

Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Leroy Biggers, Regional Director
Charles Murray, Air Section Manager
TCEQ Region 5 – Tyler
Frank Espino, North Central Texas
Area Director

Date: September 25, 2006

From: Roberta L. Grant, Ph.D.
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Subject: Health Effects Review of 2005 Ambient Air Network Monitoring Data in
Region 5, Tyler

Conclusion

- Annual average concentrations of all reported VOCs at both sites were below their long-term Effects Screening Levels (ESLs) and are not a health concern.
- Annual average concentrations of all speciated metals from PM_{2.5} filter samples at the monitoring site located at Highway 143 and Spur 449 in Karnack, were below their long-term ESLs and are not a health concern.
- Reported carbonyl annual average concentrations, including formaldehyde and methyl ethyl ketone/methacrolein which exceeded their long-term ESLs at the monitoring site located at Highway 143 and Spur 449 in Karnack, were not a health concern.

Background

This memorandum conveys the Toxicology Section's evaluation of ambient air sampling conducted at two monitoring network sites in Region 5–Tyler during 2005. Summary results for 24-hour Volatile Organic Compounds (VOCs) and carbonyls collected every sixth day and speciated metals from 24-hour PM_{2.5} filter samples collected every third day from a site located at Highway 143 and Spur 449 in Karnack, Texas, as well as 24-hour VOCs collected every sixth day from a site located at Gregg County Airport in Longview, Texas, were evaluated on a chemical-by-chemical basis. The speciated metals data were only collected from January through August; therefore, this evaluation only covers data collected through August. Information about the monitoring sites, the only locations in TCEQ Region 5 with a monitor, is presented in Table 1. The specific chemicals evaluated are listed in Table 2 and the locations of the sites are shown in Figures 1 and 2.

The TCEQ Monitoring Operations Division reported data for all chemicals evaluated in this memorandum. The data return for the Karnack monitor met completeness requirements for estimating annual average concentrations for all 96 VOCs and for 16 of 17 carbonyls. The data return for the speciated metals was not complete and only represents the first eight months of 2005. Although it does not meet completeness requirements, the data were used for estimating annual average concentrations, with seventy-two 24-hour samples reported for each metal. The data return for the Longview monitor met completeness requirements for estimating annual average concentrations for all 96 VOCs. For all VOCs and carbonyls that met completeness requirements and speciated metals, annual average concentrations were compared to their respective long-term ESLs. 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.

Evaluation

Of 96 reported VOCs, 67 were undetectable at the Longview site and 71 were undetectable at the Karnack site. Of the 14 reported metals and 16 carbonyls at the Karnack monitor, 6 and 2, respectively, were undetectable. All annual average concentrations of VOCs and metals were below their long-term ESLs and would not be expected to cause adverse health effects. With the exception of formaldehyde and methyl ethyl ketone (MEK)/methacrolein, all annual average concentrations of carbonyls that met data completeness requirements were below their long-term ESLs and would not be expected to cause adverse health effects. Data for crotonaldehyde (2-butenal) did not meet completeness requirements and could not be evaluated. Although formaldehyde and MEK/methacrolein exceeded their long-term ESLs at the Karnack monitoring site, these concentrations were not of a health concern. Formaldehyde and MEK/methacrolein are discussed below.

Formaldehyde

The 2005 annual average formaldehyde concentration of 1.3 ppbv slightly exceeded the current long-term ESL of 1.2 ppbv. Assuming continuous lifetime exposure to the measured levels and using the EPA unit risk factor, the excess cancer risk estimate is approximately 2 in 100,000. However, the current EPA formaldehyde unit risk factor, which was promulgated in 1991 based on rat data from a 1987 study, does not represent the best available science in the peer-reviewed literature and is generally believed to substantially overestimate risk. EPA is currently reviewing this risk factor in light of significant new data and analyses. Use of a new risk factor (published in 2004) that incorporates more recent toxicological research affecting formaldehyde carcinogenicity (e.g., anatomical differences between rat and human nasal passages, regional dosimetry throughout the human respiratory tract, mode of action information) results in *de minimus* risk estimates of 1 in 10 million to 2 in 10 million for lifetime exposure to these

formaldehyde levels. The new risk factor is considered more scientifically-defensible as it utilizes more recently available mechanistic and dosimetric science on the dose-response for portal of entry (i.e., respiratory tract) cancers due to formaldehyde exposure.

MEK/Methacrolein

The annual average concentration of MEK/methacrolein (0.15 ppbv) slightly exceeded the methacrolein health-based ESL (0.13 ppbv) but was well below the MEK ESL and odor threshold. MEK and methacrolein are not analytically separated by the method, and it is unknown whether the reported concentrations were only MEK, only methacrolein, or both MEK and methacrolein. However, exposure to the reported MEK/methacrolein concentrations would not be expected to cause adverse health effects even if they were comprised entirely of methacrolein.

Information on ESLs can be obtained by contacting the TCEQ Toxicology Section (512-239-1795) or visiting the ESL website:

<http://www.tceq.state.tx.us/implementation/tox/esl/ESLMain.html>

If you have any questions about this evaluation, please call me at (512) 239-4115 or e-mail me at rgrant@tceq.state.tx.us.

Table 1. Monitoring Sites Located in TCEQ Region 5				
City and Site Location	County	Monitor ID	Monitored Compounds	Begin Date
Longview, Gregg County Airport	Gregg	481830001	VOCs	November 5, 1997
Karnack, Highway 143 and Spur 449	Harrison	482030002	VOCs, carbonyls, and metals (PM _{2.5})	August 28, 2001

Table 2. Monitored Chemicals		
CATMN VOCs		
1,1,1-Trichloroethane	Acetylene	c-2-Hexene
1,1,2,2-Tetrachloroethane	Benzene	c-2-Pentene
1,1,2-Trichloroethane	Bromomethane	Dichlorodifluoromethane
1,1-Dichloroethane	Butyl Acetate	Isobutyraldehyde
1,1-Dichloroethylene	cis 1,3-Dichloropropylene	m-Diethylbenzene
1,2,3-Trimethylbenzene	Carbon Tetrachloride	m-Ethyltoluene
1,2,4-Trimethylbenzene	Chlorobenzene	Methyl Chloride
1,2-Dibromoethane	Chloroform	n-Butane
1,2-Dichloroethane	Chloroprene	n-Decane
1,2-Dichloropropane	Cyclohexane	n-Heptane
1,3,5-Trimethylbenzene	Cyclopentane	n-Hexane
1,3-Butadiene	Cyclopentene	n-Nonane
1-Butene	Ethane	n-Octane
1-Hexene+2-methyl-1-pentene	Ethyl Acetate	n-Pentane
1-Pentene	Ethyl Benzene	n-Propyl Acetate
2,2,4-Trimethylpentane	Ethylene	n-Propylbenzene
2,2-Dimethylbutane - Neohexane	Isobutane	n-Undecane
2,3,4-Trimethylpentane	Isopentane	o-Ethyltoluene
2,3-Dimethylbutane	Isoprene	o-Xylene
2,3-Dimethylpentane	Isopropylbenzene	p-Diethylbenzene
2,4-Dimethylpentane	Methyl Butyl Ketone (MBK)	p-Ethyltoluene
2-Butanone	Methyl t-Butyl ether	p-Xylene + m-Xylene
2-Chloropentane	Methylcyclohexane	t-2-Butene
2-Methyl-2-Butene	Methylcyclopentane	t-2-Hexene

Table 2. Monitored Chemicals		
2-Methylheptane	Methylene Chloride	t-2-Pentene
2-Methylhexane	Methylisobutylketone	trans-1-3-Dichloropropylene
2-Methylpentane - Isohexane	Propane	
2-Methyl-3-hexanone	Propylene	
3-Methyl-1-Butene	Styrene	
3-Methylheptane	Tetrachloroethylene - Perchloroethylene	
3-Methylhexane	Toluene	
3-Methylpentane	Trichloroethylene	
3-Hexanone	Trichlorofluoromethane	
3-Pentanone	Vinyl Chloride	
4-Methyl-1-Pentene	c-2-Butene	
Carbonyls		
2,5-Dimethylbenzaldehyde	Crotonaldehyde - 2-Butenal	Propanal - Propionaldehyde
Acetaldehyde	Formaldehyde	Valeraldehyde
Acetone	Heptaldehyde	m-Tolualdehyde
Acrolein	Hexanaldehyde	o-Tolualdehyde
Benzaldehyde	Isovaleraldehyde	p-Tolualdehyde
Butyraldehyde	MEK/Methacrolein	
Metals (PM_{2.5})		
Aluminum	Chromium	Nickel
Antimony	Cobalt	Selenium
Arsenic	Copper	Tin
Barium	Manganese	Zinc
Cadmium	Molybdenum	

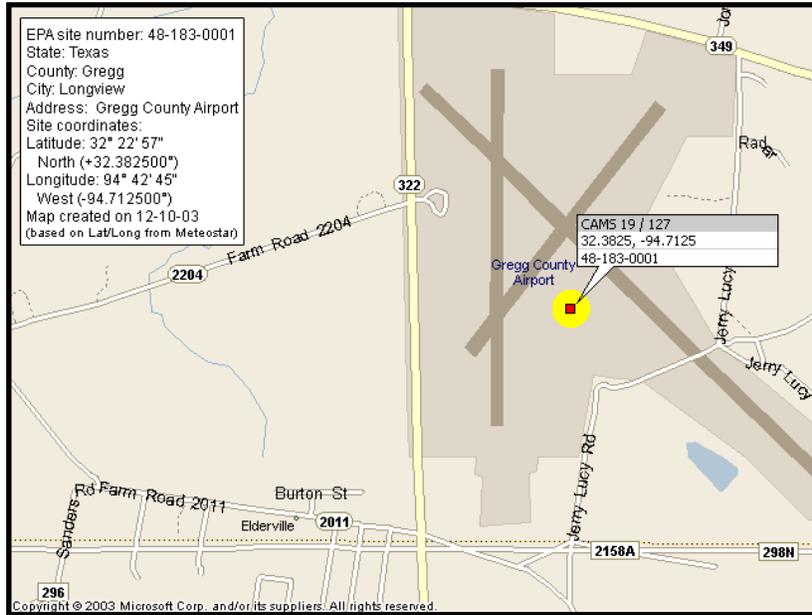


Figure 1. Location of Gregg County Airport Monitor

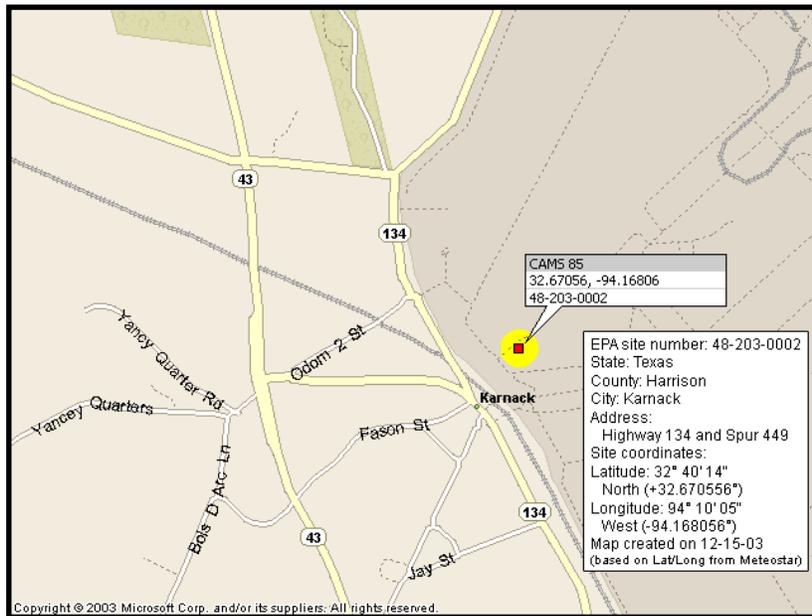


Figure 2. Location of Karnack Monitoring Site

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