

Health Consultation

GENERAL ELECTRIC: MOREWOOD LAKE

PITTSFIELD, MASSACHUSETTS

EPA FACILITY ID: MAD002084093

MAY 20, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

Agency for Toxic Substances and Disease Registry

Division of Health Assessment and Consultation

Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation 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.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR

or

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

HEALTH CONSULTATION

GENERAL ELECTRIC: MOREWOOD LAKE

PITTSFIELD, MASSACHUSETTS

EPA FACILITY ID: MAD002084093

Prepared by:
Environmental Toxicology Program
Center for Environmental Health
Massachusetts Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Health Consultation

**GENERAL ELECTRIC:
MOREWOOD LAKE**
Pittsfield, Massachusetts

EPA Facility ID: MAD002084093

Conducted by

Environmental Toxicology Program
Center for Environmental Health
Massachusetts Department of Public Health
Boston, Massachusetts

Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry
Atlanta, Georgia

TABLE OF CONTENTS

BACKGROUND & STATEMENT OF ISSUES	1
RESULTS	3
DISCUSSION	6
ATSDR CHILD HEALTH CONSIDERATIONS.....	9
CONCLUSIONS.....	10
RECOMMENDATIONS	10
PUBLIC HEALTH ACTION PLAN.....	10
FIGURES	17
CERTIFICATION	19
REFERENCES	20
APPENDIX.....	22

LIST OF TABLES

- Table 1** Barrel liquid contaminants detected in barrels removed from Morewood Lake between November 6 and 14, 2003
- Table 2** Sediment contaminants detected in samples collected from Morewood Lake between May 7, 2003 and June 15, 2004
- Table 3** Sediment contaminants detected in samples collected offshore of the beach at Morewood Lake on December 16, 2003
- Table 4** Total PCB compounds detected in fish fillet samples collected from Morewood Lake on September 27, 2004

LIST OF FIGURES

- Figure 1** Morewood Lake, Pittsfield, MA

BACKGROUND & STATEMENT OF ISSUES

This health consultation provides a review and public health interpretation of environmental data collected from Morewood Lake in Pittsfield, Massachusetts. In November 2004, the Massachusetts Department of Environmental Protection (MDEP) submitted fish data to the Massachusetts Department of Public Health (MDPH) and requested that MDPH evaluate the fish data to determine whether a fish consumption advisory was needed. MDEP stated that additional environmental sampling data existed for the lake. In order to thoroughly review the fish data in light of the additional environmental sampling information, MDPH performed a file review on December 14, 2004, at the MDEP Western Regional Office to ensure all collected data would be evaluated. This health consultation will evaluate the result of sediment, surface water, barrel liquid, and fish tissue sampling [for polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), total petroleum hydrocarbons (TPHs), and metals] in the lake. PCBs are the primary contaminant of concern in the fish and environmental media (e.g., sediment) in the Housatonic River. Hence, concern arose as to whether a hydraulic connection might exist between the Housatonic River and Morewood Lake independent of potential sources of contamination (e.g., barrels) in Morewood Lake itself. The MDPH prepared this health consultation as part of its cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR).

Morewood Lake is a waterbody, approximately 17 acres in size, located on the grounds of the Pittsfield Country Club. The lake has a small beach, where club members recreate during the warmer months of the year. Environmental concerns about the lake arose after MDEP was contacted in early 2003 by an individual who reported that, many years ago while scuba diving, he had seen barrels on the bottom of the lake. On May 7 and May 9, 2003, an underwater assessment was performed by Environmental Compliance Services, an environmental consulting company, which confirmed the existence of approximately 40 steel 55-gallon barrels located in several different areas on the bottom of the lake. A majority of the barrels appeared to be intact, and the manner in which they were sealed suggested that they contained a liquid. Sediment samples were collected from areas adjacent to most of the barrels and from the deepest point in the lake and analyzed for VOCs, TPHs, PCBs, and metals (ECS 2003).

Due to the confirmed existence and apparent good condition of the barrels, MDEP ordered their removal and additional environmental sampling. On October 29, 2003, sediment samples were collected approximately 10-feet offshore of the beach that is located on the lake. From November 4 to 14, 2003, Eco-Genesis Corporation, an environmental consulting company, located 36 barrels and removed 28 barrels that were largely intact. Most, if not all of the barrels had structural failures that allowed lake sediment and water to enter. The barrels were sealed underwater and removed, and the liquid inside was analyzed. One barrel contained approximately 6-inches of sediment, which was collected and analyzed. In addition, a sediment sample was collected from underneath each barrel, unless the barrels were located close together, in which a single sample was collected. In order to determine natural background levels, additional surface water and sediment samples were collected on December 16, 2003, from several locations where barrels were not located. The sediment, barrel liquid, and surface water samples were analyzed for VOCs, TPHs, PCBs, and metals (Eco-Genesis Corporation 2004a) (see Tables 1, 2, and 3).

In early 2004, MDEP ordered additional sediment sampling of Morewood Lake and a nearby waterbody unconnected to the lake in order to assist in evaluating the conditions at Morewood Lake. Sediment data collected in 2003 appeared to exhibit elevated TPH concentrations based on a method that is valid as a screening tool but whose results can be influenced by naturally occurring organic material. Morewood Lake is rich in organic matter. On June 15 and 16, 2004, Eco-Genesis Corporation collected 13 sediment samples from Morewood Lake and two sediment samples from the nearby waterbody and analyzed them for extractable petroleum hydrocarbons (EPHs), polycyclic aromatic hydrocarbons (PAHs), and TPHs using a different analytical method (Eco-Genesis Corporation 2004b) (see Table 2).

Based on the environmental data, it did not appear that the PCB contaminants in the sediment originated from the barrels. MDEP was informed by an employee of the Country Club of Pittsfield, on the property of which the lake is located, that during certain high rainfall events, water flows from the nearby Housatonic River into the lake. In 1982, MDPH issued a fish consumption advisory for the Housatonic River due to elevated levels of PCBs in the fish. The

PCBs in the river originated from the General Electric (GE) plant in Pittsfield. MDEP became concerned that fish from the Housatonic River might enter the lake during periods of high rainfall and pose a risk for individuals who fish in the lake. While it is not known to what degree individuals may catch and consume fish from this lake, the lake is located near a rather densely settled area (see Figure 1) and hence, there are opportunities for easy access for recreational or subsistence fish consumption. Largemouth bass and bluegill are popular edible sportfish among anglers. These were plentiful in the Lake, another reason that the Lake might be a desirable spot for fishing. Although private property, MDEP observed evidence of fishing. There is a neighborhood nearby and no fence around the lake. Since the lake contains popular sport fish, it is likely to be an attractive place to catch fish for consumption purposes.

Subsequently, GE agreed to hire an environmental consultant to collect and analyze fish in the lake. On September 27, 2004, Blasland, Bouck & Lee (BBL), a private consulting firm, collected bluegill and largemouth bass from Morewood Lake using a boat-mounted electroshocking unit. Only fish of edible size were collected, defined as greater than 6-inches in length for bluegill and greater than 12-inches in length for largemouth bass. Northeast Analytical, Inc. analyzed the samples for PCBs (BBL 2004a; BBL 2004b) (see Table 4). MDPH received the analytical data for the samples in late November 2004.

RESULTS

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. 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. A description of comparison values is included as an Appendix of this health consultation.

Surface Water

Two surface water samples were collected and analyzed for PCBs, VOCs, TPHs, and metals. No contaminants were detected.

Barrel Liquid

Twenty-eight barrel liquid samples were collected and analyzed for PCBs, VOCs, TPHs, and metals. Twenty contaminants were detected in the barrel water: 11 VOCs, PCBs, TPHs, and seven metals (see Table 1). Most of the VOCs were detected once at very low levels. Two of the contaminants, PCBs and arsenic, were detected at levels above their comparison values. Drinking water comparison values were used for barrel liquid since comparison values for barrel liquid do not exist. This is a conservative approach to screening since the lake is not a drinking water supply and incidental ingestion of barrel liquid during recreational activities is unlikely. PCB was detected in 27 of 28 samples at concentrations ranging from 0.092 micrograms per liter ($\mu\text{g/L}$) to 3.62 $\mu\text{g/L}$, with a mean concentration of 0.46 $\mu\text{g/L}$. All of the concentrations exceeded the PCB cancer risk evaluation guide (CREG) of 0.02 $\mu\text{g/L}$ (see Appendix). Arsenic was detected in 23 of 28 samples at concentrations ranging from 0.0072 $\mu\text{g/L}$ to 0.172 $\mu\text{g/L}$, with a mean concentration of 0.054 $\mu\text{g/L}$ (Eco-Genesis Corporation 2003). Seventeen of the samples exceeded the arsenic CREG of 0.02 $\mu\text{g/L}$. None of the samples exceeded the chronic environmental media evaluation guide (EMEG) for non-cancer health effects for children (i.e., 3 $\mu\text{g/L}$) or adults (i.e., 10 $\mu\text{g/L}$) and none of the samples exceeded the arsenic drinking water standard. Hence, contact with lake water during recreational activities is unlikely to result in unusual cancer or non-cancer health concerns.

Sediment

Lake Sediment: Thirty-seven sediment samples were collected and analyzed for PCBs, VOCs, and metals. Forty sediment samples were collected and analyzed for TPHs. Seven contaminants were detected in the sediment samples, three of which exceeded comparison values for soil, based on direct contact (see Table 2). Again, this is a conservative screening approach, as direct

contact would be expected to be considerably lower for sediment than for residential soil. TPHs were detected in eight samples at concentrations exceeding the DEP S-1 standard for soil. However, as discussed earlier, the method used to analyze for TPHs could be subject to false positives. Additional samples were analyzed using a method deemed to be reliable in distinguishing between organic matter and contaminants. These samples were non-detect for TPHs. Arsenic was detected twice, at 2.87 and 4.69 milligrams per kilogram (mg/kg), which exceeds its CREG of 0.5 mg/kg, which is based on daily exposure over a lifetime. However, these concentrations are below the mean background concentration of 7.3 mg/kg and the chronic EMEGs for non-cancer health effects for children and adults (i.e., 20mg/kg and 200 mg/kg, respectively) and hence are unlikely to result in unusual cancer or non-cancer health concerns. However, in the Discussion section, concerns regarding potential exposure will be further addressed. PCB was detected in five samples (0.440 mg/kg, 0.568 mg/kg, 0.605 mg/kg, 0.608 mg/kg, and 0.970 mg/kg) at levels that exceed its CREG of 0.4 mg/kg (Eco-Genesis Corporation 2004a; Eco-Genesis Corporation 2004b). No PCB detects exceeded the MDEP residential soil standard of 2 ppm, and therefore are not of health concern.

Beach Sediment: Three samples were collected and analyzed for PCBs, VOCs, TPHs, and metals. Four contaminants were detected in the sediment samples, including TPHs, which exceeded its comparison values for soil based on direct contact (see Table 3). However, as discussed above, additional testing using a method that can differentiate between organic matter and contaminants were non-detect for TPHs. Hence, contact with beach sediment does not present health concerns.

Fish Tissue

To help decide whether PCBs detected in fish may need further evaluation, health assessors also use comparison values that were derived using EPA methods (EPA 2000). Comparison values for non-carcinogenic health effects were derived using EPA's reference doses (RfDs) for PCBs [i.e., 2.0E-05 milligrams/kilogram/day (mg/kg/day)]. Comparison values for carcinogenic health effects were derived using EPA's oral slope factor for each compound, assuming an excess lifetime cancer risk of 1:100,000. By using the EPA's methods, it is also assumed that the body

weight of an adult is 70 kilograms (kg) and the consumption rate is 0.0175 kilograms per day (kg/day) (or 4.4 ounces per week) of fish and shellfish for general population. Individual fillet samples (i.e., the edible portions) were evaluated using these health-based comparison values.

The United States Food and Drug Administration (FDA) tolerance level for PCB concentration in fish tissue is 2 mg/kg. Some populations (e.g., pregnant women, women of childbearing age who may become pregnant, nursing mothers, and children under 12 years old) are known to be more sensitive to PCB exposure than the rest of the population. To be protective of these sensitive populations, the MDPH applies an additional safety factor of 2 to the FDA tolerance level. Therefore, the MDPH has historically used a fish tissue PCB concentration of 1 mg/kg as the tolerance level for sensitive populations.

Ten largemouth bass and ten bluegill were collected from Morewood Lake, filleted, and analyzed for PCBs. The mean total PCB concentration found in the fish was 5.6 mg/kg (see Table 4). Specifically, the mean total PCB concentration found in bluegill was 0.93 mg/kg and in largemouth bass was 10.2 mg/kg. The mean total PCB concentration found in the largemouth bass samples exceeded 1 mg/kg. The bluegill and the largemouth bass concentrations both exceeded the EPA's-derived screening value (i.e., 0.02 mg/kg).

Two out of 10 bluegill samples had PCB concentrations above MDPH's tolerance level of 1 mg/kg (1.6 mg/kg and 4.3 mg/kg). Nine out of 10 largemouth bass samples had PCB concentrations above 1 mg/kg, ranging from 1.1 to 30.6 mg/kg.

DISCUSSION

This health consultation has summarized available environmental data. The contaminant and medium of concern at Morewood Lake are PCBs in fish. PCBs are a group of 209 different chemicals that were used up until 1977 as coolants and lubricants in electrical equipment. After 1977, the manufacture of PCBs was no longer permitted in the United States because they were found to accumulate in the environment and cause harmful effects. However, they are still found at many hazardous waste sites and in older electrical equipment (ATSDR 2000). PCBs are

compounds that bioaccumulate in fish. Bioaccumulation is a process where concentrations of contaminants can increase in biota, in this case fish, when exposed to the contaminant in the water, sediment, and food. PCBs may accumulate in individuals who eat fish contaminated with PCBs, thus leading to an increased risk of health effects which include immunological effects, developmental toxicity, liver damage and cancer (MDPH 2000).

Developmental effects (e.g., subtle cognitive deficits) appear to be associated with exposure to PCBs. Developmental effects observed in animal studies have also been seen in a number of human studies. The most susceptible population to these effects seems to be fetuses in utero (MDPH 2000).

To determine whether individuals were, are, or could be exposed to contaminants, such as PCBs, an evaluation was made of environmental and human components that lead to human exposure. The pathway analysis consists of five elements: a source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and an exposed 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., soil) 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 2005). A completed exposure pathway exists when all of the above 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.

The completed pathway that could present an opportunity for exposure at the lake is consumption of fish. Exposure to average PCB levels in fish (5.6 mg/kg) at Morewood Lake assuming the general fish consumption rate of 0.0175 kg/day are above ATSDR's Minimum Risk Level (MRL) and approach the lowest-observed-adverse-effect levels (LOAEL) and may pose non-cancer health effects (e.g., immunological effects) or an increased concern for cancer for both adults and children¹ (see Appendix A for an explanation of MRL and LOAEL). Although some levels of PCBs and arsenic in barrel water and sediment exceeded comparison values, there is no manner in which individuals would come into sufficient contact with the elevated levels of contaminants that would lead to health concerns. The only area of the lake where individuals could potentially have opportunities for exposure to contaminants in sediment is the beach, and the sediment samples that were collected near the beach did not have detectable concentrations of PCBs or arsenic. Water from the lake is not used for drinking. Some water may be ingested during swimming but this would not be sufficient to cause health concerns as no contaminants were detected in surface water samples.

The source of the PCBs in the lake appears to be the Housatonic River. The highest concentrations of PCBs in sediment were located in the northeast corner of the lake, where lake

¹ Fish Child Non-Cancer Exposure Estimate

Average PCB Fish Concentration = 5.6 milligrams/kilogram

Assumed Fish Consumption Rate for General Population = 0.0175 kilograms/day EPA (2000)

Assumed Child Body Weight = 35 kilograms

PCB MRL = 2.0E-05 milligrams/kilogram/day

PCB LOAEL = 5.0E-03 milligrams/kilogram/day

Child Exposure Dose = (5.6 milligrams/kilogram * 0.0175 kilograms/day) / 35 kilograms = 2.8E-03 milligrams/kilogram/day

Fish Child Cancer Risk Estimate

PCB Oral Slope Factor = 2 (milligrams/kilogram/day)⁻¹

Cancer Risk = 2 (milligrams/kilogram/day)⁻¹ * 2.8E-03 milligrams/kilogram/day = 5.6E-03

Fish Adult Non-Cancer Exposure Estimate

Average PCB Fish Concentration = 5.6 milligrams/kilogram

Assumed Fish Consumption Rate = 0.0175 kilograms/day EPA (2000)

Adult Body Weight = 70 kilograms

Adult Exposure Dose = (5.6 milligrams/kilogram * 0.0175 kilograms/day) / 70 kilograms = 1.4E-03 milligrams/kilogram/day

PCB MRL = 2.0E-05 milligrams/kilogram/day

PCB LOAEL = 5.0E-03 milligrams/kilogram/day

Fish Adult Cancer Risk Estimate

PCB Oral Slope Factor = 2 (milligrams/kilogram/day)⁻¹

Cancer Risk = 2 (milligrams/kilogram/day)⁻¹ * 1.4E-02 milligrams/kilogram/day = 2.8E-03

water normally drains into a stream that leads to the Housatonic River. However, the northeast corner is also the location where river water enters the lake during periods of high rainfall. However, the location of the highest levels of PCBs in the sediment, the occasional backflow of water from the river into the lake, and the high levels of PCBs in fish suggest that the primary source of the PCBs in the fish and the lake is the Housatonic River, as fish with elevated PCB levels enter the lake via the intermittent stream and then become trapped as the stream recedes.

Because of widespread concerns regarding contamination in fish, methylmercury in particular, MDPH issued a statewide fish consumption advisory in 1994. This advisory was updated in 2001. While the advisory was first issued primarily due to concerns regarding mercury, it applies to all fish consumption by pregnant women, women of childbearing age who may become pregnant, nursing mothers, and children younger than 12 years old and was primarily to address health concerns related to developmental toxicity, fetal brain development in particular. This action may also have provided an additional measure of protection for cases such as Morewood Lake where fish have been found with elevated PCB concentrations.

ATSDR CHILD HEALTH CONSIDERATIONS

ATSDR and MDPH recognize that the unique vulnerabilities of infants and children demand special emphasis when evaluating opportunities for exposures to environmental contaminants. Children are at greater risk than adults from certain kinds of exposure to hazardous substances. They are more likely to be exposed for several reasons. Because of their small stature, they may breathe dust, soil, and heavy vapors close to the ground. Children are also smaller, resulting in higher doses of chemical 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. PCB concentrations in fish from Morewood Lake pose a health concern for children.

CONCLUSIONS

PCBs were detected at levels of health concern in fish samples. Based upon the data evaluated, a fish consumption advisory for PCBs should be issued for Morewood Lake. Due to the intermittent connection with the Housatonic River and the levels of PCBs detected in the fish, the advisory should state that the general public, including sensitive populations, should refrain from consuming any fish from the lake.

ATSDR requires that one of five conclusion categories be used to summarize findings of health consultation. 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. Based on ATSDR criteria, ATSDR would classify Morewood Lake as a “Public Health Hazard” based on the levels of PCBs in fish tissue collected from the lake.

RECOMMENDATIONS

A fish consumption advisory for PCBs should be issued for Morewood Lake. The general public, including sensitive populations (children younger than 12 years, pregnant women, nursing mothers, and women of childbearing age who may become pregnant) should not eat any fish from this water body.

PUBLIC HEALTH ACTION PLAN

1. MDPH will issue a fish advisory for Morewood Lake.
2. MDPH will coordinate with local health officials and others to provide local notification to the public and the press about the advisory including posting signs at the lake.

PREPARER OF HEALTH CONSULTATION

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

Table 1: Barrel liquid contaminants detected in barrels removed from Morewood Lake between November 6 and 14, 2003¹.

Compound	Detects/ Samples	Min (µg/L)	Mean ² (µg/L)	Max (µg/L)	Comparison Values ³ (µg/L)
n-butylbenzene	1/28	ND	NC	1.87	NA
sec-butylbenzene	1/28	ND	NC	1.36	NA
tert-butylbenzene	1/28	ND	NC	1.11	NA
p-Isopropyltoluene	1/28	ND	NC	1.67	NA
Methyl tertiary butyl ether	4/28	ND	NC	7.38	Int. EMEG ⁴ (child)-3,000 Int. EMEG (adult)-10,000 ORSG-70
Toluene	4/28	ND	NC	30	Int. EMEG (child)-200 Int. EMEG (adult)-700 MMCL-100
1,2,3-trichlorobenzene	1/28	ND	NC	3.55	NA
1,2,4-trichlorobenzene	1/28	ND	NC	2.59	RMEG ⁵ (child)-100 RMEG (adult)-400 MMCL-70
1,2,4-trimethylbenzene	4/28	ND	NC	1.96	RBC-12
1,3,5-trimethylbenzene	1/28	ND	NC	1	RBC-12
m,p-Xylene	1/28	ND	NC	1.58	Int. EMEG (child)-2,000 Int. EMEG (adult)-7,000
PCBs	27/28	ND	NC	3.62	CREG-0.02 MMCL-0.5
TPH	5/28	ND	NC	3.68	ORSG-200
Arsenic	23/28	ND	NC	0.172	CREG-0.02 Chronic EMEG ⁶ (child)-3 Chronic EMEG (adult)-10 MMCL-10
Barium	26/28	ND	NC	2.25	RMEG (child)-700 RMEG (adult)-2,000 MMCL-2,000
Cadmium	2/28	ND	NC	0.157	Chronic EMEG (child)-2 Chronic EMEG (adult)-7 MMCL-5

¹ No contaminants were detected in surface water.

² Mean values could not be calculated because not all detection limits were available.

³ Drinking water comparison values were used for barrel liquid since comparison values for barrel liquid do not exist.

⁴ Intermediate EMEGs correspond to exposures lasting longer than 14 days to less than one year.

⁵ RMEG values assume chronic exposure.

⁶ Chronic EMEGs correspond to exposures lasting one year or longer.

Compound	Detects/ Samples	Min (µg/L)	Mean² (µg/L)	Max (µg/L)	Comparison Values³ (µg/L)
Chromium ⁷	24/28	ND	NC	0.503	RMEG (child)-30 RMEG (adult)-100 MMCL-100
Lead	19/28	ND	NC	2.89	MDEP Action Level-15
Mercury	14/28	ND	NC	0.00661	MMCL-2
Silver	1/28	ND	NC	0.0056	RMEG (child)-50 RMEG (adult)-200

µg/L- micrograms per liter

ND- Not Detected

NC- Not Calculable

NA- Not Available

Int. EMEG- Intermediate Environmental Media Evaluation Guide

ORSG- Massachusetts Department of Environmental Protection Office of Research and Standard
Guideline

RMEG- Reference Dose Media Evaluation Guide

MMCL- Massachusetts Maximum Contaminant Level

RBC- Risk-based Concentrations

PCB- Polychlorinated Biphenyls

CREG- Cancer Risk Evaluation Guide

TPH- Total Petroleum Hydrocarbons

Chronic EMEG- Chronic Environmental Media Evaluation Guide

MDEP Action Level- Massachusetts Department of Environmental Protection Action Level

⁷ Chromium comparison values are for Chromium VI.

Table 2: Sediment contaminants detected in samples collected from Morewood Lake between May 7, 2003 and June 16, 2004.

Compound	Detects/ Samples	Min (mg/kg)	Mean ⁸ (mg/kg)	Max (mg/kg)	Comparison Values ² (mg/kg)	Background Level (mg/kg)
TPH	9/53	ND	NC	1,640	MDEP S-1 Soil Standard-200	NA
PCB	27/40	ND	NC	0.97	CREG-0.4 MDEP S-1 Soil Standard-2	NA
Arsenic	2/40	ND	NC	4.69	CREG-0.5 Chronic EMEG ³ (child)-20 Chronic EMEG (adult)-200 MDEP S-1 Soil Standard-30	Range: <0.1- 73 Mean: 7.4
Barium	40/40	1.42	12.8	43.3	RMEG ⁴ (child)- 4,000 RMEG (adult)- 50,000 MDEP S-1 Soil Standard-1,000	Range: 10- 1,500 Mean: 420
Chromium ⁵	32/40	ND	NC	32.3	RMEG (child)- 200 RMEG (adult)- 2000 MDEP S-1 Soil Standard-1,000	Range: 1- 1,000 Mean: 52
Lead	23/40	ND	NC	174	EPA-300	Range: <10- 300 Mean: 17
Mercury	2/40	ND	NC	0.792	MDEP S-1 Soil Standard-20	Range: 0.01- 3.4 Mean: 0.12

mg/kg- milligram per kilogram; TPH- Total Petroleum Hydrocarbons; ND- Not Detected; NC- Not Calculable; MDEP- Massachusetts Department of Environmental Protection; NA- Not Available; PCB- Polychlorinated Biphenyls; CREG- Cancer Risk Evaluation Guide; Chronic EMEG- Chronic Environmental Media Evaluation Guide; <- Less Than; RMEG- Reference Dose Media Evaluation Guide; EPA- United States Environmental Protection Agency.

¹ Mean values could not be calculated for most contaminants because not all detection limits were available

² Soil comparison values were used for sediment, as sediment comparison values were not available.

³Chronic EMEGs correspond to exposures lasting one year or longer.

⁴ RMEG values assume chronic exposure.

⁵ Chromium comparison values are for Chromium VI

Table 3: Sediment contaminants detected in samples collected offshore of the beach at Morewood Lake on December 16, 2003.

Compound	Detects/ Samples	Min (mg/kg)	Mean (mg/kg)	Max (mg/kg)	Comparison Values ¹ (mg/kg)	Background Level (mg/kg)
TPH	3/3	305	348	409	MDEP S-1 Soil Standard-200	NA
Barium	3/3	18.2	25	35.3	RMEG ² (child)- 4,000 RMEG (adult)- 50,000 MDEP S-1 Soil Standard-1,000	Range: 10- 1,500 Mean: 420
Chromium ³	3/3	2.78	4	4.74	RMEG (child)- 200 RMEG (adult)- 2000 MDEP S-1 Soil Standard-1,000	Range: 1- 1,000 Mean: 52
Lead	3/3	3.84	4.61	5.55	EPA-300	Range: <10- 300 Mean: 17

mg/kg- milligram per kilogram

TPH- Total Petroleum Hydrocarbons

MDEP- Massachusetts Department of Environmental Protection

NA- Not Available

RMEG- Reference Dose Media Evaluation Guide

EPA- United States Environmental Protection Agency

<- Less Than

¹ Soil comparison values were used for sediment, as sediment comparison values were not available.

² RMEG values assume chronic exposure.

³ Chromium comparison values are for Chromium VI

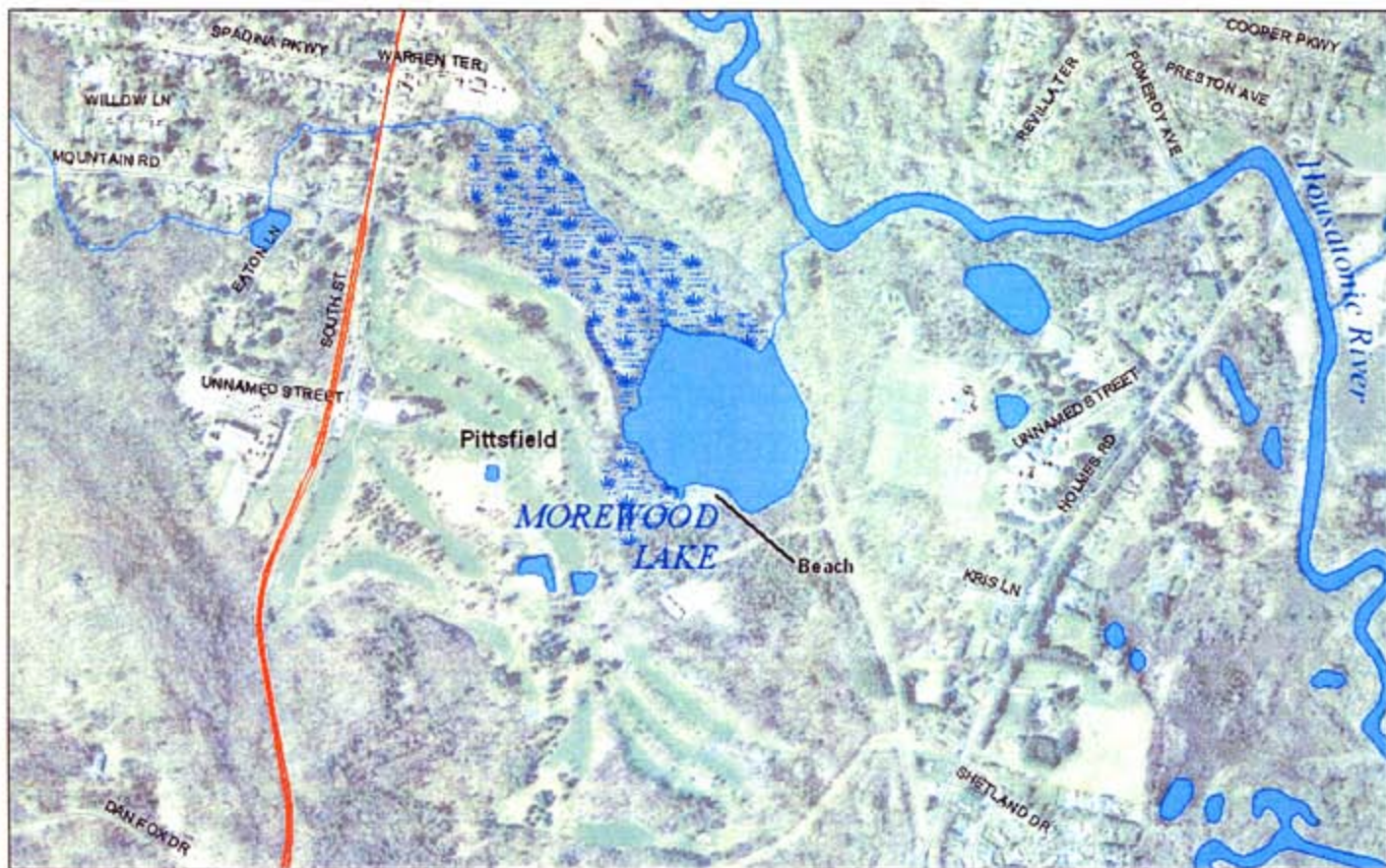
Table 4: Total PCBs detected in fish fillet samples collected from Morewood Lake on September 27, 2004.

Species	Length (cm) ¹	Weight (g)	PCB Concentration (mg/kg)	Species Minimum (mg/kg)	Species Mean (mg/kg)	Species Maximum (mg/kg)
Bluegill	18.8	153	4.3			
Bluegill	16	87	0.32			
Bluegill	20.4	209	1.6			
Bluegill	19.3	147	0.36			
Bluegill	17.6	115	0.44			
Bluegill	16.8	99	0.73			
Bluegill	18.1	120	0.51			
Bluegill	18.6	132	0.57			
Bluegill	17.2	98	0.46			
Bluegill	17.1	103	ND (0.055)			
				ND (0.055)	0.93	4.3
Largemouth Bass	35	731	19.1			
Largemouth Bass	39.2	955	5.2			
Largemouth Bass	44.4	1638	1.9			
Largemouth Bass	38.2	1084	19.2			
Largemouth Bass	38.6	956	6.5			
Largemouth Bass	39.8	1361	30.6			
Largemouth Bass	42.7	1351	2			
Largemouth Bass	40.5	1175	16			
Largemouth Bass	31.3	518	0.52			
Largemouth Bass	33.1	590	1.1			
				0.52	10.2	30.6
Total for Lake					5.6	

PCBs- Polychlorinated Biphenyls
 cm- Centimeter
 g- Grams
 mg/kg- Milligram per kilogram
 ND- Not Detected

¹ 2.54 centimeters = 1 inch

FIGURE 1
MOREWOOD LAKE, PITTSFIELD, MA



Legend

Blue line	Water	Red line	Highway
Blue area	Water	Black line	Boundary
Blue area	Water	Black line	Boundary
Blue area	Water	Black line	Boundary
Blue area	Water	Black line	Boundary
Blue area	Water	Black line	Boundary
Blue area	Water	Black line	Boundary

Figure 1. Morewood Lake, Pittsfield, MA



CERTIFICATION

The Health Consultation for Morewood Lake, Pittsfield, Massachusetts 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 this health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

Tammie McRae
Technical Project Officer
Division of Health Assessment and Consultation (DHAC)
ATSDR

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

Cooperative Agreement Team Leader
CAT, DHAC, ATSDR

REFERENCES

ATSDR (2005). Public Health Assessment Guidance Manual (Update). U.S. Agency for Toxic Substances and Disease Registry, Atlanta, GA.

ATSDR (2000). Toxicological profile for polychlorinated biphenyls (PCBs). U.S. Agency for Toxic Substances and Disease Registry, Atlanta, GA.

BBL (2004a). Letter to Anna Symington (MA DEP) from Stewart D. Messur (Blasland, Bouck, & Lee, Inc.) on October 22, 2004. RE: Morewood Lake Fish Sampling Results.

BBL (2004b). Letter to Anna Symington (MA DEP) from Stewart D. Messur (Blasland, Bouck, & Lee, Inc.) on November 8, 2004. RE: Morewood Lake Fish Sampling Report.

Eco-Genesis Corporation (2003). Morewood Lake Barrel Removal and Disposal, MA DEP Immediate Response Action Status Report – 120 day. Eco-Genesis Corporation. December 30, 2003.

Eco-Genesis Corporation (2004a). Morewood Lake Barrel Removal and Disposal, Country Club of Pittsfield, Interim IRA Status Report. Eco-Genesis Corporation. March 19, 2004.

Eco-Genesis Corporation (2004b). Class A-1 Response Action Outcome Statement. Eco-Genesis Corporation. July 28, 2004.

ECS (2003). Imminent Hazard Evaluation, Morewood Lake, Pittsfield, MA. Environmental Compliance Services. June, 2003.

EPA (2000). Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Vol 1. EPA 823-R-95-007, Washington, DC.

KERA Environmental LLC (2004). Memo to Philip G. Clark, PE, LSP of Pittsfield, MA from Kate Ewald, PhD, KERA Environmental LLC, Worthington, MA on March 18, 2004. Re: Morewood Lake Barrel Removal Project, Pittsfield (RTN # 1-14974) Risk Assessment Status Report.

MDPH (2000). Meeting Summary of the Expert Panel on the Health Effects of Polychlorinated Biphenyls (PCBs) Massachusetts Department of Public Health , Boston, MA.

APPENDIX

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 (EMEG), reference dose media evaluation guides (RMEG), cancer risk evaluation guides (CREG), and maximum contaminant levels for drinking water (MCL). These comparison values have been scientifically peer reviewed or were derived from 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 non-cancer health effects. CREG values provide information on the potential for carcinogenic effects. CREGs are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) persons exposed during their lifetime (70 years). ATSDR's CREGs are calculated from EPA's cancer slope factors for oral exposures or unit risk values for inhalation exposures. These values are based on EPA evaluations and assumptions about hypothetical cancer risks at low levels of exposure. For chemicals that do not have these comparison 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 non-cancer health effects might be possible. Conversely, if the concentration is less than the EMEG, it is unlikely that exposure would result in non-cancer 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.

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 non-cancer 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.