

Health Assessment for

THE WILLIAMS PROPERTY
CAPE MAY COUNTY, NEW JERSEY
FEBRUARY 23, 1988

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

SUMMARY

The Williams Property is located in a rural area of Middle Township, Cape May County, New Jersey. The property encompasses 5.6 acres of wooded land with a single residence. The surrounding area is sparsely populated and is covered by low lying scrub pine forests and swamps. Surface soils on-site are contaminated with bis(2-ethylhexyl)phthalate (DEHP) and xylenes, and the groundwater is contaminated with chromium and lead. Presently, only the Williams' domestic well, which has been closed since 1985, is contaminated. However, the Bishop Property, a property to the Northeast of the Williams Property, is located over the contaminant plume. This plume is moving to the east-northeast at a rate of 90 feet per year and could eventually reach the Bishop Property and contaminate their drinking water supply. There have been no reported problems to date at the Bishop residence. Exposure pathways include potential ingestion of contaminated groundwater and dermal absorption and/or ingestion of soil contaminants. The public health impact of the Williams site is minimal at this time, as indicated by the available information; however, there are many potential health threats that need to be addressed at the site and additional data is needed to make comprehensive conclusions about the apparent public health risks. These potential threats include ingestion of soil by children in the area, the Williams' drinking of contaminated monitoring well water, and the possibility that the contaminant plume will reach the Bishop's drinking water supply.

Recommendations are being made to keep the Williams well closed, to discontinue use of the monitoring well as a potable water supply, to limit access to the initial spill area, to monitor the Bishop residence, to eliminate use of the Williams' well water for livestock and/or irrigation purposes, and to consolidate the drums stockpiled to the north of the site.

BACKGROUND

The Williams Property is a National Priorities List (NPL) site located in the semirural, coastal plain community of Swainton, NJ. The property and surrounding area is primarily used for residential purposes. In August, 1979, approximately 150 drums of industrial chemicals were emptied on the ground at the Williams property. An emergency action was conducted in June, 1980, 1200 cubic yards of soil and sludge were excavated; however, monitoring from 1982 to 1985 indicated that contaminants were still present on-site.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. ON-SITE CONTAMINATION

The following chart describes the on-site contaminants that are of concern to human health.

CONTAMINANT	MAX. LEVEL FOUND ² GROUNDWATER	GUIDELINE ²
Chromium	70 ¹	50 ³
Lead	2880 ¹	50 ³
	SOIL	
Bis(2-ethylhexyl)phthalate	22,000	NA
Xylenes	61,000	NA

1. Williams potable water supply
2. Units = ppb
3. National Interim Primary Drinking Water Regulations

B. OFF-SITE CONTAMINATION

Contamination was not found in the residential wells sampled. However, the full extent of off-site contamination of the groundwater is not known at this time. A more thorough characterization of the groundwater east-northeast of the Williams Property will give a better indication of whether or not such contamination has occurred, since this is the direction the contaminant plume is moving.

C. PHYSICAL HAZARDS

The 55 gallon drums which were removed during the excavation in 1980 are widely scattered on property surrounding the site. Some of the drums are rusty, punctured, and/or bottomless.

DEMOGRAPHICS

There are approximately eight families in the area of the site. However, the exact location, size, age distribution, and socioeconomic makeup of residents near the Williams property was not present in the information available for review. The site and surrounding areas are used primarily for residential purposes.

DISCUSSION

A. SITE CHARACTERIZATION

1. Environmental Media

All of the major media were addressed in the remedial investigation presented to ATSDR. Residential well samples showed no contamination in any wells adjacent to the Williams property. Wells to the Northeast of the site, across Siegtown Road, are in potential danger of contamination because of the movement of the plume at 90 feet per year in that direction; however, monitoring has not been performed in this area. Further investigation of these areas will contribute to better characterization of the off-site contamination.

Drums that were excavated from the spill area in 1980 were stockpiled on property North and Northwest of the site. These drums are reported to be empty, with the exception of one that contains water, and further investigation of them for public health discussions is not required

2. Land Use and Demographics

Additional information on the demographics of the surrounding area is needed to fully characterize present or potential human health hazards resulting from this site. It is necessary that at least information on the number of children of the soil ingesting age in the area be provided. This information is needed before soil ingestion can be eliminated as a potential exposure pathway.

3. Quality Assurance/Quality Control

The conclusions contained in this report are based on the data package supplied to ATSDR. The accuracy of these conclusions is based on the reliability and availability of the data contained in the Remedial Investigation.

B. ENVIRONMENTAL PATHWAYS

The major environmental pathway on the Williams Property is groundwater. Monitoring of groundwater has indicated contaminants have reached the water table 10 feet beneath the site. The groundwater on-site are contaminated with chromium and lead. Presently, only the Williams' domestic well is contaminated to an extent that may be hazardous to human health.

Contaminants that were left in the soil after the initial clean-up include 22,000 ppb of DEHP and 61,000 ppb xylenes. The soil is potentially a source of dermal exposure since residents live relatively close and there are no barriers around the spill site.

C. HUMAN EXPOSURE PATHWAYS

Ingestion of contaminated well water is the major route of probable human exposure at the Williams site. The Williams domestic well water is not being consumed by humans; however, the contaminant plume is moving to the east-northeast in the direction of other wells in the area which are being used as potable water supplies. The Bishop's domestic well appears to be in the most direct path of the plume at this time.

Instead of obtaining their potable water from the public water main, as residents in the surrounding area are, the Williams are getting their water from a monitoring well (MW-85-5) which is near their home. Contaminant levels in this well pose a public health threat to those ingesting the waters.

Dermal absorption through contact with contaminated soil, especially in the initial spill area, is another probable exposure pathway. Because soil samples were taken at a depth of 2 - 4 feet, additional sampling of surface soils is needed to further evaluate dermal exposure.

Contaminated domestic food chain is not believed to be a potential exposure pathway at this site although the Williams are raising pigs, ducks, and chickens in a fenced area near their home. These animals are located outside the contaminated area; therefore, consumption of these animals should cause no human health problems. However, if these domestic animals are watered using contaminated groundwater, a potential human exposure pathway could exist.

There are several other potential human exposure pathways. These potential pathways include soil ingestion by children in the area, and ingestion of game animals and vegetation in the area.

Inhalation of contaminated soil is an unlikely pathway due to the rate that the contaminants volatilize to the air and biodegrade in the soil. When surface soil samples are collected they may indicate a possible inhalation pathway; elevated levels of contaminants could indicate a possible exposure to contaminant-entrained fugitive dusts.

PUBLIC HEALTH IMPLICATIONS

Physical Hazards

It was reported that rusty and punctured drums lie off-site. These drums pose a potential problem to children who may play in and around this area. Drums should be consolidated and access of drums to the public should be restricted.

Chemical Hazards

a. Bis 2(-ethylhexyl) Phthalate (DEHP)

DEHP has been detected in on-site soil at maximum concentrations of 22,000 ppb. In addition, DEHP was below detected levels in groundwater with the exception of one monitoring well (1000 ppb at MW-85-3B). The primary human exposure pathway whereby potential adverse health effects can occur regarding phthalates is through ingestion. Ingestion groundwaters, except by the Williams' use of the monitoring well, is not occurring at this time. Ingestion of soils is difficult to address without surface soil sampling and information on potential access to the site by children.

DEHP may be displaced by surface water or leach into groundwater. However, DEHP is not soluble in water to an appreciable extent, is strongly bound to the soil, and under aerobic conditions is degraded by microorganisms. With the exception of one groundwater sample (MW-85-3B) groundwater samples detected no appreciable amounts of phthalates in the water.

Volatilization of this compound in air is negligible from soil and water. Therefore inhalation exposures resulting from volatilization of phthalates is not a concern at this site.

Phthalates are a class of materials used in industry as substances that make plastics more flexible. Gosselin (1984) in a publication on clinical toxicology and commercial products assigns to this compound a toxicity rating of 1 or practically nonlethal. DEHP is a ubiquitous environmental contaminant and is of substantial human exposure. Presently, no available case studies or epidemiological evidence are available to suggest that DEHP levels detected in environmental media are associated with significant human exposure to pose adverse health effects.

Dermal exposure to phthalates do not appear to be a public health concern. A human insult patch test containing undiluted butylbenzylphthalate (BBP), a less potent phthalate than DEHP, was performed on 200 human volunteers (Hammond et al., 1987). Patches containing BBP were applied to the skin for 24 hours, 3 times a week for 5 weeks. After a 2-week rest

period (no patches were applied), the human subjects were rechallenged by applying patches containing BBP to previously unexposed sites on the skin. Primary irritations and sensitizing reactions were not observed after 15 daily applications of a subsequent challenge with BBP. This study results are consistent with results of BBP dermal challenges from animal studies.

The previous discussion is not meant to imply that pthlates are without potential health concerns. Animal research data has demonstrated sufficient evidence to classify this compound as a probable human carcinogen (classified as weight of evidence Group B-2) under EPA guidelines for Carcinogen Risk Assessment (EPA 1986a). DEHP was fed to rats (6000 and 12000 ppm) and mice, and found to be carcinogenic (Menzer and Nelson 1986, NTP 1982). DEHP elevates the activity of lipid metabolizing enzymes and induces morphological (both liver enlargement and the proliferation of hepatic peroxisomes) and biochemical changes of exposed rodents at high dose levels. The mechanism of hepatocarcinogenicity of peroxisomes proliferation resulting from phthalate exposure is at present not known. In addition, DEHP has been shown to be associated with developmental and reproductive effects in these rodents. Testicular effects of DEHP are characterized by a decrease in the relative organ weight and damage to the seminiferous tubules.

b. Xylenes

Xylenes have been detected in on-site soil at maximum concentrations to 61,000 ppb. Soil xylene concentrations volatilize to the air and degrade rapidly in air. Xylenes have a half life of a few days and are further biodegraded readily in soils. Xylenes occur naturally as components of petroleum oil. The xylene content of gasoline can be as high as several percent. Because of the widespread use of gasoline and other petroleum products, xylene is ubiquitous in the urban environment.

The primary exposure pathway in which xylene produces adverse human health effects is the inhalation route. Adverse health effects reported in the literature include central nervous system disturbances. Without demographic information concerning the number of children who might have access to the site, we cannot assess the human health hazard from ingestion of contaminated soil. However, if children are not a consideration with respect to the area in question, xylenes in on-site soils do not appear to pose a significant public health threat because of the unlikely inhalation exposure pathway. Furthermore, applying the criteria from animal research, the xylenes are classified as Group D or "not classified". This category is for agents with inadequate animal evidence of carcinogenicity.

c. Chromium and Lead

Chromium and lead were detected in on-site monitoring wells at concentrations of 70 and 2880 ppb respectively. It has been reported that the residents living on-site have been obtaining their water from monitoring wells. This practice should be avoided because concentrations of chromium and lead pose significant adverse human health effects at these levels when ingested. Lead has been demonstrated to cause central nervous system disturbances, the most serious of which is lead encephalopathy. Lead intoxication is more prevalent in children and may cause EEG abnormalities and mental retardation. In addition, pregnant women (i.e. fetus) are at high risk from lead exposure.

The maximum contaminant level (MCL) established by the EPA for chromium is 50 ppb. Chromium toxicity depends on its respective valence and its associated cations. Chromium (VI) is carcinogenic through the inhalation route. However, information on the carcinogenic potential, as well as other adverse health effects of ingested chromium (VI), is not available. Therefore, a conservative approach is warranted to protect public health of residents who may be ingesting water containing chromium at the above mentioned levels.

CONCLUSIONS AND RECOMMENDATIONS

1. The Williams site does not represent a significant public health threat. Several potential human health concerns cannot be addressed because of insufficient environmental and demographic data. However, the Williams' use of the monitoring well for domestic purposes represents an unnecessary exposure to groundwater contaminants; this well should not be used for domestic purposes of any kind.

In addition, if on-site contaminants are detected in other area residential wells we recommend that water from these wells not be used for human or animal consumption until sampling data has been reviewed by ATSDR.

2. It is known that the Williams well draws in the contaminant plume when pumped. Therefore, it is recommended that the well remain closed. The Williams should immediately discontinue use of the monitoring well water and use an alternate water supply. Also, it is recommended that the Williams well water not be used for watering livestock or irrigation. The residents in the surrounding area should continue to use the public water supply until the plume has been contained.
3. Access should be limited in the initial spill area to eliminate exposure to contaminated soil.

4. Drums stockpiled to the North of the property need to be consolidated and access to them restricted in order to protect children playing in the area.
5. In order to further characterize the contaminant plume, monitoring at the Bishop residence and other areas beyond Siegtown Road (east-northeast of the site) is warranted.
6. It is recommended that further demographic data be obtained, particularly with respect to children, in order to further define human exposure pathways and health concerns.

REVIEWER CITATION

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