ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

# Public Health Assessment for



**KEDDY MILL SITE**

**WINDHAM, CUMBERLAND COUNTY, MAINE**

**EPA FACILITY ID: MEN000106078**

**AUGUST 18, 2015**

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

**Comment Period Ends:**

OCTOBER 2, 2015

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment-Public Comment Release was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate. This document represents the agency's best efforts, based on currently available information, to fulfill the statutory criteria set out in CERCLA section 104 (i)(6) within a limited time frame. To the extent possible, it presents an assessment of potential risks to human health. Actions authorized by CERCLA section 104 (i)(11), or otherwise authorized by CERCLA, may be undertaken to prevent or mitigate human exposure or risks to human health. In addition, ATSDR will utilize this document to determine if follow-up health actions are appropriate at this time.

This document has previously been provided to EPA and the affected state in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. Where necessary, it has been revised in response to comments or additional relevant information provided by them to ATSDR. This revised document has now been released for a 45-day public comment period. Subsequent to the public comment period, ATSDR will address all public comments and revise or append the document as appropriate. The public health assessment will then be reissued. This will conclude the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.



Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

Please address comments regarding this report to:

Agency for Toxic Substances and Disease Registry
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Atlanta, Georgia 30333

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Visit our Home Page at: http://www.atsdr.cdc.gov

# PUBLIC HEALTH ASSESSMENT

KEDDY MILL SITE

WINDHAM, CUMBERLAND COUNTY, MAINE

EPA FACILITY ID: MEN000106078

Prepared by:

Eastern Branch
Division of Community Health Investigations
Agency for Toxic Substances and Disease Registry

## Foreword

Congress established the Agency for Toxic Substances and Disease Registry, ATSDR, in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Superfund law. This law set up a process to identify and clean up our country's worst hazardous waste sites. The U.S. Environmental Protection Agency (EPA) is responsible for implementing the law to ensure the investigation and clean-up of the sites.

Since 1986, Superfund law has required ATSDR to conduct a public health assessment for each of the sites proposed for the EPA National Priorities List (NPL). The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR have cooperative agreements. The public health assessment process allows ATSDR scientists and public health assessment cooperative agreement partners' flexibility in document format when presenting findings about the public health impact of hazardous waste sites. The flexible format allows health assessors to convey to affected populations important public health messages in a clear and expeditious way.

**Exposure:** As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

**Health Effects:** If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high-risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicological, and epidemiologic studies to evaluate the possible health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available.

**Community:** ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals, and community groups. To ensure that the report responds to the community's health concerns, an

early version is also distributed to the public for their comments. All the public comments related to the document are addressed in the final version of the report.

**Conclusions:** The report presents conclusions about the public health threat posed by a site. Ways to stop or reduce exposure will then be recommended in the public health action plan. ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA or other responsible parties. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also recommend health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

**Comments:** If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Manager, ATSDR Records Center

Agency for Toxic Substances and Disease Registry

4770 Buford Hwy, NE, MS F-09

Atlanta, GA 30341

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# Summary


### Introduction

In 1997, Polychlorinated Biphenyls (PCBs) were found to be elevated on the Keddy Mill site. Following several removal actions by the owner, the State of Maine and the US Environmental Protection Agency (EPA), several PCB hotspots remain in on-site surface soil as well as in downstream fish in the Presumpscot River. The Keddy Mill site was proposed for inclusion on the EPA National Priorities List (NPL) on December 11, 2013, with a final ruling on May 12, 2014. The Agency for Toxic Substances and Disease Registry (ATSDR) is required to conduct public health assessments of sites proposed for the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and its amendments. The US Environmental Protection Agency (EPA) has not yet scheduled its Remedial Investigation (RI) for this site. ATSDR's job is to ensure that the community has the best information possible to safeguard its health.

### Conclusions

| | |
|---|---|
| **Conclusion 1** | Children of subsistence fishermen may be at risk of impaired health from PCBs in fish. ATSDR concludes that eating fresh fish from the Presumpscot River will not in general harm people's health. |
| **Basis for Conclusion 1** | Those subsistence fishermen's children who eat one caught fish meal per week, or more, may be at increased risk for impaired immune response. Based on fish measurements taken by the State of Maine from 1994 to 2010, it would not harm children's or adults' health to eat less than one fish meal per week. |
| **Next Steps** | ATSDR recommends that the State of Maine sample typical game fish (e.g., salmon and trout) in the Presumpscot River for PCBs, and post a fish advisory for the Presumpscot River downstream from the Keddy Mill site. |
| **Conclusion 2** | ATSDR concludes that PCBs in on-site soil will not harm people's health. |
| **Basis for Conclusion 2** | The site is fully fenced and heavily overgrown with vegetation. There are no visible paths worn around the site perimeter that would suggest active trespassing by neighborhood residents. |

| | |
|---|---|
| **Next Steps** | When EPA conducts additional sampling, ATSDR recommends sampling on-site soil for a typical full spectrum of contaminants (e.g., Metals, Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Pesticides, and PAHs) in addition to PCBs in its remedial investigation, ATSDR will reevaluate when new data become available. |

## Background and Statement of Issues

The Keddy Mill site was proposed for inclusion on the NPL, on December 11, 2013, with a final ruling on May 12, 2014[1]. ATSDR is required to conduct public health assessments of sites proposed for the NPL under CERCLA and its amendments. The US EPA has not yet scheduled its Remedial Investigation (RI) for this site.

### Site Description

Keddy Mill is a 6.9-acre site located at 7 Depot Street in the Town of Windham, Cumberland County, Maine. The property is located in the Little Falls portion of South Windham, Maine, which is approximately 14 miles northeast of Portland. The property is bounded to the north by Depot Street; to the northeast by a partially-developed commercial parcel also owned by Keddy Mill Enterprises, LLC; to the east by a former Maine Central Railroad right-of-way (currently owned by Maine Department of Transportation); to the south and southwest by undeveloped property owned by S.D. Warren Company and the Presumpscot River; to the west by the Presumpscot River, a parking lot property owned by S.D. Warren Company, and a hydroelectric dam and power generating station (also owned by S.D. Warren Company); and to the northwest by "Little Falls Landing" a disabled and senior assisted living complex, owned by the South Windham Housing Corporation. The Keddy Mill property is currently vacant, but has a derelict two-story concrete industrial building (circa 1900) with a full basement[2].

The property formerly contained several additional industrial buildings which have since been demolished. A visit to the Keddy Mill property was conducted by EPA and its contractor on April 26, 2012, during the performance of the EPA Site Inspection (SI). In addition to the vacant concrete building, EPA and contractor personnel observed that the property was enclosed by a chain-link fence and locked fence gates.

### Site Visit

ATSDR performed a site visit on August 24, 2014. The perimeter of the site is overgrown with heavy vegetation. There is one large remaining structure on-site, directly adjacent to an active hydroelectric dam. During the site visit the health assessor observed that the property was fully

fenced with no breaks. There were no obvious trails worn through the vegetation outside the fence-line. The remaining structure showed no graffiti or other signs of trespassing.

**Site Operations and History**

Many industrial activities were conducted on the Keddy Mill site between 1756 and 1997 including, a sawmill, grist and wool carding mill, wood pulp and boxboard manufacturing, steel manufacturing and fabrication of heavy equipment buckets, manufacturing of fire suppression piping and materials, a small machine shop, and equipment storage. Several buildings on the site have been demolished, and the site currently consists of a single abandoned multistoried concrete building. The site has been vacant since 1997. Table 1 highlights the historic ownership and type of operations at the Keddy Mills site.

**Table 1 Historic Ownership and Type of Operations**

| Approximate Years of Ownership | Owner | Operations and Events of Significance |
|---|---|---|
| Prior to 1756-unknown | William Knight | Sawmill |
| Unknown - 1847 | Unknown | Grist mill and wool carding mills |
| 1847-1853+/- | Unknown | Sawmill (disassembled and relocated in approximately 1853) |
| 1853-1875 | Unknown | Unoccupied |
| 1875-1900 | Charles A. Brown Company | Wood pulp and box-board manufacture; constructed large mill complex on the property |
| 1900- March 1940 | Androscoggin Pulp Company | Wood pulp and box-board manufacture; enlarged the mill complex on the property with the construction of several new buildings |
| March 1940-July 1945 | Cumberland Securities Group | Operations at this time are not known, but are assumed to be wood pulp and box-board manufacture |
| July 1945-December 1945 | Windham Fibers | Operations at this time are not known, but are assumed to be wood pulp and box-board manufacture |
| December 1945-August 1953 | Maine Steel | Steel manufacture and fabrication of heavy equipment buckets |
| August 1953-December 1953 | Weiland, Hoodin, Buthckes, Jelin | Unknown |
| December 1953-August 1954 | Irving Fox | Unknown |
| August 1954-June 1961 | Atlantic Mills, Inc. | Unknown |
| June 1961-November 1969 | Keddy Manufacturing Co. | Unknown |
| November 1969-August 1973 | Grinnell Corporation | Fire suppression piping and materials manufacture |
| August 1973-May 1974 | Park Corporation | Liquidation of heavy machinery within the former mill complex |
| May 1974-July 1975 | Lawrence J. Keddy | Operations not known. |
| January 1975-January 1978 | National Metal Converters | Operated by National Metal Converters (also known as New England Steel Company); operations not known; presumed steel manufacture |
| January 1978-April 1993 | Lawrence J. Keddy | Unknown; however a Phase I Investigation performed in 1993 stated that reinforcing steel had been manufactured on the Keddy Mill property |

Ref: EPA Hazard Ranking Score for Keddy Mill, December 2013.

## Regulatory History and Activities

There have been numerous environmental assessments of the site beginning in 1993. Two past cleanup activities were performed in 1997 and 2010. Table 2 lists all the environmental investigations performed at the site.

**Table 2 History of Past Environmental Investigations**

| Performing Company/Agency | Performed For | Investigation Type | Report Date | Tasks Performed | Hazardous Substance |
|---|---|---|---|---|---|
| Consla Geotechnical Engineering, Inc. | Mr. Laurence Keddy | Phase I Limited Environmental Site Assessment | 3/18/93 | Property history, interviews, visit | N/A |
| S.W. Cole Engineering, Inc. | Mr. George Wood | Phase I & II Environmental Site Assessment | 11/17/97 | Property history, interviews, visit; soil sampling, test pitting, limited petroleum-related soil excavation | Tested for arsenic, cadmium, chromium, copper, lead, nickel, zinc, petroleum hydrocarbon, PCBs |
| Jacques Whitford Company, Inc | Unknown | Supplemental Site Investigation | 3/9/04 | Visit, soil sample collection | Petroleum hydrocarbons, PCBs (in excess of TSCA), metals |
| Ransom Environmental Consultants, Inc. | Village at Little Falls, LLC | Plan for Self-Implementation Cleanup of PCB Remediation Waste-Phase I | 4/28/06 | Visit, PCB sample collection | PCBs |
| Summit Environmental Consultants, Inc. | Town of Windham (through MEDEP) | Soil Sampling Memorandum | 5/20/10 | Visit, sample collection | PCBs |
| Summit Environmental Consultants, Inc. | Town of Windham (through MEDEP) | Soil Sampling Memorandum | 1/5/11 | Visit, sample collection | PCBs |
| Summit Environmental Consultants, Inc. | Town of Windham (through MEDEP) | Phase I Environmental Site Assessment | 3/17/11 | Property history analysis, visit, records review, interviews | N/A |
| Summit Environmental Consultants, Inc. | Town of Windham (through MEDEP) | Supplemental Sampling Memorandum | 7/25/11 | Soil and concrete core samples | PCBs |
| Summit Environmental Consultants, Inc. | Town of Windham (through MEDEP) | Electrical Conductivity Testing | 10/24/11 | Visit, soil drilling, and conductivity probing | N/A |
| H&S/Nobis Environmental JV, LLC | EPA | Preliminary Assessment | 3/21/12 | Visit | N/A |
| H&S/Nobis Environmental JV, LLC | EPA | Site Inspection | 1/15/13 | Visit, property history review, sample collection | PCBs |

### *Past Clean-Up Activities*

Two removal actions were performed on the Keddy Mill property by the property owners at the time. The first removal action took place in 1997, and involved the excavation of 10.88 tons of petroleum-impacted soil from the north-central portion of the property. Post-excavation samples were not collected for PCB analysis. In May and July 2010, the second removal action was performed in accordance with the Toxic Substances Control Act (TSCA) Self Implementing Clean-up Plan (SICP) submitted in 2006. The SICP included three phases of cleanup actions within the Keddy Mill property buildings:

- Phase I – Removed PCB-contaminated fuel oils remaining in piping and PCB-contaminated sludge, dirt, debris, and oily materials within the buildings.
- Phase II – Performed additional testing for PCB contamination on building interior porous surfaces. A separate plan was to be prepared to describe this activity, but has not yet been prepared.
- Phase III – Performed additional testing of soil surrounding and underlying the buildings.

**Land Use and Natural Resources Information**

The Little Falls area is mixed use comprised of a disabled and senior assisted living home, a hydro-electric dam, a derelict former mill site (i.e., Keddy Mill) and a railroad right of way. There is a school within a tenth of a mile to the East of the site, and a number of single family homes within a quarter mile of the site. The shoreline above and below the dam is used regularly by subsistence fishermen[2]. The periphery of the former mill site is vegetated and not readily visible from the street. Figure 1 is an aerial map that shows the site boundaries, vegetation and structures.

The Presumpscot River is the drinking water source for the Town of Gorham, Maine. The intake is just downstream from the Little Falls Dam. PCBs have not been detected at the water intake.

**Demographic Information**

The total population within a mile of the former Keddy Mill was 2,205 according to the 2010 US Census[3]. Figure 2 shows the population density and demographic distribution around the site. Minorities comprise less than 5 percent of the population. There were 152 children under six years of age within a mile of the site.

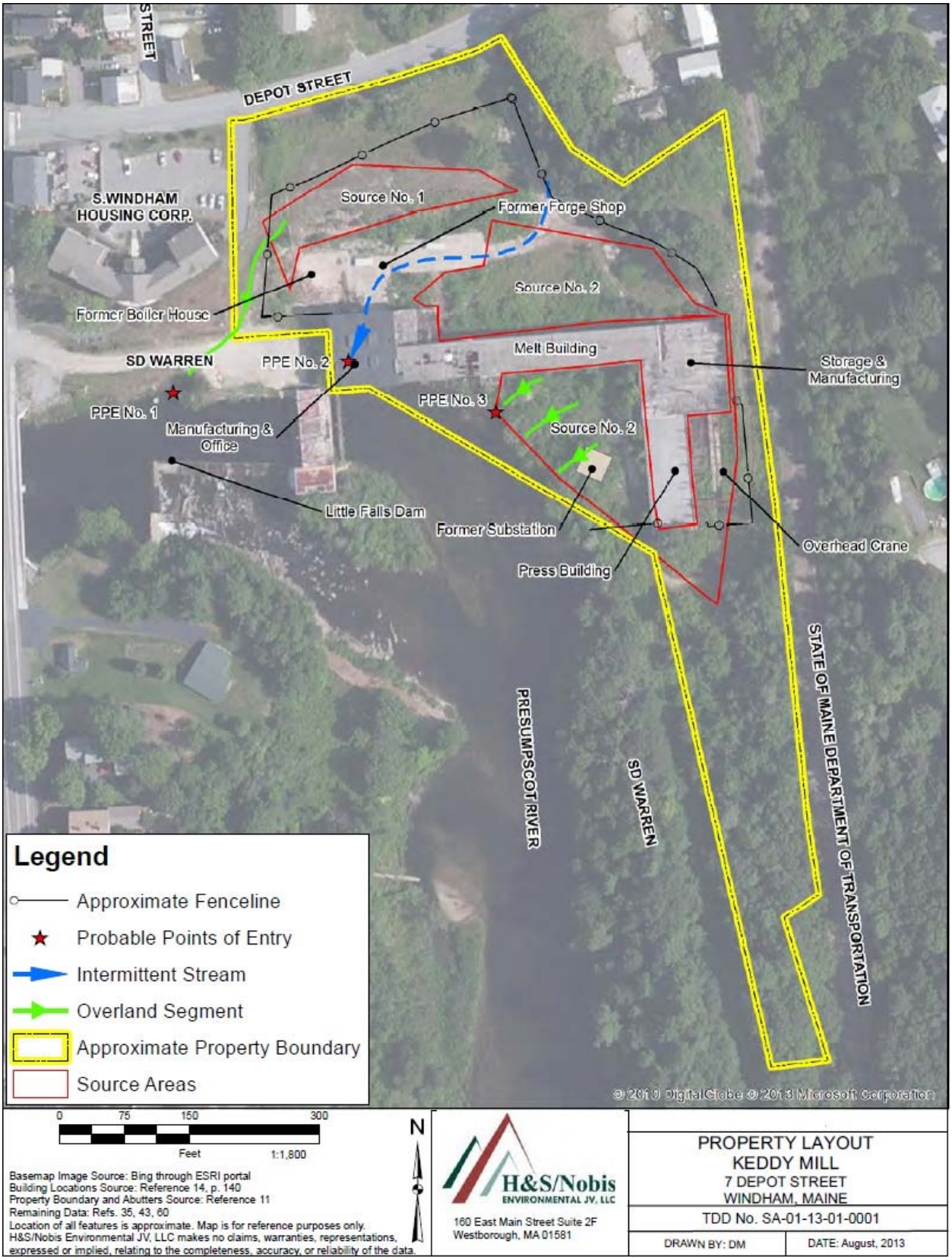


**Figure 1 Map of Keddy Mill Site, Windham, Maine**

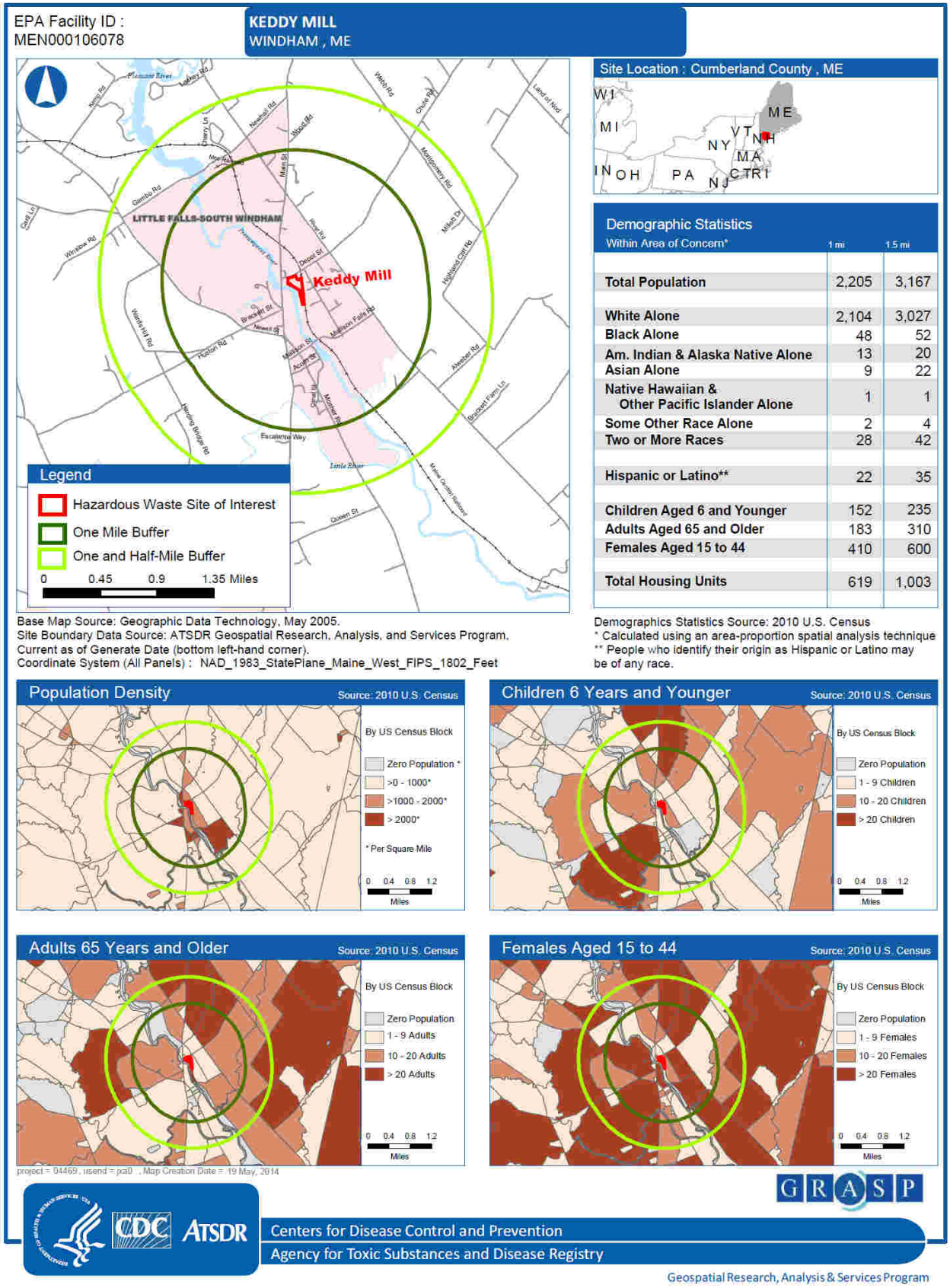


**Figure 2 Population Breakdown Around Keddy Mill**

## Discussion

### Evaluation of Exposure Pathways

#### *What is meant by exposure?*

ATSDR's public health assessments focus on exposure to, or contact with, environmental contaminants. Contaminants released into the environment have the potential to cause harmful health effects. Nevertheless, *a release does not always result in exposure.* People can only be exposed to a contaminant if they come in contact with that contaminant—if they breathe, eat, drink, or come into skin contact with a substance containing the contaminant (see Figure 3). If no one is exposed to a contaminant, no health effects could occur. Often the public does not have access to the source area of contamination or areas where contaminants are moving through the environment. This lack of access to these areas becomes important in determining whether people could be exposed to the contaminants.

> An exposure pathway has five elements: (1) a source of contamination, (2) an environmental media, (3) a point of exposure, (4) a route of human exposure, and (5) a receptor population. The *source* is the place where the chemical or radioactive material was released. The *environmental media* (such as groundwater, soil, surface water, or air) transport the contaminants. The *point of exposure* is the place where people come into contact with the contaminated media. The *route of exposure* (for example, ingestion, inhalation, or dermal contact) is the way the contaminant enters the body. The people actually exposed are the *receptor population*.

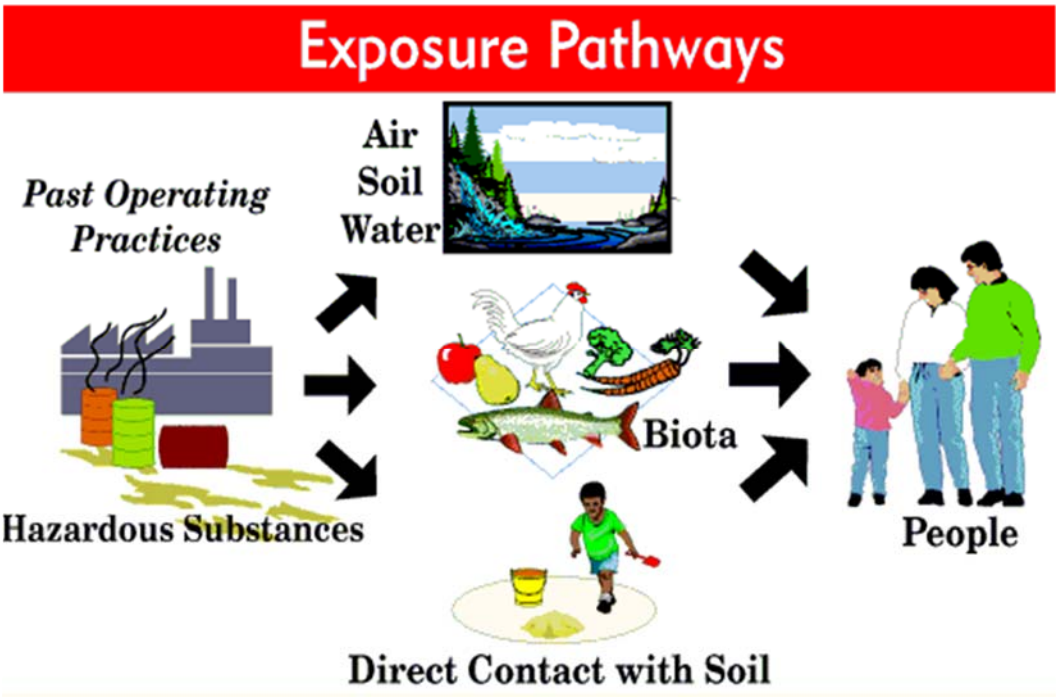


**Figure 3 Exposure Pathways**

The route of a contaminant's movement is the *pathway*. ATSDR identifies and evaluates exposure pathways by considering how people might come in contact with a contaminant. An exposure pathway could involve air, surface water, groundwater, soil, dust, or even plants and animals. Exposure can occur by breathing, eating, drinking, or by skin contact with the chemical contaminant. ATSDR identifies an exposure pathway as completed, potentially completed, or eliminates the pathway from further evaluation.

- *Completed exposure pathways* exist for a past, current, or future exposures if contaminant sources can be linked to a receptor population. All five elements of the exposure pathway must be present. In other words, people contact or are likely to come into contact with site-related contamination at a particular exposure point. As stated above, a release of a chemical into the environment does not always result in human exposure. For an exposure to occur, a completed exposure pathway—contact with the contaminant—must exist.
- *Potential exposure pathways* indicate that exposure to a contaminant might have occurred in the past, might be occurring currently, or might occur in the future. It exists when one or more of the elements are missing but available information indicates possible human exposure. A potential exposure pathway is one that ATSDR cannot rule out, even though not all of the five elements are identifiable.
- An *eliminated exposure pathway* exists when one or more of the elements are missing. Exposure pathways can be ruled out if the site characteristics make past, current, and future human exposures extremely unlikely. If people are not exposed to contaminated areas, the pathway is eliminated from further evaluation. Also, an exposure pathway is eliminated if site monitoring reveals that media in accessible areas are not contaminated.

***How does ATSDR determine which exposure situations to evaluate?***

ATSDR scientists evaluate site conditions to determine if people could have been, are being, or could be exposed in the future (i.e., exposed in a past scenario, a current scenario, or a future scenario) to site-related contaminants. When evaluating exposure pathways, ATSDR identifies whether exposure to contaminated media (soil, sediment, water, air, or biota) has occurred, is occurring, or will occur through ingestion (eating or drinking), dermal (skin) contact, or inhalation (breathing).

If exposure was, is, or could be possible, ATSDR scientists consider whether contamination is present at levels that might adversely affect public health. ATSDR scientists select contaminants for further evaluation by comparing them to comparison values. These are developed by ATSDR from available scientific literature related to exposure and adverse health effects. Comparison values are derived for each of the different media and reflect an estimated contaminant concentration that is *not likely* to cause non-cancer adverse health effects for a given chemical, assuming a certain exposure rate (e.g., an amount of water or soil consumed or an amount of air breathed) and body weight.

*Comparison values are not thresholds for adverse health effects*. ATSDR comparison values establish contaminant concentrations many times lower than known levels at which "no" or "lowest" effect were observed in experimental animal or human studies. If contaminant concentrations are above comparison values, ATSDR further analyzes exposure variables (for

example, duration and frequency of exposure), the toxicology of the contaminant, other epidemiology studies, and the scientific weight of evidence for adverse health effects.

Some of the comparison values used by ATSDR scientists include ATSDR's environmental media evaluation guides (EMEGs), reference dose media evaluation guides (RMEGs), and cancer risk evaluation guides (CREGs). ATSDR may also consider EPA's drinking water maximum contaminant levels (MCLs). EMEGs, RMEGs, RfCs, and CREGs are non-enforceable, comparison values developed by ATSDR for screening environmental contamination data to determine if further evaluation is necessary. MCLs are enforceable EPA drinking water regulations and are to be set as close to the maximum contaminant level goals (MCLGs) (Health Goals) as is feasible and are based upon treatment technologies, costs (affordability) and other feasibility factors, such as availability of analytical methods, treatment technology and costs for achieving various levels of removal.

You can find out more about the ATSDR evaluation process by calling ATSDR's toll-free telephone number, 1-800-CDC-INFO (1-800-232-4636) or reading ATSDR's Public Health Assessment Guidance Manual at http://www.atsdr.cdc.gov/HAC/PHAManual/.

***If someone is exposed, will they get sick?***

*Exposure does not always result in harmful health effects*. The type and severity of health effects (if any) a person can experience because of contact with a contaminant depend on the exposure concentration (how much), the frequency (how often) and/or duration of exposure (how long), the route or pathway of exposure (breathing, eating, drinking, or skin contact), and the exposure to more than one contaminant. Once exposure occurs, a person's characteristics such as age, sex, nutritional status, genetics, lifestyle, and health status influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. Together, these factors and characteristics determine if adverse health effects that may occur.

In almost every situation, there is considerable uncertainty about the true level of exposure to environmental contamination. To account for this uncertainty and to be protective of public health, ATSDR scientists typically use worst-case exposure level estimates as the basis for determining whether adverse health effects are possible. These estimates are usually much higher than the levels that people are really exposed to. If the exposure levels indicate that adverse health effects may be possible, ATSDR performs more detailed reviews of exposure and reviews the toxicologic and epidemiologic literature for scientific information about the health effects from exposure to hazardous substances.

***What exposure situations were evaluated for residents living near the Keddy Mill?***

ATSDR obtained information to support the exposure pathway analysis for the Keddy Mill Superfund Site from multiple site investigation reports; state, local, and facility documents; and information from communication with local, state officials and from the site visit. The analysis also draws from available environmental data for groundwater, soil, surface water and sediment, and biota. The only contaminants identified on site were polychlorinated biphenyls

(PCBs). Table 3 shows the evaluation of exposures by pathway and reasons for further analysis or whether that pathway was incomplete.

Polychlorinated Biphenyls (PCBs)[8]

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor. The site sampling events identified Aroclor-1254, Aroclor-1248 and Aroclor-1260.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

**Table 3 Exposure Pathways**

| Pathway | Source | Media | Exposure Point | Exposure Route | Exposed Population | Time | Pathway Complete? |
|---|---|---|---|---|---|---|---|
| Public Water supply | Keddy Mill PCB Releases | Drinking Water | Gorham Municipal Water System | Ingestion, Dermal, Inhalation | Gorham, Maine Residents | Past<br>Present<br>Future | Incomplete - not detected at water intake |
| Soil | Keddy Mill PCB Releases | Surface Soil | On-Site Surface Soil | Ingestion, Dermal, Inhalation | Trespassers | Past<br>Present<br>Future | Incomplete - No Access, site fenced and no evidence of trespassing |
| Air | Keddy Mill PCB Releases | Air | On-Site | Inhalation | Trespassers | Past<br>Present<br>Future | Incomplete - Well Vegetated |
| Surface Water | Keddy Mill PCB Releases | Wetlands, Streams, Rivers | Presumpscot River Below Little Falls Dam | Ingestion, Dermal, Inhalation | Recreational Users | Past<br>Present<br>Future | Incomplete - Insoluble |
| Fish | Keddy Mill PCB Releases | Fish | Caught from Presumpscot River | Ingestion | Anglers and Family | Past<br>Present<br>Future | Complete<br><br>Potential |

*Groundwater and Surfacewater Pathways*

There is no groundwater data for the site and the surrounding neighborhood is on municipal water. The levels of PCBs in the Presumpscot River downstream from the site at the Gorham intake were reported as non-detect. According to EPA, “PCBs are not soluble in water”. http://www.epa.gov/ogwdw/pdfs/factsheets/soc/tech/pcbs.pdf

*Air Pathway*

There are no data for air at this site. It is not expected that there would be any PCB contamination in air since PCBs bind heavily to soil and sediment. The site is heavily vegetated which would reduce any fugitive dust and with no evidence of trespassing there does not appear to be a completed pathway from air exposure.

*Soil Ingestion Pathway*

**Has there been current or past contact with contamination on the Keddy Mill property is eliminated as an exposure pathway of concern?**

Because the mill site is fenced and access is restricted, public exposure to on-site contamination at the Keddy Mill is eliminated. Further, remediation efforts have removed some of the contaminated on-site soil.

The site is fully fenced with no apparent breaks or cuts when the site was visited in September 2014. The perimeter is heavily overgrown with vegetation and there were no worn paths or litter visible that could indicate trespassers entering the site. A site-wide environmental assessment that analyzed for a full spectrum of contaminants was performed in 1997 and reported finding only petroleum and PCB contamination on-site[4]. Soil samples were collected in May 2010, January 2011, and July 2011 identified that much of the on-site surface soil surrounding the Keddy Mill property buildings is contaminated with PCB mixtures including Aroclor-1248, Aroclor-1254, and Aroclor-1260. The PCBs in soil appeared to be related to the presence of metal filings associated with cutting oils, slag materials, and transformers on the Keddy Mill property[2].

Most importantly, there was no indication of regular trespassing on-site. Therefore, the soil ingestion pathway does not appear to be completed.

*Biota Pathway*

The State of Maine sampled fish in all major rivers for PCBs from 1994 to 2010. No fish sampling data are available since 2010. The two species sampled were small mouth bass and white suckers. Small mouth bass are a game species and white suckers in this area is considered a bait fish only. According to the Maine Department of Inland Fisheries and Wildlife[5] white suckers are not fished for, and therefore we did not consider them when calculating doses. According to the same report, the three most popular gamefish in Maine are smallmouth bass, trout and landlocked salmon. There are no samples for either trout or salmon in the Presumpscot River. Samples were taken at Windham upstream from Keddy Mills, Gorham just downstream from the site and in Westbrook several miles further downstream. The data are presented in Table 4 and illustrates that there are relatively low PCB concentrations in fish caught upstream from Keddy Mill above the dam at Little Falls. Arithmetic mean PCB

concentrations from 2010 in small mouth bass caught just downstream from Keddy Mill were 18 times higher than above the dam in Windham. Concentrations then drop to roughly half that at Westbrook. PCB concentrations in fish more than doubled between 2009 and 2010. We do not know if the PCB levels in fish have continued to rise or dropped since 2010. Since ATSDR does not have any health based comparison values for PCBs in fish, we calculated possible doses to determine if harmful effects are possible.

**Table 4 Arithmetic Mean and (95% UCL) Total PCBs in game fish from the Presumpscot River (mg/kg)**

| Year | Species | Windham PWD (upstream) | Gorham PGO (downstream) | Westbrook PWB (downstream) |
|---|---|---|---|---|
| 1994 | SMB | 0.008 | | 0.008 |
| 2009 | SMB | | 0.041 (0.048) | 0.026 (0.027) |
| 2010 | SMB | 0.006 (0.007) | 0.109 (0.131) | 0.051 (0.051) |

SMB = small mouth bass

## Public Health Implications

### Noncancer Risk Evaluation

Studies across the country show women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported in most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.[6]

To evaluate the potential for noncancer adverse health effects that might result from exposure to PCBs in Presumpscot River freshwater fish downstream of the Little Falls Dam, estimated doses for high end and average consumers were calculated. These estimated doses were then compared to ATSDR's minimal risk levels (MRLs) or EPA's oral reference doses (RfDs). MRLs and RfDs are doses below which noncancer adverse health effects are not expected to occur (so called "safe" doses). They are derived from toxic effect levels obtained from human populations and laboratory animal studies. This toxic effect level is divided by "uncertainty factors" to give the lower, more protective MRL or RfD. A dose that exceeds the MRL indicates only the potential for adverse health effects. The magnitude of this potential can be inferred from the degree to which this value is exceeded by the exposure dose. If the estimated exposure dose is only slightly above the MRL, then that dose will fall well below the toxic effect level. The higher the estimated dose is above the MRL, the closer it will be to an adverse effect level. The MRL is based on a lowest-observed adverse effect level (LOAEL) of 0.005 milligrams per kilogram per

day (mg/kg-day) where immune system changes were seen in monkeys chronically exposed to Aroclor-1254 in their diet. This LOAEL was divided by an uncertainty factor of 300 to give an MRL of 0.00002 mg/kg-day.

The Environmental Protection Agency's Exposure Factors Handbook from September 2011 (http://www.epa.gov/ncea/efh/pdfs/efh-chapter10.pdf page 10-11), lists the average consumption rate for freshwater fish caught in Maine as 7.5 grams per day[7]. That equates to one 8 ounce serving per month. A child from one to six years of age would have a serving size of 3 ounces per month or 2.8 grams per day. We also analyzed for a high consumption rate of one serving per week (for subsistence fishers), which corresponds to 32.3 g/day for an adult and 12.1 g/day for a child. We assumed that people consumed fish with at the highest 95% Upper Confidence Level (95% UCL) concentration of total PCBs at 131 ng/g caught just below Little Falls or just downstream from the Keddy Mill site.

Using the following formula to determine the toxicological dose from PCBs in fish. We calculated that the dose to an average adult consumer from one fish meal per month would be $1.4x10^{-5}$ mg/kg-day and for a child it would be $2.3x10^{-5}$ mg/kg-day. Likewise, we calculated that a high consuming adult and child from one fish meal per week would be $6.1x10^{-5}$ mg/kg-day and $1.0 \times 10^{-4}$ mg/kg-day, respectively. EPA's reference dose (RfD) for Total PCBs (equivalent to Aroclor 1254) is $2 \times 10^{-5}$mg/kg-day.

$$D = (IR \times C)/Bw$$

Where:
*D* = dose in milligrams per kilogram-day
*C* = concentration of total PCBs in fish in milligrams per kilogram
*Bw* = body weight in kilograms
*IR* = ingestion rate in kilograms per day

*Example Calculation for an Average 70 kg Adult eating 7,456 mg of fresh caught fish per day:*

$$7{,}456\ mg/day * 0.000000131/70kg = 0.000014\ mg/kg\text{-}day = 1.4 \times 10^{-5}\ mg/kg\text{-}day$$

**Table 5 Dose Assumptions**

| | PCB Concentration in Fish | Body Weight | Ingestion Rate* | Dose | Hazard Quotient HQ |
|---|---|---|---|---|---|
| Average Adult | 0.131 mg/kg | 70 kg | 7,456 mg/day | $1.4x10^{-5}$mg/kg-day | 0.7 |
| Average Child | 0.131 mg/kg | 16 kg | 2,796 mg/day | $2.3x10^{-5}$mg/kg-day | 1.1 |
| High Adult | 0.131 mg/kg | 70 kg | 32,300 mg/day | $6.1x10^{-5}$mg/kg-day | 3.1 |
| High Child | 0.131 mg/kg | 16 kg | 12,100 mg/day | $1.0x10^{-4}$mg/kg-day | 5 |

* United States Environmental Protection Agency. Exposure Factors Handbook: 2011 Edition. Washington (DC); 2011

For comparison, the estimated dose can be divided by the MRL to give a value known as the hazard quotient (HQ), which provides a convenient method to measure the relative health risk associated with a dose. As the hazard quotient exceeds one and approaches the actual toxic effect level, the dose becomes more of a health concern. While the doses estimated for the average child consumer exceed the MRL, they are not very much above the MRL with a HQ of 1.1. Hazard quotients calculated for exposure to PCBs in Presumpscot River freshwater fish downstream of the Little Falls Dam ranged from less than one for adults to 1.1 for children.

Average adult and child consumers of fish from Presumpscot River downstream of the Little Falls Dam are not expected to experience adverse health effects from exposure to contaminants in those fish. The HRS document[2] states that there a subsistence fishermen in the area. High consuming (i.e., subsistence) children, or those eating 1 or more fish meals a week appear to be at risk of adverse health effects (see Table 4). The HQ is 5 for this group. The high consuming child is also only a factor of 50 below the lowest observed adverse effect levels (LOAEL) for children. Information about health effects of PCBs can be found in ATSDR's Toxicological Profile[8].

**Cancer Risk Evaluation**

Cancer risks from exposure to total PCBs in Presumpscot River freshwater fish downstream of the Little Falls Dam are discussed below.

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and

the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans[8].

PCBs are classified as a probable human carcinogen (Group B2) by EPA based on sufficient evidence of cancer in animals, but inadequate evidence in humans. Cancer risk estimates assume long-term exposure (i.e., 30 years) averaged over a 70-year lifetime. This average daily dose is then multiplied by a measure of toxicity—the cancer potency factor (or slope factor)—to produce an estimate of carcinogenic risk. Specifically, IRIS advises to use the high risk and persistence slope factor when there is food chain exposure and early-life exposure http://www.epa.gov/iris/subst/0294.htm).

Upper-bound slope factor: 2.0 per (mg/kg)/day
Central-estimate slope factor: 1.0 per (mg/kg)/day

We have both scenarios here, assuming that fishermen take fish home to share with their families including young children. We used the central-estimate slope factor in combination with the maximum plausible average intake rate for our estimates. Extimated cancer risks from exposure to total PCBs estimated for average (one 8 oz. meal per month) and high end (one 8 oz. meal per week) consumers of Presumpscot River freshwater fish downstream of the Little Falls Dam ranged from 4 to 16 in 1,000,000 respectively. The childhood risk was also evaluated, but was less than the lifetime adult risk in both scenarios. This means that out of the total population within a 1.5 mile radius of 3,200, there is a 1 in 20 chance that anyone would develop cancer over a 76 year lifetime. The cancer risk is elevated, but still very low for the high end consumer scenario.

The estimated risk of developing cancer resulting from exposure to the contaminants was calculated by multiplying the site-specific estimated exposure dose by an appropriate cancer slope factor (CSF for Total PCBs is 0.001 (µg/kg-day)$^{-1}$). EPA CSFs can be found at http://www.epa.gov/iris. The results estimate the maximum increase in risk of developing cancer after 70 years of exposure to the contaminant. For this site, we assumed 30 years as conservative worst-case exposure duration. The formula used for cancer risk calculation is:

Excess Cancer Risk = (C x CSF x IR x ED)/BW x AD where

C (mg/kg) = contaminant concentration in fish

CSF (mg/kg/day)$^{-1}$ = cancer slope factor

IR (kg/day) = fish ingestion rate

ED (years) = Exposure duration

BW (kg) = body weight

AD (Adjusted lifetime exposure duration in years) = Exposure duration/70 years

For example, for an adult using the body weight of 70 kg, mean ingestion rate of 7,456 mg/day (7.456x10$^{-6}$ kg/day), and ED of 30 years, AT of 78 years, the excess cancer risk is:

Excess Cancer Risk = 0.131 mg/kg x 1 (mg/kg-day )$^{-1}$) x 7.456x10$^{-3}$ kg/day x 30 year/70 kg x 1/70 year = 4x10$^{-6}$

## Community Health Concerns

ATSDR has not been able to identify any public health concerns about the site. The only concern relates to the derelict nature of the property.

## Conclusions

1. Those subsistence fishermen's children who eat one caught fish meal per week, or more, may be at increased risk for impaired immune response from PCBs in fish. ATSDR concludes that eating fresh fish from the Presumpscot River will not harm normal fish consumers' health. Based on fish measurements taken by the State of Maine from 1994 to 2010, it would not harm children's or adults' health to eat less than one fish meal per week.
2. ATSDR concludes that PCBs in on-site soil will not harm people's health, because people are not exposed to enough on-site soil. The site is fully fenced and heavily overgrown with vegetation. There are no visible paths worn around the site perimeter that would suggest active trespassing by neighborhood residents.

## Recommendation

1. ATSDR recommends that the State of Maine sample typical game fish (e.g., salmon and trout) in the Presumpscot River for PCBs, and consider posting a fish advisory for the Presumpscot River downstream from the Keddy Mill site.

2. When EPA conducts additional sampling, ATSDR recommends sampling for a typical full spectrum of contaminants (e.g., RCRA Metals, VOCs, SVOCs, Pesticides, and PAHs) in addition to PCBs in its remedial investigation. ATSDR will reevaluate when new data become available.

# PUBLIC HEALTH ACTION PLAN

### Completed Actions

None

### Ongoing and Planned Actions

There is currently no EPA activity on this site. When EPA conducts additional sampling, ATSDR recommends sampling for a typical full spectrum of contaminants (e.g., RCRA Metals, VOCs, SVOCs, Pesticides, and PAHs) in addition to PCBs in its remedial investigation. ATSDR will reevaluate when new data become available.

## Preparer of Report

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## References

[1] "National Priorities List, Final Rule No.58", 79 Federal Register 91 (May 12, 2014) pp. 26853-26860.

[2] "EPA Hazard Ranking System (HRS) Documentation Record for Keddy Mill EPA ID MEN000106078" December, 2013.

[3] United States Census Bureau. 2010 Census, U.S. Census Bureau. 2010. Web. 1 January 2013 <http://www.census.gov/2010census/data/>

[4] S.W. Cole Engineering Co., Environmental Site Assessment- Phase I & II Former Steel Mill Property, November 17, 1997.

[5] Maine Office of Tourism & Maine Department of Inland Fisheries and Wildlife. Fishing in Maine in 2013: A statewide and regional analysis of participation and economic contributions, Augusta, Maine; January 2015.

[6] Gladen BC, Rogan WJ, Hardy P, et al. 1988. Development after exposure to polychlorinated biphenyls and dichlorodiphenyl dichloroethene transplacentally and through human milk. J Pediatr 113:991-995.

[7] United States Environmental Protection Agency. Exposure Factors Handbook: 2011 Edition. Washington (DC); 2011

[8] Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Polychlorinated Biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

# Appendix A

## Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency in Atlanta, Georgia, with 10 regional offices in the United States. ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases from toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces laws to protect the environment and human health. This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. For additional questions or comments, call 1-800-CDC-INFO.

**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

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

**Cancer risk**
A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

**Carcinogen**
A substance that causes cancer.

**Central nervous system**
The part of the nervous system that consists of the brain and the spinal cord.

**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.

**Completed exposure pathway**
[see exposure pathway].

**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. The Superfund Amendments and Reauthorization Act (SARA) later amended this law.

**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.

**Dermal**
Referring to the skin. For example, dermal absorption means passing through the skin.

**Dermal contact**
Contact with (touching) the skin [see route of exposure].

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

**Dose**
The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

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

**Epidemiologic study**
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

**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.

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

**Health outcome data**
Information from private and public institutions on the health status of populations. Health outcome data can include morbidity and mortality statistics, birth statistics, tumor and disease registries, or public health surveillance data.

**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].

**Intermediate duration exposure**
Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].

**Metabolism**
The conversion or breakdown of a substance from one form to another by a living organism.

**Metabolic byproduct**
Any product of metabolism.

**Minimal risk level (MRL)**
An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs is not used as predictors of harmful (adverse) health effects [see reference dose].

**Morbidity**
State of being ill or diseased. Morbidity is the occurrence of a disease or condition that alters health and quality of life.

**Mortality**
Death. Usually the cause (a specific disease, a condition, or an injury) is stated.

**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.

**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).

**Prevention**
Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

**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.

**Public health surveillance**
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

**Reference dose** (RfD)
An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

**Risk**
The probability that something will cause injury or harm.

**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.

**Sample size**
The number of units chosen from a population or an environment.

**Source of contamination**
The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

**Substance**
A chemical.

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

**Superfund Amendments and Reauthorization Act** (SARA)
In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

**Toxicological profile**
An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

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

**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.

**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)