Health Consultation

PUBLIC COMMENT VERSION

Groundwater Monitoring Data Review

BoRit Asbestos Site
Ambler, Montgomery County, Pennsylvania

Prepared by
Pennsylvania Department of Health

AUGUST 3, 2012

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Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

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Pennsylvania Department of Health
Division of Environmental Health Epidemiology
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry (ATSDR)

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Summary

Introduction

In response to concerns from some community members regarding groundwater quality at and near the BoRit asbestos site ('the site'), the Pennsylvania Department of Health (PADOH) prepared this Health Consultation (HC) document. PADOH's primary goal is to evaluate whether a community is being exposed to levels of contaminants that may harm their health and make any necessary recommendations to prevent and mitigate exposures, as well as to ensure that the community has the best information possible to protect public health. PADOH worked under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) to complete this HC document.

PADOH evaluated the groundwater sampling data collected at the site by the Environmental Protection Agency (EPA) for volatile organic compounds (VOCs), semi- volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), inorganics/metals, and asbestos. In addition, PADOH reviewed Safe Drinking Water Act compliance monitoring for the Ambler Borough public water system. The purpose of this HC is to provide a summary of PADOH's review, answer community concerns, and provide relevant public health findings and recommendations.

Conclusions

PADOH reviewed the groundwater sampling data collected from the groundwater under the BoRit site as well as the public drinking water system serving the community, and conclude the following:

Conclusion 1

Based on an evaluation of the available site groundwater sampling data for VOCs, SVOCs, PCBs, pesticides, inorganics/metals, and asbestos, exposure to **groundwater beneath the site is not expected to harm people's health**.

Basis for Conclusion

PADOH reviewed the piezometer and groundwater monitoring data collected by EPA at the BoRit site. Piezometer data are not considered reliable for monitoring contaminants in an aquifer due to potential impacts from surface water contamination, the sampling technique and their intended use (i.e., to evaluate water depth and flow direction). Groundwater quality is better evaluated using groundwater monitoring well data. A review of the groundwater monitoring well data showed asbestos levels well below EPA's standard for public drinking water supplies or Maximum Contaminant Level (MCL). Carbon tetrachloride, tetrachloroethylene (PCE), and bis(2-ethylhexy)phthalate were detected in some groundwater wells at levels above EPA's MCL. Groundwater beneath the site is not used for drinking for the public drinking water supply.

Based on information from the environmental agencies, the groundwater underneath the site does not appear to influence the public drinking water sources. The monitoring data represent shallow wells, less than 100 feet in depth, as opposed to the closest Ambler public wells, which range from 300 to 438 feet in depth. Groundwater in the shallow bedrock flows toward the Wissahickon Creek and away from the public water supply wells. The deeper aquifer layers tend to be under confined conditions, and would not be susceptible to surface contamination. Therefore, contaminants in groundwater from this site do not represent a completed exposure pathway for this community.

Next steps

EPA will be continuing its investigation of the groundwater at this site. PADOH plans to produce a Public Health Assessment document. This public health assessment will evaluate any additional groundwater data from the site area, as well as air, soil, and surface water/sediment data collected under EPA's Remedial Investigation/Feasibility Study (RI/FS) for this site.

Conclusion 2

Based on a review of the public water supply sampling data for the Ambler area**, exposure to asbestos, and other contaminants, in public drinking water is not expected to harm people's health.**

Basis for Conclusion

In response to concerns by some community members that asbestos could be present in the drinking water supply from the site and asbestos containing pipes, the Borough of Ambler along with the PADEP collected water samples along the water distribution system for asbestos. Five samples were collected at or near areas that may contain asbestos containing pipes in the public drinking water system. Sampling results showed the highest level of asbestos at 0.09 million fibers per liter (MFL),

which is well below the MCL of 7 MFL. In 2011, Ambler Borough conducted water testing for asbestos in the public drinking water wells. Results of this analysis did not show levels of asbestos in the public water supply above the current MCL.

Some residents have also indicated they are concerned about historical public water data showing PCE above the MCL in the Ambler Borough water system. In September 1996, Ambler public water sampling showed levels of PCE (maximum value of 70 ppb) exceeding the MCL of 5 ppb. However, based on quarterly monitoring data for the Ambler Borough public water system, PCE has not exceeded the MCL since 1997.

Next steps

If additional water sampling data become available, PADOH will review this data and provide a response to the community. PADOH anticipate releasing a public health assessment for the site, which will review the EPA's RI/FS.

Conclusion 3

It appears that private well water use near the site is very limited. However, PADOH does not have much information on private well use or sampling of private wells in the site area. Therefore, PADOH **cannot currently make a conclusion regarding public health and private wells in the area**.

Basis for Conclusion

Although public water is the main source of drinking water in the area, there are some private wells in the vicinity. No private wells are documented in Ambler Borough or Upper Dublin, but there are some private wells documented in Whitpain Township. A few of these wells appear to be approximately 2 miles from the BoRit site. However, currently, PADOH does not have sampling data from private wells for evaluation.

Next steps

Due to the lack of information and data on private wells, PADOH suggests EPA conduct a private well survey near the site to establish if any private well users could be impacted by site-related contamination. Any private well owner, regardless of where they live, should have their drinking water tested on a regular basis. Montgomery County residents with private wells may want to visit the county's health department's well testing program website at: http://health.montcopa.org/health/cwp/view,A,3,Q,65367.asp In addition, The Penn State Extension Program offers well water testing at low costs. You may contact the Montgomery County Extension Office for further information at 610-489-4315 or visit the Penn State Extension lab testing website: http://www.aasl.psu.edu/Water_drinking_main.html
If additional information and sampling data for private wells near the site becomes available, PADOH will review this information.

For More Information and to Submit Public Comments

If you have concerns about your health, you should contact your health care provider. For questions concerns about the BoRit site or to submit public comments about this HC, please contact the Pennsylvania Department of Health, Division of Environmental Health Epidemiology at (717) 346-3285 or via e-mail at chlloyd@pa.gov or fahmed@pa.gov

Background and Statement of Issues

The BoRit Asbestos Site ('the site') is located in the Borough of Ambler, Montgomery County, Pennsylvania. The site was historically used to dispose of asbestos-containing materials (ACM) from the Keasbey & Mattison Company. Keasbey & Mattison Company began manufacturing asbestos products in the Borough of Ambler in the late 1800s. Sometime during the 1930s, Keasbey & Mattison Company began dumping waste materials containing ACM into a reservoir, the current location of the asbestos waste pile. In 1962, Nicolet Industries purchased Keasbey & Mattison Company and continued to dispose of ACM at the location of the former reservoir until the 1970s, when Nicolet Industries ceased manufacturing ACM. The asbestos waste pile property is currently vacant and not used for any purpose. [1]

The site is bordered on the north by residential properties; on the northeast and east by Chestnut Avenue, West Maple Street, and commercial and residential areas; on the south by commercial properties (McDonalds, Classic Coachworks, and the Sons of Italy); on the southwest by Montgomery County and Pennsylvania Department of Transportation open space; and on the northwest by residential properties. A playground (Westside Tiny Tot Park) and basketball courts are located northeast and north of the property, respectively. Ambler Warehouse, Ambler Manor (an apartment complex), and a shopping plaza are located east of the property. [1]

The site currently consists of three parcels; an asbestos waste pile ('The Pile'), a reservoir ('The Reservoir'), and the Whitpain Wissahickon Park ('The Park') (Appendix 1, Figure 1). The Pile comprises 6 acres. The Reservoir is a 15-acre reservoir with a berm and was constructed of asbestos shingles, millboard, and soil. Asbestos product waste, such as piping and tiles, is visible surrounding the reservoir and the nearby stream banks. The Park is approximately 11 acres and was formally used as a park/playground for a number of years. In the mid-1980s, the park was closed and fenced due to asbestos contamination. Creeks running through the site include an intermittent tributary named Tannery Run, which is located south of the asbestos waste pile and Rose Valley Creek, located between the park and the reservoir. Both of these creeks eventually join the Wissahickon Creek, which is located along the western boundary of the site. The reservoir discharges to Wissahickon Creek. [1]

In the mid-1980s, the site was fenced (including the reservoir, park and pile) due to asbestos contamination. The asbestos waste pile is currently partially enclosed by a 12 foot high chain link fence that borders West Maple Street to the northeast and runs along Tannery Run to the south. Warning signs are posted along the fence line indicating that the enclosed area contains ACM. The asbestos waste pile is unfenced along Wissahickon Creek to the west of the pile. The asbestos waste pile is currently about 20 to 30 feet above the ground surface and is heavily vegetated with brush and small trees. The BoRit site is located a few hundred yards northwest of the asbestos piles that became the Ambler Asbestos Piles NPL Site, which was remediated by EPA in 1993. In April 2009, the BoRit Asbestos site was listed on the EPA National Priorities List (NPL), also known as Superfund. [2] Under the Superfund program, EPA is currently conducting a removal cleanup action and remedial investigation at the site for the asbestos waste, which includes the asbestos pile, park and areas along the reservoir and stream banks.

Public Health Involvement

The Pennsylvania Department of Health (PADOH), the Agency for Toxic Substances and Disease Registry (ATSDR) and the Centers for Disease Control and Prevention (CDC) have provided public health guidance, review of environmental sampling data, health education information and health outcome data reviews at various times for the Ambler Asbestos NPL and BoRit asbestos site. More

recently, PADOH has produced three health consultations for the site. The first HC was produced in 2009 and evaluated 2006-2007 air sampling data collected at the site for asbestos and the second HC responded to public comments. [3] The third HC document reviewed health outcome data from the Pennsylvania Cancer Registry for the community. [4] In August 2011, at the request of the community, PADOH prepared an updated cancer evaluation in the communities surrounding the BoRit Asbestos Site. PADOH found an excess rate of mesothelioma diagnosed in men and women residing in the Ambler Zip code when compared with the commonwealth as a whole. PADOH distributed a community fact sheet discussing the findings to the Ambler community and also presented this information to the Community Advisory Group (CAG). [5]

Some community members have expressed concern that asbestos or other chemicals could be present in residential drinking water as a result of contamination from the site. In response to this concern, PADOH evaluated the groundwater sampling data collected at the site and samples collected within the public drinking water supply system. The results of this evaluation are presented in this health consultation. Additional information about the BoRit asbestos site can be found on the EPA's On-Scene Coordinator page at: http://www.epaosc.org/site/site_profile.aspx?site_id=2475 and on EPA's National Priorities List page for this site at: http://www.epa.gov/reg3hwmd/npl/PAD981034887.htm.

Groundwater Well Installation and Sampling

In 2009, as part of the on-going Remedial Investigation/Feasibility Study (RI/FS) for the BoRit site, EPA initiated a groundwater investigation. This groundwater investigation involved the installation of two different types of wells at the BoRit site: piezometers (tubes) placed in the overburden (soil and waste just beneath the ground surface) and monitoring wells placed in the fractured bedrock beneath the overburden. Both piezometers and monitoring wells can be used to determine how groundwater flows beneath the site. However, the two well types are constructed differently leading to differences in the water quality of their samples. Piezometers and monitoring wells are compared and contrasted in Table 1 below. Piezometers function as points for collection of water level data (flow and direction), but due to their construction are prone to potential surface soil contamination and are not intended for high-quality sample collection for water quality analyses. Groundwater monitoring wells are intended for the collection of high-quality samples for chemical analysis from the bedrock aquifer, since they are constructed with a surface and sand seal and a sand filter pack which would reduce potential surface contamination. [6]

Table 1- Comparing and Contrasting of Well Types	
Overburden Piezometers	**Bedrock Monitoring Wells**
Intended for Temporary Use	More permanent construction
Groundwater is collected from within asbestos waste (pile and park disposal area)	Groundwater is collected from bedrock beneath waste
Used to access water at shallow depths: 25 feet or shallower	Used to access water at deeper depths: 50 to 100 feet
Tube allowing water to enter but having no seals or sand pack to prevent contamination from entering	Construction includes a sand seal, sand pack, and screened interval where the water sample is taken
A grab sample of groundwater is taken *without* purging (pumping the water out) to stabilize water quality parameters	Generally, groundwater is sampled after purging (pumping the water out) 3 well volumes to stabilize water quality parameters
Easily impacted by surface contamination	Not easily impacted by surface contamination
Water quality data can be used for qualitative analyses	Water quality data good for quantitative analyses and health assessment

Based on community questions and concerns about piezometer and groundwater sampling, PADOH is presenting both sampling efforts in the following sections.[7] However, due to the sampling method, usage and construction, PADOH summarized the peizometer data for qualitative purposes and did not use the piezometer data for public health evaluation of contaminants at the site. The data discussed below are for shallow wells, less than 100 feet in depth, as opposed to the closest Ambler public drinking water wells, which range from 300 to 438 feet in depth. Groundwater in the shallow bedrock flows toward the Wissahickon Creek and away from the public water supply wells. The deeper aquifer layers, where the public drinking water wells draw water from, tend to be under confined (pressurized) conditions, and would therefore not be susceptible to contamination from the surface. The shallower layers are unconfined, and are more likely to be impacted by surface conditions.

Piezometer Wells

In late 2009 and early 2010, during Phase I activities at the site, EPA completed geotechnical soil borings at the site. As part of this process, EPA installed six temporary piezometers, including three in the park and three on the Pile to a depth of approximately 25 feet (Appendix 1, Figure 2). The piezometers were not installed for the collection of high quality groundwater samples for laboratory analysis. The piezometers were not purged prior to sampling (and therefore are not representative of the groundwater in the water-bearing zone), making the samples potentially turbid. Turbid samples can be expected to have higher concentrations of some contaminants (e.g., metals and asbestos) because they adsorb to the fine-grained material (silt and clay) that cause the turbidity. EPA also decided to conduct laboratory analyses on the piezometers wells. Samples collected included three grab samples from the pile and park and one duplicate sample. EPA analyzed these samples for volatile organic

compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), inorganics/metals, and asbestos. [8]

Groundwater Monitoring Wells

In November 2010, EPA completed installation of six groundwater monitoring wells around the site perimeter, along the Wissahickon Creek, near the reservoir and in areas of the site where asbestos materials were disposed, including the Pile (Appendix 1, Figure 3). The monitoring wells at the BoRit site were installed within the bedrock, ranging from 53 feet to 100 feet. [9] In contrast, Ambler Borough public water wells are deeper, ranging from 300 to 438 feet in depth. [10] As part of the Phase 2 field investigation at the site, groundwater samples were collected from all six bedrock wells, with MW-01 being sampled twice, once at its shallower depth of 53 feet and once at a final depth of 73 feet. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, inorganics/metals, and asbestos. Piezometeres were not sampled during Phase 2 site activities. [11] Lastly, in June 2011, EPA collected one groundwater sample for asbestos from monitoring well 5 (MW-5), located on the Pile. [12]

Exposure Pathways

To determine whether nearby residents are, have been, or are likely to be exposed to contaminants associated with the site, the PADOH evaluates the environmental and human components that could lead to human exposure. An exposure pathway is the way chemicals may enter a person's body. Exposure pathway includes the following five elements [13]:

1. A contaminant source
2. Environmental medium (or media) and transport mechanisms
3. A point of exposure
4. A route of exposure
5. A receptor population

Exposure pathways are categorized as completed, potential or eliminated. A completed exposure pathway is one in which all five elements are present, indicating that an exposure has occurred, is occurring or will occur in the future. In a potential exposure pathway, at least one of the pathways elements are missing and are uncertain, indicating that exposure to a contaminant could have occurred in the past, may be occurring or could occur in the future. A pathway is eliminated when one or more elements are missing and are very unlikely to be present. It is important to note, that having contact with a chemical does not necessarily result in adverse (harmful) health effects. A chemical's ability to produce adverse health effects is influenced by a number of factors in the exposure situation, including [13]:

- how much of the chemical a person is exposed to (the dose)
- how long a time period a person is exposed to the chemical (the duration)
- how often the person is exposed (the frequency)
- the amount and type of damage the chemical can cause in the body (the toxicity of the chemical)

In the case of the groundwater exposure pathway related to the site, the community nearest the site is on public water supply. Therefore, the groundwater pathway near the site is eliminated as a potential exposure pathway. Because VOCs have been detected below the EPA Maximum Contaminant Levels (MCLs), groundwater near the site is not expected to pose a vapor intrusion risk to the community. The public could also potentially be exposed to asbestos via private wells, although PADOH do not have any data to evaluate this pathway. Asbestos-containing pipes installed in the public drinking

water system are also a potential source of exposure which is discussed in the Public Drinking Water Supply Section.

ATSDR Comparison Values and EPA Maximum Contaminant Levels

To evaluate whether the residents may be exposed to contaminants at levels that could harm their health, PADOH compared the environmental sampling data against ATSDR's comparison values (CVs). These values are used to identify contaminants at a site that require further site-specific evaluation. Exceeding a CV does not necessarily indicate a contaminant level associated with or expected to cause adverse health effects. Rather, concentrations that exceed a CV indicate the need for further assessment to determine potential public health impacts. For most contaminants that are considered to be known human carcinogens, probable human carcinogens, or possible human carcinogens, ATSDR has developed cancer risk evaluation guides (CREGs). CREGs are media-specific comparison values used to identify concentrations of cancer-causing substances that are unlikely to result in an increase of cancer rates in an exposed population. ATSDR develops CREGs using EPA's cancer slope factor (CSF), a target risk level (10^{-6}), and default exposure assumptions. ATSDR has established CVs for non-cancerous endpoints including Environmental Media Evaluation Guides (EMEGs), Minimum Risk Levels (MRLs) and reference dose media evaluation guides (RMEG). When both a cancer and non-cancer CV exists for a particular chemical, the lower of the values is selected for health-protectiveness[13]

In addition to ATSDR CVs, PADOH also uses EPA MCLs to evaluate water sampling data. Under the Safe Drinking Water Act (SDWA), EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement the National Primary Drinking Water Regulations (NPDWRs or primary standards). The standards are legally enforceable standards that apply to public water systems. An MCL is the legal threshold limit on the amount of a substance that is allowed in public water systems. To set a MCL for a contaminant, EPA first determines how much of the contaminant may be present with no adverse health effects. This level is called the Maximum Contaminant Level Goal (MCLG). MCLGs are non-enforceable public health goals. The legally enforced MCL is then set as close as possible to the MCLG. The MCL for a contaminant may be higher than the MCLG because of difficulties in measuring small quantities of a contaminant, a lack of available treatment technologies, or if EPA determines that the costs of treatment would outweigh the public health benefits of a lower MCL. MCLs are deemed protective of public health during a lifetime (70 years) at an exposure rate of 2 L/day. For asbestos, EPA has set a MCL of 7 million fibers per liter (MFL) for fibers longer than 10 microns (µm). [14]

Results and Discussion

Piezometer Results

PADOH reviewed the piezometer sampling data (Appendix 2) but did not perform an exposure evaluation of these results due to the limitations of these data as discussed previously in the Groundwater Well Installation and Sampling section. These piezometer water samples were grab samples intended to provide "screening level" analytical data to characterize the shallow overburden groundwater in a general sense. Piezometer groundwater sampling is prone to contamination from the surface during sampling. For instance, surface soil that contains asbestos could enter the sampling well resulting in detectable levels of asbestos. A more comprehensive groundwater investigation to determine water quality, and the potential impact from the site, is presented in the next section. In

addition, the community currently is not using the groundwater immediately under the site as a drinking water source. The following provides a qualitative summary of the maximum results, by piezometer well location [7]:

- **Pile 1** – Manganese was detected at 1,180 micrograms per liter (µg/L or ppb) and asbestos was detected at 3384 (1a) and 6057 (1b) MFL.
- **Pile 2** – Manganese was detected at 7,210 µg/L. Arsenic was detected at 22.7 µg/L. Asbestos was detected ranging from 1,247 MFL to 7,838 MFL.
- **Pile 3** - Manganese was detected at 11,500 µg/L. Arsenic and lead were detected at 28.9 µg/L and 69.6 µg/L, respectively. Asbestos was detected at 2,076 MFL (3a) and 1,440 (3b) MFL.
- **Park 1** – Manganese and lead were detected at 5,150 µg/L and 512 µg/L, respectively. Asbestos was detected at 4,008 MFL (1a) and 1,211MFL (1b).
- **Park 2/Duplicate** – Benzene was detected at 6 µg/L. Arsenic was detected at 17.2 µg/L and lead at 29.4 µg/L. Manganese was detected at 5,670 µg/L. Asbestos was found at 19,952 MFL (2a) and 9,441 MFL (2b).
- **Park 3** – Benzene was detected at 2.6 µg/L. Arsenic and lead were detected at 12.2 µg/L and 26.8, respectively. The asbestos samples were 19,315 MFL (3a) and 34,204 MFL (3b).

Groundwater monitoring well results

PADOH evaluated the results of the groundwater monitoring data (Appendix 3). The results were then compared against the ATSDR CVs and EPA MCL values. During the 2010 sampling event only one well (MW-4) had a detected level of asbestos (chrysotile) at 0.51 MFL. The June 2011 groundwater sample collected from MW-5 (pile) had an asbestos (chrysotile) level of 0.21 MFL. It is important to note, groundwater beneath the site is not used for drinking for the public drinking water supply and there appears, based on current PADOH and ATSDR knowledge, to be no private drinking water wells in the immediately adjacent to the site. The following summarizes the sampling results by groundwater monitoring well location for samples detected above EPA MCL or ATSDR CV [11]:

- **MW-1 (park)** - no contaminants detected above the EPA MCL or ATSDR CV.
- **MW-2 (park)** - Carbon tetrachloride and tetrachloroethylene (PCE) were detected at 5.8 µg/L and 22 µg/L, respectively, which exceeds the MCLs for both of these chemicals of 5 µg/L. ATSDR CREG CV for PCE is 17 µg/L. Bis(2-ethylhexy)phthalate was also detected at 55 µg/L, exceeding the EPA MCL of 6 µg/L and the ATSDR CREG of 2.5 µg/L.
- **MW-3 (between the reservoir and the pile)** - Manganese was detected at 9,620 µg/L, which is above the EPA lifetime health advisory for drinking water (LTHA) value of 300 ppb and the secondary MCL of 50 µg/L (note, secondary MCLs are established based on aesthetic considerations, such as taste and odor, not on health endpoints)
- **MW-4** (**between the reservoir and the pile**) - no contaminants detected above the MCL or ATSDR CV.
- **MW-5 (pile)** - Bis(2-ethylhexy)phthalate was the only contaminated detected above CV's at 42 µg/L, exceeding the EPA MCL of 6 µg/L and the ATSDR CREG of 2.5 µg/L
- **MW-6 (pile)** – For this well, Bis(2-ethylhexy)phthalate was the only contaminated detected above CV's at 14 µg/L, exceeding the EPA MCL of 6 µg/L and the ATSDR CREG of 2.5 µg/L

Public Drinking Water Supply

Public drinking water is supplied to residents in the immediate site area via the Ambler Borough Water Department. The sources of the water for the Ambler Water Department includes the groundwater wells (which includes the Whitemarsh Pumping Station) and surface water from the Spring Well and North Spring in Whitemarsh Township. Most of the public drinking water wells are more than a mile away from the site, with the closest well approximately 500 yards from the site. The source wells for the Ambler public drinking water supply range from 300 to 438 feet in depth, as opposed to the BoRit wells that are less than 100 feet in depth. [10] The deeper aquifer layers tend to be under confined (pressurized) conditions, and would therefore not be susceptible to contamination from the surface. The shallower layers are unconfined, and are more likely to be impacted by surface conditions. [15] It appears the groundwater near the site flows toward the Wissahickon Creek and away from the public water supply wells. [10] All source water for the public drinking water is treated, and meets state and federal requirements for quality and safety, before being distributed to the public. The Department provides water to customers in a 6.5-square-mile area encompassing Ambler Borough and sections of Lower Gwynedd, Upper Dublin, Whitemarsh and Whitpain townships. The Ambler Borough Water Department routinely monitors for constituents in drinking water as required under The EPA NPDWRs. The PADEP is responsible for enforcing the standards.

PADOH obtained and reviewed water quality monitoring reporting for the Ambler Borough Water Department. , [16] Ambler public water system quarterly monitoring data are available on PADEP's website: http://www.drinkingwater.state.pa.us/dwrs/HTM/SelectionCriteria.html The website allows searches by the water authority name, contaminant, inventory information, and monitoring requirement. Primary standards protect public health by limiting the levels of contaminants in drinking water. Drinking water standards apply to public water supplies, which provide water for human consumption through at least 15 service connections, or regularly serve at least 25 individuals. [17] PADOH reviewed the quarterly monitoring data in the PADEP system, through March of 2012, and the annual water monitoring reporting, and the levels of drinking water contaminants, which includes VOC's and metals, were below MCLs. [18]

Under the Drinking Water Act, the regulation for asbestos testing in public drinking water supplies became effective in 1992. Between 1993 and 1995, EPA required water suppliers to collect water samples once and analyze them to find out if asbestos is present above the MCL. If asbestos is present above this level, the system must continue to monitor quarterly. Based on information provided by PADEP, Ambler Borough, in response to the EPA asbestos regulation, conducted monitoring for asbestos in drinking water in the early 1990's and again in 2011. The results from the public drinking water system for asbestos were below the MCL. [10]. In spring 2011, the Ambler Borough applied for and received a waiver for sampling of asbestos in their water supply, after sampling wells in its distribution system for asbestos as part of PADEP's waiver process. Three of the four samples taken in 2011 did not detect asbestos. One sample initially showed 1 chrysotile fiber greater than 0.5 microns.

Some residents are concerned about historical public water data showing PCE above the MCL in Ambler Borough water system. PADOH reviewed the public water data, collected from 1994 to 2012. In September 1996, Ambler public water sampling showed levels of PCE (two detections at 44 ppb and 70 ppb) exceeding the MCL of 5 ppb. As a result of these detections, the Ambler public water supply was required to collect additional monitoring sampling beginning in 1997 through 2011, as reported in the PADEP drinking water reporting system. [18] PCE was not detected from 1997 to 2001, or prior to 1996. In 2002, one sample for PCE was detected at 0.6 ppb but was below the MCL. It appears these were isolated occurrences. Since that time, PCE has not been detected in routine water

monitoring. [18] Thus these detects appears to be anomalies that could be attributed to sampling, laboratory errors or transient (non-lasting) conditions.

In addition to the above testing, the community has been concerned that asbestos could be present in their water either from the site or leaching from asbestos-containing pipes. In Ambler, the early water mains were constructed of cast iron. Asbestos cement pipes were installed generally from 1940 to 1980. Since 1980, ductile iron pipe has been used on all new installations. Approximately one-third of the Ambler Water Department's pipes are made of asbestos cement, but none of the asbestos containing pipes are in the downtown Ambler area which is near the site. [20] In 2010, to address community concerns, PADEP in conjunction with the Borough of Ambler, collected water samples along the distribution system for asbestos. (Appendix 4) Five samples were collected and included locations at or near the portions that were suspected of having asbestos-containing pipes. Asbestos sampling results showed the highest concentration of fibers was 0.09 MFL [20]. This level is well below the Safe Drinking Water Act standard of 7 MFL. The remaining four samples were less than 0.09 MFL. Based on the sampling data, it is unlikely that asbestos is entering the public drinking water supply at levels that could harm the public's health.

Private Wells

Although public water is the main source of drinking water in the site area, there are some private wells. Based on information available to the Montgomery County Health Department, no private wells are documented in Ambler Borough or Upper Dublin, but there are some private wells documented in Whitpain Township. A few of these wells appear to be approximately 2 miles from the site. PADOH does not have information on water quality in these private wells at this time. Based on information provided by PADEP, it appears the groundwater at the site flows towards the Wissahickon Creek and would therefore not be expected to impact water wells. [10] However, PADOH does not have data collected from private drinking water and therefore cannot currently make a conclusion regarding public health and private wells in the area. For this reason, PADOH suggests EPA conduct a private well survey in the area to determine the potential impact, if any, from the site on private drinking water wells.

As prudent public health practice, any private well owner, regardless of where they live, should have their drinking water tested on a regular basis. Montgomery County residents with private wells may want to visit the county's health department's well testing program website at: http://health.montcopa.org/health/cwp/view,A,3,Q,65367.asp In addition, The Penn State Extension Program offers well water testing at low costs. You may contact the Montgomery County Extension Office for further information at 610-489-4315 or visit the Penn State Extension lab testing website: http://www.aasl.psu.edu/Water_drinking_main.html

Asbestos in drinking water

It is well documented that breathing asbestos fibers can increase a person's risk of developing lung cancer, asbestosis, and mesothelioma. [21] The potential health effects via the inhalation (breathing) route of exposure are not the same as through the ingestion (drinking) exposure pathway. Current evidence does not suggest that ingestion of drinking water containing asbestos would increase a person's risk of developing lung cancer or mesothelioma. This section explores the current knowledge and scientific and epidemiological studies regarding asbestos exposures in drinking water.

Toxicology Information

If you swallow asbestos fibers (either those present in water or those that are moved to your throat from your lungs), nearly all of the fibers pass along your intestines within a few days and are excreted in the feces. A small number of fibers may penetrate into cells that line your stomach or intestines, and a few penetrate all the way through and get into your blood. Some of these become trapped in other tissues, and some are removed in your urine. The health effects from swallowing asbestos are not conclusive, but studies do indicate that levels below the current MCL are not expected to result in adverse health effects. Some groups of people who have been exposed to asbestos fibers in their drinking water have higher-than-average death rates from cancer of the esophagus, stomach, and intestines. However, it is very difficult to tell whether this is caused by asbestos or by something else. Animals that were given very high doses of asbestos in food did not get more fatal cancers than usual. Although some extra nonfatal polyps did occur in the intestines of rats. [22] EPA's MCL for asbestos is based on this study, specifically the evidence of benign polyps occurring in male rats following oral administration of intermediate size chrysotile fibers (i.e., >10 micrometer range). The study did not indicate potential adverse health effects for short-range fibers. [23] According to EPA, some people who drink water containing asbestos in excess of the MCL over many years may have an increased risk of developing intestinal polyps but are nonfatal and benign.[24]

According to the World Health Organization (WHO), the health hazards associated with the inhalation of asbestos in the occupational environment have long been recognized and include asbestosis, bronchial carcinoma, malignant mesothelioma of the pleura and peritoneum, and possibly cancers of the gastrointestinal tract and larynx. In contrast, little convincing evidence has been found of the carcinogenicity of ingested asbestos in epidemiological studies of populations supplied with drinking-water containing high concentrations of asbestos. Moreover, the ability of asbestos fibers ingested in drinking water to migrate through the walls of the gastrointestinal tract in sufficient numbers to cause adverse local or systemic effects is the subject of disagreement. [25] Based on the current scientific knowledge, as outlined above, it does not appear that asbestos ingested via drinking water, especially below the MCL for asbestos, will result in adverse health effects.

Epidemiology Studies

PADOH reviewed the available epidemiology studies on the relationship between asbestos in drinking water and potential health effects. The following is a summary of the epidemiology studies, in drinking water systems:

- A case control study was performed in Washington State in an area with an unusually high concentration of chrysotile asbestos (as high as 200 MFL at the tap) in drinking water. The study looked at the tumor registry for 382 individuals with cancer of the buccal cavity, pharynx, respiratory system, digestive system, bladder, or kidney. There were significantly elevated risks only for male stomach and male pharyngeal cancer, but these sex-inconsistent results, based on small numbers of cases, are probably due to other factors. Overall, there was no convincing evidence for increased cancer risk from ingesting asbestos. [26]

- A cancer mortality study in Florida attempted to study the usage of asbestos containing pipes in a public drinking water system. An analysis of covariance was run to test for differences in standard mortality ratios for seven cancer sites among three potential asbestos exposure groups based on asbestos containing pipe usage. No evidence for an association between the use of asbestos containing pipes for carrying drinking water and deaths due to gastrointestinal and related cancers was found. [27]

- A cancer incidence study was conducted in New York State investigating asbestos containing pipes and drinking water. Residential levels of asbestos ranged from 3.2 MFL to 304.5 MFL. Despite the high concentrations of asbestos in the drinking water, no evidence was found for elevated cancer risk at any sites previously associated with asbestos exposure. However, the major limitation of this study was many of the residents within the study area were not on the public water supply and the study was unable to only study those on public drinking water. [28]

- Connecticut conducted two studies to investigate the potential for asbestos in drinking water to cause increased cancers. The first study looked at the relationship between asbestos in drinking water and mesothelioma. The second investigation involved rates of stomach, colon, rectum, pancreas, lungs, urinary bladder, and kidneys. Eleven of the state's 169 towns used source waters containing small amounts of asbestos (less than 0.5 MFL as delivered to users). In 82 towns, some of the population received water delivered through asbestos cement pipes located in some part(s) of the distribution systems. No consistent evidence or correlation of a cancer risk from asbestos in water was found. [29]

Community Concerns

PADOH understands some community members have concerns about groundwater at the site and potential contaminants from the site that may have gotten into the drinking water system. Our agency's goal is to make sure the Ambler community has the best science information available to keep the community safe. Here is a summary of community concerns regarding groundwater at the site, and PADOH's responses:

Piezometer data showed levels of asbestos exceeding the MCL but subsequent groundwater monitoring well data showed asbestos levels below the MCL or non-detect. Therefore, based on the piezometer data, is asbestos present in the groundwater above the MCL?

Asbestos was detected above the MCL in the BoRit piezometer grab samples which were collected from areas where asbestos waste was present. However, piezometers can be subject to surface contamination. The grab samples collected from the piezometers were intended to provide "screening level" analytical data to characterize the shallow overburden groundwater in a general sense. Groundwater monitoring well samples are representative of the upper bedrock groundwater zone because of proper construction in that zone and the sampling techniques used to collect the samples. Therefore, the groundwater monitoring well sampling results are the most reliable indicators of the level of asbestos in the groundwater under the site. The groundwater monitoring well results did not find asbestos above the MCL in the groundwater under the site. It is PADOH's understanding that EPA will continue to monitor the groundwater at the BoRit site.

Is contamination from the site migrating to the wells used by the Borough of Ambler for the public drinking water supply?

There is no information available at this time indicating that the limited detections of contaminants in the groundwater under the site is affecting any of the drinking water wells used by the Borough of Ambler for the public drinking water supply. PCE, carbon tetrachloride, and asbestos were detected in groundwater under the site. Based on a review of the PADEP drinking water monitoring system, which provides quarterly sampling results for Ambler, none of these chemicals are currently being detected in the Ambler Borough water supply. [18] Most of the public drinking water wells are more

than a mile upgradient from the site, with the closest well approximately 500 yards from the site and located in another aquifer. In addition, the groundwater near the site appears to flow towards the Wissahickon Creek and away from the public water supply wells.

Is the Borough of Ambler required to test for asbestos under EPA National Primary Drinking Water Regulations?

In Pennsylvania, the PADEP is the delegated authority for enforcing the drinking water regulations. Under the Drinking Water Act, the regulation for asbestos became effective in 1992. Between 1993 and 1995, EPA required water suppliers to collect water samples once and analyze them to find out if asbestos is present above the MCL. [17] If asbestos is present above this level, the system must continue to monitor quarterly. Based on information provided by PADEP, Ambler Borough, in response to the EPA asbestos regulation, conducted monitoring for asbestos in drinking water in the early 1990's. The results from the public drinking water system were below the MCL. [30].

In spring 2011, Ambler Borough applied for and received a waiver for sampling of asbestos in their water supply, after sampling wells in its distribution system for asbestos as part of DEP's waiver process. A waiver allows Ambler to sample for asbestos on a less frequent basis than the routine EPA sampling schedule. In order to be granted a waiver, water suppliers must first submit documentation showing that the contaminant in question had not been detected in recent monitoring. Only after the completed monitoring indicates that there were no detects can a waiver be granted. The granting of waivers follows the standards and requirements approved by EPA. Three of the four samples taken in 2011 showed no levels of asbestos. One sample initially showed 1 chrysotile fiber greater than 0.5 microns (but less than 10 microns). Upon reanalysis, that result could not be confirmed. Since the MCL for asbestos is 7 MFL, all of the samples met drinking water standards and satisfied PADEP public water supply requirements.

There are reports of Ambler Borough using asbestos containing pipes in the water supply system. Could asbestos be leaching from the pipes and entering the public water supply system?

The Borough of Ambler historically used asbestos-containing pipes in some areas of the public drinking water system. [19] However, due to the water chemistry and pipe construction, it is unlikely that asbestos from the pipes could leach into the water supply. The asbestos in the pipes is considered non-friable (meaning it won't crumble or break off) and therefore is not likely to enter the water stream. In addition, there are several other factors that would affect the potential degradation of the pipes. First, the inside of the pipes are coated with iron, which decreases the chance of degradation. Second, pH is the main cause of aggressive water, also called corrosive water. The pH of the Ambler water is neutral, generally ranging from 7.2-7.5, indicating the water is not aggressive and unlikely to cause deterioration of the pipes. Lastly, the level of calcium/hardness of the water, to a lesser degree, also affects potential break down. The water in Ambler generally is considered hard (ranging from around 30- 60 mg/L of calcium) making it less likely to degrade the pipes. [31]

To further address this concern, the Borough of Ambler, in conjunction with the PADEP, collected water samples along the distribution system, including locations at or near areas that may have asbestos containing pipes. Five samples were collected and the highest sampling result was 0.09 MFL, which is well below the Safe Drinking Water act standards of 7 MFL. [20]

Why were drinking water samples for asbestos not collected in West Ambler and South Ambler? These communities are the closest to the site.

EPA and PADEP preferentially selected areas and homes for sampling that receive drinking water from asbestos containing pipes. The reason outlying locations, versus downtown Ambler, were chosen was because the water headed to outlying homes would have spent a greater time in the pipes, and thereby more time for asbestos to potentially enter the water stream, representing the worst case scenario.

Ambler Borough had violations, historically, for PCE in public drinking water. Why were they granted a waiver by PADEP for PCE sampling?

In September 1996, Ambler public water sampling data showed four detections of PCE. Two of these detections (70 ppb and 44 ppb) exceeded EPA's MCL for PCE of 5 ppb. As a result of these detections, the Ambler public water supply was required to collect additional monitoring sampling beginning in 1997 through 2011, as reported in the PADEP drinking water monitoring system. PCE was not detected from 1997 to 2001, or prior to 1996. In 2002 one sample for PCE contained a level of 0.6 ppb, which is below the MCL. Based on these data, there were no detections above the MCL for PCE since 1996. [18] Thus these detects appears to be anomalies that could be attributed to sampling or laboratory errors or transient (non-lasting) conditions]. Thus these detects appears to be anomalies that could be attributed to sampling or laboratory errors. [15]

In April 2011, Ambler Borough applied to PADEP and was granted waivers related to sampling of PCE, carbon tetrachloride, bis(2-ethylhexy)phthalate, and dioxins. This does not mean routine sampling ceases, only that the water authority is permitted to sample on a less frequent basis (once a year or every 3 years, rather than quarterly). In order to be granted a waiver, water suppliers must first submit documentation showing that the contaminant in question had not been detected in recent monitoring. Only after the completed monitoring indicates that there were no detects can a waiver be granted. All of the waivers granted followed standard requirements approved by EPA and applicable to all public water systems. Sampling schedules are based on federal requirements related to class of contaminant, source type, previous detections, treatment type, etc. Sampling cycles can vary from quarterly, annually or every three years for different contaminant classes. [32] All of Ambler's sources are in compliance with required monitoring cycles dictated by state and federal requirements. Please visit the PADEP public water systems for additional information on monitoring requirements and results: http://www.drinkingwater.state.pa.us/dwrs/HTM/SelectionCriteria.html

Conclusions

1. Based on an evaluation of the available site groundwater sampling data for VOCs, SVOCs, PCBs, pesticides, inorganics/metals, and asbestos, exposure to contaminants in groundwater beneath the site is not expected to harm people's health. A review of the groundwater monitoring well data showed asbestos levels well below the MCL Carbon tetrachloride, tetrachloroethylene (PCE) , and bis(2-ethylhexy)phthalate were detected in some groundwater wells at levels above EPA's MCL. However, based on information from the environmental agencies, the groundwater underneath the site is not used for drinking for the

public drinking water supply and there appear to be no private drinking water wells in the immediate vicinity.

2. Based on a review of the public water supply sampling data for the Ambler area, exposure to asbestos, and other contaminants, in public drinking water is not expected to harm people's health. Based on the current monitoring data for the Ambler Borough public water system, this public water supply, contaminants are below their respective MCLs and is in compliance with Safe Drinking Water Act requirements.

3. It appears that private well use near the site is very limited. However, PADOH do not have much information on private well use or sampling of private wells in the site area and cannot currently make a conclusion regarding the risk to public health from private wells in the area. Although public water is the main source of drinking water in the area, there are some private wells in the vicinity. No private wells are documented in Ambler Borough or Upper Dublin, but there are some private wells documented in Whitpain Township. A few of these wells appear to be approximately 2 miles from BoRit site.

4. Although not specific to this health consultation, PADOH supports the removal actions currently underway at the site and recommends EPA continue plans for a permanent remedy for the site that will reduce any public health hazards.

Recommendations

PADOH recommend that EPA continue sampling the groundwater and surface water near the site, to monitor contaminant trends over time.

If EPA's site groundwater investigations indicate a groundwater contamination plume with contaminant levels of health concern could exist offsite, EPA should conduct a private well survey near the site to establish if any private well users could be impacted by site-related contamination.

While not site-related, PADOH routinely recommends, as prudent public health practice, that all private well owners in Montgomery County and throughout the Commonwealth of Pennsylvania have their water tested. For additional information on private water wells and testing:

- For general information on private wells, visit the PADEP website: http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/SrceProt/well/default.htm
- Any private well owner, regardless of where they live, should have their drinking water tested on a regular basis.
    - Montgomery County residents with private wells may want to visit the county health department's well testing program website at: http://health.montcopa.org/health/cwp/view,A,3,Q,65367.asp The Penn State Extension Program offers well water testing at low costs. You may contact the Montgomery County Extension Office for further information at 610-489-4315 or visit the Penn State Extension lab testing website:http://www.aasl.psu.edu/Water_drinking_main.html

Public Health Action Plan
The public health action plan for the site contains a description of actions that have been or will be taken by PADOH. The purpose of the public health action plan is to ensure that this health consultation both identifies public health hazards and provides a plan of action designed to mitigate and prevent harmful human health effects resulting from exposure to hazardous substances.

Public health actions that have been taken include:

In 2007-2009, PADOH prepared 3 previous health consultations for the site, including two health consultations evaluating on-site and off-site air sampling data for asbestos and one health consultation on health outcome data;

In 2008, PADOH prepared a community factsheet summarizing the air sampling health consultation;

In 2011, at the request of the community, PADOH prepared an updated cancer evaluation in the communities surrounding the site;

In 2011, PADOH prepared a community fact sheet on the updated cancer evaluation for the Ambler area and distributed it to the community;

In 2011, PADOH collaborated with the University of Pennsylvania Occupational Medicine Program and reached out to health professionals serving the Ambler community;

In 2011, PADOH updated Ambler area nurse practitioners on the status of the former asbestos site and solicited their experience in serving the community surrounding the site. PADOH distributed a poster on asbestos risk factors which is designed to encourage at-risk individuals to discuss their concerns with their primary health provider; and

In 2012, PADOH prepared this health consultation document for the site;

PADOH serve as members of the BoRit CAG and attend bimonthly CAG meetings

Public health actions that currently are being or will be implemented:

PADOH will review the RI/FS data, and any additional environmental sampling data, collected at the site and produce a public health assessment;

PADOH will make this health consultation available to the residents and will be available to answer the residents' health questions;

PADOH will remain available to discuss any public health questions or concerns related to the site with community members and local authorities; and

PADOH will attend meetings with the community, as well as state and local government agencies.

References

1. EPA. HRS Documentation for the BoRit Site. http://www.epa.gov/superfund/sites/docrec/pdoc1781.pdf
2. EPA. BoRit Asbestos NPL site narrative. 2011 http://www.epa.gov/superfund/sites/npl/nar1781.htm
3. ATSDR. Health Consultation, BoRit air sampling data results from 2006-2007, response to public comments. March 2009 http://www.atsdr.cdc.gov/HAC/pha/BoritAsbestosAirSamplingResults/BoritAsbestosAirSamplingResultsHC3-17-2009.pdf
4. ATSDR. Health Consultation, Health Outcome Data Evaluation 1996-2005, BoRit Site. January 2009. http://www.atsdr.cdc.gov/HAC/pha/BoritSite/BoritHODHC01-28-2009.pdf
5. PADOH. Health Assessment Program website. Cancer Evaluation for the Ambler Area, Montgomery County. July 2011 http://www.portal.state.pa.us/portal/server.pt/community/environmental_health/14143/health_assessment_program/954979
6. WRP. Technical notes. Installing monitoring wells and piezometers in wetlands. August 1993. http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA434496
7. EPA Region 3. BoRit Superfund site, Phase 1 Data Evaluation Report. June 2010 http://www.epaosc.org/sites/2475/files/BoRit%20Phase%201%20Data%20Evaluation%20Report%20.pdf
8. CDM. Phase 2 Site Management Plan for the BoRit site. September 2010. http://www.epaosc.org/sites/2475/files/FINAL%20PHASE%202%20SMP_9-24-2010.pdf
9. EPA Region 3. BoRit Superfund site Community Update. July 2011 http://boritcag.org/pdf/BoRit%20Asbestos%20Site%20factsheet%20July2011.pdf
10. PADEP response to BoRit CAG. January 2012 http://www.boritcag.org/pdf/PADEP%20email%20response%20to%20RR&M%20%20ref%20Susceptibility%20waivers%20Jan%2030th%202012.pdf
11. EPA Region 3. BoRit Superfund site, Preliminary Groundwater Report. February 2011. http://www.epa.gov/reg3hwmd/npl/PAD981034887/documents/Preliminary_Phase_2_Groundwater_Report-2011.pdf
12. EMSL. Laboratory report for Weston Solutions. Water sample results for asbestos, method TEM EPA 100.2. July 2011.
13. ATSDR. Public Health Guidance manual. 2005 http://www.atsdr.cdc.gov/hac/PHAManual/toc.html
14. EPA. Safe Drinking Water Act Regulations for Public Water Systems. 2011 http://water.epa.gov/lawsregs/rulesregs/regulatingcontaminants/basicinformation.cfm
15. BoRit CAG. Letter to Ambler Borough Manager, Mary Aversa. January 2012. http://www.boritcag.org/pdf/RR&M%20letter%20to%20Ambler%20Borough%20ref%20exemptions%20final%20draft%20Jan%2022nd%202012%20(1).pdf
16. Amber Borough Water Department. http://www.ambler.pa.us/utilities.asp
17. EPA. National Primary Drinking Water Regulations. 2011 http://water.epa.gov/drink/contaminants/index.cfm#Primary
18. PADEP. Drinking Water Reporting System. Accessed on 2/14/2012 http://www.drinkingwater.state.pa.us/dwrs/HTM/SelectionCriteria.html
19. Amber Borough. Public Utilities website. 2009 http://www.ambler.pa.us/utilities.asp

20. Ambler Gazette. DEP Testing of Area Tap Water Yields Positive Results. December 2010 http://www.montgomerynews.com/articles/2010/12/07/ambler_gazette/news/doc4cfe79ca6d279975357547.txt?viewmode=2
21. EPA. Consumer Factsheet on Asbestos. http://www.epa.gov/ogwdw/pdfs/factsheets/ioc/asbestos.pdfATSDR. Toxicological Profile for Asbestos. 2001 http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=30&tid=4
22. EPA. Frequently asked question, asbestos MCL in drinking water. October 2004. http://safewater.supportportal.com/link/portal/23002/23015/Article/25100/Why-is-the-maximum-contaminant-level-MCL-for-asbestos-in-drinking-water-measured-in-terms-of-fibers-greater-than-10-micrometers-in-length
23. EPA. Basic information about asbestos in drinking water. Last accessed June 6, 2012. http://water.epa.gov/drink/contaminants/basicinformation/asbestos.cfm
24. The World Health Organization. Asbestos in Drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality. 2002 http://www.who.int/water_sanitation_health/dwq/asbestos.pdf
25. Polissar, L. et al. Environmental Health Perspectives. Cancer Risk from Asbestos in Drinking Water: Summary of a Case Control Study in Western. Washington. Vol. 53, pp. 57-60, 1983http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1569113/pdf/envhper00459-0062.pdf
26. Millette, J. et al. Environmental Health Perspectives. Epidemiology Study of the Use of Asbestos Cement Pipe for the Distribution of Drinking Water in Escambia County, Florida. Vol. 53, pp. 91-98, 1983 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1569111/pdf/envhper00459-0094.pdf
27. Howe, H., et al. Public Health Reports. Cancer Incidence Following Exposure to Drinking Water with Asbestos Leachate. May-June 1989, Vol. 104, No. 253 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1579917/pdf/pubhealthrep00203-0045.pdf
28. Meigs, Wister. Environmental Health Perspectives. Assessment of Studies on Cancer Risks from Asbestos in Connecticut Drinking Water. Vol. 53., 1983 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1569095/pdf/envhper00459-0110.pd0f
29. EPA. BoRit, Questions and Answers website. http://www.epa.gov/reg3hwmd/npl/PAD981034887/QA/faq/index.html
30. Salvato, J.A., et al. Environmental Engineering, 5th edition. 2003 http://books.google.com/books?id=r1jV1d_BEMkC&pg=PA307&dq=calcium+aggressiveness+water&sig=THi63yL7tVrB6bvBLxIdMGCt9E4
31. EPA. Public Water System Guidance. 2012 http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/compliance.cfm

Report Preparation

This Health Consultation for the BoRit Site was prepared by the Pennsylvania Department of Health (PADOH) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented. ATSDR's approval of this document has been captured in an electronic database, and the approving agency reviewers are listed below.

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Appendix 1:

Figures

Figure 1- Overview map of the BoRit site.

Figure 2- Map of approximate piezometer locations at the BoRit asbestos site

Figure 3 – Map of groundwater monitoring well locations at the BoRit asbestos site

Appendix 2:

Piezometer results

Table 1 – 2010 piezometer data (µg/L) for Volatile Organic Compounds (VOC's) collected on the BoRit asbestos site.

	Pile			Park			
VOCs	**1**	**2**	**3**	**1**	**2**	**2 Dup**	**3**
1,1,1-Trichloroethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,1,2,2-Tetrachloroethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,1,2-Trichloro-1,2,2-trifluoroethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.12J	0.5U
1,1,2-Trichloroethane	0.5U	0.5UL	0.5UL	0.5U	0.5U	0.5UL	0.5UL
1,1-Dichloroethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,1-Dichloroethene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,3-Trichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2,4-Trichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dibromo-3-chloropropane	R	R	R	R	R	R	R
1,2-Dibromoethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichloroethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,2-Dichloropropane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,3-Dichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,4-Dichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
1,4-Dioxane							
2-Butanone	14 L	78 L	1400 L	350L	21L	46L	52L
2-Hexanone	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
4-Methyl-2-pentanone	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Acetone	5.6B	5.7B	3.3B	3.7B	6.8B	5.4B	7.1B
Benzene	0.5U	0.5U	0.5U	0.5U	5.1	6	2.6
Bromochloromethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Bromodichloromethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Bromoform	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Bromomethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
CarbonDisulfide	0.43B	0.73	1.1	0.089B	0.71	0.57B	0.49B
Carbontetrachloride	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Chlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Chloroethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Chloroform	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Chloromethane	0.15B	0.5U	0.5U	0.14B	0.5U	0.079B	0.5U
cis-1,2-Dichloroethene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
cis-1,3-Dichloropropene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5UL	0.5UL
Cyclohexane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Dibromochloromethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Dichlorodifluoromethane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Ethylbenzene	0.5U	0.5U	0.5U	0.5U	0.11J	0.11J	0.28J
Isopropylbenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
m,p-Xylene	0.5U	0.5U	0.5U	0.5U	0.4J	0.43J	2.6
Methylacetate	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Methylcyclohexane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1.2
Methylenechloride	0.086B	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U

Table 1 (continued) – 2010 piezometer data (µg/L) for VOC's collected on the BoRit asbestos site.

	Pile			Park			
VOCs	**1**	**2**	**3**	**1**	**2**	**2 Dup**	**3**
Methyltert-butylether	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
o-Xylene	0.5U	0.5U	0.5U	0.5U	0.21J	0.23J	0.63
Styrene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Tetrachloroethene	0.5U	0.5U	0.5U	0.075J	0.084J	0.074J	0.5U
Toluene	0.056J	0.054J	0.5U	0.056J	1.2	1.4	0.77
trans-1,2-Dichloroethene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
trans-1,3-Dichloropropene	0.5U	0.5UL	0.5UL	0.5U	0.5U	0.5UL	0.5UL
Trichloroethene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Trichlorofluoromethane	0.5U	0.5U	0.5U	0.067J	0.5U	0.5U	0.5U
Vinylchloride	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U

UL = Not detected, quantitation limit is probably higher.
B = Analyte not detected substantially above the level reported in laboratory or field blanks
J = Analyte present. Reported value may not be accurate or precise.
U = Analyte not detected
R - Rejected result. Analyte may or may not be present in sample.

Table 2 – 2010 piezometer data (µg/L) for Semi Volatile Organic Compounds (VOC's) collected on the BoRit asbestos site.

	Pile			Park	
SVOC's	**1**	**2**	**3**	**1**	**3**
1,1'-Biphenyl	25U	10U	5U	5U	5U
1,2,4,5-Tetrachlorobenzene	25U	10U	5U	5U	5U
2,2'-Oxybis(1-chloropropane)	25U	10U	5U	5U	5U
2,3,4,6-Tetrachlorophenol	25U	10U	5U	5U	5U
2,4,5-Trichlorophenol	25U	10U	5U	5U	5U
2,4,6-Trichlorophenol	25U	10U	5U	5U	5U
2,4-Dichlorophenol	25U	10U	5U	10U	10U
2,4-Dimethylphenol	25U	10U	5U	5U	5U
2,4-Dinitrophenol	50U	20U	10U	5U	5U
2,4-Dinitrotoluene	25U	10U	5U	5U	5U
2,6-Dinitrotoluene	25U	10U	5U	5U	5U
2-Chloronaphthalene	25U	10U	5U	5U	5U
2-Chlorophenol	25U	10U	5U	5U	1.7J
2-Methylnaphthalene	25U	10U	5U	5U	5U
2-Methylphenol	25U	10U	5U	5U	5U
2-Nitroaniline	25U	10U	5U	10U	10U
2-Nitrophenol	25U	10U	5U	5U	5U
3,3'-Dichlorobenzidine	R	10U	5U	5U	5U
3-Nitroaniline	50U	9.2J	10U	10U	10U
4,6-Dinitro-2-methylphenol	50U	20U	10U	10U	10U
4-Bromophenyl-phenylether	25U	10U	5U	5U	5U
4-Chloro-3-methylphenol	25U	10U	5U	5U	5U
4-Chloroaniline	R	10U	5U	5U	5U
4-Chlorophenyl-phenylether	25U	10U	5U	5U	5U
4-Methylphenol	25U	10U	5U	5U	5U
4-Nitroaniline	50U	20U	10U	10U	10U
4-Nitrophenol	50U	20U	10U	10U	10U
Acenaphthene	25U	10U	5U	10U	10U
Acenaphthylene	25U	10U	5U	5U	5U
Acetophenone	25U	10U	5U	5U	5U
Anthracene	25U	10UL	5U	5U	5U
Atrazine	25U	10UL	5U	5U	5U
Benzaldehyde	25U	10U	5U	5U	5U
Benzo(a)anthracene	25U	10UL	5U	5UL	5U
Benzo(a)pyrene	25U	R	5UL	5UL	5U
Benzo(b)fluoranthene	25U	R	5UL	5UL	5U
Benzo(g,h,i)perylene	25U	R	5UL	5UL	5U
Benzo(k)fluoranthene	25U	R	5UL	5UL	5U
Bis(2-chloroethoxy)methane	25U	10U	5U	5U	5U
Bis(2-chloroethyl)ether	25U	10U	5U	5U	5U
Bis(2-ethylhexyl)phthalate	25U	10U	5U	5U	5U
Butylbenzylphthalate	25U	10U	5U	5U	5U

Table 2 (continued) – 2010 piezometer data (µg/L) for SVOC's collected on the BoRit asbestos site.

	Pile			Park	
SVOC's	**1**	**2**	**3**	**1**	**3**
Caprolactam	25U	10U	5U	5U	5U
Carbazole	25U	10U	5U	5U	0.58J
Chrysene	25U	10U	5U	5UL	5U
Dibenzo(a,h)anthracene	25U	R	5UL	5UL	5U
Dibenzofuran	2.6	10U	5U	5U	5U
Diethylphthalate	25U	10U	5U	5U	5U
Dimethylphthalate	25U	10U	5U	5U	5U
Di-n-butylphthalate	25U	10U	5U	5U	5U
Di-n-octylphthalate	25U	10U	5U	5U	5U
Fluoranthene	25U	10U	5U	5UL	5U
Fluorene	5.1	10U	5U	5U	5U
Hexachlorobenzene	25U	10U	5U	5U	5U
Hexachlorobutadiene	25U	10U	5U	5U	5U
Hexachlorocyclopentadiene	R	10U	5U	5U	5U
Hexachloroethane	25U	10U	5U	5U	5U
Indeno(1,2,3-cd)pyrene	25U	R	5UL	5UL	5U
Isophorone	25U	10U	5U	5U	5U
Naphthalene	25U	10U	5U	5U	2.1J
Nitrobenzene	25U	10U	5U	5U	5U
N-Nitroso-di-n-propylamine	25U	10U	5U	5U	5U
N-Nitrosodiphenylamine	25U	10U	5U	5U	5U
Pentachlorophenol	50U	20U	5U	10U	10U
Phenanthrene	11J	10UL	5U	5U	5U
Phenol	25U	10U	5U	5U	5U
Pyrene	4.5J	10UL	5U	5U	5U

UL = Not detected, quantitation limit is probably higher.
B = Analyte not detected substantially above the level reported in laboratory or field blanks
J = Analyte present. Reported value may not be accurate or precise.
U = Analyte not detected
R - Rejected result. Analyte may or may not be present in sample.

Table 3– 2010 piezometer data (µg/L) for polychlorinated biphenyls (PCBs) and pesticides collected on the BoRit asbestos site.

	Pile			Park			
PCB's/Pesticides	**1**	**2**	**3**	**1**	**2**	**2 Dup**	**3**
Aroclor-1016	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
*Aroclor-1221	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
*Aroclor-1232	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
*Aroclor-1242	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
*Aroclor-1248	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
*Aroclor-1254	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
*Aroclor-1260	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
*Aroclor-1262	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
*Aroclor-1268	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
Pesticide Compound	1.4UJ	1U	1UJ	1U	1UJ	1U	1UJ
4,4'-DDD	0.0057J	0.1U	0.1UJ	0.1UL	0.1UJ	0.1UJ	0.1U
4,4'-DDE	0.1U	0.1U	0.1U	0.1UL	0.1UL	0.1UJ	0.1U
4,4'-DDT	0.1U	0.1U	0.1U	0.1UL	0.1UL	0.1UJ	0.1U
Aldrin	0.05U	0.05U	0.05U	0.05UL	0.05UJ	0.05UJ	0.05U
alpha-BHC	0.05U	0.05UJ	0.05UJ	0.05UJ	0.05UJ	0.05UJ	0.05U
alpha-Chlordane	0.05U	0.05U	0.05U	0.05UL	0.05UJ	0.05UJ	0.05U
beta-BHC	0.0058J	0.0058J	0.05U	0.05UL	0.05UJ	0.05UJ	0.0087J
delta-BHC	0.05U	0.05U	0.05U	0.05UL	0.05UJ	0.05UJ	0.05U
Dieldrin	0.1UL	0.1U	0.1U	0.1UL	0.1UL	0.1UJ	0.1U
Endosulfan I	0.05UL	0.05U	0.05U	0.05UL	0.05UJ	0.05UJ	0.05U
Endosulfan II	0.0096J	0.0096J	0.1U	0.1UL	0.1UJ	0.1UJ	0.1U
Endosulfan sulfate	0.1U	0.1U	0.0076J	0.1UL	0.0080J	0.1UJ	0.1U
Endrin	0.1U	0.1U	0.1U	0.1UL	0.1UJ	0.1UJ	0.1U
Endrin aldehyde	0.1U	0.1U	0.1U	0.1UL	0.1UJ	0.1UJ	0.1U
Endrin ketone	0.01J	0.01J	0.1U	0.1UL	0.1UJ	0.1UJ	0.1U
gamma-BHC (Lindane)	0.05U	0.05U	0.05U	0.05UL	0.05Uj	0.05UJ	0.05U
gamma-Chlordane	0.05U	0.05U	0.05U	0.05UL	0.05Uj	0.05UJ	0.05U
Heptachlor	0.05U	0.05U	0.05U	0.05UL	0.05Uj	0.05UJ	0.05U
Heptachlor epoxide	0.05U	0.05U	0.05U	0.05UL	0.05Uj	0.05UJ	0.05U
Methoxychlor	0.5U	0.5U	0.051J	0.0064J	0.0071J	0.5UJ	0.5U
Toxaphene	5U	5UL	5U	5UL	5UJ	5UJ	5U

UL = Not detected, quantitation limit is probably higher.
B = Analyte not detected substantially above the level reported in laboratory or field blanks
J = Analyte present. Reported value may not be accurate or precise.
U = Analyte not detected

Table 4 - 2010 piezometer data (µg/L) for metals and inorganics collected on the BoRit asbestos site.

	Pile			Park			
Metals and Inorganics	1	2	3	1	2	2Dup	3
ALUMINUM	200U	1340	7380	6760	10500	8250	3760
ANTIMONY	60U	60U	60U	60U	60U	60U	60U
ARSENIC	6.3J	22.7	28.9	4.1J	15.2	17.2	12.2
BARIUM	317	924	1810	1600	2430	2820	154J
BERYLLIUM	5U	5U	10.3	8.8	16.9	18.2	5U
CADMIUM	5U	5U	5U	2.9J	5U	5U	5U
CALCIUM	729000	472000	146000	97200	61300	79900	34700
CHROMIUM	10U	8.2J	25.3	15.7	28	26.9	14
COBALT	50U	50U	42.2J	92	62.6	72.5	50U
COPPER	25U	25U	33.3	158	25U	25U	25U
CYANIDE	4.9J	10UL	10UL	7.9J	10UL	10UL	10UL
IRON	19800	27800	87300	5320	85600	111000	8710
LEAD	5.7J	5.5J	69.6	512	29.4	17.1	26.8
MAGNESIUM	179000	17100	23500	25400	7770	9360	2550J
MANGANESE	1180	7210	11500	5150	3750	5670	148
MERCURY	0.087B	0.071B	0.064B	0.067B	0.069B	0.069B	0.069B
NICKEL	11.5J	2.1J	51.6	51.3	41.5	39.4	18.5J
POTASSIUM	60900	24100	18300	41300	60000	65900	49200
SELENIUM	35U	35U	35U	35U	35U	35U	35U
SILVER	10U	10U	10U	10U	10U	10U	10U
SODIUM	11800	8830	31100	18900	56700	59900	18400
THALLIUM	25U	25U	25U	25U	25U	25U	25U
VANADIUM	50U	50U	134	53.3	203	189	25.4J
ZINC	1280	84	128	900	117	118	91.8

B = Analyte not detected substantially above the level reported in laboratory or field blanks
J = Analyte present. Reported value may not be accurate or precise.
U = Analyte not detected

Table 5 –Piezometer water sampling data for asbestos collected at the BoRit site.

Asbestos, chrysotile (MFL)	Park								**Pile**					
	1a	1b	2a	2b	2a Dup	2b Dup	3a	3b	1a	1b	2a	2b	3a	3b
	3384	6057	7838	1247	4547	2565	2076	1440	4008	1211	19952	9441	19315	34204

MFL= Millions of asbestos fiber per liter

Appendix 3:

Groundwater monitoring well results

Table 1 – 2010 groundwater monitoring well results (µg/L) for VOCs collected at the BoRit site.

		Park			Reservoir		Pile		CV	CV Type
VOCs	**MW1**	**MW1a**	**MW2**	**MW 3**	**MW 4**	**MW5**	**MW5**	**MW 6**		
1,1,1-Trichloroethane									200	MCL
1,1,2,2-Tetrachloroethane									0.2	CREG
1,1,2-Trichloro-1,2,2-trifluoroethane									1,000,000	RMEG
1,1,2-Trichloroethane									0.6	CREG
1,1-Dichloroethane									0.4	CREG
1,1-Dichloroethene									300	Chronic EMEG
1,2,3-Trichlorobenzene										
1,2,4-Trichlorobenzene									70	MCL
1,2-Dibromo-3-chloropropane									0.2	MCL
1,2-Dibromoethane									0.02	CREG
1,2-Dichlorobenzene									600	MCL
1,2-Dichloroethane									0.4	CREG
1,2-Dichloropropane									5	MCL
1,3-Dichlorobenzene									700	Inter EMEG
1,4-Dichlorobenzene									75	MCL
1,4-Dioxane			UL	UL	UL	UL	UL		0.3	CREG
2-Butanone									4000	LTHA
2-Hexanone									200	RMEG
4-Methyl-2-pentanone										
Acetone	13	9.4B							70,000	RMEG
Benzene									0.6	CREG
Bromochloromethane									90	LTHA
Bromodichloromethane									0.6	CREG
Bromoform									4	CREG
Bromomethane									700	RMEG
CarbonDisulfide									40	MCL
Carbontetrachloride			**5.8**						5	MCL
Chlorobenzene									100	MCL
Chloroethane										
Chloroform									80	MCL
Chloromethane									30	LTHA
cis-1,2-Dichloroethene									70	MCL
cis-1,3-Dichloropropene										
Cyclohexane										
Dibromochloromethane									80	MCL
Dichlorodifluoromethane									7000	RMEG
Ethylbenzene									700	MCL
Isopropylbenzene										
m,p-Xylene									7000 total Xylene	Chronic EMEG
Methylacetate										
Methylcyclohexane										
Methylenechloride	9.0B	13B	6.6B	6.3B	6.7B	6.8B	6.6B	9.5B	**5**	MCL

Table 1 (continued) – 2010 groundwater monitoring well results (µg/L) for VOC's collected at the BoRit site

VOCs	MW1	MW1a	MW2	MW 3	MW 4	MW5	MW5	MW 6		
Methyltert-butylether									10,000	Inter EMEG
o-Xylene									7000 total Xylene	Chronic EMEG
Styrene									100	MCL
Tetrachloroethene			**22**						17	CREG
Toluene									700	RMEG
trans-1,2-Dichloroethene									100	MCL
trans-1,3-Dichloropropene										
Trichloroethene									0.76	CREG
Trichlorofluoromethane			30						2000	LTHA
Vinylchloride									0.02	CREG

MCL = EPA Maximum Contaminant Level
CV = ATSDR Comparison Value
CREG = ATSDR Cancer Risk Evaluation Guide
EMEG = ATSDR Environmental Media Evaluation Guide
RMEG = ATSDR Reference Dose Media Evaluation Guide
LTHA = EPA Lifetime Health Advisory for drinking water
Blank cells = analyte not detected
Bolded sample results indicated levels exceeding either the MCL or ATSDR CV

Table 2 – 2010 groundwater monitoring well results for SVOCs (µg/L) collected at the BoRit site.

		Park			Reservoir		Pile		CV	CV Type
SVOC's	**MW1**	**MW1a**	**MW2**	**MW 3**	**MW 4**	**MW5**	**MW5 Dup**	**MW 6**		
1,1'-Biphenyl										
1,2,4,5-Tetrachlorobenzene									10	RMEG
2,2'-Oxybis(1-chloropropane)										
2,3,4,6-Tetrachlorophenol									1000	RMEG
2,4,5-Trichlorophenol									4000	RMEG
2,4,6-Trichlorophenol									3	CREG
2,4-Dichlorophenol									100	RMEG
2,4-Dimethylphenol									700	RMEG
2,4-Dinitrophenol									70	RMEG
2,4-Dinitrotoluene									70	RMEG
2,6-Dinitrotoluene									70	RMEG
2-Chloronaphthalene									3000	RMEG
2-Chlorophenol									40	LTHA
2-Methylnaphthalene									1000	Chronic EMEG
2-Methylphenol										
2-Nitroaniline										
2-Nitrophenol										
3,3'-Dichlorobenzidine									0.08	CREG
3-Nitroaniline										
4,6-Dinitro-2-methylphenol										
4-Bromophenyl-phenylether										
4-Chloro-3-methylphenol										
4-Chloroaniline									100	RMEG
4-Chlorophenyl-phenylether										
4-Methylphenol										
4-Nitroaniline										
4-Nitrophenol									60	LTHA
Acenaphthene									2000	RMEG
Acenaphthylene										
Acetophenone									4000	RMEG
Anthracene									10000	RMEG
Atrazine									100	RMEG
Benzaldehyde									4000	RMEG
Benzo(a)anthracene										
Benzo(a)pyrene									0.005	CREG
Benzo(b)fluoranthene										
Benzo(g,h,i)perylene										
Benzo(k)fluoranthene										
Bis(2-chloroethoxy)methane										
Bis(2-chloroethyl)ether									0.03	CREG
Bis(2-ethylhexyl)phthalate	3.1J		**55**		3.0J	**42**	**26**	**14**	2; 6	CREG; MCL
Butylbenzylphthalate										

Table 2 (continued)– 2010 groundwater monitoring well results (µg/L) for VOC's collected at the BoRit site.

SVOC's	MW1	MW1a	MW2	MW 3	MW 4	MW5	MW5 Dup	MW 6		
Caprolactam									20000	RMEG
Carbazole										
Chrysene										
Dibenzo(a,h)anthracene										
Dibenzofuran										
Diethylphthalate										
Dimethylphthalate										
Di-n-butylphthalate										
Di-n-octylphthalate										
Fluoranthene									1000	RMEG
Fluorene									1000	RMEG
Hexachlorobenzene									0.02	CREG
Hexachlorobutadiene									0.006	CREG
Hexachlorocyclopentadiene									200	RMEG
Hexachloroethane									2	CREG
Indeno(1,2,3-cd)pyrene										
Isophorone									40	CREG
Naphthalene									2000	Chronic EMEG
Nitrobenzene									70	RMEG
N-Nitroso-di-n-propylamine										
N-Nitrosodiphenylamine									7	CREG
Pentachlorophenol									0.09	CREG
Phenanthrene										
Phenol									2000	LTHA
Pyrene									1000	RMEG adults

CV = ATSDR Comparison Value
CREG = ATSDR Cancer Risk Evaluation Guide
EMEG = ATSDR Environmental Media Evaluation Guide
RMEG = ATSDR Reference Dose Media Evaluation Guide
LTHA = EPA Lifetime Health Advisory
Blank cells=analyte not detected
Bolded sample results indicated levels exceeding either the MCL or ATSDR CV

Table 3- 2010 groundwater monitoring well results (µg/L) for Pesticides and PCB's collected at the BoRit site.

		Park			Reservoir		Pile		CV	CV Type
PCB's/Pesticides	**MW1**	**MW1a**	**MW2**	**MW 3**	**MW 4**	**MW5**	**MW5 Dup**	**MW 6**		
Aroclor-1016									2	RMEG
*Aroclor-1221										
*Aroclor-1232										
*Aroclor-1242										
*Aroclor-1248										
*Aroclor-1254									0.7	CREG
*Aroclor-1260										
*Aroclor-1262										
*Aroclor-1268										
Pesticide Compound										
4,4'-DDD									0.1	CREG
4,4'-DDE									0.1	CREG
4,4'-DDT									0.1	CREG
Aldrin									0.002	CREG
alpha-BHC										
alpha-Chlordane										
beta-BHC										
delta-BHC										
Dieldrin									0.002	CREG
Endosulfan I									70	Chronic EMEG
Endosulfan II									70	Chronic EMEG
Endosulfan sulfate										
Endrin									10	Chronic EMEG
Endrin aldehyde										
Endrin ketone										
gamma-BHC (Lindane)										
gamma-Chlordane										
Heptachlor									0.008	Chronic EMEG
Heptachlor epoxide									0.004	Chronic EMEG
Methoxychlor									200	RMEG
Toxaphene									0.03	CREG

MCL = EPA Maximum Contaminant Level
CV = ATSDR Comparison Value
CREG = ATSDR Cancer Risk Evaluation Guide
EMEG = ATSDR Environmental Media Evaluation Guide
RMEG = ATSDR Reference Dose Media Evaluation Guide
Blank cells=analyte not detected
Bolded sample results indicated levels exceeding either the MCL or ATSDR CV

Table 4 – 2010 Groundwater monitoring well results (µg/L) for metals and inorganics collected at the BoRit site.

Dissolved		Park		Reservoir			Pile		CV	CV Type
Metals and Inorganics	MW1	MW1a	MW2	MW 3	MW 4	MW5	MW5 Dup	MW 6		
ALUMINUM	1510								40,000	Chronic EMEG
ANTIMONY	UL	UL	UL	UL	UL	UL	UL	UL	6	MCL
ARSENIC				7.6J			5J		10	MCL
BARIUM	669	175J	112J	561	20.4J	27.4J	20.8J	101J	2000	MCL
BERYLLIUM									70	Chronic EMEG
CADMIUM						0.71J	1.1J		4	Chronic EMEG
CALCIUM	281000J	58300J	105000J	104000J	92500J	268000J	264000J	113000J		
CHROMIUM	19.4B	8.3B	2.7B	3.8B	1.7B	UL	UL	5.4B	100	MCL
COBALT									400	Interm EMEG
COPPER	25.9	1.1J	0.98J	3J		1.1J	0.98J	1.8J	400	Interm EMEG
IRON	78.2J				147	135	125			
LEAD	13.3B			3B					15	MCL
MAGNESIUM		15200	19000	15300	4860J	10800	10500	16200		
MANGANESE		4.4J		**9620**	86.7	156	121	**426**	300	LTHA
MERCURY										
NICKEL									700	Interm EMEG
POTASSIUM	73200	1490J	2150J	2140J		3120J	2670J	4260J		
SELENIUM						14.3J	13.1J		50	MCL
SILVER	2.8B	1.8B	1.2B	1.6B		2.1B	1.2B	2.7B	200	Interm EMEG
SODIUM	94200	13500	22900	34400	13400	38500	37200	40600		
THALLIUM	3.6B		6.7B	9.1B		3.7B	3.7B	3.9B	2	MCL
VANADIUM									400	Interm EMEG
ZINC		0.08B				0.05B		0.01B	10,000	Chronic EMEG

UL = Not detected, quantitation limit is probably higher.
B = Analyte not detected substantially above the level reported in laboratory or field blanks
J = Analyte present. Reported value may not be accurate or precise.
U = Analyte not detected
MCL = EPA Maximum Contaminant Level
CV = ATSDR Comparison Value
CREG = ATSDR Cancer Risk Evaluation Guide
EMEG = ATSDR Environmental Media Evaluation Guide
LTHA = EPA Lifetime Health Advisory for drinking water
RMEG = ATSDR Reference Dose Media Evaluation Guide
Blank cells=analyte not detected
Bolded sample results indicated levels exceeding either the MCL or ATSDR CV

Table 5 – 2010 and 2011 groundwater monitoring results (MFL) for asbestos (fibers greater than 10µm, based on TEM method), collected at the BoRit site.

		Park			Reservoir		Pile			
Asbestos, chrysotile	**MW1**	**MW1a**	**MW2**	**MW 3**	**MW 4**	**MW5**	**MW5 Dup**	**MW 6**	**CV**	**CV Type**
November 2010 Samples										
	<0.20	<0.20	<0.20	<0.20	0.51*	<0.20	<0.20	<0.20	7	MCL
June 2011 sample										
						0.2				

MFL= Millions of asbestos fibers per liter
Blank cells=analyte not detected
* Detected asbestos fiber was a chrysotile fiber.

Appendix 4:

Public Drinking Water Sampling in Ambler Borough

Table 1 – 2011 public water supply testing along the distribution system in the Borough of Ambler for asbestos from suspected asbestos-containing pipes.

Sample	Location	Total Asbestos (MFL)	Asbestos fibers >10 microns (MFL)	CV (MFL)	CV Type
1	Davis Rd. & Marie Rd.	<0.08	<0.08	7	MCL
2	Madison Ave. & Hartranft Ave.	<0.09	<0.09	7	MCL
3	Toland Dr. & Militia Hill Rd.	0.09	<0.09	7	MCL
3a	Toland Dr. & Militia Hill Rd.	<0.06	<0.06	7	MCL
4	Batleson Rd. & Aldrin Rd.	<0.09	<0.09	7	MCL

MFL= Millions of asbestos fibers per liter
MCL = EPA Maximum Contaminant Level

Appendix 5:

Glossary of Terms

Acute
Occurring over a short time [compare with chronic].

Acute exposure
Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

Adverse health effect
A change in body function or cell structure that might lead to disease or health problems

Analyte
A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

Cancer
Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

Carcinogen
A substance that causes cancer.

Case study
A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.

Case-control study
A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.

Chronic
Occurring over a long time [compare with acute].

Chronic exposure
Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]

Comparison value (CV)
Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

Concentration
The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant
A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Detection limit
The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Environmental media
Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

Environmental media and transport mechanism
Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.

EPA
United States Environmental Protection Agency.

Epidemiology
The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

Exposure
Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

Exposure pathway
The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Feasibility study
A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

Groundwater
Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

Health consultation
A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health

assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

Health education
Programs designed with a community to help it know about health risks and how to reduce these risks.

Ingestion
The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

Inhalation
The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

Maximum Contaminant Level (MCL)
Established under the EPA, the MCL is an enforceable standard for the maximum concentration of a chemical that is allowed in public drinking water system

Millions of Fibers per Liter (MFL)
For asbestos in drinking water, EPA has set an enforceable MCL for asbestos of 7 MFL, for fibers > 10 μm.

mg/kg
Milligram per kilogram.

Migration
Moving from one location to another.

National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)
EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

National Toxicology Program (NTP)
Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.

Plume
A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Point of exposure
The place where someone can come into contact with a substance present in the environment [see exposure pathway].

Population
A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

ppb
Parts per billion.

ppm
Parts per million.

Public health action
A list of steps to protect public health.

Public health assessment (PHA)
An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].

Remedial investigation
The CERCLA process of determining the type and extent of hazardous material

Route of exposure
The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

Sample
A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

Toxicology
The study of the harmful effects of substances on humans or animals.

Volatile organic compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:
Environmental Protection Agency (http://www.epa.gov/OCEPAterms/)
National Library of Medicine (NIH) (http://www.nlm.nih.gov/medlineplus/mplusdictionary.html