TCEQ Interoffice Memorandum

To: Lorinda Gardener, Regional Director
Kent Waggoner, Air Section Manager
Ramiro Garcia, Border and South Central Texas Area Director

From: Tiffany Bredfeldt, Ph.D. TB
Toxicology Division, Chief Engineer's Office

Date: August 4, 2011

Subject: Health Effects Review of 2010 Ambient Air Network Monitoring Data in Region 6, El Paso

Conclusions

- Reported short-term concentrations of volatile organic compounds (VOCs) as detected by1-hour automated gas chromatography (autoGC) would not be expected to cause adverse acute health effects, vegetation effects, or odorous conditions.

- Reported annual concentrations of VOCs, polycyclic aromatic hydrocarbons (PAHs), carbonyls, and metals reported as particulate matter with aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) and for one metal measured also in total suspended particulate matter (TSP) would also not be expected to cause long-term adverse human health or vegetation effects.

Background

This memorandum conveys the Toxicology Division's (TD) evaluation of ambient air sampling conducted at eight monitoring sites in Region 6-El Paso during 2010. TCEQ Region 6 monitoring site information is presented in Table 1 along with hyperlinks to detailed information regarding the monitoring sites and their maps. Lists 1-5, which can be found in Attachment A, display the target analytes for five monitoring sites. Three additional sites, Kern, Skyline Park, and Tillman, listed in Table 1 are the location where lead TSP data were collected. The TD reviewed air monitoring summary results from 1-hour automated gas chromatography (autoGC) VOC samples, VOC canister samples collected on a 24-hour every sixth day schedule at Community Air Toxics Monitoring Network (CATMN) monitors, 24-hour metals samples ($PM_{2.5}$ or TSP), 24-hour carbonyl samples, and 24-hour PAH or semivolatile organic compound (SVOC) samples.

The TCEQ Field Operations Support Division (FOSD) reported the data for all chemicals evaluated in this memorandum. Data discussed in this evaluation for all monitoring sites (84 VOCs from canister samples, 46 VOCs from autoGC, 17 carbonyls, 15 metals, and 16 PAHs), met the data completeness objective of 75 percent data return or at least 45 valid samples per year. Since 24-hour samples collected using the every sixth day schedule are designed to provide a representative long-term, ambient concentration for chemicals of concern, annual averages from all 24-hour samples were evaluated using appropriate long-term Air Monitoring Comparison Values (AMCVs) for the potential to adversely impact long-term human health and vegetation effects. Thus, annual average concentrations of carbonyls, metals, PAHs, and VOCs (collected via canister sample), were compared to their respective long-term AMCVs. Reported annual average concentrations of lead ($PM_{2.5}$ or TSP) were compared to the National Ambient Air Quality Standard (NAAQS). Annual average concentrations of VOCs collected via autoGC were also compared to their respective long-term AMCV. Hourly concentrations of VOCs collected by the autoGC were evaluated using the appropriate short-term AMCV. Additional information regarding the derivation and application of AMCVs is available online.

The El Paso Lower Valley monitor measures ambient concentrations of hydrogen sulfide (H_2S) and elevated levels of this chemical have been reported annually at this monitoring station since 2004. Further information regarding historical data collected at this monitoring station and subsequent evaluations of collected data are available from the Air Pollutant Watch List website.

Table 1. Monitoring Sites Located in TCEQ Region 6

City and Site Location	County	Monitor ID	Monitored Compounds
650 R.E. Thomason Loop (Ascarate Park SE)	El Paso	48-141-0055	VOCs[a], Carbonyls, Metals ($PM_{2.5}$)
800 S. San Marcial Street (El Paso Chamizal)	El Paso	48-141-0044	VOCs[b], Carbonyls, Metals ($PM_{2.5}$)
700 San Francisco Ave (El Paso Sun Metro)	El Paso	48-141-0053	VOCs[a], PAHs, Metals ($PM_{2.5}$)
301 East Robinson (Kern)	El Paso	48-141-0033	Lead (TSP)
5050 A Yvette Drive (Skyline Park)	El Paso	48-141-0058	Lead (TSP)
J. Harold Tillman HLT CT 222 S Campbell S (Tillman)	El Paso	48-141-0002	Lead (TSP)
Clark & Cleveland Streets (Womble)	El Paso	48-141-0047	VOCs[a]
Rt.12 and K-Bar Rd. (Bravo Big Bend)	Brewster	48-043-0101	Metals ($PM_{2.5}$)

[a]24-hour canister only ; [b]24-hour canister and one-hour autoGC

Evaluation

VOCs

Hourly average concentrations of the 46 VOCs collected at the Chamizal autoGC monitoring site were below their respective short-term health-, odor-, and vegetation-based AMCVs. Thus, exposure to the reported hourly average concentrations would not be expected to cause adverse human health or welfare effects.

The 2010 annual average concentrations for all 84 VOCs collected as 24-hour canister samples at the Ascarate Park SE, Chamizal, Sun Metro and Womble monitoring sites were well below their respective long-term AMCVs. Similarly, annual average concentrations for the 46 VOCs collected at the Chamizal autoGC monitoring site were also below their long-term AMCVs. Thus, adverse human health or vegetation effects would not be expected to occur as a result of long-term exposure to the reported levels of these chemicals at these monitoring sites.

Carbonyls

Reported annual average concentrations of the 17 carbonyls measured at the Ascarate Park SE and Chamizal monitoring sites were below their respective long-term AMCVs and would not be expected to cause long-term adverse human health effects.

Metals

Reported annual average concentrations for all 14 metals ($PM_{2.5}$) measured at the Bravo Big Bend, Chamizal, and Sun Metro monitoring sites were below their respective AMCVs. In the case of lead ($PM_{2.5}$ or TSP), reported annual average concentrations collected at the Bravo Big Bend, Chamizal, Sun Metro, Kern, Skyline Park, and Tillman monitoring sites were below the lead NAAQS. Thus, none of the reported annual average concentrations for these15 metals ($PM_{2.5}$ or TSP) would be expected to cause long term adverse health effects.

PAHs

The reported annual average concentrations for 15 of the 16 PAHs reported at the Sun Metro monitoring site in 2010 were well below their long-term AMCVs and would not be expected to cause long-term adverse human health effects. Phenanthrene was the only PAH with an annual average concentration (114 ng/m^3) that exceeded the long-term AMCV (50 ng/m^3). Figure 1 shows the annual average phenanthrene concentrations detected at the Sun Metro Monitoring Site from 1996 through the first quarter of 2011.

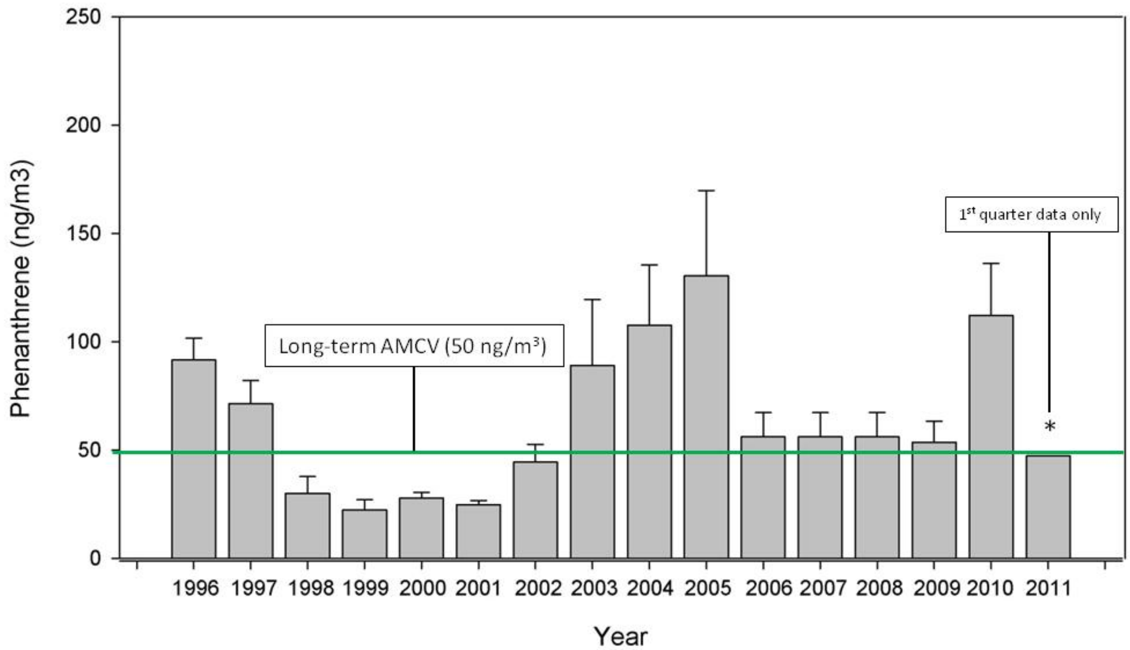

Figure 1. Phenanthrene Annual Average Concentrations at the Sun Metro Monitor for15 Years. Note that bars are mean ± standard error. The 2011 data bar (*) represents only the first quarter phenanthrene concentrations.

Average annual concentrations of phenanthrene for 10 of the past 15 years, 1996, 1997, 2003, 2004, 2005, 2006, 2007, 2008, 2009, and 2010, respectively, have been greater than the long-term AMCV. The 15-year average phenanthrene concentration of 64 ng/m^3 is also greater than the long-term AMCV. The AMCV of 50 ng/m^3 is a conservative interim value calculated from occupational exposure limits. Available literature investigating the toxicity of phenanthrene suggests that it is not carcinogenic to animals and is, therefore, significantly less toxic than the PAH benzo(a)pyrene, which is a known human carcinogen (Fertmann et al., 2002). The difference in toxicity and carcinogenicity appears to be due to metabolism. When phenanthrene enters human or animal bodies it is not metabolized to the same type of chemical intermediates that make benzo(a)pyrene carcinogenic (Hecht et al., 2010). Thus, based on toxicity data and the conservative nature of the long-term, health-based AMCV, we would not expect adverse effects on human health or welfare to occur as a result of exposure to the reported concentration of phenanthrene.

If you have any questions or comments regarding this evaluation, please feel free to contact me at (512) 239-1799 or tiffany.bredfeldt@tceq.texas.gov.

cc (via email):
Casso, Ruben – EPA Region 6, Dallas
Prosperie, Susan – Department of State Health Services

Attachment A

List 1. Target VOC Analytes in Canister Samples

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

List 2. Target Carbonyl Analytes

2,5-Dimethylbenzaldehyde	Formaldehyde	o-Tolualdehyde
Acetaldehyde	Heptaldehyde	Propanal - Propionaldehyde
Acetone	Hexanaldehyde	p-Tolualdehyde
Acrolein	Isovaleraldehyde	Valeraldehyde
Benzaldehyde	Methyl Ethyl Ketone (MEK)/Methacrolein	
Butyraldehyde	m-Tolualdehyde	
Crotonaldehyde - 2-Butenal		

List 3. Target Metal Analytes

Aluminum ($PM_{2.5}$)	Antimony ($PM_{2.5}$)	Arsenic ($PM_{2.5}$)

Barium ($PM_{2.5}$)	Copper ($PM_{2.5}$)	Nickel ($PM_{2.5}$)
Cadmium ($PM_{2.5}$)	Lead ($PM_{2.5}$ or TSP)	Selenium ($PM_{2.5}$)
Chromium ($PM_{2.5}$)	Manganese($PM_{2.5}$)	Tin ($PM_{2.5}$)
Cobalt ($PM_{2.5}$)	Molybdenum ($PM_{2.5}$)	Zinc ($PM_{2.5}$)

List 4. Target PAH Analytes

Acenaphthene	Benzo (ghi) perylene	Indeno (1,2,3-cd) pyrene
Acenaphthylene	Benzo (k) fluoranthene	Naphthalene
Anthracene	Chrysene	Phenanthrene
Benzo (a) anthracene	Dibenzo (a,h) anthracene	Pyrene
Benzo (a) pyrene	Fluoranthene	
Benzo (b) fluoranthene	Fluorene	

List 5. Target VOC Analytes in AutoGC

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	