ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

GENERAL ELECTRIC SITE-EAST STREET AREA I
(a/k/a GE-HOUSATONIC RIVER)
PITTSFIELD, BERKSHIRE COUNTY, MASSACHUSETTS
EPA FACILITY ID: MAD002084093
SEPTEMBER 23, 2003

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

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment 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.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes 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.

Agency for Toxic Substances & Disease Registry ....Julie L. Gerberding, M.D., M.P.H., Administrator
Henry Falk, M.D., M.P.H., Assistant Administrator

Division of Health Assessment and Consultation. .... Robert C. Williams, P.E., DEE, Director
Sharon Williams-Fleetwood, Ph.D., Deputy Director

Community Involvement Branch .... Germano E. Pereira, M.P.A., Chief

Exposure Investigations and Consultation Branch .... John E. Abraham, Ph.D, Chief

Federal Facilities Assessment Branch ....Sandra G. Isaacs, Chief

Program Evaluation, Records, and Information Services Branch... Max M. Howie, Jr., M.S., Chief

Superfund Site Assessment Branch ....Richard E. Gillig, M.C.P., Chief

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.

Additional copies of this report are available from:
National Technical Information Service, Springfield, Virginia
(703) 605-6000

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR
or
Visit our Home Page at: http://www.atsdr.cdc.gov

PUBLIC HEALTH ASSESSMENT
GENERAL ELECTRIC SITE
EAST STREET AREA 1
PITTSFIELD, BERKSHIRE COUNTY, MASSACHUSETTS
CERCLIS NO. MAD002084093

Prepared by

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
BUREAU OF ENVIRONMENTAL HEALTH ASSESSMENT
ENVIRONMENTAL TOXICOLOGY PROGRAM
under a cooperative agreement with
Public Health Service
Agency for Toxic Substances and Disease Registry
Atlanta, Georgia

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Preface

The Massachusetts Department of Public Health (MDPH) prepared this public health assessment as part of its cooperative agreement with the U.S. Agency for Toxic Substances and Disease Registry. In addition MDPH points out that this is only one of 10 General Electric sites for which public health assessments or health consultations are being or have been prepared. Thus any conclusions presented here cannot be extrapolated to any other area of the General Electric site or to the entire General Electric site as a whole. Finally, MDPH has attempted to gather available data for the General Electric site through many visits to the U.S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection offices for file reviews or document retrieval. This document, as with the other General Electric documents, was released for public comment. Comments and responses to the comments are presented in Appendix A. MDPH is preparing a Summary Public Health Assessment that will address health and exposure concerns for the GE sites as a whole. That document will be released for public review and comment.

SUMMARY

The East Street Area 1 site of the General Electric (GE) site in Pittsfield, Massachusetts, is one of 10 areas being evaluated in separate public health assessments and health consultations.[1] In addition, the Massachusetts Department of Public Health (MDPH) is conducting or has conducted other health activities (e.g., descriptive analysis of cancer incidence data, ongoing serum polychlorinated biphenyl [PCB] analyses for Pittsfield area residents), the results of which will be incorporated into the summary public health assessment for the GE sites.

The East Street Area 1 site is a residential, commercial, and industrial site located in the center of the GE facility in Pittsfield, Massachusetts. This site is bound to the north by Tyler Street, to the east by New York Avenue, the Hill 78 Area Site, and Fasce Street, to the south by the Housatonic River, and to the west by the East Street Area 2 site (see Figure 1). Former Oxbow J, which is part of the Former Oxbows site, is located in the area just to the east of Fasce Street. This site consists of two areas: the industrial and the residential/commercial areas. The industrial area includes the entire site area north of Merrill Road and the western part of the area between Merrill Road and East Street (shaded area of Figure 2). The residential/commercial area includes the eastern part of the area between Merrill Road and East Street and the remainder of the site south of Merrill Road (see Figure 2). The industrial area is fenced, locked with gates, and has access restricted to GE personnel and their contractors only. Historically, nearly all of this area has been paved. In July 1998, an above-ground steamline was installed to connect Buildings 100 and 14 at the western section of the industrial area to the Altresco Cogeneration facility located approximately 1,200 feet (ft) to the east of the site (within the Hill 78 Area site) (Blasland, Bouck and Lee, Inc. 1994a) (see Figure 3).

The main compounds and environmental medium of concern at the site were PCBs in soil, grease, sediment, wall scrapings or materials deposited around subsurface utility connections from basements of the houses in the residential area. This PCB-containing oil was believed to be originating from underground storage tanks in the Building 12F Tank Farm at the GE facility (Blasland, Bouck and Lee, Inc. 1994a).

Populations with the greatest opportunities for exposure to compounds at the East Street Area 1 site were residents living in the Lakewood area and on the properties that are currently owned by GE, GE employees who might have been involved with the maintenance of the Altresco steamline, and employees and customers of commercial businesses on the site. Past opportunities for exposure to PCBs contained in oil in basements and surface soils could have presented some health concerns, thereby making the residential area of the site a public health hazard in the past. However, lawn cover might have reduced contact with contaminated soil at the residences south of Merrill Road. The short-term contact with soils below the steamline of the industrial area was also not likely to result in adverse health effects to GE employees. Currently, average levels of PCBs in residential surface soils are below levels of health concern.

[1] For a discussion of the difference between public health assessments and risk assessments, see Appendix B.

Under the current use conditions (i.e., limited use, average levels of PCBs in residential surface soil below levels of health concern, institutional controls), the East 1 site is classified as a "No Apparent Public Health Hazard" because current exposure opportunities are limited. Should the conditions at the site change (e.g., increased amount of exposed soil, decreased amount of vegetative cover, occurrence of construction activities, removal of institutional controls, or remediation activities are not properly completed/maintained) the site could pose a public health hazard in the future, depending on the extent to which opportunities for exposure increase.

BACKGROUND

A. Purpose and History

The East Street Area 1 site is one of 10 areas that comprise the GE site in Pittsfield, Massachusetts. On September 25, 1997, the GE site was proposed by the U.S. Environmental Protection Agency (EPA) for the National Priorities List (NPL) (EPA 1997). When a site is proposed for listing, the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) is required by federal law to conduct a public health assessment for the site. MDPH has a cooperative agreement with ATSDR to conduct public health assessments at NPL or other sites in Massachusetts. Thus, public health assessments for nine of the 10 areas of the GE site are being conducted by MDPH under its cooperative agreement with ATSDR. The tenth area, Allendale School Property, was evaluated by ATSDR in a health consultation. A health consultation was also conducted by ATSDR for Silver Lake. Negotiations between EPA and GE resulted in EPA's decision not to add the site to the NPL contingent on various cleanup actions agreed to by GE. In October 2000, a court-ordered consent decree was signed by EPA and GE, and it was agreed that GE would perform remediation actions to U.S. Environmental Protection Agency (EPA) and Massachusetts Department of Environmental Protection (MA DEP) performance standards (e.g., an average of less than 10 parts per million (ppm) in recreational surface soils, and an average of less than 2 ppm PCBs in residential soils). However, remediation does not eliminate past exposures and exposures occurring at parts of the site that may not yet have been remediated.

The 10 areas evaluated as part of the GE site are as follows:

1. Newell Street Area I
2. Newell Street Area II
3. East Street Area 1
4. East Street Area 2
5. Unkamet Brook Area
6. Hill 78 Area
7. Lyman Street
8. Allendale School Property
9. Housatonic River and Silver Lake
10. The Former Oxbows

Because each site has unique characteristics and opportunities for exposure, separate evaluations were developed for each of the 10 sites listed. In addition, MDPH is also preparing a summary document for the GE site as a whole that will contain MDPH's overall assessment of public health implications for the entire site.

The GE site has a long history in terms of community health concerns. MDPH has been involved in addressing public health issues in the area since the early 1980s, when it issued a fish consumption advisory for the Housatonic River based on elevated PCB levels in fish. These final public health assessments address public health concerns related to contaminants found at the GE site, as well as health studies or exposure investigations that have been conducted or are ongoing by MDPH in the area. These studies include a PCB exposure assessment study completed in 1997 (the information booklet from this report is included as appendix E), a descriptive assessment completed in 2002 of cancer incidence for the Housatonic River area for a 13-year period, an ongoing evaluation of serum PCB levels among residents who called the MDPH PCB Hotline concerned about their opportunities for exposure to PCBs in the Housatonic River, and a 2000 expert panel report on non-occupational PCB health effects (the information booklet from this report is included as appendix F).

The public health assessments or health consultations for the GE site review environmental data for the 10 areas mentioned above. They do not consider opportunities for past worker exposures within the GE facilities themselves (e.g., handling of materials containing PCBs), although they do consider opportunities for exposure to contaminants found in outdoor air, soil, or surface water bodies (including biota) for all potentially affected populations, including workers. Exposures to groundwater and sediments of the Housatonic River and its tributaries will be discussed in the public health assessment for the river.

These public health assessments also do not include evaluations of specific residential properties throughout Pittsfield (with the exception of properties evaluated as part of the site investigations for the 10 areas of the site). As part of the Residential Fill Property Project, the MA DEP and EPA have sampled residential properties suspected of containing elevated PCB levels in soil due to past use of fill material. As a result of public health concerns following the discovery of the use of PCB-contaminated soil for residential fill, MDPH has offered and continues to offer to any resident concerned about their opportunities for exposure to PCBs the exposure assessment questionnaire and, as warranted, having their blood tested for PCB levels as a service.

B. Site Description and History

The East Street Area 1 site includes industrial, residential, and commercial areas. The site is bounded to the north by Tyler Street, to the east by New York Avenue, the Hill 78 Area Site, Fasce Street, and Former Oxbow J, to the south by the Housatonic River, and to the west by the East Street Area 2 site (Blasland, Bouck and Lee, Inc. 1994a, Golder

Associates and Blasland, Bouck and Lee 1996) (see Figure 1)[2]. East Street, Merrill Road, and an active railroad track traverse the central portion of the site. Within the site are public roads such as East, Newell, Lombard, Milan, Buckingham, and Fasce Streets (see Figure 4). The industrial area, which includes the entire site area north of Merrill Road and the western part of the area between Merrill Road and East Street, is owned by GE. The eastern part of the area between Merrill Road and East Street is owned by an electric and plumbing supply business and a realty construction company (MA DEP 1998a). The residential area, which includes the remainder of the site south of Merrill Road, is a combined commercial and residential area known as the Lakewood area.

Since 1903, GE has used the facilities in the industrial area for various manufacturing operations, including manufacturing electrical transformers and associated components since 1934. Before 1964, a portion of the facility known as the Building 12F Tank Farm was used to store mineral oil dielectric fluid used in GE's transformer manufacturing processes (Blasland, Bouck and Lee, Inc. 1994a). Building 12F Tank Farm comprised 14 underground storage tanks (USTs) with capacities of 20,000 gallons to 25,000 gallons and one above-ground storage tank (AST) of 100,000-gallon capacity, which were installed in 1918, 1925, and 1947. Although these tanks were not used to store PCB-fluids, PCBs are believed to have existed in this area because of limited interconnections between PCB and mineral oil distribution systems. Releases from these tanks were believed to be the source of oils floating on the water table in this site (Blasland, Bouck and Lee, Inc. 1994a). Figures 5 and 6 show the oil plumes at the site in 1983 and in 1996.

EPA has identified and investigated 19 Solid Waste Management Units (SWMUs) within the site. A SWMU, as defined by the Resource Conservation and Recovery Act (RCRA), is any distinct unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. The 19 SWMUs at the East Street Area 1 site are as follows:

- SWMU T-9 (Building 10 Sump Tank);
- SWMU T-26 (Building 14 Extension Drain Tank-UST 14-04);
- SWMU T-61 (Building 12F Tank Farm Area, including 14 SWMUs T-X through T-KK, also known as 14 underground storage tanks 12F-01 through 12F-14 and one above-ground storage tank);
- SWMU T-W (Building 9G Underground Storage Tank 9G-01);
- SWMU T-NN (Building 14 Underground Storage Tank 14-03).

At the GE Facility Disposal Sites, SWMUs are considered to be sources or potential sources of hazardous waste release. Former drum storage areas, oil/water separators, drainage pits and sumps, chemical transfer areas/unloading stations, baghouses, underground storage tanks, underground pipes and tunnels, scrap yards and landfills are examples of SWMUs found at the GE facility (MA DEP 1995b).

---

[2] These site boundaries have changed somewhat after the consent decree. These public health assessment documents describe the sites and the site boundaries as they existed prior to the signing of the consent decree in 1999.

In 1955, a mixture of oil with PCBs was detected in the basement of 1229/1231 East Street, which was located south of the Building 12F Tank Farm (Blasland, Bouck and Lee, Inc. 1994a) (see Figure 4). GE then installed a well point system north of this property to remove oil, which was subsequently replaced by an underground oil/water collection trench. In 1978, GE bought 1229/1231 East Street and demolished the structure in June 1979. GE also bought the property at 1217 East Street in October 1979 and the former Berkshire Auto Parts business at 1215 East Street in April 1980. Structures on both these properties were subsequently demolished (Blasland, Bouck and Lee, Inc. 1994a). During the late 1970s and early 1980s, GE installed 141 groundwater-monitoring wells to determine the source and extent of the oil plume. In 1979, an upgraded oil-recovery system called the East Street Area 1-Northside Recovery System, which consisted of a drain and caisson system (i.e., a watertight box or chamber used for construction work under water) was installed north of East Street to replace the existing groundwater-collection system. In the late 1980s, GE bought and demolished three other residential properties at 1250/1252, 1254/1256, and 1260 East Street. In 1987, GE added a second oil-recovery system south of East Street called the East Street Area 1-Southside Recovery System, which consisted of a perforated caisson, an oil-skimming device, and a groundwater draw down pump (Blasland, Bouck and Lee, Inc. 1994b, 1995). From 1983 to 1996, these two oil-recovery systems helped reduce a large oil plume at East Street to two small oil pockets near the Northside and Southside Recovery Systems (see Figures 5 and 6).

Currently, the industrial area north of Merrill Road in the East Street Area 1 site is surrounded by a fence with locked gates, except for the grass/tree strip of land along New York Avenue and the grass/gravel/dirt corner southeast of Building 10 (see Figure 1). Access to this area is restricted to GE personnel and contractors through active surveillance and security measures (MA DEP 1998a). All of the SWMUs in this area were installed from the 1940s to the early 1970s and removed or closed from the 1960s to the 1990s (Blasland, Bouck and Lee, Inc. 1994a). Much of the site north of Merrill Road is covered by structures and asphalt-paved areas, including the parking lots bordering East Street. Figure 1 shows the surface cover for the site.

The residential area south of East Street consists of grassy areas and lawns maintained by individual property owners. A wooded area of approximately 2 acres is located in the residential area along the embankment bordering the Housatonic River (Blasland, Bouck and Lee, Inc. 1994a). The paved portions in this area include structures and residential driveways. Residences are located on the following streets: East, Newell, Lombard, Milan, Buckingham, and Fasce. Although no fence exists along the Housatonic River bank south of the site, access to this site via the river is restricted by high vegetation and steep terrain (Blasland, Bouck and Lee, Inc. 1994a).

Land at the East Street Area 1 site is zoned as industrial, commercial, and residential, and no changes in land use are foreseeable. Residences and businesses in this area, as well as in Pittsfield as a whole, use municipal water supplies. No known private drinking water supply wells exist in this area.

C. Site Visit

For this public health assessment, MDPH staff conducted five site visits: one on March 13, 1998, with EPA Region I and ATSDR representatives; one on April 9, 1998, with MA DEP and GE representatives; one on August 20, 1998; and one on July 27, 1999. A site visit conducted on June 21, 2001, following initiation of remedial activities outlined in the consent decree[3], provided an update of on-going activities at the GE sites. The residential area has approximately 37 residences, about 5 or 6 commercial/residential properties, and 1 commercial property. The industrial area north of Merrill Road is all fenced with locked gates. The fences and locks are in good condition. The residential area south of Merrill Road is mostly covered with grass and trees between the existing structures. Although additional work is planned, site conditions remain the same at the time this document was prepared.

D. Demographics

The East Street Area 1 site is located southeast of Silver Lake in the eastern section of Pittsfield. The 1980 U.S. Census indicated that 51,974 persons lived in the city of Pittsfield. The 1990 U.S. Census showed a population of 48,622, which is a 6.5% decrease from the 1980 population. The 2000 U.S. Census totaled a population of 45,793, which is a 5.8% decrease from 1990 and an 11.5% decrease from 1980. The sex, race, and age breakdowns for Pittsfield are presented in Table 1 (U.S. Census 2001).

Within the city of Pittsfield, the East Street Area 1 site is located primarily within U.S. census tract 9012. In 1990, the census tract 9012 was newly created and separated from census tract 9010. Hence, in this area, census tract 9012 abuts census tract 9010 in the vicinity of East Street along the railroad tracks that pass through the GE property. The 2000 U.S. Census showed that 5,226 individuals lived in census tract 9010 and only 66 individuals lived in census tract 9012. Census tract 9002 with 4,674 residents and census tract 9011 with 3,503 residents also abut the East Street Area 1 site along Tyler Street. The sex, race, and age breakdowns are summarized in Table 1. Table 1 also summarizes the demographic data for these census tracts.

E. Health Outcome Data

Cancer incidence as reported by the Massachusetts Cancer Registry (MCR) for the city of Pittsfield is described in Table 2. To determine whether Pittsfield experienced elevated cancer rates, standardized incidence ratios (SIRs) were calculated[4]. For the years 1995 through 1999, the most recent years for which cancer incidence data are available, no cancers were statistically significantly elevated (MDPH 2002b).

---

[3] The consent decree was signed by several regulatory agencies, GE, and the city of Pittsfield.
[4] A detailed explanation of SIRs is presented in Appendix D.

MDPH evaluated cancer incidence data for Pittsfield, Lenox, Lee, Stockbridge, and Great Barrington and for smaller geographic areas within each community for the period from 1982 through 1994. Cancers evaluated include bladder, liver, breast, non-Hodgkin's lymphoma, thyroid, and Hodgkin's disease. Results of this analysis were presented in a separate health consultation report released in April 2002. Cancer information relevant to the GE sites was examined for patterns that might indicate an environmental exposure pathway.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

To evaluate whether a site poses an existing or potential hazard to an exposed or potentially exposed population, health assessors review all available on-site and off-site environmental contamination data for all media (e.g., soil, surface water, groundwater, air). The quality of the environmental data is discussed in the Quality Assurance and Quality Control section. Physical conditions of the contaminant sources and physical hazards, if any, are discussed in the Physical and Other Hazards section. A plain language glossary of environmental health terms can be found at the end of this document (Appendix C).

A. On-Site Contamination

Surface soil, soil boring, sediment, grease, vegetable, and groundwater data from environmental sampling at the East Street Area 1 site are available from 1979 to 1991 and for 1996 (Blasland, Bouck and Lee 1994a; Blasland, Bouck and Lee 1994b; Blasland, Bouck and Lee 1995; and Golder Associates-Blasland, Bouck and Lee 1996; Blasland, Bouck and Lee 2000a)[5]. Data for soil samples collected at 0 to 0.5 feet and 0 to 2 feet were reviewed for this site. Although air sampling was not conducted directly within this site due to the lack of an identified surface PCB source area compared to adjacent areas, air data are available and evaluated for the Lyman Street, Newell Street Area I, Hill 78 Area, and East Street Area 2 sites, which are close to the East Street Area 1 site.

Health assessors use a variety of health-based screening values, called comparison values, to help decide whether compounds detected at a site might need further evaluation. These comparison values include environmental media evaluation guides (EMEGs), reference dose media evaluation guides (RMEGs), cancer risk evaluation guides (CREGs), maximum contaminant levels for drinking water (MCLs), or other applicable standards. These comparison values have been scientifically peer reviewed or derived using scientifically peer-reviewed values and published by ATSDR and/or EPA. The MA DEP has established Massachusetts's maximum contaminant levels (MMCL) for public drinking water supplies. EMEG, RMEG, MCL, and MMCL values are used to evaluate the potential for noncancer health effects. CREG values provide information on the potential for carcinogenic effects. For chemicals that do not have these comparison

[5] Most data considered in this public health assessment are pre-consent decree. However, the surface and subsurface soil data reviewed from 2000 and 2001 are post-consent decree.

values available for the medium of concern, EPA risk-based concentrations (RBCs) developed by EPA regional offices are used. For lead, EPA has developed a hazard standard for residential soil (EPA 2001).

If the concentration of a compound exceeds its comparison value, adverse health effects are not necessarily expected. Rather, these comparison values help in selecting compounds for further consideration. For example, if the concentration of a chemical in a medium (e.g., soil) is greater than the EMEG for that medium, the potential for exposure to the compound should be further evaluated for the specific situation to determine whether noncancer health effects might be possible. Conversely, if the concentration is less than the EMEG, it is unlikely that exposure would result in noncancer health effects. EMEG values are derived for different durations of exposure according to ATSDR's guidelines. Acute EMEGs correspond to exposures lasting 14 days or less. Intermediate EMEGs correspond to exposures lasting longer than 14 days to less than one year. Chronic EMEGs correspond to exposures lasting one year or longer. CREG values are derived assuming a lifetime duration of exposure. RMEG values also assume chronic exposure. All the comparison values (i.e., CREGs, EMEGs, RMEGs, and RBCs) are derived assuming opportunities for exposure in a residential setting.

For this site, soil data were evaluated by the residential and industrial areas, as discussed previously in the background section. For each area, data were reviewed at 0 to 0.5 feet and 0 to 2 feet. Also for the residential area, results of PCB concentrations in samples collected from residential basements, garden soils, and vegetables were available. Tables 3a through 3e show PCB levels of samples collected from garden soils and from inside the residences at the residential area. Tables 3f through 3i show the minimum, mean, and maximum values of soil compounds that exceeded their respective health-based comparison values developed by ATSDR, or in the case of polycyclic aromatic hydrocarbons (PAHs) and metals, their respective typical background values. Of the compounds that were detected in soil 0 to 0.5 feet and 0 to 2 feet from both the residential and industrial areas at this site, the ones that exceeded health comparison values or typical background levels in soil were PCBs, dioxins, two PAHs [benzo(a)pyrene and dibenz(a,h)anthracene, in the industrial area], and lead (Shacklette 1984; ATSDR 1993).

Residential Area

Although it was mentioned that in 1955 (Blasland, Bouck and Lee 1994a), oil was detected in the basement of 1229/1231 East Street and that GE bought and demolished this and two other structures (i.e., 1217 East Street, and 1215 East Street) from the late 1970s to 1980, MDPH is not aware of any environmental data available for these properties. Thus, opportunities for past exposures at these properties cannot be fully assessed. The oil that was detected in the basement of 1229/1231 East Street was thought to have entered the basement through groundwater seepage and likely originated from facilities upgradient of the property (Blasland, Bouck and Lee, Inc., 1994a). After the demolition of the houses on these three properties, GE built the Northside Recovery System on that section of land. The area surrounding the system was subsequently covered by grass and not fenced (Silfer 2001). See Figure 4 for locations of the residential and commercial properties in the residential area of the East Street Area 1 site.

Table 3a summarizes the 1980 results of 17 samples from unknown depths that were collected from vegetable garden soils of 14 residences from the Lakewood residential area (i.e., East, Lombard, Fasce, Newell, Buckingham, and Milan streets). All samples had concentrations less than or equal to 1 ppm PCBs. The most conservative health-based comparison value available for PCBs in soil is 0.4 ppm, which is the CREG.

Tables 3b through 3e summarize the 1980 results of 66 PCB samples that were collected from soil, grease, sump sediment, wall scrapings or materials deposited around subsurface utility connections inside basements of 46 residences of the Lakewood residential area (i.e., East, Lombard, Fasce, Newell, Buckingham, and Milan streets). Of these 66 samples collected from inside the residences, a total of 21 samples had detected PCBs. Of the detected samples, the highest PCB levels were found in sump sediment at 1250 East Street (i.e., 152 ppm), soil from the basement floor of 1260 East Street (i.e., 44 ppm and 73 ppm) and Fasce Street House I (i.e., 40 ppm), and grease from the floor surface of Lombard Street House C/D (i.e., 37 ppm).[6] Of these properties, 1250/1252 East Street, 1254/1256 East Street and 1260 East Street were subsequently bought and demolished by GE in the late 1980s. To supplement the Northside Recovery System in recovering the remaining scattered pockets of oil, GE installed the Southside Recovery System on that section of land in 1987 (Blasland, Bouck and Lee, Inc., 1994a).

Cleaning activities (specifics not reported) were done at Fasce Street House I and Lombard Street House C/D (Blasland, Bouck and Lee 1994a). For Fasce Street House I, two soil samples were collected on February 29, 1980, from the basement and had PCB levels of 40 ppm and 0.2 ppm. On April 16, 1980, following a cleaning of the area, four sediment samples were collected from the sump area of this basement. PCBs were detected in only one sample, with a level of 1.6 ppm. Because the oil delineation program did not indicate the presence of oil in this area and because of the distance between this property and the area of the oil plume, no additional sampling activities were conducted at this property. For Lombard Street House C/D, two samples were collected on March 14, 1980, from a basement wall crack and grease on the concrete basement floor. The sample from the basement grease had a PCB level of 37 ppm, while PCBs were not detected in the other sample. Subsequently, two more samples were collected in late March and April 1980 of the soil beneath the concrete basement floor and both were non-detectable for PCBs. As an additional measure to prevent further contact, a steel trap door that covered this area was attached to the basement floor and locked. Periodic observations indicated that the grease did not reappear in this area (Blasland, Bouck and Lee 1994a).

It was also noted that all of these indoor samples were taken from areas of the basement where access was limited and contact would be infrequent (e.g., utility line holes and sumps) (Blasland, Bouck and Lee 1994a). After the demolition of the three properties

---

[6] For confidentiality considerations, presently occupied homes have been coded. Descriptions in text match those in tables (e.g., Fasce Street House A).

mentioned above (i.e., 1250/1252 East Street, 1254/1256 East Street and 1260 East Street), GE built the Southside Recovery System on that section of land. The area surrounding the system was subsequently paved, resulting in no exposure to bare soil (Silfer 2001). No soil excavation activities were done for the residential area (Silfer 2001).

Table 3f summarizes 12 vegetable samples (i.e., tomatoes, beans, cauliflower, carrots, spinach, and zucchini) that were collected from two residences (i.e., Fasce Street Houses E and F) in 1980. Except for one vegetable sample with a PCB detection level of 0.01 ppm, all other vegetable samples were non-detect.

In 1996, two surface soil samples were collected at 0 to 0.5 feet from vacant lots near Lombard and Fasce streets, and four surface soil samples were collected (two at 0 to 2 feet and two at unknown depths) from the Southside Recovery System and an adjacent commercial property. Table 3g summarizes PCB concentrations found in these soil samples. PCB concentrations found in these soil samples were 0.69 ppm and 0.96 ppm for the 0- to 0.5-foot samples; 3.2 ppm and 4.1 ppm for the samples with unknown depths and 1.9 ppm and 13 ppm for the 0- to 2-foot samples.

Two of these six soil samples (with unknown depths) were also analyzed for dioxins, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and inorganic chemicals. These samples had levels of dioxin, benzo(a)pyrene, and lead above their respective comparison values. These two samples were collected south of East Street on the Southside Recovery System property and were not on a residential lot. Table 3g shows the concentrations detected.

Two other samples were collected from 0.5 to 2 feet near the Housatonic River between Fasce and Lombard Streets and analyzed for VOCs, SVOCs, dioxins and furans, and inorganic chemicals. Compounds analyzed were either non-detectable or less than their respective comparison values.

Also for the residential area, in 1996, nine subsurface soil samples were located at depths of 2 to 10 feet from vacant lots near Lombard and Fasce streets and from the Southside Recovery System area and adjacent commercial property and analyzed for PCBs. Levels of these subsurface soil samples ranged from non-detectable to 7.8 ppm, with an average of 1.16 ppm. Out of these nine samples, four were also analyzed for VOCs, SVOCs, dioxins, and inorganic chemicals. The levels of these compounds were all either non-detectable or less than their respective comparison values.

Between September 1997 and February 2001, East Street Houses D, E/F. and G, Fasce Street Houses D, F & G, H, and I, a Fasce Street lot, Lombard Street Houses A, G, H, I, and K, a Lombard Street lot, and Milan Street Houses C/D and F had soils sampled for PCBs. There were 182 surface samples (0 through 0.5 feet) taken with 168 detections ranging from a minimum of non-detectable to a maximum of 5.0 ppm with a mean of 0.711 ppm. Eighteen surface soil samples (0 through 2 feet) were also taken, with seven detections found, ranging from a minimum of non-detectable to a maximum of 1.0 ppm with a mean of 0.339 ppm (See table 3l). For subsurface soil, 406 samples (0.5 through 18 feet) were taken, with 192 detections ranging from a minimum of non-detectable to a maximum of 16.3 ppm with a mean of 0.377 ppm (Blasland, Bouck and Lee, Inc., 1998b, 1999a, 1999c, 1999e, 1999f, 1999g, 1999h, 1999i, 1999j, 2000b, 2000c, 2001, GE 1997, 1998) (See Table 3m).

Between October 1997 and June 1999, Newell Street House A had soils sampled for PCBs. There were 51 surface soil samples (0 through 0.5 feet) taken with 50 detections, ranging from a minimum of non-detectable to a maximum of 36.1 ppm with a mean of 6.57 ppm (See Table 3l). There were 178 subsurface soil samples (0.5 through 18 feet) taken with 118 detections ranging from a minimum of non-detectable to a maximum of 170 ppm with a mean of 4.61 ppm (See Table 3m). Initial remediation activities were completed in 1999 for this property (Blasland, Bouck and Lee, 1998a, 1998b, 1999a, 1999b, 1999d, 1999e, 1999g, 1999i, and GE, 1997, 1998, 1999).

Industrial Area

Nearly all of the industrial area is covered with structures or pavement. Thus, most soil sampling results reflect soil that was under pavement or structures. Many samples were taken as part of and prior to the installation of the Altresco Cogeneration facility (which is located approximately 1,200 feet to the east of the site, within the Hill 78 site). An above-ground steam line was installed to connect south and east of Building 9B. The foundation for each strain pole involved soil excavation to approximately 10 feet below ground surface (Blasland, Bouck and Lee 1994a). As part of the sampling activities, 149 soil samples were collected in July and August 1989 from various depths at 4-foot intervals at 52 locations along the Altresco steamline and analyzed for PCBs.

Of 149 samples, the levels fell into the following ranges:

- 39 samples did not have detectable levels of PCBs;
- 25 samples had PCB levels below 0.4 ppm, which is the most conservative comparison value for PCBs;
- 16 samples had PCB levels from 0.4 ppm to less than 1 ppm (the former EMEG level for children);
- 36 samples had PCB levels from 1 ppm to less than 10 ppm (the former EMEG level for adults);
- 19 samples had PCB levels from 10 ppm to 100 ppm;
- 8 samples had PCB levels from 100 ppm to less than 1,000 ppm (i.e., 100 ppm, 110 ppm, 160 ppm, 160 ppm, 200 ppm, 540 ppm, 700 ppm and 800 ppm); and,
- 6 samples had PCB levels of 1,000 ppm or higher (i.e., 1000 ppm, 1400 ppm, 1500 ppm, 5500 ppm, 7100 ppm and 14000 ppm).

The average PCB concentration of these 149 samples was 230 ppm. Of these samples, the hot spots were found north of Buildings 9D, 9F, 10, and directly south of Building 14E (2nd extension). Other elevated levels were found consistently along the steamline.

Of the 149 samples taken below the steamline, 39 were surface soil samples with the highest PCB concentrations in surface soil at 1,400 ppm and 1,500 ppm. Four other samples had PCB levels ranging from 100 ppm to 540 ppm. During the period of 1989-1991 and in 1996, 25 surface soil samples from other locations in the industrial area were collected at 0 to 0.5 feet and 0 to 2 feet and were analyzed for PCBs. Three samples had PCB levels from 100 ppm to 540 ppm and were located at the non-paved land strip along New York Avenue and at the corner southeast of Building 10. Throughout the area along Merrill Road and the railroad tracks, PCB levels ranged from non-detectable to 14 ppm.

Four soil samples were collected in 1996 at 0 to 0.5 feet or 0 to 2 feet in the industrial area and had levels of dioxins, PAHs (i.e., benzo(a)pyrene and dibenz(a,h)anthracene), or lead above comparison values or typical background levels. These samples were collected at the northern and western boundaries of the site, along the Altresco steamline, and east of the site along Merrill Road.

In addition to sampling along the Altresco steamline, subsurface soil samples were collected at other locations throughout the industrial area. The maximum PCB concentration of 3,000 ppm was detected in a sample from the 16- to 18-foot depth increment collected at the northeast corner of the industrial area by New York Avenue. These compounds were analyzed for PCBs, VOCs, SVOCs, dioxins and furans, and inorganic chemicals. Eighteen (18) to twenty (20) of these subsurface samples were also analyzed for VOCs, SVOCs, dioxins and furans, and inorganic chemicals. The VOC, SVOC, and dioxin levels found in these samples ranged from non-detectable to less than their comparison values.

In 2000, data from surface and subsurface soil collected during the years 1990-1999 were reviewed to determine whether they met soil sampling requirements for the remedial activities for the section of buildings in the East Street Area 1 site known as the 20s, 30s, and 40s Complexes (see Figure 7) (Blasland, Bouck, and Lee 2000a). For the 20s, 30s, and 40s Complexes, surface soil PCB concentrations ranged from ND to 131 ppm. The maximum PCB concentration for the Complexes was detected in the 30s Complex area, at a depth of 0 to 2 feet. PAHs (i.e., benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene) and arsenic were also detected above their respective health-based comparison values in surface soil (see Table 3j). Subsurface soil from the 20s, 30s, and 40s Complexes exceeded health-based comparison values for PCBs, benzo(a)pyrene, and arsenic (see Table 3k).

Other Site Sampling

On various dates during the well installation program in 1979 and 1980, GE collected 44 groundwater samples from 22 monitoring wells and analyzed them for PCBs. In addition, MA DEP also collected 31 samples for independent PCB analyses (Blasland, Bouck and Lee 1994a). Of these 75 unfiltered groundwater samples, PCBs were detected in 14 samples. Detected PCB levels ranged from 0.03 ppb to 743 ppb, which exceeded the MCL of 0.5 ppb in drinking water for PCBs. Since PCBs have extremely low solubility in water, these high concentrations detected in groundwater samples may reflect traces of PCB-bearing oil in the samples instead of the actual PCB concentrations dissolved in groundwater (Blasland, Bouck and Lee 1994a). Most of these monitoring wells were located south of the Southside Recovery System across the whole residential area of the site. A few other monitoring wells were located near the residences along Fasce Street and East Street. In 1991, eight groundwater samples (including a duplicate sample) were collected from seven monitoring wells (four installed along Merrill Road in the industrial area, one at the Northside Recovery System, one at the Southside Recovery System and one at the corner of New York Avenue in the industrial area). These groundwater samples were collected and analyzed for VOCs, SVOCs, organochlorine pesticides, and inorganic compounds. The levels found in these samples were less than their respective comparison values. Except for the four monitoring wells along Merrill Road and the monitoring well at the corner of New York Avenue, all other monitoring wells where the groundwater samples were taken were located downgradient of the oil plume discovered originally at 1229/1231 East Street (currently the Northside Recovery System area).

The oil plume at the site is a mixture of PCBs and mineral oil. In October 1993, the main portion of the oil plume extended to about 3 acres between the Northside and Southside Recovery Systems. Another smaller oil pocket occurred approximately 200 feet east of the Southside Recovery System (Blasland, Bouck, and Lee, Inc. 1994a) (see Figure 5). By Fall 1996, the same oil plume was reduced to 2 small pockets near the Northside and Southside Recovery Systems (see Figure 6).

NAPLs are the liquid contaminants that cannot be mixed with water. The light non-aqueous phase liquids (LNAPLs) are the NAPLs that are lighter than groundwater and exist as a separate layer floating on the water table. The dense non-aqueous phase liquids (DNAPLs) are the NAPLs that are denser than groundwater. These liquids sink through the aquifer and exist as a separate liquid phase below the water table (MA DEP 1995b). Only one LNAPL sample was collected from the Northside Recovery System and analyzed for PCBs, VOCs, SVOCs, and inorganics. PCBs were found at a level of 91 ppm in this sample (Golder Associates 1996; Blasland, Bouck and Lee 1996).

Air data are not available for this site. However, air data are available and evaluated for the sites close to the East Street Area 1 site (i.e., Lyman Street, Newell Street Area I, and East Street Area 2 sites). The average PCB concentrations in air samples collected at these sites were 0.0023 microgram per cubic meter ($\mu g/m^3$), 0.0082 $\mu g/m^3$, and 0.0016 $\mu g/m^3$, respectively. These PCB concentrations exceeded the average PCB level of 0.0007 $\mu g/m^3$ found in background samples, but are lower than ATSDR's CREG of 0.01 $\mu g/m^3$.

B. Off-Site Contamination

The GE site comprises 10 different areas, for which separate public health assessments are being developed. Those 10 areas are the Housatonic River/Silver Lake, the Former Oxbows (Oxbows A, B, C, J, and K), East Street Area 1, East Street Area 2, Newell

Street Area I, Newell Street Area II, Unkamet Brook Area, Lyman Street Parking Lot, Hill 78 Area, and Allendale School Property. Environmental data for the Housatonic River, which borders the East Street Area 1 site, typically would be considered off-site from the East Street Area 1 site. However, these data will be addressed in a separate health assessment for the Housatonic River rather than be included as off-site contamination for the East Street Area 1 site.

C. Quality Assurance/Quality Control (QA/QC)

The reports on GE facilities were also associated with a sampling and analysis plan that included information on QA/QC (Blasland, Bouck and Lee 1994a). The information shows that QA/QC was performed appropriately for the samples. The validity of the conclusions made in this public health assessment depends on the accuracy and reliability of the data provided in the cited reports.

For surface soil, many dioxin congeners from two samples do not have method detection limits. Therefore, the most conservative method detection limits available from other congeners were used as default method detection limits to calculate the minimum, mean, and maximum values. For surface and subsurface soil, many compounds (i.e., VOCs, SVOCs, inorganics) were detected as estimated values because of interference or because the concentrations detected exceeded the instrument calibration range. For some other inorganic compounds in subsurface soil samples, the values were estimated values that were less than the contract laboratory program required detection limits but greater than the instrument detection limits. For vegetable samples, method detection limits were higher than the values reported.

Most samples from canned and frozen vegetables from gardens at the residential area were affected by interference; hence, a reliable minimum and mean could not be determined. No other QA/QC problems were identified that would alter the interpretations of the data for this site. All data have been approved by EPA pursuant to the Field Sampling Plan/Quality Assurance Project Plan (EPA 2000).

D. Physical and Other Hazards

No known physical hazards to the general public are at this site. The industrial area north of Merrill Road is fenced, and all GE facilities are vacant and closed to manufacturing (MA DEP 1998a). Access to the residences is mainly through East, Newell, Lombard, Milan, Buckingham, and Fasce streets. Access to the industrial area is restricted to the public with well-maintained fences and locked gates.

PATHWAY ANALYSIS

To determine whether nearby residents and people on-site were, are, or could be exposed to contaminants, an evaluation was made of the environmental and human components that lead to human exposure. An exposure pathway consists of five elements: a source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and a receptor population.

Exposure to a chemical must first occur before any adverse health effects can result. Five conditions must be met for exposure to occur. First, there must be a source of that chemical. Second, a medium (e.g., water) must be contaminated by either the source or by chemicals transported away from the source. Third, there must be a location where a person can potentially contact the contaminated medium. Fourth, there must be a means by which the contaminated medium could enter a person's body (e.g., ingestion). Finally, the chemical must actually reach the target organ susceptible to the toxic effects from that particular substance at a sufficient dose for a sufficient time for an adverse health effect to occur (ATSDR 1993).

A completed exposure pathway exists when all of the five elements are present. A potential exposure pathway exists when one or more of the five elements is missing and indicates that exposure to a contaminant could have occurred in the past, could be occurring in the present, or could occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will not likely be present. The discussion that follows incorporates only those pathways that are important and relevant to the site.

A. Completed Exposure Pathways

Residential area

Various Media containing PCBs in Residential Basements

For the residential area of the site, past opportunities for exposures to PCBs in basements of several residences and a commercial establishment on East Street likely occurred. Some residences, especially those along East Street, were likely affected by groundwater seepage, which was contaminated with PCBs. The earliest discovery of PCB contamination in a residence was 1955 (1229/1231 East Street), and GE eventually bought and demolished a total of six structures, all on East Street, between the late 1970s and the late 1980s. Little or no environmental data are available for these properties, and MDPH does not have information on the possible duration of exposure opportunities to the affected residences. The only environmental data available for any of these six residences were from testing in 1980 of various surfaces (e.g., walls, utility lines, soil) in the basements. Opportunities for exposures might have occurred through inhalation of PCBs volatilized from these surfaces in the basements or contact with these surfaces in the basements.

Garden Soil and Surface Soil

Other past and present opportunities for exposures might have occurred through incidental ingestion of and dermal contact with contaminated surface garden soil at the residences and surface soil in the residential area during wintertime when there was no grass cover.

Industrial area

Surface Soil

For the industrial area, past opportunities for exposures to soil contaminants may have occurred to workers involved in excavation for the steamline. Past exposures may have occurred through incidental ingestion of soils or possibly skin absorption of PCBs through direct contact with PCB-contaminated soils at the site.

Past and present opportunities for exposures to surface soil on the strip of land along New York Avenue might have happened to trespassers since this strip of land is outside the fence of the industrial area. Exposures could have happened through incidental ingestion of or dermal contact with PCB-contaminated soils.

B. Potential Exposure Pathways

Industrial area

Surface Soil Under Pavement

For GE employees in the industrial area who were not involved in excavation for the steamline, past opportunities for exposure to PCBs in soils appear to be infrequent. Most of the industrial area is paved and, hence, access to contaminated soils under the paved area likely was, at most, infrequent. In addition, the site is currently not operating and only occasional access of GE employees or contractors is occurring.

Subsurface Soil

For both industrial and residential areas at the site, future exposures to contaminated soils through incidental ingestion might occur to individuals who contact soil if excavation activities occur. Exposure to PCBs through contact with these soils would mostly happen through incidental ingestion or skin absorption. At this time, MDPH is not aware of excavation activities (e.g., new buildings) planned for the site.

Surface Water

Groundwater from this site discharges into the Housatonic River (Blasland, Bouck and Lee 1994a). However, the contribution of PCBs in the Housatonic River via groundwater from the East Street Area 1 site versus other sources is difficult to assess because of limited sampling data. Thus, although this might be considered a potential exposure pathway (e.g., via ingestion of fish contaminated with PCBs or incidental ingestion of and dermal contact with surface water), this public health assessment will not attempt to quantify the possible role of groundwater as a contributor of PCBs or other compounds for the Housatonic River. Also, surface water, sediment, and fish chemical concentration data exist for the Housatonic River itself. The public health assessment document being developed for the Housatonic River will evaluate opportunities for exposure to PCBs or other contaminants in the river utilizing all available data from the river.

Ambient Air

Based on the fact that PCB levels in ambient air samples collected from sites adjacent to the East Street Area 1 site (i.e., Lyman Street, Newell Street Area I, and East Street Area 2 sites) exceeded the average PCB level of 0.0007 $\mu g/m^3$ found in background samples, past, present, and future opportunities for exposures to PCBs in ambient air might occur to former GE workers, GE maintenance workers, and residents in the Lakewood area. Exposures might happen through daily inhalation.

Groundwater Seepage

While it would not appear from available groundwater data that homes in the residential area today would likely be subject to contamination found in the past, until site clean-up is achieved, the potential remains.

C. Eliminated Exposure Pathways

Groundwater/ Drinking Water Wells

Present and future exposures to contaminants in groundwater are unlikely to occur at this site because residences in the East Street Area 1 site, as well as Pittsfield as a whole, use a municipal water supply. Residents are, therefore, unlikely to use this groundwater for potable purposes.

DISCUSSION

MDPH staff has summarized the available environmental data and exposure pathways for the East Street Area 1 site in this public health assessment. Completed exposure pathways included contact with various media containing PCBs in the residential area, contact with garden soil, surface soil in the residential area, contact with contaminated soil during excavation for the Altresco steamline, and surface soil on the strip of land along New York Avenue in the industrial area. The main compounds of concern at the site are PCBs. Other compounds that exceeded screening or typical background values in at least some surface soil samples from the residential area were dioxins, PAHs (i.e., benzo[a]pyrene), and lead. Other compounds that exceeded screening or typical background values in surface soil samples from the industrial area were dioxins, PAHs (i.e., benzo[a]pyrene and dibenz(a,h)anthracene), and lead.

Opportunities for exposures to these compounds were primarily via incidental ingestion of, inhalation of or dermal contact with PCBs in basement materials (e.g., soil, grease, sediment, wall scrapings, or materials deposited around subsurface utility connections) or surface soil at the site in the past. Groundwater at the site has not been and is not being used for drinking water or other industrial purposes and, hence, at the present time, groundwater does not present a complete exposure pathway. Although groundwater might discharge to the Housatonic River, it is more appropriate to use actual chemical concentration data for the river surface water and sediment in estimating public health effects. Public health implications from opportunities for exposure to chemicals in the river will be covered in a separate public health assessment.

In evaluating the public health implications of opportunities for exposure to PCBs, MDPH has been conducting a variety of activities in the Housatonic River area. MDPH previously completed an exposure assessment study of the Housatonic River area (MDPH 1997). Residents of eight communities that live within one-half mile of the Housatonic River were randomly chosen to participate in the exposure assessment study. In addition, residents who were not chosen for the study but who were concerned about exposure to PCBs were offered the opportunity to volunteer to participate in a separate effort.

The exposure assessment study found that although the participants generally had serum PCB levels within the reported background range for nonoccupationally exposed individuals (ATSDR 2000), those who engaged in high-risk activities (e.g., high frequency and duration of consumption of contaminated fish) had higher serum PCB levels.

Because of the discovery during summer 1997 of widespread residential PCB soil contamination, MDPH is conducting a separate study of residents who might be at risk of exposure through contact with residential soil. MDPH set up a hotline number for individuals to call with health-related concerns, to complete exposure questionnaires, and to request serum PCB testing. Since August of 1997, over 150 individuals have had their serum tested for PCBs. This is an ongoing community service by MDPH. Results of serum PCB testing and evaluation of the community health concerns resulting from the hotline calls will be reported in the summary public health assessment for the GE sites.

MDPH has also been conducting ongoing outreach with the local health community to inform them of activities in the area. For example, MDPH held Grand Rounds in 1993, 1996, 1997, September 2000, and December 2000 at the Berkshire Medical Center or North Adams Hospital to discuss MDPH activities, particularly those related to serum PCB testing, with health professionals at these facilities. During 1999, MDPH staff have spoken at a number of other health-related forums sponsored by local health professionals and community groups.

Other activities performed or ongoing by MDPH include the following:

1. MDPH conducted a descriptive cancer incidence analysis of selected cancer types (i.e., bladder cancer, liver cancer, non-Hodgkin's lymphoma, breast cancer, thyroid cancer, and Hodgkin's disease) in Pittsfield, Lenox, Lee, Stockbridge, and Great Barrington that occurred from 1982 through 1994, utilizing data from the Massachusetts Cancer Registry. This analysis included evaluations of temporal

and geographic trends (e.g., analysis of smaller geographic areas, or census tracts).

2. The Executive Office of Health and Human Services (EOHHS) convened an independent panel of national experts to advise MDPH on the most up-to-date information on possible health effects from non-occupational exposure to PCBs. A public meeting attended by the panel chair was held in Pittsfield in January 1999, prior to the first panel meeting. The panel prepared a written report that was submitted to EOHHS and released to the public in October 2000 (MDPH 2000). A public meeting attended by most of the panel members was held in Pittsfield in December 2000. In addition, panel members along with MDPH met with MDPH's advisory committee and with physicians at the Berkshire Medical Center.

3. MDPH established its Housatonic River Area Advisory Committee on Health in 1995. This committee is comprised of local residents, representatives from the local medical community, environmental and health professionals, representatives from the offices of elected officials and local health departments. MDPH staff hold meetings with committee members to report on the status of various activities and to discuss and get feedback on the conduct of MDPH health activities (e.g., education and outreach) in the area.

Information gathered from these additional activities improves MDPH's ability to assess the public health implications of PCB contamination in the Pittsfield area. The following discussion of potential public health implications is based on available information. A summary public health assessment incorporating all available information from the individual GE site PHAs and addressing public health and exposure concerns will be developed and released for public comment.

A. Chemical-Specific Toxicity Information

As noted earlier in this public health assessment, PCBs, dioxins, benzo(a)pyrene, and lead exceeded their respective comparison values or typical background values in the residential area. PCBs, dioxins, benzo(a)pyrene, dibenz(a,h)anthracene, and lead exceeded their respective comparison values or typical background values in the industrial area.

In order to evaluate possible public health implications, estimates of opportunities for exposure to compounds (e.g., in soil) must be combined with what is known about the toxicity of the chemicals. ATSDR has developed minimal risk levels (MRL) for many chemicals. An MRL is an estimate of daily human exposure to a substance that is likely to be without an appreciable risk of adverse noncancer health effects over a specified duration of exposure. MRLs are derived based on no-observed-adverse-effect levels (NOAELs) or lowest-observed-adverse-effect levels (LOAELs) from either human or animal studies. The LOAELs or NOAELs reflect the actual levels of exposure that are used in studies. ATSDR has also classified LOAELs into "less serious" or "serious" effects. “Less serious” effects are those that are not expected to cause significant dysfunction or whose significance to the organism is not entirely clear. “Serious” effects are those that evoke failure in a biological system and can lead to illness or death. When reliable and sufficient data exist, MRLs are derived from NOAELs or from less serious LOAELs, if no NOAEL is available for the study. To derive these levels, ATSDR also accounts for uncertainties about the toxicity of a compound by applying various margins of safety to the MRL, thereby establishing a level that is well below a level of health concern.

PCBs

For PCBs, the rhesus monkey is the most sensitive animal species in terms of health effects resulting from exposure to PCBs, and studies in this species form the basis of ATSDR’s screening values for PCBs. ATSDR derived a chronic oral MRL of 0.00002 milligrams per kilogram per day (mg/kg/day) for chronic exposure to PCBs. The MRL was based on a LOAEL for immunological effects (e.g., decreased IgM and IgG antibody levels in response to sheep red blood cells) in female rhesus monkeys administered 0.005 mg/kg/day aroclor 1254 by gavage for 55 months (Tryphonas et al. 1989, 1991a; as cited in ATSDR 2000). A LOAEL of 0.005 mg/kg/day for 37 months also induced adverse dermatological effects (e.g., prominent toe nail beds, elevated toe nails, separated toe nails) in adult monkeys (Arnold et al. 1993a; as cited in ATSDR 2000) as well as in their offspring (Arnold et al. 1995; as cited in ATSDR 2000). A LOAEL of 0.005 mg/kg/day for 37 months in adult monkeys also induced effects (e.g., inflammation of tarsal glands, nail lesions, and gum recession) in their offspring.

An uncertainty factor of 300 was used to derive the chronic oral MRL (10 for extrapolation from a LOAEL to a NOAEL, 10 for human variability and 3 for extrapolation from animals to humans). These effects at the LOAELs discussed above are considered by ATSDR to be “less serious” effects. Other effects (“less serious” or “serious”) were generally reported to occur at levels approximately four times greater than those that form the basis for the lowest LOAELs (ATSDR 2000). A panel of international experts cited support for this chronic oral MRL from human studies (ATSDR 2000).

ATSDR has also developed an intermediate oral MRL of 0.00003 mg/kg/day. The MRL was based on a LOAEL of 0.0075 mg/kg/day for neurobehavioral effects in infant monkeys that were exposed to a PCB congener mix representing 80% of the congeners typically found in human breast milk (ATSDR 2000).

ATSDR has not developed an MRL for the inhalation route of exposure because of a lack of sufficient data on which to base an MRL. The chronic MRL will be used for evaluating human health concerns associated with opportunities for exposure to PCBs at this site, regardless of duration or route of exposure. This is a conservative assumption.

While the above health effects were the most sensitive health effects (forming the basis of the MRL), a number of human and animal studies have suggested that other effects include liver damage, neurological effects, reproductive and developmental effects, and cancer. Also, the International Agency for Research on Cancer (IARC) has classified PCBs as “probable human carcinogens” based on sufficient evidence of carcinogenicity in animals and limited evidence in humans. Because it is difficult to show that a chemical causes cancer in humans, animal studies are used to identify chemicals that have the potential to cause cancer in humans. PCBs do cause cancer in animals. Thus, it is assumed that exposure to PCBs over a period of time might pose a risk for humans. The degree of risk depends on the intensity and frequency of exposure.

Dioxins

The compound 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) is one of 75 different congeners of chlorinated dibenzo-p-dioxins (CDDs). Dioxins are not intentionally manufactured but can be formed in the manufacturing process of chlorophenols (e.g., herbicides and germicides). The main environmental sources of dioxins are herbicides, wood preservatives, germicides, pulp and paper manufacturing plants, incineration of municipal and certain industrial and medical wastes, transformer/capacitor fires involving PCBs, exhaust from automobiles using leaded gasoline, chemical wastes from improper disposal, coal combustion, and residential wood burning stoves.

ATSDR has developed an MRL for TCDD of 1x10-9 mg/kg/day, or 1 picogram per kilogram per day (pg/kg/day) (ATSDR 1998). This was based on an LOAEL for developmental effects in rhesus monkeys. This MRL is similar to what ATSDR has estimated as a background exposure level of approximately 0.7 pg/kg/day for TCDD. ATSDR notes that the primary route of exposure to dioxin compounds for the general population is the food supply (e.g., fish), which is the main contributor to the background exposure. The EPA has estimated that greater than 90 percent of the human body burden of dioxins is derived from foods. If one considers exposure to all CDD and chlorinated dibenzofuran congeners, the background exposure level increases to as much as 2.75 pg/kg/day (ATSDR 1998).

The EPA has determined that TCDD is a “probable human carcinogen” based on sufficient animal and limited or inadequate evidence in human studies. IARC has classified TCDD as carcinogenic to humans (Group 1) (ATSDR 1998).

PAH Compounds

PAHs are ubiquitous in soil. Combustion processes release PAHs into the environment. Therefore, the major sources of PAHs in soils, sediments, and surface water include fossil fuels, cigarette smoke, industrial processes, and exhaust emissions from gasoline engines, oil-fired heating, and coal burning. PAHs are also found in other environmental media and in foods, particularly charbroiled, broiled, or pickled food items, and refined fats and oils (ATSDR 1995a).

No MRLs are available for benzo(a)pyrene or dibenz(a,h)anthracene. The primary health concern for these compounds is carcinogenicity, and EPA considers both compounds to be “probable human carcinogens,” based on sufficient evidence in animal studies and inadequate evidence for human studies.

Lead

Lead occurs naturally in the environment. Before EPA banned leaded gasoline in 1976, car exhaust was the major cause of lead being released into the environment. Other sources of lead released to the air include burning fuel such as coal or oil, industrial processes, and burning solid waste. Most lead in inner city soils comes from deteriorated housing, previous automotive exhaust, and leaded paint. Landfills have waste from lead ore mining, ammunition manufacturing, and from other industrial activities such as battery production, disposal, and recycling (ATSDR 1995b).

No MRLs have been developed for lead because a threshold has not yet been defined for the most sensitive effects of lead (i.e., neurotoxicity). The primary health concern for this compound is carcinogenicity, and EPA considers lead to be "probable human carcinogen," based on sufficient evidence in animal studies and insufficient evidence in human studies (ATSDR 1995b).

MA DEP does, however, screen soil lead levels using their S-1 Soil Standards of 300 ppm (MA DEP 1995a). Public health screening for lead in children indicates that lead paint in older housing stock continues to be the most important risk factor for lead exposure in children.

B. Evaluation of Possible Health Effects

Several areas of the East Street Area 1 site present limited opportunities for exposure to soil contaminants because of such factors as the presence of pavement, grass-covered lawns, or steep or heavily vegetated embankments (as is the case for most of the portion of the Housatonic River that flows through the East Street Area 1 site). However, because this site comprises both industrial and residential areas, opportunities for exposure vary. For that reason, MDPH has divided its summary of the environmental data into two sections; the first focuses on those areas considered to be primarily or exclusively industrial or commercial, and the second looks at those areas that are residential.

Industrial/Commercial Area

The entire area north of Merrill Road is an industrial area. In addition, the area between Merrill Road and East Street is mostly industrial or commercial, though a few residential properties existed in the past in this area (e.g., 1217 and 1229/1231 East Street). South of East Street is a mixed commercial and residential area called the Lakewood area (see discussion of residential areas below).

The industrial area contains facilities that GE has used for various manufacturing operations since 1903; various operations were phased out from the 1960s to the 1990s. Most of this industrial area north of Merrill Road is currently fenced, and all operations have ceased. Access to this area is restricted to GE personnel and contractors. Much of this area is also covered by structures and asphalt-paved areas, including parking lots along East Street.

For the industrial/commercial area, populations that could have been exposed to chemicals in soil include GE employees, and employees and customers of commercial businesses. However, the likelihood of exposure to such individuals would be low (e.g., customers or employees walking between their cars and the buildings are unlikely to have many opportunities for exposure to chemicals in the soil). Except for the grass/tree strip of land along New York Avenue and the grass/gravel/dirt corner southeast of Building 10, this industrial area is covered with concrete/asphalt and buildings, which limit exposures to contaminants in surface soils.

The highest PCB concentrations in soil for the industrial area were found underneath the Altresco steamline and under the strip of land along New York Avenue, which is the easterly border of the site. Figure 3 shows where the soil borings were taken along the Altresco steamline and at the strip of land along New York Avenue. The Altresco steamline, however, is covered with pavement and hence, present opportunities for exposure along the steamline are not expected. Opportunities for exposure may have occurred to GE employees during excavation activities for the strain lines used to support the steamline. However, MDPH is not aware of any information on exposure duration for GE employees during the installation of the steamline. A conservative assumption of a period of six months to complete the installation was made to calculate the risk of exposure to contaminated soil. These opportunities would have been relatively short-term, and hence, adverse health effects would not be expected.

Past and present opportunities for exposure to the contaminated surface soil along New York Avenue would not be likely to result in adverse health effects to trespassers through incidental ingestion of or dermal contact, considering how very limited such contact would likely be given the limited size of the area.

There were very limited soil data on all other compounds. Hence, these soil data on other compounds would not be considered as representative of the whole site. Dioxins, two PAH compounds, and lead also exceeded screening values for soil in this area. One 0- to 0.5-foot soil sample and two 0- to 2- foot soil samples were collected from the industrial area and analyzed for dioxin compounds. The only sample of dioxin had a detected value of 0.185 parts per billion of toxicity equivalency (ppb TEQ), found in the 0- to 0.5-foot sample[7]. Estimated exposures to dioxin compounds were less than the MRL and, thus, opportunities for exposure to GE employees and other employees and customers to dioxin through intermittent contact should not have resulted in adverse noncancer health effects.

The PAH compounds (i.e., benzo(a)pyrene and dibenz(a,h)anthracene) exceeded their comparison values, in 0- to 0.5-foot soil samples. The detected levels that exceeded comparison values were 3.1 ppm for benzo(a)pyrene and 0.27 ppm for dibenz(a,h)anthracene. However, only two soil samples were collected and analyzed for these compounds. Since these data are limited, they would not represent the condition of the whole site and would not indicate levels of health concern.

[7] See footnote 3 of Table 3g for more explanation on TEQ.

Air data are not available for this site. However, air data are available and evaluated for the Lyman Street, Hill 78 Area, Newell Street Area I, and East Street Area 2 sites, which are adjacent or close to the East Street Area 1 site. The average PCB concentrations in air samples collected at these adjacent sites were 0.0023 $\mu g/m^3$, 0.0082 $\mu g/m^3$, and 0.0016 $\mu g/m^3$, respectively. These PCB concentrations exceeded the average PCB level of 0.0007 $\mu g/m^3$ found in background samples. However, assuming that employees working at facilities on the site could be exposed to PCBs in ambient air from area sites for each working day (260 days/year), the estimated exposure to the maximum reported concentration of PCBs in ambient air was still below ATSDR's MRL. Thus, opportunities for exposure to PCBs in ambient air at the site under current conditions would not be expected to result in non-cancer or cancer health effects.

Residential/Commercial Area

A mixed residential/commercial area (i.e., the Lakewood area) lies south of East Street. In addition, some residential properties (including 1217 and 1229/1231 East Street) were located between Merrill Road and East Street. In 1955, a mixture of oil with PCBs was detected in the basement of 1229/1231 East Street. The oil was thought to have entered the basement through groundwater seepage and likely originated from facilities upgradient of the property (Blasland, Bouck and Lee, Inc., 1994a). Contamination of the groundwater affected other residences, including 1217 East Street, and by 1980s, GE had bought and demolished a total of six structures along East Street, five of which were residences.

For the residential/commercial area, populations that could have been exposed to chemicals in soil or PCBs in indoor air include residents and employees and customers of the businesses. Employees and customers of businesses in this area would likely have little opportunities for such exposure (e.g., the activity of walking between their cars and the buildings is unlikely to present few opportunities for exposure to chemicals in soil). Besides buildings and paved driveways, this area consists of grassy areas and lawns maintained by the individual property owners and a wooded area of approximately 2 acres along the embankment bordering the river.

For children living in the residential area, opportunities for exposure to chemicals in soil due to incidental ingestion of contaminated soil or dust are unlikely to result in adverse health effects. Using the mean PCB concentration of 3.97 ppm for six surface soil samples collected from the residential area, the estimated exposure dose due to incidental ingestion was less than the MRL. Also using this mean PCB concentration, it is not likely for children of age 1 to 6 to develop increased risk of cancer.

Soil concentrations of PCBs at the residential area were consistently distributed throughout the site with levels from non-detectable to less than 10 ppm. The highest PCB levels of 152 ppm, 73 ppm, 37 ppm, and 13 ppm were found from the samples of the basements at 1250 East Street, 1260 East Street, Lombard Street House C/D, and from the top 2-ft soil sample at East Street House I, respectively. Except for Lombard

Street House C/D and East Street House I, the other two properties were bought and structures demolished by GE in the late 1980s.

No information was available to MDPH regarding what happened to the residents occupying these properties discovered to be contaminated in the 1950s. We also do not have information on whether any remedial activities occurred at these houses. Further, environmental data for these residences and one commercial establishment (former Berkshire Auto Parts) are not available before demolition of the structures. Available information suggests that the primary concern for individuals on these properties was actual contact with the basement surfaces or possible volatilization of PCBs in oils in the basement into living spaces above. It is also not known how long opportunities for exposure might have been present. Thus, it is difficult to evaluate possible health effects that might be related to opportunities for exposure to PCBs for residents of these homes.

For the rest of the residential area south of East Street and not affected by seepage of PCB oils into basements, most of the properties are grass covered with well-maintained lawns. A wooded area of approximately 2 acres is located along the embankment bordering the Housatonic River. Approximately 37 residences are located within the site boundaries, with about 5 commercial establishments. Access to the river in this area appears to be limited because of steep terrain and heavy vegetative cover.

For garden soil samples collected from the residences, PCB levels were either non-detectable or below 1 ppm except for one sample at Newell Street House F/G (1 ppm). Although some detected levels would exceed the most conservative comparison value for PCBs (CREG = 0.4 ppm), gardeners' opportunities for exposure to these levels would not likely result in adverse health effects.

For six surface soil samples collected from the residential area, PCB levels ranged from 0.69 ppm to 4.1 ppm. Although these levels would exceed CREG and EMEG levels for children, trespassers' opportunities for exposures to these levels would not likely result in adverse health effects.

For samples collected indoors from basements of the residences, the highest PCB levels were found from sump sediment of 1250 East Street (152 ppm), basement floor of 1260 East Street (44 ppm and 73 ppm), basement of Fasce Street House I (40 ppm) and grease from floor surface of Lombard Street House C/D (37 ppm). As previously mentioned, information on how long the exposures had occurred for residents at 1250 and 1260 East Street is not available to MDPH. Hence, although it is likely that past exposures to PCBs in basements at these two properties may have resulted in adverse health effects, it is difficult for MDPH to quantify the risks. For residents at Fasce Street House I and Lombard Street House C/D, past exposures to PCBs in the basements would not likely result in adverse health effects (i.e., no apparent increased cancer concern)[8]. For

---

[8] Cancer Risk = Exposure Dose x EPA's oral slope factor.

Exposure Dose = $\frac{\text{(max. contaminant concentration) (ingestion rate) (exposure factor) (1 kg/}10^6\text{ mg)}}{\text{Body weight}}$

Cancer Exposure Factor (child playing) = (5 days/week) (50 weeks/year) (18 years) = 0.18

residents at other properties in the Lakewood area where PCBs were either not detected or detected at lower levels, past opportunities for exposures would also not likely result in adverse health effects.

Dioxins, one PAH compound (i.e., benzo(a)pyrene), and lead also exceeded screening values for soil in this area. Two 0- to 0.5-foot soil samples that were collected from the residential area were analyzed for dioxin compounds. The maximum detected value was found at 0.78 ppb TEQ. Estimated exposures to dioxin compounds were less than the MRL level and, thus, opportunities for exposures to dioxins by the residents and employees and customers of businesses in the area through intermittent contacts would not have resulted in adverse health effects and elevated cancer concerns.

The PAH compound exceeded its screening value, which was based on cancer risk estimates. Two 0- to 0.5-foot soil samples were collected in this area and analyzed for benzo(a)pyrene. The maximum value detected was 0.62 ppm (the other sample was non-detect). However, intermittent contact by the residents and well-maintained lawns might have mitigated opportunities for exposures to contaminated soils. Thus, contacts with PAHs in soils are not expected to have resulted in adverse health effects based on these limited results.

Two 0- to 0.5-foot soil samples were collected and analyzed for lead in this area. The values were 154 ppm and 347 ppm. The maximum value exceeded the MA DEP Soil-1 Standards of 300 ppm but did not exceed EPA's hazard standard for residential soil (i.e., 400 ppm) (EPA 2001). However, intermittent contact by the residents and well-maintained lawns might have mitigated opportunities for exposures to contaminated soils. Thus, contacts with contaminated soils are not expected to have resulted in adverse health effects based on the lead results.

For the residential homes sampled for PCBs between 1997 and 2001, maximum PCB concentrations detected were above comparison values. Estimated exposures to maximum PCB concentrations were below the MRL and LOAEL for both adults and children (assumed to recreate on site 5 days a week for 50 weeks a year) for all properties tested except Newell Street House A. For Newell House A, which had elevated surface soil PCB concentrations (i.e., maximum 36.1 ppm) estimated exposures to maximum levels for children were above the MRL, but below the lowest LOAEL, and would not result in an apparent increased cancer concern[9]. However, exposures to maximum levels

---

(70 years) (365 days/year)

$$\text{Cancer Exposure Factor (adult recreating)} = \frac{(5\ \text{days/week})\ (50\ \text{weeks/year})\ (52\ \text{years})}{(70\ \text{years})\ (365\ \text{days/year})} = 0.51$$

$$\text{Cancer Exposure Dose (child)} = \frac{(40\ \text{mg/kg})\ (200\ \text{mg/day})\ (0.18)\ (1\ \text{kg}/10^{6}\ \text{mg})}{35\ \text{kg}} = 4.0 \times 10^{-05}\ (\text{mg/kg/day})$$

$$\text{Cancer Exposure Dose (adult)} = \frac{(40\ \text{mg/kg})\ (100\ \text{mg/day})\ (0.51)\ (1\ \text{kg}/10^{6}\ \text{mg})}{70\ \text{kg}} = 2.9 \times 10^{-05}\ (\text{mg/kg/day})$$

Cancer risk (child) (PCB) = 4.0×10^{-05} (mg/kg/day) x 2.0 $(\text{mg/kg/day})^{-01}$ = 8.0×10^{-05}
Cancer risk (adult) (PCB) = 2.9×10^{-05} (mg/kg/day) x 2.0 $(\text{mg/kg/day})^{-01}$ = 5.8×10^{-05}

[9] Cancer Risk = Exposure Dose x EPA's oral slope factor.

would be unlikely, and estimated exposures to mean concentrations (i.e., 6.57 ppm) at Newell Street House A were slightly above the MRL, but well below LOAEL, the level at which adverse health effects have been observed in animal or human studies, for both adults and children (assumed to recreate 5 days a week for 50 weeks a year), and would not result in an apparent increased concern for cancer. Also, currently Newell Street House A is undergoing remediation and PCBs levels in surface soils will be below 2 ppm, the MA DEP residential soil standard (Blasland, Bouck, and Lee 1999g). Therefore, overall adverse health effects would not be expected from estimated exposures to PCBs in surface soils in the residential area south of East Street in the past or currently.

Furthermore, in the early 1980s a study conducted by Rosenman was done on residents living on the East Street Area 1 site after PCB oils were found in basements of homes. Rosenman reported no significant difference in median serum PCB values between the 7 residents of the contaminated community who had no association with General Electric and the 9 residents of a control community who also had had no association with general electric. However, General Electric workers and family members of workers had elevated serum PCB levels compared to those who were not associated with General Electric (Rosenman undated). The study also stated that occupational exposure to PCBs overshadowed the potential adverse health effects of the groundwater contamination that was leaking into basements (Rosenman undated). It is probably worthwhile to note that the worst contaminated houses were bought and torn down by GE and that the groundwater plume has been substantially contained by groundwater recovery systems on the North and South sides of East Street (BBL 1994).

Residential area summary

Under past conditions (contact with various media containing PCBs such as walls, utility lines, soil in residential basements and/or inhalation of PCBs volatilized from these basement surfaces), it is likely that opportunities for exposure to PCBs in various media (e.g., indoor air) from residential basements that had oil in basements would result in health concerns for adults and children who lived there (i.e., 1250 East Street and 1260

$$\text{Exposure Dose} = \frac{(\text{max. contaminant concentration})\ (\text{ingestion rate})\ (\text{exposure factor})\ (1\ \text{kg}/10^6\ \text{mg})}{\text{Body weight}}$$

$$\text{Cancer Exposure Factor (child playing)} = \frac{(5\ \text{days/week})\ (50\ \text{weeks/year})\ (18\ \text{years})}{(70\ \text{years})\ (365\ \text{days/year})} = 0.18$$

$$\text{Cancer Exposure Factor (adult recreating)} = \frac{(5\ \text{days/week})\ (50\ \text{weeks/year})\ (52\ \text{years})}{(70\ \text{years})\ (365\ \text{days/year})} = 0.51$$

$$\text{Cancer Exposure Dose (child)} = \frac{(36.1\ \text{mg/kg})\ (200\ \text{mg/day})\ (0.18)\ (1\ \text{kg}/10^6\ \text{mg})}{35\ \text{kg}} = 3.71 \times 10^{-05}\ (\text{mg/kg/day})$$

$$\text{Cancer Exposure Dose (adult)} = \frac{(36.1\ \text{mg/kg})\ (100\ \text{mg/day})\ (0.51)\ (1\ \text{kg}/10^6\ \text{mg})}{70\ \text{kg}} = 2.63 \times 10^{-05}\ (\text{mg/kg/day})$$

Cancer risk (child) (PCB) = 3.71×10^{-05} (mg/kg/day) x 2.0 $(\text{mg/kg/day})^{-01}$ = 7.43×10^{-05}
Cancer risk (adult) (PCB) = 2.63×10^{-05} (mg/kg/day) x 2.0 $(\text{mg/kg/day})^{-01}$ = 5.26×10^{-05}

East Street). However, these houses were bought by GE and demolished in 1980s. Although past opportunities for exposure to garden soil and surface soil in the residential area might also occurred to gardeners, children, and visitors, it would not likely result in adverse health effects due to intermittent contact with contaminated soil. Under current conditions, opportunities for exposure to average levels in contaminated soils would also not result in adverse health effects even during wintertime when there was no grass cover. Thus, the residential area poses no apparent public health hazard under current conditions.

Industrial area summary

Under past conditions, GE employees who were involved with the excavation for the Altresco steamline likely had had short-term opportunities for exposure during contact with contaminated soils below the steamline. However, opportunities for exposure to PCBs in these soils were not likely to result in adverse health effects due to short-term exposures.

Under past conditions, GE employees who worked at the industrial area and were not involved in the excavation activity might have had very limited opportunities for exposure to contaminated subsurface soil since almost the whole site was either paved or covered with structures. Therefore, these opportunities for exposure would not result in adverse health effects for these workers.

Under past and present conditions, trespassers might have had some opportunities for exposure to the contaminated surface soil on the strip of land along New York Avenue outside the fence of the industrial area. However, due to intermittent opportunities for exposure and grass cover of the strip except for the wintertime, these opportunities for exposure would not result in adverse health effects for trespassers.

Should institutional controls currently in place be removed (e.g., fences with locked gates be removed) or not be maintained, should construction activities occur that would disturb soil, should the use of the site change (e.g., new recreational use), or remedial activities by environmental agencies and GE outlined in the consent decree are not properly completed and maintained, the industrial area of the site could be a potential public health hazard in the future, depending on the extent to which opportunities for exposure increase.

Furthermore, the MDPH's 1997 Exposure Assessment Study concluded that serum levels of the non-occupationally exposed participants from communities surrounding the Housatonic River including Pittsfield were generally within background levels. The 2000 Expert Panel on the Health Effects of Non-Occupational Exposure to PCBs agreed that the available data indicate that serum PCB-levels for non-occupationally exposed populations from MDPH's Exposure Assessment Study are generally similar to the background exposure levels in recent studies (MDPH 2000). However, MDPH notes that serum PCB levels tended to be higher in older residents of the Housatonic River Area who were frequent and/or long-term fish eaters or who reported opportunities for occupational exposure. In addition, there was some indication that other activities (e.g., fiddlehead fern consumption, gardening) may have contributed slightly to serum PCB levels.

The MDPH 2002 Assessment of Cancer Incidence Health Consultation showed that, for the majority of cancer types evaluated, residents of the Housatonic River Area did not experience excessive rates of cancer incidence during the period 1982-1994. For most primary cancer types evaluated, the incidence occurred at or below expected rates, concentrations of cancer cases appeared to reflect the population density, and, when reviewed in relation to the GE sites, the pattern of cancer incidence did not suggest that these sites played a primary role in this development. While Pittsfield did experience more cancer elevations than the other communities; and the pattern of some cancer types showed elevations that were statistically significantly higher than expected in certain areas or during certain time periods, no pattern among those census tracts with statistically significant elevations was observed. Specifically, although two of the three census tracts in Pittsfield adjacent to the GE site experienced statistically significant elevations in cancers of the bladder, breast, and NHL, a pattern suggesting that a common environmental exposure pathway played a primary role in these census tracts was not observed nor were cases distributed more toward the vicinity of the GE sites. It is important to note, however, that it is impossible to determine whether exposure to GE site contaminants may have played a role in any individual cancer diagnosis. Further review of the available risk factor and occupational information suggested that workplace exposures and smoking may have been potential factors in the development of some individuals' cancers (e.g., bladder cancer). However, the pattern of cancer in this area does not suggest that environmental factors played a primary role in the increased rates in this area (MDPH 2002a).

As noted earlier in this PHA, more recent cancer incidence data for the period 1995-1999 shows that for Pittsfield as a whole, no cancer type was statistically significantly elevated. Although bladder cancer among males for Pittsfield as a whole was statistically significantly elevated during 1982 – 1994 (MDPH 2002a), this cancer type occurred less often than expected among males during 1995 – 1999 (28 cases observed vs. approximately 36 cases expected) (MDPH 2002b).

C. ATSDR Child Health Considerations

ATSDR and MDPH recognize that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination of their environment. Children are at a greater risk than adults from certain kinds of exposure to hazardous substances emitted from waste sites. They are more likely exposed because they play outdoors and because they often bring food into contaminated areas. Because of their smaller stature, they might breathe dust, soil, and heavy vapors close to the ground. Children are also smaller, resulting in higher doses of contaminant exposure per body weight. The developing body systems of children can sustain permanent damage if certain toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

MDPH evaluated the likelihood of exposures to children from compounds in ambient air or surface soil at the East Street Area 1 site and the adjacent residential neighborhood. See section B above ("Evaluation of Possible Health Effects") for a discussion of these exposure scenarios.

CONCLUSIONS

MDPH has conducted public health activities in the past for Pittsfield and the Housatonic River area. These included the MDPH Housatonic River Area Exposure Assessment Study, which concluded that serum levels of the non-occupationally exposed participants from communities surrounding the Housatonic River including Pittsfield were generally within background levels, the MDPH Expert Panel on the Health Effects of Non-occupational Exposure to PCBs, which generally agreed with these findings, and the MDPH Assessment of Cancer Incidence Health Consultation, which concluded that the pattern of cancer in this area does not suggest that environmental factors played a primary role in increased rates in this area.

MDPH is currently conducting ongoing public health activities (e.g., exposure assessment and serum PCB testing, as warranted, on an individual basis as a public service). Information gathered from these additional activities will continue to improve MDPH's ability to assess the public health implications of PCB contamination at all sites being evaluated in public health assessments for the GE site. Thus, MDPH evaluation of potential public health implications related to the Unkamet Brook Area site is based on currently available information. An extensive sampling effort, including additional work on the site by the environmental agencies to better define the nature and extent of contamination (surface, subsurface, PCBs, and other constituents) at the site will generate new information regarding the site. Information from this public health assessment will be included in the summary public health assessment for all of the GE sites.

ATSDR requires that one of five conclusion categories be used to summarize findings of health consultations and public health assessments. These categories are: 1) Urgent Public Health Hazard, 2) Public Health Hazard, 3) Indeterminate Public Health Hazard, 4) No Apparent Public Health Hazard, 5) No Public Health Hazard. A category is selected from site-specific conditions such as the degree of public health hazard based on the presence and duration of human exposure, contaminant concentration, the nature of toxic effects associated with site-related contaminants, presence of physical hazards, and community health concerns.

Conclusions from evaluating the East Street Area 1 site include the following:

1. Residents of certain Lakewood area homes (i.e., 1250 East Street and 1260 East Street) had opportunities for exposure to various media containing PCBs in

residential basements (soil, grease, sump sediment, wall scrapings or materials deposited around subsurface utility lines), garden soil, and surface soils. Incidental ingestion, dermal contact and inhalation of volatilized vapors from these contaminated soil and basement surfaces could have presented some health concerns to these residents, thereby making the residential area of the East Street Area 1 site a “Public Health Hazard” in the past. However, evaluating possible health effects that might be related to these opportunities for exposure to PCBs for residents of these past homes is difficult because of limited information. Data available from 1980 for garden soils of some residences in the area show PCB levels below comparison values and, therefore, the opportunities of exposure to these soils would not result in adverse health effects and public health hazard. More recent data from 1997 to 2001 also indicated in general average PCB levels on residential properties tested in the Lakewood area below levels of health concern. Well-maintained lawns of these residences might also have reduced contact with contaminated surface soil at the residences south of Merrill Road in the Lakewood area.

2. Individuals who might have had opportunities for exposure to the PCBs in soil detected in the industrial area are primarily employees of GE who might have been involved with the excavation for the Altresco steamline. Opportunities for exposure might have occurred through incidental ingestion of or dermal contact with contaminated soils. However, in the case of the steamline, it is likely that individuals had short-term contact with soils below the steamline, and thus, opportunities for exposure to PCBs in these soils were not likely to result in adverse health effects.

3. For GE employees who were not involved in the excavation for the steamline, opportunities for exposure to contaminated soil might be very limited since almost the whole site was either paved or covered with structures. Therefore, these opportunities for exposure would not result in adverse health effects for these workers. Likewise, employees of the companies or facilities located in the industrial area are not likely to have had sufficient opportunities for exposure to chemicals in soil such that adverse health effects are likely to have resulted.

4. Considering these surface soil concentrations and based on available environmental data and other relevant information (e.g., residential properties generally have average PCB surface soil concentrations below levels of health concern and appear to have well-maintained grass lawns, and the industrial area is fenced and locked), it does not appear that present exposures to chemicals in surface soils in both the industrial and residential areas of the site would result in adverse health effects.

Under current conditions, ATSDR would classify the whole site as a “No Apparent Health Hazard.” Should the conditions at the site change (e.g., increased amount of exposed soil, decreased amount of vegetative cover, occurrence of construction activities, removal of institutional controls, or remedial activities are not properly completed/maintained, etc.), the site could pose a public health hazard in the future, depending on the extent to which opportunities for exposure increase.

RECOMMENDATIONS

1. MDPH recognizes that there have been multiple opportunities for exposure to PCBs throughout Pittsfield and the Housatonic River area and supports ongoing remedial efforts to reduce opportunities for exposure to PCBs throughout Pittsfield and the Housatonic River Area.

2. MDPH supports ongoing site characterization efforts, including collection of additional samples and remedial activities, by the environmental regulatory agencies, in order to reduce opportunities for exposure to PCBs throughout the Pittsfield and Housatonic River area.

PUBLIC HEALTH ACTION PLAN

1. Due to the discovery during summer 1997 of widespread residential PCB soil contamination, MDPH is conducting a separate study of residents who were concerned about this exposure. MDPH set up a hotline number for individuals to call with health-related concerns, to complete exposure questionnaires, and to request serum PCB testing. Results of these more recent analyses of serum PCB levels and evaluation of the community health concerns expressed on the hotline calls are being developed as part of the summary public health assessment for the GE sites.

2. MDPH will continue to offer to evaluate any resident's opportunities for past exposure to PCBs and, if warranted, have their serum PCB levels determined.

3. As previously stated in the Health Consultation's Assessment of Cancer Incidence, Housatonic River Area, 1982-1994, MDPH will continue to monitor bladder cancer incidence in Pittsfield through the Massachusetts Cancer Registry to determine whether the pattern of bladder cancer changes.

4. MDPH established its Housatonic River Area Advisory Committee on Health in 1995. This committee is comprised of local residents, representatives from the local medical community, environmental and health professionals, representatives from the offices of elected officials and local health departments. MDPH staff will continue to hold meetings with committee members to report on the status of various activities and to discuss and get feedback on the conduct of MDPH health activities (e.g., education and outreach) in the area.

5. MDPH will incorporate information from the East Street Area 1 site public health assessment into the summary public health assessment for the GE sites.

6. Upon receipt from EPA of any additional data that EPA believes may warrant further public health assessment, MDPH will review this information and

determine an appropriate public health response (e.g., health consultation, technical assistance).

This document was prepared by the Bureau of Environmental Health Assessment of the Massachusetts Department of Public Health. If you have any questions about this document, please contact Suzanne K. Condon, Director of BEHA/MDPH, 7th Floor, 250 Washington Street, Boston, Massachusetts 02108.

TABLES

Table 1. Demographic Characteristics of Pittsfield (2000 U.S. Census)

	Pittsfield		Census Tract 9010		Census Tract 9011		Census Tract 9012		Census Tract 9002	
Characteristics	Persons	%	Persons	%	Persons	%	Persons	%	Persons	%
Age[1]										
Under 5	2719	5.9	298	5.7	167	4.76	2	3.03	322	6.89
5 – 14	6072	13.2	705	13.5	353	10.07	8	12.12	644	13.78
15 – 44	17924	39.1	1988	38.04	1009	28.8	25	37.88	2366	50.62
45 – 64	10540	23.0	1262	24.15	869	24.8	13	19.7	803	17.18
65 and over	8538	18.6	973	18.61	1105	31.5	18	27.27	539	11.53
Sex										
Male	21,765	47.5	2,485	47.55	1,619	46.22	31	43.8	2,371	47.0
Female	24,028	52.5	2,741	52.45	1,884	53.78	35	56.2	2,303	53.0

[1] Within Census Tracts 9002, 9010, and 9011, the total numbers of persons by race are higher than the total numbers of persons by sex and by age because many people might come from more than 2 different racial origins.

Table 2. Pittsfield Cancer Incidence: Expected and Observed Case Counts, with Standardized Incidence Ratios, 1995-1999 Pittsfield

	Exp	Obs	SIR
Bladder, Urinary			
Male	36.46	28	77
Female	15.43	14	91
Total	51.88	42	81
Brain and Other Central Nervous System			
Male	9.65	9	93
Female	8.51	6	71
Total	18.15	15	83
Breast			
Male	1.65	1	NC*
Female	217.96	226	104
Total	219.61	227	103
Cervix Uteri			
Female	11.32	13	115
Colon / Rectum			
Male	89.61	85	95
Female	97.11	75	77 #–
Total	186.72	160	86
Esophagus			
Male	12.24	9	74
Female	4.74	3	NC*
Total	16.98	12	71
Hodgkin's Disease (Hodgkin Lymphoma)			
Male	4.64	4	NC*
Female	3.83	1	NC*
Total	8.47	5	59
Kidney and Renal Pelvis			
Male	19.90	13	65
Female	13.83	9	65
Total	33.72	22	65 #–
Larynx			
Male	11.24	10	89
Female	3.09	4	NC*
Total	14.34	14	98
Leukemia			
Male	16.23	15	92
Female	13.77	6	44 #–
Total	29.99	21	70
Liver and Intrahepatic Bile Ducts			
Male	7.72	3	NC*
Female	3.82	3	NC*
Total	11.54	6	52
Lung and Bronchus			
Male	111.39	94	84
Female	96.82	83	86
Total	208.21	177	85 #–

	Exp	Obs	SIR
Melanoma of Skin			
Male	22.34	16	72
Female	17.80	12	67
Total	40.14	28	70
Multiple Myeloma			
Male	6.88	10	145
Female	6.68	4	NC*
Total	13.56	14	103
Non-Hodgkin('s) Lymphoma			
Male	27.40	18	66
Female	27.74	17	61 #–
Total	55.14	35	63 ~–
Oral Cavity and Pharynx			
Male	20.47	15	73
Female	11.24	3	NC*
Total	31.71	18	57 #–
Ovary			
Female	25.16	28	111
Pancreas			
Male	14.81	21	142
Female	17.81	10	56
Total	32.62	31	95
Prostate			
Male	215.29	168	78 ^–
Stomach			
Male	15.06	10	66
Female	10.52	8	76
Total	25.58	18	70
Testis			
Male	6.82	4	NC*
Thyroid			
Male	4.09	3	NC*
Female	11.18	11	98
Total	15.28	14	92
Uteri, Corpus and Uterus, NOS			
Female	42.36	34	80
All Sites / Types			
Male	701.74	584	83 ^–
Female	715.26	606	85 ^–
Total	1417.00	1190	84 ^–

Table 2 (continued). Pittsfield Cancer Incidence: Expected and Observed Case Counts, with Standardized Incidence Ratios, 1995-1999

Exp = expected case count, based on the Massachusetts average age-specific incidence rates for this cancer
Obs = observed case count

SIR = standardized incidence ratio [(**Obs** / **Exp**) X 100]

* = **SIR** and statistical significance not calculated when Obs < 5

+ indicates number of observed cases is statistically significantly higher than the expected number of cases
- indicates number of observed cases is statistically significantly lower than the expected number of cases

# indicates statistical significance at the p <= 0.05 level
~ indicates statistical significance at the p <= 0.01 level, as well as at the p <= 0.05 level
^ indicates statistical significance at the p <= 0.001 level, as well as at the p <= 0.05 and p <= 0.01 levels

Table 3a. Summary of samples for garden soils of the residences from the residential area (1980)[1]

Residential Addresses	PCB levels in garden soils (mg/kg)
East Street	
East Street House B	0.2
East Street House D	0.4
East Street House E/F	0.5
East Street House H	0.4 and 0.4
East Street House J	0.5 and 0.8
East Street House M	0.1
Fasce Street	
Fasce Street House D	0.7
Fasce Street House G	ND
Newell Street	
Newell Street House F/G	1.0
Newell Street House F	ND
Lombard Street	
Lombard Street House G	0.8
Lombard Street House H	0.1
Buckingham Street	
Buckingham Street House A	0.1
Milan Street	
Milan Street House E	ND and ND

ND Not Detected (Detection Limit = 0.1)

[1] For confidentiality considerations, presently occupied homes have been coded. Descriptions in tables match those in text (e.g., Fasce Street House A).

Table 3b. Summary of soil samples from basement floors of residences from the residential (1980)

Residential Addresses	PCB levels (mg/kg)
East Street	
East Street House A	ND
East Street House C	2.4
East Street House G	2.5
East Street House I	ND
East Street House K	ND
East Street House L	ND
East Street House M	ND
East Street House N/O	ND
East Street House P	ND
East Street 1260 (demolished)	44 and 73
Lombard Street	
Lombard Street House A	ND
Lombard Street House B	ND
Lombard Street House D	ND and ND
Lombard Street House G	ND
Lombard Street House H	ND
Lombard Street House I	2.4
Lombard Street House J	ND
Lombard Street House L	0.6; 1.6; ND and ND
Fasce Street	
Fasce Street House G	ND
Fasce Street House I	0.2 and 40
Newell Street	
Newell Street House C	ND
Newell Street House D	ND
Newell Street House E	0.6; ND and ND
Milan Street	
Milan Street House D	ND
Milan Street House E	ND

ND Not Detected (Detection Limit = 0.1)

Table 3c. Summary of grease sample found on basement floor of Lombard Street House C/D at the residential area in the East Street Area 1 site (1980)

Residential Address	PCB level (mg/kg)
Lombard Street	
Lombard Street House C/D	37

Table 3d. Summary of sediment samples from sumps inside the residences in the area (1980)

Residential Addresses	PCB levels (mg/kg)
East Street	
East Street House D	3.2
East Street House E	1.0
East Street House G	ND (DL = 0.1)
East Street House H	3.8
East Street House J	ND (DL = 0.1)
East Street House 1250 (demolished)	152 and 5.5
East Street House 1254 (demolished)	ND and ND (DL = 0.1)
Lombard Street	
Lombard Street House E/F	ND (DL = 0.1)
Fasce Street	
Fasce Street House E	8.4 and ND (DL = 0.1)
Fasce Street House F	ND; ND and ND (DL = 0.07)
Fasce Street House G	ND (DL = 0.07)
Fasce Street House H	3.7
Fasce Street House I	1.6; ND; ND and ND (DL = 0.07)
Newell Street	
Newell Street House B	ND (DL = 0.1)
Buckingham Street	
Buckingham Street House A	ND and ND (DL = 0.1)
Milan Street	
Milan Street House C/D	ND (DL = 0.1)

See Next Page

DL Detection Limit
ND Not Detected

Table 3e. Summary of samples from wall scrapings or materials deposited around subsurface utility connections inside the residences at the residential area (1980)

Residential Addresses	PCB levels (mg/kg)
East Street	
East Street House B	ND
Fasce Street	
Fasce Street House A	ND
Fasce Street House B/C	ND
Fasce Street House G	7.9
Lombard Street	
Lombard Street House C/D	ND
Lombard Street House K	7.6
Newell Street	
Newell Street House A	ND
Milan Street	
Milan Street House A/B	ND

ND Not Detected (Detection Limit = 0.1)

Table 3f. Summary of contaminants of concern from canned and frozen vegetables from gardens at the residential area (1980)

Compounds	Detects/ Samples	Minimum (mg/kg)	Mean[1] (mg/kg)	Maximum (mg/kg)	Comparison Values (mg/kg)
Total PCBs	1/12	*	*	0.01	CREG = 0.4

CREG Cancer Risk Evaluation Guide (ATSDR)
ND Not Detected
* Most of the samples were affected by interference; hence, a reliable minimum and mean could not be determined.

[1] Mean values calculated using one half the method detection limit for samples in which the compound was below detection

Table 3g. Summary of surface soil (0 to 0.5 feet and 0 to 2 feet in depth) contaminants of concern from the residential and commercial area (May 1996)

Compounds	**Detects/ Samples**	**Minimum (mg/kg)**	**Mean[1] (mg/kg)**	**Maximum (mg/kg)**	**Comparison Values (mg/kg)**	**Background Levels (mg/kg)**
Total PCBs[2]	6/6	0.69	3.98	13	CREG = 0.4	
Dioxin Toxicity Equivalence[3] (µg/kg)	2/2[4]	0.46 (µg/kg)	0.6 (µg/kg)	0.78 (µg/kg)	EMEG (child, chronic) = 0.05 EMEG (adult, chronic) = 0.7	
Benzo(a)pyrene	1/2	ND	NC*	0.62J	CREG = 0.1	0.17 – 0.22[5]
Lead	2/2	154	250.5	347	S-1 soil & GW-1 = 300[6] EPA std (res.) = 400	<10-300[7]

See next page for key to abbreviations used in this table.

[1] Mean values calculated using one half the method detection limit for samples in which the compound was below detection

[2] Of these six samples, two were collected at 0 to 0.5 ft, two were collected at 0 to 2 ft and two were collected at unknown depth. These samples were analyzed for Aroclor 1260 only.

[3] Toxicity equivalents (TEQ) represent 2,3,7,8-TCDD toxic equivalents for mixtures of dioxin-like chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs). Since limited data on toxicity exist for many of the CDDs and CDFs, toxic equivalency factors (TEFs) were developed and validated in animals. TEFs compare the relative toxicity of individual congeners to that of 2,3,7,8-TCDD. The 2,3,7,8-TCDD congener is used as the basis of the TEFs because it appears to be the most toxic of the CDDs to mammals. The TEQ is calculated by calculating the sum of the products of the TEFs for each congener and its concentration in the mixture.

[4] The samples did not have depth specification, and one of the two samples had a duplicate. The average of sample and its duplicate were taken as a single value in calculating the overall mean.

[5] From Toxicology Profile for Polycyclic Aromatic Hydrocarbons (PAHs), August 1995, ATSDR

[6] From 310 CMR 40.0975 MCB Method 1 Soil Standards, March 1998

[7] From Shacklette (1984), "Element Concentrations in Soils and Other Surface Materials of the Conterminous United States"

CREG	Cancer Risk Evaluation Guide (ATSDR)
EMEG	Environmental Media Evaluation Guide (ATSDR)
J	The analyte was detected and is considered an estimated value
ND	Not Detected
NC*	Value could not be calculated because the method detection limits were not available

Table 3h. Summary of 0 to 0.5 ft soil contaminants of concern from the industrial area (May 1996[1])

Compounds	Detects / Samples	Minimum (mg/kg)	Mean[2] (mg/kg)	Maximum (mg/kg)	Comparison Values (mg/kg)	Background Levels (mg/kg)
PCBs[3]	10/10[4]	0.45	15.8	120	CREG = 0.4	
Dioxin Toxicity Equivalence[5] (µg/kg)	1/1	0.19[6]	0.19	0.19	EMEG (child, chronic) = 0.05 µg/kg EMEG (adult, chronic) = 0.7 µg/kg	
Benzo(a) pyrene	2/2	0.13J	1.62	3.1	CREG = 0.1	0.17 – 0.22[7]
Dibenz(a,h) anthracene	½	ND	NC*	0.27J	*CREG = 0.02	
Lead	22	26	181.5	337	S-1 soil & GW-1 = 300[8] EPA std (res.) = 400	<10 – 300[9]

See next page for key to abbreviations used in this table.

---

[1] According to phone conversation with MA DEP on 6/9/98
[2] Mean values calculated using one half the method detection limit for samples in which the compound was below detection
[3] Only Aroclor 1260 was analyzed for
[4] One (1) out of these 10 samples was considered a surface soil sample but did not have information on depth
[5] Toxicity equivalents (TEQ) represent 2,3,7,8-TCDD toxic equivalents for mixtures of dioxin-like chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs). Since limited data on toxicity exist for many of the CDDs and CDFs, toxic equivalency factors (TEFs) were developed and validated in animals. TEFs compare the relative toxicity of individual congeners to that of 2,3,7,8-TCDD. The 2,3,7,8-TCDD congener is used as the basis of the TEFs because it appears to be the most toxic of the CDDs to mammals. The TEQ is calculated by calculating the sum of the products of the TEFs for each congener and its concentration in the mixture.
[6] One non-detectable dioxin congener does not have detection limit and a default method detection limit of 0.0026 ppb was used for that congener
[7] From Toxicology Profile for Polycyclic Aromatic Hydrocarbons (PAHs), August 1995, ATSDR
[8] From 310 CMR 40.0975 MCB Method 1 Soil Standards, March 1998
[9]From Shacklette (1984), “Element Concentrations in Soils and Other Surface Materials of the Conterminous United States”

CREG	Cancer Risk Evaluation Guide (ATSDR)
*CREG	Values were calculated by using TEFs in relation to CREG = 0.1 ppm given to benzo(a)pyrene in ATSDR guideline
EMEG	Environmental Media Evaluation Guide (ATSDR)
J	The analyte was detected and is considered an estimated value
ND	Not Detected
NC*	Value could not be calculated because the method detection limits were not available

Table 3i. Summary of 0 to 2 ft soil contaminants of concern from the industrial area[10]

Compounds	Detects/ Samples	Minimum (mg/kg)	Mean[11] (mg/kg)	Maximum (mg/kg)	Comparison Values (mg/kg)	Background levels (mg/kg)
PCBs	42/54[12]	ND	84.53	1,500	CREG = 0.4	
Dioxin Toxicity Equivalence[13] (µg/kg)	2/2	0.03[14]	0.07	0.11	EMEG (child, chronic) = 0.05[15] µg/kg EMEG (adult, chronic) = 0.7 µg/kg	
Benzo(a)pyrene	2/2	0.07J	1.03	2	CREG = 0.1	0.17 – 0.22[16]
Dibenz(a,h)anthracene	1/2	ND	NC*	0.27	*CREG = 0.02	

See next page for key to abbreviations used in this table.

[10] According to phone conversation with MA DEP representative on 6/9/98 sampling was performed from 1989-1991and in 1996
[11] Mean values calculated using one half the method detection limit for samples in which the compound was below detection
[12] Out of these fifty-four (54) samples, 39 were collected in July 1989, 1 in March 2000, 4 were collected in 1991, and 10 were collected in 1996
[13] Toxicity equivalents (TEQ) represent 2,3,7,8-TCDD toxic equivalents for mixtures of dioxin-like chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs). Since limited data on toxicity exist for many of the CDDs and CDFs, toxic equivalency factors (TEFs) were developed and validated in animals. TEFs compare the relative toxicity of individual congeners to that of 2,3,7,8-TCDD. The 2,3,7,8-TCDD congener is used as the basis of the TEFs because it appears to be the most toxic of the CDDs to mammals. The TEQ is calculated by calculating the sum of the products of the TEFs for each congener and its concentration in the mixture.
[14] Five non-detectable dioxin congeners do not have detection limits and a default method detection limit of 0.0023 ppb was used for these congeners
[15] Comparison value for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)
[16] From Toxicology Profile for Polycyclic Aromatic Hydrocarbons (PAHs), August 1995, ATSDR

CREG	Cancer Risk Evaluation Guide (ATSDR)
*CREG	Values were calculated by using TEFs in relation to CREG = 0.1 ppm given to benzo(a)pyrene in ATSDR guideline
EMEG	Environmental Media Evaluation Guide (ATSDR)
J	The analyte was detected and is considered an estimated value
ND	Not Detected
NC*	Value could not be calculated because the method detection limits were not available

Table 3j. Summary of the 0 to 0.5 ft and 0 to 2 ft surface soil contaminants of concern from the 20s, 30s, and 40s Complexes

Compounds	**Detects/ Samples**	**Minimum (mg/kg)**	**Mean[1] (mg/kg)**	**Maximum (mg/kg)**	**Comparison Values (mg/kg)**
PCBs	23/28	ND	NC*	131	CREG = 0.4
Benzo(a)anthracene	4/4	0.21J	1.22	3.7	*CREG = 1
Benzo(a)pyrene	4/4	0.21JB	1.29	4	CREG = 0.1
Benzo(b)fluoranthene	4/4	0.25J	1.54	4.5	*CREG = 1
Arsenic	3/3	6.2	8.03	11	RMEG (child)= 20 RMEG (adult) = 200 CREG = 0.5

B The analyte was also detected in the associated method blank
CREG Cancer Risk Evaluation Guide (ATSDR)
*CREG Values were calculated by using TEFs in relation to CREG = 0.1 ppm given to benzo(a)pyrene in ATSDR guideline
ND Not Detected
NC* Not Available
* The CREG value calculated by using TEFs relative to CREG = 0.1 ppm for benzo(a)pyrene, as contained in ATSDR toxicological profile for PAHs
RMEG Reference Dose Media Evaluation Guide (ATSDR, based on EPA Reference Dose)

[1] Mean values calculated using one half the detection limit for samples in which the compound was below detection

Table 3k. Summary of the subsurface soil contaminants of concern from the 20s, 30s, and 40s Complexes

Compounds	**Detects/ Samples**	**Minimum (mg/kg)**	**Mean[1] (mg/kg)**	**Maximum (mg/kg)**	**Comparison Values (mg/kg)**
PCBs	68/118	ND	NC*	520	CREG = 0.4
Benzo(a)pyrene	2/10[2]	ND	NC*	0.53J	CREG = 0.1
Arsenic	8/8	4.10	6.59	10.6J	RMEG (child) = 20 RMEG (adult) = 200 CREG = 0.5

CREG Cancer Risk Evaluation Guide
J Estimated value less than contract lab program required quantitation limit
NC* Not Available
ND Not Detected
RMEG Reference Dose Media Evaluation Guide (ATSDR, based on EPA Dose)
* CREG value calculated by using TEFs relative to CREG = 0.1 ppm for benzo(a)pyrene, as found in the ATSDR toxicological profile for PAHs

[1] Mean values calculated using one half the method detection limit for samples in which the compound was below detection

[2] One sample had a duplicate; average of sample and its duplicate were taken as a single value in calculating the overall mean.

Table 3l. PCBs in surface soil from houses and accessible lots in the East Street 1 neighborhood.

House	Sample Depth	Detects/ Samples	Minimum (ppm)	Mean[1] (ppm)	Maximum (ppm)	Comparison Values (ppm)
East Street House D	Surface (0 to 0.5 ft)	15/16	ND(0.6)	0.556	1.7	CREG = 0.4
	Surface (0 to 2 ft)	3/7	ND(0.5)	0.379	1	
East Street House E/F	Surface (0 to 0.5 ft.)	18/18	0.027	0.53	1.15	
East Street House G	Surface (0 to 0.5 ft.)	16/16	0.11	1.265	3.5	
Fasce Street House D	Surface (0 to 0.5 ft.)	10/10	0.183	1.0547	2.35	
Fasce Street Houses F & G	Surface (0 to 0.5 ft.)	3/3	0.138	0.182	0.215	
Fasce Street House H	Surface (0 to 0.5 ft.)	14/15	ND(0.048)	0.28	1.16	
Fasce Street House I	Surface (0 to 0.5 ft.)	2/3	ND(0.428)	0.273	0.40	
Fasce Street Lot	Surface (0 to 0.5 ft.)	15/15	0.059	0.32	1.2	
Lombard Street House A	Surface (0 to 0.5 ft)	10/10	0.22	1.343	4.2	
Lombard Street House G	Surface (0 to 0.5 ft)	13/14	ND(0.042)	0.975	5	
Lombard Street House H	Surface (0- to 0.5 ft)	3/3	0.67	0.78	0.96	
Lombard Street House I	Surface (0 to 0.5 ft)	6/6	0.096	1.114	2.18	
Lombard Street House K	Surface (0 to 0.5 ft)	14/24	ND(0.4)	0.58	1.34	
	Surface (0 to 2 ft)	2/7	ND(0.5)	0.329	0.5	
Lombard Street Lot	Surface (0 to 0.5 ft)	17/17	0.058	0.617	2.36	
Milan Street House C/D	Surface (0 to 0.5 ft)	5/5	0.3	0.872	1.98	
Milan Street House F	Surface (0 to 0.5 ft)	7/7	0.4 J	0.7	0.9	
	Surface (0 to 2 ft)	2/4	ND(0.60)	0.2875	0.3 J	
Newell Street House A	Surface (0 to 0.5 ft)	50/51	ND(0.13)	6.575	36.1	

ND = Not Detected
CREG = Cancer Risk Evaluation Guide (ATSDR)

[1] Mean values calculated using one half the detection limit for samples in which the compound was below detection, and using averages for duplicate samples.

Table 3m. PCBs in subsurface soil from houses and accessible lots in the East Street 1 neighborhood.

House	Sample Depth	Detects/ Samples	Minimum (ppm)	Mean[1] (ppm)	Maximum (ppm)	Comparison Values (ppm)
East Street House D	Subsurface (0.5 to 8 ft)	16/33	ND(0.27)	0.360	1.2	CREG = 0.4
East Street House E/F	Subsurface (0.5 to 16 ft.)	22/42	ND(0.041)	0.229	1.42	
East Street House G	Subsurface (0.5 to 16 ft.)	19/40	ND(0.036)	0.455	3.3	
Fasce Street House D	Subsurface (0.5 to 4 ft.)	10/26	ND(0.114)	0.938	16.3	
Fasce Street Houses F & G	Subsurface (0.5 to 1 ft.)	1/3	ND(0.123)	0.105	0.193	
Fasce Street House H	Subsurface (0.5 to 16 ft.)	18/36	ND(0.036)	0.093	0.69	
Fasce Street House I	Subsurface (0.5 to 1 ft.)	2/3	ND(0.126)	0.209	0.393	
Fasce Street Lot	Subsurface (0.5 to 16 ft.)	10/39	ND(0.041)	0.057	0.61	
Lombard Street House A	Subsurface (0.5 to 4 ft)	17/20	ND(0.0385)	0.593	5.3	
Lombard Street House G	Subsurface (0.5 to 8 ft)	17/28	ND(0.039)	0.464	3.5	
Lombard Street House H	Subsurface (0.5 to 1 ft)	3/3	0.049	0.206	0.35	
Lombard Street House I	Subsurface (0.5 to 2 ft)	5/12	ND(0.112)	0.276	0.84	
Lombard Street House K	Subsurface (0.5 to 8 ft)	25/53	ND(0.034)	0.494	8.325	
Lombard Street Lot	Subsurface (0.5 to 16 ft.)	16/41	ND(0.037)	0.329	9.4	
Milan Street House C/D	Subsurface (0.5 to 4 ft)	7/9	ND(0.036)	1.033	4.82	
Milan Street House F	Subsurface (0.5 to 8 ft)	4/18	ND(0.269)	0.264	0.51	
Newell Street House A	Subsurface (0.5 to 18 ft)	118/178	ND(0.013)	4.61	170	

ND = Not Detected
CREG = Cancer Risk Evaluation Guide (ATSDR)

[1] Mean values calculated using one half the detection limit for samples in which the compound was below detection, and using averages for duplicate samples.

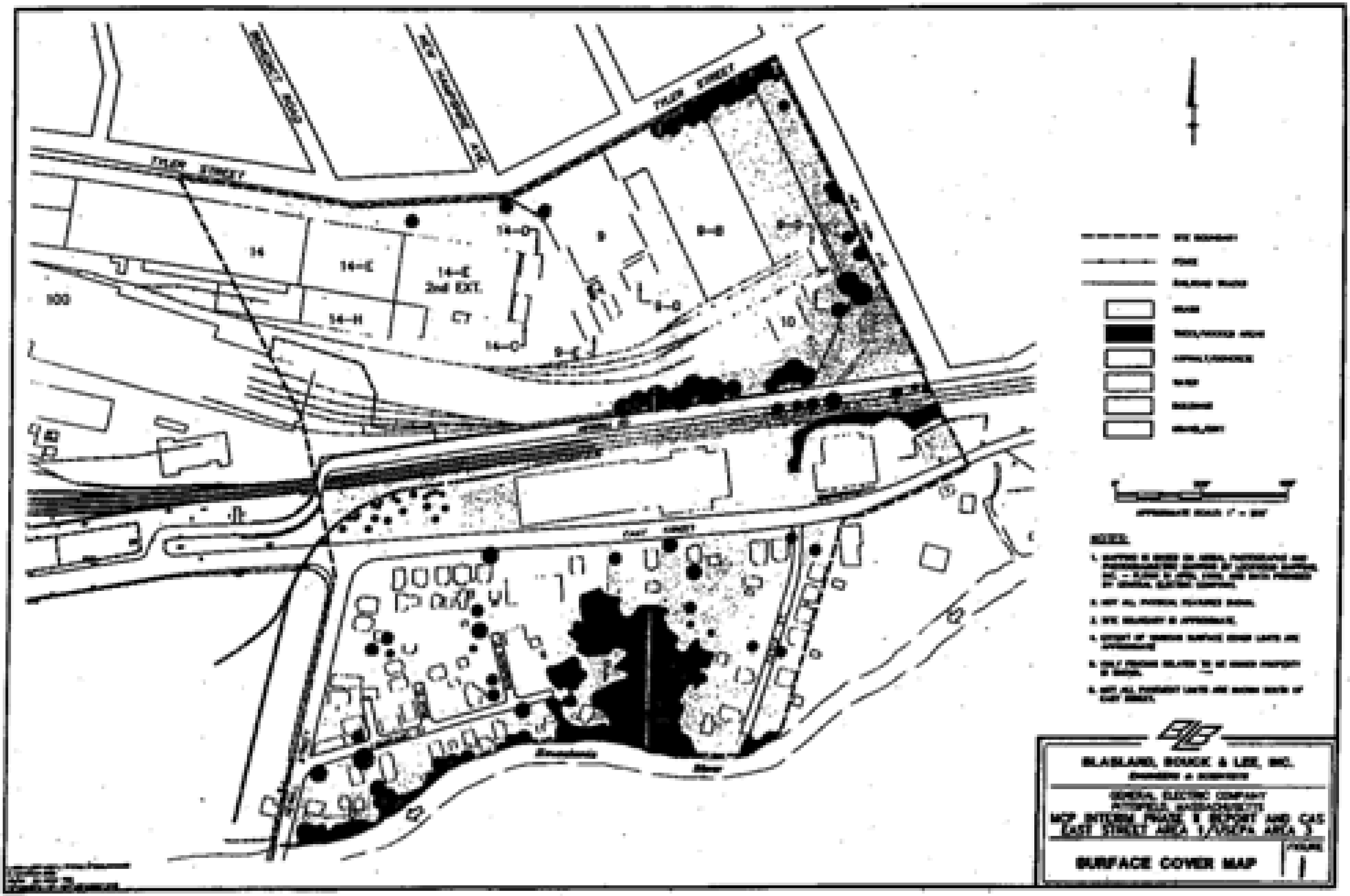
Table 3n. Summary of the groundwater contaminants of concern

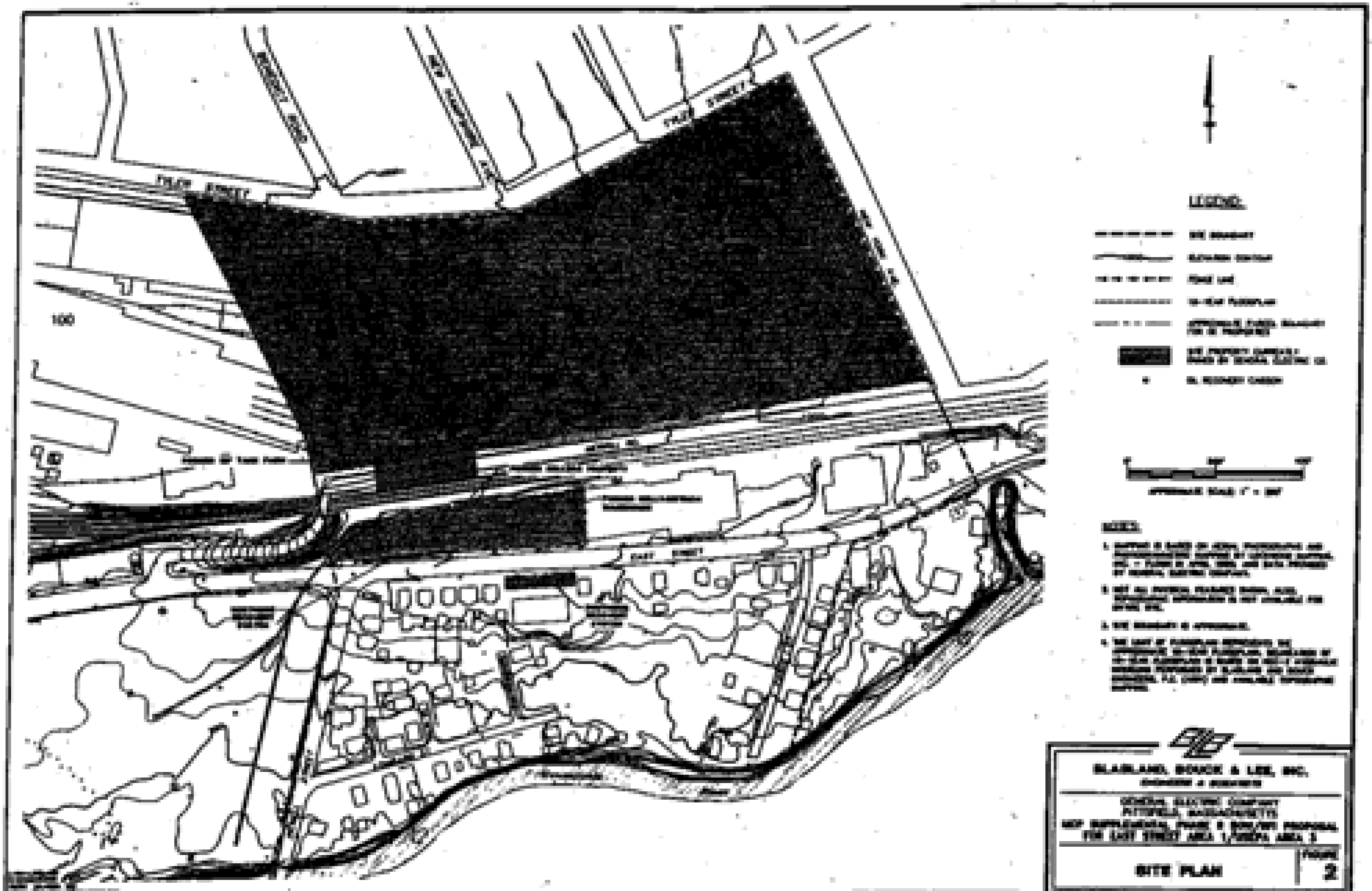
Compounds	Detects/ Samples	Minimum (μg/kg)	Mean[1] (μg/kg)	Maximum (μg/kg)	Comparison Values (μg/kg)
PCBs	14/75	0.3	NC*	743	CREG = 0.5

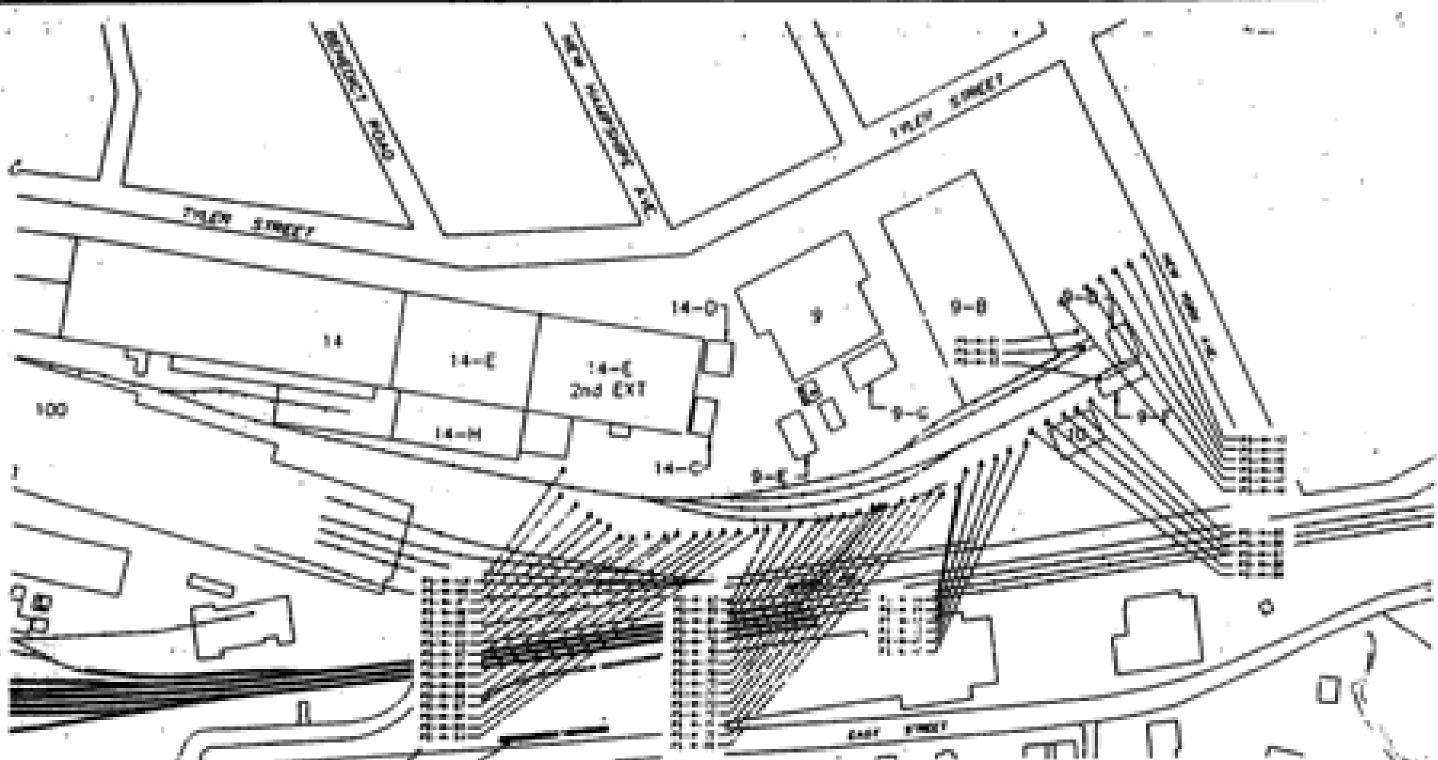
CREG Cancer Risk Evaluation Guide
NC* Not Available

[1] Mean values calculated using one half the method detection limit for samples in which the compound was below detection

FIGURES


TYLER STREET
100
14
14-E
14-E
2nd EXT.
14-H
9
9-B
10
BLASLAND, BOUCK & LEE, INC.
EAST STREET AREA 1/USEPA AREA 3
SURFACE COVER MAP
1


LEGEND:
NOTES:
100
BLASLAND, BOUCK & LEE, INC.
SITE PLAN
FIGURE
2



LEGEND:

▲ SOIL BORING

0 200 400

APPROXIMATE SCALE: 1" = 200'

NOTES:

1. MAPPING IS BASED ON AERIAL PHOTOGRAPHS AND PHOTOGRAMMETRIC MAPPING BY [illegible] MAPPING, INC. - [illegible] AND DATA PROVIDED BY GENERAL ELECTRIC COMPANY.
2. NOT ALL PHYSICAL FEATURES SHOWN.
3. SITE BOUNDARY IS APPROXIMATE.
4. ALL BORING LOCATIONS ARE APPROXIMATE.
5. DATA ARE PRESENTED IN DRY WEIGHT PARTS PER MILLION (PPM).
6. ND = COMPOUND WAS ANALYZED BUT NOT DETECTED.
7. LOCATION PS-W-54 NOT ILLUSTRATED.

Sample ID	Sample Depth (ft)	PCBs (ppm)
[illegible]	[illegible]	[illegible]

Sample ID	Sample Depth (ft)	PCBs (ppm)
[illegible]	[illegible]	[illegible]

Sample ID	Sample Depth (ft)	PCBs (ppm)
[illegible]	[illegible]	[illegible]

Sample ID	Sample Depth (ft)	PCBs (ppm)
[illegible]	[illegible]	[illegible]

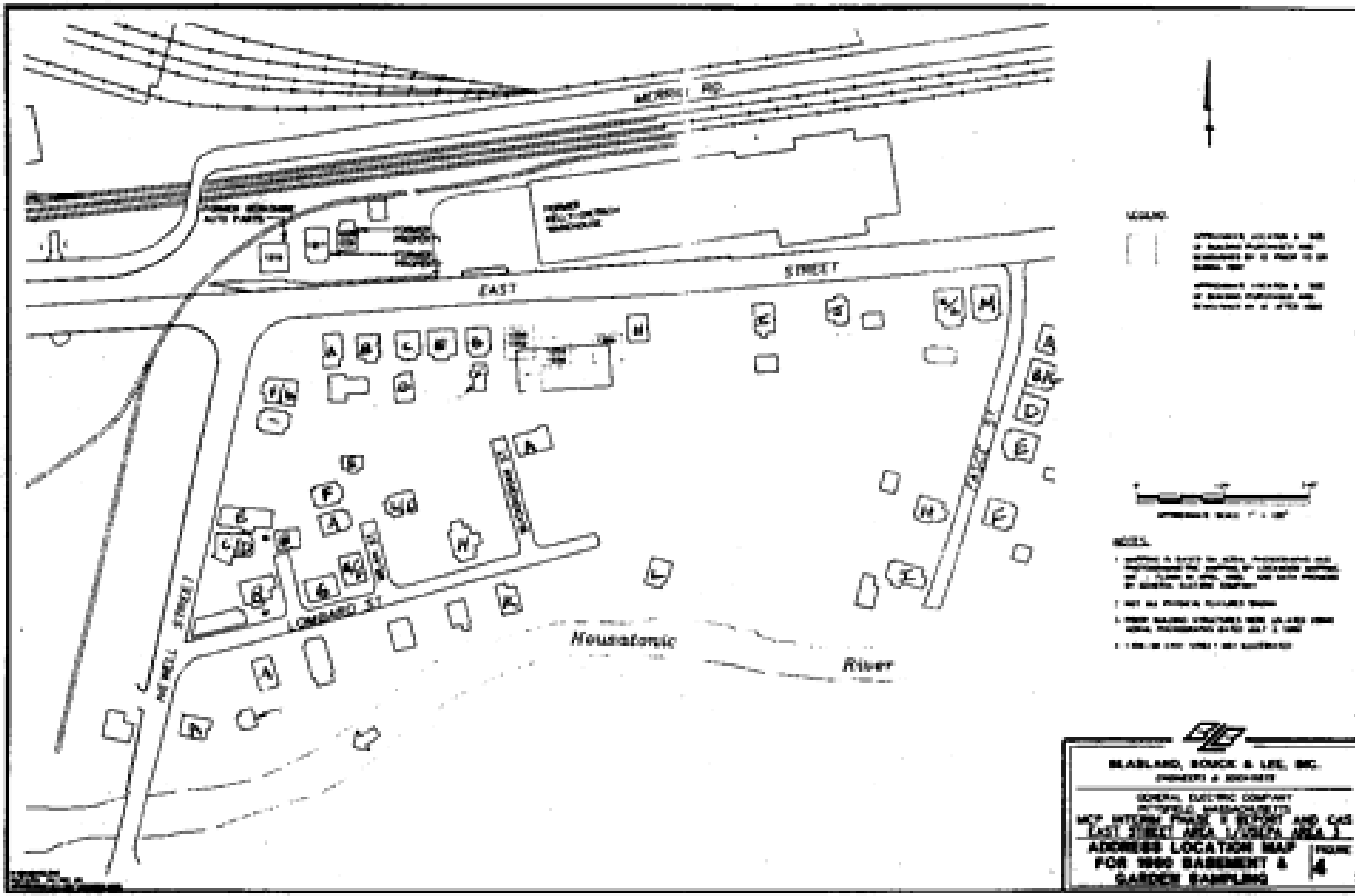
Sample ID	Sample Depth (ft)	PCBs (ppm)
[illegible]	[illegible]	[illegible]

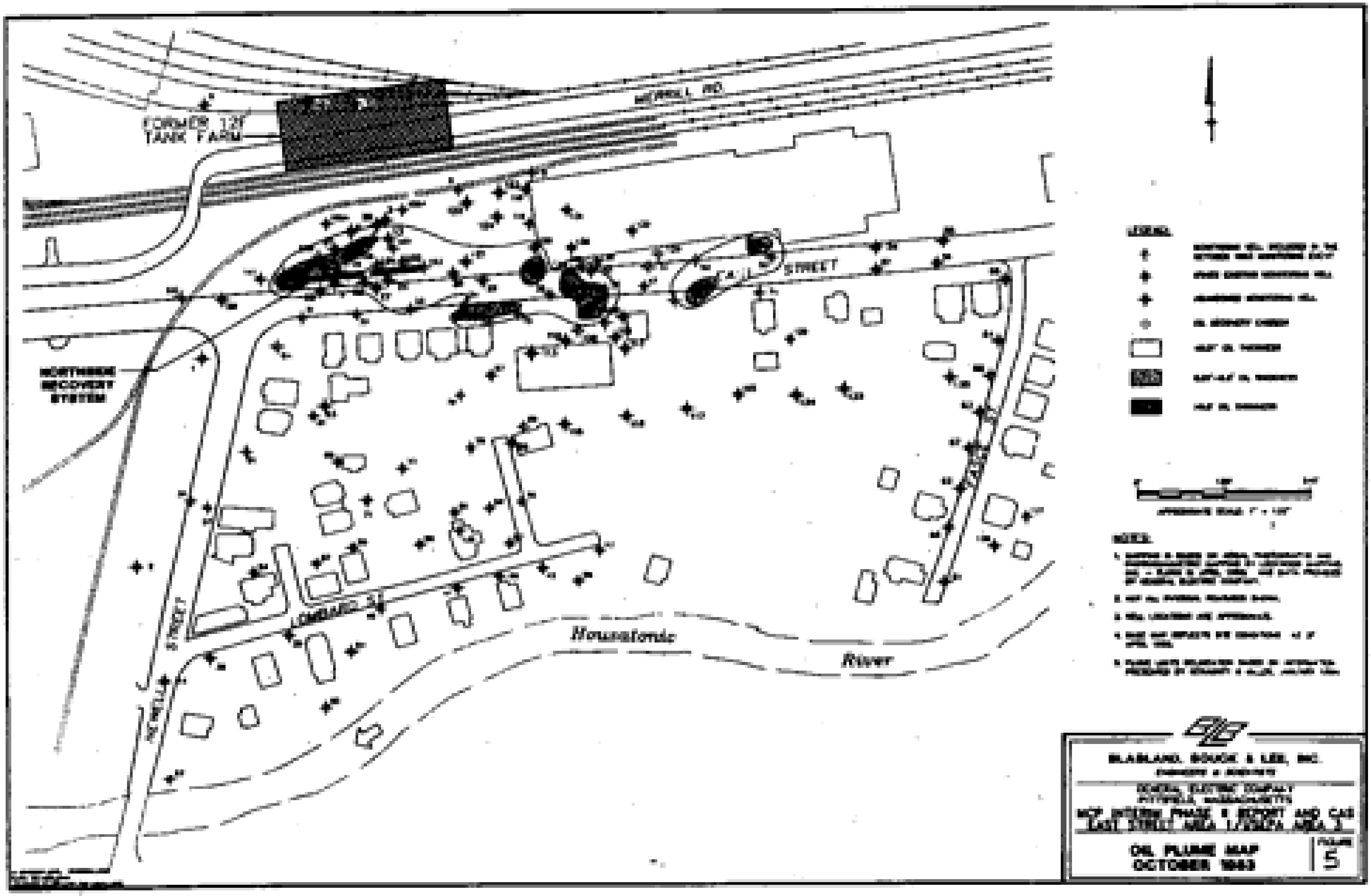
BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
MCP INTERIM PHASE II REPORT AND CAS
EAST STREET AREA 1/USEPA AREA 3

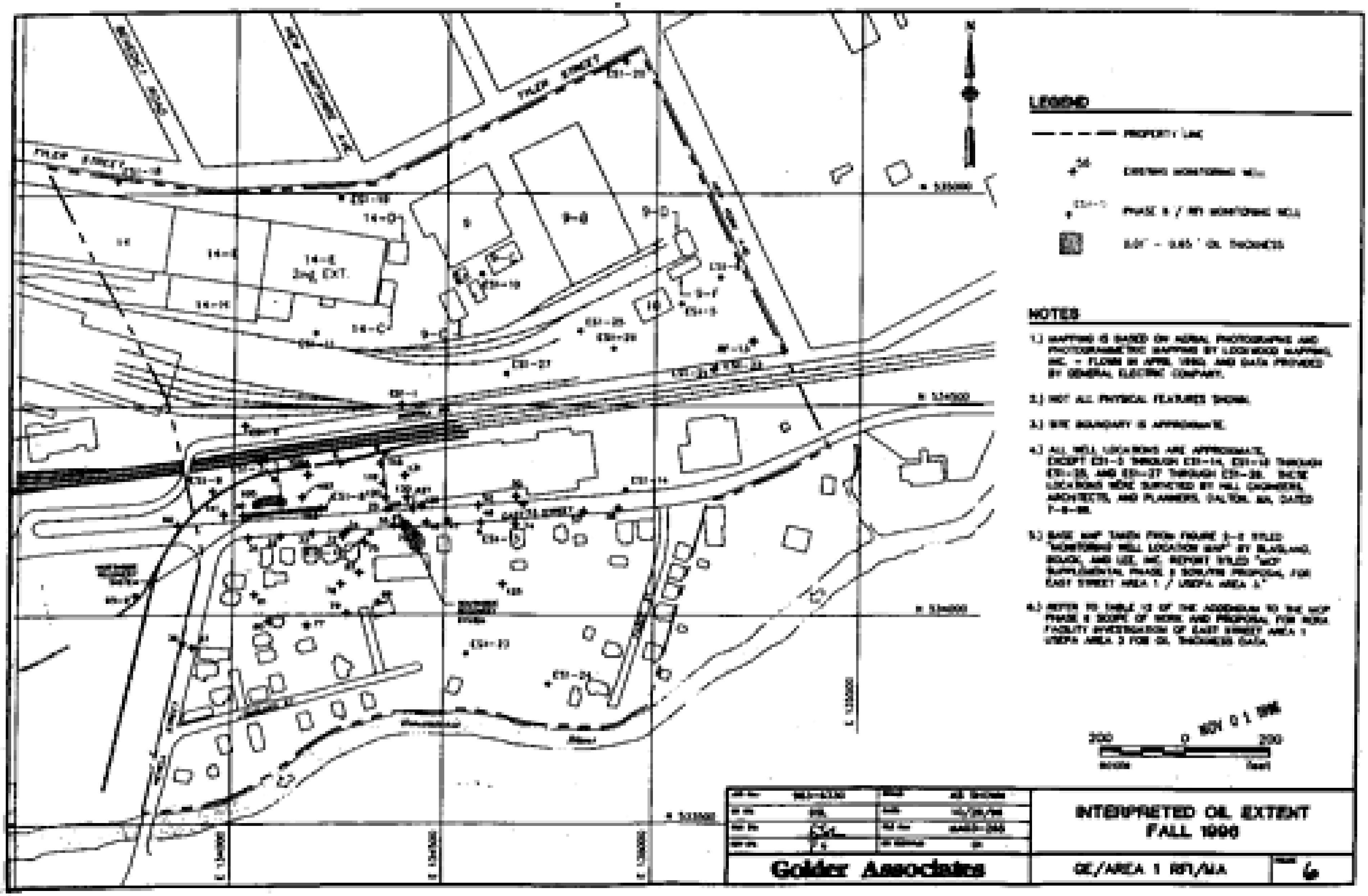
ALTRESCO STEAMLINE SOIL BORING LOCATIONS AND PCB DATA

FIGURE 3


EAST
STREET
LOMBARD ST
Housatonic
River
ADDRESS LOCATION MAP
GARDEN SAMPLING



FORMER 12' TANK FARM
MERRILL RD
STREET
Housatonic
River
OIL PLUME MAP
5


TYLER STREET
LEGEND
PROPERTY LINE
NOTES
2.) NOT ALL PHYSICAL FEATURES SHOWN.
3.) SITE BOUNDARY IS APPROXIMATE.
200
0
200
feet
INTERPRETED OIL EXTENT
FALL 1996
Golder Associates

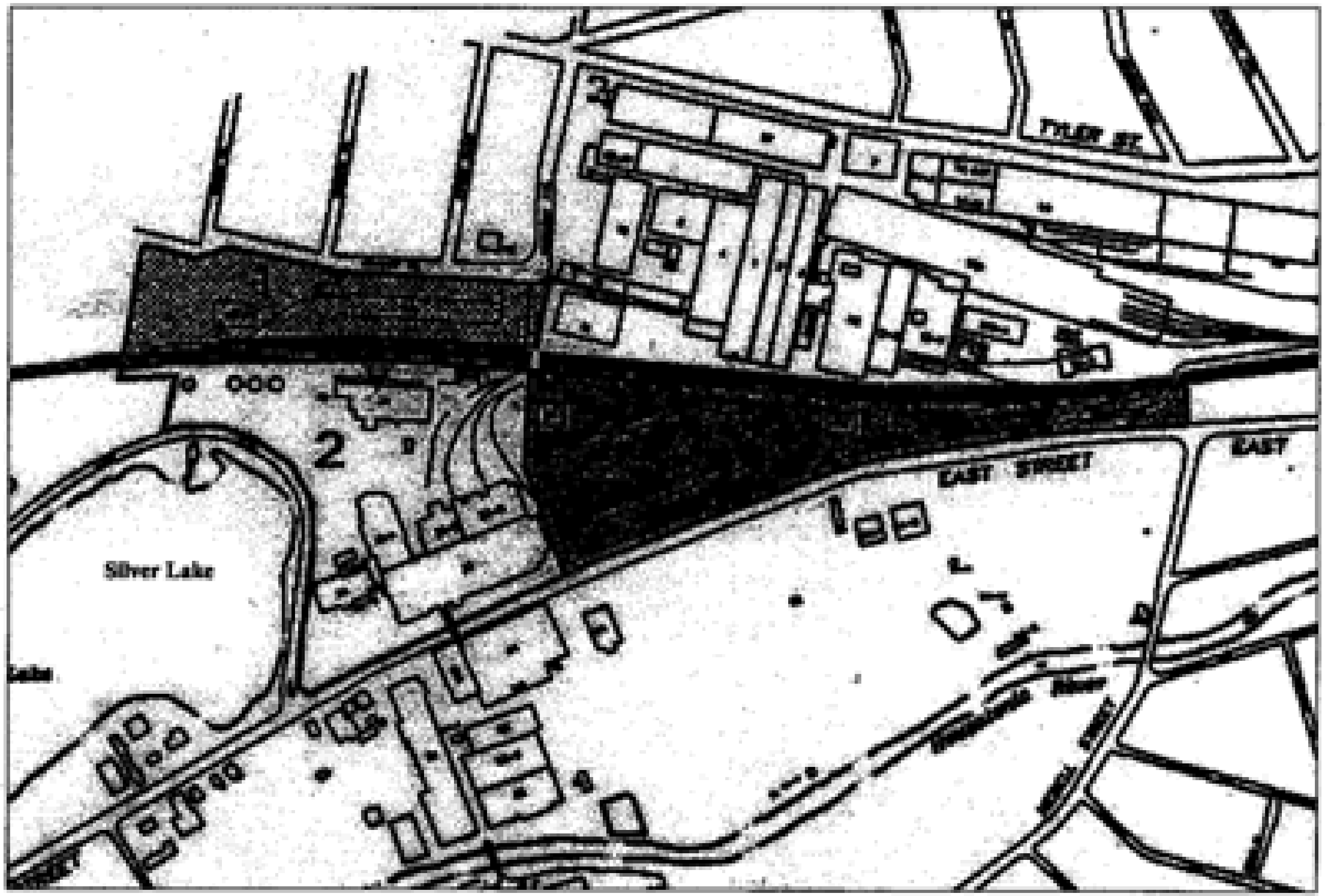


Figure 7 The 20s, 30s, and 40s Complexes

REFERENCES

ATSDR. 1993. Public health assessment manual. Boca Raton, FL: Lewis Publishers.

ATSDR. 1995a. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: Agency for Toxic Substances and Disease Registry.

ATSDR. 1995b. Toxicological profile for lead. Atlanta, GA: Agency for Toxic Substances and Disease Registry.

ATSDR. 1998. Toxicological profile for chlorinated dibenzo-p-dioxins. Atlanta, GA: Agency for Toxic Substances and Disease Registry.

ATSDR. 2000. Toxicological profile for polychlorinated biphenyls. Atlanta, GA: Agency for Toxic Substances and Disease Registry.

Blasland, Bouck and Lee. 1994a. MCP Interim Phase II Report and Current Assessment Summary for East Street Area 1/USEPA Area 3. (volume I of IV). Syracuse, NY: Blasland, Bouck and Lee, Inc.

Blasland, Bouck and Lee. 1994b. MCP Supplemental Phase II Scope of Work and Proposal for RCRA Facility Investigation for East Street Area 1/USEPA Area 3. Syracuse, NY: Blasland, Bouck and Lee, Inc.

Blasland, Bouck and Lee. 1995. MCP Supplemental Phase II Scope of Work and Proposal for RCRA Facility Investigation for East Street Area 1/USEPA Area 3. Syracuse, NY: Blasland, Bouck and Lee, Inc.

Blasland, Bouck and Lee, Inc. 1996. Addendum to MCP Supplemental Phase II Scope of Work and Proposal for RCRA Facility Investigation of East Street Area 1/USEPA Area 3 Pittsfield Massachusetts. Syracuse, New York.

Blasland, Bouck, & Lee, Inc. 1998a. Parcel J10-5-1 Supplemental Investigation Summary Report and Proposal for Additional Investigations. October 13, 1998.

Blasland, Bouck & Lee, Inc. 1998b. Parcels J10-5-1 and 2 Further Investigation Summary Report. November 24, 1998.

Blasland, Bouck & Lee, Inc. 1999a. Parcel J10-5-1 and 2 Additional Investigation Summary Report and Proposal for Further Investigation. January 12, 1999.

Blasland, Bouck & Lee, Inc. 1999b. Parcel J10-5-1 Further Investigation Summary Report and Proposal for Additional Investigations. March 18, 1999.

Blasland, Bouck & Lee, Inc. 1999c. Parcels J9-23-12, 14, 15 and Undeveloped Ontario Street – Supplemental Investigation Summary Report and Proposal for Additional Investigations. March 23, 1999.

Blasland, Bouck & Lee, Inc. 1999d. Parcel J10-5-1 Supplemental Investigation Summary Report and Proposal for Additional Investigations. May 19, 1999.

Blasland, Bouck & Lee, Inc. 1999e. Parcels J10-5-1 & 2 Additional Investigations Summary Report. July 8, 1999.

Blasland, Bouck & Lee, Inc. 1999f. Parcel J10-5-6 and Undeveloped Dante Street Sampling Results and Summary Report.   August 5, 1999.

Blasland, Bouck & Lee, Inc.. 1999g. Remedial Action Work Plan for Parcels J10-5-1 and J10-5-2 Pittsfield, Massachusetts.   August 11, 1999.

Blasland, Bouck, & Lee, Inc. 1999h. Parcel J10-5-2 Supplemental Investigation Summary Report. August 25, 1999.

Blasland Bouck & Lee, Inc. 1999i. Revised Remedial Action Work Plan Drawings for Parcels J10-5-1, J9-21-3, J9-21-4, J9-21-5. September 20, 1999.

Blasland Bouck & Lee, Inc. 1999j. Parcel J10-6-8 Preliminary Sampling Results and Summary Report and Proposal for Additional Investigations. December 20, 1999.

Blasland, Bouck & Lee, Inc. 2000a. Pre-Design Investigation Work Plan for 20s, 30s,and 40s Complexes. Syracuse, NY: Blasland, Bouck and Lee, Inc.

Blasland, Bouck & Lee, Inc. 2000b. Parcels J10-6-7 and 9 Supplemental Investigation Summary Report and Porposal for Additional Investigations. March 1, 2000.

Blasland, Bouck & Lee, Inc. 2000c. Parcels J10-6-7 and 9 Further Investigation Summary Report. April 6, 2000.

Blasland, Bouck & Lee, Inc. 2001. Initial Investigation Summary Report and Supplemental Investigation Plan for Parcels J10-6-10, J10-6-21, J10-6-14, K10-17-1, and K10-17-3. May 4, 2001.

EPA. 1997. 40 CFR 300. National Priorities List for Uncontrolled Hazardous Waste Sites, Proposed Rule No. 23. September 25, 1997 (Vol. 62, No. 186).

EPA. 2000. Field Sampling Plan/Quality Assurance Project Plan. Washington DC: Environmental Protection Agency.

EPA. 2001. 40 CFR 745. Lead; Final Identification of Dangerous Levels of Lead; Final Rule. January 5, 2001 (Vol. 66, No.4).

General Electric. 1997. Letter to J. Lyn Cutler, Department of Environmental Protection, Bureau of Waste Site Cleanup and to Bryan Olson, U.S. Environmental Protection Agency, Waste Management Division, Re: DEP Site No. 1-0147/EPA Area 6 Residential Floodplain Sampling. October 20, 1997.

General Electric. 1998. Letter to Anna G. Symington Acting Section Chief, Special Projects, Department of Environmental Protection, Bureau of Waste Site Cleanup and to Bryan Olson, U.S. Environmental Protection Agency, Waste Management Division from Andrew T. Silfer, Manager, Site Remediation, General Electric Re: DEP Site No. 1-0147/EPA Area 6 Floodplain Soil Sampling. April 30, 1998.

General Electric. 1999. Letter to J. Lyn Cutler, Bureau of Waste Site Cleanup, Massachusetts Department of Environmental Protection from Richard W. Gates, Remediation Project Manager, General Electric, Re: Evaluation of Appendix IX+3 constituents at Parcel J10-5-1. September 2, 1999.

Golder Associates-Blasland, Bouck and Lee. 1996. Addendum to MCP Supplemental Phase II RCRA Facility Investigation of East Street Area 1/USEPA Area 3. Syracuse, NY: Golder Associates and Blasland, Bouck and Lee, Inc.

MA DEP. 1995a. Guidance for Disposal Site Risk Characterization. Boston, MA: Massachusetts Department of Environmental Protection.

MA DEP. 1995b. Revised Public Involvement Plan for the Housatonic River and the General Electric Company Disposal Sites. Springfield, MA: Massachusetts Department of Environmental Protection.

MA DEP 1998a (personal communication with Susan Steenstrup on June 9, 1998 and June 15, 1998).

MA DEP 1998b (personal communication with Adam Wright on May 22, 1998).

MDPH. 1997. Housatonic River Area Exposure Assessment. Boston, MA: Massachusetts Department of Public Health.

MDPH. 2000. Expert Panel on the Health Effects of Non-Occupational Exposure to Polychlorinated Biphenyls (PCBs). Boston MA: Massachusetts Department of Public Health.

MDPH 2002a. Assessment of Cancer Incidence Housatonic River Area Health Consultation. Massachusetts Department of Public Health, Bureau of Environmental Health Assessment, Community Assessment Unit. April, 2002.

MDPH 2002b. Cancer Incidence in Massachusetts, 1995-1999: City and Town Supplement. Massachusetts Department of Public Health, Bureau of Health Statistics, Research and Evaluation, Massachusetts Cancer Registry. December, 2002.

Rosenman, K.D. Undated. Assessment of PCB Serum Levels in Pittsfield, Massachusetts. Undated.

Shacklette HT, Boerngen JG. 1984. Element concentration in soils and other surficial materials of the conterminous United States. Washington, DC: U.S. Geological Survey Professional Paper 1270.

Silfer, Andy, General Electric (personal communication: January 2, 2001)

U.S. Bureau of the Census. 2001. 2000 Census Population: Characteristics of the Population. Washington: US Department of Commerce.

Roy F. Weston, Inc. 1999a. Site Investigation Report for the General Electric Residential Sampling Project Residential Property –R126 Pittsfield, Massachusetts, 27 May and 15 June, 1999.

Roy F. Weston, Inc. 1999b. Site Investigation Report for the General Electric Residential Sampling Project Residential Property-R154 Pittsfield, Massachusetts, 21 June 1999 and 29 June 1999.

APPENDICES

Appendix A:
Comments on General Electric Site – East Street Area 1 Public Health Assessment

The Massachusetts Department of Public Health (MDPH) Bureau of Environmental Health Assessment (BEHA) Environmental Toxicology Program (ETP) received and responded to the following comments for the General Electric Site – East Street Area 1 Public Health Assessment. Sixteen comments were received from both the Housatonic River Initiative (HRI), a community group based in Pittsfield, and from General Electric (GE).

General Comments

1. **Comment:** More soil sampling is needed, GE initiated testing and EPA testing was inadequate. There was a lawsuit against GE on information disclosure that was settled out of court.

   Response: MDPH has incorporated all known and the most recently available data, which includes new data that has become available since 1998 and includes more residences and lots in the area south of East Street. MDPH feels the available data are sufficient to characterize exposure opportunities in areas tested because we have estimated exposures from maximum soil concentrations as well as average soil concentrations. It is important to note that the methods for evaluating exposures are a very conservative approach. Maximum concentrations are unlikely to be representative of the entire site. However, the recommendation section states that "MDPH supports ongoing site characterization efforts, including collection of additional samples and remedial activities, by the regulatory agencies, in order to reduce opportunities for exposure to PCBs throughout the Pittsfield and Housatonic River area." This additional site work is reportedly going to be done in accordance with the consent decree signed by EPA and GE in 2000 (see comment 5).

2. **Comment:** MDPH should take into account multiple exposure pathways (i.e., soil exposures at multiple sites, and eating fish from the Housatonic River).

   Response: Each site was evaluated separately in order to assess health concerns specific to a particular site. For those sites with multiple exposure pathways, these exposure opportunities were taken into account in developing the conclusions for that individual site. However, MDPH is putting together an executive summary for all the public health assessments combined, including the Housatonic River, that will summarize overall health concerns for the entire GE site. That document will include an evaluation of health concerns related to all applicable exposure opportunities and available health (e.g., cancer incidence) and biomonitoring information.

3. **Comment:** A study by Rosenman showed GE workers, their families, and those who lived in the Lakewood section, including Newell St. Area I, had significantly higher PCB serum levels than other Pittsfield residents. MDPH should address this.

Response: The Rosenman study refers to an evaluation of retired GE workers, residents of the Lakewood area of Pittsfield and residents in an area of Pittsfield thought to be unaffected by PCB contamination. MDPH's copy of this report is undated, but it appears that the work was conducted in the early 1980s. Participants had serum PCB levels measured and they completed a questionnaire. Rosenman reported that former GE workers had the highest PCB exposures and that family members of workers exposed to PCBs had an excess body burden of PCBs. The author also reported that "because of the large number of residents who were exposed to PCBs at work or through a family member who worked with PCBs, we were unable to document the tissue accumulation of PCBs as a consequence of living in the contaminated neighborhood. No significant difference in median serum PCB values were found between the 7 residents of the contaminated community who had had no association with GE and the 9 residents of a control community who also had had no association with GE" (pg 5-6, Rosenman, undated).

The following text has been added to the Discussion Section on page 27:

"Furthermore, in the early 1980s a study conducted by Rosenman was done on residents living on the East Street Area 1 site after PCB oils were found in basements of homes. Rosenman reported no significant difference in median serum PCB values between the 7 residents of the contaminated community who had no association with General Electric and the 9 residents of a control community who also had had no association with general electric. However, General Electric workers and family members of workers had elevated serum PCB levels compared to those who were not associated with General Electric (Rosenman undated). The study also stated that occupational exposure to PCBs overshadowed the potential adverse health effects of the groundwater contamination that was leaking into basements (Rosenman undated). It is probably worthwhile to note that the worst contaminated houses were bought and torn down by GE, and that the groundwater plume has been substantially contained by groundwater recovery systems on the North and South sides of East Street (BBL 1994)."

Background

4. **Comment:** Groundwater PCB oil recovery systems in 1980 were inadequate.

Response: MDPH described the groundwater recovery systems in the Site History and Description Section. They significantly reduced the plumes, but did not eliminate them (BBL 1996), and hence MDPH agrees that these systems did not completely recover PCB oils. MDPH, in the pathway analysis section, has also acknowledged the future potential for PCB seepage into homes from groundwater as a potential exposure pathway until clean-up is achieved. According to the consent decree signed by GE and EPA in 2000, GE is required to continue groundwater monitoring and oil removal.

5. **Comment:** The consent decree for remediation actions to EPA and MDEP performance standards (i.e., average of < 2 ppm PCBs in residential soils) should be emphasized in all PHAs.

Response: MDPH has mentioned in the background section that there is an agreement between EPA and GE for various clean-up actions. This has been elaborated on and expanded in the text of the Background section under section A, Purpose and Health Issues by adding the following passage on page 2:

"In October 2000, a court-ordered consent decree was signed by EPA and GE, and it was agreed that GE would perform remediation actions to U.S. Environmental Protection Agency (EPA) and Massachusetts Department of Environmental Protection (MA DEP) performance standards (e.g., an average of less than 10 parts per million (ppm) PCBs in recreational surface soils, and an average of less than 2 ppm PCBs in residential soils). However, remediation does not eliminate past exposures and exposures occurring at parts of the site that have not yet been remediated."

Pathway Analysis

6. **Comment:** MDPH should address the possible groundwater plume still flowing below Grossman's.

Response: MDPH has addressed the oil plumes in the site history section. The oil plume under the former Grossman's (a.k.a., the former

Kelly-Dietrich Warehouse on the East I site) is part of these same oil plumes and has been significantly reduced by the northside and southside recovery systems, according to available groundwater monitoring as of October 1996 (BBL 1996). As long as part of the plume exists there is the potential for oil seepage under properties. MDPH supports further monitoring, and according to the consent decree signed by GE and EPA in 2000, GE is required to continue groundwater monitoring and oil removal.

7. **Comment:** Basement levels of PCBs in soils are inadequate, MDPH should recommend more testing as well as indoor air testing.

Response: The basement soil testing was done for 44 residences in the Lakewood area as discussed in the Environmental Contamination and Other Hazards section. With respect to indoor air data for PCBs, MDPH is aware of testing that has been done in the GE Facility vicinity and has reviewed the results. For example, the Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia, prepared a health consultation for indoor air quality testing at parcel number J9-23-7 in April of 2000, which included data from a State University of New York study, and the EPA/Roy F. Weston report. ATSDR concluded that PCBs measured in indoor air at the residence were below levels of health concern and presented no apparent public health hazard (ATSDR 2000b). Basement soil data or indoor air data were not available for residences on the East Street 1 Site that were torn down in the past after the discovery of groundwater, containing oils laden with PCBs, seepage into their basements. MDPH is not aware of existing residences that are believed to be contaminated with PCB oils. Outdoor ambient air data are also available for the adjacent East Street Area 2 site and is addressed in the East Street Area 2 PHA. The available information does not suggest indoor sources of PCBs (e.g., groundwater seeps) are currently present, assuming there is no additional PCB source in the indoor environment.

Discussion

8. **Comment:** MDPH should collect thorough residential and employment history of people surrounding the site.

Response: MDPH conducted the 1997 Housatonic River Area PCB Exposure Assessment Study, which is mentioned in the conclusion section of this PHA. This study included administering an exposure assessment questionnaire to approximately 1,500 residents. The survey included questions about residential and employment history and a general comment section. MDPH continues to offer the exposure assessment questionnaire and, as warranted, serum testing as a public service to those concerned about PCB exposure opportunities. This activity involves interviewing residents about a range of exposure opportunities in the Housatonic River area. To request this assistance, residents may contact MDPH Bureau of Environmental Health Assessment, 250 Washington Street, Boston, MA 02108 at 1-800-319-3042 or 1-617-624-5757. In addition, MDPH convened the Expert Panel on the Health Effects of Non-occupational Exposure to PCBs, which was initiated to help address any other specific exposure concerns of residents, and has held several public meetings at which residents could voice their concerns. MDPH plans to hold future public meeting(s) related to the summary public health assessment for the GE sites at which residents can also voice their concerns. MDPH is also completing an occupational feasibility study to determine the feasibility of conducting a health study of former GE workers. This is the type of study that would consider worker opportunities for exposure (e.g., via direct contact with PCB oils) and possible associations with health effects (e.g., concerns). The public health assessments or health consultations for the GE site review environmental data to determine general residential exposure concerns. It is not possible to determine past worker exposures within the GE facilities themselves (e.g., handling of materials containing PCBs) based on available data, although they do consider opportunities for exposure to contaminants found in outdoor air, soil, or surface water bodies (including biota) for all potentially affected populations, including workers.

9. **Comment:** The CREG is too conservative to use as a comparison value for PCBs, and MDPH should use the 2-ppm EPA action level as a comparison value.

Response: MDPH has a cooperative agreement with the US ATSDR to conduct PHAs in Massachusetts. ATSDR has published health based comparison values to screen contaminates for further evaluation for possible health effects from exposure to a particular contaminant. A comparison value does not indicate that health effects occur at that particular level. This is explained in the Environmental Contamination and Other Hazards under section A, On-Site Contamination in paragraphs two and three. Comparison values are used to determine if a particular contaminant needs to be further evaluated for possible health effects that may or may not occur given the potential opportunities for exposure at the site. Regulatory action levels are set by environmental regulatory agencies for clean-up/remediation purposes and are not typically used by health agencies to evaluate possible health concerns based on site-specific exposure opportunities.

10. **Comment:** The exposure factors used in the risk calculations are too conservative and should be more realistic and clarified at least in the appendix.

Response: MDPH has used exposure factors reasonable for this area in evaluating site-specific information. MPDH used more conservative exposure factors than typically used because in Pittsfield, many people reportedly grew up playing near GE sites, have had jobs at GE as teenagers, and could have gone on to work at GE as adults and worked there throughout there working lifetime, because GE was the major Pittsfield employer. Hence, MDPH has used exposure factors consistent with the community-based history and discussions with individuals who reported such a history of contact with the GE sites.

11. **Comment:** MDPH should reference studies that assess the possible link between PCBs and cancer or non-cancer health effects that found no credible links to cancer or other serious health effects (i.e., *A Weight-of-Evidence Review of the Potential Human Cancer Effects of PCBs*, and *Non-Cancer- Effects of PCBs – A Comprehensive Review of Literature*).

Response: MDPH has relied on the ATSDR Toxicological Profile for PCBs (ATSDR 2000) and other scientifically peer-reviewed documents that discuss cancer and non-cancer health effects of PCBs. For example, PCBs are currently considered a probable human carcinogen by EPA, and the International Agency for Research on Cancer currently classifies PCBs as probable human carcinogens based on sufficient evidence in animals and limited evidence in humans as presented in the Discussion Section under section A Chemical-Specific Toxicity Information in this PHA. Also, discussed in this section of the PHA are the ATSDR derivations of Minimal Risk Levels (MRLs) for non-cancer health effects. In addition, the summary report of the Expert Panel on the Health Effects of Non-Occupational Exposure to PCBs convened by MDPH stated: "While the panel cited some conflicting human studies, overall the panel members agreed that the evidence is clear that PCBs are a definitive carcinogen in animals. In humans, the evidence with regard to cancer is suggestive, but inconclusive," and stated, "PCBs are thought to behave as tumor promoters in susceptible tissues. Therefore, the carcinogenic effects of PCBs are likely to be influenced by other carcinogens or toxins that may be present." Large epidemiological studies of GE workers were included in the Expert Panel's considerations. The Expert Panel also "agreed that there appears to be some developmental effects (e.g., subtle cognitive deficits) associated with exposures to PCB," and stated, "The current research suggests that prenatal exposures to fetuses at near background levels of PCBs may subtly affect the mental development of children." These sources are referenced in the Public Health Assessments.

12. **Comment:** MDPH should use a revised higher MRL of 0.0002 mg/kg/d for PCBs developed by AMEC Earth and Environmental, Inc. in their study, *Development of a Revised Reference Dose for Polychlorinated Biphenyls (Aroclor 1254) Based on Empirical Data*.

Response: MDPH, through its Cooperative Agreement with ATSDR, will continue to use the ATSDR chronic MRL of 0.00002 mg/kg/d as derived and supported in the toxicological profile for PCBs, which was scientifically peer reviewed and issued for a public comment period prior to adoption (ATSDR, 2000a). EPA's reference dose (Rfd) for chronic exposure is also 0.00002 mg/kg/d (EPA IRIS, 2002).

13. **Comment:** Page 20 of the Lyman Street PHA states average soil PCB concentrations were used in risk calculations, while the equation states the maximum value was used, which is it for the Lyman Street PHA as well as the other PHAs?

Response: Both maximum and average PCB concentrations were used in the risk calculations. Separate calculations were done for hotspot locations as well. The risk calculations have been reviewed by MDPH and references to them in the PHAs have been clarified.

Conclusions

14. **Comment:** No Public Health Hazard for the future should be declared because the site will be cleaned up according to EPA and MDEP performance standards.

Response: MDPH cannot make conclusion contingent upon actions that have not been completed yet. There are also opportunities for future exposures that are not possible to define at this time (e.g., pavement on the site is torn up or a building on the site is demolished). However, it is expected that once the activities in the consent decree are fully implemented, the likelihood that future exposures could be of public health concern should be considerably reduced or eliminated.

15. **Comment:** Health risk evaluations should be qualified by the fact that serum levels in the area were generally found to be in the background range for non-occupationally exposed people.

Response: MDPH has added the following text to the Discussion section on page 28:

"Furthermore, the MDPH's 1997 Exposure Assessment Study concluded that serum levels of the non-occupationally exposed participants from communities surrounding the Housatonic River, including Pittsfield, were generally within background levels. The Expert Panel on the Health Effects of Non-Occupational Exposure to PCBs agreed that the available data indicate that serum PCB-levels for non-occupationally exposed populations from MDPH's Exposure Assessment Study are generally similar to the background exposure levels in recent studies (MDPH 2000). However, MDPH notes that serum PCB levels tended to be higher in older residents of the Housatonic River Area who were frequent and/or long-term fish eaters or who reported opportunities for occupational exposure. In addition, there was some indication that other activities (e.g., fiddlehead fern consumption, gardening) may have contributed slightly to serum PCB levels."

16. **Comment:** The MDPH Cancer Incidence Report findings that any elevations in cancer had no statistically significant link to the GE site should be reiterated in all the conclusion sections.

Response: MDPH has added the following passage to the text of the Discussion section on pages 28 and 29:

"The MDPH 2002 Assessment of Cancer Incidence Health Consultation showed that, for the majority of cancer types evaluated, residents of the Housatonic River Area did not experience excessive rates of cancer incidence during the period 1982-1994. For most primary cancer types evaluated, the incidence occurred at or below expected rates, concentrations of cancer cases appeared to reflect the population density, and, when reviewed in relation to the GE sites, the pattern of cancer incidence did not suggest that these sites played a primary role in this development. While Pittsfield did experience more cancer elevations than the other communities, and the pattern of some cancer types showed elevations that were statistically significantly higher than expected in certain areas or during certain time periods, no pattern among those census tracts with statistically significant elevations was observed. Specifically, although two of the three census tracts in

Pittsfield adjacent to the GE site experienced statistically significant elevations in cancers of the bladder, breast, and NHL, a pattern suggesting that a common environmental exposure pathway played a primary role in these census tracts was not observed nor were cases distributed more toward the vicinity of the GE sites. It is important to note, however, that it is impossible to determine whether exposure to GE site contaminants may have played a role in any individual cancer diagnosis. Further review of the available risk factor and occupational information suggested that workplace exposures and smoking may have been potential factors in the development of some individuals' cancers (e.g., bladder cancer). However, the pattern of cancer in this area does not suggest that environmental factors played a primary role in the increased rates in this area (MDPH 2002a).

As noted earlier in this PHA, more recent cancer incidence data for the period 1995-1999 shows that for Pittsfield as a whole, no cancer type was statistically significantly elevated. Although bladder cancer among males for Pittsfield as a whole was statistically significantly elevated during 1982 – 1994 (MDPH 2002a), this cancer type occurred less often than expected among males during 1995 – 1999 (28 cases observed vs. approximately 36 cases expected) (MDPH 2002b)."

Appendix B:
Public Health Assessments vs. Risk Assessments

Public health assessments and risk assessments both investigate the impact or potential impact of hazardous substances at a specific site on public health. However, the two types of assessment differ in their goals and focus. Quantitative risk assessments are geared largely toward arriving at numeric estimates of the risk posed to a population by the hazardous substances found on a site. These calculations use statistical and biological models based on dose-response data from animal toxicologic studies and (if available) human epidemiological studies. Risk assessments estimate the public health risk posed by a site, and their conclusions can be used to establish allowable contamination levels, or to establish clean-up levels and select remedial measures to be taken at the site.

Public health assessments are intended to determine the past, current or future public health implications of a specific site, but focus more than risk assessments do on the health concerns of the specific community. Public health assessments are based on environmental characterization information (including information on environmental contamination and exposure pathways), community health concerns associated with the site, and community-specific health outcome data. They make recommendations for actions needed to protect public health (which may include the development and issuing of health advisories), and they identify populations in need of further health actions or studies.

Appendix C:
ATSDR Glossary of Environmental Health Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to 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 environmental 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. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

Absorption
The process of taking in. For a person or animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

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]**.

Additive effect
A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with **antagonistic effect** and **synergistic effect]**.

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

Aerobic
Requiring oxygen [compare with **anaerobic**].

Ambient
Surrounding (for example, *ambient* air).

Anaerobic
Requiring the absence of oxygen [compare with **aerobic**].

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.

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

Antagonistic effect
A biologic response to exposure to multiple substances that is **less** than would be expected if the known effects of the individual substances were added together [compare with **additive effect** and **synergistic effect**].

Background level
An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Biodegradation
Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

Biologic indicators of exposure study
A study that uses (a) **biomedical testing** or (b) the measurement of a substance [an **analyte**], its **metabolite**, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see **exposure investigation**].

Biologic monitoring
Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

Biologic uptake
The transfer of substances from the environment to plants, animals, and humans.

Biomedical testing
Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.

Biota
Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Body burden
The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

CAP
See **Community Assistance Panel**.

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

Cancer risk
A theoretical risk of 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.

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.

CAS registry number
A unique number assigned to a substance or mixture by the American Chemical Society Abstracts Service.

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

CERCLA [see **Comprehensive Environmental Response, Compensation, and Liability Act of 1980**]

Chronic
Occurring over a long time (more than 1 year) [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**].

Cluster investigation
A review of an unusual number, real or perceived, of health events (for example, reports of cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.

Community Assistance Panel (CAP)
A group of people, from a community and from health and environmental agencies, who work with ATSDR to resolve issues and problems related to hazardous substances in the community. CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.

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.

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.

Delayed health effect
A disease or injury that happens as a result of exposures that might have occurred in the past.

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**].

Descriptive epidemiology
The study of the amount and distribution of a disease in a specified population by person, place, and time.

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

Disease prevention
Measures used to prevent a disease or reduce its severity.

Disease registry
A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

DOD
United States Department of Defense.

DOE
United States Department of Energy.

Dose (for chemicals that are not radioactive)
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.

Dose (for radioactive chemicals)
The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship
The relationship between the amount of exposure [**dose**] to a substance and the resulting changes in body function or health (response).

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.

Epidemiologic 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.

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 assessment
The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure-dose reconstruction
A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

Exposure investigation
The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

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**.

Exposure registry
A system of ongoing followup of people who have had documented environmental exposures.

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.

Geographic information system (GIS)
A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

Grand rounds
Training sessions for physicians and other health care providers about health topics.

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

Half-life ($t_{½}$)
The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.

Hazard
A source of potential harm from past, current, or future exposures.

Hazardous Substance Release and Health Effects Database (HazDat)
The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

Hazardous waste
Potentially harmful substances that have been released or discarded into the environment.

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.

Health investigation
The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to estimate the possible association between the occurrence and exposure to hazardous substances.

Health promotion
The process of enabling people to increase control over, and to improve, their health.

Health statistics review
The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.

Indeterminate public health hazard
The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

Incidence
The number of new cases of disease in a defined population over a specific time period [contrast with **prevalence**].

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**].

In vitro
In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with **in vivo**].

In vivo
Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with **in vitro**].

Lowest-observed-adverse-effect level (LOAEL)
The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Medical monitoring
A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

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

Metabolite
Any product of **metabolism**.

mg/kg
Milligram per kilogram.

mg/cm^2
Milligram per square centimeter (of a surface).

mg/m^3
Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration
Moving from one location to another.

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 should not be 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, condition, or injury) is stated.

Mutagen
A substance that causes **mutations** (genetic damage).

Mutation
A change (damage) to the DNA, genes, or chromosomes of living organisms.

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.

No apparent public health hazard
A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

No-observed-adverse-effect level (NOAEL)
The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

No public health hazard
A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

NPL [see **National Priorities List for Uncontrolled Hazardous Waste Sites]**

Physiologically based pharmacokinetic model (PBPK model)
A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.

Pica
A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

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).

Potentially responsible party (PRP)
A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

ppb
Parts per billion.

ppm
Parts per million.

Prevalence
The number of existing disease cases in a defined population during a specific time period [contrast with **incidence**].

Prevalence survey
The measure of the current level of disease(s) or symptoms and exposures through a questionnaire that collects self-reported information from a defined population.

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

Public comment period
An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public availability session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

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

Public health advisory
A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human 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**].

Public health hazard
A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or **radionuclides** that could result in harmful health effects.

Public health hazard categories
Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are **no public health hazard, no apparent public health hazard**, **indeterminate public health hazard**, **public health hazard**, and **urgent public health hazard**.

Public health statement
The first chapter of an ATSDR **toxicological profile**. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

Public meeting
A public forum with community members for communication about a site.

Radioisotope
An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.

Radionuclide
Any radioactive isotope (form) of any element.

RCRA [See **Resource Conservation and Recovery Act (1976, 1984)**]

Receptor population
People who could come into contact with hazardous substances [see **exposure pathway**].

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.

Registry
A systematic collection of information on persons exposed to a specific substance or having specific diseases [see **exposure registry** and **disease registry**].

Remedial Investigation
The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)
This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

RFA
RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

RfD
See **reference dose**.

Risk
The probability that something will cause injury or harm.

Risk reduction
Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

Risk communication
The exchange of information to increase understanding of health risks.

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**].

Safety factor [see **uncertainty factor]**

SARA [see **Superfund Amendments and Reauthorization Act**]

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 environment.

Solvent
A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

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**.

Special populations
People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Stakeholder
A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics
A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance
A chemical.

Substance-specific applied research
A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's **toxicological profiles**. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.

Superfund Amendments and Reauthorization Act (SARA)
In 1986, SARA amended 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.

Surface water
Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with **groundwater**].

Surveillance [see **epidemiologic surveillance**]

Survey
A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see **prevalence survey**].

Synergistic effect
A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see **additive effect** and **antagonistic effect**].

Teratogen
A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

Toxic agent
Chemical or physical (for example, radiation, heat, cold, microwaves) agents which, under certain circumstances of exposure, can cause harmful effects to living organisms.

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.

Tumor
An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor
Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a **safety factor**].

Urgent public health hazard
A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

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 Center for Environmental Health (CDC)
http://www.cdc.gov/nceh/dls/report/glossary.htm
National Library of Medicine
http://www.nlm.nih.gov/medlineplus/dictionaries.html

Appendix D:
Explanation of a Standardized Incidence Ratio (SIR)

In order to evaluate cancer incidence a statistic known as a standardized incidence ratio (SIR) was calculated for each cancer type. An SIR is an estimate of the occurrence of cancer in a population relative to what might be expected if the population had the same cancer experience as some larger comparison population designated as “normal” or average. Usually, the state as a whole is selected to be the comparison population. Using the state of Massachusetts as a comparison population provides a stable population base for the calculation of incidence rates. As a result of the instability of incidence rates based on small numbers of cases, SIRs were not calculated when fewer than five cases were observed.

Specifically, an SIR is the ratio of the observed number of cancer cases to the expected number of cases multiplied by 100. An SIR of 100 indicates that the number of cancer cases observed in the population evaluated is equal to the number of cancer cases expected in the comparison or “normal” population. An SIR greater than 100 indicates that more cancer cases occurred than expected and an SIR less than 100 indicates that fewer cancer cases occurred than expected. Accordingly, an SIR of 150 is interpreted of 50% more cases than the expected number; an SIR of 90 indicates 10% fewer cases than expected.

Caution should be exercised, however, when interpreting an SIR. The interpretation of an SIR depends on both the size and the stability of the SIR. Tow SIRs can have the same size but not the same stability. For example, a SIR of 150 based on four expected cases and six observed cases indicates a 50% excess in cancer, but the excess is actually only two cases. Conversely, an SIR of 150 based on 400 expected cases and 600 observed cases represents the same 50% excess in cancer, but because the SIR is based upon a greater number of cases, the estimate is more stable. It is very unlikely that 200 excess cases of cancer would occur by chance alone.

Source: Massachusetts Department of Public Health, Bureau of Environmental Health Assessment (December 1998)

Appendix E:

INFORMATION BOOKLET

for

THE FINAL REPORT ON THE HOUSATONIC RIVER AREA PCB EXPOSURE ASSESSMENT

and

RELATED HEALTH ISSUES

prepared by
MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
BUREAU OF ENVIRONMENTAL HEALTH ASSESSMENT

September 1997

QUESTIONS AND ANSWERS

1. **Q. Why was the "Housatonic River Area PCB Exposure Assessment" conducted?**

   A. The assessment was conducted to identify the frequency of different activities that might lead to opportunities for PCB exposure, and to determine, through the use of blood testing, how various activities may have contributed to higher serum PCB levels among HRA residents.

2. **Q. What is meant by the "Housatonic River Area" (or "HRA")?**

   A. The Housatonic River Area or HRA comprises eight communities in Berkshire County, Massachusetts: Dalton, Great Barrington, Lanesborough, Lee, Lenox, Pittsfield, Sheffield, and Stockbridge.

3. **Q. What are PCBs?**

   A. PCBs or polychlorinated biphenyls are man-made, odorless chemicals. They do not evaporate and do not dissolve easily in water. In the HRA, PCBs were largely used in the manufacture of electrical transformers.

4. **Q. How did PCBs get into the Housatonic River and the surrounding communities?**

   A. PCBs were used in the manufacture of electrical and associated products in Pittsfield from 1932 to 1972, and they reached the Housatonic River in large quantities. This contamination was first discovered in the 1970s, in fish and sediments in lakes along the Housatonic. Extensive environmental sampling has revealed widespread contamination of Housatonic River sediments, floodplain soil, fish and other biota. Very recently, some residential properties were found to be contaminated with PCBs due to contaminated fills.

5. **Q. Who conducted the study?**

   A. The Housatonic River Area PCB Exposure Assessment was conducted by the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health Assessment, with support from the Massachusetts Department of Environmental Protection and the federal Agency for Toxic Substances and Disease Registry. The MDPH received input from local citizens or citizens' groups (e.g. Housatonic River Initiative), especially during the study design and protocol development. The MDPH also formed the Housatonic River Area Advisory Committee for Health Studies and MDPH staff held periodic meetings with committee members to report status and get feed back on the conduct of the study.

6. **Q. How were participants chosen for the Exposure Prevalence Study?**

A. In the Exposure Prevalence Study, 800 households were randomly chosen from among all those located within one-half mile of the Housatonic River in the following eight communities: Dalton, Great Barrington, Lanesborough, Lee, Lenox, Pittsfield, Sheffield, and Stockbridge. Four hundred of those households were from Pittsfield, and four hundred were from the other seven communities.

7. Q. How were participants chosen for the Volunteer Study?

A. In the Volunteer Study, subjects were recruited by means of a Public Service Announcement in local newspapers and radio stations, and through a mass mailing to interested parties. The Volunteer Study allowed those residents who were concerned about PCB exposure, but who were not selected to participate in the Exposure Prevalence Study, to be scheduled for a blood test. MDPH arranged to administer questionnaires to the volunteers in person at three walk-in sites: the Great Barrington Senior Center, the Tri-town Health Department in Lee, and the Berkshire Athenaeum in Pittsfield. The questionnaire administered to the volunteers was the same as the one used in the Exposure Prevalence Study.

8. Q. How were opportunities for exposure to PCBs assessed?

A. A household screening questionnaire was administered to the 800 households. A representative of each household answered questions for all the members of his or her family. After the questionnaires were completed, the responses of every household member were weighted, with those activities more likely to lead to greater potential for PCB exposure weighted more heavily. Thus, those with the greatest potential for PCB exposure would receive the highest weights or scores.

9. Q. How were respondents selected to participate in blood testing?

A. In the Exposure Prevalence Study, individuals with the highest potential exposure to PCBs based on screening questionnaire scores were offered the opportunity for a blood test. Results of blood tests allowed MDPH to determine whether those individuals who were suspected to have had greater opportunities for exposure to PCBs did in fact have higher levels than those with lesser opportunities for exposure. All respondents in the Volunteer Study were offered blood testing.

10. Q. What was the range of serum PCB levels found in the Exposure Prevalence and Volunteer Studies?

A. Sixty-nine residents who participated in the Exposure Prevalence Study had serum PCB levels as follows:

Concentrations of PCBs in Parts Per Billion (ppb)	Number of Individuals
0-4	43
5-9	18
10-14	6
15-20	1
over 20	1

Seventy-nine residents who participated in the Volunteer Study had serum PCB levels shown as follows:

Concentrations of PCBs in Parts Per Billion (ppb)	Number of Individuals
0-4	32
5-9	25
10-14	15
15-20	2
over 20	5

The average serum PCB level in the Exposure Prevalence Study among non-occupationally exposed participants was 4.49 ppb, and in the Volunteer Study, the average was 5.77 ppb. These levels were generally within the normal background range for non-occupationally exposed individuals.

11. Q. Was occupational exposure related to serum PCB levels?

A. Yes. Among all participants who had blood testing, those who had had opportunities for occupational exposure had higher serum PCB levels than the rest.

12. Q. Was age related to serum PCB levels?

A. Yes. Age was found to be the prominent predictor of serum PCB level.

13. Q. Do most people in the United States have PCBs in their bodies?

A. PCBs have been measured in human blood, fatty tissue, and breast milk throughout the country. Ninety-five percent of the U.S. population have serum levels of less than 20 ppb. Ninety-nine percent of the U.S. population have serum levels of less than 30 ppb. The national average for serum PCB level in persons non-occupationally exposed is between 4 and 8 ppb. The greatest on-going source of public exposure to PCBs is from food, particularly fish.

14. Q. Is there anything I can do to reduce PCB levels in my blood?

A. Currently, there is no treatment available to lower PCB blood levels. However, if an individual was exposed, PCB levels will decrease over time once exposure to PCBs has been reduced.

15. Q. Is it safe to eat fish from the Housatonic River and its tributaries?

A. No. In 1982, the MDPH restricted fish, frog, and turtle consumption in the Housatonic River and its tributaries. Because of continued evidence of PCB contamination, it is expected that PCB levels in these species still remain elevated.

Both the Exposure Prevalence Study and the Volunteer Study showed that study participants who had higher frequency and duration of contaminated fish consumption had higher serum PCB levels. Due to health effects that have been suggested as potentially related to PCB exposure, the MDPH maintains that the current ban on these activities in or near the river remain in effect.

16. Q. Is it safe to eat fish from restaurants, supermarkets, and local markets in the Housatonic River Area?

A. Yes. In general, fish caught in marine open and bay waters is the source of most commercial catches in New England and is not affected by PCB contamination from local and freshwater areas. State and federal health regulatory officials regulate fish sold for the commercial markets.

17. Q. Was consumption of fiddlehead ferns associated with higher serum PCB levels?

A. Individuals who reported greater frequency and duration of fiddlehead fern consumption had slightly higher serum PCB levels.

18. Q. If my only exposure to PCBs is through soil contact, should I be concerned?

A. Previous studies conducted by MDPH have not shown that exposure through soil contact alone has resulted in appreciable increases in serum PCB levels. MDPH continues to consider consumption of contaminated fish to be the most significant non-occupational exposure concern. However, due to the recent discovery of widespread residential PCB contamination, MDPH is coordinating a separate study of residents who may be concerned about exposure.

19. Q. If PCBs have been discovered in soils on my property, what can I do about getting my health concerns addressed or my blood tested?

A. MDPH has established a toll free hot-line to advise local area residents about any health related concerns or questions they may have. The exposure assessment questionnaire will be provided to all residents who wish to have their opportunities for exposure evaluated and a blood test taken. The hot-line number is 1-800-240-4266.

20. Q. What health effects are caused by exposure to PCBs?

A. PCBs are not very acutely toxic. Large amounts of PCBs are necessary to produce acute effects. These effects can include skin lesions or irritations, fatigue, and hyperpigmentation (increased pigmentation) of the skin and nails. Chronic effects occur after weeks or years of exposure or long after initial exposure to PCBs. A number of studies have suggested that these effects include immune system suppression, liver damage, neurological effects, and possibly cancer.

21. Q. What happens to PCBs in your body?

A. Once PCBs enter the body they are first distributed in the liver and muscles and then are stored in fatty tissues. PCBs can be stored in fat tissue for years. Also, breast milk may concentrate PCBs because of its fat content. The PCBs can then be transferred to children through breastfeeding.

22. Q. Are cancer rates elevated in the HRA?

A. According to the most recent data from the Massachusetts Cancer Registry, cancer rates during 1982-1986 and 1987-1992 for the eight communities (i.e., Dalton, Great Barrington, Lanesborough, Lee, Lenox, Pittsfield, Sheffield, and Stockbridge) showed that, with the exception of bladder cancer in Pittsfield males during the 1982-1986 period, no statistically significant elevation was noted.

23. Q. Do PCBs cause reproductive effects?

A. Studies have reported that infants born to mothers who were environmentally or occupationally exposed to PCBs had decreases in birth weight, gestational age, and neonatal performance. However, the strength of the association with PCBs is unclear. PCBs have been shown to cause these and other reproductive effects in a variety of mammalian species.

24. Q. Are there any problems with reproductive outcomes for the HRA?

A. According to 1990-1994 birth data from the MDPH Registry of Vital Records and Statistics, infant mortality and the proportion of low birth weight in the HRA were similar to those of the state averages.

Appendix F:

Commonwealth of Massachusetts
EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES

Expert Panel on the Health Effects of Non-Occupational Exposure to Polychlorinated Biphenyls (PCBs)

Questions and Answers

1. Q. Why was an expert panel convened?

A. Because of continuing concerns relative to the health effects of PCBs among Pittsfield area residents, the Secretary of the Executive Office of Health and Human Services (EOHHS) called for a review of this topic by a panel of independent experts. It was hoped that this panel would establish consensus on the available health information where possible, reflect the range of scientific opinion, and report on the current state of the science and directions of current research.

2. Q. Who was on the expert panel?

A. The panel comprised 11 nationally and internationally recognized experts on the health effects of PCBs from a wide range of disciplines, including toxicology, epidemiology, public health, and analytical chemistry.

3. Q. How and why were the panelists selected?

A. The Secretary of EOHHS invited the public to nominate potential panel members who had expertise in one of the following disciplines: toxicology; epidemiology; environmental exposure assessment; laboratory science; medicine (including cancer and reproductive outcomes); environmental fate and transport; and organic chemistry. The public comment period for submission of nominations ran from August 2nd to August 21st, 1998. Nearly 40 individuals were nominated representing a variety of disciplines. In selecting the final 11 panelists, the Secretary made every effort to have a panel of individuals with the diversity of technical disciplines noted above and who were nominated by a variety of publicly interested parties.

4. Q. What topics did the panel discuss? How were these topics selected?

A. The role of the panel was to review, assess, and summarize the most up-to-date published and ongoing research on PCBs and public health, with special emphasis on:

- The latest information on typical levels in the U.S. of PCBs in blood serum and the public health significance of these levels;
- The adverse health outcomes associated with exposure to PCBs;
- The thoroughness of information on ways humans can be exposed to PCBs (such as via air, water, soil, food);

- The interactions between PCBs and other chemicals.

EOHHS compiled a preliminary list of questions for the panel based on the experiences of the Massachusetts Department of Public Health (MDPH) with PCB contamination in the Houstonic River Area and throughout the Commonwealth. Furthermore, EOHHS and the chairman of the panel held a public meeting in Pittsfield on the eve of the panel meeting to solicit additional questions and comments from the public in Berkshire County.

5. Q. What were the findings of the expert panel with respect to typical background levels of PCBs in blood serum?

A. The panel agreed that the information on typical background serum PCB levels for non-occupationally exposed people in the Toxicological Profile for PCBs[1] (i.e., 4-8 ppb) is not current. In addition, the panel concluded that the information that now exists suggests that the range is probably lower than 4-8 ppb, but that comparisons are difficult due to differences in the age of various study populations and whether or not they eat fish. Some recent studies have found background serum PCB levels for women of reproductive age around 2 ppb, while other researchers have observed levels around 6 ppb for elderly people who do not eat much fish. The recent studies provide valuable data points that must be shared within the context of all relevant factors. For example, studies have consistently shown that serum PCB levels increase with age and are correlated to factors such as fish consumption and exposures to PCBs at work.

The varied analytical and statistical methods used by different researchers often make comparisons between studies difficult or impossible. Therefore, the panel strongly recommended that an individual's serum PCB level be evaluated by comparisons to the distribution of levels within the local and other comparable populations, considering age, fish consumption habits, and occupational exposures.

6. Q. How do the serum PCB levels from residents of the Housatonic River Area compare to the current estimates of typical background levels for non-occupationally exposed individuals?

A. When comparing serum PCB levels between different studies, it is important to match populations with similar ages and opportunities for exposures to PCBs (e.g., occupation, fish consumption habits). Analytical and statistical methods (e.g., chromatographic and detection methods, detection limits, target congeners, treatment of non-detected samples) can also vary among studies, further complicating comparisons. Nevertheless, if the appropriate factors are considered, the serum PCB levels measured in recent studies may provide useful comparison data for the results from the Housatonic River Area.

7. Q. How do the serum PCB levels from residents of the Housatonic River Area compare to the population in the study from The Netherlands?

[1] Toxicological Profile for Polychlorinated Biphenyls, Draft for Public Comment, Agency for Toxic Substances and Disease Registry, Atlanta, Georgia, December 1998.

A. In a recent study from The Netherlands, 415 women of reproductive age (i.e., mid-20s to mid-30s) were found to have median serum PCB levels around 2 ppb. Because of the analytical methods used in this study, this result may actually correspond to approximately 4 ppb of total serum PCBs as measured for MDPH's Exposure Assessment Study. This could be predicted with greater certainty if some samples are analyzed by both techniques. In contrast, non-occupationally exposed residents of the Housatonic River Area between 18 and 34 years old (n=8) had median serum PCB concentrations less than 2 ppb.

8. Q. How do the serum PCB levels from residents of the Housatonic River Area compare to people over 50 years old who do not each much fish?

A. A recently published study reportedly found that 180 people over 50 years old who do not eat much fish (i.e., less than 6 pounds per year) had serum PCB levels around 6 ppb. The median serum PCB levels for non-occupationally exposed, older (i.e., 50 years and older, including those greater than 70) participants in MDPH's Exposure Assessment Study were 3.70 (n=19) and 5.90 (n=12) ppb for the Exposure Prevalence and Volunteer phases, respectively.

9. Q. How do the serum PCB levels from residents of the Housatonic River Area compare to the population in the Great Lakes study?

A. A mixed-age population in the Great Lakes region who did not consume sport-caught fish had geometric mean (i.e., approximately median) serum PCB levels of 1.5 and 0.9 ppb for males (n=57) and females (n=42), respectively. For a similar population in the Housatonic River Area (i.e., non-occupationally exposed participants, 18-64 years old, who either never ate fish or ate only store-bought fish), the median serum PCB levels were 3.30 (n=10) and 1.66 (n=8) ppb in the Exposure Prevalence and Volunteer phases, respectively. Direct comparisons between these studies are hampered by the fact that the method detection limit for MDPH's Exposure Assessment Study (2 ppb) was greater than the median levels measured in the Great Lakes study.

10. Q. How do the serum PCB levels from residents of the Housatonic River Area compare to the populations in the New York breast disease studies?

A. Two studies of women with benign breast disease in the New York area reported average concentrations of serum PCBs of 2.15 (n=173) and 4.06 (n=19) ppb. The average serum PCB concentrations for non-occupationally exposed participants in MDPH's Exposure Assessment Study were slightly higher than this range, 4.49 (n=52) and 5.77 (n=53) ppb for the Exposure Prevalence and Volunteer phases, respectively. This may be because the women in the New York studies were on average about 10 years younger than the participants in MDPH's Exposure Assessment Study. Furthermore, the method detection limit for the larger of the New York studies (0.5 ppb) was four times lower than the detection limit for MDPH's Exposure Assessment Study (2 ppb).

11. Q. Overall, how do the serum PCB levels from residents of the Housatonic River Area

compare to the populations in these recent studies?

A. Because of the complications discussed earlier, direct comparisons between studies are difficult. However, the available data indicate that serum PCB levels for the non-occupationally exposed population from MDPH's Exposure Assessment Study are generally similar to the background exposure levels reported in recent studies.

12. Q. What were the findings of the expert panel with respect to adverse health outcomes associated with PCB exposures?

A. While the panel cited some conflicting human studies, overall the panel members agreed that the evidence is clear that PCBs are a definite carcinogen in animals. In humans, the evidence with regard to cancer is suggestive but inconclusive.

Most of the panel agreed that there appears to be some developmental effects (e.g., subtle cognitive deficits) associated with exposure to PCBs. Developmental effects observed in animal studies have also been seen in humans. However, frank neurotoxic effects such as seizure disorders have not been seen. Many agreed that the most susceptible population to these effects seems to be fetuses *in utero*.

There is some suggestive, but not conclusive, evidence from animal and human studies that exposures to PCBs can affect the immune system. Dermal effects (e.g., chloracne) have been observed in workers who were exposed to PCBs on the job.

13. Q. What were the findings of the expert panel with respect to the public health implications of serum PCB levels near background levels?

A. The current research suggests that prenatal exposures to fetuses at near background levels of PCBs may subtly affect the mental development of children. Immunological and hormonal effects have also been seen following prenatal exposure, in addition to the neurological effects. Recent studies in The Netherlands observed that children born to mothers with greater than 3 ppb of serum PCBs scored slightly lower on tests of cognitive abilities than children whose mothers had serum PCB levels less than 1.5 ppb. While statistically significant for the study population, the panel agreed that these effects were probably not noticeable on an individual basis. Moreover, because of the analytical methods used in this study, the serum PCB measurements represent approximately one-half the total serum PCBs and, hence, should be doubled to be comparable to the test results from MDPH's Exposure Assessment Study.

Importantly, this same study also found that children who were breast fed scored better on cognitive tests than children who were fed formula, despite additional exposures to PCBs and dioxins in breast milk. This finding reinforces the beneficial properties of breast feeding and highlights that exposures to PCBs *in utero* are likely of greatest concern.

14. Q. Should I be concerned about the cognitive development of my children?

A. The results of recent studies from The Netherlands raise legitimate concerns about developmental effects as a result of near background exposures to PCBs for fetuses *in utero*. However, the cognitive effects observed are slight and many panelists felt they were not biologically significant on an individual basis. Furthermore, the panel felt that other factors that affect a child's aptitude for learning (e.g., parental involvement with the child's education, good nutrition, supportive family environment) probably play a much larger role than background PCB exposures. Nevertheless, these findings provide more justification for continuing to clean up PCB contamination to reduce opportunities for exposure as much as possible.

15. Q. What were the findings of the expert panel with respect to exposure routes for non-occupationally exposed populations?

A. The panel agreed that exposures to PCBs are possible through multiple routes (e.g., air, water, soil, and food), however, the vast majority of exposure typically occurs through eating food of animal origin (e.g., fish, meat, dairy).

16. Q. How can people avoid important opportunities for exposure to PCBs?

A. Observing fish consumption advisories and eating a healthy diet that is low in fatty foods is the most effective way to reduce overall exposures to PCBs. However, because even small exposures add incrementally to overall body burden, it is important to reduce exposures via all routes.

Because the bioavailability of PCBs in air, water, and soil is uncertain, the expert panel endorsed serum PCB tests as the best available measure of actual exposure for individuals who are concerned about their exposures to PCBs.

17. Q. What were the findings of the expert panel with respect to interactions between PCBs and other chemicals?

A. PCBs are thought to behave as tumor promoters in susceptible tissues. Therefore, the carcinogenic effects of PCBs are likely to be influenced by other carcinogens or toxins that may be present. It is hoped that ongoing research will reveal more about the toxicity of mixtures of PCBs and other chemicals in the future.

18. Q. The focus in the Housatonic River Area Exposure Assessment Study was on individuals living near the river. Is there a need for the MDPH to examine the PCB serum levels of a population further away from the river?

A: The Housatonic River Area Exposure Assessment Study was purposely aimed to select individuals with highest opportunity for exposure, therefore the focus was on individuals living near the river or engaging in a variety of activities that may increase their opportunities for exposure to PCBs (e.g., fish consumption, recreational activities near the river, gardening, construction activities, fiddlehead fern consumption). Since these people were largely found to have levels near typical background ranges, individuals living further away from the river would not be expected to have higher PCB levels.

19. Q. Will MDPH evaluate all the adverse health outcomes that have been associated with PCB exposures?

A. In addition to a large number of public health assessments, MDPH is conducting an analysis of cancer incidence from 1982 to 1994 in the Housatonic River Area using data from the Massachusetts Cancer Registry. For this project, the cancers most strongly associated with PCB exposures will be evaluated (i.e., liver cancer, breast cancer, non-Hodgkin's lymphoma, Hodgkin's disease, thyroid cancer, and bladder cancer). If environmental data indicate significant opportunities for exposure to other carcinogens (e.g., PCBs and smoking as co-carcinogens), or if the literature and further discussions with appropriate experts identifies additional cancers of concern (e.g., brain, testicular, lung cancer), the list of cancers under review may be expanded. The expert panel agreed that MDPH's approach for the health assessment and other public health activities, along with the continued clean-up efforts, were adequate measures to be taken at this time.

MDPH is also conducting a pilot study assessing the relationship between environmental exposures to PCBs and DDE and new diagnoses of breast cancer.

20. Q. What can I do if I am concerned about my exposures to PCBs?

A. MDPH has established a toll free hotline to advise local area residents about any health related concerns or questions they may have. An exposure assessment questionnaire has been and will continue to be provided to all residents who wish to have their opportunities for exposure evaluated and a blood test taken. The hotline number is (800) 240-4266.

21. Q. Where can I get additional information?

A. For information on the expert panel or MDPH health studies in the Housatonic River Area, contact the Bureau of Environmental Health Assessment of MDPH at (617) 624-5757 or (800) 240-4266.

Certification

The Public Health Assessment for East Street Area I was prepared by the Massachusetts Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated.

Gail Godfrey
Technical Project Officer
Superfund Site Assessment Branch (SSAB)
Division of Health Assesment and Consulttion (DHAC)
ATSDR

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

Roberta Erlwein, MPH
Section Chief, SPS, SSAB, DHAC, ATSDR