Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

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Date: December 14, 2009

From: Gulan Sun, Ph.D. G. S.
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Subject: Health Effects Review of 2008 Ambient Air Network Monitoring Sites in Region 4- Dallas/Fort Worth

Conclusions

- All hourly average concentrations of the 46 volatile organic compounds (VOCs) reported at Texas Commission on Environmental Quality (TCEQ) Region 4-Dallas/Fort Worth automated gas chromatograph (autoGC) monitoring sites were below their TCEQ short-term, health-based comparison values and odor thresholds, and would not be expected to cause short-term adverse health effects or odor concerns.
- Annual average concentrations of the 46 VOCs from 1-hour autoGC , 84 VOCs from 24-hour canisters , 17 carbonyls, 14 metals (measured as particulate matter with an aerodynamic diameter 2.5 microns or less, $PM_{2.5}$) and 2 metals (measured as Total Suspended Particulate (TSP)) reported at TCEQ Region 4-Dallas/Fort Worth monitoring sites, except nickel TSP at Dallas-Morrell site, were below their TCEQ long-term, health-based comparison values and would not be expected to cause chronic adverse health effects.
- Annual nickel TSP levels at the Dallas-Morrell site exceeded the long-term, health-based comparison values in 2008. Elevated annual nickel levels have been detected at the Morrell site since 1987. Metallic nickel is likely the major form of nickel detected at the site due to emissions from Dal Chrome Co., Inc. However, the presence of other nickel species in the particulate matter samples and other nickel sources in the area cannot be excluded. A special monitoring study is being conducted at the Dallas-Morrell site, where a new monitor collecting inhalable $PM_{2.5}$ is co-located with the same sampling schedule of the current TSP monitor. The study will identify the percentage of inhalable $PM_{2.5}$ out of TSP. Toxicology Division (TD) advises reductions in nickel concentrations to levels less than or equal to 0.06 microgram per cubic meter ($\mu g/m^3$). Nickel will remain on the TCEQ's Air Pollutant Watch List (APWL) at the Dallas-Morrell site.
- Air quality impacted by Barnett Shale activities is currently under investigation.

Background

Ambient air sampling conducted at monitoring network sites in Region 4-Dallas/FortWorth during 2008 was evaluated by the TD. Table 1 contains information regarding the 11 air toxics monitoring sites located in Region 4-Dallas/Forth Worth. Of the 11 sites, one site in Dallas County (EPA Site ID 48-113-0057) has historically reported VOC concentrations well below health-based comparison values or odor thresholds, and therefore was deactivated on February 29, 2008, and will not be evaluated in this review. The TD reviewed air monitoring summary results for VOCs and carbonyls from one-hour and 24-hour samples collected continuously and/or every sixth day. Metals from 24-hour filter samples (either as $PM_{2.5}$ or TSP) collected every third or sixth day were also reviewed by TD. For a complete list of all chemicals evaluated, please see Table 2.

The TCEQ Monitoring Operations Division reported the data for all chemicals evaluated in this memorandum. The target analyte list of 95 VOCs 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 an asterisk on the target analyte table (Table 2). All other data (84 VOCs (canister), 46 VOCs (autoGC), 17 carbonyls, 14 metals ($PM_{2.5}$), and two metals (TSP)) highlighted in this evaluation met TCEQ's data completeness objective of 75 percent data return.

One-hour autoGC VOC samples were compared to TCEQ's short-term appropriate comparison values. Twenty-four-hour air samples collected every third or sixth day for a year are designed to provide representative long-term average concentrations. The TD evaluated the reported annual average concentrations from 1-hour autoGC and 24-hour samples for each target analyte for potential chronic health and vegetation concerns by comparing measured chemical concentrations to long-term TCEQ appropriate comparison values. 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.

Information on the appropriate comparison values can be obtained by contacting the TD at 512-239-1795 or by visiting the TCEQ website:
http://www.tceq.state.tx.us/implementation/tox/esl/ESLMain.html

Table 1: Monitoring Site Information for Region 4-Dallas/Fort Worth

County	City and Site Location	EPA Site ID	Monitored Compounds
Dallas	Dallas, 1415 Hinton St.	48-113-0069	VOCs[a], Carbonyl, Metals ($PM_{2.5}$)
Dallas	Dallas, 3004 N. Westmoreland	48-113-0057 (inactive on February 29, 2008)	VOCs[b]
Dallas	Dallas, 3049 Morrell St	48-113-0018	Metals (TSP)
Dallas	Dallas, 717 South Akard Street	48-113-0050	Metals ($PM_{2.5}$)
Denton	Denton, Denton Municipal Airport	48-121-0034	VOCs[b]
Ellis	Midlothian, 2725 Old Fort Worth Road.	48-139-0016	VOCs[b], Metals ($PM_{2.5}$)
Ellis	900 FM 667 Ellis County	48-139-1044	VOCs[b]
Kaufman	Kaufman, 3790 South Houston St.	48-257-0005	VOCs[b]
Tarrant	Fort Worth (Northwest), 3317 Ross Avenue	48-439-1002	VOCs[a], Carbonyl
Tarrant	Grapevine, 4100 Fairway Dr.	48-439-3009	VOCs[b]
Hunt	Greenville, 824 Sayle St	48-231-1006	VOCs[b]

[a]24-hour Canister and One-hour AutoGC; [b] 24-hour Canister only.

Evaluation

VOCs

Hourly average concentrations of the 46 VOCs reported at the two autoGC sites at Fort Worth-Northwest and Dallas-Hinton were below their respective short-term, health-based comparison values and odor thresholds. Exposures to the reported hourly average concentrations would not be expected to cause adverse short-term health effects or odor concerns.

Annual average concentrations of the 46 VOCs reported at the two 1-hour autoGC sites and the 84 VOCs reported at each of the eight 24-hour canister monitoring sites for 2008 were well below their respective long-term appropriate comparison values. Exposure to the reported annual average concentrations would not be expected to cause chronic adverse health or vegetative effects.

Carbonyls

Annual average concentrations of the 17 carbonyls reported at the Fort Worth-Northwest and Dallas-Hinton sites were below long-term appropriate comparison values. Exposure to the reported annual average concentrations would not be expected to cause chronic adverse health effects.

Metals

At the three sites reporting speciated $PM_{2.5}$ metals data, annual average concentrations of all 14 metals were well below their respective long-term, health-based comparison values. Exposures to the reported levels of these metals would not be expected to cause chronic adverse health effects.

At the Dallas-Morrell site, only nickel and chromium measured as TSP were reported. The annual average concentration of chromium TSP was below its long-term, health-based comparison level. Exposure to the reported annual concentration of chromium TSP would not be expected to cause chronic adverse health effects. The annual average concentration of nickel (as TSP) was above the long-term comparison value, as discussed below in APWL section.

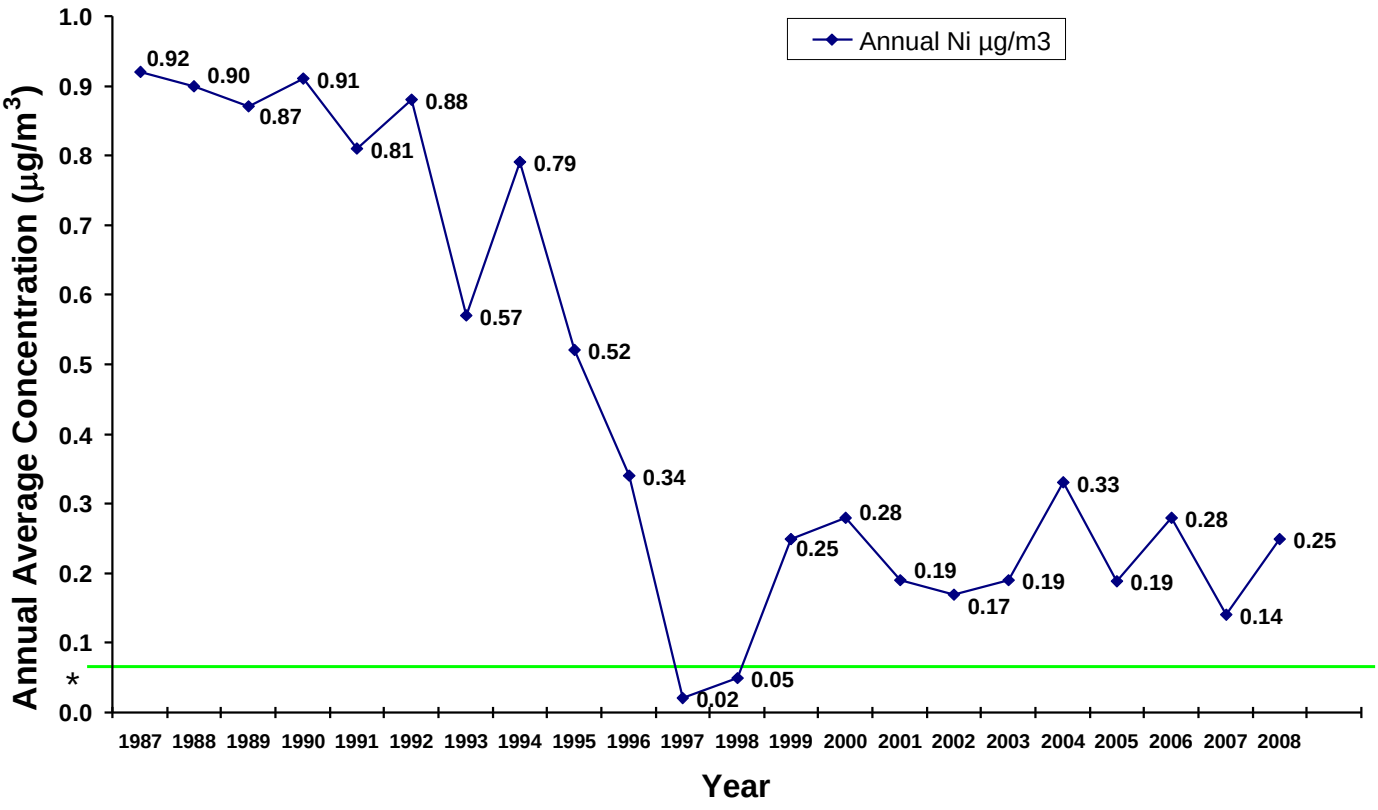
Air Pollutant Watch List Area (APWL0401, Nickel)

The 2008 annual average nickel TSP concentration of 0.25 $\mu g/m^3$ exceeded the current long-term comparison value of 0.015 $\mu g/m^3$ and the TCEQ's long-term goal of no greater than 0.06 $\mu g/m^3$ for ambient nickel levels. The long-term comparison value for nickel is currently under review by the TD, and the goal of no greater than 0.06 $\mu g/m^3$ for the annual average is based on a risk factor published in USEPA 1999 National-Scale Air Toxic Assessment that conservatively assumes that 65% of nickel emissions are in the forms of nickel that may be carcinogenic. The air monitoring data from the Dallas-Morrell site are representative of total nickel concentration, and do not indicate the specific forms of nickel. Dal Chrome Co., Inc. is known to emit mainly metallic nickel and is expected to be the predominant nickel emissions source in the vicinity of the Dallas-Morrell site. Metallic nickel is considered to be a non-carcinogenic form of nickel.

Elevated annual nickel levels have been detected at the Morrell site since 1987. From 1987 through 1994, the annual nickel concentrations ranged approximately from 0.6 to 0.9 $\mu g/m^3$. Beginning in 1995, the annual nickel levels decreased and since 1997 have stabilized in the range of 0.1 to 0.3 $\mu g/m^3$ (Figure 1). The reductions in annual nickel levels first observed in 1995 are attributed to actions taken by Dal Chrome, which is located upwind from the Morrell site.

Different chemical forms of nickel are known to have widely different biological effects. Characterization of the concentration and speciation of nickel compounds in particulate fractions of ambient air is the best way to quantify the risks associated with exposure. However, it is currently not feasible due to lack of standard protocol. A special monitoring study is being conducted at the Dallas-Morrell site, where a new monitor collecting inhalable $PM_{2.5}$ is co-located with the same sampling schedule of the current TSP monitor. The study, in part, will identify the percentage of inhalable $PM_{2.5}$ out of TSP. Nickel will continue to be monitored and assessed at the Dallas-Morrell site, and the TD advises reductions in nickel concentrations to annual average levels less than or equal to 0.06 $\mu g/m^3$ to reflect TCEQ's long-term goal. Nickel will remain on TCEQ's APWL at the Dallas-Morrell site.

Figure 1: Annual Nickel (μg/m³) at the Dallas-Morrell Site



*** 0.06 μg/m³ reflects TCEQ's long-term goal for ambient Nickel levels**

Investigations of Air Quality Impacted by Barnett Shale Activities

The TCEQ has conducted three mobile monitoring trips this year to monitor emissions from natural gas operations in the Barnett Shale area: August 24-28, October 9-16, and November 16-20, 2009. The first two trips included surveying the area using the GasFind IR camera, total vapor analyzers, hydrogen sulfide monitors, monitoring for nitrogen oxides, and collecting VOCs (canister and real-time gas chromatograph). Over sixty locations were monitored in the five county areas of Tarrant, Parker, Wise, Denton, and Johnson counties. The third trip included monitoring for sulfur-based compounds including carbon disulfide and VOCs. A fourth trip is tentatively planned for spring 2010 to look at specific characteristics of emissions from different types of sources and off-site impacts from identified sources.

The TCEQ currently has a contract with the University of Texas at Austin (UT) to conduct ambient monitoring in the Barnett Shale area. The UT monitoring van is outfitted with instruments to sample ambient air quality around oil and gas facilities. The purpose of the project

is to sample ambient emissions, primarily downwind of gas compressor engines, and develop typical compressor engine ambient signature of emissions. Additional emission signatures will be developed for oil and gas wells and pipelines. These signatures should allow the agency to identify the impact gas compressors and oil/gas extraction has on ozone levels in the Dallas/Forth Worth area under varying conditions.

For more information about Barnett Shale activities and potential health effects resulted from emissions from overall oil and gas operations, you may visit TCEQ website at http://www.tceq.state.tx.us/implementation/barnettshale/bshale-main.

If you have any questions about this evaluation, please call me at (512)-239-1336 or email me at gsun@tceq.state.tx.us.

cc (via email):
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Table 2: Target Analytes for Ambient Air Monitoring Network in Region 4-Dallas/Fort Worth

CATMN VOCs		Metals
1,1,1-Trichloroethane 1,1,2,2-tetrachloroethane 1,1,2-Trichloroethane 1,1-Dichloroethylene 1,2,3-Trimethylbenzene 1,2,4-Trimethylbenzene 1,2-Dibromoethane 1,2-Dichloroethane 1,2-Dichloropropane 1,3,5-Trimethylbenzene 1,3-Butadiene 1-Butene 1-Hexene+2-methyl-1-pentene 1-Pentene 2,2,4-Trimethylpentane 2,2-Dimethylbutane - Neohexane 2,3,4-Trimethylpentane 2,3-Dimethylbutane 2,3-Dimethylpentane 2,4-Dimethylpentane 2-Butanone* 2-Chloropentane 2-Methyl-2-Butene 2-Methylheptane 2-Methylhexane 2-Methylpentane - Isohexane 2-methyl-3-hexanone* 3-Methyl-1-Butene 3-Methylheptane 3-Methylhexane 3-Methylpentane 3-hexanone* 3-pentanone* 4-Methyl-1-Pentene Acetylene Benzene Bromomethane Butyl Acetate* Cis 1,3-dichloropropylene Carbon Tetrachloride Chlorobenzene Chloroform Chloroprene Cyclohexane Cyclopentane Cyclopentene Ethane Ethyl Acetate*	Ethyl Benzene Ethylene Isobutane Isopentane Isoprene Isopropylbenzene Methyl Butyl Ketone (MBK)* Methyl t-Butyl ether* Methylcyclohexane Methylcyclopentane Methylene Chloride Methylisobutylketone* Propane Propylene Styrene Tetrachloroethylene - Perchloroethylene Toluene Trichloroethylene Trichlorofluoromethane Vinyl Chloride c-2-Butene c-2-Hexene c-2-Pentene dichlorodifluoromethane isobutyraldehyde* m-Diethylbenzene m-Ethyltoluene methyl chloride n-Butane n-Decane n-Heptane n-Hexane n-Nonane n-Octane n-Pentane n-Propyl Acetate* n-Propylbenzene n-Undecane o-Ethyltoluene o-Xylene p-Diethylbenzene p-Ethyltoluene p-Xylene + m-Xylene t-2-Butene t-2-Hexene t-2-Pentene trans-1-3-dichloropropylene	Aluminum ($PM_{2.5}$) Antimony ($PM_{2.5}$) Arsenic ($PM_{2.5}$) Barium ($PM_{2.5}$) Cadmium ($PM_{2.5}$) Chromium ($PM_{2.5}$, TSP) Cobalt ($PM_{2.5}$) Copper ($PM_{2.5}$) Manganese($PM_{2.5}$) Molybdenum ($PM_{2.5}$) Nickel ($PM_{2.5}$, TSP) Selenium ($PM_{2.5}$) Tin ($PM_{2.5}$) Zinc ($PM_{2.5}$)

* Chemicals that did not meet data completeness requirements

AutoGC VOCs		Carbonyls
1,2,3-Trimethylbenzene 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene 1,3-Butadiene 1-Butene 1-Pentene 2,2,4-Trimethylpentane 2,2-Dimethylbutane 2,3,4-Trimethylpentane 2,3-Dimethylpentane 2,4-Dimethylpentane 2-Methylheptane 2-Methylhexane 3-Methylheptane 3-Methylhexane Acetylene Benzene Cyclohexane Cyclopentane Ethane Ethyl Benzene Ethylene Isobutane Isopentane Isoprene Isopropyl Benzene (Cumene) Methylcyclohexane Methylcyclopentane Propane Propylene Styrene Toluene c-2-Butene c-2-Pentene n-Butane	n-Decane n-Heptane n-Hexane n-Nonane n-Octane n-Pentane n-Propylbenzene o-Xylene p-Xylene + m-Xylene t-2-Butene t-2-Pentene	2,5-Dimethylbenzaldehyde Acetaldehyde Acetone Acrolein Benzaldehyde Butyraldehyde Crotonaldehyde (2-Butenal) Formaldehyde Heptaldehyde Hexanaldehyde Isovaleraldehyde m-Tolualdehyde MEK/Methacrolein o-Tolualdehyde p-Tolualdehyde Propanal (Propionaldehyde) Valeraldehyde