

# Office of Science

## Research Project Summary

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### Additional Air Monitoring in Paterson Study (AAMPS)

#### Author

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#### Abstract

The United States Environmental Protection Agency (USEPA) awarded funding to the New Jersey Department of Environmental Protection (NJDEP) for an additional year of air toxics monitoring in Paterson City, N.J. to follow up on findings from the Urban Community Air Toxics Monitoring Project, Paterson City, NJ (UCAMPP) study conducted during 2005-2006. In the earlier study, temporarily elevated levels of p-dichlorobenzene at one (176 Broadway) of the three monitoring locations in Paterson resulted in community concerns about the possible long-term implications of this exposure. The Additional Air Monitoring in Paterson Study's (AAMPS) main purpose was to determine if concentrations of p-dichlorobenzene would become elevated again or if this excursion was an isolated event. A secondary goal of the project was to obtain more information on the sources of an additional six air toxics, benzene, 1,3-butadiene, carbon tetrachloride, chloroform, chloromethane and tetrachloroethylene, that were found to be above the health benchmark during UCAMPP. The majority of the risk associated with these air toxics is primarily from mobile sources. These chemicals are generally elevated throughout New Jersey. AAMPS air toxics monitoring occurred from April 2010 through May 2011. Two types of air samples were collected; vacuum canisters were analyzed by the USEPA TO-15 method and Organic Vapor Monitors were used for spatial saturation sampling. Concentrations and associated risks observed during AAMPS were very similar to those observed during UCAMPP and also similar to those observed in other areas in New Jersey. In contrast to UCAMPP, no elevation in p-dichlorobenzene was observed compared to background levels. None of the facilities adjacent to 176 Broadway used p-dichlorobenzene, even in small quantities. The investigation by NJDEP's Compliance and Enforcement program area identified nine potential sources of p-dichlorobenzene in and around Paterson. Of these nine potential sources, one was located in Clifton but it was too far away and the prevailing wind direction on days in 2006 with elevated levels precluded this company as the source, four other facilities did not use/make p-dichlorobenzene and four other facilities had closed and there were no records available. Based upon the investigation by NJDEP's Compliance and Enforcement program area, on-the-ground knowledge of the facilities by NJDEP inspectors and prevailing wind direction, the most likely source would have been Galaxy Chemical. This facility shut down and no records are available from 2006. Thus, there is a good possibility that the source of the p-dichlorobenzene no longer exists. The spatial saturation sampling did not reveal any patterns that could be associated with sources.

#### Introduction

The United States Environmental Protection Agency (USEPA) awarded \$157,984 to the New Jersey Department of Environmental Protection (NJDEP) for an additional year of air toxics monitoring in Paterson City, N.J. This funding was awarded in recognition of community concerns regarding an increase and subsequent decrease in concentrations of p-dichlorobenzene measured over a two month period at one of three monitoring locations in Paterson as part of the Urban Community Air Toxics Monitoring Project, Paterson City, NJ (UCAMPP); see <http://www.state.nj.us/dep/dsr/paterson/index.htm> for more information on UCAMPP. UCAMPP was funded by the USEPA as part of its competitive grants program: National Air Toxics Monitoring Program-Community Assessments. This program is designed to fund pilot projects to help air pollution control agencies

characterize, track and reduce air pollutants. Paterson was chosen because it is a good example of an urban setting in which industrial, mobile, commercial and residential areas are in close proximity to each other and not because it has unusual or severe air quality problems. Of the 132 air pollutants that were investigated during UCAMPP, only p-dichlorobenzene was found at levels higher than are typical for a New Jersey urban setting.

The NJDEP Compliance and Enforcement program worked to identify the source of the elevated concentrations of p-dichlorobenzene. This investigation involved a review of agency databases, on-site inspections at facilities in the general area and communication with county and local health officials regarding potential sources of p-dichlorobenzene in the area. Based on consideration of prevailing wind direction and consulta-

tion with NJDEP field inspectors, it appeared likely that the source of these elevated concentrations, Galaxy Chemical, had shut down. Nonetheless, given the ongoing uncertainty about the source of this observed elevation, NJDEP and USEPA determined that an additional year of air monitoring was warranted.

The Additional Air Monitoring in Paterson Study's (AAMPS) main purpose was to determine if concentrations of p-dichlorobenzene would become elevated again. A secondary goal of the project was to obtain additional information on the sources of the additional six air toxics that were found to be above the health benchmark (a lifetime increase of one-in-a-million cancer risk) during UCAMPP. These six chemicals are also elevated in other parts of New Jersey.

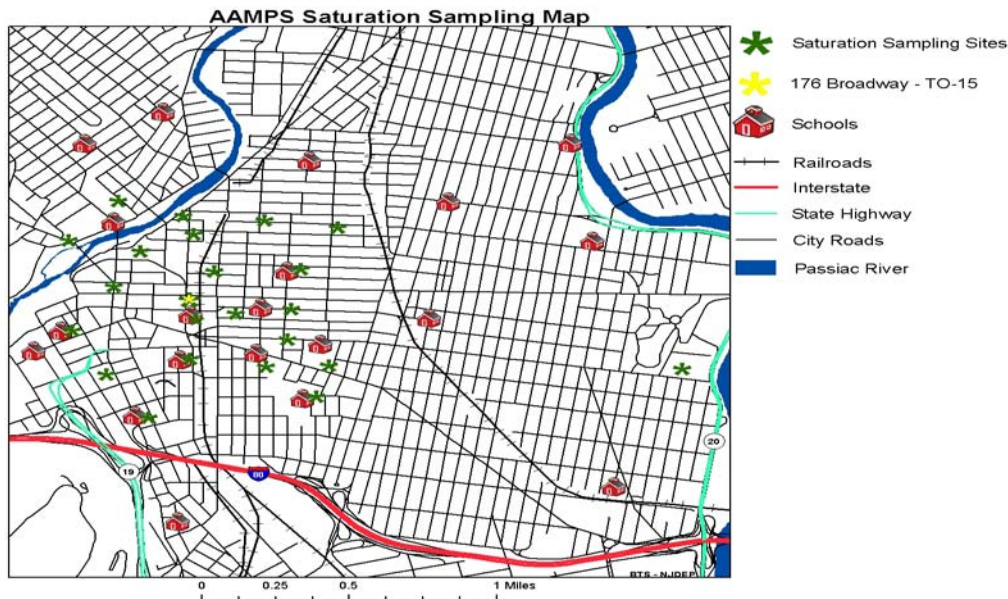
Ambient air toxics constitute a large group of compounds which can be emitted from a single source or a wide variety of stationary and mobile sources. Mobile sources (e.g., motor vehicles) are the largest sources contributing to ambient air toxics in urban areas (NATA 2005 <http://www.nj.gov/dep/airtoxics/nataest05.htm>). Epidemiological studies have shown an association between exposure to elevated concentrations of air toxics and adverse health effects, including respiratory and cardiovascular diseases, cancer, and neurological, reproductive, and developmental effects (Bascom et al. 1996; Delfino 2002; Dockery et al. 1993; Hagen et al. 2000; Leikauf 1992; Norback et al. 1995).

### Study Design and Methods

Two types of air toxic samples were collected in Paterson. One type was collected in the same way (24-hour TO-15 method using a vacuum canister) as was done in the earlier UCAMPP study. This is also the same method that is used at the three NJDEP permanent air toxics monitoring locations around the state (Chester, New Brunswick and Elizabeth). Using the same method allows for a direct comparison to the other sites around the state. The TO-15 method has the ability to identify up to sixty air toxics. The other type of sample was taken with passive Organic Vapor Monitors (OVM 3500, 3 M Company, Maplewood, MN). These badges are commonly used for occupational exposure monitoring and that method (OSHA 7) was modified for ambient air samples. The OVM samples were deployed for three days each time and were analyzed for benzene, ethylbenzene, carbon tetrachloride, chloroform, tetrachloroethylene, and p-dichlorobenzene. These compounds were chosen because they were measured at levels above the NJDEP health benchmark during UCAMPP and they could be quantified with this method.

The canister TO-15 samples were collected at 176 Broadway, which is the location where the elevated levels of p-dichlorobenzene were observed during UCAMPP. These samples were collected every twelve days to coincide with measurements obtained at the three other monitoring locations around the state.

The badges were deployed at 23 locations at and around 176 Broadway five times over the course of the year. This type of sampling is commonly known as spatial saturation sampling.



Sampling began on 4/26/10 and ended on 5/15/11. A total of 38 canister samples and 155 badge samples were collected during the year of monitoring.

### Results

No elevated levels of p-dichlorobenzene were observed in any of the samples collected. The concentrations measured in AAMPS were similar to those measured in the earlier UCAMPP study prior to the 2-month elevation.

The air toxics that were measured above the NJDEP health benchmark and selected for saturation sampling on the basis of chronic cancer risk, were the same as those in UCAMPP and at the three permanent NJDEP air toxics. They are: benzene, carbon tetrachloride, chloroform, ethylbenzene, p-dichlorobenzene, and tetrachloroethylene (PERC). 1,3-butadiene could not be quantified with the OVM badges. Across New Jersey, these compounds typically have a slightly greater risk than the NJDEP health benchmark of  $1 \times 10^{-6}$ . A health benchmark is a chemical-specific air concentration reflecting a policy-based determination of a level of *de minimus* health risk. For cancer-causing chemicals, the health benchmark is the air concentration that would contribute a one-in-a-million increase in the risk of getting cancer over a lifetime. The risks ranged from  $2 \times 10^{-6}$  for chloroform to

1x10<sup>-5</sup> for benzene. This level of risk is similar to other urban parts of the state. Table 1 compares the cancer risks and risk ratios in Paterson with those of the three NJDEP permanent air monitoring stations around the state. The risk ratio is a comparison of an air concentration to a chemical's health benchmark, in this case 1 x 10<sup>-6</sup> lifetime cancer risk.

## Discussion and Conclusion

No elevated levels of p-dichlorobenzene were observed during this follow-up study. The two largest sources of risk, benzene and 1,3-butadiene, are emitted from mobile sources. The spatial saturation sampling did not

reveal any patterns that could be associated with potential sources. The source or sources of the p-dichlorobenzene observed in the UCAMPP study could not be identified in the AAMPS study. Based upon the investigation by NJDEP's Compliance and Enforcement program area, on-the-ground knowledge of the facilities by NJDEP inspectors and prevailing wind direction, the most likely source would have been Galaxy Chemical. This facility shut down and no records are available from 2006. Thus, there is a good possibility that the source of the p-dichlorobenzene no longer exists. The health risk from exposure to the air toxics that were measured in Paterson is similar to other parts of the state.

**Table 1: Comparison of Cancer Risk and Risk Ratios for AAMPS and Other NJDEP Monitoring Sites using 2010 annual averages or the Average of the First Five Months of 2011, whichever is highest. The data used in the table are from the TO-15 method which is used at the NJDEP's permanent air toxics monitoring stations.**

Air Contaminant	AAMPS	AAMPS risk ratio *	New Brunswick	New Brunswick risk ratio *	Chester	Chester risk ratio *	Elizabeth	Elizabeth risk ratio *
Benzene	1E-05	10	6E-06	6	4E-06	4	8E-06	8
1,3-Butadiene	7E-06	7	2E-06	2	3E-07	<1	4E-06	4
Carbon Tetrachloride	4E-06	4	8E-06	8	4E-06	4	4E-06	4
Chloroform	4E-06	4	3E-06	3	2E-06	2	3E-06	3
Chloromethane (methyl chloride)	2E-06	2	2E-06	2	2E-06	2	2E-06	2
p-Dichlorobenzene	3E-06	3	5E-07	<1	1E-07	<1	9E-07	<1
Tetrachloroethylene	2E-06	2	7E-07	<1	4E-07	<1	1E-06	1

\* The risk ratio is a comparison of an air concentration to a chemical's health benchmark, in this case 1 x 10<sup>-6</sup> lifetime cancer risk.

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## RESEARCH PROJECT SUMMARY

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