

STATE OF MISSOURI  
**DEPARTMENT OF NATURAL RESOURCES**

Bob Holden, Governor • Stephen M. Mahfood, Director

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**MEMORANDUM**

DATE: **JUN 15 2004**

TO: Ed Galbraith, Director  
Hazardous Waste Program, ALPD

FROM: *STM*  
Leanne Tippet Mosby, Director  
Air Pollution Control Program, ALPD

SUBJECT: Ambient Benzene Concentrations in Various Airsheds

The Air Pollution Control Program, cooperating with other agencies and interested parties, recently participated in three ambient air quality studies in which the Program determined ambient benzene concentrations. These studies occurred in St. Louis City, Kansas City, and Sugar Creek, all within the past four years. Each study reported detecting various concentrations of benzene in the ambient air.

The purpose of one of these studies was to determine the baseline ambient concentrations of hazardous air pollutants in St. Louis City and Kansas City. On July 20, 2000, at the corner of 11<sup>th</sup> and Cass in St. Louis City, a SUMMA canister collected, and subsequent chemical analysis quantified, an ambient benzene concentration of 5.10 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) during a 12-hour collection.

A month later, on August 23 and 24, 2000, unusually high concentrations of benzene were detected in Kansas City. At Richard Berkley Park, the Fourier Transform Infrared Spectrometer measured benzene at an average ambient concentration of  $198 \mu\text{g}/\text{m}^3$  for 3.5 hours. At the same time and location, a SUMMA canister collected, and subsequent chemical analysis quantified, an ambient benzene concentration of  $140 \mu\text{g}/\text{m}^3$  during a 12-hour collection. A day later at the Truman Sports Complex, a SUMMA canister collected, and subsequent chemical analysis quantified, an ambient benzene concentration of  $99 \mu\text{g}/\text{m}^3$  during a 12-hour collection.

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Ed Galbraith  
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Prior and subsequent to these two sampling events, benzene concentrations were consistently measured at least an order of magnitude smaller. For example, on August 28, 2001, SUMMA canisters collected 24-hour ambient air samples at Richard Berkley Park and the North Kansas City PM<sub>2.5</sub> (particulate matter smaller than 2.5 microns) monitoring site. Later chemical analyses of these ambient air samples did not quantify a detectable amount of benzene present in these samples. An explanation for the high ambient benzene concentrations detected in Kansas City on August 23 and 24, 2000 still remains unknown.

The second study was part of a petitioned Health Consultation of the former AMOCO Oil refinery in Sugar Creek. As part of this Health Consultation, Environmental Services Program staff collected 24-hour composite ambient air samples in SUMMA canisters, every third day from February 3 to April 7, 2001, near the former refinery site. Chemical analyses of the canister contents yielded a 24-hour average ambient benzene concentration as high as 1.3 parts per billion (ppb).

The St. Louis Community Air Project was the third project in which the Program determined ambient benzene concentrations. In this study, St. Louis City staff collected 24-hour composite ambient air samples in SUMMA canisters every sixth day from May 13, 2001 through December 20, 2003 at the Grant School site, and from May 13, 2001 through May 14, 2002 at the Grattan Street and Kristof's Market sites. Chemical analyses of the canister contents yielded the annual average ambient benzene concentrations at the following sites:

- Grant School: 0.468 parts per billion by volume (ppbv) (2.13 ppbv 24-hour max).
- Grattan Street: 0.410 ppbv (2.18 ppbv 24-hour max).
- Kristof's Market: 0.455 ppbv (1.37 ppbv 24-hour max).

The annual average ambient benzene concentration for all three sites was 0.444 ppbv. These data, as well as the other data, are presented in a convenient format in the attached table.

Of further interest to you might be the findings of the U.S. Environmental Protection Agency's (EPA) National Air Toxics Assessment (NATA). Using emissions data and computer air dispersion modeling, U.S. EPA staff estimated the statewide annual average ambient benzene concentration and a background ambient benzene concentration. For Missouri, NATA reported that the statewide annual average ambient benzene concentration was 1.21  $\mu\text{g}/\text{m}^3$ , and the background ambient benzene concentration was 0.48  $\mu\text{g}/\text{m}^3$ .

LTM:egb

Attachment

**TABLE I — Ambient Air Quality Studies Reporting Measurable Benzene Concentrations**

Study, Location, and Year	Analytical Method	Duration (Hours)	Ambient Concentration	
			( $\mu\text{g}/\text{m}^3$ ) <sup>a</sup>	(ppb) <sup>b,c</sup>
<b>Baseline Hazardous Air Pollutants</b>				
St. Louis City, 11 <sup>th</sup> and Cass, 2000	SUMMA Canister	12	5.10	1.56
Kansas City, Richard Berkley Park, 2000	FTIR Spectrometer	3.5	198.0	60.74
Kansas City, Richard Berkley Park, 2000	SUMMA Canister	12	140.0	42.94
Kansas City, Truman Sports Complex, 2000	SUMMA Canister	12	99.0	30.37
Kansas City, Richard Berkley Park, 2001	SUMMA Canister	24	ND <sup>d</sup>	ND <sup>d</sup>
North Kansas City, PM <sub>2.5</sub> <sup>e</sup> Monitoring Site, 2001	SUMMA Canister	24	ND <sup>d</sup>	ND <sup>d</sup>
<b>Health Consultation</b>				
Sugar Creek, Former AMOCO Refinery Site	SUMMA Canister	24	4.24	1.3
<b>St. Louis Community Air Project</b>				
Grant School	SUMMA Canister	Annual	1.52	0.468
		24 max	7.09	2.18
		24 2 <sup>nd</sup> max	2.37	.73
Grattan Street	SUMMA Canister	Annual	1.34	0.410
		24 max	6.93	2.13
		24 2 <sup>nd</sup> max	2.99	.92
Kristof's Market	SUMMA Canister	Annual	1.48	0.455
		24 max	4.46	1.37
		24 2 <sup>nd</sup> max	3.38	1.04

<sup>a</sup>  $\mu\text{g}/\text{m}^3$  = micrograms per cubic meter

<sup>b</sup> ppb = parts per billion

<sup>c</sup> 1 ppb = 3.26  $\mu\text{g}/\text{m}^3$

<sup>d</sup> ND = not detected

<sup>e</sup> PM<sub>2.5</sub> = particulate matter smaller than 2.5 microns