# Health Consultation

SCHUYLKILL HAVEN MGP SITE

SCHUYLKILL HAVEN, SCHUYLKILL COUNTY, PENNSIYLVANIA

EPA FACILITY ID: PAD981104870

SEPTEMBER 30, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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# HEALTH CONSULTATION

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Prepared By:

Pennsylvania Department of Health
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

## TABLE OF CONTENTS

# I. EXECUTIVE SUMMARY

At the request of the Pennsylvania Department of Environmental Protection (PADEP), the Pennsylvania Department of Health (PADOH), working under a cooperative agreement with Agency for Toxic Substances and Disease Registry (ATSDR), prepared this Health Consultation (HC) in an attempt to evaluate if residents near the Schuylkill Haven Manufactured Gas Plant (MPG) site (the Site) have been exposed to volatile organic compounds (VOCs) in the air. The PADEP Northeast Regional Office (NERO) has been collecting indoor air samples from approximately five homes near the site.

Indoor air sampling of the concrete slab townhouse apartments has identified seven VOCs of interest: acrylonitrile, benzene, methylene chloride, 1,3-butadiene, naphthalene, dichlorodifluoromethane, and 1,2,4- trimethylbenzene from three sampling events since December 2002. Based on these three sampling events, the exposures and levels of the VOCs of interest in the apartments ***represent no apparent health hazard***. While indoor air samples (samplers were placed in kitchen closets beside the water heater) during one event did detect acrylonitrile and 1,3-butadiene at a level that would be considered a low increased lifetime cancer risk, the levels detected in the other sampling events at the same apartment were below a level of concern. Additional sampling would be needed to verify if the chemicals were still in the home or from an object recently placed in the home. It is possible a paste known as acrylonitrile-butadiene-styrene (ABS) copolymer may have been used recently to fix items in the home [1].

Additional sampling of the homes is recommended for acrylonitrile, benzene, naphthalene, 1,3-butadiene, 1,2,4-trimethylbenzene, methylene chloride, and dichloro-difluoromethane along with the EPA approved TO-15 method for summa air canisters.

# II. Background Statement of Issues

The PADEP NERO as been collecting indoor air samples from approximately five (5) homes situated near the Schuylkill Haven MGP Site in Schuylkill Haven, Schuylkill County, PA over the past 41 months. The PADEP collected these **indoor** air samples to determine the levels of VOCs in the air that residents were potentially exposed to inside their homes. These indoor air samples were analyzed by a certified laboratory, which utilized EPA's TO-14 and TO-15 methods for analysis. The results of the laboratory analysis were furnished to the PADOH, by the PADEP NERO, **to determine if there are exposures occurring at levels of health concern.** This document, prepared by PADOH under a Cooperative Agreement with ATSDR, responds to PADEP NERO's request.

The Schuylkill Haven MGP Site encompasses approximately one acre and is located near a residential area at the end of Fritz Reed Avenue in Schuylkill Haven, Schuylkill County, Pennsylvania. The site was historically used for a manufactured gas plant burning coal to produce natural gas and creating coal tars. Coal tar may contain various mixtures consisting up to 300 organic chemicals. The main ingredient in coal tar is

polycyclic aromatic hydrocarbons (PAHs), such as naphthalene and benzo(a)pyrene, along with phenolic compounds, VOCs, and inorganic compounds [2]. The perimeter of the site was later redeveloped into a residential apartment complex and remains occupied by tenants. The site also includes an area of vacant land adjacent to the West Branch of the Schuylkill River. The site is easily accessible and unrestricted. The site includes a recreational path for residents [3].

Indoor air sampling events since December 2002 have been evaluated for this HC. Vapor intrusion was identified in two of the apartments [4]. PADEP NRCO's Hazardous Substances Control Act (HSCA) program is in charge of the investigation. PADEP NRCO **requested** the PADOH **evaluate the sample results and determine if the indoor air levels are at a level of health concern.** PADOH Health Assessment Section has responded to the request from PADEP with this HC document.

# III. Site Visit

A member from PADOH Health Assessment Section met with a PADEP representative on August 9, 2005 and conducted a site visit of the area.

# IV. DISCUSSION

**Pathway Analysis**

PADOH evaluated residents' exposure to possible odor sources by looking for a completed exposure pathway. For an exposure pathway to be completed, all the following elements must be present:
1) a source of contamination;
2) transport through an environmental medium;
3) a point of exposure;
4) a route of human exposure, and;
5) a receptor population.

Completed pathways for the contaminants found are listed below.

| Source of Contamination | Transport via Environmental Medium | Point of Exposure | Route of Exposure | Receptor Population |
|---|---|---|---|---|
| Benzene, Methylene Chloride, Acrylonitrile, 1,3-butadiene, 1,2,4-trimethylbenzene, naphthalene, dichlorodifluoromethane | Air | Ambient Indoor Air | Inhalation | Residents near the Schuylkill Haven MGP Site |

## A. Sampling Events

The first sampling event took place on December 6, 2002 in two homes and the maintenance shop using EPA TO-14 method. The second sampling event sampled two of

the apartments along with two occupied apartments and one empty apartment on November 9, 2005 using EPA TO-15 method. The third sampling event occurred on April 11, 2006 with the same apartments. The summa air canisters were analyzed using EPA TO-15 method. One of the apartments was vacant during two sampling events and was used as a "background" reading to the other lived in apartments. A nearby maintenance shop was analyzed during the first event but removed due to possible solvent issues with the building

## B. Sample Results

The three sampling events starting from December 6, 2002 and ending on April 12, 2006 were evaluated by PADOH. PADOH and the Agency of Toxic Substances and Disease Registry (ATSDR) use Comparison Values (CV) for evaluation of sample results. CVs utilized in this case were derived from the current Environmental Media Evaluation Guide (EMEG) developed by ATSDR. CVs are concentrations or doses that are conservatively derived with many uncertainty or safety factors applied based on the health effects literature, and are below the levels associated with adverse health effects. CVs are utilized to assess voluminous data sets in an efficient and consistent manner during a screening analysis. They enable identification of substances that are not expected to result in adverse health effects (i.e. substances detected below CVs) and substances requiring further evaluation (i.e. substances detected above CVs). CVs should not be used to predict adverse health effects or to set cleanup levels at a site. The CVs serve only as guidelines to provide an initial screen of the data to determine what contaminant and potential exposures need to be evaluated further.

ATSDR has developed health-driven CVs for non-carcinogenic health effects resulting from substance exposures, known as Minimal Risk Levels (MRLs). An MRL is a health guideline, and is basically a minimum concentration and exposure level below which non-carcinogenic adverse health effects would not be expected. The MRL is based on human studies (if available), animal studies, and uncertainty factors to extrapolate a number to be considered "safe". Exposure to a level above an MRL does not necessarily mean adverse health effects will occur [5]. Preliminary Remediation Goals (PRG) are sometimes developed by regional EPA agencies where an ATSDR CV does not exist or the PRG is developed for that particular region due to regulations set by one of their states. ATSDR has also developed inhalation risk units (IUR) for compounds that are or maybe potentially carcinogenic. The IUR is used to find the excess lifetime increased cancer risk. This does not necessarily mean someone will develop cancer but there is a theoretical increased additional risk.

After comparing the available data, seven VOCs were identified above their respective CVs from indoor air sampling events including: acrylonitrile, benzene, 1,3-butadiene, dichlorodifluoromethane, methylene chloride, naphthalene, and 1,2,4-trimethylbenzene. Three apartments were sampled twice and two apartments were sampled three times.

## 1. Acrylonitrile

Indoor air studies typically do not find acrylonitrile, as levels are too low to be measured [6]. 1,3-butadiene is found in cigarette smoke and combustion processes [7]. However, acrylonitrile and 1,3-butadiene appeared in the sampling results only once from the same apartment. It is possible these two contaminants may be from someone recently smoking a non-American made cigarette or tobacco in the apartment. The same tentatively identified compounds (TIC) were not selected each time for each sampling event.

Acrylonitrile has a garlic onion type odor and breaks down in the air quickly. Acrylonitrile is used to make plastics, synthetic rubber, and acrylic fibers. A mixture of acrylonitrile and carbon tetrachloride was once used as a pesticide [8]. This practice was discontinued. Most studies from occupational workers and volunteers found acute inhalation exposure for 20 to 45 minutes to 16 ppm (35000 $ug/m^3$) reported skin irritation and irritability. An 8 hour exposure study to 4.6 ppm acrylonitrile was used to extrapolate the 0.1 $ug/m^3$ acute MRL [6]. A study of 576 Japanese workers inhaling 5-20 ppm over 10 years reported headaches, fatigue, nausea, anemia, jaundice, and conjunctivitis [9]. The maximum concentration acrylonitrile from the one apartment was 2.7 $ug/m^3$, which is above the 0.01 $ug/m^3$ CV but several magnitudes lower than 5-20 ppm (11000 – 43000 $ug/m^3$) from the chronic inhalation study of Japanese workers referred to in the above paragraph. Acrylonitrile has been listed as a possible carcinogen from limited human studies. Lung cancer has been associated with acrylonitrile exposure. Based on the IUR value assigned to acrylonitrile 6.80E-05 $[ug/m^3]^{-1}$, the calculated excess cancer risk for acrylonitrile exposure to 2.7 $ug/m^3$, calculates to a theoretical increased lifetime risk of 1.0 E-04. In other words,1 additional person out of 10,000 may develop cancer if exposed to this level (2.7 $ug/m^3$) continuously for 30 years. This exposure is considered “low increased risk” for lifetime excess cancer, and it is important to note that it is considered to be unlikely that the resident or residents in this one apartment are or will be exposed to this level of 2.7 $ug/m^3$ continuously for 30 years.

## 2. 1,3 – Butadiene

1,3-butadiene is used to make synthetic rubber (tires), plastics, acrylics, and a constituent of gasoline with what is described as a ‘a mild gasoline-like odor’. Inhalation of 1,3-butadiene may result from inhaling automobile exhaust, cigarette smoke, waste incineration and wood fires. It breaks down quickly in the air from sunlight exposure [10]. An acute inhalation exposure to 8000 ppm 1,3-butadiene for 6-8 hours resulted in No Observable Adverse Effects Level (NOAEL). However, two men reported eye irritation and difficulty focusing from exposure to 2000 ppm and 4000 ppm of 1,3-butadiene for up to seven hours. The study also had the two men inhale 8000 ppm 1,3-butadiene for 6 – 8 hours to test their psychomotor responses before and after the exposure with the responses being the same. A cancer link was found with workers in

rubber plants exposured to 1,3- butadiene for increased incidences of bladder, respiratory, stomach, and lymphato-hematopoietic cancers. These workers were also exposed to styrene and some other chemicals, so 1,3-butadiene may not be the only chemical involved [11]. The median concentration of 1,3 butadiene expected for outdoor ambient air for an urban area is 0.29 ppb (0.64 ug/$m^3$) [10]. The maximum concentration of 1,3-butadiene in the one apartment was 9.9 ug/$m^3$, above the CV of 0.03 ug/$m^3$. Two separate studies analyzing indoor air from a tavern found 1,3-butadiene concentrations at 11 ug/$m^3$ and 19 ug/$m^3$. Another indoor air study of a smoke filled bar found 1,3-butadiene concentrations between 2.7 – 4.5 ug/$m^3$ [10]. A human chronic inhalation study with known concentrations of 1,3-butadiene was not available for comparison. However, the time weighted average of 2 ppm (4400 ug/$m^3$) for 8 hours exposure is 400 times greater than the 9.9 ug/$m^3$ 1,3-butadiene found in comparison for a daily exposure. 1,3-butadiene has classified it as a probable human carcinogen based on limited human studies and sufficient animal studies [11]. Using the 1,3-butadiene IUR of 3.00E-05; the calculated excess cancer risk for exposure to 1,3-butadiene at the maximum level of 9.9 ug/$m^3$, calculates to an increased excess lifetime cancer risk of 1.0 E-04. In other words, 1 additional person out of 10,000 might develop cancer if exposed to this level (9.9 ug/$m^3$) continuously for 30 years. This exposure is considered to be "low increased risk" for lifetime excess cancer, and it is important to note that it is considered to be unlikely that the resident or residents in this one apartment are or will be exposed to this level 9.9 ug/$m^3$ continuously for 30 years.

### 3. Methylene Chloride

Methylene chloride has what is described as a 'mild sweet' odor. It can be found in solvents, paint strippers, aerosols, pesticide products, and used in the manufacturing of photographic film. About half the methylene chloride released into the air takes between 53 to 127 days to disappear. The Food and Drug Administration (FDA) has established limits on the amounts of methylene chloride that can remain after processing of spices, hops extract, and decaffeinated coffee to lower exposure [12]. Many studies of methylene chloride exposure involved occupational workers. A study found the Lowest Observable Adverse Effects level (LOAEL) for acute exposure to 300 ppm methylene chloride resulted in neurological effects such as decreased visual and auditory functions. Another study of occupational exposure from inhaling as much as 475 ppm (1.65E+06 ug/$m^3$) methylene chloride over 10 years resulted in increased blood cell count and hemocrit for women, and hepatic effects such as an enlarged liver [13]. Methylene chloride was found in one apartment from the last sampling event but not in this apartment or the other apartments previously. The maximum methylene chloride indoor air result found was 2.8 ug/$m^3$, which is above the 2.0 ug/$m^3$ CV but well below the the 300 ppm LOAEL and the acute inhalation MRL of 0.6 ppm (2100 ug/$m^3$), and well below the 100 ppm eight hour study [13]. Methylene chloride is classified as a probable human carcinogen from animal studies. The calculated excess lifetime risk of cancer risk for exposure to methylene chloride at the highest level seen in one sample, 2.8 ug/$m^3$, calculates to an increased excess lifetime cancer risk of 1.0 E-06. In other words, 1 additional person out of one million may develop cancer if exposed to this level (2.8

ug/$m^3$) continuously for 30 years. This exposure is considered to be "insignificant or no increased risk" for lifetime excess cancer, and it is important to note that it is considered to be unlikely that the resident or residents in this one apartment are or will be exposed to this level of 2.8 ug/$m^3$ continuously for 30 years.

## 4. Benzene

Benzene was found in indoor air samples from all five apartments at least once, and in some cases as many as three times during separate sampling events. Benzene vapors can come from cigarette smoke, volcanoes, forest fires, crude oil, gasoline, and has a sweet odor. It can be used to make other solvents, plastics, resins, nylon, rubber, lubricants, dyes, detergents, and pesticides [14]. Many human studies involving occupational exposures are available. An inhalation exposure of 20,000 ppm benzene for 5- 10 minutes can be deadly. One study found inhaling 300 ppm benzene for 30 minutes leads to drowsiness, dizziness, and headaches with mucus membrane and skin irritations. Another study using a group of male workers inhaling benzene concentrations around 60 ppm for 3 weeks, with varying hours per day for a maximum 21 days, reported dizziness, nausea, headache, chemical taste, and fatigue. An exposure of one year to 150 ppm benzene found a reduction of red blood cells, white blood cells, and platelets. Another study reported a chronic exposure to a mean benzene concentration of 0.53 ppm (1700 ug/$m^3$) benzene over 21 years with normal blood cell ranges. The CV for benzene is 0.1 ug/$m^3$ and the chronic EMEG/MRL is 10 ug/$m^3$ [15]. The maximum concentration found was 9.6 ug/$m^3$ and verified by a duplicate sample of 9.1 ug/$m^3$, just below the chronic inhalation EMEG/MRL. An earlier sample from the first sampling event for this apartment found 3.83 ug/$m^3$ benzene. The average benzene sample results for this apartment over the past 3 sampling events are 5.5 ug/$m^3$ benzene. Benzene is a known carcinogen based on sufficient human studies. Leukemia has been observed in workers using benzene many years after exposure occurred. The calculated excess cancer risk for exposure to benzene at the highest level seen in samples of 9.6 ug/$m^3$, calculates to a theoretical increased excess lifetime cancer risk of 3.0 E-05. In other words, 3 additional persons out of 100,000 may develop cancer if exposed to this level (9.6 ug/$m^3$) continuously for 30 years. This exposure is considered "no apparent increased risk" for lifetime excess cancer, and it is important to note that it is considered to be unlikely that the resident or residents in this one apartment are or will be exposed to this level 9.6 ug/$m^3$ continuously for 30 years.

## 5. Dichlorodifluoromethane (Freon 12)

Dichlorodifluoromethane (Freon 12) was found in all five apartments at least once and in four apartments on the same sampling date. It is a gas above 75 degrees Fahrenheit with an ether-like odor and evaporates quickly in to the air [16, 17]. Freon 12 is found in older refrigerators and air conditioners. It is no longer manufactured in the United States and phased out for more environmentally friendly refrigerants but previously made Freon 12 is still around from earlier production and can be used. It was used in aerosol sprays and

plastics previously [17]. A human study found inhalation of 10,000 ppm for 2.5 hours produced Central Nervous System (CNS) effects of intoxication and some loss of psychomotor coordination. The maximum concentration found was 404 ug/$m^3$, above the EPA Region III Risk Based Concentration (RBC) of 180 ug/$m^3$ was used as a comparison value. No signs or symptoms of chronic exposure to dichlorodifluoromethane have been reported in humans [18]. A time weighted average of 8 hours occupational exposure to Freon 12 is 1000 ppm (4.95E+06 ug/$m^3$) which is well above the 404 ug/$m^3$ maximum detected at these apartments [16]. Evidence is not available to classify dichlorodifluoromethane as a carcinogen so an excess lifetime cancer risk was not calculated.

## 6. Naphthalene

Naphthalene was found in three of the apartments during one sampling event but not during the other sampling events. Napthalene easily evaporates with a strong but not unpleasant odor. Moisture and sunlight break down naphthalene in the air within a day. It is found in moth repellents, toilet deodorant blocks, petroleum, coal, burning tobacco and wood, and polyvinyl chloride (PVC) plastics [19]. One study found nausea, vomiting, headaches, and abdominal pain was reported in a few homes with mothballs scattered around for pest and odor control. The indoor air of one of these homes measured 20 ppb naphthalene but was probably higher when the mothballs were fresher. The symptoms went away after the mothballs were removed. The same individuals also reported renal disease without specifics. One occupation study reported eight of twenty-one workers exposed to naphthalene for 5 years reported eye problems but the concentration was not recorded [20]. The maximum concentration of naphthalene found was 9.7 ug/$m^3$, the second highest concentration was 3.7 ug/$m^3$ in the apartments. The chronic EMEG/MRL for naphthalene is 4.0 ug/$m^3$. It is unknown if any of the apartments dwellers allowed smokers into the homes (naphthalene is produced from tobacco smoke). Naphthalene was found in the vacant apartment but not found in the apartment of the one occupant that did smoke. It is unknown if this person only smoked outside. However, the highest concentration of an indoor air compound found in this apartment was ethyl acetate (367 ug/$m^3$, which is below the RBC of 3300 ug/$m^3$). Most of the same chemicals found in that smoker's apartment were also found in the other apartments at the same low levels not to produce adverse health effects. Naphthalene may be carcinogenic from animal studies with rats developing lung and nose tumors. However, not enough human studies are available to determine if naphthalene is carcinogenic in humans.

## 7. 1, 2, 4 – Trimethylbenzene

1,2,4-trimethylbenzene was found in three apartments during the same sampling event and once during a previous sampling event. 1,2,4-trimethylbenzene is found as a component of chicken, beef, and pork flavors. It is also used as a solvent and paint thinner, and in the manufacture of dyes, perfumes, resins, pharmaceuticals, and trimellitic anhydride. 1,2,4-trimethylbenzene is found in coal tar and minerals from crude oil

refining. It is also generated as a byproduct from methanol in the manufacturing of methanol to gas and automobile exhaust. People buying self-serve gasoline will be exposed to 1,2,4-trimethylbenzene according to a study of gasoline vapor at Cincinnati, OH, Phoenix, AZ, and Los Angeles, CA service stations (October to November 1990) at concentrations between 0.005-0.09 ppm (24.9 ug/$m^3$ to 442 ug/$m^3$) for a few minutes [21] The maximum concentration found was 10.2 ug/$m^3$. The second highest concentration from another apartment was 6.39 ug/$m^3$. The rest of the 1,2,4-trimethylbenzene sampling results were below the EPA Region IX PRG of 6.2 ug/$m^3$. 1,2,4-trimethylbenzene has not been classified as a carcinogen.

**Mixture Assessment**

Mixture assessments are performed when a combination of chemicals may increase the health hazard effects. The maximum dose (numerator) is divided by the MRL or NOAEL (denominator) for each chemical for a hazard quotient. If the hazard quotient is less than 0.1, then no further evaluation is required. If the hazard quotient is greater than 0.1, then a further evaluation is required and a Hazard Index (HI) is evaluated. The maximum sampling values were utilized for the hazard quotients calculations in this HC. Acrylonitrile had a calculated hazard quotient of 27 and naphthalene had a calculated hazard quotient of 2.4. All other chemicals listed above had hazard quotients calculated to below 0.1. Usually the hazard quotients are added together to calculate a Hazard Index (HI), but this is done when the chemicals are or are assumed to be acting in concern or in combination as an exposure to humans. However, each individual chemical (acrylonitrile and naphthalene) was found in different apartments and not in the same apartment, thus the individual chemicals do not appear to be interacting with each other as a mixture or in combination.

## C. Quality Assurance and Quality Control

In preparing this health consultation, ATSDR and PADOH relied on the information provided in the referenced documents. ATSDR and PADOH reviewed the quality assurance and quality control measures that were followed regarding data gathering, chain-of-custody, laboratory procedures, and data reporting. ATSDR and PADOH expected and presumed that to ensure the accuracy of the data, extreme care was taken during all aspects of sample collection. ATSDR and PADOH also assumed that the laboratory only used certified, clean sampling collection devices. Once samples were collected, ATSDR and PADOH expected they were stored according to the method protocol and were delivered to the analytical laboratory as soon as possible. Finally, ATSDR and PADOH presumed that laboratory Standard Operating Procedures and other procedures and guidance for sample analysis, reporting, and chains of custody were followed. The analyses, conclusions, and recommendations in this health consultation are valid only if the reference documents are complete and reliable.

# V. CHILD HEALTH CONSIDERATIONS

PADOH and ATSDR recognize that infants and children may be more vulnerable to chemical exposure than adults. As part of their child health considerations, PADOH and ATSDR are committed to evaluating childhood exposure scenarios that potentially involve children. Considering exposure to indoor residential air at the Schuylkill Haven MGP site, children may have an increased vulnerability due to many factors including:

1) children weigh less than adults, resulting in higher doses of chemical exposure relative to body weight;
2) children have higher rates of respiration;
3) metabolism and detoxification mechanisms differ in both the very young and very old and may increase or decrease susceptibility and;
4) exposure during different stages of growth development in children may result in permanent damage if toxic exposures occur during critical growth periods.

Although a study listing known concentrations in regards to the susceptibility of children exposed to these specific compounds does not exist, the recorded concentrations of the compounds evaluated from the previous sampling events are considered low in comparison to their MRLs.

# VI. CONCLUSIONS

Based on the data evaluated, the levels of VOCs found in the apartments at the Schuylkill Haven MGP site represent no apparent health hazard at this time.

Acrylonitrile, and 1,3-butadiene appeared only once in one of the apartments. The maximum values were utilized in this evaluation, and resulted in a calculated low increased excess lifetime cancer risk based on living in the apartment and being exposed to those highest levels continuously over a 30 year period. It is considered unlikely that this is the case regarding the actual levels of exposure and exposure scenarios in this apartment. Nevertheless, although most people do not live in the same apartment for 30 years, the possible timeframe and exposure scenario must be taken into consideration. Both of these compounds are found in acrylics and plastics but were not found in the other apartments, thus it is possible that material or object(s) inside the apartment may be the source. The air sample results are at levels that, when compared to human studies, are not expected to produce any non-cancer adverse health effects.

Naphthalene, 1,2,4-trimethylbenzene, and benzene are all components of heating oil (fuel oil #2). Low concentrations of benzene in indoor air were detected in all the of apartments sampled. Low levels of naphthalene and 1,2,4-trimethylbenzene were found in indoor air samples of three of the apartments sampled. Exposure to these low

concentrations in indoor air are not expected to result in cancer or non-cancer health effects in adults and children.

## VII. PUBLIC HEALTH RECOMMENDATIONS

Residents who wish to reduce indoor air exposures should:

1. Stop smoking in the apartment(s);
2. Remove possible VOC sources and items from the apartment(s) and store them properly;
3. Consider requesting PADEP to look into the feasibility of monitoring or conducting another round of indoor air sampling to include acrylonitrile, benzene, 1,2-butadiene, dichlorodifluoromethane, methylene chloride, naphthalene, and 1,2,4-trimethylbenzene while running the samples for the TO-15 to see if the compounds found previously are still in the apartments, and if so at what concentrations.

## VIII. PUBLIC HEALTH ACTIONS PLANNED

PADOH and ATSDR will make this HC available to the PADEP NERO. No other actions are planned.

## IX. REFERENCES

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## Certification

This health consultation for the Schuylkill Haven MGP Site was prepared by the Pennsylvania Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner.

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Technical Project Officer, CAT, CAPEB, DHAC, ATSDR

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Alan Yarbrough

Team Leader, CAT, SPAB, DHAC, ATSDR

# APPENDIX A. FIGURES

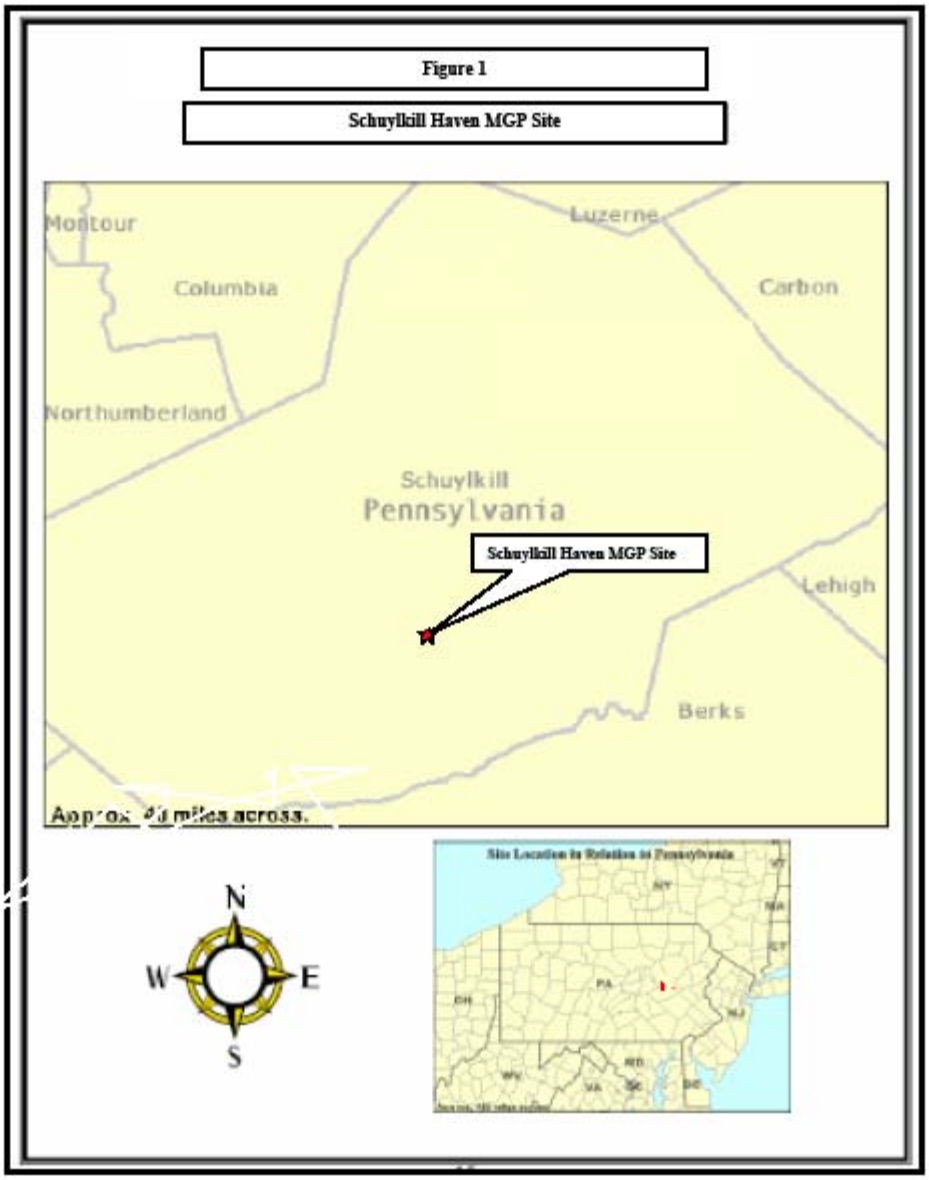


Figure 1
Schuylkill Haven MGP Site
Montour
Luzerne
Columbia
Carbon
Northumberland
Schuylkill
Pennsylvania
Schuylkill Haven MGP Site
Lehigh
Berks
N
W
E
S

Figure 2

Aerial Picture of
Fritz Reed Avenue

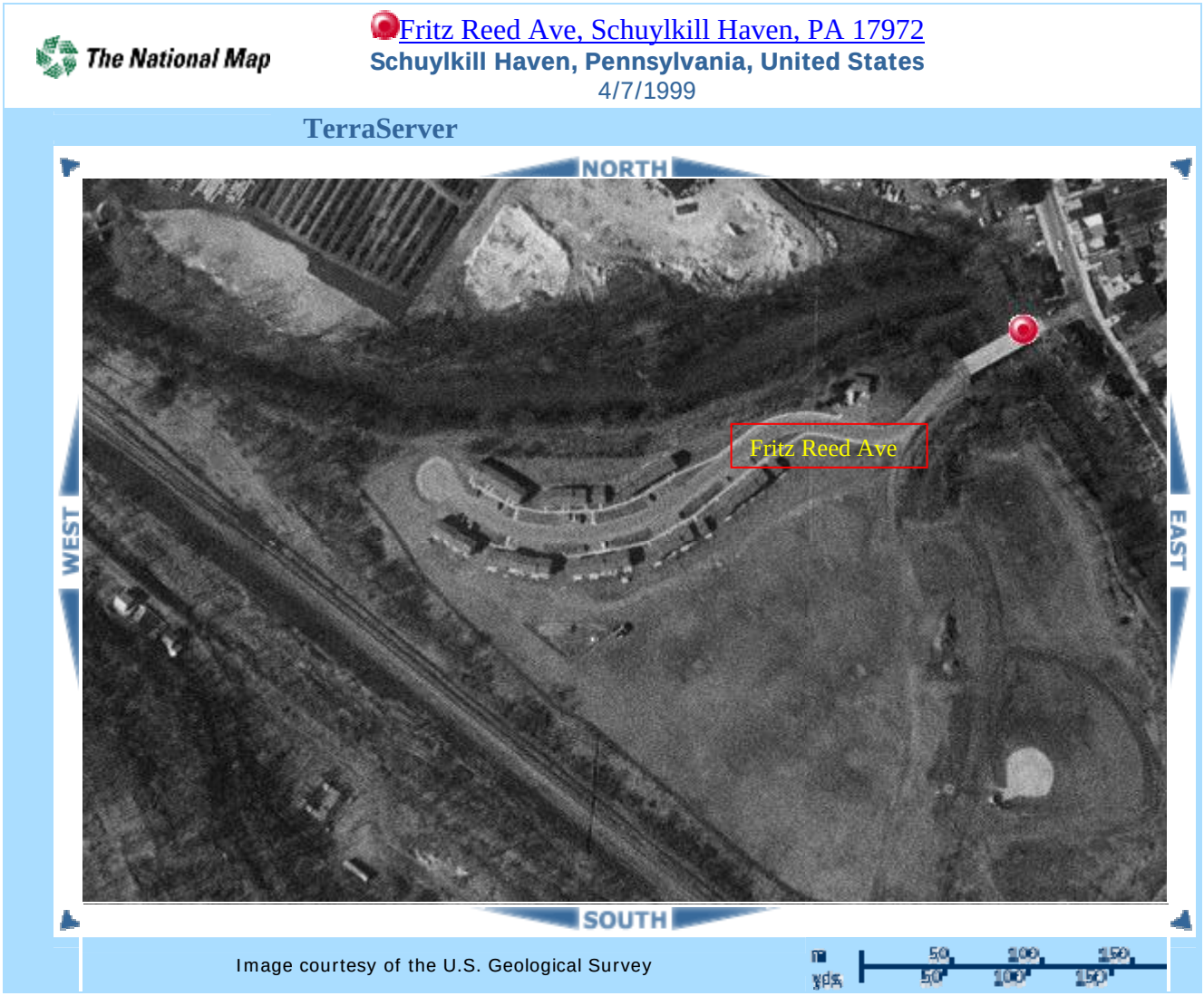
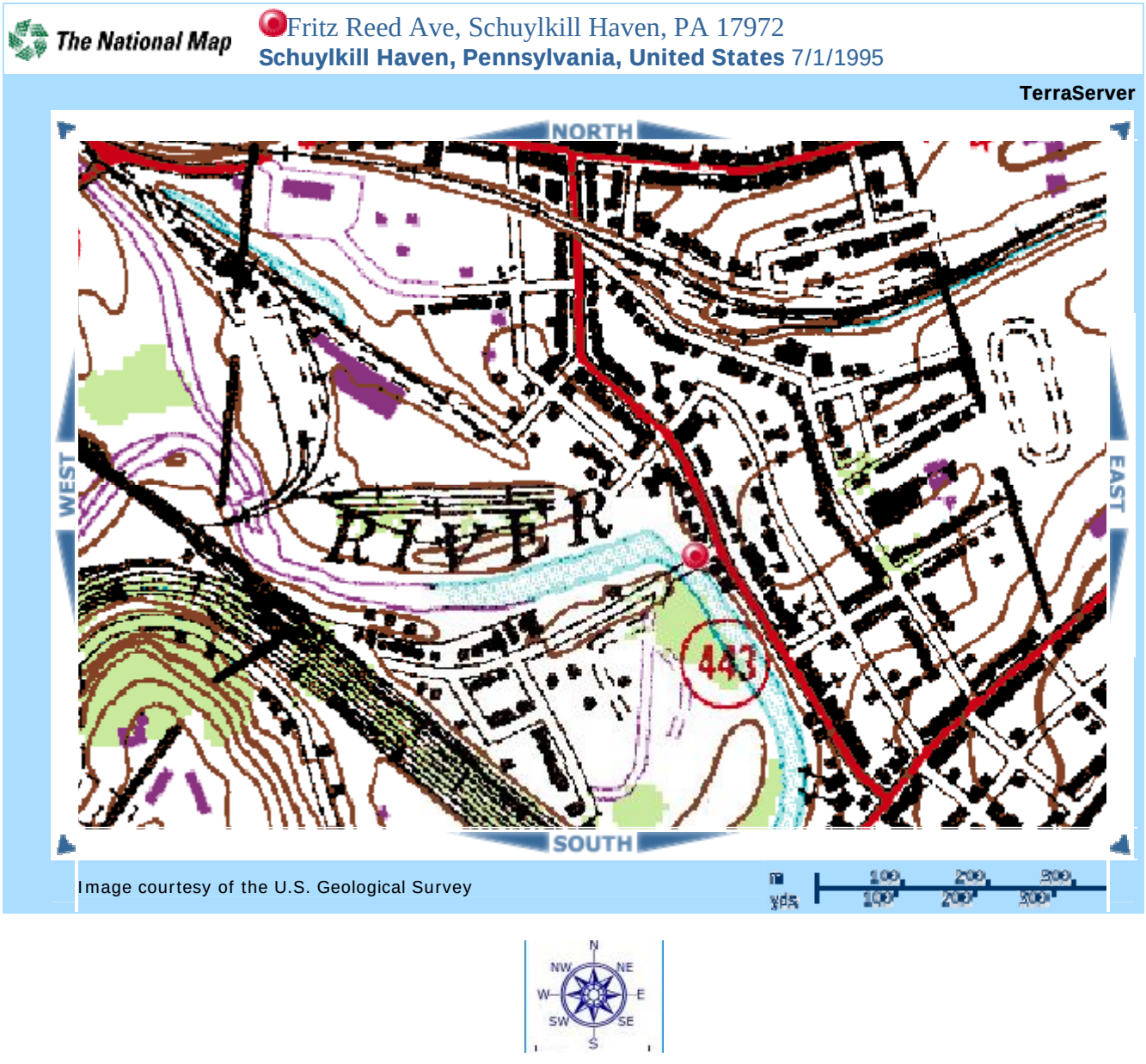


Figure 3

Topographic Picture of
Fritz Reed Avenue



# APPENDIX B. TABLE

Table 1

| Volatile Organic Compound | Maximum Concentration inside Apartments ug/$m^3$ | Next Highest Maximum Concentration Inside Apartments ug/$m^3$ | Health Based Comparison Value (CV) ug/$m^3$ | Source of ATSDR Comparison Value |
|---|---|---|---|---|
| Acrylonitrile | 2.7 (dup. 2.2) | ND | 0.01 | CREG |
| Benzene | 9.6 (dup. 9.1) | 3.83 | 0.1 | CREG |
| 1,3 Butadiene | 9.9 (dup. 7.2) | ND | 0.03 | CREG |
| Dichlorodifluoromethane | 404 | 308 | 180 | EPA Region III |
| Methylene chloride | 2.8 | ND | 2.0 | CREG |
| Naphthalene | 9.7 | 3.7 | 4.0 | Chronic EMEG/MRL |
| 1,2,4 Trimethylbenzene | 10.2 | 6.39 | 6.2 | PRG |

# APPENDIX C. CALCULATIONS

## Calculations and Assumptions

### Inhalation Calculations

Environmental sampling data produced air sample results in both parts per billion volume (ppbv) and ug/$m^3$. To keep all units consistent, all data was converted to ug/$m^3$ and then parts per million (ppm) if necessary for comparison exposure purposes.

The compound of interest (**C**) was calculated from ppbv to ug/$m^3$ by using the following equation:

$$\textbf{C}\ \text{ug/m}^3 = \frac{\textbf{C}\ \text{ppbv} \times (\text{Molecular Weight of } \textbf{C} \text{ in grams/mol})}{24.45\ \text{L/mol (Molar Volume of Air)}}$$

The theoretical excess cancer risk for compounds believed to be carcinogenic or possibly carcinogenic from inhalation over 30 years during a lifetime is calculated by the following equation:

$$\text{Increased Excess Cancer Risk (IECR)} = \frac{\textbf{C}\ \text{ug/m}^3 \times \text{IUR}[\text{ug/m}^3]^{-1} \times 30\ \text{years}}{70\ \text{years (lifetime)}}$$

(unitless)

where **C** = compound of interest and

IUR = Inhalation Unit Risk for **C**

Some data from studies of the compounds report results in ppm instead of ug/$m^3$ as in the CV values for the air data or ppb.

To convert air data from ppm to ppb, then multiply by 1000

1 ppm **C** = 1000 ppb **C**