Health Consultation

OMC/WAUKEGAN HARBOR:
WAUKEGAN HARBOR UNIT

WAUKEGAN, LAKE COUNTY, ILLINOIS

CERCLIS NO: ILD000802827

Prepared by
Illinois Department of Public Health

NOVEMBER 29, 2012

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

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Summary

The Illinois Department of Public Health (IDPH) and the Agency for Toxic Substances and Disease Registry (ATSDR) want to ensure that the Waukegan community has the best information possible to safeguard its health regarding Waukegan Harbor.

In 2004, ATSDR released a health consultation prepared by IDPH for the Outboard Marine Corporation (OMC)/Waukegan Harbor site. In 2007, the U.S. Environmental Protection Agency (USEPA) released the Second Five Year Review of the OMC/Waukegan Harbor Superfund site. For this current health consultation, IDPH evaluated the changes that have occurred at the site since the release of the 2004 health consultation.

IDPH concludes that PCB contamination in some fish from Waukegan Harbor and Lake Michigan could harm people's health. Future residential development of harbor property could result in increasing the potential human exposure to PCBs in fish, unless PCB concentrations in fish in the harbor decrease. Following the recommendations for Lake Michigan in the Illinois Fish Advisory will reduce the risk of adverse health effects for those persons who eat fish caught in Waukegan Harbor. The contaminated sediments of Waukegan Harbor pose no public health hazard because they are covered by 14 to 20 feet of water, and direct human exposure would not occur. While contamination from OMC Waukegan Harbor is not the only source of PCB contamination for fish in Lake Michigan, data suggest the PCBs located in the sediment could be affecting the benthic organisms and bioaccumulating in the fish living in the harbor waters (USEPA 2010.

IDPH, as part of the Illinois Fish Contaminant Monitoring Program, will annually evaluate fish samples data from Waukegan Harbor and will adjust fish advisories accordingly.

Purpose

On September 26, 2007, the U.S. Environmental Protection Agency (USEPA) released the Second Five Year Review of the Outboard Marine Corporation (OMC)/Waukegan Harbor site. In 2004, the Agency for Toxic Substances and Disease Registry (ATSDR) released a health consultation prepared by the Illinois Department of Public Health (IDPH) for the OMC/Waukegan Harbor site. In this document, IDPH evaluates the changes that have occurred at the site since the release of the 2004 health consultation.

Background and Statement of Issues

The OMC/Waukegan Harbor NPL site (Figures 1 and 2) contains four operational units designated by the U.S. Environmental Protection Agency (USEPA): Waukegan Harbor, the Waukegan Manufactured Gas and Coke Plant, the polychlorinated biphenyl (PCB) disposal cells, and OMC Plant 2. This health consultation evaluates only Waukegan Harbor. Separate health consultations discuss the other parts of the site, one for the Waukegan Manufactured Gas and Coke Plant, and a future document for OMC Plant 2 and the PCB containment cells. Waukegan

Harbor is about 37 acres in size, with a water depth generally ranging from 14 to 20 feet (USEPA 2007b).

On April 20, 1989, ATSDR released a Preliminary Public Health Assessment for the OMC/Waukegan Harbor site (IDPH 1989). On September 30, 1994, ATSDR published a Public Health Assessment (PHA) for the site (IDPH 1994). IDPH prepared both documents under a cooperative agreement with ATSDR. In the PHA, IDPH concluded that the site was a public health hazard because people had probably been exposed to PCBs in fish at concentrations that may result in adverse health effects. The consumption of contaminated fish was the only significant exposure pathway for humans.

On August 7, 1998, ATSDR released a Site Review and Update (SRU) prepared by IDPH for the OMC/Waukegan Harbor site (IDPH 1998). This document concluded that although the site had been dredged, exposure to some fish from Waukegan Harbor and Lake Michigan remained a public health hazard.

On April 24, 2004, ATSDR released a health consultation prepared by IDPH for the Waukegan Harbor portion of the OMC/Waukegan Harbor site (IDPH 2004). This document made three recommendations:

- Monitoring of PCB levels in fish in and around Waukegan Harbor should continue. The state of Illinois will continue to sample and monitor fish in the Waukegan Harbor as part of the fish advisory program separate from the overall Lake Michigan Fish Advisory.

- People eating fish from Lake Michigan should follow the fish advisories of the state of Illinois for the maximum amounts, species, and sizes to be consumed, as well as the method of preparation. A copy of the Illinois Fishing Information guide can be obtained by calling the Illinois Department of Natural Resources at 217-782-6424.

- USEPA should continue to evaluate the adequacy of the initial sediment cleanup of Waukegan Harbor.

Current land use around Waukegan Harbor is commercial and industrial. The harbor serves commercial shipping, including delivery of raw materials and cement, and barge and tug mooring. About 90 to 100 commercial ships per year use Waukegan Harbor. Waukegan Harbor is a designated safe harbor for ships in case of severe weather (USEPA 2007b). The harbor also provides access to marinas and maintenance facilities for recreational boating. A public beach is east of the site. As noted in the 1994 PHA and the 1998 SRU, IDPH staff members have observed people fishing in Waukegan Harbor on several occasions. Charter boats for anglers also operate out of the harbor.

Currently, the nearest homes are about half a mile west of the site, on a bluff. By road, the homes are about twice that distance from the harbor. The 2000 U.S. Census reported that 10,492 people lived within 1 mile of the site, with Hispanics comprising 47% of the total and African Americans 19%. About 44% of the residents within 1 mile of Waukegan Harbor are characterized as having low income (USEPA 2007b).

The City of Waukegan bought the 36-acre Waukegan Manufactured Gas and Coke Plant property, which borders Waukegan Harbor. The city has rezoned that property for high-density residential housing. The city also bought the OMC Plant 2 property. The city plans to redevelop the harbor for mixed use, including condominiums, stores, and recreational boating facilities (USEPA 2010, USEPA 2007b, City of Waukegan 2006).

Proposed plans for the future development of properties around Waukegan Harbor include the following (City of Waukegan 2006):

- Establish a permanent, continuous parkland edge to the lakefront.
- Relocate industry along the harbor to an area near Interstate 94.
- Develop a marina village with housing for boat owners.
- Build 2,500 residential units.
- Build 100,000 square feet of retail services.
- Build a new hotel with meeting rooms.
- Construct a modern train station.
- Link downtown and lakefront property in a pedestrian-friendly manner.
- Develop boat storage facilities.

The city initially projected that residential development near the harbor would begin within five years, but the sites must be cleaned up before construction may begin.

The Great Lakes Legacy Act, which was signed into law on November 27, 2002, made money available for the cleanup of contaminated sediments in the 31 "areas of concern" designated by the USEPA. Waukegan Harbor is one of those areas of concern (USEPA 2004), and USEPA entered negotiations with the city to use Great Lakes Legacy Act funds to expedite the cleanup of the remaining contamination in Waukegan Harbor. On February 27, 2007, the city submitted its initial proposal to remove 250,000 cubic yards of PCB-contaminated sediment from the harbor. The estimated total project cost was $36 million, of which $23.4 million would come from Great Lakes Legacy Act Funds. On July 27, 2007, USEPA received a plan from the city, which insisted that the city would pay its share of the cost only if the state contributed its $4 million share toward the project, and USEPA would ban commercial ship traffic from the harbor (USEPA 2007a).

On August 21, 2007, USEPA (2007a) replied in writing that the two contingencies were unnecessary and had nothing to do with restoration. The future of ship traffic in the harbor was not their decision. USEPA expressed disappointment and said that the cleanup would revert back to the Superfund Program, which would slow the cleanup of the harbor.

On September 6, 2007, the city filed suit in the U.S. District Court of Chicago against businesses that use Waukegan Harbor. The city alleged that the initial harbor cleanup left high concentrations of PCBs near the harbor walls, and that prop wash from ship traffic disturbed the remaining sediment contamination, redistributing the PCBs throughout the harbor. Harbor businesses named in the suit included Bombardier Motor Corporation of America, Lafarge North America, Inc., Lafarge Building Materials, Inc., Larsen Marine Services, Inc., National Gypsum Co., and St. Mary's Cement, Inc. Also named in the suit were the Elgin Joliet, and Eastern Railway Co., which delivers materials to the harbor, and the Waukegan Port District, which owns the facility. The suit sought to have the named businesses pay for any further cleanup of the harbor (Moran 2007).

On September 26, 2007, USEPA released its third Five Year Review of the OMC site (USEPA 2007b). This document concluded that because of the remaining contamination in Waukegan Harbor, some fish from the harbor continue to have PCB concentrations that may pose a health hazard to people who eat the fish. The document recommended that USEPA select a protective cleanup level for Waukegan Harbor sediments, and then choose and implement a cleanup remedy to achieve that protective cleanup level.

In October 2008, after evaluating several cleanup options, USEPA (2008a) issued a recommended cleanup plan for the harbor. This plan includes the removal of contaminated sediments with 1 ppm or more of PCBs. The remaining harbor sediments would then be covered with a thin layer of clean sand to dilute the remaining PCBs. This cleanup method will preserve the shipping channel in Waukegan Harbor. Because the shipping channel is federally-authorized, USEPA likely would be prevented from conducting any cleanup option that would interfere with the shipping channel. The dredged sediments would be pumped onto the OMC Plant 2 site, dewatered, and covered with clean soil. Water removed from the sediments would be filtered and returned to the harbor. Contaminated sediments near the sheet metal harbor walls, however, cannot be removed without risking the collapse of the harbor walls. Consequently, these sediments will be capped with a layer of rocks. USEPA estimates that once completed, this cleanup plan will result in acceptable PCB concentrations in Waukegan Harbor fish within five years. The next step was to produce design plans which enabled the cleanup work to be placed out for bid; the cost for cleaning up the harbor is estimated at about $43 million. The work assignment to begin the harbor cleanup was issued to the contractor in June 2011. Contracting work began in fall 2011 which will enable harbor dredging to begin in summer 2012.

Discussion

Chemicals of Interest

IDPH compared the maximum level of each chemical detected during environmental sampling with appropriate screening comparison values. Comparison values are used to select chemicals for further evaluation for both carcinogenic and noncarcinogenic health effects. Chemicals that exceeded comparison values were selected for further evaluation. A description of the comparison values can be found in Attachment 1.

Comparison values do not represent thresholds of toxicity. Exposure to chemicals that exceed comparison values does not necessarily cause adverse health effects. Comparison values are used to determine which contaminants need further evaluation. Even though a chemical may be found at a level greater than its comparison values it can only affect human health if a person is exposed to a sufficient amount. The amount of the contaminant, the duration and route of exposure, and the health status of exposed individuals are important factors in determining the potential for adverse health effects. PCBs are the chemicals of interest at this site. PCBs are found in harbor sediments and in Waukegan Harbor fish (Table 1).

Exposure Pathways

A hazardous chemical can affect people only if they come into contact with the chemical through an exposure pathway at a level high enough to cause adverse health effects. Exposure pathways must be complete for exposure to occur. Exposure pathways have five parts, and all five parts must be present before a person is considered to be exposed.

- a source of exposure (where the hazardous substance originates or where it is released),
- an environmental medium (such as air, soil or water) in which the hazardous substance exists and may be transported to a place where a person can come into contact with it,
- a route of exposure (the way in which a person is exposed). For example, a person can be exposed by breathing air that contains a hazardous substance,
- a point of exposure (the location where a person can come into contact with a hazardous substance), and
- a receptor population (a person or persons exposed to a hazardous substance)

A pathway is considered complete if all the components are present and people are currently being exposed, were exposed in the past, or could be exposed in the future. Sometimes there are missing components or insufficient data to decide whether a pathway is complete. If the missing or unidentified part(s) might be present, could have been present in the past, or could be present in the future, it is considered a potential exposure pathway. If part of a pathway has never been present, and never will be, the pathway is incomplete and is not considered further.

Sediments

Because contaminated sediments of Waukegan Harbor are covered from about 14 to 20 feet of water, direct human exposure is not expected.

Fish

Eating fish contaminated with PCBs is a completed exposure pathway and is the only completed exposure pathway at the Waukegan Harbor site. While fish can accumulate PCBs through exposure in the water column, the contaminated sediments of Waukegan Harbor are the primary

source. Fish and other organisms can accumulate PCBs in several ways (U.S. Army Corps of Engineers, 1986):

- Absorption from the water column,
- Contact with bottom sediments,
- Accumulation of suspended sediments on gill filaments,
- Or eating contaminated food.

Because PCBs are soluble in fat, relatively insoluble in water, and not easily broken down by the body, PCBs tend to accumulate in animals. If an organism absorbs a chemical faster than the chemical is eliminated from its body, it will accumulate the chemical in a process called bioaccumulation. In the food chain, animals eat large quantities of their prey or plants, and for chemicals that bioaccumulate, this can cause higher concentrations in organisms at successive levels of the food chain. For example, the zooplankton that eat phytoplankton have higher concentrations of bioaccumulating chemicals than their food. The fish that eat zooplankton have even higher concentrations, and the large fish that eat smaller fish have still higher concentrations. This phenomenon is called biomagnification. PCBs exhibit bioaccumulation and biomagnification.

Many factors influence the uptake and bioaccumulation of PCBs in fish and other organisms. Fish living permanently in a contaminated area could have higher PCB concentrations than fish in uncontaminated areas. Bottom feeders, which have frequent contact with sediment and incidental consumption of sediment, accumulate PCBs readily. Older and larger fish would be expected to have higher concentrations of PCBs. Fast-growing species should have lower PCB concentrations. Fish with more fat should accumulate higher PCB concentrations. Fish that live in cold water have a slower metabolism and cannot eliminate PCBs as rapidly as fish that live in warmer waters, so they tend to accumulate higher levels of PCBs (Harris 1982).

Persons Potentially Exposed to PCBs in Fish

Currently, nearby residents must travel at least 0.6 miles by road to fish in Waukegan Harbor. However, the city has rezoned the Waukegan Manufactured Gas and Coke Plant property for residential housing. Completion of this and other proposed housing around Waukegan Harbor could bring a large population of people to the immediate vicinity, which could increase the number of anglers and the frequency of angling in and near Waukegan Harbor.

A study of anglers in Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin who ate fish from the Great Lakes found that, overall, many of the anglers (49%), women (61%), and minorities (78%) who ate Great Lakes fish were unaware of fish advisories. This study also found that not many of the people who were aware of fish advisories followed the recommendations to reduce exposure to contaminants in fish (Tilden et al. 1997). People who do not follow the Illinois Fish Advisory guidelines will likely increase their exposure to PCBs and other contaminants.

Currently, 68% of the persons living within 1 mile of Waukegan Harbor belong to a minority group, and 44% of the persons living within 1 mile have low-income status (USEPA 2007b). Minority populations are often less aware of fish advisories, and people with low incomes are more likely to depend on fish for subsistence. Unless PCB levels in fish decrease, people who do not follow the Illinois Fish Advisory recommendations could be exposed to elevated levels of PCBs , see Appendix I (Great Lakes Sport Fish Advisory Task Force 1993).

Toxicological Evaluation

Polychlorinated Biphenyls

Eating contaminated fish and not following the Illinois Fish Advisory recommendations may expose anglers and their families to elevated levels of PCBs. These chemicals cause liver cancer in rats, and USEPA considers PCBs to be probable human carcinogens. Cancers caused by chemical exposure often do not appear until 10 years or more after exposure begins; consequently, cancers could still arise from past exposures. Most cancers caused by exposure to chemicals cannot be distinguished from cancers that occur from other causes, though there are a few like mesothelioma.

IDPH estimated cancer rates using USEPA cancer slope factors, USEPA fish consumption rates (USEPA 1997), and the average PCB concentrations in various Waukegan Harbor fish. IDPH also assumed that people would eat fish from Waukegan Harbor for 30 years. Using these assumptions, eating fish from Waukegan Harbor could pose a low increased cancer risk for recreational anglers and a moderate increased cancer risk for subsistence fish eaters (Table 2). Cancer risks could be greatly reduced by following the Illinois Fish Advisory recommendations. These have been updated and can be found at:

http://www.idph.state.il.us/envhealth/factsheets/fishadv.htm

IDPH examined the risk of non-cancerous effects using the ATSDR minimal risk level (MRL), the USEPA fish consumption rates (USEPA 1977), and the average PCB concentrations in various Waukegan Harbor fish. Using these assumptions, all the exposure scenarios in Table 2 would exceed the chronic oral MRL for PCBs. Subtle neurological effects may occur in the infants of women who eat large quantities of fish contaminated with PCBs. These effects are discussed in the following Child Health Considerations section. In studies of animals that consumed fish with PCB levels similar to those in some fish from Waukegan Harbor and Lake Michigan, researchers have observed immunological depression and more serious reproductive effects. PCBs can decrease reproductive success in animals, but human studies of these effects have been less clear (ATSDR 2000).

For anglers in the Waukegan area, the greatest risk for adverse health effects are for people who regularly eat PCB-contaminated fish from the harbor itself. The risk should decrease with fish obtained at increasing distances from the harbor. Future residential development of the harbor could increase the number of potential anglers and the frequency with which they fish in the harbor. Therefore, human exposure could increase, unless PCB concentrations in fish decrease.

Child Health Considerations

Subtle neurological effects may occur in the infants of women who eat large quantities of fish contaminated with PCBs. Health effects have included decreased reflexes, motor immaturity, and lower psychomotor scores in children between 6 months and 2 years of age. Some of these neurological effects may persist into later childhood. In one study, statistical analyses suggested that PCBs, rather than other contaminants in the fish, caused the observed neurological effects. Results of human studies of birth weight and infant growth after maternal PCB consumption have been inconsistent (ATSDR 2000).

Conclusions

IDPH concludes that PCB contamination in some fish from Waukegan Harbor and Lake Michigan could harm people's health. Future residential development of harbor property could result in increased fishing of the harbor. This would increase the potential human exposure to PCBs in fish, unless PCB concentrations in fish in the harbor decrease. Following the recommendations for Lake Michigan in the Illinois Fish Advisory will reduce the risk of adverse health effects for those persons who eat fish caught in Waukegan Harbor.

Contaminated sediments of Waukegan Harbor pose no public health hazard because they are covered by 14 to 20 feet of water, and direct human exposure would not occur. These sediments are likely the primary source of the PCBs that bioaccumulate in the food chain, especially fish, found in the Waukegan Harbor area. Any future remediation of the remaining PCB contamination in Waukegan Harbor sediments should lead to a decrease in fish PCB concentrations and less human exposure to PCBs.

Recommendations

IDPH makes the following recommendations for the OMC/Waukegan Harbor site:

- Monitoring of PCB levels in fish in and around Waukegan Harbor should continue. The state of Illinois will continue to sample and monitor fish in Waukegan Harbor as part of the fish advisory program.

- People eating fish from Lake Michigan should follow the fish advisories of the state of Illinois for the maximum amounts, species, and sizes to be consumed, as well as the method of preparation. A copy of the Illinois Fishing Information guide can be obtained by calling the Illinois Department of Natural Resources at 217-782-6424 or accessing the following website: http://www.idph.state.il.us/envhealth/factsheets/fishadv.htm

- Now that USEPA has established a protective PCB cleanup level of 1 ppm for Waukegan Harbor sediments, they should finalize and implement a cleanup remedy to achieve this protective cleanup level.

Public Health Action Plan

IDPH, as part of the Illinois Fish Contaminant Monitoring Program, will annually evaluate fish samples data from Waukegan Harbor and will adjust fish advisories accordingly. When the new housing on the harbor property is completed, IDPH will provide individuals in the area with health education information explaining the PCB contamination in the area and the Illinois Fish Advisory. These materials will be provided in English and in other languages, as appropriate.

Preparer of Report

Thomas A. Baughman, Ph.D.
Environmental Toxicologist
Illinois Department of Public Health

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Appendix I. Example calculations of hazard quotient and theoretical cancer risk

Assumptions:
1. Health Protection Value = 0.05 ug PCB/kg/day (Great Lakes Sport Fish Advisory Task Force 1993)
2. Average meal = 227 g (1/2 lb) uncooked fish (Great Lakes Sport Fish Advisory Task Force 1993)
3. Representative target consumer is a 70 kg adult
4. Five advisory groups - meal rates = unrestricted (225/yr); 1/wk; 1/mo; 6/yr; none)
5. Assume skinning/trimming/cooking reduces residues 50% from raw, skin-on filet used to assess PCB residue level.

Calculation of Maximum Daily PCB Ingestion When Following Advisory
0.05 ug/kg/day X 70 kg body weight = 3.5 ug PCB/day. The goal of the advisory is to keep the sport fish associated dietary PCB ingestion below 3.5 ug PCB per day.

Advisory Calculations
Group 1
For unrestricted consumption or up to 225 meals/year (140 g sport fish/day)
3.5 ug/day PCB / 140 g/day fish / .5 (cleaning reduction)
0.05 ppm PCB in raw fish filet

Group 2
For consumption up to one meal a week (32 g sport fish/day)
3.5 ug/day PCB / 32 g/day fish / .5 (cleaning reduction)
0.22 ppm PCB in raw fish filet

Group 3
For consumption up to 1 meal per month (7.4 g sport fish/day)
3.5 ug/day PCB / 7.4 g/day fish / .5 (cleaning reduction)
0.95 ppm PCB in raw fish filet

Group 4
For vacationer consumption up to 6 meals/yr (3.7 g sport fish/day)
3.5 ug/day PCB / 3.7 g/day fish / .5 (cleaning reduction)
1.89 ppm PCB in raw fish filet

Group 5
Do not eat
Greater than 1.89 ppm PCB in raw fish filet

Model Advisory Groupings
Placement of fish species/size classes into consumption advice groups based upon fish tissue concentration of PCB.

Group 1
(Unrestricted Consumption)
raw fish filet with
0 - 0.05 ppm PCB

Group 2
(1 meal/week - 52 meals/year)
raw fish filet with
0.06 - 0.2 ppm PCB

Group 3
(1 meal/month- 12 meals/year)
raw fish filet with
0.21 - 1.0 ppm PCB

Group 4
(6 meals/year)
raw fish filet with
1.1 - 1.9 ppm PCB

Group 5
(No consumption)
raw fish filet with
> 1.9 ppm PCB

Table 1. PCB Concentrations in Fish of Waukegan Harbor, sampled June 14, 2004 to June 22, 2005.

Fish	Average PCB Concentration (ppm)	Range of PCB Concentrations (ppm)
Carp	1.13	0.28-2.0
Sunfish	0.28	N.D.-0.49
Largemouth Bass	0.48	0.48
White Sucker	0.26	0.20-0.31

ppm = parts per million.
N.D. = not detected.

Table 2. Public Health Implications of PCBs in Fish of Waukegan Harbor.

Fish	Average PCB Concentration (ppm)	Angler Type	Fish Consumption Rate (g/day)	Estimated Daily Dose of PCBs (mg/kg-day)	Minimum Risk Level (mg/kg-day)	Hazard Index (if <1, not a hazard)	Estimated Lifetime Dose of PCBs (mg/kg-day)	Estimated Cancer Risk (if >1E-4, low increased risk)
Carp	1.13	Average Recreational	8	1.3E-4	2.2E-5	5.9	5.5E-5	1E-4
	1.13	95th Percentile Recreational	25	4.0E-4	2.2E-5	18	1.7E-4	3E-4
	1.13	Average Subsistence	70	1.1E-3	2.2E-5	50	4.8E-3	1E-3
	1.13	95th Percentile Subsistence	170	2.7E-3	2.2E-5	120	1.2E-3	2E-3
Sunfish	0.28	Average Recreational	8	3.2E-5	2.2E-5	1.5	1.4E-5	3E-5
	0.28	95th Percentile Recreational	25	1E-4	2.2E-5	4.5	4.3E-5	1E-4
	0.28	Average Subsistence	70	2.8E-4	2.2E-5	13	1.2E-4	2E-4
	0.28	95th Percentile Subsistence	170	6.8E-4	2.2E-5	31	2.9E-4	6E-4

ppm = parts per million.
< = less than.
g/d = grams of fish eaten per day.
mg/kg-day = milligrams of chemical per kilogram of body weight per day.
Estimated lifetime dose assumes consumption of fish from Waukegan Harbor for 30 years.

Table 2. Public Health Implications of PCBs in Fish of Waukegan Harbor.

Fish	Average PCB Concentration (ppm)	Angler Type	Fish Consumption Rate (g/day)	Estimated Dose of PCBs (mg/kg-day)	Minimum Risk Level (mg/kg-day)	Hazard Index (if <1, not a hazard)	Estimated Lifetime Dose of PCBs (mg/kg-day)	Estimated Cancer Risk (if >1E-4, low increased risk)
Largemouth Bass	0.48	Average Recreational	8	5.5E-5	2.2E-5	2.5	2.4E-5	5E-5
	0.48	95th Percentile Recreational	25	1.7E-4	2.2E-5	7.7	7.3E-5	1E-4
	0.48	Average Subsistence	70	4.8E-4	2.2E-5	22	2.1E-4	4E-4
	0.48	95th Percentile Subsistence	170	1.2E-3	2.2E-5	55	5.0E-4	1E-3
White Sucker	0.26	Average Recreational	8	3.0E-5	2.2E-5	1.4	1.3E-5	3E-5
	0.26	95th Percentile Recreational	25	9.3E-5	2.2E-5	4.2	4.0E-5	8E-5
	0.26	Average Subsistence	70	2.6E-4	2.2E-5	12	1.1E-4	2E-4
	0.26	95th Percentile Subsistence	170	6.3E-4	2.2E-5	29	2.7E-4	5E-4

ppm = parts per million.
< = less than.
g/d = grams of fish eaten per day.
mg/kg-day = milligrams of chemical per kilogram of body weight per day.
Recreation angler = fishing for pleasure or competition.
Subsistence angler = fishing for survival.
Estimated lifetime dose assumes consumption of fish from Waukegan Harbor for 30 years.
Only one largemouth bass greater than 21 inches may be legally kept per day.

Attachment 2

Comparison Values Used In Screening Contaminants for Further Evaluation

Environmental media evaluation guides (EMEGs) are developed for chemicals on the basis of their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive populations and are not action levels, but rather comparison values. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Reference dose media evaluation guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Cancer risk evaluation guides (CREGs) are estimated contaminant concentrations that are based on a probability of 1 excess cancer in 1 million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.

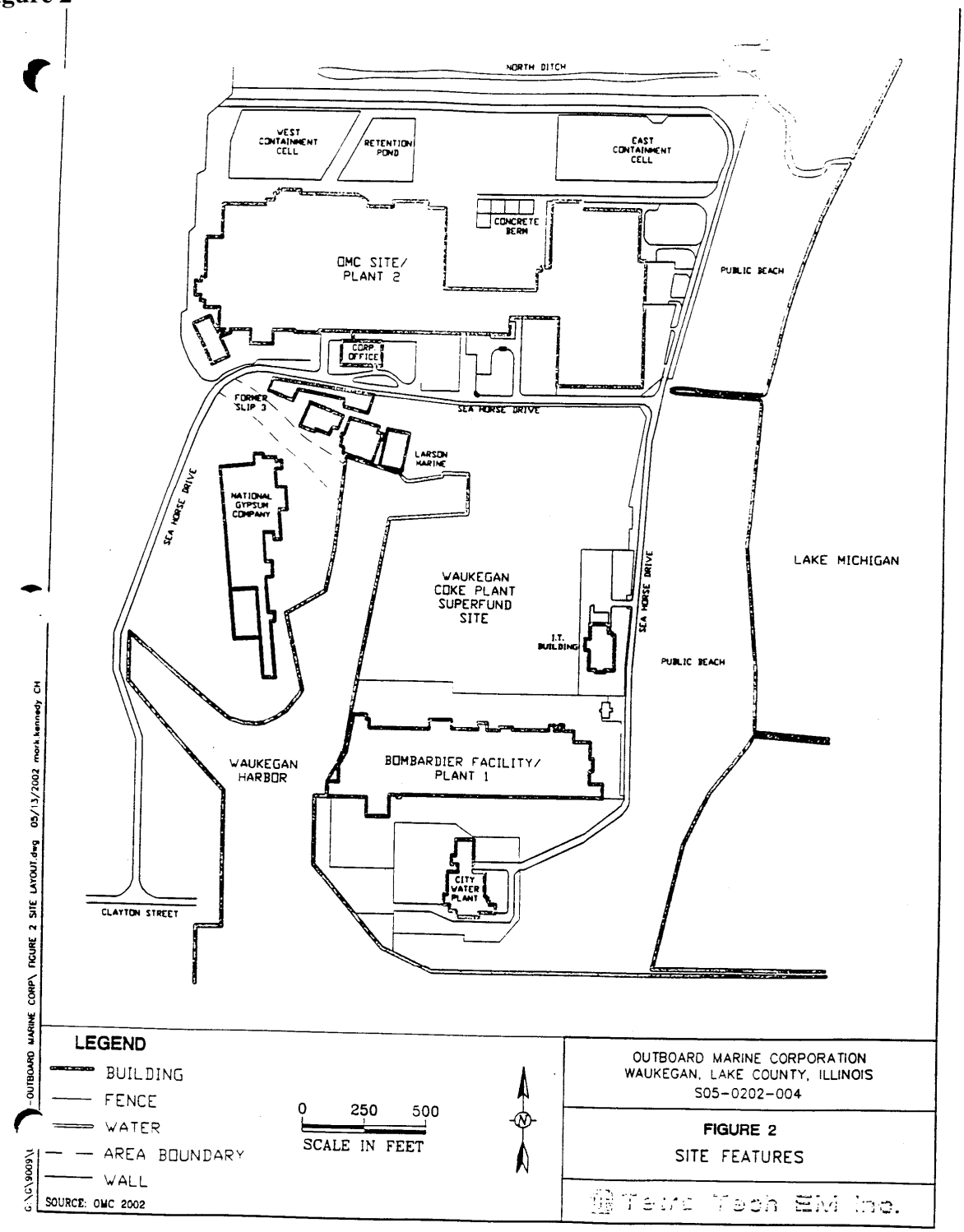
Maximum contaminant levels (MCLs) have been established by USEPA for public water supplies to reduce the chances of adverse health effects from contaminated drinking water. These standards are well below levels for which health effects have been observed and take into account the financial feasibility of achieving specific contaminant levels. These are enforceable limits that public water supplies must meet.

Lifetime health advisories for drinking water (LTHAs) have been established by USEPA for drinking water and are the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects over a lifetime of exposure. These are conservative values that incorporate a margin of safety.

Figure 1

WAUKEGAN
HARBOR
Lake
Michigan
Country
Club
Beech Ave
Burris Ave
Sunset Ave
Ryan Rd
N Delany Rd
Clearview Ct
Atlantic Ave
N Green Bay Rd
W Florida Ave
W Clearview Ave
W Keith Ave
Peppertree Ln
Delaware Rd
Kellogg Ave
N Lewis Ave
Western Ave
Walnut St
Golf Rd
N Sheridan Rd
E Greenwood Ave
Grove Ave
Lee Ave
W Lee Ave
W Grove Ave
Judge Pl
W Pacific Ave
W Glen Flora Ave
Amstutz Expy
Chittenden
W Crescent Ave
Grandville Ave
W Grandville Ave
Grandview Ave
W Ridgeland Ave
Garden Pl
Massena Ave
Harrison Pl
Waverly Pl
Pershing Rd
Grand Ave
Gurnee
Edwards St
4th St
E Sea Horse Dr
University Ave
Woodlawn Ave
Spaulding Corners
Lydia St
Paul St
Cory Ave
Kenwood Ave
Julian St
Blackstone Ave
Harper Ave
Magnolia Ave
Leith Ave
Brookside Ave
W Monroe St
Mill Ct
Baldwin Ave
Dunlay Ct
Waukegan
Washington St
S Sheridan Rd
McGaw Park
W Water St
Tower Ct
Old Skokie Rd
Teske Blvd
Susan Cir E
Laurel Ave
Bluff St
Melrose Ave
Lucia Ave
Skyle Dr
S Green Bay Rd
Dodge Ave
Belvidere St
Jen Ave
Cornell Ave
S Lewis Ave
Glen Ct
S Genesee St
Market St
Belvidere Rd
Park City
Cummings Ave
Wilson
8th Pky
8th St
9th Pky
9th St
10th St
11th St
S Waukegan Rd
12th St
S Elder Ln
13th St
Jackson St
Park Ave
Sheridan Rd
Casimer Pulaski Dr
14th St
Abbott
Laboratories
McGaw
Park
15th St
16th St
Abbott Park
A19
46
41
22
27
132
A22
W29
72
43
120
13
137

Figure 2



(USEPA 2002c)

REPORT PREPARATION

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

Authors
Tom Baughman
Health Assessor
Illinois Department of Public Health

Jon Pressley
Health Assessor
Illinois Department of Public Health

State Reviewers
Ken Runkle
University of Illinois at Springfield

Cary Ware
Health Assessor
Illinois Department of Public Health

ATSDR Reviewers
Charisse Walcott
APPLETREE Program
ATSDR/DCHI/Western Branch

Alan Yarbrough
APPLETREE Program Coordinator
ATSDR/DCHI

Richard Gillig
Central Branch Chief
ATSDR/DCHI

Lynn Wilder
Assistant Director for Science
ATSDR/DCHI

Tina Forrester
Division Director (Acting)
ATSDR/DCHI