CCAQP, TCEQ, CCNET, and Formosa sponsored monitoring networks were below TCEQ's 24-hour AMCVs for benzene and 1,3-butadiene. The reported 20-minute VOCs concentrations from CCAQP event triggered canisters were below TCEQ's respective acute AMCVs. Therefore, acute adverse health or vegetation effects and odor nuisances are not expected to occur as a result of short-term exposure to the reported levels of these chemicals.

## **Long-Term Data**

### **VOCs**

The TD evaluated the reported annual average concentrations for each targeted VOC for potential chronic health and vegetation concerns by comparing the measured chemical concentrations to their respective long-term AMCVs. Annual average concentrations of 46 VOCs at the Oak Park and the Solar Estates CCAQP autoGC monitoring sites and annual average concentrations of 46 VOCs at the Palm TCEQ autoGC monitoring site were reported to be below their respective long-term AMCVs. The reported annual average concentrations of the 84 VOCs evaluated at the TCEQ canister monitoring sites (i.e., Huisache, Hillcrest, and Dona Park) were also below their respective long-term AMCVs. In addition, the reported annual average concentrations of 15 metals were below their respective long-term AMCVs. The reported annual average concentrations of the VOCs evaluated at the Formosa Plastics Corporation monitoring sites and the CCNET monitoring sites were below their respective long-term AMCVs. Exposure to these reported concentrations would not be expected to result in long-term adverse health or vegetation effects.

### **Metals**

All 24-hour and annual average metal concentrations, except lead, collected at the Corpus Christi Dona Park monitoring site were below their respective AMCVs. Since lead is a criteria pollutant, lead PM<sub>2.5</sub> levels (i.e., rolling three-month averages) were compared to the appropriate comparison value (i.e., 0.15 µg/m<sup>3</sup>). Exposure to these reported concentrations would not be expected to result in long-term adverse health effects.

## **Benzene Trends at the TCEQ, CCAQP, and CCNET Air Monitoring Sites**

The 2013 reported annual average benzene concentrations at the TCEQ Huisache monitor (0.896 ppb<sub>v</sub>) and the CCNET Huisache autoGC (1.03 ppb<sub>v</sub>) were below the TCEQ's long-term AMCV of 1.4 ppb<sub>v</sub>. The predominant wind direction at the Huisache monitors is southeasterly and away from the nearby neighborhood. The TCEQ Huisache monitoring site is no longer considered to be located in a residential area as when it was first established in 1998. With the exception of one residential lot, the former neighborhood surrounding the TCEQ Huisache monitoring site is now industrial property. Given the local meteorology and proximity of the Huisache monitors to industrial sources of benzene, it is expected that the sources that impact these monitors would have less influence on benzene concentrations in residential areas to the east, south and west of the Huisache site.

Annual average benzene levels at other TCEQ and CCAQP sites in residential areas showed lower benzene concentrations than those at the Huisache sites and are much lower than the TCEQ's long-term AMCV and are as follows: 0.403 ppb<sub>v</sub> at Hillcrest, 0.327 ppb<sub>v</sub> at Dona Park, 0.275 ppb<sub>v</sub> at Palm, 0.147 ppb<sub>v</sub> at Solar Estates, and 0.308 ppb<sub>v</sub> at Oak Park. Long-term exposure to these reported levels of benzene would not be expected to cause chronic adverse health effects.

## Regional Information

The regional staff has heightened awareness on matters involving benzene emissions through both scheduled and reactive compliance investigations. These investigations include hand-held sampling and other monitoring equipment. In addition, the regional staff regularly participates in cooperative and constructive efforts with local community and industry representatives through a monthly forum which actively focuses on the potential sources and reductions of localized benzene emissions.

If you have any questions regarding this memorandum, please contact Neeraja Erraguntla (512-239-2492), Darrell McCant (512-239-4477), or Ross Jones (512-239-1804) by phone or by email at [Neeraja.erraguntla@tceq.texas.gov](mailto:Neeraja.erraguntla@tceq.texas.gov), [Darrell.McCant@tceq.texas.gov](mailto:Darrell.McCant@tceq.texas.gov), or [Ross.Jones@tceq.texas.gov](mailto:Ross.Jones@tceq.texas.gov).

## Attachment A

### List 1. Target VOC Analytes in TCEQ and/or Industrial Canister sites (Formosa Plastics Corporation and CCNET,

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

Susan Clewis, et al.

Page 7

October 8, 2014

Styrene <sup>2</sup>	Trans-2-Butene	Trichlorofluoromethane
Tetrachloroethylene <sup>2</sup>	Trans-2-Hexene	Vinyl Chloride <sup>1</sup>
Toluene <sup>2</sup>	Trans-2-Pentene	
Trans-1-3-Dichloropropylene	Trichloroethylene <sup>2</sup>	

1 Formosa Plastics Corporation Target Analytes

2 CCNET Target Analytes; Methyl t-Butylether and Naphthalene are additional CCNET target analytes

## List 2. 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> )	Zinc (PM <sub>2.5</sub> )

**List 3. Target VOC Analytes in TCEQ, CCNET<sup>1</sup>, and CCAQP AutoGCs**

1-Butene	Benzene <sup>1</sup>	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 <sup>2</sup>	n-Decane	

<sup>1</sup> CCNET Target Analyte for Huisache AutoGC.

Figure 1: Air Monitor Locations in the Corpus Christi Bay Area, Nueces County, Texas

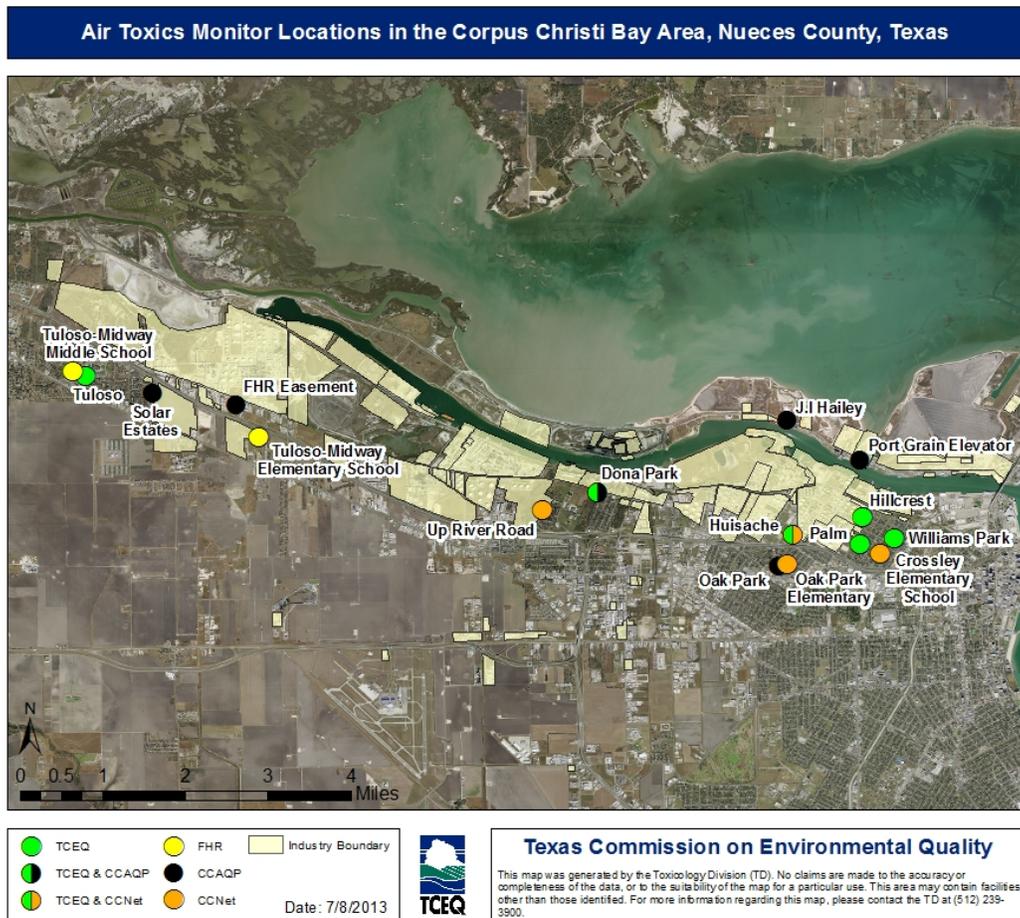


Figure 2: Industry-Sponsored Air Toxics Monitoring Locations in Point Comfort, Calhoun County, Texas

