



## *Project Summary*

# Sources of Halogenated Hydrocarbons in an Urban Water Supply

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**The sources of halogenated hydrocarbons in the Passaic River basin were investigated from several viewpoints. The distribution and concentration of both low- and high-boiling halogenated hydrocarbons and halogenated pesticides were determined in the following surveys: (1) general stream, (2) sewage treatment plant effluent, (3) industrial waste treatment plant effluent, and (4) source, finished and delivered drinking water.**

**Intensive sampling programs centered around the variation of halogenated material contained in both raw and finished drinking water processed at the Passaic Valley Treatment Plant located in Little Falls, N.J. Intensive studies using short- and long-sampling frequencies showed that resulting halogenated hydrocarbon concentrations varied to a greater extent when a smaller sampling period was used. Additional investigations of trihalomethane formation potential and rate of trihalomethane production for stream samples were performed.**

***This Project Summary was developed by EPA's Municipal Environmental Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).***

### **Introduction**

One of our major water quality problems is the presence of halogenated

organics in water supplies and the formation of certain halocarbons. This summary presents the results of research on the sources and nature of such halocarbons in a highly urbanized watershed.

The Passaic River in Little Falls, N.J., was selected as the study area because it represents one of the major water supplies in the northern part of the State of New Jersey.

The purpose of this study was to investigate the extent of contamination of the Passaic River by halogenated organic compounds and to determine the influence of chlorination at a drinking water treatment plant on the concentration of halogenated material in the finished water. The nature, source, concentration, distribution, and variation of halogenated organics in the water supply and their potential to form additional halogenated organics during chlorination will indicate the procedures required to reduce the contamination levels of the finished water.

The sources of halogenated hydrocarbons in the Passaic River basin have been investigated from several viewpoints. The distribution and concentration of both low- and high-boiling halogenated hydrocarbons and halogenated pesticides were determined in the following surveys: (1) general stream, (2) sewage treatment plant effluent, (3) industrial waste treatment plant effluent, and (4) source, finished and delivered drinking water.

## Procedures

For all halogenated organics, grab sampling techniques were used.

Twenty-two volatile halogenated organics (Table 1) were potentially determined by purge and trap gas chromatographic procedures coupled with Hall electrolytic conductivity or mass spectrometric detection. Also, liquid-liquid extraction using n-pentane as the solvent, followed by packed column gas chromatography and electron capture detection, was routinely employed.

Fourteen high-boiling organochlorine pesticides and PCB's (Table 2) were routinely measured (when present) by liquid-liquid extraction and steam distillation procedures followed by gas chromatography and electron capture detection.

Five chlorophenols (Table 3) were determined by an aqueous acylation procedure followed by solvent extraction and gas chromatography with electron capture detection.

## Results and Conclusions

The results of this study may be divided into two parts: halogenated compounds found in the source water and halogenated compounds formed during chlorination.

1. Quantitative analysis revealed that during summer samplings,

chloroform was the predominant purgeable halogenated hydrocarbon observed in the Passaic River and its tributaries. During colder months (all under ice cover), methylene chloride was the predominant halomethane. Additional purgeable halogenated organics detected in the source water above the Little Falls water treatment plant included: 1,1,1-trichloroethane, tetrachloroethylene, bromodichloromethane, 1,1,2-trichloroethane, and dibromomethane. Dominant pesticides observed were alpha- and beta-BHC, and some polychlorinated biphenyls (such as Arochlor 1254) were frequently detected. Of the chlorophenols, trichlorophenol had the greatest distribution followed by 2,4-dichlorophenol, 2,6-dichlorophenol, tetrachlorophenol, and pentachlorophenol.

2. Trihalomethane concentrations always increased in the water samples after chlorination, and trihalomethane formation potentials in stream samples ranged from 66 to 282  $\mu\text{g/L}$  total trihalomethanes.

## Recommendations

After assessing the collected data and then evaluating the trends present in the data, the following set of recom-

mendations were advanced—recommendations directed specifically toward protecting and enhancing the quality of potable water: (1) Require routine schedule of watershed monitoring to control the discharge of halogenated materials that enter the water treatment facility. (2) Monitor municipal and industrial discharges into the watershed. (3) Institute simple and rapid test procedures to ensure the quality of raw and finished water. (4) Monitor treatment modification, such as disinfectant application, to minimize trihalomethane formation.

The full report was submitted in fulfillment of Grant No. R804394 by Rutgers, The State University, New Brunswick, N.J., under the sponsorship of the U.S. Environmental Protection Agency. The authors of the full report were J.V. Hunter and T. Sabatino of the Department of Environmental Science, Cook College, Rutgers, The State University.

**Table 3.** Chlorophenols Measured

4-Chlorophenol
2,4-Dichlorophenol
2,6-Dichlorophenol
Trichlorophenol
Pentachlorophenol

**Table 1.** Purgeable Organohalides Measured

Fluoroform	Methylene chloride
Methyl Chloride	Dibromochloromethane
Methyl Bromide	1,2-Dibromoethane
Vinyl Chloride	Tetrachloroethylene
Chloroform	Bromoform
1,2-Dichloroethane	Diiodomethane
1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane
Carbontetrachloride	m-dichlorobenzene
Trichloroethylene	p-dichlorobenzene
Dichlorobromomethane	o-dichlorobenzene
1,1,2-Trichloroethane	1,2,4-Trichlorobenzene

**Table 2.** High-Boiling Organochlorine Compounds Measured

alpha-BHC	Endrin
Lindane	o,p' DDT
Heptachlor	p,p' DDT
Aldrin	p,p' DDD
Heptachlor Epoxide	Mirex
p,p' DDE	PCB's as Arochlor 1254
Dieldrin	Gamma-chlordane

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***Alan A. Stevens** is the EPA Project Officer (see below).*

*The complete report, entitled "Sources of Halogenated Hydrocarbons in an Urban Water Supply," (Order No. PB 81-208 191; Cost: \$11.00, subject to change) will be available only from:*

*National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Telephone: 703-487-4650*

*The EPA Project Officer can be contacted at:*

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