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New England Region
Boston, Massachusetts

HUMAN HEALTH RISK ASSESSMENT GE/HOUSATONIC RIVER SITE REST OF RIVER

VOLUME I

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1. INTRODUCTION

1.1 OVERVIEW

The Housatonic River flows from north of Pittsfield, MA, to Long Island Sound and drains an area of approximately 1,950 square miles (500,000 hectares) in Massachusetts, New York, and Connecticut. The Housatonic River, its sediment, and associated floodplain have been contaminated with polychlorinated biphenyls (PCBs) and other hazardous substances released from the General Electric Company (GE) facility located in Pittsfield, MA. The entire site, known as the General Electric/Housatonic River Site, consists of the 254-acre (103-hectare) GE manufacturing facility; the Housatonic River and associated riverbanks and floodplains from Pittsfield, MA, to Long Island Sound; former river oxbows that have been filled; neighboring commercial properties; Allendale School; Silver Lake; and other properties or areas that have become contaminated as a result of GE's facility operations.

Because of its size and complexity, the GE/Housatonic River Site has been divided into several areas for investigation and cleanup. This report provides a comprehensive Human Health Risk Assessment (HHRA) for the portion of the site known as the Rest of River. The Rest of River extends from the confluence of the East and West Branches of the Housatonic River (the confluence) to the Massachusetts border with Connecticut, a distance of approximately 54 miles (87 km), and beyond into Connecticut to Long Island Sound. The total distance from the confluence to Long Island Sound is approximately 139 miles (224 km). In addition to the river proper, the Rest of River includes the associated riverbank and floodplain.

In September 1998, after years of scientific investigations and regulatory actions, a comprehensive agreement was reached between GE and various governmental entities, including the U.S. Environmental Protection Agency (EPA), the Massachusetts Department of Environmental Protection (MDEP), the U.S. Department of Justice (DOJ), the Connecticut Department of Environmental Protection (CTDEP), and the City of Pittsfield. The agreement provides for the investigation and cleanup of the Housatonic River and associated areas. The agreement was documented in a Consent Decree between all parties that was entered by the court in October 2000. Under the terms of the Consent Decree, EPA conducted the human health and

ecological risk assessments, and is conducting a modeling study of PCB transport and fate for the Housatonic River below the confluence of the East and West Branches (Rest of River) and the surrounding watershed.

The Rest of River is defined in the Consent Decree as follows:

- "Between the confluence of the East and West Branches of the River and Woods Pond Dam, the Rest of the River generally includes the Housatonic River and its sediments, as well as its floodplain (except for Actual/Potential Lawns) extending laterally to the approximate 1 ppm PCB isopleth."

- "Downstream of Woods Pond Dam, the Rest of the River shall include those areas of the River and its sediments and floodplain (except for Actual/Potential Lawns) at which Waste Materials originating at the GE Plant Area have come to be located and which are being investigated and/or remediated pursuant to this Consent Decree."

Between the confluence and Woods Pond Dam, the 1-ppm tPCB isopleth is approximately equivalent to the 10-year floodplain (BBL, 1996; BBL and QEA, 2003). Downstream of Woods Pond Dam, the Rest of River is approximated by the 100-year floodplain; the 10-year floodplain has not been delineated.

The Consent Decree also includes specific language that requires the risk assessments and components of the modeling studies to be submitted for formal Peer Review. The Human Health Risk Assessment (HHRA) was submitted for Peer Review in June 2003. The Peer Review was conducted in November 2003, and EPA issued a Responsiveness Summary in March 2004. This final HHRA reflects the comments from the Peer Review Panel.

The HHRA is an important component of EPA's Supplemental Investigation of the Rest of River, along with the Ecological Risk Assessment and Modeling Study. It provides a comprehensive evaluation of health risks associated with uses of the river, its banks, and floodplain under baseline conditions (i.e., no action) for current and future uses. This evaluation will be considered in:

- Determining the need for remedial actions.
- Setting media protection goals for contaminants of concern.

The HHRA consists of seven volumes. This volume (Volume I) provides a comprehensive summary of the potential risks to human health associated with contamination in the Rest of

River portion of the GE/Housatonic River Site for all exposure pathways, including those arising from direct contact with soil and sediment, consumption of fish and waterfowl from the river, and consumption of agricultural products (both plant and animal) grown on the floodplain. The six remaining volumes are appendices that provide the details of the assessment conducted for each exposure pathway. They are:

- Appendix A (Volumes IIA and IIB): Phase 1 Direct Contact Screening Risk Assessment.
- Appendix B (Volumes IIIA and IIIB): Phase 2 Direct Contact Risk Assessment.
- Appendix C (Volume IV): Consumption of Fish and Waterfowl Risk Assessment.
- Appendix D (Volume V): Agricultural Product Consumption Risk Assessment.

1.2 SITE HISTORY

The Housatonic River is located in a predominantly rural area of western Massachusetts and Connecticut, where farming was the main occupation from colonial settlement through the late 1800s. As with most rivers, the onset of the industrial revolution in the late 1800s brought manufacturing to the banks of the Housatonic River in Pittsfield, MA. GE began its operations in its present location in 1903. Three manufacturing divisions have operated at the GE facility (Transformer, Ordnance, and Plastics).

The 254-acre GE facility in Pittsfield has historically been the major handler of PCBs in western Massachusetts, and is the only known source of PCBs found in the Housatonic River sediment and floodplain soil in Massachusetts. Although GE performed many functions at the Pittsfield facility throughout the years, the activities of the Transformer Division, including the construction and repair of electrical transformers using dielectric fluids, some of which contained PCBs (primarily Aroclors 1260, and to a lesser extent, 1254), were one likely significant source of PCB contamination. According to GE's reports, from 1932 through 1977, releases of PCBs reached the wastewater and stormwater systems associated with the facility and were subsequently conveyed to the East Branch of the Housatonic River and to Silver Lake, a 25-acre lake adjacent to the GE facility.

During the 1940s, efforts to straighten the Pittsfield reach of the Housatonic River by the City of Pittsfield and the U.S. Army Corps of Engineers (USACE) resulted in 11 former oxbows being isolated from the river channel. The oxbows were filled with material, some of which was later discovered to contain PCBs and other hazardous substances.

The State of Connecticut posted a fish consumption advisory for most of the Connecticut section of the river in 1977 as a result of the PCB contamination in the river sediment and fish tissue. In 1982, the Massachusetts Department of Public Health (MDPH) issued a consumption advisory for fish, frogs, and turtles for the Housatonic River. In addition, in 1999, MDPH issued a waterfowl consumption advisory from Pittsfield to Great Barrington due to PCB concentrations in wood ducks and mallards collected from the river by EPA.

Although a portion of the first 2 miles downstream from the facility was historically channelized, the river's course is relatively unaffected (with the exception of the several dams downstream) in areas south of Pittsfield. The river, from the confluence of the East and West Branches of the Housatonic to Woods Pond Dam in Lenox, is 10.7 miles long. The channel in this area is commonly 60 to 90 ft wide (and is occasionally as narrow as 40 ft or as wide as 125 ft), is bordered by extensive floodplain (up to 3,600 ft wide), and has a meandering pattern with numerous oxbows and backwaters. Woods Pond, the first impoundment downstream of the GE facility, is a shallow 54-acre (22-hectare) impoundment that was formed by the construction of a dam in the late 1800s.

The land uses of the floodplain properties in Massachusetts include residential, commercial/industrial, agricultural, recreational (such as canoeing, fishing, and hunting), wildlife management, and parks and a golf course. The Housatonic River floodplain is an attractive area for recreation, including fishing and waterfowl hunting.

Numerous studies conducted since 1988 have documented PCB contamination of soil within the floodplain of the Housatonic River downstream of the GE facility. PCBs originating from the GE facility in Pittsfield have been detected in river sediment in Massachusetts as far downstream as the border with Connecticut (BBL, 1996), and in Connecticut as far as the Derby Dam and beyond into Long Island Sound (other sources have been identified downstream of this dam).

The PCBs detected in Housatonic River floodplain soil and sediment consist predominantly of Aroclor 1260, with a minor contribution of Aroclor 1254.

Numerous residential properties have been the focus of efforts by MDEP to coordinate the cleanup of PCB-contaminated residential soil that was brought to the properties as fill from GE. As of December 2003, GE has cleaned up 174 properties under this program.

Other properties or areas in Pittsfield and the surrounding communities have been discovered over the years to have received waste from the GE facility and/or are contaminated with PCBs, including the Pittsfield Landfill, Rose Disposal Site (National Priorities List [NPL] site), and Dorothy Amos Park located on the West Branch of the Housatonic River. Actions to address these properties have been taken or investigation is underway.

The highest concentrations of Aroclors 1254 and 1260 have been detected in the vicinity of the facility and downstream of Building 68 (WESTON, 2000; BBL, 1994, 1995; O'Brien & Gere Engineers, Inc., 1995). Widespread contamination of the river downstream of the GE facility has resulted from the transport of PCB-contaminated river sediment and floodplain soil by river flow, sediment transport, and overbank flooding (WESTON, 2000). Total PCBs (tPCBs) have been detected at concentrations of greater than 1 ppm in floodplain soil as far downstream as Bartholomew's Cobble in Massachusetts, close to the Massachusetts-Connecticut state line.

1.3 REGULATORY BACKGROUND

The GE Housatonic River site has been subject to regulatory investigations dating back to the late 1970s. These investigations were consolidated under two regulatory mechanisms: an Administrative Consent Order (ACO) with the Massachusetts Department of Environmental Protection (MDEP) and a Corrective Action Permit with the U.S. Environmental Protection Agency (EPA) under the Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA).

In 1991, EPA issued a RCRA Corrective Action Permit to the GE facility. Following an appeal and subsequent modification, the permit was reissued in 1994. The permit included the 254-acre facility; Silver Lake; the Housatonic River, its floodplains, and adjacent wetlands; and sediment contaminated by PCBs migrating from the GE facility.

Decree, both of the risk assessments and three aspects of the modeling effort are to undergo formal external Peer Review, with the review of the Modeling Framework Design having taken place in April 2001 and the human health and ecological reviews in November 2003 and January 2004, respectively. The Responsiveness Summary for the HHRA (WESTON, 2004a) summarizes the comments submitted by the Peer Review Panel and how EPA will address them in this document. This report is a revision of the document reviewed by the external Peer Reviewers (WESTON, 2003) and addresses their comments, as described in the Responsiveness Summary.

Following the investigations, as required in the Draft Revised RCRA Permit, GE has prepared a Supplemental RCRA Facility Investigation Report (BBL and QEA, 2003), will propose cleanup levels (Interim Media Protection Goals), and will analyze cleanup alternatives (Corrective Measures Study) for consideration by EPA. EPA will propose the draft Statement of Basis (cleanup plan) for the Corrective Measure(s) for the Rest of River and, after public comment, will finalize the Statement of Basis. GE and other members of the public may then appeal EPA's decision to the EPA Environmental Appeals Board (EAB) and the First Circuit District Court. GE is then required, under the Consent Decree, to implement and pay for the remedy selected after resolution of any appeals. The Rest of River response action will be implemented through a modification to the Revised RCRA Permit and an amendment to the CERCLA Consent Decree, and is estimated to begin in 2007.

1.4 SITE DESCRIPTION AND CURRENT USES

The Rest of River encompasses the Housatonic River and its associated floodplain from the confluence of the East and West Branches downstream to Long Island Sound. To simplify the description of the Rest of River evaluation, reaches of the river were designated. Figures 1-1 through 1-4 present an overview of the Rest of River and the reach designations. The 13 reaches are:

- ***Reach 5*** – From the confluence of the East and West Branches to the Woods Pond headwaters.
- ***Reach 6*** – Woods Pond impoundment.

- ***Reach 7*** – From Woods Pond Dam to the upstream extent of the Rising Pond impoundment.
- ***Reach 8*** – Rising Pond impoundment.
- ***Reach 9*** – From Rising Pond Dam to the Massachusetts/Connecticut border.
- ***Reach 10*** – From the Massachusetts/Connecticut border to Great Falls Dam.
- ***Reach 11*** – From Great Falls Dam to Cornwall Bridge.
- ***Reach 12*** – From Cornwall Bridge to Bulls Bridge Dam.
- ***Reach 13*** – From Bulls Bridge Dam to Bleachery (New Milford) Dam.
- ***Reach 14*** – From Bleachery Dam to Shepaug Dam (Lake Lillinonah).
- ***Reach 15*** – From Shepaug Dam to Stevenson Dam (Lake Zoar).
- ***Reach 16*** – From Stevenson Dam to Derby Dam (Lake Housatonic).
- ***Reach 17*** – From Derby Dam to Long Island Sound.

The HHRA evaluates the current and reasonably anticipated future uses of the Housatonic River, its floodplain, and its environs in the analysis of potential risks. For pathways involving direct and indirect exposure to floodplain soil and sediment, current land and river uses form the basis for the evaluation of existing (i.e., baseline) conditions. Future land and river uses form the basis for the evaluation of risks associated with future use of the site. An understanding of potential future land use is important when formulating realistic assumptions regarding reasonably anticipated future land use, describing how these assumptions apply to the baseline risk assessment, and informing the development of alternatives in the remedy selection process (EPA, 1995).

A number of information sources were consulted when identifying the current land and river uses described in this section, including:

- Aerial photographs and maps.
- Field notes and observations of EPA and contractor field personnel who were on site over the course of several years.
- Representatives of local recreational activities (marathon canoers), conservation groups (e.g., Massachusetts Audubon), school-based educational programs (St.

Joseph's High School, Berkshire Community College), school-based outing clubs, and community organizations (e.g., the Boy Scouts) that sponsor programs that use the river.

- Sportsmen's club leaders and members who hunt and/or fish along the Housatonic River, including the Lenox Sportsmen's Club, the Lee Sportsmen's Club, and Berkshire League of Sportsmen—an umbrella group of local sportsmen's clubs.

- Owners/operators of sporting goods stores, summer camps, and resort hotels in the Housatonic River area.

- Regional representatives of MDEP, Massachusetts Department of Environmental Management (MDEM) (currently part of Department of Conservation and Recreation), and the Massachusetts Division of Fisheries and Wildlife (MassWildlife).

- Farmers, the U.S. Department of Agriculture (USDA) Farm Services Agency, the Massachusetts Department of Food and Agriculture (MDFA), regional agricultural groups (e.g., Berkshire Grown), and grocery stores that sell animal products and produce from area farms.

- Websites with information on uses of the Housatonic River and floodplain, including local farms advertising the sale of produce, marathon canoe sites listing races, Massachusetts and Connecticut fish and wildlife sites with fishery information and angling and hunting regulations, and sites maintained by local environmental and conservation organizations.

- Housatonic River Floodplain User Survey, a report prepared by consultants to GE (TER, 2003).

1.4.1 Reach 5

The Rest of River portion of the Housatonic River flows through one of the most biologically diverse regions of Massachusetts (Barbour et al., 1998) and Connecticut. The first 10.7 miles (17.3 km) from the confluence to the headwaters of Woods Pond is referred to as Reach 5. Reach 5 has a significant amount of forested, undeveloped land that supports a wide variety of recreational uses, including hunting, fishing, hiking, and canoeing. A large amount of the lower portion of this reach is included within the Housatonic River Valley Wildlife Management area, owned by MassWildlife, which is adjacent to October Mountain State Forest to the east. There are also residential areas, agricultural areas, including a portion of a commercial dairy farm operation, corn silage and hay production areas, and several commercial/industrial areas and utility easements. In this area, the river flows through the towns of Pittsfield and Lenox.

The floodplain, river, and other features of Reaches 5 and 6 comprise what is known as the Primary Study Area (PSA). Reach 5 is subdivided further into four subreaches. The acreages and features of the PSA are summarized below.

Primary Study Area Acreages and Features (Within the 10-Year Floodplain)

Reach	Floodplain Area (acres)	Backwater Areas (acres)	Main and Side Channels (acres)	Floodplain Width (minimum) (ft)	Floodplain Width (maximum) (ft)	Floodplain Width (average) (ft)
5A	382	NC	40	150	2,300	940
5B	178	NC	26	475	2,200	900
5C	546	NC	43	1,400	3,600	2,200
5D	NA	44	NA	NA	NA	NA
6	39	NA	68	NA	NA	NA

NA = Not applicable
NC = Not calculated, included in main channel area

Reach 5A extends from the confluence of the East and West Branches downstream to just above the Pittsfield Wastewater Treatment Plant (WWTP) discharge, and Reach 5B is from the WWTP downstream to the confluence with Roaring Brook. The river in Reaches 5A and 5B is free-flowing, oriented roughly north-northwest—south-southeast, with a narrow floodplain, numerous meanders and remnant oxbows, and riverbanks that are generally scoured and eroded. The width of the river in Reaches 5A and 5B ranges from 40 to 120 ft, but is commonly 60 to 70 ft, and ranges in depth from 2 to 11 ft. The sediment bed consists of coarse to fine sands with approximately 10 to 15% silt and clay. The floodplain in Reach 5A varies from several hundred feet wide near the confluence, to steep banks with little floodplain in the central part of Reach 5A, to floodplain with upland habitat that is annually flooded in the lower part of the reach near the WWTP. Aquatic habitat includes snags (large woody debris), undercut banks, and rocks. The land use in this area includes residential, recreational, and agricultural activities. The land near New Lenox Road is predominantly agricultural and forested. The portion of Reach 5B from the WWTP to New Lenox Road is similar to Reach 5A. The land near New Lenox Road is predominantly agricultural and forested. Below New Lenox Road, the river widens (60 to 160

ft) and becomes shallower (4 to 8 ft). This portion of Reach 5B is dominated by a broad wetland floodplain, ranging from 800 to 3,000 ft wide.

Reach 5C, downstream of the confluence with Roaring Brook, is influenced by the backwater effect from Woods Pond Dam. The river is oriented approximately north-south and is characterized by a broad floodplain (~800- to 3,000-ft width) on the west bank with numerous backwater areas, side channels, and meanders. The narrower floodplain on the east bank of the river is confined by the steep slopes of October Mountain. The width of the river channel ranges from about 70 to 200 ft (typically 80 to 90 ft) with depths of 8 to 16 ft. The sediment bed is characterized predominantly by fine sands and silts. Dense vegetation lines the banks of the river in the upper portion of this section, and extensive backwaters border the lower section.

Reach 5D consists of several upstream backwater areas associated with Woods Pond and covers more than 120 acres (49 ha). Reach 5D is characterized by stands of emergent vegetation, macrophytes, and surface algal mats. Under high-flow conditions, the numerous broad and shallow backwater areas are hydraulically connected to the main river channel. Under low-flow conditions, however, the backwater areas appear to be largely isolated from the influence of flow in the main river channel.

Although the entire area is a warm water fishery, most fishing activity has been observed in Reaches 5B through 5D, where the greatest fish biomass has been observed (WESTON, 2004b). Fishing has been observed along the shoreline, generally at locations with easy access to the river or trails along the river. These locations are described in detail in Appendix B, the Phase 2 direct contact risk assessment. Fishing from boats has also been observed. John Decker Canoe Launch (JDCL), which is in Reach 5B near the end of New Lenox Road, is a popular launch site for fishing trips, recreational canoeing, and for paddlers training for marathon canoe races. Anglers tend to put in at JDCL and take out at Woods Pond (Reach 6), while marathon canoeists paddle to Woods Pond and back to JDCL. However, some anglers put in at Fred Garner Park, which is in Pittsfield above the confluence (and outside the Rest of River) and take out at JDCL.

1.4.2 Reach 6

Reach 6 begins 10.1 miles (16.3 km) downstream of the confluence and consists of Woods Pond, an impounded body of water formed by the construction of Woods Pond Dam in the late 1800s, and a small portion of the river channel just upstream and just downstream of the pond. This is the first impoundment downstream from the GE facility and is a depositional environment (HEC, 1996). Woods Pond itself is approximately 0.2 mile (0.3 km) in length and has an area of 54 acres (22 hectares). The maximum depth is 16 ft (4.9 m), but most of the pond is 1 to 3 ft (0.3 to 0.9 m) deep (HEC, 1996; Stewart Laboratories, Inc., 1982; CR Environmental, 1998). The water in Woods Pond is relatively slow-moving and contains aquatic habitat characteristic of a standing-water environment. The banks of the pond provide extensive cover, such as overhanging vegetation, woody debris, rock piles, and submerged macrophytes. The Town of Lenox is located west of Woods Pond.

Woods Pond is a popular recreational area, with easy access to the water at several locations for launching canoes or boats, or fishing from shore. It is also a well-known ice-fishing location, with many anglers observed on winter days, especially weekends. It is a warm water fishery with good fishing for largemouth bass, yellow perch, sunfish, and brown bullhead.

1.4.3 Reach 7

Reach 7 extends 18.5 miles (29.8 km) from Woods Pond to the upstream end of Rising Pond in Great Barrington (Figure 1-2). There are five dams in this reach, and the river has an average depth of between 3 and 5 ft (0.9 to 1.5 m) in the faster flowing sections of the river channel and upwards of 20 feet (6 m) just upstream of the dams. Agricultural activity becomes more common in this area than in the upstream reaches and is dominated by corn silage production with some hay production. One resident living along this reach keeps a herd of beef cattle. The Towns of Lee and Stockbridge control most of the floodplain area in this reach.

The best fishing in this reach is reportedly just below Woods Pond Dam and near the Glendale Dam (Tom Keefe, MassWildlife, personal communication, 2002). Two areas were designated catch and release areas by MassWildlife in 2004: (1) from the Route 20 Bridge in Lee downstream to the Willow Mill Dam in South Lee and (2) from the Glendale Dam downstream

to the Railroad Bridge. MassWildlife began stocking trout in the Housatonic River in these areas in spring 2004.

1.4.4 Reach 8

Reach 8, known as Rising Pond (Figure 1-2), is a 45-acre (18-hectare) pond created by the construction of a dam at the Rising Paper Company (WESTON, 2000). Rising Pond has depositional characteristics similar to Woods Pond, and is located just south of the Town of Housatonic. Route 183 borders the eastern shore with residential areas on the eastern side of the road. The western side has a narrow floodplain with undeveloped land.

1.4.5 Reach 9

Reach 9 begins downstream of Rising Pond and extends for approximately 23.9 miles (38.5 km) to the Massachusetts/Connecticut state line (Figure 1-2). It contains low-gradient sections with deeper river habitat, as well as moderate gradient sections with riffle habitat. This reach is wide with flat floodplains and several oxbows, and includes the towns of Great Barrington and Sheffield.

Agriculture is a predominant land use in this reach. Most of the agricultural acreage is devoted to commercial dairy farms and corn silage production, followed by commercial production of vegetables and free-range poultry. In this and other reaches, lactating dairy animals do not graze in the floodplain, but they consume feed crops grown in the floodplain. However, non-lactating animals graze in one small part of this reach.

MassWildlife maintains a canoe launch in Great Barrington, providing public access to the river. Stretches of Reach 9 are used for recreational canoeing, with trips sponsored, for example, by the Berkshire Chapter of the Appalachian Mountain Club. The fishery in Reach 9 is typical of a warm water fishery.

1.4.6 Reach 10

Reach 10 begins at the Massachusetts/Connecticut border and extends 7.4 miles (12 km) to the dam at Great Falls Village (Figure 1-3). The river characteristics are similar to those of Reach 9, with a meandering river course.

1.4.7 Reach 11

Reach 11 begins on the downstream side of the dam at Great Falls and ends at Cornwall Bridge, where Route 7 crosses the river (Figure 1-3). This reach is 11.5 miles (18.5 km) long. Reach 11 is mostly shallow and fast flowing. Historically, this reach had been stocked with trout from Cornwall to West Cornwall, although the practice was halted in 1980 as a result of the fish consumption advisory issued in 1977 due to PCB contamination. In 1981, a 15-km stretch was designated as a Trout Management Area (TMA), with fishing for trout restricted to catch and release. The stocking program resumed (brown trout), and the TMA received much attention in national fishing magazines such as *Flyfisherman*, *Sports Afield*, and *Field and Stream* (Barry, 1988). This stretch is also designated as a Bass Management Area. Reach 11 is located in the towns of Salisbury, Canaan, Sharon, and Cornwall.

1.4.8 Reach 12

Reach 12 extends from Cornwall Bridge to the dams at Bulls Bridge (Figure 1-3), a length of 13.1 miles (21.1 km). The river is relatively straight through this reach and generally flows quickly. Near the town of Kent, the river slows and deepens as it enters the backwater from the dams at Bulls Bridge.

The Schaghticoke reservation is located on the western bank of the river upstream from Bulls Bridge. Residents and tribe members fish from the shore of the reservation, reportedly for carp and eel in addition to bass and perch (DiLorenzo et al., personal communication, 2004).

1.4.9 Reach 13

Reach 13 starts on the downstream side of the dams at Bulls Bridge and runs 10.9 miles (17.5 km) to the Bleachery Dam at New Milford, CT (Figure 1-3). The Bleachery Dam is virtually submerged as a result of the backwater created by the Shepaug Dam farther downstream. The river meanders more than in the previous reach and, as in Reaches 11 and 12, flows quickly.

1.4.10 Reach 14

Reach 14, from Bleachery Dam to Shepaug Dam, is known as Lake Lillinonah (Figure 1-4). The reach is 12.5 miles (20.2 km) long. Shepaug Dam is approximately 100 ft (30 m) high. The

1.6.3.1 Size of the Angling Population

The 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USFWS, 2001) provides population and economic data for angling for the Commonwealth of Massachusetts as a whole. In 2001, it was estimated that 278,000 state residents over the age of 16 participated in at least 1 day of freshwater fishing. Based on a total Massachusetts population over the age of 16 in 2001 of 4,837,000, the percentage of residents who participated in freshwater fishing was 5.75%. Based on the data in the previous section, the 1991 population for Berkshire County that is over 18 is 104,090. Assuming the same participation in angling as in the rest of the state yields an estimate of 5,985 anglers over the age of 18 in Berkshire County. However, an analysis of SCORP data indicates that residents of Berkshire County are 1.9 times more likely to be anglers than the rest of the Commonwealth. Making this correction yields an estimate of the over-18 angler population in Berkshire County of 11,371.

According to 2001 census data, 17.2% of the population in Berkshire County, roughly 23,000 individuals, is between the ages of 6 and 18. A screening survey of Massachusetts resident anglers 6 to 15 years old (USFWS, 2001) indicated that 29% of children aged 9 to 15 years old participated in angling activities (freshwater and saltwater combined) and 24% of 6 to 8 year olds participated. These percentages are higher than the 8.8% participation of adults over the age of 16 in combined freshwater and saltwater angling. These numbers suggest that on the order of 6,000 Berkshire County youths under age 18 may participate in angling.

Three surveys have been conducted in the last 20 years that have information related to fishing the Housatonic River, including the number of individuals who fish the river. The quality of the information is variable, depending upon the study. In all cases, the reported or estimated fishing activity (including the number of anglers) may be depressed by the presence of fish consumption advisories (Connelly et al., 1992).

CTDEP conducted a creel survey of the Housatonic River in Connecticut from the winter of 1984 through late fall of 1986 (Barry, 1988). The study was funded by General Electric. The survey area was divided into 6 sections that correspond to Reaches 10 to 15 in this report. It was conducted as a roving census with a stratified design. Barry (1988) estimated that 33,022 angler days (95% confidence interval [CI] ±12%) were spent fishing these reaches of the Housatonic

River each year. Fishing in the Trout Management Area (Reach 11) accounted for 12,344 or 27% of these days. Lake Lillinonah (Reach 14) accounted for 12,097 angler days annually while Lake Zoar (Reach 15) accounted for 6,456 angler days each year. Most of the non-Connecticut resident angler days were fly fishermen (1,939 angler days).

ChemRisk was retained by GE to conduct a survey of the Massachusetts portions of the Housatonic River. The survey design included a creel and interview component and an aerial overview (angler counting) component. The survey was conducted from May 26 to October 31, 1992: it did not include spring months, which are more popular for trout fishing, and the ice fishing season. The river was divided into two sections. Section 1 began at the Newell Street Bridge in Pittsfield, and included the Rest of River area from the confluence to Woods Pond Dam, Reaches 5 and 6. Section 2 spanned from below Woods Pond Dam to the Massachusetts/Connecticut border, corresponding to Reaches 7 through 9. The aerial surveys were conducted 1 week day and 1 weekend day each week of the study, and were less than 1 hour in duration. In the creel component of the survey, the clerk was on-site 3 days/week (1 weekend day) between 6 and 8 hours per day. Observations in Reaches 5 and 6 were limited to defined access points, with the clerk spending 2 to 4 hours at an access point. A roving survey design was used in Reaches 7 through 9 (ChemRisk, 1994). A total of 85 anglers were interviewed by the creel clerk.

The results of this limited survey were converted to angler effort (hours) by ChemRisk and reported as follows for summer and fall only. The values in parentheses are the 95% lower and upper confidence limits as reported by ChemRisk (1994):

- Location 1: 3,300 (2,568 to 4,032) angler hours.
- Woods Pond: 926 (609 to 1,242) angler hours.
- Location 2: 3,535 (2,766 to 5,305) angler hours.

MDPH conducted a PCB Exposure Assessment Study of residents in the HRA in 1995/1996 (MDPH, 1997), which is described in Section 1.7. One question in this survey asked whether the individual had ever fished the Housatonic River. Of the 1,529 respondents, 205 (13%) had fished the Housatonic River at least once. The number of respondents who had fished any river was not reported. However, the percentage of the population who reported having fished the Housatonic River in the MDPH survey (13%) is very close to the 11% of the population of

Berkshire County predicted to participate in freshwater fishing activities based on the USFWS and SCORP data described earlier.

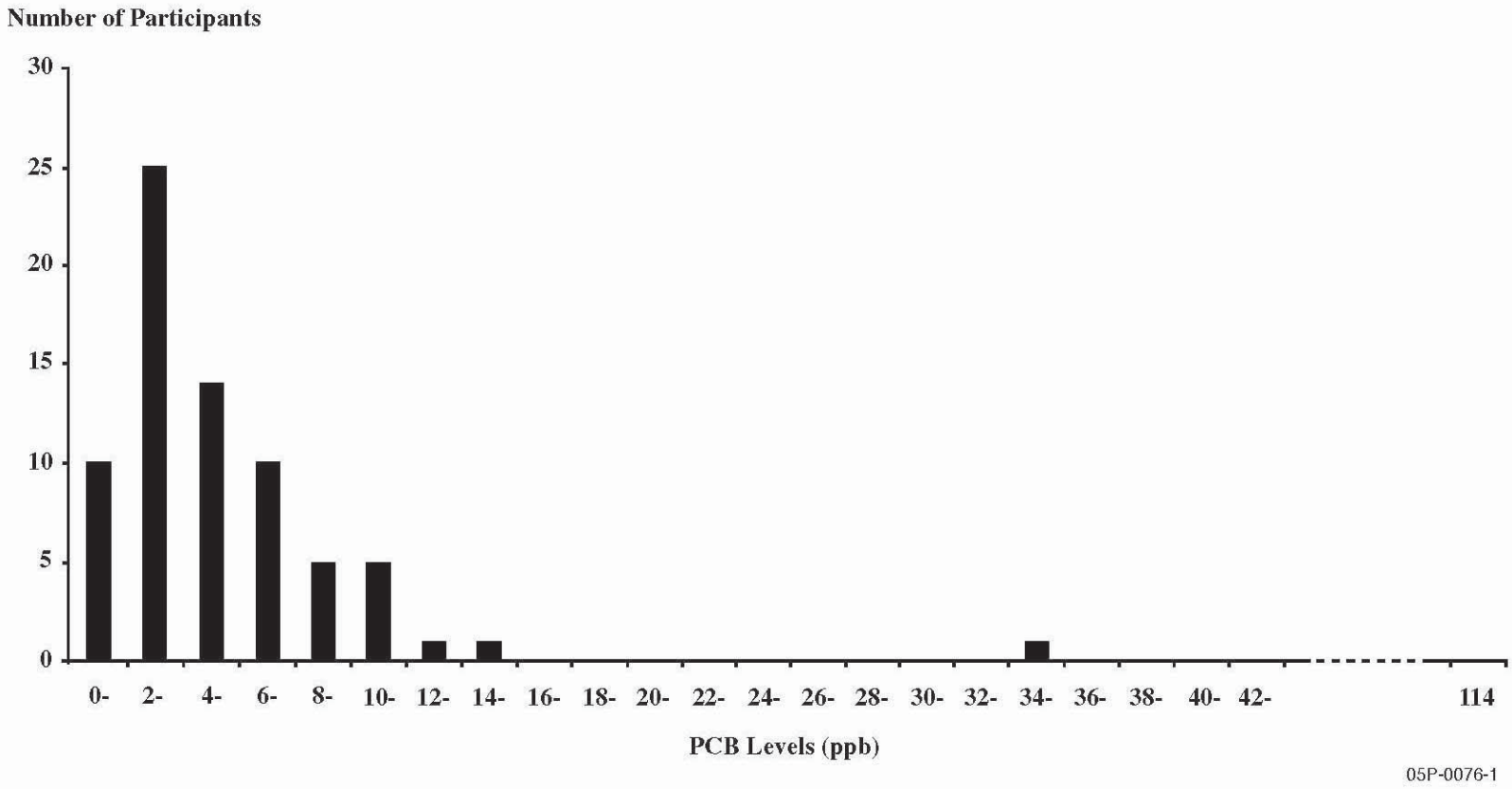
1.6.3.2 Size of Waterfowl Hunting Population

The 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USFWS, 2001) provides population and economic data for migratory bird (waterfowl) hunting for the Commonwealth of Massachusetts as a whole. In 2001, it was estimated that 28,000 state residents over the age of 16 participated in at least 1 day of migratory bird hunting and 64,000 participated in all hunting (big game, small game, migratory bird). Based on a total Massachusetts population over the age of 16 in 2001 of 4,837,000, the percentage of residents who participate in migratory bird hunting and in "all hunting" is 0.58% and 1.3%, respectively. Based on the data in the previous section, the 1991 population for Berkshire County that is over 18 is 104,090. Assuming the same participation in waterfowl hunting as in the rest of the state, yields an estimate of 604 waterfowl hunters and 1,353 "all hunters" over the age of 18. However, an analysis of SCORP data indicates that residents of Berkshire County are 5.8 times more likely to be waterfowl hunters than the rest of the Commonwealth. Making this correction yields an estimate of the over-18 waterfowl hunter population in Berkshire County of 3,503. Based on the data in USFWS (2001), approximately 3% of the population in Massachusetts is between the ages of 16 and 17. Thus, adding in this age group to the waterfowl hunting population increases the estimated population to approximately 3,600 individuals in Berkshire County.

The MDPH PCB Exposure Assessment Study survey asked whether the individual had ever hunted in the HRA (this included waterfowl and upland hunting). Of the 1,529 respondents, 117 (7.6%) had hunted in the Housatonic River at least once. This number is consistent with the 7.5% of the population estimated to participate in hunting based on the USFWS (2001) survey corrected by the SCORP dataset.

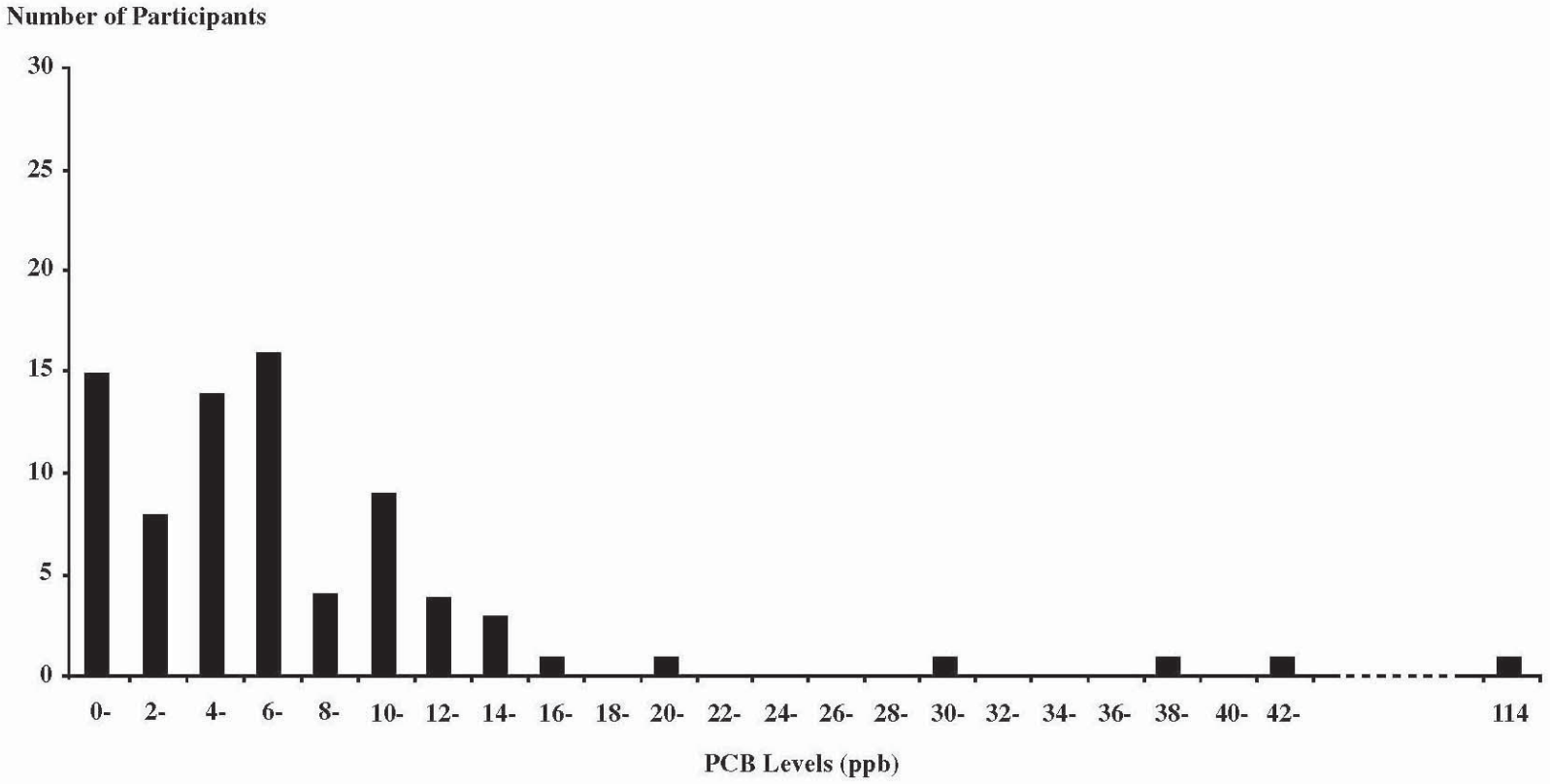
1.6.4 Size of Populations Engaging in Recreational Activities Other Than Hunting and Fishing

Individuals may engage in a variety of recreational activities in the floodplain other than hunting and fishing. These include walking, watching birds or other wildlife, upland hunting, launching



Source: MDPH. 1997. *Housatonic River Area PCB Exposure Assessment Study, Final Report.*

Figure 1-6 Distribution of Serum PCB Levels – Exposure Prevalence Study



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Source: MDPH. 1997. *Housatonic River Area PCB Exposure Assessment Study, Final Report.*

Figure 1-7 Distribution of Serum PCB Levels – Volunteer Study