

Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

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David Kennebeck, Air Section Manager, R14
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From: Neeraja K. Erraguntla, Ph.D. *NKE*
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Subject: Health Effects Review of the 2008 Ambient Air Network Monitoring Sites in Region 14
– Corpus Christi

Date: December 17, 2009

Key Findings

- Long-term exposures to the reported annual average concentrations of 84 volatile organic compounds (VOCs) and 14 metals (measured as particulate matter less than 2.5 microns in diameter, PM_{2.5}) monitored at Texas Commission on Environmental Quality (TCEQ) monitoring sites in 2008 are not expected to cause chronic adverse health effects and vegetative effects.
- Long-term exposures to the reported annual average concentrations of VOCs from the automated gas chromatographs (autoGCs) at the Corpus Christi Air Quality Project (CCAQP) sites in 2008 are not expected to cause chronic adverse health effects or vegetative effects.
- Short-term exposures to the reported hourly concentrations of VOCs from the autoGCs at the CCAQP sites are not expected to cause short-term adverse health effects, nuisance odor concerns, or vegetative effects.
- TCEQ's mobile monitoring team reported strong sulfur odors and several elevated hydrogen sulfide (H₂S) concentrations above the TCEQ's 30-minute net standard (0.080 ppm_v for residential, business, and/or commercial areas and 0.120 ppm_v for industrial areas) downwind of the Corpus Christi Greenwood and Broadway Wastewater Treatment Plants (WWTPs). The Toxicology Division (TD) recommends reductions in the H₂S levels near the WWTPs.

Background

This memorandum conveys the TD'S evaluation of ambient air sampling measurements at TCEQ and [Corpus Christi Air Quality Project \(CCAQP\)](#) monitoring sites and highlights of relevant mobile monitoring trips in TCEQ Region 14-Corpus Christi during 2008. Table 1 lists the sites and provides links to additional site information. Target analytes are listed in Table 2. The short-term data included hourly VOC data from autoGCs, 20-minute and 1-hour canister VOC samples, and metals speciated from 24-hour PM_{2.5} filter samples. Annual average concentrations were calculated from every-sixth-day 24-hour VOC and metal, and autoGC data. Figure 1 is a depiction of the annual average levels of benzene at TCEQ and CCAQP monitoring sites in Corpus Christi. Figure 2 is a map of TCEQ and CCAQP sites which provided ambient air measurements for this evaluation.

Measured short-term and annual averages were compared to their respective appropriate comparison values. The TCEQ Monitoring Operations Division reported the data for all chemicals evaluated in this memorandum. The target analyte list of 95 VOCs for 24 hour samples was changed in the third quarter of 2008. Eleven oxygenated compounds were dropped from the list due to water issues in the laboratory analysis. Therefore, those compounds did not meet the data completeness objective of 75 percent data return, or 45 valid samples per year. Those eleven compounds are identified by asterisk on the target analyte table (Table 2). All other VOCs and metals data collected by the TCEQ exceeded a 75 percent data completeness objective, which is expected to provide sufficiently-representative annual average concentrations.

The 2008 CCAQP data except for the two autoGCs (i.e, the triggered short-term canister data) did not meet the TCEQ's 75 percent data completeness objective. The 2008 CCAQP data for the autoGC met the 75 percent data completeness objective. The TD will therefore evaluate the CCAQP data from the triggered short-term canister data from a short-term health perspective and the 2008 autoGC data from the CCAQP sites from both a short-term and long-term perspective.

Because 24-hour air samples are designed to provide representative long-term average concentrations, annual averages from 24-hour samples were evaluated for potential chronic health concerns. Short-term or peak concentrations are not captured by 24-hour samples; therefore, daily maximum concentrations have limited use in evaluating the potential for acute health effects.

Table 1. TCEQ and CCAQP Air Monitoring Sites in Corpus Christi, Nueces County			
Site	Monitor ID	TCEQ/CCAQP Monitoring Sites	Monitored Chemicals
<u>Huisache 3810 Huisache St</u>	48-355-0032	TCEQ	VOCs (every-6 th -day 24-hr canister)
<u>Hillcrest 1802 Nueces Bay Blvd</u>	48-355-0029	TCEQ	VOCs (every-6 th -day 24-hr canister)
<u>Dona Park 5707 Up River Rd</u>	48-355-0034	TCEQ	VOCs (every-6 th -day 24-hr canister) Metals (every-6 th -day 24-hr PM _{2.5})
<u>Solar Estates 9122 Leopard St</u>	48-355-0041	CCAQP	VOCs (hourly autoGC)
<u>Oak Park 842 Erwin St</u>	48-355-0035	CCAQP	VOCs (hourly autoGC)
<u>Port Grain Elevator 2001B E Navigation Blvd</u>	48-355-0036	CCAQP	VOCs (triggered short-term canister)
<u>J.I. Hailey 2702B E Navigation Blvd</u>	48-355-0037	CCAQP	VOCs (triggered short-term canister)
<u>West End Inner Harbor 3149B Suntide Rd</u>	48-355-0038	CCAQP	VOCs (triggered short-term canister)
<u>FHR Easement Off Up River Rd 8401B Up River Rd</u>	48-355-0039	CCAQP	VOCs (triggered short-term canister)

EVALUATION

Short-term Concentrations

Hourly concentrations of all 46 VOCs monitored at the Solar Estates and Oak Park autoGCs were less than their respective appropriate comparison values and would not be expected to cause short-term adverse health effects, nuisance odor concerns, or vegetative effects. Reported concentrations of all VOCs at the CCAQP sites were below their respective health-based comparison values except for two VOCs (i.e., 2-methylpentane and/or isoprene) at the Port Grain Elevator, J.I. Hailey, Up River Road, and CC Inner Harbor that exceeded their respective odor-based comparison values and are discussed below.

VOCs Exceeding Odor-Based Values at the CCAQP Monitoring Site

While the CCAQP triggered sample sites are more representative of industrial property and do not reflect community air quality, they are included in this evaluation primarily to provide continuity of air quality

evaluation. In the short-term (i.e., 20-minute) triggered samples collected by the CCAQP, 2-methylpentane exceeded its odor threshold but not its health-based comparison value one time at each of the CCAQP monitoring sites. In addition, isoprene was detected slightly above its odor threshold at the Up River Road and the J. I. Hailey monitoring sites. Short-term exposures to the reported concentrations of the two VOCs that exceeded their respective odor-based comparison levels would not be expected to cause direct short-term adverse health effects such as respiratory irritation.

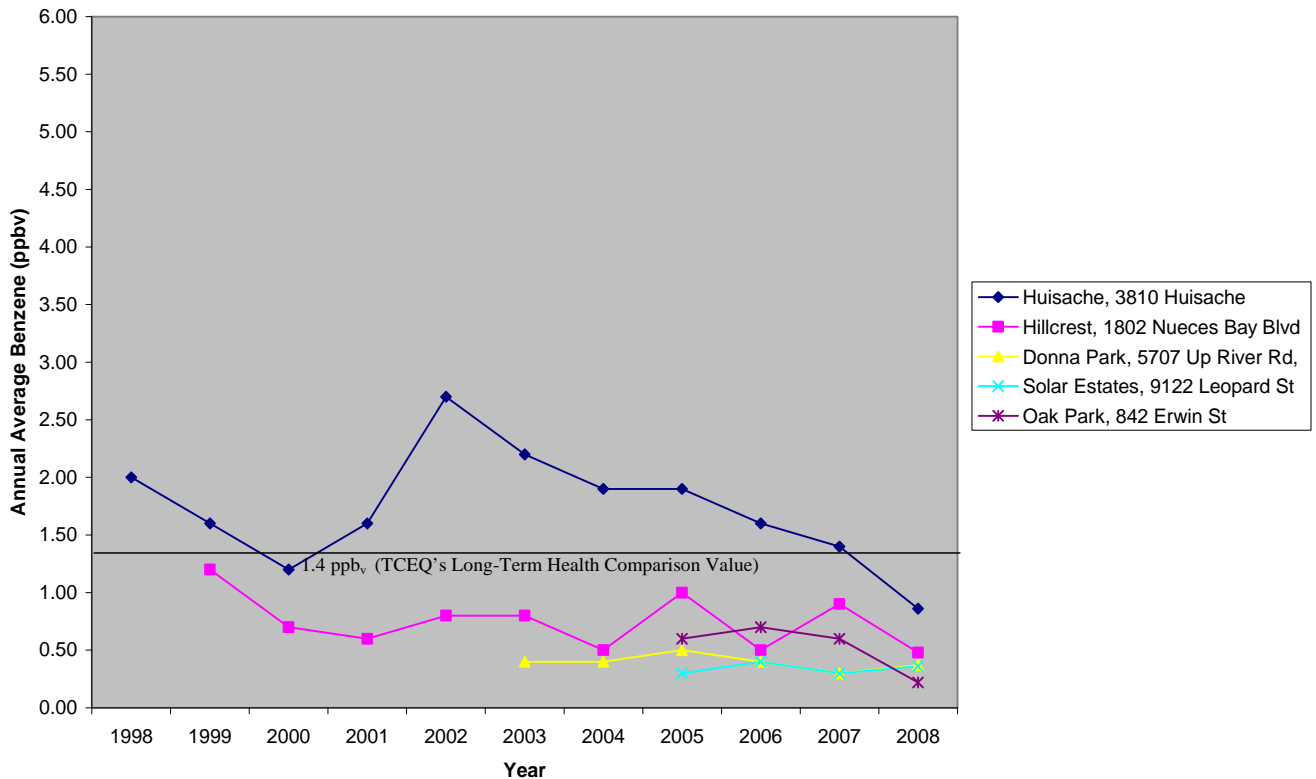
Long-term Concentrations

The reported annual average concentrations of up to 84 VOCs and 14 PM_{2.5} metals were below their respective appropriate comparison values. Chronic exposure to the reported annual average concentrations of all the VOCs and metals would not be expected to cause chronic health effects or vegetative effects. Benzene levels at the Huisache site have historically been of interest and are discussed further below.

Annual Average Benzene Concentrations

The 2008 annual average benzene concentration at Huisache was 0.86 ppb_v, and was based on every-sixth-day sampling. Annual average benzene levels at other TCEQ sites included 0.48 ppb_v at Hillcrest and 0.37 ppb_v at Dona Park, while the CCAQP reported 0.22 ppb_v at Solar Estates and 0.36 ppb_v at Oak Park. Annual average benzene levels at these five sites are less than the TCEQ’s long-term appropriate comparison value of 1.4 ppb_v and are not expected to cause long-term adverse health effects (Figure 1).

Figure 1: Annual Average Benzene Levels (ppbv) at TCEQ & CCAQP Air Toxics Monitoring Sites in Corpus Christi



Air Pollutant Watch List (APWL)

The Huisache Air Pollutant Watch List (APWL1402) area and benzene have been recommended for removal because benzene levels are no longer at a level of concern. The 2008 annual average benzene concentration at Huisache was 0.86 ppb_v and was based on every-sixth-day sampling. The benzene levels

continued a seven-year downward trend and are shown in Figure 1. In addition, the Huisache monitoring site is no longer considered to be located in a residential area as it was when it was first established in 1998. With the exception of one residential lot, the former neighborhood surrounding the Huisache monitoring site is now industrial property. Therefore, the benzene levels described for the Huisache site do not reflect community air quality, but are included in this evaluation primarily to provide continuity of air quality evaluation provided for this site. Given the local meteorology and proximity of the Huisache monitor to industrial sources of benzene, it is expected that these sources would have less influence on benzene concentrations in communities that are farther away from the Huisache site.

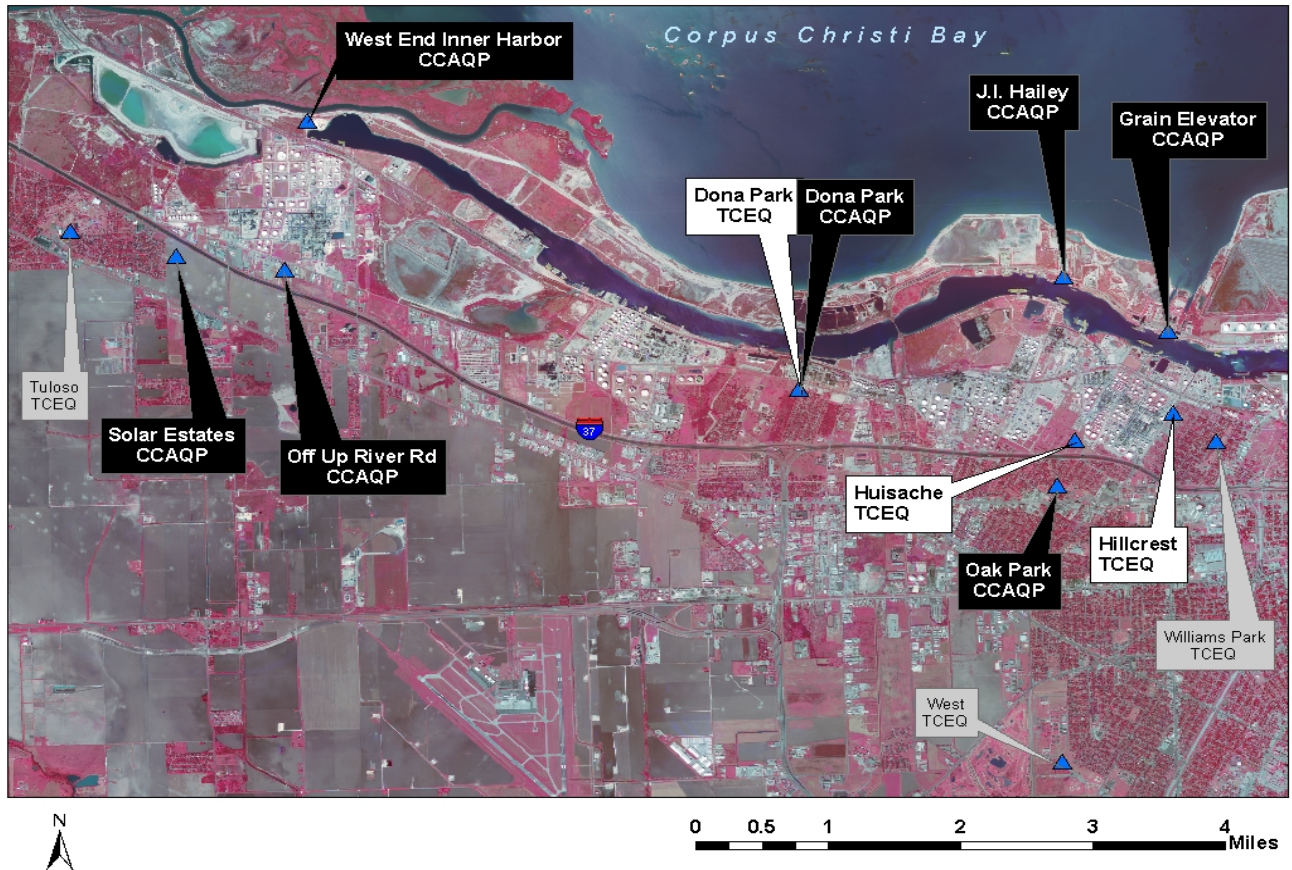


Figure 2: Map of TCEQ (white) and CCAQP (black) Sites Which Provided Ambient Air Measurements for this Evaluation.

Relevant 2008 Mobile Monitoring Trips

City of Corpus Christi Wastewater Treatment Plants- (WWTP)

TCEQ's mobile monitoring team (MMT) surveyed and conducted sulfur sampling downwind of several Corpus Christi WWTPs and identified elevated H₂S levels at the Greenwood and Broadway WWTPs by odors, survey equipment, and by continuous monitoring. The contribution of other total reduced sulfur compounds could not be ascertained because of equipment malfunction.

Downwind of City of Corpus Christi Greenwood WWTP

During sampling on multiple days (April 1 – 3, 2008), MMT reported several elevated 30-minute average H₂S concentrations above the TCEQ's 30-minute net standard (0.080 ppm_v for residential, business, and/or commercial areas and 0.120 ppm_v for industrial areas) downwind of the facility. On April 3, 2008, the MMT also reported odors that were moderate to strong in intensity. The reported maximum downwind 30-minute average H₂S concentration (0.099 ppm_v), which included a peak concentration of 0.187 ppm_v exceeded TCEQ's net 30-minute regulatory standard (0.080 ppm_v) and the odor threshold

(0.005 ppm_v). Short-term exposures to the measured H₂S levels could potentially cause health effects (e.g., eye irritation, decreased lung function, headache) in sensitive individuals. Persistent or recurrent exposures to the moderate to strong odors may cause odor-related health effects such as headaches and nausea in some individuals.

Downwind of City of Corpus Christi Broadway WWTP

TCEQ's mobile monitoring team (MMT) conducted monitoring downwind of the WWTPs in Corpus Christi during March 29 – April 4, and April 21, 2008. During this sampling period, the MMT reported strong septic-type odors downwind of the Corpus Christi Broadway WWTP during the evening, overnight, and early morning hours. During sampling periods over 8 hours on April 3, 2008, staff reported several elevated 30-minute net (i.e., downwind-upwind) average H₂S concentrations above the TCEQ's 30-minute net standard (0.080 ppm_v for residential, business, and/or commercial areas and 0.120 ppm_v for industrial areas) and the odor threshold of 0.005 ppm_v. The maximum reported peak H₂S concentration (0.544 ppm_v), exceeded the working range of the monitor on April 3, 2008. The highest net (downwind-upwind) 30-minute net average concentration (0.356 ppm_v) exceeded the TCEQ's 30-minute net regulatory standard of 0.080 ppm_v by more than 4 times.

Persistent or recurrent exposures to the moderate to strong odors may cause odor-related health effects such as headaches and nausea. Also short-term exposures to the reported peak levels could potentially cause health effects (e.g., eye irritation, decreased lung function) in the general population and especially in sensitive individuals. According to the Agency for Toxic Substances and Disease Registry exposures to low concentrations of H₂S may cause irritation to the eyes, nose, or throat. It may also cause difficulty in breathing for some asthmatics.

The TD recommends reduction in the H₂S levels as this facility is located north of a residential neighborhood and the emissions from this facility could potentially under the right wind conditions negatively impact the nearby neighborhood. Also, this facility is adjacent to an outdoor concert venue and south of the Corpus Christi Hooks Baseball Team-Whataburger Field near downtown, at the intersection of IH 37 and State Highway 35.

Information on the appropriate comparison values can be obtained by contacting the TD (512-239-1795). If you have any questions regarding this memorandum, please do not hesitate to contact me at 512-239-2492 or email me at nerragun@tceq.state.tx.us.

cc: (via email)

Casso, Ruben- EPA Region 6, Dallas
Prosperie, Susan- Department of State Health Services

VOCs (Canister samples)		VOCs (Auto-GC samples)	Metals (PM_{2.5})
1,1,1-Trichloroethane	Cyclopentane	1,2,3-Trimethylbenzene	Aluminum
1,1,2,2-Tetrachloroethane	Cyclopentene	1,2,4-Trimethylbenzene	Antimony
1,1,2-Trichloroethane	Dichlorodifluoromethane	1,3,5-Trimethylbenzene	Arsenic
1,1-Dichloroethane	Ethane	1,3-Butadiene	Barium
1,1-Dichloroethylene	Ethyl Acetate*	1-Butene	Cadmium
1,2,3-Trimethylbenzene	Ethyl Benzene	1-Pentene	Chromium
1,2,4-Trimethylbenzene	Ethylene	2,2,4-Trimethylpentane	Cobalt
1,2-Dibromoethane	Isobutane	2,2-Dimethylbutane	Copper
1,2-Dichloroethane	Isobutyraldehyde*	2,3,4-Trimethylpentane	Manganese
1,2-Dichloropropane	Isopentane	2,3-Dimethylpentane	Molybdenum
1,3,5-Trimethylbenzene	Isoprene	2,4-Dimethylpentane	Nickel
1,3-Butadiene	Isopropylbenzene	2-Methylheptane	Selenium
1-Butene	m-Diethylbenzene	2-Methylhexane	Tin
1-Hexene +2-Methyl-1-Pentene	Methylene Chloride	3-Methylheptane	Zinc
1-Pentene	Methyl Butyl Ketone* (MBK)	3-Methylhexane	
2,2,4-Trimethylpentane	Methyl t-Butyl Ether (MTBE)*	Acetylene	
2,2-Dimethylbutane (Neohexane)	Methylcyclohexane	Benzene	
2,3,4-Trimethylpentane	Methylcyclopentane	c-2-Butene	
2,3-Dimethylbutane	Methylene Chloride	c-2-Pentene	
2,3-Dimethylpentane	Methylisobutylketone*	Cyclohexane	
2,4-Dimethylpentane	m-Ethyltoluene	Cyclopentane	
2-Butanone*	n-Butane	Ethane	
2-Chloropentane	n-Decane	Ethyl Benzene	
2-Methyl-2-Butene	n-Heptane	Ethylene	
2-Methyl-3-Hexanone*	n-Hexane	Isobutane	
2-Methylheptane	n-Nonane	Isopentane	
2-Methylhexane	n-Octane	Isoprene	
2-Methylpentane (Isohexane)	n-Pentane	Isopropylbenzene	
3-Hexanone*	n-Propyl Acetate*	Methylcyclohexane	
3-Methyl-1-Butene	n-Propylbenzene	Methylcyclopentane	
3-Methylheptane	n-Undecane	n-Butane	
3-Methylhexane	o-Ethyltoluene	n-Decane	
3-Methylpentane	o-Xylene	n-Heptane	
3-Pentanone*	p-Diethylbenzene	n-Hexane	
4-Methyl-1-Pentene	p-Ethyltoluene	n-Nonane	
Acetylene	Propane	n-Octane	
Benzene	Propylene	n-Pentane	
Bromomethane	p-Xylene + m-Xylene	n-Propylbenzene	
Butyl Acetate*	Styrene	o-Xylene	
c-1,3-Dichloropropylene	t-2-Butene	Propane	
c-2-Butene	t-2-Hexene	Propylene	
c-2-Hexene	t-2-Pentene	p-Xylene + m-Xylene	
c-2-Pentene	Tetrachloroethylene (Perc)	Styrene	
Carbon Tetrachloride	Toluene	t-2-Butene	
Chlorobenzene	Trans-1-3- Dichloropropylene	t-2-Pentene	
Chloroform	Trichloroethylene	Toluene	
Cyclohexane	Trichlorofluoromethane		
	Vinyl Chloride		

* Chemicals that did not meet data completeness requirements